Web Programming

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Web Programming

- Unit – 1 : Internet and HTML
- Unit -2: HTML5 and CSS3
- Unit - 3: Client Side Scripting (Java Script)
- Unit - 4: Server Side Scripting (JSP)
- Unit - 5: JSP Programming – Database Access

Introduction to Internet

- Definition of Internet
- History of Internet
- Switching

Definition of Internet

- **The Internet is a vast network of computers, and server's, which communicate with each other.**

History of Internet

- **First Prototype 1960's**
  - **ARPANET funded by U.S. Department of Defense.**
- **First Message - October 29, 1969**
  - **ARPANET first node-to-node message**

Contd…

- **Technology Development 1970's**
  - Robert Kahn and Vinton Cerf developed Transmission Control Protocol and Internet Protocol.
- **TCP/IP adopted – January 1, 1983**
  - ARPANET adopted TCP/IP
  - Beginning of "network of networks"
- **Recognizable form – 1990**
  - Tim Berners-Lee invented the word wide web.
  - URIs, HTTP and HTML

Advantages

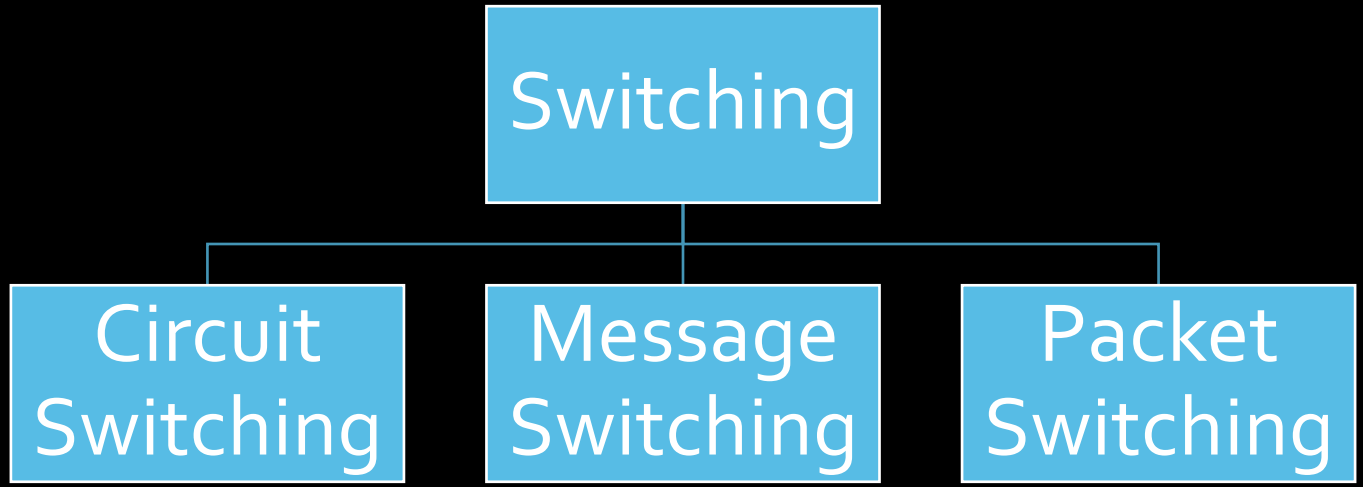
- Connectivity (communication & sharing)
- Entertainment
- Selling
- Banking
- Learning
- Work from home
- Internet of things.
- Cloud computing

Disadvantages

- Identity Theft
- Virus
- Spam
- Stalking
- Time waster
- Unable to disconnect from work

Switching

- **Switching is process to forward packets coming in from one port to a port leading towards the destination.**



Circuit Switching

- Dedicated commutation path
- Three phases of Circuit Switching
  1. Establish a Circuit
  2. Transfer the Data
  3. Disconnect the Circuit

Message Switching

- In message switching, the whole message is treated as a data unit and is transferred entirely.

Packet Switching

- The entire message is broken down into smaller chunks called packets. The switching information is added in the header of each packet and transmitted independently.

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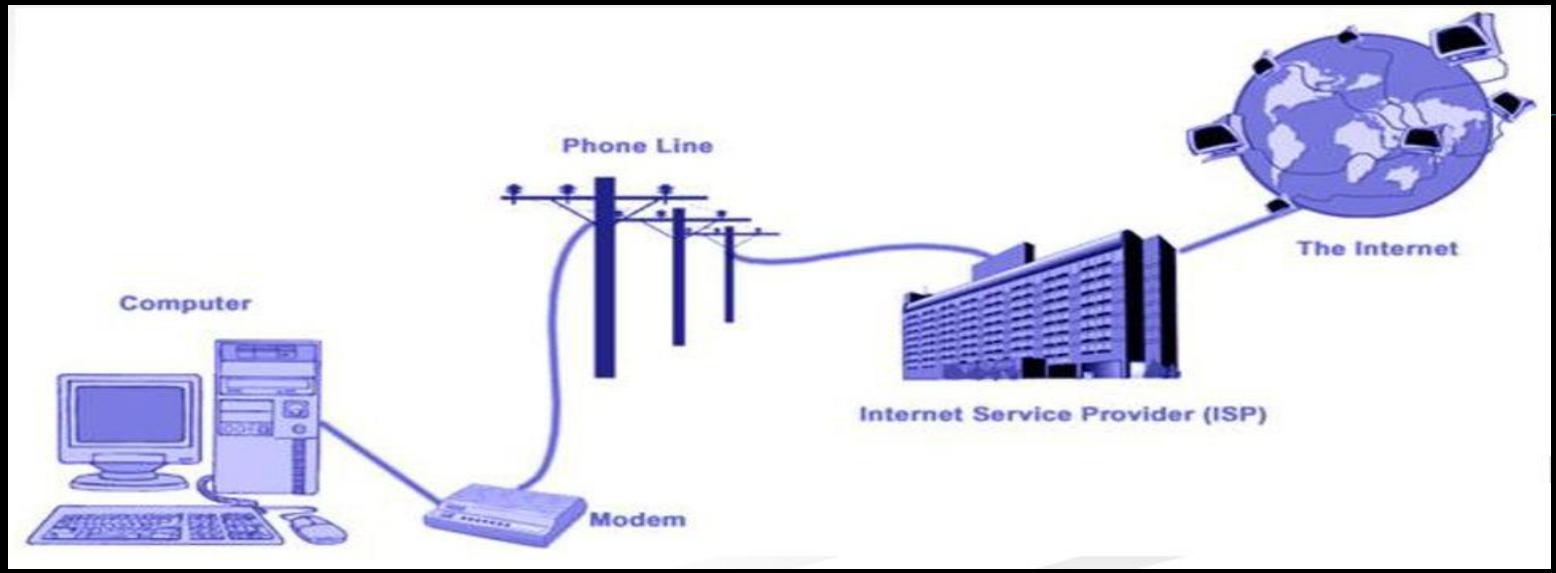
Topics

- **Different Types of Connections**
  - Dial-up Connection
  - ISDN
  - ADSL Connection
  - DSL
  - Leased Line
  - Satellite Connections
- **Modem**
  - Cable Modem

Dial-Up Connection

- Dial-up refers to an Internet connection that is established using a modem over standard telephone line.
- When a dial-up connection is initiated, the modem dials a phone number of an Internet Service Provider (ISP).
- The ISP then establishes the connection.
- Connection Speed 56kbps.


Phone Line
The Internet
Computer
Internet Service Provider (ISP)
Modem

Advantages/Disadvantages

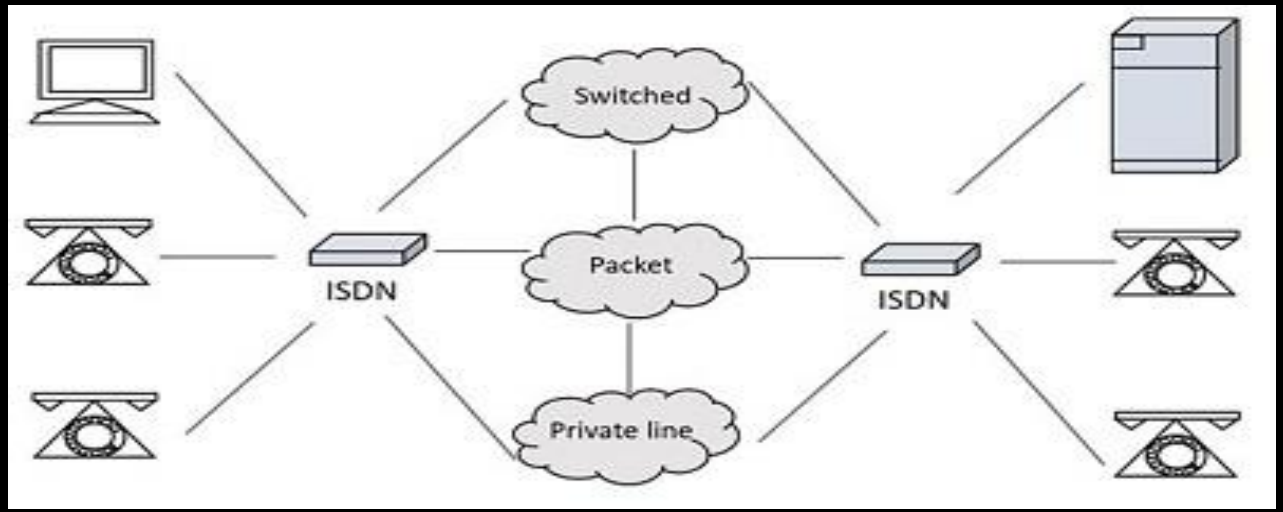
- Only telephone line is needed
- Dial up account can be used on any phone line

↓ It provides slow connection

↓ Only one device can be active at a time

ISDN - [Integrated Services Digital Network]

- These standards allows simultaneous transmission of voice and data over telephone line.
- It is an circuit-switched telephone network system, with access to packet switched network for data transmission.
- Download Speed of 128kbps
- Upload Speed of 64kbps


