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```
[3.14] gh-135034: Normalize link targets in tarfile, add
os.path.realpath(strict='allow_missing') (gh-135037) (gh-135065)

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

(cherry picked from commit 3612d8f)

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```

3.14 (#135065) · v3.14.4 ... v3.14.0b3

1 parent 78fd7ce commit 9e0ac76

11 files changed +967 -170

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▼ Doc/library/os.path.rst



```

@@ -408,9 +408,26 @@ the :mod:`glob` module.)
408 408     system). On Windows, this function will also resolve MS-DOS (also called
      8.3)
409 409     style names such as ``C:\PROGRA~1`` to ``C:\Program Files``.
410 410
411 -   If a path doesn't exist or a symlink loop is encountered, and strict is
412 -   ``True``, :exc:`OSError` is raised. If strict is ``False`` these errors
413 -   are ignored, and so the result might be missing or otherwise inaccessible.
411 +   By default, the path is evaluated up to the first component that does not
412 +   exist, is a symlink loop, or whose evaluation raises :exc:`OSError`.
413 +   All such components are appended unchanged to the existing part of the path.
414 +
415 +   Some errors that are handled this way include "access denied", "not a
416 +   directory", or "bad argument to internal function". Thus, the
417 +   resulting path may be missing or inaccessible, may still contain
418 +   links or loops, and may traverse non-directories.
419 +
420 +   This behavior can be modified by keyword arguments:
421 +
422 +   If strict is ``True``, the first error encountered when evaluating the
      path is
423 +   re-raised.
424 +   In particular, :exc:`FileNotFoundError` is raised if path does not exist,
425 +   or another :exc:`OSError` if it is otherwise inaccessible.
426 +

```

```

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

414 431
415 432     .. note::
416 433         This function emulates the operating system's procedure for making a path
@@ -429,6 +446,15 @@ the :mod:`glob` module.)
429 446     .. versionchanged:: 3.10
430 447         The *strict* parameter was added.
431 448

449 +     .. versionchanged:: next
450 +         The :py:data:`~os.path.ALLOW_MISSING` value for the *strict* parameter
451 +         was added.
452 +
453 + .. data:: ALLOW_MISSING
454 +
455 +     Special value used for the *strict* argument in :func:`realpath`.
456 +
457 +     .. versionadded:: next

432 458
433 459     .. function:: relpath(path, start=os.curdir)
434 460

```

Doc/library/tarfile.rst

```

@@ -255,6 +255,15 @@ The :mod:`tarfile` module defines the following
exceptions:

255 255         Raised to refuse extracting a symbolic link pointing outside the
destination
256 256         directory.
257 257

258 + .. exception:: LinkFallbackError
259 +
260 +     Raised to refuse emulating a link (hard or symbolic) by extracting another
261 +     archive member, when that member would be rejected by the filter location.
262 +     The exception that was raised to reject the replacement member is
available
263 +     as :attr:`!BaseException.__context__`.
264 +

```

265	+	.. <code>versionadded:: next</code>
266	+	
258	267	
259	268	The following constants are available at the module level:
260	269	
↓		@@ -1068,6 +1077,12 @@ reused in custom filters:
↑		
1068	1077	Implements the <code>``'data'``</code> filter.
1069	1078	In addition to what <code>``tar_filter``</code> does:
1070	1079	
1080	+	- Normalize link targets (<code>:attr:`TarInfo.linkname`</code>) using
1081	+	<code>:func:`os.path.normpath`</code> .
1082	+	Note that this removes internal <code>``..``</code> components, which may change the
1083	+	meaning of the link if the path in <code>:attr:`!TarInfo.linkname`</code> traverses
1084	+	symbolic links.
1085	+	
1071	1086	- <code>:ref:`Refuse <tarfile-extraction-refuse>`</code> to extract links (hard or soft)
1072	1087	that link to absolute paths, or ones that link outside the destination.
1073	1088	
↓		@@ -1099,6 +1114,10 @@ reused in custom filters:
↑		
1099	1114	Note that this filter does not block <i>*all*</i> dangerous archive features.
1100	1115	See <code>:ref:`tarfile-further-verification`</code> for details.
1101	1116	
1117	+	.. <code>versionchanged:: next</code>
1118	+	
1119	+	Link targets are now normalized.
1120	+	
1102	1121	
1103	1122	.. <code>_tarfile-extraction-refuse:</code>
1104	1123	
↓		@@ -1127,6 +1146,7 @@ Here is an incomplete list of things to consider:
↑		
1127	1146	* Extract to a <code>:func:`new temporary directory <tempfile.mkdtemp>`</code>
1128	1147	to prevent e.g. exploiting pre-existing links, and to make it easier to
1129	1148	clean up after a failed extraction.
1149	+	* Disallow symbolic links if you do not need the functionality.
1130	1150	* When working with untrusted data, use external (e.g. OS-level) limits on
1131	1151	disk, memory and CPU usage.
1132	1152	* Check filenames against an allow-list of characters



