

UNIT-8 The Internet and Internet Services

- ❑ Internet, Internet services, ISP, DNS, IP addressing,
 - ❑ TCP, IP, FTP, HTTP, UDP, Email, URL,
- ❑ IoT, Cloud Computing, E-commerce, E-governance

Internet

- Internet is defined as an Information super Highway, to access information over the web. However, It can be defined in many ways as follows:
- Internet is a world-wide global system of interconnected computer networks.
- Internet uses the standard Internet Protocol (TCP/IP).
- Every computer in internet is identified by a unique IP address.
- IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer location.
- A special computer DNS (Domain Name Server) is used to give name to the IP Address so that user can locate a computer by a name.
- For example, a DNS server will resolve a name **http://www.tutorialspoint.com** to a particular IP address to uniquely identify the computer on which this website is hosted.
- Internet is accessible to every user all over the world.

Internet , Intranet and Extranet

- **1. Internet :**

The network formed by the co-operative interconnection of millions of computers, linked together is called Internet. Internet comprises of :

- **People :** People use and develop the network.
- **Resources :** A collection of resources that can be reached from those networks.
- **A setup for collaboration :** It includes the member of the research and educational committees worldwide.

Internet , Intranet and Extranet Cont..

- **2. Intranet :**

It is an internal private network built within an organization using Internet and World Wide Web standards and products that allows employees of an organization to gain access to corporate information.

- 3. Extranet :**

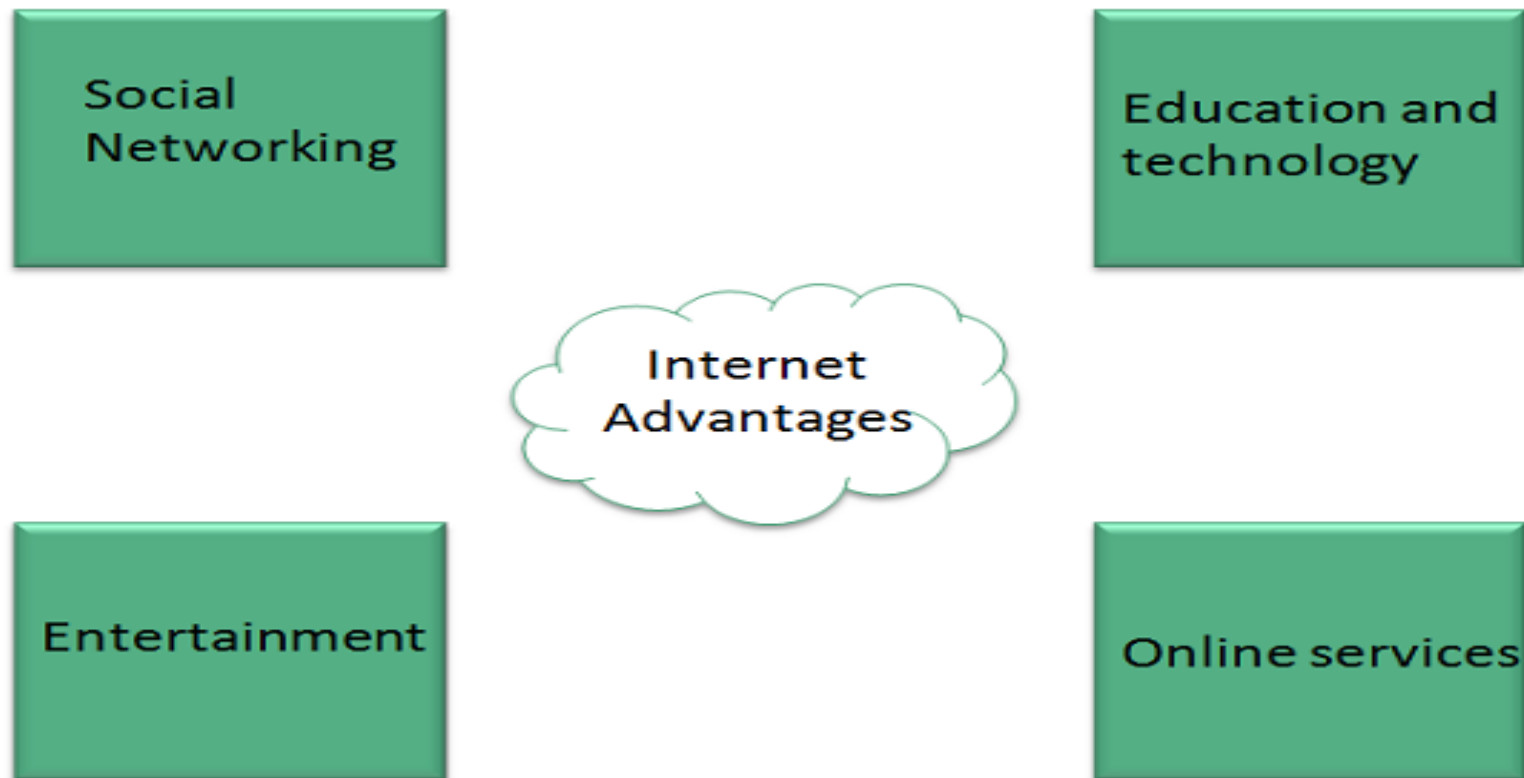
It is the type of network that allows users from outside to access the Intranet of an organization.

Point of difference	Internet	Intranet	Extranet
Accessibility of network	Public	Private	Private
Availability	Global system.	Specific to an organization.	To share information with suppliers and vendors it makes the use of public network.
Coverage	All over the world.	Restricted area upto an organization.	Restricted area upto an organization and some of its stakeholders or so.
Accessibility of content	It is accessible to everyone connected.	It is accessible only to the members of organization.	Accessible only to the members of organization and external members with logins.
No. of computers connected	It is largest in number of connected devices.	The minimal number of devices are connected.	The connected devices are more comparable with Intranet.
Owner	No one.	Single organization.	Single/ Multiple organization.

Purpose of the network	It's purpose is to share information throughout the world.	It's purpose is to share information throughout the organization.	It's purpose is to share information between members and external, members.
Security	It is dependent on the user of the device connected to network.	It is enforced via firewall.	It is enforced via firewall that separates internet and extranet.
Users	General public.	Employees of the organization.	Employees of the organization which are connected.
Policies behind setup	There is no hard and fast rule for policies.	Policies of the organization are imposed.	Policies of the organization are imposed.
Maintenance	It is maintained by ISP.	It is maintained by CIO. HR or communication department of an organization.	It is maintained by CIO. HR or communication department of an organization.
Economical	It is more economical to use.	It is less economical.	It is also less economical.
Relation	It is the network of networks.	It is derived from Internet.	It is derived from Intranet.
Example	What we are normally using is internet.	WIPRO using internal network for its business operations.	DELL and Intel using network for its business operations.

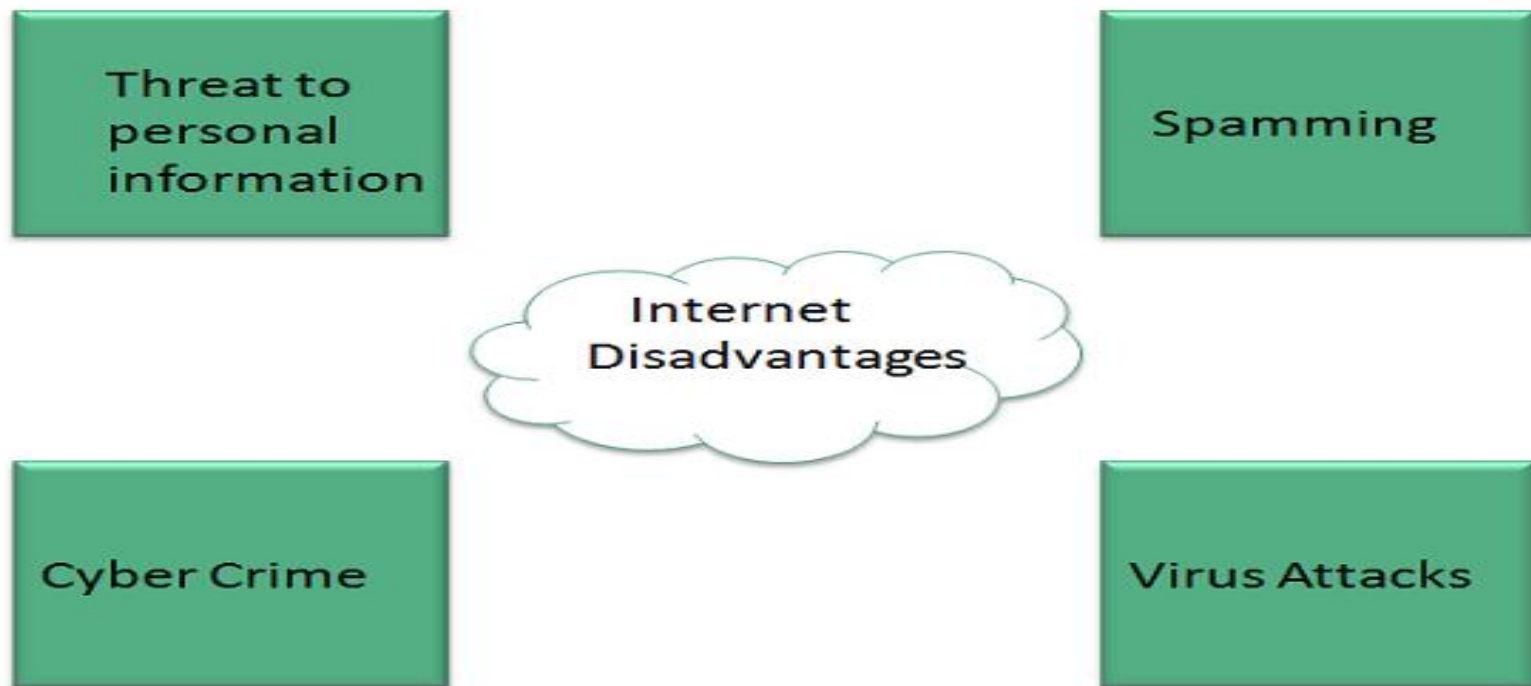
Internet Advantages

- Internet covers almost every aspect of life, one can think of. Here, we will discuss some of the advantages of Internet:



