



## ***Red Hat Enterprise Linux Release 9.2 Manual Pages on 'gai\_suspend.3' command***

### ***\$ man gai\_suspend.3***

GETADDRINFO\_A(3)      Linux Programmer's Manual      GETADDRINFO\_A(3)

#### **NAME**

getaddrinfo\_a, gai\_suspend, gai\_error, gai\_cancel - asynchronous net?  
work address and service translation

#### **SYNOPSIS**

```
#define _GNU_SOURCE      /* See feature_test_macros(7) */
#include <netdb.h>

int getaddrinfo_a(int mode, struct gaicb *list[],
                  int nitems, struct sigevent *sevp);

int gai_suspend(const struct gaicb * const list[], int nitems,
                const struct timespec *timeout);

int gai_error(struct gaicb *req);

int gai_cancel(struct gaicb *req);

Link with -lanl.
```

#### **DESCRIPTION**

The `getaddrinfo_a()` function performs the same task as `getaddrinfo(3)`, but allows multiple name look-ups to be performed asynchronously, with optional notification on completion of look-up operations.

The mode argument has one of the following values:

##### **GAI\_WAIT**

Perform the look-ups synchronously. The call blocks until the look-ups have completed.

##### **GAI\_NOWAIT**

Perform the look-ups asynchronously. The call returns immediately, and the requests are resolved in the background. See the discussion of the `sevp` argument below.

The `array` list specifies the look-up requests to process. The `nitems` argument specifies the number of elements in list. The requested look-up operations are started in parallel. NULL elements in list are ignored. Each request is described by a `gaicb` structure, defined as follows:

```
struct gaicb {
    const char      *ar_name;
    const char      *ar_service;
    const struct addrinfo *ar_request;
    struct addrinfo  *ar_result;
};
```

The elements of this structure correspond to the arguments of `getaddrinfo(3)`. Thus, `ar_name` corresponds to the node argument and `ar_service` to the service argument, identifying an Internet host and a service. The `ar_request` element corresponds to the hints argument, specifying the criteria for selecting the returned socket address structures. Finally, `ar_result` corresponds to the `res` argument; you do not need to initialize this element, it will be automatically set when the request is resolved. The `addrinfo` structure referenced by the last two elements is described in `getaddrinfo(3)`.

When `mode` is specified as `GAI_NOWAIT`, notifications about resolved requests can be obtained by employing the `sigevent` structure pointed to by the `sevp` argument. For the definition and general details of this structure, see `sigevent(7)`. The `sevp->sigev_notify` field can have the following values:

**SIGEV\_NONE**

Don't provide any notification.

**SIGEV\_SIGNAL**

When a look-up completes, generate the signal `sigev_signo` for the process. See `sigevent(7)` for general details. The `si_code`

field of the `siginfo_t` structure will be set to `SI_ASYNCNL`.

## SIGEV\_THREAD

When a look-up completes, invoke `sigev_notify_function` as if it were the start function of a new thread. See `sigevent(7)` for details.

For `SIGEV_SIGNAL` and `SIGEV_THREAD`, it may be useful to point `sevp->sigev_value.sival_ptr` to list.

The `gai_suspend()` function suspends execution of the calling thread, waiting for the completion of one or more requests in the array list.

The `nitems` argument specifies the size of the array list. The call blocks until one of the following occurs:

- \* One or more of the operations in list completes.
- \* The call is interrupted by a signal that is caught.
- \* The time interval specified in `timeout` elapses. This argument specifies a timeout in seconds plus nanoseconds (see `nanosleep(2)` for details of the `timespec` structure). If `timeout` is `NULL`, then the call blocks indefinitely (until one of the events above occurs).

No explicit indication of which request was completed is given; you must determine which request(s) have completed by iterating with `gai_error()` over the list of requests.

The `gai_error()` function returns the status of the request `req`: either `EAI_INPROGRESS` if the request was not completed yet, 0 if it was handled successfully, or an error code if the request could not be resolved.

The `gai_cancel()` function cancels the request `req`. If the request has been canceled successfully, the error status of the request will be set to `EAI_CANCELED` and normal asynchronous notification will be performed.

The request cannot be canceled if it is currently being processed; in that case, it will be handled as if `gai_cancel()` has never been called.

If `req` is `NULL`, an attempt is made to cancel all outstanding requests that the process has made.

## RETURN VALUE

The `getaddrinfo_a()` function returns 0 if all of the requests have been

enqueued successfully, or one of the following nonzero error codes:

#### EAI\_AGAIN

The resources necessary to enqueue the look-up requests were not available. The application may check the error status of each request to determine which ones failed.