Doc/whatsnew/3.14.rst



@@ -1608,6 +1608,16 @@ os

1608 1608 (Contributed by Cody Maloney in [:gh:`129205`](#).)

1609 1609

1610 1610

1611 + os.path

1612 + -----

1613 +

1614 + * The *strict* parameter to `:func:`os.path.realpath`` accepts a new value,

1615 + `:data:`os.path.ALLOW_MISSING``.

1616 + If used, errors other than `:exc:`FileNotFoundError`` will be re-raised;

1617 + the resulting path can be missing but it will be free of symlinks.

1618 + (Contributed by Petr Viktorin for [:cve:`2025-4517`](#).)

1619 +

1620 +

1611 1621 pathlib

1612 1622 -----

1613 1623



@@ -1796,6 +1806,28 @@ sysconfig



1796 1806 (Contributed by Xuehai Pan in [:gh:`131799`](#).)

1797 1807

1798 1808

1809 + tarfile

1810 + -----

1811 +

1812 + * `:func:`~tarfile.data_filter`` now normalizes symbolic link targets in order
to

1813 + avoid path traversal attacks.

1814 + (Contributed by Petr Viktorin in [:gh:`127987`](#) and [:cve:`2025-4138`](#).)

1815 + * `:func:`~tarfile.TarFile.extractall`` now skips fixing up directory
attributes

1816 + when a directory was removed or replaced by another kind of file.

1817 + (Contributed by Petr Viktorin in [:gh:`127987`](#) and [:cve:`2024-12718`](#).)

1818 + * `:func:`~tarfile.TarFile.extract`` and `:func:`~tarfile.TarFile.extractall``

1819 + now (re-)apply the extraction filter when substituting a link (hard or

1820 + symbolic) with a copy of another archive member, and when fixing up

1821 + directory attributes.

```

1822 + The former raises a new exception, :exc:`~tarfile.LinkFallbackError`.
1823 + (Contributed by Petr Viktorin for :cve:`2025-4330` and :cve:`2024-12718`.)
1824 + * :func:`~tarfile.TarFile.extract` and :func:`~tarfile.TarFile.extractall`
1825 + no longer extract rejected members when
1826 + :func:`~tarfile.TarFile.errorlevel` is zero.
1827 + (Contributed by Matt Prodan and Petr Viktorin in :gh:`112887`
1828 + and :cve:`2025-4435`.)
1829 +
1830 +

```

```

1799 1831   threading

```

```

1800 1832   -----

```

```

1801 1833

```



Lib/genericpath.py



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

```

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

```

```

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

```



```
@@ -189,3 +189,12 @@ def _check_arg_types(funcname, *args):
```

```

189 189             f'os.PathLike object, not
           {s.__class__.__name__!r}') from None
190 190             if hasstr and hasbytes:
191 191                 raise TypeError("Can't mix strings and bytes in path components") from
           None

```

```

192 +
193 + # A singleton with a true boolean value.
194 + @object.__new__
195 + class ALLOW_MISSING:
196 +     """Special value for use in realpath()."""
197 +     def __repr__(self):
198 +         return 'os.path.ALLOW_MISSING'
199 +     def __reduce__(self):
200 +         return self.__class__.__name__