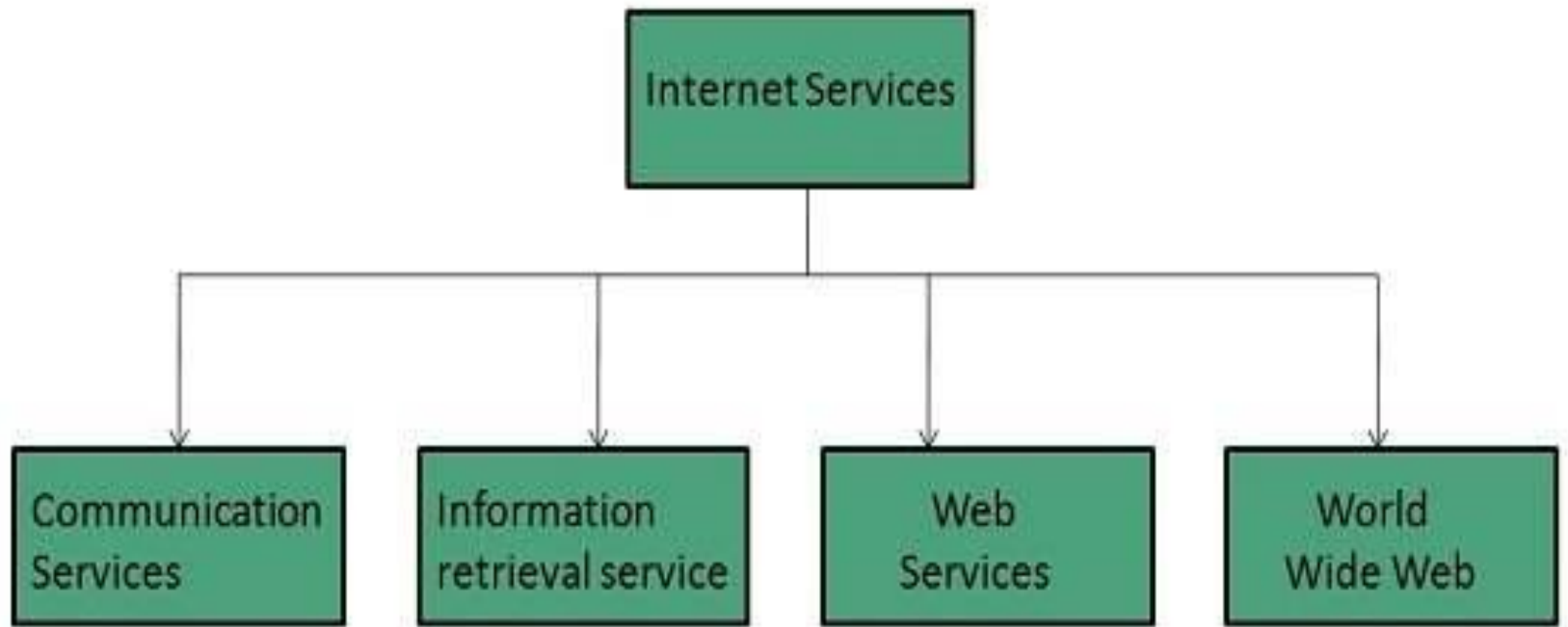
Internet Disadvantages

- However, Internet has proved to be a powerful source of information in almost every field, yet there exists many disadvantages discussed below:



Internet Services

- **Internet Services** allows us to access huge amount of information such as text, graphics, sound and software over the internet. Following diagram shows the four different categories of Internet Services.



Communication Services

- There are various Communication Services available that offer exchange of information with individuals or groups.
- The following table gives a brief introduction to these services:

S.N.	Service Description
1	Electronic Mail Used to send electronic message over the internet.
2	Telnet Used to log on to a remote computer that is attached to internet.
3	Newsgroup Offers a forum for people to discuss topics of common interests.
4	Internet Relay Chat (IRC) Allows the people from all over the world to communicate in real time.
5	Mailing Lists Used to organize group of internet users to share common information through e-mail.
6	Internet Telephony (VoIP) Allows the internet users to talk across internet to any PC equipped to receive the call.
7	Instant Messaging Offers real time chat between individuals and group of people. Eg. Yahoo messenger, MSN messenger

Information Retrieval Services

S.N.	Service Description
1	File Transfer Protocol (FTP) Enable the users to transfer files.
2	Archie It's updated database of public FTP sites and their content. It helps to search a file by its name.
3	Gopher Used to search, retrieve, and display documents on remote sites.
4	Very Easy Rodent Oriented Netwide Index to Computer Achieved (VERONICA) VERONICA is gopher based resource. It allows access to the information resource stored on gopher's servers.

Web Services

- Web services allow exchange of information between applications on the web.
- Using web services, applications can easily interact with each other.
- The web services are offered using concept of **Utility Computing**.

World Wide Web (WWW)

- WWW is also known as W3. It offers a way to access documents spread over the several servers over the internet.
- These documents may contain texts, graphics, audio, video, hyperlinks. The hyperlinks allow the users to navigate between the documents.

Video Conferencing

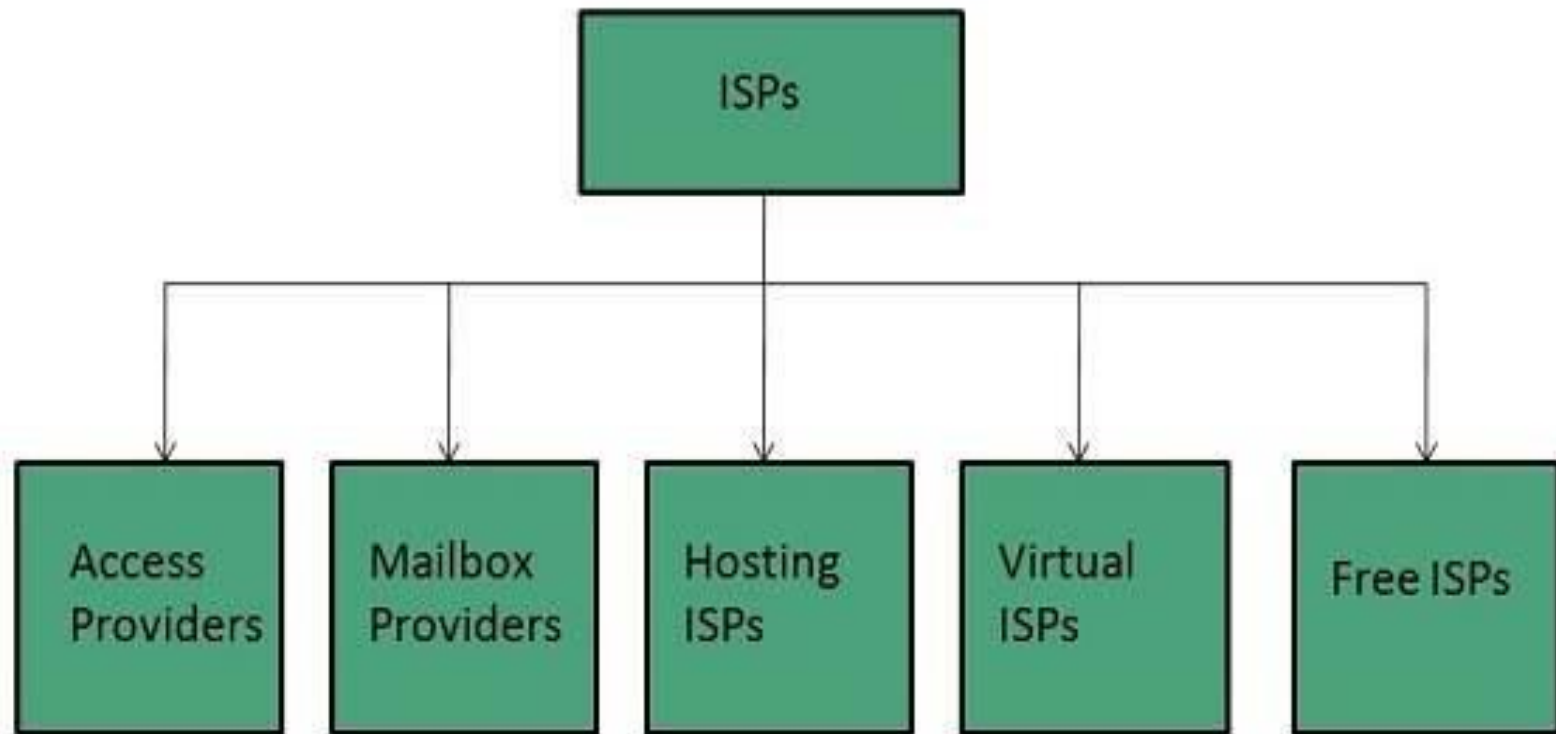
- Video conferencing or Video teleconferencing is a method of communicating by two-way video and audio transmission with help of telecommunication technologies.

