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 *)_. If _size_ is 0, then the value placed in _*memptr_ is either NULL, or a unique pointer value that can later be successfully passed to **free**(3).

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_PAGE-SIZE),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.1-2016.

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 in all Linux libc libraries.

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).

Interface	Attribute	Value
aligned_alloc(), **memalign**(), **posix_memalign**()	Thread safety	MT-Safe
valloc(), **pvalloc**()	Thread safety	MT-Unsafe init

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>*. Libc4,5 and glibc declare 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 *pathconf(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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