Unit-1
Internet & Web

By Er. Abinash Adhikari

History of Internet and Web

- The Internet began as a U.S. Department of Defense project (ARPANET) in the 1960s.
- Expanded globally in the 1980s, connecting universities and research institutions.
- In 1989, Tim Berners-Lee created the World Wide Web (WWW), revolutionizing how we access information.
- Early internet focused on data sharing, while the Web provided an interface for users to navigate the Internet.

Uses of Internet and Services

1. **Communication:** Email, messaging, video conferencing
2. **Information:** Search engines, online libraries, news websites
3. **Entertainment:** Streaming services, gaming, social media
4. **E-commerce:** Online shopping, online banking
5. **Education:** Online courses, distance learning
6. **Business:** Remote work, online collaboration

1. Communication

- Email:
  - One of the earliest and still widely used services of the Internet, allowing users to send and receive messages, files, and multimedia globally.
- Instant Messaging:
  - Apps like WhatsApp, Telegram, and Messenger allow real-time text and voice communication.
- Video Calls:
  - Services like Zoom, Skype, and Google Meet enable face-to-face communication over the Internet.
- Social Media:
  - Platforms like Facebook, Twitter, and Instagram connect people for personal, professional, and social interactions.

2. Information Access

- Search Engines:
  - Google, Bing, and Yahoo provide vast amounts of information, helping users search for anything from news to academic articles.
- Online Libraries:
  - Educational resources and databases, such as JSTOR, Google Scholar, and Wikipedia, provide access to a wealth of knowledge.
- News and Blogs:
  - Real-time access to global news, editorials, and personal blogs, keeping users informed on current events and specialized topics.

3. Entertainment

- Streaming Services:
  - Websites and apps like YouTube, Netflix, and Spotify provide access to movies, TV shows, music, and videos.
- Online Gaming:
  - The Internet allows users to play video games with others across the globe, often through platforms like Steam or Xbox Live.
- Social Media Entertainment:
  - Platforms like TikTok and Instagram offer short-form video entertainment and user-generated content.

4. E-Commerce

- Online Shopping:
  - Websites like Amazon, eBay, and Alibaba allow users to purchase goods and services from around the world.
- Online Banking:
  - Internet banking services enable users to manage their finances, transfer money, and pay bills without visiting a physical bank.
- Digital Payments:
  - Services like PayPal, Apple Pay, and Google Pay provide secure online transactions.

5. Online Education

- E-Learning Platforms:
  - Websites like Coursera, Udemy, and Khan Academy offer courses, certifications, and tutorials on a wide range of subjects.
- Webinars and Virtual Classes:
  - Educational institutions and organizations host online lectures, workshops, and meetings through platforms like Zoom and Microsoft Teams.
- Opencourseware:
  - Many universities provide free educational materials, such as MIT OpenCourseWare and edX.

6. Business

- Remote work:
  - Working from home or other locations using internet-connected devices.
- Online collaboration:
  - Working together on projects with colleagues located in different places.
- E-commerce:
  - Selling products and services online.
- Digital marketing:
  - Promoting businesses and products online.

Introduction to WWW (World Wide Web)

- Definition:
  - The WWW is a vast information system where hyperlinked documents (web pages) can be accessed via the Internet.
- Structure:
  - HTML: Web pages are written in HyperText Markup Language.
  - HTTP/HTTPS: The web uses the HyperText Transfer Protocol for communication.
- Difference from the Internet:
  - The Web is a service that runs on the Internet.

Components of WWW

1. **Web:** The interconnected system of web pages accessible via the Internet.
2. **Webpage:** A document on the web (HTML-based).
3. **Website:** A collection of related web pages hosted under a common domain (e.g., www.example.com).
4. **Homepage:** The main page of a website.
5. **Web Browsers:** Software to access the web (e.g., Chrome, Firefox).
6. **Web Servers:** Machines that store and serve web pages (e.g., Apache, Nginx).
7. **URL:** Uniform Resource Locator, the address used to access web resources.
8. **Search Engines:** Tools to find web pages (e.g., Google, Bing).

1. Web

- Definition:
  - The Web is the system of interlinked hypertext documents and multimedia resources accessed through the Internet.
- Functionality:
  - It allows users to navigate between web pages using hyperlinks, enabling a seamless flow of information.
- Content:
  - The Web hosts a variety of content types, including text, images, audio, and video.

2. Webpage

- Definition:
  - A web page is a single document on the Web, typically written in HTML (HyperText Markup Language).
- Characteristics:
  - Can contain text, images, videos, and interactive elements.
  - Identified by a unique URL (Uniform Resource Locator).
- Example:
  - A news article on a news website or a product page on an e-commerce site.