```

```

Lib/ntpath.py
@@ -29,7 +29,7 @@
29 29         "abspath","curdir","pardir","sep","pathsep","defpath","altsep",
30 30
31 31         "extsep","devnull","realpath","supports_unicode_filenames","relpath",
32 31         "samefile", "sameopenfile", "samestat", "commonpath", "isjunction",
32 -         "isdevdrive"]
32 +         "isdevdrive", "ALLOW_MISSING"]
33 33
34 34     def _get_bothseps(path):
35 35         if isinstance(path, bytes):
@@ -601,9 +601,10 @@ def abspath(path):
601 601         from nt import _findfirstfile, _getfinalpathname, readlink as _nt_readlink
602 602         except ImportError:
603 603             # realpath is a no-op on systems without _getfinalpathname support.
604 -         realpath = abspath
604 +         def realpath(path, *, strict=False):
605 +             return abspath(path)
606 else:
606 -         def _readlink_deep(path):
607 +         def _readlink_deep(path, ignored_error=OSError):
607 608             # These error codes indicate that we should stop reading links and
608 609             # return the path we currently have.
609 610             # 1: ERROR_INVALID_FUNCTION
@@ -636,7 +637,7 @@ def _readlink_deep(path):
636 637                 path = old_path
637 638                 break
638 639                 path = normpath(join(dirname(old_path), path))
639 -         except OSError as ex:
640 +         except ignored_error as ex:
640 641                 if ex.winerror in allowed_winerror:
641 642                     break
642 643                 raise
@@ -645,7 +646,7 @@ def _readlink_deep(path):
645 646                 break
646 647                 return path
647 648

```

```

648 - def _getfinalpathname_nonstrict(path):
649 + def _getfinalpathname_nonstrict(path, ignored_error=OSError):
649 650     # These error codes indicate that we should stop resolving the path
650 651     # and return the value we currently have.
651 652     # 1: ERROR_INVALID_FUNCTION
@@ -673,25 +674,26 @@ def _getfinalpathname_nonstrict(path):
673 674         try:
674 675             path = _getfinalpathname(path)
675 676             return join(path, tail) if tail else path
676 - except OSError as ex:
677 + except ignored_error as ex:
677 678             if ex.winerror not in allowed_winerror:
678 679                 raise
679 680             try:
680 681                 # The OS could not resolve this path fully, so we attempt
681 682                 # to follow the link ourselves. If we succeed, join the
        tail
682 683                 # and return.
683 - new_path = _readlink_deep(path)
684 + new_path = _readlink_deep(path,
685 +                             ignored_error=ignored_error)
684 686                 if new_path != path:
685 687                     return join(new_path, tail) if tail else new_path
686 - except OSError:
688 + except ignored_error:
687 689                 # If we fail to readlink(), let's keep traversing
688 690                 pass
689 691                 # If we get these errors, try to get the real name of the file
        without accessing it.
690 692                 if ex.winerror in (1, 5, 32, 50, 87, 1920, 1921):
691 693                     try:
692 694                         name = _findfirstfile(path)
693 695                         path, _ = split(path)
694 - except OSError:
696 + except ignored_error:
695 697                             path, name = split(path)
696 698                     else:
697 699                         path, name = split(path)
@@ -721,24 +723,32 @@ def realpath(path, *, strict=False):