Switched
Packet
Private line
ISDN
ISDN

Advantages/Disadvantages

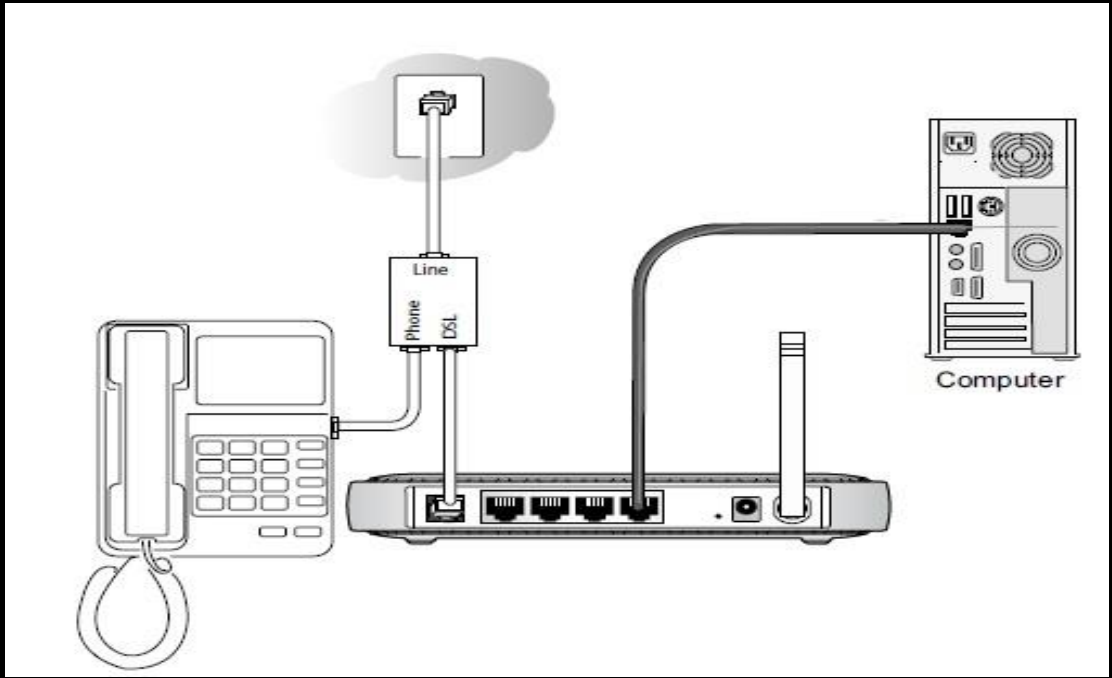
- Allow both voice and data
- Less chance of error as line is digital
- Higher bandwidth

↓ It is costly as it requires digital services

↓ Difficult to configure

DSL – Digital Subscriber Line

- DSL is a communications medium used to transfer digital signals over standard telephone lines.
- Phone line voice call uses low frequency 0Hz to 4 kHz (Voice band).
- Digital signal uses high frequency 25 kHz to 1.5 MHZ.
- A splitter is used to split these two frequencies
- Symmetric Data Transfer.


Line
Phone
DSL
Computer

Advantages / Disadvantages

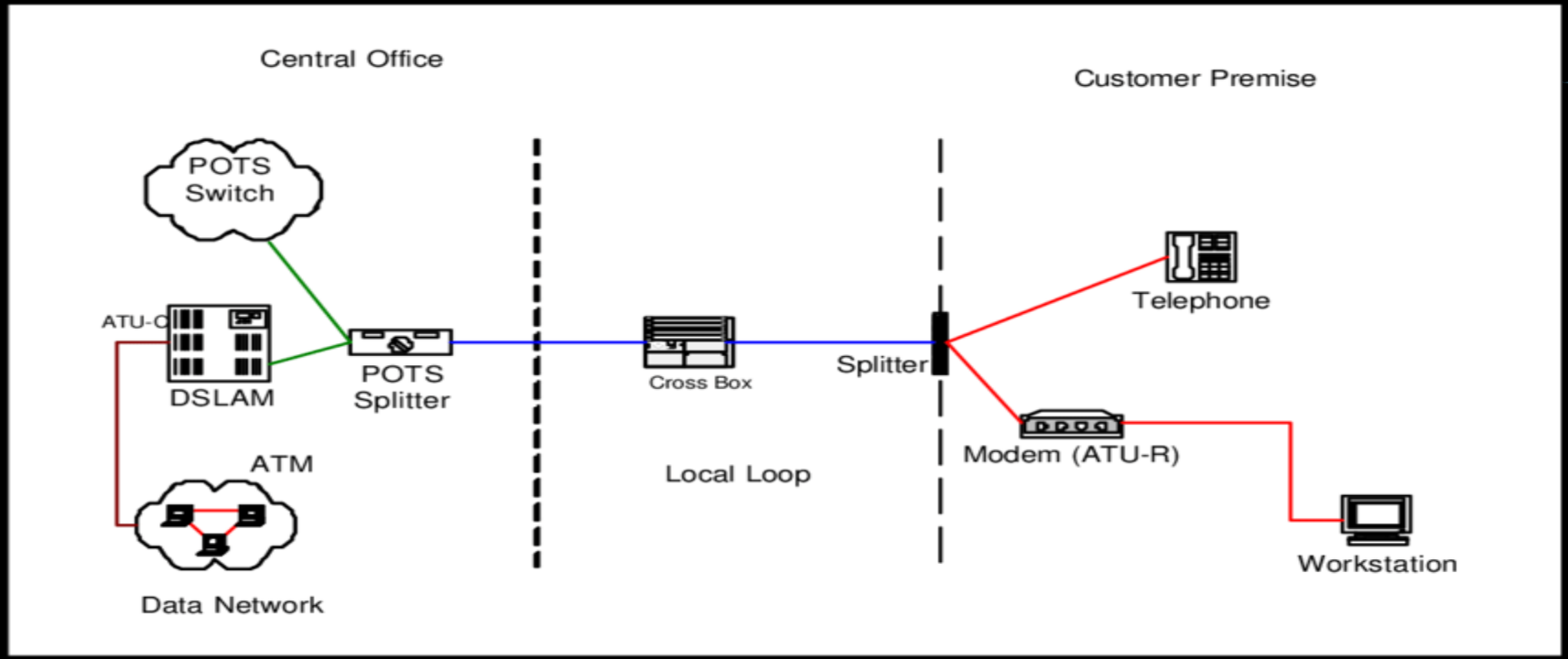
- High Speed Connection
- Phone can be used, uses existing infrastructure
- Always online

↓ Variable Speed

↓ Reliable only on copper line

ADSL [Asymmetric Digital Subscriber Line]

- It is a type of broadband communications
- Transmits digital data at a high bandwidth using existing phone lines.
- Download Speed 1.5Mbps
- Upload Speed 256Kbps
- Poor choice for servers


Central Office
Customer Premise
POTS
Switch
ATU-C
DSLAM
POTS
Splitter
ATM
Data Network
Cross Box
Local Loop
Splitter
Telephone
Modem (ATU-R)
Workstation

Advantages / Disadvantages

- High Speed Connection
- Phone can be used, uses existing infrastructure
- Always online

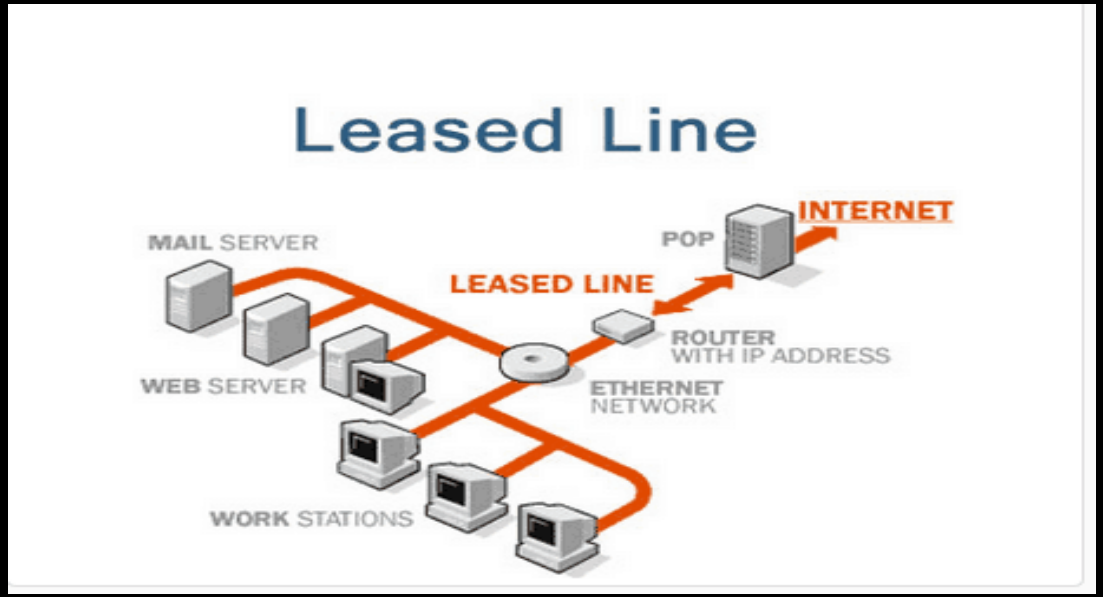
↓ Variable Speed

↓ Faster to download slow to upload

↓ Reliable only on copper line

Leased Line

- A permanent telephone connection between two points set up by a telecommunications common carrier.
- Typically, leased lines are used by businesses to connect geographically distant offices.


Leased Line
INTERNET
POP
MAIL SERVER
LEASED LINE
ROUTER
WITH IP ADDRESS
WEB SERVER
ETHERNET
NETWORK
WORK STATIONS

Advantages / Disadvantages

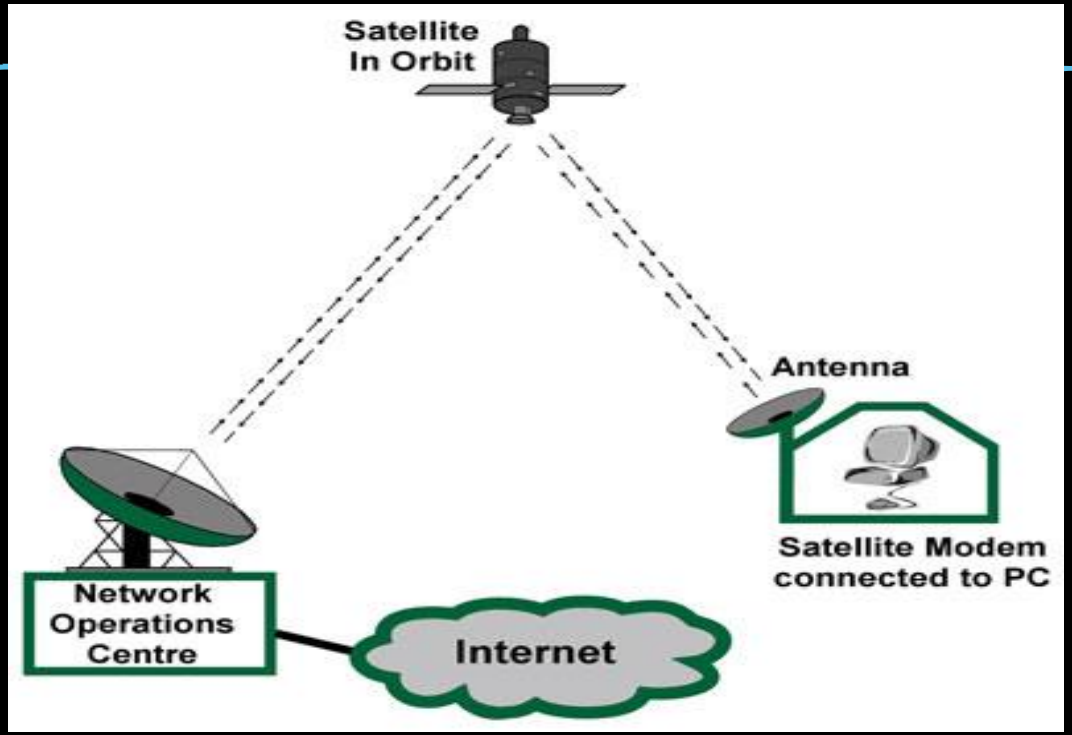
- Symmetric bandwidth
- Uninterrupted bandwidth
- Speeds up to 10mbps
- Uninterrupted service

↓ High cost

↓ High installation time

Satellite Connections

- Satellite Internet connection offers high speed connection to the internet
- Two types of connections
  - One way
  - Two way
- Average speed 512kbps.


