## Contents

**SCons API Documentation**

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SCons API Documentation

Attention!

This is the internal API Documentation for SCons (aka “everything”). It is generated automatically from code docstrings using the Sphinx documentation generator.

Any missing/incomplete information is due to shortcomings in the docstrings in the code. To not be too flippant about it, filling in all the docstrings has not always been a priority across the two-plus decades SCons has been in existence (contributions on this front are welcomed). Additionally, for SCons classes which inherit from Python standard library classes (such as UserList, UserDict, UserString), the generated pages will show methods that are inherited, sometimes with no information at all, sometimes with a signature/description that seems mangled: Python upstream has similar limitations as to the quality of docstrings vs the current standards Sphinx expects. Inherited interfaces from outside SCons code can be identified by the lack of a [source] button to the right of the method signature.

If you are looking for the Public API - the interfaces that have long-term consistency guarantees, which you can reliably use when writing a build system for a project - see the SCons Reference Manual. Note that what is Public API and what is not is not clearly delineated in these API Docs.

The target audience is both developers contributing to SCons itself, and those writing external Tools, Builders, and other related functionality for their project, who may need to reach beyond the Public API to accomplish their tasks. Reaching into internals is fine, but comes with the usual risks of “things here could change, it’s up to you to keep your code working”.

SCons package

Module contents

Subpackages

SCons.Node package

Module contents

The Node package for the SCons software construction utility.

This is, in many ways, the heart of SCons.

A Node is where we encapsulate all of the dependency information about any thing that SCons can build, or about any thing which SCons can use to build some other thing. The canonical “thing,” of course, is a file, but a Node can also represent something remote (like a web page) or something completely abstract (like an Alias).

Each specific type of “thing” is specifically represented by a subclass of the Node base class: Node.FS.File for files, Node.Alias for aliases, etc. Dependency information is kept here in the base class, and information specific to files/aliases/etc. is in the subclass. The goal, if we’ve done this correctly, is that any type of “thing” should be able to depend on any other type of “thing.”

SCons.Node.Annotate (node) → None
class SCons.Node.BuildInfoBase
Bases: object
The generic base class for build information for a Node.
This is what gets stored in a .sconsign file for each target file. It contains a Nodelnfo instance for this node (signature information that’s specific to the type of Node) and direct attributes for the generic build stuff we have to track: sources, explicit dependencies, implicit dependencies, and action information.
__getstate__() 
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

__setstate__(state) → None
Restore the attributes from a pickled state.

bact
bactsig
bdepends
bdependsigs
bimplicit
bimplicitssigs
bsources
bsourcesigs
current_version_id = 2
merge(other) → None
Merge the fields of another object into this object. Already existing information is overwritten by the other instance's data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.

class SCons.Node.Node
Bases: object
The base Node class, for entities that we know how to build, or use to build other Nodes.
class Attr
Bases: object
shared
BuildInfo
    alias of BuildInfoBase
Decider(function) → None
GetTag(key)
    Return a user-defined tag.
NodeInfo
    alias of NodeInfoBase
Tag(key, value) → None
    Add a user-defined tag.
    _add_child(collection, set, child) → None
    Adds 'child' to 'collection', first checking 'set' to see if it’s already present.
    _children_get ()
    _children_reset () → None
    _func_exists
    _func_get_contents
    _func_is_derived
    _func_rexists
    _func_target_from_source
    _get_scanner(env, initial_scanner, root_node_scanner, kw)
    _memo
    _specific_sources
    _tags
add_dependency(depend)
    Adds dependencies.
add_ignore(depend)
    Adds dependencies to ignore.
add_prerequisite(prerequisite) → None
    Adds prerequisites
add_source(source)
    Adds sources.
add_to_implicit(deps) → None
add_to_waiting_parents(node) → int
Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)

```python
add_to_waiting_s_e(node) → None
add_wkid(wkid) → None
```

Add a node to the list of kids waiting to be evaluated

```python
all_children(scan: int = 1)
```

Return a list of all the node’s direct children.

```python
alter_targets()
```

Return a list of alternate targets for this Node.

```python
always_build
attributes
binfo
build(**kw)
```

Actually build the node.

This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

```python
builder
```

builder_set(builder) → None

```python
built() → None
```

Called just after this node is successfully built.

```python
cached
changed(node=None, allowcache: bool = False)
```

Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.

Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.

The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().

@see: FS.File.changed(), FS.File.release_target_info()

```python
changed_since_last_build
check_attributes(name)
```

Simple API to check if the node.attributes for name has been set

```python
children(scan: int = 1)
```

Return a list of the node’s direct children, minus those that are ignored by this node.

```python
children_are_up_to_date() → bool
```

Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.


```python
clear() → None
```

Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).

```python
clear_memoized_values() → None
del_binfo() → None
depends
depends_set
disambiguate(must_exist=None)
```

```python
env
```

env_set(env, safe: bool = False) → None

```python
executor
```

This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

```python
```

Builder
```
executor_cleanup () \rightarrow None
Let the executor clean up any cached information.
exists () \rightarrow bool
Reports whether node exists.
explain ()
Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the \_str\_() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of \_str\_() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.

get_abspath ()
Return an absolute path to the Node. This will return simply \_str\_(Node) by default, but for Node types that have a concept of relative path, this might return something different.

get_binfo ()
Fetch a node’s build information.

node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature
This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.

get_build_env ()
Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
Return the set builder, or a specified default value

get_cachedir_csig ()
get_contents ()
Fetch the contents of the entry.

get_csig ()
get_env ()

get_env_scanner (env, kw={})

get_executor (create: int = 1) \rightarrow Executor
Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)
Return the scanned include lines (implicit dependencies) found in this node.
The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})
Return a list of implicit dependencies for this node.
This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.

get_ninfo ()

get_source_scanner (node)
Fetch the source scanner for the specified node
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()
Fetch the stored implicit dependencies

get_stored_info ()

get_string (for_signature)
This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature
argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.

Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()

This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix () \to str

get_target_scanner ()

has_builder () \to bool

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ... "). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () \to bool

Return whether this Node has an explicit builder.

This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes
is_conftest () \to bool

Returns true if this node is a conftest node

is_derived () \to bool

Returns true if this node is derived (i.e. built).

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () \to bool

Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () \to bool

Returns true if this node is an sconscript

is_up_to_date () \to bool

Default check for whether the Node is current: unknown Node subtypes are always out of date, so they will always get built.

linked

make_ready () \to None

Get a Node ready for evaluation.

This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () \to bool

multiple_side_effect_has_builder () \to bool

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
postprocess () → None
  Clean up anything we don’t need to hang onto after we’ve been built.
precious
prepare ()
  Prepare for this Node to be built.
  This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually
  calling the method to build the Node.
  This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes
  the BuildInfo structure that will hold the information about how this node is, uh, built.
  (The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets
  built by a specific action.)
  Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that
  subclass methods should call this base class method to get the child check and the BuildInfo structure.
prerequisites
pseudo
push_to_cache () → bool
  Try to push a node into a cache
ref_count
release_target_info () → None
  Called just after this node has been marked up-to-date or was built completely.
  This is where we try to release as many target node infos as possible for clean builds and update runs, in order to
  minimize the overall memory consumption.
  By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much
  how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.
  @see: built() and File.release_target_info()
remove ()
  Remove this Node: no-op by default.
render_include_tree ()
  Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.
reset_executor () → None
  Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
  Try to retrieve the node’s content from a cache
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
  stuff in built().
  Returns true if the node was successfully retrieved.
rexists ()
  Does this node exist locally or in a repository?
scan () → None
  Scan this node’s dependents for implicit dependencies.
scanner_key ()
select_scanner (scanner)
  Selects a scanner for this Node.
  This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use
  their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) → None
  Set the Node’s always_build value.
set_executor (executor: Executor) → None
  Set the action executor for this node.
set_explicit (is_explicit) → None
set_nocache (nocache: int = 1) → None
  Set the Node’s nocache value.
set_noclean (noclean: int = 1) → None
    Set the Node’s noclean value.
set_precious (precious: int = 1) → None
    Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
    Set the Node’s pseudo value.
set_specific_source (source) → None
set_state (state) → None
side_effect
side_effects
sources
sources_set
state
store_info
visited () → None
    Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids
class SCons.Node.NodeInfoBase
    Bases: object
    The generic base class for signature information for a Node.
    Node subclasses should subclass NodeInfoBase to provide their own logic for dealing with their own Node-specific signature information.
    __getstate__() → None
        Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a ‘__dict__’ slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.
    __setstate__(state) → None
        Restore the attributes from a pickled state. The version is discarded.
convert (node, val) → None
    current_version_id = 2
format (field_list=None, names: int = 0) → None
merge (other) → None
    Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s data. WARNING: If a ‘__dict__’ slot is added, it should be updated instead of replaced.
update (node) → None
class SCons.Node.NodeList (initlist=None)
    Bases: UserList
    _abc_impl = <abc._abc_data object>
append (item)
    S.append(value) – append value to the end of the sequence
clear () → None -- remove all items from S
copy ()
count (value) → integer -- return number of occurrences of value
extend (other)
    S.extend(iterable) – extend sequence by appending elements from the iterable
index (value[, start[, stop]]) → integer -- return first index of value.
    Raises ValueError if the value is not present.
    Supporting start and stop arguments is optional, but recommended.
insert (i, item)
    S.insert(index, value) – insert value before index
pop ([, index]) → item -- remove and return item at index (default last).
    Raise IndexError if list is empty or index is out of range.
remove (item)
S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse()
S.reverse() – reverse IN PLACE

sort(*args, **kwds)

class SCons.Node.Walker (node, kids_func=<function get_children>, cycle_func=<function ignore_cycle>, eval_func=<function do_nothing>)

Bases: object
An iterator for walking a Node tree.
This is depth-first, children are visited before the parent. The Walker object can be initialized with any node, and returns the next node on the descent with each get_next() call. get the children of a node instead of calling ‘children’.
‘cycle_func’ is an optional function that will be called when a cycle is detected.
This class does not get caught in node cycles caused, for example, by C header file include loops.

get_next()
Return the next node for this walk of the tree.

This function is intentionally iterative, not recursive, to sidestep any issues of stack size limitations.
is_done() → bool

SCons.Node.changed_since_last_build_alias (node, target, prev_ni, repo_node=None) → bool
SCons.Node.changed_since_last_build_entry (node, target, prev_ni, repo_node=None) → bool
SCons.Node.changed_since_last_build_node (node, target, prev_ni, repo_node=None) → bool
Must be overridden in a specific subclass to return True if this Node (a dependency) has changed since the last time it was used to build the specified target. prev_ni is this Node’s state (for example, its file timestamp, length, maybe content signature) as of the last time the target was built.
Note that this method is called through the dependency, not the target, because a dependency Node must be able to
use its own logic to decide if it changed. For example, File Nodes need to obey if we’re configured to use timestamps, but Python Value Nodes never use timestamps and always use the content. If this method were called through the target, then each Node’s implementation of this method would have to have more complicated logic to handle all the different Node types on which it might depend.
SCons.Node.changed_since_last_build_python (node, target, prev_ni, repo_node=None) → bool
SCons.Node.changed_since_last_build_state_changed (node, target, prev_ni, repo_node=None) → bool
SCons.Node.classname (obj)
SCons.Node.decide_source (node, target, prev_ni, repo_node=None) → bool
SCons.Node.decide_target (node, target, prev_ni, repo_node=None) → bool
SCons.Node.do_nothing (node, parent) → None
SCons.Node.do_nothing_node (node) → None
SCons.Node.exists_always (node) → bool
SCons.Node.exists_base (node) → bool
SCons.Node.exists_entry (node) → bool
Return if the Entry exists. Check the file system to see what we should turn into first. Assume a file if there’s no
directory.
SCons.Node.exists_file (node) → bool
SCons.Node.exists_none (node) → bool
SCons.Node.get_children (node, parent)
SCons.Node.get_contents_dir (node)
Return content signatures and names of all our children separated by new-lines. Ensure that the nodes are sorted.
SCons.Node.get_contents_entry (node)
Fetch the contents of the entry. Returns the exact binary contents of the file.
SCons.Node.get_contents_file (node)
SCons.Node.get_contents_node (node)
SCons.Node.get_contents_none (node)
SCons.Node.ignore_cycle (node, stack) → None
SCons.Node.is_derived_node (node) → bool
Returns true if this node is derived (i.e. built).
SCons.Node.is_derived_node (node)
SCons.Node.reexists_base (node)
SCons.Node.reexists_node (node)
SCons.Node.reexists_none (node)
SCons.Node.store_info_file (node) → None
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SCons.Node.store_info_pass (node) → None
SCons.Node.target_from_source_base (node, prefix, suffix, splitext)
SCons.Node.target_from_source_none (node, prefix, suffix, splitext)

Submodules

SCons.Node.Alias module

Alias nodes.

This creates a hash of global Aliases (dummy targets).

class SCons.Node.Alias.Alias (name)
    Bases: Node
class Attrs
    Bases: object
    shared
BuildInfo
    alias of AliasBuildInfo
Decider (function) → None
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of AliasNodeInfo
Tag (key, value) → None
    Add a user-defined tag.
    _add_child (collection, set, child) → None
        Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
    _children_get ()
    _childrenReset () → None
    _func_exists
    _func_get_contents
    _func_is_derived
    _func_rexists
    _func_target_from_source
    _get_scanner (env, initial_scanner, root_node_scanner, kw)
    _memo
    _specific_sources
    _tags
    add_dependency (depend)
        Adds dependencies.
    addIgnore (depend)
        Adds dependencies to ignore.
    add_prerequisite (prerequisites) → None
        Adds prerequisites
    add_source (source)
        Adds sources.
    add_to_implicit (deps) → None
    add_to_waiting_parents (node) → int
        Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)
    add_to_waiting_s_e (node) → None
    add_wkid (wkid) → None
        Add a node to the list of kids waiting to be evaluated
    all_children (scan: int = 1)
        Return a list of all the node’s direct children.
    alter_targets ()
Return a list of alternate targets for this Node.
always_build
attributes
binfo
build () → None
   A “builder” for aliases.
builder
builder_set (builder) → None
built () → None
   Called just after this node is successfully built.
cached
changed (node=None, allowcache: bool = False)
   Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to
compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in
a Repository) can be used instead.
   Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we
detected any difference, but we now rely on checking every dependency to make sure that any necessary Node
information (for example, the content signature of an #included .h file) is updated.
The allowcache option was added for supporting the early release of the executor/builder structures, right after a
File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like
this, the executor isn’t needed any longer for subsequent calls to changed().
@see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
   Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
   Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
   Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
   up-to-date, too.
clear () → None
   Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
   integration builds).
clear_memoized_values () → None
convert () → None
del_binfo () → None
   Delete the build info from this node.
depends
depends_set
disambiguate (must_exist=None)
env
env_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
   Let the executor clean up any cached information.
exists () → bool
   Reports whether node exists.
explain ()
for_signature ()
   Return a string representation of the Node that will always be the same for this particular Node, no matter what.
   This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
   purpose of this method is to generate a value to be used in signature calculation for the command line used to
   build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
   return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
   not change.
get_abspath ()
    Return an absolute path to the Node. This will return simply str(Node) by default, but for Node types that have a
    concept of relative path, this might return something different.

get_binfo ()
    Fetch a node's build information.
    node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
    build signature
    This no longer handles the recursive descent of the node's children's signatures. We expect that they're already
    built and updated by someone else, if that's what's wanted.

get_build_env ()
    Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
    Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
    Return the set builder, or a specified default value

get_cachedir_csig ()

get_contents ()
    The contents of an alias is the concatenation of the content signatures of all its sources.

get_csig ()
    Generate a node's content signature, the digested signature of its content.
    node - the node cache - alternate node to use for the signature cache returns - the content signature

get_env ()

get_env_scanner (env, kw={})

get_executor (create: int = 1) → Executor
    Fetch the action executor for this node. Create one if there isn't already one, and requested to do so.

get_found_includes (env, scanner, path)
    Return the scanned include lines (implicit dependencies) found in this node.
    The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be
    scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})
    Return a list of implicit dependencies for this node.
    This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the
    scanner, if the scanner's recursive flag says that we should.

get_ninfo ()

get_source_scanner (node)
    Fetch the source scanner for the specified node
    NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
    Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
    This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()
    Fetch the stored implicit dependencies

get_stored_info ()

get_string (for_signature)
    This is a convenience function designed primarily to be used in command generators (i.e.,
    CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature
    argument that is nonzero if the command generator is being called to generate a signature for the command line,
    which determines if we should rebuild or not.
    Such command generators should use this method in preference to str(Node) when converting a Node to a string,
    passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly,
    depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
    This method is expected to return an object that will function exactly like this Node, except that it implements any
    additional special features that we would like to be in effect for Environment variable substitution. The principle use
    is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a
tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to
return self if no new functionality is needed for Environment substitution.

gget_suffix () → str
gget_target_scanner ()
has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if
node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
__len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
slowing things down immensely.

has_explicit_builder () → bool
Return whether this Node has an explicit builder.
This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an
explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes

is_conftest () → bool
Returns true if this node is a conftest node

isDerived () → bool
Returns true if this node is derived (i.e. built).
This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should
contribute their build signatures when they are used as source files to other derived files. For example: source with
source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () → bool
Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool

is_under (dir) → bool
is_up_to_date () → bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
up-to-date, too.

linked
make_ready () → None
Get a Node ready for evaluation.
This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a
Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool
multipleSide_effect_has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if
node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
__len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
slowing things down immensely.

new_binfo ()
new_ninfo ()
ninfo
nocache
neclean
postprocess () → None
Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare ()
  Prepare for this Node to be built.
  This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually
calling the method to build the Node.
  This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes
the BuildInfo structure that will hold the information about how this node is, uh, built.
  (The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets
built by a specific action.)
  Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that
subclass methods should call this base class method to get the child check and the BuildInfo structure.
prerequisites
pseudo
push_to_cache () \rightarrow bool
  Try to push a node into a cache
really_build (**kw)
  Actually build the node.
  This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the
prepare() method has gotten everything, uh, prepared.
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
stuff in built().
ref_count
release_target_info () \rightarrow None
  Called just after this node has been marked up-to-date or was built completely.
  This is where we try to release as many target node infos as possible for clean builds and update runs, in order to
minimize the overall memory consumption.
  By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much
how many KBytes a Node actually requires...as long as we free the memory shortly afterwards.
@see: built() and File.release_target_info()
remove ()
  Remove this Node: no-op by default.
render_include_tree ()
  Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.
reset_executor () \rightarrow None
  Remove cached executor; forces recompute when needed.
retrieve_from_cache () \rightarrow bool
  Try to retrieve the node’s content from a cache
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
stuff in built().
  Returns true if the node was successfully retrieved.
rexists ()
  Does this node exist locally or in a repository?
scan () \rightarrow None
  Scan this node’s dependents for implicit dependencies.
scanner_key ()
  An Alias is not recorded in .sconsign files
select_scanner (scanner)
  Selects a scanner for this Node.
  This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use
their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) \rightarrow None
  Set the Node’s always_build value.
set_executor (executor: Executor) \rightarrow None
  Set the action executor for this node.
set_explicit (is_explicit) \rightarrow None
set_nocache (nocache: int = 1) \rightarrow None
Set the Node’s nocache value.

```python
set_noclean(noclean: int = 1) -> None
```

Set the Node’s noclean value.

```python
set_precious(precious: int = 1) -> None
```

Set the Node’s precious value.

```python
set_pseudo(pseudo: bool = True) -> None
```

Set the Node’s pseudo value.

```python
set_specific_source(source) -> None
```

Set the Node’s specific source.

```python
set_state(state) -> None
```

Set the Node’s state.

```python
class SCons.Node.Alias.AliasBuildInfo
Bases: BuildInfoBase
__getstate__() -> None
  Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.
__setstate__(state) -> None
  Restore the attributes from a pickled state.
```

```python
class SCons.Node.Alias.AliasNameSpace (dict=None, **kwargs)
Bases: UserDict
Alias (name, **kw)
  _abc_impl = <_abc._abc_data object>
clear () -> None. Remove all items from D.
copy ()
classmethod fromkeys (iterable, value=None)
get (k[, d]) -> D[k] if k in D, else d. d defaults to None.
items () -> a set-like object providing a view on D’s items
keys () -> a set-like object providing a view on D’s keys
lookup (name, **kw)
pop (k[, d]) -> v, remove specified key and return the corresponding value.
  If key is not found, d is returned if given, otherwise KeyError is raised.
popitem () -> (k, v), remove and return some (key, value) pair
```

Called just after this node has been visited (with or without a build).
as a 2-tuple; but raise KeyError if D is empty.

setdefault (k[, d]) → D.get(k,d), also set D[k]=d if k not in D
update ([, E], **F) → None. Update D from mapping/iterable E and F.

If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v

values () → an object providing a view on D's values


Bases: NodeInfoBase

_getstate__ ()
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a ‘__dict__’ slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

_setstate__ (state) → None
Restore the attributes from a pickled state. The version is discarded.

convert (node, val) → None
csig
current_version_id = 2
field_list = ['csig']
format (field_list=None, names: int = 0)
merge (other) → None

Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s data. WARNING: If a ‘__dict__’ slot is added, it should be updated instead of replaced.

str_to_node (s)
update (node) → None

SCons.Node.FS module

These Nodes represent the canonical external objects that people think of when they think of building software: files and directories.

This holds a “default_fs” variable that should be initialized with an FS that can be used by scripts or modules looking for the canonical default.

class SCons.Node.FS.Base (name, directory, fs)

Bases: Node
A generic class for file system entries. This class is for when we don’t know yet whether the entry being looked up is a file or a directory. Instances of this class can morph into either Dir or File objects by a later, more precise lookup.

Note: this class does not define __cmp__ and __hash__ for efficiency reasons. SCons does a lot of comparing of Node.FS.{Base,Entry,File,Dir} objects, so those operations must be as fast as possible, which means we want to use Python’s built-in object identity comparisons.

class Attrs

Bases: object
shared
BuildInfo
alias of BuildInfoBase
Decider (function) → None
GetTag (key)
Return a user-defined tag.

NodeInfo
alias of NodeInfoBase
RDdirs (pathlist)
Search for a list of directories in the Repository list.

Rfindalldirs (pathlist)
Return all of the directories for a given path list, including corresponding “backing” directories in any repositories.
The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up the same path for each target in a given directory.

Tag (key, value) → None
Add a user-defined tag.

__getattr__(attr)

Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘tpath’, ‘suffix’ and ‘path_elements’. These Node attributes used to be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is only called as fallback when the requested attribute can’t be found, so there should be no speed performance penalty involved for standard builds.

__lt__(other)

less than operator used by sorting on py3

__str__() → str

A Node.FS.Base object’s string representation is its path name.

_abspath

_add_child(collection, set, child) → None

Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.

_children_get()

_children_reset() → None

_func_exists

_func_get_contents

_func_is_derived

_func_rexists

_func_sconsign

_func_target_from_source

_get_scanner(env, initial_scanner, root_node_scanner, kw)

_get_str()

_glob1(pattern, ondisk: bool = True, source: bool = False, strings: bool = False)

_labspath

_local

_memo

_path

_path_elements

_proxy

_save_str() → None

_specific_sources

_tags

_tpath

add_dependency(depend)

 Adds dependencies.

add_ignore(depend)

 Adds dependencies to ignore.

add_prerequisite(prerequisite) → None

 Adds prerequisites.

add_source(source)

 Adds sources.

add_to_implicit(deps) → None

add_to_waiting_parents(node) → int

 Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)

add_to_waiting_s_e(node) → None

add_wkid(wkid) → None

 Add a node to the list of kids waiting to be evaluated

all_children(scan: int = 1)

 Return a list of all the node’s direct children.
alter_targets ()
   Return a list of alternate targets for this Node.
always_build
attributes
binfo
build (**kw)
   Actually build the node.
   This is called by the Taskmaster after it's decided that the Node is out-of-date and must be rebuilt, and after
   the prepare() method has gotten everything, uh, prepared.
   This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
   stuff in built().
builder
builder_set (builder) → None
build () → None
   Called just after this node is successfully built.
cached
changed (node=None, allowcache: bool = False)
   Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to
   compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in
   a Repository) can be used instead.
   Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we
   detected any difference, but we now rely on checking every dependency to make sure that any necessary Node
   information (for example, the content signature of an #included .h file) is updated.
   The allowcache option was added for supporting the early release of the executor/builder structures, right after a
   File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like
   this, the executor isn’t needed any longer for subsequent calls to changed().
   @see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
   Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
   Return a list of the node's direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
   Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
   up-to-date, too.
clear () → None
   Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
   integration builds).
clear_memoized_values () → None
cwd
del_binfo () → None
   Delete the build info from this node.
depends
depends_set
dir
disambiguate (must_exist=None)
duplicate
e env
   env_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
   Let the executor clean up any cached information.
exists ()
   Reports whether node exists.
explain ()
for_signature ()
Return a string representation of the Node that will always be the same for this particular Node, no matter what.
This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
purpose of this method is to generate a value to be used in signature calculation for the command line used to
build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
not change.

fs
Reference to parent Node.FS object

get_abspath ()
Get the absolute path of the file.

get_binfo ()
Fetch a node’s build information.

node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
build signature

This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already
built and updated by someone else, if that’s what’s wanted.

get_build_env ()
Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
Return the set builder, or a specified default value

get_cachedir_csig ()

get_contents ()
Fetch the contents of the entry.

gcig ()

g_dir ()

g_env ()

g_env_scanner (env, kw={})

get_executor (create: int = 1) → Executor
Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)
Return the scanned include lines (implicit dependencies) found in this node.

The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be
scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})
Return a list of implicit dependencies for this node.

This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the
scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()

get_labspath ()
Get the absolute path of the file.

g_ninfo ()

get_path (dir=None)
Return path relative to the current working directory of the Node.FS.Base object that owns us.

g_path_elements ()

get_relpfind ()
Get the path of the file relative to the root SConstruct file’s directory.

get_source_scanner (node)
Fetch the source scanner for the specified node

NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()
Fetch the stored implicit dependencies

get_stored_info()

get_string(for_signature)

This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.

Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy()

This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kll performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix()

get_target_scanner()

get_tpath()

gmtime()

getsize()

has_builder() → bool

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder() → bool

Return whether this Node has an explicit builder.

This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore

ignore_set

implicit

implicit_set

includes

is_conftest() → bool

Returns true if this node is a conftest node

is_derived() → bool

Returns true if this node is derived (i.e. built).

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit

is_literal() → bool

Always pass the string representation of a Node to the command interpreter literally.

is_sconscript() → bool

Returns true if this node is an sconscript

is_under(dir) → bool

is_up_to_date() → bool

Default check for whether the Node is current: unknown Node subtypes are always out of date, so they will always get built.

isdir() → bool

isfile() → bool

islink() → bool

linked
lstat ()
make_ready () → None
    Get a Node ready for evaluation.
    This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a
    Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.
missing () → bool
multiple_side_effect_has_builder () → bool
    Return whether this Node has a builder or not.
    In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if
    node.builder: …"). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
    __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
    slowing things down immensely.
must_be_same (klass)
    This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.
name
new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
postprocess () → None
    Clean up anything we don’t need to hang onto after we’ve been built.
precious
prepare ()
    Prepare for this Node to be built.
    This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually
calling the method to build the Node.
    This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes
the BuildInfo structure that will hold the information about how this node is, uh, built.
    (The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets
built by a specific action.)
    Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that
subclass methods should call this base class method to get the child check and the BuildInfo structure.
prerequisites
pseudo
push_to_cache () → bool
    Try to push a node into a cache
ref_count
release_target_info () → None
    Called just after this node has been marked up-to-date or was built completely.
    This is where we try to release as many target node infos as possible for clean builds and update runs, in order to
minimize the overall memory consumption.
    By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much
how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.
    @see: built() and File.release_target_info()
remove ()
    Remove this Node: no-op by default.
render_include_tree ()
    Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.
rentry ()
reset_executor () → None
    Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
    Try to retrieve the node’s content from a cache
    This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
stuff in built().
Returns true if the node was successfully retrieved.
rexists ()

Does this node exist locally or in a repository?
rfile ()

rstr () → str
A Node.FS.Base object's string representation is its path name.
sbuilder

scan () → None
Scan this node's dependents for implicit dependencies.
scanner_key ()

select_scanner (scanner)
Selects a scanner for this Node.

This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use
their own Scanner and don't select one the Scanner.Selector that's configured for the target.

set_always_build (always_build: int = 1) → None
Set the Node's always_build value.

set_executor (executor: Executor) → None
Set the action executor for this node.

set_explicit (is_explicit) → None

set_local () → None

set_nocache (nocache: int = 1) → None
Set the Node's nocache value.

set_noclean (noclean: int = 1) → None
Set the Node's noclean value.

set_precious (precious: int = 1) → None
Set the Node's precious value.

set_pseudo (pseudo: bool = True) → None
Set the Node's pseudo value.

set_specific_source (source) → None

set_src_builder (builder) → None
Set the source code builder for this node.

set_state (state) → None

side_effect
side_effects

sources

sources_set

src_builder ()
Fetch the source code builder for this node.

If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value
from its parent directory, and so on up to the file system root).

srcnode ()
If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourself.

stat ()

state

store_info

str_for_display ()
target_from_source (prefix, suffix, splitext=<function splitext>)
Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
Note that this method can be overridden dynamically for generated files that need different behavior. See
Tool/swig.py for an example.

target_peers

visited () → None
Called just after this node has been visited (with or without a build).

waiting_parents

waiting_s_e

wkids
class SCons.Node.FS.Dir(name, directory, fs)
Bases: Base
A class for directories in a file system.
class Attrs
Bases: object
shared
BuildInfo
    alias of DirBuildInfo
Decider(function) → None
Dir(name, create: bool = True)
    Looks up or creates a directory node named ‘name’ relative to this directory.
Entry(name)
    Looks up or creates an entry node named ‘name’ relative to this directory.
File(name)
    Looks up or creates a file node named ‘name’ relative to this directory.
GetTag(key)
    Return a user-defined tag.
NodeInfo
    alias of DirNodeInfo
RDirs(pathlist)
    Search for a list of directories in the Repository list.
Rfindalldirs(pathlist)
    Return all of the directories for a given path list, including corresponding “backing” directories in any repositories.
    The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up
    the same path for each target in a given directory.
Tag(key, value) → None
    Add a user-defined tag.
__Rfindalldirs_key(pathlist)
__clearRepositoryCache(duplicate=None) → None
    Called when we change the repository(ies) for a directory. This clears any cached information that is invalidated by
    changing the repository.
__getattr__(attr)
    Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for
    the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘ppath’, ‘suffix’ and ‘path_elements’. These Node attributes used to
    be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single
    variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and
    SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is
    only called as fallback when the requested attribute can’t be found, so there should be no speed performance
    penalty involved for standard builds.
__lt__(other)
    less than operator used by sorting on py3
__resetDuplicate(node) → None
__str__() → str
    A Node.FS.Base object’s string representation is its path name.
__abspath
__add_child(collection, set, child) → None
    Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
__children_get()
__children_reset() → None
__create()
    Create this directory, silently and without worrying about whether the builder is the default or not.
_func_exists
_func_get_contents
_func_is_derived
_func_rexists
_func_sconsign
_func_target_from_source
_get_scanner (env, initial_scanner, root_node_scanner, kw)
_get_str ()
_glob1 (pattern, ondisk: bool = True, source: bool = False, strings: bool = False)
Globs for and returns a list of entry names matching a single pattern in this directory.
This searches any repositories and source directories for corresponding entries and returns a Node (or string)
relative to the current directory if an entry is found anywhere.
TODO: handle pattern with no wildcard. Python’s glob.glob uses a separate _glob0 function to do this.
_labspath
_local
_memo
_morph () → None
Turn a file system Node (either a freshly initialized directory object or a separate Entry object) into a proper
directory object.
Set up this directory’s entries and hook it into the file system tree. Specify that directories (this Node) don’t use
signatures for calculating whether they’re current.
_path
_path_elements
_proxy
_rel_path_key (other)
_save_str ()
_sconsign
_specific_sources
_scdir_find_file_key (filename)
_tags
_tpath
addRepository (dir) → None
add_dependency (depend) → None
Adds dependencies.
add_ignore (depend) → None
Adds dependencies to ignore.
add_prerequisite (prerequisite) → None
Adds prerequisites.
add_source (source) → None
Adds sources.
add_to_implicit (deps) → None
add_to_waiting_parents (node) → int
Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note
that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up”
this function by using True and False instead…)
add_to_waiting_s_e (node) → None
add_wkid (wkid) → None
Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
Return a list of all the node’s direct children.
alter_targets ()
Return any corresponding targets in a variant directory.
always_build
attributes
binfo
build (**kw) → None
A null “builder” for directories.
builder
builder_set (builder) → None
built () → None
Called just after this node is successfully built.
cached
cachedir_csigin
cachesign

changed(node=None, allowcache: bool = False)
Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.
Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.
The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().
@see: FS.File.changed(), FS.File.release_target_info()

changed_since_last_build
check_attributes(name)
  Simple API to check if the node.attributes for name has been set
children(scan: int = 1)
  Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date() -> bool
  Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.
clear() -> None
  Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).
clear_memoized_values() -> None
contentsig
cwd
del_binfo() -> None
  Delete the build info from this node.
depends
depends_set
dir
dir_on_disk(name)
dirname
disambiguate(must_exist=None)
diskcheck_match() -> None
do_duplicate(src) -> None
duplicate
entries
entry_abspath(name)
entry_exists_on_disk(name)
  Searches through the file/dir entries of the current directory, and returns True if a physical entry with the given name could be found.
  @see rentry_exists_on_disk
entry_labspath(name)
entry_path(name)
entry_tpath(name)
env
eval_set(env, safe: bool = False) -> None
executor
executor_cleanup() -> None
  Let the executor clean up any cached information.
exists()
  Reports whether node exists.
explain ()

file_on_disk (name)

for_signature ()

Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.

fs

Reference to parent Node.FS object

getRepositories ()

Returns a list of repositories for this directory.

get_abspath () → str

Get the absolute path of the file.

get_all_rdirs ()

get_binfo ()

Fetch a node’s build information.

node - the node whose sources will be collected

cache - alternate node to use for the signature cache

returns - the build signature

This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.

get_build_env ()

Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)

Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)

Return the set builder, or a specified default value

get_cachedir_csig ()

get_contents ()

Return content signatures and names of all our children separated by new-lines. Ensure that the nodes are sorted.

get_csig ()

Compute the content signature for Directory nodes. In general, this is not needed and the content signature is not stored in the DirNodeInfo. However, if get_contents on a Dir node is called which has a child directory, the child directory should return the hash of its contents.

get_dir ()

get_env ()

get_env_scanner (env, kw={})

get_executor (create: int = 1) → Executor

Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)

Return this directory’s implicit dependencies.

We don’t bother caching the results because the scan typically shouldn’t be requested more than once (as opposed to scanning .h file contents, which can be requested as many times as the files is #included by other files).

getImplicit_deps (env, initial_scanner, path_func, kw={})

Return a list of implicit dependencies for this node.

This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()

get_labspath () → str

Get the absolute path of the file.

get_ninfo ()

get_path (dir=None)

Return path relative to the current working directory of the Node.FS.Base object that owns us.
get_relpath ()
Get the path of the file relative to the root SConstruct file's directory.

get_source_scanner (node)
Fetch the source scanner for the specified node
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()
get_stored_implicit ()
Fetch the stored implicit dependencies

get_stored_info ()
get_string (for_signature)
This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.
Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix ()
get_target_scanner ()
get_text_contents ()
We already emit things in text, so just return the binary version.

get_timestamp () → int
Return the latest timestamp from among our children

glob ( pathname, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None ) → list
Returns a list of Nodes (or strings) matching a pathname pattern.
Pathname patterns follow POSIX shell syntax:

* matches everything
? matches any single character
[seq] matches any character in seq (ranges allowed)
[!seq] matches any char not in seq

The wildcard characters can be escaped by enclosing in brackets. A leading dot is not matched by a wildcard, and needs to be explicitly included in the pattern to be matched. Matches also do not span directory separators.
The matches take into account Repositories, returning a local Node if a corresponding entry exists in a Repository (either an in-memory Node or something on disk).
The underlying algorithm is adapted from a rather old version of glob.glob() function in the Python standard library (heavily modified), and uses fnmatch.fnmatch() under the covers.
This is the internal implementation of the external Glob API.
### Parameters:

- **pattern** – pathname pattern to match.
- **ondisk** – if false, restricts matches to in-memory Nodes. By default, matches entries that exist on-disk in addition to in-memory Nodes.
- **source** – if true, corresponding source Nodes are returned if globbing in a variant directory. The default behavior is to return Nodes local to the variant directory.
- **strings** – if true, returns the matches as strings instead of Nodes. The strings are path names relative to this directory.
- **exclude** – if not None, must be a pattern or a list of patterns following the same POSIX shell semantics. Elements matching at least one pattern from *exclude* will be excluded from the result.

```python
has_builder() -> bool
```

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a *lot* more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling `__getattr__` for both the `__len__` and `__bool__` attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

```python
has_explicit_builder() -> bool
```

Return whether this Node has an explicit builder.

This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore

```python
ignore_set
```

implicit

```python
implicit_set
```

includes

```python
is_conftest() -> bool
```

Returns true if this node is a conftest node

```python
is-derived() -> bool
```

Returns true if this node is derived (i.e. built).

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

```python
is_explicit
```

```python
is_literal() -> bool
```

Always pass the string representation of a Node to the command interpreter literally.

```python
is_sconscript() -> bool
```

Returns true if this node is an sconscript

```python
is_under(dir) -> bool
```

is_up_to_date() -> bool

If any child is not up-to-date, then this directory isn’t, either.

```python
isdir() -> bool
```

```python
isfile() -> bool
```

```python
islink() -> bool
```

```python
link(srcdir, duplicate) -> None
```

Set this directory as the variant directory for the supplied source directory.

```python
linked
```

```python
lstat() -> None
```

get a Node ready for evaluation.

This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

```python
make_ready() -> None
```

missing() -> bool

```python
multiple_side_effect_has_builder() -> None
```


Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

must_be_same(klass)

This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.

name
new_binfo ()
new_ninfo ()
ninfo
nocache
clean
on_disk_entries
postprocess () → None

Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare () → None

Prepare for this Node to be built.

This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.

This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.

(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)

Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites
pseudo
push_to_cache () → bool

Try to push a node into a cache

rdir ()
ref_count
rel_path (other)

Return a path to “other” relative to this directory.

release_target_info () → None

Called just after this node has been marked up-to-date or was built completely.

This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires...as long as we free the memory shortly afterwards.

@see: built() and File.release_target_info()

released_target_info
remove ()

Remove this Node: no-op by default.

render_include_tree ()

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

render ()
rentry_exists_on_disk (name)

Searches through the file/dir entries of the current and all its remote directories (repos), and returns True if a physical entry with the given name could be found. The local directory (self) gets searched first, so repositories take a lower precedence regarding the searching order.

@see entry_exists_on_disk

repositories
reset_executor () → None

Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
    Try to retrieve the node’s content from a cache
    This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
    Returns true if the node was successfully retrieved.
rexists ()
    Does this node exist locally or in a repository?
rlen ()
    root
rstr () → str
    A Node.FS.Base object’s string representation is its path name.
sbuilder
scan () → None
    Scan this node’s dependents for implicit dependencies.
snscanner ()
    A directory does not get scanned.
snscanner_paths
sconsign ()
    Return the .sconsign file info for this directory.
ssearched
select_scanner (scanner)
    Selects a scanner for this Node.
    This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) → None
    Set the Node’s always_build value.
set_executor (executor: Executor) → None
    Set the action executor for this node.
set_explicit (is_explicit) → None
set_local () → None
set_nocache (nocache: int = 1) → None
    Set the Node’s nocache value.
set_noclean (noclean: int = 1) → None
    Set the Node’s noclean value.
set_precious (precious: int = 1) → None
    Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
    Set the Node’s pseudo value.
set_specific_source (source) → None
set_src_builder (builder) → None
    Set the source code builder for this node.
set_state (state) → None
side_effect
side_effects
sources
sources_set
src_builder ()
    Fetch the source code builder for this node.
    If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value from its parent directory, and so on up to the file system root).
srcdir
srcdir_duplicate (name)
srcdir_find_file (filename)
srcdir_list ()
srcnode ()
    Dir has a special need for srcnode()...if we have a srcdir attribute set, then that is our srcnode.
Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix. Note that this method can be overridden dynamically for generated files that need different behavior. See Tool/swig.py for an example.

target_peers
up ()

variant_dirs
visited () → None
Called just after this node has been visited (with or without a build).

waitingParents
waiting_s_e

walk (func, arg) → None
Walk this directory tree by calling the specified function for each directory in the tree. This behaves like the os.path.walk() function, but for in-memory Node.FS.Dir objects. The function takes the same arguments as the functions passed to os.path.walk():

    func(arg, dirname, fnames)

Except that “dirname” will actually be the directory Node, not the string. The ‘.’ and ‘..’ entries are excluded from fnames. The fnames list may be modified in-place to filter the subdirectories visited or otherwise impose a specific order. The “arg” argument is always passed to func() and may be used in any way (or ignored, passing None is common).

wkids

class SCons.Node.FS.DirBuildInfo
Bases: BuildInfoBase

__getstate__() → None
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

__setstate__(state) → None
Restore the attributes from a pickled state.

bact
bactsig
bdepends
bdependssigs
bimplicit
bimplicitsigs
bsources
bsourcesigs
current_version_id = 2
merge (other) → None
Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.

class SCons.Node.FS.DirNodeInfo
Bases: NodeInfoBase

__getstate__() → None
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

__setstate__(state) → None
Restore the attributes from a pickled state. The version is discarded.

convert (node, val) → None
current_version_id = 2
format (field_list=Node, names: int = 0)
fs = None
merge(other) → None
    Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s
data. WARNING: If a ‘__dict__’ slot is added, it should be updated instead of replaced.
str_to_node(s)
update(node) → None
class SCons.Node.FS.DiskChecker(disk_check_type, do_check_function, ignore_check_function)
    Bases: object
    Implement disk check variation.
    This Class will hold functions to determine what this particular disk checking implementation should do when enabled
    or disabled.
    enable(disk_check_type_list) → None
        If the current object’s disk_check_type matches any in the list passed :param disk_check_type_list: List of disk
        checks to enable :return:
class SCons.Node.FS.Entry(name, directory, fs)
    Bases: Base
    This is the class for generic Node.FS entries—that is, things that could be a File or a Dir, but we’re just not sure yet.
    Consequently, the methods in this class really exist just to transform their associated object into the right class when
    the time comes, and then call the same-named method in the transformed class.
class Attr
    Bases: object
    shared
    BuildInfo
        alias of BuildInfoBase
    Decider(function) → None
    GetTag(key)
        Return a user-defined tag.
    NodeInfo
        alias of NodeInfoBase
    RDirs(pathlist)
        Search for a list of directories in the Repository list.
    Rfindalldirs(pathlist)
        Return all of the directories for a given path list, including corresponding “backing” directories in any repositories.
        The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up
        the same path for each target in a given directory.
    Tag(key, value) → None
        Add a user-defined tag.
    _Rfindalldirs_key(pathlist)
    __getattr__(attr)
        Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for
        the Node attributes ‘abspath’, ‘l abspath’, ‘path’, ‘tpath’, ‘suffix’ and ‘path_elements’. These Node attributes used to
        be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single
        variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and
        SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is
        only called as fallback when the requested attribute can’t be found, so there should be no speed performance
        penalty involved for standard builds.
    __lt__(other)
        less than operator used by sorting on py3
    __str__() → str
        A Node.FS.Base object’s string representation is its path name.
    _abspath
    _add_child(collection, set, child) → None
        Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
    _children_get()
    _children_reset() → None
    _func_exists
SCons API Documentation

```python
_func_get_contents
_func_is_derived
_func_rexists
_func_sconsign
_func_target_from_source
_get_scanner(env, initial_scanner, root_node_scanner, kw)
_get_str()
_glob1(pattern, ondisk: bool = True, source: bool = False, strings: bool = False)
_labspath
_local
_memo
_path
_path_elements
_proxy
_save_str()
_sconsign
_specific_sources
_tags
_tpath
add_dependency(depend)
  Adds dependencies.
add_ignore(depend)
  Adds dependencies to ignore.
add_prerequisite(prerequisite) → None
  Adds prerequisites
add_source(source)
  Adds sources.
add_to_implicit(deps) → None
add_to_waiting_parents(node) → int
  Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note
  that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up”
  this function by using True and False instead…)
add_to_waiting_s_e(node) → None
add_wkid(wkid) → None
  Add a node to the list of kids waiting to be evaluated
all_children(scan: int = 1)
  Return a list of all the node’s direct children.
alter_targets()
  Return a list of alternate targets for this Node.
always_build
attributes
binfo
build(**kw)
  Actually build the node.
  This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the
  prepare() method has gotten everything, uh, prepared.
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
  stuff in built().
builder
builder_set(builder) → None
built() → None
  Called just after this node is successfully built.
cached
cachedir_csigen
cachesig
changed(node=None, allowcache: bool = False)
```
Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.

Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.

The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().

@see: FS.File.changed(), FS.File.release_target_info()

**changed_since_last_build**

**check_attributes (name)**

Simple API to check if the node attributes for `name` has been set

**children (scan: int = 1)**

Return a list of the node’s direct children, minus those that are ignored by this node.

**children_are_up_to_date () → bool**

Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.


**clear () → None**

Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).

**clear_memoized_values () → None**

**contentsig**

**cwd**

**del_binfo () → None**

Delete the build info from this node.

**depends**

**depends_set**

**dir**

**dirname**

**disambiguate (must_exist= None)**

**diskcheck_match () → None**

**duplicate**

**entries**

**env**

**env_set (env, safe: bool = False) → None**

**executor**

**executor_cleanup () → None**

Let the executor clean up any cached information.

**exists ()**

**explain ()**

**for_signature ()**

Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.

**fs**

Reference to parent Node.FS object

**get_abspath ()**

Get the absolute path of the file.

**get_binfo ()**

Fetch a node’s build information.
node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature

This no longer handles the recursive descent of the node's children's signatures. We expect that they're already built and updated by someone else, if that's what's wanted.

get_build_env ()
    Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
    Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
    Return the set builder, or a specified default value

get_cachedir_csig ()
get_contents ()
    Fetch the contents of the entry. Returns the exact binary contents of the file.

get_csig ()
get_dir ()
get_env ()
get_env_scanner (env, kw={})
get_executor (create: int = 1) → Executor

Fetch the action executor for this node. Create one if there isn't already one, and requested to do so.

get_found_includes (env, scanner, path)
    Return the scanned include lines (implicit dependencies) found in this node.

The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})
    Return a list of implicit dependencies for this node.

This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner's recursive flag says that we should.

get_internal_path ()
get_labspath ()
    Get the absolute path of the file.

get_ninfo ()
get_path (dir=None)
    Return path relative to the current working directory of the Node.FS.Base object that owns us.

get_path_elements ()
get_relpath ()
    Get the path of the file relative to the root SConstruct file's directory.

get_source_scanner (node)
    Fetch the source scanner for the specified node

NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
    Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
    This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()
get_stored_implicit ()
    Fetch the stored implicit dependencies

get_stored_info ()
get_string (for_signature)
    This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.
    Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
    This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use
is that some Nodes would like to implement a \_getattr\_() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

```python
get_suffix()
get_target_scanner()
get_text_contents() \rightarrow \text{str}
```

Fetch the decoded text contents of a Unicode encoded Entry.

Since this should return the text contents from the file system, we check to see into what sort of subclass we should morph this Entry.

```python
get_tpath()
gmtime()
getsize()
```

```python
has_builder() \rightarrow \text{bool}
```

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ... "). When the builder attribute is examined directly, it ends up calling \_getattr\_ for both the \_len\_ and \_bool\_ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

```python
has_explicit_builder() \rightarrow \text{bool}
```

Return whether this Node has an explicit builder.

This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

```python
ignore
ignore_set
implicit
implicit_set
includes
```

```python
is\_conftest() \rightarrow \text{bool}
```

Returns true if this node is an conftest node

```python
is\_derived() \rightarrow \text{bool}
```

Returns true if this node is derived (i.e. built).

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

```python
is\_explicit
```

```python
is\_literal() \rightarrow \text{bool}
```

Always pass the string representation of a Node to the command interpreter literally.

```python
is\_sconscript() \rightarrow \text{bool}
```

Returns true if this node is an sconscript

```python
is\_under(dir) \rightarrow \text{bool}
```

```python
is\_up\_to\_date() \rightarrow \text{bool}
```

Default check for whether the Node is current: unknown Node subtypes are always out of date, so they will always get built.

```python
isdir() \rightarrow \text{bool}
isfile() \rightarrow \text{bool}
islink() \rightarrow \text{bool}
linked
```

```python
lstat()
make\_ready() \rightarrow \text{None}
```

Get a Node ready for evaluation.

This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

```python
missing() \rightarrow \text{bool}
multiple\_side\_effect\_has\_builder() \rightarrow \text{bool}
```

Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

Called to make sure a Node is a Dir. Since we’re an Entry, we can morph into one.

name
new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
on_disk_entries
postprocess () → None

Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare ()

Prepare for this Node to be built.

This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.

This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.

(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)

Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites
pseudo
push_to_cache () → bool

Try to push a node into a cache

ref_count
rel_path (other)
release_target_info () → None

Called just after this node has been marked up-to-date or was built completely.

This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.

@see: built() and File.release_target_info()

released_target_info
remove ()

Remove this Node: no-op by default.

render_include_tree ()

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

rentry ()
repositories
reset_executor () → None

Remove cached executor; forces recompute when needed.

retrieve_from_cache () → bool

Try to retrieve the node’s content from a cache

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

Returns true if the node was successfully retrieved.

rexists ()

Does this node exist locally or in a repository?

rfile ()
We’re a generic Entry, but the caller is actually looking for a File at this point, so morph into one.

A Node.FS.Base object’s string representation is its path name.

Scan this node’s dependents for implicit dependencies.

Selects a scanner for this Node.

This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

Set the Node’s always_build value.

Set the action executor for this node.

Set the Node’s nocache value.

Set the Node’s noclean value.

Set the Node’s precious value.

Set the Node’s pseudo value.

Set the source code builder for this node.

Set state (state) → None

Fetch the source code builder for this node.

If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value from its parent directory, and so on up to the file system root).

If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourself.

Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix. Note that this method can be overridden dynamically for generated files that need different behavior. See Tool/swig.py for an example.
SCons API Documentation

```python
waiting_s_e
wkids
class SCons.Node.FS.EntryProxy (subject)
    Bases: Proxy
    __get_abspath ()
    __get_base_path ()
        Return the file’s directory and file name, with the suffix stripped.
    __get_dir ()
    __get_file ()
    __get_filebase ()
    __get_posix_path ()
        Return the path with / as the path separator, regardless of platform.
    __get_relp ath ()
    __get_rsrcdir ()
        Returns the directory containing the source node linked to this node via VariantDir(), or the directory of this node if not linked.
    __get_rsrcnode ()
    __get_s rcdir ()
        Returns the directory containing the source node linked to this node via VariantDir(), or the directory of this node if not linked.
    __get_s rcdir ()
    __get_suffix ()
    __get_windows_path ()
        Return the path with as the path separator, regardless of platform.

dictSpecialAttrs = {'abspath': <function EntryProxy.__get_abspath>, 'base': <function EntryProxy.__get_base_path>, 'dir': <function EntryProxy.__get_dir>, 'file': <function EntryProxy.__get_file>, 'filebase': <function EntryProxy.__get_filebase>, 'posix': <function EntryProxy.__get_posix_path>, 'relpath': <function EntryProxy.__get_relp ath>, 'rsrcdir': <function EntryProxy.__get_rsrcdir>, 'rsrcnode': <function EntryProxy.__get_rsrcnode>, 'srcdir': <function EntryProxy.__get_srcdir>, 'srcpath': <function EntryProxy.__get_srcpath>, 'windows': <function EntryProxy.__get_windows_path>

get ()
    Retrieve the entire wrapped object

exception SCons.Node.FS.EntryProxyAttributeError (entry_proxy, attribute)
    Bases: AttributeError
    An AttributeError subclass for recording and displaying the name of the underlying Entry involved in an AttributeError exception.
    add_note ()
        Exception.add_note(note) – add a note to the exception
    args
    name
    attribute name
    obj
        object
    with_traceback ()
        Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

class SCons.Node.FS.FS (path=None)
    Bases: LocalFS
    Dir (name, directory=None, create: bool = True)
        Look up or create a Dir node with the specified name. If the name is a relative path (begins with ./, ../, or a file name), then it is looked up relative to the supplied directory node, or to the top level directory of the FS (supplied at construction time) if no directory is supplied.
        This method will raise TypeError if a normal file is found at the specified path.
    Entry (name, directory=None, create: bool = True)
```

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Look up or create a generic Entry node with the specified name. If the name is a relative path (begins with ./, ../, or a file name), then it is looked up relative to the supplied directory node, or to the top level directory of the FS (supplied at construction time) if no directory is supplied.

File (name, directory=None, create: bool = True)
Look up or create a File node with the specified name. If the name is a relative path (begins with ./, ../, or a file name), then it is looked up relative to the supplied directory node, or to the top level directory of the FS (supplied at construction time) if no directory is supplied.
This method will raise TypeError if a directory is found at the specified path.

Glob (pathname, ondisk: bool = True, source: bool = True, strings: bool = False, exclude=None, cwd=None)
Globs
This is mainly a shim layer

PyPackageDir (modulename) → Dir | None
Locate the directory of Python module modulename.
For example 'SCons' might resolve to Windows: C:Python311Libsite-packagesSCons Linux:
/usr/lib64/python3.11/site-packages/SCons
Can be used to determine a toolpath based on a Python module name.
This is the backend called by the public API function PyPackageDir().

Repository (*dirs) → None
Specify Repository directories to search.

VariantDir (variant_dir, src_dir, duplicate: int = 1)
Link the supplied variant directory to the source directory for purposes of building files.

_lookup (p, directory, fsclass, create: bool = True)
The generic entry point for Node lookup with user-supplied data.
This translates arbitrary input into a canonical Node.FS object of the specified fsclass. The general approach for strings is to turn it into a fully normalized absolute path and then call the root directory’s lookup_abs() method for the heavy lifting.
If the path name begins with ‘#’, it is unconditionally interpreted relative to the top-level directory of this FS. ‘#’ is treated as a synonym for the top-level SConstruct directory, much like ‘~’ is treated as a synonym for the user’s home directory in a UNIX shell. So both ‘#foo’ and ‘#/foo’ refer to the ‘foo’ subdirectory underneath the top-level SConstruct directory.
If the path name is relative, then the path is looked up relative to the specified directory, or the current directory (self._cwd, typically the SConscript directory) if the specified directory is None.

_chdir (dir, change_os_dir: bool = False)
Change the current working directory for lookups. If change_os_dir is true, we will also change the “real” cwd to match.

_chmod (path, mode)
copy (src, dst)
copy2 (src, dst)
exists (path)
get_max_drift ()
get_root (drive)
Returns the root directory for the specified drive, creating it if necessary.

getcwd ()
getmtime (path)
getsize (path)
isdir (path) → bool
isfile (path) → bool
islink (path) → bool
link (src, dst)
listdir (path)
lstat (path)
makedirs (path, mode: int = 511, exist_ok: bool = False)
mkdir (path, mode: int = 511)
open (path)
readlink (file) → str
rename(old, new)
scandir(path)
set_SConstruct_dir(dir) → None
set_max_drift(max_drift) → None
stat(path)
symlink(src, dst)
unlink(path)

variant_dir_target_climb(orig, dir, tail)
  Create targets in corresponding variant directories
  Climb the directory tree, and look up path names relative to any linked variant directories we find.
  Even though this loops and walks up the tree, we don’t memoize the return value because this is really only used
to process the command-line targets.

class SCons.Node.FS.File(name, directory, fs)
Bases: Base
A class for files in a file system.
class Attrs
Bases: object
shared
BuildInfo
  alias of FileBuildInfo
Decider(function) → None
Dir(name, create: bool = True)
  Create a directory node named ‘name’ relative to the directory of this file.
Dirs(pathlist)
  Create a list of directories relative to the SConscript directory of this file.
Entry(name)
  Create an entry node named ‘name’ relative to the directory of this file.
File(name)
  Create a file node named ‘name’ relative to the directory of this file.
GetTag(key)
  Return a user-defined tag.
NodeInfo
  alias of FileNodeInfo
RDirs(pathlist)
  Search for a list of directories in the Repository list.
Rfindalldirs(pathlist)
  Return all of the directories for a given path list, including corresponding “backing” directories in any repositories.
The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up
the same path for each target in a given directory.
Tag(key, value) → None
  Add a user-defined tag.
_Rfindalldirs_key(pathlist)
__dmap_cache = {}
__dmap_sig_cache = {}
__getattr__(attr)
  Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for
the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘tpath’, ‘suffix’ and ‘path_elements’. These Node attributes used to
be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single
variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and
SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is
only called as fallback when the requested attribute can’t be found, so there should be no speed performance
penalty involved for standard builds.
__lt__(other)
less than operator used by sorting on py3
__str__() → str
A Node.FS.Base object’s string representation is its path name.
_abspath

_add_child (collection, set, child) → None
   Adds 'child' to 'collection', first checking 'set' to see if it's already present.

_add_strings_to_dependency_map (dmap)
   In the case comparing node objects isn't sufficient, we'll add the strings for the nodes to the dependency map
:return:

_build_dependency_map (binfo)
   Build mapping from file -> signature

Parameters:
   • self (self) –
   • considered (binfo - buildinfo from node being) –

Returns: dictionary of file->signature mappings

_children_get ()

_children_reset () → None

_createDir () → None

_func_exists

_func_get_contents

_func_is Derived

_func_exists

_func_sconsign

_func_target_from_source

_get_found_includes_key (env, scanner, path)

_get_previous_signatures (dmap)
   Return a list of corresponding csigs from previous build in order of the node/files in children.

Parameters:
   • self (self) –
   • csig (dmap - Dictionary of file ->) –

Returns: List of csigs for provided list of children

_get_scanner (env, initial Scanner, root_node_scanner, kw)

_get_str ()

_glob1 (pattern, ondisk: bool = True, source: bool = False, strings: bool = False)

_labspath

_local

_memo

_morph () → None
   Turn a file system node into a File object.

_path

_path_elements

_proxy

_rmv_existing ()

_save_str ()

_sconsign

_specific_sources

_tags

_tpath

add_dependency (depend)
   Adds dependencies.

add_ignore (depend)
   Adds dependencies to ignore.

add_prerequisite (prerequisite) → None
   Adds prerequisites

add_source (source)
   Adds sources.

add_to_implicit (deps) → None
add_to_waiting_parents(node) → int
   Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)

add_to_waiting_s_e(node) → None
add_wkid(wkid) → None
   Add a node to the list of kids waiting to be evaluated

all_children(scan: int = 1) → None
   Return a list of all the node’s direct children.

alter_targets() → None
   Return any corresponding targets in a variant directory.

always_build

attributes

binfo

build(**kw)
   Actually build the node.
   This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.
   This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

builder

builder_set(builder) → None
built() → None
   Called just after this File node is successfully built.
   Just like for ‘release_target_info’ we try to release some more target node attributes in order to minimize the overall memory consumption.
   @see: release_target_info

cached

cachedir_csig

cachesig

cached

changed(node=None, allowcache: bool = False) → bool
   Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built.
   For File nodes this is basically a wrapper around Node.changed(), but we allow the return value to get cached after
   the reference to the Executor got released in release_target_info().
   @see: Node.changed()

changed_content(target, prev_ni, repo_node=None) → bool

changed_since_last_build

changed_state(target, prev_ni, repo_node=None) → bool

changed_timestamp_match(target, prev_ni, repo_node=None) → bool
   Return True if the timestamps don’t match or if there is no previous timestamp.
   Information about the node from the previous build.
   :param target:
   :param prev_ni:

changed_timestamp_newer(target, prev_ni, repo_node=None) → bool

changed_timestamp_then_content(target, prev_ni, node=None) → bool
   Used when decider for file is Timestamp-MD5

NOTE: If the timestamp hasn’t changed this will skip md5’ing the
file and just copy the prev_ni provided. If the prev_ni is wrong. It will propagate it. See:
https://github.com/SCons/scons/issues/2980

Parameters:

  * dependency (self -)
  * target (target -)
  * .sconsign (prev_ni - The NodeInfo object loaded from previous builds)

Returns: Boolean - Indicates if node(File) has changed.

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check_attributes (name)
    Simple API to check if the node.attributes for name has been set

children (scan = 1)
    Return a list of the node’s direct children, minus those that are ignored by this node.

children_are_up_to_date () → bool
    Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
    up-to-date, too.


clear () → None
    Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
    integration builds).

clear_memoized_values () → None

contentsig

convert_copy_attrs = ['bsources', 'bimplicit', 'bdepends', 'bact', 'bactsig', 'ninfo']

convert_old_entry(old_entry)

convert_sig_attrs = ['bsourcesigs', 'bimplicit_sigs', 'bdependsigs']

cwd

del_binfo () → None
    Delete the build info from this node.

depends

depends_set

dir

dirname

disambiguate (must_exist=None)

diskcheck_match () → None

do_duplicate (src)
    Create a duplicate of this file from the specified source.

duplicate

directories

env

env_set (env, safe: bool = False) → None

executor

executor_cleanup () → None
    Let the executor clean up any cached information.

exists ()
    Reports whether node exists.

explain ()

find_repo_file ()
    For this node, find if there exists a corresponding file in one or more repositories: return: list of corresponding files
    in repositories

find_src_builder ()

for_signature ()
    Return a string representation of the Node that will always be the same for this particular Node, no matter what.
    This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
    purpose of this method is to generate a value to be used in signature calculation for the command line used to
    build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
    return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
    not change.

fs
    Reference to parent Node.FS object

get_abspath ()
    Get the absolute path of the file.

get_binfo ()
    Fetch a node’s build information.

node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
build signature
This no longer handles the recursive descent of the node's children's signatures. We expect that they're already built and updated by someone else, if that's what's wanted.

get_build_env ()
Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
Return the set builder, or a specified default value

get_cachedir_bsig ()
Return the signature for a cached file, including its children.
It adds the path of the cached file to the cache signature, because multiple targets built by the same action will all have the same build signature, and we have to differentiate them somehow.
Signature should normally be string of hex digits.

get_cachedir_csig ()
Fetch a Node's content signature for purposes of computing another Node’s cachesig.
This is a wrapper around the normal get_csig() method that handles the somewhat obscure case of using CacheDir with the -n option. Any files that don’t exist would normally be “built” by fetching them from the cache, but the normal get_csig() method will try to open up the local file, which doesn’t exist because the -n option meant we didn’t actually pull the file from cachedir. But since the file does actually exist in the cachedir, we can use its contents for the csig.

get_content_hash () → str
Compute and return the hash for this file.

get_contents () → bytes
Return the contents of the file as bytes.

get_contents_sig ()
A helper method for get_cachedir_bsig.
It computes and returns the signature for this node’s contents.

get_csig () → str
Generate a node's content signature.

get_dir ()

get.env ()

get_env_scanner (env, kw={})

get_executor (create: int = 1) → Executor
Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)
Return the included implicit dependencies in this file. Cache results so we only scan the file once per path regardless of how many times this information is requested.

get Implicit_deps (env, initial_scanner, path_func, kw={})
Return a list of implicit dependencies for this node.
This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()

get.labspath ()
Get the absolute path of the file.

get max_drift_csig () → str | None
Returns the content signature currently stored for this node if it’s been unmodified longer than the max_drift value, or the max_drift value is 0. Returns None otherwise.

get_ninfo ()

get_path (dir=None)
Return path relative to the current working directory of the Node.FS.Base object that owns us.

get_path_elements ()

get_relnrpath ()
Get the path of the file relative to the root SConstruct file’s directory.

get_size () → int

get_source_scanner (node)
Fetch the source scanner for the specified node.
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()
get_stored_implicit ()
   Fetch the stored implicit dependencies
get_stored_info ()
get_string (for_signature)
   This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.
   Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
   This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix ()
get_target_scanner ()
get_text_contents () → str
   Return the contents of the file as text.

get_timestamp () → int
get_tpath ()
getmtime ()
getsize ()
has_builder () → bool
   Return whether this Node has a builder or not.
   In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () → bool
   Return whether this Node has an explicit builder.
   This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

has_src_builder () → bool
   Return whether this Node has a source builder or not.
   If this Node doesn’t have an explicit source code builder, this is where we figure out, on the fly, if there’s a transparent source code builder for it.
   Note that if we found a source builder, we also set the self.builder attribute, so that all of the methods that actually build this file don’t have to do anything different.

hash_chunksize = 65536
ignore
ignore_set
implicit
implicit_set
includes
is_conftest () → bool
   Returns true if this node is a conftest node
is_derived () → bool
   Returns true if this node is derived (i.e. built).
This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () → bool
   Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
   Returns true if this node is an sconscript

is_under (dir) → bool
   Check for whether the Node is current.
   In all cases self is the target we're checking to see if it's up to date

isdir () → bool
isfile () → bool
islink () → bool
linked

lstat ()
make_ready () → None
   Get a Node ready for evaluation.
   This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool
multiple_side_effect_has_builder () → bool
   Return whether this Node has a builder or not.
   In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

must_be_same (klass)
   This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn't.

name
new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
on_disk_entries
postprocess () → None
   Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare ()
   Prepare for this file to be created.
prerequisites
pseudo
push_to_cache () → bool
   Try to push the node into a cache

ref_count
rel_path (other)
release_target_info () → None
   Called just after this node has been marked up-to-date or was built completely.
   This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

We'd like to remove a lot more attributes like self.sources and self.sources_set, but they might get used in a next build step. For example, during configuration the source files for a built E(*)o file are used to figure out which linker to use for the resulting Program (gcc vs. g++)! That's why we check for the 'keep_targetinfo' attribute, config Nodes and the Interactive mode just don't allow an early release of most variables.
In the same manner, we can’t simply remove the self.attributes here. The smart linking relies on the shared flag, and some parts of the java Tool use it to transport information about nodes…

@see: built() and Node.release_target_info()

remove ()
Remove this file.
render_include_tree ()
Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

reentry ()
repositories
reset_executor () → None
Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
Try to retrieve the node’s content from a cache
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
Returns True if the node was successfully retrieved.
rexists ()
Does this node exist locally or in a repository?
rfile ()
root
rstr ()
A Node.FS.Base object’s string representation is its path name.
sbuilder
scan () → None
Scan this node’s dependents for implicit dependencies.
scanner_key ()
scanner_paths
searched
select_scanner (scanner)
Selects a scanner for this Node.
This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

set_always_build (always_build: int = 1) → None
Set the Node’s always_build value.
set_executor (executor: Executor) → None
Set the action executor for this node.
set_explicit (is_explicit) → None
set_local () → None
set_nocache (nocache: int = 1) → None
Set the Node’s nocache value.
set_nochange (nochange: int = 1) → None
Set the Node’s nochange value.
set_precious (precious: int = 1) → None
Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
Set the Node’s pseudo value.
set_specific_source (source) → None
set_src_builder (builder) → None
Set the source code builder for this node.
set_state (state) → None
side_effect
side_effects
sources
sources_set
src_builder ()
Fetch the source code builder for this node.
If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value from its parent directory, and so on up to the file system root).

```
srcdir
srcnode ()

If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourself.

stat ()
state
store_info
str_for_display ()
```

target_from_source (prefix, suffix, splitext=<function splitext>)}
Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix. Note that this method can be overridden dynamically for generated files that need different behavior. See Tool/swig.py for an example.

target_peers
variant_dirs
visited () \rightarrow None
Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids

```
class SCons.Node.FS.FileBuildInfo
Bases: BuildInfoBase
This is info loaded from sconsign.

Attributes unique to FileBuildInfo:

dependency_map : Caches file->csig mapping
    for all dependencies. Currently this is only used when using MD5-timestamp decider. It’s used to ensure that
    we copy the correct csig from the previous build to be written to .sconsign when current build is done.
    Previously the matching of csig to file was strictly by order they appeared in bdepends, bsources, or
    bimplicit, and so a change in order or count of any of these could yield writing wrong csig, and then false
    positive rebuilds
    
    __getstate__()  
    Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a
    ‘__dict__’ slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all
    instances of a class.
    __setstate__(state) \rightarrow None
    Restore the attributes from a pickled state.
    bact
    bactsig
    bdepends
    bdependstsigs
    bimplicit
    bimlicitsigs
    bsources
    bsourcesigs
    convert_from_sconsign (dir, name) \rightarrow None
    Converts a newly-read FileBuildInfo object for in-SCons use
    For normal up-to-date checking, we don’t have any conversion to perform–but we’re leaving this method here to
    make that clear.
    convert_to_sconsign () \rightarrow None
    Converts this FileBuildInfo object for writing to a .sconsign file
    This replaces each Node in our various dependency lists with its usual string representation: relative to the
top-level SConstruct directory, or an absolute path if it’s outside.

    current_version_id = 2
    dependency_map
```
merge (other) → None
  Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s data. WARNING: If a ‘__dict__’ slot is added, it should be updated instead of replaced.
prepare_dependencies () → None
  Prepares a FileBuildInfo object for explaining what changed
  The bsources, bdepends and bimplicit lists have all been stored on disk as paths relative to the top-level SConstruct directory. Convert the strings to actual Nodes (for use by the –debug=explain code and –implicit-cache).

exception SCons.Node.FS.FileBuildInfoFileToCsigMappingError
  Bases: Exception
  add_note ()
  Exception.add_note(note) – add a note to the exception
  args
  with_traceback ()
  Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

class SCons.Node.FS.FileFinder
  Bases: object
  _find_file_key (filename, paths, verbose=None)
  filedir_lookup (p, fd=None)
    A helper method for find_file() that looks up a directory for a file we’re trying to find. This only creates the Dir Node if it exists on-disk, since if the directory doesn’t exist we know we won’t find any files in it… :-)
    It would be more compact to just use this as a nested function with a default keyword argument (see the commented-out version below), but that doesn’t work unless you have nested scopes, so we define it here just so this work under Python 1.5.2.
  find_file (filename, paths, verbose=None)
    Find a node corresponding to either a derived file or a file that exists already.
    Only the first file found is returned, and none is returned if no file is found.
    filename: A filename to find
    paths: A list of directory path nodes
    returns The node created from the found file.

class SCons.Node.FS.FileNodeInfo
  Bases: NodeInfoBase
  __getstate__ ()
    Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a ‘__dict__’ slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.
  __setstate__ (state) → None
    Restore the attributes from a pickled state. The version is discarded.
  convert (node, val) → None
  csig
  current_version_id = 2
  field_list = [‘csig’, ‘timestamp’, ‘size’]
  format (field_list=None, names: int = 0)
  fs = None
  merge (other) → None
    Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s data. WARNING: If a ‘__dict__’ slot is added, it should be updated instead of replaced.
  size
  str_to_node (s)
  timestamp
  update (node) → None

SCons.Node.FS.LinkFunc (target, source, env) → int
  Relative paths cause problems with symbolic links, so we use absolute paths, which may be a problem for people who want to move their soft-linked src-trees around. Those people should use the ‘hard-copy’ mode, softlinks cannot be used for that; at least I have no idea how ...
class SCons.Node.FS.LocalFS
    Bases: object
This class implements an abstraction layer for operations involving a local file system. Essentially, this wraps any function in the os, os.path or shutil modules that we use to actually go do anything with or to the local file system. Note that there’s a very good chance we’ll refactor this part of the architecture in some way as we really implement the interface(s) for remote file system Nodes. For example, the right architecture might be to have this be a subclass instead of a base class. Nevertheless, we’re using this as a first step in that direction.

We’re not using chdir() yet because the calling subclass method needs to use os.chdir() directly to avoid recursion. Will we really need this one?

chmod (path, mode)
copy (src, dst)
copy2 (src, dst)
exists (path)
getmtime (path)
getsize (path)
isdir (path) → bool
isfile (path) → bool
islink (path) → bool
link (src, dst)
listdir (path)
lstat (path)
makedirs (path, mode: int = 511, exist_ok: bool = False)
mkdir (path, mode: int = 511)
open (path)
readlink (file) → str
rename (old, new)
scandir (path)
stat (path)
symlink (src, dst)
unlink (path)

SCons.Node.FS.LocalString (target, source, env) → str
SCons.Node.FS.MkdirFunc (target, source, env) → int
class SCons.Node.FS.RootDir (drive, fs)
    Bases: Dir
    A class for the root directory of a file system.
    This is the same as a Dir class, except that the path separator ('/' or '') is actually part of the name, so we don’t need to add a separator when creating the path names of entries within this directory.
class Attrs
    Bases: object
    shared
BuildInfo
    alias of DirBuildInfo
Decider (function) → None
Dir (name, create: bool = True)
    Looks up or creates a directory node named ‘name’ relative to this directory.
Entry (name)
    Looks up or creates an entry node named ‘name’ relative to this directory.
File (name)
    Looks up or creates a file node named ‘name’ relative to this directory.
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of DirNodeInfo
RDirs (pathlist)
    Search for a list of directories in the Repository list.
Rfindalldirs (pathlist)
Return all of the directories for a given path list, including corresponding “backing” directories in any repositories. The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up the same path for each target in a given directory.

Tag \((key, value) \rightarrow \text{None}\)
Add a user-defined tag.

\[\text{RFindalldirs}_\text{key}(\text{pathlist})\]
\[\text{__getattr__}(\text{attr})\]

Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘tpath’, ‘suffix’ and ‘path_elements’. These Node attributes used to be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and SCons continue to work without any additional changes, fully transparent to the user. Note, that \text{__getattr__} is only called as fallback when the requested attribute can’t be found, so there should be no speed performance penalty involved for standard builds.

\[\text{If} (\text{other})\]
less than operator used by sorting on py3
\[\text{abspath}\]
\[\text{add_child}(\text{collection, set, child}) \rightarrow \text{None}\]
Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
\[\text{children_get}()\]
\[\text{children_reset()} \rightarrow \text{None}\]
\[\text{create}()\]
Create this directory, silently and without worrying about whether the builder is the default or not.
\[\text{func_exists}\]
\[\text{func_get_contents}\]
\[\text{func_is_derived}\]
\[\text{func_rexists}\]
\[\text{func_sconsign}\]
\[\text{func_target_from_source}\]
\[\text{get_scanner}(\text{env, initial_scanner, root_node_scanner, kw})\]
\[\text{get_str}()\]
\[\text{glob1}(\text{pattern, ondisk: bool = True, source: bool = False, strings: bool = False})\]
Globs for and returns a list of entry names matching a single pattern in this directory.
This searches any repositories and source directories for corresponding entries and returns a Node (or string) relative to the current directory if an entry is found anywhere.
TODO: handle pattern with no wildcard. Python’s glob.glob uses a separate \text{__glob0} function to do this.
\[\text{labspath}\]
\[\text{local}\]
\[\text{lookupDict}\]
\[\text{lookup_abs}(p, \text{klass, create: bool = True})\]
Fast (?) lookup of a \textit{normalized} absolute path.
This method is intended for use by internal lookups with already-normalized path data. For general-purpose lookups, use the FS.Entry(), FS.Dir() or FS.File() methods.
The caller is responsible for making sure we’re passed a normalized absolute path; we merely let Python’s dictionary look up and return the One True Node.FS object for the path.
If a Node for the specified “p” doesn’t already exist, and “create” is specified, the Node may be created after recursive invocation to find or create the parent directory or directories.
\[\text{memo}\]
\[\text{morph()} \rightarrow \text{None}\]
Turn a file system Node (either a freshly initialized directory object or a separate Entry object) into a proper directory object.
Set up this directory’s entries and hook it into the file system tree. Specify that directories (this Node) don’t use signatures for calculating whether they’re current.
\[\text{path}\]
\[\text{path_elements}\]
\[\text{proxy}\]
addRepository (dir) → None
add_dependency (depend)
   Adds dependencies.
add_ignore (depend)
   Adds dependencies to ignore.
add_prerequisite (prerequisite) → None
   Adds prerequisites
add_source (source)
   Adds sources.
add_to_implicit (deps) → None
add_to_waiting_parents (node) → int
   Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)
add_to_waiting_s_e (node) → None
add_wkid (wkid) → None
   Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
   Return a list of all the node’s direct children.
alter_targets ()
   Return any corresponding targets in a variant directory.
always_build
attributes
binfo
build (**kw) → None
   A null “builder” for directories.
builder
builder_set (builder) → None
built () → None
   Called just after this node is successfully built.
cached
cachedir_csigt
 cachesigt
changed (node=None, allowcache: bool = False)
   Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.
   Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.
   The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().
   @see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
   Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
Return a list of the node’s direct children, minus those that are ignored by this node.

```python
children_are_up_to_date() → bool
```

Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.


```python
clear() → None
```

Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).

```python
clear_memoized_values() → None
```

Delete the build info from this node.

```python
del_binfo() → None
```

Delete the build info from this node.

```python
dirs
```

Get the absolute path of the file.

```python
dir_on_disk(name)
dirname
disambiguate(must_exist=None)
diskcheck_match() → None
do_duplicate(src) → None
duplicate
etries
```

Searches through the file/dir entries of the current directory, and returns True if a physical entry with the given name could be found.

```python
entry_abspath(name)
entry_exists_on_disk(name)
entry_labspath(name)
entry_path(name)
entry_tpath(name)
```

```python
env
```

Get the absolute path of the file.

```python
env_set(env, safe: bool = False) → None
```

```python
executor
```

Let the executor clean up any cached information.

```python
executor_cleanup() → None
```

```python
exists() → True
```

Reports whether node exists.

```python
explain() → None
```

```python
file_on_disk(name)
```

For signature

```python
Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.
```

```python
fs
```

Reference to parent Node.FS object

```python
getRepositories() → list
```

Returns a list of repositories for this directory.

```python
get_abspath() → str
```

Get the absolute path of the file.

