

# *Chapter One*

## The Fundamentals

# Overview of the internet

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- Internet is network of networks (i.e. when two or more devices are connected for sharing data or resources or exchange messages we call it networks).
- No company owns the internet (i.e no central administration or control for the internet), it is cooperative effort governed by a system of standard and rules.

# Origin of the internet

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In the 1960s departments of defense (DOD of USA) started a network called ARPANET (Advanced Research Projects Agency Network) with one computer at California and three at Utah.

# Use and service of the internet

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**E-mail:-** allows user to:

- Send a message to just only one user or group of users,
- To read, print, forward, answer (reply) or delete a message
- Attach large documents.

**Telnet (Remote login):**

- Is a way that the users enable to logon to a remote computer and interactively access its resources.
- Uses a special protocol called **Network Terminal Protocol**
- Protocol is the standard set of rule that governs all communication over a computer network

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### **File Transfer Protocol (FTP):-**

- Used to download files from an FTP sites.

### **World Wide Web**

- Internet  web
- Internet is a collection of computers and other devices connected by equipment to communicate with each other.

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### **WWW**

- Is the most popular application or service of an internet.
- Also called web.
- It consists of a worldwide collection of electronic documents.
- An electronic document on the Web is called a Web page, which can contain text, graphics, animation, audio, and video.
- Web pages could be static (fixed) or dynamic (changing).
- A Web site is a collection of related Web pages stored on the same web server.
- A Web Server is a computer that delivers requested Web pages to your computer. The same Web server can store multiple Web sites.

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World Wide Web is combination of four ideas:

- Hypertext
- Resource identifiers
- Client-server architecture
- Markup language

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- **Hypertext**, that is the ability, in a computer environment, to move from one part of a document to another or from one document to another through internal connections among these documents (called "hyperlinks");
- **Resource identifiers**, that is the ability, on a computer network, to locate a particular resource (computer, document or other resource) on the network through a unique identifier called IP address;

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- **The client-server model**, of computing, in which client software or a client computer makes requests of server software or a server computer that provides the client with resources or services, such as data or files;
- **Markup language**, in which characters or codes embedded in text indicate to a computer how to print or display the text, e.g. as in italics or bold type or font.
  - Document annotation/formatting language.
  - The rule/standard making body of the web is called **W3C** (world- wide web consortium)
  - **W3C** is the non- profit organizations which makes the web standard.
    - The most known web standards are: HTML, CSS, XML, and XHTML.

# Static & Dynamic web page

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## **Static (fixed) web page**

- Is a web page that is written entirely using HTML.
- Each web page is a separate document and there are no databases or external files that are drawn upon.
- The only way to edit this type of website is to go into each page and edit the HTML.
- Difficult to manage and handle the web page
- Hard for Mobility and Modification, also difficult to host up-to-date information
- Visitors to a static Web page always see the same content (unchanged).
- Pre build document and not sufficient

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### **Dynamic (changing) web page**

- Is written using more complex code — such as PHP or ASP — and has a greater degree of functionality.
- Potentially able to make updates without needing any change of HTML document.
- Each page of a dynamic website is generated from information stored in a database or external file.
- Visitors of the dynamic Web page see the changed content.
- Visitors can customize some or all of the viewed content such as weather for a region, or ticket availability for flights.

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### **Drawbacks of Dynamic Site**

- It needs large amount of budget to develop, because they require more complex coding.
- You will need to obtain web hosting which supports databases and dynamic languages.
- Needs a skilled person.

# Client-server Architecture

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A network architecture in which each computer or process on the network is either a client or a server.

