

Disallow control characters in hostnames in `http.client`, addressing CVE-2019-18348. Such potentially malicious header injection URLs now cause a `InvalidURL` to be raised.

Optimize pending calls in multithreaded applications. If a thread different than the main thread schedules a pending call (`c:func:'Py_AddPendingCall'`), the bytecode evaluation loop is no longer interrupted at each bytecode instruction to check for pending calls which cannot be executed. Only the main thread can execute pending calls.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 18); [backlink](#)

Unknown interpreted text role "c:func".

Previously, the bytecode evaluation loop was interrupted at each instruction until the main thread executes pending calls.

Port `_weakref` extension module to multiphase initialization ([PEP 489](#)).

Port `_collections` module to multiphase initialization ([PEP 489](#)).

Optimize signal handling in multithreaded applications. If a thread different than the main thread gets a signal, the bytecode evaluation loop is no longer interrupted at each bytecode instruction to check for pending signals which cannot be handled. Only the main thread of the main interpreter can handle signals.

Previously, the bytecode evaluation loop was interrupted at each instruction until the main thread handles signals.

If `c:func:'Py_AddPendingCall'` is called in a subinterpreter, the function is now scheduled to be called from the subinterpreter, rather than being called from the main interpreter. Each subinterpreter now has its own list of scheduled calls.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 68); [backlink](#)

Unknown interpreted text role "c:func".

Port `_heapq` module to multiphase initialization.

Port `itertools` module to multiphase initialization ([PEP 489](#)).

Speed up calls to `frozenset()` by using the [PEP 590](#) `vectorcall` calling convention. Patch by Dong-hee Na.

subinterpreters: Move `_PyRuntimeState.ceval.tracing_possible` to `PyInterpreterState.ceval.tracing_possible`: each interpreter now has its own variable.

Speed up calls to `set()` by using the [PEP 590](#) `vectorcall` calling convention. Patch by Dong-hee Na.

Port `_statistics` module to multiphase initialization ([PEP 489](#)).

Use inline function to replace extension modules' `get_module_state` macros.

Correctly raise `SyntaxError` if `await` is used inside non-async functions and `PyCF_ALLOW_TOP_LEVEL_AWAIT` is set (like in the asyncio REPL). Patch by Pablo Galindo.

Allow executing asynchronous comprehensions on the top level when the `PyCF_ALLOW_TOP_LEVEL_AWAIT` flag is given. Patch by Batuhan Taskaya.

Speed up calls to `tuple()` by using the [PEP 590](#) `vectorcall` calling convention. Patch by Dong-hee Na.

Changed list overallocation strategy. It no longer overallocates if the new size is closer to overallocated size than to the old size and adds padding.

Update Unicode database to Unicode version 13.0.0.

Clear the frames of daemon threads earlier during the Python shutdown to call objects destructors. So "unclosed file" resource warnings are now emitted for daemon threads in a more reliable way.

Fix a bug that was causing incomplete results when calling `pathlib.Path.glob` in the presence of symlinks that point to files where the user does not have read access. Patch by Pablo Galindo and Matt Wozniski.

Fix `c:func:'PyEval_RestoreThread'` random crash at exit with daemon threads. It now accesses the `_PyRuntime` variable directly instead of using `tstate->interp->runtime`, since `tstate` can be a dangling pointer after `c:func:'Py_Finalize'` has been called. Moreover, the daemon thread now exits before trying to take the GIL.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 220); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 220); [backlink](#)

Unknown interpreted text role "c:func".

Fix a possible `exc: 'SystemError'` in `math.{atan2, copysign, remainder}()` when the first argument cannot be converted to a `class: 'float'`. Patch by Zackery Spytz

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 233); [backlink](#)

Unknown interpreted text role "exc".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 233); [backlink](#)

Unknown interpreted text role "class".

Fix race condition where threads created by `PyGILState_Ensure()` could get a duplicate id.

This affects consumers of `tstate->id` like the contextvar caching machinery, which could return invalid cached objects under heavy thread load (observed in embedded scenarios).

Fixed a crash due to incorrect handling of weak references in `collections.OrderedDict` classes. Patch by Pablo Galindo.

Port audioop extension module to multiphase initialization ([PEP 489](#)).

Relax `term: 'decorator'` grammar restrictions to allow any valid expression ([PEP 614](#)).

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 277); [backlink](#)

Unknown interpreted text role "term".

Tweak import deadlock detection code to not deadlock itself.

Port `_locale` extension module to multiphase initialization ([PEP 489](#)).

