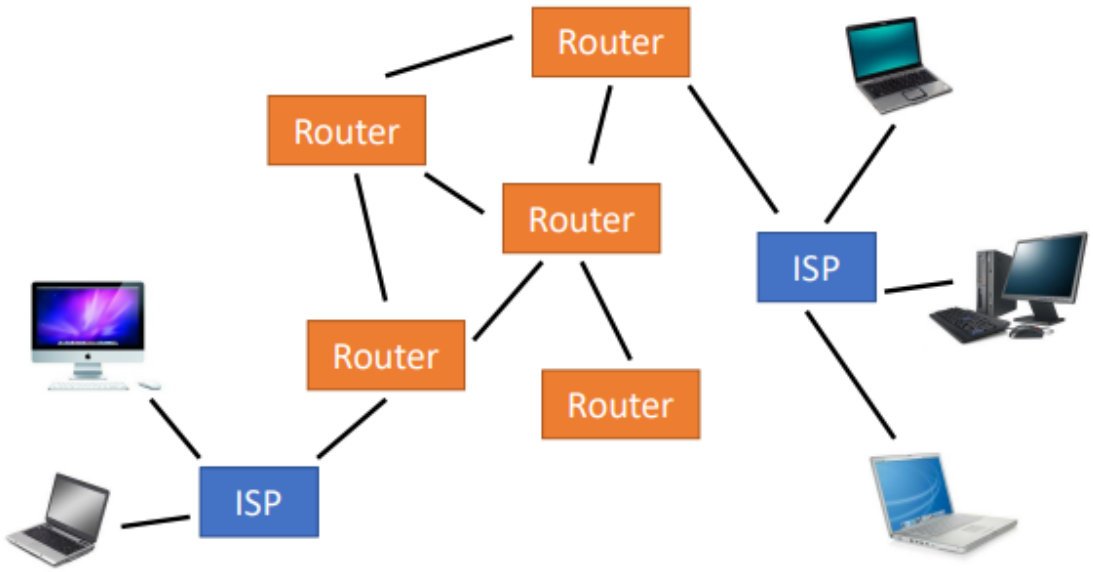
CALIBRAINT TECHNOLOGIES

DAY - 1 - 02.09.2024

- Internet and how it works
- HTTP
- Domain Name
- Hosting
- DNS and how it works
- Browsers and how they work

Internet

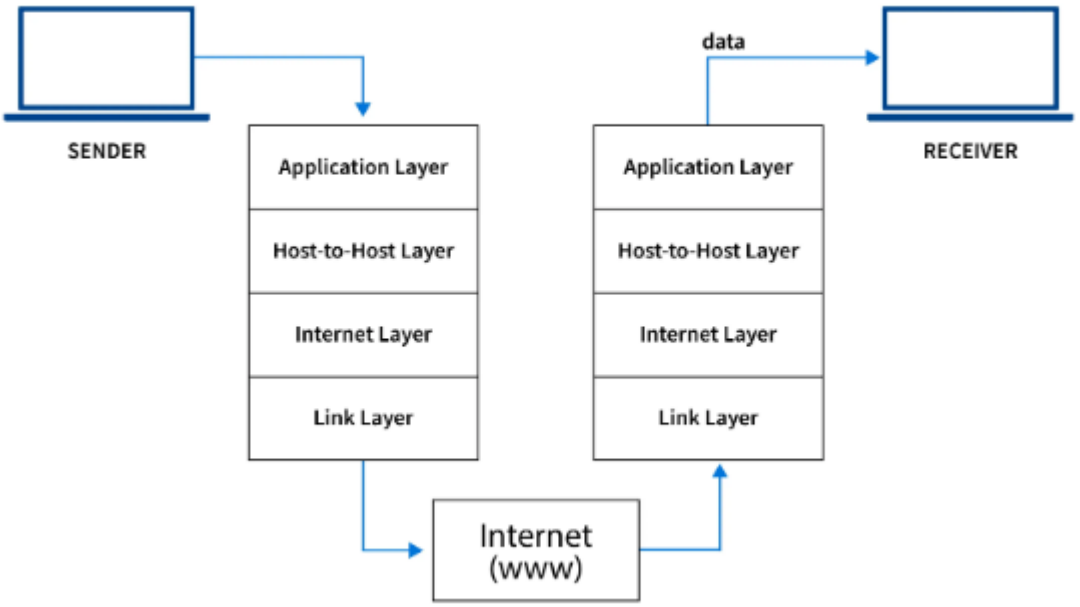
- Internetwork - backbone of the Web - Network - group of connected computers that are able to send data to each other - the word internet has been been derived from this interconnected networks
- purpose of the internet is to send data between different computers
- It's like a graph, where the nodes are computers and the edges are different methods of transmitting information.