Satellite
In Orbit
Antenna
Satellite Modem
connected to PC
Network
Operations
Centre
Internet

Advantages / Disadvantages

- Remote area access
- Always on connectivity

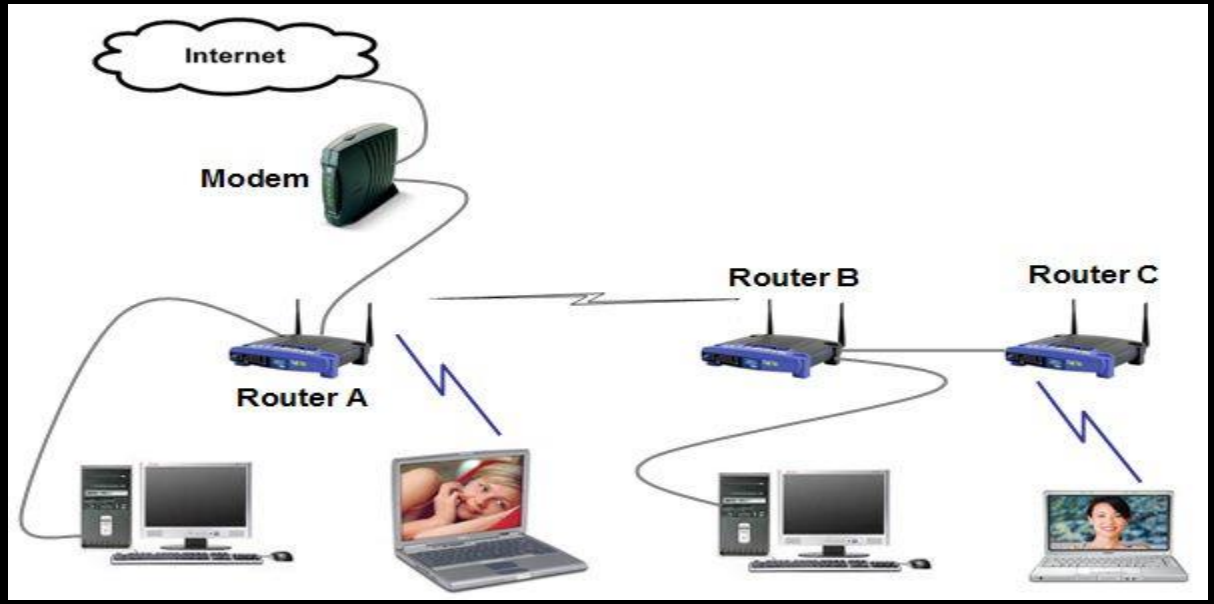
↓ Slow connection

↓ Weather disturbance

↓ High cost

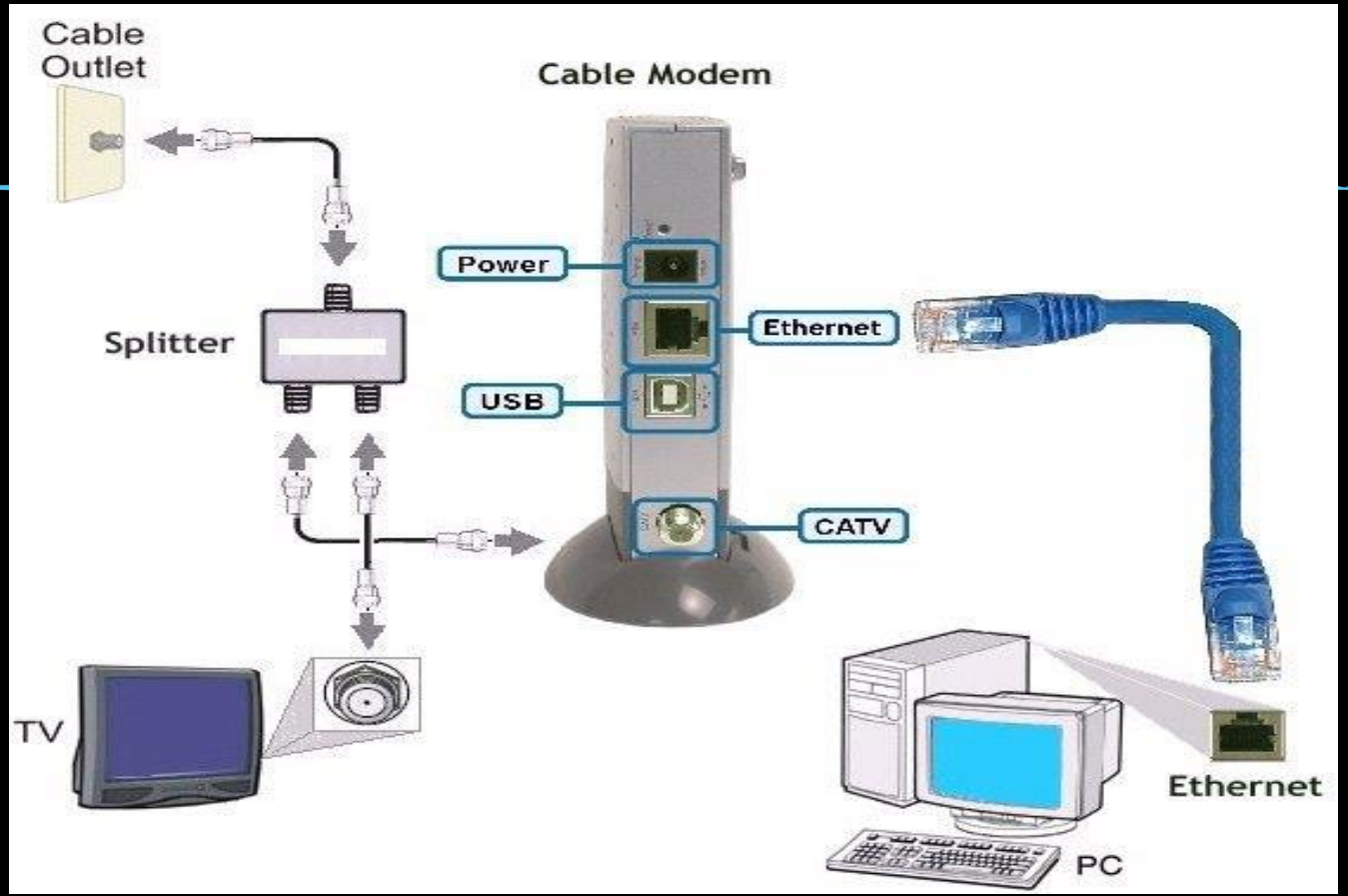
Modem

- Modem is short for "Modulator-Demodulator”
- It is a hardware device that helps a computer to connect to the internet
- Convert analog to digital “modulates”
- Converts digital to analog “demodulates”


Internet
Modem
Router B
Router C
Router A

Cable Modem

- Cable modem is a hardware device that is used to connect the computer with the Internet Service Provider (ISP) through the local cable TV line.


Cable
Outlet
Cable Modem
Power
Ethernet
USB
CATV
Splitter
TV
Ethernet
PC

Advantages / Disadvantages

- Telephone line not needed
- Always connected
- High bandwidth

↓ Slow speed compared to fiber optics

↓ Not available in all areas

↓ Peak hour disturbance

Unit 1
Section 1.1

Topics

- Different types of Connections
- Modem

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Topics

- Internet Tools
- Web Server
- Domain Name
- Search Engines

Internet Tools

- Internet tools are basically used to make the internet easy to use by the use of applications specially made for a particular internet business.
- Some of the Internet Tools are
  - Telnet
  - Electronic Mail
  - FTP
  - HTTP
  - Gopher

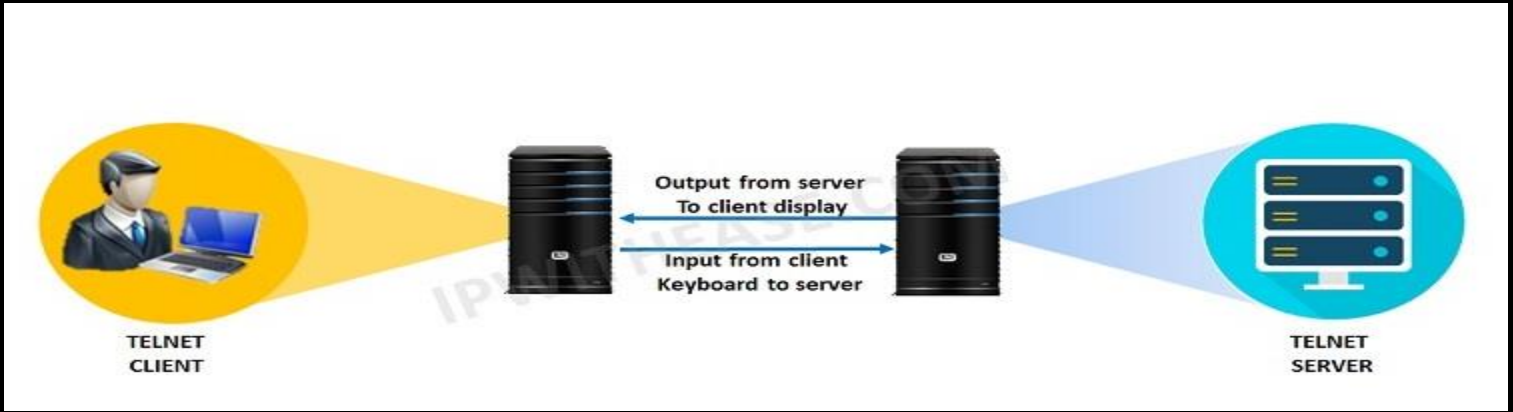
Telnet - Teletype Network

- It was implement in 1969, by the IETF (Internet Engineering Task Force)
- Telnet is the "protocol" or set of rules used on the Internet for connecting to another computer.
- Telnet is often referred to as "remote login”.