Optimize `c:func: 'PyUnicode_AsUTF8'` and `c:func: 'PyUnicode_AsUTF8AndSize'` slightly when they need to create internal UTF-8 cache.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 305); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 305); [backlink](#)

Unknown interpreted text role "c:func".

Fix unparsing of ext slices with no items (`f00[: ,]`). Patch by Batuhan Taskaya.

Do not optimize annotations if `'from __future__ import annotations'` is used. Patch by Pablo Galindo.

Using `data: 'NotImplemented'` in a boolean context has been deprecated. Patch contributed by Josh Rosenberg.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 335); [backlink](#)

Unknown interpreted text role "data".

Don't leak environment variable `__PYENVV_LAUNCHER__` into the interpreter session on macOS.

Add `class: 'zipfile.Path'` to `__all__` in the `mod: 'zipfile'` module.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 355); [backlink](#)

Unknown interpreted text role "class".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 355); [backlink](#)

Unknown interpreted text role "mod".

Improved error messages for validation of `ast.Constant` nodes. Patch by Batuhan Taskaya.

`__module__` of the AST node classes is now set to "ast" instead of "`__ast__`". Added docstrings for dummy AST node classes and deprecated attributes.

`:func:'uuid.getnode'` now skips IPv6 addresses with the same string length than a MAC address (17 characters): only use MAC addresses.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 385); [backlink](#)

Unknown interpreted text role "func".

Deprecated `ast.AugLoad` and `ast.AugStore` node classes because they are no longer used.

Ensure `bin/python3.#` is always present in virtual environments on POSIX platforms - by Anthony Sottile.

Deprecated `ast.Param` node class because it's no longer used. Patch by Batuhan Taskaya.

Ensure all workers exit when finalizing a `:class:'multiprocessing.Pool'` implicitly via the module finalization handlers of multiprocessing. This fixes a deadlock situation that can be experienced when the Pool is not properly finalized via the context manager or a call to `multiprocessing.Pool.terminate`. Patch by Batuhan Taskaya and Pablo Galindo.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 425); [backlink](#)

Unknown interpreted text role "class".

`sys.settrace()`, `sys.setprofile()` and `_lsprof.Profiler.enable()` now properly report `:c:func:'PySys_Audit'` error if "sys.setprofile" or "sys.settrace" audit event is denied.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 439); [backlink](#)

Unknown interpreted text role "c:func".

AIX: Fix `_aix_support` module when the subprocess is not available, when building Python from scratch. It now uses new private `_bootsubprocess` module, rather than having two implementations depending if subprocess is available or not. So `_aix_support.aix_platform()` result is now the same if subprocess is available or not.

`:class:'collections.OrderedDict'` now implements `|` and `|=` (PEP 584).

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 463); [backlink](#)

Unknown interpreted text role "class".

The column name found in `sqlite3.Cursor.description` is now truncated on the first '[' only if the `PARSE_COLNAMES` option is set.

Ensure `:attr:'unittest.mock.AsyncMock.await_args_list'` has call objects in the order of awaited arguments instead of using `:attr:'unittest.mock.Mock.call_args'` which has the last value of the call. Patch by Karthikeyan Singaravelan.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 483); [backlink](#)

Unknown interpreted text role "attr".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 483); [backlink](#)

Unknown interpreted text role "attr".

Updated `:data:'os.environ'` and `:data:'os.environb'` to support PEP 584's merge (`|`) and update (`|=`) operators.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 495); [backlink](#)

Unknown interpreted text role "data".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 495); [backlink](#)

Unknown interpreted text role "data".

The `ensurepip` module now invokes `pip` via the `runpy` module. Hence it is no longer tightly coupled with the internal API of the bundled `pip` version, allowing easier updates to a newer `pip` version both internally and for distributors.

Fix the `:meth:`random.Random.seed`` method when a `:class:`bool`` is passed as the seed.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 517); [backlink](#)

Unknown interpreted text role "meth".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 517); [backlink](#)

Unknown interpreted text role "class".

More reliable use of `os.scandir()` in `Path.glob()`. It no longer emits a `ResourceWarning` when interrupted.

`:mod:`multiprocessing`` now supports abstract socket addresses (if abstract sockets are supported in the running platform). When creating arbitrary addresses (like when default-constructing `:class:`multiprocessing.connection.Listener`` objects) abstract sockets are preferred to avoid the case when the temporary-file-generated address is too large for an `AF_UNIX` socket address. Patch by Pablo Galindo.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 537); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 537); [backlink](#)

Unknown interpreted text role "class".

