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Web Development

UNIT-1

Introduction to World Wide Web and Concepts of Web Designing

Prof. Ankita Chauhan
Assistant Professor
Department of Computer Engineering
MBIT

FACULTY OF ENGINEERING & TECHNOLOGY
Third Year Bachelor of Engineering

- **Textbook:**

Web Technology

By: Ralph Moseley & M T Savaliya

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	40 / 14	20 / 07	60/ 21	30/10	150 / 52

* **J**: Jury; **V**: Viva; **P**: Practical

Introduction to WWW

- Affectionately called "The Web"
- It is a collection of information stored on the networked computers over the world.
- Individual document pages on the World Wide Web are called web pages and are accessed with a software application running on the user's computer, commonly called a web browser.
- Web pages may contain text, images, videos, and other multimedia components, as well as web navigation features consisting of hyperlinks.
- The WWW was proposed in 1991 by Tim Berners-Lee at CERN.

Web or Internet?

- Web or Internet, both are not the same things.
- The Internet is a collection of computers or networking devices connecting together.
  - Devices can communicate with each other.
- The Web is a collection of documents that are interconnected by hyper-links.
  - These documents are accessed by web browsers and provided by web servers.

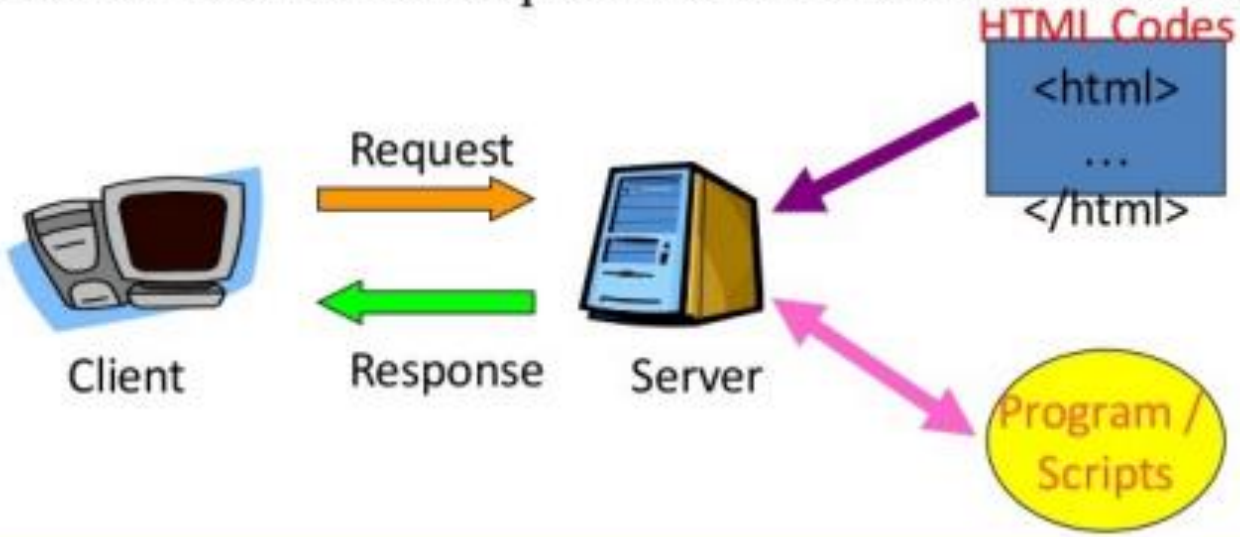
Web Terminologies

- **Client**
  - Any computer on the network that requests services from another computer on the network.
- **Server**
  - Any computer that receives requests from client computers, processes and sends the output.
- **Web Page**
  - Any page that is hosted on the Internet.

- **Web Site**
  - Collection of interlinked web pages that is hosted on the Internet.
- **Web Development**
  - The process of creating, modifying web pages.
- **Web Browser**
  - A program that receives information from the web. E.g. IE, Chrome, Mozilla etc.

How does the web work?

- The web information is stored in the web pages. (In HTML Format)
- The web pages are stored in the computers called web servers. (In the web server file system.)
- The computer reading the pages is called web clients with specific web browsers. (IE, Netscape, Mozilla, Chrome, Safari, Opera etc.)
- The web server waits for the request from the web clients over the Internet.



- **H**yper **T**ext **T**ransfer **P**rotocol is text-based request-response protocol

Who defines Web standard?

- The web standards are not defined or setup by the browser companies or Microsoft, but the World Wide Web Consortium (W3C).
- W3C's long term goals for the web are:
  - Universal Access: To make the web accessible to all by promoting technologies that take into account the vast differences in culture, languages, education, ability, material resources, and physical limitations of users on all continents.
  - Semantic Web: To develop a software environment that permits each user to make the best use of the resources available on the Web.
  - Web of Trust: To guide the web's development with careful consideration for the novel legal, commercial, and social issues raised by this technology.

What is the Internet?

The Internet is a massive **network of networks**, a networking infrastructure.

It connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the Internet.

Information that travels over the Internet uses many different set of rules which are known as **protocols**.

Web Browsers

- A web browser or Internet browser is a **software application** for **retrieving**, **presenting**, and **traversing** information resources on the **World Wide Web**.
- Example :