Command format

TELNET address

TELNET MIT.EDU



Thing needed to use telnet

- Address of the remote host
- Any login information if provided
- Information about how to use the system
- Information about how to exit the system

Electronic Mail

- Electronic Mail (e-mail) is a computer-based system for exchange of messages and other information.
- Email programs: PINE, ELM, VMS mail

Example

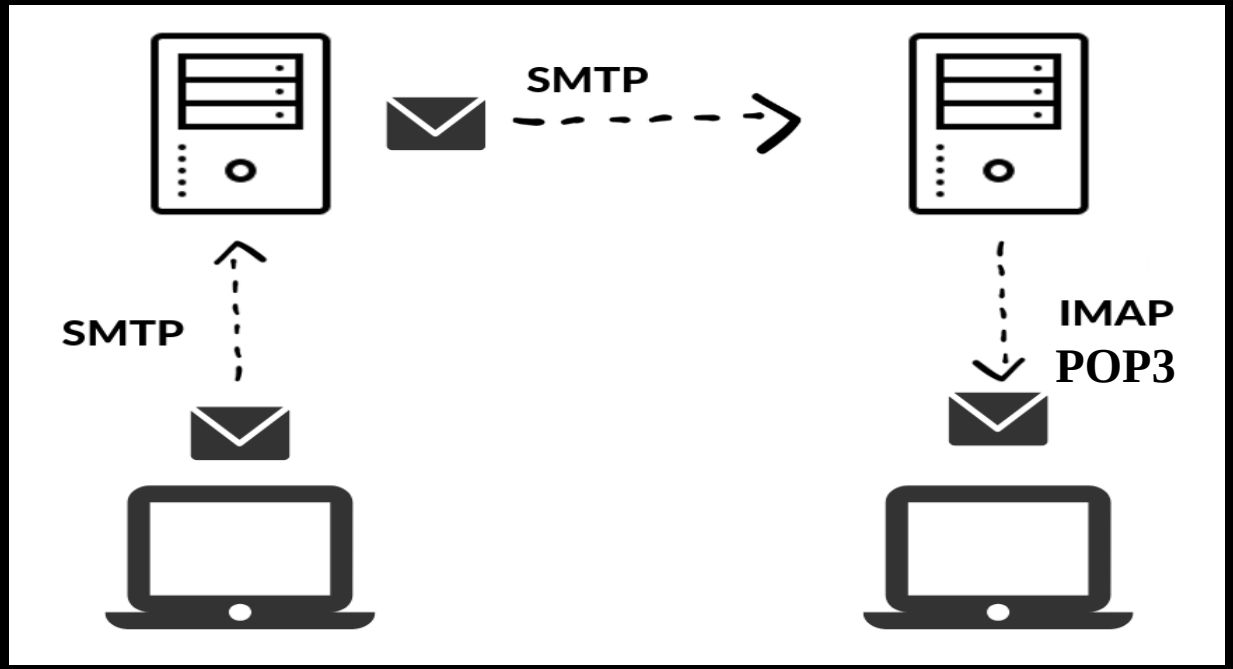
dnstnpt@gmail.com

Basic email functions

- Send a message
- Read an incoming message
- Reply to the sender of a message
- Forward a message to another address
- Print your messages
- Delete messages that are no longer required

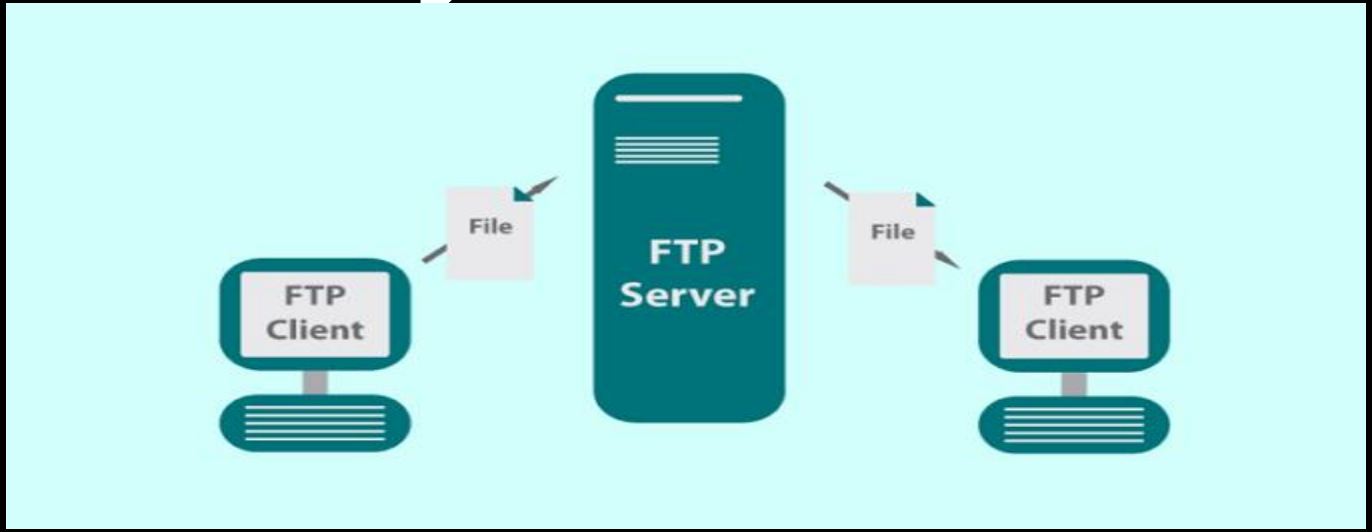
Email Protocols

- **Sending**
  - SMTP: Simple Mail Transfer Protocol
- **Receiving**
  - POP3: Post Office Protocol
  - IMAP: Internet Message Access Protocol


SMTP
SMTP
IMAP
POP3

FTP: File Transfer Protocol

- FTP is a protocol designed for transferring files over the Internet.



Contd..

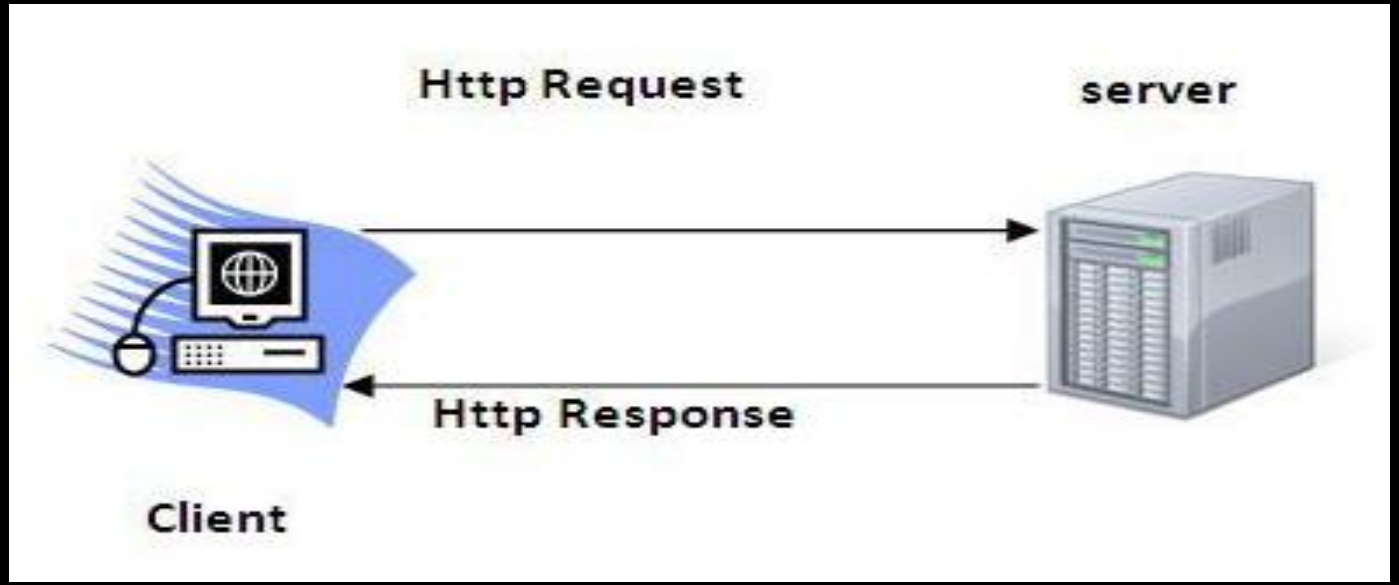
ftp.yahoo.com:21

Types of FTP connection

- Anonymous FTP
- Secured FTP

HTTP: Hyper Text Transfer Protocol

- HTTP is an application-level protocol
- This is used to transfer data over the WWW.
- HTTP uses a request-response model.
- Used for implementing websites



Request-Response model

Features of HTTP

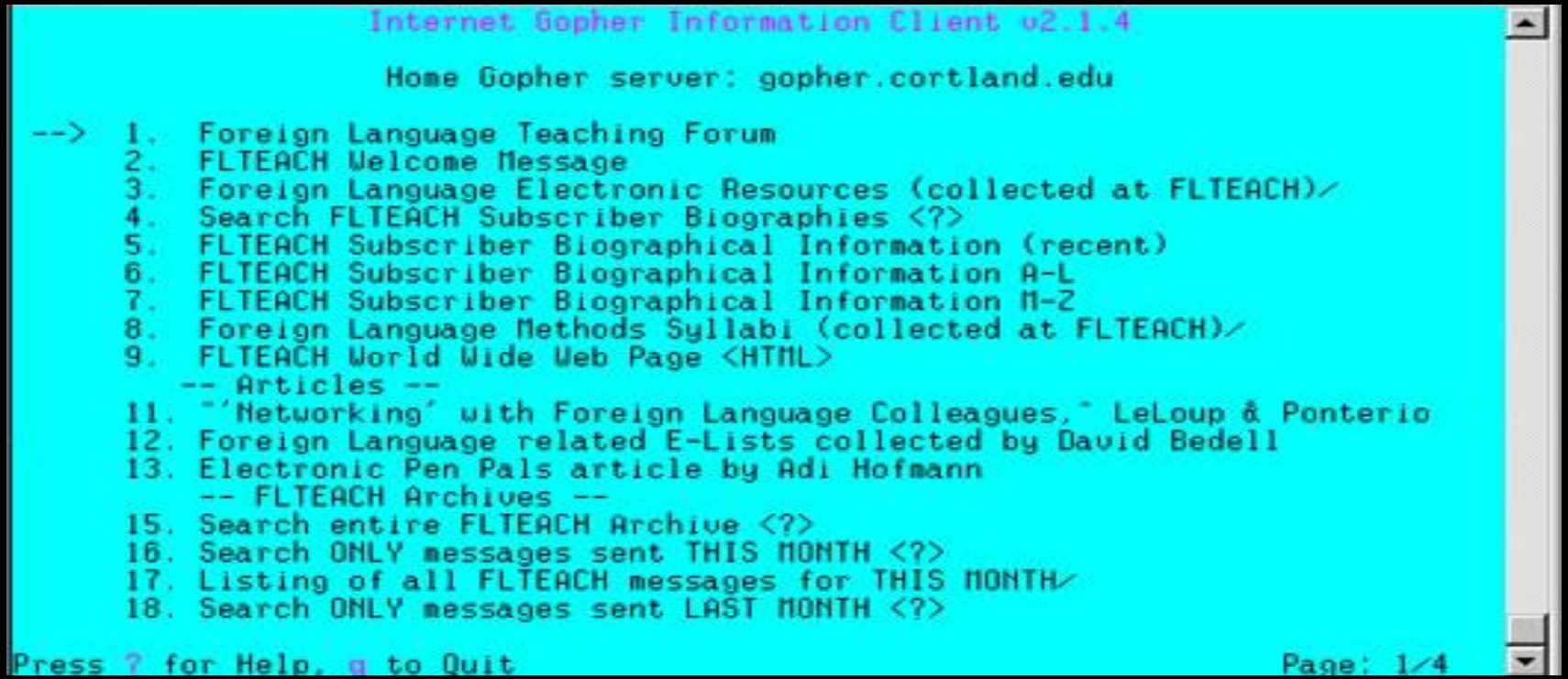
- HTTP is connectionless
- HTTP is media independent
- HTTP is stateless

