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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