29.9. `traceback` — Print or retrieve a stack traceback

Source code: Lib/traceback.py

This module provides a standard interface to extract, format and print stack traces of Python programs. It exactly mimics the behavior of the Python interpreter when it prints a stack trace. This is useful when you want to print stack traces under program control, such as in a "wrapper" around the interpreter.

The module uses traceback objects — this is the object type that is stored in the `sys.last_traceback` variable and returned as the third item from `sys.exc_info()`.

The module defines the following functions:

`traceback.`**`print_tb`**(*tb*, *limit=None*, *file=None*)

Print up to *limit* stack trace entries from traceback object *tb* (starting from the caller's frame) if *limit* is positive. Otherwise, print the last `abs(limit)` entries. If *limit* is omitted or `None`, all entries are printed. If *file* is omitted or `None`, the output goes to `sys.stderr`; otherwise it should be an open file or file-like object to receive the output.

Changed in version 3.5: Added negative *limit* support.

`traceback.`**`print_exception`**(*etype*, *value*, *tb*, *limit=None*, *file=None*, *chain=True*)

Print exception information and stack trace entries from traceback object *tb* to *file*. This differs from `print_tb()` in the following ways:

- if *tb* is not `None`, it prints a header `Traceback (most recent call last):`
- it prints the exception *etype* and *value* after the stack trace
- if *etype* is `SyntaxError` and *value* has the appropriate format, it prints the line where the syntax error occurred with a caret indicating the approximate position of the error.

The optional *limit* argument has the same meaning as for `print_tb()`. If *chain* is true (the default), then chained exceptions (the `__cause__` or `__context__` attributes of the exception) will be printed as well, like the interpreter itself does when printing an unhandled exception.

`traceback.`**`print_exc`**(*limit=None*, *file=None*, *chain=True*)

This is a shorthand for `print_exception(*sys.exc_info(), limit, file, chain)`.

`traceback.`**`print_last`**(*limit=None*, *file=None*, *chain=True*)

This is a shorthand for `print_exception(sys.last_type, sys.last_value, sys.last_traceback, limit, file, chain)`. In general it will work only after an exception has reached an interactive prompt (see `sys.last_type`).

`traceback.`**`print_stack`**(*f=None*, *limit=None*, *file=None*)

Print up to *limit* stack trace entries (starting from the invocation point) if *limit* is positive. Otherwise, print the last `abs(limit)` entries. If *limit* is omitted or `None`, all entries are printed. The optional *f* argument can be used to specify an alternate stack frame to start. The optional *file* argument has the same meaning as for `print_tb()`.

Changed in version 3.5: Added negative *limit* support.

`traceback.`**`extract_tb`**(*tb*, *limit=None*)

Return a list of "pre-processed" stack trace entries extracted from the traceback object *tb*. It is useful for alternate formatting of stack traces. The optional *limit* argument has the same meaning as for `print_tb()`. A "pre-processed" stack trace entry is a 4-tuple (*filename*, *line number*, *function name*, *text*) representing the information that is usually printed for a stack trace. The *text* is a string with leading and trailing whitespace stripped; if the source is not available it is `None`.

`traceback.`**`extract_stack`**(*f=None*, *limit=None*)

Extract the raw traceback from the current stack frame. The return value has the same format as for `extract_tb()`. The optional *f* and *limit* arguments have the same meaning as for `print_stack()`.

`traceback.`**`format_list`**(*extracted_list*)

Given a list of tuples as returned by `extract_tb()` or `extract_stack()`, return a list of strings ready for printing. Each string in the resulting list corresponds to the item with the same index in the argument list. Each string ends in a newline; the strings may contain internal newlines as well, for those items whose source text line is not `None`.

`traceback.`**`format_exception_only`**(*etype*, *value*)

Format the exception part of a traceback. The arguments are the exception type and value such as given by `sys.last_type` and `sys.last_value`. The return value is a list of strings, each ending in a newline. Normally, the list contains a single string; however, for `SyntaxError` exceptions, it contains several lines that (when printed) display detailed information about where the syntax error occurred. The message indicating which exception occurred is the always last string in the list.

`traceback.`**`format_exception`**(*etype*, *value*, *tb*, *limit=None*, *chain=True*)

Format a stack trace and the exception information. The arguments have the same meaning as the corresponding arguments to `print_exception()`. The return value is a list of strings, each ending in a newline and some containing internal newlines. When these lines are concatenated and printed, exactly the same text is printed as does `print_exception()`.

`traceback.`**`format_exc`**(*limit=None*, *chain=True*)

This is like `print_exc(limit)` but returns a string instead of printing to a file.

`traceback.`**`format_tb`**(*tb*, *limit=None*)

A shorthand for `format_list(extract_tb(tb, limit))`.

