

NAME

cap_bind, **cap_connect**, **cap_getaddrinfo**, **cap_gethostbyaddr**, **cap_gethostbyname**, **cap_gethostbyname2**, **cap_getnameinfo**, **cap_net_free**, **cap_net_limit**, **cap_net_limit_addr2name**, **cap_net_limit_addr2name_family**, **cap_net_limit_bind**, **cap_net_limit_connect**, **cap_net_limit_init**, **cap_net_limit_name2addr**, **cap_net_limit_name2addr_family**, - library for networking in capability mode

LIBRARY

library "libcap_net"

SYNOPSIS

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

```
#include <libcasper.h>
```

```
#include <casper/cap_net.h>
```

int

```
cap_bind(cap_channel_t *chan, int s, const struct sockaddr *addr, socklen_t addrlen);
```

int

```
cap_connect(cap_channel_t *chan, int s, const struct sockaddr *name, socklen_t namelen);
```

int

```
cap_getaddrinfo(cap_channel_t *chan, const char *hostname, const char *servname,
    const struct addrinfo *hints, struct addrinfo **res);
```

int

```
cap_getnameinfo(cap_channel_t *chan, const struct sockaddr *sa, socklen_t salen, char *host,
    size_t hostlen, char *serv, size_t servlen, int flags);
```

struct hostent *

```
cap_gethostbyname(const cap_channel_t *chan, const char *name);
```

struct hostent *

```
cap_gethostbyname2(const cap_channel_t *chan, const char *name, int af);
```

struct hostent *

```
cap_gethostbyaddr(const cap_channel_t *chan, const void *addr, socklen_t len, int af);
```

cap_net_limit_t *

```
cap_net_limit_init(cap_channel_t *chan, uint64_t mode);
```

int

cap_net_limit(*cap_net_limit_t* *limit);

void

cap_net_free(*cap_net_limit_t* *limit);

cap_net_limit_t *

cap_net_limit_addr2name_family(*cap_net_limit_t* *limit, *int* *family, *size_t* size);

cap_net_limit_t *

cap_net_limit_addr2name(*cap_net_limit_t* *limit, *const struct sockaddr* *sa, *socklen_t* salen);

cap_net_limit_t *

cap_net_limit_name2addr_family(*cap_net_limit_t* *limit, *int* *family, *size_t* size);

cap_net_limit_t *

cap_net_limit_name2addr(*cap_net_limit_t* *limit, *const char* *name, *const char* *serv);

cap_net_limit_t *

cap_net_limit_connect(*cap_net_limit_t* *limit, *const struct sockaddr* *sa, *socklen_t* salen);

cap_net_limit_t *

cap_net_limit_bind(*cap_net_limit_t* *limit, *const struct sockaddr* *sa, *socklen_t* salen);

DESCRIPTION

The functions **cap_bind()**, **cap_connect()**, **cap_getaddrinfo()**, **cap_getnameinfo()**, **cap_gethostbyname()**, **cap_gethostbyname2()**, and **cap_gethostbyaddr()** provide a set of APIs equivalent to **bind(2)**, **connect(2)**, **getaddrinfo(3)**, **getnameinfo(3)**, **gethostbyname(3)**, **gethostbyname2(3)**, and **gethostbyaddr(3)** except that a connection to the **system.net** service needs to be provided.

These functions, as well as **cap_net_limit()**, are reentrant but not thread-safe. That is, they may be called from separate threads only with different *cap_channel_t* arguments or with synchronization.

LIMITS

By default, the **cap_net** capability provides unrestricted access to the network namespace. Applications typically only require access to a small portion of the network namespace: The **cap_net_limit()** function can be used to restrict access to the network. The **cap_net_limit_init()** returns an opaque limit handle used to store a list of capabilities. The restricts the functionality of the service. Modes are encoded using the following flags:

| | |
|-----------------------------|--|
| CAPNET_ADDR2NAME | reverse DNS lookups are allowed with cap_getnameinfo |
| CAPNET_NAME2ADDR | name resolution is allowed with cap_getaddrinfo |
| CAPNET_DEPRECATED_ADDR2NAME | reverse DNS lookups are allowed with cap_gethostbyaddr |
| CAPNET_DEPRECATED_NAME2ADDR | name resolution is allowed with cap_gethostbyname and cap_gethostbyname2 |
| CAPNET_BIND | bind syscall is allowed |
| CAPNET_CONNECT | connect syscall is allowed |
| CAPNET_CONNECTDNS | connect syscall is allowed to the values returned from previous call to the cap_getaddrinfo or cap_gethostbyname |

cap_net_limit_addr2name_family() limits the **cap_getnameinfo()** and **cap_gethostbyaddr()** to do reverse DNS lookups to specific family (AF_INET, AF_INET6, etc.)

