

Cauvery College for Women (Autonomous)

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Programme : BCA

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UNIT-V

- Introduction of Application Layer
- Client / Server Computing
- Interactive programming
- World Wide Web
- FTP
- Electronic mail
- TELNET
- Domain Name System

Introduction about Application Layer

- Application layer protocol defines how application processes (clients and servers), running on different end systems, pass messages to each other. In particular, an application layer protocol defines:
The types of messages, e.g., request messages and response messages.
- The syntax of the various message types, i.e., the fields in the message and how the fields are delineated.
- The semantics of the fields, i.e., the meaning of the information that the field is supposed to contain;
- Rules for determining when and how a process sends messages and responds to messages.

Simple Mail Transfer Protocol

- ▣ **SMTP (Simple Mail Transfer Protocol):**
- ▣ One of the most popular network service is electronic mail (e-mail).
- ▣ The TCP/IP protocol that supports electronic mail on the Internet is called Simple Mail Transfer Protocol (SMTP).
- ▣ SMTP transfers messages from senders' mail servers to the recipients' mail servers using TCP connections.
- ▣ Users based on e-mail addresses.
- ▣ SMTP provides services for mail exchange between users on the same or different computers.

Following the client/server model:

- SMTP has two sides: a client side which executes on a sender's mail server, and server side which executes on recipient's mail server.
- Both the client and server sides of SMTP run on every mail server.
- When a mail server sends mail (to other mail servers), it acts as an SMTP client.
- When a mail server receives mail (from other mail servers) it acts as an SMTP server.

File Transfer Protocol

- ❑ FTP is the standard mechanism provided by TCP/IP for copying a file from one host to another.
- ❑ FTP differs from other client-server applications because it establishes 2 connections between hosts.
- ❑ Two connections are: Data Connection and Control Connection.
- ❑ Data Connection uses PORT 20 for the purpose and control connection uses PORT 21 for the purpose.
- ❑ FTP is built on a client-server architecture and uses separate control and data connections between the client and the server.
- ❑ One connection is used for data transfer, the other for control information (commands and responses).
- ❑ It transfer data reliably and efficiently.

Multipurpose Internet Mail Extension

- ▣ It is an extension of SMTP that allows the transfer of multimedia messages.
- ▣ If binary data is included in a message MIME headers are used to inform the receiving mail agent:
 - Content-Transfer-Encoding: Header alerts the receiving user agent that the message body has been ASCII encoded and the type of encoding used.
 - Content-Type: Header informs the receiving mail agent about the type of data included in the message.

Post Office Protocol

- ❑ POP is also called as POP3 protocol.
- ❑ This is a protocol used by a mail server in conjunction with SMTP to receive and holds mail for hosts.
- ❑ POP3 mail server receives e-mails and filters them into the appropriate user folders. When a user connects to the mail server to retrieve his mail, the messages are downloaded from mail server to the user's hard disk.

Hypertext Transfer Protocol

- ❑ This is a protocol used mainly to access data on the World Wide Web (www).
- ❑ The Hypertext Transfer Protocol (HTTP) the Web's main application-layer protocol although current browsers can access other types of servers
- ❑ A respository of information spread all over the world and linked together.
- ❑ The HTIP protocol transfer data in the form of plain text, hyper text, audio, video and so on.
- ❑ HTTP utilizes TCP connections to send client requests and server replies.
- ❑ it is a synchronous protocol which works by making both persistent and non persistent connections.

Domain Name System

- ❑ To identify an entity, TCP/IP protocol uses the IP address which uniquely identifies the connection of a host to the Internet.
- ❑ DNS is a hierarchical system, based on a distributed database, that uses a hierarchy of Name Servers to resolve Internet host names into the corresponding IP addresses required for packet routing by issuing a DNS query to a name server.
- ❑ However, people refer to use names instead of address. Therefore, we need a system that can map a name to an address and conversely an address to name.
- ❑ In TCP/IP, this is the domain name system.
- ❑ DNS in the Internet: DNS is protocol that can be used in different platforms.
- ❑ Domain name space is divided into three categories.
- ❑ **Generic Domain:** The generic domain defines registered hosts according, to their generic behaviour. Each node in the tree defines a domain which is an index to the domain name space database.

- ▣ **Country Domain:** The country domain section follows the same format as the generic domain but uses 2 characters country abbreviations (e.g., US for United States) in place of 3 characters.
- ▣ **Inverse Domain:** The inverse domain is used to map an address to a name.