`:func:`ast.dump()`` no longer outputs optional fields and attributes with default values. The default values for optional fields and attributes of AST nodes are now set as class attributes (e.g. `Constant.kind` is set to `None`).

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 551); [backlink](#)

Unknown interpreted text role "func".

Fixed `:func:`ast.unparse`` for extended slices containing a single element (e.g. `a[i:j,]`). Remove redundant tuples when index with a tuple (e.g. `a[i, j]`).

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 563); [backlink](#)

Unknown interpreted text role "func".

Fix `:mod:`json.tool`` to catch `:exc:`BrokenPipeError``. Patch by Dong-hee Na.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 574); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 574); [backlink](#)

Unknown interpreted text role "exc".

Avoid a possible *"RuntimeError: dictionary changed size during iteration"* from `:func:`inspect.getmodule`` when it tried to loop through `:attr:`sys.modules``.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 583); [backlink](#)

Unknown interpreted text role "func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 583); [backlink](#)

Unknown interpreted text role "attr".

Revert "bpo-37330: open() no longer accept 'U' in file mode". The "U" mode of open() is kept in Python 3.9 to ease transition from Python 2.7, but will be removed in Python 3.10.

The hosts method on 32-bit prefix length IPv4Networks and 128-bit prefix IPv6Networks now returns a list containing the single Address instead of an empty list.

Add getConnection method to logging HTTPHandler to enable custom connections.

Reimplement `:func:`distutils.spawn.spawn`` function with the `:mod:`subprocess`` module.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 626); [backlink](#)

Unknown interpreted text role "func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 626); [backlink](#)

Unknown interpreted text role "mod".

Add `--without-decimal-contextvar` build option. This enables a thread-local rather than a coroutine local context.

`:class:`collections.defaultdict`` now implements | (PEP 584).

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 646); [backlink](#)

Unknown interpreted text role "class".

Fix `runpy.run_path()` when using pathlike objects

Change `inspect.Signature.parameters` back to `collections.OrderedDict`. This was changed to `dict` in Python 3.9.0a4.

Refactor `queue_manager` in `:class:`concurrent.futures.ProcessPoolExecutor`` to make it easier to maintain.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 674); [backlink](#)

Unknown interpreted text role "class".

Fix `AttributeError` when calling `get_stack` on a `PyAsyncGenObject` Task

The `:func:`compileall.compile_dir`` function's `ddir` parameter and the `compileall` command line flag `-d` no longer write the wrong pathname to the generated pyc file for submodules beneath the root of the directory tree being compiled. This fixes a regression introduced with Python 3.5.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 693); [backlink](#)

Unknown interpreted text role "func".

`:class:`types.MappingProxyType`` objects now support the `merge()` operator from PEP 584.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 705); [backlink](#)

Unknown interpreted text role "class".

The `mod:importlib` module now ignores the `envvar:PYTHONCASEOK` environment variable when the `option:-E` or `option:-I` command line options are being used.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 715); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 715); [backlink](#)

Unknown interpreted text role "envvar".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 715); [backlink](#)

Unknown interpreted text role "option".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 715); [backlink](#)

Unknown interpreted text role "option".

Remove `meth:tempfile.SpooledTemporaryFile.softspace` as files no longer have the `softspace` attribute in Python 3. Patch by Shantanu.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 726); [backlink](#)

Unknown interpreted text role "meth".

Improve `pathlib.Path` compatibility on `zipfile.Path` and correct performance degradation as found in `zip` 3.0.

Keep ASDL signatures in the docstrings for `AST` nodes. Patch by Batuhan Taskaya

Deprecated `ast.Suite` node class because it's no longer used. Patch by Batuhan Taskaya.

Add `thread_name_prefix` to default `asyncio` executor

Fix handling of header in `class:urlib.request.AbstractDigestAuthHandler` when the optional `qop` parameter is not present.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 775); [backlink](#)

Unknown interpreted text role "class".

HTTP status codes `103 EARLY_HINTS` and `425 TOO_EARLY` are added to `class:http.HTTPStatus`. Patch by Dong-hee Na.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 785); [backlink](#)

Unknown interpreted text role "class".

Adding HTTP status `418 "I'm a Teapot"` to `HTTPStatus` in `http` library. Patch by Ross Rhodes.

Remove default value from `attrs` parameter of `meth:xml.etree.ElementTree.TreeBuilder.start` for consistency between Python and C implementations.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 805); [backlink](#)

Unknown interpreted text role "meth".