Mozila Firefox

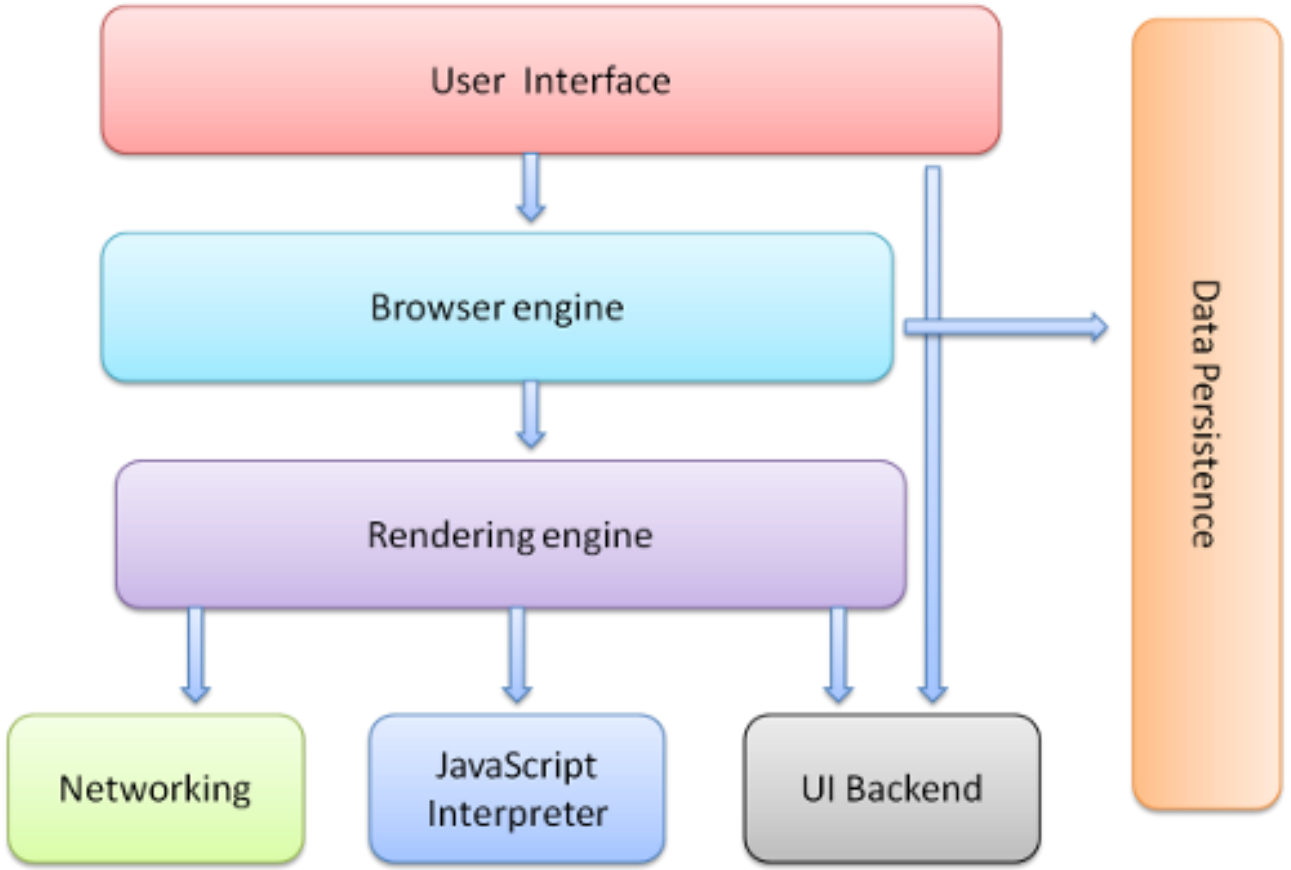

Google Chrome


Opera


Internet Explorer

- An *information resource* is identified by a Uniform Resource Identifier (**URI**) and may be a web page, image, video, or other piece of content.
- URL Format : protocol://domain:port/path),
- Example -> http://http://en.wikipedia.org/
- URI (Uniform Resource Identifier), determines how the URL will be interpreted.
- Hyperlinks present in resources enable users to easily navigate their browsers to related resources.

Web Browsers Architecture



Components of Web Browsers

1. User Interface

It is an environment allowing users to use certain features like search bar, refresh button, menu, bookmarks, etc.

2. Browser Engine

It is a core component of every web browser. The browser engine functions as an intermediary or a bridge between the user interface and the rendering engine. It queries and handles the rendering engine as per the inputs received from the user interface.

3. The rendering engine :

responsible for displaying requested content. For example, if the requested content is HTML, the rendering engine parses HTML and CSS, and displays the parsed content on the screen.

4. Networking

This component is responsible for managing network calls using standard protocols like HTTP or FTP. It also looks after security issues associated with internet communication.

(FTP: FTP is a standard internet protocol provided by TCP/IP used for transmitting the files from one host to another.)

Components of Web Browsers

5. Data Storage

It is a persistent layer. A web browser needs to store various types of data locally, for example, cookies. As a result, browsers must be compatible with data storage mechanisms such as WebSQL, IndexedDB, FileSystem, etc.

5. JavaScript Interpreter

It allows conversion of JavaScript code in a document and the executes it. Then the engine shows the translation on the screen to the users.

6. UI backend:

Used for drawing basic widgets like combo boxes and windows. This backend exposes a generic interface that is not platform specific. Underneath it uses operating system user interface methods.

How Computers link to the Internet.