`traceback.`**`format_stack`**(*f=None*, *limit=None*)

A shorthand for `format_list(extract_stack(f, limit))`.

`traceback.`**`clear_frames`**(*tb*)

Clears the local variables of all the stack frames in a traceback *tb* by calling the `clear()` method of each frame object.

New in version 3.4.

`traceback.`**`walk_stack`**(*f*)

Walk a stack following `f.f_back` from the given frame, yielding the frame and line number for each frame. If *f* is `None`, the current stack is used. This helper is used with `StackSummary.extract()`.

New in version 3.5.

`traceback.`**`walk_tb`**(*tb*)

Walk a traceback following `tb_next` yielding the frame and line number for each frame. This helper is used with `StackSummary.extract()`.

New in version 3.5.

The module also defines the following classes:

29.9.1. `TracebackException` Objects

New in version 3.5.

`TracebackException` objects are created from actual exceptions to capture data for later printing in a lightweight fashion.

class `traceback.`**`TracebackException`**(*exc_type*, *exc_value*, *exc_traceback*, ***, *limit=None*, *lookup_lines=True*, *capture_locals=False*)

Capture an exception for later rendering. *limit*, *lookup_lines* and *capture_locals* are as for the `StackSummary` class.

Note that when locals are captured, they are also shown in the traceback.

`__cause__`

A `TracebackException` of the original `__cause__`.

`__context__`

A `TracebackException` of the original `__context__`.

`__suppress_context__`

The `__suppress_context__` value from the original exception.

`stack`

A `StackSummary` representing the traceback.

`exc_type`

The class of the original traceback.

`filename`

For syntax errors - the file name where the error occurred.

`lineno`

For syntax errors - the line number where the error occurred.

`text`

For syntax errors - the text where the error occurred.

`offset`

For syntax errors - the offset into the text where the error occurred.

`msg`

For syntax errors - the compiler error message.

classmethod **`from_exception`**(*exc*, ***, *limit=None*, *lookup_lines=True*, *capture_locals=False*)

Capture an exception for later rendering. *limit*, *lookup_lines* and *capture_locals* are as for the `StackSummary` class.

Note that when locals are captured, they are also shown in the traceback.

`format`(*, *chain=True*)

Format the exception.

If *chain* is not `True`, `__cause__` and `__context__` will not be formatted.

The return value is a generator of strings, each ending in a newline and some containing internal newlines. `print_exception()` is a wrapper around this method which just prints the lines to a file.

The message indicating which exception occurred is always the last string in the output.

`format_exception_only`()

Format the exception part of the traceback.

The return value is a generator of strings, each ending in a newline.

Normally, the generator emits a single string; however, for `SyntaxError` exceptions, it emits several lines that (when printed) display detailed information about where the syntax error occurred.

The message indicating which exception occurred is always the last string in the output.

29.9.2. `StackSummary` Objects

New in version 3.5.

`StackSummary` objects represent a call stack ready for formatting.

class `traceback.`**`StackSummary`**

classmethod **`extract`**(*frame_gen*, ***, *limit=None*, *lookup_lines=True*, *capture_locals=False*)

Construct a `StackSummary` object from a frame generator (such as is returned by `walk_stack()` or `walk_tb()`).

If *limit* is supplied, only this many frames are taken from *frame_gen*. If *lookup_lines* is `False`, the returned `FrameSummary` objects will not have read their lines in yet, making the cost of creating the `StackSummary` cheaper (which may be valuable if it may not actually get formatted). If *capture_locals* is `True` the local variables in each `FrameSummary` are captured as object representations.

classmethod **`from_list`**(*a_list*)

Construct a `StackSummary` object from a supplied old-style list of tuples. Each tuple should be a 4-tuple with filename, lineno, name, line as the elements.

29.9.3. `FrameSummary` Objects

New in version 3.5.

`FrameSummary` objects represent a single frame in a traceback.

class `traceback.`**`FrameSummary`**(*filename*, *lineno*, *name*, *lookup_line=True*, *locals=None*, *line=None*)

Represent a single frame in the traceback or stack that is being formatted or printed. It may optionally have a stringified version of the frames locals included in it. If *lookup_line* is `False`, the source code is not looked up until the `FrameSummary` has the `line` attribute accessed (which also happens when casting it to a tuple). `line` may be directly provided, and will prevent line lookups happening at all. *locals* is an optional local variable dictionary, and if supplied the variable representations are stored in the summary for later display.