## **Server (“back end”):**

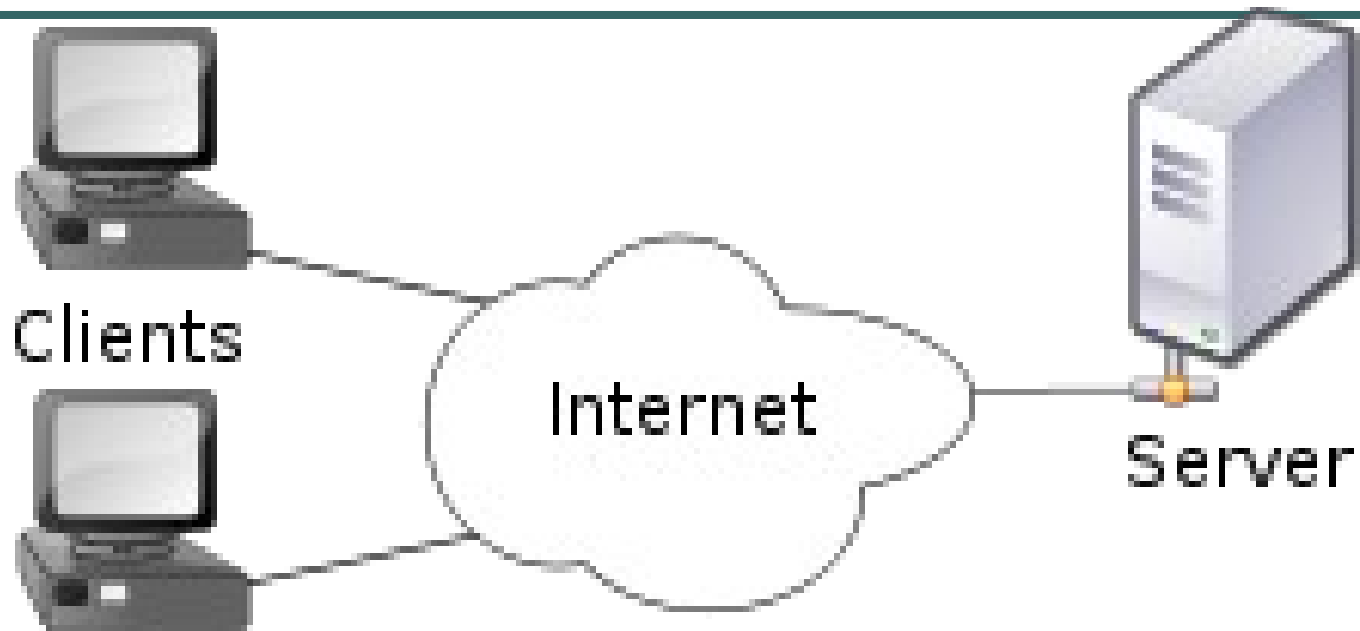
- A database from which a client requests information
- Fulfills a request for information by managing the request or serving the requested information to the client
- Responsible for data storage and management

## **Client (“front end”):**

- Presents an interface to the user
- Gathers information from the user, submits it to a server, then receives, formats, and presents the results returned from the server.

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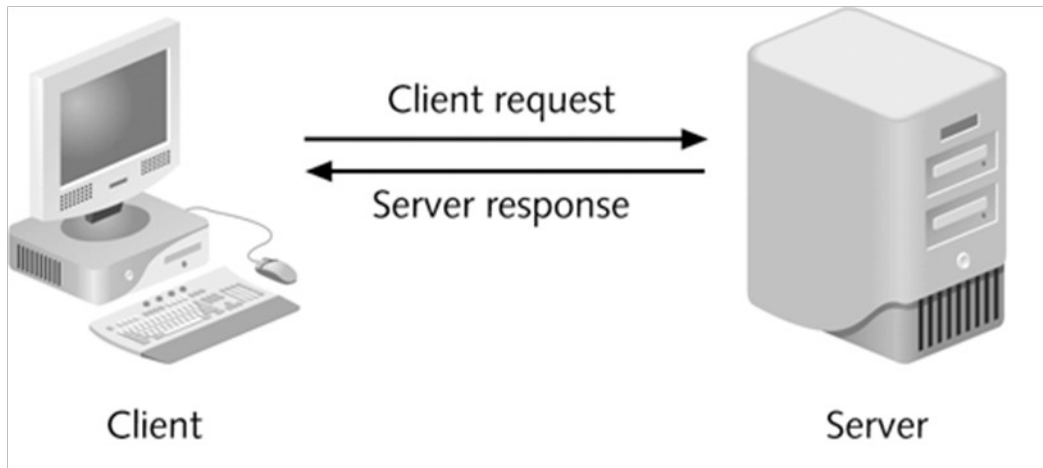
The client-server model