Internet Service Providers (ISP)

- An Internet service provider is an organization that provides many different services for accessing, using, or participating in the Internet. Internet service providers can be organized in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned

ISP Types

- ISPs can broadly be classified into six categories as shown in the following diagram:



ISP Types Cont..

Access providers

- They provide access to internet through telephone lines, cable wi-fi or fiber optics.

Mailbox Provider

- Such providers offer mailbox hosting services.

Hosting ISPs

- Hosting ISPs offers e-mail, and other web hosting services such as virtual machines, clouds etc.

Virtual ISPs

- Such ISPs offer internet access via other ISP services.

Free ISPs

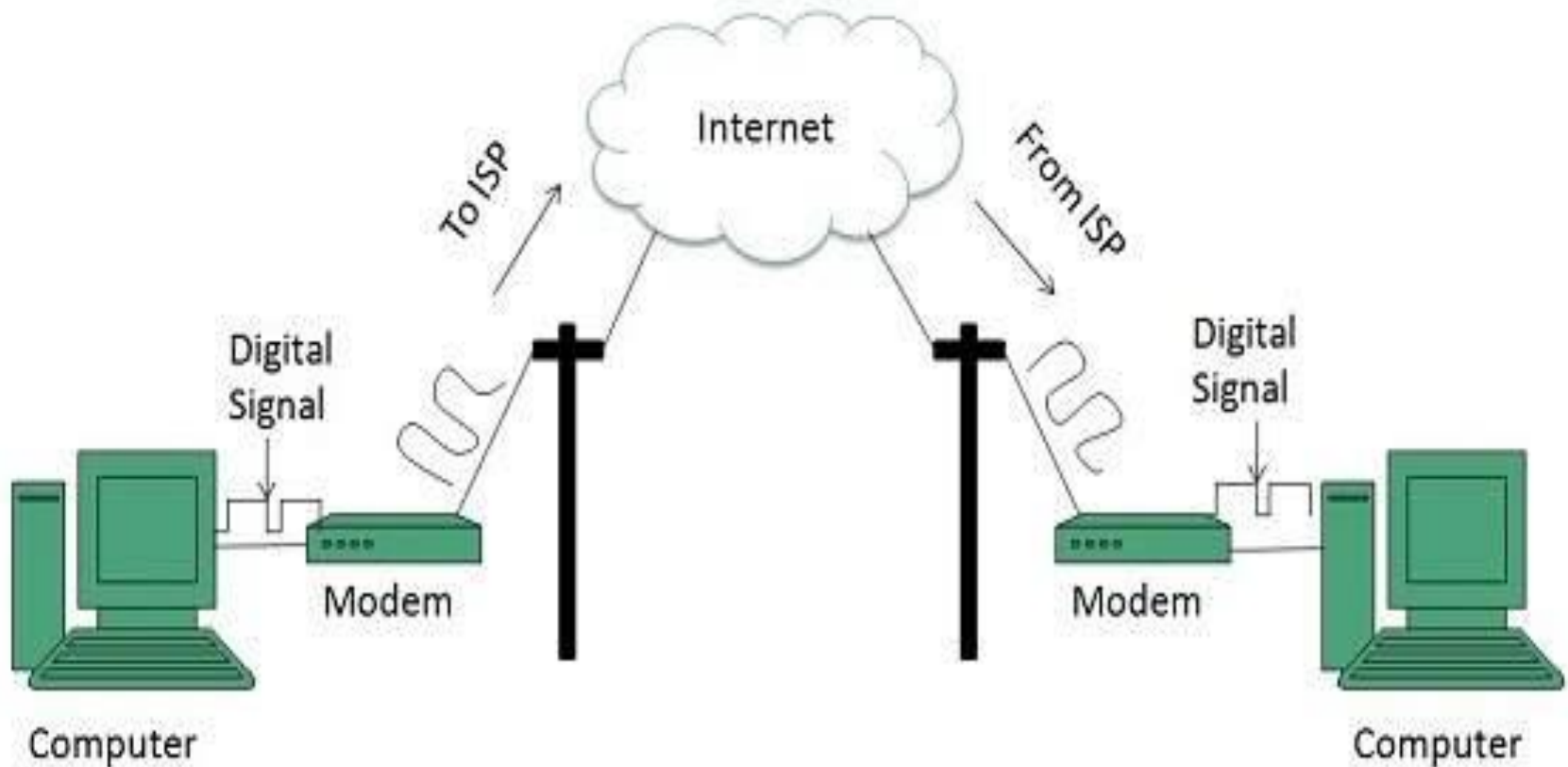
- Free ISPs do not charge for internet services.

Connection Types

- There exist several ways to connect to the internet.
- Following are these connection types available:
- Dial-up Connection
- ISDN
- DSL
- Cable TV Internet connections
- Satellite Internet connections
- Wireless Internet Connections

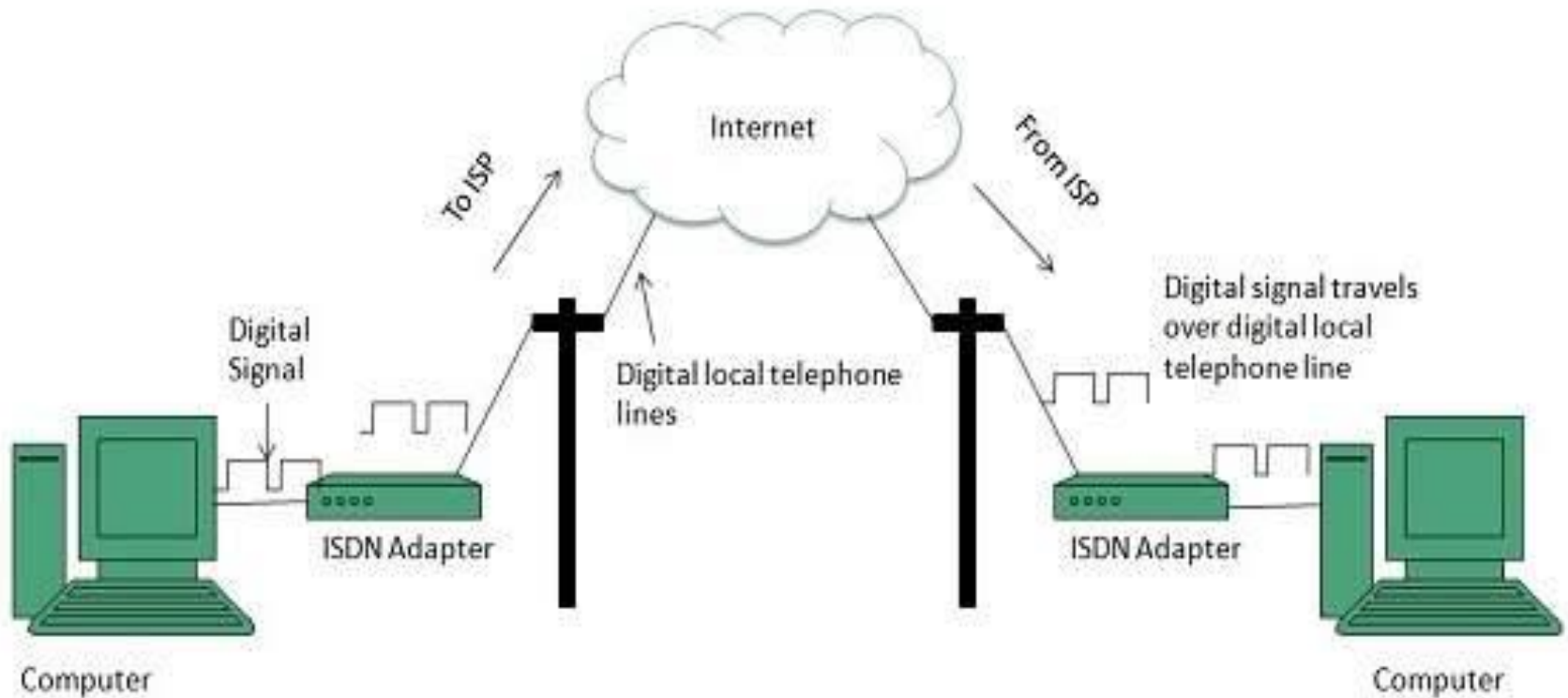
Dial-up Connection

- **Dial-up** connection uses telephone line to connect PC to the internet. It requires a modem to setup dial-up connection.