3. Website

- Definition:
  - A website is a collection of related web pages hosted under a single domain name.
- Structure:
  - Comprises multiple webpages, often organized hierarchically.
  - Includes a homepage, which serves as the main entry point to the website.
- Example:
  - A university’s website may have different pages for admissions, courses, faculty, and research.

4. Homepage

- Definition:
  - The homepage is the main page of a website, often serving as the starting point for navigation.
- Features:
  - Typically includes links to other sections of the website.
  - Contains important information, such as the site’s purpose, announcements, and navigation menus.
- Example:
  - The homepage of Google (www.google.com) provides a search bar and links to other Google services.

5. Web Browsers

- Definition:
  - Web browsers are software applications that allow users to access, retrieve, and display web content.
- Functions:
  - Interpret HTML and render web pages for users to view.
  - Support navigation through hyperlinks, bookmarks, and tabs.
- Examples:
  - Popular web browsers include Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari.

6. Web Servers

- Definition:
  - A web server is a computer system that stores, processes, and delivers web pages to users upon request.
- Functionality:
  - Responds to requests from web browsers using the HTTP/HTTPS protocols.
  - Hosts websites and handles data transfer over the Internet.
- Examples:
  - Apache, Nginx, and Microsoft Internet Information Services (IIS).

7. URL (Uniform Resource Locator)

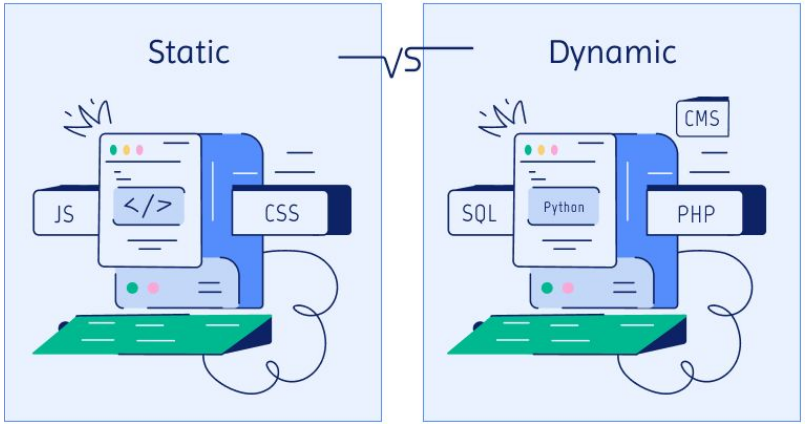
- Definition:
  - A URL is the address used to access a specific resource on the Web.
- Structure:
  - Composed of several parts: protocol (http/https), domain name, and path (location of the resource).
  - Example: https://www.example.com/path/to/resource.
- Importance:
  - URLs provide a unique identifier for each webpage or resource, allowing users to navigate directly.

8. Search Engines

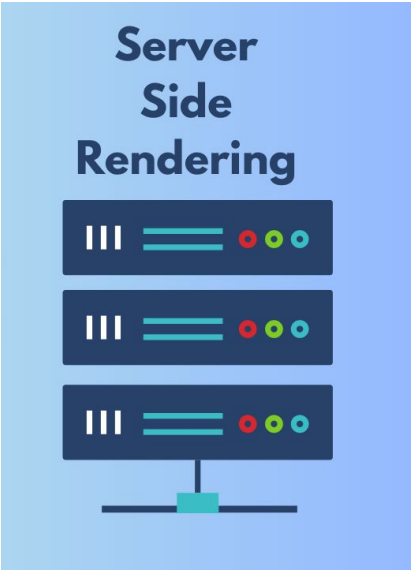
- Definition:
  - Search engines are tools that index and retrieve information from the Web based on user queries.
- Functionality:
  - Crawlers scan the web to collect data about pages and their content.
  - Search algorithms rank and display relevant results based on user input.
- Examples:
  - Google, Bing, Yahoo, and DuckDuckGo.

Types of Web Pages & its Processing in WWW

- **Static Web Pages:**
  - Created using HTML.
  - Content remains the same for all users.
  - Simple to create, but lacks interactivity.
- **Dynamic Web Pages:**
  - Generated in real-time using server-side languages (e.g., PHP, ASP.NET).
  - Content changes based on user interaction.



- **Client-Side Processing:**
  - Scripts run in the browser (e.g., JavaScript).
  - Used for interactive interfaces, forms, animations.



- **Server-Side Processing:**
  - Scripts run on the web server (e.g., PHP, Node.js).
  - Handles database queries, business logic.