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## Types of Client-server Architecture:-

**1. Two-tire:-** it consist a client and a server.



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**A three-tier:**-client/server architecture consists of three distinct pieces:

**Client tier**, or user interface tier, is the Web browser

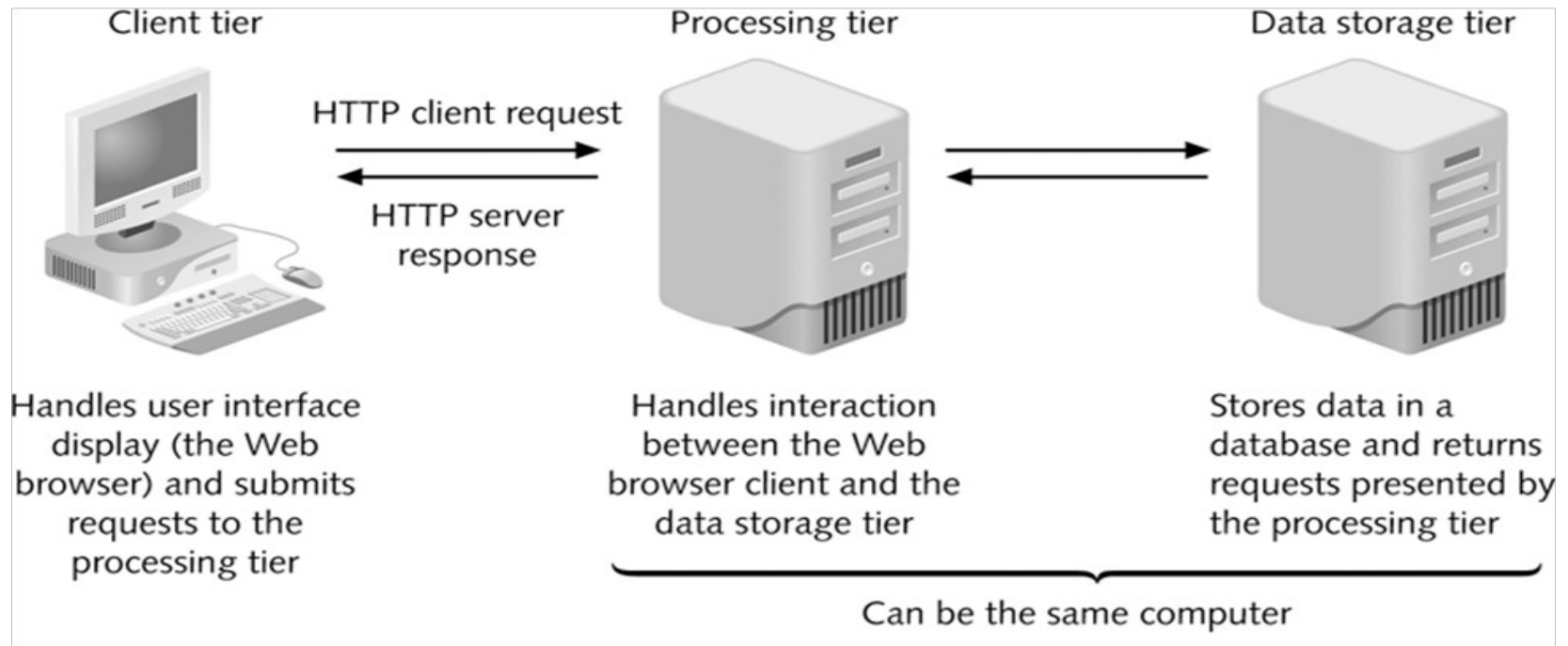
**Processing tier**, or middle tier, handles the interaction between the Web browser clients

And the **data storage tier**

- Performs necessary processing or calculations based on the request from the client tier
- Handles the return of any information to the client tier

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## Graphically



# How the Web Work?

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1. You request a web page by either typing its URL(for e.g <http://www.bhu.edu.et>) directly in the browser or by clicking on a link on the page. The URL contains all the information needed to target a specific document on a specific web server on the internet.
2. your browser send an HTTP request to the server addressed in the URL and asks for a specific file .if the URL specifies a directory(not a file).it is the same as request the default file in that directory.