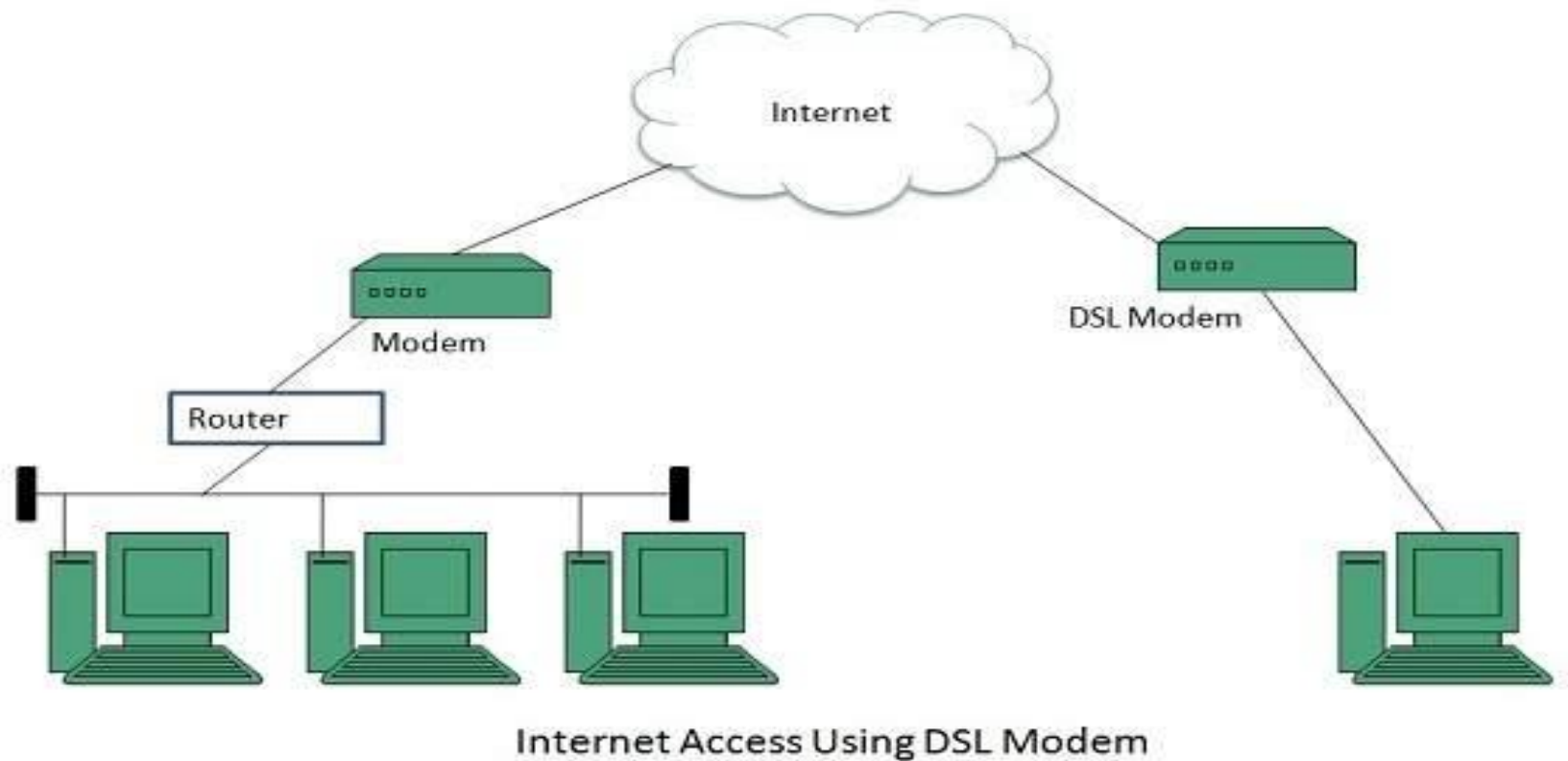
Integrated Services Digital Network(ISDN)

- It establishes the connection using the phone lines which carry digital signals instead of analog signals.



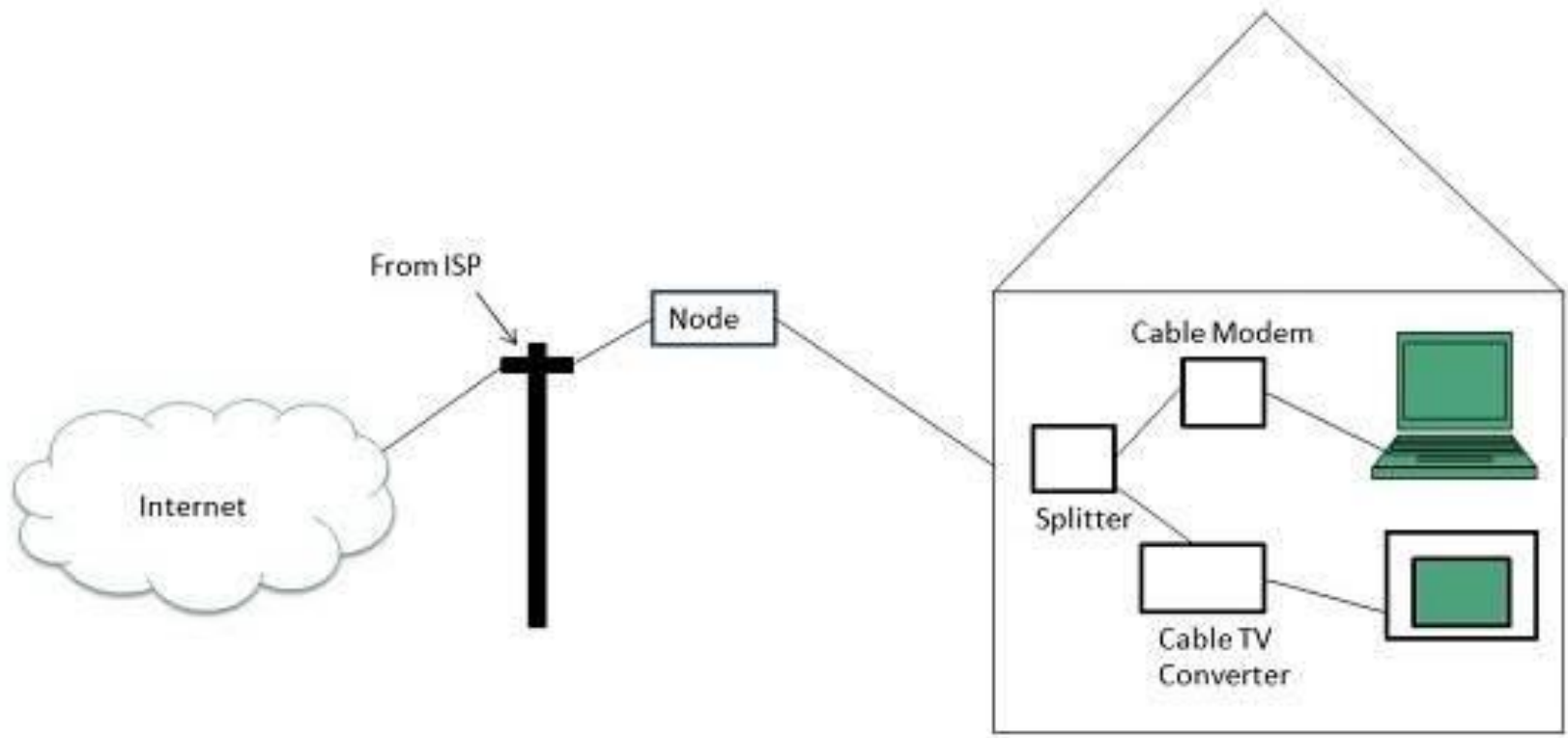
Digital Subscriber Line (DSL)

- It is a form of broadband connection as it provides connection over ordinary telephone lines.