```

		↑
721	723	<code>if normcase(path) == devnull:</code>
722	724	<code>return '\\\\.\\NUL'</code>
723	725	<code>had_prefix = path.startswith(prefix)</code>
726	+	
727	+	<code>if strict is ALLOW_MISSING:</code>
728	+	<code>ignored_error = FileNotFoundError</code>
729	+	<code>strict = True</code>
730	+	<code>elif strict:</code>
731	+	<code>ignored_error = ()</code>
732	+	<code>else:</code>
733	+	<code>ignored_error = OSError</code>
734	+	
724	735	<code>if not had_prefix and not isabs(path):</code>
725	736	<code>path = join(cwd, path)</code>
726	737	<code>try:</code>
727	738	<code>path = _getfinalpathname(path)</code>
728	739	<code>initial_winerror = 0</code>
729	740	<code>except ValueError as ex:</code>
730	741	<code># gh-106242: Raised for embedded null characters</code>
731	-	<code># In strict mode, we convert into an OSError.</code>
742	+	<code># In strict modes, we convert into an OSError.</code>
732	743	<code># Non-strict mode returns the path as-is, since we've already</code>
733	744	<code># made it absolute.</code>
734	745	<code>if strict:</code>
735	746	<code>raise OSError(str(ex)) from None</code>
736	747	<code>path = normpath(path)</code>
737	-	<code>except OSError as ex:</code>
738	-	<code>if strict:</code>
739	-	<code>raise</code>
748	+	<code>except ignored_error as ex:</code>
740	749	<code>initial_winerror = ex.winerror</code>
741	-	<code>path = _getfinalpathname_nonstrict(path)</code>
750	+	<code>path = _getfinalpathname_nonstrict(path,</code>
751	+	<code>ignored_error=ignored_error)</code>
742	752	<code># The path returned by _getfinalpathname will always start with \\?\ -</code>
743	753	<code># strip off that prefix unless it was already provided on the original</code>
744	754	<code># path.</code>
		↓

```

Lib/posixpath.py
@@ -36,7 +36,7 @@
36 36         "samefile", "sameopenfile", "samestat",
37 37         "curdir", "pardir", "sep", "pathsep", "defpath", "altsep", "extsep",
38 38         "devnull", "realpath", "supports_unicode_filenames", "relpath",
39 -         "commonpath", "isjunction", "isdevdrive"]
39 +         "commonpath", "isjunction", "isdevdrive", "ALLOW_MISSING"]
40 40
41 41
42 42     def _get_sep(path):
@@ -402,10 +402,18 @@ def realpath(filename, *, strict=False):
402 402         curdir = '.'
403 403         pardir = '..'
404 404         getcwd = os.getcwd
405 -         return _realpath(filename, strict, sep, curdir, pardir, getcwd)
405 +         if strict is ALLOW_MISSING:
406 +             ignored_error = FileNotFoundError
407 +             strict = True
408 +         elif strict:
409 +             ignored_error = ()
410 +         else:
411 +             ignored_error = OSError
412 +
413 +         lstat = os.lstat
414 +         readlink = os.readlink
415 +         maxlinks = None
406 416
407 - def _realpath(filename, strict=False, sep=sep, curdir=curdir, pardir=pardir,
408 -             getcwd=os.getcwd, lstat=os.lstat, readlink=os.readlink,
409             # The stack of unresolved path parts. When popped, a special value of None
410             # indicates that a symlink target has been resolved, and that the original
411             # symlink path can be retrieved by popping again. The [::-1] slice is a
@@ -477,27 +485,28 @@ def _realpath(filename, strict=False, sep=sep,
477 485         path = newpath
478 486         continue
479 487         target = readlink(newpath)

```

```
480 -         except OSError:
481 -             if strict:
482 -                 raise
483 -             path = newpath
488 +         except ignored_error:
489 +             pass
490 +         else:
491 +             # Resolve the symbolic link
492 +             if target.startswith(sep):
493 +                 # Symlink target is absolute; reset resolved path.
494 +                 path = sep
495 +                 if maxlinks is None:
496 +                     # Mark this symlink as seen but not fully resolved.
497 +                     seen[newpath] = None
498 +                     # Push the symlink path onto the stack, and signal its
499 +                     # specialness
500 +                     # by also pushing None. When these entries are popped, we'll
501 +                     # record the fully-resolved symlink target in the 'seen'
502 +                     # mapping.
503 +                     rest.append(newpath)
504 +                     rest.append(None)
505 +                     # Push the unresolved symlink target parts onto the stack.
506 +                     target_parts = target.split(sep)[::-1]
507 +                     rest.extend(target_parts)
508 +                     part_count += len(target_parts)
509 +                     continue
510 +             # Resolve the symbolic link
511 +             if target.startswith(sep):
512 +                 # Symlink target is absolute; reset resolved path.
513 +                 path = sep
514 +                 if maxlinks is None:
515 +                     # Mark this symlink as seen but not fully resolved.
516 +                     seen[newpath] = None
517 +                     # Push the symlink path onto the stack, and signal its specialness
518 +                     # by also pushing None. When these entries are popped, we'll
519 +                     # record the fully-resolved symlink target in the 'seen' mapping.
520 +                     rest.append(newpath)
521 +                     rest.append(None)
522 +                     # Push the unresolved symlink target parts onto the stack.
523 +                     target_parts = target.split(sep)[::-1]
```

```

499 -         rest.extend(target_parts)
500 -         part_count += len(target_parts)
508 +         # An error occurred and was ignored.
509 +         path = newpath
501 510
502 511         return path
503 512

