

UNIT—I BASIC INTERNET CONCEPTS

History of internet-Internet addressing-TCP/IP-DNS and directory services-Internet Applications-Electronic mail, New groups UUCP, FTP, Telnet, Finger.

HISTORY OF INTERNET

TODO

Internet Standards

- Internet Standard (STD) is a normative specification of a technology or methodology applicable to the Internet.
- Internet Standards are created and published by the Internet Engineering Task Force (IETF)

Standardization Process Team Members

- IETF Working Group
- Internet Architecture Board
- Internet Engineering Steering Group
- Individuals
- WG Chair
- Internet Drafts Editor
- RFC Editor

Output

- Proposed
- Draft
- Standard (STD)
- Best Current Practice
- Informational
- Experimental
- Historic

Published Standards

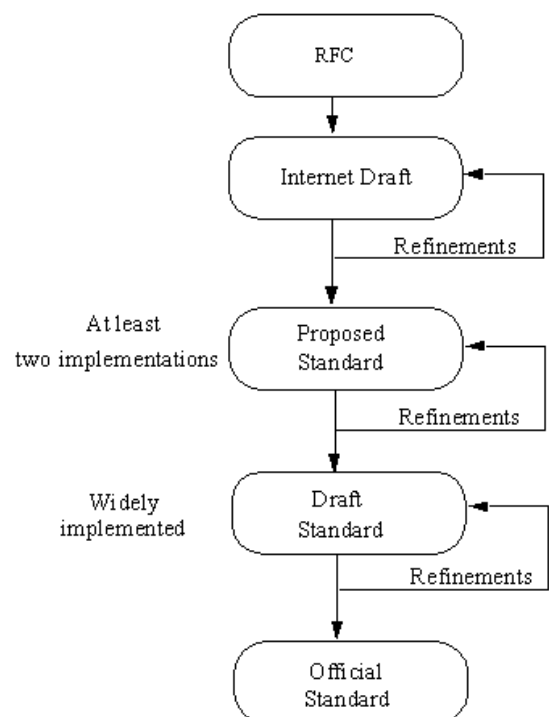
IP, ICMP, IGMP, UDP, TCP, TELNET, FTP, SMTP, MAIL, HTTP, HTML, XML, MIME

W3C

- The World Wide Web Consortium (W3C) is the main international standards organization for the World Wide Web (abbreviated WWW or W3) has more than 350 members
- W3C tries to enforce compatibility and agreement among industry members in the adoption of new standards defined by the W3C
- The consortium tries to get all those vendors to implement a set of core principles and components which are chosen by the consortium

ARPANET

- The Advanced Research Projects Agency Network (ARPANET) was the world's first operational packet switching network
- Core network of a set that came to compose the global Internet.
- The network was funded by the Advanced Research Projects Agency (ARPA)
- This later evolved into the Defense Advanced Research Projects Agency (DARPA)
- Prior to the advent of packet switching, both voice and data communications had been based on the idea of circuit switching



- With packet switching, a data system could use a single communications link to communicate with more than one machine
- Each packet can be routed independently of other packets

INTERNET ADDRESSING

An Internet Protocol address (IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication

- Two principal functions: host or network interface identification, location addressing
- Two versions of the Internet Protocol (IP) are in use: IPv4, IPv6
- Each version defines an IP address differently
 - IPv4: 32 bit number
 - IPv6: 128 bits for the address, standardized as RFC 2460

The Internet Assigned Numbers Authority (IANA) manages the IP address space allocations globally and delegates five regional Internet registries (RIRs) to allocate IP address blocks to local Internet registries (Internet service providers) and other entities.

Address Class	High-Order Bits	First Octet Address Range	Number of Bits in the Network Address	Number of Networks	Number of Hosts per Network
Class A	0	0-127	8	126	16,777,216
Class B	10	128-191	16	16,384	65,536
Class C	110	192-223	24	2,097,152	254
Class D	1110	224-239	28	N/A	N/A

Loopback Address

- The loopback address 127 cannot be used as an internet address.
- This address allows a client and server on the same host to communicate with each other.
- This is ideal for testing and troubleshooting.
- This loopback address is often assigned the name localhost.

Broadcast Address

- The broadcast address is 255 and is used to send messages to all network hosts.
- The address 255.255.255.255 is known as a limited broadcast and is used for configuration at boot up.

Reserved IP Addressing

ICANN has reserved three blocks of IP addresses for private networks:

- 10.0.0.0 to 10.255.255.255
- 172.16.0.0 to 172.31.255.255
- 192.168.0.0 to 192.168.255.255

Subnet Masks

A subnet mask is a 32-bit number (like an IP address) with a one-to-one correlation to each bit of the IP address. The subnet mask server two main purposes:

- Distinguish the network and host portions of an IP address
- Specify whether a destination address is local or remote

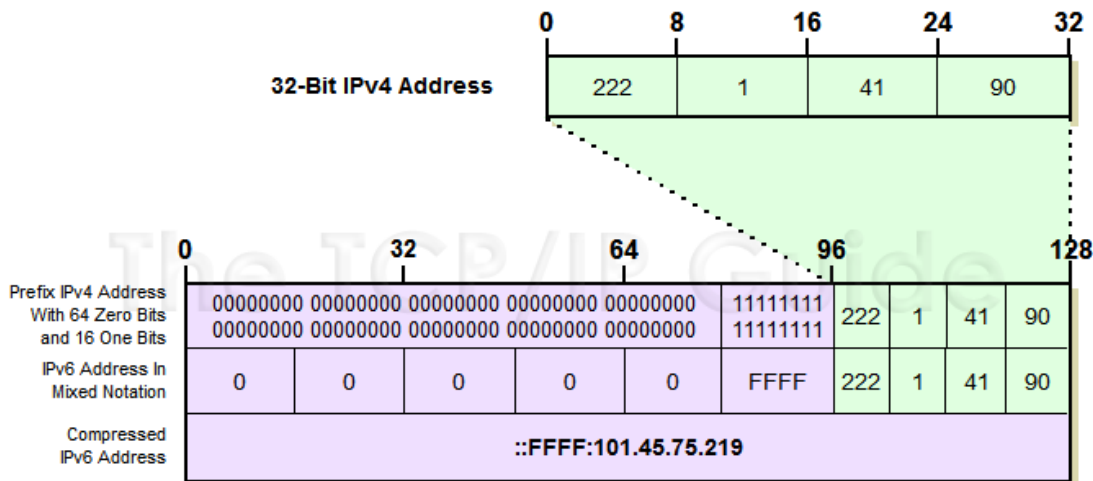
The following shows the default subnet masks for the first three classes:

- 255.0.0.0 Class A
- 255.255.0.0 Class B

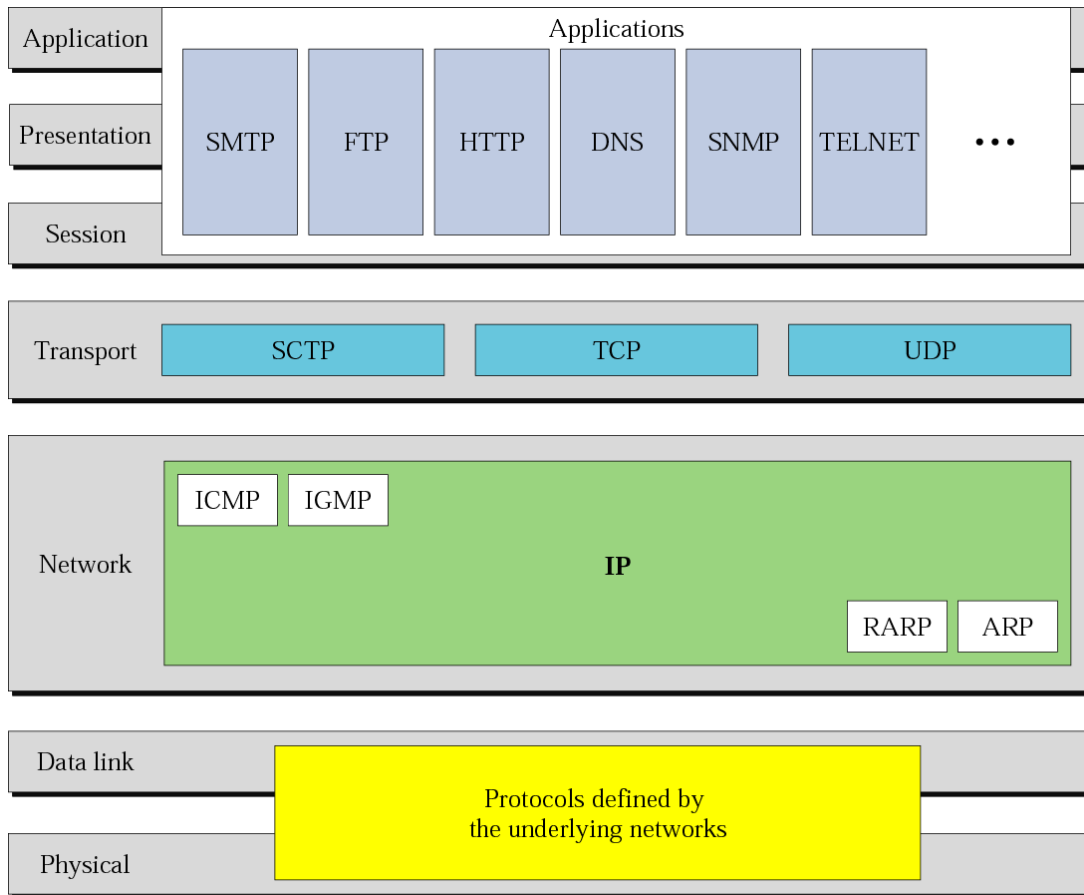
- 255.255.255.0 Class C

IPv6 Addressing

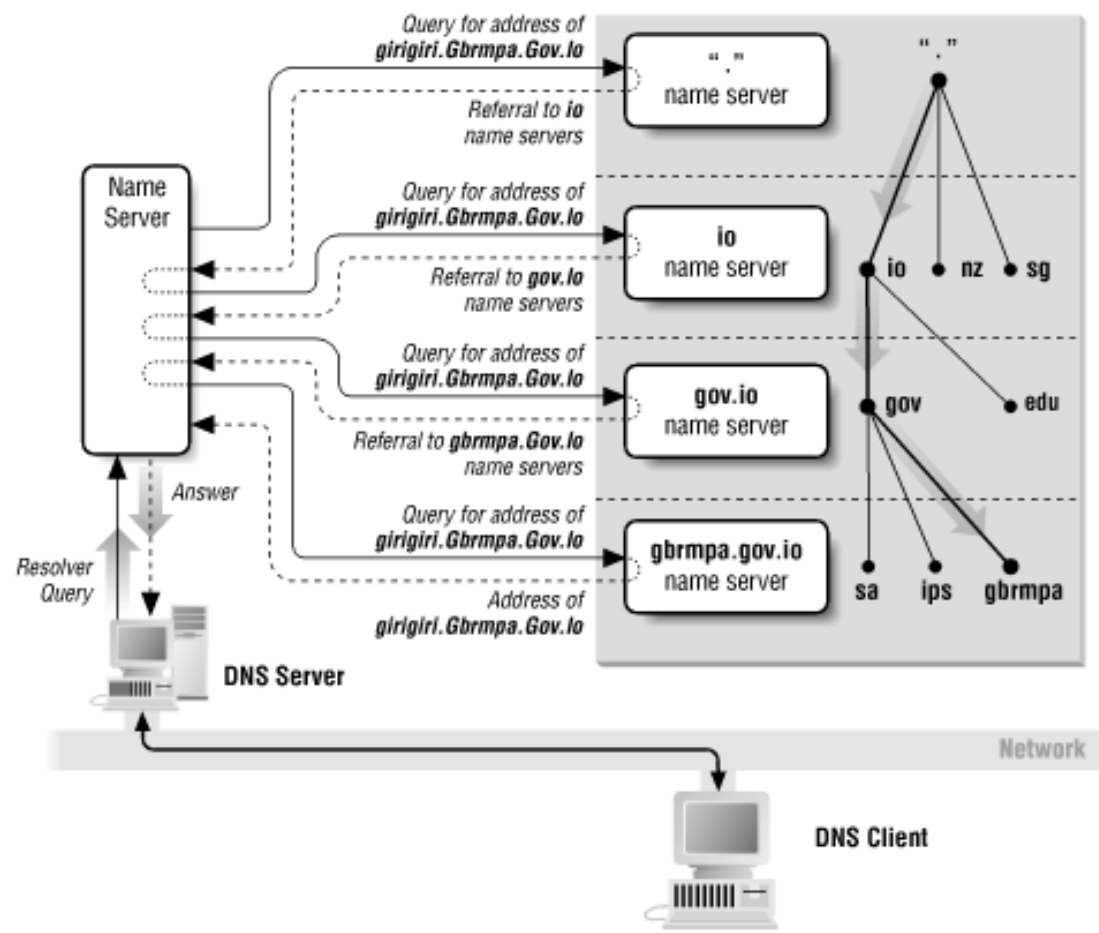
- An IPv6-layer identifier for an interface or set of interfaces
 - Preferred form: 3FFE:3600:0:FF:8:800:200C:417A
 - Compressed form: FF01:0:0:0:0:0:0:7 becomes FF01::7
 - IPv4-embedded: 0:0:0:0:0:0:140.113.131.3 or ::140.113.131.3
- Address prefix: 3FFE:3600:B:88::/64 (note: no masks in IPv6!)
- 128-bit IPv6 Address/prefix length
- Addresses are assigned to interfaces
- No change from IPv4 Model
- Interface 'expected' to have multiple addresses
- Addresses have scope
