Network Protocols

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Name and Address Conversions

Outline

- Name and Address Conversions (Chapter 11)
  - Domain Name System
  - **gethostbyname** Function
  - **gethostbyaddr** Function
  - **gethostname** Function
  - **getservbyname** and **getservbyport** Functions

Domain Name System

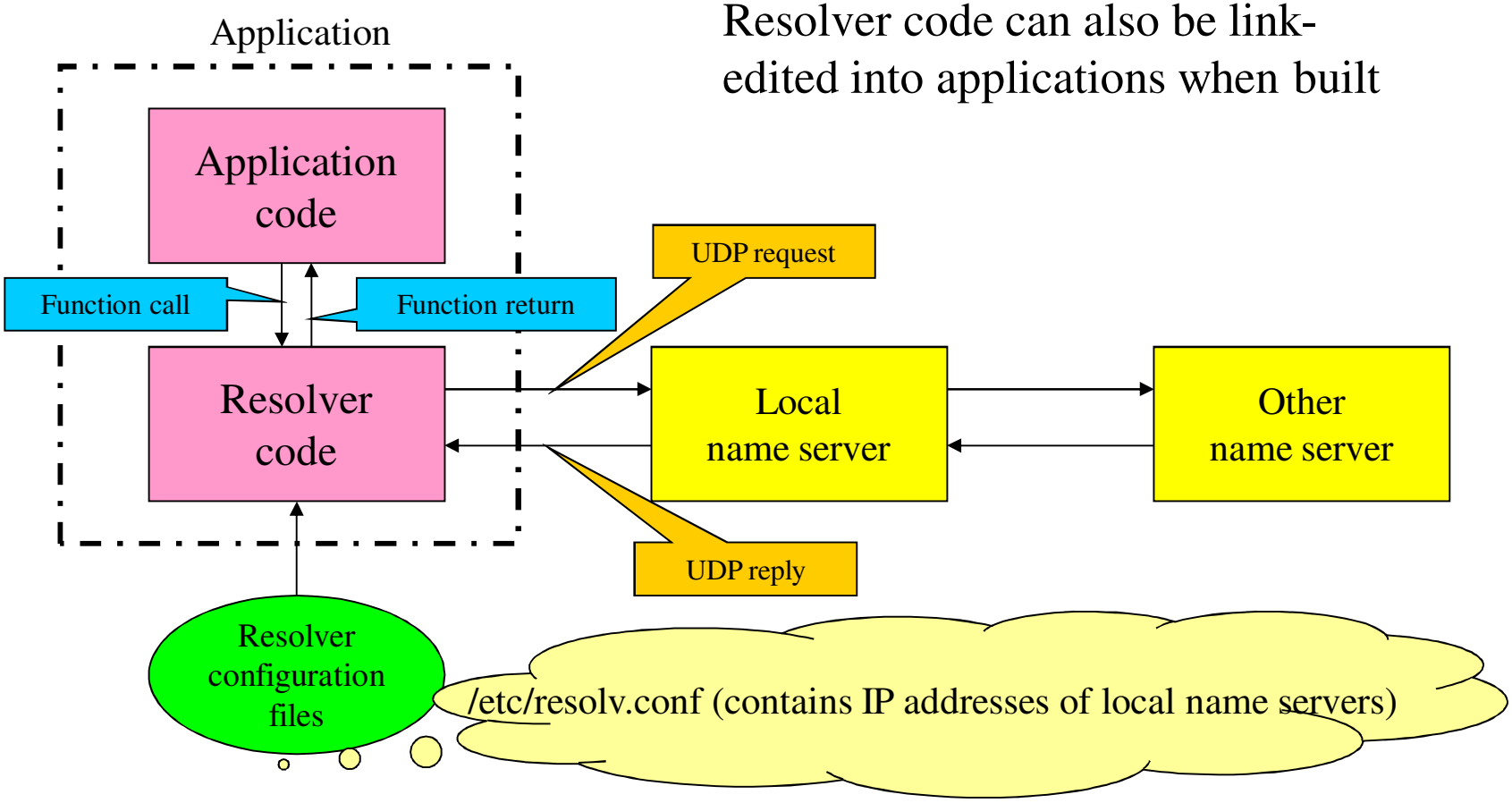
- Fully Qualified Domain Name FQDN
- DNS uses Resource Records RR to store information about items

•SOA	Start of Authortiy	Parameters for this zone
•A	IP address of a host	32 bit integer
•MX	Mail Exchange	priority, domain willing to accept email
•NS	Name server	name of a server for this domain
•CNAME	Canonical name	create aliases
•PTR	Pointer	map IP addresses into host names
•HINFO	Host Description	CPU and OS in ASCII
•TXT	Text	Un-interpreted ASCII text

m.cs.vt.edu.	86400	IN	HINFO	Sun Unix
m.cs.vt.edu.	86400	IN	A	128.173.40.39
m.cs.vt.edu	86400	IN	A	128.173.41.38