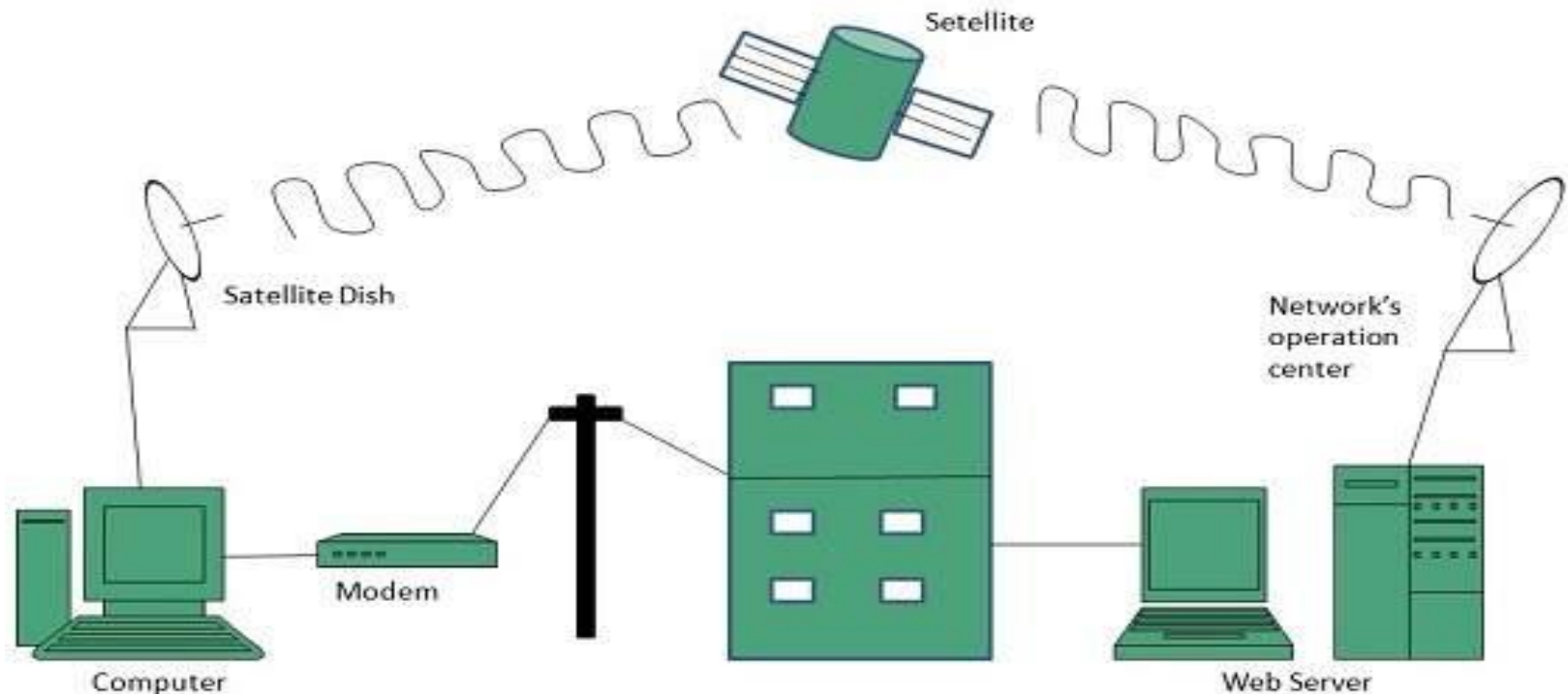
Cable TV Internet Connection

- Cable TV Internet connection is provided through Cable TV lines. It uses coaxial cable which is capable of transferring data at much higher speed than common telephone line.



Satellite Internet Connection

- Satellite Internet connection offers high speed connection to the internet. There are two types of satellite internet connection: one way connection or two way connection.
- In one way connection, we can only download data but if we want to upload, we need a dialup access through ISP over telephone line.
- In two way connection, we can download and upload the data by the satellite. It does not require any dialup connection.



Wireless Internet Connection

- Wireless Internet Connection makes use of radio frequency bands to connect to the internet and offers a very high speed. The wireless internet connection can be obtained by either WiFi or Bluetooth.
- **Key Points:**
- Wi Fi wireless technology is based on IEEE 802.11 standards which allow the electronic device to connect to the internet.
- Bluetooth wireless technology makes use of short-wavelength radio waves and helps to create personal area network (PAN).

Transmission Control Protocol (TCP)

- TCP is a connection oriented protocol and offers end-to-end packet delivery. It acts as back bone for connection. It exhibits the following key features:
- Transmission Control Protocol (TCP) corresponds to the Transport Layer of OSI Model.
- TCP is a reliable and connection oriented protocol.
- TCP offers:
 - **Stream Data Transfer.**
 - **Reliability.**
 - **Efficient Flow Control**
 - **Full-duplex operation.**
 - **Multiplexing.**
- TCP offers connection oriented end-to-end packet delivery.
- TCP ensures reliability by sequencing bytes with a forwarding acknowledgement number that indicates to the destination the next byte the source expect to receive.
- It retransmits the bytes not acknowledged with in specified time period.

TCP Services

- TCP offers following services to the processes at the application layer:
- Stream Delivery Service
- Sending and Receiving Buffers
- Bytes and Segments
- Full Duplex Service
- Connection Oriented Service
- Reliable Service
- Stream Deliver Service
- TCP protocol is stream oriented because it allows the sending process to send data as stream of bytes and the receiving process to obtain data as stream of bytes.

Internet Protocol (IP)

- Internet Protocol is **connectionless** and **unreliable** protocol. It ensures no guarantee of successfully transmission of data.
- In order to make it reliable, it must be paired with reliable protocol such as TCP at the transport layer.
- **Points to remember:**
 - The length of datagram is variable.
 - The Datagram is divided into two parts: **header** and **data**.
 - The length of header is 20 to 60 bytes.
 - The header contains information for routing and delivery of the packet.

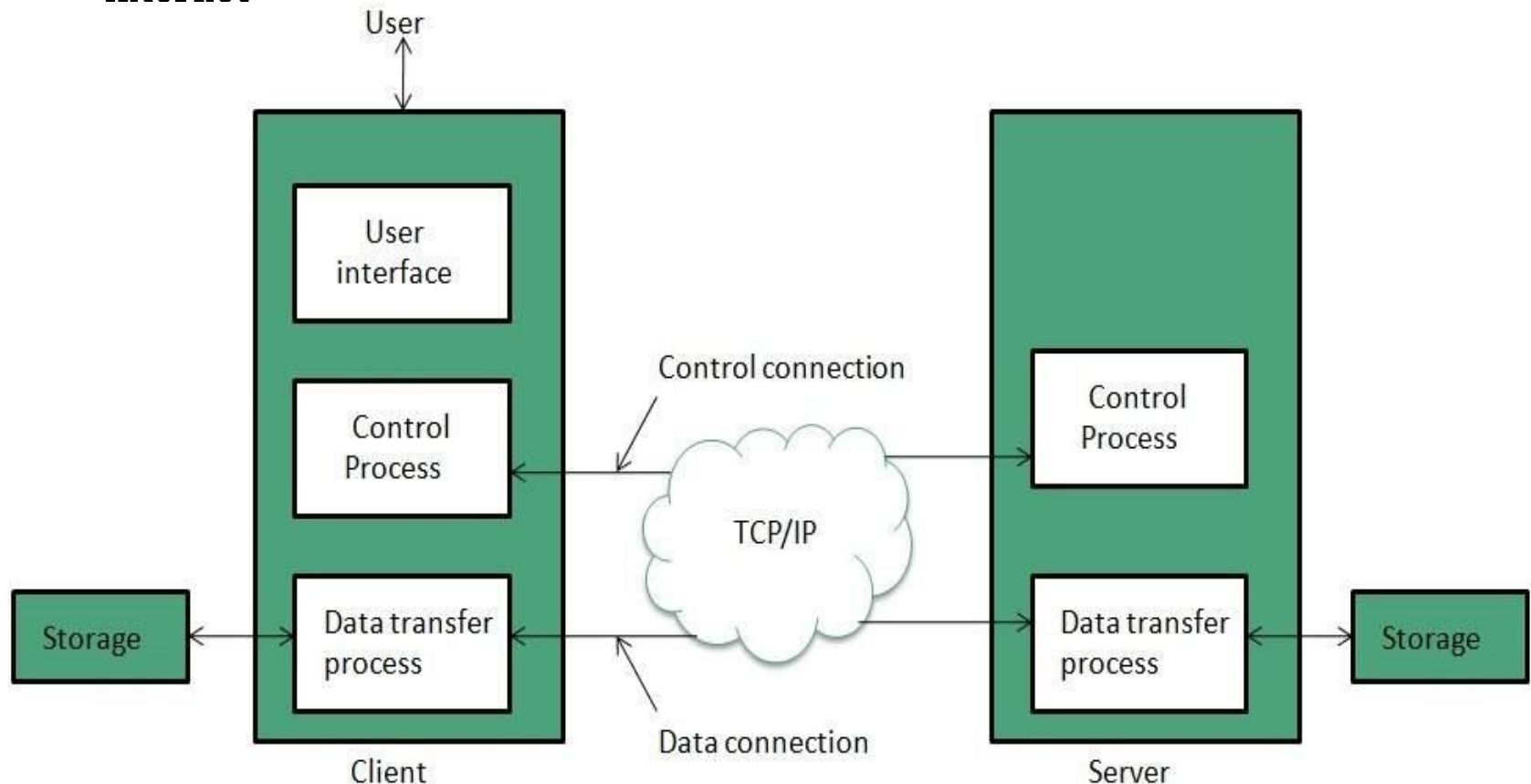
User Datagram Protocol (UDP)

- User Datagram Protocol (**UDP**) – a communications protocol that facilitates the exchange of messages between **computing** devices in a **network**.