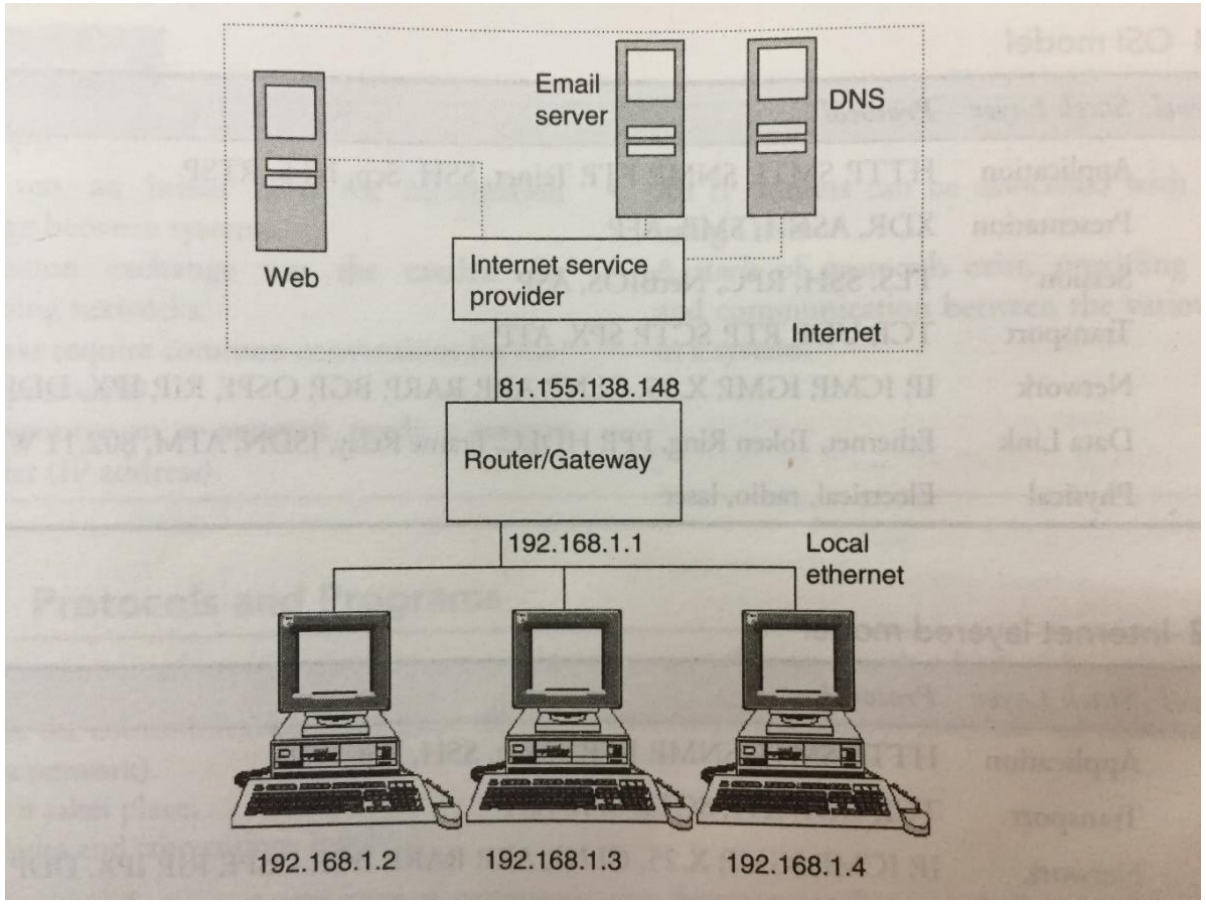


Fig Shows basic Idea behind IP addressing for one particular network.

Fig shows group of computers are connected to Local Area network (LAN), each having a local IP address.

These are connected to a gatway/ router, which in turn is linked to an Internet Service Privder, usually with some type of Modem.

The ISP allows access to the internet, DNS lookup service and email.

The ISP also allocates an IP address for the network, which in turn can be utilized to resolve to individual machine using techniques such as Network address Translation (NAT).

How Computers link to the Internet.

- **HTTP:**

- Hypertext Transfer Protocol is an application protocol that defines a language (Text Based Protocol) for clients and servers to speak to each other. This is like the language you use to order your goods.

- **Router:**

The router is a physical or virtual internetworking device that is designed to receive, analyze, and forward data packets between computer networks.

- **Modem:**

A modem is a network device that both modulates and demodulates analog carrier signals (called sine waves) for encoding and decoding digital information for processing.

- **ISP:**

An Internet service provider is an organization that provides services for accessing, using, or participating in the Internet. An ISP (internet service provider) is a company that provides individuals and organizations access to the internet and other related services.

How Computers link to the Internet.

- **Host name**
- The host name identifies the host where resource is located. A hostname is a domain name assigned to a host computer. This is usually a combination of the host's local name with its parent domain's name.
- For example, www.tutorialrepublic.com consists of host's machine name www and the domain name tutorialrepublic.com.

How Computers link to the Internet.

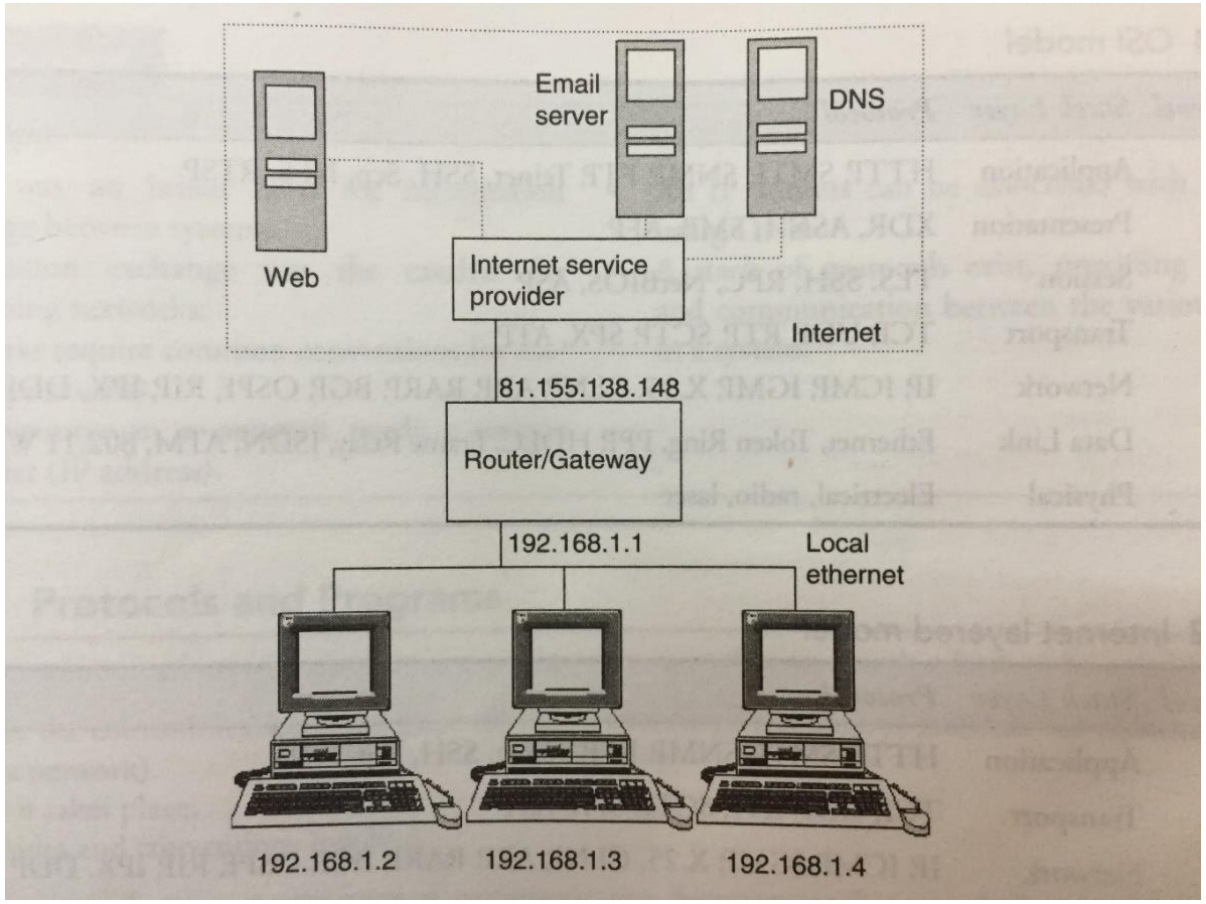
- **DNS:**
- Domain Name System is like an address book for websites.
- When you type a web address in your browser, the browser looks at the DNS to find the website's IP address before it can retrieve the website. The browser needs to find out which server the website lives on, so it can send HTTP messages to the right place.
- This is like looking up the address of the shop so you can access it. These are special servers that match up a web address you type into your browser (like "mozilla.org") to the website's real (IP) address.
- **Generic Domains**

