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Rocky Enterprise Linux 9.2 Manual Pages on command 'epoll_ctl.2'

\$ man epoll_ctl.2

EPOLL_CTL(2) Linux Programmer's Manual EPOLL_CTL(2)

NAME

epoll_ctl - control interface for an epoll file descriptor

SYNOPSIS

```
#include <sys/epoll.h>

int epoll_ctl(int epfd, int op, int fd, struct epoll_event *event);
```

DESCRIPTION

This system call is used to add, modify, or remove entries in the interest list of the epoll(7) instance referred to by the file descriptor epfd. It requests that the operation op be performed for the target file descriptor, fd.

Valid values for the op argument are:

EPOLL_CTL_ADD

Add an entry to the interest list of the epoll file descriptor, epfd. The entry includes the file descriptor, fd, a reference to the corresponding open file description (see epoll(7) and open(2)), and the settings specified in event.

EPOLL_CTL_MOD

Change the settings associated with fd in the interest list to the new settings specified in event.

EPOLL_CTL_DEL

Remove (deregister) the target file descriptor fd from the interest list. The event argument is ignored and can be NULL (but see BUGS below).

The event argument describes the object linked to the file descriptor fd. The struct epoll_event is defined as:

```

typedef union epoll_data {
    void    *ptr;
    int     fd;
    uint32_t  u32;
    uint64_t  u64;
} epoll_data_t;

struct epoll_event {
    uint32_t  events;    /* Epoll events */
    epoll_data_t data;    /* User data variable */
};

```

The data member of the `epoll_event` structure specifies data that the kernel should save and then return (via `epoll_wait(2)`) when this file descriptor becomes ready.

The `events` member of the `epoll_event` structure is a bit mask composed by ORing together zero or more of the following available event types:

EPOLLIN

The associated file is available for `read(2)` operations.

EPOLLOUT

The associated file is available for `write(2)` operations.

EPOLLRDHUP (since Linux 2.6.17)

Stream socket peer closed connection, or shut down writing half of connection. (This flag is especially useful for writing simple code to detect peer shutdown when using edge-triggered monitoring.)

EPOLLPRI

There is an exceptional condition on the file descriptor. See the discussion of `POLLPRI` in `poll(2)`.

EPOLLERR

Error condition happened on the associated file descriptor. This event is also reported for the write end of a pipe when the read end has been closed. `epoll_wait(2)` will always report for this event; it is not necessary to set it in events when calling `epoll_ctl()`.

EPOLLHUP

Hang up happened on the associated file descriptor.

`epoll_wait(2)` will always wait for this event; it is not necessary to set it in

events when calling `epoll_ctl()`.

Note that when reading from a channel such as a pipe or a stream socket, this event merely indicates that the peer closed its end of the channel. Subsequent reads from the channel will return 0 (end of file) only after all outstanding data in the channel has been consumed.

EPOLLET

Requests edge-triggered notification for the associated file descriptor. The default behavior for `epoll` is level-triggered. See `epoll(7)` for more detailed information about edge-triggered and level-triggered notification.

This flag is an input flag for the `event.events` field when calling `epoll_ctl()`; it is never returned by `epoll_wait(2)`.

EPOLLONESHOT (since Linux 2.6.2)

Requests one-shot notification for the associated file descriptor. This means that after an event notified for the file descriptor by `epoll_wait(2)`, the file descriptor is disabled in the interest list and no other events will be reported by the `epoll` interface. The user must call `epoll_ctl()` with `EPOLL_CTL_MOD` to rearm the file descriptor with a new event mask.

This flag is an input flag for the `event.events` field when calling `epoll_ctl()`; it is never returned by `epoll_wait(2)`.

EPOLLWAKEUP (since Linux 3.5)

If `EPOLLONESHOT` and `EPOLLET` are clear and the process has the `CAP_BLOCK_SUSPEND` capability, ensure that the system does not enter "suspend" or "hibernate" while this event is pending or being processed. The event is considered as being "processed" from the time when it is returned by a call to `epoll_wait(2)` until the next call to `epoll_wait(2)` on the same `epoll(7)` file descriptor, the closure of that file descriptor, the removal of the event file descriptor with `EPOLL_CTL_DEL`, or the clearing of `EPOLLWAKEUP` for the event file descriptor with `EPOLL_CTL_MOD`. See also [BUGS](#).

This flag is an input flag for the `event.events` field when calling `epoll_ctl()`; it is never returned by `epoll_wait(2)`.