 - Link Local
 - Site Local
 - Global
- Addresses have lifetime
 - Valid and Preferred lifetime
- Basic Address Types
 - Unicast
 - Multicast
 - Anycast
 - No Broadcast



TCP/IP

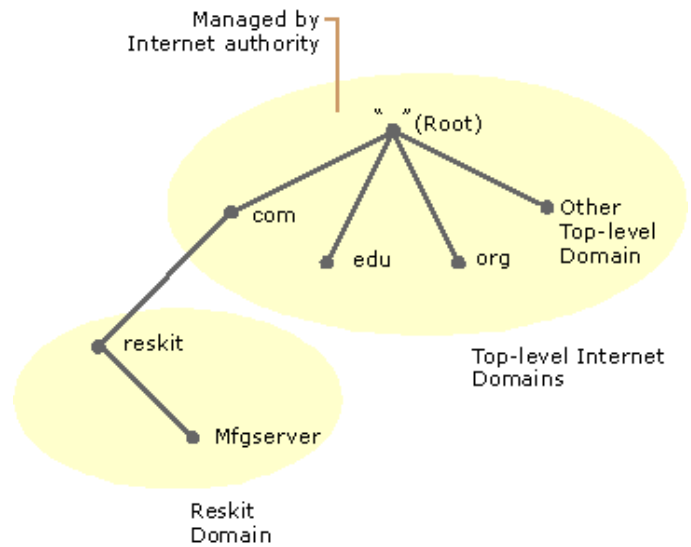


DNS

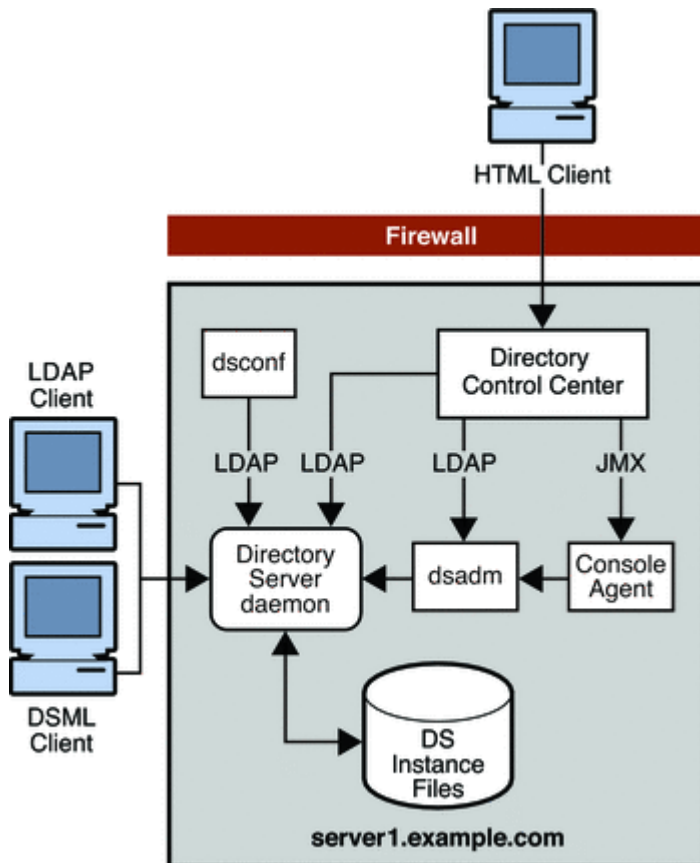


- The naming system on which DNS is based is a hierarchical and logical tree structure called the domain namespace
- Organizations can also create private networks that are not visible on the Internet, using their own domain namespaces
- DNS Domains; Computers; Services; Subdomains
- Organizational Domains
- Geographical Domains
 - .in, .au, .us etc
- Reverse Domains
 - .arpa