It defines the registered hosts according to their generic behavior. Like org, edu, gov, net etc.

- **Country Domain**

The format of country domain is same as a generic domain, but it uses two-character country abbreviations (e.g., us for the United States) in place of three character organizational abbreviation ex. In, au, us, ca

How Computers link to the Internet.



A user enters a URL into a browser (for example, Google.com. This request is pass'ed to a domain name server.

The domain name server returns an IP address for the server that hosts the Website (for example, 68.178.157.132).

The browser requests the page from the Web server using the IP address specified by the domain name server.

The Web server returns the page to the IP address specified by the browser requesting the page. The page may also contain links to other files on the same server, such as images, which the browser will also request.

The browser collects all the information and displays to your computer in the form of Web page.

Types of Website:

- **What is Website?**
  Website is the collection of web pages, different multimedia content such as text, images, and videos which can be accessed by the URL which you can see in the address bar of the browser. For example: https://www.geeksforgeeks.org

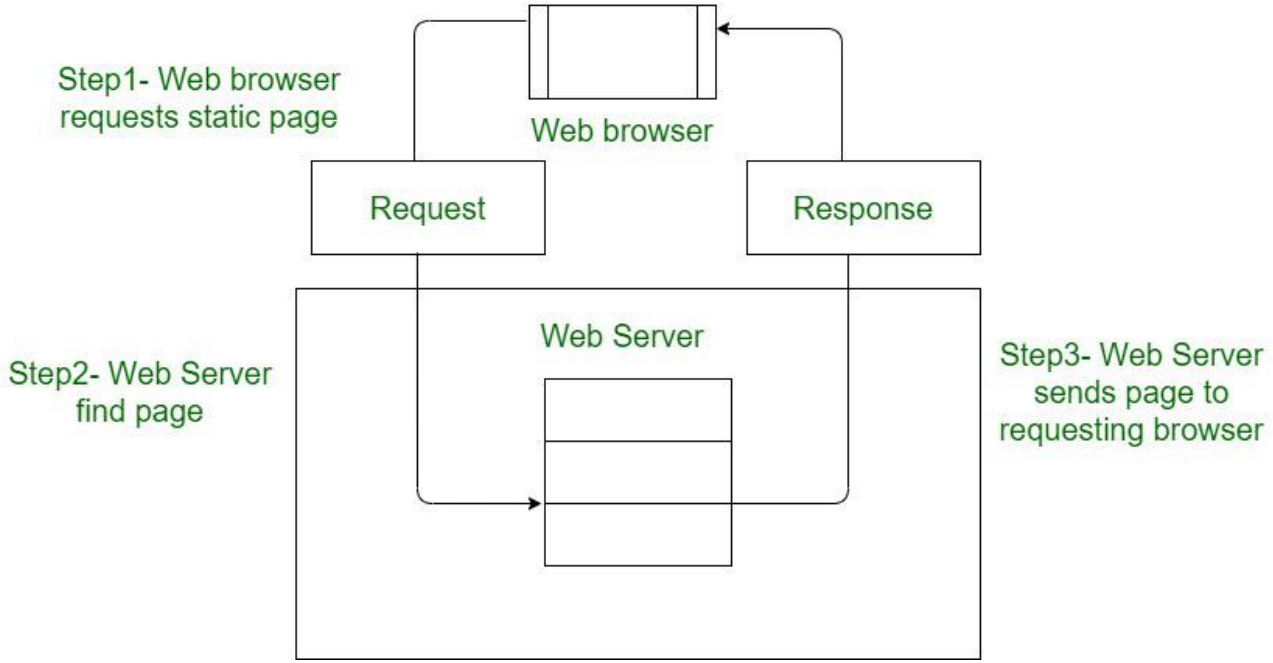
- **How to access Websites?**
  When we type a certain URL in a browser search bar, the browser requests the page from the Web server and the Web server returns the required web page and its content to the browser. Now, it differs how the server returns the information required in the case of static and dynamic websites.

Types of Website:

- Static Website
- Dynamic Website

Types of Website:

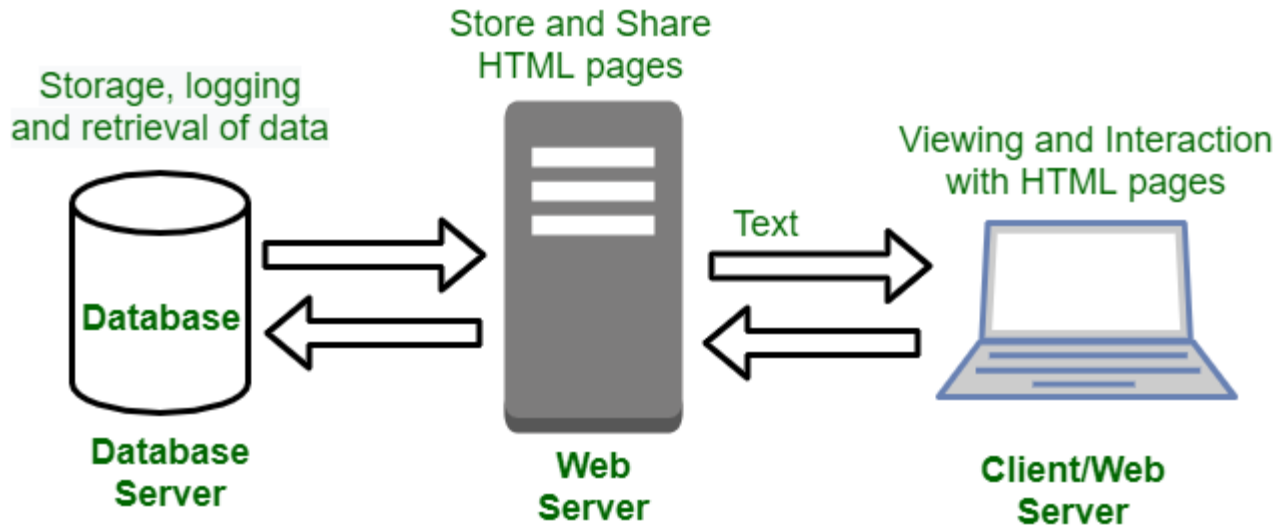
- **Static Website:** In Static Websites, Web pages are returned by the server which are prebuilt source code files built using simple languages such as HTML, CSS, or JavaScript. There is no processing of content on the server (according to the user) in Static Websites. Web pages are returned by the server with no change therefore, static Websites are fast. There is no interaction with databases. Also, they are less costly as the host does not need to support server-side processing with different languages.



