WEB ESSENTIALS

1. CLIENTS

Definition: A client is a computer, device or software application that requests services or resources from another computer called a server through a network.

In simple words, a client is a device or application that requests information from a server.

Examples

- A laptop accessing Google.
- A mobile phone opening YouTube.
- A computer accessing an online banking website.
- A browser requesting a webpage.

Working principle

- The user opens a web browser.
- The user enters a website address.
- The browser sends a request to the web server.
- The server processes the request and sends the required information.
- The client displays the result to the user.

CLIENT **Request**	NETWORK **Communication**	SERVER **Response**

Figure: Basic client–server communication.

Types of clients

- **Thick client:** Performs most processing on the client computer and may work with limited network connectivity. Example: desktop applications.
- **Thin client:** Depends mainly on the server for processing and storage. Example: browser-based applications.
- **Mobile client:** Uses mobile devices to access server services. Example: Android and iOS applications.

Advantages

- Easy access to remote services.
- Provides a user-friendly interface.
- Supports communication with servers.
- Allows users to access data from different locations.

2. SERVERS

Definition: A server is a computer or software system that provides services, resources or data to other computers called clients over a network.

In simple words, a server receives requests from clients and provides the required information.

Types of servers

- **Web server:** Stores and delivers web pages using HTTP or HTTPS. Examples: Apache and Nginx.
- **Database server:** Stores and manages data and processes database queries. Examples: MySQL and Oracle Database.
- **Mail server:** Sends, receives and stores email messages.
- **File server:** Stores and shares files over a network.

• **Application server:** Executes application programs and business logic and provides application services to clients.

Working principle

- The server waits for client requests.
- The client sends a request through the network.
- The server receives and processes the request.
- It retrieves the required information.
- It sends a response back to the client.

Client sends request	Server processes request	Server sends response	Client displays result

Figure: Request–response process.

Advantages

- Centralized data storage.
- Security and access control.
- Supports multiple clients.
- Easy data management.
- Resource sharing.

3. WEB BROWSERS

Definition: A web browser is a software application used to access, retrieve and display information available on the World Wide Web.

In simple words, a browser helps users open and view websites.

Examples

- Google Chrome
- Mozilla Firefox
- Microsoft Edge
- Apple Safari
- Opera

Functions of a web browser

- **Access websites:** Opens websites using URLs.
- **Display web pages:** Displays HTML, CSS and JavaScript content.
- **Navigation:** Provides back, forward and refresh options.
- **Bookmarking:** Saves frequently visited websites.
- **Download files:** Downloads images, documents and other files.
- **Security:** Supports HTTPS and security warnings.
- **Storage:** Maintains cookies, cache and browsing history.

Working of a web browser

- The user enters a URL.
- The browser identifies the website address.
- DNS converts the domain name into an IP address.
- The browser connects to the web server.

- The browser sends an HTTP/HTTPS request.
- The server sends HTML, CSS, JavaScript and other resources.
- The browser interprets the resources and displays the webpage.

Components of a web browser

- **User interface:** Address bar, back button, tabs and menus.
- **Browser engine:** Coordinates browser components.
- **Rendering engine:** Displays HTML and CSS content.
- **JavaScript engine:** Executes JavaScript code.
- **Networking:** Handles network communication.
- **Data storage:** Stores cookies, cache and local storage.

4. DNS (DOMAIN NAME SYSTEM)

Definition: DNS stands for Domain Name System. It is a naming system that converts human-readable domain names into IP addresses.

In simple words, DNS works like a phonebook of the Internet.

Why is DNS required?

Computers communicate using IP addresses, but humans find domain names easier to remember. For example, a user can type www.google.com instead of remembering a numeric IP address. The corresponding IP address can vary.

Working of DNS

- The user enters a domain name in a browser.
- The browser checks its DNS cache.
- If the address is not available, it sends a query to a DNS resolver.
- The resolver finds the corresponding IP address, contacting other DNS servers when necessary.
- The IP address is returned to the browser.
- The browser connects to the web server.

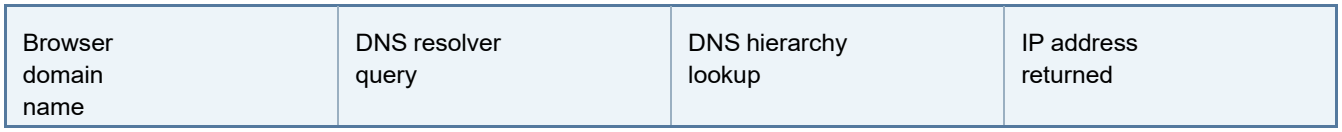


Figure: Simplified DNS name-resolution process.

Types of DNS servers

- **DNS resolver:** Receives DNS queries from users and finds the required IP address.
- **Root name server:** Directs DNS queries to the appropriate Top-Level Domain server.
- **TLD server:** Manages domain extensions such as .com, .org and .in.
- **Authoritative name server:** Provides the DNS records for a domain.