.com; .edu; .gov; .int; .mil; .net; .org



DIRECTORY SERVICES



- A network service that identifies all resources on a network and makes them accessible to users and applications.
- Resources include e-mail addresses, computers, and peripheral devices such as printers.
- Ideally, the directory service should make the physical network topology and protocols transparent so that a user on a network can access any resource without knowing where or how it is physically connected.
- There are a number of directory services that are used widely.
- Two of the most important ones are LDAP, which is used primarily for e-mail addresses, and Network Directory Service (NDS), which is used on Novell Netware networks.
- Virtually all directory services are based on the X.500 ITU standard, although the standard is so large and complex that no vendor complies with it fully

- Prior to X.500 implementations.
 - Domain Name System
 - Network Information Service
 - Banyan VINES
 - NT Domains
- Lightweight Directory Access Protocol - LDAP/X.500 based implementations
 - Active Directory
 - eDirectory
 - Open Directory
 - Sun Java System Directory Server
 - Windows NT Directory Services
 - Open LDAP
 - Lotus Domino

INTERNET APPLICATIONS

- Home
 - Communication Email, Skype
 - Online Purchase
 - Networking Twitter, Facebook
- Education
 - Online Smart Classes
 - Online Presentation
 - Simulator
 - Design
- Government
 - Government Orders
 - Income Tax Returns
 - Legal Documents
 - Driving License



- Trading
- Programs
- Driver
- Link
- Chat
- Search
- Entertainment
- Video Conferencing
- E-Mail
- Email and the web using mobile devices
- The Internet allows greater flexibility in working hours and location
- The Internet can be accessed almost anywhere by numerous means, including through mobile Internet devices.
- Educational material at all levels from pre-school to post-doctoral is available from websites. Examples range from CBeebies, through school and high-school revision guides, virtual universities, to access to top-end scholarly literature through the likes of Google
- For distance education, help with homework and other assignments, self-guided learning, whiling away spare time, or just looking up more detail on an interesting fact, it has never been easier for people to access educational information at any level from anywhere.
- The Internet in general and the World Wide Web in particular are important enablers of both formal and informal education.

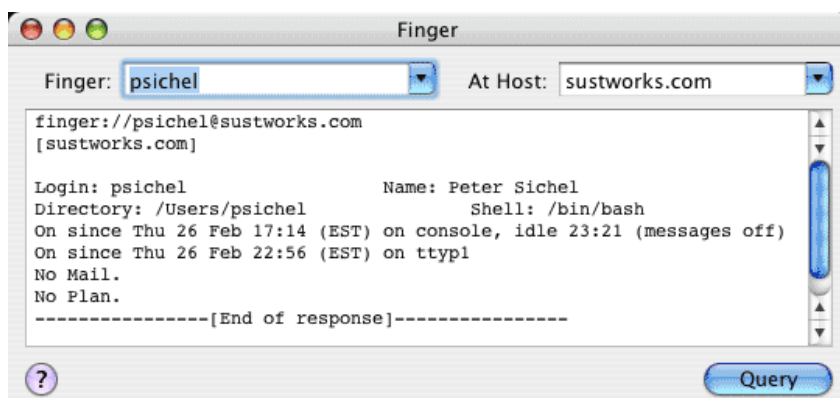
- The low cost and nearly instantaneous sharing of ideas, knowledge, and skills has made collaborative work dramatically easier, with the help of collaborative software.
- Not only can a group cheaply communicate and share ideas but the wide reach of the Internet allows such groups more easily to form.
 - An example: Linux, Mozilla Firefox, and OpenOffice.org.
- Internet chat, whether in the form of an IRC chat room or channel, via an instant messaging system, or a social networking website, allows colleagues to stay in touch in a very convenient way when working at their computers during the day.
- Messages can be exchanged even more quickly and conveniently than via email.
- These systems may allow files to be exchanged, drawings and images to be shared, or voice and video contact between team members.
- Content management systems allow collaborating teams to work on shared sets of documents simultaneously without accidentally destroying each other's work.
- Business and project teams can share calendars as well as documents and other information. Such collaboration occurs in a wide variety of areas including scientific research, software development, conference planning, and creative writing.
- Social and political collaboration is also becoming more widespread as both Internet access and computer literacy spread.
- The Internet allows computer users to remotely access other computers and information stores easily, wherever they may be.
- They may do this with or without computer security, i.e. authentication and encryption technologies, depending on the requirements.
- This is encouraging new ways of working from home, collaboration and information sharing in many industries.

FINGER PROTOCOL

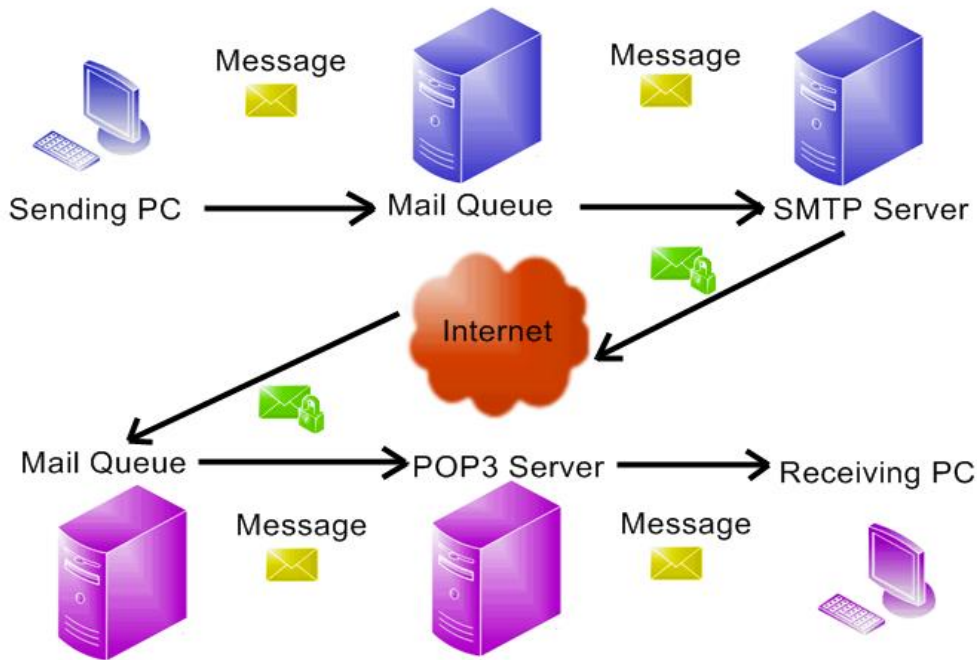
- Finger is a simple Internet query and response protocol.
- The Name/Finger Protocol (FINGER) is an application-level Internet protocol that provides an interface between the finger command and the fingerd daemon.
- The fingerd daemon returns information about the users currently logged in to a specified remote host.
- If you execute the finger command specifying a user at a particular host, you will obtain specific information about that user.
- The FINGER Protocol must be present at the remote host and at the requesting host. FINGER uses Transmission Control Protocol (Transmission Control Protocol) as its underlying protocol.