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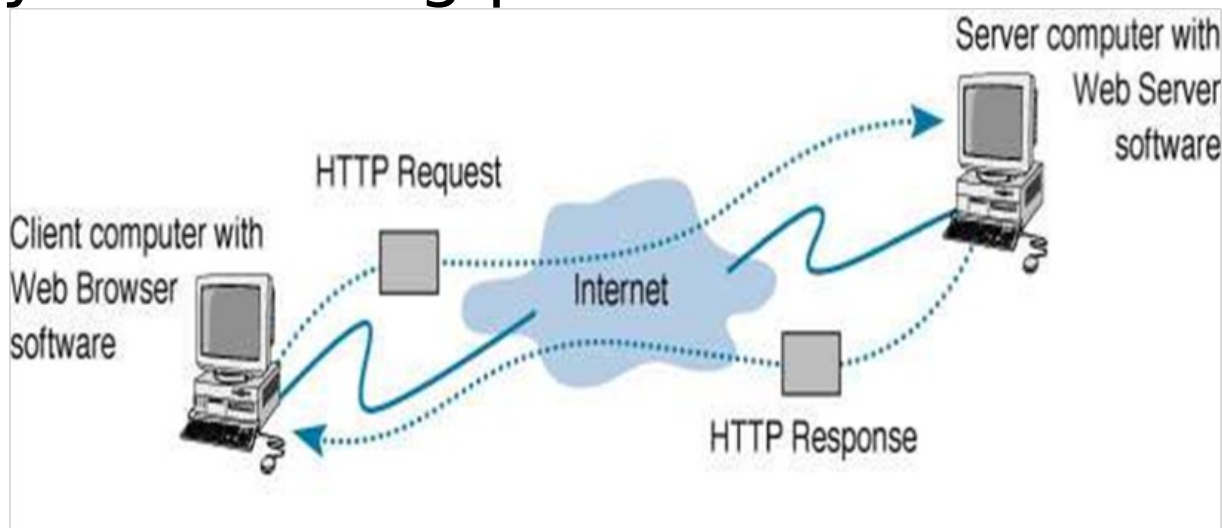
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3. The server looks for the request file and sends an either of the following HTTP response:
  - If the page cannot be found. The server return an error message .the message typical says “404” not found.
  - If the document is found. The server retrieves the requested file and returns it to the browser.
4. The browser parses the HTML document. If the page contains images (indicated by the HTML img tag), the browser contacts the server again to request each image files specified in the markup

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5. The browser inserts each image in the document flow where indicated by the `img.` Then, the assembled web page is displayed for your viewing pleasure.



# Browser and Web Server

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## Browser

- It is a software that retrieves information from the Web.
- Its purpose is to retrieve and display information from a Web server by using HTTP protocol.
- It allows any user to access a server easily
- There are different web browsers that are available and in use today and they all come with a variety of features. Some of these are:-

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- **NCSA Mosaic** :- The first real HTML browser (1993)
- **Microsoft Internet Explorer** :- Most commonly found browsers
- **Lynx**:-Text based web client
- **Mozilla Firefox Netscape, Safari, Google Chrome, opera** etc.

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### **Web Server**

- It is a program that provides documents to clients. Examples:
  - **CERN httpd** (the first webserver)
  - **Apache**(most widely used Web server software)
  - **IIS**(internet information server)
  - **Netscape Web server** ...

# **Uniform Resource Locators (URLs)**

- A URL is the exact address or location of the electronic files/web page to be retrieved on the internet.
- It consists of a protocol, domain name, and sometimes the path to a specific Web page or location on a Web page.
  - Example:
    - <http://www.Yahoo.com/new/mypage/about.html>

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- **http**:represents the protocol
- **WWW.Yahoo.com**:- represents the domain name
- **New/mypage**:- represents the path of the web page
- **about.html** :- represent the web page name/file name.

# Domain Name System (DNS)

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- Domain name is a human readable name given to a server for ease of reference by human, i.e. It is an IP address in the textual form rather than numbers.
- The Domain Name System is a system by which it converts human-readable name (domain name) such as “www.bhu.edu.et” to their corresponding IP addresses, 197.156.122.34.