```

Lib/tarfile.py

```

@@ -67,7 +67,7 @@
67 67         "DEFAULT_FORMAT", "open", "fully_trusted_filter", "data_filter",
68 68         "tar_filter", "FilterError", "AbsoluteLinkError",
69 69         "OutsideDestinationError", "SpecialFileError",
        "AbsolutePathError",
70 -         "LinkOutsideDestinationError"]
70 +         "LinkOutsideDestinationError", "LinkFallbackError"]
71 71
72 72
73 73     #-----
@@ -766,10 +766,22 @@ def __init__(self, tarinfo, path):
766 766         super().__init__(f'{tarinfo.name!r} would link to {path!r}, '
767 767             + 'which is outside the destination')
768 768
769 + class LinkFallbackError(FilterError):
770 +     def __init__(self, tarinfo, path):
771 +         self.tarinfo = tarinfo
772 +         self._path = path
773 +         super().__init__(f'link {tarinfo.name!r} would be extracted as a '
774 +             + f'copy of {path!r}, which was rejected')
775 +
776 + # Errors caused by filters -- both "fatal" and "non-fatal" -- that
777 + # we consider to be issues with the argument, rather than a bug in the
778 + # filter function
779 + _FILTER_ERRORS = (FilterError, OSError, ExtractError)
780 +
769 781     def _get_filtered_attrs(member, dest_path, for_data=True):
770 782         new_attrs = {}
771 783         name = member.name

