Add audit events to functions in *fcntl*, *msvcrt*, *os*, *resource*, *shutil*, *signal* and *syslog*.

Avoid unsafe DLL load at startup on Windows 7 and earlier.

Add audit events to command execution functions in os and pty modules.

Fix a use-after-free in the single inheritance path of `issubclass()`, when the `__bases__` of an object has a single reference, and so does its first item. Patch by Yonatan Goldschmidt.

Update clinic tool to use :c:func:`Py_IS_TYPE`. 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) 3.9.0a4.rst, line 46); *backlink***
>
> Unknown interpreted text role "c:func".

Enable use of :func:`os.chroot` on HP-UX systems.

> **System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main) (Misc) (NEWS.d) 3.9.0a4.rst, line 55); *backlink***
>
> Unknown interpreted text role "func".

Add :c:func:`Py_IS_TYPE` static inline function to check whether the object *o* type is *type*.

> **System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main) (Misc) (NEWS.d) 3.9.0a4.rst, line 64); *backlink***
>
> Unknown interpreted text role "c:func".

Fix regression caused by fix for bpo-39386, that prevented calling `aclose` on an async generator that had already been closed or exhausted.

Change the ending column offset of *Attribute* nodes constructed in *ast_for_dotted_name* to point at the end of the current node and not at the end of the last *NAME* node.

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

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

Fix segfault in `readinto()` method on closed BufferedReader.

Fix :func:`time.localtime` on 64-bit AIX to support years before 1902 and after 2038. Patch by M Felt.

> **System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main) (Misc) (NEWS.d) 3.9.0a4.rst, line 123); *backlink***
>
> Unknown interpreted text role "func".

Fix a reference cycle in the C Pickler that was preventing the garbage collection of deleted, pickled objects.

Fixed a possible crash in :meth:`list.__contains__` when a list is changed during comparing items. 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) 3.9.0a4.rst, line 143); *backlink***
>
> Unknown interpreted text role "meth".

:term:`floor division` of float operation now has a better performance. Also the message of :exc:`ZeroDivisionError` for this operation is updated. 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) 3.9.0a4.rst, line 153); *backlink***
>
> Unknown interpreted text role "term".

> **System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main) (Misc) (NEWS.d) 3.9.0a4.rst, line 153); *backlink***
>
> Unknown interpreted text role "exc".

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

Port _bz2 extension module to multiphase initialization ([PEP 489](#)).

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

Replace two complex bytecodes for building dicts with two simpler ones. The new bytecodes `DICT_MERGE` and `DICT_UPDATE` have been added The old bytecodes `BUILD_MAP_UNPACK` and `BUILD_MAP_UNPACK_WITH_CALL` have been removed.

Syntax errors raised in the tokenizer now always set correct "text" and "offset" attributes.

Drop the GIL during large `bytes.join` operations. Patch by Bruce Merry.

Fix DTrace build issues on FreeBSD. Patch by David Carlier.

Speed up calls to `range()` by about 30%, by using the PEP 590 `vectorcall` calling convention. Patch by Mark Shannon.

:class:`dict` (and :class:`collections.UserDict`) objects now support PEP 584's merge (`|`) and update (`|=`) operators. Patch by Brandt Bucher.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 241**); *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)3.9.0a4.rst`, **line 241**); *backlink*
>
> Unknown interpreted text role "class".

Optimized the idiom for assignment a temporary variable in comprehensions. Now `for y in [expr]` in comprehensions is as fast as a simple assignment `y = expr`.

Fix :exc:`IndexError` when trying to decode an invalid string with punycode codec.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 262**); *backlink*
>
> Unknown interpreted text role "exc".

Remove obsolete check for *__args__* in bdb.Bdb.format_stack_entry.

Expanded :func:`math.gcd` and :func:`math.lcm` to handle multiple arguments.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 281**); *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)3.9.0a4.rst`, **line 281**); *backlink*
>
> Unknown interpreted text role "func".

Fix a regression where the C pickle module wouldn't allow unpickling from a file-like object that doesn't expose a readinto() method.

Raise :exc:`io.UnsupportedOperation` in :meth:`io.BufferedReader.truncate` when it is called on a read-only :class:`io.BufferedReader` instance.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 300**); *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)3.9.0a4.rst`, **line 300**); *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)3.9.0a4.rst`, **line 300**); *backlink*

Unknown interpreted text role "class".

Add :func:`math.lcm` function: least common multiple.

Revert "Do not expose abstract collection classes in the collections module" change (bpo-25988). Aliases to ABC like collections.Mapping are kept in Python 3.9 to ease transition from Python 2.7, but will be removed in Python 3.10.