Common DNS records

Record	Purpose
A	Maps a domain name to an IPv4 address.
AAAA	Maps a domain name to an IPv6 address.
CNAME	Creates an alias for another domain name.
MX	Identifies mail servers for a domain.

Record	Purpose
NS	Identifies authoritative name servers.
TXT	Stores text information associated with a domain.

Advantages of DNS

- Easy website identification.
- No need to remember IP addresses.
- Supports email routing.
- Improves network management.
- Provides a distributed and scalable naming service.

5. INTERNET

Definition: The Internet is a worldwide network of interconnected computer networks that communicate with each other using standard communication protocols such as TCP/IP.

In simple words, the Internet connects millions of computers and devices across the world.

Features

- **Global connectivity:** Connects computers worldwide.
- **Information sharing:** Provides access to information.
- **Communication:** Supports email, chat and video calls.
- **Online services:** Supports banking, shopping and education.
- **File sharing:** Allows users to upload and download files.
- **Entertainment:** Provides online games, music and videos.

Working of the Internet

- A user connects to the Internet through an Internet Service Provider (ISP).
- The user sends a request to a destination server.
- Data is divided into packets for transmission.
- Routers forward packets through different networks.
- The destination server receives and processes the request.
- The response is transmitted back to the user.

User device	ISP / access network	Routers and networks	Destination server

Figure: Simplified Internet communication path.

Common Internet services

Service	Description
Email	Sending and receiving messages.
WWW	Accessing websites and webpages.
FTP	Transferring files.
VoIP	Internet-based voice communication.

Service	Description
Video conferencing	Online meetings.
E-commerce	Buying and selling products online.
Cloud computing	Accessing computing resources online.

Advantages and disadvantages

- **Advantages:** Global communication, easy access to information, online education, banking and shopping, business development and entertainment.
- **Disadvantages:** Cybersecurity threats, privacy issues, Internet addiction, spread of false information, online fraud and phishing.

6. INTRANET

Definition: An intranet is a private network used within an organization to share information, resources and services among authorized users.

In simple words, an intranet is an internal network used by a college, company or organization.

Features

- Private network access.
- Restricted to authorized users.
- Centralized information sharing.
- Secure communication.
- Supports internal collaboration.
- Easy document management.

Working of an intranet

- An organization creates a private network.
- The administrator provides login credentials to authorized users.
- Users connect to the internal network.
- They access shared files, applications and information.
- The organization manages access and security.

Authorized user	Organization 's private network	Internal server / applications

Figure: Basic intranet structure.

Applications

- Employee attendance management.
- Internal communication.
- Student information systems.
- Online examination systems.
- Document sharing.
- Employee payroll management.

Advantages and disadvantages

- **Advantages:** Secure internal communication, reduced communication costs, improved productivity, resource sharing and centralized information management.
- **Disadvantages:** Limited access outside the organization, maintenance requirements, initial setup cost and the need for proper security management.

7. WORLD WIDE WEB (WWW)

Definition: The World Wide Web (WWW) is a collection of interconnected webpages and websites that are accessed through the Internet using web browsers.

In simple words, WWW is a collection of websites and webpages available through the Internet.

Important components of WWW

- **Web page:** A document displayed in a web browser. It is commonly created using HTML. Example: a student registration page.
- **Website:** A collection of related webpages under a common domain name. Example: a college website containing Home, About Us, Courses and Contact pages.
- **Web browser:** Software used to access and display websites. Example: Google Chrome.
- **Web server:** A computer or software that stores and delivers web content.
- **URL (Uniform Resource Locator):** The address used to locate a resource on the web. Example: https://www.google.com
- **HTTP and HTTPS:** Hypertext Transfer Protocol and Hypertext Transfer Protocol Secure. They are used for communication between browsers and web servers.

Working of WWW

- The user opens a web browser.
- The user enters a website URL.
- DNS finds the IP address of the web server.
- The browser sends an HTTP/HTTPS request.
- The web server processes the request.
- The server returns the requested webpage and resources.
- The browser displays the webpage.

User / browser	DNS lookup	Web server	Webpage shown

Figure: Simplified working of the World Wide Web.

8. DIFFERENCE BETWEEN INTERNET, INTRANET AND WWW

Basis	Internet	Intranet	WWW
Meaning	Global network of networks.	Private organizational network.	Collection of webpages.
Access	Publicly accessible network.	Authorized users.	Web content is generally public, but may be restricted.
Scope	Worldwide.	Within an organization.	Worldwide.
Purpose	Global communication and services.	Internal communication.	Sharing web information.
Example	Online services.	College internal portal.	College website.

9. DIFFERENCE BETWEEN CLIENT AND SERVER

Client	Server
Requests services.	Provides services.
Usually initiates communication.	Responds to requests.
Used by end users to access resources.	Provides resources to multiple clients.
Displays information.	Stores or processes information.
Example: web browser.	Example: web server.