Source Port	Destination Port
Length	UDP checksum
Data	

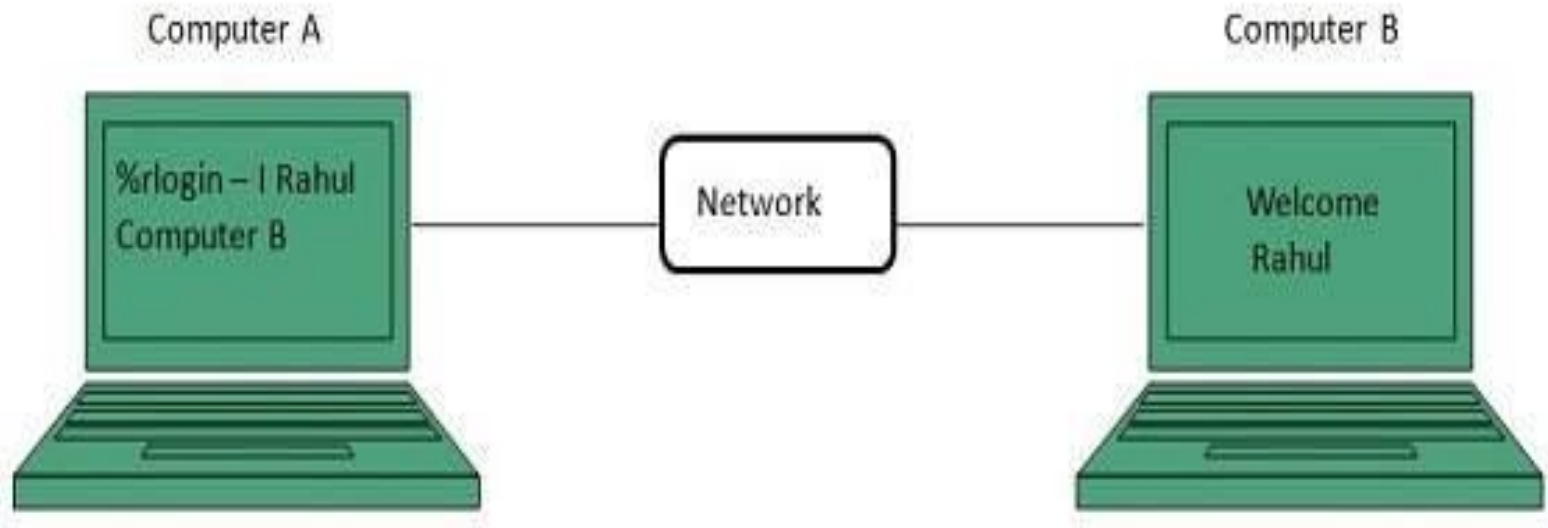
File Transfer Protocol (FTP)

- File transfer protocol (**FTP**) is a set of rules that **computers** follow for the transferring of files from one system to another over the internet



Telnet

- Telnet is a protocol used to log in to remote computer on the internet. There are a number of Telnet clients having user friendly user interface.
- The following diagram shows a person is logged in to computer A, and from there, he remote logged into computer B.



Hyper Text Transfer Protocol (HTTP)

- **HTTP** is a protocol which allows the fetching of resources, such as HTML documents. It is the foundation of any data exchange on the Web and it is a client-server protocol, which means requests are initiated by the recipient, usually the Web browser



Email

- Email is a service which allows us to send the message in electronic mode over the internet.
- It offers an efficient, inexpensive and real time mean of distributing information among people.
- **E-Mail Address**
- Each user of email is assigned a unique name for his email account. This name is known as E-mail address. Different users can send and receive messages according to the e-mail address.
- E-mail is generally of the form `username@domainname`. For example, `webmaster@tutorialspoint.com` is an e-mail address where `webmaster` is username and `tutorialspoint.com` is domain name.
- The username and the domain name are separated by @ (**at**) symbol.
- E-mail addresses are not case sensitive.
- Spaces are not allowed in e-mail address.

E-mail Message Components

- E-mail message comprises of different components: E-mail Header, Greeting, Text, and Signature.

E-mail Header

- The first five lines of an E-mail message is called E-mail header.
- The header part comprises of following fields:
- From
- Date
- To
- Subject
- CC
- BCC

E-mail Cont..

Advantages

- **Reliable**
- **Convenience**
- **Speed**
- **Inexpensive**
- **Printable**
- **Global**
- **Generality**

Disadvantages:

- **Forgery**
- **Overload**
- **Misdirection**
- **Junk**
- **No response**

E-mail Protocol

- E-mail Protocols are set of rules that help the client to properly transmit the information to or from the mail server.

SMTP

- **SMTP** stands for **Simple Mail Transfer Protocol**. It was first proposed in 1982. It is a standard protocol used for sending e-mail efficiently and reliably over the internet.
- **Key Points:**
 - SMTP is application level protocol.
 - SMTP is connection oriented protocol.
 - SMTP is text based protocol.
 - It handles exchange of messages between e-mail servers over TCP/IP network.
 - Apart from transferring e-mail, SMTP also provides notification regarding incoming mail.
 - When you send e-mail, your e-mail client sends it to your e-mail server which further contacts the recipient mail server using SMTP client.
 - These SMTP commands specify the sender's and receiver's e-mail address, along with the message to be send.
 - The exchange of commands between servers is carried out without intervention of any user.
 - In case, message cannot be delivered, an error report is sent to the sender which makes SMTP a reliable protocol.

E-mail Protocol Cont..

- **IMAP** stands for **Internet Message Access Protocol**. It was first proposed in 1986.
- **Key Points:**
- IMAP allows the client program to manipulate the e-mail message on the server without downloading them on the local computer.
- The e-mail is hold and maintained by the remote server.
- It enables us to take any action such as downloading, delete the mail without reading the mail.It enables us to create, manipulate and delete remote message folders called mail boxes.
- IMAP enables the users to search the e-mails.
- It allows concurrent access to multiple mailboxes on multiple mail servers.

E-mail System

- E-mail system comprises of the following three components:
- Mailer
- Mail Server
- Mailbox
- Mailer
- It is also called **mail program, mail application** or **mail client**. It allows us to manage, read and compose e-mail.
- Mail Server
- The function of mail server is to receive, store and deliver the email. It is must for mail servers to be Running all the time because if it crashes or is down, email can be lost.
- Mailboxes
- Mailbox is generally a folder that contains emails and information about them.

Domain Name System

- **Domain Name System** helps to resolve the host name to an address. It uses a hierarchical naming scheme and distributed database of IP addresses and associated names

IP Address

- IP address is a unique logical address assigned to a machine over the network. An IP address exhibits the following properties:
- IP address is the unique address assigned to each host present on Internet.
- IP address is 32 bits (4 bytes) long.
- IP address consists of two components: **network component** and **host component**.
- Each of the 4 bytes is represented by a number from 0 to 255, separated with dots. For example 137.170.4.124
- IP address is 32-bit number while on the other hand domain names are easy to remember names.

Uniform Resource Locator (URL)

- A **URL (Uniform Resource Locator)** is a unique **identifier** used to locate a **resource** on the Internet.
- It is also referred to as a web address.
- URLs consist of multiple parts -- including a protocol and domain name -- that tell a web browser how and where to retrieve a **resource**.
- An **example** of a **URL** is <https://www.computerhope.com>, which is the **URL** for the Computer Hope website

Domain Name System Cont..

- The following table shows the **Generic Top-Level Domain** names:

Domain Name	Meaning
Com	Commercial business
Edu	Education
Gov	U.S. government agency
Int	International entity
Mil	U.S. military
Net	Networking organization
Org	Non profit organization

Internet of Things (IOT)

- The Internet of things describes the network of physical objects— "things"— that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet.
- IoT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service.
- IoT systems have applications across industries through their unique flexibility and ability to be suitable in any environment.
- They enhance data collection, automation, operations, and much more through smart devices and powerful enabling technology.
- IoT systems allow users to achieve deeper automation, analysis, and integration within a system. They improve the reach of these areas and their accuracy.
- IoT utilizes existing and emerging technology for sensing, networking, and robotics.

IoT — Key Features

- **AI** — IoT essentially makes virtually anything “smart”, meaning it enhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks.
- **Connectivity** — New enabling technologies for networking, and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT creates these small networks between its system devices.
- **Sensors** — IoT loses its distinction without sensors. They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration.
- **Active Engagement** — Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.
- **Small Devices** — Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.

IoT — Advantages

- **Improved Customer Engagement** — Current analytics suffer from blind-spots and significant flaws in accuracy; and as noted, engagement remains passive. IoT completely transforms this to achieve richer and more effective engagement with audiences.
- **Technology Optimization** — The same technologies and data which improve the customer experience also improve device use, and aid in more potent improvements to technology. IoT unlocks a world of critical functional and field data.
- **Reduced Waste** — IoT makes areas of improvement clear. Current analytics give us superficial insight, but IoT provides real-world information leading to more effective management of resources.
- **Enhanced Data Collection** — Modern data collection suffers from its limitations and its design for passive use. IoT breaks it out of those spaces, and places it exactly where humans really want to go to analyze our world. It allows an accurate picture of everything.

IoT — Disadvantages

- **Security** — IoT creates an ecosystem of constantly connected devices communicating over networks. The system offers little control despite any security measures. This leaves users exposed to various kinds of attackers.
- **Privacy** — The sophistication of IoT provides substantial personal data in extreme detail without the user's active participation.
- **Complexity** — Some find IoT systems complicated in terms of design, deployment, and maintenance given their use of multiple technologies and a large set of new enabling technologies.
- **Flexibility** — Many are concerned about the flexibility of an IoT system to integrate easily with another. They worry about finding themselves with several conflicting or locked systems.
- **Compliance** — IoT, like any other technology in the realm of business, must comply with regulations. Its complexity makes the issue of compliance seem incredibly challenging when many consider standard software compliance a battle.