```python
get_all_rdirs()
```

```python
get_binfo() → None
```

Fetch a node’s build information.
node - the node whose sources will be collected
This no longer handles the recursive descent of the node's children's signatures. We expect that they're already
built and updated by someone else, if that's what's wanted.

get_build_env ()
Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
Return the set builder, or a specified default value

get_cachedir_csig ()
get_contents ()
Return content signatures and names of all our children separated by new-lines. Ensure that the nodes are sorted.

get_csig ()
Compute the content signature for Directory nodes. In general, this is not needed and the content signature is not
stored in the DirNodeInfo. However, if get_contents on a Dir node is called which has a child directory, the child
directory should return the hash of its contents.

get_dir ()
get_env ()
get_env_scanner (env, kw={})
get_executor (create: int = 1) → Executor
Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)
Return this directory’s implicit dependencies.
We don’t bother caching the results because the scan typically shouldn’t be requested more than once (as
opposed to scanning .h file contents, which can be requested as many times as the files is #included by other
files).

get_implicit_deps (env, initial_scanner, path_func, kw={})
Return a list of implicit dependencies for this node.
This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the
scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()
get_labspath () → str
Get the absolute path of the file.

get_ninfo ()
get_path (dir=None)
Return path relative to the current working directory of the Node.FS.Base object that owns us.

get_path_elements ()
get_relpath ()
Get the path of the file relative to the root SConstruct file's directory.

get_source_scanner (node)
Fetch the source scanner for the specified node
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

g_get_state ()
Fetch the stored implicit dependencies

gtored_info ()
get_string (for_signature)
This is a convenience function designed primarily to be used in command generators (i.e.,
CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature
argument that is nonzero if the command generator is being called to generate a signature for the command line,
which determines if we should rebuild or not.
Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()

This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix ()
get_target_scanner ()
get_text_contents ()

We already emit things in text, so just return the binary version.

glob (pathname, ondisk: bool = True, source: bool = False, strings: bool = False, exclude = None) → list

Returns a list of Nodes (or strings) matching a pathname pattern.
Pathname patterns follow POSIX shell syntax:

* matches everything
? matches any single character
[seq] matches any character in seq (ranges allowed)
[!seq] matches any char not in seq

The wildcard characters can be escaped by enclosing in brackets. A leading dot is not matched by a wildcard, and needs to be explicitly included in the pattern to be matched. Matches also do not span directory separators.
The matches take into account Repositories, returning a local Node if a corresponding entry exists in a Repository (either an in-memory Node or something on disk).
The underlying algorithm is adapted from a rather old version of glob.glob() function in the Python standard library (heavily modified), and uses fnmatch.fnmatch() under the covers.
This is the internal implementation of the external Glob API.

Parameters:

- **pattern** – pathname pattern to match.
- **ondisk** – if false, restricts matches to in-memory Nodes. By default, matches entries that exist on-disk in addition to in-memory Nodes.
- **source** – if true, corresponding source Nodes are returned if globbing in a variant directory. The default behavior is to return Nodes local to the variant directory.
- **strings** – if true, returns the matches as strings instead of Nodes. The strings are path names relative to this directory.
- **exclude** – if not None, must be a pattern or a list of patterns following the same POSIX shell semantics. Elements matching at least one pattern from exclude will be excluded from the result.

has_builder () → bool

Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () → bool
Return whether this Node has an explicit builder.
This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an
explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes

is_conftest () → bool
    Returns true if this node is an conftest node

is_derived () → bool
    Returns true if this node is derived (i.e. built).
    This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should
contribute their build signatures when they are used as source files to other derived files. For example: source with
source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () → bool
    Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
    Returns true if this node is an sconscript

is_under (dir) → bool
is_up_to_date () → bool
    If any child is not up-to-date, then this directory isn’t, either.

isdir () → bool
isfile () → bool
islink () → bool

link (srcdir, duplicate) → None
    Set this directory as the variant directory for the supplied source directory.

linked
lstat ()
make_ready () → None
    Get a Node ready for evaluation.
    This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a
Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool

multiple_side_effect_has_builder ()
    Return whether this Node has a builder or not.
    In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if
node.builder: …"). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
__len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
slowing things down immensely.

must_be_same (klass) → None
    This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.

name
new_binfo ()
new_ninfo ()
ninfo

nocache
noclean

on_disk_entries

path
postprocess () → None
    Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare () → None
    Prepare for this Node to be built.
This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node. This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built. (The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)

Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites

pseudo

push_to_cache () \to \text{bool}

Try to push a node into a cache

rdir ()

ref_count

rel_path (other)

Return a path to “other” relative to this directory.

release_target_info () \to \text{None}

Called just after this node has been marked up-to-date or was built completely.

This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.

@see: built() and File.release_target_info()

released_target_info

remove ()

Remove this Node: no-op by default.

render_include_tree ()

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

rentry ()

rentry_exists_on_disk (name)

Searches through the file/dir entries of the current and all its remote directories (repos), and returns True if a physical entry with the given name could be found. The local directory (self) gets searched first, so repositories take a lower precedence regarding the searching order.

@see entry_exists_on_disk

repositories

reset_executor () \to \text{None}

Remove cached executor; forces recompute when needed.

retrieve_from_cache () \to \text{bool}

Try to retrieve the node’s content from a cache

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

Returns true if the node was successfully retrieved.

rexists ()

Does this node exist locally or in a repository?

rfile ()

root

rstr () \to \text{str}

A Node.FS.Base object’s string representation is its path name.

sbuilder

scan () \to \text{None}

Scan this node’s dependents for implicit dependencies.

scanner_key ()

A directory does not get scanned.

scanner_paths

sconsign ()

Return the .sconsign file info for this directory.
searched
select_scanner (scanner)
  Selects a scanner for this Node.
  This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

set_always_build (always_build: int = 1) → None
  Set the Node’s always_build value.

set_executor (executor: Executor) → None
  Set the action executor for this node.

set_explicit (is_explicit) → None

set_local () → None

set_nocache (nocache: int = 1) → None
  Set the Node’s nocache value.

set_noclean (noclean: int = 1) → None
  Set the Node’s noclean value.

set_precious (precious: int = 1) → None
  Set the Node’s precious value.

set_pseudo (pseudo: bool = True) → None
  Set the Node’s pseudo value.

set_specific_source (source) → None
  Set the source code builder for this node.

set_state (state) → None

side_effect
side_effects
sources
sources_set
src_builder ()
  Fetch the source code builder for this node.
  If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value from its parent directory, and so on up to the file system root).

srcdir
srcdir_duplicate (name)
srcdir_find_file (filename)
srcdir_list ()
srcnode ()
  Dir has a special need for srcnode()…if we have a srcdir attribute set, then that is our srcnode.
stat ()
state
store_info
str_for_display ()
target_from_source (prefix, suffix, splitext=<function splitext>)
  Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
  Note that this method can be overridden dynamically for generated files that need different behavior. See Tool/swig.py for an example.
target_peers
up ()
variant_dirs
visited () → None
  Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
walk (func, arg) → None
  Walk this directory tree by calling the specified function for each directory in the tree.
  This behaves like the os.path.walk() function, but for in-memory Node.FS.Dir objects. The function takes the same arguments as the functions passed to os.path.walk():
```
func(arg, dirname, fnames)

Except that “dirname” will actually be the directory Node, not the string. The ‘.’ and ‘..’ entries are excluded from fnames. The fnames list may be modified in-place to filter the subdirectories visited or otherwise impose a specific order. The “arg” argument is always passed to func() and may be used in any way (or ignored, passing None is common).

wkids
SCons.Node.FS.UnlinkFunc (target, source, env) → int

class SCons.Node.FS._Null
    Bases: object
SCons.Node.FS._classEntry
    alias of Entry
SCons.Node.FS._copy_func (fs, src, dest) → None
SCons.Node.FS._hardlink_func (fs, src, dst) → None
SCons.Node.FS._my_normcase (x)
SCons.Node.FS._softlink_func (fs, src, dst) → None
SCons.Node.FS.diskcheck_types ()
SCons.Node.FS.do_diskcheck_match (node, predicate, errorfmt)
SCons.Node.FS.find_file (filename, paths, verbose=None)
    Find a node corresponding to either a derived file or a file that exists already.
    Only the first file found is returned, and none is returned if no file is found.
    filename: A filename to find
    paths: A list of directory path nodes to search in. Can be represented as a list, a tuple, or a callable that is called with no arguments and returns the list or tuple.
    returns The node created from the found file.
SCons.Node.FS.get_MkdirBuilder ()
SCons.Node.FS.get_default_fs ()
SCons.Node.FS.has_glob_magic (s) → bool
SCons.Node.FS.ignore_diskcheck_match (node, predicate, errorfmt) → None
SCons.Node.FS.initialize_do_splitdrive () → None
    Set up splitdrive usage.
    Avoid unnecessary function calls by recording a flag that tells us whether or not os.path.splitdrive() actually does anything on this system, and therefore whether we need to bother calling it when looking up path names in various methods below.
    If do_splitdrive is True, _my_splitdrive() will be a real function which we can call. As all supported Python versions’ ntpath module now handle UNC paths correctly, we no longer special-case that.
    Deferring the setup of _my_splitdrive also lets unit tests do their thing and test UNC path handling on a POSIX host.
SCons.Node.FS.invalidate_node_memos (targets) → None
    Invalidate the memoized values of all Nodes (files or directories) that are associated with the given entries. Has been added to clear the cache of nodes affected by a direct execution of an action (e.g. Delete/Copy/Chmod). Existing Node caches become inconsistent if the action is run through Execute(). The argument targets can be a single Node object or filename, or a sequence of Nodes/filenames.
SCons.Node.FS.needs_normpath_match (string, pos=0, endpos=9223372036854775807)
    Matches zero or more characters at the beginning of the string.
SCons.Node.FS.save_strings (val) → None
SCons.Node.FS.sconsign_dir (node)
    Return the .sconsign file info for this directory, creating it first if necessary.
SCons.Node.FS.sconsign_none (node)
SCons.Node.FS.set_diskcheck (enabled_checkers) → None
SCons.Node.FS.set_duplicate (duplicate)

SCons.Node.Python module

Python nodes.
class SCons.Node.Python.Value (value, built_value=None, name=None)
    Bases: Node
    A Node class for values represented by Python expressions.
    Values are typically passed on the command line or generated by a script, but not from a file or some other source.
```
 Changed in version 4.0: the name parameter was added.

class Attrs
    Bases: object
    shared
BuildInfo
    alias of ValueBuildInfo
Decider (function) ∈ None
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of ValueNodeInfo
Tag (key, value) ∈ None
    Add a user-defined tag.
_add_child (collection, set, child) ∈ None
    Adds 'child' to 'collection', first checking 'set' to see if it's already present.
_children_get ()
_children_reset () ∈ None
    _func_exists
    _func_get_contents
    _func_is_derived
    _func_rexists
    _func_target_from_source
_get_scanner (env, initial_scanner, root_node_scanner, kw)
    _memo
    _specific_sources
    _tags
    add_dependency (depend)
        Adds dependencies.
    add_ignore (depend)
        Adds dependencies to ignore.
    add_prerequisite (prerequisite) ∈ None
        Adds prerequisites
    add_source (source)
        Adds sources.
    add_to_implicit (deps) ∈ None
    add_to_waiting_parents (node) ∈ int
        Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)
    add_to_waiting_s_e (node) ∈ None
    add_wkid (wkid) ∈ None
        Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
    Return a list of all the node’s direct children.
alter_targets ()
    Return a list of alternate targets for this Node.
always_build
attributes
binfo
build (**kw) ∈ None
    Actually build the node.
    This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.
    This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
builder
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builder_set (builder) → None
built () → None
  Called just after this node is successfully built.
cached
changed (node=None, allowcache: bool = False)
  Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.
  Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.
  The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().
  @see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
  Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
  Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
  Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.
clear () → None
  Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).
clear_memoized_values () → None
del_binfo () → None
  Delete the build info from this node.
depends
depends_set
disambiguate (must_exist=None)
env
  env_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
  Let the executor clean up any cached information.
exists () → bool
  Reports whether node exists.
explain ()
for_signature ()
  Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.
get_abspath ()
  Return an absolute path to the Node. This will return simply str(Node) by default, but for Node types that have a concept of relative path, this might return something different.
get_binfo ()
  Fetch a node’s build information.
  node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature
This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.

**get_build_env()**
Fetch the appropriate Environment to build this node.

**get_build_scanner_path()**
Fetch the appropriate scanner path for this node.

**get_builder()**
Return the set builder, or a specified default value.

**get_cachedir_csig()**
Get contents for signature calculations.

**get_csig()**
Because we’re a Python value node and don’t have a real timestamp, we get to ignore the calculator and just use the value contents.

**get_contents()**
Returns string. Ideally string of hex digits. (Not bytes)

**get_env()**
**get_env_scanner()**
**get_executor()**
Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

**get_found_includes()**
Return the scanned include lines (implicit dependencies) found in this node.

**get_implicit_deps()**
Return a list of implicit dependencies for this node.

**get_ninfo()**
**get_source_scanner()**
Fetch the source scanner for the specified node.

**get_state()**
**get_stored_implicit()**
**get_stored_info()**
Fetch the stored implicit dependencies.

**get_string()**
This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.

**get_suffix()**
This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

**get_target_scanner()**
**get_text_contents()**
By the assumption that the node.built_value is a deterministic product of the sources, the contents of a Value are the concatenation of all the contents of its sources. As the value need not be built when get_contents() is called, we cannot use the actual node.built_value.

has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () → bool
Return whether this Node has an explicit builder.
This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes
is_conftest () → bool
Returns true if this node is an conftest node

is_derived () → bool
Returns true if this node is derived (i.e. built).
This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () → bool
Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
Returns true if this node is an sconscript

is_under (dir) → bool
is_up_to_date () → bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.

linked
make_ready () → None
Get a Node ready for evaluation.
This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool
multiple_side_effect_has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
postprocess () → None
Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare ()
Prepare for this Node to be built. This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.

This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.

(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)

Overriding this method allows for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites

pseudo

push_to_cache () → bool

Try to push a node into a cache

read ()

Return the value. If necessary, the value is built.

ref_count

release_target_info () → None

Called just after this node has been marked up-to-date or was built completely.

This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.

@see: built() and File.release_target_info()

remove ()

Remove this Node: no-op by default.

render_include_tree ()

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

reset_executor () → None

Remove cached executor; forces recompute when needed.

retrieve_from_cache () → bool

Try to retrieve the node’s content from a cache

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

Returns true if the node was successfully retrieved.

reexists ()

Does this node exist locally or in a repository?

scan () → None

Scan this node’s dependents for implicit dependencies.

scanner_key ()

select_scanner (scanner)

Selects a scanner for this Node.

This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

set_always_build (always_build: int = 1) → None

Set the Node’s always_build value.

set_executor (executor: Executor) → None

Set the action executor for this node.

set_explicit (is_explicit) → None

set_nocache (nocache: int = 1) → None

Set the Node’s nocache value.

set_noclean (noclean: int = 1) → None

Set the Node’s noclean value.

set_precious (precious: int = 1) → None

Set the Node’s precious value.

set_pseudo (pseudo: bool = True) → None

Set the Node’s pseudo value.
set_specific_source(source) \rightarrow None
set_state(state) \rightarrow None
side_effect
side_effects
sources
sources_set
state
store_info
str_for_display()
target_peers
visited() \rightarrow None
    Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids
write(built_value) \rightarrow None
    Set the value of the node.

class SCons.Node.Python.ValueBuildInfo
Bases: BuildInfoBase
    __getstate__()  
        Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a
        '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all
        instances of a class.
    __setstate__(state) \rightarrow None
        Restore the attributes from a pickled state.
bact
bactsig
bdepends
bdependsigs
bimplicit
bimplicitsigs
bsources
bsourcesigs
current_version_id = 2
merge(other) \rightarrow None
    Merge the fields of another object into this object. Already existing information is overwritten by the other instance's
data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.

Bases: NodeInfoBase
    __getstate__()  
        Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a
        '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all
        instances of a class.
    __setstate__(state) \rightarrow None
        Restore the attributes from a pickled state. The version is discarded.
convert(node, val) \rightarrow None
csig
current_version_id = 2
field_list = ['csig']
format(field_list=None, names= int = 0)
merge(other) \rightarrow None
    Merge the fields of another object into this object. Already existing information is overwritten by the other instance's
data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.
str_to_node(s)
update(node) \rightarrow None
SCons.Node.Python.ValueWithMemo(value, built_value=None, name=None)
Memoized Value node factory.
Changed in version 4.0: the name parameter was added.

SCons.Platform package

Module contents

SCons platform selection.

Looks for modules that define a callable object that can modify a construction environment as appropriate for a given platform.

Note that we take a more simplistic view of “platform” than Python does. We’re looking for a single string that determines a set of tool-independent variables with which to initialize a construction environment. Consequently, we’ll examine both sys.platform and os.name (and anything else that might come in to play) in order to return some specification which is unique enough for our purposes.

Note that because this subsystem just selects a callable that can modify a construction environment, it’s possible for people to define their own “platform specification” in an arbitrary callable function. No one needs to use or tie in to this subsystem in order to roll their own platform definition.

SCons.Platform.DefaultToolList (platform, env)
  Select a default tool list for the specified platform.

SCons.Platform.Platform (name='darwin')
  Select a canned Platform specification.

class SCons.Platform.PlatformSpec (name, generate)
  Bases: object

class SCons.Platform.TempFileMunge (cmd, cmdstr=None)
  Bases: object
  Convert long command lines to use a temporary file.
  You can set an Environment variable (usually TEMPFILE) to this, then call it with a string argument, and it will perform temporary file substitution on it. This is used to circumvent limitations on the length of command lines. Example:

```python
env['TEMPFILE'] = TempFileMunge
env['LINKCOM'] = '${TEMPFILE($LINK $TARGET $SOURCES', '$LINKCOMSTR')}'
```

By default, the name of the temporary file used begins with a prefix of '@'. This may be configured for other tool chains by setting the TEMPFILEPREFIX variable. Example:

```python
env['TEMPFILEPREFIX'] = '-@'  # diab compiler
env['TEMPFILEPREFIX'] = '-via'  # arm tool chain
env['TEMPFILEPREFIX'] = ''   # (the empty string) PC Lint
```

You can configure the extension of the temporary file through the TEMPFILESUFFIX variable, which defaults to `.lnk` (see comments in the code below). Example:

```python
env['TEMPFILESUFFIX'] = '.lnt'  # PC Lint
```

Entries in the temporary file are separated by the value of the TEMPFILEARGJOIN variable, which defaults to an OS-appropriate value.

A default argument escape function is SCons.Subst.quote_spaces. If you need to apply extra operations on a command argument before writing to a temporary file (fix Windows slashes, normalize paths, etc.), please set TEMPFILEARGESCFUNC variable to a custom function. Example:

```python
import sys
import re
```
from SCons.Subst import quote_spaces
WINPATHSEP_RE = re.compile(r"\([^"'\]|\)\)

def tempfile_arg_esc_func(arg):
    arg = quote_spaces(arg)
    if sys.platform != "win32":
        # GCC requires double Windows slashes, let's use UNIX separator
        return WINPATHSEP_RE.sub(r"\[\]", arg)
    return arg

env["TEMPFILEARGESCFUNC"] = tempfile_arg_esc_func

_SPrintCmdStr_ (target, source, env, cmdstr) → None
SCons.Platform.platform_default ()
    Return the platform string for our execution environment.
    The returned value should map to one of the SCons/Platform/*.py files. Since scons is architecture independent,
    though, we don't care about the machine architecture.
SCons.Platform.platform_module (name='darwin')
    Return the imported module for the platform.
    This looks for a module name that matches the specified argument. If the name is unspecified, we fetch the
    appropriate default for our execution environment.

Submodules
SCons.Platform.aix module
Platform-specific initialization for IBM AIX systems.
There normally shouldn't be any need to import this module directly. It will usually be imported through the generic
SCons.Platform.aix.generate (env) → None
SCons.Platform.aix.get_xlc (env, xlc=None, packages=[])
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SCons.Platform.irix module

Platform-specific initialization for SGI IRIX systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic
SCons.Platform.irix.generate (env) → None

SCons.Platform.mingw module

Platform-specific initialization for the MinGW system.

SCons.Platform.os2 module

Platform-specific initialization for OS/2 systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic
SCons.Platform.os2.generate (env) → None

SCons.Platform.posix module

Platform-specific initialization for POSIX (Linux, UNIX, etc.) systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic
SCons.Platform.posix.escape (arg)
   escape shell special characters
SCons.Platform.posix.exec_popen3 (l, env, stdout, stderr)
SCons.Platform.posix.exec_subprocess (l, env)
SCons.Platform.posix.generate (env) → None
SCons.Platform.posix.piped_env_spawn (sh, escape, cmd, args, env, stdout, stderr)
SCons.Platform.posix.subprocess_spawn (sh, escape, cmd, args, env)

SCons.Platform.sunos module

Platform-specific initialization for Sun systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic
SCons.Platform.sunos.generate (env) → None

SCons.Platform.virtualenv module

"Platform" support for a Python virtualenv.
SCons.Platform.virtualenv.ImportVirtualenv (env) → None
   Copies virtualenv-related environment variables from OS environment to env['ENV'] and prepends virtualenv’s
   PATH to env['ENV'] ['PATH'].
SCons.Platform.virtualenv.IsInVirtualenv (path)
   Returns True, if path is under virtualenv’s home directory. If not, or if we don’t use virtualenv, returns False.
SCons.Platform.virtualenv.Virtualenv ()
   Returns path to the virtualenv home if scons is executing within a virtualenv or None, if not.
SCons.Platform.virtualenv._enable_virtualenv_default ()
SCons.Platform.virtualenv._ignore_virtualenv_default ()
SCons.Platform.virtualenv._inject_venv_path (env, path_list=\None) → None
   Modify environment such that SCons will take into account its virtualenv when running external tools.
SCons.Platform.virtualenv._inject_venv_variables (env) → None
SCons.Platform.virtualenv._is_path_in (path, base) → bool
   Returns true if path is located under the base directory.
SCons.Platform.virtualenv._running_in_virtualenv ()
   Returns True if scons is executed within a virtualenv

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SCons.Platform.virtualenv.select_paths_in_venv (path_list)
  Returns a list of paths from path_list which are under virtualenv's home directory.

SCons.Platform.win32 module

Platform-specific initialization for Win32 systems.

There normally shouldn't be any need to import this module directly. It will usually be imported through the generic

class SCons.Platform.win32.ArchDefinition (arch, synonyms=[])
  Bases: object
  Determine which windows CPU were running on. A class for defining architecture-specific settings and logic.

SCons.Platform.win32.escape (x)

SCons.Platform.win32.exec_spawn (l, env)

SCons.Platform.win32.generate (env)

SCons.Platform.win32.get_architecture (arch=None)
  Returns the definition for the specified architecture string.
  If no string is specified, the system default is returned (as defined by the registry PROCESSOR_ARCHITECTURE
  value, PROCESSOR_ARCHITEW6432 environment variable, PROCESSOR_ARCHITECTURE environment
  variable, or the platform machine).

SCons.Platform.win32.get_program_files_dir ()
  Get the location of the program files directory

SCons.Platform.win32.get_system_root ()

SCons.Platform.win32.piped_spawn (sh, escape, cmd, args, env, stdout, stderr)

SCons.Platform.win32.spawn (sh, escape, cmd, args, env)

SCons.Platform.win32.spawnve (mode, file, args, env)

SCons.Scanner package

Module contents

The Scanner package for the SCons software construction utility.

SCons.Scanner.Base
  alias of ScannerBase

class SCons.Scanner.Classic (name, suffixes, path_variable, regex, *args, **kwargs)
  Bases: Current
  A Scanner subclass to contain the common logic for classic CPP-style include scanning, but which can be
  customized to use different regular expressions to find the includes.
  Note that in order for this to work "out of the box" (without overriding the find_include() and sort_key() methods), the
  regular expression passed to the constructor must return the name of the include file in group 0.

  __call__ (node, env, path=()) → list
    Scans a single object.

    Parameters:
      • node – the node that will be passed to the scanner function
      • env – the environment that will be passed to the scanner function.
      • path – tuple of paths from the path_function

    Returns: A list of direct dependency nodes for the specified node.

  static __recurse_all_nodes (nodes)
  static __recurse_no_nodes (nodes)

  add_scanner (skey, scanner) → None
  add_skey (skey) → None
    Add a skey to the list of skeys

  static find_include (include, source_dir, path)

  find_names (node)

  get_skeys (env=None)

  path (env, dir=None, target=None, source=None)
scan (node, path=())
select (node)

static sort_key (include)

**class** SCons.Scanner.ClassicCPP (name, suffixes, path_variable, regex, *args, **kwargs)
Bases: Classic
A Classic Scanner subclass which takes into account the type of bracketing used to include the file, and uses classic
CPP rules for searching for the files based on the bracketing.
Note that in order for this to work, the regular expression passed to the constructor must return the leading bracket in
group 0, and the contained filename in group 1.

__call__ (node, env, path=()) → list
Scans a single object.

Parameters:
* node – the node that will be passed to the scanner function
* env – the environment that will be passed to the scanner function.
* path – tuple of paths from the path_function

Returns: A list of direct dependency nodes for the specified node.

static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) → None
add_skey (skey) → None
  Add a skey to the list of skeys
static find_include (include, source_dir, path)
find_include_names (node)
get_skeys (env=None)
path (env, dir=None, target=None, source=None)
scan (node, path=())
select (node)

static sort_key (include)

**class** SCons.Scanner.Current (*args, **kwargs)
Bases: ScannerBase
A class for scanning files that are source files (have no builder) or are derived files and are current (which implies that
they exist, either locally or in a repository).

__call__ (node, env, path=()) → list
Scans a single object.

Parameters:
* node – the node that will be passed to the scanner function
* env – the environment that will be passed to the scanner function.
* path – tuple of paths from the path_function

Returns: A list of direct dependency nodes for the specified node.

static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) → None
add_skey (skey) → None
  Add a skey to the list of skeys
get_skeys (env=None)
path (env, dir=None, target=None, source=None)
select (node)

**class** SCons.Scanner.FindPathDirs (variable)
Bases: object
Class to bind a specific E{*}PATH variable name to a function that will return all of the E{*}path directories.

SCons.Scanner.Scanner (function, *args, **kwargs)
Factory function to create a Scanner Object.
Creates the appropriate Scanner based on the type of “function”.

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TODO: Deprecate this some day. We've moved the functionality inside the ScannerBase class and really don't need this factory function any more. It was, however, used by some of our Tool modules, so the call probably ended up in various people's custom modules patterned on SCons code.

```python
class SCons.Scanner.ScannerBase (function, name: str = 'NONE', argument=<class 'SCons.Scanner._Null'>, skeys=<class 'SCons.Scanner._Null'>, path_function=None, node_class=<class 'SCons.Node.FS.Base'>, node_factory=None, scan_check=None, recursive=None)
Bases: object
Base class for dependency scanners.
Implements straightforward, single-pass scanning of a single file.
A Scanner is usually set up with a scanner function (and optionally a path function), but can also be a kind of dispatcher which passes control to other Scanners.
A scanner function takes three arguments: a Node to scan for dependencies, the construction environment to use, and an optional tuple of paths (as generated by the optional path function). It must return a list containing the Nodes for all the direct dependencies of the file.
The optional path function is called to return paths that can be searched for implicit dependency files. It takes five arguments: a construction environment, a Node for the directory containing the SConscript file that defined the primary target, a list of target nodes, a list of source nodes, and the optional argument for this instance.
Examples:

```python
s = Scanner(my_scanner_function)
s = Scanner(function=my_scanner_function)
s = Scanner(function=my_scanner_function, argument='foo')
```

Parameters:

- **function** – either a scanner function taking two or three arguments and returning a list of File Nodes; or a mapping of keys to other Scanner objects.
- **name** – an optional name for identifying this scanner object (defaults to “NONE”).
- **argument** – an optional argument that will be passed to both `function` and `path_function`.
- **skeys** – an optional list argument that can be used to determine if this scanner can be used for a given Node. In the case of File nodes, for example, the `skeys` would be file suffixes.
- **path_function** – an optional function which returns a tuple of the directories that can be searched for implicit dependency files. May also return a callable which is called with no args and returns the tuple (supporting Bindable class).
- **node_class** – optional class of Nodes which this scan will return. If not specified, defaults to `SCons.Node.FS.Base`. If `node_class` is `None`, then this scanner will not enforce any Node conversion and will return the raw results from `function`.
- **node_factory** – optional factory function to be called to translate the raw results returned by `function` into the expected `node_class` objects.
- **scan_check** – optional function to be called to first check whether this node really needs to be scanned.
- **recursive** – optional specifier of whether this scanner should be invoked recursively on all of the implicit dependencies it returns (for example #include lines in C source files, which may refer to header files which should themselves be scanned). May be a callable, which will be called to filter the list of nodes found to select a subset for recursive scanning (the canonical example being only recursively scanning subdirectories within a directory). The default is to not do recursive scanning.

```python
__call__ (node, env, path=()) → list
```
Scans a single object.
Parameters:
- **node** – the node that will be passed to the scanner function
- **env** – the environment that will be passed to the scanner function.
- **path** – tuple of paths from the `path_function`

Returns: A list of direct dependency nodes for the specified node.

```python
class SCons.Scanner.Selector(mapping, *args, **kwargs)
    Bases: ScannerBase
    A class for selecting a more specific scanner based on the scanner_key() (suffix) for a specific Node.
    TODO: This functionality has been moved into the inner workings of the ScannerBase class, and this class will be
    deprecated at some point. (It was never exposed directly as part of the public interface, although it is used by the
    Scanner() factory function that was used by various Tool modules and therefore was likely a template for custom
    modules that may be out there.)
    static _recurse_all_nodes(nodes)
    static _recurse_no_nodes(nodes)
    add_scanner(skey, scanner) \to None
    add_skey(skey) \to None
        Add a skey to the list of skeys
    get_skeys(env=None)
    path(env, dir=None, target=None, source=None)
    select(node)
```

class SCons.Scanner._Null
    Bases: object
    SCons.Scanner._null
        alias of _Null

Submodules

SCons.Scanner.C module

Dependency scanner for C/C++ code.

Two scanners are defined here: the default CScanner, and the optional CConditionalScanner, which must be explicitly
selected by calling add_scanner() for each affected suffix.

SCons.Scanner.C.CConditionalScanner()
    Return an advanced conditional Scanner instance for scanning source files
    Interprets C/C++ Preprocessor conditional syntax (#ifdef, #if, defined, #else, #elif, etc.).

SCons.Scanner.C.CScanner()
    Return a prototype Scanner instance for scanning source files that use the C pre-processor

class SCons.Scanner.C.SConsCPPConditionalScanner(*args, **kwargs)
    Bases: PreProcessor
    SCons-specific subclass of the cpp.py module’s processing.
    We subclass this so that: 1) we can deal with files represented by Nodes, not strings; 2) we can keep track of the files
    that are missing.
    __call__(file)
        Pre-processes a file.
        This is the main public entry point.
    _do_if_else_condition(condition) \to None
        Common logic for evaluating the conditions on #if, #ifdef and #ifndef lines.
SCons API Documentation

_match_tuples(tuples)
_process_tuples(tuples, file=None)
all_include(t) → None
do_define(t) → None
    Default handling of a #define line.
do_if(t) → None
    Default handling of a #if line.
do_elif(t) → None
    Default handling of a #elif line.
do_else(t) → None
    Default handling of a #else line.
do endif(t) → None
    Default handling of a #endif line.
do_ifdef(t) → None
    Default handling of a #ifdef line.
do ifndef(t) → None
    Default handling of a #ifndef line.
do import(t) → None
    Default handling of a #import line.
do include(t) → None
    Default handling of a #include line.
do include_next(t) → None
    Default handling of a #include line.
do nothing(t) → None
    Null method for when we explicitly want the action for a specific preprocessor directive to do nothing.
do undef(t) → None
    Default handling of a #undef line.
eval_expression(t)
    Evaluates a C preprocessor expression.
    This is done by converting it to a Python equivalent and eval()ing it in the C preprocessor namespace we use to track #define values.
finalize_result(fname)
find_include_file(t)
    Finds the #include file for a given preprocessor tuple.
initialize_result(fname) → None
process_contents(contents)
    Pre-processes a file contents.
    Is used by tests
process_file(file)
    Pre-processes a file.
    This is the main internal entry point.
read_file(file) → str
resolve_include(t)
    Resolve a tuple-ized #include line.
    This handles recursive expansion of values without "" or <> surrounding the name until an initial " or < is found, to handle #include FILE where FILE is a #define somewhere else.
restore() → None
    Pops the previous dispatch table off the stack and makes it the current one.
save() → None
    Pushes the current dispatch table on the stack and re-initializes the current dispatch table to the default.
scons_current_file(t) → None
start_handling_includes(t=None) → None
    Causes the PreProcessor object to start processing #import, #include and #include_next lines.
    This method will be called when a #if, #ifdef, #ifndef or #elif evaluates True, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated False.
stop_handling_includes(t=\texttt{None}) \rightarrow \texttt{None}

Causes the PreProcessor object to stop processing \#import, \#include and \#include\_next lines.

This method will be called when a \#if, \#ifdef, \#ifndef or \#elif evaluates False, or when we reach the \#else in a \#if, \#ifdef, \#ifndef or \#elif block where a condition already evaluated True.

tupleize (contents)

Turns the contents of a file into a list of easily-processed tuples describing the CPP lines in the file.

The first element of each tuple is the line’s preprocessor directive (\#if, \#include, \#define, etc., minus the initial ‘\#’).

The remaining elements are specific to the type of directive, as pulled apart by the regular expression.

class SCons.Scanner.C.SConsCPPConditionalScannerWrapper (name, variable)

Bases: object

The SCons wrapper around a cpp.py scanner.

This is the actual glue between the calling conventions of generic SCons scanners, and the (subclass of) cpp.py class that knows how to look for \#include lines with reasonably real C-preprocessor-like evaluation of \#if/\#ifdef/\#else/\#elif lines.

recurse_nodes (nodes)

select (node)

class SCons.Scanner.C.SConsCPPScanner (*args, **kwargs)

Bases: PreProcessor

SCons-specific subclass of the cpp.py module’s processing.

We subclass this so that: 1) we can deal with files represented by Nodes, not strings; 2) we can keep track of the files that are missing.

\_call\_ (file)

Pre-processes a file.

This is the main public entry point.

\_do_if\_else\_condition (condition) \rightarrow \texttt{None}

Common logic for evaluating the conditions on \#if, \#ifdef and \#ifndef lines.

\_match\_tuples (tuples)

\_parse\_tuples (contents)

\_process\_tuples (tuples, file=\texttt{None})

all\_include (t) \rightarrow \texttt{None}

\_do\_define (t) \rightarrow \texttt{None}

Default handling of a \#define line.

\_do\_elif (t) \rightarrow \texttt{None}

Default handling of a \#elif line.

\_do\_else (t) \rightarrow \texttt{None}

Default handling of a \#else line.

\_do\_endif (t) \rightarrow \texttt{None}

Default handling of a \#endif line.

\_do\_if (t) \rightarrow \texttt{None}

Default handling of a \#if line.

\_do\_ifdef (t) \rightarrow \texttt{None}

Default handling of a \#ifdef line.

\_do\_ifndef (t) \rightarrow \texttt{None}

Default handling of a \#ifndef line.

\_do\_import (t) \rightarrow \texttt{None}

Default handling of a \#import line.

\_do\_include (t) \rightarrow \texttt{None}

Default handling of a \#include line.

\_do\_include\_next (t) \rightarrow \texttt{None}

Default handling of a \#include line.

\_do\_nothing (t) \rightarrow \texttt{None}

Null method for when we explicitly want the action for a specific preprocessor directive to do nothing.

\_do\_undef (t) \rightarrow \texttt{None}

Default handling of a \#undef line.

\_eval\_expression (t)

Evaluates a C preprocessor expression.
This is done by converting it to a Python equivalent and eval()ing it in the C preprocessor namespace we use to track #define values.

finalize_result (fname)
find_include_file (t)
   Finds the #include file for a given preprocessor tuple.
initialize_result (fname) → None
process_contents (contents)
   Pre-processes a file contents.
   Is used by tests
process_file (file)
   Pre-processes a file.
   This is the main internal entry point.
read_file (file) → str
resolve_include (t)
   Resolve a tuple-ized #include line.
   This handles recursive expansion of values without "" or <> surrounding the name until an initial "" or < is found, to handle #include FILE where FILE is a #define somewhere else.
restore () → None
   Pops the previous dispatch table off the stack and makes it the current one.
save () → None
   Pushes the current dispatch table on the stack and re-initializes the current dispatch table to the default.
scons_current_file (t) → None
start_handling_includes (t=None) → None
   Causes the PreProcessor object to start processing #import, #include and #include_next lines.
   This method will be called when a #if, #ifdef, #ifndef or #elif evaluates True, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated False.
stop_handling_includes (t=None) → None
   Causes the PreProcessor object to stop processing #import, #include and #include_next lines.
   This method will be called when a #if, #ifdef, #ifndef or #elif evaluates False, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated True.
tupleize (contents)
   Turns the contents of a file into a list of easily-processed tuples describing the CPP lines in the file.
   The first element of each tuple is the line’s preprocessor directive (#if, #include, #define, etc., minus the initial ' #').
   The remaining elements are specific to the type of directive, as pulled apart by the regular expression.
class SCons.Scanner.C.SConsCPPScannerWrapper (name, variable)
   Bases: object
   The SCons wrapper around a cpp.py scanner.
   This is the actual glue between the calling conventions of generic SCons scanners, and the (subclass of) cpp.py class that knows how to look for #include lines with reasonably real C-preprocessor-like evaluation of #if/#ifdef/#elif lines.
   recurse_nodes (nodes)
select (node)
SCons.Scanner.C.Dictify_CPPDEFINES (env) → dict
   Returns CPPDEFINES converted to a dict.
   This should be similar to processDefines(). Unfortunately, we can’t do the simple thing of calling that routine and passing the result to the dict() constructor, because it turns the defines into a list of “name=value” pairs, which the dict constructor won’t consume correctly. Also cannot just call dict on CPPDEFINES itself - it’s fine if it’s stored in the converted form (currently deque of tuples), but CPPDEFINES could be in other formats too.
   So we have to do all the work here - keep concepts in sync with processDefines.

SCons.Scanner.D module

Scanner for the Digital Mars “D” programming language.

Coded by Andy Friesen, 17 Nov 2003
class SCons.Scanner.D.D
   Bases: Classic
Scans a single object.

Parameters:

- node -- the node that will be passed to the scanner function
- env -- the environment that will be passed to the scanner function.
- path -- tuple of paths from the path_function

Returns: A list of direct dependency nodes for the specified node.

SCons.Scanner.D.DScanner ()
Return a prototype Scanner instance for scanning D source files

SCons.Scanner.Dir module

SCons.Scanner.Dir.DirEntryScanner (**kwargs)
Return a prototype Scanner instance for "scanning" directory Nodes for their in-memory entries

SCons.Scanner.Dir.DirScanner (**kwargs)
Return a prototype Scanner instance for scanning directories for on-disk files

SCons.Scanner.Dir.do_not_scan (k)
SCons.Scanner.Dir.only_dirs (nodes)
SCons.Scanner.Dir.scan_in_memory (node, env, path=())
"Scans" a Node.FS.Dir for its in-memory entries.
SCons.Scanner.Dir.scan_on_disk (node, env, path=())
Scans a directory for on-disk files and directories therein.

SCons.Scanner.Fortran module

Dependency scanner for Fortran code.

class SCons.Scanner.Fortran.F90Scanner (name, suffixes, path_variable, use_regex, incl_regex, def_regex, *args, **kwargs)
Bases: Classic
A Classic Scanner subclass for Fortran source files which takes into account both USE and INCLUDE statements. This scanner will work for both F77 and F90 (and beyond) compilers.
Currently, this scanner assumes that the include files do not contain USE statements. To enable the ability to deal with USE statements in include files, add logic right after the module names are found to loop over each include file, search for and locate each USE statement, and append each module name to the list of dependencies. Caching the search results in a common dictionary somewhere so that the same include file is not searched multiple times would be a smart thing to do.

__call__ (node, env, path=()) → list
Scans a single object.
Parameters:
- **node** – the node that will be passed to the scanner function
- **env** – the environment that will be passed to the scanner function.
- **path** – tuple of paths from the *path_function*

Returns: A list of direct dependency nodes for the specified node.

```python
static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) \rightarrow None
add_skey (skey) \rightarrow None

Add a skey to the list of skeys

static find_include (include, source_dir, path)
find_include_names (node)
get_skeys (env=None)
path (env, dir=None, target=None, source=None)
scan (node, env, path=())
select (node)
static sort_key (include)
```

SCons.Scanner.Fortran module

Dependency scanner for Fortran files.
SCons.Scanner.Fortran.FortranScan (**path_variable**: str = 'FORTRANPATH')

Return a prototype Scanner instance for scanning source files for Fortran USE & INCLUDE statements

SCons.Scanner.IDL module

Dependency scanner for IDL (Interface Definition Language) files.
SCons.Scanner.IDL.IDLScan ()

Return a prototype Scanner instance for scanning IDL source files

SCons.Scanner.Java module

SCons.Scanner.Java.JavaScanner ()

Scanner for .java files.
New in version 4.4.

SCons.Scanner.Java._collect_classes (**classlist**, dirname, **files**) \rightarrow None
SCons.Scanner.Java._subst_paths (**env**, **paths**) \rightarrow list

Return a list of substituted path elements.

If **paths** is a string, it is split on the search-path separator. Otherwise, substitution is done on string-valued list elements but they are not split.

Note helps support behavior like pulling in the external CLASSPATH and setting it directly into JAVACLASSPATH, however splitting on os.pathsep makes the interpretation system-specific (this is warned about in the manpage entry for JAVACLASSPATH).

SCons.Scanner.Java.scan (**node**, **env**, **libpath=()**) \rightarrow list
Scan for files both on JAVACLASSPATH and JAVAPROCESSORPATH.

The JAVACLASSPATH/JAVAPROCESSORPATH path can contain:

- Explicit paths to JAR/Zip files
- Wildcards (*)
- Directories which contain classes in an unnamed package
- Parent directories of the root package for classes in a named package

Class path entries that are neither directories nor archives (.zip or JAR files) nor the asterisk (*) wildcard character are ignored.

SCons.Scanner.LaTeX module

Dependency scanner for LaTeX code.
class SCons.Scanner.LaTeX.FindENVPathDirs (**variable**)
Bases: object
A class to bind a specific E[*]PATH variable name to a function that will return all of the E[*]path directories.

```python
class SCons.Scanner.LaTeX.LaTeX (name, suffixes, graphics_extensions, *args, **kwargs)

Bases: ScannerBase

Class for scanning LaTeX files for included files.

Unlike most scanners, which use regular expressions that just return the included file name, this returns a tuple consisting of the keyword for the inclusion ("include", "includegraphics", "input", or "bibliography"), and then the file name itself. Based on a quick look at LaTeX documentation, it seems that we should append .tex suffix for the "include" keywords, append .tex if there is no extension for the "input" keyword, and need to add .bib for the "bibliography" keyword that does not accept extensions by itself.

Finally, if there is no extension for an "includegraphics" keyword latex will append .ps or .eps to find the file, while pdftex may use .pdf, .jpg, .tif, .mps, or .png.

The actual subset and search order may be altered by DeclareGraphicsExtensions command. This complication is ignored. The default order corresponds to experimentation with teTeX:

```
$ latex --version
pdfeTeX 3.141592-1.21a-2.2 (Web2C 7.5.4)
kpathsea version 3.5.4
```

The order is:

- ['.eps', '.ps'] for latex ['.png', '.pdf', '.jpg', '.tif']

Another difference is that the search path is determined by the type of the file being searched: env['TEXINPUTS'] for "input" and "include" keywords env['TEXINPUTS'] for "includegraphics" keyword env['TEXINPUTS'] for "\inputlisting" keyword env['BIBINPUTS'] for "\bibliography" keyword env['BSTINPUTS'] for "\bibliographystyle" keyword env['INDEXSTYLE'] for "\makeindex" keyword, no scanning support needed just allows user to set it if needed.

FIXME: also look for the class or style in document\[class|style\]{}

```python
__call__ (node, env, path=()) → list

Scans a single object.

Parameters:
- node – the node that will be passed to the scanner function
- env – the environment that will be passed to the scanner function.
- path – tuple of paths from the path_function

Returns:
- A list of direct dependency nodes for the specified node.
```

```python
_latex_names (include_type, filename)
static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) → None
add_skey (skey) → None

Add a skey to the list of skews

canonical_text (text)

- Standardize an input TeX-file contents.

Currently:

```python
env_variables = ['TEXINPUTS', 'BIBINPUTS', 'BSTINPUTS', 'INDEXSTYLE']

find_include (include, source_dir, path)
get_skeys (env=None)

keyword_paths = ['addbibresource': 'BIBINPUTS', 'addglobalbib': 'BIBINPUTS', 'addsectionbib': 'BIBINPUTS', 'bibliography': 'BIBINPUTS', 'bibliographystyle': 'BSTINPUTS', 'include': 'TEXINPUTS', 'includegraphics': 'TEXINPUTS', 'input': 'TEXINPUTS', 'inputlisting': 'TEXINPUTS', 'makeindex': 'INDEXSTYLE', 'usepackage': 'TEXINPUTS']

path (env, dir=None, target=None, source=None)

scan (node, subdir: str = '.')
```
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scan_recurse (node, path=())
do a recursive scan of the top level target file This lets us search for included files based on the directory of the main file just as latex does
select (node)
static sort_key (include)
two_arg_commands = ['import', 'subimport', 'includefrom', 'subincludefrom', 'inputfrom', 'subinputfrom']
SCons.Scanner.LaTeX.LaTeXScanner ()
Return a prototype Scanner instance for scanning LaTeX source files when built with latex.
SCons.Scanner.LaTeX.PDFLaTeXScanner ()
Return a prototype Scanner instance for scanning LaTeX source files when built with pdflatex.
class SCons.Scanner.LaTeX._Null
Bases: object
SCons.Scanner.LaTeX._null
alias of _Null
SCons.Scanner.LaTeX.modify_env_var (env, var, abspath)
SCons.Scanner.Prog module
Dependency scanner for program files.
SCons.Scanner.Prog.ProgramScanner (**kwargs)
Return a prototype Scanner instance for scanning executable files for static-lib dependencies
SCons.Scanner.Prog._subst_libs (env, libs)
Substitute environment variables and split into list.
SCons.Scanner.Prog.scan (node, env, libpath=())
Scans program files for static-library dependencies.
It will search the LIBPATH environment variable for libraries specified in the LIBS variable, returning any files it finds as dependencies.
SCons.Scanner.RC module
Dependency scanner for RC (Interface Definition Language) files.
SCons.Scanner.RC.RCScan ()
Return a prototype Scanner instance for scanning RC source files
SCons.Scanner.RC.no_tlb (nodes)
Filter out .tlb files as they are binary and shouldn’t be scanned.
SCons.Scanner.SWIG module
Dependency scanner for SWIG code.
SCons.Scanner.SWIG.SWIGScanner ()
SCons.Script package

Module contents

The main() function used by the scons script.
Architecturally, this is the scons script, and will likely only be called from the external “scons” wrapper. Consequently, anything here should not be, or be considered, part of the build engine. If it’s something that we expect other software to want to use, it should go in some other module. If it’s specific to the “scons” script invocation, it goes here.
SCons.Script.HelpFunction (text, append: bool = False, keep_local: bool = False) → None
The implementation of the the Help method.
See Help().
Changed in version 4.6.0: The keep_local parameter was added.
class SCons.Script.TargetList (initlist=)
Bases: UserList
_abc_impl = <_abc_abc_data object>
_add_Default (list) → None
_clear () → None
do_nothing (*args, **kw) → None
append (item)
S.append(value) – append value to the end of the sequence
clear () → None -- remove all items from S
copy ()
count (value) → integer -- return number of occurrences of value
extend (other)
S.extend(iterable) – extend sequence by appending elements from the iterable
index (value[, start[, stop]]) → integer -- return first index of value.
    Raises ValueError if the value is not present.
    Supporting start and stop arguments is optional, but recommended.
insert (i, item)
S.insert(index, value) – insert value before index
pop ([, index]) → item -- remove and return item at index (default last).
    Raise IndexError if list is empty or index is out of range.
remove (item)
S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.
reverse ()
S.reverse() – reverse IN PLACE
sort (*args, **kwds)
SCons.Script.Variables (files=None, args={})
SCons.Script._Add_Arguments (alist) → None
SCons.Script._Add_Targets (tlist) → None
SCons.Script._Get_Default_Targets (d, fs)
SCons.Script._Set_Default_Targets (env, tlist) → None
SCons.Script._Set_Default_Targets_Has_Been_Called (d, fs)
SCons.Script._Set_Default_Targets_Has_Not_Been_Called (d, fs)
SCons.Script.set_missing_sconscript_error (flag: bool = True) → bool
    Set behavior on missing file in SConscript() call.

    Returns: previous value

Submodules
SCons.Script.Interactive module
SCons interactive mode.
class SCons.Script.Interactive.SConsInteractiveCmd (**kw)
    Bases: Cmd
build [TARGETS] Build the specified TARGETS and their dependencies. ‘b’ is a synonym. clean [TARGETS] Clean (remove) the specified TARGETS and their dependencies. ‘c’ is a synonym. exit Exit SCons interactive mode. help [COMMAND] Prints help for the specified COMMAND. ‘h’ and ‘?’ are synonyms. shell [COMMANDLINE] Execute COMMANDLINE in a subshell. ‘sh’ and ‘!’ are synonyms. version Prints SCons version information.
_do_one_help (arg) → None
_doc_to_help (obj)
_strip_initial_spaces (s)
cmdloop (intro=None)
    Repeatedly issue a prompt, accept input, parse an initial prefix off the received input, and dispatch to action methods, passing them the remainder of the line as argument.
columnize (list, displaywidth=80)
    Display a list of strings as a compact set of columns.
    Each column is only as wide as necessary. Columns are separated by two spaces (one was not legible enough).
complete (text, state)
    Return the next possible completion for ‘text’.
    If a command has not been entered, then complete against command list. Otherwise try to call complete_<command> to get list of completions.
complete_help (*args)
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completedefault (*ignored)
    Method called to complete an input line when no command-specific complete_*() method is available.
    By default, it returns an empty list.
completenames (text, *ignored)
default (argv) → None
    Called on an input line when the command prefix is not recognized.
    If this method is not overridden, it prints an error message and returns.
do_EOF (argv) → None
do_build (argv) → None
    build [TARGETS] Build the specified TARGETS and their dependencies. ‘b’ is a synonym.
do_clean (argv)
    clean [TARGETS] Clean (remove) the specified TARGETS and their dependencies. ‘c’ is a synonym.
do_exit (argv) → None
    exit Exit SCons interactive mode.
do_help (argv) → None
    help [COMMAND] Prints help for the specified COMMAND. ‘h’ and ‘?’ are synonyms.
do_shell (argv) → None
    shell [COMMANDLINE] Execute COMMANDLINE in a subshell. ‘sh’ and ‘!’ are synonyms.
do_version (argv) → None
    version Prints SCons version information.
doc_header = 'Documented commands (type help <topic>):'
doc_leader = ''
emptyline ()
    Called when an empty line is entered in response to the prompt.
    If this method is not overridden, it repeats the last nonempty command entered.
get_names ()
identchars = 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789_'
intro = None
lastcmd = ''
misc_header = 'Miscellaneous help topics:
nohelp = '*** No help on %s'
onecmd (line)
    Interpret the argument as though it had been typed in response to the prompt.
    This may be overridden, but should not normally need to be; see the precmd() and postcmd() methods for useful
    execution hooks. The return value is a flag indicating whether interpretation of commands by the interpreter should
    stop.
parseline (line)
    Parse the line into a command name and a string containing the arguments. Returns a tuple containing (command,
    args, line). ‘command’ and ‘args’ may be None if the line couldn’t be parsed.
postcmd (stop, line)
    Hook method executed just after a command dispatch is finished.
postloop ()
    Hook method executed once when the cmdloop() method is about to return.
pPrecmd (line)
    Hook method executed just before the command line is interpreted, but after the input prompt is generated and
    issued.
preloop ()
    Hook method executed once when the cmdloop() method is called.
print_topics (header, cmds, cmdlen, maxcol)
prompt = '(Cmd) '  
ruler = '='
synonyms = {'b': 'build', 'c': 'clean', 'h': 'help', 'scons': 'build', 'sh': 'shell'}
undoc_header = 'Undocumented commands:'
use_rawinput = 1
SCons.Script.Interactive.interact (fs, parser, options, targets, target_top) → None
SCons API Documentation

SCons.Script.Main module

The main() function used by the scons script.

Architecturally, this is the scons script, and will likely only be called from the external “scons” wrapper. Consequently, anything here should not be, or be considered, part of the build engine. If it’s something that we expect other software to want to use, it should go in some other module. If it’s specific to the “scons” script invocation, it goes here.

SCons.Script.Main.AddOption (*args, settable: bool = False, **kw) → SConsOption

Add a local option to the option parser - Public API.

If the settable parameter is true, the option will be included in the list of settable options; all other keyword arguments are passed on to add_local_option().

Changed in version 4.8.0: The settable parameter added to allow including the new option to the table of options eligible to use SetOption().

class SCons.Script.Main.BuildTask (tm, targets, top, node)

Bases: OutOfDateTask

An SCons build task.

LOGGER = None

_abc_impl = _abc._abc_data object

_exception_raise ()

Raises a pending exception that was recorded while getting a Task ready for execution.

__no_exception_to_raise () → None

display (message) → None

Hook to allow the calling interface to display a message.

This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.

do_failed (status: int = 2) → None

exc_clear () → None

Clears any recorded exception.

This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info ()

Returns info about a recorded exception.

exception_set (exception=None) → None

Records an exception to be raised at the appropriate time.

This also changes the “exception_raise” attribute to point to the method that will, in fact

execute () → None

Called to execute the task.

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

executed ()

Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.

This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_with_callbacks () → None

Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.

This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_without_callbacks () → None

Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.
fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready () → None
Make a task ready for execution

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c”
option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute () → bool
Returns True (indicating this Task should be executed) if this Task’s target state indicates it needs executing,
which has already been determined by an earlier up-to-date check.

postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no
build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a
common side effect, that can be put back on the candidates list.

prepare ()
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary
directories before the Action is actually called to build the targets.

trace_message (node, description: str = 'node') → None
Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out
what Node should be built next, the actual target list may be altered, along with a message describing the
alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see
those messages.
exc_clear () → None
Clears any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

```
exc_info ()
```

Returns info about a recorded exception.

```
exception_set (exception=None) → None
```

Records an exception to be raised at the appropriate time.

This also changes the “exception_raise” attribute to point to the method that will, in fact

```
execute () → None
```

Called to execute the task.

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

```
executed () → None
```

Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

```
executed_with_callbacks () → None
```

Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.

This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

```
executed_without_callbacks () → None
```

Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

```
fail_continue () → None
```

Explicit continue-the-build failure.

This sets failure status on the target nodes and all of their dependent parent nodes.

Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

```
fail_stop () → None
```

Explicit stop-the-build failure.

This sets failure status on the target nodes and all of their dependent parent nodes.

Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

```
failed () → None
```

Default action when a task fails: stop the build.

Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

```
fs_delete (path, pathstr, remove: bool = True)
```

```
get_target ()
```

Fetch the target being built or updated by this task.

```
make_ready () → None
```

Marks all targets in a task ready for execution.

This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

```
make_ready_all () → None
```

Marks all targets in a task ready for execution.

This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

```
make_ready_current ()
```

Marks all targets in a task ready for execution if any target is not current.

This is the default behavior for building only what’s necessary.

```
eeds_execute () → bool
```

Always returns True (indicating this Task should always be executed).

Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:
class MyTaskSubclass(SCons.Taskmaster.Task):
    needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute

postprocess () → None
Post-processes a task after it's been executed.
This examines all the targets just built (or not, we don't care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare () → None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

remove () → None
show () → None

trace_message (node, description: str = 'node') → None
SCons.Script.Main.DebugOptions (json: str | None = None) → None
Specify options to SCons debug logic - Public API.
Currently only json is supported, which changes the JSON file written to if the --debug=json command-line option is specified to the value supplied.
New in version 4.6.0.

class SCons.Script.Main.FakeOptionParser
Bases: object
A do-nothing option parser, used for the initial OptionsParser value.
During normal SCons operation, the OptionsParser is created right away by the main() function. Certain test scripts however, can introspect on different Tool modules, the initialization of which can try to add a new, local option to an otherwise uninitialized OptionsParser object. This allows that introspection to happen without blowing up.

class FakeOptionValues
Bases: object

add_local_option (*args, **kw) → SConsOption
values = <SCons.Script.Main.FakeOptionParser.FakeOptionValues object>
SCons.Script.Main.GetBuildFailures ()
Get the value from an option - Public API.
SCons.Script.Main.PrintHelp (file=None, local_only: bool = False) → None
Show progress during building - Public API.

class SCons.Script.Main.QuestionTask (tm, targets, top, node)
Bases: AlwaysTask
An SCons task for the -q (question) option.
LOGGER = None
_abcd_impl = <abc._abc_data object>
_exception_raise ()
Raises a pending exception that was recorded while getting a Task ready for execution.
_no_exception_to_raise () → None
display (message) → None
Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.

exc_clear () → None
Clears any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info ()
Returns info about a recorded exception.

exception_set (exception=None) → None
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact

execute () → None
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

executed () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

done_with_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_without_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

failed () → None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.
**make_ready_current()**
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

**needs_execute()** → bool
Always returns True (indicating this Task should always be executed).
Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:

```python
class MyTaskSubclass(SCons.Taskmaster.Task):
    needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute
```

**postprocess()** → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

**prepare()** → None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

**trace_message(node, description='node')** → None

**exception SCons.Script.Main.SConspPrintHelpException**
Bases: Exception
```
add_note() – add a note to the exception
```
```
with_traceback() – set self.__traceback__ to tb and return self.
```

**SCons.Script.Main.SetOption(name, value)**
Set the value of an option - Public API.

**class SCons.Script.Main.TreePrinter(derived=False, prune=False, status=False, sLineDraw=False)**
Bases: object
```
display(t) → None
```
```
get_all_children(node)
```
```
get_derived_children(node)
```

**SCons.Script.Main.ValidateOptions(throw_exception=False) → None**
Validate options passed to SCons on the command line.
Checks that all options given on the command line are known to this instance of SCons. Call after all of the cli options have been set up through AddOption() calls. For example, if you added an option --xyz and you call SCons with --xyy you can cause SCons to issue an error message and exit by calling this function.

**Parameters:**
- **throw_exception** – if an invalid option is present on the command line, raises an exception if this optional parameter evaluates true; if false (the default), issue a message and exit with error status.

**Raises:**
- **SConsBadOptionError** – If **throw_exception** is true and there are invalid options on the command line.

New in version 4.5.0.

**SCons.Script.Main._SConstruct_exists(dirname, repositories, filelist)** → str | None
Check that an SConstruct file exists in a directory.

**Parameters:**
- **dirname** – the directory to search. If empty, look in cwd.
- **repositories** – a list of repositories to search in addition to the project directory tree.
- **filelist** – names of SConstruct file(s) to search for. If empty list, use the built-in list of names.
Returns: The path to the located SConstruct file, or None.

SCons.Script.Main._build_targets (fs, options, targets, target_top)
SCons.Script.Main._create_path (plist)
SCons.Script.Main._exec_main (parser, values) → None
SCons.Script.Main._load_all_site_scons_dirs (topdir, verbose: bool = False) → None
    Load all of the predefined site_scons dir. Order is significant; we load them in order from most generic
    (machine-wide) to most specific (topdir). The verbose argument is only for testing.
SCons.Script.Main._load_site_scons_dir (topdir, site_dir_name=None)
    Load the site directory under todir.
    If a site dir name is supplied use it, else use default “site_scons” Prepend site dir to sys.path. If a “site_tools” subdir
    exists, prepend to toolpath. Import “site_init.py” from site dir if it exists.
SCons.Script.Main._main (parser)
SCons.Script.Main._scons_internal_error () → None
    Handle all errors but user errors. Print out a message telling the user what to do in this case and print a normal trace.
SCons.Script.Main._scons_internal_warning (e) → None
    Slightly different from _scons_user_warning in that we use the current call stack rather than sys.exc_info() to get our
    stack trace. This is used by the warnings framework to print warnings.
SCons.Script.Main._scons_syntax_error (e) → None
    Handle syntax errors. Print out a message and show where the error occurred.
SCons.Script.Main._scons_user_error (e) → None
    Handle user errors. Print out a message and a description of the error, along with the line number and routine where
    it occurred. The file and line number will be the deepest stack frame that is not part of SCons itself.
SCons.Script.Main._scons_user_warning (e) → None
    Handle user warnings. Print out a message and a description of the warning, along with the line number and routine
    where it occurred. The file and line number will be the deepest stack frame that is not part of SCons itself.
SCons.Script.Main._set_debug_values (options) → None
SCons.Script.Main.find_deepest_user_frame (tb)
    Find the deepest stack frame that is not part of SCons.
    Input is a “pre-processed” stack trace in the form returned by traceback.extract_tb() or traceback.extract_stack()
SCons.Script.Main.main () → None
SCons.Script.Main.path_string (label, module) → str
SCons.Script.Main.python_version_deprecated (version=sys.version_info(major=3, minor=11, micro=9,
    releaselevel='final', serial=0))
SCons.Script.Main.python_version_string ()
SCons.Script.Main.python_version_unsupported (version=sys.version_info(major=3, minor=11, micro=9,
    releaselevel='final', serial=0))
SCons.Script.Main.revert_io () → None
SCons.Script.Main.test_load_all_site_scons_dirs (d) → None
SCons.Script.Main.version_string (label, module)

SCons.Script.SConsOptions module
SCons.Script.SConsOptions.Parser (version)
    Returns a parser object initialized with the standard SCons options.
    Add options in the order we want them to show up in the --help help text, basically alphabetical. For readability, Each
    add_option() call should have a consistent format:

    op.add_option(
        "-L", "--long-option-name",
        nargs=1, type="string",
        dest="long_option_name", default='foo',
        action="callback", callback=opt_long_option,
        help="help text goes here",
        metavar="VAR"
    )
Even though the optparse module constructs reasonable default destination names from the long option names, we’re going to be explicit about each one for easier readability and so this code will at least show up when grepping the source for option attribute names, or otherwise browsing the source code.

```python
exception SCons.Script.SConsOptions.SConsBadOptionError (opt_str, parser=None)
Bases: BadOptionError
Exception used to indicate that invalid command line options were specified

Variables:
- **opt_str** (str) – The offending option specified on command line which is not recognized
- **parser** (OptionParser) – The active argument parser
```

```
add_note ()
   Exception.add_note(note) – add a note to the exception
args
with_traceback ()
   Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
```

```
class SCons.Script.SConsOptions.SConsIndentedHelpFormatter (indent_increment=2,
   max_help_position=24, width=None, short_first=1)
Bases: IndentedHelpFormatter
NO_DEFAULT_VALUE = 'none'
_format_text (text)
   Format a paragraph of free-form text for inclusion in the help output at the current indentation level.
dedent ()
expand_default (option)
format_description (description)
format_epilog (epilog)
format_heading (heading)
   Translates heading to “SCons Options”
   Heading of “Options” changed to “SCons Options.” Unfortunately, we have to do this here, because those titles are hard-coded in the optparse calls.
format_option (option)
   Customized option formatter.
A copy of the normal optparse.IndentedHelpFormatter.format_option() method. This has been snarfed so we can modify text wrapping to our liking:

- add our own regular expression that doesn’t break on hyphens (so things like --no-print-directory don’t get broken).
- wrap the list of options themselves when it’s too long (the wrapper.fill(opts) call below).
- set the subsequent_indent when wrapping the help_text.
The help for each option consists of two parts:

- the opt strings and metavars e.g. (“-x”, or “--fFILENAME, --file=FILENAME”)
- the user-supplied help string e.g. (“turn on expert mode”, “read data from FILENAME”)
If possible, we write both of these on the same line:

```
-x turn on expert mode
```

But if the opt string list is too long, we put the help string on a second line, indented to the same column it would start in if it fit on the first line:

```
-fFILENAME, --file=FILENAME
   read data from FILENAME
```

```
format_option_strings (option)
   Return a comma-separated list of option strings & metavariables.
format_usage (usage) → str
```
Formats the usage message.
indent()
set_long_opt_delimiter(delim)
set_parser(parser)
set_short_opt_delimiter(delim)
store_local_option_strings(parser, group)
  Local-only version of store_option_strings.
  We need to replicate this so the formatter will be set up properly if we didn't go through the “normal”.
  New in version 4.6.0.
store_option_strings(parser)
class SCons.Script.SConsOptions.SConsOption(*opts, **attrs)
  Bases: Option
  ACTIONS = ('store', 'store_const', 'store_true', 'store_false', 'append', 'append_const', 'count', 'callback', 'help', 'version')
  ALWAYS_TYPED_ACTIONS = ('store', 'append')
  ATTRS = ['action', 'type', 'dest', 'default', 'nargs', 'const', 'choices', 'callback', 'callback_args', 'callback_kwarg', 'help', 'metavar']
  CHECK_METHODS = [<function Option._check_action>, <function Option._check_type>, <function Option._check_choice>, <function Option._check_dest>, <function Option._check_const>, <function Option._check_nargs>, <function Option._check_callback>, <function SConsOption._check_nargs_optional>]
  CONST_ACTIONS = ('store_const', 'append_const', 'store', 'append', 'callback')
  STORE_ACTIONS = ('store', 'store_const', 'store_true', 'store_false', 'append', 'append_const', 'count')
  TYPED_ACTIONS = ('store', 'append', 'callback')
  TYPES = ('string', 'int', 'long', 'float', 'complex', 'choice')
  TYPE_CHECKER = {'choice': <function check_choice>, 'complex': <function check_builtin>, 'float': <function check_builtin>, 'int': <function check_builtin>, 'long': <function check_builtin>}
  _check_action()
  _check_callback()
  _check_choice()
  _check_dest()
  _check_nargs()
  _check_nargs_optional()
  _check_opt_strings(opts)
  _check_type()
  _set_attrs(attrs)
  _set_opt_strings(opts)
  check_value(opt, value)
  convert_value(opt, value)
  get_opt_string()
  process(opt, value, values, parser)
  take_action(action, dest, opt, value, values, parser)
  takes_value()
class SCons.Script.SConsOptions.SConsOptionGroup(parser, title, description= None)
  Bases: OptionGroup
  A subclass for SCons-specific option groups.
  The only difference between this and the base class is that we print the group’s help text flush left, underneath their own title but lined up with the normal “SCons Options”:
  _check_conflict(option)
  _create_option_list()
  _create_option_mappings()
  _share_option_mappings(parser)
  add_option (Option)
  add_option (opt_str, ..., kwarg=val, ...) -> None
  add_options (option_list)
  destroy()
SCons API Documentation

```python
see OptionParser.destroy().
format_description(formatter)
format_help(formatter)
    Format an option group's help text.
    The title is dedented so it's flush with the “SCons Options” title we print at the top.
format_option_help(formatter)
get_description()
get_option(opt_str)
has_option(opt_str)
remove_option(opt_str)
set_conflict_handler(handler)
set_description(description)
set_title(title)
class SCons.Script.SConsOptions.SConsOptionParser (usage=None, option_list=None,
    option_class=<class 'optparse.Option'>, version=None, conflict_handler='error',
    description=None, formatter=None, add_help_option=True, prog=None, epilog=None)
Bases: OptionParser
    _add_help_option ()
    _add_version_option ()
    _check_conflict (option)
    _create_option_list ()
    _create_option_mappings ()
    _get_all_options ()
    _get_args (args)
    _init_parsing_state ()
    _match_long_opt (opt: string) → string
        Determine which long option string 'opt' matches, ie. which one it is an unambiguous abbreviation for. Raises BadOptionError if 'opt' doesn't unambiguously match any long option string.
    _populate_option_list (option_list, add_help=True)
    _process_args (largs : [string], rargs : [string], values : Values)
        Process command-line arguments and populate 'values', consuming options and arguments from 'rargs'. If 'allow_interspersed_args' is false, stop at the first non-option argument. If true, accumulate any interspersed non-option arguments in 'largs'.
    _process_long_opt (rargs, values)
        SCons-specific processing of long options.
        This is copied directly from the normal optparse._process_long_opt() method, except that, if configured to do so, we catch the exception thrown when an unknown option is encountered and just stick it back on the “leftover” arguments for later (re-)processing. This is because we may see the option definition later, while processing SConscript files.
    _process_short_opts (rargs, values)
    _share_option_mappings (parser)
add_local_option (*args, **kw) → SConsOption
    Adds a local option to the parser.
    This is initiated by an AddOption() call to add a user-defined command-line option. Add the option to a separate option group for the local options, creating the group if necessary.
    The keyword argument settable is recognized specially (and removed from kw). If true, the option is marked as modifiable; by default “local” (project-added) options are not eligible for for SetOption() calls.
    Changed in version 4.8.0: Added special handling of settable.
add_option (Option)
add_option (opt_str, ..., kwarg=val, ...) → None
add_option_group (*args, **kwargs)
add_options (option_list)
check_values (values: Values, args: [string])
```
Check that the supplied option values and leftover arguments are valid. Returns the option values and leftover arguments (possibly adjusted, possibly completely new – whatever you like). Default implementation just returns the passed-in values; subclasses may override as desired.

**destroy()**

Declare that you are done with this OptionParser. This cleans up reference cycles so the OptionParser (and all objects referenced by it) can be garbage-collected promptly. After calling destroy(), the OptionParser is unusable.

**disable_interspersed_args()**

Set parsing to stop on the first non-option. Use this if you have a command processor which runs another command that has options of its own and you want to make sure these options don’t get confused.

**enable_interspersed_args()**

Set parsing to not stop on the first non-option, allowing interspersing switches with command arguments. This is the default behavior. See also disable_interspersed_args() and the class documentation description of the attribute allow_interspersed_args.

**error(msg)**

Overridden OptionValueError exception handler.

**exit(status=0, msg=None)**

**expand_prog_name(s)**

**format_description(formatter)**

**format_epilog(formatter)**

**format_help(formatter=None)**

**format_local_option_help(formatter=None, file=None)**

Return the help for the project-level ("local") options. New in version 4.6.0.

**format_option_help(formatter=None)**

**get_default_values()**

**get_description()**

**get_option(opt_str)**

**get_option_group(opt_str)**

**get_prog_name()**

**get_usage()**

**get_version()**

**has_option(opt_str)**

**parse_args(args : [string] = sys.argv[1:], values : Values = None)**

Parse the command-line options found in ‘args’ (default: sys.argv[1:]). Any errors result in a call to ‘error()’, which by default prints the usage message to stderr and calls sys.exit() with an error message. On success returns a pair (values, args) where ‘values’ is a Values instance (with all your option values) and ‘args’ is the list of arguments left over after parsing options.

**preserve_unknown_options = False**

**print_help(file: file = stdout)**

Print an extended help message, listing all options and any help text provided with them, to ‘file’ (default stdout).

**print_local_option_help(file=None)**

Print help for just project-defined options. Writes to ‘file’ (default stdout). New in version 4.6.0.

**print_usage(file: file = stdout)**

Print the usage message for the current program (self.usage) to ‘file’ (default stdout). Any occurrence of the string “%prog” in self.usage is replaced with the name of the current program (basename of sys.argv[0]). Does nothing if self.usage is empty or not defined.

**print_version(file: file = stdout)**
Print the version message for this program (self.version) to ‘file’ (default stdout). As with print_usage(), any occurrence of “\%prog” in self.version is replaced by the current program’s name. Does nothing if self.version is empty or undefined.

```
raise_exception_on_error = False
remove_option (opt_str)
reparse_local_options () → None
```

Re-parse the leftover command-line options.

Leftover options are stored in self.largs, so that any value overridden on the command line is immediately available if the user turns around and does a GetOption() right away.

We mimic the processing of the single args in the original OptionParser._process_args(), but here we allow exact matches for long-opts only (no partial argument names!). Otherwise there could be problems in add_local_option() below. When called from there, we try to reparse the command-line arguments that

1. haven’t been processed so far (self.largs), but

2. are possibly not added to the list of options yet.

So, when we only have a value for --myargument so far, a command-line argument of --myarg=test would set it, per the behaviour of _match_long_opt(), which allows for partial matches of the option name, as long as the common prefix appears to be unique. This would lead to further confusion, because we might want to add another option --myarg later on (see issue #2929).

```
set_conflict_handler (handler)
set_default (dest, value)
set_defaults (**kwargs)
set_description (description)
set_process_default_values (process)
set_usage (usage)
```

```
standard_option_list = []
```

```
class SCons.Script.SConsOptions.SConsValues (defaults)
```

Bases: Values

Holder class for uniform access to SCons options.

A SCons option value can originate three different ways:

1. set on the command line.
2. set in an SConscript file via SetOption().
3. the default setting (from the the op.add_option() calls in the Parser() function, below).

The command line always overrides a value set in a SConscript file, which in turn always overrides default settings. Because we want to support user-specified options in the SConscript file itself, though, we may not know about all of the options when the command line is first parsed, so we can’t make all the necessary precedence decisions at the time the option is configured.

The solution implemented in this class is to keep these different sets of settings separate (command line, SConscript file, and default) and to override the __getattr__() method to check them in turn. This allows the rest of the code to just fetch values as attributes of an instance of this class, without having to worry about where they came from (the scheme is similar to a ChainMap).

Note that not all command line options are settable from SConscript files, and the ones that must be explicitly added to the settable list in this class, and optionally validated and coerced in the set_option() method.

```
__getattr__ (attr)
```

Fetch an options value, respecting priority rules.

This is a little tricky: since we’re answering questions about ourselves, we have avoid lookups that would send us into infinite recursion, thus the __dict__ stuff.

```
_update (dict, mode)
_update_careful (dict)
```

Update the option values from an arbitrary dictionary, but only use keys from dict that already have a corresponding attribute in self. Any keys in dict without a corresponding attribute are silently ignored.

```
_update_loose (dict)
```

Update the option values from an arbitrary dictionary, using all keys from the dictionary regardless of whether they have a corresponding attribute in self or not.