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- Without DNS, the Internet would be much less usable.
- Their conversions are done by software systems called domain name servers
- Domain name server is simply a computer that contains a database of domain names and their corresponding IP addresses.

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### **DNS name**

- Is constructed hierarchically
- The highest level of the hierarchy being the last component or label of the DNS address
- Label can be up to 63 characters long and are case insensitive
- A maximum length of 253 characters is allowed
- Labels must start with a letter and can only consists of letters, digits and hyphens.
- Final most significant label of a fully qualified name can be:-  
**www.bhu.edu.et**

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- **Three letter code** :- indicate the type of organization hosting the computer

| Code | Meaning                       |
|------|-------------------------------|
| com  | Commercial. Now international |
| edu  | Educational                   |
| gov  | governmental                  |
| Int  | International origination     |
| mil  | military                      |
| net  | Network related               |
| org  | Miscellaneous organization    |

**Two letter codes:-**indicate the country of origin  
et for Ethiopia  
kr for KOREA

# TCP/ IP Protocols

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## General description of the TCP/IP protocols

- **Protocols** are sets of rules for message formats and procedures that allow machines and application programs to exchange information.
- ***Why we need to build Protocols?***
  - The TCP/IP protocol suite is so named for two of its most important protocols:- Transmission Control Protocol (TCP) and Internet Protocol (IP).

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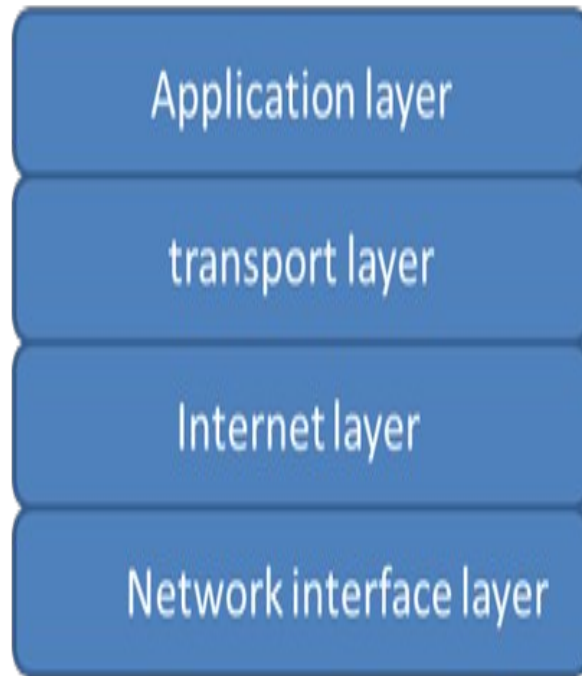
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### **TCP/IP**

- is a set of protocols developed to allow cooperating computers to share resources across a network
- A highly standardized protocol used widely on the Internet
- The main design goal of TCP/IP was to build an interconnection of networks, referred to as an inter-network, or internet, that provided universal communication services over heterogeneous physical networks.
- The set of TCP/IP protocols are partitioned into 4-layers:

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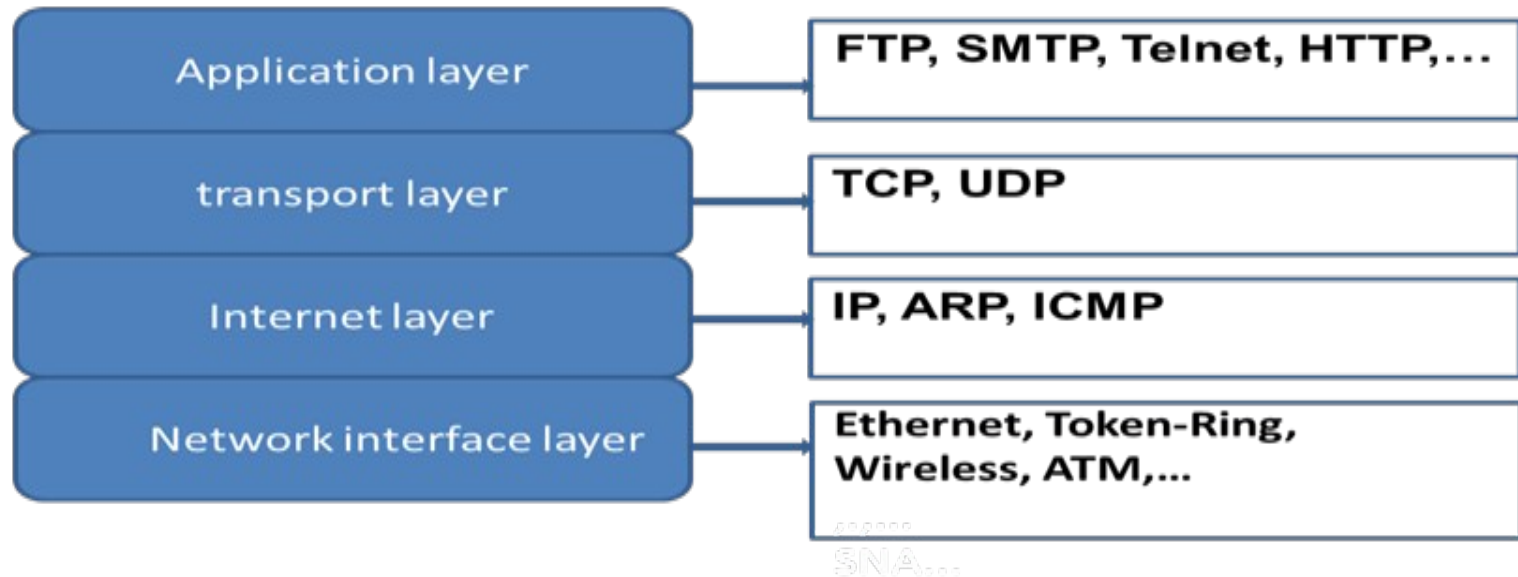
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## TCP/IP Suite of Protocols

Layers

protocols



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### Protocol Suite and services

- **Application layer protocols**
  - provide accurate and efficient data delivery
  - **Typical protocols in application layer:**
    - **FTP** – File Transfer Protocol
      - For file transfer
    - **Telnet** – Remote terminal protocol
      - Provides remote login service. It allows a user on one machine to log into another machine on the network.

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- **SMTP** – Simple Mail Transfer Protocol
  - For mail transfer
- **HTTP** – Hypertext Transfer Protocol
  - For Web browsing
- **LPD**-Line Printer Daemon
  - designed for printer sharing

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### • **Transport Layer protocols define the rules of**

- **Dividing a large piece of data into segments**
- **Reassemble segments into the original piece**
- **Typical protocols in transport layer:**
  - TCP – Transmission Control Protocol
    - Provide further functions such as reordering and data resend
  - UDP- User datagram protocol
    - does *not* provide functions such as reordering and data resend

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- **Internet layer protocols**
  - define the rules of how to find the routes for a packet to the destination
  - It only gives best effort delivery. Packets can be delayed, corrupted, lost, duplicated, out-of-order
  - Typical protocols in internet layer:
    - **IP** – Internet Protocol
      - Provide packet delivery
    - **ARP** – Address Resolution Protocol
      - Define the procedures of network address / MAC address translation
    - **ICMP** – Internet Control Message Protocol
      - Define the procedures of error message transfer

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- **Network Interface layer:-**

- Formats IP data grams at the Network layer into packets that specific network technologies can understand and transmit.
- Responsible for sending and receiving TCP/IP packets on the network medium (physical/Data Link)
- Applicable LAN technologies
  - Ethernet
- Applicable WAN technologies
  - ATM
- Note that some technologies such as ATM and FDDI may be used at both the WAN and the LAN levels

# Hypertext Transfer Protocol (HTTP)

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**Hyper Text Markup Language (HTML):-** is the language used to describe the inside of web document.

**Hypertext Transfer Protocol (HTTP):-**

- Is the protocol used to described how this documents are sent over the internet.
- Is designed to enable communications between clients and servers.
- Is a protocol for requesting Document over the network.
- Prescribes the rules by which browse ( a web client application) make request and servers supply response.

