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Rocky Enterprise Linux 9.2 Manual Pages on command 'gai_error.3'

\$ man gai_error.3

GETADDRINFO_A(3) Linux Programmer's Manual GETADDRINFO_A(3)

NAME

getaddrinfo_a, gai_suspend, gai_error, gai_cancel - asynchronous network address and ser?
vice 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 `attributes(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 fa?

cility 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("[%0s] %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

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GETADDRINFO_A(3)