```
ensure_value (attr, value)
```
read_file (filename, mode='careful')
read_module (modname, mode='careful')
set_option (name: str, value) → None

Sets an option name from an SConscript file.
Validation steps for known (that is, defined in SCons itself) options are in-line here. Validation should be along the same lines as for options processed from the command line - it's kind of a pain to have to duplicate. Project-defined options can specify callbacks for the command-line version, but will have no inbuilt validation here.
It's up to the build system maintainer to make sure SetOption() is being used correctly, we can't really do any better here.

Raises: UserError – the option is not settable.

settable = ['clean', 'diskcheck', 'duplicate', 'experimental', 'hash_chunksize', 'hash_format', 'help', 'implicit_cache', 'implicit_deps_changed', 'implicit_deps_unchanged', 'max_drift', 'md5_chunksize', 'no_exec', 'no_progress', 'num_jobs', 'random', 'silent', 'stack_size', 'warn']
SCons.Script.SConsOptions.diskcheck_convert (value)

SCons.Script.SConscript module

This module defines the Python API provided to SConscript files.
SCons.Script.SConscript.BuildDefaultGlobals ()
Create a dictionary containing all the default globals for SConstruct and SConscript files.
SCons.Script.SConscript.Configure (*args, **kw)
class SCons.Script.SConscript.DefaultEnvironmentCall (method_name, subst: int = 0)
  Bases: object
  A class that implements “global function” calls of Environment methods by fetching the specified method from the DefaultEnvironment’s class. Note that this uses an intermediate proxy class instead of calling the DefaultEnvironment method directly so that the proxy can override the subst() method and thereby prevent expansion of construction variables (since from the user’s point of view this was called as a global function, with no associated construction environment).

class SCons.Script.SConscript.Frame (fs, exports, sconscript)
  Bases: object
  A frame on the SConstruct/SConscript call stack
SCons.Script.SConscript.Return (*vars, **kw)
class SCons.Script.SConscript.SConsEnvironment (platform=None, tools=None, toolpath=None, variables=None, parse_flags=None, **kw)
  Bases: Base
  An Environment subclass that contains all of the methods that are particular to the wrapper SCons interface and which aren’t (or shouldn’t be) part of the build engine itself.
  Note that not all of the methods of this class have corresponding global functions, there are some private methods.
  Action (*args, **kw)
  AddMethod (function, name=None) → None
    Adds the specified function as a method of this construction environment with the specified name. If the name is omitted, the default name is the name of the function itself.
  AddPostAction (files, action)
  AddPreAction (files, action)
  Alias (target, source=[], action=None, **kw)
  AlwaysBuild (*targets)
  Append (**kw) → None
    Append values to construction variables in an Environment.
The variable is created if it is not already present.
  AppendENVPath (name, newpath, envname: str = 'ENV', sep=':', delete_existing: bool = False) → None
    Append path elements to the path name in the envname dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.
    If delete_existing is False, a newpath element already in the path will not be moved to the end (it will be left where it is).
AppendUnique (delete_existing: bool = False, **kw) \rightarrow \text{None}

Append values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to end.

Builder (**kw)

CacheDir (path, custom_class=None) \rightarrow \text{None}

Clean (targets, files) \rightarrow \text{None}

Clone (tools=[], toolpath=None, variables=None, parse_flags=None, **kw)

Return a copy of a construction Environment.

The copy is like a Python “deep copy”: independent copies are made recursively of each object, except that a reference is copied when an object is not deep-copyable (like a function). There are no references to any mutable objects in the original environment.

Unrecognized keyword arguments are taken as construction variable assignments.

**Parameters:**

- **tools** – list of tools to initialize.
- **toolpath** – list of paths to search for tools.
- **variables** – a Variables object to use to populate construction variables from command-line variables.
- **parse_flags** – option strings to parse into construction variables.

New in version 4.8.0: The optional **variables** parameter was added.

Command (target, source, action, **kw)

Set up a one-off build command.

Builds target from source using action, which may be be any type that the Builder factory will accept for an action. Generates an anonymous builder and calls it, to add the details to the build graph. The builder is not named, added to BUILDERS, or otherwise saved.

Recognizes the Builder() keywords source_scanner, target_scanner, source_factory and target_factory. All other arguments from kw are passed on to the builder when it is called.

Configure (*args, **kw)

Decider (function)

Default (*targets) \rightarrow \text{None}

Depends (target, dependency)

Explicitly specify that target depends on dependency.

Detect (progs)

Return the first available program from one or more possibilities.

**Parameters:** **progs** (str or list) – one or more command names to check for

Dictionary (*args)

Return construction variables from an environment.

**Parameters:** **args** (optional) – variable names to look up

Returns: If args omitted, the dictionary of all construction variables. If one arg, the corresponding value is returned. If more than one arg, a list of values is returned.

Raises: KeyError – if any of args is not in the construction environment.

Dir (name, *args, **kw)

Dump (key: str | None = None, format: str = 'pretty') \rightarrow \text{str}

Returns a dump of serialized construction variables.

The display formats are intended for human readers when debugging - none of the supported formats produce a result that SCons itself can directly make use of. Objects that cannot directly be represented get a placeholder like <function foo at 0x123456> or <<non-serializable: function>>.

**Parameters:**

- **key** – if None, format the whole dict of variables, else format just the value of key.
- **format** – specify the format to serialize to. "pretty" generates a pretty-printed string, "json" a JSON-formatted string.

Raises: ValueError – format is not a recognized serialization format.
**EnsurePythonVersion** *(major, minor) → None*
Exit abnormally if the Python version is not late enough.

**EnsureSConsVersion** *(major: int, minor: int, revision: int = 0) → None*
Exit abnormally if the SCons version is not late enough.

**Entry** *(name, *args, **kw)*

**Environment** *(**kw)*

**Execute** *(action, *args, **kw)*
Directly execute an action through an Environment

**Exit** *(value: int = 0) → None*

**Export** *(**vars, **kw) → None*

**File** *(name, *args, **kw)*

**FindFile** *(file, dirs)*

**FindInstalledFiles** *
returns the list of all targets of the Install and InstallAs Builder.

**FindIxes** *(paths: Sequence[str], prefix: str, suffix: str) → str | None*
Search paths for a path that has prefix and suffix.
Returns on first match.

**Parameters:**
- paths – the list of paths or nodes.
- prefix – construction variable for the prefix.
- suffix – construction variable for the suffix.

**Returns:**
The matched path or None

**FindSourceFiles** *(node: str = '.') → list*
Return a list of all source files.

**Flatten** *(sequence)*

**GetBuildPath** *(files)*

**GetLaunchDir** *(*)

**GetOption** *(name)*

**GetSConsVersion** *(*) → Tuple[int, int, int]*
Return the current SCons version.
New in version 4.8.0.

**Glob** *(pattern, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None)*

**Help** *(text, append: bool = False, keep_local: bool = False) → None*
Update the help text.
The previous help text has text appended to it, except on the first call. On first call, the values of append and keep_local are considered to determine what is appended to.

**Parameters:**
- text – string to add to the help text.
- append – on first call, if true, keep the existing help text (default False).
- keep_local – on first call, if true and append is also true, keep only the help text from AddOption calls.

Changed in version 4.6.0: The keep_local parameter was added.

**Ignore** *(target, dependency)*
Ignore a dependency.

**Import** *(**vars)*

**Literal** *(string)*

**Local** *(**targets)*

**MergeFlags** *(args, unique: bool = True) → None*
Merge flags into construction variables.
Merges the flags from args into this construction environment. If args is not a dict, it is first converted to one with flags distributed into appropriate construction variables. See ParseFlags().
As a side effect, if `unique` is true, a new object is created for each modified construction variable by the loop at the end. This is silently expected by the Override() `parse_flags` functionality, which does not want to share the list (or whatever) with the environment being overridden.

**Parameters:**
- `args` – flags to merge
- `unique` – merge flags rather than appending (default: True). When merging, path variables are retained from the front, other construction variables from the end.

**NoCache** (*targets*)
Tag target(s) so that it will not be cached.

**NoClean** (*targets*)
Tag target(s) so that it will not be cleaned by `-c`.

**Override** (*overrides*)
Produce a modified environment whose variables are overridden by the overrides dictionaries. “overrides” is a dictionary that will override the variables of this environment.

This function is much more efficient than Clone() or creating a new Environment because it doesn’t copy the construction environment dictionary, it just wraps the underlying construction environment, and doesn’t even create a wrapper object if there are no overrides.

**ParseConfig** (command, function=('', unique: bool = True))
Parse the result of running a command to update construction vars.
Use `function` to parse the output of running `command` in order to modify the current environment.

**Parameters:**
- `command` – a string or a list of strings representing a command and its arguments.
- `function` – called to process the result of `command`, which will be passed as `args`. If `function` is omitted or `None`, `MergeFlags()` is used. Takes 3 args (env, args, unique)
- `unique` – whether no duplicate values are allowed (default true)

**ParseDepends** (filename, must_exist=(), only_one: bool = False)
Parse a mkdep-style file for explicit dependencies. This is completely abusable, and should be unnecessary in the “normal” case of proper SCons configuration, but it may help make the transition from a Make hierarchy easier for some people to swallow. It can also be genuinely useful when using a tool that can write a .d file, but for which writing a scanner would be too complicated.

**ParseFlags** (*flags*) `→` dict
Return a dict of parsed flags.

**Parse** flags and return a dict with the flags distributed into the appropriate construction variable names. The flags are treated as a typical set of command-line flags for a GNU-style toolchain, such as might have been generated by one of the {foo}-config scripts, and used to populate the entries based on knowledge embedded in this method - the choices are not expected to be portable to other toolchains.

If one of the `flags` strings begins with a bang (exclamation mark), it is assumed to be a command and the rest of the string is executed; the result of that evaluation is then added to the dict.

**Platform** (platform)

**Precious** (*targets*)
Mark targets as precious: do not delete before building.

**Prepend** (**kw) `→` None
Prepend values to construction variables in an Environment.
The variable is created if it is not already present.

**PrependENVPath** (name, newpath, envname: str = “ENV”, sep=‘:’, delete_existing: bool = True) `→` None
Prepend path elements to the path `name` in the `envname` dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.

If `delete_existing` is False, a `newpath` component already in the path will not be moved to the front (it will be left where it is).

**PrependUnique** (delete_existing: bool = False, **kw) `→` None
Prepend values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to front.

Pseudo (*targets)
Mark targets as pseudo: must not exist.

PyPackageDir (modulename)

RemoveMethod (function) → None
Removes the specified function’s MethodWrapper from the added_methods list, so we don’t re-bind it when making a clone.

Replace (*kw) → None
Replace existing construction variables in an Environment with new construction variables and/or values.

ReplaceIxes (path, old_prefix, old_suffix, new_prefix, new_suffix)
Replace old_prefix with new_prefix and old_suffix with new_suffix.

env - Environment used to interpolate variables. path - the path that will be modified. old_prefix - construction variable for the old prefix. old_suffix - construction variable for the old suffix. new_prefix - construction variable for the new prefix. new_suffix - construction variable for the new suffix.

Repository (*dirs, **kw) → None
Specify Repository directories to search.

Requires (target, prerequisite)
Specify that prerequisite must be built before target.
Creates an order-only relationship, not a full dependency. prerequisite must exist before target can be built, but a change to prerequisite does not trigger a rebuild of target.

SConscript (*ls, **kw)
Execute SCons configuration files.

Parameters: *ls (str or list) – configuration file(s) to execute.

Keyword Arguments:

• dirs (list) – execute SConscript in each listed directory.
• name (str) – execute script ‘name’ (used only with ‘dirs’).
• exports (list or dict) – locally export variables the called script(s) can import.
• variant_dir (str) – mirror sources needed for the build in a variant directory to allow building in it.
• duplicate (bool) – physically duplicate sources instead of just adjusting paths of derived files (used only with ‘variant_dir’) (default is True).
• must_exist (bool) – fail if a requested script is missing (default is False, default is deprecated).

Returns: list of variables returned by the called script

Raises: UserError – a script is not found and such exceptions are enabled.

static SConscriptChdir (flag: bool) → None
SConsignFile (name='.sconsign', dbm_module=None) → None
Scanner (*args, **kw)
SetDefault (**kw) → None
SetOption (name, value) → None
SideEffect (side_effect, target)
Tell scons that side_effects are built as side effects of building targets.

Split (arg)
This function converts a string or list into a list of strings or Nodes. This makes things easier for users by allowing files to be specified as a white-space separated list to be split.

The input rules are:

• A single string containing names separated by spaces. These will be split apart at the spaces.
• A single Node instance
• A list containing either strings or Node instances. Any strings in the list are not split at spaces.
In all cases, the function returns a list of Nodes and strings.

**Tool**

```python
Tool(tool: str | Callable, toolpath: Collection[str] | None = None, **kwargs) -> Callable
```

Find and run tool module `tool`. 
- `tool` is generally a string, but can also be a callable object, in which case it is just called, without any of the setup.
- The skipped setup includes storing `kwargs` into the created Tool instance, which is extracted and used when the instance is called, so in the skip case, the called object will not get the `kwargs`.

Changed in version 4.2: returns the tool object rather than `None`.

**Value**

```python
Value(value, built_value=None, name=None)
```

Return a Value (Python expression) node.

Changed in version 4.0: the `name` parameter was added.

**VariantDir**

```python
VariantDir(variant_dir, src_dir, duplicate: int = 1) -> None
```

Where `prog` in the path.

**_canonicalize**

```python
_allow Dirs and strings beginning with # for top-relative.
Note this uses the current env's fs (in self).
```

**_changed_build**

```python
_changed_build(dependency, target, prev_ni, repo_node=None) -> bool
```

**_changed_content**

```python
_changed_content(dependency, target, prev_ni, repo_node=None) -> bool
```

**_changed_timestamp_match**

```python
_changed_timestamp_match(dependency, target, prev_ni, repo_node=None) -> bool
```

**_changed_timestamp_newer**

```python
_changed_timestamp_newer(dependency, target, prev_ni, repo_node=None) -> bool
```

**_changed_timestamp_then_content**

```python
_changed_timestamp_then_content(dependency, target, prev_ni, repo_node=None) -> bool
```

**_find_toolpath_dir**

```python
_find_toolpath_dir(tp)
```

**_get_SConscript_filenames**

```python
Convert the parameters passed to SConscript() calls into a list of files and export variables. If the parameters are invalid, throws SCons.Errors.UserError. Returns a tuple (l, e) where l is a list of SConscript filenames and e is a list of exports.
```

**static _get_major_minor_revision**

```python
_split a version string into major, minor and (optionally) revision parts.
This is complicated by the fact that a version string can be something like 3.2b1.
```

**_gsm ()**

**_init_special () -> None**

Initial the dispatch tables for special handling of special construction variables.

**_update (other) -> None**

Private method to update an environment's consvar dict directly.
Bypasses the normal checks that occur when users try to set items.

**_update_onlynew (other) -> None**

Private method to add new items to an environment's consvar dict.
Only adds items from `other` whose keys do not already appear in the existing dict; values from `other` are not used for replacement. Bypasses the normal checks that occur when users try to set items.

**arg2nodes**

```python
arg2nodes(args, node_factory=<class 'SCons.Environment._Null'>, lookup_list=<class 'SCons.Environment._Null'>, **kw)
```

Converts `args` to a list of nodes.

**Parameters:**

- `just` *(args - filename strings or nodes to convert; nodes are) – added to the list without further processing.*
- `not` *(node_factory - optional factory to create the nodes; if) – specified, will use this environment’s ‘fs.File method.*
- `to` *(lookup_list - optional list of lookup functions to call) – attempt to find the file referenced by each args.*
- `add` *(kw - keyword arguments that represent additional nodes to)*

**backtick (command) -> str**

Emulate command substitution.
Provides behavior conceptually like POSIX Shell notation for running a command in backquotes (backticks) by running `command` and returning the resulting output string.
This is not really a public API any longer, it is provided for the use of ParseFlags() (which supports it using a syntax of !command) and ParseConfig().

Raises: OSError – if the external command returned non-zero exit status.

get(key, default=None)
Emulates the get() method of dictionaries.

get_CacheDir()

get_builder(name)
Fetch the builder with the specified name from the environment.

get_factory(factory, default: str = 'File')
Return a factory function for creating Nodes for this construction environment.

get_scanner(skey)
Find the appropriate scanner given a key (usually a file suffix).

gvars()
Emulates the items() method of dictionaries.

keys()
Emulates the keys() method of dictionaries.

lvars()

scanner_map_delete(kw=None) → None
Delete the cached scanner map (if we need to).

setdefault(key, default=None)
Emulates the setdefault() method of dictionaries.

subst(string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)
Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphabetic character followed by any number of underscores or alphanumerical characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

validate_CacheDir_class(custom_class=None)
Validate the passed custom CacheDir class, or if no args are passed, validate the custom CacheDir class from the environment.

values()
Emulates the values() method of dictionaries.

exception SCons.Script.SConscript.SConscriptReturn
Bases: Exception

add_note()  # Exception.add_note(note) – add a note to the exception

with_traceback()  # Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
SCons API Documentation

SCons.Script.SConscript.SConscript_exception (file=<_io.TextIOWrapper name='<stderr>' mode='w' encoding='utf-8'>) → None

Print an exception stack trace just for the SConscript file(s). This will show users who have Python errors where the problem is, without cluttering the output with all of the internal calls leading up to where we exec the SConscript.

SCons.Script.SConscript._SConscript (fs, *files, **kw)

SCons.Script.SConscript.annotate (node)

Annotate a node with the stack frame describing the SConscript file and line number that created it.

SCons.Script.SConscript.compute_exports (exports)

Compute a dictionary of exports given one of the parameters to the Export() function or the exports argument to SConscript().

SCons.Script.SConscript.get_DefaultEnvironmentProxy ()

SCons.Script.SConscript.get_calling_namespaces ()

Return the locals and globals for the function that called into this module in the current call stack.

SCons.Script.SConscript.handle_missing_SConscript (f: str, must_exist: bool = True) → None

Take appropriate action on missing file in SConscript() call.

Print a warning or raise an exception on missing file, unless missing is explicitly allowed by the must_exist parameter or by a global flag.

Parameters:

- f – path to missing configuration file
- must_exist – if true (the default), fail. If false do nothing, allowing a build to declare it’s okay to be missing.

Raises: UserError – if must_exist is true or if global SCons.Script._no_missing_sconscript is true.

SCons.Taskmaster package

Module contents

Generic Taskmaster module for the SCons build engine.

This module contains the primary interface(s) between a wrapping user interface and the SCons build engine. There are two key classes here:

Taskmaster

This is the main engine for walking the dependency graph and calling things to decide what does or doesn’t need to be built.

Task

This is the base class for allowing a wrapping interface to decide what does or doesn’t actually need to be done. The intention is for a wrapping interface to subclass this as appropriate for different types of behavior it may need.

The canonical example is the SCons native Python interface, which has Task subclasses that handle its specific behavior, like printing “foo is up to date” when a top-level target doesn’t need to be built, and handling the -c option by removing targets as its “build” action. There is also a separate subclass for suppressing this output when the -q option is used.

The Taskmaster instantiates a Task object for each (set of) target(s) that it decides need to be evaluated and/or built.

class SCons.Taskmaster.AlwaysTask (tm, targets, top, node)

Bases: Task

LOGGER = None

_abc_impl = <_abc._abc_data object>

_exception_raise ()

Raises a pending exception that was recorded while getting a Task ready for execution.

_no_exception_to_raise () → None

display (message) → None

Hook to allow the calling interface to display a message.

This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the
alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see
those messages.

exc_clear () → None
Clears any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info ()
Returns info about a recorded exception.

exception_set (exception=None) → None
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact

eexecute ()
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
stuff in prepare(), executed() or failed().

executed () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s
callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before
deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was
an actual built target or a source Node.

executed_with_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s
callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before
deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was
an actual built target or a source Node.

executed_without_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s
callback methods.

fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

failed () → None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c”
option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute() \(\rightarrow\) bool

Always returns True (indicating this Task should always be executed).

Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:

```python
class MyTaskSubclass(SCons.Taskmaster.Task):
    needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute
```

postprocess() \(\rightarrow\) None

Post-processes a task after it’s been executed.

This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare() \(\rightarrow\) None

Called just before the task is executed.

This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

trace_message(node, description='node') \(\rightarrow\) None

Hook to allow the calling interface to display a message.

This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.

exc_clear() \(\rightarrow\) None

Clears any recorded exception.

This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info() \(\rightarrow\) None

Returns info about a recorded exception.

exception_set(exception=None) \(\rightarrow\) None

Records an exception to be raised at the appropriate time.

This also changes the “exception_raise” attribute to point to the method that will, in fact

execute() \(\rightarrow\) None

Called to execute the task.

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

executed() \(\rightarrow\) None

Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.

This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_with_callbacks() \(\rightarrow\) None

Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.

This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_without_callbacks () \rightarrow None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

fail_continue () \rightarrow None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

fail_stop () \rightarrow None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

failed () \rightarrow None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () \rightarrow None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute ()
Returns True (indicating this Task should be executed) if this Task’s target state indicates it needs executing, which has already been determined by an earlier up-to-date check.

postprocess () \rightarrow None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare () \rightarrow None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

trace_message ((node, description: str = 'node')) \rightarrow None

class SCons.Taskmaster.Stats
Bases: object
A simple class for holding statistics about the disposition of a Node by the Taskmaster. If we’re collecting statistics, each Node processed by the Taskmaster gets one of these attached, in which case the Taskmaster records its decision each time it processes the Node. (Ideally, that’s just once per Node.)

class SCons.Taskmaster.Task (tm, targets, top, node)
Bases: ABC
SCons build engine abstract task class.
This controls the interaction of the actual building of node and the rest of the engine.
This is expected to handle all of the normally-customizable aspects of controlling a build, so any given application should be able to do what it wants by sub-classing this class and overriding methods as appropriate. If an application
needs to customize something by sub-classing Taskmaster (or some other build engine class), we should first try to
migrate that functionality into this class.
Note that it’s generally a good idea for sub-classes to call these methods explicitly to update state, etc., rather than
roll their own interaction with Taskmaster from scratch.
LOGGER = None
_abc_impl = _abc._abc_data object>
_exception_raise ()
Raises a pending exception that was recorded while getting a Task ready for execution.
_no_exception_to_raise () → None
display (message) → None
Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out
what Node should be built next, the actual target list may be altered, along with a message describing the
alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see
those messages.
exc_clear () → None
Clears any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.
exc_info ()
Returns info about a recorded exception.
exception_set (exception=None) → None
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact
execute ()
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
stuff in prepare(), executed() or failed().
executed () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s
callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before
deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was
an actual built target or a source Node.
executed_with_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s
callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before
deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was
an actual built target or a source Node.
executed_without_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s
callback methods.
fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().
fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().
failed () → None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

abstract needs_execute ()
postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare () → None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

trace_message (node, description: str = 'node') → None

class SCons.Taskmaster.Taskmaster (targets=[], tasker=None, order=None, trace=None)
Bases: object
The Taskmaster for walking the dependency DAG.

_find_next_ready_node ()
Finds the next node that is ready to be built.
This is the main guts of the DAG walk. We loop through the list of candidates, looking for something that has no un-built children (i.e., that is a leaf Node or has dependencies that are all leaf Nodes or up-to-date). Candidate Nodes are re-scanned (both the target Node itself and its sources, which are always scanned in the context of a given target) to discover implicit dependencies. A Node that must wait for some children to be built will be put back on the candidates list after the children have finished building. A Node that has been put back on the candidates list in this way may have itself (or its sources) re-scanned, in order to handle generated header files (e.g.) and the implicit dependencies therein.

Note that this method does not do any signature calculation or up-to-date check itself. All of that is handled by the Task class. This is purely concerned with the dependency graph walk.

_validate_pending_children () → None
Validate the content of the pending_children set. Assert if an internal error is found.
This function is used strictly for debugging the taskmaster by checking that no invariants are violated. It is not used in normal operation.
The pending_children set is used to detect cycles in the dependency graph. We call a “pending child” a child that is found in the “pending” state when checking the dependencies of its parent node.
A pending child can occur when the Taskmaster completes a loop through a cycle. For example, let’s imagine a graph made of three nodes (A, B and C) making a cycle. The evaluation starts at node A. The Taskmaster first considers whether node A’s child B is up-to-date. Then, recursively, node B needs to check whether node C is up-to-date. This leaves us with a dependency graph looking like:

```
+-------------------------------------+
|                                     |
|                                     |
|                                     |
|                                     |
```

Next candidate
Now, when the Taskmaster examines the Node C’s child Node A, it finds that Node A is in the “pending” state. Therefore, Node A is a pending child of node C.

Pending children indicate that the Taskmaster has potentially loop back through a cycle. We say potentially because it could also occur when a DAG is evaluated in parallel. For example, consider the following graph:

```
Node A (Pending) --> Node B(Pending) --> Node C (Pending) --> ...
                      ^
                      +----------> Node D (NoState) --------+
                        /                          /
                    Next candidate /
```

The Taskmaster first evaluates the nodes A, B, and C and starts building some children of node C. Assuming, that the maximum parallel level has not been reached, the Taskmaster will examine Node D. It will find that Node C is a pending child of Node D.

In summary, evaluating a graph with a cycle will always involve a pending child at one point. A pending child might indicate either a cycle or a diamond-shaped DAG. Only a fraction of the nodes ends-up being a “pending child” of another node. This keeps the pending_children set small in practice.

We can differentiate between the two cases if we wait until the end of the build. At this point, all the pending children nodes due to a diamond-shaped DAG will have been properly built (or will have failed to build). But, the pending children involved in a cycle will still be in the pending state.

The taskmaster removes nodes from the pending_children set as soon as a pending_children node moves out of the pending state. This also helps to keep the pending_children set small.

**cleanup ()**
Check for dependency cycles.

**configure_trace (trace=None) → None**
This handles the command line option --taskmastertrace= It can be: - : output to stdout <filename> : output to a file False/None : Do not trace

**find_next_candidate ()**
Returns the next candidate Node for (potential) evaluation.

The candidate list (really a stack) initially consists of all of the top-level (command line) targets provided when the Taskmaster was initialized. While we walk the DAG, visiting Nodes, all the children that haven’t finished processing get pushed on to the candidate list. Each child can then be popped and examined in turn for whether their children are all up-to-date, in which case a Task will be created for their actual evaluation and potential building.

Here is where we also allow candidate Nodes to alter the list of Nodes that should be examined. This is used, for example, when invoking SCons in a source directory. A source directory Node can return its corresponding build directory Node, essentially saying, “Hey, you really need to build this thing over here instead.”

**next_task ()**
Returns the next task to be executed.
This simply asks for the next Node to be evaluated, and then wraps it in the specific Task subclass with which we were initialized.

**no_next_candidate ()**
Stops Taskmaster processing by not returning a next candidate.

Note that we have to clean-up the Taskmaster candidate list because the cycle detection depends on the fact all nodes have been processed somehow.

**stop () → None**
Stops the current build completely.

**tm_trace_node (node) → str**

**will_not_build (nodes, node_func=<function Taskmaster.<lambda>>) → None**
Perform clean-up about nodes that will never be built. Invokes a user defined function on all of these nodes (including all of their parents).

SCons.Taskmaster.dump_stats () → None
SCons.Taskmaster.find_cycle (stack, visited)
Submodules

SCons.Taskmaster.Job module

Serial and Parallel classes to execute build tasks.

The Jobs class provides a higher level interface to start, stop, and wait on jobs.

```python
class SCons.Taskmaster.Job.InterruptState
    Bases: object
    set () → None

class SCons.Taskmaster.Job.Jobs (num, taskmaster)
    Bases: object
    An instance of this class initializes N jobs, and provides methods for starting, stopping, and waiting on all N jobs.
    _reset_sig_handler () → None
        Restore the signal handlers to their previous state (before the call to _setup_sig_handler()).
    _setup_sig_handler () → None
        Setup an interrupt handler so that SCons can shutdown cleanly in various conditions:
        
        a. SIGINT: Keyboard interrupt
        b. SIGTERM: kill or system shutdown
        c. SIGHUP: Controlling shell exiting

        We handle all of these cases by stopping the taskmaster. It turns out that it’s very difficult to stop the build process
        by throwing asynchronously an exception such as KeyboardInterrupt. For example, the python Condition variables
        (threading.Condition) and queues do not seem to be asynchronous-exception-safe. It would require adding a
        whole bunch of try/finally block and except KeyboardInterrupt all over the place.
        Note also that we have to be careful to handle the case when SCons forks before executing another process. In
        that case, we want the child to exit immediately.
    run (postfunc=<function Jobs.<lambda>>) → None
        Run the jobs.
        postfunc() will be invoked after the jobs has run. It will be invoked even if the jobs are interrupted by a keyboard
        interrupt (well, in fact by a signal such as either SIGINT, SIGTERM or SIGHUP). The execution of postfunc() is
        protected against keyboard interrupts and is guaranteed to run to completion.
    were_interrupted ()
        Returns whether the jobs were interrupted by a signal.

class SCons.Taskmaster.Job.LegacyParallel (taskmaster, num, stack_size)
    Bases: object
    This class is used to execute tasks in parallel, and is somewhat less efficient than Serial, but is appropriate for
    parallel builds.
    This class is thread safe.
    start ()
        Start the job. This will begin pulling tasks from the taskmaster and executing them, and return when there are no
        more tasks. If a task fails to execute (i.e. execute() raises an exception), then the job will stop.

class SCons.Taskmaster.Job.NewParallel (taskmaster, num, stack_size)
    Bases: object
    class FakeCondition (lock)
        Bases: object
        notify ()
        notify_all ()
        wait ()
    class FakeLock
        Bases: object
        lock ()
        unlock ()

class State (value, names=None, *, module=None, qualname=None, type=None, start=1, boundary=None)
    Bases: Enum
    COMPLETED = 3
```
```python
class Worker (owner)

Bases: Thread

_bootstrap ()
_bootstrap_inner ()
_delete ()

Remove current thread from the dict of currently running threads.

_initialized = False
_reset_internal_locks (is_alive)
_set_ident ()
_set_native_id ()
_set_tstate_lock ()
_set_ident ()
_set_tstate_lock ()

Set a lock object which will be released by the interpreter when the underlying thread state (see pystate.h) gets deleted.

_stop ()
_wait_for_tstate_lock (block=True, timeout=-1)

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName ()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon ()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive ()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join (timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.
```
A thread can be join()ed many times. join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

_property name
A string used for identification purposes only.
It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

_property native_id
Native integral thread ID of this thread, or None if it has not been started.
This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run () → None
Method representing the thread’s activity.
You may override this method in a subclass. The standard run() method invokes the callable object passed to the object’s constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon (daemonic)
Set whether this thread is a daemon.
This method is deprecated, use the .daemon property instead.

setName (name)
Set the name string for this thread.
This method is deprecated, use the name attribute instead.

start ()
Start the thread’s activity.
It must be called at most once per thread object. It arranges for the object’s run() method to be invoked in a separate thread of control.
This method will raise a RuntimeError if called more than once on the same thread object.

_adjust_stack_size ()
_maybe_start_worker () → None
_restore_stack_size (prev_size) → None
_setup_logging ()
_start_worker () → None
_work ()
start () → None
trace_message (message) → None

class SCons.Taskmaster.Job.Serial (taskmaster)
Bases: object
This class is used to execute tasks in series, and is more efficient than Parallel, but is only appropriate for non-parallel builds. Only one instance of this class should be in existence at a time.
This class is not thread safe.

start ()
Start the job. This will begin pulling tasks from the taskmaster and executing them, and return when there are no more tasks. If a task fails to execute (i.e. execute() raises an exception), then the job will stop.

class SCons.Taskmaster.Job.ThreadPool (num, stack_size, interrupted)
Bases: object
This class is responsible for spawning and managing worker threads.

cleanup () → None
Shuts down the thread pool, giving each worker thread a chance to shut down gracefully.

get ()
Remove and return a result tuple from the results queue.

preparation_failed (task) → None

put (task) → None
Put task into request queue.

class SCons.Taskmaster.Job.Worker (requestQueue, resultsQueue, interrupted)
Bases: Thread
A worker thread waits on a task to be posted to its request queue, dequeues the task, executes it, and posts a tuple including the task and a boolean indicating whether the task executed successfully.
Removed current thread from the dict of currently running threads.

Reset internal locks.

Set a lock object which will be released by the interpreter when the underlying thread state gets deleted.

Set a lock object which will be released by the interpreter when the underlying thread state gets deleted.

Set a lock object which will be released by the interpreter when the underlying thread state gets deleted.

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.
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setDaemon (daemonic)
Set whether this thread is a daemon.
This method is deprecated, use the .daemon property instead.

setName (name)
Set the name string for this thread.
This method is deprecated, use the name attribute instead.

start ()
Start the thread’s activity.
It must be called at most once per thread object. It arranges for the object’s run() method to be invoked in a separate thread of control.
This method will raise a RuntimeError if called more than once on the same thread object.

SCons.Tool package

Module contents
SCons tool selection.
Looks for modules that define a callable object that can modify a construction environment as appropriate for a given tool (or tool chain).

Note that because this subsystem just selects a callable that can modify a construction environment, it’s possible for people to define their own “tool specification” in an arbitrary callable function. No one needs to use or tie in to this subsystem in order to roll their own tool specifications.

SCons.Tool.CreateJarBuilder (env)
The Jar builder expects a list of class files which it can package into a jar file.
The jar tool provides an interface for passing other types of java files such as .java, directories or swig interfaces and will build them to class files in which it can package into the jar.

SCons.Tool.CreateJavaClassDirBuilder (env)
SCons.Tool.CreateJavaClassFileBuilder (env)
SCons.Tool.CreateJavaFileBuilder (env)
SCons.Tool.CreateJavaHBuilder (env)
SCons.Tool.FindAllTools (tools, env)
SCons.Tool.FindTool (tools, env)
SCons.Tool.Initializers (env) → None

class SCons.Tool.Tool (name, toolpath=None, **kwargs)
Bases: object
_tool_module ()
Try to load a tool module.
This will hunt in the toolpath for both a Python file (toolname.py) and a Python module (toolname directory), then try the regular import machinery, then fallback to try a zipfile.

class SCons.Tool.ToolInitializer (env, tools, names)
Bases: object
A class for delayed initialization of Tools modules.
Instances of this class associate a list of Tool modules with a list of Builder method names that will be added by those Tool modules. As part of instantiating this object for a particular construction environment, we also add the appropriate ToolInitializerMethod objects for the various Builder methods that we want to use to delay Tool searches until necessary.
apply_tools (env) → None
Searches the list of associated Tool modules for one that exists, and applies that to the construction environment.
remove_methods (env) → None
Removes the methods that were added by the tool initialization so we no longer copy and re-bind them when the construction environment gets cloned.

class SCons.Tool.ToolInitializerMethod (name, initializer)
Bases: object
This is added to a construction environment in place of a method(s) normally called for a Builder (env.Object, env.StaticObject, etc.). When called, it has its associated ToolInitializer object search the specified list of tools and
apply the first one that exists to the construction environment. It then calls whatever builder was (presumably) added
to the construction environment in place of this particular instance.

__call__ (env, *args, **kw)

get_builder (env)

Returns the appropriate real Builder for this method name after having the associated ToolInitializer object apply
the appropriate Tool module.

SCons.Tool.createCFileBuilders (env)

This is a utility function that creates the CFile/CXXFile Builders in an Environment if they are not there already.
If they are there already, we return the existing ones.
This is a separate function because soooo many Tools use this functionality.
The return is a 2-tuple of (CFile, CXXFile)

SCons.Tool.createLoadableModuleBuilder (env, loadable_module_suffix: str = '$_LDMODULESUFFIX')

This is a utility function that creates the LoadableModule Builder in an Environment if it is not there already.
If it is already there, we return the existing one.

Parameters:  loadable_module_suffix – The suffix specified for the loadable module builder

SCons.Tool.createObjBuilders (env)

This is a utility function that creates the StaticObject and SharedObject Builders in an Environment if they are not
there already.
If they are there already, we return the existing ones.
This is a separate function because soooo many Tools use this functionality.
The return is a 2-tuple of (StaticObject, SharedObject)

SCons.Tool.createProgBuilder (env)

This is a utility function that creates the Program Builder in an Environment if it is not there already.
If it is already there, we return the existing one.

SCons.Tool.createSharedLibBuilder (env, shlib_suffix: str = '$_SHLIBSUFFIX')

This is a utility function that creates the SharedLibrary Builder in an Environment if it is not there already.
If it is already there, we return the existing one.

Parameters:  shlib_suffix – The suffix specified for the shared library builder

SCons.Tool.createStaticLibBuilder (env)

This is a utility function that creates the StaticLibrary Builder in an Environment if it is not there already.
If it is already there, we return the existing one.

SCons.Tool.find_program_path (env, key_program, default_paths=None, add_path: bool = False) → str | None

Find the location of a tool using various means.
Mainly for windows where tools aren’t all installed in /usr/bin, etc.

Parameters:

• env – Current Construction Environment.
• key_program – Tool to locate.
• default_paths – List of additional paths this tool might be found in.
• add_path – If true, add path found if it was from default_paths.

SCons.Tool.tool_list (platform, env)

SCons.Util package

Module contents

SCons utility functions

This package contains routines for use by other parts of SCons. Candidates for inclusion here are routines that do not
need other parts of SCons (other than Util), and have a reasonable chance of being useful in multiple places, rather
then being topical only to one module/package.

class  SCons.Util.CLVar (initiallist=None)

Bases: UserList

A container for command-line construction variables.
Forces the use of a list of strings intended as command-line arguments. Like collections.UserList, but the argument passed to the initializter will be processed by the Split() function, which includes special handling for string types: they will be split into a list of words, not coerced directly to a list. The same happens if a string is added to a CLVar, which allows doing the right thing with both Append()/Prepend() methods, as well as with pure Python addition, regardless of whether adding a list or a string to a construction variable.

Side effect: spaces will be stripped from individual string arguments. If you need spaces preserved, pass strings containing spaces inside a list argument.

```python
>>> u = UserList("--some --opts and args")
>>> print(len(u), repr(u))
22 ['-', '-', 's', 'o', 'm', 'e', ' ', '-', '-', 'o', 'p', 't', 's', ' ', 'a', 'n', 'd', ' ', 'a', 'r', 'g', 's']
>>> c = CLVar("--some --opts and args")
>>> print(len(c), repr(c))
4 ['--some', '--opts', 'and', 'args']
>>> c += "strips spaces "
>>> print(len(c), repr(c))
6 ['--some', '--opts', 'and', 'args', 'strips', 'spaces']
>>> c += ['does not split or strip ']
7 ['--some', '--opts', 'and', 'args', 'strips', 'spaces', 'does not split or strip ']
```

_SCon API Documentation_
default_msec_format = "%s,%03d"
default_time_format = "%Y-%m-%d %H:%M:%S"

format (record)
  Format the specified record as text.
  The record's attribute dictionary is used as the operand to a string formatting operation which yields the returned string. Before formatting the dictionary, a couple of preparatory steps are carried out. The message attribute of the record is computed using LogRecord.getMessage(). If the formatting string uses the time (as determined by a call to usesTime()), formatTime() is called to format the event time. If there is exception information, it is formatted using formatException() and appended to the message.

formatException (ei)
  Format and return the specified exception information as a string.
  This default implementation just uses traceback.print_exception()

formatMessage (record)

formatStack (stack_info)
  This method is provided as an extension point for specialized formatting of stack information.
  The input data is a string as returned from a call to traceback.print_stack(), but with the last trailing newline removed.
  The base implementation just returns the value passed in.

formatTime (record, datefmt=None)
  Return the creation time of the specified LogRecord as formatted text.
  This method should be called from format() by a formatter which wants to make use of a formatted time. This method can be overridden in formatters to provide for any specific requirement, but the basic behaviour is as follows: if datefmt (a string) is specified, it is used with time.strftime() to format the creation time of the record. Otherwise, an ISO8601-like (or RFC 3339-like) format is used. The resulting string is returned. This function uses a user-configurable function to convert the creation time to a tuple. By default, time.localtime() is used; to change this for a particular formatter instance, set the ‘converter’ attribute to a function with the same signature as time.localtime() or time.gmtime(). To change it for all formatters, for example if you want all logging times to be shown in GMT, set the ‘converter’ attribute in the Formatter class.

usesTime ()
  Check if the format uses the creation time of the record.

class SCons.Util.DisplayEngine
  Bases: object
  A callable class used to display SCons messages.
  print_it = True
  set_mode (mode) → None

SCons.Util.IDX (n) → bool
  Generate in index into strings from the tree legends.
  These are always a choice between two, so bool works fine.

class SCons.Util.LogicalLines (fileobj)
  Bases: object
  Wrapper class for the logical_lines() function.
  Allows us to read all “logical” lines at once from a given file object.
  readlines ()

class SCons.Util.NodeList (initlist=None)
  Bases: UserList
  A list of Nodes with special attribute retrieval.
  Unlike an ordinary list, access to a member's attribute returns a NodeList containing the same attribute for each member. Although this can hold any object, it is intended for use when processing Nodes, where fetching an attribute of each member is very common, for example getting the content signature of each node. The term “attribute” here includes the string representation.

>>> someList = NodeList(['  foo  ', '  bar  '])
>>> someList.strip()
['foo', 'bar']

__getattr__ (name) → NodeList
Returns a NodeList of name from each member.

```python
__getitem__(index)
```
Returns one item, forces a NodeList if index is a slice.

```python
abc_impl = _abc._abc_data object
```
append(item)

S.append(value) – append value to the end of the sequence

clear() → None -- remove all items from S

copy()

count(value) → integer -- return number of occurrences of value

extend(other)

S.extend(iterable) – extend sequence by appending elements from the iterable

```python
index(value[, start[, stop]])
```

→ integer -- return first index of value. Raises ValueError if the value is not present.

Supporting start and stop arguments is optional, but recommended.

insert(i, item)

S.insert(index, value) – insert value before index

pop([, index])

→ item -- remove and return item at index (default last). Raise IndexError if list is empty or index is out of range.

remove(item)

S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse()

S.reverse() – reverse IN PLACE

sort(*args, **kwds)

class SCons.Util.Proxy(subject)

Bases: object
A simple generic Proxy class, forwarding all calls to subject.
This means you can take an object, let’s call it ‘obj_a’, and wrap it in this Proxy class, with a statement like this:

```python
proxy_obj = Proxy(obj_a)
```

Then, if in the future, you do something like this:

```python
x = proxy_obj.var1
```

since the Proxy class does not have a var1 attribute (but presumably obj_a does), the request actually is equivalent to saying:

```python
x = obj_a.var1
```

Inherit from this class to create a Proxy.
With Python 3.5+ this does not work transparently for Proxy subclasses that use special dunder method names, because those names are now bound to the class, not the individual instances. You now need to know in advance which special method names you want to pass on to the underlying Proxy object, and specifically delegate their calls like this:

```python
class Foo(Proxy):
    __str__ = Delegate('__str__')
```

```python
__getattr__(name)
Retrieve an attribute from the wrapped object.
Raises: AttributeError – if attribute name doesn’t exist.
```

```python
get()
Retrieve the entire wrapped object
```

SCons.Util.RegError
alias of _NoError

SCons.Util.RegGetValue (root, key)
SCons.Util.RegOpenKeyEx (root, key)

class SCons.Util.Selector
Bases: dict
A callable dict for file suffix lookup.
Often used to associate actions or emitters with file types.
Depends on insertion order being preserved so that get_suffix() calls always return the first suffix added.
clear () \rightarrow None. Remove all items from D.
copy () \rightarrow a shallow copy of D
fromkeys (value=None, /)
Create a new dictionary with keys from iterable and values set to value.
get (key, default=None, /)
Return the value for key if key is in the dictionary, else default.
items () \rightarrow a set-like object providing a view on D's items
keys () \rightarrow a set-like object providing a view on D's keys
pop (k, d) \rightarrow v, remove specified key and return the corresponding value.
If the key is not found, return the default if given; otherwise, raise a KeyError.
popitem ()
Remove and return a (key, value) pair as a 2-tuple.
Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
setdefault (key, default=None, /)
Insert key with a value of default if key is not in the dictionary.
Return the value for key if key is in the dictionary, else default.
update ([, E], **F) \rightarrow None. Update D from dict/iterable E and F.
If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys() method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
values () \rightarrow an object providing a view on D's values

SCons.Util.Split (arg) \rightarrow list
Returns a list of file names or other objects.
If arg is a string, it will be split on whitespace within the string. If arg is already a list, the list will be returned untouched. If arg is any other type of object, it will be returned in a single-item list.

>>> print(Split(" this is a string "))
['this', 'is', 'a', 'string']
>>> print(Split(["stringlist", " preserving ", " spaces "]))
['stringlist', ' preserving ', ' spaces ']

class SCons.Util.Unbuffered (file)
Bases: object
A proxy that wraps a file object, flushing after every write.
Delegates everything else to the wrapped object.
write (arg) \rightarrow None
writelines (arg) \rightarrow None

class SCons.Util.UniqueList (initlist=None)
Bases: UserList
A list which maintains uniqueness.
Uniquing is lazy: rather than being enforced on list changes, it is fixed up on access by those methods which need to act on a unique list to be correct. That means things like membership tests don’t have to eat the uniquing time.

__make_unique () \rightarrow None
__abc_impl = <abc._abc_data object>
append (item) \rightarrow None
S.append(value) – append value to the end of the sequence
clear () \rightarrow None -- remove all items from S
copy ()
count (value) \rightarrow integer -- return number of occurrences of value
extend (other) → None
   S.extend(iterable) – extend sequence by appending elements from the iterable
index (value[, start[, stop]]) → integer -- return first index of value.
   Raises ValueError if the value is not present.
   Supporting start and stop arguments is optional, but recommended.
insert (i, item) → None
   S.insert(index, value) – insert value before index
pop ([, index]) → item -- remove and return item at index (default last).
   Raise IndexError if list is empty or index is out of range.
remove (item)
   S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.
reverse () → None
   S.reverse() – reverse IN PLACE
sort (*args, **kwds)
SCons.Util.WhereIs (file, path=None, pathext=None, reject=None) → str | None
Return the path to an executable that matches file.
   Searches the given path for file, considering any filename extensions in pathext (on the Windows platform only), and returns the full path to the matching command of the first match, or None if there are no matches. Will not select any path name or names in the optional reject list.
   If path is None (the default), os.environ[PATH] is used. On Windows, If pathext is None (the default), os.environ[PATHEXT] is used.
   The construction environment method of the same name wraps a call to this function by filling in path from the execution environment if it is None (and for pathext on Windows, if necessary), so if called from there, this function will not backfill from os.environ.

Note
   Finding things in os.environ may answer the question “does file exist on the system”, but not the question “can SCons use that executable”, unless the path element that yields the match is also in the the Execution Environment (e.g. env['ENV']['PATH']). Since this utility function has no environment reference, it cannot make that determination.

exception SCons.Util._NoError
   Bases: Exception
   add_note ()
      Exception.add_note(note) – add a note to the exception
   args
   with_traceback ()
      Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
SCons.Util._semi_deepcopy_list (obj) → list
SCons.Util._semi_deepcopy_tuple (obj) → tuple
SCons.Util.adjustixes (fname, pre, suf, ensure_suffix: bool = False) → str
   Adjust filename prefixes and suffixes as needed.
   Add prefix to fname if specified. Add suffix to fname if specified and if ensure_suffix is True
SCons.Util.case_sensitive_suffixes (s1: str, s2: str) → bool
   Returns whether platform distinguishes case in file suffixes.
SCons.Util.cmp (a, b) → bool
   A cmp function because one is no longer available in Python3.
SCons.Util.containsAll (s, pat) → bool
   Check whether string s contains ALL of the items in pat.
SCons.Util.containsAny (s, pat) → bool
   Check whether string s contains ANY of the items in pat.
SCons.Util.containsOnly (s, pat) → bool
   Check whether string s contains ONLY items in pat.
SCons.Util.dictify (keys, values, result=None) → dict
SCons.Util.do_flatten (sequence, result, isinstance=<built-in function isinstance>,
   StringTypes=(<class 'str'>, <class 'collections.UserString'>),
   SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>,
   <class 'collections.UserList'>, <class 'collections.abc.MappingView'>)) → None
SCons.Util.flatten (obj, isistance=<built-in function isinstance>,
   StringTypes=(<class 'str'>, <class 'collections.UserString'>),
   SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>,
   <class 'collections.UserList'>, <class 'collections.abc.MappingView'>),
   do_flatten=<function do_flatten>) → list
Flatten a sequence to a non-nested list.
Converts either a single scalar or a nested sequence to a non-nested list. Note that flatten() considers strings to be
scalars instead of sequences like pure Python would.
SCons.Util.flatten_sequence (sequence, isistance=<built-in function isinstance>,
   StringTypes=(<class 'str'>, <class 'collections.UserString'>),
   SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>,
   <class 'collections.UserList'>, <class 'collections.abc.MappingView'>),
   do_flatten=<function do_flatten>) → list
Flatten a sequence to a non-nested list.
Same as flatten(), but it does not handle the single scalar case. This is slightly more efficient when one knows that
the sequence to flatten can not be a scalar.
SCons.Util.get_native_path (path: str) → str
Transform an absolute path into a native path for the system.
In Cygwin, this converts from a Cygwin path to a Windows path, without regard to whether path refers to an existing
file system object. For other platforms, path is unchanged.
SCons.Util.logical_lines (physical_lines, joiner=<built-in method join of str object>)
SCons.Util.make_path_relative (path) → str
Converts an absolute path name to a relative pathname.
SCons.Util.print_time ()
Hack to return a value from Main if can't import Main.
SCons.Util.print_tree (root, child_func, prune: bool = False, showtags: int = 0, margin: List[bool] = [False],
   visited: dict | None = None, lastChild: bool = False, singleLineDraw: bool = False) → None
Print a tree of nodes.
This is like func:render_tree, except it prints lines directly instead of creating a string representation in memory, so
that huge trees can be handled.
Parameters:
  - root — the root node of the tree
  - child_func — the function called to get the children of a node
  - prune — don’t visit the same node twice
  - showtags — print status information to the left of each node line The default is false (value
2). A value of 2 will also print a legend for the margin tags.
  - margin — the format of the left margin to use for children of root. Each entry represents a
column, where a true value will display a vertical bar and a false one a blank.
  - visited — a dictionary of visited nodes in the current branch if prune is false, or in the
whole tree if prune is true.
  - lastChild — this is the last leaf of a branch
  - singleLineDraw — use line-drawing characters rather than ASCII.
SCons.Util.render_tree (root, child_func, prune: bool = False, margin: List[bool] = [False], visited: dict | None = None) → str
Render a tree of nodes into an ASCII tree view.
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Parameters:
- **root** – the root node of the tree
- **child_func** – the function called to get the children of a node
- **prune** – don’t visit the same node twice
- **margin** – the format of the left margin to use for children of root. Each entry represents a column where a true value will display a vertical bar and a false one a blank.
- **visited** – a dictionary of visited nodes in the current branch if prune is false, or in the whole tree if prune is true.

SCons.Util.rightmost_separator (path, sep)

SCons.Util.sanitize_shell_env (execution_env: dict) → dict
Sanitize all values in execution_env
The execution environment (typically comes from env['ENV']) is propagated to the shell, and may need to be cleaned first.

Parameters:
- **execution_env** – The shell environment variables to be propagated
- **shell. (to the spawned)** –

Returns:
- sanitized dictionary of env variables (similar to what you’d get from os.environ)

SCons.Util.semi_deepcopy (obj)

SCons.Util.semi_deepcopy_dict (obj, exclude=None) → dict
Intern a string without failing.
Perform sys.intern on the passed argument and return the result. If the input is ineligible for interning the original argument is returned and no exception is thrown.

SCons.Util.splitext (path) → tuple
Split path into a (root, ext) pair.
Same as os.path.splitext but faster.

SCons.Util.unique (seq)
Return a list of the elements in seq without duplicates, ignoring order.
For best speed, all sequence elements should be hashable. Then unique() will usually work in linear time.
If not possible, the sequence elements should enjoy a total ordering, and if list(s).sort() doesn’t raise TypeError it is assumed that they do enjoy a total ordering. Then unique() will usually work in O(N*log2(N)) time.
If that’s not possible either, the sequence elements must support equality-testing. Then unique() will usually work in quadratic time.

```python
>>> mylist = unique([1, 2, 3, 1, 2, 3])
>>> print(sorted(mylist))
[1, 2, 3]
>>> mylist = unique("abcabc")
>>> print(sorted(mylist))
['a', 'b', 'c']
>>> mylist = unique(([1, 2], [2, 3], [1, 2]))
>>> print(sorted(mylist))
[[1, 2], [2, 3]]
```

SCons.Util.uniquer_hashables (seq)
SCons.Util.updrive (path) → str
Make the drive letter (if any) upper case.
This is useful because Windows is inconsistent on the case of the drive letter, which can cause inconsistencies when calculating command signatures.

SCons.Util.wait_for_process_to_die (pid) → None
Wait for specified process to die, or alternatively kill it NOTE: This function operates best with psutil pypi package
TODO: Add timeout which raises exception

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### SCons.Util.envs module

**SCons environment utility functions.**

Routines for working with environments and construction variables that don’t need the specifics of the Environment class.

**SCons.Util.envs.AddMethod**(obj, function: Callable, name: str | None = None) → None

Add a method to an object.

_Adds function to obj if obj is a class object. Adds function as a bound method if obj is an instance object. If obj looks like an environment instance, use MethodWrapper to add it. If name is supplied it is used as the name of function. Although this works for any class object, the intent as a public API is to be used on Environment, to be able to add a method to all construction environments; it is preferred to use env.AddMethod to add to an individual environment._

```python
def f(self, x, y):
    self.z = x + y
```

```python
>>> class A:
...    ...
...    ...
>>> a = A()

>>> def f(self, x, y):
...    self.z = x + y

>>> AddMethod(A, f, "add")
>>> a.add(2, 4)
6
>>> a.data = ['a', 'b', 'c', 'd', 'e', 'f']
>>> AddMethod(a, lambda self, i: self.data[i], "listIndex")
>>> print(a.listIndex(3))
d
```

**SCons.Util.envs.AppendPath**(oldpath, newpath, sep: str = ':', delete_existing: bool = True, canonicalize: Callable | None = None) → list | str

Append newpath path elements to oldpath.

_Will only add any particular path once (leaving the last one it encounters and ignoring the rest, to preserve path order), and will os.path.normpath and os.path.normcase all paths to help assure this. This can also handle the case where oldpath is a list instead of a string, in which case a list will be returned instead of a string. For example:_

```python
>>> p = AppendPath("/foo/bar:/foo", ":/biz/boom:/foo")
>>> print(p)
/foo/bar:/biz/boom:/foo
```
If `delete_existing` is `False`, then adding a path that exists will not move it to the end; it will stay where it is in the list.

```python
>>> p = AppendPath("/foo/bar:/foo", "/biz/boom:/foo", delete_existing=False)
>>> print(p)
/foo/bar:/foo:/biz/boom
```

If `canonicalize` is not `None`, it is applied to each element of `newpath` before use.

```python
class SCons.Util.envs.MethodWrapper (obj: Any, method: Callable, name: str | None = None)
Bases: object
A generic Wrapper class that associates a method with an object.
As part of creating this MethodWrapper object an attribute with the specified name (by default, the name of the supplied method) is added to the underlying object. When that new “method” is called, our `__call__()` method adds the object as the first argument, simulating the Python behavior of supplying “self” on method calls.
We hang on to the name by which the method was added to the underlying base class so that we can provide a method to “clone” ourselves onto a new underlying object being copied (without which we wouldn’t need to save that info).

clone (new_object)
Returns an object that re-binds the underlying “method” to the specified new object.
```n
```python
SCons.Util.envs.PrependPath (oldpath: str, newpath: str, sep=':', delete_existing: bool = True, canonicalize: Callable | None = None) → list | str
Prepend `newpath` path elements to `oldpath`.
Will only add any particular path once (leaving the first one it encounters and ignoring the rest, to preserve path order), and will os.path.normpath and os.path.normcase all paths to help assure this. This can also handle the case where `oldpath` is a list instead of a string, in which case a list will be returned instead of a string. For example:

```python
>>> p = PrependPath("/foo/bar:/foo", "/biz/boom:/foo")
>>> print(p)
/biz/boom:/foo:/foo/bar
```

If `delete_existing` is `False`, then adding a path that exists will not move it to the beginning; it will stay where it is in the list.

```python
>>> p = PrependPath("/foo/bar:/foo", "/biz/boom:/foo", delete_existing=False)
>>> print(p)
/biz/boom:/foo/bar:/foo
```

If `canonicalize` is not `None`, it is applied to each element of `newpath` before use.

```python
SCons.Util.envs.is_valid_construction_var (varstr: str) → bool
Return True if `varstr` is a legitimate name of a construction variable.
```n
```python
SCons.Util.filelock module
SCons file locking functions.
Simple-minded filesystem-based locking. Provides a context manager which acquires a lock (or at least, permission) on entry and releases it on exit.
Usage:

```python
from SCons.Util.filelock import FileLock
with FileLock("myfile.txt", writer=True) as lock:
    print(f"Lock on {lock.file} acquired.")
    # work with the file as it is now locked
```
class SCons.Util.filelock.FileLock(file: str, timeout: int | None = None, delay: float | None = 0.05, writer: bool = False)

Bases: object

Lock a file using a lockfile.

Basic locking for when multiple processes may hit an externally shared resource that cannot depend on locking within a single SCons process. SCons does not have a lot of those, but caches come to mind.

Cross-platform safe, does not use any OS-specific features. Provides context manager support, or can be called with acquire_lock() and release_lock().

Lock can be a write lock, which is held until released, or a read lock, which releases immediately upon acquisition - we want to not read a file which somebody else may be writing, but not create the writers starvation problem of the classic readers/writers lock.

TODO: Should default timeout be None (non-blocking), or 0 (block forever), or some arbitrary number?

Parameters:

- **file** – name of file to lock. Only used to build the lockfile name.
- **timeout** – optional time (sec) to give up trying. If None, quit now if we failed to get the lock (non-blocking). If 0, block forever (well, a long time).
- **delay** – optional delay between tries [default 0.05s]
- **writer** – if True, obtain the lock for safe writing. If False (default), just wait till the lock is available, give it back right away.

Raises: **SConsLockFailure** – if the operation “timed out”, including the non-blocking mode.

__enter__ () → FileLock

Context manager entry: acquire lock if not holding.

__exit__ (exc_type, exc_value, exc_tb) → None

Context manager exit: release lock if holding.

__repr__ () → str

Nicer display if someone repr’s the lock class.

acquire_lock () → None

Acquire the lock, if possible.

If the lock is in use, check again every delay seconds. Continue until lock acquired or timeout expires.

release_lock () → None

Release the lock by deleting the lockfile.

exception SCons.Util.filelock.SConsLockFailure

Bases: Exception

Lock failure exception.

add_note ()

Exception.add_note(note) – add a note to the exception

args

with_traceback ()

Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

SCons.Util.hashes module

SCons hash utility routines.

Routines for working with content and signature hashes.

SCons.Util.hashes.MD5collect (signatures)

Deprecated. Use hash_collect() instead.

SCons.Util.hashes.MD5filesignature (fname, chunksize: int = 65536)

Deprecated. Use hash_file_signature() instead.

SCons.Util.hashes.MD5signature (s)

Deprecated. Use hash_signature() instead.
SCons.Util.hashes._attempt_get_hash_function (hash_name, hashlib_used=<module 'hashlib' from '/opt/local/Library/Frameworks/Python.framework/Versions/3.11/lib/python3.11/hashlib.py'>, sys_used=<module 'sys' (built-in)>)

Wrapper used to try to initialize a hash function given.
If successful, returns the name of the hash function back to the user.
Otherwise returns None.

SCons.Util.hashes._attempt_init_of_python_3_9_hash_object (hash_function_object, sys_used=<module 'sys' (built-in)>)

Initialize hash function with non-security indicator.
In Python 3.9 and onwards, hashlib constructors accept a keyword argument usedforsecurity, which, if set to False,
lets us continue to use algorithms that have been deprecated either by FIPS or by Python itself, as the MD5 algorithm
SCons prefers is not being used for security purposes as much as a short, 32 char hash that is resistant to accidental
collisions.
In prior versions of python, hashlib returns a native function wrapper, which errors out when it’s queried for the
optional parameter, so this function wraps that call.
It can still throw a ValueError if the initialization fails due to FIPS compliance issues, but that is assumed to be the
responsibility of the caller.

SCons.Util.hashes._get_hash_object (hash_format, hashlib_used=<module 'hashlib' from '/opt/local/Library/Frameworks/Python.framework/Versions/3.11/lib/python3.11/hashlib.py'>, sys_used=<module 'sys' (built-in)>)

Allocates a hash object using the requested hash format.

Parameters:
hash_format – Hash format to use.

Returns:
hashlib object.

SCons.Util.hashes._set_allowed_viable_default_hashes (hashlib_used, sys_used=<module 'sys' (built-in)>) → None

Check if the default hash algorithms can be called.
This util class is sometimes called prior to setting the user-selected hash algorithm, meaning that on FIPS-compliant
systems the library would default-initialize MD5 and throw an exception in set_hash_format. A common case is using
the SConf options, which can run prior to main, and thus ignore the options.hash_format variable.
This function checks the DEFAULT_HASH_FORMATS and sets the ALLOWED_HASH_FORMATS to only the ones
that can be called. In Python >= 3.9 this will always default to MD5 as in Python 3.9 there is an optional attribute
“usedforsecurity” set for the method.
Throws if no allowed hash formats are detected.

SCons.Util.hashes._show_md5_warning (function_name) → None

Shows a deprecation warning for various MD5 functions.

SCons.Util.hashes.get_current_hash_algorithm_used ()

Returns the current hash algorithm name used.
Where the python version >= 3.9, this is expected to return md5. If python’s version is <= 3.8, this returns md5 on
non-FIPS-mode platforms, and sha1 or sha256 on FIPS-mode Linux platforms.
This function is primarily useful for testing, where one expects a value to be one of N distinct hashes, and therefore
the test needs to know which hash to select.

SCons.Util.hashes.get_hash_format ()

Retrieves the hash format or None if not overridden.
A return value of None does not guarantee that MD5 is being used; instead, it means that the default precedence
order documented in SCons.Util.set_hash_format() is respected.

SCons.Util.hashes.hash_collect (signatures, hash_format=None)

Collects a list of signatures into an aggregate signature.

Parameters:
• signatures – a list of signatures

Returns: the aggregate signature

SCons.Util.hashes.hash_file_signature (fname, chunksize: int = 65536, hash_format=None)

Generate the md5 signature of a file
SCons API Documentation

Parameters:
- **fname** – file to hash
- **chunksize** – chunk size to read
- **hash_format** – Specify to override default hash format

Returns: String of Hex digits representing the signature
SCons.Util.hashes.hash_signature(s, hash_format=None)
Generate hash signature of a string

Parameters:
- **s** – either string or bytes. Normally should be bytes
- **hash_format** – Specify to override default hash format

Returns: String of hex digits representing the signature
SCons.Util.hashes.set_hash_format(hash_format, hashlib_used=<module 'hashlib' from '/opt/local/Library/Frameworks/Python.framework/Versions/3.11/lib/python3.11/hashlib.py'>, sys_used=<module 'sys' (built-in)>)
Sets the default hash format used by SCons.
If **hash_format** is None or an empty string, the default is determined by this function.
Currently the default behavior is to use the first available format of the following options: MD5, SHA1, SHA256.

SCons.Util.sctypes module
Various SCons utility functions

Routines which check types and do type conversions.

* **class** SCons.Util.sctypes.Null(*args, **kwargs)
  Bases: object
  Null objects always and reliably ‘do nothing’.

* **class** SCons.Util.sctypes.NullSeq(*args, **kwargs)
  Bases: Null
  A Null object that can also be iterated over.

SCons.Util.sctypes.get_env_bool(env, name: str, default: bool = False) → bool
Convert a construction variable to bool.
If the value of **name** in dict-like object **env** is ‘true’, ‘yes’, ‘y’, ‘on’ (case insensitive) or anything convertible to int that yields non-zero, return True; if ‘false’, ‘no’, ‘n’, ‘off’ (case insensitive) or a number that converts to integer zero return False. Otherwise, or if **name** is not found, return the value of **default**.

Parameters:
- **env** – construction environment, or any dict-like object.
- **name** – name of the variable.
- **default** – value to return if **name** not in **env** or cannot be converted (default: False).

SCons.Util.sctypes.get_environment_var(varstr) → str | None
Return undecorated construction variable string.
Determine if **varstr** looks like a reference to a single environment variable, like "$FOO" or "${FOO}". If so, return that variable with no decorations, like "FOO". If not, return None.

SCons.Util.sctypes.is_Dict(obj, isinstance=<built-in function isinstance>, DictTypes=(<class 'dict'>, <class 'collections.UserDict'>)) → bool
Check if object is a dict.

SCons.Util.sctypes.is_List(obj, isinstance=<built-in function isinstance>, ListTypes=(<class 'list'>, <class 'collections.UserList'>, <class 'collections.deque'>)) → bool
Check if object is a list.

SCons.Util.sctypes.is_Scalar(obj, isinstance=<built-in function isinstance>, StringType=(<class 'str'>, <class 'collections.UserString'>), Iterable=<class 'collections.abc.Iterable'>) → bool
Check if object is a scalar: not a container or iterable.

SCons.Util.sctypes.is_Sequence (obj, isinstance=<built-in function isinstance>, SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>)) → bool

Check if object is a sequence.

SCons.Util.sctypes.is_String (obj, isinstance=<built-in function isinstance>, StringTypes=(<class 'str'>, <class 'collections.UserString'>)) → bool

Check if object is a string.

SCons.Util.sctypes.is_Tuple (obj, isinstance=<built-in function isinstance>, tuple=<class 'tuple'>) → bool

Check if object is a tuple.

SCons.Util.sctypes.to_String (obj, isinstance=<built-in function isinstance>, str=<class 'str'>, UserString=<class 'collections.UserString'>, BaseStringTypes=<class 'str'>) → str

Return a string version of obj.

Use this for data likely to be well-behaved. Use to_Text() for unknown file data that needs to be decoded.

SCons.Util.sctypes.to_String_for_signature (obj, to_String_for_subst=<function to_String_for_subst>, AttributeError=<class 'AttributeError'>) → str

Return a string version of obj for signature usage.

Like to_String_for_subst() but has special handling for scons objects that have a for_signature() method, and for dicts.

SCons.Util.sctypes.to_String_for_subst (obj, isinstance=<built-in function isinstance>, str=<class 'str'>, BaseStringTypes=<class 'str'>, SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>), UserString=<class 'collections.UserString'>) → str

Return a string version of obj for subst usage.

SCons.Util.sctypes.to_Text (data: bytes) → str

Return bytes data converted to text.

Useful for whole-file reads where the data needs some interpretation, particularly for Scanners. Attempts to figure out what the encoding of the text is based upon the BOM bytes, and then decodes the contents so that it's a valid python string.

SCons.Util.sctypes.to_bytes (s) → bytes

Convert object to bytes.

SCons.Util.sctypes.to_str (s) → str

Convert object to string.

SCons.Util.stats module

SCons statistics routines.

This package provides a way to gather various statistics during an SCons run and dump that info in several formats

Additionally, it probably makes sense to do stderr/stdout output of those statistics here as well

There are basically two types of stats:

1. Timer (start/stop/time) for specific event. These events can be hierarchical. So you can record the children events of some parent. Think program compile could contain the total Program builder time, which could include linking, and stripping the executable

2. Counter. Counting the number of events and/or objects created. This would likely only be reported at the end of a given SCons run, though it might be useful to query during a run.

class SCons.Util.stats.CountStats

    Bases: Stats

    _abc_impl = <abc._abc_data object>

    do_append (label)

    do_nothing (**args, **kw)

    do_print ()

    enable (outfp)

    class SCons.Util.stats.MemStats
SCons API Documentation

Bases: Stats
   _abc_impl = _abc._abc_data object
   do_append (label)
   do_nothing (*args, **kw)
   do_print ()
   enable (outfp)
class SCons.Util.stats.Stats
   Bases: ABC
   _abc_impl = _abc._abc_data object
   do_append (label)
   do_nothing (*args, **kw)
   do_print ()
   enable (outfp)
class SCons.Util.stats.TimeStats
   Bases: Stats
   _abc_impl = _abc._abc_data object
   add_command (command, start_time, finish_time)
   do_append (label)
   do_nothing (*args, **kw)
   do_print ()
   enable (outfp)
   total_times (build_time, sconscript_time, scons_exec_time, command_exec_time)

SCons.Util.stats.add_stat_type (name, stat_object)
   Add a statistic type to the global collection
SCons.Util.stats.write_scons_stats_file ()
   Actually write the JSON file with debug information. Depending which of : count, time, action-timestamps, memory
   their information will be written.

SCons.Variables package

Module contents

Adds user-friendly customizable variables to an SCons build.
class SCons.Variables.Variable
   Bases: object
   A Build Variable.
   __lt__ (other)
      Comparison function so Variable instances sort.
   __str__ () → str
      Provide a way to “print” a Variable object.
   aliases
   converter
   default
   do_subst
   help
   key
   validator

class SCons.Variables.Variables (files: str | Sequence[str] | None = None, args: dict | None = None, is_global: bool = False)
   Bases: object
   A container for multiple Build Variables.
   Includes methods to updates the environment with the variables, and to render the help text.
Parameters:
- `files` – string or list of strings naming variable config scripts (default None)
- `args` – dictionary to override values set from `files`. (default None)
- `is_global` – if true, return a global singleton Variables object instead of a fresh instance. Currently inoperable (default False)

Changed in version 4.8.0: The default for `is_global` changed to False (previously True but it had no effect due to an implementation error).
Deprecated since version 4.8.0: `is_global` is deprecated.

Add (key: str | Sequence, *args, **kwargs) → None
Add a Build Variable.

Parameters:
- `key` – the name of the variable, or a 5-tuple (or other sequence). If `key` is a tuple, and there are no additional arguments except the `help`, `default`, `validator` and `converter` keyword arguments, `key` is unpacked into the variable name plus the `help`, `default`, `validator` and `converter` arguments; if there are additional arguments, the first elements of `key` is taken as the variable name, and the remainder as aliases.
- `args` – optional positional arguments, corresponding to the `help`, `default`, `validator` and `converter` keyword args.
- `kwargs` – arbitrary keyword arguments used by the variable itself.

Keyword Arguments:
- `help` – help text for the variable (default: empty string)
- `default` – default value for variable (default: None)
- `validator` – function called to validate the value (default: None)
- `converter` – function to be called to convert the variable’s value before putting it in the environment. (default: None)
- `subst` – perform substitution on the value before the converter and validator functions (if any) are called (default: True)

New in version 4.8.0: The `subst` keyword argument is now specially recognized.

AddVariables (*optlist) → None
Add a list of Build Variables.
Each list element is a tuple/list of arguments to be passed on to the underlying method for adding variables.
Example:

```python
opt = Variables()
opt.AddVariables(
    ('debug', '', 0),
    ('CC', 'The C compiler'),
    ('VALIDATE', 'An option for testing validation', 'notset', validator, None),
)
```

FormatVariableHelpText (env, key: str, help: str, default, actual, aliases: List[str] | None = None) → str
Format the help text for a single variable.
The caller is responsible for obtaining all the values, although now the Variable class is more publicly exposed, this method could easily do most of that work - however that would change the existing published API.

GenerateHelpText (env, sort: bool | Callable = False) → str
Generate the help text for the Variables object.

Parameters:
- `env` – an environment that is used to get the current values of the variables.
- `sort` – Either a comparison function used for sorting (must take two arguments and return -1, 0 or 1) or a boolean to indicate if it should be sorted.
Save (filename, env) → None
Save the variables to a script.
Saves all the variables which have non-default settings to the given file as Python expressions. This script can then be used to load the variables for a subsequent run. This can be used to create a build variable “cache” or capture different configurations for selection.

Parameters:
- filename – Name of the file to save into
- env – the environment to get the option values from

UnknownVariables () → dict
Return dict of unknown variables.
Identifies variables that were not recognized in this object.

Update (env, args: dict | None = None) → None
Update an environment with the Build Variables.

Parameters:
- env – the environment to update.
- args – a dictionary of keys and values to update in env. If omitted, uses the saved args

__str__ () → str
Provide a way to “print” a Variables object.

_do_add (key: str | List[str], help: str = '', default=0, validator: Callable | None = None, converter: Callable | None = None, **kwargs) → None
Create a Variable and add it to the list.
This is the internal implementation for Add() and AddVariables(). Not part of the public API.
New in version 4.8.0: subst keyword argument is now recognized.
aliasfmt = '
%s: %s
 default: %s
 actual: %s
 aliases: %s'
fmt = '
%s: %s
 default: %s
 actual: %s
'
keys () → list
Return the variable names.

Submodules
SCons.Variables.BoolVariable module
Variable type for true/false Variables.

Usage example:

```python
opts = Variables()
opts.Add(BoolVariable('embedded', 'build for an embedded system', False))
env = Environment(variables=opts)
if env['embedded']:
...
```

Return a tuple describing a boolean SCons Variable.
The input parameters describe a boolean variable, using a string value as described by TRUE_STRINGS and FALSE_STRINGS. Returns a tuple including the correct converter and validator. The help text will have (yes|no) automatically appended to show the valid values. The result is usable as input to Add().

SCons.Variables.BoolVariable._text2bool (val: str) → bool
Convert boolean-like string to boolean.
If val looks like it expresses a bool-like value, based on the TRUE_STRINGS and FALSE_STRINGS tuples, return the appropriate value.
This is usable as a converter function for SCons Variables.

Raises: ValueError – if val cannot be converted to boolean.
SCons API Documentation

SCons.Variables.BoolVariable._validator (key, val, env) → None
Validate that the value of key in env is a boolean.
Parameter val is not used in the check.
Usable as a validator function for SCons Variables.

Raises:
- KeyError – if key is not set in env
- UserError – if the value of key is not True or False.

SCons.Variables.EnumVariable module

Variable type for enumeration Variables.

Enumeration variables allow selection of one from a specified set of values.

Usage example:

```python
opts = Variables()
opts.Add(
    EnumVariable(
        'debug',
        help='debug output and symbols',
        default='no',
        allowed_values=('yes', 'no', 'full'),
        map={},
        ignorecase=2,
    )
)
env = Environment(variables=opts)
if env['debug'] == 'full':
    ...
```

SCons.Variables.EnumVariable.EnumVariable (key, help: str, default: str, allowed_values: List[str], map: dict | None = None, ignorecase: int = 0) → Tuple[str, str, str, Callable, Callable]

Return a tuple describing an enumeration SCons Variable.

The input parameters describe a variable with only predefined values allowed. The value of ignorecase defines the behavior of the validator and converter: if 0, the validator/ converter are case-sensitive; if 1, the validator/converter are case-insensitive; if 2, the validator/converter are case-insensitive and the converted value will always be lower-case.

Parameters:
- key – variable name, passed directly through to the return tuple.
- default – default values, passed directly through to the return tuple.
- help – descriptive part of the help text, will have the allowed values automatically appended.
- allowed_values – list of the allowed values for this variable.
- map – optional dictionary which may be used for converting the input value into canonical values (e.g. for aliases).

Returns: A tuple including an appropriate converter and validator. The result is usable as input to Add(). and AddVariables().

SCons.Variables.EnumVariable._validator (key, val, env, vals) → None
Validate that val is in vals.
Usable as the base for EnumVariable validators.
Variable type for List Variables.

A list variable allows selecting one or more from a supplied set of allowable values, as well as from an optional mapping of alternate names (such as aliases and abbreviations) and the special names 'all' and 'none'. Specified values are converted during processing into values only from the allowable values set.

Usage example:

```python
list_of_libs = Split('x11 gl qt ical')

opts = Variables()
opts.Add(
    ListVariable(
        'shared',
        help='libraries to build as shared libraries',
        default='all',
        elems=list_of_libs,
    )
)
env = Environment(variables=opts)
for lib in list_of_libs:
    if lib in env['shared']:
        env.SharedObject(...)
    else:
        env.Object(...)
```

SCons.Variables.ListVariable.ListVariable (key, help: str, default: str | List[str], names: List[str], map: dict | None = None, validator: Callable | None = None) → Tuple[str, str, str, None]

Return a tuple describing a list variable.
The input parameters describe a list variable, where the values can be one or more from names plus the special values all and none.

Parameters:

- **key** – the name of the list variable.
- **help** – the basic help message. Will have text appended indicating the allowable values (not including any extra names from map).
- **default** – the default value(s) for the list variable. Can be given as string (possibly comma-separated), or as a list of strings. all or none are allowed as default. You can also simulate a must-specify ListVariable by giving a default that is not part of names, it will fail validation if not supplied.
- **names** – the allowable values. Must be a list of strings.
- **map** – optional dictionary to map alternative names to the ones in names, providing a form of alias. The converter will make the replacement, names from map are not stored and will not appear in the help message.
- **validator** – optional callback to validate supplied values. The default validator is used if not specified.

Returns: A tuple including the correct converter and validator. The result is usable as input to Add().
Internal class holding the data for a List Variable.
This is normally not directly instantiated, rather the ListVariable converter callback “converts” string input (or the default value if none) into an instance and stores it.

Parameters:

- **initlist** – the list of actual values given.
- **allowedElems** – the list of allowable values.