FTP vs HTTP

FTP	HTTP
Connection oriented	Connectionless
Slow Speed	High Speed
Transfer files	Access website
File explorer as client	Any browser as client
Few people use it	Most people use it

Gopher

- The gopher system allows people to search for and retrieve information using a text interface.
- It is based on a client-server structure, where a gopher client program is used to search gopher servers.
- This is a menu based application

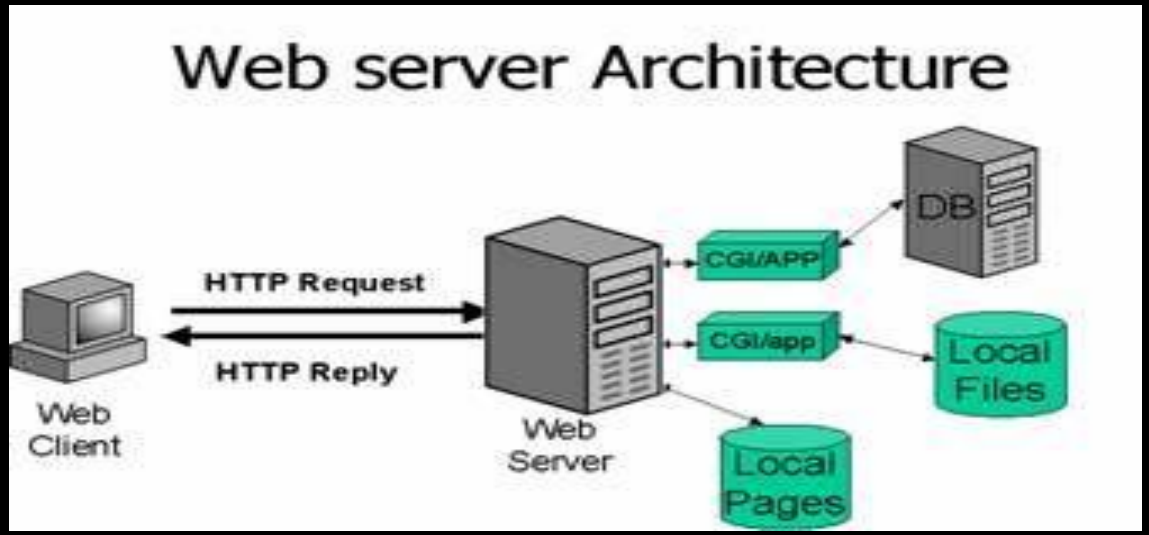

Internet Gopher Information Client v2.1.4
Home Gopher server: gopher.cortland.edu
--> 1. Foreign Language Teaching Forum
2. FLTEACH Welcome Message
3. Foreign Language Electronic Resources (collected at FLTEACH)/
4. Search FLTEACH Subscriber Biographies <?>
5. FLTEACH Subscriber Biographical Information (recent)
6. FLTEACH Subscriber Biographical Information A-L
7. FLTEACH Subscriber Biographical Information M-Z
8. Foreign Language Methods Syllabi (collected at FLTEACH)/
9. FLTEACH World Wide Web Page <HTML>
-- Articles --
11. "'Networking' with Foreign Language Colleagues," LeLoup & Ponterio
12. Foreign Language related E-Lists collected by David Bedell
13. Electronic Pen Pals article by Adi Hofmann
-- FLTEACH Archives --
15. Search entire FLTEACH Archive <?>
16. Search ONLY messages sent THIS MONTH <?>
17. Listing of all FLTEACH messages for THIS MONTH/
18. Search ONLY messages sent LAST MONTH <?>
Press ? for Help, q to Quit
Page: 1/4

Web Server

- A Web server is a computer system that hosts websites.
- It runs Web server software, which provides access to hosted web pages over the Internet.
- Web servers host multiple websites

Web server software

- Apache
- IIS – Internet Information Server



Domain Name

- A domain name is a unique name that identifies a website.

  www.name.suffix

Examples

www.amazon.com

www.amazon.in

DNS: Domain Name System

- Computers access internet devices by their IP address
- DNS translates domain names into IP addresses
- This allows us to access an Internet location by its domain name
- DNS translation table is not stored in a single location

Contd..

- Domain name must be stored in “nameservers”
- A nameserver is a server that stores the directory of domain names and their associated IP address
- ISP has a local cache of the DNS records for easy access.

Search Engines

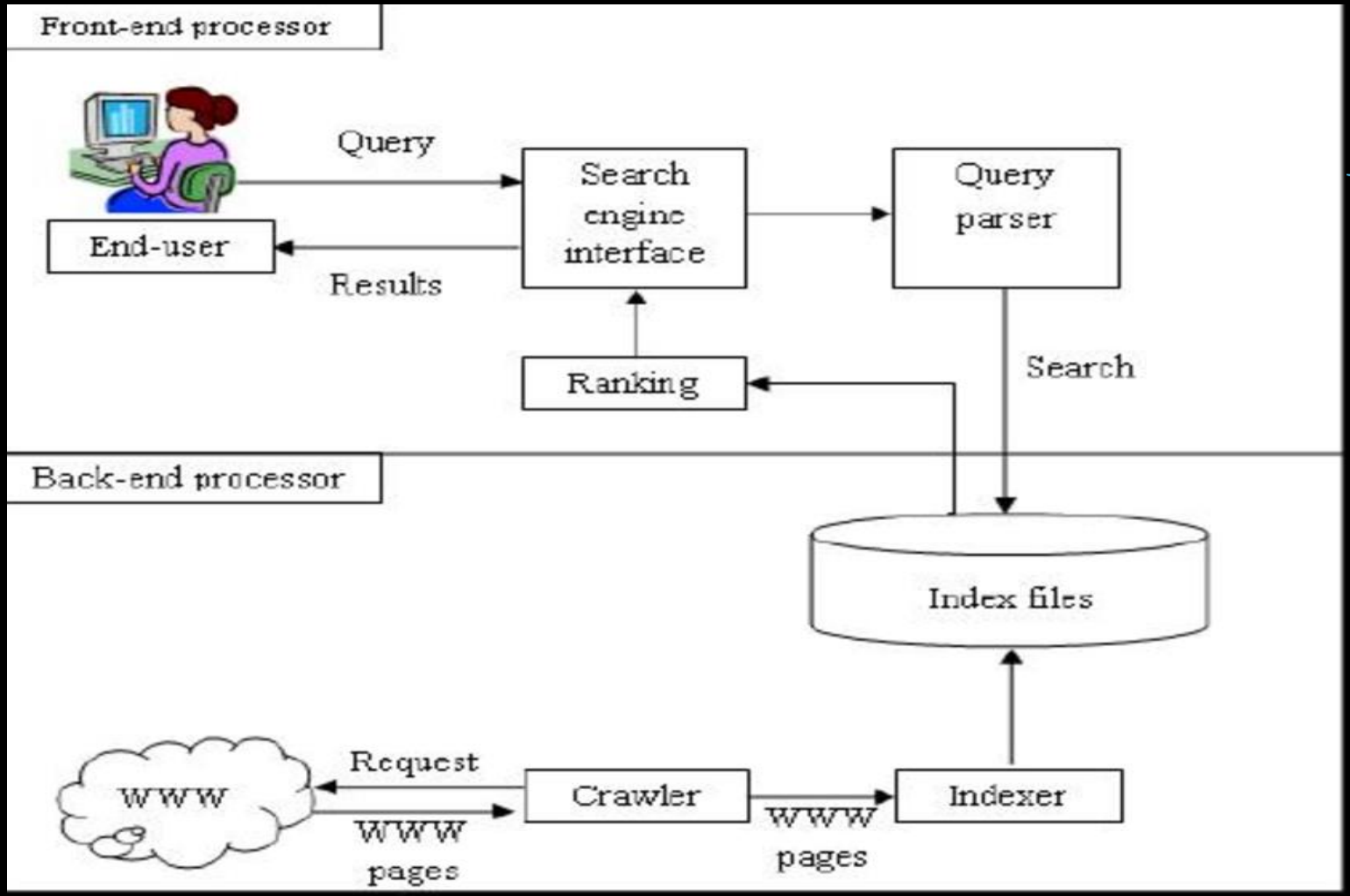
- Search engines are answer machines
- Search engines do all of this by discovering and cataloguing all available content on the Internet
- Various search engines
  - Google
  - Bing
  - Yahoo
  - Yandex

How search engine works?

- Each search engine has its own algorithm

- Basic principles of a search engine
  - Crawling
  - Indexing
  - Creating results (Rank)

- **Crawling**
  - Search engine sends robots known as spiders or crawlers to find new and updated content
- **Indexing**
  - Store the information in a large database in an organized manner
  - Enable super fast response to query
- **Creating Results (Rank)**
  - Search engine search the index to get result for a user search
  - The results are ordered by rank and displayed to user


Front-end processor
Query
End-user
Search
engine
interface
Results
Query
parser
Search
Ranking
Back-end processor
Index files
Request
WWW
WWW
pages
Crawler
WWW
pages
Indexer

Unit 1

Section 1.1

Topics

- Web Server
- Domain Name
- Search Engine

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Topics

- **Web Browser**
  - What is a Web Browser?
  - History of Web Browser
  - Components of Web Browser

Web Browser

- It is an application used to access website
- Common web browsers
  - Chrome
  - Firefox
  - Edge
  - Safari

Contd...

- Primary function is to render HTML
- When a web page is loaded browser process the following
  - HTML tags containing text, links, images and videos
  - Cascaded Style Sheets
  - Java Scripts

History of Web Browsers

- 1991: WorldWideWeb
  - First web browser Developed by Tim Berners-Lee
  - Later renamed as Nexus
- 1993: Mosaic
  - It could display text and images together
  - Designed for use by anyone
  - Created by university of Illinois NCSA

Contd...

- 1994: Netscape Navigator
  - First commercial browser released by Mosaic corporation
  - It was designed for the speed of dial-up modems
- 1994: Opera
  - Cross-platform browser engine
  - Still being used

Contd...