Types of Website:

Dynamic Website: In Dynamic Websites, Web pages are returned by the server which are processed during runtime means they are not prebuilt web pages but they are built during runtime according to the user's demand with the help of server-side scripting languages such as PHP, Node.js, ASP.NET and many more supported by the server. So, they are slower than static websites but updates and interaction with databases are possible.

Dynamic Websites are used over Static Websites as updates can be done very easily as compared to static websites (Where altering in every page is required) but in Dynamic Websites, it is possible to do a common change once and it will reflect in all the web pages.



Difference Between Static and Dynamic Websites:

Static Website	Dynamic Website
Content of Web pages can not be change at runtime.	Content of Web pages can be changed.
No interaction with database possible.	Interaction with database is possible
It is faster to load as compared to dynamic website.	It is slower then static website.
Cheaper Development costs.	More Development costs.
No feature of Content Management.	Feature of Content Management System.
HTML, CSS, Javascript is used for developing the website.	Server side languages such as PHP, Node.js are used.
Same content is delivered everytime the page is loaded.	Content may change everytime the page is loaded.

Introduction to HTTP and HTTPS protocols

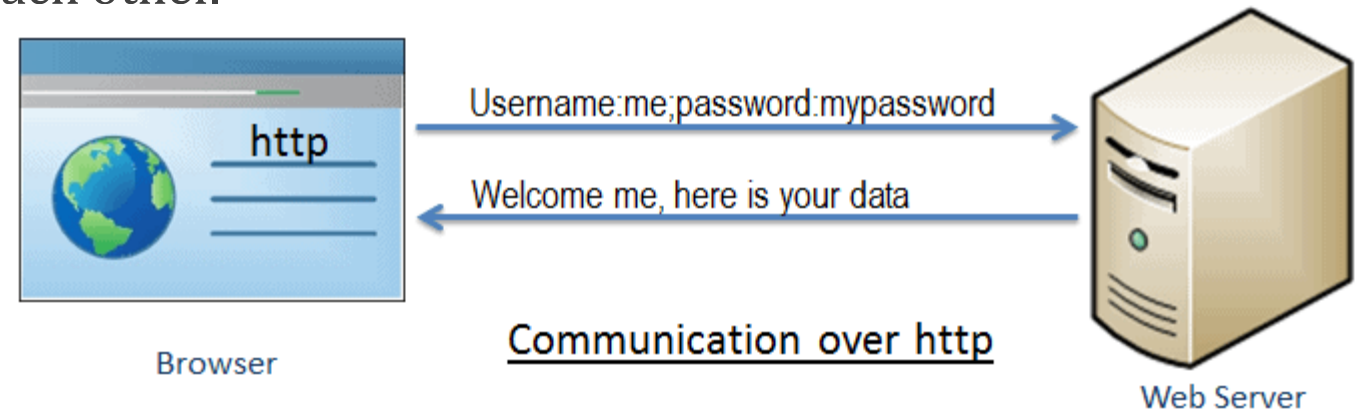
HTTP stands for **H**ypertext **T**ransfer **P**rotocol. This is the protocol being used to transfer hypertext documents that makes the World Wide Web possible.

A standard web address such as gmail.com is called a URL and here the prefix **http** indicates its protocol.

When the user makes an HTTP request on the browser, then the webserver sends the requested data to the user in the form of web pages. In short, we can say that the HTTP protocol allows us to transfer the data from the server to the client.

An HTTP is an application layer protocol that comes above the TCP layer

It has provided some standard rules to the web browsers and servers, which they can use to communicate with each other.



Introduction to HTTP and HTTPS protocols

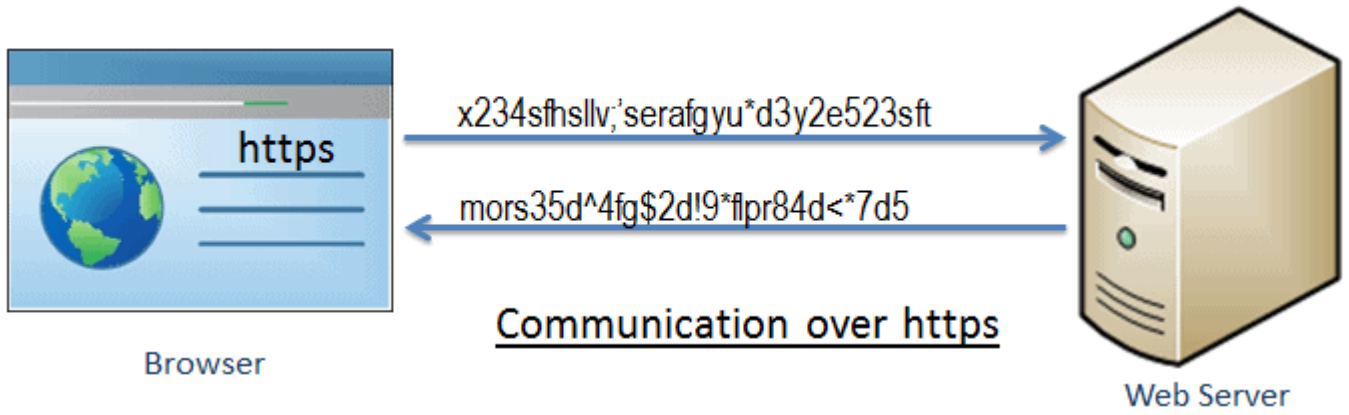
HTTPS

HTTPS is an abbreviation of **Hypertext Transfer Protocol Secure**. It is a secure extension or version of HTTP. This protocol is mainly used for providing security to the data sent between a website and the web browser. It is widely used on the internet and used for secure communications. This protocol uses the 443 port number for communicating the data.

