

**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
<b>aligned_alloc()</b> , <b>memalign()</b> , <b>posix_memalign()</b>	Thread safety	MT-Safe
<b>valloc()</b> , <b>pvalloc()</b>	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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