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Red Hat Enterprise Linux Release 9.2 Manual Pages on 'memalign.3' command

\$ man 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 dec?

laration 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 ?

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?`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.

Headers

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 `posix_memalign()` 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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