#### EAI\_MEMORY

Out of memory.

#### EAI\_SYSTEM

mode is invalid.

The `gai_suspend()` function returns 0 if at least one of the listed requests has been completed. Otherwise, it returns one of the following nonzero error codes:

#### EAI\_AGAIN

The given timeout expired before any of the requests could be completed.

#### EAI\_ALLDONE

There were no actual requests given to the function.

#### EAI\_INTR

A signal has interrupted the function. Note that this interruption might have been caused by signal notification of some completed look-up request.

The `gai_error()` function can return `EAI_INPROGRESS` for an unfinished look-up request, 0 for a successfully completed look-up (as described above), one of the error codes that could be returned by `getaddrinfo(3)`, or the error code `EAI_CANCELED` if the request has been canceled explicitly before it could be finished.

The `gai_cancel()` function can return one of these values:

#### EAI\_CANCELED

The request has been canceled successfully.

#### EAI\_NOTCANCELED

The request has not been canceled.

#### EAI\_ALLDONE

The request has already completed.

The `gai_strerror(3)` function translates these error codes to a human readable string, suitable for error reporting.

## ATTRIBUTES

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

??

?Interface                    ? Attribute   ? Value   ?

??

?getaddrinfo\_a(), gai\_suspend(), ? Thread safety ? MT-Safe ?

?gai\_error(), gai\_cancel()    ?            ?        ?

??

## CONFORMING TO

These functions are GNU extensions; they first appeared in glibc in version 2.2.3.

## NOTES

The interface of `getaddrinfo_a()` was modeled after the `lio_listio(3)` interface.

## EXAMPLES

Two examples are provided: a simple example that resolves several requests in parallel synchronously, and a complex example showing some of the asynchronous capabilities.

### Synchronous example

The program below simply resolves several hostnames in parallel, giving a speed-up compared to resolving the hostnames sequentially using `getaddrinfo(3)`. The program might be used like this:

```
$ ./a.out ftp.us.kernel.org enoent.linuxfoundation.org gnu.cz
ftp.us.kernel.org: 128.30.2.36
enoent.linuxfoundation.org: Name or service not known
gnu.cz: 87.236.197.13
```

Here is the program source code

```
#define _GNU_SOURCE
#include <netdb.h>
#include <stdio.h>
```

```

#include <stdlib.h>

#include <string.h>

int

main(int argc, char *argv[])
{
    int ret;

    struct gaicb *reqs[argc - 1];

    char host[NI_MAXHOST];

    struct addrinfo *res;

    if (argc < 2) {
        fprintf(stderr, "Usage: %s HOST...\n", argv[0]);
        exit(EXIT_FAILURE);
    }

    for (int i = 0; i < argc - 1; i++) {
        reqs[i] = malloc(sizeof(*reqs[0]));

        if (reqs[i] == NULL) {
            perror("malloc");
            exit(EXIT_FAILURE);
        }

        memset(reqs[i], 0, sizeof(*reqs[0]));

        reqs[i]->ar_name = argv[i + 1];
    }

    ret = getaddrinfo_a(GAI_WAIT, reqs, argc - 1, NULL);

    if (ret != 0) {
        fprintf(stderr, "getaddrinfo_a() failed: %s\n",
            gai_strerror(ret));
        exit(EXIT_FAILURE);
    }

    for (int i = 0; i < argc - 1; i++) {
        printf("%s: ", reqs[i]->ar_name);

        ret = gai_error(reqs[i]);

        if (ret == 0) {
            res = reqs[i]->ar_result;

```

```

ret = getnameinfo(res->ai_addr, res->ai_addrlen,
    host, sizeof(host),
    NULL, 0, NI_NUMERICHOST);
if (ret != 0) {
    fprintf(stderr, "getnameinfo() failed: %s\n",
        gai_strerror(ret));
    exit(EXIT_FAILURE);
}
puts(host);
} else {
    puts(gai_strerror(ret));
}
}
exit(EXIT_SUCCESS);
}

```

#### Asynchronous example

This example shows a simple interactive `getaddrinfo_a()` front-end. The notification facility is not demonstrated.