cap_net_limit_addr2name() limits the **cap_getnameinfo()** and **cap_gethostbyaddr()** to do reverse DNS lookups only on those specific structures.

cap_net_limit_name2addr_family() limits the **cap_getaddrinfo()**, **cap_gethostbyname()** and **cap_gethostbyname2()** to do the name resolution on specific family (AF_INET, AF_INET6, etc.)

cap_net_limit_addr2name() restricts **cap_getaddrinfo()**, **cap_gethostbyname()** and **cap_gethostbyname2()** to a set of domains.

cap_net_limit_bind() limits **cap_bind()** to bind only on those specific structures.

cap_net_limit_connect() limits **cap_connect()** to connect only on those specific structures. If the CAPNET_CONNECTDNS is set the limits are extended to the values returned by **cap_getaddrinfo()**, **cap_gethostbyname()** and **cap_gethostbyname2()**. In case of the **cap_getaddrinfo()** the restriction is strict. In case of the **cap_gethostbyname()** and **cap_gethostbyname2()** any port will be accepted in the **cap_connect()** function.

The **cap_net_limit()** will consume and apply the limits.

Once a set of limits is applied, subsequent calls to **cap_net_limit()** will fail unless the new set is a subset of the current set.

If the **cap_net_limit()** was not called the rights may be freed using **cap_net_free()**. Multiple calls to

`cap_net_limit_addr2name_family()`, `cap_net_limit_addr2name()`, `cap_net_limit_name2addr_family()`, `cap_net_limit_name2addr()`, `cap_net_limit_connect()`, and `cap_net_limit_bind()` is supported, each call is extending preview capabilities.

EXAMPLES

The following example first opens a capability to casper and then uses this capability to create the **system.net** casper service and uses it to resolve a host and connect to it.

```
cap_channel_t *capcas, *capnet;
cap_net_limit_t *limit;
int familylimit, error, s;
const char *host = "example.com";
struct addrinfo hints, *res;

/* Open capability to Casper. */
capcas = cap_init();
if (capcas == NULL)
    err(1, "Unable to contact Casper");

/* Cache NLA for gai_strerror. */
caph_cache_catpages();

/* Enter capability mode sandbox. */
if (caph_enter_casper() < 0)
    err(1, "Unable to enter capability mode");

/* Use Casper capability to create capability to the system.net service. */
capnet = cap_service_open(capcas, "system.net");
if (capnet == NULL)
    err(1, "Unable to open system.net service");

/* Close Casper capability. */
cap_close(capcas);

/* Limit system.net to reserve IPv4 addresses, to host example.com . */
limit = cap_net_limit_init(capnet, CAPNET_NAME2ADDR | CAPNET_CONNECTDNS);
if (limit == NULL)
    err(1, "Unable to create limits.");
cap_net_limit_name2addr(limit, host, "80");
familylimit = AF_INET;
```

```
cap_net_limit_name2addr_family(limit, &familylimit, 1);
if (cap_net_limit(limit) < 0)
    err(1, "Unable to apply limits.");

/* Find IP addresses for the given host. */
memset(&hints, 0, sizeof(hints));
hints.ai_family = AF_INET;
hints.ai_socktype = SOCK_STREAM;

error = cap_getaddrinfo(capnet, host, "80", &hints, &res);
if (error != 0)
    errx(1, "cap_getaddrinfo(): %s: %s", host, gai_strerror(error));

s = socket(res->ai_family, res->ai_socktype, res->ai_protocol);
if (s < 0)
    err(1, "Unable to create socket");

if (cap_connect(capnet, s, res->ai_addr, res->ai_addrlen) < 0)
    err(1, "Unable to connect to host");
```

SEE ALSO

bind(2), cap_enter(2), connect(2), caph_enter(3), err(3), gethostbyaddr(3), gethostbyname(3), gethostbyname2(3), getnameinfo(3), capsicum(4), nv(9)

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