Electronic Mail

ARCHITECTURE AND SERVICES:

E-mail systems consist of two subsystems. They are:-

- **User Agents**, which allow people to read and send e-mail
 - **Message Transfer Agents**, which move messages from source to destination
- E-mail systems support 5 basic functions:-

Composition

Transfer

Reporting

Displaying

Disposition

- ▣ **Composition:** It refers to the process of creating messages and answers. Any text editor is used for body of the message. While the system itself can provide assistance with addressing and numerous header fields attached to each message.

- ▣ **Reporting:** It has to do with telling the originator what happened to the message that is, whether it was delivered, rejected (or) lost.
- ▣ **Transfer:** It refers to moving messages from originator to the recipient.
- ▣ **Displaying:** Incoming messages are to be displayed so that people can read their email.
- ▣ **Disposition:** It concerns what the recipient does with the message after receiving it. Possibilities include throwing it away before reading (or) after reading, saving it and so on.
- ▣ Most systems allow users to create **mailboxes** to store incoming e-mail.
Commands are needed to create and destroy mailboxes, inspect the contents of mailboxes, insert and delete messages from mailboxes, and so on.

▣ THE USER AGENT

A user agent is normally a program (sometimes called a mail reader) that accepts a variety of commands for composing, receiving, and replying to messages, as well as for manipulating mailboxes.

▣ SENDING E-MAIL

To send an e-mail message, a user must provide the message, the destination address, and possibly some other parameters. The message can be produced with a free-standing text editor, a word processing program, or possibly with a specialized text editor built into the user agent. The destination address must be in a format that the user agent can deal with. Many user agents expect addresses of the form *user@dns-address*.

▣ READING E-MAIL

When a user agent is started up, it looks at the user's mailbox for incoming e-mail before displaying anything on the screen. Then it may announce the number of messages in the mailbox or display a one-line summary of each one and wait for a command.

MESSAGE FORMATS RFC 822

Messages consist of a primitive envelope (described in RFC 821), some number of header fields, a blank line, and then the message body. Each header field (logically) consists of a single line of ASCII text containing the field name, a colon, and, for most fields, a value.

Header	Meaning
To:	E-mail address(es) of primary recipient(s)
Cc:	E-mail address(es) of secondary recipient(s)
Bcc:	E-mail address(es) for blind carbon copies
From:	Person or people who created the message
Sender:	E-mail address of the actual sender
Received:	Line added by each transfer agent along the route
Return-Path:	Can be used to identify a path back to the sender