The syntax for the Finger utility is

- Finger [-l] [user] @hostname
- Sample Usage: Finger jimbob@andrew.cmu.edu



ELECTRONIC MAIL



- Electronic mail (e-mail for short) is a method of sending and receiving formatted messages and files over the Internet to other people
- an e-mail message can go anywhere in the world in as little as a few seconds
- Internet Service Providers issue e-mail addresses in the form username@domainname
- Many e-mail programs are available, such as Pegasus Mail, Eudora, Outlook Express
- When a new e-mail message arrives, it is placed in the Inbox
- Standard buttons New, Forward, Reply, Reply All
- Addressed to To, CC, BCC
- Priority Normal, High
- Delivery Receipts

Various email protocols

- SMTP
- Post Office Protocol
- Internet Message Access Protocol
- Multipurpose Internet Mail Extensions

SMTP: End-to-end delivery

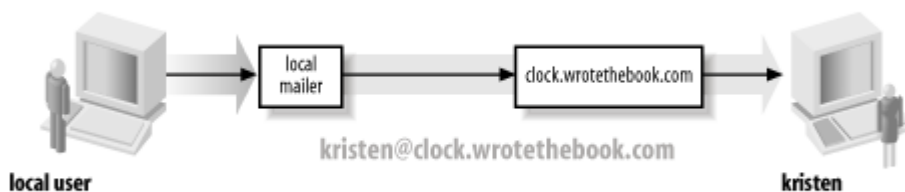
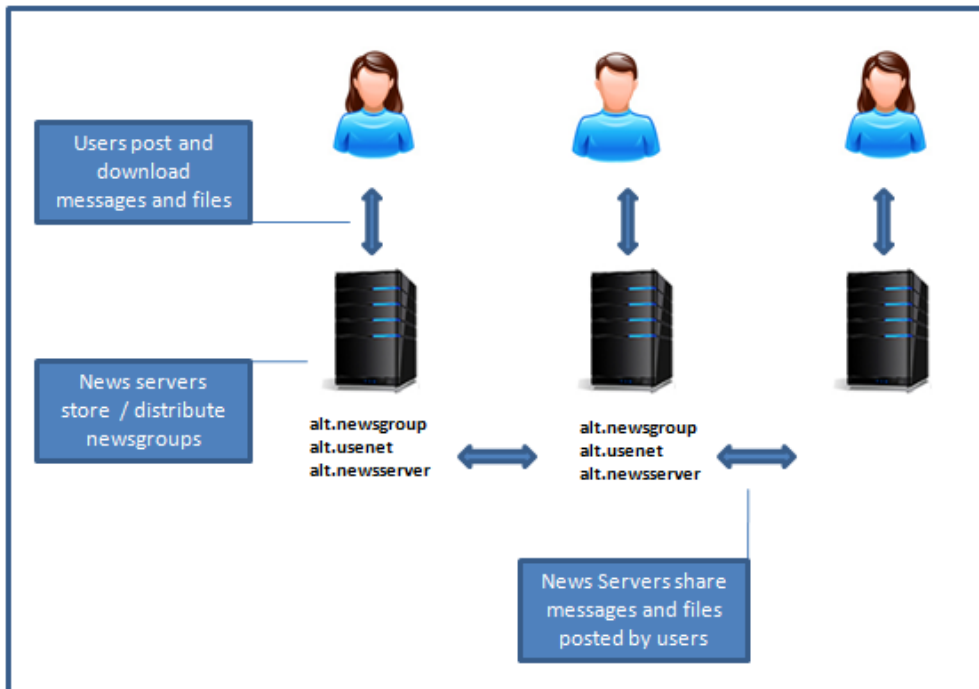