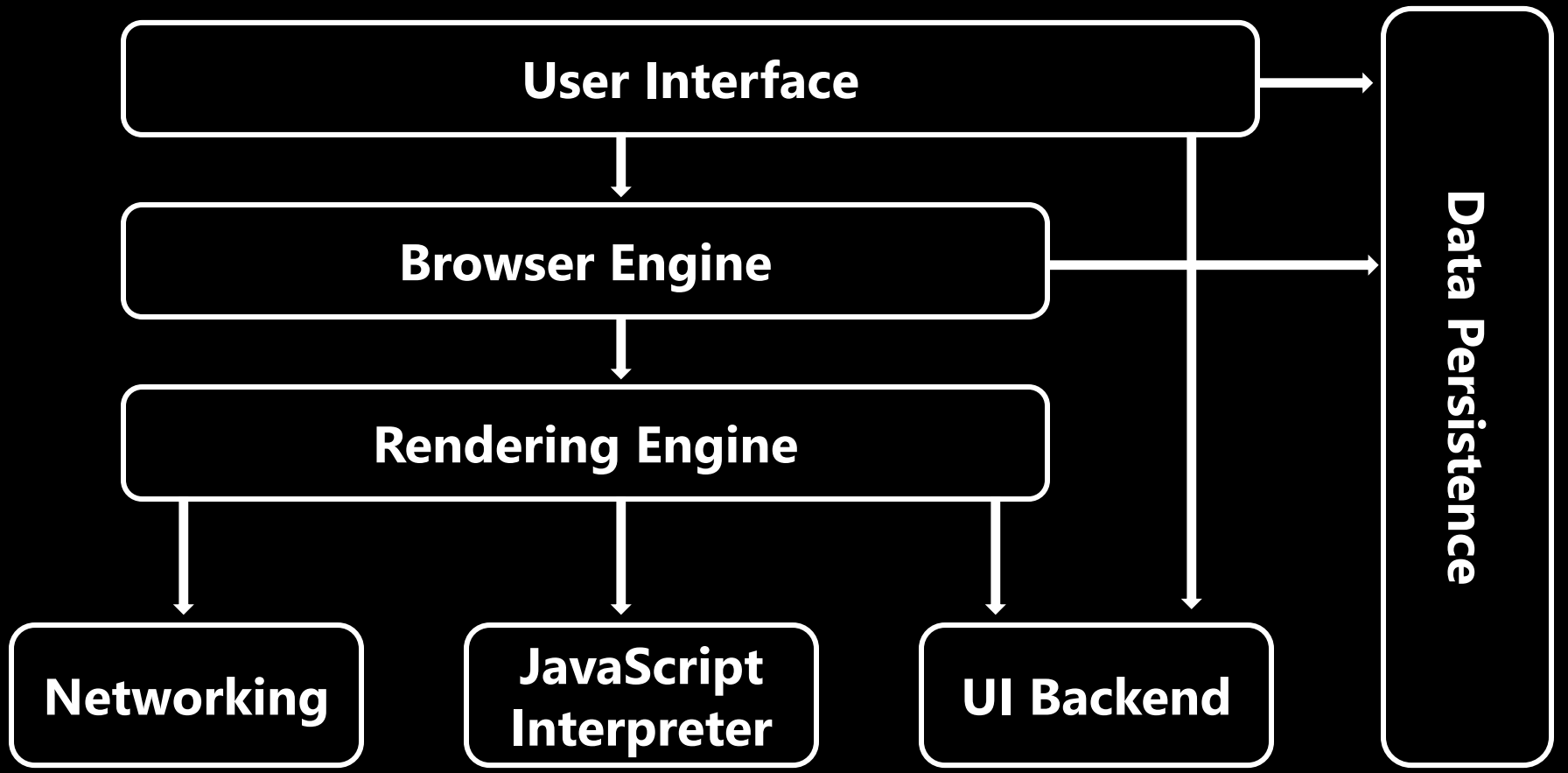
- 1995: Internet Explorer
  - It became the most used browser
  - Supported multimedia applications
  - Email features embedded in browser
- 2003: Safari
  - Apple's first web browser
  - Included in OS X operating system

Contd...

- **2004: Firefox**
  - Open-source web browser
  - Successor of Netscape Navigator
  - Pop-up blocking, online fraud protection, tabbed browsing, extensible.
- **2008: Chrome**
  - Partial Open-source code from Chromium
  - Became the most used browser

Components of Web Browser

- User Interface
- Browser Engine
- Rendering Engine
- Networking
- Javascript Interpreter
- UI Backend
- Data Persistence



Component Diagram

User Interface

- It is the layer between user and browser engine
- It provides features such as toolbars, download handling, preferences and printing
- Communicate with desktop applications

Browser Engine

- It is an high-level interface between UI and the rendering engine
- It has methods to initiate the loading of URL and high-level browsing actions.
- It handles messages relating to error messages and loading progress

Rendering Engine

- Produce visual representation for a given URI
- It contains HTML parser
- It can display HTML, XML by using CSS
- Different browsers use different rendering engine

Networking

- Has functions to handle retrieval of URLs using HTTP and FTP
- It handles security and resolve MIME media types
- It has cache of recently retrieved resources

Javascript Interpreter

- This executes the JavaScript code embedded in a website
- Result of execution is passed to the rendering engine to display

UI Backend

- Used for drawing basic widgets like combo boxes and windows
- It is closely tied with the operating system

Data Persistence

- Store data related to browsing session
- Data may be bookmarks, toolbar setting or data such as cookies, security certificates

Unit 1

Section 1.1

Topics

- Web Browser

Web Programming

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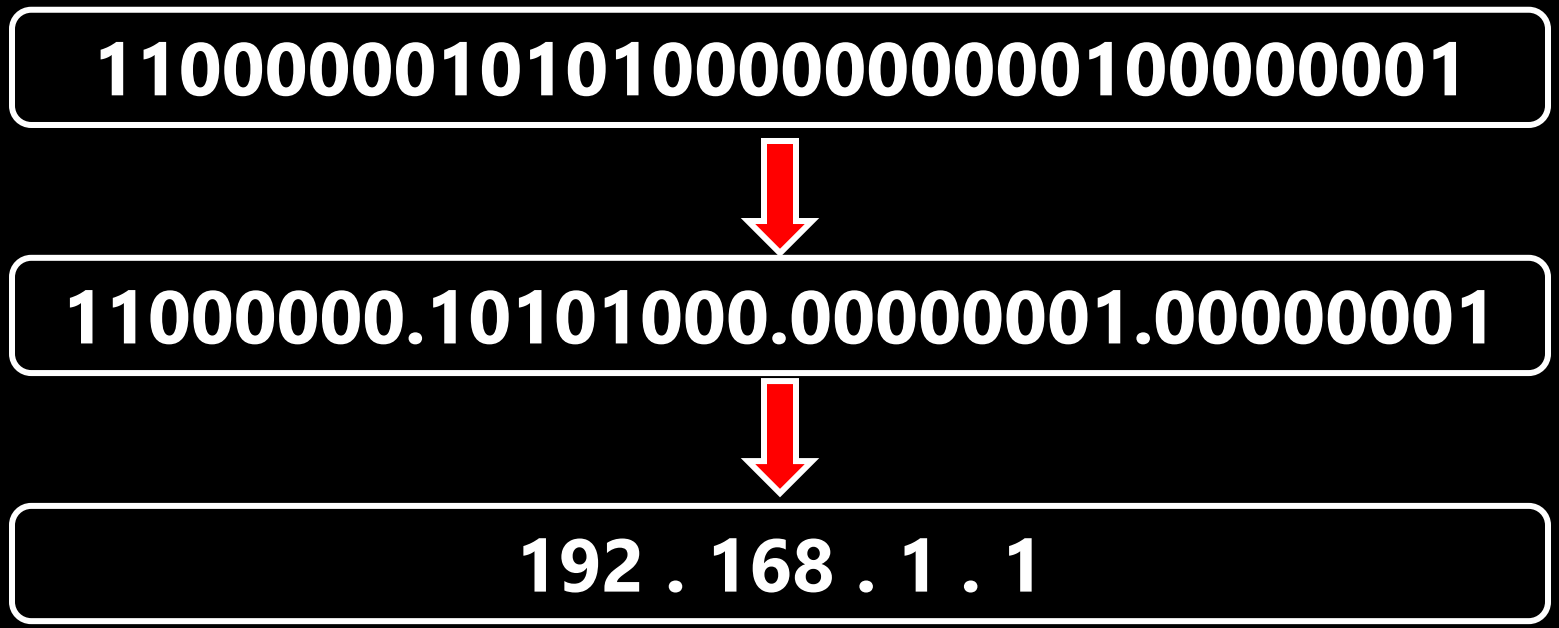
Topics

- IP Address
- Versions

IP Address

- It is an unique address that identifies a device on the Internet or a local network.
- It is a 32 bit address.
- It can be written as dotted decimal or binary notation

Contd...


11000000101010000000000100000001
11000000.10101000.00000001.00000001
192 . 168 . 1 . 1

Versions

- IPv4
- IPv6

IPv4

- It uses 32 bit addressing
- 32 bits are divided into two parts
  - Network portion
  - Host portion

IP Address Types

- **Network address:** Used to identify a specific network
  - Network ID + Zeros
- **Broadcast address:** Used to transmit data to all the systems on a network
  - Network ID + Ones

- **Host address:** used to identify a specific device
  - Network ID + Host-ID

Addressing Modes

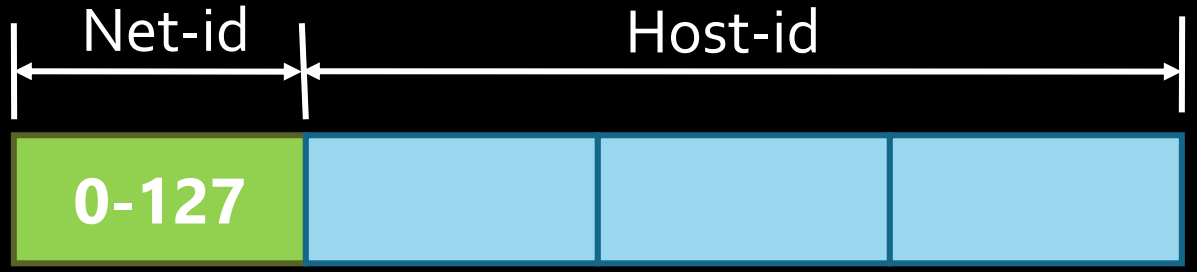
- Classful Addressing
- Classless Addressing

Classful Addressing

- In this the IPv4 address space is divided into five classes
- The classes consists of A, B, C, D and E

Class A

- First bit is ‘0’, remaining 7 bits for net id
- Total no of block $2^7 = 128$
- Host in each block $2^{24} = 1,67,77,216$

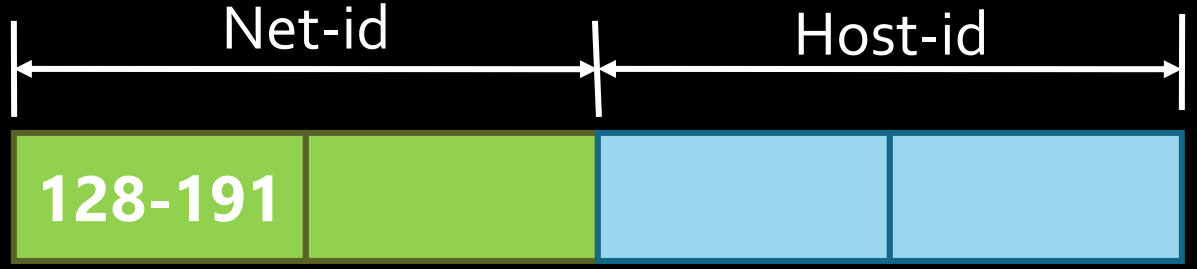


- Total address in Class A

$2^{31} = 214,74,83,648$

Class B

- First two bits are fixed as ‘10’, remaining 14 bits net-id
- Total no of block 2^{14} = 16,384
- Host in each block 2^{16} = 65,536