This protocol is also called **HTTP over SSL** because the HTTPS communication protocols are encrypted using the SSL (Secure Socket Layer).

By default, it is supported by various web browsers.

Those websites which need login credentials should use the HTTPS protocol for sending the data.



Differences between HTTP and HTTPS

HTTP	HTTPS
HTTP stands for HyperText Transfer Protocol.	HTTPS for HyperText Transfer Protocol Secure.
In HTTP, URL begins with “http://”.	In HTTPs, URL starts with “https://”.
HTTP uses port number 80 for communication.	HTTPs uses 443 port number for communication.
HTTP is considered to be unsecure.	HTTPs is considered as secure.
HTTP works at Application Layer.	HTTPS works at Transport Layer.
In HTTP, Encryption is absent.	Encryption is present in HTTPS.
HTTP does not require any certificates.	HTTPS needs SSL Certificates.
HTTP does not improve search ranking	HTTPS helps to improve search ranking
HTTP faster than HTTPS	HTTPS slower than HTTP
HTTP does not use data hashtags to secure data.	While HTTPS will have the data before sending it and return it to its original state on the receiver side.

How Web Pages work?

A web page is a simple text file which also contains markup tags that describe how the text should be formatted on screen. The web page is stored on a computer known as a **web server** (**server**, for short). In order for the web page to be displayed on that computer or another computer, it must be accessed and interpreted by a specially designed program called the **client software** (**client**, for short).

In order to request a web page, a browser must follow a network protocol, a set of rules for how data should be transfered.

File Transfer Protocol (FTP).

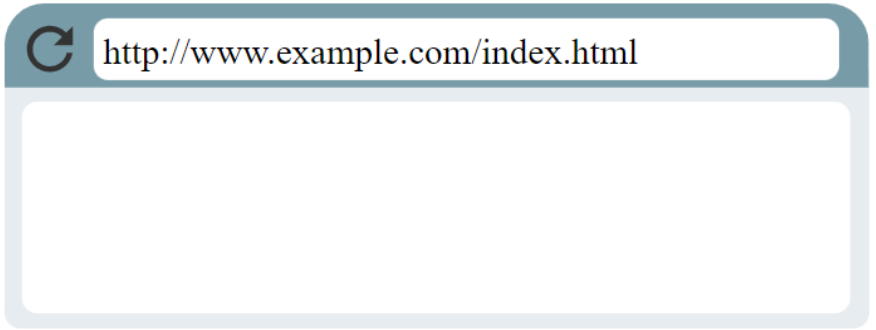
One of the easiest network protocols to understand is **File Transfer Protocol (FTP)**. In practical terms, an FTP client requests from the server an exact copy of a file and saves it on the client (or vice versa). Although not used for directly accessing the markup of web pages, FTP programs are important parts of web publishing since web pages which may be designed on a PC must be placed on a web server to be accessible to the internet.

How Web Pages work?

Web browsers use a different network protocol called **Hypertext Transfer Protocol (HTTP)**.

Step 1: Direct browser to URL

When we want to browse the web, we can use many types of computers (like laptops, desktops, and phones), as long as the computer has a **browser** application installed.

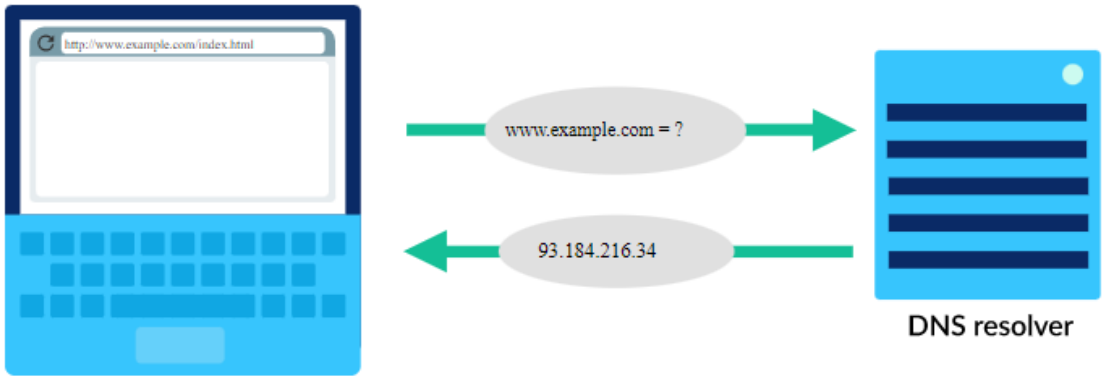


The user either types a Uniform Resource Locator (URL) in the browser or :

Step 2: Browser looks up IP

We typically type nice human-friendly URLs into browsers, like "khanacademy.org" and "wikipedia.org". Those domain names map to IP addresses, the true location of the domain's computers. That's handled by the Domain Name System.

The browser uses a DNS resolver to map the domain to an IP address:



How Web Pages work?

Step 3: Browser sends HTTP request

Once the browser identifies the IP address of the computer hosting the requested URL, it sends an **HTTP request**.

An HTTP request can be as short as two lines of text:

GET /index.html HTTP/1.1

Host: www.example.com

The first word is the HTTP verb: "GET". There are other verbs for other actions on the web, like submitting form data ("POST").

The next part specifies the path: "/index.html". The host computer stores the content of the entire website, so the browser needs to be specific about which page to load.

