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```
[3.12] gh-135034: Normalize link targets in tarfile, add
os.path.realpath(strict='allow_missing') (GH-135037) (GH-135066)

Addresses CVEs 2024-12718, 2025-4138, 2025-4330, and 2025-4517.

(cherry picked from commit 3612d8f)

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```

🔗 3.12 (#135066) · 🔖 v3.12.13 ... v3.12.11

1 parent f3272d8 commit 19de092 📄

11 files changed +1064 -139 lines changed

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```

@@ -377,10 +377,26 @@ the :mod:`glob` module.)
377 377     links encountered in the path (if they are supported by the operating
378 378     system).
379 379
380 -   If a path doesn't exist or a symlink loop is encountered, and strict is
381 -   ``True``, :exc:`OSError` is raised. If strict is ``False``, the path is
382 -   resolved as far as possible and any remainder is appended without checking
383 -   whether it exists.
380 +   By default, the path is evaluated up to the first component that does not
381 +   exist, is a symlink loop, or whose evaluation raises :exc:`OSError`.
382 +   All such components are appended unchanged to the existing part of the path.
383 +
384 +   Some errors that are handled this way include "access denied", "not a
385 +   directory", or "bad argument to internal function". Thus, the
386 +   resulting path may be missing or inaccessible, may still contain
387 +   links or loops, and may traverse non-directories.
388 +
389 +   This behavior can be modified by keyword arguments:
390 +
391 +   If strict is ``True``, the first error encountered when evaluating the
    path is
392 +   re-raised.
393 +   In particular, :exc:`FileNotFoundError` is raised if path does not exist,
394 +   or another :exc:`OSError` if it is otherwise inaccessible.
395 +

```

```

396 + If *strict* is :py:data:`os.path.ALLOW_MISSING`, errors other than
397 + :exc:`FileNotFoundError` are re-raised (as with ``strict=True``).
398 + Thus, the returned path will not contain any symbolic links, but the named
399 + file and some of its parent directories may be missing.

384 400
385 401     .. note::
386 402         This function emulates the operating system's procedure for making a path
@@ -399,6 +415,15 @@ the :mod:`glob` module.)
399 415     .. versionchanged:: 3.10
400 416         The *strict* parameter was added.
401 417

418 +     .. versionchanged:: next
419 +         The :py:data:`~os.path.ALLOW_MISSING` value for the *strict* parameter
420 +         was added.
421 +
422 + .. data:: ALLOW_MISSING
423 +
424 +     Special value used for the *strict* argument in :func:`realpath`.
425 +
426 +     .. versionadded:: next

402 427
403 428     .. function:: relpath(path, start=os.curdir)
404 429

```

Doc/library/tarfile.rst

```

@@ -249,6 +249,15 @@ The :mod:`tarfile` module defines the following
exceptions:

249 249     Raised to refuse extracting a symbolic link pointing outside the
destination
250 250     directory.
251 251

252 + .. exception:: LinkFallbackError
253 +
254 +     Raised to refuse emulating a link (hard or symbolic) by extracting another
255 +     archive member, when that member would be rejected by the filter location.
256 +     The exception that was raised to reject the replacement member is
available
257 +     as :attr:`!BaseException.__context__`.
258 +

```

259	+	.. <code>versionadded:: next</code>
260	+	
252	261	
253	262	The following constants are available at the module level:
254	263	
⋮ ↓ ↑ ⋮		@@ -1039,6 +1048,12 @@ reused in custom filters:
1039	1048	Implements the ``'data'`` filter.
1040	1049	In addition to what ``tar_filter`` does:
1041	1050	
1051	+	- Normalize link targets (<code>:attr:TarInfo.linkname`</code>) using
1052	+	<code>:func:os.path.normpath`</code> .
1053	+	Note that this removes internal ``..`` components, which may change the
1054	+	meaning of the link if the path in <code>:attr:!TarInfo.linkname`</code> traverses
1055	+	symbolic links.
1056	+	
1042	1057	- <code>:ref:Refuse <tarfile-extraction-refuse></code> to extract links (hard or soft)
1043	1058	that link to absolute paths, or ones that link outside the destination.
1044	1059	
⋮ ↓ ↑ ⋮		@@ -1067,6 +1082,10 @@ reused in custom filters:
1067	1082	
1068	1083	Return the modified ``TarInfo`` member.
1069	1084	
1085	+	.. <code>versionchanged:: next</code>
1086	+	
1087	+	Link targets are now normalized.
1088	+	
1070	1089	
1071	1090	.. <code>_tarfile-extraction-refuse:</code>
1072	1091	
⋮ ↕ ⋮		@@ -1093,6 +1112,7 @@ Here is an incomplete list of things to consider:
1093	1112	* Extract to a <code>:func:new temporary directory <tempfile.mkdtemp></code>
1094	1113	to prevent e.g. exploiting pre-existing links, and to make it easier to
1095	1114	clean up after a failed extraction.
1115	+	* Disallow symbolic links if you do not need the functionality.
1096	1116	* When working with untrusted data, use external (e.g. OS-level) limits on
1097	1117	disk, memory and CPU usage.
1098	1118	* Check filenames against an allow-list of characters
⋮ ↓ ⋮		