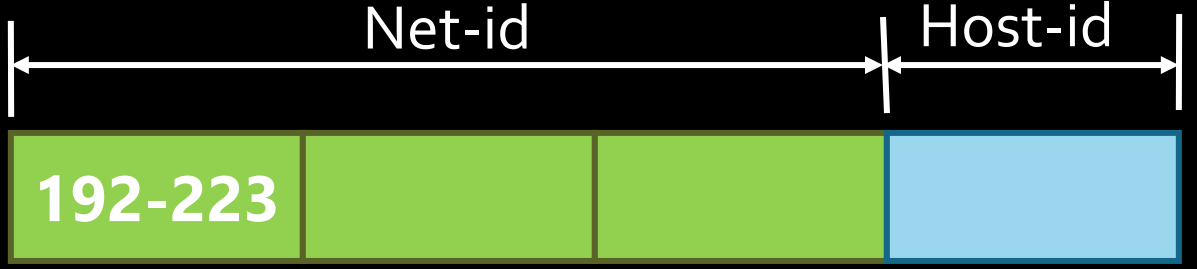


- Total address in Class B

2^{30} = 107,37,41,824

Class C

- First three bits are fixed as ‘110’, remaining 21 bits net-id
- Total no of block 2^{21} = 20,97,152
- Host in each block 2^{8} = 256

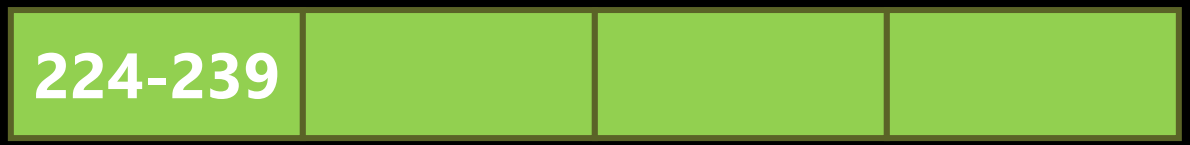


- Total address in Class C

2^{29} = 53,68,70,912

Class D

- Does not divide IPv4 into net-id and host-id
- First four bit of class D is ‘1110’

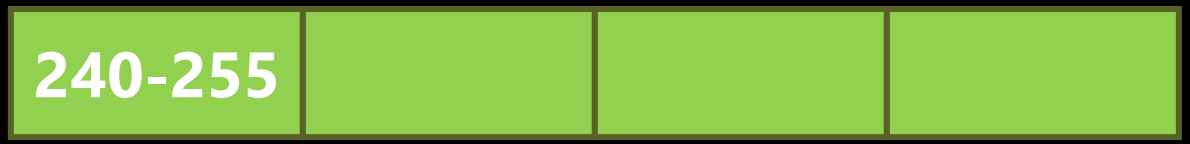


- Total address in Class D

2^{28} = 26,84,35,456

Class E

- Same as Class D use single block
- First four bit of class E is ‘1111’



- Total address in Class E

$2^{28} = 26,84,35,456$

Classless Addressing

- In this based on the need of the organization a block of address is given
- It does not contain any class
- It is implement by the process called as subnetting

IPv6

- Next generation Internet Protocol intended to replace IPv4
- Developed by IEFT
- It is a 128 bit addressing system
- It uses Colon-Hexa representation

ABCD:EF01:2345:6789:ABCD:B201:4523:DD0F

Comparison IPv4 and IPv6

IPv4	IPv6
32 bit address length	128 bit address length
Can generate 4.29×109 address space	Can generate 3.4×1038 address space
Security feature is dependent on application	Inbuilt security feature in the IPv6 protocol
Checksumfield is available	Checksumfield is not available

Unit-1

Section 1.1

Topics

- IP Address
- Versions

Web Programming

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Topics

- Internet Protocols
  - TCP/IP
  - FTP
  - HTTP
  - TelNet
- WAIS

Internet Protocols

- Set of rules for sending and receiving data over internet
- Using IP devices running on different platforms can communicate with each other through Internet.

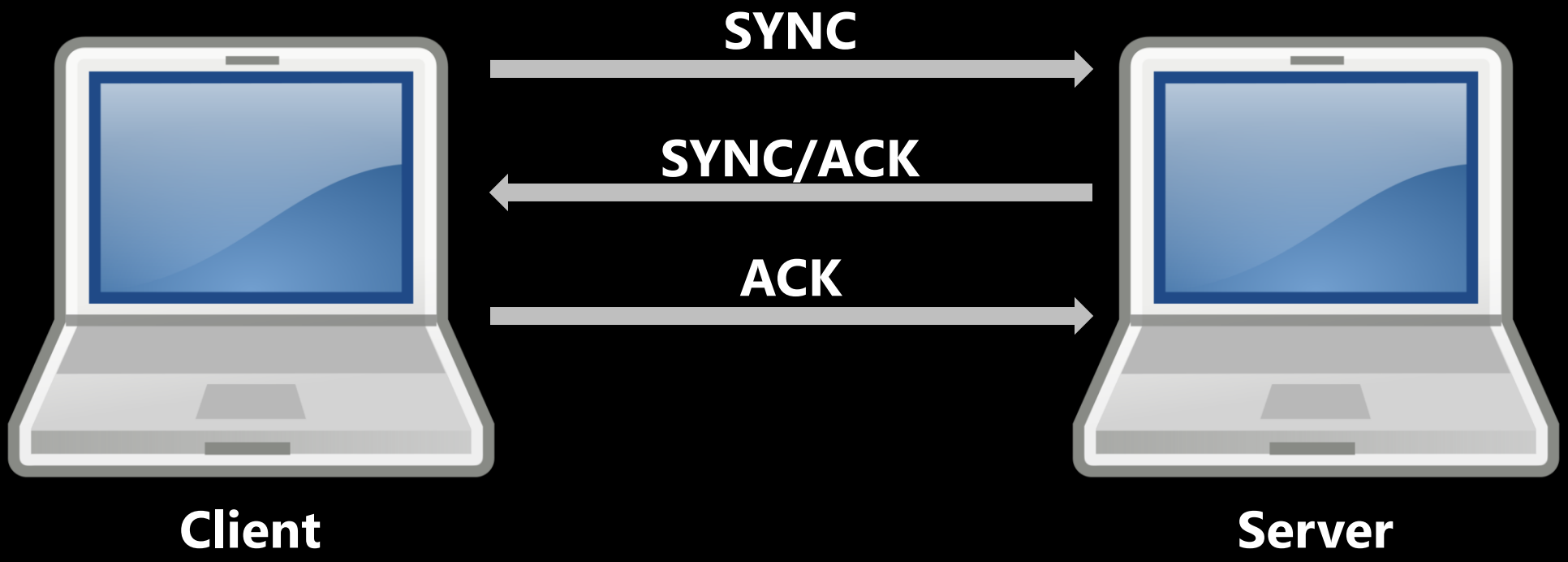
TCP/IP

- TCP – Transmission Control Protocol
- IP – Internet Protocol
- These two protocols are used for interconnection of devices in internet

TCP

- It is a connection oriented protocol
- It first makes a connection between the sender and receiver
- Connection is made before sending data
- It is closed only after the final data is sent

Three-way Handshake



- It allows two way communication
- Data loss is detected and automatically corrected

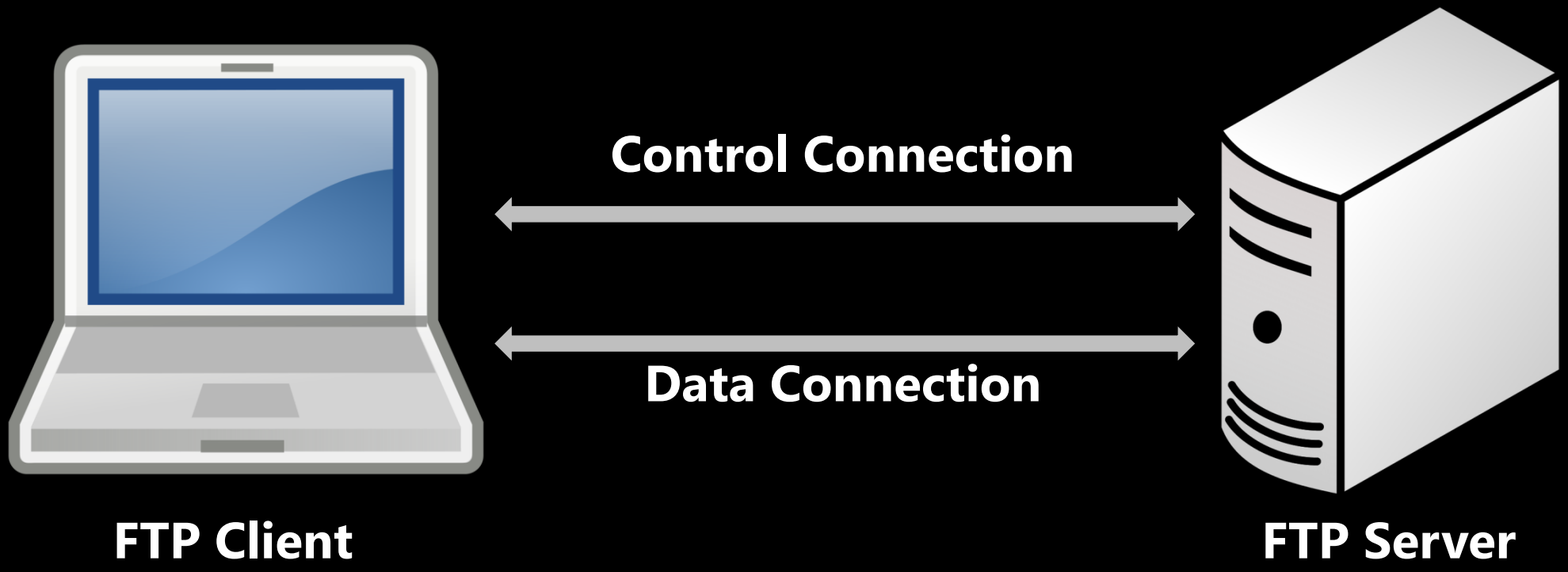
IP

- It is a connectionless protocol
- Data is divided into small packets with IP address
- It is sent over the network to reach destination

FTP – File Transfer Protocol

- It is based on IP
- It is used for data transfer
- An FTP connections allows (File Manager)
  - Upload
  - Download
  - Delete

- FTP uses port number “21” for connection
- FTP uses two connections
  - Control Connection
  - Data Connection