Fix hanging ProcessPoolExcutor on `shutdown(wait=False)` when a task has failed pickling.

Fixed TypedDict totality check for inherited keys.

Fixed starting position of AST for expressions like `(a)(b)`, `(a)[b]` and `(a).b`.

The :mod:`pydoc` and :mod:`trace` modules now use the :mod:`sysconfig` module to get the path to the Python standard library, to support uncommon installation path like `/usr/lib64/python3.9/` on Fedora. Patch by Jan MatÄ›jek.

Collections.deque now holds strong references during deque.__contains__ and deque.count, fixing crashes.

The distutils `bdist_msi` command is deprecated in Python 3.9, use `bdist_wheel` (wheel packages) instead.

Improved performance of zipfile.Path for files with a large number of entries. Also improved performance and fixed minor issue as published with importlib_metadata 1.5.

Fix regression in :class:`fractions.Fraction` if the numerator and/or the denominator is an :class:`int` subclass. The :func:`math.gcd` function is now used to normalize the *numerator* and *denominator*. :func:`math.gcd` always return a :class:`int` type. Previously, the GCD type depended on *numerator* and *denominator*.

Added audit for :func:`os.walk`, :func:`os.fwalk`, :meth:`pathlib.Path.glob` and :meth:`pathlib.Path.rglob`.

Remove unused, undocumented argument getters from :func:`uuid.getnode`

:func:`sys.audit` is now called only once per call of :func:`glob.glob` and :func:`glob.iglob`.

Fix a regression in :class:`~argparse.ArgumentParser` where allow_abbrev=False was ignored for long options that used a prefix character other than "-".

Striped whitespace from docstring before returning it from :func:`unittest.case.shortDescription`.

A new function `resolve_name` has been added to the `pkgutil` module. This resolves a string of the form `'a.b.c.d'` or `'a.b:c.d'` to an object. In the example, `a.b` is a package/module and `c.d` is an object within that package/module reached via recursive attribute access.

The :func:`binascii.crc_hqx` function is no longer deprecated.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 479**); *backlink*
>
> Unknown interpreted text role "func".

Mark `typing.IO.closed` as a property

Add :data:`typing.Annotated` and `include_extras` parameter to :func:`typing.get_type_hints` as part of PEP 593. Patch by Till Varoquaux, documentation by Till Varoquaux and Konstantin Kashin.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 497**); *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)3.9.0a4.rst`, **line 497**); *backlink*
>
> Unknown interpreted text role "func".

Fix a bug in :func:`unittest.mock.create_autospec` that would complain about the wrong number of arguments for custom descriptors defined in an extension module returning functions.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 508**); *backlink*
>
> Unknown interpreted text role "func".

Mock fully resets child objects on reset_mock(). Patch by Vegard Stikbakke

Allow AsyncMock to correctly patch static/class methods

Implement PEP-489 algorithm for non-ascii "PyInit_..." symbol names in distutils to make it export the correct init symbol also on Windows.

Omit `devmajor` and `devminor` fields for non-device files in :mod:`tarfile` archives, enabling bit-for-bit compatibility with GNU `tar(1)`.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 547**); *backlink*
>
> Unknown interpreted text role "mod".

Added a new *cancel_futures* parameter to :meth:`concurrent.futures.Executor.shutdown` that cancels all pending futures which have not started running, instead of waiting for them to complete before shutting down the executor.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 558**); *backlink*
>
> Unknown interpreted text role "meth".

`bool(fraction.Fraction)` now returns a boolean even if (numerator != 0) does not return a boolean (ex: numpy number).

Remove support for `with (await asyncio.lock):` and `with (yield from asyncio.lock):`. The same is correct for `asyncio.Condition` and `asyncio.Semaphore`.

Ensure, if `wraps` is supplied to :class:`unittest.mock.MagicMock`, it is used to calculate return values for the magic methods instead of using the default return values. Patch by Karthikeyan Singaravelan.

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, **line 591**); *backlink*
>
> Unknown interpreted text role "class".

inspect.Signature.parameters and *inspect.BoundArguments.arguments* are now dicts instead of OrderedDicts. Patch contributed by RÃ©mi Lapeyre.

Fix sys.exit() and sys.exit(None) exit code propagation when used in multiprocessing.Process.

- Add *lazycache* function to *__all__*.
- Use *dict.clear* to clear the cache.
- Refactoring *getline* function and *checkcache* function.

The language reference now specifies restrictions on class namespaces. Adapted from a patch by Ethan Furman.