WORLD WIDE WEB

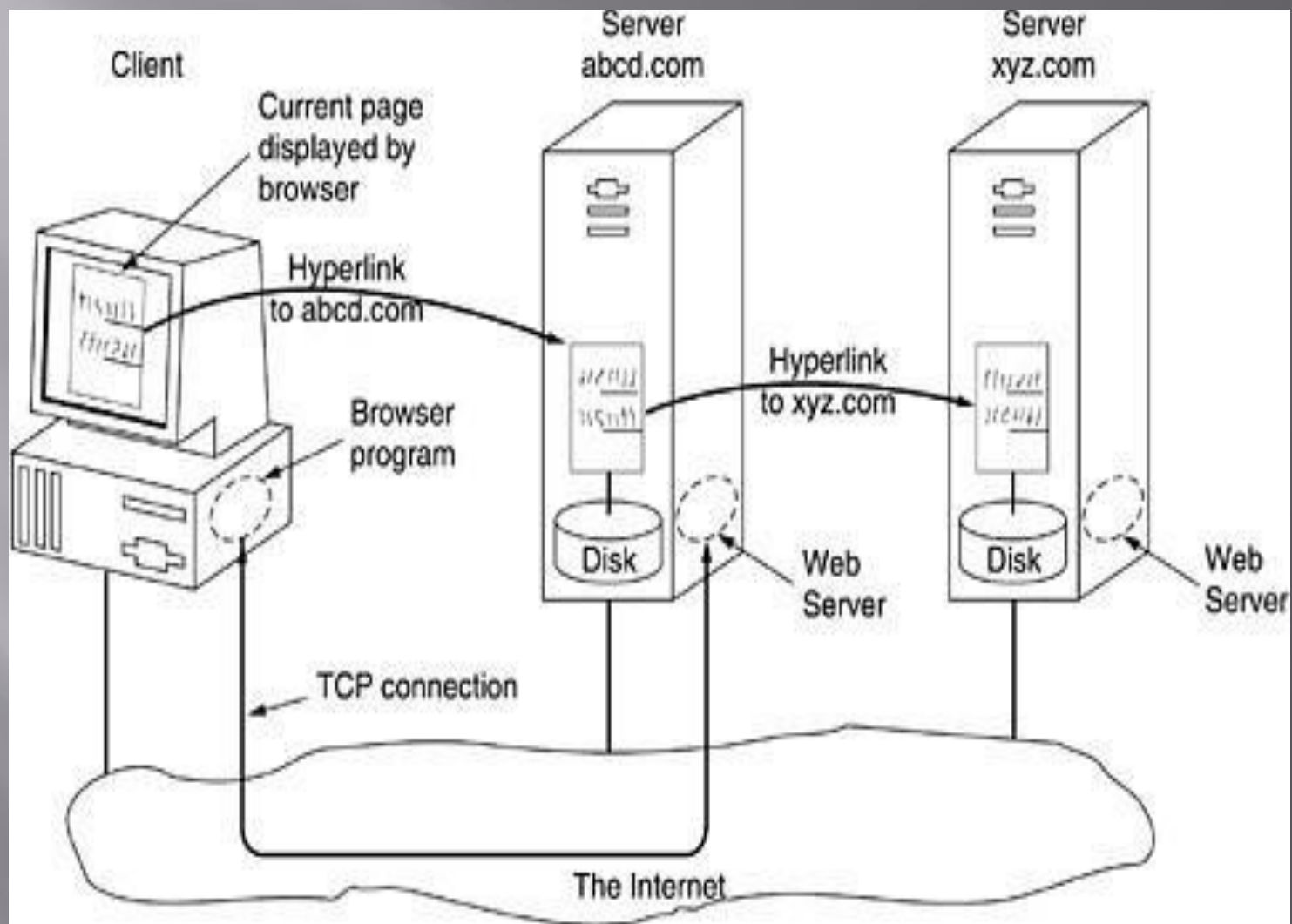
The World Wide Web is an architectural framework for accessing linked documents spread out over millions of machines all over the Internet. The initial proposal for a web of linked documents came from CERN physicist Tim Berners-Lee in 1989.

ARCHITECTURAL OVERVIEW

From the users' point of view, the Web consists of a vast, worldwide collection of documents or **Web pages**. Each page may contain links to other pages anywhere in the world. Users can follow a link by clicking on it, which then takes them to the page pointed to. This process can be repeated indefinitely.

Pages are viewed with a program called a **browser**, of which Internet Explorer and Netscape Navigator are two popular ones. The browser fetches the page requested, interprets the text and formatting commands on it, and displays the page, properly formatted, on the screen.

Strings of text that are links to other pages, called **hyperlinks**, are often highlighted, by underlining, displaying them in a special color, or both.



▣ CLIENT SIDE

When an item is selected, the browser follows the hyperlink and fetches the page selected. Therefore, the embedded hyperlink needs a way to name any other page on the Web. Pages are named using **URLs (Uniform Resource Locators)**.

The steps that occur at the client side are:

- ▣ The browser determines the URL
- ▣ The browser asks DNS for the IP address
- ▣ DNS replies with the IP address
- ▣ The browser makes a TCP connection to port 80 on the IP address
- ▣ It sends a request asking for file
- ▣ The *site* server sends the file
- ▣ The TCP connection is released.
- ▣ The browser fetches and displays all the text and images in the file.
- ▣ Web pages are written in standard HTML language to make it understandable by all browsers.
- ▣

SERVER SIDE

The steps to be followed by the server side are:

- Accept a TCP connection from a client (a browser).
- Get the name of the file requested.
- Get the file (from disk).
- Return the file to the client.
- Release the TCP connection.

UNIFORM RESOURCE LOCATORS

When the Web was first created, it was immediately apparent that having one page point to another Web page required mechanisms for naming and locating pages. In particular, three questions had to be answered before a selected page could be displayed:

What is the page called?

Where is the page located?

How can the page be accessed?

- ▣ If every page were somehow assigned a unique name, there would not be any ambiguity in identifying pages. Nevertheless, the problem would not be solved.
- ▣ Consider a parallel between people and pages. In the United States, almost everyone has a social security number, which is a unique identifier, as no two people are supposed to have the same one. Nevertheless, if you are armed only with a social security number, there is no way to find the owner's address, and certainly no way to tell whether you should write to the person in English, Spanish, or Chinese. The Web has basically the same problems.