Open issue in the BPO indicated a desire to make the implementation of `codecs.open()` at parity with `io.open()`, which implements a `try/except` to assure file stream gets closed before an exception is raised.

Added starred expressions support to `return` and `yield` statements for `lib2to3`. Patch by Vlad Emelianov.

When using minidom module to generate XML documents the ability to add Standalone Document Declaration is added. All the changes are made to generate a document in compliance with Extensible Markup Language (XML) 1.0 (Fifth Edition) W3C Recommendation (available here: <https://www.w3.org/TR/xml/#sec-prolog-dtd>).

Add support for scoped IPv6 addresses to `mod:'ipaddress'`. Patch by Oleksandr Pavliuk.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 850); [backlink](#)

Unknown interpreted text role "mod".

Simplified AST for subscription. Simple indices are now represented by their value, extended slices are represented as tuples. `mod:'ast'` classes `Index` and `ExtSlice` are considered deprecated and will be removed in future Python versions. In the meantime, `Index(value)` now returns a value itself, `ExtSlice(slices)` returns `Tuple(slices, Load())`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 860); [backlink](#)

Unknown interpreted text role "mod".

Updated the Language Reference for [PEP 572](#).

Change 'string' to 'specification' in format doc.

The language reference no longer restricts default class namespaces to dicts only.

Fix misleading documentation about mixed-type numeric comparisons.

Update `mod:'token'` documentation to reflect additions in Python 3.8

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 910); [backlink](#)

Unknown interpreted text role "mod".

Changed operand name of `MAKE_FUNCTION` from `argc` to `flags` for module `mod:'dis'`

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 919); [backlink](#)

Unknown interpreted text role "mod".

`test_gdb` now skips tests if it detects that `gdb` failed to read debug information because the Python binary is optimized.

`test_site.test_startup_imports()` is now skipped if a path of `data:'sys.path'` contains a `.pth` file.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 939); [backlink](#)

Unknown interpreted text role "data".

Do not fail `test_shutil` `test_chown` test when uid or gid of user cannot be resolved to a name.

`test_subprocess.test_user()` now skips the test on an user name if the user name doesn't exist. For example, skip the test if the user "nobody" doesn't exist on Linux.

Fix build with DTrace but without additional DFLAGS.

`setup.py` now uses a basic implementation of the `mod:'subprocess'` module if the `mod:'subprocess'` module is not available: before required C extension modules are built.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 979); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 979); [backlink](#)

Unknown interpreted text role "mod".

Add `--with-platlibdir` option to the configure script: name of the platform-specific library directory, stored in the new `attr:'sys.platlibdir'` attribute. It is used to build the path of platform-specific extension modules and the path of the standard library. It is equal to "lib" on most platforms. On Fedora and SuSE, it is equal to "lib64" on 64-bit platforms. Patch by Jan MatÄjek, MatÄj Cepl, Charalampos Stratakis and Victor Stinner.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 990); [backlink](#)

Unknown interpreted text role "attr".

Ensures the required `:file:'vcruntime140.dll'` is included in install packages.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1005); [backlink](#)

Unknown interpreted text role "file".

Avoid hang when computer is hibernated whilst waiting for a mutex (for lock-related objects from `mod:'threading'`) around 49-day uptime.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1015); [backlink](#)

Unknown interpreted text role "mod".

`mod:'distutils'` will no longer statically link `:file:'vcruntime140.dll'` when a redistributable version is unavailable. All future releases of CPython will include a copy of this DLL to ensure distributed extensions can continue to load.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1025); [backlink](#)

Unknown interpreted text role "mod".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1025); [backlink](#)

Unknown interpreted text role "file".

Update Windows builds to use SQLite 3.31.1

Update Windows release build machines to Visual Studio 2019 (MSVC 14.2).

Package for nuget.org now includes repository reference and bundled icon image.

Update macOS builds to use SQLite 3.31.1

For 'Go to Line', use a Query box subclass with IDLE standard behavior and improved error checking.

Since clicking to get an IDLE context menu moves the cursor, any text selection should be and now is cleared.

Edit "Go to line" now clears any selection, preventing accidental deletion. It also updates Ln and Col on the status bar.

Selecting code context lines no longer causes a jump.

Port python-gdb.py to FreeBSD. python-gdb.py now checks for "take_gil" function name to check if a frame tries to acquire the GIL, instead of checking for "pthread_cond_timedwait" which is specific to Linux and can be a different condition than the GIL.