```

772	-	<code>dest_path = os.path.realpath(dest_path)</code>
784	+	<code>dest_path = os.path.realpath(dest_path, strict=os.path.ALLOW_MISSING)</code>
773	785	<code># Strip leading / (tar's directory separator) from filenames.</code>
774	786	<code># Include os.sep (target OS directory separator) as well.</code>
775	787	<code>if name.startswith('/', os.sep):</code>
		@@ -779,7 +791,8 @@ def _get_filtered_attrs(member, dest_path, for_data=True):
779	791	<code># For example, 'C:/foo' on Windows.</code>
780	792	<code>raise AbsolutePathError(member)</code>
781	793	<code># Ensure we stay in the destination</code>
782	-	<code>target_path = os.path.realpath(os.path.join(dest_path, name))</code>
794	+	<code>target_path = os.path.realpath(os.path.join(dest_path, name),</code>
795	+	<code>strict=os.path.ALLOW_MISSING)</code>
783	796	<code>if os.path.commonpath([target_path, dest_path]) != dest_path:</code>
784	797	<code>raise OutsideDestinationError(member, target_path)</code>
785	798	<code># Limit permissions (no high bits, and go-w)</code>
		@@ -817,14 +830,18 @@ def _get_filtered_attrs(member, dest_path, for_data=True):
817	830	<code>if member.islnk() or member.issym():</code>
818	831	<code>if os.path.isabs(member.linkname):</code>
819	832	<code>raise AbsoluteLinkError(member)</code>
833	+	<code>normalized = os.path.normpath(member.linkname)</code>
834	+	<code>if normalized != member.linkname:</code>
835	+	<code>new_attrs['linkname'] = normalized</code>
820	836	<code>if member.issym():</code>
821	837	<code>target_path = os.path.join(dest_path,</code>
822	838	<code>os.path.dirname(name),</code>
823	839	<code>member.linkname)</code>
824	840	<code>else:</code>
825	841	<code>target_path = os.path.join(dest_path,</code>
826	842	<code>member.linkname)</code>
827	-	<code>target_path = os.path.realpath(target_path)</code>
843	+	<code>target_path = os.path.realpath(target_path,</code>
844	+	<code>strict=os.path.ALLOW_MISSING)</code>
828	845	<code>if os.path.commonpath([target_path, dest_path]) != dest_path:</code>
829	846	<code>raise LinkOutsideDestinationError(member, target_path)</code>
830	847	<code>return new_attrs</code>
		@@ -2386,30 +2403,58 @@ def extractall(self, path=".", members=None, *, numeric_owner=False,
2386	2403	<code>members = self</code>

```
2387 2404
2388 2405         for member in members:
2389 -         tarinfo = self._get_extract_tarinfo(member, filter_function,
        path)
2406 +         tarinfo, unfiltered = self._get_extract_tarinfo(
2407 +         member, filter_function, path)
2390 2408         if tarinfo is None:
2391 2409             continue
2392 2410         if tarinfo.isdir():
2393 2411             # For directories, delay setting attributes until later,
2394 2412             # since permissions can interfere with extraction and
2395 2413             # extracting contents can reset mtime.
2396 -         directories.append(tarinfo)
2414 +         directories.append(unfiltered)
2397 2415         self._extract_one(tarinfo, path, set_attrs=not tarinfo.isdir(),
2398 -         numeric_owner=numeric_owner)
2416 +         numeric_owner=numeric_owner,
2417 +         filter_function=filter_function)
2399 2418
2400 2419         # Reverse sort directories.
2401 2420         directories.sort(key=lambda a: a.name, reverse=True)
2402 2421
2422 +
2403 2423         # Set correct owner, mtime and filemode on directories.
2404 -         for tarinfo in directories:
2405 -         dirpath = os.path.join(path, tarinfo.name)
2424 +         for unfiltered in directories:
2406 2425         try:
2426 +         # Need to re-apply any filter, to take the *current*
        filesystem
2427 +         # state into account.
2428 +         try:
2429 +         tarinfo = filter_function(unfiltered, path)
2430 +         except _FILTER_ERRORS as exc:
2431 +         self._log_no_directory_fixup(unfiltered, repr(exc))
2432 +         continue
2433 +         if tarinfo is None:
2434 +         self._log_no_directory_fixup(unfiltered,
2435 +         'excluded by filter')
2436 +         continue
```

```

2437 +         dirpath = os.path.join(path, tarinfo.name)
2438 +         try:
2439 +             lstat = os.lstat(dirpath)
2440 +         except FileNotFoundError:
2441 +             self._log_no_directory_fixup(tarinfo, 'missing')
2442 +             continue
2443 +         if not stat.S_ISDIR(lstat.st_mode):
2444 +             # This is no longer a directory; presumably a later
2445 +             # member overwrote the entry.
2446 +             self._log_no_directory_fixup(tarinfo, 'not a directory')
2447 +             continue
2407 2448         self.chown(tarinfo, dirpath, numeric_owner=numeric_owner)
2408 2449         self.utime(tarinfo, dirpath)
2409 2450         self.chmod(tarinfo, dirpath)
2410 2451         except ExtractError as e:
2411 2452             self._handle_nonfatal_error(e)
2412 2453
2454 +     def _log_no_directory_fixup(self, member, reason):
2455 +         self._dbg(2, "tarfile: Not fixing up directory %r (%s)" %
2456 +             (member.name, reason))
2457 +
2413 2458     def extract(self, member, path="", set_attrs=True, *,
2414 2459         numeric_owner=False,
2415 2460         filter=None):
2416 2461         """Extract a member from the archive to the current working
2417 2462         directory,
2418 2463
2419 2464         @@ -2425,41 +2470,56 @@ def extract(self, member, path="",
2420 2465         set_attrs=True, *, numeric_owner=False,
2421 2466
2422 2467         String names of common filters are accepted.
2423 2468         """
2424 2469         filter_function = self._get_filter_function(filter)
2425 2470         tarinfo = self._get_extract_tarinfo(member, filter_function, path)
2426 2471         tarinfo, unfiltered = self._get_extract_tarinfo(
2427 2472             member, filter_function, path)
2428 2473         if tarinfo is not None:
2429 2474             self._extract_one(tarinfo, path, set_attrs, numeric_owner)
2430 2475
2431 2476
2432 2477     def _get_extract_tarinfo(self, member, filter_function, path):
2433 2478         """Get filtered TarInfo (or None) from member, which might be a
2434 2479         str"""

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2479 +         """Get (filtered, unfiltered) TarInfos from *member*
2480 +
2481 +         *member* might be a string.
2482 +
2483 +         Return (None, None) if not found.
2484 +         """
2485 +
2434 2486         if isinstance(member, str):
2435 -             tarinfo = self.getmember(member)
2487 +             unfiltered = self.getmember(member)
2436 2488         else:
2437 -             tarinfo = member
2489 +             unfiltered = member
2438 2490
2439 -             unfiltered = tarinfo
2491 +             filtered = None
2440 2492         try:
2441 -             tarinfo = filter_function(tarinfo, path)
2493 +             filtered = filter_function(unfiltered, path)
2442 2494         except (OSError, UnicodeEncodeError, FilterError) as e:
2443 2495             self._handle_fatal_error(e)
2444 2496         except ExtractError as e:
2445 2497             self._handle_nonfatal_error(e)
2446 -             if tarinfo is None:
2498 +             if filtered is None:
2447 2499                 self._dbg(2, "tarfile: Excluded %r" % unfiltered.name)
2448 -             return None
2500 +             return None, None
2501 +
2449 2502         # Prepare the link target for makelink().
2450 -             if tarinfo.islnk():
2451 -                 tarinfo = copy.copy(tarinfo)
2452 -                 tarinfo._link_target = os.path.join(path, tarinfo.linkname)
2453 -             return tarinfo
2503 +             if filtered.islnk():
2504 +                 filtered = copy.copy(filtered)
2505 +                 filtered._link_target = os.path.join(path, filtered.linkname)
2506 +             return filtered, unfiltered
2507 +
2508 +         def _extract_one(self, tarinfo, path, set_attrs, numeric_owner,