Updated documentation of `total` flag of `TypedDict`.

In pyclbr doc, update 'class' to 'module' where appropriate and add readmodule comment. Patch by Hakan Ã‡elik.

Clarify refcounting semantics for the following functions: - PyObject_SetItem - PyMapping_SetItemString - PyDict_SetItem - PyDict_SetItemString

Explain that when filling with turtle, overlap regions may be left unfilled.

Update mmap readline method description. The fact that the readline method does update the file position should not be ignored since this might give the impression for the programmer that it doesn't update it.

Include subsection in TOC for PDF version of docs.

Skip tests on non-BMP characters of test_winconsoleio.

Skip test_zipfile.test_add_file_after_2107() if :func:`time.localtime` fails with :exc:`OverflowError`. It is the case on AIX 6.1 for example.

> **System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, line 711); *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)3.9.0a4.rst`, line 711); *backlink***
>
> Unknown interpreted text role "exc".

Remove `COUNT_ALLOCS` special build.

Delete unused code related to SxS manifests.

Honor the Python path when a virtualenv is active on Windows.

Improve the error message when attempting to load a DLL with unresolved dependencies.

:meth:`~pathlib.Path.home()` and :meth:`~pathlib.Path.expanduser()` on Windows now prefer :envvar:`USERPROFILE` and no longer use :envvar:`HOME`, which is not normally set for regular user accounts. This makes them again behave like :func:`os.path.expanduser`, which was changed to ignore :envvar:`HOME` in 3.8, see :issue:`36264`.

> **System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\cpython-main\Misc\NEWS.d\(cpython-main)(Misc)(NEWS.d)3.9.0a4.rst`, line 758); *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)3.9.0a4.rst`, line 758); *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)3.9.0a4.rst`, line 758); *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)3.9.0a4.rst`, line 758); *backlink***
>
> Unknown interpreted text role "envvar".

> **System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\cpython-**

The build.bat script has additional options for very-quiet output (-q) and very-verbose output (-vv)

Add tests for pyparse find_good_parse_start().

In the font configuration window, remove duplicated font names.

Add remaining configdialog tests for buttons and highlights and keys tabs.

IDLE Settings Cancel button now cancels pending changes

Close an IDLE shell calltip if a :exc:`KeyboardInterrupt` or shell restart occurs. Patch by Zackery Spytz.

Move the `bytes_methods.h` header file to the internal C API as `pycore_bytes_methods.h`: it only contains private symbols (prefixed by `_Py`), except of the `PyDoc_STRVAR_shared()` macro.

Move the `dtoa.h` header file to the internal C API as `pycore_dtoa.h`: it only contains private functions (prefixed by `_Py`). The :mod:`math` and :mod:`cmath` modules must now be compiled with the `Py_BUILD_CORE` macro defined.

Add :c:func:`Py_SET_SIZE` function to set the size of an object.

:c:func:`PyUnicode_IsIdentifier` does not call :c:func:`Py_FatalError` anymore if the string is not ready.

Add :c:func:`Py_SET_TYPE` function to set the type of an object.

Add a :c:func:`Py_SET_REFCNT` function to set the reference counter of an object.

Convert :c:func:`PyType_HasFeature`, :c:func:`PyType_Check` and :c:func:`PyType_CheckExact` macros to static inline functions.

In the limited C API, `PyObject_INIT()` and `PyObject_INIT_VAR()` are now defined as aliases to :c:func:`PyObject_Init` and :c:func:`PyObject_InitVar` to make their implementation opaque. It avoids to leak implementation details in the limited C API. Exclude the following functions from the limited C API: `_Py_NewReference()`, `_Py_ForgetReference()`, `_PyTraceMalloc_NewReference()` and `_Py_GetRefTotal()`.

Exclude trashcan mechanism from the limited C API: it requires access to PyTypeObject and PyThreadState structure fields, whereas these structures are opaque in the limited C API.

The :c:func:`PyThreadState_Clear` function now calls the :c:member:`PyThreadState.on_delete` callback. Previously, that happened in :c:func:`PyThreadState_Delete`.

Fix to clear the interpreter state only after clearing module globals to guarantee module state access from C Extensions during runtime destruction

The Vectorcall API (PEP 590) was made public, adding the functions `PyObject_Vectorcall`, `PyObject_VectorcallMethod`, `PyVectorcall_Function`, `PyObject_CallOneArg`, `PyObject_CallMethodNoArgs`, `PyObject_CallMethodOneArg`, `PyObject_FastCallDict`, and the flag `Py_TPFLAGS_HAVE_VECTORCALL`.