29.9.4. Traceback Examples

This simple example implements a basic read-eval-print loop, similar to (but less useful than) the standard Python interactive interpreter loop. For a more complete implementation of the interpreter loop, refer to the `code` module.

```
import sys, traceback

def run_user_code(envdir):
    source = input(">>> ")
    try:
        exec(source, envdir)
    except Exception:
        print("Exception in user code:")
        print("-"*60)
        traceback.print_exc(file=sys.stdout)
        print("-"*60)

envdir = {}
while True:
    run_user_code(envdir)
```

The following example demonstrates the different ways to print and format the exception and traceback:

```
import sys, traceback

def lumberjack():
    bright_side_of_death()

def bright_side_of_death():
    return tuple()[0]

try:
    lumberjack()
except IndexError:
    exc_type, exc_value, exc_traceback = sys.exc_info()
    print("*** print_tb:")
    traceback.print_tb(exc_traceback, limit=1, file=sys.stdout)
    print("*** print_exception:")
    traceback.print_exception(exc_type, exc_value, exc_traceback,
                              limit=2, file=sys.stdout)
    print("*** print_exc:")
    traceback.print_exc()
    print("*** format_exc, first and last line:")
    formatted_lines = traceback.format_exc().splitlines()
    print(formatted_lines[0])
    print(formatted_lines[-1])
    print("*** format_exception:")
    print(repr(traceback.format_exception(exc_type, exc_value,
                                          exc_traceback)))
    print("*** extract_tb:")
    print(repr(traceback.extract_tb(exc_traceback)))
    print("*** format_tb:")
    print(repr(traceback.format_tb(exc_traceback)))
    print("*** tb_lineno:", exc_traceback.tb_lineno)
```

The output for the example would look similar to this:

```
*** print_tb:
  File "<doctest...>", line 10, in <module>
    lumberjack()
*** print_exception:
Traceback (most recent call last):
  File "<doctest...>", line 10, in <module>
    lumberjack()
  File "<doctest...>", line 4, in lumberjack
    bright_side_of_death()
IndexError: tuple index out of range
*** print_exc:
Traceback (most recent call last):
  File "<doctest...>", line 10, in <module>
    lumberjack()
  File "<doctest...>", line 4, in lumberjack
    bright_side_of_death()
IndexError: tuple index out of range
*** format_exc, first and last line:
Traceback (most recent call last):
IndexError: tuple index out of range
*** format_exception:
['Traceback (most recent call last):\n',
 '  File "<doctest...>", line 10, in <module>\n    lumberjack()\n',
 '  File "<doctest...>", line 4, in lumberjack\n    bright_side_of_death()\n',
 '  File "<doctest...>", line 7, in bright_side_of_death\n    return tuple()[0]\
 'IndexError: tuple index out of range\n']
*** extract_tb:
[('<doctest...>', 10, '<module>', 'lumberjack()'),
 ('<doctest...>', 4, 'lumberjack', 'bright_side_of_death()'),
 ('<doctest...>', 7, 'bright_side_of_death', 'return tuple()[0]')]
*** format_tb:
['  File "<doctest...>", line 10, in <module>\n    lumberjack()\n',
 '  File "<doctest...>", line 4, in lumberjack\n    bright_side_of_death()\n',
 '  File "<doctest...>", line 7, in bright_side_of_death\n    return tuple()[0]\
*** tb_lineno: 10
```

The following example shows the different ways to print and format the stack:

```
>>> import traceback
>>> def another_function():
...     lumberstack()
...
>>> def lumberstack():
...     traceback.print_stack()
...     print(repr(traceback.extract_stack()))
...     print(repr(traceback.format_stack()))
...
>>> another_function()
  File "<doctest>", line 10, in <module>
    another_function()
  File "<doctest>", line 3, in another_function
    lumberstack()
  File "<doctest>", line 6, in lumberstack
    traceback.print_stack()
[('<doctest>', 10, '<module>', 'another_function()'),
 ('<doctest>', 3, 'another_function', 'lumberstack()'),
 ('<doctest>', 7, 'lumberstack', 'print(repr(traceback.extract_stack()))')]
['  File "<doctest>", line 10, in <module>\n    another_function()\n',
 '  File "<doctest>", line 3, in another_function\n    lumberstack()\n',
 '  File "<doctest>", line 8, in lumberstack\n    print(repr(traceback.format_st
```

This last example demonstrates the final few formatting functions:

```
>>> import traceback
>>> traceback.format_list([('spam.py', 3, '<module>', 'spam.eggs()'),
...                        ('eggs.py', 42, 'eggs', 'return "bacon"')])
['  File "spam.py", line 3, in <module>\n    spam.eggs()\n',
 '  File "eggs.py", line 42, in eggs\n    return "bacon"\n']
>>> an_error = IndexError('tuple index out of range')
>>> traceback.format_exception_only(type(an_error), an_error)
['IndexError: tuple index out of range\n']
```