Figure 3-3. Mail delivery systems

NEW GROUPS



How newsgroups work

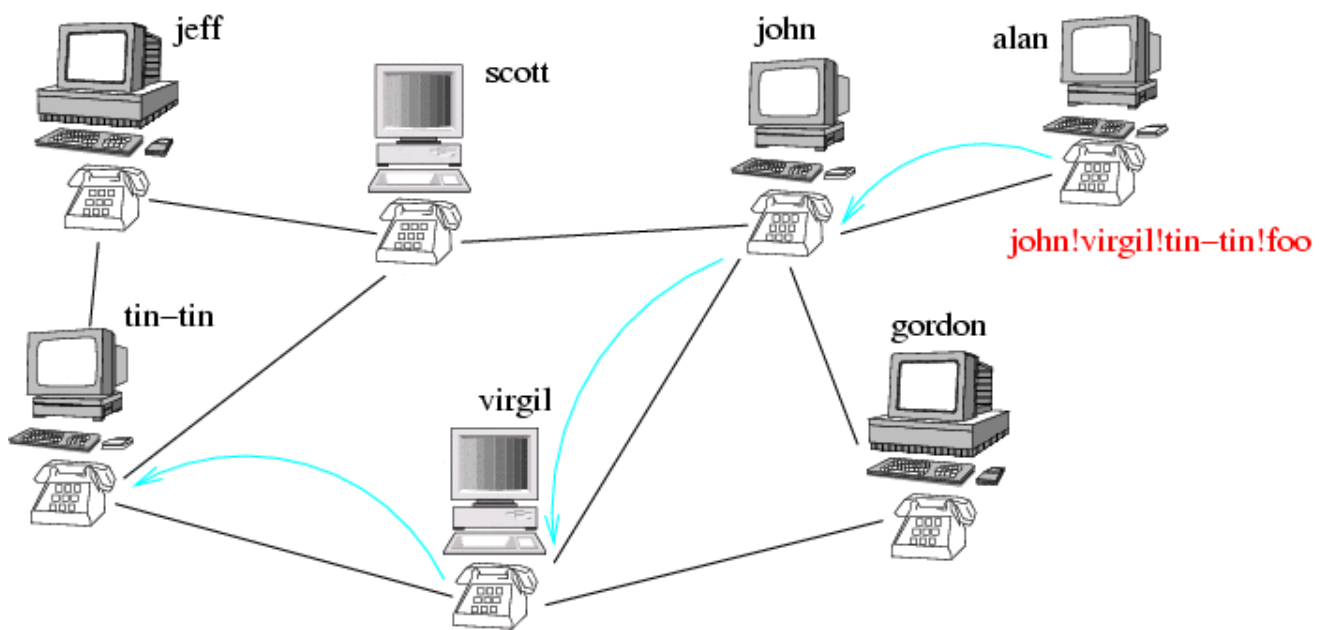
- Newsgroup servers are hosted by various organizations and institutions.
- Most Internet service providers host their own news servers,
- Every host of a news server maintains agreements with others to regularly synchronize.
- In this way news servers form a network.
- When a user posts to one news server, the message is stored locally.
- That server then shares the message with the servers that are connected to it if both carry the newsgroup, and from those servers to servers that they are connected to, and so on.
- a carrier group is used for crossposting to aid distribution.

Hierarchies

- often arranged into hierarchies, theoretically making it simpler to find related groups.
- The term top-level hierarchy refers to the hierarchy defined by the prefix before the first dot.
- The most commonly known hierarchies are the Usenet hierarchies.
- comp.* — Discussion of computer-related topics
- news.* — Discussion of Usenet itself
- sci.* — Discussion of scientific subjects
- rec.* — Discussion of recreational activities (e.g. games and hobbies)
- soc.* — Socialising and discussion of social issues.
- talk.* — Discussion of contentious issues such as religion and politics.
- misc.* — Miscellaneous discussion
- alt.* hierarchy has discussion of all kinds of topics

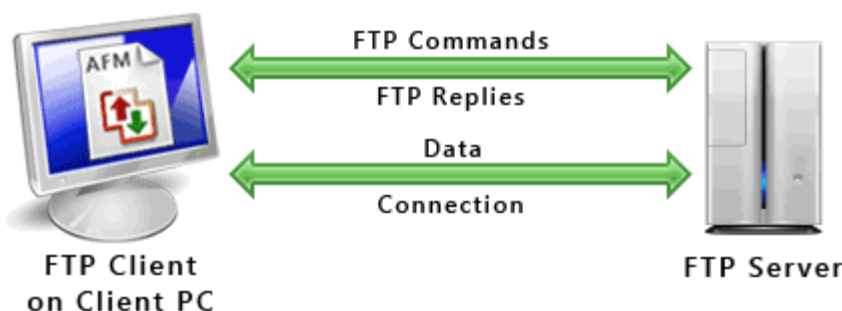
UUCP

- UUCP is an abbreviation of Unix-to-Unix Copy : **Store and forward delivery**
 - The term generally refers to a suite of computer programs and protocols allowing remote execution of commands and transfer of files, email and netnews between computers.
 - UUCP uses the computers' modems to dial out to other computers, establishing temporary, point-to-point links between them.
 - Each system in a UUCP network has a list of neighbor systems, with phone numbers, login names and passwords, etc.
 - **UUCPNET** was the name for the totality of the network of computers connected through UUCP.
- UUCP is the UNIX-to-UNIX Copy system, a collection of programs that have provided rudimentary networking for UNIX computers since 1977.
 - UUCP has three main uses:
 - Sending mail and news to users on remote systems
 - Transferring files between UNIX systems
 - Executing commands on remote systems
 - UUCP consists of two main programs:
 - uucp, which copies files between computers
 - `$ uucp /tmp/file12 idr!/tmp/file12`
 - uux, which executes programs on remote machines
 - `$ uux - "idr!lpr" < report`
 - UUCP was one of the few ways you could use for transmitting files on those old days, when networks were crappy, computers were connected with unreliable links and bandwidth was much more expensive than nowadays.
 - the UUCP transmission path was directly specified as a list of host names separated by exclamation marks (ie, john!virgil!tin-tin!foo).
 - Files remained stored in a machine until the link to the next hop went up, so files were transmitted from hop to hop when some connectivity was available between them.
 - No intelligent scheduling or whatsoever, but it was simple enough for doing the job.