```python
_abc_impl = <abc._abc_data object>
```

- **append** (item)
  - `S.append(value)` – append value to the end of the sequence
  - `clear()` → `None` -- remove all items from S
  - `count(value)` → `integer` -- return number of occurrences of value
  - `extend(other)`
    - `S.extend(iterable)` – extend sequence by appending elements from the iterable
    - Raises `ValueError` if the value is not present.
  - `index(value[, start[, stop]])` → `integer` -- return first index of value.
    - Supporting start and stop arguments is optional, but recommended.
  - `insert(i, item)`
    - `S.insert(index, value)` – insert value before index
  - `pop([, index])` → `item` -- remove and return item at index (default last).
    - Raise `IndexError` if list is empty or index is out of range.
  - `prepare_to_store()`
  - `remove(item)`
    - `S.remove(value)` – remove first occurrence of value. Raise `ValueError` if the value is not present.
  - `reverse()`
    - `S.reverse()` – reverse IN PLACE
  - `sort(*args, **kwds)`

**SCons.Variables.ListVariable._converter** *(val, allowedElems, mapdict) → _ListVariable*

Callback to convert list variables into a suitable form.

- The arguments `allowedElems` and `mapdict` are non-standard for a Variables converter: the lambda in the `ListVariable()` function arranges for us to be called correctly.

**SCons.Variables.ListVariable._validator** *(key, val, env) → None*

Callback to validate supplied value(s) for a ListVariable.

- Validation means “is val in the allowed list”? `val` has been subject to substitution before the validator is called. The converter created a `_ListVariable` container which is stored in `env` after it runs; this includes the allowable elements list. Substitution makes a string made out of the values (only), so we need to fish the allowed elements list out of the environment to complete the validation.

- Note that since 18b45e456, whether `subst` has been called is conditional on the value of the `subst` argument to `Add()`, so we have to account for possible different types of `val`.

**Raises**: `UserError` – if validation failed.

New in version 4.8.0: `_validator` split off from `_converter()` with an additional check for whether `val` has been substituted before the call.

**SCons.Variables.PackageVariable module**

Variable type for package Variables.

To be used whenever a ‘package’ may be enabled/disabled and the package path may be specified.

Given these options

```ini
x11=no   (disables X11 support)
x11=yes  (will search for the package installation dir)
x11=/usr/local/X11 (will check this path for existence)
```

Can be used as a replacement for autoconf’s `--with-xxx=yyy`
opts = Variables()
opts.Add(
    PackageVariable(
        key='x11',
        help='use X11 installed here (yes = search some places)',
        default='yes'
    )
)
env = Environment(variables=opts)
if env['x11'] is True:
    dir = ...  # search X11 in some standard places ...
    env['x11'] = dir
if env['x11']:
    ...  # build with x11 ...


Return a tuple describing a package list SCons Variable.
The input parameters describe a ‘package list’ variable. Returns a tuple with the correct converter and validator appended. The result is usable as input to Add().

A ‘package list’ variable may either be a truthy string from ENABLE_STRINGS, a falsy string from DISABLE_STRINGS, or a pathname string. This information is appended to help using only one string each for truthy/falsy.

SCons.Variables.PackageVariable._converter (val)

Convert package variables.
Returns True or False if one of the recognized truthy or falsy values is seen, else return the value unchanged (expected to be a path string).

SCons.Variables.PackageVariable._validator (key, val, env, searchfunc) → None

Validate package variable for valid path.
Checks that if a path is given as the value, that pathname actually exists.

SCons.Variables.PathVariable module

Variable type for path Variables.
To be used whenever a user-specified path override setting should be allowed.

Arguments to PathVariable are:

- **key** - name of this variable on the command line (e.g. “prefix”)
- **help** - help string for variable
- **default** - default value for this variable
- **validator** - [optional] validator for variable value. Predefined are:
  - *PathAccept* - accepts any path setting; no validation
  - *PathIsDir* - path must be an existing directory
  - *PathIsDirCreate* - path must be a dir; will create
  - *PathIsFile* - path must be a file
  - *PathExists* - path must exist (any type) [default]

The validator is a function that is called and which should return True or False to indicate if the path is valid. The arguments to the validator function are: (*key*, *val*, *env*). *key* is the name of the variable, *val* is the path specified for the variable, and *env* is the environment to which the Variables have been added.

Usage example:
opts = Variables()
opts.Add(
    PathVariable(
        'qtdir',
        help='where the root of Qt is installed',
        default=qtdir,
        validator=PathIsDir,
    )
)
opts.Add(
    PathVariable(
        'qt_includes',
        help='where the Qt includes are installed',
        default='$qtdir/includes',
        validator=PathIsDirCreate,
    )
)
opts.Add(
    PathVariable(
        'qt_libraries',
        help='where the Qt library is installed',
        default='$qtdir/lib',
    )
)

class SCons.Variables.PathVariable._PathVariableClass
    Bases: object
    Class implementing path variables.
    This class exists mainly to expose the validators without code having to import the names: they will appear as
    methods of PathVariable, a statically created instance of this class, which is placed in the SConscript namespace.
    Instances are callable to produce a suitable variable tuple.
    __call__ (key: str, help: str, default, validator: Callable | None = None) → Tuple[str, str, str, Callable | None]
    Return a tuple describing a path list SCons Variable.
    The input parameters describe a 'path list' variable. Returns a tuple with the correct converter and validator
    appended. The result is usable for input to Add().
    The default parameter specifies the default path to use if the user does not specify an override with this variable.
    validator is a validator, see this file for examples

SCons.compat package

Module contents

SCons compatibility package for old Python versions
This subpackage holds modules that provide backwards-compatible implementations of various things from newer Python versions that we cannot count on because SCons still supported older Pythons.

Other code will not generally reference things in this package through the SCons.compat namespace. The modules included here add things to the builtins namespace or the global module list so that the rest of our code can use the objects and names imported here regardless of Python version. As a result, if this module is used, it should violate the normal convention for imports (standard library imports first, then program-specific imports, each ordered alphabetically) and needs to be listed first.

The rest of the things here will be in individual compatibility modules that are either: 1) suitably modified copies of the future modules that we want to use; or 2) backwards compatible re-implementations of the specific portions of a future module’s API that we want to use.

GENERAL WARNINGS: Implementations of functions in the SCons.compat modules are NOT guaranteed to be fully compliant with these functions in later versions of Python. We are only concerned with adding functionality that we actually use in SCons, so be wary if you lift this code for other uses. (That said, making these more nearly the same as later, official versions is still a desirable goal, we just don’t need to be obsessive about it.)

We name the compatibility modules with an initial ‘_scons_’ (for example, _scons_subprocess.py is our compatibility module for subprocess) so that we can still try to import the real module name and fall back to our compatibility module if we get an ImportError. The import_as() function defined below loads the module as the “real” name (without the ‘_scons_’), after which all of the “import {module}” statements in the rest of our code will find our pre-loaded compatibility module.

class SCons.compat.NoSlotsPyPy (name, bases, dct)
  Bases: type
  Metaclass for PyPy compatibility.
  PyPy does not work well with __slots__ and __class__ assignment.
  mro ()
    Return a type's method resolution order.
SCons.compat.rename_module (new, old) → bool
  Attempt to import the old module and load it under the new name. Used for purely cosmetic name changes in Python 3.x.

Submodules

SCons.Action module

SCons Actions.

Information about executing any sort of action that can build one or more target Nodes (typically files) from one or more source Nodes (also typically files) given a specific Environment.

The base class here is ActionBase. The base class supplies just a few utility methods and some generic methods for displaying information about an Action in response to the various commands that control printing.

A second-level base class is _ActionAction. This extends ActionBase by providing the methods that can be used to show and perform an action. True Action objects will subclass _ActionAction; Action factory class objects will subclass ActionBase.

The heavy lifting is handled by subclasses for the different types of actions we might execute:

CommandAction CommandGeneratorAction FunctionAction ListAction

The subclasses supply the following public interface methods used by other modules:

__call__()  
THE public interface, “calling” an Action object executes the command or Python function. This also takes care of printing a pre-substitution command for debugging purposes.

get_contents()
Fetched the "contents" of an Action for signature calculation plus the varlist. This is what gets checksummed to decide if a target needs to be rebuilt because its action changed.

**genstring()**

Returns a string representation of the Action without command substitution, but allows a CommandGeneratorAction to generate the right action based on the specified target, source and env. This is used by the Signature subsystem (through the Executor) to obtain an (imprecise) representation of the Action operation for informative purposes.

Subclasses also supply the following methods for internal use within this module:

**__str__()**

Returns a string approximation of the Action; no variable substitution is performed.

**execute()**

The internal method that really, truly, actually handles the execution of a command or Python function. This is used so that the __call__() methods can take care of displaying any pre-substitution representations, and then execute an action without worrying about the specific Actions involved.

**get_presig()**

Fetches the "contents" of a subclass for signature calculation. The varlist is added to this to produce the Action's contents. TODO(?) Change this to always return bytes and not str?

**strfunction()**

Returns a substituted string representation of the Action. This is used by the _ActionAction.show() command to display the command/function that will be executed to generate the target(s).

There is a related independent ActionCaller class that looks like a regular Action, and which serves as a wrapper for arbitrary functions that we want to let the user specify the arguments to now, but actually execute later (when an out-of-date check determines that it's needed to be executed, for example). Objects of this class are returned by an ActionFactory class that provides a __call__() method as a convenient way for wrapping up the functions.

**SCons.Action.Action (act, *args, **kw)**

A factory for action objects.

**class SCons.Action.ActionBase**

Bases: ABC

Base class for all types of action objects that can be held by other objects (Builders, Executors, etc.) This provides the common methods for manipulating and combining those actions.

**SCons.ActionEvent.get_contents (target, source, env)**

get_varlist (target, source, env, executor: Executor | None = None) → str

get_targets (env, executor: Executor | None = None)

get_implicit_deps (target, source, env, executor: Executor | None = None)

get_presig (target, source, env, executor: Executor | None = None)

get_varlist (target, source, env, executor: Executor | None = None)

no_batch_key (env, target, source)

presub_lines (env)

**class SCons.Action.ActionCaller (parent, args, kw)**

Bases: object

A class for delaying calling an Action function with specific (positional and keyword) arguments until the Action is actually executed.

This class looks to the rest of the world like a normal Action object, but what it's really doing is hanging on to the arguments until we have a target, source and env to use for the expansion.

**SCons.ActionEvent.get_contents (target, source, env)**

strfunction (target, source, env)

subst (s, target, source, env)

subst_args (target, source, env)

subst_kw (target, source, env)
A factory class that will wrap up an arbitrary function as an SCons-executable Action object.

The real heavy lifting here is done by the ActionCaller class. We just collect the (positional and keyword) arguments that we're called with and give them to the ActionCaller object we create, so it can hang onto them until it needs them.

Class for command-execution actions.

Lightweight dependency scanning involves scanning only the first entry in an action string. This means that this class can actually handle lists of commands, even though that's not how we use it externally.

轻量级依赖扫描仅涉及扫描动作字符串中的第一个条目。这意味着这个类实际上可以处理命令列表，尽管实际上我们不这样使用它。

Class for command-generator actions.

这个类实际上可以处理命令列表，尽管实际上我们不这样使用它。
This strips $(-$) and everything in between the string, since those parts don’t affect signatures.

get_targets (env, executor: Executor | None)
Returns the type of targets ($TARGETS, $CHANGED_TARGETS) used by this action.

get_varlist (target, source, env, executor: Executor | None = None)
no_batch_key (env, target, source)
presub_lines (env)

class SCons.Action.FunctionAction (execfunction, kw)
Bases: _ActionAction
Class for Python function actions.

_batch_key = <_abc._abc_data object>

batch_key (env, target, source)
execute (target, source, env, executor: Executor | None = None)
function_name ()
genstring (target, source, env, executor: Executor | None = None) → str
get_contents (target, source, env)
get_implicit_deps (target, source, env, executor: Executor | None = None)
get_presig (target, source, env, executor: Executor | None = None)

Return the signature contents of this callable action.

get_targets (env, executor: Executor | None = None)
Returns the type of targets ($TARGETS, $CHANGED_TARGETS) used by this action.

get_varlist (target, source, env, executor: Executor | None = None)
no_batch_key (env, target, source)
presub_lines (env)

print_cmd_line (s, target, source, env) → None

In python 3, and in some of our tests, sys.stdout is a String io object, and it takes unicode strings only. This code assumes s is a regular string.

strfunction (target, source, env, executor: Executor | None = None)

class SCons.Action.LazyAction (var, kw)
Bases: CommandGeneratorAction, CommandAction

A LazyAction is a kind of hybrid generator and command action for strings of the form "$VAR". These strings normally expand to other strings (think "$CCCOM" to "$CC -c -o $TARGET $SOURCE"), but we also want to be able to replace them with functions in the construction environment. Consequently, we want lazy evaluation and creation of an Action in the case of the function, but that’s overkill in the more normal case of expansion to other strings. So we do this with a subclass that’s both a generator and a command action. The overridden methods all do a quick check of the construction variable, and if it’s a string we just call the corresponding CommandAction method to do the heavy lifting. If not, then we call the same-named CommandGeneratorAction method. The CommandGeneratorAction methods work by using the overridden _generate() method, that is, our own way of handling “generation” of an action based on what’s in the construction variable.

_abc_impl = <_abc._abc_data object>

_generate (target, source, env, for_signature, executor: Executor | None = None)
_generate_cache (env)

_get_implicit_deps_heavyweight (target, source, env, executor: Executor | None, icd_int)
Heavyweight dependency scanning involves scanning more than just the first entry in an action string. The exact behavior depends on the value of icd_int. Only files are taken as implicit dependencies; directories are ignored. If icd_int is an integer value, it specifies the number of entries to scan for implicit dependencies. Action strings are also scanned after a &&. So for example, if icd_int=2 and the action string is “cd <some_dir> && $PYTHON $SCRIPT_PATH <another_path>”, the implicit dependencies would be the path to the python binary and the path to the script. If icd_int is None, all entries are scanned for implicit dependencies.

_get_implicit_deps_lightweight (target, source, env, executor: Executor | None)
Lightweight dependency scanning involves only scanning the first entry in an action string, even if it contains &&.

batch_key (env, target, source)
execute (target, source, env, executor: Executor | None = None)
Execute a command action.
This will handle lists of commands as well as individual commands, because construction variable substitution may turn a single "command" into a list. This means that this class can actually handle lists of commands, even though that's not how we use it externally.

genstring (target, source, env, executor: Executor | None = None) → str
get_contents (target, source, env)
get_implicit_deps (target, source, env, executor: Executor | None = None)
    Return the implicit dependencies of this action's command line.
get_parent_class (env)
get_presig (target, source, env, executor: Executor | None = None)
    Return the signature contents of this action's command line.
    This strips $(-$) and everything in between the string, since those parts don’t affect signatures.
get_targets (env, executor: Executor | None = None)
    Returns the type of targets ($TARGETS, $CHANGED_TARGETS) used by this action.
no_batch_key (env, target, source)
presub_lines (env)
print_cmd_line (s, target, source, env) → None
    In python 3, and in some of our tests, sys.stdout is a String io object, and it takes unicode strings only This code assumes s is a regular string.
process (target, source, env, executor=None, overrides: dict | None = None) → Tuple[List, bool, bool]
strfunction (target, source, env, executor: Executor | None = None, overrides: dict | None = None) → str

class SCons.Action.ListAction (actionlist)
    Bases: ActionBase
    Class for lists of other actions.
    _abc_impl = <_abc._abc_data object>
    batch_key (env, target, source)
    genstring (target, source, env, executor: Executor | None = None) → str
get_contents (target, source, env)
get_implicit_deps (target, source, env, executor: Executor | None = None)
get_presig (target, source, env, executor: Executor | None = None)
    Returns the signature contents of this action list.
    Simple concatenation of the signatures of the elements.
get_targets (env, executor: Executor | None = None)
    Returns the type of targets ($TARGETS, $CHANGED_TARGETS) used by this action.
no_batch_key (env, target, source)
presub_lines (env)
class SCons.Action._ActionAction (cmdstr=<class 'SCons.Action._null'>, strfunction=<class 'SCons.Action._null'>, varlist=(), presub=<class 'SCons.Action._null'>, chdir=None, exitstatfunc=None, batch_key=None, targets: str = '$TARGETS', **kw)
    Bases: ActionBase
    Base class for actions that create output objects.
    _abc_impl = <_abc._abc_data object>
    batch_key (env, target, source)
    genstring (target, source, env, executor: Executor | None = None) → str
get_contents (target, source, env)
get_implicit_deps (target, source, env, executor: Executor | None = None)
get_presig (target, source, env, executor: Executor | None = None)
get_targets (env, executor: Executor | None = None)
    Returns the type of targets ($TARGETS, $CHANGED_TARGETS) used by this action.
no_batch_key (env, target, source)
presub_lines (env)
print_cmd_line (s, target, source, env) → None
In Python 3, and in some of our tests, sys.stdout is a String io object, and it takes unicode strings only. This code assumes s is a regular string.

SCons.Action._actionAppend (act1, act2)
Joins two actions together.
Mainly, it handles ListActions by concatenating into a single ListAction.

SCons.Action._callables_contents (obj) → bytearray
Return the signature contents of a callable Python object.

SCons.Action._code_contents (code, docstring=None) → bytearray
Return the signature contents of a code object.
By providing direct access to the code object of the function, Python makes this extremely easy. Hooray! Unfortunately, older versions of Python include line number indications in the compiled byte code. Boo! So we remove the line number byte codes to prevent recompilations from moving a Python function.

See:

- https://docs.python.org/3/library/inspect.html

For info on what each co_variable provides
The signature is as follows (should be byte/chars): co_argcount, len(co_varnames), len(co_cellvars), len(co_freevars), ( comma separated signature for each object in co_consts ), ( comma separated signature for each object in co_names ), ( The bytecode with line number bytecodes removed from co_code )

co_argcount - Returns the number of positional arguments (including arguments with default values). co_varnames - Returns a tuple containing the names of the local variables (starting with the argument names). co_cellvars - Returns a tuple containing the names of local variables that are referenced by nested functions. co_freevars - Returns a tuple containing the names of free variables. (?) co_consts - Returns a tuple containing the literals used by the bytecode. co_names - Returns a tuple containing the names used by the bytecode. co_code - Returns a string representing the sequence of bytecode instructions.

SCons.Action._do_create_action (act, kw)
The internal implementation for the Action factory method.
This handles the fact that passing lists to Action() itself has different semantics than passing lists as elements of lists. The former will create a ListAction, the latter will create a CommandAction by converting the inner list elements to strings.

SCons.Action._do_create_keywords (args, kw)
This converts any arguments after the action argument into their equivalent keywords and adds them to the kw argument.

SCons.Action._do_create_list_action (act, kw) → ListAction
A factory for list actions.
Convert the input list act into Actions and then wrap them in a ListAction. If act has only a single member, return that member, not a ListAction. This is intended to allow a contained list to specify a command action without being processed into a list action.

SCons.Action._function_contents (func) → bytearray
Return the signature contents of a function.
The signature is as follows (should be byte/chars): < _code_contents (see above) from func.__code__ > ,( comma separated _object_contents for function argument defaults ) ,( comma separated _object_contents for any closure contents )

See also: https://docs.python.org/3/reference/datamodel.html

- func.__code__ - The code object representing the compiled function body.
- func.__defaults__ - A tuple containing default argument values for those arguments that have defaults, or None if no arguments have a default value
- func.__closure__ - None or a tuple of cells that contain bindings for the function's free variables.

class SCons.Action._null (object)

SCons.Action._object_contents (obj) → bytearray
Return the signature contents of any Python object.
We have to handle the case where object contains a code object since it can be pickled directly.

**SCons.Action._object_instance_content** *(obj)*

Returns consistent content for an action class or an instance thereof

**Parameters:**
- *obj* Should be either an action class or an instance thereof

**Returns:** bytearray or bytes representing the obj suitable for generating a signature from.

**SCons.Action._resolve_shell_env** *(env, target, source)*

Returns a resolved execution environment.

First get the execution environment. Then if SHELL_ENV_GENERATORS is set and is iterable, call each function to allow it to alter the created execution environment, passing each the returned execution environment from the previous call.

New in version 4.4.

**SCons.Action._string_from_cmd_list** *(cmd_list)*

Takes a list of command line arguments and returns a pretty representation for printing.

**SCons.Action._subproc** *(scons_env, cmd, error='ignore', **kw)*

Wrapper for subprocess.Popen which pulls from construction env.

Use for calls to subprocess which need to interoplate values from an SCons construction environment into the environment passed to subprocess. Adds an an error-handling argument. Adds ability to specify std{in,out,err} with "devnull" tag.

Deprecated since version 4.6.

**SCons.Action.default_exitstatfunc** *(s)*

**SCons.Action.get_default_ENV** *(env)*

Returns an execution environment.

If there is one in *env*, just use it, else return the Default Environment, insantiated if necessary.

A fiddlin’ little function that has an import *SCons.Environment* which cannot be moved to the top level without creating an import loop. Since this import creates a local variable named *SCons*, it blocks access to the global variable, so we move it here to prevent complaints about local variables being used uninitialized.

**SCons.Action.rfile** *(n)*

**SCons.Action.scons_subproc_run** *(scons_env, *args, **kwargs) → CompletedProcess*

Run an external command using an SCons execution environment.

SCons normally runs external build commands using subprocess, but does not harvest any output from such commands. This function is a thin wrapper around subprocess.run() allowing running a command in an SCons context (i.e. uses an “execution environment” rather than the user’s existing environment), and provides the ability to return any output in a subprocess.CompletedProcess instance (this must be selected by setting stdout and/or stderr to PIPE, or setting capture_output=True - see Keyword Arguments). Typical use case is to run a tool’s “version” option to find out the installed version.

If supplied, the *env* keyword argument provides an execution environment to process into appropriate form before it is supplied to subprocess; if omitted, *scons_env* is used to derive a suitable default. The other keyword arguments are passed through, except that the SCons legacy *error* keyword is remapped to the subprocess *check* keyword; if both are omitted *check=False* will be passed. The caller is responsible for setting up the desired arguments for subprocess.run().

This function retains the legacy behavior of returning something vaguely usable even in the face of complete failure, unless *check=True* (in which case an error is allowed to be raised): it synthesizes a CompletedProcess instance in this case.

A subset of interesting keyword arguments follows; see the Python documentation of subprocess for the complete list.
Keyword Arguments:

- **stdout** – (and **stderr**, **stdin**) if set to subprocess.PIPE. send input to or collect output from the relevant stream in the subprocess; the default None does no redirection (i.e. output or errors may go to the console or log file, but is not captured); if set to subprocess.DEVNULL they are explicitly thrown away. capture_output=True is a synonym for setting both stdout and stderr to PIPE.

- **text** – open stdin, stdout, stderr in text mode. Default is binary mode. universal_newlines is a synonym.

- **encoding** – specifies an encoding. Changes to text mode.

- **errors** – specified error handling. Changes to text mode.

- **input** – a byte sequence to be passed to stdin, unless text mode is enabled, in which case it must be a string.

- **shell** – if true, the command is executed through the shell.

- **check** – if true and the subprocess exits with a non-zero exit code, raise a subprocess.CalledProcessError exception. Otherwise (the default) in case of an OSErr, report the exit code in the CompletedProcess instance.

New in version 4.6.

SCons.Builder module

SCons.Builder

Builder object subsystem.

A Builder object is a callable that encapsulates information about how to execute actions to create a target Node (file) from source Nodes (files), and how to create those dependencies for tracking.

The main entry point here is the Builder() factory method. This provides a procedural interface that creates the right underlying Builder object based on the keyword arguments supplied and the types of the arguments.

The goal is for this external interface to be simple enough that the vast majority of users can create new Builders as necessary to support building new types of files in their configurations, without having to dive any deeper into this subsystem.

The base class here is BuilderBase. This is a concrete base class which does, in fact, represent the Builder objects that we (or users) create.

There is also a proxy that looks like a Builder:

**CompositeBuilder**

This proxies for a Builder with an action that is actually a dictionary that knows how to map file suffixes to a specific action. This is so that we can invoke different actions (compilers, compile options) for different flavors of source files.

Builders and their proxies have the following public interface methods used by other modules:

- **__call__()**

  The public interface. Calling a Builder object (with the use of internal helper methods) sets up the target and source dependencies, appropriate mapping to a specific action, and the environment manipulation necessary for overridden construction variable. This also takes care of warning about possible mistakes in keyword arguments.

- **add_emitter()**

  Adds an emitter for a specific file suffix, used by some Tool modules to specify that (for example) a yacc invocation on a .y can create a .h and a .c file.

- **add_action()**
Adds an action for a specific file suffix, heavily used by Tool modules to add their specific action(s) for turning a source file into an object file to the global static and shared object file Builders.

There are the following methods for internal use within this module:

- **execute()**
  The internal method that handles the heavily lifting when a Builder is called. This is used so that the __call__() methods can set up warning about possible mistakes in keyword-argument overrides, and then execute all of the steps necessary so that the warnings only occur once.

- **get_name()**
  Returns the Builder’s name within a specific Environment, primarily used to try to return helpful information in error messages.

- **adjust_suffix()**

- **get_prefix()**

- **get_suffix()**

- **get_src_suffix()**

- **set_src_suffix()**

  Miscellaneous stuff for handling the prefix and suffix manipulation we use in turning source file names into target file names.

SCons.Builder.Builder (**kw)

A factory for builder objects.

```python
class SCons.Builder.BuilderBase (action=None, prefix: str = '', suffix: str = '', src_suffix: str = '', target_factory=None, source_factory=None, target_scanner=None, source_scanner=None, emitter=None, multi: bool = False, env=None, single_source: bool = False, name=None, chdir=<class 'SCons.Builder._Null'>, ensure_suffix: bool = False, **overrides)
Bases: object
```

Base class for Builders, objects that create output nodes (files) from input nodes (files).

```python
_adjustixes (files, pre, suf, ensure_suffix: bool = False)
_create_nodes (env, target=None, source=None)
Create and return lists of target and source nodes.
_execute (env, target, source, overwarn={}, executor_kw={})
_get_sdict (env)
 Returns a dictionary mapping all of the source suffixes of all src_builders of this Builder to the underlying Builder that should be called first. This dictionary is used for each target specified, so we save a lot of extra computation by memoizing it for each construction environment. Note that this is re-computed each time, not cached, because there might be changes to one of our source Builders (or one of their source Builders, and so on, and so on...) that we can’t “see.” The underlying methods we call cache their computed values, though, so we hope repeatedly aggregating them into a dictionary like this won’t be too big a hit. We may need to look for a better way to do this if performance data show this has turned into a significant bottleneck.
_get_src_builders_key (env)
_subst_src_suffixes_key (env)
add_emitter (suffix, emitter) → None
Add a suffix-emitter mapping to this Builder. This assumes that emitter has been initialized with an appropriate dictionary type, and will throw a TypeError if not, so the caller is responsible for knowing that this is an appropriate method to call for the Builder in question.
add_src_builder (builder) → None
Add a new Builder to the list of src_builders. This requires wiping out cached values so that the computed lists of source suffixes get re-calculated.
adjust_suffix (suff)
get_name (env)
```
Attempts to get the name of the Builder.
Look at the BUILDERS variable of env, expecting it to be a dictionary containing this Builder, and return the key of the dictionary. If there’s no key, then return a directly-configured name (if there is one) or the name of the class (by default).

\[
\text{get\_prefix (env, sources=[])}
\]

\[
\text{get\_src\_builders (env)}
\]

Returns the list of source Builders for this Builder.
This exists mainly to look up Builders referenced as strings in the ‘BUILDER’ variable of the construction environment and cache the result.

\[
\text{get\_src\_suffix (env)}
\]

Get the first src_suffix in the list of src_suffixes.

\[
\text{get\_suffix (env, sources=[])}
\]

\[
\text{set\_src\_suffix (src\_suffix)} \rightarrow \text{None}
\]

\[
\text{set\_suffix (suffix)} \rightarrow \text{None}
\]

\[
\text{splitext (path, env=None)}
\]

\[
\text{src\_builder\_sources (env, source, overwarn={})}
\]

\[
\text{src\_suffixes (env)}
\]

Returns the list of source suffixes for all src_builders of this Builder.
This is essentially a recursive descent of the src_builder “tree.” (This value isn’t cached because there may be changes in a src_builders many levels deep that we can’t see.)

\[
\text{subst\_src\_suffixes (env)}
\]

The suffix list may contain construction variable expansions, so we have to evaluate the individual strings. To avoid doing this over and over, we memoize the results for each construction environment.

\[\text{class SCons.Builder.CallableSelector}\]

Bases: Selector
A callable dictionary that will, in turn, call the value it finds if it can.

\[
\text{clear ()} \rightarrow \text{None. Remove all items from D.}
\]

\[
\text{copy ()} \rightarrow \text{a shallow copy of D}
\]

\[
\text{fromkeys (value=\text{None}, /)}
\]

Create a new dictionary with keys from iterable and values set to value.

\[
\text{get (key, default=\text{None}, /)}
\]

Return the value for key if key is in the dictionary, else default.

\[
\text{items ()} \rightarrow \text{a set-like object providing a view on D’s items}
\]

\[
\text{keys ()} \rightarrow \text{a set-like object providing a view on D’s keys}
\]

\[
\text{pop (k[, d])} \rightarrow v, \text{remove specified key and return the corresponding value.}
\]

If the key is not found, return the default if given; otherwise, raise a KeyError.

\[
\text{popitem ()}
\]

Remove and return a (key, value) pair as a 2-tuple.
Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.

\[
\text{setdefault (key, default=\text{None}, /)}
\]

Insert key with a value of default if key is not in the dictionary.
Return the value for key if key is in the dictionary, else default.

\[
\text{update ([, E], **F)} \rightarrow \text{None. Update D from dict/iterable E and F.}
\]

If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys() method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]

\[
\text{values ()} \rightarrow \text{an object providing a view on D’s values}
\]

\[\text{class SCons.Builder.CompositeBuilder (builder, cmdgen)}\]

Bases: Proxy
A Builder Proxy whose main purpose is to always have a DictCmdGenerator as its action, and to provide access to the DictCmdGenerator’s add_action() method.

\[
\text{__getattr__ (name)}
\]

Retrieve an attribute from the wrapped object.

\[\text{Raises: AttributeError – if attribute \text{name} doesn’t exist.}\]

\[
\text{add\_action (suffix, action)} \rightarrow \text{None}
\]

\[
\text{get ()}
\]
Retrieve the entire wrapped object

class SCons.Builder.DictCmdGenerator (mapping=None, source_ext_match: bool = True)

Bases: Selector

This is a callable class that can be used as a command generator function. It holds on to a dictionary mapping file
suffixes to Actions. It uses that dictionary to return the proper action based on the file suffix of the source file.

add_action (suffix, action)  →  None

Add a suffix-action pair to the mapping.
clear ()  →  None. Remove all items from D.
copy ()  →  a shallow copy of D
fromkeys (value=None, /)

Create a new dictionary with keys from iterable and values set to value.

get (key, default=None, /)

Return the value for key if key is in the dictionary, else default.

items ()  →  a set-like object providing a view on D's items
keys ()  →  a set-like object providing a view on D's keys

pop (k[, d])  →  v, remove specified key and return the corresponding value.

If the key is not found, return the default if given; otherwise, raise a KeyError.

popitem ()

Remove and return a (key, value) pair as a 2-tuple.

Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.

setdefault (key, default=None, /)

Insert key with a value of default if key is not in the dictionary.

Return the value for key if key is in the dictionary, else default.

src_suffixes ()

update ([, e], **F)  →  None. Update D from dict/iterable E and F.

If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]

values ()  →  an object providing a view on D's values

class SCons.Builder.DictEmitter

Bases: Selector

A callable dictionary that maps file suffixes to emitters. When called, it finds the right emitter in its dictionary for the
suffix of the first source file, and calls that emitter to get the right lists of targets and sources to return. If there's no
emitter for the suffix in its dictionary, the original target and source are returned.
clear ()  →  None. Remove all items from D.
copy ()  →  a shallow copy of D
fromkeys (value=None, /)

Create a new dictionary with keys from iterable and values set to value.

get (key, default=None, /)

Return the value for key if key is in the dictionary, else default.

items ()  →  a set-like object providing a view on D's items
keys ()  →  a set-like object providing a view on D's keys

pop (k[, d])  →  v, remove specified key and return the corresponding value.

If the key is not found, return the default if given; otherwise, raise a KeyError.

popitem ()

Remove and return a (key, value) pair as a 2-tuple.

Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.

setdefault (key, default=None, /)

Insert key with a value of default if key is not in the dictionary.

Return the value for key if key is in the dictionary, else default.

update ([, e], **F)  →  None. Update D from dict/iterable E and F.

If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]

values ()  →  an object providing a view on D's values

class SCons.Builder.EmitterProxy (var)

Bases: object
This is a callable class that can act as a Builder emitter. It holds on to a string that is a key into an Environment dictionary, and will look there at actual build time to see if it holds a callable. If so, we will call that as the actual emitter.

class SCons.Builder.ListEmitter (initlist=None)
Bases: UserList
A callable list of emitters that calls each in sequence, returning the result.

append (item)
  S.append(value) → append value to the end of the sequence

clear ()
copy ()
count (value) → integer -- return number of occurrences of value

extend (other)
  S.extend(iterable) – extend sequence by appending elements from the iterable

index (value[, start[, stop]]) → integer -- return first index of value.
  Raises ValueError if the value is not present.
  Supporting start and stop arguments is optional, but recommended.

insert (i, item)
  S.insert(index, value) – insert value before index

pop ()
  S.pop() – remove and return item at index (default last).
  Raise IndexError if list is empty or index is out of range.

remove (item)
  S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse ()
  S.reverse() – reverse IN PLACE

sort (*args, **kwds)

class SCons.Builder.OverrideWarner (mapping)
Bases: UserDict
A class for warning about keyword arguments that we use as overrides in a Builder call.
This class exists to handle the fact that a single Builder call can actually invoke multiple builders. This class only emits the warnings once, no matter how many Builders are invoked.

get (k[, d]) → D[k] if k in D, else d. d defaults to None.

items () → a set-like object providing a view on D's items

keys () → a set-like object providing a view on D's keys

pop (k[, d]) → v, remove specified key and return the corresponding value.
  If key is not found, d is returned if given, otherwise KeyError is raised.

popitem () → (k, v), remove and return some (key, value) pair
  as a 2-tuple; but raise KeyError if D is empty.

setdefault (k[, d]) → D[k] if k in D, else d if k not in D

update ([, E], **F) → None. Update D from mapping/iterable E and F.
  If E present and has a .keys() method, does: for k in E: D[k]=E[k] If E present and lacks .keys() method, does: for
  (k, v) in E: D[k]=v In either case, this is followed by: for k, v in F.items(): D[k] = v

values () → an object providing a view on D's values

warn () → None

class SCons.Builder._Null
Bases: object
SCons.Builder._node_errors (builder, env, tlist, slist)
  Validate that the lists of target and source nodes are legal for this builder and environment. Raise errors or issue warnings as appropriate.

SCons.Builder._null
  alias of _Null

SCons.Builder.is_a_Builder (obj) → bool
SCons API Documentation

"Returns True if the specified obj is one of our Builder classes.
The test is complicated a bit by the fact that CompositeBuilder is a proxy, not a subclass of BuilderBase.
SCons.Builder.match_splitext (path, suffixes=[])

SCons.CacheDir module

CacheDir support
class SCons.CacheDir.CacheDir (path)
    Bases: object
    CacheDebug (fmt, target, cachefile) → None
    _readconfig (path)
    Read the cache config.
    If directory or config file do not exist, create. Take advantage of Py3 capability in os.makedirs() and in file open():
    just try the operation and handle failure appropriately.
    Omit the check for old cache format, assume that’s old enough there will be none of those left to worry about.

    Parameters:   path – path to the cache directory
cachepath (node) → tuple
    Return where to cache a file.
    Given a Node, obtain the configured cache directory and the path to the cached file, which is generated from the
    node’s build signature. If caching is not enabled for the None, return a tuple of None.
classmethod copy_from_cache (env, src, dst) → str
    Copy a file from cache.
classmethod copy_to_cache (env, src, dst) → str
    Copy a file to cache.
    Just use the FS copy2 (“with metadata”) method, except do an additional check and if necessary a chmod to
    ensure the cachefile is writeable, to forestall permission problems if the cache entry is later updated.
ge_cache_dir_csig (node)
    property hit_ratio: float
    is_enabled () → bool
    is_readonly () → bool
    property misses: int
    push (node)
    push_if_forced (node)
    retrieve (node) → bool
    Retrieve a node from cache.
    Returns True if a successful retrieval resulted.
    This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
    stuff in built().
    Note that there’s a special trick here with the execute flag (one that’s not normally done for other actions). Basically
    if the user requested a no_exec (-n) build, then SCons.Action.execute_actions is set to 0 and when any action is
    called, it does its showing but then just returns zero instead of actually calling the action execution operation. The
    problem for caching is that if the file does NOT exist in cache then the CacheRetrieveString won’t return anything
    to show for the task, but the Action.__call__ won’t call CacheRetrieveFunc; instead it just returns zero, which
    makes the code below think that the file was successfully retrieved from the cache, therefore it doesn’t do any
    subsequent building. However, the CacheRetrieveString didn’t print anything because it didn’t actually exist in the
    cache, and no more build actions will be performed, so the user just sees nothing. The fix is to tell Action.__call__
    to always execute the CacheRetrieveFunc and then have the latter explicitly check SCons.Action.execute_actions
    itself.
SCons.CacheDir.CachePushFunc (target, source, env)
SCons.CacheDir.CacheRetrieveFunc (target, source, env) → int
SCons.CacheDir.CacheRetrieveString (target, source, env) → None

SCons.Conftest module

Autoconf-like configuration support
The purpose of this module is to define how a check is to be performed.

A context class is used that defines functions for carrying out the tests, logging and messages. The following methods and members must be present:

context.Display(msg)
Function called to print messages that are normally displayed for the user. Newlines are explicitly used. The text should also be written to the logfile!

context.Log(msg)
Function called to write to a log file.

context.BuildProg(text, ext)
Function called to build a program, using “ext” for the file extension. Must return an empty string for success, an error message for failure. For reliable test results building should be done just like an actual program would be build, using the same command and arguments (including configure results so far).

context.CompileProg(text, ext)
Function called to compile a program, using “ext” for the file extension. Must return an empty string for success, an error message for failure. For reliable test results compiling should be done just like an actual source file would be compiled, using the same command and arguments (including configure results so far).

context.AppendLIBS(lib_name_list)
Append “lib_name_list” to the value of LIBS. “lib_namelist” is a list of strings. Return the value of LIBS before changing it (any type can be used, it is passed to SetLIBS() later.)

context.PrependLIBS(lib_name_list)
Prepend “lib_name_list” to the value of LIBS. “lib_namelist” is a list of strings. Return the value of LIBS before changing it (any type can be used, it is passed to SetLIBS() later.)

context.SetLIBS(value)
Set LIBS to “value”. The type of “value” is what AppendLIBS() returned. Return the value of LIBS before changing it (any type can be used, it is passed to SetLIBS() later.)

context.headerfilename
Name of file to append configure results to, usually “confdefs.h”. The file must not exist or be empty when starting. Empty or None to skip this (some tests will not work!).

context.config_h (may be missing).
If present, must be a string, which will be filled with the contents of a config_h file.

context.vardict
Dictionary holding variables used for the tests and stores results from the tests, used for the build commands. Normally contains “CC”, “LIBS”, “CPPFLAGS”, etc.

context.havedict
Dictionary holding results from the tests that are to be used inside a program. Names often start with “HAVE_”. These are zero (feature not present) or one (feature present). Other variables may have any value, e.g., “PERLVERSION” can be a number and “SYSTEMNAME” a string.

SCons.Conftest.CheckBuilder (context, text=None, language=None)
Configure check to see if the compiler works. Note that this uses the current value of compiler and linker flags, make sure $CFLAGS, $CPPFLAGS and $LIBS are set correctly. “language” should be “C” or “C++” and is used to select the compiler. Default is “C”. “text” may be used to specify the code to be build. Returns an empty string for success, an error message for failure.

SCons.Conftest.CheckCC (context)
Configure check for a working C compiler.
This checks whether the C compiler, as defined in the $CC construction variable, can compile a C source file. It uses the current $CCCOM value too, so that it can test against non working flags.

SCons.Conftest.CheckCXX (context)
Configure check for a working CXX compiler.
This checks whether the CXX compiler, as defined in the $CXX construction variable, can compile a CXX source file. It uses the current $CXXCOM value too, so that it can test against non working flags.

SCons.Conftest.CheckDeclaration (context, symbol, includes=None, language=None)

Checks whether symbol is declared.

Use the same test as autoconf, that is test whether the symbol is defined as a macro or can be used as an r-value.

Parameters:
- symbol – str the symbol to check
- includes – str Optional “header” can be defined to include a header file.
- language – str only C and C++ supported.

Returns: bool True if the check failed, False if succeeded.

Return type: status

SCons.Conftest.CheckFunc (context, function_name, header=None, language=None, funcargs=None)

Configure check for a function “function_name”. “language” should be “C” or “C++” and is used to select the compiler. Default is “C”. Optional “header” can be defined to define a function prototype, include a header file or anything else that comes before main(). Optional “funcargs” can be defined to define an argument list for the generated function invocation. Sets HAVE_function_name in context.havedict according to the result. Note that this uses the current value of compiler and linker flags, make sure $CFLAGS, $CPPFLAGS and $LIBS are set correctly. Returns an empty string for success, an error message for failure.

Changed in version 4.7.0: The funcargs parameter was added.

SCons.Conftest.CheckHeader (context, header_name, header=None, language=None, include_quotes=None)

Configure check for a C or C++ header file “header_name”. Optional “header” can be defined to do something before including the header file (unusual, supported for consistency). “language” should be “C” or “C++” and is used to select the compiler. Default is “C”. Sets HAVE_header_name in context.havedict according to the result. Note that this uses the current value of compiler and linker flags, make sure $CFLAGS and $CPPFLAGS are set correctly. Returns an empty string for success, an error message for failure.

SCons.Conftest.CheckLib (context, libs, func_name=None, header=None, extra_libs=None, call=None, language=None, autoadd: int = 1, append: bool = True, unique: bool = False)

Configure check for a C or C++ libraries “libs”. Searches through the list of libraries, until one is found where the test succeeds. Tests if “func_name” or “call” exists in the library. Note: if it exists in another library the test succeeds anyway! Optional “header” can be defined to include a header file. If not given a default prototype for “func_name” is added. Optional “extra_libs” is a list of library names to be added after “lib_name” in the build command. To be used for libraries that “lib_name” depends on. Optional “call” replaces the call to “func_name” in the test code. It must consist of complete C statements, including a trailing “;”. Both “func_name” and “call” arguments are optional, and in that case, just linking against the libs is tested. “language” should be “C” or “C++” and is used to select the compiler. Default is “C”. Note that this uses the current value of compiler and linker flags, make sure $CFLAGS and $CPPFLAGS and $LIBS are set correctly. Returns an empty string for success, an error message for failure.

SCons.Conftest.CheckMember (context, aggregate_member, header=None, language=None)

Configure check for a C or C++ member “aggregate_member”. Optional “header” can be defined to include a header file. “language” should be “C” or “C++” and is used to select the compiler. Default is “C”. Note that this uses the current value of compiler and linker flags, make sure $CFLAGS, $CPPFLAGS and $LIBS are set correctly.

Parameters:
- aggregate_member – str the member to check. For example, ‘struct tm.tm_gmtoff’.
- includes – str Optional “header” can be defined to include a header file.
- language – str only C and C++ supported.

Returns the status (0 or False = Passed, True/non-zero = Failed).

SCons.Conftest.CheckProg (context, prog_name)

Configure check for a specific program.

Check whether program prog_name exists in path. If it is found, returns the path for it, otherwise returns None.

SCons.Conftest.CheckSHCC (context)

Configure check for a working shared C compiler.

This checks whether the C compiler, as defined in the $SHCC construction variable, can compile a C source file. It uses the current $SHCCCOM value too, so that it can test against non working flags.
SCons.Conftest.CheckSHCXX (context)
Configure check for a working shared CXX compiler.
This checks whether the CXX compiler, as defined in the $SHCXX construction variable, can compile a CXX source file. It uses the current $SHCXXCOM value too, so that it can test against non working flags.

SCons.Conftest.CheckType (context, type_name, fallback=None, header=None, language=None)
Configure check for a C or C++ type “type_name”. Optional “header” can be defined to include a header file. “language” should be “C” or “C++” and is used to select the compiler. Default is “C”. Sets HAVE_type_name in context.havedict according to the result. Note that this uses the current value of compiler and linker flags, make sure $CFLAGS, $CPPFLAGS and $LIBS are set correctly. Returns an empty string for success, an error message for failure.

SCons.Conftest.CheckTypeSize (context, type_name, header=None, language=None, expect=None)
This check can be used to get the size of a given type, or to check whether the type is of expected size.

Parameters:
- **type** (-) – str the type to check
- **includes** (-) – sequence list of headers to include in the test code before testing the type
- **language** (-) – str ‘C’ or ‘C++’
- **expect** (-) – int if given, will test wether the type has the given number of bytes. If not given, will automatically find the size.
- **Returns** – status int 0 if the check failed, or the found size of the type if the check succeeded.

SCons.Conftest._Have (context, key, have, comment=None) → None
Store result of a test in context.havedict and context.headerfilename.

Parameters:
- **key** - is a “HAVE_abc” name. It is turned into all CAPITALS and non-alphanumerics are replaced by an underscore.
- **have** - value as it should appear in the header file, include quotes when desired and escape special characters!
- **comment** is the C comment to add above the line defining the symbol (the comment is automatically put inside a /* */). If None, no comment is added.

The value of “have” can be:
- **1** - Feature is defined, add “#define key”.
- **0** - Feature is not defined, add “/# undef key””. Adding “undef” is what autoconf does. Not useful for the compiler, but it shows that the test was done.
- **number** - Feature is defined to this number “#define key have”. Doesn’t work for 0 or 1, use a string then.
- **string** - Feature is defined to this string “#define key have”.

SCons.Conftest._LogFailed (context, text, msg) → None
Write to the log about a failed program. Add line numbers, so that error messages can be understood.

SCons.Conftest._YesNoResult (context, ret, key, text, comment=None) → None
Handle the result of a test with a “yes” or “no” result.

Parameters:
- **ret** is the return value: empty if OK, error message when not.
- **key** is the name of the symbol to be defined (HAVE_foo).
- **text** is the source code of the program used for testing.
- **comment** is the C comment to add above the line defining the symbol (the comment is automatically put inside a /* */). If None, no comment is added.

SCons.Conftest._check_empty_program (context, comp, text, language, use_shared: bool = False) → None
Return 0 on success, 1 otherwise.

SCons.Conftest._lang2suffix (lang)
Convert a language name to a suffix. When "lang" is empty or None C is assumed. Returns a tuple (lang, suffix, None) when it works. For an unrecognized language returns (None, None, msg).

Where:

- lang = the unified language name
- suffix = the suffix, including the leading dot
- msg = an error message

SCons.Debug module

Code for debugging SCons internal things.

Shouldn’t be needed by most users. Quick shortcuts:

```python
from SCons.Debug import caller_trace
caller_trace()
```

SCons.Debug.Trace (msg, tracefile=None, mode: str = 'w', tstamp: bool = False) → None

Write a trace message.

Write messages when debugging which do not interfere with stdout. Useful in tests, which monitor stdout and would break with unexpected output. Trace messages can go to the console (which is opened as a file), or to a disk file; the tracefile argument persists across calls unless overridden.

Parameters:

- **tracefile** – file to write trace message to. If omitted, write to the previous trace file (default: console).
- **mode** – file open mode (default: ‘w’)
- **tstamp** – write relative timestamps with trace. Outputs time since scons was started, and time since last trace (default: False)

SCons.Debug._dump_one_caller (key, file, level: int = 0) → None

SCons.Debug.caller_stack ()

return caller’s stack

SCons.Debug.caller_trace (back: int = 0) → None

Trace caller stack and save info into global dicts, which are printed automatically at the end of SCons execution.

SCons.Debug.countLoggedInstances (classes, file=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='utf-8'>) → None

SCons.Debug.dumpLoggedInstances (classes, file=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='utf-8'>) → None

SCons.Debug.dump_caller_counts (file=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='utf-8'>) → None

SCons.Debug.fetchLoggedInstances (classes: str = ")

SCons.Debug.func_shorten (func_tuple)

SCons.Debug.listLoggedInstances (classes, file=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='utf-8'>) → None

SCons.Debug.logInstanceCreation (instance, name=None) → None

SCons.Debug.memory () → int

SCons.Debug.string_to_classes (s)

SCons.Defaults module

Builders and other things for the local site.

Here’s where we’ll duplicate the functionality of autoconf until we move it into the installation procedure or use something like qmconf.

The code that reads the registry to find MSVC components was borrowed from distutils.msvccompiler.
Construct the global ("default") construction environment. The environment is provisioned with the values from `**kwargs`. After the environment is created, this function is replaced with a reference to `_fetch_default_environment()` which efficiently returns the initialized default construction environment without checking for its existence. Historically, some parts of the code held references to this function. Thus it still has the existence check for `_default_env` rather than just blindly creating the environment and overwriting itself.

**Callable class for use as a no-effect command generator.**

The `__call__` method for this class simply returns the thing you instantiated it with. Example usage:

```python
env["DO NOTHING"] = NullCmdGenerator
env["LINKCOM"] = "${DO NOTHING('$LINK $SOURCES $TARGET')}"
```

A class for finding a construction variable on the stack and calling one of its methods.

Used to support "construction variables" appearing in string eval's that actually stand in for methods—specifically, the use of "RDirs" in a call to :func:`_concat` that should actually execute the `\TARGET.RDirs method.

Historical note: This was formerly supported by creating a little "build dictionary" that mapped RDirs to the method, but this got in the way of Memoizing construction environments, because we had to create new environment objects to hold the variables.

```
SCons.Defaults._lib_either_version_flag(env, version_var1, version_var2, flags_var)
```

if $version_var1 or $version_var2 is not empty, returns env[flags_var], otherwise returns None:

```
SCons.Defaults._libversionflags(env, version_var, flags_var)
```

if version_var is not empty, returns env[flags_var], otherwise returns None:

```
SCons.Defaults._concat(prefix, items_iter, suffix, env, f=<function <lambda>>, target=None, source=None, affect_signature: bool = True)
```

Creates a new list from 'items_iter' by first interpolating each element in the list using the 'env' dictionary and then calling f on the list, and finally calling _concat_ixes() to concatenate 'prefix' and 'suffix' onto each element of the list.

```
SCons.Defaults._concat_ixes(prefix, items_iter, suffix, env)
```

Creates a new list from 'items_iter' by concatenating the 'prefix' and 'suffix' arguments onto each element of the list. A trailing space on 'prefix' or leading space on 'suffix' will cause them to be put into separate list elements rather than being concatenated.

A wrapper around _concat_ixes() that turns a list or string into a list of C preprocessor command-line definitions.

Returns the already-created default construction environment.

```
SCons.Defaults._stripixes(prefix: str, items, suffix: str, stripprefixes: List[str], stripsuffixes: List[str], env, literal_prefix: str = '', c: Callable[[list], list] = None) → list
```

Returns a list with text added to items after first stripping them. A companion to _concat_ixes(), used by tools (like the GNU linker) that need to turn something like `libfoo.a` into `-lfoo`. stripprefixes and stripsuffixes are stripped from items. Calls function c to postprocess the result.
Parameters:

- **prefix** – string to prepend to elements
- **items** – string or iterable to transform
- **suffix** – string to append to elements
- **stripprefixes** – prefix string(s) to strip from elements
- **stripsuffixes** – suffix string(s) to strip from elements
- **env** – construction environment for variable interpolation
- **c** – optional function to perform a transformation on the list. The default is `None`, which will select `_concat_ixes()`.

*SCons.Defaults.chmod_func* *(dest, mode) → None*

Implementation of the Chmod action function.

`mode` can be either an integer (normally expressed in octal mode, as in 00755) or a string following the syntax of the POSIX chmod command (for example “ugo+w”). The latter must be converted, since the underlying Python only takes the numeric form.

*SCons.Defaults.chmod_strfunc* *(dest, mode) → str*

`strfunc` for the Chmod action function.

*SCons.Defaults.copy_func* *(dest, src, symlinks: bool = True) → int*

Implementation of the Copy action function.

Copies `src` to `dest`. If `src` is a list, `dest` must be a directory, or not exist (will be created).

Since Python shutil methods, which know nothing about SCons Nodes, will be called to perform the actual copying, args are converted to strings first.

If `symlinks` evaluates true, then a symbolic link will be shallow copied and recreated as a symbolic link; otherwise, copying a symbolic link will be equivalent to copying the symbolic link’s final target regardless of symbolic link depth.

*SCons.Defaults.copy_strfunc* *(dest, src, symlinks: bool = True) → str*

`strfunc` for the Copy action function.

*SCons.Defaults.delete_func* *(dest, must_exist: bool = False) → None*

Implementation of the Delete action function.

Lets the Python `os.unlink()` raise an error if `dest` does not exist, unless `must_exist` evaluates false (the default).

*SCons.Defaults.delete_strfunc* *(dest, must_exist: bool = False) → str*

`strfunc` for the Delete action function.

*SCons.Defaults.get_paths_str* *(dest) → str*

Generates a string from `dest` for use in a `strfunc`.

If `dest` is a list, manually converts each elem to a string.

*SCons.Defaults.mkdir_func* *(dest) → None*

Implementation of the Mkdir action function.

*SCons.Defaults.move_func* *(dest, src) → None*

Implementation of the Move action function.

*SCons.Defaults.processDefines* *(defs) → List[str]*

Return list of strings for preprocessor defines from `defs`.

Resolves the different forms `CPPDEFINES` can be assembled in: if the Append/Prepend routines are used beyond a initial setting it will be a deque, but if written to only once (Environment initializer, or direct write) it can be a multitude of types.

Any prefix/suffix is handled elsewhere (usually `_concat_ixes()`).

Changed in version 4.5.0: Bare tuples are now treated the same as tuple-in-sequence, assumed to describe a valued macro. Bare strings are now split on space. A dictionary is no longer sorted before handling.

*SCons.Defaults.touch_func* *(dest) → None*

Implementation of the Touch action function.

*SCons.Environment module*

Base class for construction Environments.

These are the primary objects used to communicate dependency and construction information to the build engine.
Keyword arguments supplied when the construction Environment is created are construction variables used to initialize the Environment.

```python
class SCons.Environment.Base (platform=None, tools=None, toolpath=None, variables=None, parse_flags=None, **kw)
```

Bases: SubstitutionEnvironment

Base class for “real” construction Environments. These are the primary objects used to communicate dependency and construction information to the build engine. Keyword arguments supplied when the construction Environment is created are construction variables used to initialize the Environment.

```python
Action(*args, **kw)
```

```python
AddMethod(function, name=None) → None
```

Adds the specified function as a method of this construction environment with the specified name. If the name is omitted, the default name is the name of the function itself.

```python
AddPostAction(files, action)
```

```python
AddPreAction(files, action)
```

```python
Alias(target, source=[], action=None, **kw)
```

```python
AlwaysBuild(*targets)
```

```python
Append(**kw) → None
```

Adds path elements to the path name in the envname dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.

If delete_existing is False, a newpath element already in the path will not be moved to the end (it will be left where it is).

```python
AppendUnique(delete_existing=False, **kw) → None
```

Append values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to end.

```python
Builder(**kw)
```

```python
CacheDir(path, custom_class=None) → None
```

```python
Clean(targets, files) → None
```

```python
Clone(tools=[], toolpath=None, variables=None, parse_flags=None, **kw)
```

Return a copy of a construction Environment.

The copy is like a Python “deep copy”: independent copies are made recursively of each object, except that a reference is copied when an object is not deep-copyable (like a function). There are no references to any mutable objects in the original environment.

Unrecognized keyword arguments are taken as construction variable assignments.

**Parameters:**

- `tools` – list of tools to initialize.
- `toolpath` – list of paths to search for tools.
- `variables` – a Variables object to use to populate construction variables from command-line variables.
- `parse_flags` – option strings to parse into construction variables.

New in version 4.8.0: The optional `variables` parameter was added.

```python
Command(target, source, action, **kw)
```

Set up a one-off build command.

Builds `target` from `source` using `action`, which may be be any type that the Builder factory will accept for an action. Generates an anonymous builder and calls it, to add the details to the build graph. The builder is not named, added to BUILDERS, or otherwise saved.

Recognizes the Builder() keywords `source_scanner`, `target_scanner`, `source_factory` and `target_factory`. All other arguments from `kw` are passed on to the builder when it is called.

```python
Configure(*args, **kw)
```
Decider (function)
Depends (target, dependency)
    Explicitly specify that target depends on dependency.
Detect (progs)
    Return the first available program from one or more possibilities.

Parameters: progs (str or list) – one or more command names to check for

Dictionary (*args)
Return construction variables from an environment.

Parameters: *args (optional) – variable names to look up

Returns: If args omitted, the dictionary of all construction variables. If one arg, the corresponding value is returned. If more than one arg, a list of values is returned.

Raises: KeyError – if any of args is not in the construction environment.

Dir (name, *args, **kw)

Dump (key: str | None = None, format: str = 'pretty') → str
Returns a dump of serialized construction variables.
The display formats are intended for human readers when debugging - none of the supported formats produce a result that SCons itself can directly make use of. Objects that cannot directly be represented get a placeholder like <function foo at 0x123456> or <<non-serializable: function>>.

Parameters:
    • key – if None, format the whole dict of variables, else format just the value of key.
    • format – specify the format to serialize to. "pretty" generates a pretty-printed string, "json" a JSON-formatted string.

Raises: ValueError – format is not a recognized serialization format.

Entry (name, *args, **kw)

Environment (**kw)

Execute (action, *args, **kw)
    Directly execute an action through an Environment

File (name, *args, **kw)

FindFile (file, dirs)

FindInstalledFiles ()
returns the list of all targets of the Install and InstallAs Builder.

FindIxes (paths: Sequence[str], prefix: str, suffix: str) → str | None
Search paths for a path that has prefix and suffix.
Returns on first match.

Parameters:
    • paths – the list of paths or nodes.
    • prefix – construction variable for the prefix.
    • suffix – construction variable for the suffix.

Returns: The matched path or None

FindSourceFiles (node: str = '.') → list
Return a list of all source files.

Flatten (sequence)

GetBuildPath (files)

Glob (pattern, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None)

Ignore (target, dependency)
    Ignore a dependency.

Literal (string)

Local (*targets)

MergeFlags (args, unique: bool = True) → None
    Merge flags into construction variables.
    Merges the flags from args into this construction environment. If args is not a dict, it is first converted to one with flags distributed into appropriate construction variables. See ParseFlags().
As a side effect, if \textit{unique} is true, a new object is created for each modified construction variable by the loop at the end. This is silently expected by the \texttt{Override()} \texttt{parse\_flags} functionality, which does not want to share the list (or whatever) with the environment being overridden.

\textbf{Parameters:}

- \texttt{args} – flags to merge
- \texttt{unique} – merge flags rather than appending (default: True). When merging, path variables are retained from the front, other construction variables from the end.

\texttt{NoCache}\texttt{\{\*targets\}}
Tag target(s) so that it will not be cached.

\texttt{NoClean}\texttt{\{\*targets\}}
Tag target(s) so that it will not be cleaned by \texttt{-c}.

\texttt{Override}\texttt{(overrides)}
Produce a modified environment whose variables are overridden by the \texttt{overrides} dictionaries. \texttt{"overrides"} is a dictionary that will override the variables of this environment.
This function is much more efficient than \texttt{Clone()} or creating a new \texttt{Environment} because it doesn’t copy the construction environment dictionary, it just wraps the underlying construction environment, and doesn’t even create a wrapper object if there are no overrides.

\texttt{Parse\_Config} (\texttt{command}, \texttt{function=}None, \texttt{unique=} bool = True)
Parse the result of running a command to update construction vars.
Use \texttt{function} to parse the output of running \texttt{command} in order to modify the current environment.

\textbf{Parameters:}

- \texttt{command} – a string or a list of strings representing a command and its arguments.
- \texttt{function} – called to process the result of \texttt{command}, which will be passed as \texttt{args}. If \texttt{function} is omitted or \texttt{None}, \texttt{Merge\_Flags()} is used. Takes 3 \texttt{args} (\texttt{env}, \texttt{args}, \texttt{unique})
- \texttt{unique} – whether no duplicate values are allowed (default true)

\texttt{Parse\_Depends} (\texttt{filename}, \texttt{must\_exist=}None, \texttt{only\_one=} bool = False)
Parse a \texttt{mkdep\-style} file for explicit dependencies. This is completely abusable, and should be unnecessary in the “normal” case of proper SCons configuration, but it may help make the transition from a Make hierarchy easier for some people to swallow. It can also be genuinely useful when using a tool that can write a .d file, but for which writing a scanner would be too complicated.

\texttt{Parse\_Flags} (\texttt{\*flags}) → dict
Return a dict of parsed flags.
Parse \texttt{flags} and return a dict with the flags distributed into the appropriate construction variable names. The flags are treated as a typical set of command-line flags for a GNU-style toolchain, such as might have been generated by one of the \{foo\}\-config scripts, and used to populate the entries based on knowledge embedded in this method - the choices are not expected to be portable to other toolchains.
If one of the \texttt{flags} strings begins with a bang (exclamation mark), it is assumed to be a command and the rest of the string is executed; the result of that evaluation is then added to the dict.

\texttt{Platform}\texttt{(platform)}

\texttt{Precious}\texttt{\{\*targets\}}
Mark targets as precious: do not delete before building.

\texttt{Prepend} (\texttt{\*\texttt{kw}}) → None
Prepend values to construction variables in an Environment.
The variable is created if it is not already present.

\texttt{Prepend\_ENV\_Path} (\texttt{name}, \texttt{newpath}, \texttt{envname=} str = \"ENV\", \texttt{sep=}\:\:\text{"\"}, \texttt{delete\_existing=} bool = True) → None
Prepend path elements to the path \texttt{name} in the \texttt{envname} dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.
If \texttt{delete\_existing} is False, a \texttt{newpath} component already in the path will not be moved to the front (it will be left where it is).

\texttt{Prepend\_Unique} (\texttt{delete\_existing=} bool = False, \texttt{\*\texttt{kw}}) → None
Prepend values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to front.

Pseudo (**targets**)
Mark targets as pseudo: must not exist.

PyPackageDir (**modulename**)

RemoveMethod (**function**) → None
Removes the specified function’s MethodWrapper from the added_methods list, so we don’t re-bind it when making a clone.

Replace (**kw**) → None
Replace existing construction variables in an Environment with new construction variables and/or values.

ReplaceIxes (**path**, old_prefix, old_suffix, new_prefix, new_suffix)
Replace old_prefix with new_prefix and old_suffix with new_suffix.

Repository (**dirs**, **kw**) → None
Specify Repository directories to search.

Requires (**target**, prerequisite)
Specify that prerequisite must be built before target.
Creates an order-only relationship, not a full dependency. prerequisite must exist before target can be built, but a change to prerequisite does not trigger a rebuild of target.

SConsignFile (name=’.sconsign’, dbm_module=None) → None

Scanner (**args**, **kw**) → None

SideEffect (side_effect, target)
Tell scons that side_effects are built as side effects of building targets.

Split (**arg**)
This function converts a string or list into a list of strings or Nodes. This makes things easier for users by allowing files to be specified as a white-space separated list to be split.

The input rules are:

- A single string containing names separated by spaces. These will be split apart at the spaces.
- A single Node instance
- A list containing either strings or Node instances. Any strings in the list are not split at spaces.

In all cases, the function returns a list of Nodes and strings.

Tool (**tool**: str | Callable, toolpath: Collection[str] | None = None, **kwargs**) → Callable
Find and run tool module tool.

tool is generally a string, but can also be a callable object, in which case it is just called, without any of the setup. The skipped setup includes storing kwargs into the created Tool instance, which is extracted and used when the instance is called, so in the skip case, the called object will not get the kwargs.

Changed in version 4.2: returns the tool object rather than None.

Value (**value**, built_value=None, name=None)
Return a Value (Python expression) node.

Changed in version 4.0: the name parameter was added.

VariantDir (**variant_dir**, src_dir, duplicate: int = 1) → None

WhereIs (**prog**, path=None, pathext=None, reject=None)
Find prog in the path.

_canonicalize (**path**)
Allow Dirs and strings beginning with # for top-relative.

Note this uses the current env’s fs (in self).

_changed_build (**dependency**, target, prev_ni, repo_node=None) → bool
_changed_content (**dependency**, target, prev_ni, repo_node=None) → bool
_changed_timestamp_match (**dependency**, target, prev_ni, repo_node=None) → bool
_changed_timestamp_newer (**dependency**, target, prev_ni, repo_node=None) → bool
_changed_timestamp_then_content (**dependency**, target, prev_ni, repo_node=None) → bool
```python
_find_toolpath_dir (tp)
gsm ()
_init_special () → None
    Initial the dispatch tables for special handling of special construction variables.
_update (other) → None
    Private method to update an environment's consvar dict directly.
    Bypasses the normal checks that occur when users try to set items.
_update_onlynew (other) → None
    Private method to add new items to an environment's consvar dict.
    Only adds items from other whose keys do not already appear in the existing dict; values from other are not used
    for replacement. Bypasses the normal checks that occur when users try to set items.
arg2nodes (args, node_factory=<class 'SCons.Environment._Null'>, lookup_list=<class 'SCons.Environment._Null'>, **kw)
    Converts args to a list of nodes.

Parameters:
- **just** (args - filename strings or nodes to convert; nodes are) – added to the list without
  further processing.
- **not** (node_factory - optional factory to create the nodes; if) – specified, will use this
  environment's `fs.File` method.
- **to** (lookup_list - optional list of lookup functions to call) – attempt to find the file
  referenced by each args.
- **add**. (kw - keyword arguments that represent additional nodes to) –

backtick (command) → str
    Emulate command substitution.
    Provides behavior conceptually like POSIX Shell notation for running a command in backquotes (backticks) by
    running command and returning the resulting output string.
    This is not really a public API any longer, it is provided for the use of ParseFlags() (which supports it using a syntax
    of !command) and ParseConfig().

Raises: OSError – if the external command returned non-zero exit status.
get(key, default=None)
    Emulates the get() method of dictionaries.
get_CacheDir ()
g_builder (name)
    Fetch the builder with the specified name from the environment.
g_get_factory (factory, default: str = 'File')
    Return a factory function for creating Nodes for this construction environment.
g_get_scanner (skey)
    Find the appropriate scanner given a key (usually a file suffix).
gvars ()
items ()
keys ()
    Emulates the keys() method of dictionaries.
lvars ()
scanner_map_delete (kw=None) → None
    Delete the cached scanner map (if we need to).
s_udata (key, default=None)
    Emulates the setudata() method of dictionaries.
subst (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None =
    None, overrides: dict | None = None)
    Recursively interpolates construction variables from the Environment into the specified string, returning the
    expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore
    or alphabetic character followed by any number of underscores or alphanumeric characters. The construction
    variable names may be surrounded by curly braces to separate the name from trailing characters.
```
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subst_kw (kw, raw: int = 0, target=None, source=None)

subst_list (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)

Calls through to SCons.Subst.scons_subst_list().
See the documentation for that function.

subst_path (path, target=None, source=None)

Substitute a path list.
Turns EntryProxies into Nodes, leaving Nodes (and other objects) as-is.

subst_target_source (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)

Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphabetic character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

validate_CacheDir_class (custom_class=None)

Validate the passed custom CacheDir class, or if no args are passed, validate the custom CacheDir class from the environment.

values ()
Emulates the values() method of dictionaries.

class SCons.Environment.BuilderDict (mapping, env)

Bases: UserDict

This is a dictionary-like class used by an Environment to hold the Builders. We need to do this because every time someone changes the Builders in the Environment’s BUILDERS dictionary, we must update the Environment’s attributes.

_abc_impl = <_abc._abc_data object>
clear () → None. Remove all items from D.
copy ()
classmethod fromkeys (iterable, value=None)
get (k[, d]) → D[k] if k in D, else d. d defaults to None.
items () → a set-like object providing a view on D’s items
keys () → a set-like object providing a view on D’s keys
pop (k[, d]) → v, remove specified key and return the corresponding value.
    If key is not found, d is returned if given, otherwise KeyError is raised.
popitem () → (k, v), remove and return some (key, value) pair
    as a 2-tuple; but raise KeyError if D is empty.
setdefault (k[, d]) → D.get(k,d), also set D[k]=d if k not in D
update ([, E], **F) → None. Update D from mapping/iterable E and F.
    If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
values () → an object providing a view on D’s values
class SCons.Environment.BuilderWrapper (obj: Any, method: Callable, name: str | None = None)

Bases: MethodWrapper

A MethodWrapper subclass that that associates an environment with a Builder.
This mainly exists to wrap the __call__() function so that all calls to Builders can have their argument lists massaged in the same way (treat a lone argument as the source, treat two arguments as target then source, make sure both target and source are lists) without having to have cut-and-paste code to do it.
As a bit of obsessive backwards compatibility, we also intercept attempts to get or set the “env” or “builder” attributes, which were the names we used before we put the common functionality into the MethodWrapper base class. We’ll keep this around for a while in case people shipped Tool modules that reached into the wrapper (like the Tool/qt.py module does, or did). There shouldn’t be a lot attribute fetching or setting on these, so a little extra work shouldn’t hurt.
clone (new_object)

Returns an object that re-binds the underlying “method” to the specified new object.

SCons.Environment.NoSubstitutionProxy (subject)

An entry point for returning a proxy subclass instance that overrides the subst(*) methods so they don’t actually perform construction variable substitution. This is specifically intended to be the shim layer in between global function
calls (which don’t want construction variable substitution) and the DefaultEnvironment() (which would substitute variables if left to its own devices).

We have to wrap this in a function that allows us to delay definition of the class until it’s necessary, so that when it subclasses Environment it will pick up whatever Environment subclass the wrapper interface might have assigned to SCons.Environment.Environment.

class SCons.Environment.OverrideEnvironment (subject, overrides=None)
Bases: Base
A proxy that overrides variables in a wrapped construction environment by returning values from an overrides dictionary in preference to values from the underlying subject environment.
This is a lightweight (I hope) proxy that passes through most use of attributes to the underlying Environment.Base class, but has just enough additional methods defined to act like a real construction environment with overridden values. It can wrap either a Base construction environment, or another OverrideEnvironment, which can in turn nest arbitrary OverrideEnvironments...
Note that we do not call the underlying base class (SubstitutionEnvironment) initialization, because we get most of those from proxying the attributes of the subject construction environment. But because we subclass SubstitutionEnvironment, this class also has inherited arg2nodes() and subst*() methods; those methods can’t be proxied because they need this object’s methods to fetch the values from the overrides dictionary.

Action (*args, **kw)
AddMethod (function, name=None) → None
    Adds the specified function as a method of this construction environment with the specified name. If the name is omitted, the default name is the name of the function itself.
AddPostAction (files, action)
AddPreAction (files, action)
Alias (target, source=[], action=None, **kw)
AlwaysBuild (*targets)
Append (**kw) → None
    Append values to existing construction variables in an Environment.
The variable is created if it is not already present.
AppendENVPath (name, newpath, envname: str = 'ENV', sep=':', delete_existing: bool = False) → None
    Append path elements to the path name in the envname dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.
    If delete_existing is False, a newpath element already in the path will not be moved to the end (it will be left where it is).
AppendUnique (delete_existing: bool = False, **kw) → None
    Append values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to end.
Builder (**kw)
CacheDir (path, custom_class=None) → None
Clean (targets, files) → None
Clone (tools=[], toolpath=None, variables=None, parse_flags=None, **kw)
    Return a copy of a construction Environment.
The copy is like a Python “deep copy”: independent copies are made recursively of each object, except that a reference is copied when an object is not deep-copyable (like a function). There are no references to any mutable objects in the original environment.
Unrecognized keyword arguments are taken as construction variable assignments.

Parameters:

- **tools** – list of tools to initialize.
- **toolpath** – list of paths to search for tools.
- **variables** – a Variables object to use to populate construction variables from command-line variables.
- **parse_flags** – option strings to parse into construction variables.

New in version 4.8.0: The optional variables parameter was added.
Command (target, source, action, **kw)
Set up a one-off build command.
Builds target from source using action, which may be be any type that the Builder factory will accept for an action.
Generates an anonymous builder and calls it, to add the details to the build graph. The builder is not named, added to BUILDERS, or otherwise saved.
Recognizes the Builder() keywords source_scanner, target_scanner, source_factory and target_factory. All other arguments from kw are passed on to the builder when it is called.
Configure (*args, **kw)
Decider (function)
Depends (target, dependency)
Explicitly specify that target depends on dependency.
Detect (progs)
Return the first available program from one or more possibilities.
Parameters:
  progs (str | list) – one or more command names to check for
Dictionary (*args)
Return construction variables from an environment.
Parameters:
  *args (optional) – variable names to look up
Returns: If args omitted, the dictionary of all construction variables. If one arg, the corresponding value is returned. If more than one arg, a list of values is returned.
Raises: KeyError – if any of args is not in the construction environment.
Dir (name, *args, **kw)
Dump (key: str | None = None, format: str = 'pretty') → str
Returns a dump of serialized construction variables.
The display formats are intended for human readers when debugging - none of the supported formats produce a result that SCons itself can directly make use of. Objects that cannot directly be represented get a placeholder like <function foo at 0x123456> or <<non-serializable: function>>.
Parameters:
  key – if None, format the whole dict of variables, else format just the value of key.
  format – specify the format to serialize to. "pretty" generates a pretty-printed string, "json" a JSON-formatted string.
Raises: ValueError – format is not a recognized serialization format.
Enter (name, *args, **kw)
Enter a dump of serialized construction variables.
Environment (**kw)
Execute (action, *args, **kw)
Directly execute an action through an Environment
File (name, *args, **kw)
FindFile (file, dirs)
FindInstalledFiles ()
returns the list of all targets of the Install and InstallAs Builder.
FindIxes (paths: Sequence[str], prefix: str, suffix: str) → str | None
Search paths for a path that has prefix and suffix.
Returns on first match.
Parameters:
  paths – the list of paths or nodes.
  prefix – construction variable for the prefix.
  suffix – construction variable for the suffix.
Returns: The matched path or None
FindSourceFiles (node: str = '.') → list
Return a list of all source files.
Flatten (sequence)
GetBuildPath (files)
Glob (pattern, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None)
Ignore \((\text{target, dependency})\)
  Ignore a dependency.
Literal \((\text{string})\)
Local \((^*\text{targets})\)
MergeFlags \((\text{args, unique; bool = True}) \rightarrow \text{None})\)
  Merge flags into construction variables.
  Merges the flags from \text{args} into this construction environment. If \text{args} is not a dict, it is first converted to one with flags distributed into appropriate construction variables. See ParseFlags().
  As a side effect, if \text{unique} is true, a new object is created for each modified construction variable by the loop at the end. This is silently expected by the Override() \text{parse\_flags} functionality, which does not want to share the list (or whatever) with the environment being overridden.

  **Parameters:**
  - \text{args} — flags to merge
  - \text{unique} — merge flags rather than appending (default: True). When merging, path variables are retained from the front, other construction variables from the end.
NoCache \((^*\text{targets})\)
  Tag target(s) so that it will not be cached.
NoClean \((^*\text{targets})\)
  Tag target(s) so that it will not be cleaned by \text{-c}.
Override \((\text{overrides})\)
  Produce a modified environment whose variables are overridden by the overrides dictionaries. “overrides” is a dictionary that will override the variables of this environment.
  This function is much more efficient than Clone() or creating a new Environment because it doesn’t copy the construction environment dictionary, it just wraps the underlying construction environment, and doesn’t even create a wrapper object if there are no overrides.
ParseConfig \((\text{command, function=}\text{None, unique; bool = True})\)
  Parse the result of running a command to update construction vars.
  Use \text{function} to parse the output of running \text{command} in order to modify the current environment.

  **Parameters:**
  - \text{command} — a string or a list of strings representing a command and its arguments.
  - \text{function} — called to process the result of \text{command}, which will be passed as \text{args}. If \text{function} is omitted or \text{None}, MergeFlags() is used. Takes 3 args \text{(env, args, unique)}
  - \text{unique} — whether no duplicate values are allowed (default true)
ParseDepends \((\text{filename, must_exist=}\text{None, only_one; bool = False})\)
  Parse a mkdep-style file for explicit dependencies. This is completely abusable, and should be unnecessary in the “normal” case of proper SCons configuration, but it may help make the transition from a Make hierarchy easier for some people to swallow. It can also be genuinely useful when using a tool that can write a .d file, but for which writing a scanner would be too complicated.
ParseFlags \((^*\text{flags}) \rightarrow \text{dict})\)
  Return a dict of parsed flags.
  Parse \text{flags} and return a dict with the flags distributed into the appropriate construction variable names. The flags are treated as a typical set of command-line flags for a GNU-style toolchain, such as might have been generated by one of the \{foo\}-config scripts, and used to populate the entries based on knowledge embedded in this method - the choices are not expected to be portable to other toolchains.
  If one of the \text{flags} strings begins with a bang (exclamation mark), it is assumed to be a command and the rest of the string is executed; the result of that evaluation is then added to the dict.
Platform \((\text{platform})\)
Precious \((^*\text{targets})\)
  Mark \text{targets} as precious: do not delete before building.
Prepend \((^*\text{kw}) \rightarrow \text{None})\)
  Prepend values to construction variables in an Environment.
  The variable is created if it is not already present.
PrependENVPath(name, newpath, envname: str = 'ENV', sep=':', delete_existing: bool = True) → None

Prepend path elements to the path name in the envname dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.

If delete_existing is False, a newpath component already in the path will not be moved to the front (it will be left where it is).

PrependUnique(delete_existing: bool = False, **kw) → None

Prepend values to existing construction variables in an Environment, if they're not already there. If delete_existing is True, removes existing values first, so values move to front.

Pseudo(**targets)

Mark targets as pseudo: must not exist.

PyPackageDir(modulename)

RemoveMethod(function) → None

Removes the specified function's MethodWrapper from the added_methods list, so we don't re-bind it when making a clone.

Replace(**kw) → None

Replace existing construction variables in an Environment with new construction variables and/or values.

ReplaceIxes(path, old_prefix, old_suffix, new_prefix, new_suffix)

Replace old_prefix with new_prefix and old_suffix with new_suffix.

env - Environment used to interpolate variables. path - the path that will be modified. old_prefix - construction variable for the old prefix. old_suffix - construction variable for the old suffix. new_prefix - construction variable for the new prefix. new_suffix - construction variable for the new suffix.

Repository(**dirs, **kw) → None

Specify Repository directories to search.

Requires(target, prerequisite)

Specify that prerequisite must be built before target.

Creates an order-only relationship, not a full dependency. prerequisite must exist before target can be built, but a change to prerequisite does not trigger a rebuild of target.

SConsignFile(name='*.sconsign', dbm_module=None) → None

Scanner(**args, **kw)

SetDefault(**kw) → None

SideEffect(side_effect, target)

Tell scons that side_effects are built as side effects of building targets.

Split(arg)

This function converts a string or list into a list of strings or Nodes. This makes things easier for users by allowing files to be specified as a white-space separated list to be split.

The input rules are:

- A single string containing names separated by spaces. These will be split apart at the spaces.
- A single Node instance
- A list containing either strings or Node instances. Any strings in the list are not split at spaces.

In all cases, the function returns a list of Nodes and strings.

Tool(tool: str | Callable, toolpath: Collection[str] | None = None, **kwars) → Callable

Find and run tool module tool.

tool is generally a string, but can also be a callable object, in which case it is just called, without any of the setup. The skipped setup includes storing kwars into the created Tool instance, which is extracted and used when the instance is called, so in the skip case, the called object will not get the kwars.

Changed in version 4.2: returns the tool object rather than None.

Value(value, built_value=None, name=None)

Return a Value (Python expression) node.

Changed in version 4.0: the name parameter was added.

VariantDir(variant_dir, src_dir, duplicate: int = 1) → None

WhereIs(prog, path=None, pathext=None, reject=None)

Find prog in the path.
Allow Dirs and strings beginning with # for top-relative.
Note this uses the current env’s fs (in self).

Initial the dispatch tables for special handling of special construction variables.

Converts args to a list of nodes.

Parameters:

- **just** (args - filename strings or nodes to convert; nodes are) – added to the list without further processing.
- **not** (node_factory - optional factory to create the nodes; if) – specified, will use this environment’s `fs.File` method.
- **to** (lookup_list - optional list of lookup functions to call) – attempt to find the file referenced by each args.
- **add**. (kw - keyword arguments that represent additional nodes to) –

Emulate command substitution.
Provides behavior conceptually like POSIX Shell notation for running a command in backquotes (backticks) by running command and returning the resulting output string.
This is not really a public API any longer, it is provided for the use of ParseFlags() (which supports it using a syntax of `!command`) and ParseConfig().

Raises: **OSError** – if the external command returned non-zero exit status.

Emulates the get() method of dictionaries.

Fetch the builder with the specified name from the environment.
Return a factory function for creating Nodes for this construction environment.
Find the appropriate scanner given a key (usually a file suffix).

Emulates the items() method of dictionaries.

Emulates the keys() method of dictionaries.

Delete the cached scanner map (if we need to).

Delete the cached scanner map (if we need to).
Emulates the `setdefault()` method of dictionaries.

```
subst (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)
```

Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphabetic character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

```
subst_kw (kw, raw: int = 0, target=None, source=None)
```

```
subst_list (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)
```

Calls through to SCons.Subst.scons_subst_list().

See the documentation for that function.

```
subst_path (path, target=None, source=None)
```

Substitute a path list.

```
subst_target_source (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)
```

Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphabetic character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

```
validate_CacheDir_class (custom_class=None)
```

Validate the passed custom CacheDir class, or if no args are passed, validate the custom CacheDir class from the environment.

```
values ()
```

Emulates the `values()` method of dictionaries.

```
class SCons.Environment.SubstitutionEnvironment (**kw)
```

Base class for different flavors of construction environments.

This class contains a minimal set of methods that handle construction variable expansion and conversion of strings to Nodes, which may or may not be actually useful as a stand-alone class. Which methods ended up in this class is pretty arbitrary right now. They’re basically the ones which we’ve empirically determined are common to the different construction environment subclasses, and most of the others that use or touch the underlying dictionary of construction variables.

Eventually, this class should contain all the methods that we determine are necessary for a “minimal” interface to the build engine. A full “native Python” SCons environment has gotten pretty heavyweight with all of the methods and Tools and construction variables we’ve jammed in there, so it would be nice to have a lighter weight alternative for interfaces that don’t need all of the bells and whistles. (At some point, we’ll also probably rename this class “Base,” since that more reflects what we want this class to become, but because we’ve released comments that tell people to subclass Environment.Base to create their own flavors of construction environment, we’ll save that for a future refactoring when this class actually becomes useful.)

```
AddMethod (function, name=None) → None
```

Adds the specified function as a method of this construction environment with the specified name. If the name is omitted, the default name is the name of the function itself.

```
MergeFlags (args, unique: bool = True) → None
```

Merge flags into construction variables.

Merges the flags from `args` into this construction environment. If `args` is not a dict, it is first converted to one with flags distributed into appropriate construction variables. See ParseFlags().

As a side effect, if `unique` is true, a new object is created for each modified construction variable by the loop at the end. This is silently expected by the Override() `parse_flags` functionality, which does not want to share the list (or whatever) with the environment being overridden.

**Parameters:**

- `args` — flags to merge
- `unique` — merge flags rather than appending (default: True). When merging, path variables are retained from the front, other construction variables from the end.
Override \texttt{(overrides)}

Produce a modified environment whose variables are overridden by the \texttt{overrides} dictionaries. \textquote{overrides} is a dictionary that will override the variables of this environment.

This function is much more efficient than \texttt{Clone()} or creating a new \texttt{Environment} because it doesn\'t copy the construction environment dictionary, it just wraps the underlying construction environment, and doesn\'t even create a wrapper object if there are no overrides.

\texttt{ParseFlags(*flags) → dict}

Return a dict of parsed flags.

\texttt{Parse flags} and return a dict with the flags distributed into the appropriate construction variable names. The flags are treated as a typical set of command-line flags for a GNU-style toolchain, such as might have been generated by one of the \{foo\}-config scripts, and used to populate the entries based on knowledge embedded in this method - the choices are not expected to be portable to other toolchains.

If one of the \texttt{flags} strings begins with a bang (exclamation mark), it is assumed to be a command and the rest of the string is executed; the result of that evaluation is then added to the dict.

\texttt{RemoveMethod(function) → None}

Removes the specified function\'s MethodWrapper from the added\_methods list, so we don\'t re-bind it when making a clone.

\texttt{_init\_special () → None}

Initial the dispatch tables for special handling of special construction variables.

\texttt{arg2nodes(args, node\_factory=<class\ 'SCons.Environment._Null'>, lookup\_list=<class\ 'SCons.Environment._Null'>, **kw)}

Converts \texttt{args} to a list of nodes.

\textbf{Parameters:}

\begin{itemize}
  \item \texttt{just} (\texttt{args} - filename strings or nodes to convert; \texttt{nodes are}) – added to the list without further processing.
  \item \texttt{not} (\texttt{node\_factory} - optional factory to create the nodes; \texttt{if}) – specified, will use this environment\'s `\``fs.File method.
  \item \texttt{to} (\texttt{lookup\_list} - optional list of lookup functions to call) – attempt to find the file referenced by each \texttt{args}.
  \item \texttt{add.} (\texttt{kw} - keyword arguments that represent additional nodes to) –
\end{itemize}

\texttt{backtick(command) → str}

Emulate command substitution.

Provides behavior conceptually like POSIX Shell notation for running a command in backquotes (backticks) by running \texttt{command} and returning the resulting output string.

This is not really a public API any longer, it is provided for the use of \texttt{ParseFlags()} (which supports it using a syntax of !command) and \texttt{ParseConfig()}.

\textbf{Raises:} \texttt{OSError} – if the external command returned non-zero exit status.

\texttt{get(key, default=None)}

Emulates the get() method of dictionaries.

\texttt{gvars()}

Emulates the items() method of dictionaries.

\texttt{keys()}  

Emulates the keys() method of dictionaries.

\texttt{lvars()}

Emulates the setdefault() method of dictionaries.

\texttt{setdefault(key, default=None)}

Emulates the setdefault() method of dictionaries.

\texttt{subst(string, raw: int = 0, target=None, source=None, conv=None, executor: Executor = None, overrides: dict = None)}

Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphabetic character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

\texttt{subst\_kw(kw, raw: int = 0, target=None, source=None)}

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```python
subst_list (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)
    Calls through to SCons.Subst.scons_subst_list().
    See the documentation for that function.

subst_path (path, target=None, source=None)
    Substitute a path list.
    Turns EntryProxies into Nodes, leaving Nodes (and other objects) as-is.

subst_target_source (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)
    Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphabetic character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

values ()
    Emulates the values() method of dictionaries.

class SCons.Environment._Null
    Bases: object
SCons.Environment._add_cppdefines (env_dict: dict, val, prepend: bool = False, unique: bool = False, delete_existing: bool = False) -> None
    Adds to CPPDEFINES, using the rules for C preprocessor macros.
    This is split out from regular construction variable addition because these entries can express either a macro with a replacement value or one without. A macro with replacement value can be supplied as val in three ways: as a combined string "name=value"; as a tuple (name, value), or as an entry in a dictionary {"name": value}. A list argument with multiple macros can also be given.
    Additions can be unconditional (duplicates allowed) or uniquing (no dupes).
    Note if a replacement value is supplied, unique requires a full match to decide uniqueness - both the macro name and the replacement. The inner _is_in() is used to figure that out.

    Parameters:
    - env_dict – the dictionary containing the CPPDEFINES to be modified.
    - val – the value to add, can be string, sequence or dict
    - prepend – whether to put val in front or back.
    - unique – whether to add val if it already exists.
    - delete_existing – if unique is true, add val after removing previous.

New in version 4.5.0.
SCons.Environment._del_SCANNERS (env, key) -> None
SCons.Environment._delete_duplicates (l, keep_last)
    Delete duplicates from a sequence, keeping the first or last.
SCons.Environment._null
    alias of _Null
SCons.Environment._set_BUILDERS (env, key, value) -> None
SCons.Environment._set_SCANNERS (env, key, value) -> None
SCons.Environment._set_future_reserved (env, key, value) -> None
SCons.Environment._set_reserved (env, key, value) -> None
SCons.Environment.alias_builder (env, target, source) -> None
SCons.Environment.apply_tools (env, tools, toolpath) -> None
SCons.Environment.copy_non_reserved_keywords (dict)
SCons.Environment.default_copy_from_cache (env, src, dst)
SCons.Environment.default_copy_to_cache (env, src, dst)
SCons.Environment.default_decide_source (dependency, target, prev_ni, repo_node=None)
SCons.Environment.default_decide_target (dependency, target, prev_ni, repo_node=None)
```

SCons.Errors module

SCons exception classes.