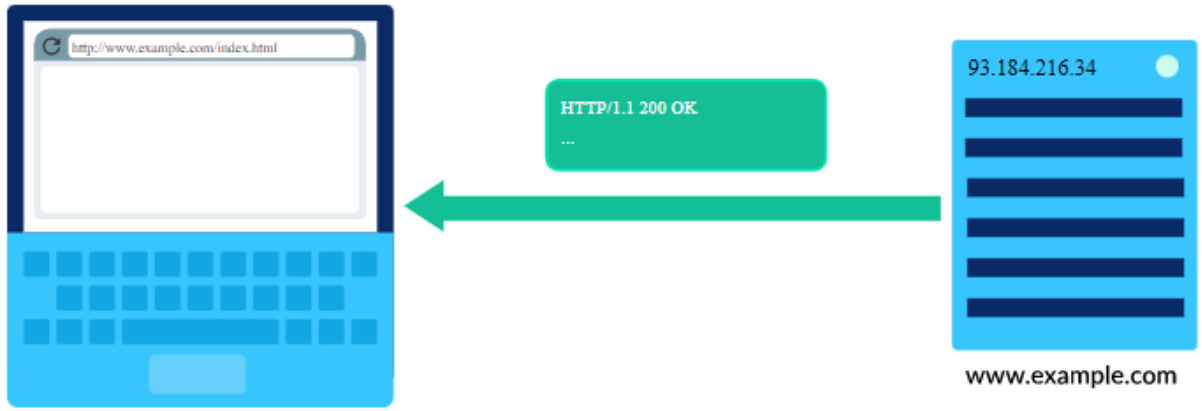
The final part of the first line specifies the protocol and the version of the protocol: "HTTP/1.1".

The second line specifies the domain of the requested URL. That's helpful in case a host computer stores the content for multiple websites.

How Web Pages work?

Step 4: Host sends back HTTP response

Once the host computer receives the HTTP request, it sends back a response with both the content and metadata about it.



The HTTP response starts similarly to the request:

HTTP/1.1 200 OK

The response begins with the protocol and version, "HTTP/1.1".

The next number is the very important HTTP status code, and in this case, it's 200. That code represents a successful retrieval of the document ("OK").

If the server failed to retrieve the document, the status codes provide more information, like if the failure was due to user error or server error. For example, the most well known status code is 404 ("File not found").

How Web Pages work?

HTTP status codes

In response to HTTP requests, servers often issue response codes, indicating the request is being processed, there was an error in the request or that the request is being redirected. Common response codes include:

- **200 OK.** This means that the request, such as GET or POST, worked and is being acted upon.
- **300 Moved Permanently.** This response code means that the URL of the requested resource has been changed permanently.
- **401 Unauthorized.** The client, or user making the request of the server, has not been authenticated.
- **403 Forbidden**. The client's identity is known but has not been given access authorization.
- **404 Not Found.** This is the most frequent error code. It means that the URL is not recognized or the resource at the location does not exist.
- **500 Internal Server Error.** The server has encountered a situation it doesn't know how to handle.

Secure Connections

- Most of the protocols discussed are not secure, they transfer plain text to transfer data and could be viewed or tampered at some stage.
- Some protocols SFTP -> FTP , SHTTP -> HTTP

Applications and Development Tools

Applications are available for using FTP – Filezilla, net2ftp

Tools (IDE) for developing webpages: notepad, notepad++, jedit, Dreamviewer etc.

Chapter – 2 Designing an Effective Web Site

Introduction

- Issues such as browser support, bandwidth of the connection, cache support, display resolution, look and feel, website theme, page layout and linking, user interaction, locating information and sitemap.
- Also website development is project which needs careful planning in order to be successful, which includes deciding objective, goal of preparing website, knowing about audience, identifying and organizing content, taking necessary steps to implement and publish the website.

Browser and OS

- Webpages are written using HTML tags and viewed in browser.
- Different browsers and their versions greatly differ in way they render the web page. The same HTML tag is interpreted in different way.
- Older versions of browsers may not support the new tags and features implemented in HTML/XHMTL.
- Some browsers may work slightly different on different OS and hardware platform.
- Browser computability is major issue to make web pages portable on different browser and versions.
- Use validation rules of W3C to validate the code, which makes browser computability in all major browsers.

Bandwidth and Cache

- Users have different connection speed (bandwidth) to access the website.
- Bandwidth plays important role in the designing of website.
- Webpage with too many images, takes more time to download and users do have patience to wait for longer time than 0-15 seconds. Then they move to other site without looking..
- Need to consider the users who have low speed connections: dial-up and also high speed connections: broadband or leased-line.
- Browsers provide temporary memory called cache to store the graphics.
- Images can be cached whenever the page is downloaded first and when next time the same page is visited then gets images from cache so, helpful on low-speed connection.

Display Resolution

- Developers do not have control on display resolution of the monitors on which users view pages.
- Now a days, most common screen resolution is: 1024 * 768. Old monitors uses 800 * 600.
- There are three choices for web page design:
  - Design a web page with fixed resolution say 800 * 600. It can fit properly in same screen resolution but leaves some part of the screen if resolution is 1024 * 768. Vice a versa.
  - Make a flexible design using HTML table to fit into different resolution.
  - If page is displayed on monitor with higher resolution then it is displayed on left-hand side and some part on the right-hand side remains blank. We can use centered design to display page , leaving equal space on both the side of the page.

Look and Feel

- It decides the overall appearance of the website. It includes website theme, font, graphics, color, presentation and access.

Website Theme:

- All pages must hold together and give impression that it is single unit. While navigating it gives feeling to user that he/she is on same website.
- Theme must reflect the objective of organization and convey message of it.
- Use logo of company as theme.
- Use color scheme as theme. Give same color to links, button, labels etc..
- Website for global warming can use pictures, message related to cause and effects of it on lives.

Cont.

Fonts:

- It is important from reading and scanning point of view.
- Different fonts have different readability and it affects the user physiology.
- Height and width of the same character is different in different fonts, which affects line ending and paragraph boundaries.
- Maintain consistency in using font type and size. Don't use too many fonts with too many sizes.
- Consider the availability of fonts on visitor's machine. Default font is Times New Roman.

Cont.