- Routers - The core of the internet is a collection of devices - These devices act like switches – they take in data and send it to one of many possible outputs based on the end destination of the data and the current connections on the internet.
- How does the internet connect across continents? Giant fiber optic cables have been laid on the ocean floor. Most international internet traffic is transmitted through these cables.
- Organisation called ICANN (Internet Corporation for Assigned Names and Numbers) assigns groups of addresses to different organizations (like ISPs and companies). The organizations then assign their numbers to individual computers when they connect to the internet.

how internet works

- two main concepts - *packets* and *protocols*
- Packets - small segment of a larger message - contains both data and information about that data - packet switching - Packets are sent across the Internet using a technique - it is not reliable (no guarantees → that all packets will use the same route,in the intended order , s will arrive at our computer , will not be corrupted)
- Protocols - Standardised protocols act as a common language that allows different computers with varied hardware and software to communicate seamlessly over the Internet - standardised way of doing certain actions and formatting data so that two or more devices are able to communicate with and understand each other
- The Internet works by breaking data into small packets, which are routed through a global network of interconnected devices using standardized protocols, eventually reassembling at their destination. This enables seamless communication between computers regardless of location or hardware.
- The protocols used by the internet are called Transmission Control Protocol/Internet Protocol universally abbreviated as TCP/IP.



- Reference link - https://www.geeksforgeeks.org/tcp-ip-model/

HTTP

- web page consists of objects each of which can be stored on different Web servers
- object can be HTML file, JPEG image, Java applet, audio file,…
- web page consists of *base HTML-file* which includes *several referenced objects, each* addressable by a *URL,*

  www.someschool.edu/someDept/pic.gif
  host name path name

- HTTP is implemented in two programs: a client program and a server program - HTTP defines the structure of these messages and how the client and server exchange the messages
- client/server model:
    - *client:* browser that requests, receives, (using HTTP protocol) and "displays" Web objects
    - *server:* Web server sends (using HTTP protocol) objects in response to requests

- HTTP uses TCP and it is stateless (doesn't maintain any previous information)
- Two Types → Persistent and Non Persistent

Persistent HTTP

- TCP connection opened to a server
- multiple objects can be sent over *single* TCP connection between client, and that server
- TCP connection closed

Non-persistent HTTP

1. TCP connection opened
2. at most one object sent over TCP connection
3. TCP connection closed

- HTTP status code

200 OK
- request succeeded, requested object later in this message

301 Moved Permanently
- requested object moved, new location specified later in this message (in Location: field in response message)

400 Bad Request
- request msg not understood by server

404 Not Found
- requested document not found on this server

505 HTTP Version Not Supported

Domain Name

- (IP address) –> Every computer on the Internet has a four part numeric address called the Internet protocol address - contains routing information that identifies its location - Each of the four parts is a number between 0 and 255 - IP address looks like 194.145.128.14
- Computers have no problems working with long strings of numbers - Most computers on the Internet also have an address called a domain name system (DNS) address, an address that uses words rather than numbers.
- DNS(Domain Name System) addresses have 2 parts · Host name – name for a computer connected to the Internet · Domain – generally identifies the type of institution that uses the address. This type of domain name is often called a top-level domain

Domain	Type of Organisation	Example
.com	Business (commercial)	ibm.com
.edu	Educational	centre.edu
.gov	Government	whitehouse.gov
.mil	Military	Navy.mil
.net	Gateway or host	Oceanfree.net
.org	Other organisation (typically non profit)	isoc.org

Hosting

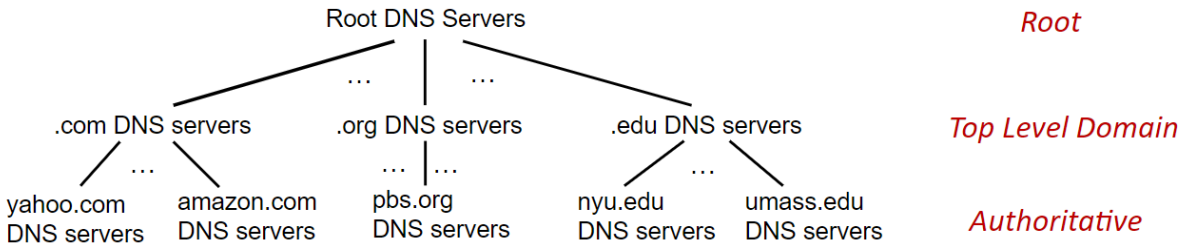
- Web hosting is a service that allows individuals and organizations to make their websites accessible on the Internet
- **Storage & Server**: Websites are stored on servers provided by hosting companies.
- **Domain Name**: The website's address (like `www.example.com`) directs users to the server.
- **Internet Access**: Hosting servers are always online, making websites accessible 24/7.