```

Doc/whatsnew/3.12.rst
@@ -2320,3 +2320,37 @@ sys
2320 2320 * The previously undocumented special function sys.getobjects,
2321 2321 which only exists in specialized builds of Python, may now return objects
2322 2322 from other interpreters than the one it's called in.
2323 +
2324 +
2325 + Notable changes in 3.12.10
2326 + =====
2327 +
2328 + os.path
2329 + -----
2330 +
2331 + * The strict parameter to os.path.realpath accepts a new value,
2332 + os.path.ALLOW_MISSING.
2333 + If used, errors other than FileNotFoundError will be re-raised;
2334 + the resulting path can be missing but it will be free of symlinks.
2335 + (Contributed by Petr Viktorin for 2025-4517.)
2336 +
2337 + tarfile
2338 + -----
2339 +
2340 + * tarfile.data_filter now normalizes symbolic link targets in order
2341 + to
2342 + avoid path traversal attacks.
2343 + (Contributed by Petr Viktorin in gh:127987 and cve:2025-4138.)
2344 + * tarfile.TarFile.extractall now skips fixing up directory
2345 + attributes
2346 + when a directory was removed or replaced by another kind of file.
2347 + (Contributed by Petr Viktorin in gh:127987 and cve:2024-12718.)
2348 + * tarfile.TarFile.extract and tarfile.TarFile.extractall
2349 + now (re-)apply the extraction filter when substituting a link (hard or
2350 + symbolic) with a copy of another archive member, and when fixing up
2351 + directory attributes.
2352 + The former raises a new exception, tarfile.LinkFallbackError.
2353 + (Contributed by Petr Viktorin for cve:2025-4330 and cve:2024-12718.)
2354 + * tarfile.TarFile.extract and tarfile.TarFile.extractall
2355 + no longer extract rejected members when
2356 + tarfile.TarFile.errorlevel is zero.

```

2355 + (Contributed by Matt Prodan and Petr Viktorin in :gh:`112887`
 2356 + and :cve:`2025-4435`.)

Lib/genericpath.py

...

@@ -8,7 +8,7 @@

```

8      8
9      9     __all__ = ['commonprefix', 'exists', 'getatime', 'getctime', 'getmtime',
10     10         'getsize', 'isdir', 'isfile', 'islink', 'samefile', 'sameopenfile',
11     -         'samestat']
11     +         'samestat', 'ALLOW_MISSING']

```

```

12     12
13     13
14     14     # Does a path exist?

```

@@ -165,3 +165,12 @@ def _check_arg_types(funcname, *args):

```

165     165         f'os.PathLike object, not
        {s.__class__.__name__!r}') from None
166     166         if hasstr and hasbytes:
167     167             raise TypeError("Can't mix strings and bytes in path components") from
        None
168     +
169     + # A singleton with a true boolean value.
170     + @object.__new__
171     + class ALLOW_MISSING:
172     +     """Special value for use in realpath()."""
173     +     def __repr__(self):
174     +         return 'os.path.ALLOW_MISSING'
175     +     def __reduce__(self):
176     +         return self.__class__.__name__

```

Lib/ntpath.py

...

@@ -30,7 +30,8 @@

```

30     30         "ismount", "expanduser", "expandvars", "normpath", "abspath",
31     31         "curdir", "pardir", "sep", "pathsep", "defpath", "altsep",
32     32
        "extsep", "devnull", "realpath", "supports_unicode_filenames", "relpath",
33     -         "samefile", "sameopenfile", "samestat", "commonpath", "isjunction"]
33     +         "samefile", "sameopenfile", "samestat", "commonpath", "isjunction",
34     +         "ALLOW_MISSING"]

```