FTP

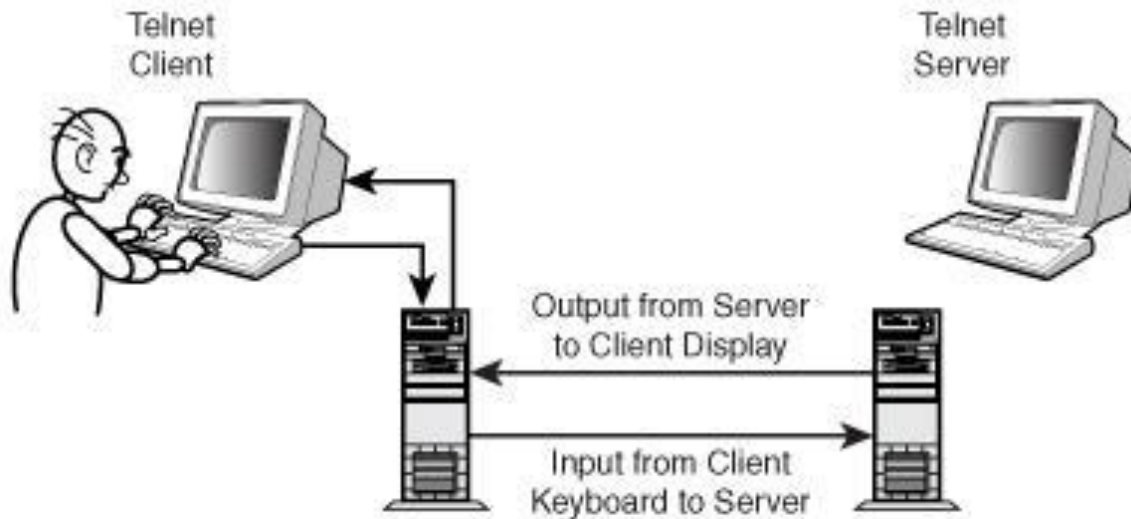
- File Transfer Protocol (FTP) allows hosts to transfer data among dissimilar hosts, as well as files between two foreign hosts indirectly.
- downloading
 - Process of copying files from internet to user's computer hard drive
 - most common Internet downloads are applications and plug-ins
- uploading
- An FTP site's URL begins with ftp://, typically accessed via hyperlinks
- Public access
 - anonymous
- Restricted access
 - user name, password
 - keeps the transport secure
- Connection Mode
 - The FTP server may support Active or Passive connections, or both
 - Active FTP connection mode, the client opens a port and listens and the server actively connects to it.
 - Passive FTP connection, the server opens a port and listens (passively) and the client connects to it.
- FTP provides for such tasks as
 - listing remote directories,
 - changing the current remote directory,
 - creating and removing remote directories, and
 - transferring multiple files in a single request.
- It also allows interactive user-oriented sessions.
- FTP uses reliable stream delivery (TCP/IP) to send the files
- Uses a Telnet connection to transfer commands and replies.
- FTP also understands several basic file formats including NETASCII, IMAGE, and Local 8.
- TCP/IP implements FTP in the ftp user command and the ftpd server command and does not provide an applications programming interface (API) to this protocol.



FTP Commands

!	delete	literal	prompt	send
?	debug	ls	put	status
append	dir	mdelete	pwd	trace
ascii	disconnect	mdir	quit	type
bell	get	mget	quote	user
binary	glob	mkdir	recv	verbose
bye	hash	mls	remotehelp	
cd	help	mput	rename	
close	lcd	open	rmdir	

TELNET



- Telnet is also a protocol
- Telnet is a set of components that provide terminal-like access to a remote computer.
- A system of rules defining the interactions between Telnet servers and clients.
- The Telnet protocol is defined in a series of RFCs.
- Because Telnet is based on a well-defined open protocol, it can be and has been implemented on a wide range of hardware and software systems.
- The basic purpose of Telnet is to provide a means by which keyboard commands typed by a remote user can cross the network and become input for a different computer.
- Screen output related to the session then crosses the network from that different computer (the server) to the client system.
- The effect is that the remote user can interact with the server as if he were logged in locally.

A Telnet session requires:

1. a Telnet client, that serves as the remote terminal, and
2. a Telnet server, that receives the connection request and allows the connection.

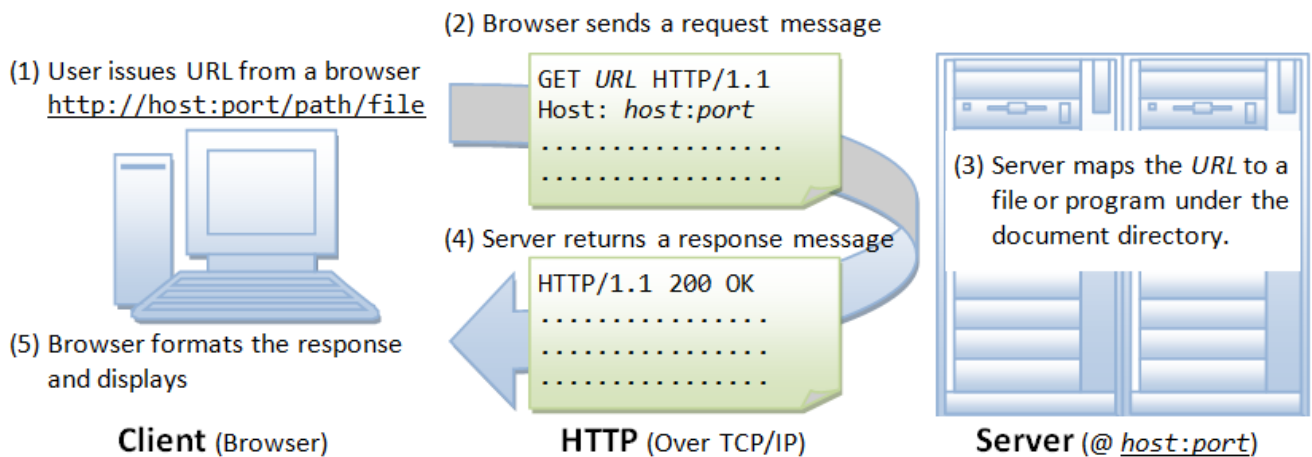
On Unix systems, the telnet command is entered at the command prompt, as follows:

```
telnet hostname/IP address
```

- Telnet was once an extremely useful tool, however, in recent years it has been replaced by more secure options such as SSH.
- One problem is that Telnet gives network intruders what they want more than anything—direct access to a terminal session on a remote server, and, although the Telnet standard supports password authentication, passwords typically are transported as clear text.