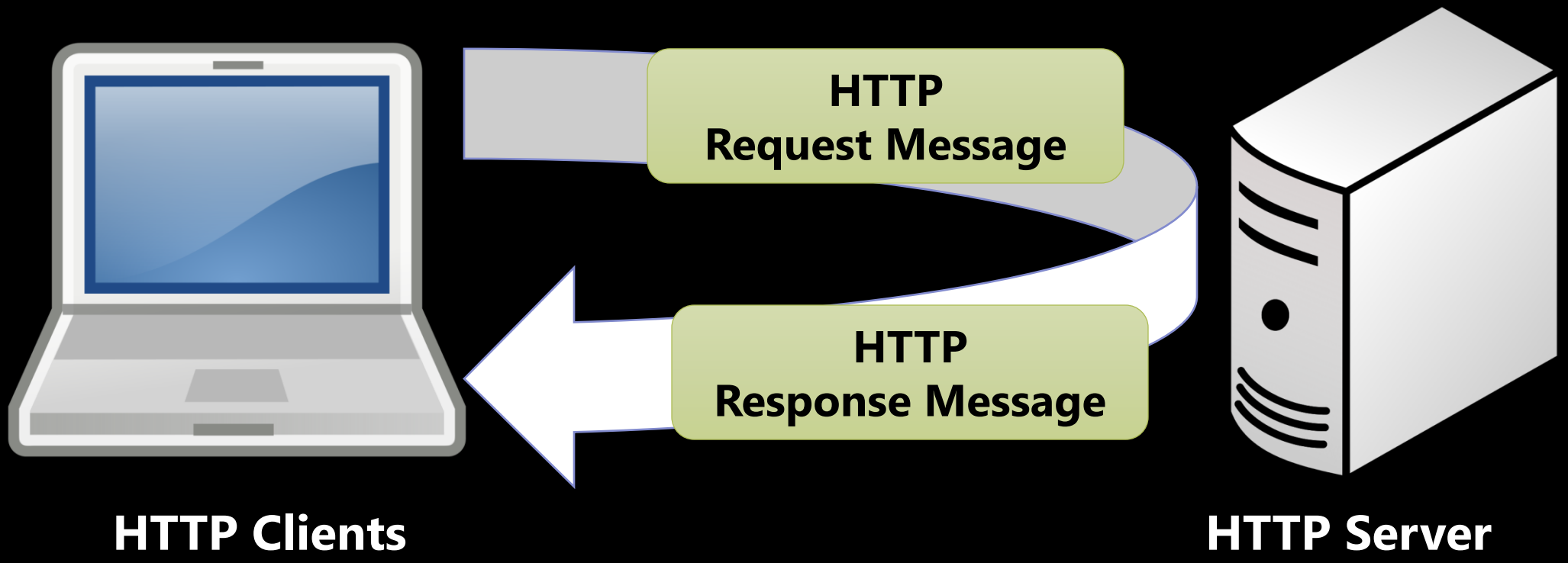

Control Connection
Data Connection
FTP Client
FTP Server

FTP Connection Modes

- **Active Mode**
  - Client opens a port and waits for connection from server
- **Passive Mode**
  - Server opens a port and waits for connection from client

HTTP - Hypertext Transfer Protocol

- It is an application level protocol
- It is a stateless protocol
- It is an asymmetric request-response client-server protocol
- It uses port number “80”

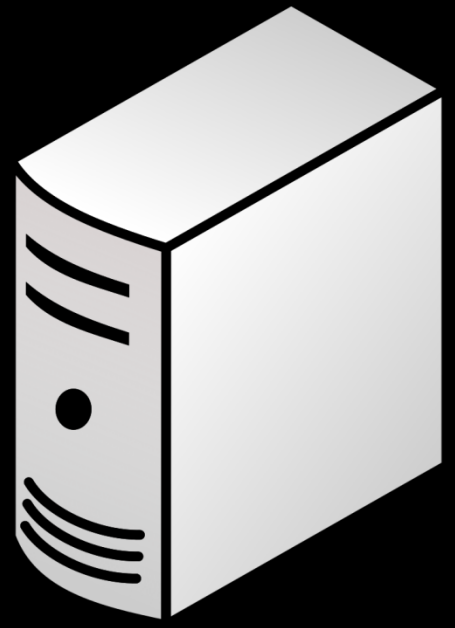

HTTP
Request Message
HTTP
Response Message
HTTP Clients
HTTP Server

TelNet

- It is used to communicate with a remote server
- It uses command line interface
- It uses port number “23” for command operations
- Commands are sent as plain text

TelNet Client

TelNet Server



TelNet protocol

“admin”
“admin123”

WAIS - Wide Area Information Servers

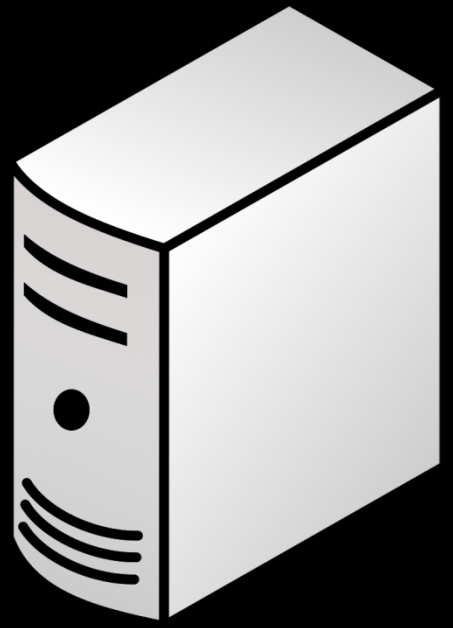
- Uses Z39.50 protocol (Information Retrieval and Library Application)
- Databases consisting of text-based documents
- Query is given by the user to search database
- Server returns the result of the search

USER

WAIS Server

Query

Results



Send Query
Read Results

Process Query
Send Back Results

Unit 1

Section 1.1

Topics

- Internet Protocols
  - TCP/IP
  - FTP
  - HTTP
  - TelNet
- WAIS

Web Programming

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TNPT

Topics

- GPRS
- EDGE
- 2.75G
- 3G
- 4G

Cellular Networks

- 1G cellular network launched by Nippon Telegraph and Telephone in 1979
- 1G is analog cellular network
- In 1983 Motorola launched first mobile phone “DynaTAC”

- Poor sound quality
- Only audio is allowed
- No roaming
- No security

- 2G is based on digital transmission
- Two network systems developed
  - GSM (Global System for Mobile Communication)
  - CDMA (Code Division Multiple Access)

- First GSM network launched in Finland in 1991
- GSM supported SMS
- Mobile phones become compact

GPRS(2.5G)

- General Packet Radio Service
- It is used on the existing GSM network infrastructure
- It is based on Internet Protocol
- Internet access with data rates from 56 kbps up to 115 kbps

- User access services like MMS, WAP and WWW
- It is considered as “always on”
- GPRS cost is based on amount of data sent and not on time spent

Advantages/Disadvantages

- Easy to deploy
- Allow data services on mobile devices
- Charged for amount of data

↓ Slow data rate

↓ Network congestion

EDGE(2.75G)

- Enhanced Data rates for GSM Evolution
- Upgrade of existing GPRS network (1997)
- High data rates compared to GPRS up to 384 kbps

- An EDGE transceiver is added to the existing cell tower
- Software upgrade is done to convert Base Station Controllers

Advantages/Disadvantages

- It has higher speed
- It is more reliable and efficient
- It is cost efficient

↓ It consumes more battery

↓ Hardware needs upgradation

3G

- Commercially introduced in 2001
- It uses UMTS (Universal Mobile Telecommunications System) technology by 3GPP
- Increase data transmission at lower cost

- Non moving device speed 2Mbps
- Moving devices speed 384 kbps
- Applications Video conferencing, streaming and location based services were introduced

Advantages/Disadvantages

- Portable high speed internet access
- Improved communication
- GPS navigation

↓ Cost of device upgradation is high

↓ High power consumption

3.5G/HSPA

- HIGH Speed Packet Access
- Enhanced version of 3G
- Upload speed 5.76Mbps / 200kbps
- Download speed 14Mbps / 500kbps

3.75G/HSPA+

- It is an advancement to HSPA network
- Also called as Evolved High Speed Packet Access
- Upload 11.5Mbps
- Download 42Mbps

4G(LTE)

- 4G launched in 2008
- Provide secure data transmission
- Data is given the highest priority
- 4G is MAGIC

- WiMax and LTE are 4G standards
- LTE is based on UMTS using MIMO
- LTE commercially available in 2009
- 4G uses some of 3G architecture
- LTE uses new architecture

- Download 100Mbps
- Upload 50Mbps

Advantages/Disadvantages

- Less power consumption
- High data transfer
- Highly secured

↓ Expensive infrastructure

↓ Upgrade to new device

5G-Current

- Launched in 2019
- Uses Massive MIMO
- Very low latency
- Implementation of IoT and connected world
- Upload 120Mbps
- Download 1Gbps

Unit 1

Section 1.1

Topics

- GPRS
- EDGE(2.75 G)
- 3G
- 4G

Web Programming

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Lecturer
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Topics

- Introduction to HTML
- Basic HTML Tags
- Installing Server on Computer/Mobile

Introduction to HTML

- Hyper Text Markup Language
- Created by Tim Berners-Lee in 1991
- Officially released in 1995
- It is a markup language
  - Uses tags

HTML Versions

- HTML 1.0 – 1991
- HTML 2.0 – 1995
- HTML 3.0 – 1996
- HTML 3.2 – 1997
- HTML 4.01 – 1999
- HTML5 – 2014

Basic HTML Tags

- HTML tags are used to markup a webpage
- Each opening tag must have a closing tag
- DOCTYPE
- HTML
  - Two main parts
    - Head
    - Body

```
<!DOCTYPE html>
<html>
  <head>
    <title>First Web Page</title>
  </head>
  <body>
    <h1>Welcome</h1>
    <p>This is My First web page</p>
  </body>
</html>
```

- <DOCTYPE>
  - It is the first element on a webpage
  - Tells the browser about the version of the HTML used
  - It must be given in all the HTML documents

- <html>
  - Root element
  - Wraps all the elements

```
<html>
    .....
    .....
</html
```

- <head>
  - Contains information about the page
  - Content not visible on webpage
  - Only title element is required
  - Scripting and styling code
  - title ,meta, script, style

- <body>
  - Only one body element
  - Content of the webpage(view)

Installing Server

- **Computer/Laptop**
  - IIS
  - Apache (preferred)
- **Mobile**
  - HTTP server

Unit 1

Section 1.2

Topics

- Introduction to HTML
- Basic HTML Tags
- Installing Server on Computer/Mobile

Web Programming

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Topics

- **Formatting of Text**
  - **Headers**
  - **Formatting Tags**

Heading

- 6 levels of heading in HTML
- h1 – h6
- h1 – most important heading
- h6 – least important heading
- Used to provide title

<h1> </h1>

Example 1

Formatting Tags

- **Paragraph**
  - Always start on a new line
  - Whitespace added before and after the paragraph

```
<p>     </p>
```

Example 2

- **Bold**
  `<b>  </b>`
- **Italics**
  `<i>  </i>`
- **Underline**
  `<u>  </u>`
- **Strikethrough**
  `<strike>  </strike>`

Example 3

- **TeleTyped**
  - <tt> </tt>
- **Emphasis**
  -
- **Horizontal Line**
  - <hr>
- **Break Line**
  -
- **Strong**
  -

Example 4

- **Preformatted Text**
  - Space and line breaks are preserved
  - Displayed as exactly given in HTML source code

    <pre> </pre>

Example 5

Unit 1

Section 1.2

Topics

- Formatting of Text
  - Headers
  - Formatting Tags