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Used to handle internal and user errors in SCons.

```python
exception SCons.Errors.BuildError (node=None, errstr: str = 'Unknown error', status: int = 2, exitstatus: int = 2, filename=None, executor: SCons.Executor.Executor | None = None, action=None, command=None, exc_info=(None, None, None))
```

Bases: Exception

SCons Errors that can occur while building.

A BuildError exception contains information both about the error itself, and what caused the error.

**Variables:**

- **node** – `(cause)` the error occurred while building this target node(s)
- **errstr** – `(info)` a description of the error message
- **status** – `(info)` the return code of the action that caused the build error. Must be set to a non-zero value even if the build error is not due to an action returning a non-zero returned code.
- **exitstatus** – `(info)` SCons exit status due to this build error. Must be nonzero unless due to an explicit Exit() call. Not always the same as `status`, since actions return a status code that should be respected, but SCons typically exits with 2 irrespective of the return value of the failed action.
- **filename** – `(info)` The name of the file or directory that caused the build error. Set to `None` if no files are associated with this error. This might be different from the target being built. For example, failure to create the directory in which the target file will appear. It can be `None` if the error is not due to a particular filename.
- **executor** – `(cause)` the executor that caused the build to fail (might be `None` if the build failures is not due to the executor failing)
- **action** – `(cause)` the action that caused the build to fail (might be `None` if the build failures is not due to the an action failure)
- **command** – `(cause)` the command line for the action that caused the build to fail (might be `None` if the build failures is not due to the an action failure)
- **exc_info** – `(info)` Info about exception that caused the build error. Set to `(None, None, None)` if this build error is not due to an exception.

```python
exception SCons.Errors.ExplicitExit (node=None, status=None, *args)
```

Bases: Exception

```
exception SCons.Errors.InternalError
exception SCons.Errors.MSVCError
exception SCons.Errors.SConsEnvironmentError
exception SCons.Errors.StopError
exception SCons.Errors.UserError
```

SCons.Errors.convert_to_BuildError (status, exc_info=None)

Convert a return code to a BuildError Exception.

The `buildError.status` we set here will normally be used as the exit status of the “scons” process.

**Parameters:**

- **status** – can either be a return code or an Exception.
- **exc_info** *(tuple, optional)* – explicit exception information.

SCons.Executor module

Execute actions with specific lists of target and source Nodes.
SCons.Executor.AddBatchExecutor (key: str, executor: Executor) → None

```python
class SCons.Executor.Batch (targets=[], sources=[])

Bases: object

Remembers exact association between targets and sources of executor.

sources

targets
```

```python
class SCons.Executor.Executor (action, env=None, overridelist=[], targets=[], sources=[], builder_kw={})

Bases: object

A class for controlling instances of executing an action.

This largely exists to hold a single association of an action, environment, list of environment override dictionaries, targets and sources for later processing as needed.

_changed_sources_list
_changed_targets_list
_do_execute
_execute_str
_get_changed_sources (*args, **kw)
_get_changed_targets (*args, **kw)
_get_changes () → None
_get_source (*args, **kw)
_get_sources (*args, **kw)
_get_target (*args, **kw)
_get_targets (*args, **kw)
_get_unchanged_sources (*args, **kw)
_get_unchanged_targets (*args, **kw)
_get_unignored_sources_key (node, ignore=())
_memo
_unchanged_sources_list
_unchanged_targets_list
action_list
add_batch (targets, sources) → None

Add pair of associated target and source to this Executor’s list. This is necessary for “batch” Builders that can be called repeatedly to build up a list of matching target and source files that will be used in order to update multiple target files at once from multiple corresponding source files, for tools like MSVC that support it.

add_post_action (action) → None
add_pre_action (action) → None
add_sources (sources) → None

Add source files to this Executor’s list. This is necessary for “multi” Builders that can be called repeatedly to build up a source file list for a given target.

batches
builder_kw
cleanup () → None
env
get_action_list ()
get_action_side_effects ()

Returns all side effects for all batches of this Executor used by the underlying Action.

get_action_targets ()
get_all_children ()

Returns all unique children (dependencies) for all batches of this Executor.

The Taskmaster can recognize when it’s already evaluated a Node, so we don’t have to make this list unique for its intended canonical use case, but we expect there to be a lot of redundancy (long lists of batched .cc files #including the same .h files over and over), so removing the duplicates once up front should save the Taskmaster a lot of work.

get_all_prerequisites ()

Returns all unique (order-only) prerequisites for all batches of this Executor.

get_all_sources ()
Returns all sources for all batches of this Executor.

get_all_targets ()
Returns all targets for all batches of this Executor.

get_build_env ()
Fetch or create the appropriate build Environment for this Executor.

get_build_scanner_path (scanner)
Fetch the scanner path for this executor's targets and sources.

get_contents ()
Fetch the signature contents. This is the main reason this class exists, so we can compute this once and cache it regardless of how many target or source Nodes there are.

Returns bytes

get_implicit_deps ()
Return the executor's implicit dependencies, i.e. the nodes of the commands to be executed.

get_kw (kw={})
get_lvars ()
get_sources ()
get_timestamp () \rightarrow int
Fetch a time stamp for this Executor. We don't have one, of course (only files do), but this is the interface used by the timestamp module.

get_unignored_sources (node, ignore={})
lvars
nullify () \rightarrow None
override_list
post_actions
pre_actions
prepare ()
Preparatory checks for whether this Executor can go ahead and (try to) build its targets.

scan (scanner, node_list) \rightarrow None
Scan a list of this Executor's files (targets or sources) for implicit dependencies and update all of the targets with them. This essentially short-circuits an N*M scan of the sources for each individual target, which is a hell of a lot more efficient.

scan_sources (scanner) \rightarrow None
scan_targets (scanner) \rightarrow None
set_action_list (action)

SCons.Executor.GetBatchExecutor (key: str) \rightarrow Executor

class SCons.Executor.Null (*.args, **kw)
Bases: object
A null Executor, with a null build Environment, that does nothing when the rest of the methods call it. This might be able to disappear when we refactor things to disassociate Builders from Nodes entirely, so we're not going to worry about unit tests for this—at least for now.

_changed_sources_list
_changed_targets_list
_do_execute
_execute_str
_memo
_morph () \rightarrow None
Morph this Null executor to a real Executor object.

_unchanged_sources_list
_unchanged_targets_list
action_list
add_post_action (action) \rightarrow None
add_pre_action (action) \rightarrow None
batches
builder_kw
cleanup () \rightarrow None
env
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get_action_list ()
get_action_side_effects ()
get_action_targets ()
get_all_children ()
get_all_prerequisites ()
get_all_sources ()
get_all_targets ()
get_build_env ()
get_build_scanner_path ()
get_contents () → str
get_unignored_sources (*args, **kw)
lvars
overridelist
post_actions
prepare () → None
set_action_list (action) → None
class SCons.Executor.NullEnvironment (*args, **kwargs)
Bases: Null
SCons = <module 'SCons' from '/Users/bdbaddog/devel/scons/git/as_scons/SCons/__init__.py'>
_CacheDir = <SCons.CacheDir.CacheDir object>
_CacheDir_path = None
get_CacheDir ()
class SCons.Executor.TSList (func)
Bases: UserList
A class that implements $TARGETS or $SOURCES expansions by wrapping an executor Method. This class is used in the Executor.lvars() to delay creation of NodeList objects until they’re needed.
Note that we subclass collections.UserList purely so that the is_Sequence() function will identify an object of this class as a list during variable expansion. We’re not really using any collections.UserList methods in practice.
_abc_impl = <_abc._abc_data object>
append (item)
S.append(value) – append value to the end of the sequence
clear () → None -- remove all items from S
copy ()
count (value) → integer -- return number of occurrences of value
extend (other)
S.extend(iterable) – extend sequence by appending elements from the iterable
index (value[, start[, stop]]) → integer -- return first index of value.
Raises ValueError if the value is not present.
Supporting start and stop arguments is optional, but recommended.
insert (i, item)
S.insert(index, value) – insert value before index
pop ([index]) → item -- remove and return item at index (default last).
Raise IndexError if list is empty or index is out of range.
remove (item)
S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.
reverse ()
S.reverse() – reverse IN PLACE
sort (*args, **kwds)
class SCons.Executor.TSObject (func)
Bases: object
A class that implements $TARGET or $SOURCE expansions by wrapping an Executor method.
SCons.Executor.execute_action_list (obj, target, kw)
Actually execute the action list.
SCons.Executor.execute_actions_str (obj)
SCons.Executor.execute_nothing (obj, target, kw) → int

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SCons.Executor.execute_null_str (obj) → str
SCons.Executor.get_NullEnvironment ()
Use singleton pattern for Null Environments.
SCons.Executor.rfile (node)
A function to return the results of a Node’s rfile() method, if it exists, and the Node itself otherwise (if it's a Value Node, e.g.).

SCons.Memoize module
Decorator-based memoizer to count caching stats.
A decorator-based implementation to count hits and misses of the computed values that various methods cache in memory.
Use of this modules assumes that wrapped methods be coded to cache their values in a consistent way. In particular, it requires that the class uses a dictionary named "_memo" to store the cached values.
Here is an example of wrapping a method that returns a computed value, with no input parameters:

```
@SCons.Memoize.CountMethodCall
def foo(self):
    try:                                                    # Memoization
        return self._memo['foo']                            # Memoization
    except KeyError:                                        # Memoization
        pass                                                # Memoization
    result = self.compute_foo_value()
    self._memo['foo'] = result                              # Memoization
    return result
```

Here is an example of wrapping a method that will return different values based on one or more input arguments:

```
def _bar_key(self, argument):                               # Memoization
    return argument                                         # Memoization
@SCons.Memoize.CountDictCall(_bar_key)
def bar(self, argument):
    memo_key = argument                                     # Memoization
    try:                                                    # Memoization
        memo_dict = self._memo['bar']                       # Memoization
    except KeyError:                                        # Memoization
        memo_dict = {}                                      # Memoization
    else:                                                   # Memoization
        try:                                                # Memoization
            return memo_dict[memo_key]                      # Memoization
        except KeyError:                                    # Memoization
            pass                                            # Memoization
    result = self.compute_bar_value(argument)
    memo_dict[memo_key] = result                            # Memoization
```

Deciding what to cache is tricky, because different configurations can have radically different performance tradeoffs, and because the tradeoffs involved are often so non-obvious. Consequently, deciding whether or not to cache a given method will likely be more of an art than a science, but should still be based on available data from this module. Here are some VERY GENERAL guidelines about deciding whether or not to cache return values from a method that’s being called a lot:

- **The first question to ask is, “Can we change the calling code**
  
  so this method isn’t called so often?” Sometimes this can be done by changing the algorithm. Sometimes the caller should be memoized, not the method you’re looking at.

  The memoized function should be timed with multiple configurations to make sure it doesn’t inadvertently slow down some other configuration.

- **When memoizing values based on a dictionary key composed of input arguments**, you don’t need to use all of the arguments if some of them don’t affect the return values.

```python
class SCons.Memoize.CountDict(cls_name, method_name, keymaker):
    Bases: Counter
    A counter class for memoized values stored in a dictionary, with keys based on the method’s input arguments.
    A CountDict object is instantiated in a decorator for each of the class’s methods that memoizes its return value in a dictionary, indexed by some key that can be computed from one or more of its input arguments.
    count(*args, **kw) → None
    Counts whether the computed key value is already present in the memoization dictionary (a hit) or not (a miss).
    display() → None
    key()
SCons.Memoize.CountDictCall(keyfunc)
    Decorator for counting memoizer hits/misses while accessing dictionary values with a key-generating function. Like CountMethodCall above, it wraps the given method fn and uses a CountDict object to keep track of the caching statistics. The dict-key function keyfunc has to get passed in the decorator call and gets stored in the CountDict instance. Wrapping gets enabled by calling EnableMemoization().
SCons.Memoize.CountMethodCall(fn)
    Decorator for counting memoizer hits/misses while retrieving a simple value in a class method. It wraps the given method fn and uses a CountValue object to keep track of the caching statistics. Wrapping gets enabled by calling EnableMemoization().
```

```python
class SCons.Memoize.CountValue(cls_name, method_name):
    Bases: Counter
    A counter class for simple, atomic memoized values.
    A CountValue object should be instantiated in a decorator for each of the class’s methods that memoizes its return value by simply storing the return value in its _memo dictionary.
    count(*args, **kw) → None
    Counts whether the memoized value has already been set (a hit) or not (a miss).
    display() → None
    key()
SCons.Memoize.Counter(cls_name, method_name)
    Bases: object
    Base class for counting memoization hits and misses.
    We expect that the initialization in a matching decorator will fill in the correct class name and method name that represents the name of the function being counted.
    display() → None
    key()
SCons.Memoize.Dump(title=None) → None
    Dump the hit/miss count for all the counters collected so far.
SCons.Memoize.EnableMemoization() → None
```
SCons.PathList module

Handle lists of directory paths.

These are the path lists that get set as CPPPATH, LIBPATH, etc.) with as much caching of data and efficiency as we can, while still keeping the evaluation delayed so that we Do the Right Thing (almost) regardless of how the variable is specified.

SCons.PathList.PathList (pathlist, split=True)

Entry point for getting PathLists.

Returns the cached _PathList object for the specified pathlist, creating and caching a new object as necessary.

class SCons.PathList._PathList (pathlist, split=True)

Bases: object

An actual PathList object.

Initializes a PathList object, canonicalizing the input and pre-processing it for quicker substitution later.

The stored representation of the PathList is a list of tuples containing (type, value), where the “type” is one of the TYPE_* variables defined above. We distinguish between:

- Strings that contain no $ and therefore need no delayed-evaluation string substitution (we expect that there will be many of these and that we therefore get a pretty big win from avoiding string substitution)

- Strings that contain $ and therefore need substitution (the hard case is things like ${TARGET.dir}/include, which require re-evaluation for every target + source)

- Other objects (which may be something like an EntryProxy that needs a method called to return a Node)

Pre-identifying the type of each element in the PathList up-front and storing the type in the list of tuples is intended to reduce the amount of calculation when we actually do the substitution over and over for each target.

subst_path (env, target, source)

Performs construction variable substitution on a pre-digested PathList for a specific target and source.

SCons.PathList.node_conv (obj)

This is the “string conversion” routine that we have our substitutions use to return Nodes, not strings. This relies on the fact that an EntryProxy object has a get() method that returns the underlying Node that it wraps, which is a bit of architectural dependence that we might need to break or modify in the future in response to additional requirements.

SCons.SConf module

Autoconf-like configuration support.

In other words, SConf allows to run tests on the build machine to detect capabilities of system and do some things based on result: generate config files, header files for C/C++, update variables in environment.

Tests on the build system can detect if compiler sees header files, if libraries are installed, if some command line options are supported etc.

SCons.SConf.CheckCC (context) → bool

SCons.SConf.CheckCHeader (context, header, include_quotes: str = '')

A test for a C header file.

SCons.SConf.CheckCXX (context) → bool

SCons.SConf.CheckCXXHeader (context, header, include_quotes: str = '')

A test for a C++ header file.

class SCons.SConf.CheckContext (sconf)

Bases: object

Provides a context for configure tests. Defines how a test writes to the screen and log file.

A typical test is just a callable with an instance of CheckContext as first argument:

    def CheckCustom(context, ...):
        context.Message('Checking my weird test ...') ret = myWeirdTestFunction(...) context.Result(ret)

Often, myWeirdTestFunction will be one of context.TryCompile/context.TryLink/context.TryRun. The results of those are cached, for they are only rebuilt, if the dependencies have changed.

AppendLIBS (lib_name_list, unique: bool = False)

BuildProg (text, ext) → bool
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- CompileProg (text, ext) → bool
- CompileSharedObject (text, ext) → bool
- Display (msg) → None
- Log (msg) → None
- Message (text) → None

Inform about what we are doing right now, e.g. ‘Checking for SOMETHING …‘

- PrependLIBS (lib_name_list, unique: bool = False)

Result (res) → None

Inform about the result of the test. If res is not a string, displays ‘yes’ or ‘no’ depending on whether res is evaluated as true or false. The result is only displayed when self.did_show_result is not set.

- RunProg (text, ext)
- SetLIBS (val)

TryAction (*args, **kw)
TryBuild (*args, **kw)
TryCompile (*args, **kw)
TryLink (*args, **kw)
TryRun (*args, **kw)

SCons.SConf.CheckDeclaration (context, declaration, includes: str = '', language=None) → bool
SCons.SConf.CheckFunc (context, function_name, header=None, language=None, funcargs=None) → bool
SCons.SConf.CheckHeader (context, header, include_quotes: str = '<>', language=None) → bool

A test for a C or C++ header file.

SCons.SConf.CheckLib (context, library=None, symbol: str = 'main', header=None, language=None, autoadd: bool = True, append: bool = True, unique: bool = False) → bool

A test for a library. See also CheckLibWithHeader. Note that library may also be None to test whether the given symbol compiles without flags.

SCons.SConf.CheckLibWithHeader (context, libs, header, language, call=None, autoadd: bool = True, append: bool = True, unique: bool = False) → bool

Another (more sophisticated) test for a library. Checks, if library and header is available for language (may be ‘C’ or ‘CXX’). Call maybe be a valid expression _with_ a trailing ‘;’. As in CheckLib, we support library=None, to test if the call compiles without extra link flags.

SCons.SConf.CheckMember (context, aggregate_member, header=None, language=None) → bool

Returns the status (False : failed, True : ok).

SCons.SConf.CheckProg (context, prog_name)

Simple check if a program exists in the path. Returns the path for the application, or None if not found.

SCons.SConf.CheckSHCC (context) → bool
SCons.SConf.CheckSHCXX (context) → bool
SCons.SConf.CheckType (context, type_name, includes: str = '', language=None) → bool
SCons.SConf.CheckTypeSize (context, type_name, includes: str = '', language=None, expect=None)

exception SCons.SConf.ConfigureCacheError (target)

Bases: SConfError

Raised when a use explicitly requested the cache feature, but the test is run the first time.

add_note ()
Exception.add_note(note) – add a note to the exception

args
with_traceback ()
Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

exception SCons.SConf.ConfigureDryRunError (target)

Bases: SConfError

Raised when a file or directory needs to be updated during a Configure process, but the user requested a dry-run

add_note ()
Exception.add_note(note) – add a note to the exception

args
with_traceback ()
Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
This is simply a class to represent a configure context. After creating a SConf object, you can call any tests. After finished with your tests, be sure to call the Finish() method, which returns the modified environment. Some words about caching: In most cases, it is not necessary to cache Test results explicitly. Instead, we use the scons dependency checking mechanism. For example, if one wants to compile a test program (SConf.TryLink), the compiler is only called, if the program dependencies have changed. However, if the program could not be compiled in a former SConf run, we need to explicitly cache this error.

AddTest (test_name, test_instance) → None

Adds test_class to this SConf instance. It can be called with self.test_name(…)

AddTests (tests) → None

Adds all the tests given in the tests dictionary to this SConf instance

BuildNodes (nodes)

Tries to build the given nodes immediately. Returns 1 on success, 0 on error.

Define (name, value=None, comment=None) → None

Define a pre processor symbol name, with the optional given value in the current config header.

If value is None (default), then #define name is written. If value is not none, then #define name value is written.

comment is a string which will be put as a C comment in the header, to explain the meaning of the value (appropriate C comments will be added automatically).

Finish ()

Call this method after finished with your tests: env = sconf.Finish()

class TestWrapper (test, sconf)

Bases: object

A wrapper around Tests (to ensure sanity)

TryAction (action, text=None, extension: str = '')

Tries to execute the given action with optional source file contents <text> and optional source file extension <extension>, Returns the status (0 : failed, 1 : ok) and the contents of the output file.

TryBuild (builder, text=None, extension: str = '')

Low level TryBuild implementation. Normally you don’t need to call that - you can use TryCompile / TryLink / TryRun instead

TryCompile (text, extension)

Compiles the program given in text to an env.Object, using extension as file extension (e.g. ‘.c’). Returns 1, if compilation was successful, 0 otherwise. The target is saved in self.lastTarget (for further processing).

TryLink (text, extension)

Compiles the program given in text to an executable env.Program, using extension as file extension (e.g. ‘.c’). Returns 1, if compilation was successful, 0 otherwise. The target is saved in self.lastTarget (for further processing).

TryRun (text, extension)

Compiles and runs the program given in text, using extension as file extension (e.g. ‘.c’). Returns (1, outputStr) on success, (0, '') otherwise. The target (a file containing the program’s stdout) is saved in self.lastTarget (for further processing).

_createDir (node)

_shutdown ()

_Private method. Reset to non-piped spawn

_startup () → None

_Private method. Set up logstream, and set the environment variables necessary for a piped build

pspawn_wrapper (sh, escape, cmd, args, env)

Wrapper function for handling piped spawns.

This looks to the calling interface (in Action.py) like a “normal” spawn, but associates the call with the PSPAWN variable from the construction environment and with the streams to which we want the output logged. This gets slid into the construction environment as the SPAWN variable so Action.py doesn’t have to know or care whether it’s spawning a piped command or not.
Special build info for targets of configure tests. Additional members are result (did the builder succeed last time?) and string, which contains messages of the original build phase.

```python
__getstate__ ()
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.
```

```python
__setstate__ (state) → None
Restore the attributes from a pickled state.
```

```python
bact
bactsig
bdepends
bdependsigs
bimplicit
bimplicitsigs
bsources
bsourcesigs
convert_from_sconsign (dir, name) → None
Converts a newly-read FileBuildInfo object for in-SCons use
For normal up-to-date checking, we don't have any conversion to perform--but we're leaving this method here to make that clear.
```

```python
convert_to_sconsign () → None
Converts this FileBuildInfo object for writing to a .sconsign file
This replaces each Node in our various dependency lists with its usual string representation: relative to the top-level SConstruct directory, or an absolute path if it's outside.
```

```python
current_version_id = 2
dependency_map
format (names: int = 0)
merge (other) → None
    Merge the fields of another object into this object. Already existing information is overwritten by the other instance's data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.
```

```python
prepare_dependencies () → None
Prepares a FileBuildInfo object for explaining what changed
The bsources, bdepends and bimplicit lists have all been stored on disk as paths relative to the top-level SConstruct directory. Convert the strings to actual Nodes (for use by the --debug=explain code and --implicit-cache).
```

```python
result
set_build_result (result, string) → None
string
```

```python
class SCons.SConf.SConfBuildTask (tm, targets, top, node)
Bases: AlwaysTask
This is almost the same as SCons.Script.BuildTask. Handles SConfErrors correctly and knows about the current cache_mode.
```

```python
LOGGER = None
__abc_impl = _abc._abc_data object>
__exception_raise ()
    Raises a pending exception that was recorded while getting a Task ready for execution.
__no_exception_to_raise () → None
collect_node_states () → Tuple [bool, bool, bool]
display (message) → None
    Hook to allow the calling interface to display a message.
    This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.
```

```python
display_cached_string (bi) → None
Log the original builder messages, given the SConfBuildInfo instance bi.
```

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exc_clear () → None
Cleans any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info ()
Returns info about a recorded exception.

exception_set (exception=None) → None
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact

execute ()
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
do stuff in prepare(), executed() or failed().

exectuted () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s
callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before
deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was
an actual built target or a source Node.

executed_with_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s
callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before
deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call
“visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was
an actual built target or a source Node.

executed_without_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s
callback methods.

fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

failed ()
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready () → None
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c”
option.

make_ready_current () → None
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute () → bool
Always returns True (indicating this Task should always be executed).
Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:

```python
class MyTaskSubclass(SCons.Taskmaster.Task):
    needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute
    non_sconf_nodes = {}
    postprocess () → None
    Post-processes a task after it's been executed.
    This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.
    prepare () → None
    Called just before the task is executed.
    This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.
    trace_message (node, description: str = 'node') → None
    exception SCons.SConf.SConfWarning (msg)
    Bases: SConsWarning
    add_note ()
    Exception.add_note(note) – add a note to the exception
    args
    with_traceback ()
    Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
```

SCons.SConf._createConfigH (target, source, env) → None
SCons.SConf._createSource (target, source, env) → None
SCons.SConf._set_conftest_node (node) → None
SCons.SConf._stringConfigH (target, source, env)
SCons.SConf._stringSource (target, source, env)
SCons.SConf.createIncludesFromHeaders (headers, leaveLast, include_quotes: str = '')

SCons.SConsign module

Operations on signature database files (.sconsign).

```python
class SCons.SConsign.Base
    Bases: object
```
This is the controlling class for the signatures for the collection of entries associated with a specific directory. The actual directory association will be maintained by a subclass that is specific to the underlying storage method. This class provides a common set of methods for fetching and storing the individual bits of information that make up signature entry.

do_not_set_entry (filename, obj) → None

do_not_store_info (filename, node) → None

get_entry (filename)
  Fetch the specified entry attribute.
  merge () → None
  set_entry (filename, obj) → None
  Set the entry.
  store_info (filename, node) → None

class SCons.SConsign.DB (dir)
  Bases: Base
  A Base subclass that reads and writes signature information from a global .sconsign.db* file—the actual file suffix is determined by the database module.
  do_not_set_entry (filename, obj) → None
  do_not_store_info (filename, node) → None
  get_entry (filename)
    Fetch the specified entry attribute.
    merge () → None
    set_entry (filename, obj) → None
    Set the entry.
    store_info (filename, node) → None
  write (sync: int = 1) → None

class SCons.SConsign.Dir (fp=None, dir=None)
  Bases: Base
  do_not_set_entry (filename, obj) → None
  do_not_store_info (filename, node) → None
  get_entry (filename)
    Fetch the specified entry attribute.
    merge () → None
    set_entry (filename, obj) → None
    Set the entry.
    store_info (filename, node) → None

class SCons.SConsign.DirFile (dir)
  Bases: Dir
  Encapsulates reading and writing a per-directory .sconsign file.
  do_not_set_entry (filename, obj) → None
  do_not_store_info (filename, node) → None
  get_entry (filename)
    Fetch the specified entry attribute.
    merge () → None
    set_entry (filename, obj) → None
    Set the entry.
    store_info (filename, node) → None
  write (sync: int = 1) → None
    Write the .sconsign file to disk.
    Try to write to a temporary file first, and rename it if we succeed. If we can’t write to the temporary file, it’s probably because the directory isn’t writable (and if so, how did we build anything in this directory, anyway?), so try to write directly to the .sconsign file as a backup. If we can’t rename, try to copy the temporary contents back to the .sconsign file. Either way, always try to remove the temporary file at the end.

SCons.SConsign.File (name, dbm_module=None) → None
  Arrange for all signatures to be stored in a global .sconsign.db* file.
SCons.SConsign.ForDirectory
  alias of DB
SCons API Documentation

SCons.SConsign.Get_DataBase (dir)
SCons.SConsign.Reset () → None
  Reset global state. Used by unit tests that end up using SCons multiple times to get a clean slate for each test.

class SCons.SConsign.SConsignEntry
  Bases: object
  Wrapper class for the generic entry in a .sconsign file. The Node subclass populates it with attributes as it pleases.
  XXX As coded below, we do expect a `.binfo` attribute to be added, but we’ll probably generalize this in the next refactorings.
  binfo
  convert_from_sconsign (dir, name) → None
  convert_to_sconsign () → None
  current_version_id = 2
  ninfo
  SCons.SConsign.corrupt_dblite_warning (filename) → None
  SCons.SConsign.current_sconsign_filename ()
  SCons.SConsign.write () → None

SCons.Subst module

SCons string substitution.

class SCons.Subst.CmdStringHolder (cmd, literal=None)
  Bases: UserString
  This is a special class used to hold strings generated by scons_subst() and scons_subst_list(). It defines a special method escape(). When passed a function with an escape algorithm for a particular platform, it will return the contained string with the proper escape sequences inserted.
  _abc_impl = <_abc._abc_data object>
  capitalize ()
  casefold ()
  center (width, *args)
  count (value) → integer -- return number of occurrences of value
  encode (encoding='utf-8', errors='strict')
  endswith (suffix, start=0, end=9223372036854775807)
  escape (escape_func, quote_func=<function quote_spaces>)
    Escape the string with the supplied function. The function is expected to take an arbitrary string, then return it with all special characters escaped and ready for passing to the command interpreter.
    After calling this function, the next call to str() will return the escaped string.
  expandtabs (tabsize=8)
  find (sub, start=0, end=9223372036854775807)
  format (*args, **kwds)
  format_map (mapping)
  index (value[, start[, stop]]) → integer -- return first index of value.
    Raises ValueError if the value is not present.
    Supporting start and stop arguments is optional, but recommended.
  is_literal () → bool
  isalnum ()
  isalpha ()
  isascii ()
  isdecimal ()
  isdigit ()
  isidentifier ()
  islower ()
  isnumeric ()
  isprintable ()
  isspace ()
  istitle ()
  isupper ()
join (seq)
ljust (width, *args)
lower ()
lstrip (chars=None)
maketrans ()
    Return a translation table usable for str.translate().
    If there is only one argument, it must be a dictionary mapping Unicode ordinals (integers) or characters to Unicode
    ordinals, strings or None. Character keys will be then converted to ordinals. If there are two arguments, they must
    be strings of equal length, and in the resulting dictionary, each character in x will be mapped to the character at the
    same position in y. If there is a third argument, it must be a string, whose characters will be mapped to None in the
    result.
partition (sep)
removeprefix (prefix, /)
removesuffix (suffix, /)
replace (old, new, maxsplit=-1)
rfind (sub, start=0, end=9223372036854775807)
rindex (sub, start=0, end=9223372036854775807)
rjust (width, *args)
rpartition (sep)
rsplit (sep=None, maxsplit=-1)
rstrip (chars=None)
split (sep=None, maxsplit=-1)
splitlines (keepends=False)
startswith (prefix, start=0, end=9223372036854775807)
strip (chars=None)
swapcase ()
title ()
translate (*args)
upper ()
zfill (width)

class SCons.Subst.ListSubber (env, mode, conv, gvars)
    Bases: UserList
    A class to construct the results of a scons_subst_list() call.
    Like StringSubber, this class binds a specific construction environment, mode, target and source with two methods
    (substitute() and expand()) that handle the expansion.
    In addition, however, this class is used to track the state of the result(s) we’re gathering so we can do the appropriate
    thing whenever we have to append another word to the result–start a new line, start a new word, append to the
    current word, etc. We do this by setting the “append” attribute to the right method so that our wrapper methods only
    need ever call ListSubber.append(), and the rest of the object takes care of doing the right thing internally.
    _abc_impl = <_abc._abc_data object>
    add_new_word (x) → None
    add_to_current_word (x) → None
    Append the string x to the end of the current last word in the result. If that is not possible, then just add it as a new
    word. Make sure the entire concatenated string inherits the object attributes of x (in particular, the escape function)
    by wrapping it as CmdStringHolder.
    append (item)
        S.append(value) – append value to the end of the sequence
    clear () → None -- remove all items from S
    close_strip (x) → None
        Handle the “close strip” $) token.
    copy ()
    count (value) → integer -- return number of occurrences of value
    expand (s, lvars, within_list)
        Expand a single “token” as necessary, appending the expansion to the current result.
This handles expanding different types of things (strings, lists, callables) appropriately. It calls the wrapper substitute() method to re-expand things as necessary, so that the results of expansions of side-by-side strings still get re-evaluated separately, not smushed together.

expanded (s) → bool
   Determines if the string s requires further expansion.
   Due to the implementation of ListSubber expand will call itself 2 additional times for an already expanded string.
   This method is used to determine if a string is already fully expanded and if so exit the loop early to prevent these recursive calls.

extend (other)
   S.extend(iterable) – extend sequence by appending elements from the iterable

index (value[, start[, stop]]) → integer -- return first index of value.
   Raises ValueError if the value is not present.
   Supporting start and stop arguments is optional, but recommended.

insert (i, item)
   S.insert(index, value) – insert value before index

literal (x)

next_line () → None
   Arrange for the next word to start a new line. This is like starting a new word, except that we have to append another line to the result.

next_word () → None
   Arrange for the next word to start a new word.

open_strip (x) → None
   Handle the “open strip” $( token.

pop ([, index]) → item -- remove and return item at index (default last).
   Raise IndexError if list is empty or index is out of range.

remove (item)
   S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse ()
   S.reverse() – reverse IN PLACE

sort (*args, **kwds)

substitute (args, lvars, within_list) → None
   Substitute expansions in an argument or list of arguments.
   This serves as a wrapper for splitting up a string into separate tokens.

this_word () → None
   Arrange for the next word to append to the end of the current last word in the result.

class SCons.Subst.Literal (lstr)
   Bases: object
   A wrapper for a string. If you use this object wrapped around a string, then it will be interpreted as literal. When passed to the command interpreter, all special characters will be escaped.

   escape (escape_func)

   for_signature ()

   is_literal () → bool

class SCons.Subst.NLWrapper (list, func)
   Bases: object
   A wrapper class that delays turning a list of sources or targets into a NodeList until it’s needed. The specified function supplied when the object is initialized is responsible for turning raw nodes into proxies that implement the special attributes like .abspath, .source, etc. This way, we avoid creating those proxies just “in case” someone is going to use $TARGET or the like, and only go through the trouble if we really have to.
   In practice, this might be a wash performance-wise, but it’s a little cleaner conceptually...

   _create_nodelist ()

   _gen_nodelist ()

   _return_nodelist ()

class SCons.Subst.NullNodeList (*args, **kwargs)
   Bases: NullSeq

   _instance

SCons.Subst.SetAllowableExceptions (*excepts) → None
**class** SCons.Subst.SpecialAttrWrapper (lstr, for_signature=None)

Bases: object

This is a wrapper for what we call a 'Node special attribute.' This is any of the attributes of a Node that we can reference from Environment variable substitution, such as $TARGET.abspath or $SOURCES[1].filebase. We implement the same methods as Literal so we can handle special characters, plus a for_signature method, such that we can return some canonical string during signature calculation to avoid unnecessary rebuilds.

escape (escape_func)

for_signature ()

is_literal () → bool

**class** SCons.Subst.StringSubber (env, mode, conv, gvars)

Bases: object

A class to construct the results of a scons_subst() call.

This binds a specific construction environment, mode, target and source with two methods (substitute() and expand()) that handle the expansion.

expand (s, lvars)

Expand a single “token” as necessary, returning an appropriate string containing the expansion.

This handles expanding different types of things (strings, lists, callables) appropriately. It calls the wrapper substitute() method to re-expand things as necessary, so that the results of expansions of side-by-side strings still get re-evaluated separately, not smushed together.

substitute (args, lvars)

Substitute expansions in an argument or list of arguments.

This serves as a wrapper for splitting up a string into separate tokens.

**class** SCons.Subst.Target_or_Source (nl)

Bases: object

A class that implements $TARGET or $SOURCE expansions by in turn wrapping a NLWrapper. This class handles the different methods used to access an individual proxy Node, calling the NLWrapper to create a proxy on demand.

**class** SCons.Subst.Targets_or_Sources (nl)

Bases: UserList

A class that implements $TARGETS or $SOURCES expansions by in turn wrapping a NLWrapper. This class handles the different methods used to access the list, calling the NLWrapper to create proxies on demand.

Note that we subclass collections.UserList purely so that the is_Sequence() function will identify an object of this class as a list during variable expansion. We’re not really using any collections.UserList methods in practice.

_abc_impl = _abc._abc_data object>

append (item)

S.append(value) – append value to the end of the sequence

clear () → None -- remove all items from S

copy ()

count (value) → integer -- return number of occurrences of value

extend (other)

S.extend(iterable) – extend sequence by appending elements from the iterable

index (value[, start[, stop]]) → integer -- return first index of value.

Raises ValueError if the value is not present.

Supporting start and stop arguments is optional, but recommended.

insert (i, item)

S.insert(index, value) – insert value before index

pop ([, index]) → item -- remove and return item at index (default last).

Raise IndexError if list is empty or index is out of range.

remove (item)

S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse ()

S.reverse() – reverse IN PLACE

sort (*args, **kwds)

SCons.Subst._remove_list (list)

SCons.Subst._rm_list (list)

SCons.Subst.escape_list (mylist, escape_func)
Escape a list of arguments by running the specified escape_func on every object in the list that has an escape() method.

**SCons.Subst.quote_spaces** \(\text{arg}\)

Generic function for putting double quotes around any string that has white space in it.

**SCons.Subst.raise_exception** \(\text{exception, target, s}\)

**SCons.Subst.scons_subst** \(\text{strSubst, env, mode=1, target=None, source=None, gvars={}, lvars={}, conv=None, overrides: dict | None = None}\)

Expand a string or list containing construction variable substitutions.
This is the work-horse function for substitutions in file names and the like. The companion scons_subst_list() function (below) handles separating command lines into lists of arguments, so see that function if that’s what you’re looking for.

**SCons.Subst.scons_subst_list** \(\text{strSubst, env, mode=1, target=None, source=None, gvars={}, lvars={}, conv=None, overrides: dict | None = None}\)

Substitute construction variables in a string (or list or other object) and separate the arguments into a command list.
The companion scons_subst() function (above) handles basic substitutions within strings, so see that function instead if that’s what you’re looking for.

**SCons.Subst.scons_subst_once** \(\text{strSubst, env, key}\)

Perform single (non-recursive) substitution of a single construction variable keyword.
This is used when setting a variable when copying or overriding values in an Environment. We want to capture (expand) the old value before we override it, so people can do things like:

\[
\text{env2} = \text{env.Clone(\text{CCFLAGS} = \$\text{CCFLAGS} -g')}
\]

We do this with some straightforward, brute-force code here...

**SCons.Subst.subst_dict** \(\text{target, source}\)

Create a dictionary for substitution of special construction variables.
This translates the following special arguments:

- **target** - the target (object or array of objects), used to generate the TARGET and TARGETS construction variables
- **source** - the source (object or array of objects), used to generate the SOURCES and SOURCE construction variables

**SCons.Warnings module**

The SCons Warnings framework.

Enables issuing warnings in situations where it is useful to alert the user of a condition that does not warrant raising an exception that could terminate the program.

A new warning class should inherit (perhaps indirectly) from one of two base classes: SConsWarning or WarningOnByDefault, which are the same except warnings derived from the latter will start out in an enabled state. Enabled warnings cause a message to be printed when called, disabled warnings are silent.

There is also a hierarchy for indicating deprecations and future changes: for these, derive from DeprecatedWarning, MandatoryDeprecatedWarning, FutureDeprecatedWarning or FutureReservedVariableWarning.

Whether or not to display warnings, beyond those that are on by default, is controlled through the command line (`--warn`) or through `SetOption('warn')`. The names used there use a different naming style than the warning class names. `process_warn_strings()` converts the names before enabling/disabling.

The behavior of issuing only a message (for “enabled” warnings) can be toggled to raising an exception instead by calling the warningAsException() function.

For new/removed warnings, the manpage needs to be kept in sync. Any warning class defined here is accepted, but we don’t want to make people have to dig around to find the names. Warnings do not have to be defined in this file, though it is preferred: those defined elsewhere cannot use the enable/disable functionality unless they monkeypatch the warning into this module’s namespace.
You issue a warning, either in SCons code or in a build project’s SConscripts, by calling the warn() function defined in this module. Raising directly with an instance of a warning class bypasses the framework and it will behave like an ordinary exception.

```python
exception SCons.Warnings.CacheCleanupErrorWarning
    Bases: SConsWarning
    Problems removing retrieved target prior to rebuilding.
exception SCons.Warnings.CacheVersionWarning
    Bases: WarningOnByDefault
    The derived-file cache directory has an out of date config.
exception SCons.Warnings.CacheWriteErrorWarning
    Bases: SConsWarning
    Problems writing a derived file to the cache.
```

```python
exception SCons.Warnings.CorruptSConsignWarning
    Bases: WarningOnByDefault
    Problems decoding the contents of the sconsign database.
exception SCons.Warnings.DependencyWarning
    Bases: SConsWarning
    A scanner identified a dependency but did not add it.
exception SCons.Warnings.DeprecatedDebugOptionsWarning
    Bases: MandatoryDeprecatedWarning
    Option-arguments to --debug that are deprecated.
exception SCons.Warnings.DeprecatedOptionsWarning
    Bases: MandatoryDeprecatedWarning
    Options that are deprecated.
exception SCons.Warnings.DeprecatedWarning
    Bases: SConsWarning
    Base class for deprecated features, will be removed in future.
exception SCons.Warnings.DevelopmentVersionWarning
    Bases: WarningOnByDefault
    Use of a deprecated feature.
exception SCons.Warnings.DuplicateEnvironmentWarning
    Bases: WarningOnByDefault
    A target appears in more than one consenv with identical actions.
    A duplicate target with different rules cannot be built; with the same rule it can, but this could indicate a problem in the build configuration.
exception SCons.Warnings.FortranCxxMixWarning
    Bases: LinkWarning
    Fortran and C++ objects appear together in a link line.
    Some compilers support this, others do not.
exception SCons.Warnings.FutureDeprecationWarning
    Bases: SConsWarning
    Base class for features that will become deprecated in a future release.
exception SCons.Warnings.FutureReservedVariableWarning
    Bases: WarningOnByDefault
    Setting a variable marked to become reserved in a future release.
exception SCons.Warnings.LinkWarning
    Bases: WarningOnByDefault
    Use for linker warnings.
exception SCons.Warnings.MandatoryDeprecationWarning
    Bases: DeprecatedWarning
    Base class for deprecated features where warning cannot be disabled.
exception SCons.Warnings.MisleadingKeywordsWarning
    Bases: WarningOnByDefault
    Use of possibly misspelled kwargs in Builder calls.
exception SCons.Warnings.MissingSConscriptWarning
    Bases: WarningOnByDefault
```
SCons API Documentation

The script specified in an SConscript() call was not found.
TODO: this is now an error, so no need for a warning. Left in for a while in case anyone is using, remove eventually.
Manpage entry removed in 4.6.0.

**exception** SCons.Warnings.NoObjectCountWarning
  Bases: WarningOnByDefault
  Object counting (debug mode) could not be enabled.

**exception** SCons.Warnings.NoParallelSupportWarning
  Bases: WarningOnByDefault
  Fell back to single-threaded build, as no thread support found.

**exception** SCons.Warnings.PythonVersionWarning
  Bases: DeprecatedWarning
  SCons was run with a deprecated Python version.

**exception** SCons.Warnings.ReservedVariableWarning
  Bases: WarningOnByDefault
  Attempt to set reserved construction variable names.

**exception** SCons.Warnings.SConsWarning
  Bases: UserError
  Base class for all SCons warnings.

SCons.Warnings.SConsWarningOnByDefault
  alias of WarningOnByDefault

**exception** SCons.Warnings.StackSizeWarning
  Bases: WarningOnByDefault
  Requested thread stack size could not be set.

**exception** SCons.Warnings.TargetNotBuiltWarning
  Bases: SConsWarning
  A target build indicated success but the file is not found.

**exception** SCons.Warnings.ToolQtDeprecatedWarning
  Bases: DeprecatedWarning
  Requested MSVC version not found and policy is to not fail.

**exception** SCons.Warnings.VisualStudioMissingWarning
  Bases: SConsWarning
  Requested MSVC version not found and policy is to not fail.

**exception** SCons.Warnings.VisualVersionMismatch
  Bases: WarningOnByDefault
  MSVC_VERSION and MSVS_VERSION do not match.
  Note MSVS_VERSION is deprecated, use MSVC_VERSION.

**exception** SCons.Warnings.WarningOnByDefault
  Bases: SConsWarning
  Base class for SCons warnings that are enabled by default.

SCons.Warnings.enableWarningClass (clazz) → None
  Enables all warnings of type clazz or derived from clazz.

SCons.Warnings.process_warn_strings (arguments: Sequence[str]) → None
  Process requests to enable/disable warnings.
  The requests come from the option-argument string passed to the --warn command line option or as the value passed to the SetOption function with a first argument of warn.
  The arguments are expected to be as documented in the SCons manual page for the --warn option, in the style some-type, which is converted here to a camel-case name like SomeTypeWarning, to try to match the warning classes defined here, which are then passed to enableWarningClass() or suppressWarningClass().
  For example, a string "deprecated" enables the DeprecatedWarning class, while a string "no-dependency" disables the DependencyWarning class.
  As a special case, the string "all" disables all warnings and a the string "no-all" disables all warnings.

SCons.Warnings.suppressWarningClass (clazz) → None
  Suppresses all warnings of type clazz or derived from clazz.

SCons.Warnings.warn (clazz, *args) → None
  Issue a warning, accounting for SCons rules.
Check if warnings for this class are enabled. If warnings are treated as exceptions, raise exception. Use the global warning emitter _warningOut, which allows selecting different ways of presenting a traceback (see Script/Main.py).

SCons.Warnings.warningAsException (flag: bool = True) → bool

Sets global _warningAsExeption flag.
If true, any enabled warning will cause an exception to be raised.

**Parameters:**
- flag – new value for warnings-as-exceptions.

**Returns:**
The previous value.

SCons.cpp module

**SCons C Pre-Processor module**

SCons.cpp.CPP_to_Python (s)
Converts a C pre-processor expression into an equivalent Python expression that can be evaluated.

SCons.cpp.CPP_to_Python_Ops_Sub (m)

SCons.cpp.Cleanup_CPP_Expressions (ts)

**class** SCons.cpp.DumbPreProcessor (*args, **kw)

**Bases:** PreProcessor

A preprocessor that ignores all #if/#elif/#else/#endif directives and just reports back all of the #include files (like the classic SCons scanner did).

This is functionally equivalent to using a regular expression to find all of the #include lines, only slower. It exists mainly as an example of how the main PreProcessor class can be sub-classed to tailor its behavior.

__call__ (file)

Pre-processes a file.
This is the main public entry point.

_do_if_else_condition (condition) → None

Common logic for evaluating the conditions on #if, #ifdef and #ifndef lines.

_match_tuples (tuples)

_parse_tuples (contents)

_process_tuples (tuples, file=None)

_all_include (t)

do_define (t) → None

Default handling of a #define line.

do_elif (t) → None

Default handling of a #elif line.

do_else (t) → None

Default handling of a #else line.

do endif (t) → None

Default handling of a #endif line.

do if (t) → None

Default handling of a #if line.

do ifdef (t) → None

Default handling of a #ifdef line.

do ifndef (t) → None

Default handling of a #ifndef line.

do import (t) → None

Default handling of a #import line.

do include (t) → None

Default handling of a #include line.

do include_next (t) → None

Default handling of a #include line.

do nothing (t) → None

Null method for when we explicitly want the action for a specific preprocessor directive to do nothing.

do undef (t) → None

Default handling of a #undef line.

eval_expression (t)
Evaluates a C preprocessor expression. This is done by converting it to a Python equivalent and eval()ing it in the C preprocessor namespace we use to track #define values.

finalize_result (fname)
find_include_file (t)

Finds the #include file for a given preprocessor tuple.
initialize_result (fname) → None

process_contents (contents)
Pre-processes a file contents. Is used by tests

process_file (file)
Pre-processes a file. This is the main internal entry point.

read_file (file) → str

resolve_include (t)
Resolve a tuple-ized #include line. This handles recursive expansion of values without "" or <> surrounding the name until an initial " or < is found, to handle #include FILE where FILE is a #define somewhere else.

restore () → None
Pops the previous dispatch table off the stack and makes it the current one.
save () → None
Pushes the current dispatch table on the stack and re-initializes the current dispatch table to the default.
scons_current_file (t) → None
start_handling_includes (t=None) → None
Causes the PreProcessor object to start processing #import, #include and #include_next lines.
This method will be called when a #if, #ifdef, #ifndef or #elif evaluates True, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated False.
stop_handling_includes (t=None) → None
Causes the PreProcessor object to stop processing #import, #include and #include_next lines.
This method will be called when a #if, #ifdef, #ifndef or #elif evaluates False, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated True.
tupleize (contents)
Turns the contents of a file into a list of easily-processed tuples describing the CPP lines in the file.
The first element of each tuple is the line’s preprocessor directive (#if, #include, #define, etc., minus the initial '#'). The remaining elements are specific to the type of directive, as pulled apart by the regular expression.

class SCons.cpp.FunctionEvaluator (name, args, expansion)
Bases: object
Handles delayed evaluation of a #define function call.
__call__ (*values)
Evaluates the expansion of a #define macro function called with the specified values.

class SCons.cpp.PreProcessor (current='', cpppath=(), dict={}, all: int = 0, depth=-1)
Bases: object
The main workhorse class for handling C pre-processing.
__call__ (file)
Pre-processes a file. This is the main public entry point.
_do_if_else_condition (condition) → None
Common logic for evaluating the conditions on #if, #ifdef and #ifndef lines.
_match_tuples (tuples)
_parse_tuples (contents)
_process_tuples (tuples, file=None)
all_include (t) → None
do_define (t) → None
Default handling of a #define line.
do_elif (t) → None
Default handling of a #elif line.
do_else (t) → None
    Default handling of a #else line.

do_endif (t) → None
    Default handling of a #endif line.

do_if (t) → None
    Default handling of a #if line.

do_ifdef (t) → None
    Default handling of a #ifdef line.

do_ifndef (t) → None
    Default handling of a #ifndef line.

do_import (t) → None
    Default handling of a #import line.

do_include (t) → None
    Default handling of a #include line.

do_include_next (t) → None
    Default handling of a #include line.

do_nothing (t) → None
    Null method for when we explicitly want the action for a specific preprocessor directive to do nothing.

do_undef (t) → None
    Default handling of a #undef line.

eval_expression (t)
    Evaluates a C preprocessor expression.
    This is done by converting it to a Python equivalent and eval(jing it in the C preprocessor namespace we use to track #define values.

finalize_result (fname)
    Finds the #include file for a given preprocessor tuple.

find_include_file (t)
    Pre-processes a file contents.
    Is used by tests

process_contents (contents)
    Starts processing #import, #include and #include_next lines.

process_file (file)
    Pre-processes a file.
    This is the main internal entry point.

read_file (file) → str
    Resolve a tuple-ized #include line.
    This handles recursive expansion of values without "" or <> surrounding the name until an initial " or < is found, to handle #include FILE where FILE is a #define somewhere else.

restore () → None
    Pops the previous dispatch table off the stack and makes it the current one.

save () → None
    Pushes the current dispatch table on the stack and re-initializes the current dispatch table to the default.

scons_current_file (t) → None

start_handling_includes (t=None) → None
    Causes the PreProcessor object to start processing #import, #include and #include_next lines.
    This method will be called when a #if, #ifdef, #ifndef or #elif evaluates True, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated False.

stop_handling_includes (t=None) → None
    Causes the PreProcessor object to stop processing #import, #include and #include_next lines.
    This method will be called when a #if, #ifdef, #ifndef or #elif evaluates False, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated True.

tupleize (contents)
    Turns the contents of a file into a list of easily-processed tuples describing the CPP lines in the file.
    The first element of each tuple is the line’s preprocessor directive (#if, #include, #define, etc., minus the initial ‘#’).
    The remaining elements are specific to the type of directive, as pulled apart by the regular expression.
This is a very simple-minded “database” used for saved signature information, with an interface modeled on the Python dbm database interface module.

```python
class SCons.dblite._Dblite:
    Bases: object
    Lightweight signature database class.
    Behaves like a dict when in memory, loads from a pickled disk file on open and writes back out to it on close.

    Open the database file using a path derived from `file_base_name`. The optional `flag` argument can be:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>'r'</td>
<td>Open existing database for reading only (default)</td>
</tr>
<tr>
<td>'w'</td>
<td>Open existing database for reading and writing</td>
</tr>
<tr>
<td>'c'</td>
<td>Open database for reading and writing, creating it if it doesn't exist</td>
</tr>
<tr>
<td>'n'</td>
<td>Always create a new, empty database, open for reading and writing</td>
</tr>
</tbody>
</table>
```

The optional `mode` argument is the POSIX mode of the file, used only when the database has to be created. It defaults to octal 0o666.

```python
static _open(file, mode='r', buffering=-1, encoding=None, errors=None, newline=None, closefd=True, opener=None)
```

Open file and return a stream. Raise OSError upon failure.

- `file` is either a text or byte string giving the name (and the path if the file isn’t in the current working directory) of the file to be opened or an integer file descriptor of the file to be wrapped. (If a file descriptor is given, it is closed when the returned I/O object is closed, unless closefd is set to False.)
- `mode` is an optional string that specifies the mode in which the file is opened. It defaults to ‘r’ which means open for reading in text mode. Other common values are ‘w’ for writing (truncating the file if it already exists), ‘x’ for creating and writing to a new file, and ‘a’ for appending (which on some Unix systems, means that all writes append to the end of the file regardless of the current seek position). In text mode, if encoding is not specified the encoding used is platform dependent: locale.getencoding() is called to get the current locale encoding. (For reading and writing raw bytes use binary mode and leave encoding unspecified.) The available modes are:

<table>
<thead>
<tr>
<th>Character</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>'r'</td>
<td>open for reading (default)</td>
</tr>
<tr>
<td>'w'</td>
<td>open for writing, truncating the file first</td>
</tr>
<tr>
<td>'x'</td>
<td>create a new file and open it for writing</td>
</tr>
<tr>
<td>'a'</td>
<td>open for writing, appending to the end of the file if it exists</td>
</tr>
<tr>
<td>'b'</td>
<td>binary mode</td>
</tr>
<tr>
<td>'t'</td>
<td>text mode (default)</td>
</tr>
<tr>
<td>'+'</td>
<td>open a disk file for updating (reading and writing)</td>
</tr>
</tbody>
</table>

The default mode is ‘rt’ (open for reading text). For binary random access, the mode ‘w+b’ opens and truncates the file to 0 bytes, while ‘r+b’ opens the file without truncation. The ‘x’ mode implies ‘w’ and raises an `FileExistsError` if the file already exists.

Python distinguishes between files opened in binary and text modes, even when the underlying operating system doesn’t. Files opened in binary mode (appending ‘b’ to the mode argument) return contents as bytes objects without any decoding. In text mode (the default, or when ‘t’ is appended to the mode argument), the contents of the file are returned as strings, the bytes having been first decoded using a platform-dependent encoding or using the specified encoding if given.
buffering is an optional integer used to set the buffering policy. Pass 0 to switch buffering off (only allowed in binary mode), 1 to select line buffering (only usable in text mode), and an integer > 1 to indicate the size of a fixed-size chunk buffer. When no buffering argument is given, the default buffering policy works as follows:

- Binary files are buffered in fixed-size chunks; the size of the buffer is chosen using a heuristic trying to determine the underlying device’s “block size” and falling back on `io.DEFAULT_BUFFER_SIZE`. On many systems, the buffer will typically be 4096 or 8192 bytes long.
- “Interactive” text files (files for which `isatty()` returns True) use line buffering. Other text files use the policy described above for binary files.

encoding is the name of the encoding used to decode or encode the file. This should only be used in text mode. The default encoding is platform dependent, but any encoding supported by Python can be passed. See the codecs module for the list of supported encodings.

errors is an optional string that specifies how encoding errors are to be handled—this argument should not be used in binary mode. Pass 'strict' to raise a ValueError exception if there is an encoding error (the default of None has the same effect), or pass 'ignore' to ignore errors. (Note that ignoring encoding errors can lead to data loss.) See the documentation for codecs.register or run `help(codecs.Codec)` for a list of the permitted encoding error strings.

ewline controls how universal newlines works (it only applies to text mode). It can be None, ‘’, ‘n’, ‘r’, and ‘rn’. It works as follows:

- On input, if newline is None, universal newlines mode is enabled. Lines in the input can end in ‘n’, ‘r’, or ‘rn’, and these are translated into ‘n’ before being returned to the caller. If it is ‘’, universal newline mode is enabled, but line endings are returned to the caller untranslated. If it has any of the other legal values, input lines are only terminated by the given string, and the line ending is returned to the caller untranslated.
- On output, if newline is None, any ‘n’ characters written are translated to the system default line separator, `os.linesep`. If newline is ‘’ or ‘n’, no translation takes place. If newline is any of the other legal values, any ‘n’ characters written are translated to the given string.

If closedfd is False, the underlying file descriptor will be kept open when the file is closed. This does not work when a file name is given and must be True in that case.

A custom opener can be used by passing a callable as opener. The underlying file descriptor for the file object is then obtained by calling opener with (file, flags). opener must return an open file descriptor (passing os.open as opener results in functionality similar to passing None).

open() returns a file object whose type depends on the mode, and through which the standard file operations such as reading and writing are performed. When open() is used to open a file in a text mode (‘w’, ‘r’, ‘wt’, ‘rt’, etc.), it returns a TextIOWrapper. When used to open a file in a binary mode, the returned class varies: in read binary mode, it returns a BufferedReader; in write binary and append binary modes, it returns a BufferedWriter, and in read/write mode, it returns a BufferedRandom.

It is also possible to use a string or bytearray as a file for both reading and writing. For strings StringIO can be used like a file opened in a text mode, and for bytes a BytesIO can be used like a file opened in a binary mode.

```python
static _os_chmod(path, mode, *, dir_fd=None, follow_symlinks=True)

Change the access permissions of a file.

path
Path to be modified. May always be specified as a str, bytes, or a path-like object. On some platforms, path may also be specified as an open file descriptor. If this functionality is unavailable, using it raises an exception.

mode
Operating-system mode bitfield.

dir_fd
If not None, it should be a file descriptor open to a directory, and path should be relative; path will then be relative to that directory.

follow_symlinks
If False, and the last element of the path is a symbolic link, chmod will modify the symbolic link itself instead of the file the link points to.

It is an error to use dir_fd or follow_symlinks when specifying path as
an open file descriptor.

dir_fd and follow_symlinks may not be implemented on your platform.

If they are unavailable, using them will raise a NotImplementedError.

\[ \text{static } \_\text{os}\text{.chown} (\text{path, uid, gid, }*, \text{dir_fd=} \text{None, follow_symlinks=} \text{True}) \]
Change the owner and group id of path to the numeric uid and gid.

path
Path to be examined; can be string, bytes, a path-like object, or open-file-descriptor int.

dir_fd
If not None, it should be a file descriptor open to a directory, and path should be relative; path will then be relative to that directory.

follow_symlinks
If False, and the last element of the path is a symbolic link, stat will examine the symbolic link itself instead of the file the link points to.

path may always be specified as a string. On some platforms, path may also be specified as an open file descriptor.

If this functionality is unavailable, using it raises an exception.

If dir_fd is not None, it should be a file descriptor open to a directory, and path should be relative; path will then be relative to that directory.

If follow_symlinks is False, and the last element of the path is a symbolic link, chown will modify the symbolic link itself instead of the file the link points to.

It is an error to use dir_fd or follow_symlinks when specifying path as an open file descriptor.

dir_fd and follow_symlinks may not be implemented on your platform.

If they are unavailable, using them will raise a NotImplementedError.

\[ \text{static } \_\text{os}\text{.replace} (\text{src, dst, }*, \text{src_dir_fd=} \text{None, dst_dir_fd=} \text{None}) \]
Rename a file or directory, overwriting the destination.

If either src_dir_fd or dst_dir_fd is not None, it should be a file descriptor open to a directory, and the respective path string (src or dst) should be relative; the path will then be relative to that directory.

src_dir_fd and dst_dir_fd, may not be implemented on your platform.

If they are unavailable, using them will raise a NotImplementedError.

\[ \text{static } \_\text{pickle}\_\text{dump} (\text{obj, file, protocol=} \text{None, }*, \text{fix_imports=} \text{True, buffer_callback=} \text{None}) \]
Write a pickled representation of obj to the open file object file.

This is equivalent to Pickler(file, protocol).dump(obj), but may be more efficient.

The optional protocol argument tells the pickler to use the given protocol; supported protocols are 0, 1, 2, 3, 4 and 5. The default protocol is 4. It was introduced in Python 3.4, and is incompatible with previous versions.

Specifying a negative protocol version selects the highest protocol version supported. The higher the protocol used, the more recent the version of Python needed to read the pickle produced.

The file argument must have a write() method that accepts a single bytes argument. It can thus be a file object opened for binary writing, an io.BytesIO instance, or any other custom object that meets this interface.

If fix_imports is True and protocol is less than 3, pickle will try to map the new Python 3 names to the old module names used in Python 2, so that the pickle data stream is readable with Python 2.

If buffer_callback is None (the default), buffer views are serialized into file as part of the pickle stream. It is an error if buffer_callback is not None and protocol is None or smaller than 5.

\[ \_\text{pickle}\_\text{protocol} = 4 \]

\[ \text{static } \_\text{shutil}\_\text{copyfile} (\text{src, dst, }*, \text{follow_symlinks=} \text{True}) \]
Copy data from src to dst in the most efficient way possible.

If follow_symlinks is not set and src is a symbolic link, a new symlink will be created instead of copying the file it points to.
static _time_time ()
  time() -> floating point number
  Return the current time in seconds since the Epoch. Fractions of a second may be present if the system clock
  provides them.
close () → None
timeitems ()
keys ()
open (path, flags)
  Database open helper when creation may be needed.
  The high-level Python open() function cannot specify a file mode for creation. Using this as the opener with the
  saved mode lets us do that.
sync () → None
  Flush the database to disk.
  This routine must succeed, since the in-memory and on-disk copies are out of sync as soon as we do anything that
  changes the in-memory version. Thus, to be cautious, flush to a temporary file and then move it over with some
  error handling.
values ()
SCons.dblite._exercise ()
SCons.dblite.open (file, flag='r', mode: int = 438)

SCons.exitfuncs module
Register functions which are executed when SCons exits for any reason.
SCons.exitfuncs._run_exitfuncs () → None
  run any registered exit functions
  __exithandlers is traversed in reverse order so functions are executed last in, first out.
SCons.exitfuncs.register (func, *targs, **kargs) → None
  register a function to be executed upon normal program termination
  func - function to be called at exit
targs - optional arguments to pass to func
kargs - optional keyword arguments to pass to func

SCons.compat package
Module contents
SCons compatibility package for old Python versions
This subpackage holds modules that provide backwards-compatible implementations of various things from newer
Python versions that we cannot count on because SCons still supported older Pythons.
Other code will not generally reference things in this package through the SCons.compat namespace. The modules
included here add things to the builtins namespace or the global module list so that the rest of our code can use the
objects and names imported here regardless of Python version. As a result, if this module is used, it should violate the
normal convention for imports (standard library imports first, then program-specific imports, each ordered
alphabetically) and needs to be listed first.
The rest of the things here will be in individual compatibility modules that are either: 1) suitably modified copies of the
future modules that we want to use; or 2) backwards compatible re-implementations of the specific portions of a future
module’s API that we want to use.

GENERAL WARNINGS: Implementations of functions in the SCons.compat modules are NOT guaranteed to be fully
compliant with these functions in later versions of Python. We are only concerned with adding functionality that we
actually use in SCons, so be wary if you lift this code for other uses. (That said, making these more nearly the same as
later, official versions is still a desirable goal, we just don’t need to be obsessive about it.)
We name the compatibility modules with an initial ‘_scons_’ (for example, _scons_subprocess.py is our compatibility
module for subprocess) so that we can still try to import the real module name and fall back to our compatibility module
if we get an ImportError. The import_as() function defined below loads the module as the “real” name (without the
SCons.Node package

`.scons`), after which all of the “import {module}” statements in the rest of our code will find our pre-loaded compatibility module.

```python
class SCons.compat.NoSlotsPyPy (name, bases, dct)
    Bases: type
    Metaclass for PyPy compatibility.
    PyPy does not work well with `__slots__` and `__class__` assignment.
    mro ()
        Return a type's method resolution order.
SCons.compat.rename_module (new, old) → bool
    Attempt to import the old module and load it under the new name. Used for purely cosmetic name changes in Python 3.x.
```

SCons.Node package

Module contents

The Node package for the SCons software construction utility.

This is, in many ways, the heart of SCons.

A Node is where we encapsulate all of the dependency information about any thing that SCons can build, or about any thing which SCons can use to build some other thing. The canonical “thing,” of course, is a file, but a Node can also represent something remote (like a web page) or something completely abstract (like an Alias).

Each specific type of “thing” is specifically represented by a subclass of the Node base class: Node.FS.File for files, Node.Alias for aliases, etc. Dependency information is kept here in the base class, and information specific to files/aliases/etc. is in the subclass. The goal, if we've done this correctly, is that any type of “thing” should be able to depend on any other type of “thing.”

```python
class SCons.Node.Annotate (node) → None

class SCons.Node.BuildInfoBase
    Bases: object
    The generic base class for build information for a Node.
    This is what gets stored in a .sconsign file for each target file. It contains a NodeInfo instance for this node (signature information that's specific to the type of Node) and direct attributes for the generic build stuff we have to track: sources, explicit dependencies, implicit dependencies, and action information.
    __getstate__() → None
        Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a `__dict__` slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.
    __setstate__(state) → None
        Restore the attributes from a pickled state.
```

```python
class SCons.Node.Node
    Bases: object
    The base Node class, for entities that we know how to build, or use to build other Nodes.
    class Attrs
```
Bases: object
    shared
BuildInfo
    alias of BuildInfoBase
Decider (function) → None
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of NodeInfoBase
Tag (key, value) → None
    Add a user-defined tag.
    _add_child (collection, set, child) → None
        Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
    _children_get ()
    _children_reset () → None
    _func_exists
    _func_get_contents
    _func_is_derived
    _func_rexists
    _func_target_from_source
    _get_scanner (env, initial_scanner, root_node_scanner, kw)
    _memo
    _specific_sources
    _tags
    add_dependency (depend)
        Adds dependencies.
    add_ignore (depend)
        Adds dependencies to ignore.
    add_prerequisite (prerequisite) → None
        Adds prerequisites
    add_source (source)
        Adds sources.
    add_to_implicit (deps) → None
    add_to_waiting_parents (node) → int
        Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead…)
    add_to_waiting_s_e (node) → None
    add_wkid (wkid) → None
        Add a node to the list of kids waiting to be evaluated
    all_children (scan: int = 1)
        Return a list of all the node’s direct children.
    alter_targets ()
        Return a list of alternate targets for this Node.
    always_build
    attributes
    binfo
    build (**kw)
        Actually build the node.
        This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.
        This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
    builder
    builder_set (builder) → None
    built () → None
Called just after this node is successfully built.
cached
changed (node=None, allowcache: bool = False)
Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is
to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in
declared:: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
check_attributes with name has been set
children (scan: int = 1)
Returns a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
up-to-date, too.
clear () → None
Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
integration builds).
clear_memoized_values () → None
del_binfo () → None
Delete the build info from this node.
depends
disambiguate (must_exist=None)
env
env_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
Let the executor clean up any cached information.
exists () → bool
Reports whether node exists.
explain ()
for_signature ()
Return a string representation of the Node that will always be the same for this particular Node, no matter what.
This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
purpose of this method is to generate a value to be used in signature calculation for the command line used to
build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
not change.
get_abspath ()
Return an absolute path to the Node. This will return simply str(Node) by default, but for Node types that have a
concept of relative path, this might return something different.
get_binfo ()
Fetch a node’s build information.
node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
build signature
This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already
built and updated by someone else, if that’s what’s wanted.
get_build_env ()
Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
    Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
    Return the set builder, or a specified default value

get_cachedir_csig ()
get_contents ()
    Fetch the contents of the entry.

get_csig ()
get_env ()

get_env_scanner (env, kw={})

get_executor (create: int = 1) → Executor
    Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)
    Return the scanned include lines (implicit dependencies) found in this node.
    The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be
    scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})
    Return a list of implicit dependencies for this node.
    This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the
    scanner, if the scanner’s recursive flag says that we should.

get_ninfo ()

get_source_scanner (node)
    Fetch the source scanner for the specified node
    NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
    Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
    This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()
    Fetch the stored implicit dependencies

get_stored_info ()

get_string (for_signature)
    This is a convenience function designed primarily to be used in command generators (i.e.,
    CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature
    argument that is nonzero if the command generator is being called to generate a signature for the command line,
    which determines if we should rebuild or not.
    Such command generators should use this method in preference to str(Node) when converting a Node to a string,
    passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly,
    depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
    This method is expected to return an object that will function exactly like this Node, except that it implements any
    additional special features that we would like to be in effect for Environment variable substitution. The principle use
    is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a
    tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to
    return self if no new functionality is needed for Environment substitution.

get_suffix () → str

get_target_scanner ()

has_builder () → bool
    Return whether this Node has a builder or not.
    In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if
    node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
    __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
    slowing things down immensely.

has_explicit_builder () → bool
    Return whether this Node has an explicit builder.
This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore
generate_set
implicit
implicit_set
includes
is_conftest () \rightarrow \text{bool}
Returns true if this node is a conftest node
is_derived () \rightarrow \text{bool}
Returns true if this node is derived (i.e. built).
This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.
is_explicit
is_literal () \rightarrow \text{bool}
Always pass the string representation of a Node to the command interpreter literally.
is_sconscript () \rightarrow \text{bool}
Returns true if this node is an sconscript
is_up_to_date () \rightarrow \text{bool}
Default check for whether the Node is current: unknown Node subtypes are always out of date, so they will always get built.
linked
make_ready () \rightarrow \text{None}
Get a Node ready for evaluation.
This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.
multiple_side_effect_has_builder () \rightarrow \text{bool}
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.
new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
postprocess () \rightarrow \text{None}
Clean up anything we don’t need to hang onto after we’ve been built.
precious
prepare ()
Prepare for this Node to be built.
This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.
This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.
(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)
Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.
prerequisites
pseudo
push_to_cache () \rightarrow \text{bool}
Try to push a node into a cache
ref_count
release_target_info () → None
   Called just after this node has been marked up-to-date or was built completely.
   This is where we try to release as many target node infos as possible for clean builds and update runs, in order
to minimize the overall memory consumption.
   By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much
how many KBytes a Node actually requires...as long as we free the memory shortly afterwards.
   @see: built() and File.release_target_info()
remove ()
   Remove this Node: no-op by default.
render_include_tree ()
   Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.
reset_executor () → None
   Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
   Try to retrieve the node’s content from a cache
   This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
   stuff in built().
   Returns true if the node was successfully retrieved.
rextists ()
   Does this node exist locally or in a repository?
scan () → None
   Scan this node’s dependents for implicit dependencies.
scanner_key ()
select_scanner (scanner)
   Selects a scanner for this Node.
   This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use
   their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) → None
   Set the Node’s always_build value.
set_executor (executor: Executor) → None
   Set the action executor for this node.
set_explicit (is_explicit) → None
set_nocache (nocache: int = 1) → None
   Set the Node’s nocache value.
set_noclean (noclean: int = 1) → None
   Set the Node’s noclean value.
set_precious (precious: int = 1) → None
   Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
   Set the Node’s pseudo value.
set_specific_source (source) → None
set_state (state) → None
side_effect
side_effects
sources
sources_set
state
store_info
target_peers
visited () → None
   Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids

class  SCons.Node.NodeInfoBase
Bases: object

The generic base class for signature information for a Node.

Node subclasses should subclass NodeInfoBase to provide their own logic for dealing with their own Node-specific signature information.

__getstate__()  
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

__setstate__(state)  
Restore the attributes from a pickled state. The version is discarded.

convert(node, val)  
None

format(field_list=None, names: int = 0)  

merge(other)  
None

Merge the fields of another object into this object. Already existing information is overwnt by the other instance’s data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.

update(node)  
None

class SCons.Node.NodeList (initlist=None)

Bases: UserList

_abc_impl = <abc._abc_data object>

append(item)  
S.append(value) – append value to the end of the sequence

clear()  
None -- remove all items from S

copy()  

count(value)  
integer -- return number of occurrences of value

extend(other)  
S.extend(iterable) – extend sequence by appending elements from the iterable

index(value[, start[, stop]])  
integer -- return first index of value.

Raises ValueError if the value is not present.

Supporting start and stop arguments is optional, but recommended.

insert(i, item)  
S.insert(index, value) – insert value before index

pop([, index])  
item -- remove and return item at index (default last).

Raise IndexError if list is empty or index is out of range.

remove(item)  
S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse()  
S.reverse() – reverse IN PLACE

sort(*args, **kwds)

class SCons.Node.Walker (node, kids_func=<function get_children>, cycle_func=<function ignore_cycle>, eval_func=<function do_nothing>)

Bases: object

An iterator for walking a Node tree.

This is depth-first, children are visited before the parent. The Walker object can be initialized with any node, and returns the next node on the descent with each get_next() call. get the children of a node instead of calling ‘children’. ‘cycle_func’ is an optional function that will be called when a cycle is detected.

This class does not get caught in node cycles caused, for example, by C header file include loops.

get_next()  
Return the next node for this walk of the tree.

This function is intentionally iterative, not recursive, to sidestep any issues of stack size limitations.

is_done()  
bool

SCons.Node.changed_since_last_build_alias (node, target, prev_ni, repo_node=None)  
bool

SCons.Node.changed_since_last_build_entry (node, target, prev_ni, repo_node=None)  
bool

SCons.Node.changed_since_last_build_node (node, target, prev_ni, repo_node=None)  
bool
SCons.Node package

Must be overridden in a specific subclass to return True if this Node (a dependency) has changed since the last time it was used to build the specified target. prev_ni is this Node’s state (for example, its file timestamp, length, maybe content signature) as of the last time the target was built.

Note that this method is called through the dependency, not the target, because a dependency Node must be able to use its own logic to decide if it changed. For example, File Nodes need to obey if we’re configured to use timestamps, but Python Value Nodes never use timestamps and always use the content. If this method were called through the target, then each Node’s implementation of this method would have to have more complicated logic to handle all the different Node types on which it might depend.

SCons.Node.changed_since_last_build_python (node, target, prev_ni, repo_node=None) → bool
SCons.Node.changed_since_last_build_state_changed (node, target, prev_ni, repo_node=None) → bool
SCons.Node.classname (obj)
SCons.Node.decide_source (node, target, prev_ni, repo_node=None) → bool
SCons.Node.decide_target (node, target, prev_ni, repo_node=None) → bool
SCons.Node.do_nothing (node, parent) → None
SCons.Node.do_nothing_node (node) → None
SCons.Node.exists_always (node) → bool
SCons.Node.exists_base (node) → bool
SCons.Node.exists_entry (node) → bool
SCons.Node.get_children (node, parent)
SCons.Node.get_contents_dir (node)
SCons.Node.get_contents_entry (node)
SCons.Node.get_contents_file (node)
SCons.Node.get_contents_none (node)
SCons.Node.ignore_cycle (node, stack) → None
SCons.Node.is_derived_node (node) → bool
SCons.Node.is_derived_none (node)
SCons.Node.rexists_base (node)
SCons.Node.rexists_node (node)
SCons.Node.rexists_none (node)
SCons.Node.store_info_file (node) → None
SCons.Node.store_info_pass (node) → None
SCons.Node.target_from_source_base (node, prefix, suffix, splitext)
SCons.Node.target_from_source_none (node, prefix, suffix, splitext)

Submodules

SCons.Node.Alias module

Alias nodes.

This creates a hash of global Aliases (dummy targets).

class SCons.Node.Alias.Alias (name)
    Bases: Node
class Attrs
    Bases: object
    shared
    BuildInfo
        alias of AliasBuildInfo
    Decider (function) → None
    GetTag (key)
Return a user-defined tag.

NodeInfo
   alias of AliasNodeInfo
Tag (key, value) → None
   Add a user-defined tag.
   _add_child(collection, set, child) → None
   Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
   _children_get ()
   _children_reset () → None
   _func_exists
   _func_get_contents
   _func_is_derived
   _func_rexists
   _func_target_from_source
   _get_scanner(env, initial_scanner, root_node_scanner, kw)
   _memo
   _specific_sources
   _tags
   add_dependency (depend)
   Adds dependencies.
   add_ignore (depend)
   Adds dependencies to ignore.
   add_prerequisite (prerequisite) → None
   Adds prerequisites
   add_source (source)
   Adds sources.
   add_to_implicit (deps) → None
   add_to_waiting_parents (node) → int
   Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up” this function by using True and False instead...)
   add_to_waiting_s_e (node) → None
   add_wkid (wkid) → None
   Add a node to the list of kids waiting to be evaluated
   all_children (scan: int = 1)
   Return a list of all the node’s direct children.
   alter_targets ()
   Return a list of alternate targets for this Node.
   always_build
   attributes
   binfo
   build () → None
   A “builder” for aliases.
   builder
   builder_set (builder) → None
   built () → None
   Called just after this node is successfully built.
   cached
   changed (node=None, allowcache: bool = False)
   Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.
   Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.
SCons.Node package

The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().