```

2509	+	filter_function=None):
2510	+	"""Extract from filtered tarinfo to disk.
2454	2511	
2455	-	def _extract_one(self, tarinfo, path, set_attrs, numeric_owner):
2456	-	"""Extract from filtered tarinfo to disk"""
2512	+	filter_function is only used when extracting a *different*
2513	+	member (e.g. as fallback to creating a symlink)
2514	+	"""
2457	2515	self._check("r")
2458	2516	
2459	2517	try:
2460	2518	self._extract_member(tarinfo, os.path.join(path, tarinfo.name),
2461	2519	set_attrs=set_attrs,
2462	-	numeric_owner=numeric_owner)
2520	+	numeric_owner=numeric_owner,
2521	+	filter_function=filter_function,
2522	+	extraction_root=path)
2463	2523	except (OSError, UnicodeEncodeError) as e:
2464	2524	self._handle_fatal_error(e)
2465	2525	except ExtractError as e:
⋮ ↓ ↑ ⋮		@@ -2517,9 +2577,13 @@ def extractfile(self, member):
2517	2577	return None
2518	2578	
2519	2579	def _extract_member(self, tarinfo, targetpath, set_attrs=True,
2520	-	numeric_owner=False):
2521	-	"""Extract the TarInfo object tarinfo to a physical
2580	+	numeric_owner=False, *, filter_function=None,
2581	+	extraction_root=None):
2582	+	"""Extract the filtered TarInfo object tarinfo to a physical
2522	2583	file called targetpath.
2584	+	
2585	+	filter_function is only used when extracting a *different*
2586	+	member (e.g. as fallback to creating a symlink)
2523	2587	"""
2524	2588	# Fetch the TarInfo object for the given name
2525	2589	# and build the destination pathname, replacing
⋮ ↓ ↑ ⋮		@@ -2548,7 +2612,10 @@ def _extract_member(self, tarinfo, targetpath,
2548	2612	elif tarinfo.ischr() or tarinfo.isblk():

```

2549 2613         self.makedev(tarinfo, targetpath)
2550 2614         elif tarinfo.islnk() or tarinfo.issym():
2551 -         self.makelink(tarinfo, targetpath)
2615 +         self.makelink_with_filter(
2616 +             tarinfo, targetpath,
2617 +             filter_function=filter_function,
2618 +             extraction_root=extraction_root)
2552 2619         elif tarinfo.type not in SUPPORTED_TYPES:
2553 2620             self.makeunknown(tarinfo, targetpath)
2554 2621         else:
2631 2698             os.makedev(tarinfo.devmajor, tarinfo.devminor))
2632 2699
2633 2700         def makelink(self, tarinfo, targetpath):
2701 +             return self.makelink_with_filter(tarinfo, targetpath, None, None)
2702 +
2703 +         def makelink_with_filter(self, tarinfo, targetpath,
2704 +             filter_function, extraction_root):
2634 2705         """Make a (symbolic) link called targetpath. If it cannot be created
2635 2706         (platform limitation), we try to make a copy of the referenced file
2636 2707         instead of a link.
2708 +
2709 +         filter_function is only used when extracting a *different*
2710 +         member (e.g. as fallback to creating a link).
2637 2711         """
2712 +         keyerror_to_extracterror = False
2638 2713         try:
2639 2714             # For systems that support symbolic and hard links.
2640 2715             if tarinfo.issym():
2641 2716                 if os.path.lexists(targetpath):
2642 2717                     # Avoid FileExistsError on following os.symlink.
2643 2718                     os.unlink(targetpath)
2644 2719                     os.symlink(tarinfo.linkname, targetpath)
2720 +             return
2645 2721         else:
2646 2722             if os.path.exists(tarinfo._link_target):
2647 2723                 os.link(tarinfo._link_target, targetpath)
2648 -             else:
2649 -                 self._extract_member(self._find_link_target(tarinfo),