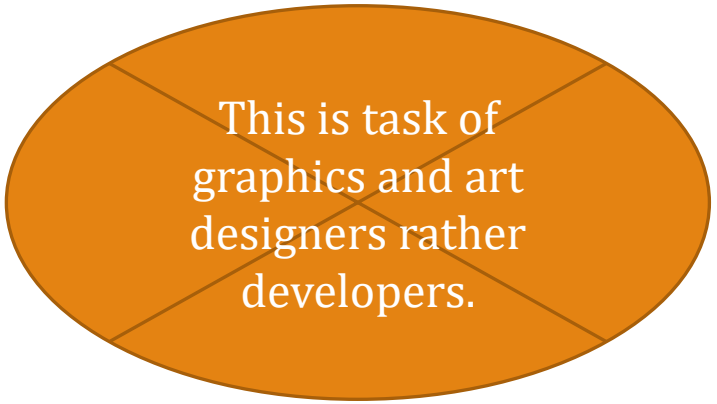
Graphics:

- It makes website attractive and convey lots of information. Images, charts etc..
- One of the important points is the graphics file format. Different file formats support different level of compression and features. Use them at right place by considering features.
- Too many images with larger sizes reduces download speed. Use limited graphics.
- Use images that suit the theme of the website and profile of target audience rather than just to include it.

Cont.

Color:

- They are part of everybody's life.
- People's liking are different for colors.
- Website with good theme but improper color scheme do not attract viewers and it fails.
- It must suit to theme, content and target audience.



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Presentation and Access:

- Website is to provide content online to diverse group of visitors having different reading habits and expectations.
- Clear presentation helps in accessing the desired information quick and easily without hurdles.
- User grid based structure to divide the page into rows and columns, use space to make different parts of webpage visible, keep page simple and focused if possible (google.com),
- Don't overload with content, don't make page lengthy instead divide into multiple pages, if lengthy page is required then put bottom, top links
- Put common links on each page (link to home page on each page)

Cont.

Page Layout and Linking :

- Website consists of individual pages which are linked together.
- Page layout defines the visual structure of the page and divides it into different parts to present the information of varying importance. It is also called page template.
- Two possible ways to prepare the layout;
  - Using HTML table to design the grid based layout
  - Using CSS to design page layout
- One can also use readymade templates available by third party (free or paid).
- Points to remember: Maintain balance between text and graphics, locate the items on the page using screen importance to attract user's attention, maintain consistency among the layout of the page which must match with theme.

Cont.

Locating Information :

- Web page is viewed on computer screen and it is divided into five major areas such as center, top, right, bottom and left. (As per the importance of viewing pattern)
- Exploit this fact to design the web page.

Make Design User-Centric:

- How to predict the exact behavior of website users which is difficult.
- Keep in mind the general behavior of common user which helps in making design user-centric.
- General reading habit on online magazine or newspaper site: reads normally from left to right and top to bottom hence, we can organize the contents in column fashion. Highlight the words in the paragraph to explore the meaning.

Cont.

Sitemap:

- Many time website is too complex with large numbers of sections and each with many pages.
- It becomes difficult to move quickly by visitors from one part to another. Even user becomes confused where he/she is in website.
- Keep hierarchy of few levels and provide the navigation bar on each page to jump directly to a particular section.
- Another solution is to provide the sitemap including links to each section and their pages directly.

Planning a Web Site

- In order to achieve higher success of the website in terms of user satisfaction, better planning is needed.
- Before you start developing website, ask the following questions:

Why are we developing this website? What do we achieve by developing this website? Who are the people who will use this website? What are the information contents? How are these contents organized? What are the possible ways? How the files prepared are organized?

- The answers to the above questions lead to better planning…

Objective and Goal

Objective:

- There is always some objective behind every activity.
- If the objective behind developing website is clear then rest of the steps in planning will become easier.
- Websites are developed for different reasons: to provide information and better service to customer, to increase sell or make the business online, government website etc…

Goal:

- It means the achievement from the development of the website. The benefit an individual or organization gets from it – called value addition.
- It depends on the type of website: if website is to provide the information then the goal should be user satisfaction in terms of getting timely and accurate information, If it is business website then the goal is to increase the sell.

Cont.

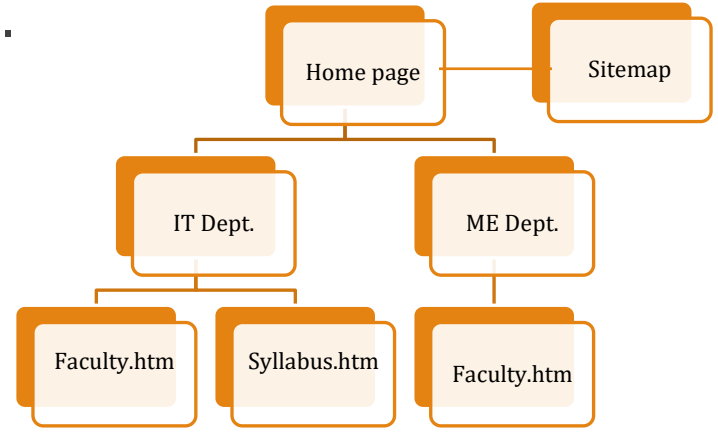
Audience/User Profile:

- Target audience needs to identified for proper planning of the website not in terms of look and feel but also to identify content and its organization.
- Ask questions: who are the visitors? Why do they visit the site? How frequently do they visit? What are their expectations, likings and preferences?
- For children website: use cartoons and graphics with colors, for technology savvy use advanced technology, for users interested in music use background music.
- For continuous improvement, a feedback form is designed to get their requirements and views about site.

Cont.

Identifying and Organizing Contents:

- Website is to provide the information in one or other form such as text, images, audio, video to the target audience.
- So, identify the content from the various sources depending upon the objective of the website.
- Once the information is identified and collected then prepare the page layout, logical grouping and navigation choices.



Cont.

Publishing of website:

- Implement each page using various suitable technologies HTML, CSS, JavaScript and any of other server side technologies such as JSP, ASP .NET, PHP etc.
- Organize the files containing your webpages and other contents like images into proper directory.
- Test your individual pages and their links on local machine so when launched it will work properly.
- Register your domain name
- Upload website on web server by copying the folder containing whole website.
- Access your website from any browser with the above URL.

Navigation

- Most important design element after page layout in website designing is navigation design.
- It provides a way to move from one page to another page in website using hyperlink given on a page.
- If not proper then user feels the problem in moving around the pages.
- Important tips: it should be either text based or graphical, it should be clear and meaningful (use words/picture related to information), it should be consistent (same font and color on each page), it should be understandable, organize the links such that contents are grouped logically, provide search link, provide the way to return to first page from anywhere, provide the user with information regarding location ->, navigation menu (horizontal or vertical)

Thank You