@see: FS.File.changed(), FS.File.release_target_info()

changed_since_last_build
check_attributes (name)
    Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
    Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
    Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.
clear () → None
    Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).
clear_memoized_values () → None
convert () → None
del_binfo () → None
    Delete the build info from this node.
deps
depends
depends_set
disambiguate (must_exist=None)
env
    env_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
    Let the executor clean up any cached information.
exists () → bool
    Reports whether node exists.
explain ()
for_signature ()
    Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.
get_abspath ()
    Return an absolute path to the Node. This will return simply str(Node) by default, but for Node types that have a concept of relative path, this might return something different.
get_binfo ()
    Fetch a node’s build information.
    node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature
    This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.
get_build_env ()
    Fetch the appropriate Environment to build this node.
get_build_scanner_path (scanner)
    Fetch the appropriate scanner path for this node.
get_builder (default_builder=None)
    Return the set builder, or a specified default value
cachedir_csig ()
get_contents ()
The contents of an alias is the concatenation of the content signatures of all its sources.
SCons.Node package

get_csig ()
Generate a node's content signature, the digested signature of its content.

node - the node cache - alternate node to use for the signature cache
returns - the content signature

get_env ()

get_env_scanner (env, kw={})

g_executor (create: int = 1) → Executor

Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)

Return the scanned include lines (implicit dependencies) found in this node.
The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be
scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})

Return a list of implicit dependencies for this node.
This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the
scanner, if the scanner's recursive flag says that we should.

get_ninfo ()

get_source_scanner (node)
Fetch the source scanner for the specified node
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()
Fetch the stored implicit dependencies

get_stored_info ()

get_string (for_signature)
This is a convenience function designed primarily to be used in command generators (i.e.,
CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature
argument that is nonzero if the command generator is being called to generate a signature for the command line,
which determines if we should rebuild or not.
Such command generators should use this method in preference to str(Node) when converting a Node to a string,
passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly,
depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
This method is expected to return an object that will function exactly like this Node, except that it implements any
additional special features that we would like to be in effect for Environment variable substitution. The principle use
is that some Nodes would like to implement a _getattr_ method, but putting that in the Node type itself has a
tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to
return self if no new functionality is needed for Environment substitution.

get_suffix () → str

get_target_scanner ()

has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if
node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
__len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
slowing things down immensely.

has_explicit_builder () → bool
Return whether this Node has an explicit builder.
This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an
explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes
SCons.Node package

is_conftest () → bool
Returns true if this node is a conftest node

is_derived () → bool
Returns true if this node is derived (i.e. built).
This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit

is_literal () → bool
Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
Returns true if this node is an sconscript

is_under (dir) → bool
is_up_to_date () → bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.

linked

make_ready () → None
Get a Node ready for evaluation.
This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool
multiple_side_effect_has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ... "). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

new_binfo ()
noinfo
nocache
noclean
postprocess () → None
Clean up anything we don’t need to hang onto after we’ve been built.

precious
prepare ()
Prepare for this Node to be built.
This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.
This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.
(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)
Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites
pseudo
push_to_cache () → bool
Try to push a node into a cache
really_build (**kw)
Actually build the node.
This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

`ref_count`

release_target_info () → None

Called just after this node has been marked up-to-date or was built completely.

This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

By purging attributes that aren’t needed any longer after a Node (==File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.

@see: built() and File.release_target_info()

remove ()

Remove this Node: no-op by default.

render_include_tree ()

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

reset_executor () → None

Remove cached executor; forces recompute when needed.

retrieve_from_cache () → bool

Try to retrieve the node’s content from a cache

This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().

Returns true if the node was successfully retrieved.

exists ()

Does this node exist locally or in a repository?

scan () → None

Scan this node’s dependents for implicit dependencies.

scaler_key ()

sconsign () → None

An Alias is not recorded in .sconsign files

select_scanner (scanner)

Selects a scanner for this Node.

This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

set_always_build (always_build: int = 1) → None

Set the Node’s always_build value.

set_executor (executor: Executor) → None

Set the action executor for this node.

set_explicit (is_explicit) → None

set_nocache (nocache: int = 1) → None

Set the Node’s nocache value.

set_noclean (noclean: int = 1) → None

Set the Node’s noclean value.

set_precious (precious: int = 1) → None

Set the Node’s precious value.

set_pseudo (pseudo: bool = True) → None

Set the Node’s pseudo value.

set_specific_source (source) → None

set_state (state) → None

side_effect

side_effects

sources

sources_set

state

store_info

str_for_display ()

target_peers

visited () → None
Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids
class SCons.Node.Alias.AliasBuildInfo
    Bases: BuildInfoBase
    __getstate__(self)
        Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state
dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id,
which is fixed for all instances of a class.
    __setstate__(state) → None
        Restore the attributes from a pickled state.
bact
bactsig
bdepends
bdependsigs
bimplicit
bimplicitsigs
bsources
bsourcesigs
current_version_id = 2
merge (other) → None
    Merge the fields of another object into this object. Already existing information is overwritten by the
other instance's data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.
class SCons.Node.Alias.AliasNameSpace (dict=None, **kwargs)
    Bases: UserDict
    Alias (name, **kw)
    _abc_impl = <_abc._abc_data object>
clear () → None. Remove all items from D.
copy ()
    classmethod fromkeys (iterable, value=None)
get (k[, d]) → D[k] if k in D, else d. d defaults to None.
items () → a set-like object providing a view on D's items
keys () → a set-like object providing a view on D's keys
lookup (name, **kw)
pop (k[, d]) → v, remove specified key and return the corresponding value.
    If key is not found, d is returned if given, otherwise KeyError is raised.
popitem () → (k, v), remove and return some (key, value) pair
    as a 2-tuple; but raise KeyError if D is empty.
setdefault (k[, d]) → D.get(k,d), also set D[k]=d if k not in D
update ([, E], **F) → None. Update D from mapping/iterable E and F.
    If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does:
    for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
values () → an object providing a view on D's values
    Bases: NodeInfoBase
    __getstate__(self)
    __setstate__(state) → None
        Restore the attributes from a pickled state. The version is discarded.
convert (node, val) → None
csig
current_version_id = 2
field_list = ['csig']
SCons.Node package

format (field_list=\texttt{None}, \texttt{names: int} = 0)
merge (other) \rightarrow \texttt{None}

Merge the fields of another object into this object. Already existing information is overwritten by the other instance's data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.

str_to_node (s)
update (node) \rightarrow \texttt{None}

SCons.Node.FS module

File system nodes.

These Nodes represent the canonical external objects that people think of when they think of building software: files and directories.

This holds a "default_fs" variable that should be initialized with an FS that can be used by scripts or modules looking for the canonical default.

class SCons.Node.FS.Base (name, directory, fs)
Bases: Node

A generic class for file system entries. This class is for when we don't know yet whether the entry being looked up is a file or a directory. Instances of this class can morph into either Dir or File objects by a later, more precise lookup.

Note: this class does not define \_\_cmp\_\_ and \_\_hash\_\_ for efficiency reasons. SCons does a lot of comparing of Node.FS.{Base,Entry,File,Dir} objects, so those operations must be as fast as possible, which means we want to use Python's built-in object identity comparisons.

class Attrs
Bases: object

shared
BuildInfo
    alias of BuildInfoBase
Decider (function) \rightarrow \texttt{None}
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of NodeInfoBase
RDirs (pathlist)
    Search for a list of directories in the Repository list.
Rfindalldirs (pathlist)
    Return all of the directories for a given path list, including corresponding “backing” directories in any repositories. The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up the same path for each target in a given directory.
Tag (key, value) \rightarrow \texttt{None}
    Add a user-defined tag.

_Rfindalldirs_key (pathlist)
_getattr\_ (attr)
Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for the Node attributes ‘abspath’, ‘abspath’, ‘path’, ‘path’, ‘suffix’ and ‘path_elements’. These Node attributes used to be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and SConstruct continue to work without any additional changes, fully transparent to the user. Note, that \_\_getattr\_\_ is only called as fallback when the requested attribute can’t be found, so there should be no speed performance penalty involved for standard builds.

\_\_lt\_ (other)

less than operator used by sorting on py3

\_\_str\_ () \rightarrow \texttt{str}

A Node.FS.Base object's string representation is its path name.

_abspath

_add_child (collection, set, child) \rightarrow \texttt{None}

Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
add_dependency (depend) → None
  Adds dependencies.
add_ignore (depend) → None
  Adds dependencies to ignore.
add_prerequisite (prerequisite) → None
  Adds prerequisites
add_source (source) → None
  Adds sources.
add_to_implicit (deps) → None
add_to_waiting_parents (node) → int
  Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don't think you can “clean up” this function by using True and False instead…)
add_to_waiting_s_e (node) → None
add_wkid (wkid) → None
  Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
  Return a list of all the node’s direct children.
alter_targets ()
  Return a list of alternate targets for this Node.
always_build
attributes
binfo
build (**kw)
  Actually build the node.
  This is called by the Taskmaster after it's decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
builder
builder_set (builder) → None
built () → None
  Called just after this node is successfully built.
cached
changed (node=None, allowcache: bool = False)
SCons.Node package

Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.

Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.

The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().

@see: FS.File.changed(), FS.File.release_target_info()

cleared_since_last_build

clear_attributes (name)

Simple API to check if the node.attributes for name has been set

clear_cache (scan: int = 1)

Return a list of the node’s direct children, minus those that are ignored by this node.

clear_children_are_up_to_date () \rightarrow bool

Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.


clear () \rightarrow None

Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).

clear_memoized_values () \rightarrow None

cwd

del_binfo () \rightarrow None

Delete the build info from this node.

depends

depends_set

dir

disambiguate (must_exist=None)

duplicate

eval

eval_env (env, safe: bool = False) \rightarrow None

eval_expr (expr)

Let the executor clean up any cached information.

exists ()

explanation

for_signature ()

Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.

fs

Reference to parent Node.FS object

global_data (node)

Get the absolute path of the file.

global_data (node)

Fetch a node’s build information.

node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature

This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.
get_build_env ()
    Fetch the appropriate Environment to build this node.
get_build_scanner_path (scanner)
    Fetch the appropriate scanner path for this node.
get_builder (default_builder=None)
    Return the set builder, or a specified default value
get_cachedir_csig ()
get_contents ()
    Fetch the contents of the entry.
get_csig ()
get_dir ()
get_env ()
get_env_scanner (env, kw={})
get_executor (create: int = 1) → Executor
    Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.
get_found_includes (env, scanner, path)
    Return the scanned include lines (implicit dependencies) found in this node.
    The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be
    scanned for implicit dependencies.
get_implicit_deps (env, initial_scanner, path_func, kw={})
    Return a list of implicit dependencies for this node.
    This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the
    scanner, if the scanner’s recursive flag says that we should.
get_internal_path ()
get_labspath ()
    Get the absolute path of the file.
get_ninfo ()
get_path (dir=None)
    Return path relative to the current working directory of the Node.FS.Base object that owns us.
get_path_elements ()
get_relpath ()
    Get the path of the file relative to the root SConstruct file’s directory.
get_source_scanner (node)
    Fetch the source scanner for the specified node
    NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
    Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
    This function may be called very often; it attempts to cache the scanner found to improve performance.
get_state ()
get_stored_implicit ()
    Fetch the stored implicit dependencies
get_stored_info ()
get_string (for_signature)
    This is a convenience function designed primarily to be used in command generators (i.e.,
    CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature
    argument that is nonzero if the command generator is being called to generate a signature for the command line,
    which determines if we should rebuild or not.
    Such command generators should use this method in preference to str(Node) when converting a Node to a string,
    passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly,
    depending on whether we are calculating a signature or actually constructing a command line.
get_subst_proxy ()
    This method is expected to return an object that will function exactly like this Node, except that it implements any
    additional special features that we would like to be in effect for Environment variable substitution. The principle use
    is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a
    tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to
    return self if no new functionality is needed for Environment substitution.
get_suffix ()
SCons.Node package

get_target_scanner ()
get_tpath ()
getmtime ()
getsize ()

has_builder () → bool

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () → bool

Return whether this Node has an explicit builder.

This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes

is_conftest () → bool

Returns true if this node is an conftest node

is Derived () → bool

Returns true if this node is derived (i.e. built).

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () → bool

Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool

is Under (dir) → bool

is Up_to_date () → bool

Default check for whether the Node is current: unknown Node subtypes are always out of date, so they will always get built.

isdir () → bool
isfile () → bool
islink () → bool
linked

lstat ()

make_ready () → None

Get a Node ready for evaluation.

This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool

multiple_side_effect_has_builder () → bool

Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

must_be_same (klass)

This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.

name

new_binfo ()
new_ninfo ()
Clean up anything we don’t need to hang onto after we’ve been built.

Prepare for this Node to be built. This is called after the Taskmaster has decided that the Node is out-of-date and must be built, but before actually calling the method to build the Node. This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built. (The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)

Overriding this method allows for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

Push a node into a cache

Try to push a node into a cache

Called just after this node has been marked up-to-date or was built completely. This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption. By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.

Remove this Node: no-op by default.

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

Remove cached executor; forces recompute when needed.

Try to retrieve the node’s content from a cache

Returns true if the node was successfully retrieved.

Does this node exist locally or in a repository?

A Node.FS.Base object’s string representation is its path name.

Scan this node’s dependents for implicit dependencies.

Selects a scanner for this Node.

This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

Set the Node’s always_build value.

Set the Node’s always_build value.
SCons.Node package

    Set the action executor for this node.
    set_explicit(is_explicit) → None
    set_local() → None
    set_nocache(nocache: int = 1) → None
        Set the Node's nocache value.
    set_noclean(noclean: int = 1) → None
        Set the Node's noclean value.
    set_precious(precious: int = 1) → None
        Set the Node's precious value.
    set_pseudo(pseudo: bool = True) → None
        Set the Node's pseudo value.
    set_specific_source(source) → None
    set_src_builder(builder) → None
        Set the source code builder for this node.
    set_state(state) → None
    side_effect
    side_effects
    sources
    sources_set
    src_builder()
        Fetch the source code builder for this node.
        If there isn't one, we cache the source code builder specified for the directory (which in turn will cache the value
        from its parent directory, and so on up to the file system root).
    srcnode()
        If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourself.
    stat()
    state
    store_info
    str_for_display()
    target_from_source(prefix, suffix, splitext=<function splitext>)
        Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
        Note that this method can be overridden dynamically for generated files that need different behavior. See
        Tool/swig.py for an example.
    target_peers
    visited() → None
        Called just after this node has been visited (with or without a build).
    waiting_parents
    waiting_s_e
    wkids

class SCons.Node.FS.Dir(name, directory, fs)
    Bases: Base
    A class for directories in a file system.

class Attrs
    Bases: object
    shared
    BuildInfo
        alias of DirBuildInfo
    Decider(function) → None
    Dir(name, create: bool = True)
        Looks up or creates a directory node named 'name' relative to this directory.
    Entry(name)
        Looks up or creates an entry node named 'name' relative to this directory.
    File(name)
        Looks up or creates a file node named 'name' relative to this directory.
    GetTag(key)
        Return a user-defined tag.
SCons.Node package

NodeInfo
   alias of DirNodeInfo
RDdirs (pathlist)
   Search for a list of directories in the Repository list.
Rfindalldirs (pathlist)
   Return all of the directories for a given path list, including corresponding “backing” directories in any repositories.
   The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up
   the same path for each target in a given directory.
Tag (key, value) \rightarrow None
   Add a user-defined tag.
Rfindalldirs_key (pathlist)
__clearRepositoryCache (duplicate=None) \rightarrow None
   Called when we change the repository(ies) for a directory. This clears any cached information that is invalidated by
   changing the repository.
__getattr__ (attr)
   Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for
   the Node attributes 'abspath', 'labspath', 'path', 'tpath', 'suffix' and 'path_elements'. These Node attributes used to
   be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single
   variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and
   SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is
   only called as fallback when the requested attribute can’t be found, so there should be no speed performance
   penalty involved for standard builds.
__lt__ (other)
   less than operator used by sorting on py3
__resetDuplicate (node) \rightarrow None
__str__ () \rightarrow str
   A Node.FS.Base object’s string representation is its path name.
_abspath
_add_child (collection, set, child) \rightarrow None
   Adds 'child' to 'collection', first checking 'set' to see if it’s already present.
_children_get ()
_children_reset () \rightarrow None
__create ()
   Create this directory, silently and without worrying about whether the builder is the default or not.
 FUNC_exists
 FUNC_get_contents
 FUNC_is_derived
 FUNC_rexists
 FUNC_sconsign
 FUNC_target_from_source
_get_scanner (env, initial_scanner, root_node_scanner, kw)
_get_str ()
_glob1 (pattern, ondisk: bool = True, source: bool = False, strings: bool = False)
   Globs for and returns a list of entry names matching a single pattern in this directory.
   This searches any repositories and source directories for corresponding entries and returns a Node (or string)
   relative to the current directory if an entry is found anywhere.
   TODO: handle pattern with no wildcard. Python’s glob.glob uses a separate _glob0 function to do this.
_labspath
_local
_memo
_morph () \rightarrow None
   Turn a file system Node (either a freshly initialized directory object or a separate Entry object) into a proper
   directory object.
   Set up this directory’s entries and hook it into the file system tree. Specify that directories (this Node) don’t use
   signatures for calculating whether they’re current.
_path
SCons.Node package

```python
_path_elements
_proxy
_rel_path_key (other)
_save_str ()
_sconsign
_specific_sources
_srcdir_find_file_key (filename)
_tags
_tpath
addRepository (dir) \rightarrow None
add_dependency (depend)
  Adds dependencies.
add_ignored (depend)
  Adds dependencies to ignore.
add_prerequisite (prerequisite) \rightarrow None
  Adds prerequisites
add_source (source)
  Adds sources.
add_to_implicit (deps) \rightarrow None
add_to_waiting_parents (node) \rightarrow int
  Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note
  that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up”
  this function by using True and False instead…)
add_to_waiting_s_e (node) \rightarrow None
add_wkid (wkid) \rightarrow None
  Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
  Return a list of all the node’s direct children.
alter_targets ()
  Return any corresponding targets in a variant directory.
always_build
attributes
binfo
build (**kw) \rightarrow None
  A null “builder” for directories.
builder
builder_set (builder) \rightarrow None
built () \rightarrow None
  Called just after this node is successfully built.
cached
cachedir_csig
cachesig
changed (node=None, allowcache: bool = False)
  Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to
  compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in
  a Repository) can be used instead.
Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we
  detected any difference, but we now rely on checking every dependency to make sure that any necessary Node
information (for example, the content signature of an #included .h file) is updated.
The allowcache option was added for supporting the early release of the executor/builder structures, right after a
  File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like
this, the executor isn’t needed any longer for subsequent calls to changed().
@see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
  Simple API to check if the node.attributes for name has been set
```
SCons.Node package

children (scan: int = 1)
    Return a list of the node's direct children, minus those that are ignored by this node.

children_are_up_to_date () → bool
    Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
    up-to-date, too.

clear () → None
    Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
    integration builds).

clear_memoized_values () → None

cwd

del_binfo () → None
    Delete the build info from this node.

depends

depends_set

dir

dir_on_disk (name)

dirname

disambiguate (must_exist=None)

diskcheck_match () → None

do_duplicate (src) → None

duplicate

duplicate_entries

duplicate_entry_abspath (name)

duplicate_entry_exists_on_disk (name)
    Searches through the file/dir entries of the current directory, and returns True if a physical entry with the given
    name could be found.
    @see entry_exists_on_disk

duplicate_entry_labspath (name)

duplicate_entry_path (name)

duplicate_entry_tpath (name)

env

env_set (env, safe: bool = False) → None

executor

execlib_cleanup () → None
    Let the executor clean up any cached information.

exists ()
    Reports whether node exists.

explain ()

file_on_disk (name)

for_signature ()
    Return a string representation of the Node that will always be the same for this particular Node, no matter what.
    This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
    purpose of this method is to generate a value to be used in signature calculation for the command line used to
    build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
    return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
    not change.
/fs
    Reference to parent Node.FS object

getRepositories ()
    Returns a list of repositories for this directory.

get_abspath () → str
    Get the absolute path of the file.

get_all_rdirs ()
get_binfo ()
Fetch a node’s build information.
node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature
This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.

get_build_env ()
Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)
Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)
Return the set builder, or a specified default value

get_cachedir_csig ()
Return content signatures and names of all our children separated by new-lines. Ensure that the nodes are sorted.

get_csig ()
Compute the content signature for Directory nodes. In general, this is not needed and the content signature is not stored in the DirNodeInfo. However, if get_contents on a Dir node is called which has a child directory, the child directory should return the hash of its contents.

get_dir ()

get_env ()

get_env_scanner (env, kw={})

get_executor (create: int = 1) → Executor
Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.

get_found_includes (env, scanner, path)
Return this directory’s implicit dependencies.
We don’t bother caching the results because the scan typically shouldn’t be requested more than once (as opposed to scanning .h file contents, which can be requested as many times as the files is #included by other files).

get_implicit_deps (env, initial_scanner, path_func, kw={})
Return a list of implicit dependencies for this node.
This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()

get_labspath () → str
Get the absolute path of the file.

get_ninfo ()

get_path (dir=None)
Return path relative to the current working directory of the Node.FS.Base object that owns us.

get_path_elements ()

get_relpah ()
Get the path of the file relative to the root SConstruct file’s directory.

get_source_scanner (node)
Fetch the source scanner for the specified node
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()
Fetch the stored implicit dependencies

get_stored_info ()

get_string (for_signature)
This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.
Such command generators should use this method in preference to str(Node) when converting a Node to a string,
passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly,
depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy()
This method is expected to return an object that will function exactly like this Node, except that it implements any
additional special features that we would like to be in effect for Environment variable substitution. The principle use
is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a
tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to
return self if no new functionality is needed for Environment substitution.

glob(pathname, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None) → list
Returns a list of Nodes (or strings) matching a pathname pattern.
Pathname patterns follow POSIX shell syntax:

```
*      matches everything
?      matches any single character
[seq]  matches any character in seq (ranges allowed)
[!seq] matches any char not in seq
```

The wildcard characters can be escaped by enclosing in brackets. A leading dot is not matched by a wildcard, and
needs to be explicitly included in the pattern to be matched. Matches also do not span directory separators.
The matches take into account Repositories, returning a local Node if a corresponding entry exists in a Repository
(either an in-memory Node or something on disk).
The underlying algorithm is adapted from a rather old version of glob.glob() function in the Python standard library
(heavily modified), and uses fnmatch.fnmatch() under the covers.
This is the internal implementation of the external Glob API.

Parameters:

- **pattern** – pathname pattern to match.
- **ondisk** – if false, restricts matches to in-memory Nodes. By default, matches entries
  that exist on-disk in addition to in-memory Nodes.
- **source** – if true, corresponding source Nodes are returned if globbing in a variant
directory. The default behavior is to return Nodes local to the variant directory.
- **strings** – if true, returns the matches as strings instead of Nodes. The strings are path
  names relative to this directory.
- **exclude** – if not None, must be a pattern or a list of patterns following the same POSIX
  shell semantics. Elements matching at least one pattern from exclude will be excluded
  from the result.

has_builder() → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if
node.builder: ...”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
__len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
slowing things down immensely.

has_explicit_builder() → bool
Return whether this Node has an explicit builder. This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

ignore
ignore_set
implicit
implicit_set
includes

is_conftest () → bool
Returns true if this node is a conftest node

is_derived () → bool
Returns true if this node is derived (i.e. built).
This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit
is_literal () → bool
Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
Returns true if this node is an sconscript

is_under (dir) → bool
is_up_to_date () → bool
If any child is not up-to-date, then this directory isn’t, either.

isdir () → bool
isfile () → bool
islink () → bool

link (srcdir, duplicate) → None
Set this directory as the variant directory for the supplied source directory.

linked
lstat ()

make_ready () → None
Get a Node ready for evaluation.
This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool
multiple_side_effect_has_builder ()
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

must_be_same (klass)
This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.

name

new_binfo ()
new_ninfo ()
ninfo

nocache
noclean

on_disk_entries
postprocess () → None
Clean up anything we don’t need to hang onto after we’ve been built.
precious
prepare () → None
Prepare for this Node to be built.
This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.
This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.
(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)
Overriding this method allows a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites

pseudo

push_to_cache () → bool
Try to push a node into a cache

rdir ()

ref_count

rel_path (other)
Return a path to “other” relative to this directory.

release_target_info () → None
Called just after this node has been marked up-to-date or was built completely.
This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.
By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.
@see: built() and File.release_target_info()

released_target_info

remove ()
Remove this Node: no-op by default.

render_includef_tree ()
Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

rentry ()

rentry_exists_on_disk (name)
Searches through the file/dir entries of the current and all its remote directories (repos), and returns True if a physical entry with the given name could be found. The local directory (self) gets searched first, so repositories take a lower precedence regarding the searching order.
@see entry_exists_on_disk

repositories

reset_executor () → None
Remove cached executor; forces recompute when needed.

retrieve_from_cache () → bool
Try to retrieve the node’s content from a cache
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
Returns true if the node was successfully retrieved.

rexists ()
Does this node exist locally or in a repository?

rfile ()

root

rstr () → str
A Node.FS.Base object’s string representation is its path name.

sbuild

scan () → None
Scan this node’s dependents for implicit dependencies.

scanner_key ()
A directory does not get scanned.

scanner_paths

sconsign ()
Return the .sconsign file info for this directory.
searched

select_scanner (scanner)

Selects a scanner for this Node. This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

set_always_build (always_build: int = 1) → None

Set the Node’s always_build value.

set_executor (executor: Executor) → None

Set the action executor for this node.

set_explicit (is_explicit) → None

set_local () → None

set_nocache (nocache: int = 1) → None

Set the Node’s nocache value.

set_noclean (noclean: int = 1) → None

Set the Node’s noclean value.

set_precious (precious: int = 1) → None

Set the Node’s precious value.

set_pseudo (pseudo: bool = True) → None

Set the Node’s pseudo value.

set_specific_source (source) → None

set_src_builder (builder) → None

Set the source code builder for this node.

set_state (state) → None

side_effect

side_effects

sources

sources_set

src_builder ()

Fetch the source code builder for this node.
If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value from its parent directory, and so on up to the file system root).

srcdir

srcdir_duplicate (name)

srcdir_find_file (filename)

srcdir_list ()

srcnode ()

Dir has a special need for srcnode()…if we have a srcdir attribute set, then that is our srcnode.

stat ()

state

store_info

str_for_display ()

target_from_source (prefix, suffix, splitext=<function splitext>)

Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
Note that this method can be overridden dynamically for generated files that need different behavior. See Tool/swig.py for an example.

target_peers

up ()

variant_dirs

visited () → None

Called just after this node has been visited (with or without a build).

waiting_parents

waiting_s_e

walk (func, arg) → None

Walk this directory tree by calling the specified function for each directory in the tree.
This behaves like the os.path.walk() function, but for in-memory Node.FS.Dir objects. The function takes the same arguments as the functions passed to os.path.walk():

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**SCons.Node package**

```python
func(arg, dirname, fnames)
```

Except that “dirname” will actually be the directory `Node`, not the string. The ‘.’ and ‘..’ entries are excluded from fnames. The fnames list may be modified in-place to filter the subdirectories visited or otherwise impose a specific order. The “arg” argument is always passed to `func()` and may be used in any way (or ignored, passing None is common).

```python
wkids
```

class SCons.Node.FS.DirBuildInfo

Bases: BuildInfoBase

__getstate__() -> None

Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

__setstate__(state) -> None

Restore the attributes from a pickled state.

```python
bact
bactsig
bdepends
bdependssigs
bimplicit
bimplicitsigs
bsources
bsourcesigs
current_version_id = 2
merge(other) -> None
```

Merge the fields of another object into this object. Already existing information is overwritten by the other instance's data. **WARNING:** If a '__dict__' slot is added, it should be updated instead of replaced.

```python
class SCons.Node.FS.DirNodeInfo

Bases: NodeInfoBase

__getstate__() -> None

Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.

__setstate__(state) -> None

Restore the attributes from a pickled state. The version is discarded.

```python
convert(node, val) -> None
```

```python
current_version_id = 2
format(field_list=None, names: int = 0)
```

```python
fs = None
merge(other) -> None
```

Merge the fields of another object into this object. Already existing information is overwritten by the other instance's data. **WARNING:** If a '__dict__' slot is added, it should be updated instead of replaced.

```python
str_to_node(s) -> None
```

```python
update(node) -> None
```

```python
class SCons.Node.FS.DiskChecker (disk_check_type, do_check_function, ignore_check_function)

Bases: object
```

Implement disk check variation.

This Class will hold functions to determine what this particular disk checking implementation should do when enabled or disabled.

```python
enable(disk_check_type_list) -> None
```

If the current object's `disk_check_type` matches any in the list passed :param disk_check_type_list: List of disk checks to enable :return:

```python
class SCons.Node.FS.Entry (name, directory, fs)

Bases: Base
```

This is the class for generic Node.FS entries—that is, things that could be a File or a Dir, but we’re just not sure yet. Consequently, the methods in this class really exist just to transform their associated object into the right class when the time comes, and then call the same-named method in the transformed class.
class Attrs
    Bases: object
    shared
BuildInfo
    alias of BuildInfoBase
Decider (function) \rightarrow None
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of NodeInfoBase
RDirs (pathlist)
    Search for a list of directories in the Repository list.
Rfindalldirs (pathlist)
    Return all of the directories for a given path list, including corresponding “backing” directories in any repositories.
    The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up the same path for each target in a given directory.
Tag (key, value) \rightarrow None
    Add a user-defined tag.
_Rfindalldirs_key (pathlist)
_getattr__ (attr)
    Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘tpath’, ‘suffix’ and ‘path_elements’. These Node attributes used to be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is only called as fallback when the requested attribute can’t be found, so there should be no speed performance penalty involved for standard builds.
__lt__ (other)
    less than operator used by sorting on py3
__str__ () \rightarrow str
    A Node.FS.Base object’s string representation is its path name.
_abspath
_add_child (collection, set, child) \rightarrow None
    Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
_children_get ()
_children_reset () \rightarrow None
_func_exists
_func_get_contents
_func_is_derived
_func_reexists
_func_sconsign
_func_target_from_source
_get_scanner (env, initial_scanner, root_node_scanner, kw)
_get_str ()
_glob1 (pattern, ondisk: bool = True, source: bool = False, strings: bool = False)
_labspath
_local
_memo
_path
_path_elements
_proxy
_save_str ()
_sconsign
_specific_sources
_tags
_tpath
add_dependency (depend)
    Adds dependencies.
add_ignore (depend)
    Adds dependencies to ignore.
add_prerequisite (prerequisite) → None
    Adds prerequisites
add_source (source)
    Adds sources.
add_to_implicit (deps) → None
add_to_waiting_parents (node) → int
    Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note
    that the returned values are intended to be used to increment a reference count, so don't think you can “clean up”
    this function by using True and False instead…)
add_to_waiting_s_e (node) → None
add_wkid (wkid) → None
    Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
    Return a list of all the node’s direct children.
alter_targets ()
    Return a list of alternate targets for this Node.
always_build
attributes
binfo
build (**kw)
    Actually build the node.
    This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the
    prepare() method has gotten everything, uh, prepared.
    This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
    stuff in built().
builder
builder_set (builder) → None
built () → None
    Called just after this node is successfully built.
cached
cachedir_csig
cachesig
changed (node=None, allowcache: bool = False)
    Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to
    compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in
    a Repository) can be used instead.
    Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we
    detected any difference, but we now rely on checking every dependency to make sure that any necessary Node
    information (for example, the content signature of an #included .h file) is updated.
    The allowcache option was added for supporting the early release of the executor/builder structures, right after a
    File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like
    this, the executor isn’t needed any longer for subsequent calls to changed().
    @see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
    Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
    Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
    Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
    up-to-date, too.
SCons.Node package

clear () \rightarrow None
  Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
  integration builds).
clear_memoized_values () \rightarrow None
  contentsig
cwd
del_binfo () \rightarrow None
  Delete the build info from this node.
depends
depends_set
dir
dirname
disambiguate (must_exist=\text{None})
diskcheck_match () \rightarrow None
duplicate
entries
env
env_set (env, safe: bool = False) \rightarrow None
executor
executor_cleanup () \rightarrow None
  Let the executor clean up any cached information.
exists ()
  Reports whether node exists.
explain ()
for_signature ()
  Return a string representation of the Node that will always be the same for this particular Node, no matter what.
  This is by contrast to the \text{str}() method, which might, for instance, return a relative path for a file Node. The
  purpose of this method is to generate a value to be used in signature calculation for the command line used to
  build a target, and we use this method instead of \text{str}() to avoid unnecessary rebuilds. This method does not need to
  return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
  not change.
fs
  Reference to parent Node.FS object
get_abspath ()
  Get the absolute path of the file.
get_binfo ()
  Fetch a node’s build information.
  node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
  build signature
  This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already
  built and updated by someone else, if that’s what’s wanted.
get_build_env ()
  Fetch the appropriate Environment to build this node.
get_build_scanner_path (scanner)
  Fetch the appropriate scanner path for this node.
get_builder (default_builder=\text{None})
  Return the set builder, or a specified default value
get_cachedir_csig ()
get_contents ()
  Fetch the contents of the entry. Returns the exact binary contents of the file.
get_csig ()
get_dir ()
get_env ()
get_env_scanner (env, kw={})
get_executor (create: int = 1) \rightarrow \text{Executor}
  Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.
get_found_includes (env, scanner, path)
Return the scanned include lines (implicit dependencies) found in this node.
The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be scanned for implicit dependencies.

get_implicit_deps (env, initial_scanner, path_func, kw={})
Return a list of implicit dependencies for this node.
This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()
get_labspath ()
Get the absolute path of the file.
get_ninfo ()
get_path (dir=None)
Return path relative to the current working directory of the Node.FS.Base object that owns us.
get_path_elements ()
get_relpath ()
Get the path of the file relative to the root SConstruct file’s directory.

get_source_scanner (node)
Fetch the source scanner for the specified node
NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()
get_stored_implicit ()
Fetch the stored implicit dependencies
get_stored_info ()
get_string (for_signature)
This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.
Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix ()
get_target_scanner ()
get_text_contents () → str
Fetch the decoded text contents of a Unicode encoded Entry.
Since this should return the text contents from the file system, we check to see into what sort of subclass we should morph this Entry.

get_tpath ()
getmtime ()
getsize ()

has_builder () → bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () → bool
Return whether this Node has an explicit builder.

This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an
explicit builder that the user supplies (the canonical example being directories).

ignore
generate_set
implicit
implicit_set
includes

is_conftest () → bool
Returns true if this node is a conftest node

isDerived () → bool
Returns true if this node is derived (i.e. built).

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should
contribute their build signatures when they are used as source files to other derived files. For example: source with
source builders are not derived in this sense, and hence should not return true.

isExplicit

isLiteral () → bool
Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
Returns true if this node is an sconscript

is_under (dir) → bool

is_up_to_date () → bool
Default check for whether the Node is current: unknown Node subtypes are always out of date, so they will always
get built.

isdird () → bool

isfile () → bool

islink () → bool

linked

lstat ()

make_ready () → None
Get a Node ready for evaluation.

This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a
Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool

multiple_side_effect_has_builder () → bool
Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if
node.builder: …"). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
__len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
slowing things down immensely.

must_be_same (klass) → None

Called to make sure a Node is a Dir. Since we’re an Entry, we can morph into one.

name

new_binfo ()

new_ninfo ()
ninfo

nocache

noclean

on_disk_entries

postprocess () → None

Clean up anything we don’t need to hang onto after we’ve been built.

precious

prepare ()

Prepare for this Node to be built.

This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually
calling the method to build the Node.
This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.

(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)

Overriding this method allows for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.

prerequisites

pseudo

- push_to_cache () → bool
  - Try to push a node into a cache

ref_count

rel_path (other)

release_target_info () → None
- Called just after this node has been marked up-to-date or was built completely.
- This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.
- By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.

@see: built() and File.release_target_info()

released_target_info

remove ()
- Remove this Node: no-op by default.

render_include_tree ()
- Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

rentry ()

repositories

reset_executor () → None
- Remove cached executor; forces recompute when needed.

retrieve_from_cache () → bool
- Try to retrieve the node’s content from a cache
- This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
- Returns true if the node was successfully retrieved.

rexists ()
- Does this node exist locally or in a repository?

rfile ()
- We’re a generic Entry, but the caller is actually looking for a File at this point, so morph into one.

root

rstr () → str
- A Node.FS.Base object’s string representation is its path name.

sbuilder

scan () → None
- Scan this node’s dependents for implicit dependencies.

scanner_key ()

scanner_paths

searched

select_scanner (scanner)
- Selects a scanner for this Node.
- This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.

set_always_build (always_build: int = 1) → None
- Set the Node’s always_build value.

set_executor (executor: Executor) → None
- Set the action executor for this node.

set_explicit (is_explicit) → None

set_local () → None
SCons.Node package

```python
def set_nocache(nocache: int = 1) -> None:
    # Set the Node's nocache value.
def set_noclean(noclean: int = 1) -> None:
    # Set the Node's noclean value.
def set_precious(precious: int = 1) -> None:
    # Set the Node's precious value.
def set_pseudo(pseudo: bool = True) -> None:
    # Set the Node's pseudo value.
def set_specific_source(source) -> None:
    # Set the source code builder for this node.
def set_src_builder(builder) -> None:
    # Set the source code builder for this node.
    if there isn't one, we cache the source code builder specified for the directory (which in turn will cache the value
    from its parent directory, and so on up to the file system root).

def srcdir() -> None:
    # If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourselves.

def srcnode() -> None:
    # If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourselves.

def target_from_source(prefix, suffix, splitext=<function splitext>) -> None:
    # Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
    # Note that this method can be overridden dynamically for generated files that need different behavior. See
    # Tool/swig.py for an example.

def target_peers() -> None:
    # Called just after this node has been visited (with or without a build).

def visited() -> None:
    # Called just after this node has been visited (with or without a build).

def waiting_parents() -> None:
    # Waiting for this node to be built.

def waiting_s_e() -> None:
    # Waiting for this node to be built.

def wkids() -> None:
    # Waiting for this node to be built.

class SCons.Node.FS.EntryProxy(subject):
    # Bases: Proxy
    def __get_abspath() -> None:
        # Return the file's directory and file name, with the suffix stripped.
    def __get_base_path() -> None:
        # Return the path with / as the path separator, regardless of platform.
    def __get_dir() -> None:
        # Return the path with / as the path separator, regardless of platform.
    def __get_file() -> None:
        # Return the path with / as the path separator, regardless of platform.
    def __get_filebase() -> None:
        # Return the path with / as the path separator, regardless of platform.
    def __get_posix_path() -> None:
        # Return the file's directory and file name, with the suffix stripped.
    def __get_relpath() -> None:
        # Returns the directory containing the source node linked to this node via VariantDir(), or the directory of this node if
        # not linked.
    def __get_rsrcdir() -> None:
        # Returns the directory containing the source node linked to this node via VariantDir(), or the directory of this node if
        # not linked.
    def __get_rsrcnode() -> None:
        # Returns the directory containing the source node linked to this node via VariantDir(), or the directory of this node if
        # not linked.

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Return the path with as the path separator, regardless of platform.

```
dictSpecialAttrs = {'abspath': <function EntryProxy.__get_abspath>, 'base': <function EntryProxy.__get_base_path>, 'dir': <function EntryProxy.__get_dir>, 'file': <function EntryProxy.__get_file>, 'filebase': <function EntryProxy.__get_filebase>, 'posix': <function EntryProxy.__get_posix_path>, 'relpath': <function EntryProxy.__get_relpath>, 'rsrcdir': <function EntryProxy.__get_rsrcdir>, 'rsrcpath': <function EntryProxy.__get_rsrcpath>, 'srcdir': <function EntryProxy.__get_srcdir>, 'srcpath': <function EntryProxy.__get_srcnode>, 'suffix': <function EntryProxy.__get_suffix>, 'windows': <function EntryProxy.__get_windows_path>}
```

get ()

Retrieve the entire wrapped object

```
exception SCons.Node.FS.EntryProxyAttributeError (entry_proxy, attribute)
```

Bases: AttributeError

An AttributeError subclass for recording and displaying the name of the underlying Entry involved in an AttributeError exception.

```
add_note ()
    Exception.add_note(note) – add a note to the exception

args
    name
    attribute name

obj
    object

with_traceback ()
    Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
```

class SCons.Node.FS.FS (path=None)

Bases: LocalFS

Dir (name, directory=None, create: bool = True)

Look up or create a Dir node with the specified name. If the name is a relative path (begins with ./, ~/. or a file name), then it is looked up relative to the supplied directory node, or to the top level directory of the FS (supplied at construction time) if no directory is supplied.

This method will raise TypeError if a normal file is found at the specified path.

Entry (name, directory=None, create: bool = True)

Look up or create a generic Entry node with the specified name. If the name is a relative path (begins with ./, ~/. or a file name), then it is looked up relative to the supplied directory node, or to the top level directory of the FS (supplied at construction time) if no directory is supplied.

File (name, directory=None, create: bool = True)

Look up or create a File node with the specified name. If the name is a relative path (begins with ./, ~/. or a file name), then it is looked up relative to the supplied directory node, or to the top level directory of the FS (supplied at construction time) if no directory is supplied.

Glob (pathname, ondisk: bool = True, source: bool = True, strings: bool = False, exclude=None, cwd=None)

Globs

This is mainly a shim layer

PyPackageDir (modulename) → Dir | None

Locate the directory of Python module modulename.

For example ‘SCons’ might resolve to Windows: C:Python311Libsite-packagesSCons Linux: /usr/lib64/python3.11/site-packages/SCons

Can be used to determine a toolpath based on a Python module name.

This is the backend called by the public API function PyPackageDir().

Repository (*dirs) → None

Specify Repository directories to search.

VariantDir (variant_dir, src_dir, duplicate: int = 1)

Link the supplied variant directory to the source directory for purposes of building files.
The generic entry point for Node lookup with user-supplied data.
This translates arbitrary input into a canonical Node.FS object of the specified fsclass. The general approach for strings is to turn it into a fully normalized absolute path and then call the root directory’s lookup_abs() method for the heavy lifting.
If the path name begins with ‘#’, it is unconditionally interpreted relative to the top-level directory of this FS. ‘#’ is treated as a synonym for the top-level SConstruct directory, much like ‘~’ is treated as a synonym for the user’s home directory in a UNIX shell. So both ‘#foo’ and ‘#/foo’ refer to the ‘foo’ subdirectory underneath the top-level SConstruct directory.
If the path name is relative, then the path is looked up relative to the specified directory, or the current directory (self._cwd, typically the SConscript directory) if the specified directory is None.

The current working directory for lookups. If change_os_dir is true, we will also change the “real” cwd to match.

Returns the root directory for the specified drive, creating it if necessary.

Create targets in corresponding variant directories.
Even though this loops and walks up the tree, we don’t memoize the return value because this is really only used to process the command-line targets.

A class for files in a file system.

A class for files in a file system.

alias of FileBuildInfo

Create targets in corresponding variant directories.

Even though this loops and walks up the tree, we don’t memoize the return value because this is really only used to process the command-line targets.
Create a directory node named 'name' relative to the directory of this file.

Dirs ([pathlist])
Create a list of directories relative to the SConscript directory of this file.

Entry (name)
Create an entry node named 'name' relative to the directory of this file.

File (name)
Create a file node named 'name' relative to the directory of this file.

GetTag (key)
Return a user-defined tag.

NodeInfo
alias of FileNodeInfo

RDirs ([pathlist])
Search for a list of directories in the Repository list.

Rfindalldirs ([pathlist])
Return all of the directories for a given path list, including corresponding "backing" directories in any repositories.

The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up the same path for each target in a given directory.

Tag (key, value) → None
Add a user-defined tag.

_Rfindalldirs_key ([pathlist])
__dmap_cache = {}
__dmap_sig_cache = {}
__getattr__ (attr)
Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘tpath’, ‘suffix’ and ‘path_elements’. These Node attributes used to be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and SConscript continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is only called as fallback when the requested attribute can’t be found, so there should be no speed performance penalty involved for standard builds.

__lt__ (other)
less than operator used by sorting on py3

__str__ () → str
A Node.FS.Base object’s string representation is its path name.

_abspath

__add_child (collection, set, child) → None
Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.

__add_strings_to_dependency_map (dmap)
In the case comparing node objects isn’t sufficient, we’ll add the strings for the nodes to the dependency map.

_build_dependency_map (binfo)
Build mapping from file -> signature

Parameters:
- self (self) –
- considered (binfo - buildinfo from node being) –

Returns: dictionary of file->signature mappings

_children_get ()
_children_reset () → None
_createDir () → None
_func_exists
_func_get_contents
_func_is_derived
_func_rexists
_func_sconsign
_func_target_from_source
SCons.Node package

$get_found_includes_key (env, scanner, path)
$get_previous_signatures (dmap)
Return a list of corresponding csigs from previous build in order of the node/files in children.

Parameters:

- self (self)
- csig (dmap - Dictionary of file ->)

Returns: List of csigs for provided list of children

_get_scanner (env, initial_scanner, root_node_scanner, kw)
_get_str ()
_glob1 (pattern, ondisk: bool = True, source: bool = False, strings: bool = False)
_labspath
_local
_memo
_morph () → None
  Turn a file system node into a File object.
_path
_path_elements
_proxy
_rmv_existing ()
_save_str ()
_sconsign
_specific_sources
_tags
_tpath

add_dependency (depend)
  Adds dependencies.
add_ignore (depend)
  Adds dependencies to ignore.
add_prerequisite (prerequisite) → None
  Adds prerequisites
add_source (source)
  Adds sources.
add_to_implicit (deps) → None
add_to_waiting_parents (node) → int
  Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note that the returned values are intended to be used to increment a reference count, so don't think you can “clean up” this function by using True and False instead…)
add_to_waiting_s_e (node) → None
add_wkid (wkid) → None
  Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
  Return a list of all the node’s direct children.
alter_targets ()
  Return any corresponding targets in a variant directory.
always_build
attributes
info
build (**kw)
  Actually build the node.
  This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the prepare() method has gotten everything, uh, prepared.
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
builder
builder_set (builder) → None
SCons.Node package

Built () → None
Called just after this File node is successfully built.
Just like for `release_target_info` we try to release some more target node attributes in order to minimize the overall memory consumption.
@see: release_target_info
cached
cachedir_csigs
cachesigs
changed (node=None, allowcache: bool = False) → bool
Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built.
For File nodes this is basically a wrapper around Node.changed(), but we allow the return value to get cached after the reference to the Executor got released in release_target_info().
@see: Node.changed()
changed_content (target, prev_ni, repo_node=None) → bool
changed_state (target, prev_ni, repo_node=None) → bool
changed_timestamp_match (target, prev_ni, repo_node=None) → bool
Return True if the timestamps don’t match or if there is no previous timestamp :param target: :param prev_ni:
Information about the node from the previous build :return:
changed_timestamp_newer (target, prev_ni, repo_node=None) → bool
changed_timestamp_then_content (target, prev_ni, node=None) → bool
Used when deciding for file is Timestamp-MD5
NOTE: If the timestamp hasn’t changed this will skip md5’ing the
file and just copy the prev_ni provided. If the prev_ni is wrong. It will propagate it. See: https://github.com/SCons/scons/issues/2980
Parameters:
  - dependency (self) –
  - target (target) –
  - .sconsign (prev_ni - The NodeInfo object loaded from previous builds) –
  - existence/timestamp (node - Node instance. Check this node for file) – if specified.
Returns: Boolean - Indicates if node(File) has changed.
check_attributes (name)
Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.
clear () → None
Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).
clear_memoized_values () → None
contentssig
convert_copy_attrs = ['bsources', 'bimplicit', 'bdepends', 'bact', 'bactsig', 'ninfo']
convert_old_entry (old_entry)
convert_sig_attrs = ['bsourcesigs', 'bimplicit_sigs', 'bdependsigs']
cwd
del_binfo () → None
  Delete the build info from this node.
depends
depends_set
dir
dirname

disambiguate (must_exist=None)
diskcheck_match () → None
do_duplicate (src)
  Create a duplicate of this file from the specified source.

duplicate
entries
env
env_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
  Let the executor clean up any cached information.
exists ()
  Reports whether node exists.
explain ()
find_repo_file ()
  For this node, find if there exists a corresponding file in one or more repositories :return: list of corresponding files in repositories
find_src_builder ()
for_signature ()
  Return a string representation of the Node that will always be the same for this particular Node, no matter what. This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The purpose of this method is to generate a value to be used in signature calculation for the command line used to build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to return something that would actually work in a command line; it can return any kind of nonsense, so long as it does not change.
fs
  Reference to parent Node.FS object
get_abspath ()
  Get the absolute path of the file.
get_binfo ()
  Fetch a node’s build information.
  node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the build signature
  This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already built and updated by someone else, if that’s what’s wanted.
get_build_env ()
  Fetch the appropriate Environment to build this node.
get_build_scanner_path (scanner)
  Fetch the appropriate scanner path for this node.
get_builder (default_builder=None)
  Return the set builder, or a specified default value
get_cachedir_bsig ()
  Return the signature for a cached file, including its children.
  It adds the path of the cached file to the cache signature, because multiple targets built by the same action will all have the same build signature, and we have to differentiate them somehow.
  Signature should normally be string of hex digits.
get_cachedir_csig ()
  Fetch a Node’s content signature for purposes of computing another Node’s cachesig.
  This is a wrapper around the normal get_csig() method that handles the somewhat obscure case of using CacheDir with the -n option. Any files that don’t exist would normally be “built” by fetching them from the cache, but the normal get_csig() method will try to open up the local file, which doesn’t exist because the -n option meant we didn’t actually pull the file from cachedir. But since the file does actually exist in the cachedir, we can use its contents for the csig.
get_content_hash () → str
  Compute and return the hash for this file.
SCons.Node package

get_contents () \rightarrow \text{bytes}
   \text{Return the contents of the file as bytes.}
get_contents_sig ()
   \text{A helper method for getcached_dir_bsig.}
   \text{It computes and returns the signature for this node's contents.}
get_csig () \rightarrow \text{str}
   \text{Generate a node's content signature.}
get_dir ()
get_env ()
get_env_scanner (env, kw={})
get_executor (create: \text{int} = 1) \rightarrow \text{Executor}
   \text{Fetch the action executor for this node. Create one if there isn't already one, and requested to do so.}
get_found_includes (env, scanner, path)
   \text{Return the included implicit dependencies in this file. Cache results so we only scan the file once per path regardless of how many times this information is requested.}
get_implicit_deps (env, initial_scanner, path_func, kw={})
   \text{Return a list of implicit dependencies for this node.}
   \text{This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner's recursive flag says that we should.}
get_internal_path ()
get_labspath ()
   \text{Get the absolute path of the file.}
get_max_drift_csig () \rightarrow \text{str} | \text{None}
   \text{Returns the content signature currently stored for this node if it's been unmodified longer than the max_drift value, or the max_drift value is 0. Returns None otherwise.}
get_ninfo ()
get_path (dir=None)
   \text{Return path relative to the current working directory of the Node.FS.Base object that owns us.}
get_path_elements ()
get_relpath ()
   \text{Get the path of the file relative to the root SConstruct file's directory.}
get_size () \rightarrow \text{int}
get_source_scanner (node)
   \text{Fetch the source scanner for the specified node}
   \text{NOTE: "self" is the target being built, "node" is the source file for which we want to fetch the scanner.}
   \text{Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.}
   \text{This function may be called very often; it attempts to cache the scanner found to improve performance.}
get_state ()
get_stored_implicit ()
   \text{Fetch the stored implicit dependencies}
get_stored_info ()
get_string (for_signature)
   \text{This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.}
   \text{Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.}
get_subst_proxy ()
   \text{This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a \text{__getattr__()} method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.}
get_suffix ()
get_target_scanner ()
get_text_contents () → str
    Return the contents of the file as text.
geet_timestamp () → int
get_tpath ()
getmtime ()
getsize ()
has_builder () → bool
    Return whether this Node has a builder or not.
    In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ...".
    When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

has_explicit_builder () → bool
    Return whether this Node has an explicit builder.
    This allows an internal Builder created by SCons to be marked non-explicit, so that it can be overridden by an explicit builder that the user supplies (the canonical example being directories).

has_src_builder () → bool
    Return whether this Node has a source builder or not.
    If this Node doesn’t have an explicit source code builder, this is where we figure out, on the fly, if there’s a transparent source code builder for it.
    Note that if we found a source builder, we also set the self.builder attribute, so that all of the methods that actually build this file don’t have to do anything different.

hash_chunksize = 65536
ignore
ignore_set
implicit
implicit_set
includes
is_conftest () → bool
    Returns true if this node is an conftest node

is_derived () → bool
    Returns true if this node is derived (i.e. built).
    This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit

is_literal () → bool
    Always pass the string representation of a Node to the command interpreter literally.

is_sconscript () → bool
    Returns true if this node is an sconscript

is_under (dir) → bool
    Check for whether the Node is current.
    In all cases self is the target we’re checking to see if it’s up to date

isdir () → bool
isfile () → bool
islink () → bool
linked
lstat ()
make_ready () → None
    Get a Node ready for evaluation.
    This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.

missing () → bool
multiple_side_effect_has_builder () → bool
Return whether this Node has a builder or not.

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

must_be_same(klass)

This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.

ame

name

new_binfo ()
nino

new_ninfo ()
ninfo

on_disk_entries

nocache

nodel

postprocess () → None

Clean up anything we don’t need to hang onto after we’ve been built.

precious

prepare ()

Prepare for this file to be created.

prerequisites

pseudo

push_to_cache () → bool

Try to push the node into a cache

ref_count

rel_path (other)

release_target_info () → None

Called just after this node has been marked up-to-date or was built completely.

This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.

We’d like to remove a lot more attributes like self.sources and self.sources_set, but they might get used in a next build step. For example, during configuration the source files for a built E[*].o file are used to figure out which linker to use for the resulting Program (gcc vs. g++)! That’s why we check for the ‘keep_targetinfo’ attribute, config Nodes and the Interactive mode just don’t allow an early release of most variables.

In the same manner, we can’t simply remove the self.attributes here. The smart linking relies on the shared flag, and some parts of the java Tool use it to transport information about nodes...

@see: built() and Node.release_target_info()

released_target_info

remove ()

Remove this file.

render_include_tree ()

Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.

rstr ()

A Node.FS.Base object’s string representation is its path name.
sbuilder
scan () → None
Scan this node’s dependents for implicit dependencies.
scanner_key ()
scanner_paths
searched
select_scanner (scanner)
Selects a scanner for this Node.
This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use
their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) → None
Set the Node’s always_build value.
set_executor (executor: Executor) → None
Set the action executor for this node.
set_explicit (is_explicit) → None
set_local () → None
set_nocache (nocache: int = 1) → None
Set the Node’s nocache value.
set_noclean (noclean: int = 1) → None
Set the Node’s noclean value.
set_precious (precious: int = 1) → None
Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
Set the Node’s pseudo value.
set_specific_source (source) → None
set_src_builder (builder) → None
Set the source code builder for this node.
set_state (state) → None
side_effect
side_effects
sources
sources_set
src_builder ()
Fetch the source code builder for this node.
If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value
from its parent directory, and so on up to the file system root).
srcdir
srcnode ()
If this node is in a build path, return the node corresponding to its source file. Otherwise, return ourself.
stat ()
state
store_info
str_for_display ()
target_from_source (prefix, suffix, splitext=<function splitext>)
Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
Note that this method can be overridden dynamically for generated files that need different behavior. See
Tool/swig.py for an example.
target_peers
variant_dirs
visited () → None
Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids
class SCons.Node.FS.FileBuildInfo
Bases: BuildInfoBase
This is info loaded from sconsign.

Attributes unique to FileBuildInfo:

- **dependency_map**: Caches file->csig mapping
  
  for all dependencies. Currently this is only used when using MD5-timestamp decider. It’s used to ensure that
  we copy the correct csig from the previous build to be written to .sconsign when current build is done. 
  Previously the matching of csig to file was strictly by order they appeared in bdepends, bsources, or
  bimplicit, and so a change in order or count of any of these could yield writing wrong csig, and then false
  positive rebuilds

__getstate__ ()

Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a
‘__dict__’ slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all
instances of a class.

__setstate__ (state) → None

Restore the attributes from a pickled state.

- **bact**
- **bactsig**
- **bdepends**
- **bdependsigs**
- **bimplicit**
- **bimplicitsigs**
- **bsources**
- **bsourcesigs**

convert_from_sconsign (dir, name) → None

Converts a newly-read FileBuildInfo object for in-SCons use

For normal up-to-date checking, we don’t have any conversion to perform–but we’re leaving this method here to
make that clear.

convert_to_sconsign () → None

Converts this FileBuildInfo object for writing to a .sconsign file

This replaces each Node in our various dependency lists with its usual string representation: relative to the
top-level SConstruct directory, or an absolute path if it’s outside.

- **current_version_id** = 2
- **dependency_map**

format (names: int = 0)

merge (other) → None

Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s
data. WARNING: If a ‘__dict__’ slot is added, it should be updated instead of replaced.

prepare_dependencies () → None

Prepares a FileBuildInfo object for explaining what changed

The bsources, bdepends and bimplicit lists have all been stored on disk as paths relative to the top-level SConstruct directory. Convert the strings to actual Nodes (for use by the –debug=explain code and
–implicit-cache).

**exception** SCons.Node.FS.FileBuildInfoFileToCsigMappingError

Bases: Exception

add_note ()

Exception.add_note(note) – add a note to the exception

args

with_traceback ()

Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

**class** SCons.Node.FS.FileFinder

Bases: object

_find_file_key (filename, paths, verbose=None)

filedir_lookup (p, fd=None)

A helper method for find_file() that looks up a directory for a file we’re trying to find. This only creates the Dir Node
if it exists on-disk, since if the directory doesn’t exist we know we won’t find any files in it… :-)

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find_file (filename, paths, verbose=None)

Find a node corresponding to either a derived file or a file that exists already.
Only the first file found is returned, and none is returned if no file is found.
filename: A filename to find paths: A list of directory path nodes to search in. Can be represented as a list, a tuple, or a callable that is called with no arguments and returns the list or tuple.

Returns The node created from the found file.

class SCons.Node.FS.FileNodeInfo
    Bases: NodeInfoBase
    _getstate__ ()
        Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a '__dict__' slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all instances of a class.
    _setstate__ (state) → None
        Restore the attributes from a pickled state. The version is discarded.
    convert (node, val) → None
    csg
    current_version_id = 2
    field_list = ['csg', 'timestamp', 'size']
    format (field_list=None, names: int = 0)
    fs = None
    merge (other) → None
        Merge the fields of another object into this object. Already existing information is overwritten by the other instance’s data. WARNING: If a '__dict__' slot is added, it should be updated instead of replaced.
    size
    str_to_node (s)
    timestamp
    update (node) → None

SCons.Node.FS.LinkFunc (target, source, env) → int

Relative paths cause problems with symbolic links, so we use absolute paths, which may be a problem for people who want to move their soft-linked src-trees around. Those people should use the 'hard-copy' mode, softlinks cannot be used for that; at least I have no idea how ...

class SCons.Node.FS.LocalFS
    Bases: object
    This class implements an abstraction layer for operations involving a local file system. Essentially, this wraps any function in the os, os.path or shutil modules that we use to actually go do anything with or to the local file system. Note that there’s a very good chance we’ll refactor this part of the architecture in some way as we really implement the interface(s) for remote file system Nodes. For example, the right architecture might be to have this be a subclass instead of a base class. Nevertheless, we’re using this as a first step in that direction.
    We’re not using chdir() yet because the calling subclass method needs to use os.getcwd() directly to avoid recursion. Will we really need this one?
    chmod (path, mode)
    copy (src, dst)
    copy2 (src, dst)
    exists (path)
    getmtime (path)
    getsize (path)
    isdir (path) → bool
    isfile (path) → bool
    islink (path) → bool
    link (src, dst)
    listdir (path)
    lstat (path)
    makedirs (path, mode: int = 511, exist_ok: bool = False)
SCons.Node package

```python
mkdir (path, mode: int = 511)
open (path)
readlink (file) → str
rename (old, new)
scandir (path)
stat (path)
symlink (src, dst)
unlink (path)
```

```python
SCons.Node.FS.LocalString (target, source, env) → str
SCons.Node.FS.MkdirFunc (target, source, env) → int
class SCons.Node.FS.RootDir (drive, fs)
    Bases: Dir
    A class for the root directory of a file system.
    This is the same as a Dir class, except that the path separator (‘/’ or ‘\’) is actually part of the name, so we don’t need to add a separator when creating the path names of entries within this directory.
class Attrs
    Bases: object
    shared
BuildInfo
    alias of DirBuildInfo
    Decider (function) → None
Dir (name, create: bool = True)
    Looks up or creates a directory node named ‘name’ relative to this directory.
Entry (name)
    Looks up or creates an entry node named ‘name’ relative to this directory.
File (name)
    Looks up or creates a file node named ‘name’ relative to this directory.
GetTag (key)
    Return a user-defined tag.
NodeInfo
    alias of DirNodeInfo
    RDirs (pathlist)
        Search for a list of directories in the Repository list.
    Rfindalldirs (pathlist)
        Return all of the directories for a given path list, including corresponding “backing” directories in any repositories. The Node lookups are relative to this Node (typically a directory), so memoizing result saves cycles from looking up the same path for each target in a given directory.
Tag (key, value) → None
    Add a user-defined tag.
    _Rfindalldirs_key (pathlist)
    _getattr__ (attr)
        Together with the node_bwcomp dict defined below, this method provides a simple backward compatibility layer for the Node attributes ‘abspath’, ‘labspath’, ‘path’, ‘path’, ‘suffix’ and ‘path_elements’. These Node attributes used to be directly available in v2.3 and earlier, but have been replaced by getter methods that initialize the single variables lazily when required, in order to save memory. The redirection to the getters lets older Tools and SConstruct continue to work without any additional changes, fully transparent to the user. Note, that __getattr__ is only called as fallback when the requested attribute can’t be found, so there should be no speed performance penalty involved for standard builds.
    __lt__ (other)
        less than operator used by sorting on py3
    _abspath
    _add_child (collection, set, child) → None
        Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
    _children_get ()
    _children_reset () → None
    _create ()
```
Create this directory, silently and without worrying about whether the builder is the default or not.

```python
_func_exists
_func_get_contents
_func_is_derived
_func_rexists
_func_sconsign
_func_target_from_source
_get_scanner(env, initial_scanner, root_node_scanner, kw)
_get_str()
_glob1(pattern, ondisk: bool = True, source: bool = False, strings: bool = False)
Globs for and returns a list of entry names matching a single pattern in this directory.
This searches any repositories and source directories for corresponding entries and returns a Node (or string)
relative to the current directory if an entry is found anywhere.
TODO: handle pattern with no wildcard. Python’s glob.glob uses a separate _glob0 function to do this.
__labspath
__local
__lookupDict
__lookup_abs(p, klass, create: bool = True)
Fast (?) lookup of a normalized absolute path.
This method is intended for use by internal lookups with already-normalized path data. For general-purpose
lookups, use the FS.Entry(), FS.Dir() or FS.File() methods.
The caller is responsible for making sure we’re passed a normalized absolute path; we merely let Python’s
dictionary look up and return the One True Node.FS object for the path.
If a Node for the specified “p” doesn’t already exist, and “create” is specified, the Node may be created after
recursive invocation to find or create the parent directory or directories.
__memo
__morph() → None
Turn a file system Node (either a freshly initialized directory object or a separate Entry object) into a proper
directory object.
Set up this directory’s entries and hook it into the file system tree. Specify that directories (this Node) don’t use
signatures for calculating whether they’re current.
__path
__path_elements
__proxy
__rel_path_key(other)
__save_str()
__sconsign
__specific_sources
__srcdir_find_file_key(filename)
__tags
__tpath
abspath
addRepository(dir) → None
add_dependency(depend)
Adds dependencies.
add_ignore(depend)
Adds dependencies to ignore.
add_prerequisite(prerequisite) → None
Adds prerequisites
add_source(source)
Adds sources.
add_to_implicit(deps) → None
add_to_waiting_parents(node) → int
Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note
that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up”
this function by using True and False instead…)
add_to_waiting_s_e (node) \rightarrow None
add_wkid (wkid) \rightarrow None
Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
Return a list of all the node’s direct children.
alter_targets ()
Return any corresponding targets in a variant directory.
always_build
attributes
binfo
build (**kw) \rightarrow None
A null “builder” for directories.
builder
builder_set (builder) \rightarrow None
built () \rightarrow None
Called just after this node is successfully built.
cached
cachedir_csig
cachesig
changed (node=None, allowcache: bool = False)
Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in a Repository) can be used instead.
Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we detected any difference, but we now rely on checking every dependency to make sure that any necessary Node information (for example, the content signature of an #included .h file) is updated.
The allowcache option was added for supporting the early release of the executor/builder structures, right after a File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like this, the executor isn’t needed any longer for subsequent calls to changed().
@see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () \rightarrow bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.
clear () \rightarrow None
Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous integration builds).
clear_memoized_values () \rightarrow None
contentsig
cwd
del_binfo () \rightarrow None
Delete the build info from this node.
depends
depends_set
dir
dir_on_disk (name)
dirname
disambiguate (must_exist=None)
diskcheck_match () \rightarrow None
do_duplicate (src) \rightarrow None
duplicate
entry_abspath (name)
entry_exists_on_disk (name)

Searches through the file/dir entries of the current directory, and returns True if a physical entry with the given
name could be found.

@see entry_exists_on_disk
entry_labspath (name)
entry_path (name)
entry_tpath (name)

env

env_set (env, safe: bool = False) → None

executor
executor_cleanup () → None

Let the executor clean up any cached information.

exists ()

Reports whether node exists.

explain ()

file_on_disk (name)

for_signature ()

Return a string representation of the Node that will always be the same for this particular Node, no matter what.
This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
purpose of this method is to generate a value to be used in signature calculation for the command line used to
build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
not change.

fs

Reference to parent Node.FS object

getRepositories ()

Returns a list of repositories for this directory.

get_abspath () → str

Get the absolute path of the file.

get_all_rdirs ()

get_binfo ()

Fetch a node’s build information.
node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
build signature

This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already
built and updated by someone else, if that’s what’s wanted.

get_build_env ()

Fetch the appropriate Environment to build this node.

get_build_scanner_path (scanner)

Fetch the appropriate scanner path for this node.

get_builder (default_builder=None)

Return the set builder, or a specified default value

get_cachedir_csig ()

get_contents ()

Return content signatures and names of all our children separated by new-lines. Ensure that the nodes are sorted.

get_csig ()

Compute the content signature for Directory nodes. In general, this is not needed and the content signature is not
stored in the DirNodeInfo. However, if get_contents on a Dir node is called which has a child directory, the child
directory should return the hash of its contents.

get_dir ()

get_env ()

get_env_scanner (env, kw={})

g_executor (create: int = 1) → Executor

Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.
SCons.Node package

get_found_includes (env, scanner, path)
   Return this directory’s implicit dependencies.
   We don’t bother caching the results because the scan typically shouldn’t be requested more than once (as opposed to scanning .h file contents, which can be requested as many times as the files is #included by other files).

get_implicit_deps (env, initial_scanner, path_func, kw={})
   Return a list of implicit dependencies for this node.
   This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.

get_internal_path ()
get_labspath () → str
   Get the absolute path of the file.

get_ninfo ()
get_path (dir=None)
   Return path relative to the current working directory of the Node.FS.Base object that owns us.

get_path_elements ()
get_relpath ()
   Get the path of the file relative to the root SConstruct file’s directory.

get_source_scanner (node)
   Fetch the source scanner for the specified node
   NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.
   Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.
   This function may be called very often; it attempts to cache the scanner found to improve performance.

get_state ()

get_stored_implicit ()

get_stored_info ()

get_string (for_signature)
   This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.
   Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

get_subst_proxy ()
   This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

get_suffix ()
get_target_scanner ()

get_text_contents ()
   We already emit things in text, so just return the binary version.

get_timestamp () → int
   Return the latest timestamp from among our children

get_tpath ()

gmtime ()

getsize ()

glob (pathname, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None) → list
   Returns a list of Nodes (or strings) matching a pathname pattern.
   Pathname patterns follow POSIX shell syntax:
The wildcard characters can be escaped by enclosing in brackets. A leading dot is not matched by a wildcard, and needs to be explicitly included in the pattern to be matched. Matches also do not span directory separators.
The matches take into account Repositories, returning a local Node if a corresponding entry exists in a Repository (either an in-memory Node or something on disk).
The underlying algorithm is adapted from a rather old version of glob.glob() function in the Python standard library (heavily modified), and uses fnmatch.fnmatch() under the covers.
This is the internal implementation of the external Glob API.

### Parameters:

- **pattern** – pathname pattern to match.
- **ondisk** – if false, restricts matches to in-memory Nodes. By default, matches entries that exist on-disk in addition to in-memory Nodes.
- **source** – if true, corresponding source Nodes are returned if globbing in a variant directory. The default behavior is to return Nodes local to the variant directory.
- **strings** – if true, returns the matches as strings instead of Nodes. The strings are path names relative to this directory.
- **exclude** – if not None, must be a pattern or a list of patterns following the same POSIX shell semantics. Elements matching at least one pattern from exclude will be excluded from the result.
SCons.Node package

```python
isdir () → bool
isfile () → bool
islink () → bool
link (srcdir, duplicate) → None
    Set this directory as the variant directory for the supplied source directory.
linked
lstat ()
make_ready () → None
    Get a Node ready for evaluation.
    This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a
    Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.
missing () → bool
multiple_side_effect_has_builder ()
    Return whether this Node has a builder or not.
    In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if
    node.builder: ..."). When the builder attribute is examined directly, it ends up calling __getattr__ for both the
    __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and
    slowing things down immensely.
must_be_same (klass) → None
    This node, which already existed, is being looked up as the specified klass. Raise an exception if it isn’t.
name
new_binfo ()
new_ninfo ()
ninfo
nocache
noclean
on_disk_entries
path
postprocess () → None
    Clean up anything we don’t need to hang onto after we’ve been built.
precious
prepare () → None
    Prepare for this Node to be built.
    This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually
    calling the method to build the Node.
    This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes
    the BuildInfo structure that will hold the information about how this node is, uh, built.
    (The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets
    built by a specific action.)
    Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that
    subclass methods should call this base class method to get the child check and the BuildInfo structure.
prerequisites
pseudo
push_to_cache () → bool
    Try to push a node into a cache
rdir ()
ref_count
rel_path (other)
    Return a path to “other” relative to this directory.
release_target_info () → None
    Called just after this node has been marked up-to-date or was built completely.
    This is where we try to release as many target node infos as possible for clean builds and update runs, in order to
    minimize the overall memory consumption.
    By purging attributes that aren’t needed any longer after a Node (=File) got built, we don’t have to care that much
    how many KBytes a Node actually requires...as long as we free the memory shortly afterwards.
@see: built() and File.release_target_info()
```
released_target_info
remove ()
   Remove this Node: no-op by default.
render_include_tree ()
   Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.
rentry ()
rentry_exists_on_disk (name)
   Searches through the file/dir entries of the current and all its remote directories (repos), and returns True if a physical entry with the given name could be found. The local directory (self) gets searched first, so repositories take a lower precedence regarding the searching order.
@see entry_exists_on_disk
repositories
reset_executor () → None
   Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
   Try to retrieve the node’s content from a cache.
   This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
   Returns true if the node was successfully retrieved.
rexists ()
   Does this node exist locally or in a repository?
rfile ()
root
rstr () → str
   A Node.FS.Base object’s string representation is its path name.
sbuilder
scan () → None
   Scan this node’s dependents for implicit dependencies.
scanner_key ()
   A directory does not get scanned.
scanner_paths
sconsign ()
   Return the .sconsign file info for this directory.
searched
select_scanner (scanner)
   Selects a scanner for this Node.
   This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) → None
   Set the Node’s always_build value.
set_executor (executor: Executor) → None
   Set the action executor for this node.
set_explicit (is_explicit) → None
set_local () → None
set_nocache (nocache: int = 1) → None
   Set the Node’s nocache value.
set_noclean (noclean: int = 1) → None
   Set the Node’s noclean value.
set_precious (precious: int = 1) → None
   Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
   Set the Node’s pseudo value.
set_specific_source (source) → None
set_src_builder (builder) → None
   Set the source code builder for this node.
set_state (state) → None
scons.node package

side_effect
side_effects
sources
sources_set
src_builder ()

Fetch the source code builder for this node.
If there isn’t one, we cache the source code builder specified for the directory (which in turn will cache the value
from its parent directory, and so on up to the file system root).

srcdir
srcdir_duplicate (name)
srcdir_find_file (filename)
srcdir_list ()
srcnode ()

Dir has a special need for srcnode()...if we have a srcdir attribute set, then that is our srcnode.
stat ()
state
store_info
str_for_display ()
target_from_source (prefix, suffix, splitext=<function splitext>)

Generates a target entry that corresponds to this entry (usually a source file) with the specified prefix and suffix.
Note that this method can be overridden dynamically for generated files that need different behavior. See
Tool/swig.py for an example.
target_peers
up ()
variant_dirs
visited () → None
Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
walk (func, arg) → None
Walk this directory tree by calling the specified function for each directory in the tree.
This behaves like the os.path.walk() function, but for in-memory Node.FS.Dir objects. The function takes the same
arguments as the functions passed to os.path.walk():

func(arg, dirname, filenames)

Except that “dirname” will actually be the directory Node, not the string. The ‘.’ and ‘..’ entries are excluded from
filenames. The names list may be modified in-place to filter the subdirectories visited or otherwise impose a specific
order. The “arg” argument is always passed to func() and may be used in any way (or ignored, passing None is
common).

wkids
scons.node.FS.UnlinkFunc (target, source, env) → int
class SCons.Node.FS._Null

Bases: object
SCons.Node.FS._classEntry

alias of Entry
SCons.Node.FS._copy_func (fs, src, dest) → None
SCons.Node.FS._hardlink_func (fs, src, dest) → None
SCons.Node.FS._my_normcase (x)
SCons.Node.FS._softlink_func (fs, src, dest) → None
SCons.Node.FS.diskcheck_types ()
SCons.Node.FS.do_diskcheck_match (node, predicate, errorfmt)
SCons.Node.FS.find_file (filename, paths, verbose=None)

Find a node corresponding to either a derived file or a file that exists already.
Only the first file found is returned, and none is returned if no file is found.
filename: A filename to find paths: A list of directory path nodes to search in. Can be represented as a list, a tuple, or
a callable that is called with no arguments and returns the list or tuple.
returns The node created from the found file.
SCons.Node package

SCons.Node.FS.get_MkdirBuilder ()
SCons.Node.FS.get_default_fs ()
SCons.Node.FS.has_glob_magic (s) → bool
SCons.Node.FS.ignore_diskcheck_match (node, predicate, errorfmt) → None
SCons.Node.FS.initialize_do_splitdrive () → None

Set up splitdrive usage.
Avoid unnecessary function calls by recording a flag that tells us whether or not os.path.splitdrive() actually does anything on this system, and therefore whether we need to bother calling it when looking up path names in various methods below.
If do_splitdrive is True, _my_splitdrive() will be a real function which we can call. As all supported Python versions’ ntpath module now handle UNC paths correctly, we no longer special-case that.
Deferring the setup of _my_splitdrive also lets unit tests do their thing and test UNC path handling on a POSIX host.
SCons.Node.FS.invalidate_node_memos (targets) → None
Invalidate the memoized values of all Nodes (files or directories) that are associated with the given entries. Has been added to clear the cache of nodes affected by a direct execution of an action (e.g. Delete/Copy/Chmod). Existing Node caches become inconsistent if the action is run through Execute(). The argument targets can be a single Node object or filename, or a sequence of Nodes/filenames.
SCons.Node.FS.needs_normpath_match (string, pos=0, endpos=9223372036854775807)
Matches zero or more characters at the beginning of the string.
SCons.Node.FS.save_strings (val) → None
SCons.Node.FS.sconsign_dir (node)
Return the .sconsign file info for this directory, creating it first if necessary.
SCons.Node.FS.sconsign_none (node)
SCons.Node.FS.set_diskcheck (enabled_checkers) → None
SCons.Node.FS.set_duplicate (duplicate)

SCons.Node.Python module

Python nodes.

class SCons.Node.Python.Value (value, built_value=None, name=None)
Bases: Node
A Node class for values represented by Python expressions.
Values are typically passed on the command line or generated by a script, but not from a file or some other source. Changed in version 4.0: the name parameter was added.

class Attrs
Bases: object
shared
BuildInfo
alias of ValueBuildInfo
Decider (function) → None
GetTag (key)
Return a user-defined tag.
NodeInfo
alias of ValueNodeInfo
Tag (key, value) → None
Add a user-defined tag.
_add_child (collection, set, child) → None
Adds ‘child’ to ‘collection’, first checking ‘set’ to see if it’s already present.
_children_get ()
_children_reset () → None
_func_exists
_func_get_contents
_func_is_derived
_func_rexists
_func_target_from_source
SCons.Node package

_get_scanner (env, initial_scanner, root_node_scanner, kw)
_memo
_specific_sources
_tags
add_dependency (depend)
  Adds dependencies.
add_ignore (depend)
  Adds dependencies to ignore.
add_prerequisite (prerequisite) → None
  Adds prerequisites
add_source (source)
  Adds sources.
add_to_implicit (deps) → None
add_to_waiting_parents (node) → int
  Returns the number of nodes added to our waiting parents list: 1 if we add a unique waiting parent, 0 if not. (Note
  that the returned values are intended to be used to increment a reference count, so don’t think you can “clean up”
  this function by using True and False instead…)
add_to_waiting_s_e (node) → None
add_wkid (wkid) → None
  Add a node to the list of kids waiting to be evaluated
all_children (scan: int = 1)
  Return a list of all the node’s direct children.
alter_targets ()
  Return a list of alternate targets for this Node.
always_build
attributes
binfo
build (**kw) → None
  Actually build the node.
  This is called by the Taskmaster after it’s decided that the Node is out-of-date and must be rebuilt, and after the
  prepare() method has gotten everything, uh, prepared.
  This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe
  stuff in built().
builder
builder_set (builder) → None
built () → None
  Called just after this node is successfully built.
cached
changed (node=Node, allowcache: bool = False)
  Returns if the node is up-to-date with respect to the BuildInfo stored last time it was built. The default behavior is to
  compare it against our own previously stored BuildInfo, but the stored BuildInfo from another Node (typically one in
  a Repository) can be used instead.
  Note that we now always check every dependency. We used to short-circuit the check by returning as soon as we
  detected any difference, but we now rely on checking every dependency to make sure that any necessary Node
  information (for example, the content signature of an #included .h file) is updated.
  The allowcache option was added for supporting the early release of the executor/builder structures, right after a
  File target was built. When set to true, the return value of this changed method gets cached for File nodes. Like
  this, the executor isn’t needed any longer for subsequent calls to changed().
  @see: FS.File.changed(), FS.File.release_target_info()
changed_since_last_build
check_attributes (name)
  Simple API to check if the node.attributes for name has been set
children (scan: int = 1)
  Return a list of the node’s direct children, minus those that are ignored by this node.
children_are_up_to_date () → bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was
up-to-date, too.
clear () → None
   Completely clear a Node of all its cached state (so that it can be re-evaluated by interfaces that do continuous
integration builds).
clear_memoized_values () → None
del_binfo () → None
   Delete the build info from this node.
deps
depends_set
disambiguate (must_exist=None)
env
eval_set (env, safe: bool = False) → None
executor
executor_cleanup () → None
   Let the executor clean up any cached information.
exists () → bool
   Reports whether node exists.
explain ()
for_signature ()
Return a string representation of the Node that will always be the same for this particular Node, no matter what.
This is by contrast to the __str__() method, which might, for instance, return a relative path for a file Node. The
purpose of this method is to generate a value to be used in signature calculation for the command line used to
build a target, and we use this method instead of str() to avoid unnecessary rebuilds. This method does not need to
return something that would actually work in a command line; it can return any kind of nonsense, so long as it does
not change.
get_abspath ()
   Return an absolute path to the Node. This will return simply str(Node) by default, but for Node types that have a
concept of relative path, this might return something different.
get_binfo ()
   Fetch a node’s build information.
   node - the node whose sources will be collected cache - alternate node to use for the signature cache returns - the
build signature
   This no longer handles the recursive descent of the node’s children’s signatures. We expect that they’re already
built and updated by someone else, if that’s what’s wanted.
get_build_env ()
   Fetch the appropriate Environment to build this node.
get_build_scanner_path (scanner)
   Fetch the appropriate scanner path for this node.
get_builder (default_builder=None)
   Return the set builder, or a specified default value
get_cachedir_csig ()
get_contents () → bytes
   Get contents for signature calculations.
get_csig (calc=None)
   Because we’re a Python value node and don’t have a real timestamp, we get to ignore the calculator and just use
the value contents.
   Returns string. Ideally string of hex digits. (Not bytes)
get_env ()
get_env_scanner (env, kw=())
get_executor (create: int = 1) → Executor
   Fetch the action executor for this node. Create one if there isn’t already one, and requested to do so.
get_found_includes (env, scanner, path)
   Return the scanned include lines (implicit dependencies) found in this node.
The default is no implicit dependencies. We expect this method to be overridden by any subclass that can be scanned for implicit dependencies.