```

```

2650 - targetpath)
2724 + return
2651 2725 except symlink_exception:
2726 +     keyerror_to_extracterror = True
2727 +
2728 +     try:
2729 +         unfiltered = self._find_link_target(tarinfo)
2730 +     except KeyError:
2731 +         if keyerror_to_extracterror:
2732 +             raise ExtractError(
2733 +                 "unable to resolve link inside archive") from None
2734 +         else:
2735 +             raise
2736 +
2737 +     if filter_function is None:
2738 +         filtered = unfiltered
2739 +     else:
2740 +         if extraction_root is None:
2741 +             raise ExtractError(
2742 +                 "makelink_with_filter: if filter_function is not None, "
2743 +                 + "extraction_root must also not be None")
2652 2744     try:
2653 -         self._extract_member(self._find_link_target(tarinfo),
2654 -                             targetpath)
2655 -     except KeyError:
2656 -         raise ExtractError("unable to resolve link inside archive")
           from None
2745 +         filtered = filter_function(unfiltered, extraction_root)
2746 +     except _FILTER_ERRORS as cause:
2747 +         raise LinkFallbackError(tarinfo, unfiltered.name) from cause
2748 +     if filtered is not None:
2749 +         self._extract_member(filtered, targetpath,
2750 +                             filter_function=filter_function,
2751 +                             extraction_root=extraction_root)
2657 2752
2658 2753     def chown(self, tarinfo, targetpath, numeric_owner):
2659 2754         """Set owner of targetpath according to tarinfo. If numeric_owner

```



Load Diff

Large diffs are not rendered by default.

Lib/test/test_posixpath.py

Load Diff

Large diffs are not rendered by default.

Lib/test/test_tarfile.py

Load Diff

Large diffs are not rendered by default.

...5-06-02-11-32-23.gh-issue-135034.RLGjbp.rst

```

@@ -0,0 +1,6 @@
1 + Fixes multiple issues that allowed ``tarfile`` extraction filters
2 + (``filter="data"`` and ``filter="tar"``) to be bypassed using crafted
3 + symlinks and hard links.
4 +
5 + Addresses :cve:`2024-12718`, :cve:`2025-4138`, :cve:`2025-4330`, and :cve:`2025-
6 + 4517`.

```

Comments 0