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- The Hypertext Transfer Protocol (HTTP) is one of the most extensively used Internet application protocols.
- It is used to communicate between **web browsers** and **web servers**, *to read* information from web pages, or *to send* responses such as completed forms or checked boxes.
- HTTP is described as “a generic, stateless, protocol which can be used for many tasks beyond its use for hypertext.”
- **Stateless protocol** is a communications protocol that treats each request as an independent transaction that is unrelated to any previous request so that the communication consists of independent pairs of requests and responses.

# HTTP Methods

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- Two commonly used methods for a request-response between a client and server are: GET and POST.
  - **GET** - Requests data from a specified resource.
  - **POST** - Submits data to be processed to a specified resource.
- **The GET Method**
  - Note that query strings (name/value pairs) is sent in the URL of a GET request: `/test/demo_form.asp?name1=value1&name2=value2`
- **GET requests**
  - remain in the browser history
  - can be bookmarked
  - should never be used when dealing with sensitive data
  - have length restrictions
  - should be used only to retrieve data

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- **The POST Method**

- **Note that query strings (name/value pairs) is sent in the HTTP message body of a POST request:**

- POST /test/demo\_form.asp HTTP/1.1

Host: w3schools.com

**name1=value1&name2=value2**

- **POST requests:**

- are never cached
- do not remain in the browser history
- cannot be bookmarked
- have no restrictions on data length

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### Other HTTP Request Methods

- **PUT**:-a request for the server to store the data in the request and the new contents on the specified URI.
- **DELETE**:- a request for the server to delete the resource named in the URI.
- **OPTIONS**:-a request for the information about the request methods the server support.
- **TRACK**:- a request for the web server to echo the HTTP request and its headers.
- **CONNECT**:-Converts the request connection to a transparent TCP/IP channel

## 1.7 Website evaluation.

### **Evaluating Web Sites**

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- The information found on the World Wide Web has added a new dimension to selecting resources.
- Anyone can create a Web site.
- No one has evaluated the quality or accuracy of the information found on the Web before you come across it.
- Some Web sites are created by subject experts and its associated pages are authored by experts in the field.
- However, the vast majority of Web sites are created by non-experts.
- It is important to keep in mind that just because information is published in a book or journal, or appears in a movie or on the Web, does not mean that it is true.

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- You must take the time to evaluate the accuracy of the information.
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### **Authority and accuracy**

- It is important to find out the author's *identity* and his or her *qualifications* or *expertise* in order to determine the credibility and reliability of the information.
- Ask the following questions:
  - Who is the author? Can you tell by the domain (e.g., .com or .edu) or Web address?
  - Is the information reliable? What qualifications or expertise does the individual or group that created the site have?
  - Does the Web site provide a means of communicating with the author or Webmaster (e.g., email or postal address, telephone number, etc)?

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- **Purpose and content**

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- Some sites provide links to information (e.g., About the Organization or a Vision Statement) detailing the purpose in creating the Web site.
- The purpose of many sites might not be obvious at first.
- Take the time to thoroughly explore a Web site to determine if the information is mostly subjective (biased or opinionated), objective (factual), or mixed.

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- Ask the following questions:
- What is the purpose of the Web site? (Look at the *title* and *headings* for clues.)
  - To provide research and scholarly information?
  - To provide educational or factual information?
  - To entertain?
  - To advertise, market or sell something?
  - To advocate ideas?
  - To persuade you?
  - Or, is there another purpose?
- Is there a link to a mission statement or "About Our Organization" page?
- Does the site provide balanced, objective or factual information?

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- Does the Web site provide subjective, editorial or opinion statements? Is the site a forum for a personal, political or ideological bias?
- Is the point of view presented in a direct manner, or is it presented in an unbalanced and unreasonable way? Are arguments well supported?

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## **Design, organization and ease of use**

- Design, organization and ease of use are important considerations. Web sites can provide useful sources of information; but if they are slow to load and/or difficult to navigate, search or read, then their contribution or usefulness will be diminished.
- Ask the following questions:
  - Is the Web site clearly organized and easy to read, use and navigate?
  - If "Help" or "Search Tips" pages available? Are they easy to understand?
  - If the Web site is large, is a search capability provided? If so, is it easy to use?