Domain Name System

Resolver code can also be link-edited into applications when built



Typical arrangement of clients, resolvers, and name servers

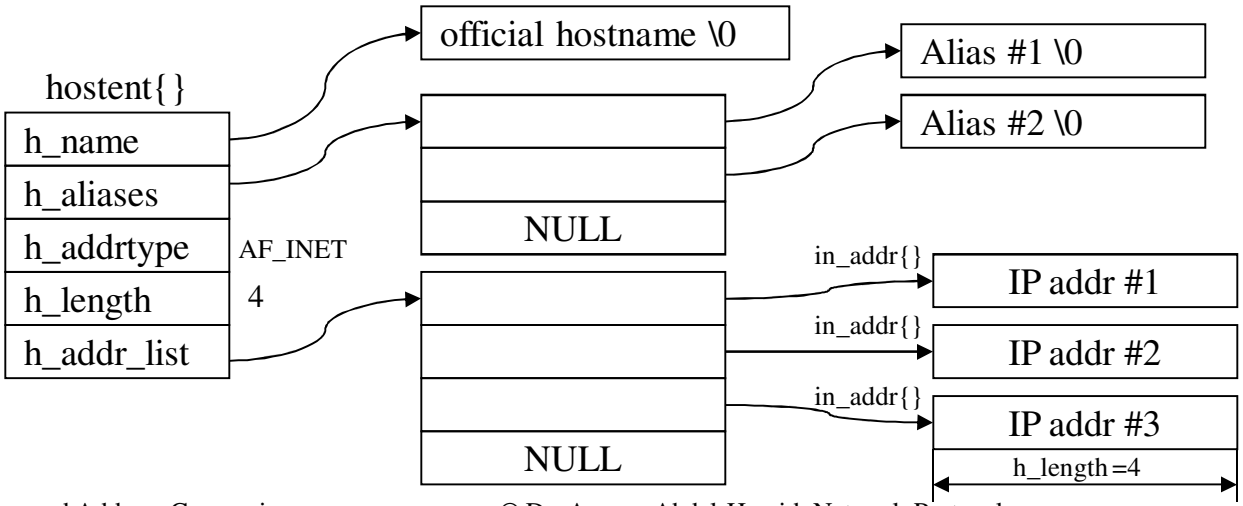
gethostbyname Function 1/2

#include <netdb.h>

struct hostent *gethostbyname (const char *hostname);

Returns: non-null pointer if OK, NULL on error with h_errno set

```
struct hostent {
        char    *h_name;        /* official (canonical) name of host */
        char    **h_aliases;    /* pointer to array of of pointers to alias names */
        int     h_addrtype;     /* host address type : AF_INET*/
        int     h_length;       /* length of address : 4*/
        char    **h_addr_list;  /* ptr to array of ptrs with IPv4 addrs*/
};
```



A host which has 2 aliases and 3 IP addresses

gethostbyname Function 2/3

- **#define h_addr h_addr_list[0]** /* for backward compatibility */

  struct hostent * hp = gethostbyname(argv[1]);

  bcopy (hp->h_addr, &server.sin_addr, hp->h_length);

  //see **intro/daytimetcpcli_hostname.c**

- Will only retrieve IPv4 addresses, performs a query for an A record
- Some versions of **gethostbyname** will allow the following

  hptr = gethostbyname ("192.168.42.2"); → not portable

gethostbyname Function 3/3

- If error, sets global integer *h_errno* to
  - HOST_NOT_FOUND
  - TRY_AGAIN
  - NO_RECOVERY
  - NO_DATA → specified name valid but does not have A records
- Can use *hsterror* function to get a description of the error (value of *h_errno*)
- See **names/hostent.c** for an example
- Example Usage

  >**hostent** ap1 >**hostent** cnn.com >**hostent** www

gethostbyaddr Function

•Takes a binary IPv4 address and tries to find the hostname corresponding to that address
•Performs a query for a PTR record

```
#include <netdb.h>
struct hostent *gethostbyaddr(const char *addr, socklen_t len, int
family);
```

Returns non-null pointer if OK, NULL on error with h_errno set

•Field of interest in the returning structure is *h_name* (canonical host name)

•*addr* argument is not a *char** but really a pointer to an *in_addr* structure containing the IPv4 address

gethostname Function

•Obtains the host name

```
#include <unistd.h>

int gethostname(char *name, size_t len);
```

// On success, zero is returned. On error, -1 is returned, and *errno* is set appropriately

•Example

```
#define MAXHOSTNAME 80
char ThisHost[80];
gethostname (ThisHost, MAXHOSTNAME);
```

getservbyname and getservbyport Functions 1/2

```
#include <netdb.h>

struct servent *getservbyname(const char *servname, const char
*protoname);
//returns non-null pointer if OK, NULL on error

struct servent *getservbyport(int port, const char *protoname);
//returns non-null pointer is OK, NULL on error
//port value must be in network byte order

struct servent {
        char *s_name;           /* official service name */
        char **s_ aliases;      /* aliases list*/
        int s_port;             /* port number, network byte order */
        char *s_proto;          /* protocol to use */
};
```

getservbyname and getservbyport Functions 2/2

struct servent *sptr;

sptr = getservbyname (“domain”,”udp”); //DNS using UDP
sptr = getservbyname (“ftp”,”tcp”); //FTP using TCP
sptr=getservbyname(“ftp”,”udp”); //this call will fail

sptr = getservbyport(htons(21),”tcp”); // FTP using TCP
sptr = getservbyport(htons(21),NULL); // FTP using TCP
sptr = getservbyport(htons(21),”udp”); // This call will fail

•See **names/daytimetcpcli1.c** for a program that takes a hostname and service name as arguments