Internet Protocols and Applications

- Internet protocols are sets of rules that govern data transmission over the Internet.
- These protocols ensure communication between different devices, enabling services like web browsing, email, file sharing, and more.
- Below are the key Internet protocols:
  - TCP/IP (Transmission Control Protocol/Internet Protocol):
  - ARP (Address Resolution Protocol):
  - HTTP/HTTPS (HyperText Transfer Protocol/Secure):
  - FTP (File Transfer Protocol):
  - SMTP (Simple Mail Transfer Protocol):
  - POP (Post Office Protocol):
  - SNMP (Simple Network Management Protocol)

1. **TCP/IP** (Transmission Control Protocol/Internet Protocol)

- Definition:
  - TCP/IP is the fundamental communication protocol used for relaying data across the Internet.
- TCP:
  - Breaks data into packets, ensures data is delivered reliably and in the correct order.
- IP:
  - Routes packets of data to their destination by using IP addresses.
- Applications:
  - Web Browsing:
    - Ensures reliable delivery of webpage data from a server to a client’s browser.
  - Email:
    - Breaks down email content into packets and reassembles them at the receiver’s end.
  - File Transfers:
    - Ensures data integrity when sending large files.

2. ARP (Address Resolution Protocol)

- Definition:
  - ARP is used to map a device's IP address to its MAC (Media Access Control) address within a local network.
- Function:
  - Helps translate the IP addresses used by routers into physical addresses used by network devices like computers and routers.
- Applications:
  - Network Communication:
    - Ensures devices on the same local network can communicate by resolving their hardware addresses.
  - Routing:
    - Facilitates communication between different devices over a local network.

3. HTTP/HTTPS (HyperText Transfer Protocol/Secure)

- HTTP:
  - The protocol used for transferring hypertext documents on the World Wide Web.
- HTTPS:
  - A secure version of HTTP, encrypting the data exchanged between the client and the server.
- Applications:
  - Web Browsing:
    - Used to retrieve and display web pages from servers.
  - API Communications:
    - Many web services use HTTP/HTTPS for data exchange between servers and clients.
  - Online Transactions:
    - HTTPS is used in e-commerce websites to ensure secure transactions.

4. FTP (File Transfer Protocol)

- Definition:
  - FTP is used for transferring files between computers on a network.
- Functionality:
  - Allows users to upload or download files from a remote server to a local device.
- Applications:
  - Website Management:
    - Web developers use FTP to upload website files to web servers.
  - File Sharing:
    - FTP is used for transferring large files between devices over the Internet.
  - Backup Services:
    - Many cloud services use FTP to backup files from local systems to remote servers.

5. SMTP (Simple Mail Transfer Protocol)

- Definition:
  - SMTP is the standard protocol for sending emails across the Internet.
- Functionality:
  - It handles the sending of emails from a client's email program to the email server and between servers.
- Applications:
  - Email Services:
    - Used by Gmail, Outlook, and other email providers to send emails.
  - Automated Emails:
    - SMTP is used for sending notifications, confirmations, and newsletters from websites or applications.

6. POP (Post Office Protocol)

- Definition:
  - POP is a protocol used to retrieve emails from a remote server to a local device.
- Functionality:
  - Once the email is downloaded, it is usually deleted from the server, unless specified otherwise (POP3 is the most common version).
- Applications:
  - Email Clients:
    - Email programs like Thunderbird, Outlook, and Apple Mail use POP to download messages from servers to local machines.
  - Offline Email Access:
    - POP allows users to access emails offline once they have been downloaded.

7. SNMP (Simple Network Management Protocol)

- Definition:
  - SNMP is used for managing and monitoring network devices, such as routers, switches, and servers.
- Functionality:
  - It collects data from devices about their performance and provides alerts when issues occur.
- Applications:
  - Network Monitoring:
    - Used by IT administrators to monitor device status and performance metrics.
  - Fault Detection:
    - SNMP systems can send alerts when devices fail or when network performance drops.

Applications of Internet Protocols

- Web Browsing:
  - HTTP/HTTPS: Ensures web pages are loaded securely in a browser.
  - TCP/IP: Manages the transmission of the web content across the Internet.
- Email Communication:
  - SMTP: Sends emails to mail servers.
  - POP: Downloads emails from the server to the client.
  - TCP/IP: Ensures reliable transmission of email data.
- File Sharing:
  - FTP: Transfers large files between users or to/from servers.
- Network Management:
  - SNMP: Helps network administrators monitor and control devices.
- Online Transactions:
  - HTTPS: Provides security for online shopping, banking, and data-sensitive websites.
- Remote Server Access:
  - TCP/IP & ARP: Enable communication between local devices and remote servers for data processing or hosting services.