An example session might look like this:

```

$ ./a.out
> a ftp.us.kernel.org enoent.linuxfoundation.org gnu.cz
> c 2
[2] gnu.cz: Request not canceled
> w 0 1
[00] ftp.us.kernel.org: Finished
> l
[00] ftp.us.kernel.org: 216.165.129.139
[01] enoent.linuxfoundation.org: Processing request in progress
[02] gnu.cz: 87.236.197.13
> l
[00] ftp.us.kernel.org: 216.165.129.139
[01] enoent.linuxfoundation.org: Name or service not known
[02] gnu.cz: 87.236.197.13

```

The program source is as follows:

```
#define _GNU_SOURCE

#include <netdb.h>

#include <stdio.h>

#include <stdlib.h>

#include <string.h>

static struct gaicb **reqs = NULL;

static int nreqs = 0;

static char *

getcmd(void)

{

    static char buf[256];

    fputs("> ", stdout); fflush(stdout);

    if (fgets(buf, sizeof(buf), stdin) == NULL)

        return NULL;

    if (buf[strlen(buf) - 1] == '\n')

        buf[strlen(buf) - 1] = 0;

    return buf;

}

/* Add requests for specified hostnames */

static void

add_requests(void)

{

    int nreqs_base = nreqs;

    char *host;

    int ret;

    while ((host = strtok(NULL, " ")) {

        nreqs++;

        reqs = realloc(reqs, sizeof(reqs[0]) * nreqs);

        reqs[nreqs - 1] = calloc(1, sizeof(*reqs[0]));

        reqs[nreqs - 1]->ar_name = strdup(host);

    }

}

/* Queue nreqs_base..nreqs requests. */
```



```

ret = getaddrinfo_a(GAI_NOWAIT, &reqs[nreqs_base],
                    nreqs - nreqs_base, NULL);

if (ret) {
    fprintf(stderr, "getaddrinfo_a() failed: %s\n",
            gai_strerror(ret));
    exit(EXIT_FAILURE);
}
}

/* Wait until at least one of specified requests completes */

static void
wait_requests(void)
{
    char *id;
    int ret, n;
    struct gaicb const **wait_reqs = calloc(nreqs, sizeof(*wait_reqs));
        /* NULL elements are ignored by gai_suspend(). */
    while ((id = strtok(NULL, " ") != NULL) {
        n = atoi(id);
        if (n >= nreqs) {
            printf("Bad request number: %s\n", id);
            return;
        }
        wait_reqs[n] = reqs[n];
    }
    ret = gai_suspend(wait_reqs, nreqs, NULL);
    if (ret) {
        printf("gai_suspend(): %s\n", gai_strerror(ret));
        return;
    }
    for (int i = 0; i < nreqs; i++) {
        if (wait_reqs[i] == NULL)
            continue;
        ret = gai_error(reqs[i]);

```

```

    if (ret == EAI_INPROGRESS)
        continue;

    printf("[%02d] %s: %s\n", i, reqs[i]->ar_name,
        ret == 0 ? "Finished" : gai_strerror(ret));
}
}

/* Cancel specified requests */

static void
cancel_requests(void)
{
    char *id;
    int ret, n;
    while ((id = strtok(NULL, " ")) != NULL) {
        n = atoi(id);
        if (n >= nreqs) {
            printf("Bad request number: %s\n", id);
            return;
        }
        ret = gai_cancel(reqs[n]);
        printf("[%s] %s: %s\n", id, reqs[atoi(id)]->ar_name,
            gai_strerror(ret));
    }
}

/* List all requests */

static void
list_requests(void)
{
    int ret;
    char host[NI_MAXHOST];
    struct addrinfo *res;
    for (int i = 0; i < nreqs; i++) {
        printf("[%02d] %s: ", i, reqs[i]->ar_name);
        ret = gai_error(reqs[i]);

```

```

if (!ret) {
    res = reqs[i]->ar_result;
    ret = getnameinfo(res->ai_addr, res->ai_addrlen,
        host, sizeof(host),
        NULL, 0, NI_NUMERICHOST);
    if (ret) {
        fprintf(stderr, "getnameinfo() failed: %s\n",
            gai_strerror(ret));
        exit(EXIT_FAILURE);
    }
    puts(host);
} else {
    puts(gai_strerror(ret));
}
}
}

int
main(int argc, char *argv[])
{
    char *cmdline;
    char *cmd;
    while ((cmdline = getcmd()) != NULL) {
        cmd = strtok(cmdline, " ");
        if (cmd == NULL) {
            list_requests();
        } else {
            switch (cmd[0]) {
            case 'a':
                add_requests();
                break;
            case 'w':
                wait_requests();
                break;

```

```

    case 'c':
        cancel_requests();

        break;

    case 'l':
        list_requests();

        break;

    default:
        fprintf(stderr, "Bad command: %c\n", cmd[0]);

        break;

    }

}

}

exit(EXIT_SUCCESS);

}

```

#### SEE ALSO

getaddrinfo(3), inet(3), lio\_listio(3), hostname(7), ip(7), sigevent(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/>.

GNU                      2020-11-01                      GETADDRINFO\_A(3)