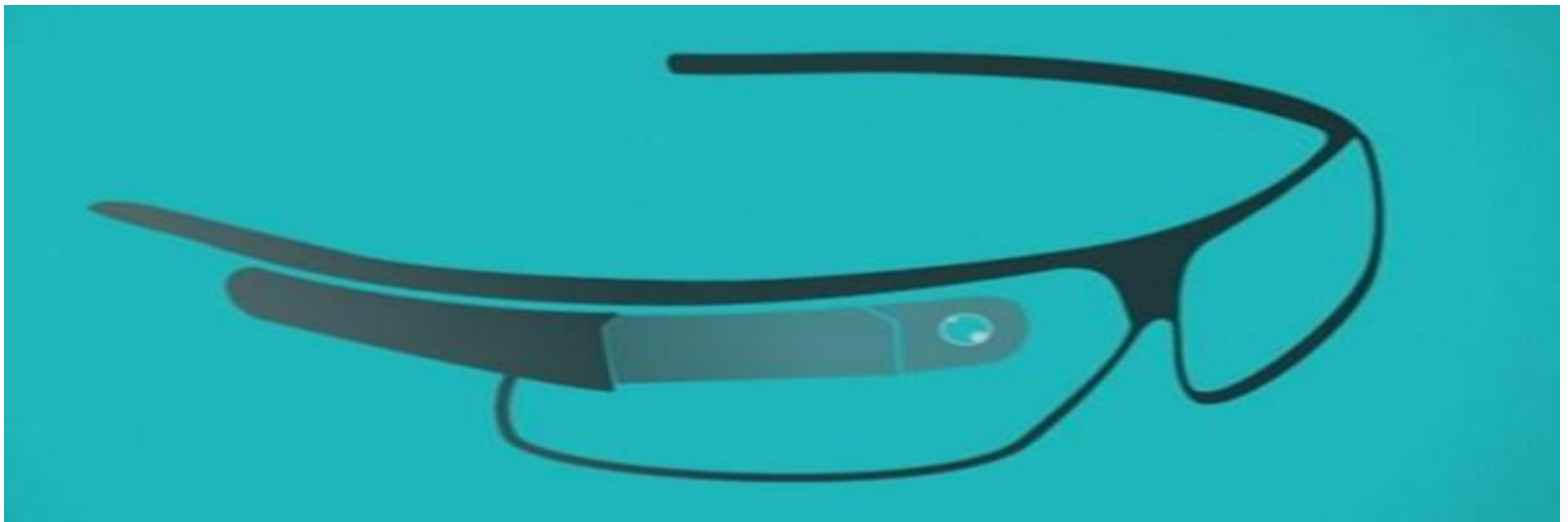
Wearable Electronics/Computing

- Wearable electronic devices are small devices worn on the head, neck, arms, torso, and feet.
- *smartwatches not only help us stay connected, but as a part of an IoT system, they allow access needed for improved productivity.*



Wearable Electronics/Computing Cont..

- Current smart wearable devices include –
 - **Head** – Helmets, glasses
 - **Neck** – Jewelry, collars
 - **Arm** – Watches, wristbands, rings
 - **Torso** – Clothing, backpacks
 - **Feet** – Socks, shoes
- Smart glasses help us enjoy more of the media and services we value, and when part of an IoT system, they allow a new approach to productivity.*



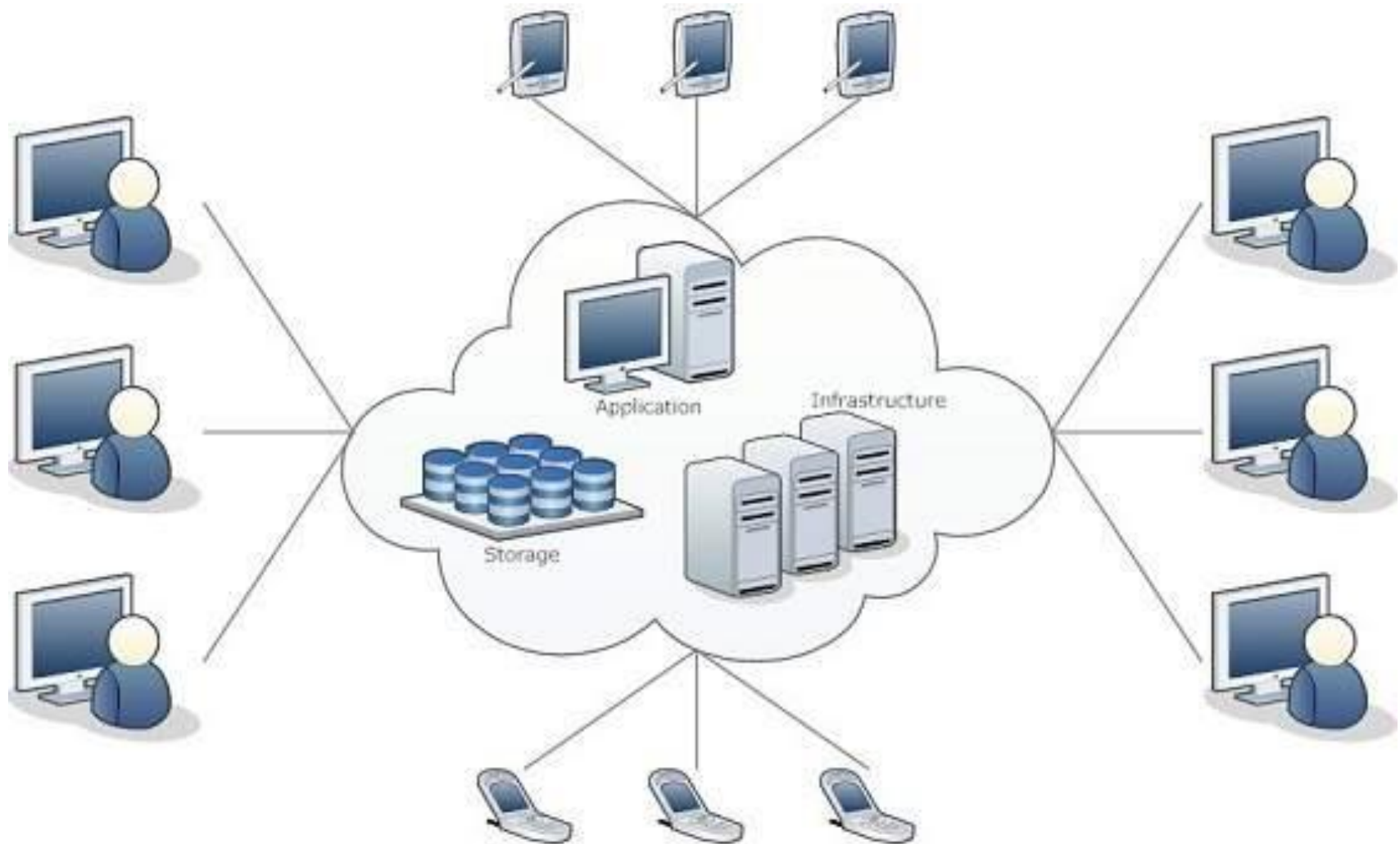
Standard Devices

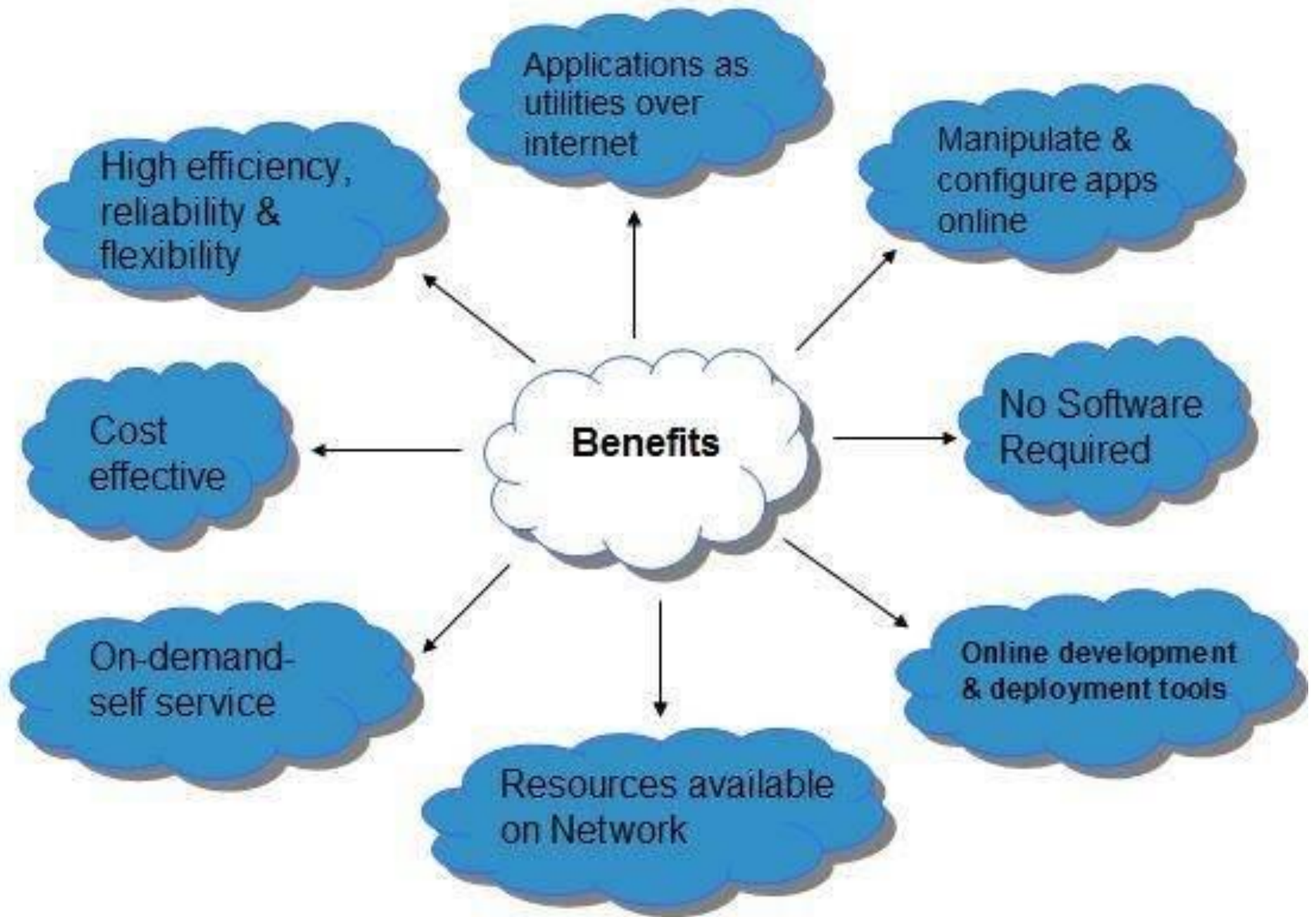
- The desktop, tablet, and cellphone remain integral parts of IoT as the command center and remotes.
- The **desktop** provides the user with the highest level of control over the system and its settings.
- The **tablet** provides access to the key features of the system in a way resembling the desktop, and also acts as a remote.
- The **cellphone** allows some essential settings modification and also provides remote functionality.
- Other key connected devices include standard network devices like **routers** and **switches**.