```

34 35
35 36     def _get_bothseps(path):
36 37         if isinstance(path, bytes):
37 38             return path
38 39
39 40     @@ -609,9 +610,10 @@ def abspath(path):
40 41
41 42         from nt import _getfinalpathname, readlink as _nt_readlink
42 43     except ImportError:
43 44         # realpath is a no-op on systems without _getfinalpathname support.
44 45
45 46     -     realpath = abspath
46 47
47 48     +     def realpath(path, *, strict=False):
48 49         +         return abspath(path)
49 50
50 51     else:
51 52
52 53     -     def _readlink_deep(path):
53 54     +     def _readlink_deep(path, ignored_error=OSError):
54 55
55 56         # These error codes indicate that we should stop reading links and
56 57         # return the path we currently have.
57 58         # 1: ERROR_INVALID_FUNCTION
58 59
59 60     @@ -644,7 +646,7 @@ def _readlink_deep(path):
60 61
61 62         path = old_path
62 63         break
63 64         path = normpath(join(dirname(old_path), path))
64 65
65 66     -     except OSError as ex:
66 67     +     except ignored_error as ex:
67 68
68 69         if ex.winerror in allowed_winerror:
69 70             break
70 71
71 72         raise
72 73
73 74     @@ -653,7 +655,7 @@ def _readlink_deep(path):
74 75
75 76         break
76 77         return path
77 78
78 79
79 80     -     def _getfinalpathname_nonstrict(path):
80 81     +     def _getfinalpathname_nonstrict(path, ignored_error=OSError):
81 82
82 83         # These error codes indicate that we should stop resolving the path
83 84         # and return the value we currently have.
84 85         # 1: ERROR_INVALID_FUNCTION
85 86
86 87     @@ -680,17 +682,18 @@ def _getfinalpathname_nonstrict(path):
87 88
88 89         try:
89 90             path = _getfinalpathname(path)
90 91
91 92         return join(path, tail) if tail else path

```

```

683 -         except OSError as ex:
685 +         except ignored_error as ex:
684 686             if ex.winerror not in allowed_winerror:
685 687                 raise
686 688             try:
687 689                 # The OS could not resolve this path fully, so we attempt
688 690                 # to follow the link ourselves. If we succeed, join the
689 691                 tail
690 691                 # and return.
690 -                 new_path = _readlink_deep(path)
692 +                 new_path = _readlink_deep(path,
693 +                                         ignored_error=ignored_error)
691 694                 if new_path != path:
692 695                     return join(new_path, tail) if tail else new_path
693 -         except OSError:
696 +         except ignored_error:
694 697             # If we fail to readlink(), let's keep traversing
695 698             pass
696 699             path, name = split(path)
697 700
698 701     @@ -721,24 +724,32 @@ def realpath(path, *, strict=False):
699 702
700 703         if normcase(path) == normcase(devnull):
701 704             return '\\\\.\\NUL'
702 705
703 706         had_prefix = path.startswith(prefix)
704 707
705 708         if strict is ALLOW_MISSING:
706 709             ignored_error = FileNotFoundError
707 710             strict = True
708 711         elif strict:
709 712             ignored_error = ()
710 713         else:
711 714             ignored_error = OSError
712 715
713 716         if not had_prefix and not isabs(path):
714 717             path = join(cwd, path)
715 718         try:
716 719             path = _getfinalpathname(path)
717 720             initial_winerror = 0
718 721         except ValueError as ex:
719 722             # gh-106242: Raised for embedded null characters
720 723

```

```

731 - # In strict mode, we convert into an OSError.
743 + # In strict modes, we convert into an OSError.
732 744 # Non-strict mode returns the path as-is, since we've already
733 745 # made it absolute.
734 746 if strict:
735 747     raise OSError(str(ex)) from None
736 748     path = normpath(path)
737 - except OSError as ex:
738 -     if strict:
739 -         raise
749 + except ignored_error as ex:
740 750     initial_winerror = ex.winerror
741 - path = _getfinalpathname_nonstrict(path)
751 + path = _getfinalpathname_nonstrict(path,
752 +                                     ignored_error=ignored_error)
742 753 # The path returned by _getfinalpathname will always start with \\?\ -
743 754 # strip off that prefix unless it was already provided on the original
744 755 # path.

```

Lib/posixpath.py

```

@@ -35,7 +35,7 @@
35 35     "samefile", "sameopenfile", "samestat",
36 36     "curdir", "pardir", "sep", "pathsep", "defpath", "altsep", "extsep",
37 37     "devnull", "realpath", "supports_unicode_filenames", "relpath",
38 -     "commonpath", "isjunction"]
38 +     "commonpath", "isjunction", "ALLOW_MISSING"]
39 39
40 40
41 41 def _get_sep(path):
@@ -438,6 +438,15 @@ def _joinrealpath(path, rest, strict, seen):
438 438     sep = '/'
439 439     curdir = '.'
440 440     pardir = '..'
441 +     getcwd = os.getcwd
442 +     if strict is ALLOW_MISSING:
443 +         ignored_error = FileNotFoundError
444 +     elif strict:
445 +         ignored_error = ()

```

```
446 +     else:
447 +         ignored_error = OSError
448 +
449 +     maxlinks = None
441 450
442 451     if isabs(rest):
443 452         rest = rest[1:]
@@ -460,9 +469,7 @@ def _joinrealpath(path, rest, strict, seen):
460 469         newpath = join(path, name)
461 470         try:
462 471             st = os.lstat(newpath)
463 -         except OSError:
464 -             if strict:
465 -                 raise
472 +         except ignored_error:
466 473             is_link = False
467 474         else:
468 475             is_link = stat.S_ISLNK(st.st_mode)
```

Comments 0