HYPER TEXT TRANSFER PROTOCOL (HTTP)

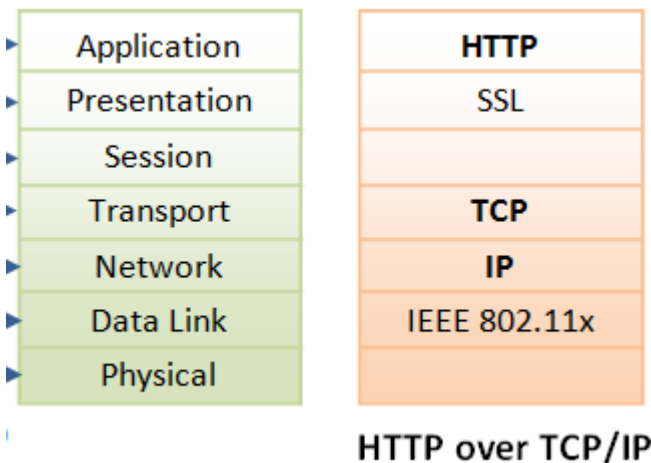
- RFC2616: "The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems. It is a generic, stateless, protocol which can be used for many tasks beyond its use for hypertext, such as name servers and distributed object management systems, through extension of its request methods, error codes and headers."
- HTTP (Hypertext Transfer Protocol) is perhaps the most popular application protocol used in the Internet (or The WEB).
- HTTP is an asymmetric request-response client-server protocol as illustrated.
- An HTTP client sends a request message to an HTTP server.
- The server, in turn, returns a response message.
- In other words, HTTP is a pull protocol, the client pulls information from the server (instead of server pushes information down to the client).
- HTTP is a stateless protocol. In other words, the current request does not know what has been done in the previous requests.
- HTTP permits negotiating of data type and representation, so as to allow systems to be built independently of the data being transferred.



HTTP over TCP/IP

HTTP is a client-server application-level protocol.

It typically runs over a TCP/IP connection, as illustrated. (HTTP needs not run on TCP/IP. It only presumes a reliable transport. Any transport protocols that provide such guarantees can be used.)



HTTP Request Methods

HTTP protocol defines a set of request methods. A client can use one of these request methods to send a request message to an HTTP server. The methods are:

GET: A client can use the GET request to get a web resource from the server.

HEAD: A client can use the HEAD request to get the header that a GET request would have obtained. Since the header contains the last-modified date of the data, this can be used to check against the local cache copy.

POST: Used to post data up to the web server.

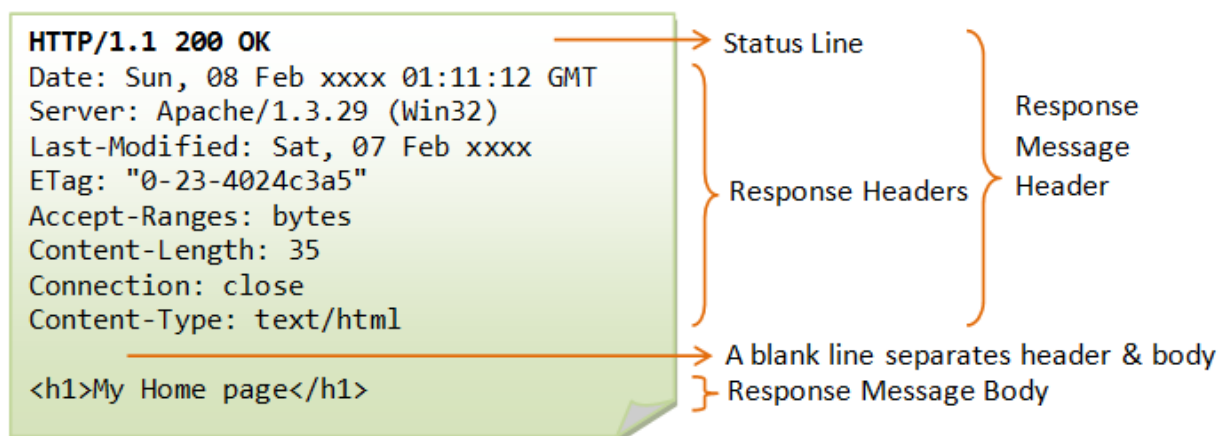
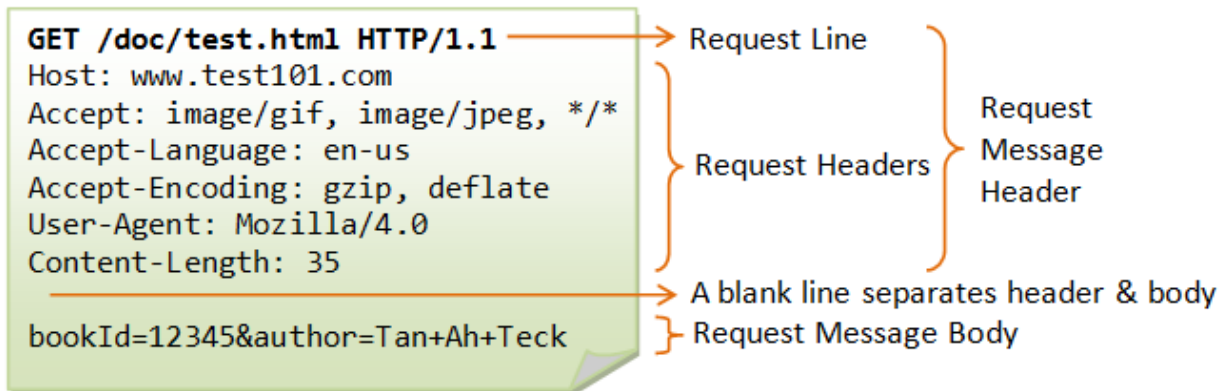
PUT: Ask the server to store the data.

DELETE: Ask the server to delete the data.

TRACE: Ask the server to return a diagnostic trace of the actions it takes.

OPTIONS: Ask the server to return the list of request methods it supports.

CONNECT: Used to tell a proxy to make a connection to another host and simply reply the content, without attempting to parse or cache it. This is often used to make SSL connection through the proxy.



Comments & Feedback

Thanks to my family members who supported me while I spent hours and hours to prepare this.
Your feedback is welcome at GHCRajan@gmail.com