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Rocky Enterprise Linux 9.2 Manual Pages on command 'posix_memalign.3'

\$ man posix_memalign.3

POSIX_MEMALIGN(3) Linux Programmer's Manual POSIX_MEMALIGN(3)

NAME

posix_memalign, aligned_alloc, memalign, valloc, pvalloc - allocate aligned memory

SYNOPSIS

```
#include <stdlib.h>

int posix_memalign(void **memptr, size_t alignment, size_t size);

void *aligned_alloc(size_t alignment, size_t size);

void *valloc(size_t size);

#include <malloc.h>

void *memalign(size_t alignment, size_t size);

void *pvalloc(size_t size);
```

Feature Test Macro Requirements for glibc (see feature_test_macros(7)):

posix_memalign(): `_POSIX_C_SOURCE >= 200112L`

aligned_alloc(): `_ISOC11_SOURCE`

valloc():

Since glibc 2.12:

`(_XOPEN_SOURCE >= 500) && !(_POSIX_C_SOURCE >= 200112L)`

```
|| /* Glibc since 2.19: */ _DEFAULT_SOURCE
```

```
|| /* Glibc versions <= 2.19: */ _SVID_SOURCE || _BSD_SOURCE
```

Before glibc 2.12:

```
_BSD_SOURCE || _XOPEN_SOURCE >= 500
```

(The (nonstandard) header file `<malloc.h>` also exposes the declaration of `valloc()`; no feature test macros are required.)

DESCRIPTION

The function `posix_memalign()` allocates `size` bytes and places the address of the allocated memory in `*memptr`. The address of the allocated memory will be a multiple of `alignment`, which must be a power of two and a multiple of `sizeof(void *)`. This address can later be successfully passed to `free(3)`. If `size` is 0, then the value placed in `*memptr` is either `NULL` or a unique pointer value.

The obsolete function `memalign()` allocates `size` bytes and returns a pointer to the allocated memory. The memory address will be a multiple of `alignment`, which must be a power of two.

The function `aligned_alloc()` is the same as `memalign()`, except for the added restriction that `size` should be a multiple of `alignment`.

The obsolete function `valloc()` allocates `size` bytes and returns a pointer to the allocated memory. The memory address will be a multiple of the page size. It is equivalent to `memalign(sysconf(_SC_PAGESIZE),size)`.

The obsolete function `pvalloc()` is similar to `valloc()`, but rounds the size of the allocation up to the next multiple of the system page size.

For all of these functions, the memory is not zeroed.

RETURN VALUE

`aligned_alloc()`, `memalign()`, `valloc()`, and `pvalloc()` return a pointer to the allocated memory on success. On error, `NULL` is returned, and `errno` is set to indicate the cause of the error.

`posix_memalign()` returns zero on success, or one of the error values listed in the next section on failure. The value of `errno` is not set.

On Linux (and other systems), `posix_memalign()` does not modify `memptr` on failure. A requirement standardizing this behavior was added in

POSIX.1-2008 TC2.

ERRORS

EINVAL The alignment argument was not a power of two, or was not a multiple of sizeof(void *).

ENOMEM There was insufficient memory to fulfill the allocation request.

VERSIONS

The functions memalign(), valloc(), and pvalloc() have been available since at least glibc 2.0.

The function aligned_alloc() was added to glibc in version 2.16.

The function posix_memalign() is available since glibc 2.1.91.

ATTRIBUTES

For an explanation of the terms used in this section, see attributes(7).

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?Interface ? Attribute ? Value ?

??

?aligned_alloc(), ? Thread safety ? MT-Safe ?

?memalign(), ? ? ?

?posix_memalign() ? ? ?

??

?valloc(), ? Thread safety ? MT-Unsafe init ?

?pvalloc() ? ? ?

??

CONFORMING TO

The function valloc() appeared in 3.0BSD. It is documented as being obsolete in 4.3BSD, and as legacy in SUSv2. It does not appear in POSIX.1.

The function pvalloc() is a GNU extension.

The function memalign() appears in SunOS 4.1.3 but not in 4.4BSD.

The function posix_memalign() comes from POSIX.1d and is specified in POSIX.1-2001 and POSIX.1-2008.

The function aligned_alloc() is specified in the C11 standard.

Everybody agrees that `posix_memalign()` is declared in `<stdlib.h>`.

On some systems `memalign()` is declared in `<stdlib.h>` instead of `<malloc.h>`.

According to SUSv2, `valloc()` is declared in `<stdlib.h>`. Glibc declares it in `<malloc.h>`, and also in `<stdlib.h>` if suitable feature test macros are defined (see above).

NOTES

On many systems there are alignment restrictions, for example, on buffers used for direct block device I/O. POSIX specifies the `conf(path, _PC_REC_XFER_ALIGN)` call that tells what alignment is needed. Now one can use `posix_memalign()` to satisfy this requirement. `posix_memalign()` verifies that alignment matches the requirements detailed above. `memalign()` may not check that the alignment argument is correct.

POSIX requires that memory obtained from `posix_memalign()` can be freed using `free(3)`. Some systems provide no way to reclaim memory allocated with `memalign()` or `valloc()` (because one can pass to `free(3)` only a pointer obtained from `malloc(3)`, while, for example, `memalign()` would call `malloc(3)` and then align the obtained value). The glibc implementation allows memory obtained from any of these functions to be reclaimed with `free(3)`.

The glibc `malloc(3)` always returns 8-byte aligned memory addresses, so these functions are needed only if you require larger alignment values.

SEE ALSO

`brk(2)`, `getpagesize(2)`, `free(3)`, `malloc(3)`

COLOPHON

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