```python
def get_implicit_deps(env, initial_scanner, path_func, kw={})
    Return a list of implicit dependencies for this node.
    This method exists to handle recursive invocation of the scanner on the implicit dependencies returned by the scanner, if the scanner’s recursive flag says that we should.
```

```python
get_ninfo()
get_source_scanner(node)
```

Fetch the source scanner for the specified node

NOTE: “self” is the target being built, “node” is the source file for which we want to fetch the scanner.

Implies self.has_builder() is true; again, expect to only be called from locations where this is already verified.

This function may be called very often; it attempts to cache the scanner found to improve performance.

```python
get_state()
get_stored_implicit()
get_stored_info()
get_string(for_signature)
```

This is a convenience function designed primarily to be used in command generators (i.e., CommandGeneratorActions or Environment variables that are callable), which are called with a for_signature argument that is nonzero if the command generator is being called to generate a signature for the command line, which determines if we should rebuild or not.

Such command generators should use this method in preference to str(Node) when converting a Node to a string, passing in the for_signature parameter, such that we will call Node.for_signature() or str(Node) properly, depending on whether we are calculating a signature or actually constructing a command line.

```python
get_subst_proxy()
```

This method is expected to return an object that will function exactly like this Node, except that it implements any additional special features that we would like to be in effect for Environment variable substitution. The principle use is that some Nodes would like to implement a __getattr__() method, but putting that in the Node type itself has a tendency to kill performance. We instead put it in a proxy and return it from this method. It is legal for this method to return self if no new functionality is needed for Environment substitution.

```python
get_suffix() → str
get_target_scanner()
get_text_contents() → str
```

By the assumption that the node.built_value is a deterministic product of the sources, the contents of a Value are the concatenation of all the contents of its sources. As the value need not be built when get_contents() is called, we cannot use the actual node.built_value.

```python
has_builder() → bool
    Return whether this Node has a builder or not.
has_explicit_builder() → bool
    Return whether this Node has an explicit builder.
```

In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly (“if node.builder: …”). When the builder attribute is examined directly, it ends up calling __getattr__ for both the __len__ and __bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.

```python
ignore
ignore_set
implicit
implicit_set
includes
is_conftest() → bool
    Returns true if this node is a conftest node
is_derived() → bool
    Returns true if this node is derived (i.e. built).
```
SCons.Node package

This should return true only for nodes whose path should be in the variant directory when duplicate=0 and should contribute their build signatures when they are used as source files to other derived files. For example: source with source builders are not derived in this sense, and hence should not return true.

is_explicit
is literal () \rightarrow bool
Always pass the string representation of a Node to the command interpreter literally.
is_sconsnode () \rightarrow bool
Returns true if this node is an sconsnode
is_under (dir) \rightarrow bool
is up to date () \rightarrow bool
Alternate check for whether the Node is current: If all of our children were up-to-date, then this Node was up-to-date, too.
linked
make ready () \rightarrow None
Get a Node ready for evaluation.
This is called before the Taskmaster decides if the Node is up-to-date or not. Overriding this method allows for a Node subclass to be disambiguated if necessary, or for an implicit source builder to be attached.
missing () \rightarrow bool
multiple side effect has builder () \rightarrow bool
Return whether this Node has a builder or not.
In Boolean tests, this turns out to be a lot more efficient than simply examining the builder attribute directly ("if node.builder: ...".) When the builder attribute is examined directly, it ends up calling __getattr__ for both the _len__ and _bool__ attributes on instances of our Builder Proxy class(es), generating a bazillion extra calls and slowing things down immensely.
n_new binfo ()
n_new ninfo ()
ninfo
nocache
noclean
postprocess () \rightarrow None
Clean up anything we don’t need to hang onto after we’ve been built.
precious
prepare ()
Prepare for this Node to be built.
This is called after the Taskmaster has decided that the Node is out-of-date and must be rebuilt, but before actually calling the method to build the Node.
This default implementation checks that explicit or implicit dependencies either exist or are derived, and initializes the BuildInfo structure that will hold the information about how this node is, uh, built.
(The existence of source files is checked separately by the Executor, which aggregates checks for all of the targets built by a specific action.)
Overriding this method allows for for a Node subclass to remove the underlying file from the file system. Note that subclass methods should call this base class method to get the child check and the BuildInfo structure.
prerequisites
pseudo
push to cache () \rightarrow bool
Try to push a node into a cache
read ()
Return the value. If necessary, the value is built.
ref_count
release target info () \rightarrow None
Called just after this node has been marked up-to-date or was built completely.
This is where we try to release as many target node infos as possible for clean builds and update runs, in order to minimize the overall memory consumption.
By purging attributes that aren’t needed any longer after a Node (File) got built, we don’t have to care that much how many KBytes a Node actually requires…as long as we free the memory shortly afterwards.
SCons.Node package

@see: built() and File.release_target_info()
remove ()
   Remove this Node: no-op by default.
render_include_tree ()
   Return a text representation, suitable for displaying to the user, of the include tree for the sources of this node.
reset_executor () → None
   Remove cached executor; forces recompute when needed.
retrieve_from_cache () → bool
   Try to retrieve the node’s content from a cache
   This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in built().
   Returns true if the node was successfully retrieved.
rexists ()
   Does this node exist locally or in a repository?
scan () → None
   Scan this node’s dependents for implicit dependencies.
scanner_key ()
select_scanner (scanner)
   Selects a scanner for this Node.
   This is a separate method so it can be overridden by Node subclasses (specifically, Node.FS.Dir) that must use their own Scanner and don’t select one the Scanner.Selector that’s configured for the target.
set_always_build (always_build: int = 1) → None
   Set the Node’s always_build value.
set_executor (executor: Executor) → None
   Set the action executor for this node.
set_explicit (is_explicit) → None
set_nocache (nocache: int = 1) → None
   Set the Node’s nocache value.
set_noclean (noclean: int = 1) → None
   Set the Node’s noclean value.
set_precious (precious: int = 1) → None
   Set the Node’s precious value.
set_pseudo (pseudo: bool = True) → None
   Set the Node’s pseudo value.
set_specific_source (source) → None
set_state (state) → None
side_effect
side_effects
sources
sources_set
state
store_info
str_for_display ()
target_peers
visited () → None
   Called just after this node has been visited (with or without a build).
waiting_parents
waiting_s_e
wkids
write (built_value) → None
   Set the value of the node.
class SCons.Node.Python.ValueBuildInfo
   Bases: BuildInfoBase
   __getstate__ ()
Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a
`__dict__` slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all
instances of a class.

```python
__setstate__(state) → None
```

Restore the attributes from a pickled state.

```python
bact
bactsig
bdepends
bdependssigs
bimplicit
bimplicitssigs
bsources
bsourcesigs
current_version_id = 2
merge (other) → None
```

Merge the fields of another object into this object. Already existing information is overwritten by the other instance's
data. WARNING: If a `__dict__` slot is added, it should be updated instead of replaced.

```python
Bases: NodeInfoBase
__getstate__() → None

Return all fields that shall be pickled. Walk the slots in the class hierarchy and add those to the state dictionary. If a
`__dict__` slot is available, copy all entries to the dictionary. Also include the version id, which is fixed for all
instances of a class.

__setstate__(state) → None
```

Restore the attributes from a pickled state. The version is discarded.

```python
convert (node, val) → None
csig
current_version_id = 2
field_list = ['csig']
format (field_list=None, names: int = 0)
merge (other) → None
```

Merge the fields of another object into this object. Already existing information is overwritten by the other instance's
data. WARNING: If a `__dict__` slot is added, it should be updated instead of replaced.

```python
str_to_node (s)
update (node) → None
```

## SCons.Node.Python.ValueWithMemo (value, built_value=None, name=None)

Memoized Value node factory.

Changed in version 4.0: the name parameter was added.

### SCons.Platform package

**Module contents**

SCons platform selection.

Looks for modules that define a callable object that can modify a construction environment as appropriate for a given
platform.

Note that we take a more simplistic view of “platform” than Python does. We're looking for a single string that
determines a set of tool-independent variables with which to initialize a construction environment. Consequently, we'll
examine both sys.platform and os.name (and anything else that might come in to play) in order to return some
specification which is unique enough for our purposes.

Note that because this subsystem just selects a callable that can modify a construction environment, it's possible for
people to define their own “platform specification” in an arbitrary callable function. No one needs to use or tie in to this
subsystem in order to roll their own platform definition.

```python
SCons.Platform.DefaultToolList (platform, env)
```
SCons.Platform package

Select a default tool list for the specified platform.
SCons.Platform.Platform (name='darwin')
Select a canned Platform specification.
class SCons.Platform.PlatformSpec (name, generate)
    Bases: object
class SCons.Platform.TempFileMunge (cmd, cmdstr=None)
    Bases: object
    Convert long command lines to use a temporary file.
You can set an Environment variable (usually TEMPFILE) to this, then call it with a string argument, and it will perform temporary file substitution on it. This is used to circumvent limitations on the length of command lines. Example:

```python
env['TEMPFILE'] = TempFileMunge
env['LINKCOM'] = '${TEMPFILE('$LINK $TARGET $SOURCES','$LINKCOMSTR')}'
```

By default, the name of the temporary file used begins with a prefix of '@'. This may be configured for other tool chains by setting the TEMPFILEPREFIX variable. Example:

```python
env['TEMPFILEPREFIX'] = '-@'  # diab compiler
env['TEMPFILEPREFIX'] = '-via'  # arm tool chain
env['TEMPFILEPREFIX'] = ''  # (the empty string) PC Lint
```

You can configure the extension of the temporary file through the TEMPFILESUFFIX variable, which defaults to '.lnk' (see comments in the code below). Example:

```python
env['TEMPFILESUFFIX'] = '.lnt'  # PC Lint
```

Entries in the temporary file are separated by the value of the TEMPFILEARGJOIN variable, which defaults to an OS-appropriate value.
A default argument escape function is SCons.Subst.quote_spaces. If you need to apply extra operations on a command argument before writing to a temporary file (fix Windows slashes, normalize paths, etc.), please set TEMPFILEARGESCFUNC variable to a custom function. Example:

```python
import sys
import re
from SCons.Subst import quote_spaces

WINPATHSEP_RE = re.compile(r'\([^\''\]|$)')

def tempfile_arg_esc_func(arg):
    arg = quote_spaces(arg)
    if sys.platform != 'win32':
        return arg
    # GCC requires double Windows slashes, let's use UNIX separator
    return WINPATHSEP_RE.sub(r'[/]', arg)

env['TEMPFILEARGESCFUNC'] = tempfile_arg_esc_func
```

_print_cmd_str (target, source, env, cmdstr) → None
SCons.Platform.platform_default ()
Return the platform string for our execution environment.
The returned value should map to one of the SCons/Platform/*.py files. Since scons is architecture independent, though, we don’t care about the machine architecture.

`SCons.Platform.platform_module (name='darwin')`

Return the imported module for the platform.
This looks for a module name that matches the specified argument. If the name is unspecified, we fetch the appropriate default for our execution environment.

Submodules

**SCons.Platform.aix module**

Platform-specific initialization for IBM AIX systems.
There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic `SCons.Platform.Platform()` selection method.

`SCons.Platform.aix.generate (env) → None`

`SCons.Platform.aix.get_xlc (env, xlc=None, packages=[])`

**SCons.Platform.cygwin module**

Platform-specific initialization for Cygwin systems.
There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic `SCons.Platform.Platform()` selection method.

`SCons.Platform.cygwin.generate (env) → None`

**SCons.Platform.darwin module**

Platform-specific initialization for Mac OS X systems.
There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic `SCons.Platform.Platform()` selection method.

`SCons.Platform.darwin.generate (env) → None`

**SCons.Platform.hpux module**

Platform-specific initialization for HP-UX systems.
There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic `SCons.Platform.Platform()` selection method.

`SCons.Platform.hpux.generate (env) → None`

**SCons.Platform.irix module**

Platform-specific initialization for SGI IRIX systems.
There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic `SCons.Platform.Platform()` selection method.

`SCons.Platform.irix.generate (env) → None`

**SCons.Platform.mingw module**

Platform-specific initialization for the MinGW system.

**SCons.Platform.os2 module**

Platform-specific initialization for OS/2 systems.
There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic `SCons.Platform.Platform()` selection method.

`SCons.Platform.os2.generate (env) → None`
SCons.Platform package

SCons.Platform.posix module
Platform-specific initialization for POSIX (Linux, UNIX, etc.) systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic SCons.Platform.Platform() selection method.

SCons.Platform.posix.escape (arg)
- escape shell special characters

SCons.Platform.posix.exec_popen3 (l, env, stdout, stderr)
SCons.Platform.posix.exec_subprocess (l, env)
SCons.Platform.posix.generate (env) → None
SCons.Platform.posix.piped_env_spawn (sh, escape, cmd, args, env, stdout, stderr)
SCons.Platform.posix.subprocess_spawn (sh, escape, cmd, args, env)

SCons.Platform.sunos module
Platform-specific initialization for Sun systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic SCons.Platform.Platform() selection method.

SCons.Platform.sunos.generate (env) → None

SCons.Platform.virtualenv module
`Platform` support for a Python virtualenv.

SCons.Platform.virtualenv.ImportVirtualenv (env) → None
- Copies virtualenv-related environment variables from OS environment to env['ENV'] and prepends virtualenv’s PATH to env['ENV']['PATH'].

SCons.Platform.virtualenv.IsInVirtualenv (path)
- Returns True, if path is under virtualenv’s home directory. If not, or if we don’t use virtualenv, returns False.

SCons.Platform.virtualenv.Virtualenv ()
- Returns path to the virtualenv home if scons is executing within a virtualenv or None, if not.

SCons.Platform.virtualenv._enable_virtualenv_default ()
SCons.Platform.virtualenv._ignore_virtualenv_default ()
SCons.Platform.virtualenv._inject_venv_path (env, path_list=None) → None
- Modify environment such that SCons will take into account its virtualenv when running external tools.

SCons.Platform.virtualenv._inject_venv_variables (env) → None
SCons.Platform.virtualenv._is_path_in (path, base) → bool
- Returns true if path is located under the base directory.

SCons.Platform.virtualenv._running_in_virtualenv ()
- Returns True if scons is executed within a virtualenv

SCons.Platform.virtualenv.select_paths_in_venv (path_list)
- Returns a list of paths from path_list which are under virtualenv’s home directory.

SCons.Platform.win32 module
Platform-specific initialization for Win32 systems.

There normally shouldn’t be any need to import this module directly. It will usually be imported through the generic SCons.Platform.Platform() selection method.

class SCons.Platform.win32.ArchDefinition (arch, synonyms=[])
- Bases: object
  - Determine which windows CPU were running on. A class for defining architecture-specific settings and logic.

SCons.Platform.win32.escape (x)
SCons.Platform.win32.exec_spawn (l, env)
SCons.Platform.win32.generate (env)
SCons.Platform.win32.get_architecture (arch=None)
- Returns the definition for the specified architecture string.
The Scanner package for the SCons software construction utility.

**SCons.Scanner.Base**  
alias of ScannerBase

**class SCons.Scanner.Classic**  
(name, suffixes, path_variable, regex, *args, **kwargs)

Bases: Current

A Scanner subclass to contain the common logic for classic CPP-style include scanning, but which can be customized to use different regular expressions to find the includes.

Note that in order for this to work "out of the box" (without overriding the find_include() and sort_key1() methods), the regular expression passed to the constructor must return the name of the include file in group 0.

__call__(node, env, path=()) → list  
Scans a single object.

**Parameters:**

- **node** – the node that will be passed to the scanner function
- **env** – the environment that will be passed to the scanner function.
- **path** – tuple of paths from the path_function

**Returns:** A list of direct dependency nodes for the specified node.

**static _recurse_all_nodes** (nodes)

**static _recurse_no_nodes** (nodes)

**add_scanner** (skey, scanner) → None

**add_skey** (skey) → None

Add a skey to the list of skeys

**static find_include** (include, source_dir, path)

**find_include_names** (node)

**get_skeys** (env=None)

**path** (env, dir=None, target=None, source=None)

**scan** (node, path=())

**select** (node)

**static sort_key** (include)

**class SCons.Scanner.ClassicCPP**  
(name, suffixes, path_variable, regex, *args, **kwargs)

Bases: Classic

A Classic Scanner subclass which takes into account the type of bracketing used to include the file, and uses classic CPP rules for searching for the files based on the bracketing.

Note that in order for this to work, the regular expression passed to the constructor must return the leading bracket in group 0, and the contained filename in group 1.

__call__(node, env, path=()) → list  
Scans a single object.
Parameters:
- **node** – the node that will be passed to the scanner function
- **env** – the environment that will be passed to the scanner function.
- **path** – tuple of paths from the `path_function`

Returns: A list of direct dependency nodes for the specified node.

```python
class SCons.Scanner.Current(*args, **kwargs):
    Bases: ScannerBase
    A class for scanning files that are source files (have no builder) or are derived files and are current (which implies that they exist, either locally or in a repository).

    __call__(node, env, path=()) → list
    Scans a single object.
```

```python
class SCons.Scanner.FindPathDirs(variable):
    Bases: object
    Class to bind a specific E[*]PATH variable name to a function that will return all of the E[*]path directories.
```

### SCons.Scanner.Scanner

Factory function to create a Scanner Object.

```
class SCons.Scanner.Scanner(function, *args, **kwargs):
    Factory function to create a Scanner Object.
```

```python
class SCons.Scanner.ScannerBase(function, name: str = 'NONE', argument=<class 'SCons.Scanner._Null'>, skeys=<class 'SCons.Scanner._Null'>, path_function=None, node_class=<class 'SCons.Node.FS.Base'>, node_factory=None, scan_check=None, recursive=None):
    Bases: object
    Base class for dependency scanners.
    Implements straightforward, single-pass scanning of a single file.
    A Scanner is usually set up with a scanner function (and optionally a path function), but can also be a kind of dispatcher which passes control to other Scanners.
```

SCons.Scanner package

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A scanner function takes three arguments: a Node to scan for dependencies, the construction environment to use, and an optional tuple of paths (as generated by the optional path function). It must return a list containing the Nodes for all the direct dependencies of the file.

The optional path function is called to return paths that can be searched for implicit dependency files. It takes five arguments: a construction environment, a Node for the directory containing the SConscript file that defined the primary target, a list of target nodes, a list of source nodes, and the optional argument for this instance.

Examples:

```
s = Scanner(my_scanner_function)
s = Scanner(function=my_scanner_function)
s = Scanner(function=my_scanner_function, argument='foo')
```

Parameters:

- **function** – either a scanner function taking two or three arguments and returning a list of File Nodes; or a mapping of keys to other Scanner objects.
- **name** – an optional name for identifying this scanner object (defaults to “NONE”).
- **argument** – an optional argument that will be passed to both function and path_function.
- **skeys** – an optional list argument that can be used to determine if this scanner can be used for a given Node. In the case of File nodes, for example, the skeys would be file suffixes.
- **path_function** – an optional function which returns a tuple of the directories that can be searched for implicit dependency files. May also return a callable which is called with no args and returns the tuple (supporting Bindable class).
- **node_class** – optional class of Nodes which this scan will return. If not specified, defaults to SCons.Node.FS.Base. If node_class is None, then this scanner will not enforce any Node conversion and will return the raw results from function.
- **node_factory** – optional factory function to be called to translate the raw results returned by function into the expected node_class objects.
- **scan_check** – optional function to be called to first check whether this node really needs to be scanned.
- **recursive** – optional specifier of whether this scanner should be invoked recursively on all of the implicit dependencies it returns (for example #include lines in C source files, which may refer to header files which should themselves be scanned). May be a callable, which will be called to filter the list of nodes found to select a subset for recursive scanning (the canonical example being only recursively scanning subdirectories within a directory). The default is to not do recursive scanning.

```
__call__(node, env, path=()) → list

Scans a single object.
```

Parameters:

- **node** – the node that will be passed to the scanner function
- **env** – the environment that will be passed to the scanner function.

Returns:

A list of direct dependency nodes for the specified node.

```
static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) → None
add_skey (skey) → None
    Add a skey to the list of skeys
get_skeys (env=None)
pool (env, dir=None, target=None, source=None)
```
SCons.Scanner package

```python
select (node)
class SCons.Scanner.Selector (mapping, *args, **kwargs)
    Bases: ScannerBase
    A class for selecting a more specific scanner based on the scanner_key() (suffix) for a specific Node.
    TODO: This functionality has been moved into the inner workings of the ScannerBase class, and this class will be
deprecated at some point. (It was never exposed directly as part of the public interface, although it is used by the
Scanner() factory function that was used by various Tool modules and therefore was likely a template for custom
modules that may be out there.)
static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) → None
add_skey (skey) → None
    Add a skey to the list of skeys
get_skeys (env=None)
path (env, dir=None, target=None, source=None)
select (node)
class SCons.Scanner._Null
    Bases: object
SCons.Scanner._null
    alias of _Null

Submodules

SCons.Scanner.C module

Dependency scanner for C/C++ code.

Two scanners are defined here: the default CScanner, and the optional CConditionalScanner, which must be explicitly
selected by calling add_scanner() for each affected suffix.
SCons.Scanner.C.CConditionalScanner ()
    Return an advanced conditional Scanner instance for scanning source files
    Interprets C/C++ Preprocessor conditional syntax (#ifdef, #if, defined, #else, #elif, etc.).
SCons.Scanner.C.CScanner ()
    Return a prototype Scanner instance for scanning source files that use the C pre-processor
class SCons.Scanner.C.SConsCPPConditionalScanner (*args, **kwargs)
    Bases: PreProcessor
    SCons-specific subclass of the cpp.py module's processing.
    We subclass this so that: 1) we can deal with files represented by Nodes, not strings; 2) we can keep track of the files
    that are missing.
__call__ (file)
    Pre-processes a file.
    This is the main public entry point.
_do_if_else_condition (condition) → None
    Common logic for evaluating the conditions on #if, #ifdef and #ifndef lines.
_match_tuples (tuples)
_parse_tuples (contents)
_process_tuples (tuples, file=None)
all_include (t) → None
do_define (t) → None
do_elif (t) → None
do_else (t) → None
do_endif (t) → None
do_if (t) → None
```
Default handling of a #if line.
do_ifdef (t) → None

Default handling of a #ifndef line.
do ifndef (t) → None

Default handling of a #import line.
do import (t) → None

Default handling of a #include line.
do include (t) → None

do include_next (t) → None

Default handling of a #include line.
do nothing (t) → None

Null method for when we explicitly want the action for a specific preprocessor directive to do nothing.
do undef (t) → None

Default handling of a #undef line.
eval_expression (t)

Evaluates a C preprocessor expression.

This is done by converting it to a Python equivalent and eval()ing it in the C preprocessor namespace we use to track #define values.

finalize_result (fname)

find_include_file (t)

Finds the #include file for a given preprocessor tuple.

initialize_result (fname) → None

process_contents (contents)

Pre-processes a file's contents.

Is used by tests

process_file (file)

Pre-processes a file.

This is the main internal entry point.

read_file (file) → str

resolve_include (t)

Resolve a tuple-ized #include line.

This handles recursive expansion of values without "" or <> surrounding the name until an initial " or < is found, to handle #include FILE where FILE is a #define somewhere else.

restore () → None

Pops the previous dispatch table off the stack and makes it the current one.

save () → None

Pushes the current dispatch table on the stack and re-initializes the current dispatch table to the default.

scons_current_file (t) → None

start_handling_includes (t=None) → None

Causes the PreProcessor object to start processing #import, #include and #include_next lines.

This method will be called when a #if, #ifdef, #ifndef or #elif evaluates True, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated False.

stop_handling_includes (t=None) → None

Causes the PreProcessor object to stop processing #import, #include and #include_next lines.

This method will be called when a #if, #ifdef, #ifndef or #elif evaluates False, or when we reach the #else in a #if, #ifdef, #ifndef or #elif block where a condition already evaluated True.

tupleize (contents)

Turns the contents of a file into a list of easily-processed tuples describing the CPP lines in the file.

The first element of each tuple is the line's preprocessor directive (#if, #include, #define, etc., minus the initial '#').

The remaining elements are specific to the type of directive, as pulled apart by the regular expression.
class SCons.Scanner.C.SConsCPPConditionalScannerWrapper (name, variable)

Bases: object

The SCons wrapper around a cpp.py scanner.
This is the actual glue between the calling conventions of generic SCons scanners, and the (subclass of) cpp.py
class that knows how to look for #include lines with reasonably real C-preprocessor-like evaluation of
#if/#ifndef/#else/#elif lines.

```python
def _process_tuples(tuples, file=None):
    """Common logic for evaluating the conditions on #if, #ifdef and ifndef lines."""
    pass
```

```python
def do_if(t):
    """Default handling of a #if line."""
    pass
```

```python
def do_elif(t):
    """Default handling of a #elif line."""
    pass
```

```python
def do_else(t):
    """Default handling of a #else line."""
    pass
```

```python
def do endif(t):
    """Default handling of a #endif line."""
    pass
```

```python
def do_ifdef(t):
    """Default handling of a #ifdef line."""
    pass
```

```python
def do ifndef(t):
    """Default handling of a #ifndef line."""
    pass
```

```python
def do include(t):
    """Default handling of a #include line."""
    pass
```

```python
def do include_next(t):
    """Default handling of a #include line."""
    pass
```

```python
def do undef(t):
    """Default handling of a #undef line."""
    pass
```

```python
def eval_expression(t):
    """Evaluates a C preprocessor expression.
    This is done by converting it to a Python equivalent and eval()ing it in the C preprocessor namespace we use to
    track #define values."""
```

```python
def do_call_(file):
    """Pre-processes a file.
    This is the main public entry point.
    """
    pass
```

```python
recurse_nodes(nodes)
select(node)
class SCons.Scanner.C.SConsCPPScanner(*args, **kwargs)
    Bases: PreProcessor
    SCons-specific subclass of the cpp.py module's processing.
    We subclass this so that: 1) we can deal with files represented by Nodes, not strings; 2) we can keep track of the files
that are missing.
```

```python
def finalize_result(fname):
```

```python
find_include_file(t):
```

```python
initialize_result(fname) → None
```

```python
process_contents (contents)
    Pre-processes a file contents.
    Is used by tests
```

```python
process_file(file)
    Pre-processes a file.
```
This is the main internal entry point.
read_file (file) → str
resolve_include (t)
Resolve a tuple-ized #include line.
This handles recursive expansion of values without "" or <> surrounding the name until an initial " " or < is found, to	handle #include FILE where FILE is a #define somewhere else.
restore () → None
Pops the previous dispatch table off the stack and makes it the current one.
save () → None
Pushes the current dispatch table on the stack and re-initializes the current dispatch table to the default.
scons_current_file (t) → None
start_handling_includes (t=None)
Causes the PreProcessor object to start processing #import, #include and #include_next lines.
This method will be called when a #if, #ifdef, #ifndef or #elif evaluates True, or when we reach the #else in a #if,
#ifdef, #ifndef or #elif block where a condition already evaluated False.
stop_handling_includes (t=None)
Causes the PreProcessor object to stop processing #import, #include and #include_next lines.
This method will be called when a #if, #ifdef, #ifndef or #elif evaluates False, or when we reach the #else in a #if,
#ifdef, #ifndef or #elif block where a condition already evaluated True.
tupleize (contents)
Turns the contents of a file into a list of easily-processed tuples describing the CPP lines in the file.
The first element of each tuple is the line’s preprocessor directive (#if, #include, #define, etc., minus the initial ‘#’).
The remaining elements are specific to the type of directive, as pulled apart by the regular expression.
class SCons.Scanner.C.SConsCPPScannerWrapper (name, variable)
Bases: object
The SCons wrapper around a cpp.py scanner.
This is the actual glue between the calling conventions of generic SCons scanners, and the (subclass of) cpp.py
class that knows how to look for #include lines with reasonably real C-preprocessor-like evaluation of
#if/#ifdef/#else/#elif lines.
recurse_nodes (nodes)
select (node)
class SCons.Scanner.C.dictify_CPPDEFINES (env) → dict
Returns CPPDEFINES converted to a dict.
This should be similar to processDefines(). Unfortunately, we can’t do the simple thing of calling that routine and
passing the result to the dict() constructor, because it turns the defines into a list of “name=value” pairs, which the
dict constructor won’t consume correctly. Also cannot just call dict on CPPDEFINES itself - it’s fine if it’s stored in the
converted form (currently deque of tuples), but CPPDEFINES could be in other formats too.
So we have to do all the work here - keep concepts in sync with processDefines.

class SCons.Scanner.D.D
Bases: Classic
Scans a single object.
Parameters:
  • node – the node that will be passed to the scanner function
  • env – the environment that will be passed to the scanner function.
  • path – tuple of paths from the path_function
Returns: A list of direct dependency nodes for the specified node.
static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
SCons.Scanner package

```python
add_scanner (skey, scanner) → None
add_skey (skey) → None
    Add a skey to the list of skeys
static find_include (include, source_dir, path)
find_include_names (node)
get_skeys (env=None)
path (env, dir=None, target=None, source=None)
scan (node, path=())
select (node)
static sort_key (include)
SCons.Scanner.D.DScanner ()
    Return a prototype Scanner instance for scanning D source files
```

SCons.Scanner.Dir module

```python
SCons.Scanner.Dir.DirEntryScanner (**kwargs)
    Return a prototype Scanner instance for “scanning” directory Nodes for their in-memory entries
SCons.Scanner.Dir.DirScanner (**kwargs)
    Return a prototype Scanner instance for scanning directories for on-disk files
SCons.Scanner.Dir.do_not_scan (k)
SCons.Scanner.Dir.only_dirs (nodes)
SCons.Scanner.Dir.scan_in_memory (node, env, path=())
    “Scans” a Node.FS.Dir for its in-memory entries.
SCons.Scanner.Dir.scan_on_disk (node, env, path=())
    Scans a directory for on-disk files and directories therein.
    Looking up the entries will add these to the in-memory Node tree representation of the file system, so all we have to
    do is just that and then call the in-memory scanning function.
```

SCons.Scanner.Fortran module

Dependency scanner for Fortran code.

```python
class SCons.Scanner.Fortran.F90Scanner (name, suffixes, path_variable, use_regex, incl_regex, def_regex, *args, **kwargs)
    Bases: Classic
    A Classic Scanner subclass for Fortran source files which takes into account both USE and INCLUDE statements.
    This scanner will work for both F77 and F90 (and beyond) compilers.
    Currently, this scanner assumes that the include files do not contain USE statements. To enable the ability to deal
    with USE statements in include files, add logic right after the module names are found to loop over each include file,
    search for and locate each USE statement, and append each module name to the list of dependencies. Caching the
    search results in a common dictionary somewhere so that the same include file is not searched multiple times would
    be a smart thing to do.
__call__ (node, env, path=()) → list
    Scans a single object.

Parameters:

- node – the node that will be passed to the scanner function
- env – the environment that will be passed to the scanner function.
- path – tuple of paths from the path_function

Returns: A list of direct dependency nodes for the specified node.
```

```python
static _recurse_all_nodes (nodes)
static _recurse_no_nodes (nodes)
add_scanner (skey, scanner) → None
add_skey (skey) → None
    Add a skey to the list of skeys
static find_include (include, source_dir, path)
find_include_names (node)
```

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SCons.Scanner package

```python
get_skeys (env=None)
path (env, dir=None, target=None, source=None)
scan (node, env, path=())
select (node)
static sort_key (include)
```

SCons.Scanner.Fortran.FortranScan (path_variable: str = 'FORTRANPATH')

Return a prototype Scanner instance for scanning source files for Fortran USE & INCLUDE statements

SCons.Scanner.IDL module

Dependency scanner for IDL (Interface Definition Language) files.
SCons.Scanner.IDL.IDLScan ()

Return a prototype Scanner instance for scanning IDL source files

SCons.Scanner.Java module

SCons.Scanner.Java.JavaScanner ()

Scanner for .java files.
New in version 4.4.
SCons.Scanner.Java._collect_classes (classList, dirName, files) → None
SCons.Scanner.Java._subst_paths (env, paths) → list

Return a list of substituted path elements.
If `paths` is a string, it is split on the search-path separator. Otherwise, substitution is done on string-valued list elements but they are not split.

Note helps support behavior like pulling in the external CLASSPATH and setting it directly into JAVACLASSPATH, however splitting on os.pathsep makes the interpretation system-specific (this is warned about in the manpage entry for JAVACLASSPATH).

SCons.Scanner.Java.scan (node, env, libpath=()) → list

Scan for files both on JAVACLASSPATH and JAVAPROCESSORPATH.

JAVACLASSPATH/JAVAPROCESSORPATH path can contain:

- Explicit paths to JAR/Zip files
- Wildcards (*)
- Directories which contain classes in an unnamed package
- Parent directories of the root package for classes in a named package

Class path entries that are neither directories nor archives (.zip or JAR files) nor the asterisk (*) wildcard character are ignored.

SCons.Scanner.LaTeX module

Dependency scanner for LaTeX code.

```python
class SCons.Scanner.LaTeX.FindENVPathDirs (variable)
    Bases: object
    A class to bind a specific E(*)PATH variable name to a function that will return all of the E(*)path directories.
class SCons.Scanner.LaTeX.LaTeX (name, suffixes, graphics_extensions, *args, **kwargs)
    Bases: ScannerBase
    Class for scanning LaTeX files for included files.
```

Unlike most scanners, which use regular expressions that just return the included file name, this returns a tuple consisting of the keyword for the inclusion (“include”, “includegraphics”, “input”, or “bibliography”), and then the file name itself. Based on a quick look at LaTeX documentation, it seems that we should append .tex suffix for the “include” keywords, append .tex if there is no extension for the “input” keyword, and need to add .bib for the “bibliography” keyword that does not accept extensions by itself.

Finally, if there is no extension for an “includegraphics” keyword latex will append .ps or .eps to find the file, while pdftex may use .pdf, .jpg, .tif, .mps, or .png.
The actual subset and search order may be altered by DeclareGraphicsExtensions command. This complication is ignored. The default order corresponds to experimentation with teTeX:

```
$ latex --version
pdfeTeX 3.141592-1.21a-2.2 (Web2C 7.5.4)
kpathsea version 3.5.4
```

The order is:

[`.eps`, `.ps`] for latex [`.png`, `.pdf`, `.jpg`, `.tif`].

Another difference is that the search path is determined by the type of the file being searched: `env[TEXINPUTS]` for “input” and “include” keywords `env[TEXINPUTS]` for “includegraphics” keyword `env[TEXINPUTS]` for “inputlisting” keyword `env[BIBINPUTS]` for “bibliography” keyword `env[BSTINPUTS]` for “bibliographystyle” keyword `env[INDEXSTYLE]` for “makeindex” keyword, no scanning support needed just allows user to set it if needed.

FIXME: also look for the class or style in document[\texttt{class|style}]{}  
FIXME: also look for the argument of \texttt{bibliographystyle}{}

```python
__call__ (node, env, path=()) → list
```

Scans a single object.

**Parameters:**
- `node` – the node that will be passed to the scanner function
- `env` – the environment that will be passed to the scanner function.
- `path` – tuple of paths from the *path_function*

**Returns:**  
A list of direct dependency nodes for the specified node.

```python
_latex_names (include_type, filename)
```

```python
static _recurse_all_nodes (nodes)
```

```python
static _recurse_no_nodes (nodes)
```

```python
add_scanner (skey, scanner) → None
```

```python
add_skey (skey) → None
```

Add a skey to the list of skeys

```python
canonical_text (text)
```

Standardize an input TeX-file contents.

**Currently:**
- removes comments, unwrapping comment-wrapped lines.

```python
ev
```

```python
env_variables = ['TEXINPUTS', 'BIBINPUTS', 'BSTINPUTS', 'INDEXSTYLE']
```

```python
find_include (include, source_dir, path)
```

```python
get_skeys (env=None)
```

```python
keyword_paths = ['addbibresource': 'BIBINPUTS', 'addglobalbib': 'BIBINPUTS', 'addsectionbib': 'BIBINPUTS', 'bibliography': 'BIBINPUTS', 'bibliographystyle': 'BSTINPUTS', 'include': 'TEXINPUTS', 'includegraphics': 'TEXINPUTS', 'input': 'TEXINPUTS', 'inputlisting': 'TEXINPUTS', 'makeindex': 'INDEXSTYLE', 'usepackage': 'TEXINPUTS']
```

```python
path (env, dir=None, target=None, source=None)
```

```python
scan (node, subdir: str = '.')
```

```python
scan_recurs (node, path=())
```

do a recursive scan of the top level target file This lets us search for included files based on the directory of the main file just as latex does

```python
select (node)
```

```python
static sort_key (include)
```

```python
two_arg_commands = ['import', 'subimport', 'includefrom', 'subincludefrom', 'inputfrom', 'subinputfrom']
```

```python
Scans.Scanner.LaTeX.LaTeXScanner ()
```

Return a prototype Scanner instance for scanning LaTeX source files when built with latex.

```python
Scans.Scanner.LaTeX.PDFLaTeXScanner ()
```

Return a prototype Scanner instance for scanning LaTeX source files when built with pdflatex.

```python
class SCons.Scanner.LaTeX_NULL
```
SCons.Script package

Bases: object
SCons.Scanner.LaTeX._null
   alias of _Null
SCons.Scanner.LaTeX.modify_env_var (env, var, abspath)

SCons.Scanner.Prog module
Dependency scanner for program files.
SCons.Scanner.Prog.ProgramScanner (**kwargs)
   Return a prototype Scanner instance for scanning executable files for static-lib dependencies
SCons.Scanner.Prog._subst_libs (env, libs)
   Substitute environment variables and split into list.
SCons.Scanner.Prog.scan (node, env, libpath=())
   Scans program files for static-library dependencies.
   It will search the LIBPATH environment variable for libraries specified in the LIBS variable, returning any files it finds as dependencies.

SCons.Scanner.RC module
Dependency scanner for RC (Interface Definition Language) files.
SCons.Scanner.RC.RCScan ()
   Return a prototype Scanner instance for scanning RC source files
SCons.Scanner.RC.no_tlb (nodes)
   Filter out .tlb files as they are binary and shouldn’t be scanned.

SCons.Scanner.SWIG module
Dependency scanner for SWIG code.
SCons.Scanner.SWIG.SWIGScanner()

SCons.Script package

Module contents

The main() function used by the scons script.

Architecturally, this is the scons script, and will likely only be called from the external “scons” wrapper. Consequently, anything here should not be, or be considered, part of the build engine. If it’s something that we expect other software to want to use, it should go in some other module. If it’s specific to the “scons” script invocation, it goes here.

SCons.Script.HelpFunction (text, append: bool = False, keep_local: bool = False) → None
   The implementaion of the the Help method.
   See Help().
   Changed in version 4.6.0: The keep_local parameter was added.

class SCons.Script.TargetList (initlist=None)
   Bases: UserList
   _abc_impl = <_abc._abc_data object>
   _add_Default (list) → None
   _clear () → None
   _do_nothing (*args, **kw) → None
   append (item)
      S.append(value) – append value to the end of the sequence
   clear () → None -- remove all items from S
   copy ()
   count (value) → integer -- return number of occurrences of value
   extend (other)
      S.extend(iterable) – extend sequence by appending elements from the iterable
   index (value[, start[, stop]]) → integer -- return first index of value.
Raises ValueError if the value is not present.
Supporting start and stop arguments is optional, but recommended.

```python
insert (i, item)
```

S.insert(index, value) – insert value before index

```python
pop ([, index]) → item -- remove and return item at index (default last).
```

Raise IndexError if list is empty or index is out of range.

```python
remove (item)
```

S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.

reverse ()

S.reverse() – reverse IN PLACE

```python
sort (**args, **kwds)
```

SCons.Script.Variables (files=None, args={})

SCons.Script._Add_Arguments (alist) → None

SCons.Script._Add_Targets (tlist) → None

SCons.Script._Get_Default_Targets (d, fs)

SCons.Script._Set_Default_Targets (env, tlist) → None

SCons.Script._Set_Default_Targets_Has_Been_Called (d, fs)

SCons.Script._Set_Default_Targets_Has_Not_Been_Called (d, fs)

SCons.Script.set_missing_sconscript_error (flag: bool = True) → bool

Set behavior on missing file in SConscript() call.

Returns: previous value

**Submodules**

SCons.Script.Interactive module

SCons interactive mode.

```python
class SCons.Script.Interactive.SConsInteractiveCmd (**kw)
```

Bases: Cmd

build [TARGETS] Build the specified TARGETS and their dependencies. ‘b’ is a synonym. clean [TARGETS] Clean (remove) the specified TARGETS and their dependencies. ‘c’ is a synonym. exit Exit SCons interactive mode. help [COMMAND] Prints help for the specified COMMAND. ‘h’ and ‘?’ are synonyms. shell [COMMANDLINE] Execute COMMANDLINE in a subshell. ‘sh’ and ‘!’ are synonyms. version Prints SCons version information.

```python
_do_one_help (arg) → None
_doc_to_help (obj)
_strip_initial_spaces (s)
```

cmdloop (intro=None)

Repeatedly issue a prompt, accept input, parse an initial prefix off the received input, and dispatch to action methods, passing them the remainder of the line as argument.

```python
columnize (list, displaywidth=80)
```

Display a list of strings as a compact set of columns.

Each column is only as wide as necessary. Columns are separated by two spaces (one was not legible enough).

```python
complete (text, state)
```

Return the next possible completion for ‘text’.

If a command has not been entered, then complete against command list. Otherwise try to call complete_<command> to get list of completions.

```python
complete_help (**args)
```

Method called to complete an input line when no command-specific complete_*() method is available.

By default, it returns an empty list.

```python
completedefault (**ignored)
```

Called on an input line when the command prefix is not recognized.

If this method is not overridden, it prints an error message and returns.

```python
do_EOF (argv) → None
```

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do_build (argv) \rightarrow None
  build [TARGETS] Build the specified TARGETS and their dependencies. ‘b’ is a synonym.
do_clean (argv)
  clean [TARGETS] Clean (remove) the specified TARGETS and their dependencies. ‘c’ is a synonym.
do_exit (argv) \rightarrow None
  exit Exit SCons interactive mode.
do_help (argv) \rightarrow None
  help [COMMAND] Prints help for the specified COMMAND. ‘h’ and ‘?’ are synonyms.
do_shell (argv) \rightarrow None
  shell [COMMANDLINE] Execute COMMANDLINE in a subshell. ‘sh’ and ‘!’ are synonyms.
do_version (argv) \rightarrow None
  version Prints SCons version information.
doc_header = 'Documented commands (type help <topic>):'
doc_leader = ''
emptyline ()
  Called when an empty line is entered in response to the prompt.
  If this method is not overridden, it repeats the last nonempty command entered.
get_names ()
  Returns a dictionary of identifiers.
identchars = 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789_'
intro = None
lastcmd = ''
misc_header = 'Miscellaneous help topics:'
nohelp = '*** No help on %s'
onecmd (line)
  Interpret the argument as though it had been typed in response to the prompt.
  This may be overridden, but should not normally need to be; see the precmd() and postcmd() methods for useful
  execution hooks. The return value is a flag indicating whether interpretation of commands by the interpreter should
  stop.
parseline (line)
  Parse the line into a command name and a string containing the arguments. Returns a tuple containing (command,
  args, line). ‘command’ and ‘args’ may be None if the line couldn’t be parsed.
prompt = '(Cmd) '
prompt = 's'
prompt = 's'
postcmd (stop, line)
  Hook method executed just after a command dispatch is finished.
prompt = '(Cmd) '
prompt = 's'
postcmd (stop, line)
  Hook method executed once when the cmdloop() method is about to return.
prompt = '(Cmd) '
precmd (line)
  Hook method executed just before the command line is interpreted, but after the input prompt is generated and
  issued.
prompt = '(Cmd) '
precmd (line)
  Hook method executed once when the cmdloop() method is called.
prompt = '(Cmd) '
print_topics (header, cmds, cmdlen, maxcol)
  Print the commands and their descriptions.
prompt = '(Cmd) '
ruler = '='
synonyms = {'b': 'build', 'c': 'clean', 'h': 'help', 'scons': 'build', 'sh': 'shell'}
undoc_header = 'Undocumented commands:'
use_rawinput = 1
SCons.Script.Interactive.interact (fs, parser, options, targets, target_top) \rightarrow None

SCons.Script package

The main() function used by the scons script.

Architecturally, this is the scons script, and will likely only be called from the external “scons” wrapper. Consequently,
anything here should not be, or be considered, part of the build engine. If it’s something that we expect other software
to want to use, it should go in some other module. If it’s specific to the “scons” script invocation, it goes here.
SCons.Script.Main.AddOption (*args, settable: bool = False, **kw) \rightarrow SConsOption
  Add a local option to the option parser - Public API.
If the `settable` parameter is true, the option will be included in the list of settable options; all other keyword arguments are passed on to `add_local_option()`.

Changed in version 4.8.0: The `settable` parameter added to allow including the new option to the table of options eligible to use `SetOption()`.

```python
class SCons.Script.Main.BuildTask (tm, targets, top, node)
Bases: OutOfDateTask
An SCons build task.
LOGGER = None
_abc_impl = <_abc._abc_data object>
_exception_raise ()
    Raises a pending exception that was recorded while getting a Task ready for execution.
_no_exception_to_raise () → None
display (message) → None
    Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.
do_failed (status: int = 2) → None
exc_clear () → None
    Clears any recorded exception.
    This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.
exc_info ()
    Returns info about a recorded exception.
exc_set (exception=None) → None
    Records an exception to be raised at the appropriate time.
    This also changes the “exception_raise” attribute to point to the method that will, in fact
execute () → None
    Called to execute the task.
    This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().
executed ()
    Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
    This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.
executed_with_callbacks () → None
    Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
    This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.
executed_without_callbacks () → None
    Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.
fail_continue () → None
    Explicit continue-the-build failure.
    This sets failure status on the target nodes and all of their dependent parent nodes.
    Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().
fail_stop () → None
    Explicit stop-the-build failure.
    This sets failure status on the target nodes and all of their dependent parent nodes.
```
SCons.Script package

Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

failed () → None
Default action when a task fails: stop the build.

Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready () → None
Make a task ready for execution

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute () → bool
Returns True (indicating this Task should be executed) if this Task’s target state indicates it needs executing, which has already been determined by an earlier up-to-date check.

postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare ()
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

trace_message (node, description: str = 'node') → None

**class** SCons.Script.Main.CleanTask (tm, targets, top, node)

Bases: AlwaysTask
An SCons clean task.

LOGGER = None

_abc_impl = <_abc._abc_data object>

_clean_targets (remove: bool = True) → None

_exception_raise ()
 Raises a pending exception that was recorded while getting a Task ready for execution.

_get_files_to_clean ()

_no_exception_to_raise () → None

display (message) → None
Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.

exc_clear () → None
Clears any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info ()
Returns info about a recorded exception.

exception_set (exception=None) → None
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact

execute () → None
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

executed () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

executed_with_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_without_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

failed () → None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

fs_delete (path:pathstr, remove: bool = True)

get_target ()
Fetch the target being built or updated by this task.

make_ready () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute () → bool
Always returns True (indicating this Task should always be executed).
Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:

class MyTaskSubclass(SCons.Taskmaster.Task):
    needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute

postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare () → None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary
directories before the Action is actually called to build the targets.

remove () → None
show () → None
trace_message (node, description: str = 'node') → None
SCons.Script.Main.DebugOptions (json: str | None = None) → None

Specify options to SCons debug logic - Public API.
Currently only json is supported, which changes the JSON file written to if the --debug=json command-line option
is specified to the value supplied.
New in version 4.6.0.
class SCons.Script.Main.FakeOptionParser
    Bases: object
    A do-nothing option parser, used for the initial OptionsParser value.
    During normal SCons operation, the OptionsParser is created right away by the main() function. Certain test scripts
however, can introspect on different Tool modules, the initialization of which can try to add a new, local option to an
otherwise uninitialized OptionsParser object. This allows that introspection to happen without blowing up.
class FakeOptionValues
    Bases: object
    add_local_option (*args, **kw) → SConsOption
values = <SCons.Script.Main.FakeOptionParser.FakeOptionValues object>
SCons.Script.Main.GetBuildFailures ()
Get the value from an option - Public API.
SCons.Script.Main.PrintHelp (file= None, local_only: bool = False) → None
SCons.Script.Main.Progress (*args, **kw) → None
Show progress during building - Public API.
class SCons.Script.Main.QuestionTask (tm, targets, top, node)
    Bases: AlwaysTask
    An SCons task for the -q (question) option.
    LOGGER = None
    _abc_impl = <_abc._abc_data object>
    _exception_raise ()
    Raises a pending exception that was recorded while getting a Task ready for execution.
    _no_exception_to_raise () → None
display (message) → None
    Hook to allow the calling interface to display a message.
    This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out
what Node should be built next, the actual target list may be altered, along with a message describing the
alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see
those messages.
exc_clear () → None
Clears any recorded exception.
    This also changes the "exception_raise" attribute to point to the appropriate do-nothing method.
exc_info ()
    Returns info about a recorded exception.
exception_set (exception=\texttt{None}) → \texttt{None}
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact
execute () → \texttt{None}
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().
executed () → \texttt{None}
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.
executed_with_callbacks () → \texttt{None}
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.
executed_without_callbacks () → \texttt{None}
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.
fail_continue () → \texttt{None}
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().
fail_stop () → \texttt{None}
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().
fail () → \texttt{None}
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().
get_target ()
Fetch the target being built or updated by this task.
make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.
make_ready_all () → \texttt{None}
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.
make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.
needs_execute () → \texttt{bool}
Always returns True (indicating this Task should always be executed).
Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:

    class MyTaskSubclass(SCons.Taskmaster.Task):

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needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute
postprocess () \rightarrow None
   Post-processes a task after it’s been executed.
   This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no
   build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a
   common side effect, that can be put back on the candidates list.
prepare () \rightarrow None
   Called just before the task is executed.
   This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary
   directories before the Action is actually called to build the targets.
trace_message (node, description: str = 'node') \rightarrow None
exception SCons.Script.Main.SConsPrintHelpException
   Bases: Exception
   add_note ()
      Exception.add_note(note) – add a note to the exception
   args
   with_traceback ()
      Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
SCons.Script.Main.SetOption (name: str, value)
   Set the value of an option - Public API.
class SCons.Script.Main.TreePrinter (derived: bool = False, prune: bool = False, status: bool = False,
   sLineDraw: bool = False)
   Bases: object
   display (t) \rightarrow None
   get_all_children (node)
   get_derived_children (node)
SCons.Script.Main.ValidateOptions (throw_exception: bool = False) \rightarrow None
   Validate options passed to SCons on the command line.
   Checks that all options given on the command line are known to this instance of SCons. Call after all of the cli options
   have been set up through AddOption() calls. For example, if you added an option --xyz and you call SCons with
   --xyy you can cause SCons to issue an error message and exit by calling this function.
   Parameters: throw_exception – if an invalid option is present on the command line, raises an exception if
   this optional parameter evaluates true; if false (the default), issue a message and exit with error
   status.
   Raises: SConsBadOptionError – If throw_exception is true and there are invalid options on the
   command line.
New in version 4.5.0.
SCons.Script.Main._SConstruct_exists (dirname: str, repositories: List[str], filelist: List[str])
   \rightarrow str | None
   Check that an SConstruct file exists in a directory.
   Parameters:
      • dirname – the directory to search. If empty, look in cwd.
      • repositories – a list of repositories to search in addition to the project directory tree.
      • filelist – names of SConstruct file(s) to search for. If empty list, use the built-in list of
   names.
   Returns: The path to the located SConstruct file, or None.
SCons.Script.Main._build_targets (fs, options, targets, target_top)
SCons.Script.Main._create_path (plist)
SCons.Script.Main._exec_main (parser, values) \rightarrow None
SCons.Script.Main._load_all_site_scons_dirs (topdir, verbose: bool = False) \rightarrow None
   Load all of the predefined site_scons dirs. Order is significant; we load them in order from most generic
   (machine-wide) to most specific (topdir). The verbose argument is only for testing.
SCons.Script.Main._load_site_scons_dir (topdir, site_dir_name=None)
Load the site directory under topon.
If a site dir name is supplied use it, else use default "site_scons". Prepend site dir to sys.path. If a "site_tools" subdir exists, prepend to toolpath. Import "site_init.py" from site dir if it exists.

SCons.Script.Main._main (parser)
SCons.Script.Main._scons_internal_error () → None
Handle all errors but user errors. Print out a message telling the user what to do in this case and print a normal trace.
SCons.Script.Main._scons_internal_warning (e) → None
Slightly different from _scons_user_warning in that we use the current call stack rather than sys.exc_info() to get our stack trace. This is used by the warnings framework to print warnings.
SCons.Script.Main._scons_syntax_error (e) → None
Handle syntax errors. Print out a message and show where the error occurred.
SCons.Script.Main._scons_user_error (e) → None
Handle user errors. Print out a message and a description of the error, along with the line number and routine where it occurred. The file and line number will be the deepest stack frame that is not part of SCons itself.
SCons.Script.Main._scons_user_warning (e) → None
Handle user warnings. Print out a message and a description of the warning, along with the line number and routine where it occurred. The file and line number will be the deepest stack frame that is not part of SCons itself.

SCons.Script.Main._set_debug_values (options) → None
SCons.Script.Main.find_deepest_user_frame (tb)
Find the deepest stack frame that is not part of SCons.
Input is a "pre-processed" stack trace in the form returned by traceback.extract_tb() or traceback.extract_stack()
SCons.Script.Main.main () → None
SCons.Script.Main.path_string (label, module) → str
SCons.Script.Main.python_version_deprecated (version=sys.version_info(major=3, minor=11, micro=9, releaselevel='final', serial=0))
SCons.Script.Main.python_version_string ()
SCons.Script.Main.python_version_unsupported (version=sys.version_info(major=3, minor=11, micro=9, releaselevel='final', serial=0))
SCons.Script.Main.revert_io () → None
SCons.Script.Main.test_load_all_site_scons_dirs (d) → None
SCons.Script.Main.version_string (label, module)

SCons.Script.SConsOptions module
SCons.Script.SConsOptions.Parser (version)
Returns a parser object initialized with the standard SCons options.
Add options in the order we want them to show up in the -H help text, basically alphabetical. For readability, Each add_option() call should have a consistent format:

```python
op.add_option(
    "-L", "--long-option-name",
nargs=1, type="string",
dest="long_option_name", default='foo',
action="callback", callback=opt_long_option,
help="help text goes here",
metavar="VAR"
)
```

Even though the optparse module constructs reasonable default destination names from the long option names, we’re going to be explicit about each one for easier readability and so this code will at least show up when grepping the source for option attribute names, or otherwise browsing the source code.

SCons.Script.SConsOptions.SConsBadOptionError (opt_str, parser=None)
Bases: BadOptionError
Exception used to indicate that invalid command line options were specified
Variables:

- **opt_str** (*str*) – The offending option specified on command line which is not recognized
- **parser** (*OptionParser*) – The active argument parser

```python
add_note ()
Exception.add_note(note) – add a note to the exception

args
with_traceback ()
Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.
```

```python
class SCons.Script.SConsOptions.SConsIndentedHelpFormatter (indent_increment=2,
max_help_position=24, width=None, short_first=1)
Bases: IndentedHelpFormatter

NO_DEFAULT_VALUE = 'none'

_format_text (text)
Format a paragraph of free-form text for inclusion in the help output at the current indentation level.

dedent ()
expand_default (option)
format_description (description)
format_epilog (epilog)
format_heading (heading)

Translates heading to “SCons Options”
Heading of “Options” changed to “SCons Options.” Unfortunately, we have to do this here, because those titles are
hard-coded in the optparse calls.

format_option (option)
Customized option formatter.
A copy of the normal optparse.IndentedHelpFormatter.format_option() method. This has been
snarfed so we can modify text wrapping to our liking:

- add our own regular expression that doesn’t break on hyphens (so things like --no-print-directory
don’t get broken).
- wrap the list of options themselves when it’s too long (the wrapper.fill(opts) call below).
- set the subsequent_indent when wrapping the help_text.
The help for each option consists of two parts:

- the opt strings and metavariables e.g. (“-x”, or “-fFILENAME, --file=FILENAME”)
- the user-supplied help string e.g. (“turn on expert mode”, “read data from FILENAME”)

If possible, we write both of these on the same line:

```
-x turn on expert mode
```

But if the opt string list is too long, we put the help string on a second line, indented to the same column it would
start in if it fit on the first line:

```
-fFILENAME, --file=FILENAME
read data from FILENAME
```

format_option_strings (option)
Return a comma-separated list of option strings & metavariables.

format_usage (usage) → str
Formats the usage message.

indent ()
set_long_opt_delimiter (delim)
set_parser (parser)
set_short_opt_delimiter (delim)
store_local_option_strings (parser, group)
```
Local-only version of store_option_strings.
We need to replicate this so the formatter will be set up properly if we didn’t go through the “normal”.
New in version 4.6.0.

```python
class SCons.Script.SConsOptions.SConsOption (*opts, **attrs)

Bases: Option

ACTIONS = ('store', 'store_const', 'store_true', 'store_false', 'append', 'append_const', 'count', 'callback', 'help', 'version')

ALWAYS_TYPED_ACTIONS = ('store', 'append')

ATTRS = ['action', 'type', 'dest', 'default', 'nargs', 'const', 'choices', 'callback', 'callback_args', 'callback_kwargs', 'help', 'metavar']

CHECK_METHODS = [Option._check_action, Option._check_type, Option._check_choice, Option._check_dest, Option._check_const, Option._check_nargs, Option._check_callback, SConsOption._check_nargs_optional]

CONST_ACTIONS = ('store_const', 'append_const', 'store', 'append', 'callback')

STORE_ACTIONS = ('store', 'store_const', 'store_true', 'store_false', 'append', 'append_const', 'count')

TYPED_ACTIONS = ('store', 'append', 'callback')

TYPES = ('string', 'int', 'long', 'float', 'complex', 'choice')

TYPE_CHECKER = {'choice': check_choice, 'complex': check_builtin, 'float': check_builtin, 'int': check_builtin, 'long': check_builtin}

_check_action()  
_check_callback()  
_check_choice()  
_check_const()  
_check_dest()  
_check_nargs()  
_check_nargs_optional()  
_check_opt_strings()  
_check_type()  
_set_attrs()  
_set_opt_strings()  
check_value()  
convert_value()  
get_opt_string()  
process()  
take_action()  
takes_value()  
```

class SCons.Script.SConsOptions.SConsOptionGroup (parser, title, description=None)

Bases: OptionGroup

A subclass for SCons-specific option groups.
The only difference between this and the base class is that we print the group’s help text flush left, underneath their own title but lined up with the normal “SCons Options”.

_check_conflict()  
_create_option_list()  
_create_option_mappings()  
_share_option_mappings()  
add_option()  
add_option()  
add_options()  
destroy()  
format_description()  
format_help()  

Format an option group’s help text.
The title is dedented so it’s flush with the “SCons Options” title we print at the top.

SCons.Script package

get_description ()
get_option (opt_str)
has_option (opt_str)
remove_option (opt_str)
set_conflict_handler (handler)
set_description (description)
set_title (title)

class SCons.Script.SConsOptions.SConsOptionParser (usage=None, option_list=None,
option_class=<class 'optparse.Option'>, version=None, conflict_handler='error',
description=None, formatter=None, add_help_option=True, prog=None, epilog=None)

    Bases: OptionParser

    _add_help_option ()
    _add_version_option ()
    _check_conflict (option)
    _create_option_list ()
    _create_option_mappings ()
    _get_all_options ()
    _get_args (args)
    _init_parsing_state ()
    _match_long_opt (opt: string) → string
    Determine which long option string 'opt' matches, ie. which one it is an unambiguous abbreviation for. Raises BadOptionError if 'opt' doesn't unambiguously match any long option string.
    _populate_option_list (option_list, add_help=True)
    _process_args (largs, rargs, values)

    _process_args(largs : [string],
    rargs : [string], values : Values)
    Process command-line arguments and populate ‘values’, consuming options and arguments from ‘rargs’. If ‘allow_interspersed_args’ is false, stop at the first non-option argument. If true, accumulate any interspersed non-option arguments in ‘largs’.

    _process_long_opt (rargs, values)
    SCons-specific processing of long options.
    This is copied directly from the normal optparse._process_long_opt() method, except that, if configured to do so, we catch the exception thrown when an unknown option is encountered and just stick it back on the “ leftover” arguments for later (re-)processing. This is because we may see the option definition later, while processing SConscript files.

    _process_short_opts (rargs, values)
    _share_option_mappings (parser)

    add_local_option (*args, **kw) → SConsOption
    Adds a local option to the parser.
    This is initiated by an AddOption() call to add a user-defined command-line option. Add the option to a separate option group for the local options, creating the group if necessary.
    The keyword argument settable is recognized specially (and removed from kw). If true, the option is marked as modifiable; by default “local” (project-added) options are not eligible for for SetOption() calls.
    Changed in version 4.8.0: Added special handling of settable.

    add_option (Option)

    add_option (opt_str, ..., kwarg=val, ...) → None
    add_option_group (*args, **kwargs)
    add_options (option_list)

    check_values (values: Values, args: [string])
    → (values : Values, args : [string])
    Check that the supplied option values and leftover arguments are valid. Returns the option values and leftover arguments (possibly adjusted, possibly completely new – whatever you like). Default implementation just returns the passed-in values; subclasses may override as desired.

    destroy ()
Declare that you are done with this OptionParser. This cleans up reference cycles so the OptionParser (and all
objects referenced by it) can be garbage-collected promptly. After calling destroy(), the OptionParser is unusable.

disable_interspersed_args ()
Set parsing to stop on the first non-option. Use this if you have a command processor which runs another
command that has options of its own and you want to make sure these options don’t get confused.

enable_interspersed_args ()
Set parsing to not stop on the first non-option, allowing interspersing switches with command arguments. This is
the default behavior. See also disable_interspersed_args() and the class documentation description of the attribute
allow_interspersed_args.

error (msg)
Overridden OptionValueError exception handler.

exit (status=0, msg=None)

expand_prog_name (s)

format_description (formatter)

format_epilog (formatter)

format_help (formatter=None)

format_local_option_help (formatter=None, file=None)
  Return the help for the project-level (“local”) options.
  New in version 4.6.0.

format_option_help (formatter=None)

get_default_values ()

get_description ()

get_option (opt_str)

get_option_group (opt_str)

get_prog_name ()

get_usage ()

get_version ()

has_option (opt_str)

parse_args (args=None, values=None)
  -> (values : Values, args : [string])
  Parse the command-line options found in ‘args’ (default: sys.argv[1:]). Any errors result in a call to ‘error()’, which
  by default prints the usage message to stderr and calls sys.exit() with an error message. On success returns a pair
  (values, args) where ‘values’ is a Values instance (with all your option values) and ‘args’ is the list of arguments left
  after parsing options.

preserve_unknown_options = False

print_help (file: file = stdout)
  Print an extended help message, listing all options and any help text provided with them, to ‘file’ (default stdout).

print_local_option_help (file=None)
  Print help for just project-defined options.
  Writes to file (default stdout).
  New in version 4.6.0.

print_usage (file: file = stdout)
  Print the usage message for the current program (self.usage) to ‘file’ (default stdout). Any occurrence of the string
  “%prog” in self.usage is replaced with the name of the current program (basename of sys.argv[0]). Does nothing if
  self.usage is empty or not defined.

print_version (file: file = stdout)
  Print the version message for this program (self.version) to ‘file’ (default stdout). As with print_usage(), any
  occurrence of “%prog” in self.version is replaced by the current program’s name. Does nothing if self.version is
  empty or undefined.

raise_exception_on_error = False

remove_option (opt_str)

reparse_local_options () -> None
  Re-parse the leftover command-line options.
Leftover options are stored in `self.largs`, so that any value overridden on the command line is immediately available if the user turns around and does a `GetOption()` right away.

We mimic the processing of the single args in the original `OptionParser._process_args()`, but here we allow exact matches for long-opts only (no partial argument names!). Otherwise there could be problems in `add_local_option()` below. When called from there, we try to reparse the command-line arguments that

1. haven’t been processed so far (`self.largs`), but
2. are possibly not added to the list of options yet.

So, when we only have a value for `--myargument` so far, a command-line argument of `--myarg=test` would set it, per the behaviour of `_match_long_opt()`, which allows for partial matches of the option name, as long as the common prefix appears to be unique. This would lead to further confusion, because we might want to add another option `--myarg` later on (see issue #2929).

```python
set_conflict_handler (handler)
set_default (dest, value)
set_defaults (**kwargs)
set_description (description)
set_process_default_values (process)
set_usage (usage)
standard_option_list = []
```

```python
class SCons.Script.SConsOptions.SConsValues (defaults)
Bases: Values
Holder class for uniform access to SCons options.
A SCons option value can originate three different ways:

1. set on the command line.
2. set in an SConscript file via `SetOption()`.
3. the default setting (from the the `op.add_option()` calls in the `Parser()` function, below).
```

The command line always overrides a value set in a SConscript file, which in turn always overrides default settings. Because we want to support user-specified options in the SConscript file itself, though, we may not know about all of the options when the command line is first parsed, so we can’t make all the necessary precedence decisions at the time the option is configured.

The solution implemented in this class is to keep these different sets of settings separate (command line, SConscript file, and default) and to override the `__getattr__()` method to check them in turn. This allows the rest of the code to just fetch values as attributes of an instance of this class, without having to worry about where they came from (the scheme is similar to a `ChainMap`).

Note that not all command line options are settable from SConscript files, and the ones that are must be explicitly added to the settable list in this class, and optionally validated and coerced in the `set_option()` method.

```python
__getattr__ (attr)
Fetch an options value, respecting priority rules.
This is a little tricky: since we’re answering questions about ourselves, we have avoid lookups that would send us
to into infinite recursion, thus the `__dict__` stuff.
__update (dict, mode)
__update_careful (dict)
Update the option values from an arbitrary dictionary, but only use keys from dict that already have a
corresponding attribute in self. Any keys in dict without a corresponding attribute are silently ignored.
__update_loose (dict)
Update the option values from an arbitrary dictionary, using all keys from the dictionary regardless of whether they
have a corresponding attribute in self or not.
```

```python
ensure_value (attr, value)
read_file (filename, mode=’careful’)
read_module (modname, mode=’careful’)
set_option (name: str, value) → None
```

Sets an option `name` from an SConscript file.

Validation steps for known (that is, defined in SCons itself) options are in-line here. Validation should be along the
same lines as for options processed from the command line - it’s kind of a pain to have to duplicate.
Project-defined options can specify callbacks for the command-line version, but will have no inbuilt validation here.
It's up to the build system maintainer to make sure SetOption() is being used correctly, we can't really do any better here.

**Raises:** `UserError` – the option is not settable.

```python
settable = ['clean', 'diskcheck', 'duplicate', 'experimental', 'hash_chunksize', 'hash_format', 'help', 'implicit_cache', 'implicit_deps_changed', 'implicit_deps_unchanged', 'max_drift', 'md5_chunksize', 'no_exec', 'no_progress', 'num_jobs', 'random', 'silent', 'stack_size', 'warn']
```

SCons.Script.SConsOptions.diskcheck_convert(value)

SCons.Script.SConscript module

This module defines the Python API provided to SConscript files.

```python
SCons.Script.SConscript.BuildDefaultGlobals ()
Create a dictionary containing all the default globals for SConstruct and SConscript files.
SCons.Script.SConscript.Configure (*args, **kw)
```

```python
class SCons.Script.SConscript.DefaultEnvironmentCall (method_name, subst: int = 0)
Bases: object
A class that implements “global function” calls of Environment methods by fetching the specified method from the DefaultEnvironment’s class. Note that this uses an intermediate proxy class instead of calling the DefaultEnvironment method directly so that the proxy can override the subst() method and thereby prevent expansion of construction variables (since from the user’s point of view this was called as a global function, with no associated construction environment).
```

```python
class SCons.Script.SConscript.Frame (fs, exports, sconscript)
Bases: object
A frame on the SConstruct/SConscript call stack
SCons.Script.SConscript.Return (*vars, **kw)
```

```python
class SCons.Script.SConscript.SConsEnvironment (platform=None, tools=None, toolpath=None, variables=None, parse_flags=None, **kw)
Bases: Base
An Environment subclass that contains all of the methods that are particular to the wrapper SCons interface and which aren’t (or shouldn’t be) part of the build engine itself.
Note that not all of the methods of this class have corresponding global functions, there are some private methods.
```

```python
Action (*args, **kw)
AddMethod (function, name=None) → None
  Adds the specified function as a method of this construction environment with the specified name. If the name is omitted, the default name is the name of the function itself.
AddPostAction (files, action)
AddPreAction (files, action)
```

```python
Alias (target, source=[], action=None, **kw)
AlwaysBuild (*targets)
```

```python
Append (**kw) → None
  Append values to construction variables in an Environment.
  The variable is created if it is not already present.
AppendENVPath (name, newpath, envname: str = 'ENV', sep=':', delete_existing: bool = False) → None
  Append path elements to the path name in the envname dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.
  If delete_existing is False, a newpath element already in the path will not be moved to the end (it will be left where it is).
AppendUnique (delete_existing: bool = False, **kw) → None
  Append values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to end.
Builder (**kw)
```

```python
CacheDir (path, custom_class=None) → None
Clean (targets, files) → None
Clone (tools=[], toolpath=None, variables=None, parse_flags=None, **kw)
```

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Return a copy of a construction Environment.
The copy is like a Python “deep copy”: independent copies are made recursively of each object, except that a reference is copied when an object is not deep-copyable (like a function). There are no references to any mutable objects in the original environment.
Unrecognized keyword arguments are taken as construction variable assignments.

**Parameters:**
- **tools** – list of tools to initialize.
- **toolpath** – list of paths to search for tools.
- **variables** – a Variables object to use to populate construction variables from command-line variables.
- **parse_flags** – option strings to parse into construction variables.

New in version 4.8.0: The optional **variables** parameter was added.

**Command** (target, source, action, **)kw**
Set up a one-off build command.
Builds target from source using action, which may be be any type that the Builder factory will accept for an action. Generates an anonymous builder and calls it, to add the details to the build graph. The builder is not named, added to BUILDERS, or otherwise saved.
Recognizes the Builder() keywords `source_scanner`, `target_scanner`, `source_factory` and `target_factory`. All other arguments from kw are passed on to the builder when it is called.

**Configure** (*args, **)kw**
Decider (**kwargs**)
Default (*targets) → None
Depends (target, dependency)
Explicitly specify that target depends on dependency.

**Detect** (progs)
Return the first available program from one or more possibilities.

**Parameters:**
- **progs** (str or list) – one or more command names to check for

**Dictionary** (*args)
Return construction variables from an environment.

**Parameters:**
- **args** (optional) – variable names to look up

**Returns:**
If **args** omitted, the dictionary of all construction variables. If one arg, the corresponding value is returned. If more than one arg, a list of values is returned.

**Raises:**
- **KeyError** – if any of **args** is not in the construction environment.

**Dir** (name, **args, **)kw**
Dump (key: str | None = None, format: str = 'pretty') → str
Returns a dump of serialized construction variables.
The display formats are intended for human readers when debugging - none of the supported formats produce a result that SCons itself can directly make use of. Objects that cannot directly be represented get a placeholder like `<function foo at 0x123456>` or `<non-serializable: function>`.

**Parameters:**
- **key** – if **key** is None, format the whole dict of variables, else format just the value of **key**.
- **format** – specify the format to serialize to. "pretty" generates a pretty-printed string, "json" a JSON-formatted string.

**Raises:**
- **ValueError** – **format** is not a recognized serialization format.

**static** EnsurePythonVersion (major, minor) → None
Exit abnormally if the Python version is not late enough.

**static** EnsureSConsVersion (major: int, minor: int, revision: int = 0) → None
Exit abnormally if the SCons version is not late enough.

**Entry** (name, **args, **)kw**
**Environment** (**kwargs**)
**Execute** (action, **args, **)kw**
Directly execute an action through an Environment

```python
static Exit (value: int = 0) \rightarrow None
```

Export (*vars, **kw) \rightarrow None

Export (name, *args, **kw)

FindFile (file, dirs)

FindInstalledFiles ()

returns the list of all targets of the Install and InstallAs Builder.

FindIxes (paths: Sequence[str], prefix: str, suffix: str) \rightarrow str | None

Search paths for a path that has prefix and suffix.

Returns on first match.

**Parameters:**
- **paths** – the list of paths or nodes.
- **prefix** – construction variable for the prefix.
- **suffix** – construction variable for the suffix.

**Returns:**
The matched path or None

FindSourceFiles (node: str = '.') \rightarrow list

Return a list of all source files.

Flatten (sequence)

GetBuildPath (files)

static GetLaunchDir ()

GetOption (name)

static GetSConsVersion () \rightarrow Tuple[int, int, int]

Return the current SCons version.

New in version 4.8.0.

Glob (pattern, ondisk: bool = True, source: bool = False, strings: bool = False, exclude=None)

Help (text, append: bool = False, keep_local: bool = False) \rightarrow None

Update the help text.

The previous help text has text appended to it, except on the first call. On first call, the values of append and keep_local are considered to determine what is appended to.

**Parameters:**
- **text** – string to add to the help text.
- **append** – on first call, if true, keep the existing help text (default False).
- **keep_local** – on first call, if true and append is also true, keep only the help text from AddOption calls.

Changed in version 4.6.0: The keep_local parameter was added.

Ignore (target, dependency)

Ignore a dependency.

Import (*vars)

Literal (string)

Local (*targets)

MergeFlags (args, unique: bool = True) \rightarrow None

Merge flags into construction variables.

Merges the flags from args into this construction environment. If args is not a dict, it is first converted to one with flags distributed into appropriate construction variables. See ParseFlags().

As a side effect, if unique is true, a new object is created for each modified construction variable by the loop at the end. This is silently expected by the Override() parse_flags functionality, which does not want to share the list (or whatever) with the environment being overridden.

**Parameters:**
- **args** – flags to merge
- **unique** – merge flags rather than appending (default: True). When merging, path variables are retained from the front, other construction variables from the end.

NoCache (*targets)

Tag target(s) so that it will not be cached.
NoClean (*targets)
Tag target(s) so that it will not be cleaned by -c.

Override (overrides)
Produce a modified environment whose variables are overridden by the overrides dictionaries. “overrides” is a dictionary that will override the variables of this environment. This function is much more efficient than Clone() or creating a new Environment because it doesn’t copy the construction environment dictionary, it just wraps the underlying construction environment, and doesn’t even create a wrapper object if there are no overrides.

ParseConfig (command, function=None, unique: bool = True)
Parse the result of running a command to update construction vars. Use function to parse the output of running command in order to modify the current environment.

Parameters:
- command – a string or a list of strings representing a command and its arguments.
- function – called to process the result of command, which will be passed as args. If function is omitted or None, MergeFlags() is used. Takes 3 args (env, args, unique)
- unique – whether no duplicate values are allowed (default true)

ParseDepends (filename, must_exist=None, only_one: bool = False)
Parse a mkdep-style file for explicit dependencies. This is completely abusable, and should be unnecessary in the “normal” case of proper SCons configuration, but it may help make the transition from a Make hierarchy easier for some people to swallow. It can also be genuinely useful when using a tool that can write a .d file, but for which writing a scanner would be too complicated.

ParseFlags (*flags) → dict
Return a dict of parsed flags. Parse flags and return a dict with the flags distributed into the appropriate construction variable names. The flags are treated as a typical set of command-line flags for a GNU-style toolchain, such as might have been generated by one of the {foo}-config scripts, and used to populate the entries based on knowledge embedded in this method - the choices are not expected to be portable to other toolchains.
If one of the flags strings begins with a bang (exclamation mark), it is assumed to be a command and the rest of the string is executed; the result of that evaluation is then added to the dict.

Platform (platform)
Precious (*targets)
Mark targets as precious: do not delete before building.

Prepend (**kw) → None
Prepend values to construction variables in an Environment.
The variable is created if it is not already present.

PrependENVPath (name, newpath, envname: str = 'ENV', sep=':', delete_existing: bool = True) → None
Prepend path elements to the path name in the envname dictionary for this environment. Will only add any particular path once, and will normpath and normcase all paths to help assure this. This can also handle the case where the env variable is a list instead of a string.
If delete_existing is False, a newpath component already in the path will not be moved to the front (it will be left where it is).

PrependUnique (delete_existing: bool = False, **kw) → None
Prepend values to existing construction variables in an Environment, if they’re not already there. If delete_existing is True, removes existing values first, so values move to front.

Pseudo (*targets)
Mark targets as pseudo: must not exist.

PyPackageDir (modulename)
RemoveMethod (function) → None
Removes the specified function’s MethodWrapper from the added_methods list, so we don’t re-bind it when making a clone.

Replace (**kw) → None
Replace existing construction variables in an Environment with new construction variables and/or values.

ReplaceIxes (path, old_prefix, old_suffix, new_prefix, new_suffix)
Replace old_prefix with new_prefix and old_suffix with new_suffix.

Repository (*dirs,**kw) → None
Specify Repository directories to search.
Requires (target,prerequisite)
Specify that prerequisite must be built before target.
Creates an order-only relationship, not a full dependency. prerequisite must exist before target can be built, but a change to prerequisite does not trigger a rebuild of target.

SConscript(*ls,**kw)
Execute SCons configuration files.

Parameters: *ls (str or list) – configuration file(s) to execute.
Keyword Arguments:
  • dirs (list) – execute SConsrtip in each listed directory.
  • name (str) – execute script ‘name’ (used only with ‘dirs’).
  • exports (list or dict) – locally export variables the called script(s) can import.
  • variant_dir (str) – mirror sources needed for the build in a variant directory to allow building in it.
  • duplicate (bool) – physically duplicate sources instead of just adjusting paths of derived files (used only with ‘variant_dir’) (default is True).
  • must_exist (bool) – fail if a requested script is missing (default is False, default is deprecated).

Returns: list of variables returned by the called script
Raises: UserError – a script is not found and such exceptions are enabled.

static SConscriptChdir (flag: bool) → None
SConsignFile (name=’.sconsign’, dbm_module=None) → None
Scanner (*args,**kw)
SetDefault (**kw) → None
SetOption (name, value) → None
SideEffect (side_effect, target)
Tell scons that side_effects are built as side effects of building targets.

Split (arg)
This function converts a string or list into a list of strings or Nodes. This makes things easier for users by allowing files to be specified as a white-space separated list to be split.

The input rules are:

  • A single string containing names separated by spaces. These will be split apart at the spaces.
  • A single Node instance
  • A list containing either strings or Node instances. Any strings in the list are not split at spaces.

In all cases, the function returns a list of Nodes and strings.

Tool (tool: str | Callable, toolpath: Collection[str] | None = None, **kw) → Callable
Find and run tool module tool.

tool is generally a string, but can also be a callable object, in which case it is just called, without any of the setup.
The skipped setup includes storing kwargs into the created Tool instance, which is extracted and used when the
instance is called, so in the skip case, the called object will not get the kwargs.

Changed in version 4.2: returns the tool object rather than None.

Value (value, built_value=None, name=None)
Return a Value (Python expression) node.

Changed in version 4.0: the name parameter was added.

VariantDir (variant_dir, src_dir, duplicate: int = 1) → None
SCons.Script package

```python
WhereIs (prog, path=None, pathext=None, reject=None)
    Find prog in the path.
_canonlize (path)
    AllowDirs and strings beginning with # for top-relative.
    Note this uses the current env's fs (in self).
_changed_build (dependency, target, prev_ni, repo_node=None) → bool
    _changed_content (dependency, target, prev_ni, repo_node=None) → bool
    _changed_timestamp_match (dependency, target, prev_ni, repo_node=None) → bool
    _changed_timestamp_newer (dependency, target, prev_ni, repo_node=None) → bool
    _find_toolpath_dir (tp)
    _get_SConscript_filenames (ls, kw)
        Convert the parameters passed to SConscript() calls into a list of files and export variables. If the parameters are invalid, throws SCons.Errors.UserError. Returns a tuple (l, e) where l is a list of SConscript filenames and e is a list of exports.
    static _get_major_minor_revision (version_string: str) → Tuple[int, int, int]
        Split a version string into major, minor and (optionally) revision parts.
        This is complicated by the fact that a version string can be something like 3.2b1.
    _gsm ()
    _init_special () → None
        Initial the dispatch tables for special handling of special construction variables.
    _update (other) → None
        Private method to update an environment's consvar dict directly.
        Bypasses the normal checks that occur when users try to set items.
    _update_onlynew (other) → None
        Private method to add new items to an environment's consvar dict.
        Only adds items from other whose keys do not already appear in the existing dict; values from other are not used for replacement. Bypasses the normal checks that occur when users try to set items.
    arg2nodes (args, node_factory=<class 'SCons.Environment._Null'>, lookup_list=<class 'SCons.Environment._Null'>, **kw)
        Converts args to a list of nodes.