EPOLLEXCLUSIVE (since Linux 4.5)

Sets an exclusive wakeup mode for the `epoll` file descriptor that is being attached to the target file descriptor, `fd`. When a wakeup event occurs and multiple `epoll`

file descriptors are attached to the same target file using EPOLLEXCLUSIVE, one or more of the epoll file descriptors will receive an event with `epoll_wait(2)`. The default in this scenario (when EPOLLEXCLUSIVE is not set) is for all epoll file descriptors to receive an event. EPOLLEXCLUSIVE is thus useful for avoiding thundering herd problems in certain scenarios.

If the same file descriptor is in multiple epoll instances, some with the EPOLLEXCLUSIVE flag, and others without, then events will be provided to all epoll instances that did not specify EPOLLEXCLUSIVE, and at least one of the epoll instances that did specify EPOLLEXCLUSIVE.

The following values may be specified in conjunction with EPOLLEXCLUSIVE: EPOLLIN, EPOLLOUT, EPOLLWAKEUP, and EPOLLET. EPOLLHUP and POLLERR can also be specified, but this is not required: as usual, these events are always reported if they occur, regardless of whether they are specified in events. Attempts to specify other values in events yield the error EINVAL.

EPOLLEXCLUSIVE may be used only in an EPOLL_CTL_ADD operation; attempts to employ it with EPOLL_CTL_MOD yield an error. If EPOLLEXCLUSIVE has been set using `epoll_ctl()`, then a subsequent EPOLL_CTL_MOD on the same `epfd`, `fd` pair yields an error. A call to `epoll_ctl()` that specifies EPOLLEXCLUSIVE in events and specifies the target file descriptor `fd` as an epoll instance will likewise fail. The error in all of these cases is EINVAL.

The EPOLLEXCLUSIVE flag is an input flag for the `event.events` field when calling `epoll_ctl()`; it is never returned by `epoll_wait(2)`.

RETURN VALUE

When successful, `epoll_ctl()` returns zero. When an error occurs, `epoll_ctl()` returns -1 and `errno` is set appropriately.

ERRORS

EBADF `epfd` or `fd` is not a valid file descriptor.

EEXIST `op` was EPOLL_CTL_ADD, and the supplied file descriptor `fd` is already registered with this epoll instance.

EINVAL `epfd` is not an epoll file descriptor, or `fd` is the same as `epfd`, or the requested operation `op` is not supported by this interface.

EINVAL An invalid event type was specified along with EPOLLEXCLUSIVE in events.

EINVAL `op` was EPOLL_CTL_MOD and events included EPOLLEXCLUSIVE.

EINVAL op was EPOLL_CTL_MOD and the EPOLLEXCLUSIVE flag has previously been applied to this epfd, fd pair.

EINVAL EPOLLEXCLUSIVE was specified in event and fd refers to an epoll instance.

ELOOP fd refers to an epoll instance and this EPOLL_CTL_ADD operation would result in a circular loop of epoll instances monitoring one another or a nesting depth of epoll instances greater than 5.

ENOENT op was EPOLL_CTL_MOD or EPOLL_CTL_DEL, and fd is not registered with this epoll instance.

ENOMEM There was insufficient memory to handle the requested op control operation.

ENOSPC The limit imposed by /proc/sys/fs/epoll/max_user_watches was encountered while trying to register (EPOLL_CTL_ADD) a new file descriptor on an epoll instance. See epoll(7) for further details.

EPERM The target file fd does not support epoll. This error can occur if fd refers to, for example, a regular file or a directory.

VERSIONS

epoll_ctl() was added to the kernel in version 2.6. Library support is provided in glibc starting with version 2.3.2.

CONFORMING TO

epoll_ctl() is Linux-specific.

NOTES

The epoll interface supports all file descriptors that support poll(2).

BUGS

In kernel versions before 2.6.9, the EPOLL_CTL_DEL operation required a non-null pointer in event, even though this argument is ignored. Since Linux 2.6.9, event can be specified as NULL when using EPOLL_CTL_DEL. Applications that need to be portable to kernels before 2.6.9 should specify a non-null pointer in event.

If EPOLLWAKEUP is specified in flags, but the caller does not have the CAP_BLOCK_SUSPEND capability, then the EPOLLWAKEUP flag is silently ignored. This unfortunate behavior is necessary because no validity checks were performed on the flags argument in the original implementation, and the addition of the EPOLLWAKEUP with a check that caused the call to fail if the caller did not have the CAP_BLOCK_SUSPEND capability caused a breakage in at least one existing user-space application that happened to randomly (and uselessly) specify this bit. A robust application should therefore double check that it has the

CAP_BLOCK_SUSPEND capability if attempting to use the EPOLLWAKEUP flag.

SEE ALSO

epoll_create(2), epoll_wait(2), poll(2), epoll(7)

COLOPHON

This page is part of release 5.10 of the Linux man-pages project. A description of the project, information about reporting bugs, and the latest version of this page, can be found at <https://www.kernel.org/doc/man-pages/>.

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