What is Cloud Computing?

- Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet
- Simply put, cloud computing is **the delivery of computing services**—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale.
- **Cloud computing** is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software. ... As long as an electronic device has access to the web, it has access to the data and the software programs to run it.

Cloud Computing Cont..

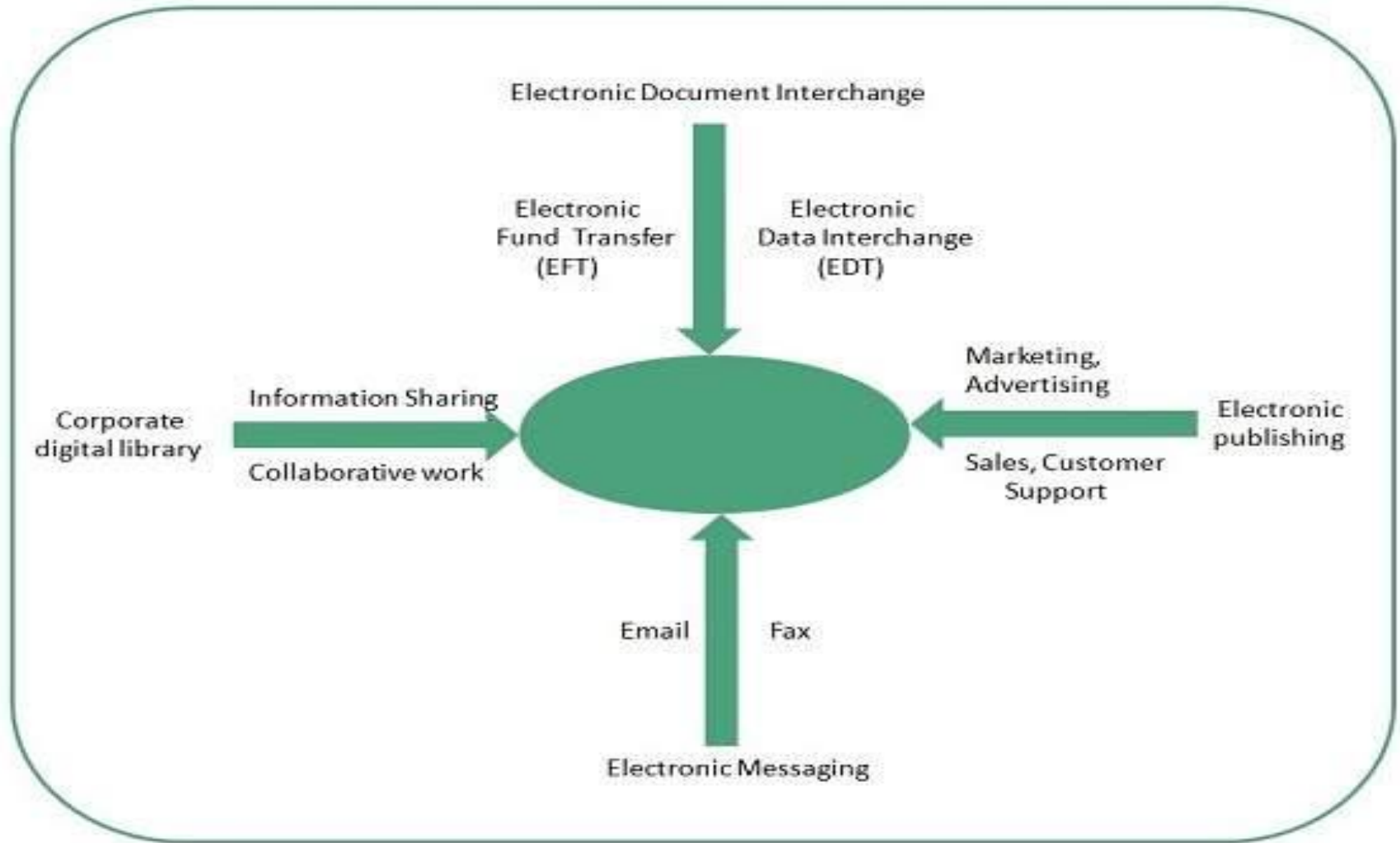




E-commerce

- **E-commerce** is the activity of electronically buying or selling of products on online services or over the Internet
- **E-Commerce** or **Electronics Commerce** is a methodology of modern business which addresses the need of business organizations, vendors and customers to reduce cost and improve the quality of goods and services while increasing the speed of delivery.
- E-commerce refers to paperless exchange of business information using following ways.
- Electronic Data Exchange (EDI)
- Electronic Mail (e-mail)
- Electronic Bulletin Boards
- Electronic Fund Transfer (EFT)
- Other Network-based technologies

E-commerce Cont..



E-commerce Features

- **Non-Cash Payment**
- E-Commerce enables use of credit cards, debit cards, smart cards, electronic fund transfer via bank's website and other modes of electronics payment.
- **24x7 Service availability**
- E-commerce automates business of enterprises and services provided by them to customers are available anytime, anywhere. Here 24x7 refers to 24 hours of each seven days of a week.
- **Advertising / Marketing**
- E-commerce increases the reach of advertising of products and services of businesses. It helps in better marketing management of products / services.
- **Improved Sales**
- Using E-Commerce, orders for the products can be generated anytime, anywhere without any human intervention. By this way, dependencies to buy a product reduce at large and sales increases.
- **Support**
- E-Commerce provides various ways to provide pre sales and post sales assistance to provide better services to customers.

Types of eCommerce



Business to
business



Business to
customer



Consumer to
business



Customer to
customer

E-governance

- **Electronic governance** is application of Information Electronics and Communication Technology in running an effective **governance** system for people.
- Communication refers to sharing of information between parties like common people, government, business, etc.
- **Definition:** E-governance, expands to **electronic governance**, is the integration of **Information and Communication Technology (ICT)** in all the processes, with the aim of enhancing government ability to address the needs of the general public. The basic purpose of e-governance is to simplify processes for all, i.e. government, citizens, businesses, etc. at National, State and local levels.

Benefits of E-governance

- Reduced corruption
- High transparency
- Increased convenience
- Growth in GDP
- Direct participation of constituents
- Reduction in overall cost.
- Expanded reach of government
- Through e-governance, the government plans to **raise the coverage and quality of information and services provided to the general public**, by the use of ICT in an easy, economical and effective manner.

Types of Interactions in E-Governance

- **G2G (Government to Government):** When the exchange of information and services is within the periphery of the government, is termed as G2G interaction. This can be both horizontal, i.e. among various government entities and vertical, i.e. between national, state and local government entities and within different levels of the entity.
- **G2C (Government to Citizen):** The interaction amidst the government and general public is G2C interaction. Here an interface is set up between government and citizens, which enables citizens to get access to wide variety of public services. The citizens has the freedom to share their views and grievances on government policies anytime, anywhere.
- **G2B (Government to Business):** In this case, the e-governance helps the business class to interact with the government seamlessly. It aims at eliminating red-tapism, saving time, cost and establish transparency in the business environment, while interacting with government.
- **G2E (Government to Employees):** The government of any country is the biggest employer and so it also deals with employees on a regular basis, as other employers do. ICT helps in making the interaction between government and employees fast and efficient, along with raising their level of satisfaction by providing perquisites and add-on benefits.



Thank you!