Added support to fix `getproxies` in the `mod:'lib2to3.fixes.fix_urllib'` module. Patch by JosÄ Roberto Meza Cabrera.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1125); [backlink](#)

Unknown interpreted text role "mod".

Add `:c:func:'PyModule_AddType'` helper function: add a type to a module. Patch by Dong-hee Na.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1135); [backlink](#)

Unknown interpreted text role "c:func".

Remove `_PyRuntime.getframe` hook and remove `_PyThreadState_GetFrame` macro which was an alias to `_PyRuntime.getframe`. They were only exposed by the internal C API. Remove also `PyThreadFrameGetter` type.

Add `:c:func:'PyThreadState_GetFrame'` function: get the current frame of a Python thread state.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1156); [backlink](#)

Unknown interpreted text role "c:func".

Add `_PyArg_NoKwnames` helper function. Patch by Dong-hee Na.

Add `:c:func:'PyThreadState_GetInterpreter'`: get the interpreter of a Python thread state.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1175); [backlink](#)

Unknown interpreted text role "c:func".

Add `:c:func:'PyInterpreterState_Get'` function to the limited C API.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1185); [backlink](#)

Unknown interpreted text role "c:func".

If `:c:func:'PySys_Audit'` fails in `:c:func:'PyEval_SetProfile'` or `:c:func:'PyEval_SetTrace'`, log the error as an unraisable exception.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1194); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1194); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1194); [backlink](#)

Unknown interpreted text role "c:func".

Move the static inline function flavor of `Py_EnterRecursiveCall()` and `Py_LeaveRecursiveCall()` to the internal C API: they access `PyThreadState` attributes. The limited C API provides regular functions which hide implementation details.

`Py_TRASHCAN_BEGIN_CONDITION` and `Py_TRASHCAN_END` macro no longer access `PyThreadState` attributes, but call new private `_PyTrash_begin()` and `_PyTrash_end()` functions which hide implementation details.

`:c:func:'PyDeser_NewMethod'` and `:c:func:'PyCFunction_NewEx'` now include the method name in the `SystemError` "bad call flags" error message to ease debug.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1227); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1227); [backlink](#)

Unknown interpreted text role "c:func".

Deprecated `:c:func:'PyEval_InitThreads'` and `:c:func:'PyEval_ThreadsInitialized'`. Calling `:c:func:'PyEval_InitThreads'` now does nothing.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1237); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1237); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1237); [backlink](#)

Unknown interpreted text role "c:func".

`:c:macro:'Py_UNREACHABLE'` is now implemented with `__builtin_unreachable()` and analogs in release mode.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1248); [backlink](#)

Unknown interpreted text role "c:macro".

`:c:func:'PyNumber_ToBase'` now raises a `:exc:'SystemError'` instead of crashing when called with invalid base.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1258); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1258); [backlink](#)

Unknown interpreted text role "exc".

The `:c:func:'Py_FatalError'` function is replaced with a macro which logs automatically the name of the current function, unless the `Py_LIMITED_API` macro is defined.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1268); [backlink](#)

Unknown interpreted text role "c:func".

Extension modules: `:c:member:'~PyModuleDef.m_traverse'`, `:c:member:'~PyModuleDef.m_clear'` and `:c:member:'~PyModuleDef.m_free'` functions of `:c:type:'PyModuleDef'` are no longer called if the module state was requested but is not allocated yet. This is the case immediately after the module is created and before the module is executed (`:c:data:'Py_mod_exec'` function). More precisely, these functions are not called if `:c:member:'~PyModuleDef.m_size'` is greater than 0 and the module state (as returned by `:c:func:'PyModule_GetState'`) is `NULL`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:member".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:member".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:member".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:data".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:member".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1279); [backlink](#)

Unknown interpreted text role "c:func".

Extension modules without module state (`m_size <= 0`) are not affected.

Fixed segfault in `Py_BuildValue()` called with a format containing `"#"` and undefined `PY_SSIZE_T_CLEAN` whwn an exception is set.

Add a private API to get and set the frame evaluation function: add `c:func: '_PyInterpreterState_GetEvalFrameFunc'` and `c:func: '_PyInterpreterState_SetEvalFrameFunc'` C functions. The `c:type: '_PyFrameEvalFunction'` function type now takes a *tstate* parameter.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1307); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1307); [backlink](#)

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\ (cpython-main) (Misc) (NEWS.d) 3.9.0a5.rst, line 1307); [backlink](#)

Unknown interpreted text role "c:type".