Parameters:

- just (args - filename strings or nodes to convert; nodes are) – added to the list without further processing.
- not (node_factory - optional factory to create the nodes; if) – specified, will use this environment's Fs.File method.
- to (lookup_list - optional list of lookup functions to call) – attempt to find the file referenced by each args.
- add. (kw - keyword arguments that represent additional nodes to) –

backtick (command) → str
    Emulate command substitution.
    Provides behavior conceptually like POSIX Shell notation for running a command in backquotes (backticks) by running command and returning the resulting output string.
    This is not really a public API any longer, it is provided for the use of ParseFlags() (which supports it using a syntax of !command) and ParseConfig().

    Raises: OSError – if the external command returned non-zero exit status.

get (key, default=None)
    Emulates the get() method of dictionaries.
get_CacheDir ()
get_builder (name)
    Fetch the builder with the specified name from the environment.
get_factory (factory, default: str = 'File')
    Return a factory function for creating Nodes for this construction environment.
get.Scanner (skey)
```
Find the appropriate scanner given a key (usually a file suffix).

gvars ()

Emulates the items() method of dictionaries.

gvars()

keys ()

Emulates the keys() method of dictionaries.

keys()

scanner_map_delete (kw=None) → None

Delete the cached scanner map (if we need to).

scanner_map_delete()

setdefault (key, default=None)

Emulates the setdefault() method of dictionaries.

setdefault()

subst (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)

Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphanumeric character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

subst()

subst_kw (kw, raw: int = 0, target=None, source=None)

Calls through to SCons.Subst.scons_subst_list().

See the documentation for that function.

subst_list (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)

Calls through to SCons.Subst.scons_subst_list().

See the documentation for that function.

subst_target_source (string, raw: int = 0, target=None, source=None, conv=None, executor: Executor | None = None, overrides: dict | None = None)

Recursively interpolates construction variables from the Environment into the specified string, returning the expanded result. Construction variables are specified by a $ prefix in the string and begin with an initial underscore or alphanumeric character followed by any number of underscores or alphanumeric characters. The construction variable names may be surrounded by curly braces to separate the name from trailing characters.

validate_CacheDir_class (custom_class=None)

Validate the passed custom CacheDir class, or if no args are passed, validate the custom CacheDir class from the environment.

values ()

Emulates the values() method of dictionaries.

values()

exception  SCons.Script.SConscript.SConscriptReturn

Bases: Exception

add_note ()

Exception.add_note(note) – add a note to the exception

add_note()

with_traceback ()

Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

with_traceback()

SCons.Script.SConscript.SConscript_exception (file=_io.TextIOWrapper name='<stderr>' mode='w' encoding='utf-8') → None

Print an exception stack trace just for the SConscript file(s). This will show users who have Python errors where the problem is, without cluttering the output with all of the internal calls leading up to where we exec the SConscript.

SConscript_exception()

SCons.Script.SConscript._SConscript (fs, *files, **kw)

SCons.Script.SConscript.annotate (node)

Annotate a node with the stack frame describing the SConscript file and line number that created it.

SConscript.annotate()

SCons.Script.SConscript.compute_exports (exports)

Compute a dictionary of exports given one of the parameters to the Export() function or the exports argument to SConscript().

compute_exports()

SCons.Script.SConscript.get_DefaultEnvironmentProxy ()

SCons.Script.SConscript.get_calling_namespaces ()

Return the locals and globals for the function that called into this module in the current call stack.
SCons.Script.SConscript.handle_missing_SConscript (f: str, must_exist: bool = True) → None
Take appropriate action on missing file in SConscript() call.
Print a warning or raise an exception on missing file, unless missing is explicitly allowed by the must_exist parameter
or by a global flag.

Parameters:
- **f** – path to missing configuration file
- **must_exist** – if true (the default), fail. If false do nothing, allowing a build to declare it’s
  okay to be missing.

Raises: **UserError** – if must_exist is true or if global SCons.Script._no_missing_sconscript is true.

SCons.Taskmaster package

Module contents

Generic Taskmaster module for the SCons build engine.

This module contains the primary interface(s) between a wrapping user interface and the SCons build engine. There
are two key classes here:

**Taskmaster**

This is the main engine for walking the dependency graph and calling things to decide what does or doesn’t need

**Task**

This is the base class for allowing a wrapping interface to decide what does or doesn’t actually need to be done.
The intention is for a wrapping interface to subclass this as appropriate for different types of behavior it may need.

The canonical example is the SCons native Python interface, which has Task subclasses that handle its specific
behavior, like printing “foo is up to date” when a top-level target doesn’t need to be built, and handling the -c
option by removing targets as its “build” action. There is also a separate subclass for suppressing this output when
the -q option is used.

The Taskmaster instantiates a Task object for each (set of) target(s) that it decides need to be evaluated and/or
built.

```
class SCons.Taskmaster.AlwaysTask (tm, targets, top, node)
    Bases: Task
    LOGGER = None
    _abc_impl = <_abc._abc_data object>
    _exception_raise ()
        Raises a pending exception that was recorded while getting a Task ready for execution.
    _no_exception_to_raise () → None
    display (message) → None
        Hook to allow the calling interface to display a message.
        This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out
        what Node should be built next, the actual target list may be altered, along with a message describing the
        alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see
        those messages.
    exc_clear () → None
        Clears any recorded exception.
        This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.
    exc_info ()
        Returns info about a recorded exception.
    exception_set (exception=None) → None
        Records an exception to be raised at the appropriate time.
        This also changes the “exception_raise” attribute to point to the method that will, in fact
        execute ()
        Called to execute the task.
```
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

executed () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_with_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_without_callbacks () → None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

fail_continue () → None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

fail_stop () → None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

failed () → None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute () → bool
Always returns True (indicating this Task should always be executed).
Subclasses that need this behavior (as opposed to the default of only executing Nodes that are out of date w.r.t. their dependencies) can use this as follows:

```
class MyTaskSubclass(SCons.Taskmaster.Task):
    needs_execute = SCons.Taskmaster.AlwaysTask.needs_execute
```

postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare () \rightarrow None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary directories before the Action is actually called to build the targets.

trace_message (node, description: str = 'node') \rightarrow None

class SCons.Taskmaster.OutOfDateTask (tm, targets, top, node)

Bases: Task
LOGGER = None
_abc_impl = <_abc._abc_data object>

_exception_raise ()
Raises a pending exception that was recorded while getting a Task ready for execution.

_no_exception_to_raise () \rightarrow None

display (message) \rightarrow None
Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.

exc_clear () \rightarrow None
Clears any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

exc_info ()
Returns info about a recorded exception.

exception_set (exception=None) \rightarrow None
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact

execute ()
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

executed () \rightarrow None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_with_callbacks () \rightarrow None
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

executed_without_callbacks () \rightarrow None
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

fail_continue () \rightarrow None
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

fail_stop () \rightarrow None
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

failed () → None
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on
up-to-date nodes when using Configure().

get_target ()
Fetch the target being built or updated by this task.

make_ready ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

make_ready_all () → None
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c”
option.

make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

needs_execute ()
Returns True (indicating this Task should be executed) if this Task’s target state indicates it needs executing,
which has already been determined by an earlier up-to-date check.

postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no
build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a
common side effect, that can be put back on the candidates list.

prepare () → None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to unlink underlying files and make all necessary
directories before the Action is actually called to build the targets.

trace_message (node, description: str = 'node') → None

class SCons.Taskmaster.Stats
Bases: object
A simple class for holding statistics about the disposition of a Node by the Taskmaster. If we’re collecting statistics,
each Node processed by the Taskmaster gets one of these attached, in which case the Taskmaster records its
decision each time it processes the Node. (Ideally, that’s just once per Node.)

class SCons.Taskmaster.Task (tm, targets, top, node)
Bases: ABC
SCons build engine abstract task class.
This controls the interaction of the actual building of node and the rest of the engine.
This is expected to handle all of the normally-customizable aspects of controlling a build, so any given application
should be able to do what it wants by sub-classing this class and overriding methods as appropriate. If an application
needs to customize something by sub-classing Taskmaster (or some other build engine class), we should first try to
migrate that functionality into this class.
Note that it’s generally a good idea for sub-classes to call these methods explicitly to update state, etc., rather than
roll their own interaction with Taskmaster from scratch.
LOGGER = None
_ABC_impl = <_abc._abc_data object>
_exceptionRaise ()
Raises a pending exception that was recorded while getting a Task ready for execution.
_no_exceptionToRaise () → None
display (message) → None
Hook to allow the calling interface to display a message.
This hook gets called as part of preparing a task for execution (that is, a Node to be built). As part of figuring out what Node should be built next, the actual target list may be altered, along with a message describing the alteration. The calling interface can subclass Task and provide a concrete implementation of this method to see those messages.

```python
exc_clear () → None
```
Cleans any recorded exception.
This also changes the “exception_raise” attribute to point to the appropriate do-nothing method.

```python
exc_info ()
```
Returns info about a recorded exception.

```python
exception_set (exception=None) → None
```
Records an exception to be raised at the appropriate time.
This also changes the “exception_raise” attribute to point to the method that will, in fact

```python
execute ()
```
Called to execute the task.
This method is called from multiple threads in a parallel build, so only do thread safe stuff here. Do thread unsafe stuff in prepare(), executed() or failed().

```python
executed () → None
```
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

```python
executed_with_callbacks () → None
```
Called when the task has been successfully executed and the Taskmaster instance wants to call the Node’s callback methods.
This may have been a do-nothing operation (to preserve build order), so we must check the node’s state before deciding whether it was “built”, in which case we call the appropriate Node method. In any event, we always call “visited()”, which will handle any post-visit actions that must take place regardless of whether or not the target was an actual built target or a source Node.

```python
executed_without_callbacks () → None
```
Called when the task has been successfully executed and the Taskmaster instance doesn’t want to call the Node’s callback methods.

```python
fail_continue () → None
```
Explicit continue-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

```python
fail_stop () → None
```
Explicit stop-the-build failure.
This sets failure status on the target nodes and all of their dependent parent nodes.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

```python
failed () → None
```
Default action when a task fails: stop the build.
Note: Although this function is normally invoked on nodes in the executing state, it might also be invoked on up-to-date nodes when using Configure().

```python
get_target ()
```
Fetch the target being built or updated by this task.

```python
make_ready ()
```
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

```python
make_ready_all () → None
```
Marks all targets in a task ready for execution.
This is used when the interface needs every target Node to be visited—the canonical example being the “scons -c” option.
make_ready_current ()
Marks all targets in a task ready for execution if any target is not current.
This is the default behavior for building only what’s necessary.

abstract needs_execute ()
postprocess () → None
Post-processes a task after it’s been executed.
This examines all the targets just built (or not, we don’t care if the build was successful, or even if there was no build because everything was up-to-date) to see if they have any waiting parent Nodes, or Nodes waiting on a common side effect, that can be put back on the candidates list.

prepare () → None
Called just before the task is executed.
This is mainly intended to give the target Nodes a chance to un-link underlying files and make all necessary directories before the Action is actually called to build the targets.

trace_message (node, description: str = 'node') → None

class SCons.Taskmaster.Taskmaster (targets=[], tasker=None, order=None, trace=None)
Bases: object
The Taskmaster for walking the dependency DAG.

_find_next_ready_node ()
Finds the next node that is ready to be built.
This is the main guts of the DAG walk. We loop through the list of candidates, looking for something that has no un-built children (i.e., that is a leaf Node or has dependencies that are all leaf Nodes or up-to-date). Candidate Nodes are re-scanned (both the target Node itself and its sources, which are always scanned in the context of a given target) to discover implicit dependencies. A Node that must wait for some children to be built will be put back on the candidates list after the children have finished building. A Node that has been put back on the candidates list in this way may have itself (or its sources) re-scanned, in order to handle generated header files (e.g.) and the implicit dependencies therein.
Note that this method does not do any signature calculation or up-to-date check itself. All of that is handled by the Task class. This is purely concerned with the dependency graph walk.

_validate_pending_children () → None
Validate the content of the pending_children set. Assert if an internal error is found.
This function is used strictly for debugging the taskmaster by checking that no invariants are violated. It is not used in normal operation.
The pending_children set is used to detect cycles in the dependency graph. We call a “pending child” a child that is found in the “pending” state when checking the dependencies of its parent node.
A pending child can occur when the Taskmaster completes a loop through a cycle. For example, let’s imagine a graph made of three nodes (A, B and C) making a cycle. The evaluation starts at node A. The Taskmaster first considers whether node A’s child B is up-to-date. Then, recursively, node B needs to check whether node C is up-to-date. This leaves us with a dependency graph looking like:

```
+-------------------------------------+
|                                     |
|                                     |
Next candidate                                                                       Node A (Pending) --> Node B(Pending) --> Node C (Pending) --> ...
|                                      
|                                      
+----------> Node D (NoState) --------+
/                                      
/                                      
Next candidate /                        ```
The Taskmaster first evaluates the nodes A, B, and C and starts building some children of node C. Assuming, that the maximum parallel level has not been reached, the Taskmaster will examine Node D. It will find that Node C is a pending child of Node D.

In summary, evaluating a graph with a cycle will always involve a pending child at one point. A pending child might indicate either a cycle or a diamond-shaped DAG. Only a fraction of the nodes ends up being a “pending child” of another node. This keeps the pending_children set small in practice.

We can differentiate between the two cases if we wait until the end of the build. At this point, all the pending children nodes due to a diamond-shaped DAG will have been properly built (or will have failed to build). But, the pending children involved in a cycle will still be in the pending state.

The taskmaster removes nodes from the pending_children set as soon as a pending_children node moves out of the pending state. This also helps to keep the pending_children set small.

cleanup ()
Check for dependency cycles.
configure_trace (trace=None) → None
This handles the command line option --taskmastertrace= It can be: - : output to stdout <filename> : output to a file False/None : Do not trace
find_next_candidate ()
Returns the next candidate Node for (potential) evaluation.
The candidate list (really a stack) initially consists of all of the top-level (command line) targets provided when the Taskmaster was initialized. While we walk the DAG, visiting Nodes, all the children that haven’t finished processing get pushed on to the candidate list. Each child can then be popped and examined in turn for whether their children are all up-to-date, in which case a Task will be created for their actual evaluation and potential building.

Here is where we also allow candidate Nodes to alter the list of Nodes that should be examined. This is used, for example, when invoking SCons in a source directory. A source directory Node can return its corresponding build directory Node, essentially saying, “Hey, you really need to build this thing over here instead.”

next_task ()
Returns the next task to be executed.
This simply asks for the next Node to be evaluated, and then wraps it in the specific Task subclass with which we were initialized.

no_next_candidate ()
Stops Taskmaster processing by not returning a next candidate.
Note that we have to clean up the Taskmaster candidate list because the cycle detection depends on the fact all nodes have been processed somehow.

stop () → None
Steps the current build completely.

tm_trace_node (node) → str
will_not_build (nodes, node_func=<function Taskmaster.<lambda>>) → None
Perform clean-up about nodes that will never be built. Invokes a user defined function on all of these nodes (including all of their parents).

SCons.Taskmaster.dump_stats () → None
SCons.Taskmaster.find_cycle (stack, visited)

Submodules

SCons.Taskmaster.Job module

Serial and Parallel classes to execute build tasks.
The Jobs class provides a higher level interface to start, stop, and wait on jobs.

class SCons.Taskmaster.Job.InterruptState
Bases: object
set () → None

class SCons.Taskmaster.Job.Jobs (num, taskmaster)
Bases: object
An instance of this class initializes N jobs, and provides methods for starting, stopping, and waiting on all N jobs.

Reset sig handler () → None
Restore the signal handlers to their previous state (before the call to _setup_sig_handler()).
Setup an interrupt handler so that SCons can shutdown cleanly in various conditions:

- SIGINT: Keyboard interrupt
- SIGTERM: Kill or system shutdown
- SIGHUP: Controlling shell exiting

We handle all of these cases by stopping the taskmaster. It turns out that it's very difficult to stop the build process by throwing asynchronously an exception such as KeyboardInterrupt. For example, the python Condition variables (threading.Condition) and queues do not seem to be asynchronous-exception-safe. It would require adding a whole bunch of try/finally block and except KeyboardInterrupt all over the place.

Note also that we have to be careful to handle the case when SCons forks before executing another process. In that case, we want the child to exit immediately.

```python
def run(postfunc=lambda):
    """Run the jobs.
    postfunc() will be invoked after the jobs has run. It will be invoked even if the jobs are interrupted by a keyboard interrupt (well, in fact by a signal such as either SIGINT, SIGTERM or SIGHUP). The execution of postfunc() is protected against keyboard interrupts and is guaranteed to run to completion.
    """
    return were_interrupted()
```

Note that we have to be careful to handle the case when SCons forks before executing another process. In that case, we want the child to exit immediately.

```python
def were_interrupted()
    """Returns whether the jobs were interrupted by a signal.
    """
    return False
```

**SCons.Taskmaster.Job.LegacyParallel**

Bases: object

This class is used to execute tasks in parallel, and is somewhat less efficient than Serial, but is appropriate for parallel builds.

This class is thread safe.

```python
class SCons.Taskmaster.Job.LegacyParallel(taskmaster, num, stack_size):
    Bases: object
    This class is used to execute tasks in parallel, and is somewhat less efficient than Serial, but is appropriate for parallel builds.
    This class is thread safe.
    
    start()
    Start the job. This will begin pulling tasks from the taskmaster and executing them, and return when there are no more tasks. If a task fails to execute (i.e. execute() raises an exception), then the job will stop.
```

**SCons.Taskmaster.Job.NewParallel**

Bases: object

```python
    Bases: object
```

**FakeCondition**

Bases: object

```python
class FakeCondition(lock):
    Bases: object
    notify()
    notify_all()
    wait()
```

**FakeLock**

Bases: object

```python
class FakeLock:
    Bases: object
    lock()
    unlock()
```

**State**

Bases: Enum

```python
class State:
    value, names=None, *, module=None, fullname=None, type=None, start=1, boundary=None)
    Bases: Enum
    COMPLETED = 3
    READY = 0
    SEARCHING = 1
    STALLED = 2
```
SCons.Taskmaster package

Bases: Thread

_bootstrap()
_bootstrap_inner()
_delete()

Remove current thread from the dict of currently running threads.

_initialized = False

_reset_internal_locks(is_alive)
_set_ident()
_set_native_id()
_set_tstate_lock()

Set a lock object which will be released by the interpreter when the underlying thread state (see pystate.h) gets deleted.

_stop()
_wait_for_tstate_lock(block=True, timeout=-1)

property daemon

A boolean value indicating whether this thread is a daemon thread.

This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.

The entire Python program exits when only daemon threads are left.

getName()

Return a string used for identification purposes only.

This method is deprecated, use the name attribute instead.

property ident

Thread identifier of this thread or None if it has not been started.

This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()

Return whether this thread is a daemon.

This method is deprecated, use the daemon attribute instead.

is_alive()

Return whether the thread is alive.

This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)

Wait until the thread terminates.

This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.

When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.

When the timeout argument is not present or None, the operation will block until the thread terminates.

A thread can be join()ed many times.

join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name

A string used for identification purposes only.

It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id

Native integral thread ID of this thread, or None if it has not been started.

This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run() → None

Method representing the thread’s activity.
You may override this method in a subclass. The standard run() method invokes the callable object passed to
the object’s constructor as the target argument, if any, with sequential and keyword arguments taken from the
args and kwargs arguments, respectively.

setDaemon(daemonic)
Set whether this thread is a daemon.
This method is deprecated, use the .daemon property instead.

setName(name)
Set the name string for this thread.
This method is deprecated, use the name attribute instead.

start()
Start the thread’s activity.
It must be called at most once per thread object. It arranges for the object’s run() method to be invoked in a
separate thread of control.
This method will raise a RuntimeError if called more than once on the same thread object.

_trace_message(message) → None
_trace_message (message) → None

class SCons.Taskmaster.Job.ThreadPool(num, stack_size, interrupted)
Bases: object
This class is responsible for spawning and managing worker threads.
cleanup() → None
Shuts down the thread pool, giving each worker thread a chance to shut down gracefully.

get() → None
Remove and return a result tuple from the results queue.

preparation_failed(task) → None
Put(task) → None
Put task into request queue.

class SCons.Taskmaster.Job.Worker(requestQueue, resultsQueue, interrupted)
Bases: Thread
A worker thread waits on a task to be posted to its request queue, dequeues the task, executes it, and posts a tuple
including the task and a boolean indicating whether the task executed successfully.

_bootstrap ()
_bootstrap_inner ()
_delete ()
Remove current thread from the dict of currently running threads.

_initialized = False
_reset_internal_locks(is_alive)
_set_ident ()
_set_native_id ()
_set_tstate_lock ()
Set a lock object which will be released by the interpreter when the underlying thread state (see pystate.h) gets
deleted.

_stop ()
__wait_for_tstate_lock__(block=True, timeout=-1)

property daemon
A boolean value indicating whether this thread is a daemon thread.
This must be set before start() is called, otherwise RuntimeError is raised. Its initial value is inherited from the creating thread; the main thread is not a daemon thread and therefore all threads created in the main thread default to daemon = False.
The entire Python program exits when only daemon threads are left.

getName()
Return a string used for identification purposes only.
This method is deprecated, use the name attribute instead.

property ident
Thread identifier of this thread or None if it has not been started.
This is a nonzero integer. See the get_ident() function. Thread identifiers may be recycled when a thread exits and another thread is created. The identifier is available even after the thread has exited.

isDaemon()
Return whether this thread is a daemon.
This method is deprecated, use the daemon attribute instead.

is_alive()
Return whether the thread is alive.
This method returns True just before the run() method starts until just after the run() method terminates. See also the module function enumerate().

join(timeout=None)
Wait until the thread terminates.
This blocks the calling thread until the thread whose join() method is called terminates – either normally or through an unhandled exception or until the optional timeout occurs.
When the timeout argument is present and not None, it should be a floating point number specifying a timeout for the operation in seconds (or fractions thereof). As join() always returns None, you must call is_alive() after join() to decide whether a timeout happened – if the thread is still alive, the join() call timed out.
When the timeout argument is not present or None, the operation will block until the thread terminates.
A thread can be join()ed many times.
join() raises a RuntimeError if an attempt is made to join the current thread as that would cause a deadlock. It is also an error to join() a thread before it has been started and attempts to do so raises the same exception.

property name
A string used for identification purposes only.
It has no semantics. Multiple threads may be given the same name. The initial name is set by the constructor.

property native_id
Native integral thread ID of this thread, or None if it has not been started.
This is a non-negative integer. See the get_native_id() function. This represents the Thread ID as reported by the kernel.

run()
Method representing the thread’s activity.
You may override this method in a subclass. The standard run() method invokes the callable object passed to the object’s constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

setDaemon(daemonic)
Set whether this thread is a daemon.
This method is deprecated, use the .daemon property instead.

setName(name)
Set the name string for this thread.
This method is deprecated, use the name attribute instead.

start()
Start the thread’s activity.
It must be called at most once per thread object. It arranges for the object’s run() method to be invoked in a separate thread of control.
This method will raise a RuntimeError if called more than once on the same thread object.
SCons.Tool package

Module contents

SCons tool selection.

Looks for modules that define a callable object that can modify a construction environment as appropriate for a given tool (or tool chain).

Note that because this subsystem just selects a callable that can modify a construction environment, it's possible for people to define their own “tool specification” in an arbitrary callable function. No one needs to use or tie in to this subsystem in order to roll their own tool specifications.

SCons.Tool.CreateJarBuilder (env)
The Jar builder expects a list of class files which it can package into a jar file.
The jar tool provides an interface for passing other types of java files such as .java, directories or swig interfaces and will build them to class files in which it can package into the jar.

SCons.Tool.CreateJavaClassDirBuilder (env)
SCons.Tool.CreateJavaClassFileBuilder (env)
SCons.Tool.CreateJavaFileBuilder (env)
SCons.Tool.CreateJavaHBuilder (env)
SCons.Tool.FindAllTools (tools, env)
SCons.Tool.FindTool (tools, env)
SCons.Tool.Initializers (env) → None
class SCons.Tool.Tool (name, toolpath=None, **kwargs)
   Bases: object
   _tool_module ()
   Try to load a tool module.
   This will hunt in the toolpath for both a Python file (toolname.py) and a Python module (toolname directory), then try the regular import machinery, then fallback to try a zipfile.
   
   class SCons.Tool.ToolInitializer (env, tools, names)
   Bases: object
   A class for delayed initialization of Tools modules.
   Instances of this class associate a list of Tool modules with a list of Builder method names that will be added by those Tool modules. As part of instantiating this object for a particular construction environment, we also add the appropriate ToolInitializerMethod objects for the various Builder methods that we want to use to delay Tool searches until necessary.
   apply_tools (env) → None
   Searches the list of associated Tool modules for one that exists, and applies that to the construction environment.
   remove_methods (env) → None
   Removes the methods that were added by the tool initialization so we no longer copy and re-bind them when the construction environment gets cloned.
   
   class SCons.Tool.ToolInitializerMethod (name, initializer)
   Bases: object
   This is added to a construction environment in place of a method(s) normally called for a Builder (env.Object, env.StaticObject, etc.). When called, it has its associated ToolInitializer object search the specified list of tools and apply the first one that exists to the construction environment. It then calls whatever builder was (presumably) added to the construction environment in place of this particular instance.
   __call__ (env, *args, **kw)
   Returns the appropriate real Builder for this method name after having the associated ToolInitializer object apply the appropriate Tool module.

SCons.Tool.createCFileBuilders (env)
This is a utility function that creates the CFile/CXXFile Builders in an Environment if they are not there already. If they are there already, we return the existing ones.
This is a separate function because soooo many Tools use this functionality.
The return is a 2-tuple of (CFile, CXXFile)

SCons.Tool.createLoadableModuleBuilder (env, loadable_module_suffix: str = '_LDMODULESUFFIX')
This is a utility function that creates the LoadableModule Builder in an Environment if it is not there already. If it is already there, we return the existing one.

**Parameters:**  
loadable_module_suffix – The suffix specified for the loadable module builder

SCons.Tool.createObjBuilders (env)

This is a utility function that creates the StaticObject and_shared_object Builders in an Environment if they are not there already. If they are there already, we return the existing ones. This is a separate function because soooo many Tools use this functionality.
The return is a 2-tuple of (StaticObject, SharedObject)

SCons.Tool.createProgBuilder (env)

This is a utility function that creates the Program Builder in an Environment if it is not there already. If it is already there, we return the existing one.

SCons.Tool.createSharedLibBuilder (env, shlib_suffix: str = ‘$_SHLIBSUFFIX’)

This is a utility function that creates the SharedLibrary Builder in an Environment if it is not there already. If it is already there, we return the existing one.

**Parameters:**  
shlib_suffix – The suffix specified for the shared library builder

SCons.Tool.createStaticLibBuilder (env)

This is a utility function that creates the StaticLibrary Builder in an Environment if it is not there already. If it is already there, we return the existing one.

SCons.Tool.find_program_path (env, key_program, default_paths=None, add_path: bool = False) \rightarrow str

Find the location of a tool using various means. Mainly for windows where tools aren’t all installed in /usr/bin, etc.

**Parameters:**
- env – Current Construction Environment.
- key_program – Tool to locate.
- default_paths – List of additional paths this tool might be found in.
- add_path – If true, add path found if it was from default_paths.

SCons.Tool.tool_list (platform, env)

**SCons.Util package**

**Module contents**

SCons utility functions

This package contains routines for use by other parts of SCons. Candidates for inclusion here are routines that do not need other parts of SCons (other than Util), and have a reasonable chance of being useful in multiple places, rather then being topical only to one module/package.

**class** SCons.Util.CLVar (initlist=None)

Bases: UserList

A container for command-line construction variables.

Forces the use of a list of strings intended as command-line arguments. Like collections.UserList, but the argument passed to the initializer will be processed by the Split() function, which includes special handling for string types: they will be split into a list of words, not coerced directly to a list. The same happens if a string is added to a CLVar, which allows doing the right thing with both Append()/Prepend() methods, as well as with pure Python addition, regardless of whether adding a list or a string to a construction variable.

Side effect: spaces will be stripped from individual string arguments. If you need spaces preserved, pass strings containing spaces inside a list argument.

```python
>>> u = UserList("--some --opts and args")
>>> print(len(u), repr(u))
```
```python
>>> c = CLVar("--some --opts and args")
>>> print(len(c), repr(c))
4 ['--some', '--opts', 'and', 'args']
>>> c += " strips spaces "
>>> print(len(c), repr(c))
6 ['--some', '--opts', 'and', 'args', 'strips', 'spaces']
>>> c += [' does not split or strip ']
7 ['--some', '--opts', 'and', 'args', 'strips', 'spaces', ' does not split or strip ']
```

```
class SCons.Util.Delegate (attribute)
Bases: object
A Python Descriptor class that delegates attribute fetches to an underlying wrapped subject of a Proxy. Typical use:

class Foo(Proxy):
    __str__ = Delegate('__str__')
```

```
class SCons.Util.DispatchingFormatter (formatters, default_formatter)  
Bases: Formatter
Logging formatter which dispatches to various formatters.
```

```
converter ()

localtime([seconds]) -> (tm_year,tm_mon,tm_mday,tm_hour,tm_min,
    tm_sec,tm_wday,tm_yday,tm_isdst)
Convert seconds since the Epoch to a time tuple expressing local time. When 'seconds' is not passed in, convert
the current time instead.
default_msec_format = '%s,%03d'
default_time_format = '%Y-%m-%d %H:%M:%S'
format (record)
Format the specified record as text.
The record's attribute dictionary is used as the operand to a string formatting operation which yields the returned
string. Before formatting the dictionary, a couple of preparatory steps are carried out. The message attribute of the
record is computed using LogRecord.getMessage(). If the formatting string uses the time (as determined by a call
to useTime(), formatTime() is called to format the event time. If there is exception information, it is formatted using
formatException() and appended to the message.
```
formatException (ei)
Format and return the specified exception information as a string.
This default implementation just uses traceback.print_exception()

formatMessage (record)

formatStack (stack_info)
This method is provided as an extension point for specialized formatting of stack information.
The input data is a string as returned from a call to traceback.print_stack(), but with the last trailing newline removed.
The base implementation just returns the value passed in.

formatTime (record, datefmt=None)
Return the creation time of the specified LogRecord as formatted text.
This method should be called from format() by a formatter which wants to make use of a formatted time. This
method can be overridden in formatters to provide for any specific requirement, but the basic behaviour is as
follows: if datefmt (a string) is specified, it is used with time.strftime() to format the creation time of the record.
Otherwise, an ISO8601-like (or RFC 3339-like) format is used. The resulting string is returned. This function uses a
user-configurable function to convert the creation time to a tuple. By default, time.localtime() is used; to change this
for a particular formatter instance, set the ‘converter’ attribute to a function with the same signature as
time.localtime() or time.gmtime(). To change it for all formatters, for example if you want all logging times to be
shown in GMT, set the ‘converter’ attribute in the Formatter class.

usesTime ()
Check if the format uses the creation time of the record.

class SCons.Util.DisplayEngine
Bases: object
A callable class used to display SCons messages.
print_it = True
set_mode (mode) → None

SCons.Util.IDX (n) → bool
Generate in index into strings from the tree legends.
These are always a choice between two, so bool works fine.

class SCons.Util.LogicalLines (fileobj)
Bases: object
Wrapper class for the logical_lines() function.
Allows us to read all “logical” lines at once from a given file object.
readlines ()

class SCons.Util.NodeList (initlist=None)
Bases: UserList
A list of Nodes with special attribute retrieval.
Unlike an ordinary list, access to a member’s attribute returns a NodeList containing the same attribute for each
member. Although this can hold any object, it is intended for use when processing Nodes, where fetching an attribute
of each member is very common, for example getting the content signature of each node. The term “attribute” here
includes the string representation.

>>> someList = NodeList(['  foo  ', '  bar  '])
>>> someList.strip()
['foo', 'bar']

__getattr__ (name) → NodeList
Returns a NodeList of name from each member.

__getitem__ (index)
Returns one item, forces a NodeList if index is a slice.

__abc_impl = <__abc__abc_data object>
append (item)
S.append(value) – append value to the end of the sequence
clear () → None -- remove all items from S
copy ()
count (value) → integer -- return number of occurrences of value
extend (other)
  S.extend(iterable) – extend sequence by appending elements from the iterable
index (value[, start[, stop]]) → integer -- return first index of value.
  Raises ValueError if the value is not present.
  Supporting start and stop arguments is optional, but recommended.
insert (i, item)
  S.insert(index, value) – insert value before index
pop ([, index]) → item -- remove and return item at index (default last).
  Raise IndexError if list is empty or index is out of range.
remove (item)
  S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.
reverse ()
  S.reverse() – reverse IN PLACE
sort (*args, **kwds)
class SCons.Util.Proxy (subject)
  Bases: object
  A simple generic Proxy class, forwarding all calls to subject.
  This means you can take an object, let’s call it ‘obj_a’, and wrap it in this Proxy class, with a statement like this:

```python
proxy_obj = Proxy(obj_a)
```
Then, if in the future, you do something like this:

```python
x = proxy_obj.var1
```
since the Proxy class does not have a var1 attribute (but presumably obj_a does), the request actually is equivalent
to saying:

```python
x = obj_a.var1
```
Inherit from this class to create a Proxy.
With Python 3.5+ this does not work transparently for Proxy subclasses that use special dunder method names,
because those names are now bound to the class, not the individual instances. You now need to know in advance
which special method names you want to pass on to the underlying Proxy object, and specifically delegate their calls
like this:

```python
class Foo(Proxy):
    __str__ = Delegate('__str__')
```

```python
__getattribute__(name)
  Retrieve an attribute from the wrapped object.

  Raises: AttributeError – if attribute name doesn’t exist.
```
get ()
  Retrieve the entire wrapped object
SCons.Util.RegError
  alias of _NoError
SCons.Util.RegGetValue (root, key)
SCons.Util.RegOpenKeyEx (root, key)
class SCons.Util.Selector
  Bases: dict
  A callable dict for file suffix lookup.
  Often used to associate actions or emitters with file types.
  Depends on insertion order being preserved so that get_suffix() calls always return the first suffix added.
clear () → None. Remove all items from D.
SCons.Util package

copy () → a shallow copy of D
fromkeys (value=None, /)
Create a new dictionary with keys from iterable and values set to value.
get (key, default=None, /)
Return the value for key if key is in the dictionary, else default.
items () → a set-like object providing a view on D’s items
keys () → a set-like object providing a view on D’s keys
pop (k[, d]) → v, remove specified key and return the corresponding value.
If the key is not found, return the default if given; otherwise, raise a KeyError.
popitem ()
Remove and return a (key, value) pair as a 2-tuple.
Pairs are returned in LIFO (last-in, first-out) order. Raises KeyError if the dict is empty.
setdefault (key, default=None, /)
Insert key with a value of default if key is not in the dictionary.
Return the value for key if key is in the dictionary, else default.
update ([, E], **F) → None. Update D from dict/iterable E and F.
If E is present and has a .keys() method, then does: for k in E: D[k] = E[k] If E is present and lacks a .keys()
method, then does: for k, v in E: D[k] = v In either case, this is followed by: for k in F: D[k] = F[k]
values () → an object providing a view on D’s values

SCons.Util.Split (arg) → list
Returns a list of file names or other objects.
If arg is a string, it will be split on whitespace within the string. If arg is already a list, the list will be returned
untouched. If arg is any other type of object, it will be returned in a single-item list.

>>> print(Split(" this is a string "))
['this', 'is', 'a', 'string']
>>> print(Split(\"stringlist", \" preserving \", \" spaces \")\n['stringlist', ' preserving ', ' spaces ']

class SCons.Util.Unbuffered (file)
Bases: object
A proxy that wraps a file object, flushing after every write.
Delegates everything else to the wrapped object.
write (arg) → None
writelines (arg) → None
class SCons.Util.UniqueList (initlist=None)
Bases: UserList
A list which maintains uniqueness.
Uniquing is lazy: rather than being enforced on list changes, it is fixed up on access by those methods which need to
act on a unique list to be correct. That means things like membership tests don’t have to eat the uniquing time.
__make_unique () → None
__abc_impl = \<_abc._abc_data object>\
append (item) → None
S.append(value) – append value to the end of the sequence
clear () → None -- remove all items from S
copy ()
count (value) → integer -- return number of occurrences of value
extend (other) → None
S.extend(iterable) – extend sequence by appending elements from the iterable
index (value[, start[, stop]]) → integer -- return first index of value.
Raises ValueError if the value is not present.
Supporting start and stop arguments is optional, but recommended.
insert (i, item) → None
S.insert(index, value) – insert value before index
pop ([, index]) → item -- remove and return item at index (default last).
Raise IndexError if list is empty or index is out of range.
SCons.Util package

remove (item)
S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.
reverse () → None
S.reverse() – reverse IN PLACE
sort (*args, **kwds)

SCons.Util.WhereIs (file, path=None, pathext=None, reject=None) → str | None
Return the path to an executable that matches file.
Searches the given path for file, considering any filename extensions in pathext (on the Windows platform only), and
returns the full path to the matching command of the first match, or None if there are no matches. Will not select any
path name or names in the optional reject list.
If path is None (the default), os.environ[PATH] is used. On Windows, If pathext is None (the default), os.environ[PATHEXT] is used.
The construction environment method of the same name wraps a call to this function by filling in path from the
execution environment if it is None (and for pathext on Windows, if necessary), so if called from there, this function
will not backfill from os.environ.

Note
Finding things in os.environ may answer the question “does file exist on the system”, but not the question “can
SCons use that executable”, unless the path element that yields the match is also in the the Execution
Environment (e.g. env['ENV']['PATH']). Since this utility function has no environment reference, it cannot
make that determination.

exception  SCons.Util._NoError
Bases: Exception
add_note ()
   Exception.add_note(note) – add a note to the exception
args
with_traceback ()
   Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

SCons.Util._semi_deepcopy_list (obj) → list
SCons.Util._semi_deepcopy_tuple (obj) → tuple

SCons.Util.adjustixes (fname, pre, suf, ensure_suffix: bool = False) → str
Adjust filename prefixes and suffixes as needed.
   Add prefix to fname if specified. Add suffix to fname if specified and if ensure_suffix is True

SCons.Util.case_sensitive_suffixes (s1: str, s2: str) → bool
Returns whether platform distinguishes case in file suffixes.

SCons.Util.do_flatten (sequence, result, do_flatten=<function do_flatten>, StringTypes=(<class 'str'>, <class 'collections.UserString'>), SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>)) → list
SCons.Util.flatten (obj, do_flatten=<function do_flatten>, StringTypes=(<class 'str'>, <class 'collections.UserString'>), SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>)) → list
Flatten a sequence to a non-nested list.

Converts either a single scalar or a nested sequence to a non-nested list. Note that flatten() considers strings to be scalars instead of sequences like pure Python would.

```python
SCons.Util.flatten_sequence (sequence, isinstance=<built-in function isinstance>,
StringTypes=(<class 'str'>, <class 'collections.UserString'>), SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>), do_flatten=<function do_flatten>) → list
```

Flatten a sequence to a non-nested list.

Same as flatten(), but it does not handle the single scalar case. This is slightly more efficient when one knows that the sequence to flatten can not be a scalar.

```python
SCons.Util.get_native_path (path: str) → str
```

Transform an absolute path into a native path for the system.

In Cygwin, this converts from a Cygwin path to a Windows path, without regard to whether path refers to an existing file system object. For other platforms, path is unchanged.

```python
SCons.Util.logical_lines (physical_lines, joiner=<built-in method join of str object>)
```

```python
SCons.Util.make_path_relative (path) → str
```

Converts an absolute path name to a relative pathname.

```python
SCons.Util.print_time ()
```

Hack to return a value from Main if can’t import Main.

```python
SCons.Util.print_tree (root, child_func, prune: bool = False, showtags: int = 0, margin: List[bool] = [False], visited: dict | None = None, lastChild: bool = False, singleLineDraw: bool = False) → None
```

Print a tree of nodes.

This is like func:render_tree, except it prints lines directly instead of creating a string representation in memory, so that huge trees can be handled.

**Parameters:**
- `root` – the root node of the tree
- `child_func` – the function called to get the children of a node
- `prune` – don’t visit the same node twice
- `showtags` – print status information to the left of each node line The default is false (value 0). A value of 2 will also print a legend for the margin tags.
- `margin` – the format of the left margin to use for children of root. Each entry represents a column, where a true value will display a vertical bar and a false one a blank.
- `visited` – a dictionary of visited nodes in the current branch if prune is false, or in the whole tree if prune is true.
- `lastChild` – this is the last leaf of a branch
- `singleLineDraw` – use line-drawing characters rather than ASCII.

```python
SCons.Util.render_tree (root, child_func, prune: bool = False, margin: List[bool] = [False], visited: dict | None = None, lastChild: bool = False, singleLineDraw: bool = False) → str
```

Render a tree of nodes into an ASCII tree view.

**Parameters:**
- `root` – the root node of the tree
- `child_func` – the function called to get the children of a node
- `prune` – don’t visit the same node twice
- `margin` – the format of the left margin to use for children of root. Each entry represents a column where a true value will display a vertical bar and a false one a blank.
- `visited` – a dictionary of visited nodes in the current branch if prune is false, or in the whole tree if prune is true.

```python
SCons.Util.rightmost_separator (path, sep)
```

```python
SCons.Util.sanitize_shell_env (execution_env: dict) → dict
```
Sanitize all values in `execution_env`.
The execution environment (typically comes from `env['ENV']`) is propagated to the shell, and may need to be cleaned first.

**Parameters:**
- `execution_env` – The shell environment variables to be propagated
- `shell` (to the spawned) –

**Returns:** sanitized dictionary of env variables (similar to what you’d get from os.environ)

```python
SCons.Util.semi_deepcopy (obj)
SCons.Util.semi_deepcopy_dict (obj, exclude=None) → dict
SCons.Util.silent_intern (__string: Any) → str
    Intern a string without failing.
    Perform sys.intern on the passed argument and return the result. If the input is ineligible for interning the original argument is returned and no exception is thrown.
SCons.Util.splitext (path) → tuple
    Split `path` into a (root, ext) pair.
    Same as os.path.splitext but faster.
SCons.Util.unique (seq)
    Return a list of the elements in `seq` without duplicates, ignoring order.
    For best speed, all sequence elements should be hashable. Then unique() will usually work in linear time.
    If not possible, the sequence elements should enjoy a total ordering, and if list(s).sort() doesn’t raise TypeError it is assumed that they do enjoy a total ordering. Then unique() will usually work in O(N*log2(N)) time.
    If that’s not possible either, the sequence elements must support equality-testing. Then unique() will usually work in quadratic time.

>>> mylist = unique([1, 2, 3, 1, 2, 3])
>>> print(sorted(mylist))
[1, 2, 3]
>>> mylist = unique("abcabc")
>>> print(sorted(mylist))
['a', 'b', 'c']
>>> mylist = unique(((1, 2), [2, 3], [1, 2]))
>>> print(sorted(mylist))
[[1, 2], [2, 3]]
```

```python
SCons.Util.uniquer_hashables (seq)
SCons.Util.updrive (path) → str
    Make the drive letter (if any) upper case.
    This is useful because Windows is inconsistent on the case of the drive letter, which can cause inconsistencies when calculating command signatures.
SCons.Util.wait_for_process_to_die (pid) → None
    Wait for specified process to die, or alternatively kill it
    NOTE: This function operates best with psutil pypi package
    TODO: Add timeout which raises exception
```

Submodules

SCons.Util.envs module

SCons environment utility functions.

Routines for working with environments and construction variables that don’t need the specifics of the Environment class.

```python
SCons.Util.envs.AddMethod (obj, function: Callable, name: str | None = None) → None
    Add a method to an object.
    Adds `function` to `obj` if `obj` is a class object. Adds `function` as a bound method if `obj` is an instance object. If `obj` looks like an environment instance, use MethodWrapper to add it. If `name` is supplied it is used as the name of `function`.
```
Although this works for any class object, the intent as a public API is to be used on Environment, to be able to add a method to all construction environments; it is preferred to use env.AddMethod to add to an individual environment.

```python
>>> class A:
...   ...

>>> a = A()

>>> def f(self, x, y):
...   self.z = x + y

>>> AddMethod(A, f, "add")

>>> a.add(2, 4)

>>> print(a.z)
6

>>> a.data = ['a', 'b', 'c', 'd', 'e', 'f']

>>> AddMethod(a, lambda self, i: self.data[i], "listIndex")

>>> print(a.listIndex(3))

SCons.Util.envs.AddPathIfNotExists (env_dict, key, path, sep: str = ':') → None
Add a path element to a construction variable.
key is looked up in env_dict, and path is added to it if it is not already present. env_dict[key] is assumed to be in the format of a PATH variable: a list of paths separated by sep tokens.

```python
>>> env = {'PATH': '/bin:/usr/bin:/usr/local/bin'}

>>> AddPathIfNotExists(env, 'PATH', '/opt/bin')

>>> print(env['PATH'])
/opt/bin:/bin:/usr/bin:/usr/local/bin
```

SCons.Util.envs.AppendPath (oldpath, newpath, sep=':', delete_existing: bool = True, canonicalize: Callable | None = None) → list | str
Append newpath path elements to oldpath. Will only add any particular path once (leaving the last one it encounters and ignoring the rest, to preserve path order), and will os.path.normpath and os.path.normcase all paths to help assure this. This can also handle the case where oldpath is a list instead of a string, in which case a list will be returned instead of a string. For example:

```python
>>> p = AppendPath("/foo/bar:/foo", "/biz/boom:/foo")

>>> print(p)
/foo/bar:/foo:/biz/boom:/foo
```

If delete_existing is False, then adding a path that exists will not move it to the end; it will stay where it is in the list.

```python
>>> p = AppendPath("/foo/bar:/foo", "/biz/boom:/foo", delete_existing=False)

>>> print(p)
/foo/bar:/foo:/biz/boom
```

If canonicalize is not None, it is applied to each element of newpath before use.

```
class SCons.Util.envs.MethodWrapper (obj: Any, method: Callable, name: str | None = None)
Bases: object
A generic Wrapper class that associates a method with an object.
```
As part of creating this MethodWrapper object an attribute with the specified name (by default, the name of the supplied method) is added to the underlying object. When that new “method” is called, our __call__() method adds the object as the first argument, simulating the Python behavior of supplying “self” on method calls.

We hang on to the name by which the method was added to the underlying base class so that we can provide a method to “clone” ourselves onto a new underlying object being copied (without which we wouldn’t need to save that info).

```
clone (new_object)
```

Returns an object that re-binds the underlying “method” to the specified new object.

```
SCons.Util.envs.PrependPath (oldpath, newpath, sep=':', delete_existing: bool = True, canonicalize: Callable | None = None) → list | str
```

Prepend `newpath` path elements to `oldpath`.

Will only add any particular path once (leaving the first one it encounters and ignoring the rest, to preserve path order), and will os.path.normpath and os.path.normcase all paths to help assure this. This can also handle the case where `oldpath` is a list instead of a string, in which case a list will be returned instead of a string. For example:

```python
>>> p = PrependPath("/foo/bar:/foo", "/biz/boom:/foo")
>>> print(p)
/biz/boom:/foo:/foo/bar
```

If `delete_existing` is `False`, then adding a path that exists will not move it to the beginning; it will stay where it is in the list.

```python
>>> p = PrependPath("/foo/bar:/foo", "/biz/boom:/foo", delete_existing=False)
>>> print(p)
/biz/boom:/foo/bar:/foo
```

If `canonicalize` is not `None`, it is applied to each element of `newpath` before use.

```
SCons.Util.envs.is_valid_construction_var (varstr: str) → bool
```

Return True if `varstr` is a legitimate name of a construction variable.

SCons.Util.filelock module

SCons file locking functions.

Simple-minded filesystem-based locking. Provides a context manager which acquires a lock (or at least, permission) on entry and releases it on exit.

Usage:

```python
from SCons.Util.filelock import FileLock

with FileLock("myfile.txt", writer=True) as lock:
    print(f"Lock on {lock.file} acquired.")
    # work with the file as it is now locked
```

```python
class SCons.Util.filelock.FileLock (file: str, timeout: int | None = None, delay: float | None = 0.05, writer: bool = False)
```

Bases: object

Lock a file using a lockfile.

Basic locking for when multiple processes may hit an externally shared resource that cannot depend on locking within a single SCons process. SCons does not have a lot of those, but caches come to mind.

Cross-platform safe, does not use any OS-specific features. Provides context manager support, or can be called with acquire_lock() and release_lock().

Lock can be a write lock, which is held until released, or a read lock, which releases immediately upon acquisition - we want to not read a file which somebody else may be writing, but not create the writers starvation problem of the classic readers/writers lock.
TODO: Should default timeout be None (non-blocking), or 0 (block forever), or some arbitrary number?

Parameters:
- file – name of file to lock. Only used to build the lockfile name.
- timeout – optional time (sec) to give up trying. If None, quit now if we failed to get the lock (non-blocking). If 0, block forever (well, a long time).
- delay – optional delay between tries [default 0.05s]
- writer – if True, obtain the lock for safe writing. If False (default), just wait till the lock is available, give it back right away.

Raises: **SConsLockFailure** – if the operation “timed out”, including the non-blocking mode.

__enter__ () → FileLock
Context manager entry: acquire lock if not holding.
__exit__ (exc_type, exc_value, exc_tb) → None
Context manager exit: release lock if holding.
__repr__ () → str
Nicer display if someone repr’s the lock class.
acquire_lock () → None
Acquire the lock, if possible.
If the lock is in use, check again every delay seconds. Continue until lock acquired or timeout expires.
release_lock () → None
Release the lock by deleting the lockfile.

SCons.Util.scons.SConsLockFailure

Bases: Exception
Lock failure exception.
add_note ()
Exception.add_note(note) – add a note to the exception args
with_traceback ()
Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

SCons.Util.hashes module
SCons hash utility routines.
Routines for working with content and signature hashes.
SCons.Util.hashes.MD5collect (signatures)
Deprecated. Use hash_collect() instead.
SCons.Util.hashes.MD5filesignature (fname, chunksize: int = 65536)
Deprecated. Use hash_file_signature() instead.
SCons.Util.hashes.MD5signature (s)
Deprecated. Use hash_signature() instead.
SCons.Util.hashes._attempt_get_hash_function (hash_name, hashlib_used=<module 'hashlib' from '/opt/local/Library/Frameworks/Python.framework/Versions/3.11/lib/python3.11/hashlib.py'>, sys_used=<module 'sys' (built-in)>)
Wrapper used to try to initialize a hash function given.
If successful, returns the name of the hash function back to the user.
Otherwise returns None.
SCons.Util.hashes._attempt_init_of_python_3_9_hash_object (hash_function_object, sys_used=<module 'sys' (built-in)>)
Initialize hash function with non-security indicator.
In Python 3.9 and onwards, hashlib constructors accept a keyword argument usedforsecurity, which, if set to False, lets us continue to use algorithms that have been deprecated either by FIPS or by Python itself, as the MD5 algorithm SCons prefers is not being used for security purposes as much as a short, 32 char hash that is resistant to accidental collisions.
SCons.Util package

In prior versions of Python, hashlib returns a native function wrapper, which errors out when it's queried for the optional parameter, so this function wraps that call.

It can still throw a ValueError if the initialization fails due to FIPS compliance issues, but that is assumed to be the responsibility of the caller.

SCons.Util.hashes._get_hash_object(hash_format, hashlib_used=<module 'hashlib' from '/opt/local/Library/Frameworks/Python.framework/Versions/3.11/lib/python3.11/hashlib.py'>, sys_used=<module 'sys' (built-in)>)

Allocates a hash object using the requested hash format.

Parameters: hash_format -- Hash format to use.
Returns: hashlib object.

SCons.Util.hashes._set_allowed_viable_default_hashes(hashlib_used, sys_used=<module 'sys' (built-in)>)

Check if the default hash algorithms can be called.

This util class is sometimes called prior to setting the user-selected hash algorithm, meaning that on FIPS-compliant systems the library would default-initialize MD5 and throw an exception in set_hash_format. A common case is using the SConf options, which can run prior to main, and thus ignore the options.hash_format variable.

This function checks the DEFAULT_HASH_FORMATS and sets the ALLOWED_HASH_FORMATS to only the ones that can be called. In Python >= 3.9 this will always default to MD5 as in Python 3.9 there is an optional attribute "usedforsecurity" set for the method.

Throws if no allowed hash formats are detected.

SCons.Util.hashes._show_md5_warning(function_name) → None

Shows a deprecation warning for various MD5 functions.

SCons.Util.hashes.get_current_hash_algorithm_used()

Returns the current hash algorithm name used.

Where the python version >= 3.9, this is expected to return md5. If python's version is <= 3.8, this returns md5 on non-FIPS-mode platforms, and sha1 or sha256 on FIPS-mode Linux platforms.

This function is primarily useful for testing, where one expects a value to be one of N distinct hashes, and therefore the test needs to know which hash to select.

SCons.Util.hashes.get_hash_format()

Retrieves the hash format or None if not overridden.

A return value of None does not guarantee that MD5 is being used; instead, it means that the default precedence order documented in SCons.Util.set_hash_format() is respected.

SCons.Util.hashes.hash_collect(signatures, hash_format=None)

Collects a list of signatures into an aggregate signature.

Parameters:

- signatures -- a list of signatures

Returns:

- hash_format -- Specify to override default hash format

the aggregate signature

SCons.Util.hashes.hash_file_signature(fname, chunksize: int = 65536, hash_format=None)

Generate the md5 signature of a file

Parameters:

- fname -- file to hash

- chunksize -- chunk size to read

Returns:

- hash_format -- Specify to override default hash format

String of Hex digits representing the signature

SCons.Util.hashes.hash_signature(s, hash_format=None)

Generate hash signature of a string

Parameters:

- s -- either string or bytes. Normally should be bytes

- hash_format -- Specify to override default hash format

Returns:

- String of hex digits representing the signature
SCons.Util.hashes.set_hash_format

Sets the default hash format used by SCons.
If hash_format is None or an empty string, the default is determined by this function.
Currently the default behavior is to use the first available format of the following options: MD5, SHA1, SHA256.

SCons.Util.sctypes module

Various SCons utility functions

Routines which check types and do type conversions.

class SCons.Util.sctypes.Null(*args, **kwargs)
Bases: object

Null objects always and reliably ‘do nothing’.

class SCons.Util.sctypes.NullSeq(*args, **kwargs)
Bases: Null

A Null object that can also be iterated over.

SCons.Util.sctypes.get_env_bool(env, name: str, default: bool = False) → bool
Convert a construction variable to boolean.

If the value of name in dict-like object env is ‘true’, ‘yes’, ‘y’, ‘on’ (case insensitive) or anything convertible to int that yields non-zero, return True; if ‘false’, ‘no’, ‘n’, ‘off’ (case insensitive) or a number that converts to integer zero return False. Otherwise, or if name is not found, return the value of default.

Parameters:

• env – construction environment, or any dict-like object.

• name – name of the variable.

• default – value to return if name not in env or cannot be converted (default: False).

SCons.Util.sctypes.get_environment_var(varstr) → str | None
Return undecorated construction variable string.
Determine if varstr looks like a reference to a single environment variable, like "$FOO" or "${FOO}". If so, return that variable with no decorations, like "FOO". If not, return None.

SCons.Util.sctypes.get_os_env_bool(name: str, default: bool = False) → bool
Convert an external environment variable to boolean.
Like get_env_bool(), but uses os.environ as the lookup dict.

SCons.Util.sctypes.is_Dict(obj, isinstance=<built-in function isinstance>, DictTypes=(<class 'dict'>, <class 'collections.UserDict'>)) → bool
Check if object is a dict.

SCons.Util.sctypes.is_List(obj, isinstance=<built-in function isinstance>, ListTypes=(<class 'list'>, <class 'collections.UserList'>, <class 'collections.deque'>)) → bool
Check if object is a list.

SCons.Util.sctypes.is_Scalar(obj, isinstance=<built-in function isinstance>, StringTypes=(<class 'str'>, <class 'collections.UserString'>), Iterable=<class 'collections.abc.Iterable'>) → bool
Check if object is a scalar: not a container or iterable.

SCons.Util.sctypes.is_Sequence(obj, isinstance=<built-in function isinstance>, SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>)) → bool
Check if object is a sequence.

SCons.Util.sctypes.is_String(obj, isinstance=<built-in function isinstance>, StringTypes=(<class 'str'>, <class 'collections.UserString'>)) → bool
Check if object is a string.

SCons.Util.sctypes.is_Tuple(obj, isinstance=<built-in function isinstance>, tuple=<class 'tuple'>) → bool
Check if object is a tuple.

SCons.Util.sctypes.to_String(obj, isinstance=<built-in function isinstance>, str=<class 'str'>, UserString=<class 'collections.UserString'>, BaseStringTypes=<class 'str'>) → str
SCons.Util package

Return a string version of obj. Use this for data likely to be well-behaved. Use to_Text() for unknown file data that needs to be decoded.
SCons.Util.sctypes.to_String_for_signature (obj, to_String_for_subst=<function to_String_for_subst>, AttributeError=<class 'AttributeError'>) → str

Return a string version of obj for signature usage.
Like to_String_for_subst() but has special handling for scons objects that have a for_signature() method, and for dicts.
SCons.Util.sctypes.to_String_for_subst (obj, isinstance=<built-in function isinstance>, str=<class 'str'>, BaseStringTypes=<class 'str'>, SequenceTypes=(<class 'list'>, <class 'tuple'>, <class 'collections.deque'>, <class 'collections.UserList'>, <class 'collections.abc.MappingView'>), UserString=<class 'collections.UserString'>) → str

Return a string version of obj for subst usage.
SCons.Util.sctypes.to_Text (data: bytes) → str

Return bytes data converted to text.
Useful for whole-file reads where the data needs some interpretation, particularly for Scanners. Attempts to figure out what the encoding of the text is based upon the BOM bytes, and then decodes the contents so that it’s a valid python string.
SCons.Util.sctypes.to_bytes (s) → bytes

Convert object to bytes.
SCons.Util.sctypes.to_str (s) → str

Convert object to string.

SCons.Util.stats module

SCons statistics routines.

This package provides a way to gather various statistics during an SCons run and dump that info in several formats.
Additionally, it probably makes sense to do stderr/stdout output of those statistics here as well.

There are basically two types of stats:

1. Timer (start/stop/time) for specific event. These events can be hierarchical. So you can record the children events of some parent. Think program compile could contain the total Program builder time, which could include linking, and stripping the executable
2. Counter. Counting the number of events and/or objects created. This would likely only be reported at the end of a given SCons run, though it might be useful to query during a run.

class SCons.Util.stats.CountStats
Bases: Stats
  _abc_impl = <_abc_abc_data object>
  do_append (label)
  do_nothing (**kw)
  do_print ()
  enable (outfp)

class SCons.Util.stats.MemStats
Bases: Stats
  _abc_impl = <_abc_abc_data object>
  do_append (label)
  do_nothing (**kw)
  do_print ()
  enable (outfp)

class SCons.Util.stats.Stats
Bases: ABC
  _abc_impl = <_abc_abc_data object>
  do_append (label)
  do_nothing (**kw)
  do_print ()
  enable (outfp)
class SCons.Util.stats.TimeStats
    Bases: Stats
    _abc_impl = <_abc._abc_data object>
    add_command (command, start_time, finish_time)
    do_append (label)
    do_nothing (*args, **kw)
    do_print ()
    enable (outfp)
    total_times (build_time, sconscript_time, scons_exec_time, command_exec_time)
SCons.Util.stats.add_stat_type (name, stat_object)
    Add a statistic type to the global collection
SCons.Util.stats.write_scons_stats_file ()
    Actually write the JSON file with debug information. Depending which of : count, time, action-timestamps, memory
    their information will be written.

SCons.Variables package

Module contents

Adds user-friendly customizable variables to an SCons build.

class SCons.Variables.Variable
    Bases: object
    A Build Variable.
    __lt__ (other)
        Comparison function so Variable instances sort.
    __str__ () → str
        Provide a way to “print” a Variable object.
    aliases
    converter
    default
    do_subst
    help
    key
    validator

class SCons.Variables.Variables (files: str | Sequence[str] | None = None, args: dict | None = None, is_global: bool = False)
    Bases: object
    A container for multiple Build Variables.
    Includes methods to updates the environment with the variables, and to render the help text.

    Parameters:
    - files – string or list of strings naming variable config scripts (default None)
    - args – dictionary to override values set from files. (default None)
    - is_global – if true, return a global singleton Variables object instead of a fresh instance.

    Changed in version 4.8.0: The default for is_global changed to False (previously True but it had no effect due to an
    implementation error).
    Deprecated since version 4.8.0: is_global is deprecated.

    Add (key: str | Sequence, *args, **kwargs) → None
    Add a Build Variable.
Parameters:
- key – the name of the variable, or a 5-tuple (or other sequence). If key is a tuple, and there are no additional arguments except the help, default, validator and converter keyword arguments, key is unpacked into the variable name plus the help, default, validator and converter arguments; if there are additional arguments, the first elements of key is taken as the variable name, and the remainder as aliases.
- args – optional positional arguments, corresponding to the help, default, validator and converter keyword args.
- kwargs – arbitrary keyword arguments used by the variable itself.
- help – help text for the variable (default: empty string)
- default – default value for variable (default: None)
- validator – function called to validate the value (default: None)
- converter – function to be called to convert the variable’s value before putting it in the environment. (default: None)
- subst – perform substitution on the value before the converter and validator functions (if any) are called (default: True)

New in version 4.8.0: The subst keyword argument is now specially recognized.

AddVariables (*optlist) → None
Add a list of Build Variables.
Each list element is a tuple/list of arguments to be passed on to the underlying method for adding variables.
Example:
```python
opt = Variables()
opt.AddVariables(
    ('debug', '', 0),
    ('CC', 'The C compiler'),
    ('VALIDATE', 'An option for testing validation', 'notset', validator, None),
)
```

FormatVariableHelpText (env, key: str, help: str, default, actual, aliases: List[str] | None = None) → str
Format the help text for a single variable.
The caller is responsible for obtaining all the values, although now the Variable class is more publicly exposed, this method could easily do most of that work - however that would change the existing published API.

GenerateHelpText (env, sort: bool | Callable = False) → str
Generate the help text for the Variables object.

Parameters:
- env – an environment that is used to get the current values of the variables.
- sort – Either a comparison function used for sorting (must take two arguments and return -1, 0 or 1) or a boolean to indicate if it should be sorted.

Save (filename, env) → None
Save the variables to a script.
Saves all the variables which have non-default settings to the given file as Python expressions. This script can then be used to load the variables for a subsequent run. This can be used to create a build variable “cache” or capture different configurations for selection.

Parameters:
- filename – Name of the file to save into
- env – the environment to get the option values from

UnknownVariables () → dict
Return dict of unknown variables.
Identifies variables that were not recognized in this object.
Update \((\text{env, args: dict} \mid \text{None} = \text{None}) \rightarrow \text{None}\)

Update an environment with the Build Variables.

**Parameters:**

- \(\text{env}\) – the environment to update.
- \(\text{args}\) – a dictionary of keys and values to update in \(\text{env}\). If omitted, uses the saved args

__str__ () \(\rightarrow\) \(\text{str}\)

Provide a way to "print" a Variables object.

_do_add\(\)\(\text{key: str} \mid \text{List[str]}, \text{help: str} = \text{""}, \text{default=\text{None}}, \text{validator: Callable} \mid \text{None} = \text{None}, \text{converter: Callable} \mid \text{None} = \text{None}, \text{**kwargs} \rightarrow \text{None}\)

Create a Variable and add it to the list.

This is the internal implementation for Add() and AddVariables(). Not part of the public API.

New in version 4.8.0: subst keyword argument is now recognized.

aliasfmt = \(\text{''ln%s: %s\text{default: %s\text{actual: %s\text{aliases: %s}}}}\)

fmt = \(\text{''ln%s: %s\text{default: %s\text{actual: %s}}}\)

def keys () \(\rightarrow \) \text{list}

Return the variable names.

### Submodules

**SCons.Variables.BoolVariable module**

Variable type for true/false Variables.

Usage example:

```python
opts = Variables()
opts.Add(BoolVariable('embedded', 'build for an embedded system', False))
env = Environment(variables=opts)
if env['embedded']:
    ...
```

**SCons.Variables.BoolVariable.BoolVariable\(\)\(\text{key, help: str, default} \rightarrow \text{Tuple}[\text{str, str, str, Callable, Callable}]\)

Return a tuple describing a boolean SCons Variable.

The input parameters describe a boolean variable, using a string value as described by TRUE_STRINGS and FALSE_STRINGS. Returns a tuple including the correct converter and validator. The help text will have \((\text{yes|no})\) automatically appended to show the valid values. The result is usable as input to Add().

**SCons.Variables.BoolVariable._text2bool()\(\text{val: str} \rightarrow \text{bool}\)

Convert boolean-like string to boolean.

If \(\text{val}\) looks like it expresses a bool-like value, based on the TRUE_STRINGS and FALSE_STRINGS tuples, return the appropriate value.

This is usable as a converter function for SCons Variables.

**Raises:** ValueError – if \(\text{val}\) cannot be converted to boolean.

**SCons.Variables.BoolVariable._validator()\(\text{key, val, env} \rightarrow \text{None}\)

Validate that the value of \(\text{key}\) in \(\text{env}\) is a boolean.

Parameter \(\text{val}\) is not used in the check.

Usable as a validator function for SCons Variables.

**Raises:**

- KeyError – if \(\text{key}\) is not set in \(\text{env}\)
- UserError – if the value of \(\text{key}\) is not True or False.

**SCons.Variables.EnumVariable module**

Variable type for enumeration Variables.
Enumeration variables allow selection of one from a specified set of values.

Usage example:

```python
opts = Variables()
opts.Add(
    EnumVariable(
        'debug',
        help='debug output and symbols',
        default='no',
        allowed_values=('yes', 'no', 'full'),
        map={},
        ignorecase=2,
    )
)
env = Environment(variables=opts)
if env['debug'] == 'full':
    ...
```

SCons.Variables.EnumVariable.EnumVariable(key, help: str, default: str, allowed_values: List[str], map: dict | None = None, ignorecase: int = 0) → Tuple[str, str, str, Callable, Callable]
Return a tuple describing an enumeration SCons Variable.

The input parameters describe a variable with only predefined values allowed. The value of `ignorecase` defines the behavior of the validator and converter: if 0, the validator/converter are case-sensitive; if 1, the validator/converter are case-insensitive; if 2, the validator/converter are case-insensitive and the converted value will always be lower-case.

**Parameters:**
- `key` – variable name, passed directly through to the return tuple.
- `default` – default values, passed directly through to the return tuple.
- `help` – descriptive part of the help text, will have the allowed values automatically appended.
- `allowed_values` – list of the allowed values for this variable.
- `map` – optional dictionary which may be used for converting the input value into canonical values (e.g. for aliases).
- `ignorecase` – defines the behavior of the validator and converter.

**Returns:** A tuple including an appropriate converter and validator. The result is usable as input to Add(). and AddVariables().

SCons.Variables.EnumVariable._validator(key, val, env, vals) → None
Validate that val is in vals.
Usable as the base for EnumVariable validators.

SCons.Variables.ListVariable module
Variable type for List Variables.

A list variable allows selecting one or more from a supplied set of allowable values, as well as from an optional mapping of alternate names (such as aliases and abbreviations) and the special names 'all' and 'none'. Specified values are converted during processing into values only from the allowable values set.

Usage example:

```python
list_of_libs = Split('x11 gl qt ical')
opts = Variables()
```
opts.Add(
    ListVariable(
        'shared',
        help='libraries to build as shared libraries',
        default='all',
        elems=list_of_libs,
    )
)
env = Environment(variables=opts)
for lib in list_of_libs:
    if lib in env['shared']:
        env.SharedObject(...)
    else:
        env.Object(...)

SCons.Variables.ListVariable.ListVariable (key, help: str, default: str | List[str], names: List[str], map: dict | None = None, validator: Callable | None = None) → Tuple[None, None, None, Callable]

Return a tuple describing a list variable.

The input parameters describe a list variable, where the values can be one or more from names plus the special values all and none.

Parameters:

- **key** – the name of the list variable.
- **help** – the basic help message. Will have text appended indicating the allowable values (not including any extra names from map).
- **default** – the default value(s) for the list variable. Can be given as string (possibly comma-separated), or as a list of strings. all or none are allowed as default. You can also simulate a must-specify ListVariable by giving a default that is not part of names, it will fail validation if not supplied.
- **names** – the allowable values. Must be a list of strings.
- **map** – optional dictionary to map alternative names to the ones in names, providing a form of alias. The converter will make the replacement, names from map are not stored and will not appear in the help message.
- **validator** – optional callback to validate supplied values. The default validator is used if not specified.

Returns: A tuple including the correct converter and validator. The result is usable as input to Add().

Changed in version 4.8.0: The validation step was split from the converter to allow for custom validators. The validator keyword argument was added.

class SCons.Variables.ListVariable._ListVariable (initlist: list | None = None, allowedElems: list | None = None)

Bases: UserList

Internal class holding the data for a List Variable.
This is normally not directly instantiated, rather the ListVariable converter callback “converts” string input (or the default value if none) into an instance and stores it.

Parameters:

- **initlist** – the list of actual values given.
- **allowedElems** – the list of allowable values.
SCons.Variables package

count(value) → integer -- return number of occurrences of value
extend(other)
    S.extend(iterable) – extend sequence by appending elements from the iterable
index(value[, start[, stop]]) → integer -- return first index of value.
    Raises ValueError if the value is not present.
    Supporting start and stop arguments is optional, but recommended.
insert(i, item)
    S.insert(index, value) – insert value before index
pop([, index]) → item -- remove and return item at index (default last).
    Raise IndexError if list is empty or index is out of range.
prepare_to_store()
remove(item)
    S.remove(value) – remove first occurrence of value. Raise ValueError if the value is not present.
reverse()
    S.reverse() – reverse IN PLACE
sort(*args, **kwds)
SCons.Variables.ListVariable._converter(val, allowedElems, mapdict) → _ListVariable
    Callback to convert list variables into a suitable form.
    The arguments allowedElems and mapdict are non-standard for a Variables converter: the lambda in the
ListVariable() function arranges for us to be called correctly.
SCons.Variables.ListVariable._validator(key, val, env) → None
    Callback to validate supplied value(s) for a ListVariable.
    Validation means “is val in the allowed list”? val has been subject to substitution before the validator is called. The
converter created a _ListVariable container which is stored in env after it runs; this includes the allowable elements
list. Substitution makes a string made out of the values (only), so we need to fish the allowed elements list out of the
environment to complete the validation.
    Note that since 18b45e456, whether subst has been called is conditional on the value of the subst argument to
Add(), so we have to account for possible different types of val.


New in version 4.8.0: _validator split off from _converter() with an additional check for whether val has been
substituted before the call.

SCons.Variables.PackageVariable module

Variable type for package Variables.

To be used whenever a ‘package’ may be enabled/disabled and the package path may be specified.

Given these options

x11=no   (disables X11 support)
x11=yes  (will search for the package installation dir)
x11=/usr/local/X11 (will check this path for existence)

Can be used as a replacement for autoconf’s --with-xxx=yyy

```python
opts = Variables()
opts.Add(
    PackageVariable(
        key='x11',
        help='use X11 installed here (yes = search some places)',
        default='yes'
    )
)
env = Environment(variables=opts)
```
if env['x11'] is True:
    dir = ...  # search X11 in some standard places ...
    env['x11'] = dir
if env['x11']:
    ...  # build with x11 ...

                                                      None = None) → Tuple [str, str, str, Callable, Callable]

Return a tuple describing a package list SCons Variable.
The input parameters describe a ‘package list’ variable. Returns a tuple with the correct converter and validator
appended. The result is usable as input to Add().
A ‘package list’ variable may either be a truthy string from ENABLE_STRINGS, a falsy string from
DISABLE_STRINGS, or a pathname string. This information is appended to help using only one string each for
truthy/falsy.

SCons.Variables.PackageVariable._converter (val)

Convert package variables.
Returns True or False if one of the recognized truthy or falsy values is seen, else return the value unchanged
(expected to be a path string).

SCons.Variables.PackageVariable._validator (key, val, env, searchfunc) → None

Validate package variable for valid path.
Checks that if a path is given as the value, that pathname actually exists.

SCons.Variables.PathVariable module

Variable type for path Variables.
To be used whenever a user-specified path override setting should be allowed.

Arguments toPathVariable are:

- **key** - name of this variable on the command line (e.g. “prefix”)
- **help** - help string for variable
- **default** - default value for this variable
- **validator** - [optional] validator for variable value. Predefined are:
  - **PathAccept** - accepts any path setting; no validation
  - **PathIsDir** - path must be an existing directory
  - **PathIsDirCreate** - path must be a dir; will create
  - **PathIsFile** - path must be a file
  - **PathExists** - path must exist (any type) [default]

The **validator** is a function that is called and which should return True or False to indicate if the path is valid. The
arguments to the validator function are: (key, val, env). key is the name of the variable, val is the path specified for
the variable, and env is the environment to which the Variables have been added.

Usage example:

```python
opts = Variables()
opts.Add(
   PathVariable(
        'qtdir',
        help='where the root of Qt is installed',
        default=qtdir,
        validator=PathIsDir,
```
class SCons.Variables.PathVariable._PathVariableClass
Bases: object

Class implementing path variables.

This class exists mainly to expose the validators without code having to import the names: they will appear as methods of PathVariable, a statically created instance of this class, which is placed in the SConscript namespace.

Instances are callable to produce a suitable variable tuple.

static PathAccept (key, val, env) → None
    Validate path with no checking.

static PathExists (key, val, env) → None
    Validate path exists.

static PathIsDir (key, val, env) → None
    Validate path is a directory.

static PathIsDirCreate (key, val, env) → None
    Validate path is a directory, creating if needed.

static PathIsFile (key, val, env) → None
    Validate path is a file.

__call__ (key: str, help: str, default, validator: Callable | None = None) → Tuple[str, str, str, Callable, None]

Return a tuple describing a path list SCons Variable.

The input parameters describe a 'path list' variable. Returns a tuple with the correct converter and validator appended. The result is usable for input to Add().

The default parameter specifies the default path to use if the user does not specify an override with this variable.

validator is a validator, see this file for examples
_adjustixes() (SCons.Builder.BuilderBase method)

_attempt_get_hash_function() (in module SCons.Util.hashes)

_attempt_init_of_python_3_9_hash_object() (in module SCons.Util.hashes)


_build_dependency_map() (SCons.Node.FS.File method)

_build_targets() (in module SCons.Script.Main)

_CacheDir (SCons.Executor.NullEnvironment attribute)

_CacheDir_path (SCons.Executor.NullEnvironment attribute)

_callable_contents() (in module SCons.Action)

_canonicalize() (SCons.Environment.Base method)

_changed_build() (SCons.Environment.Base method)

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_changed_sources_list (SCons.Executor.Executor attribute)

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