Types of Hosting

- **Shared Hosting**: Multiple websites share one server.
- **VPS Hosting**: Dedicated resources on a shared server.
- **Dedicated Hosting**: One website on a single server.
- **Cloud Hosting**: Multiple servers in the cloud for scalability.

DNS and how it works

- DNS (Domain Name System) is like the Internet's phonebook. It translates human-readable domain names (e.g., www.example.com) into IP addresses that computers use to locate and access websites.
- Services provided by DNS - hostname to IP address translation - host aliasing - mail server aliasing
- Centralize DNS cannot be used because of single point of failure,traffic volume , maintenance



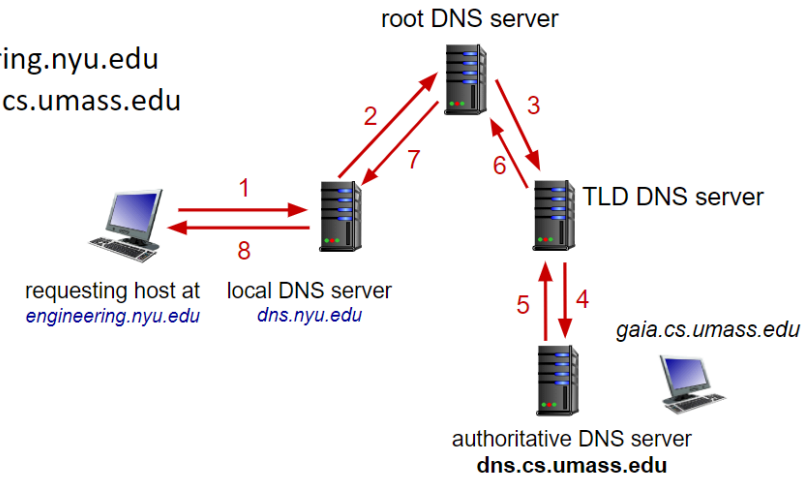
- DNS name resolution is of two types - Recursive and Iterative

DNS name resolution: recursive query

Example: host at engineering.nyu.edu wants IP address for gaia.cs.umass.edu

Recursive query:

- puts burden of name resolution on contacted name server
- heavy load at upper levels of hierarchy?

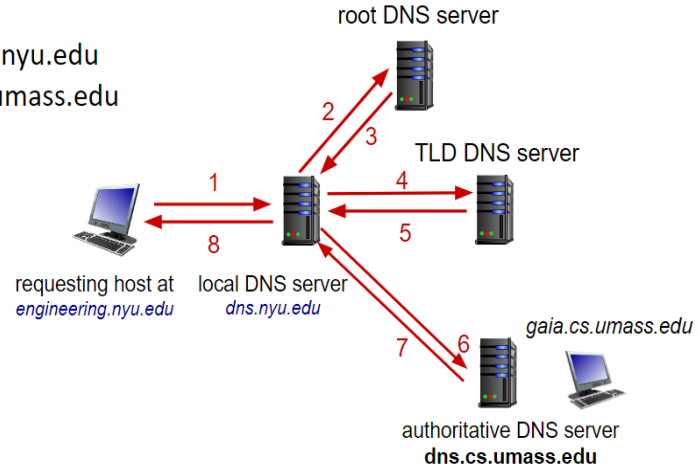


DNS name resolution: iterated query

Example: host at engineering.nyu.edu wants IP address for gaia.cs.umass.edu

Iterated query:

- contacted server replies with name of server to contact
- "I don't know this name, but ask this server"



Browsers

Browsers are software applications used to access and view websites on the internet. They interpret HTML, CSS, and JavaScript to render web pages. Key components include:

- User Interface (UI): Provides navigation controls like back, forward, refresh, and address bar.
- Rendering Engine: Converts HTML and CSS into a visual representation.
- JavaScript Engine: Executes JavaScript code for dynamic content.
- Networking: Handles communication with servers via protocols like HTTP/HTTPS.
- Data Storage: Manages cookies, local storage, and caches for faster access to resources.

How browsers work ?

- Browsers work by sending a request to a web server for a specific webpage using the URL entered by the user.
- The server responds with the HTML, CSS, JavaScript, and other resources needed for the page.
- The browser's rendering engine processes the HTML and CSS to construct the visual layout, while the JavaScript engine executes any scripts to enable interactivity.
- The browser then displays the fully rendered page to the user, managing network communication, handling user inputs, and maintaining data like cookies and cache to optimize performance