Class   :II B.Sc (Maths) and II B.Sc (Stat)

Subject   :INTERNET TECHNOLOGY

**Subject Code :CNCS44**

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.
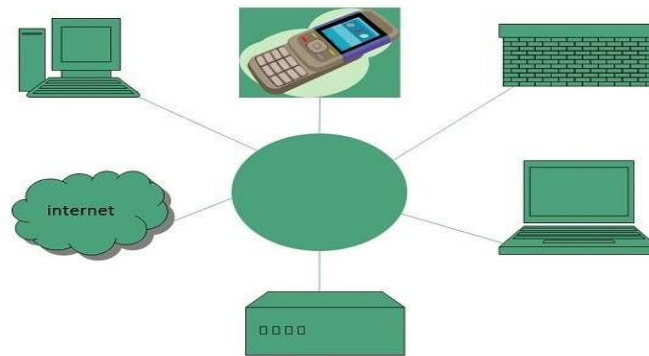
EVOLUTION

The concept of Internet was originated in 1969 and has undergone several technological & Infrastructural changes as discussed below:
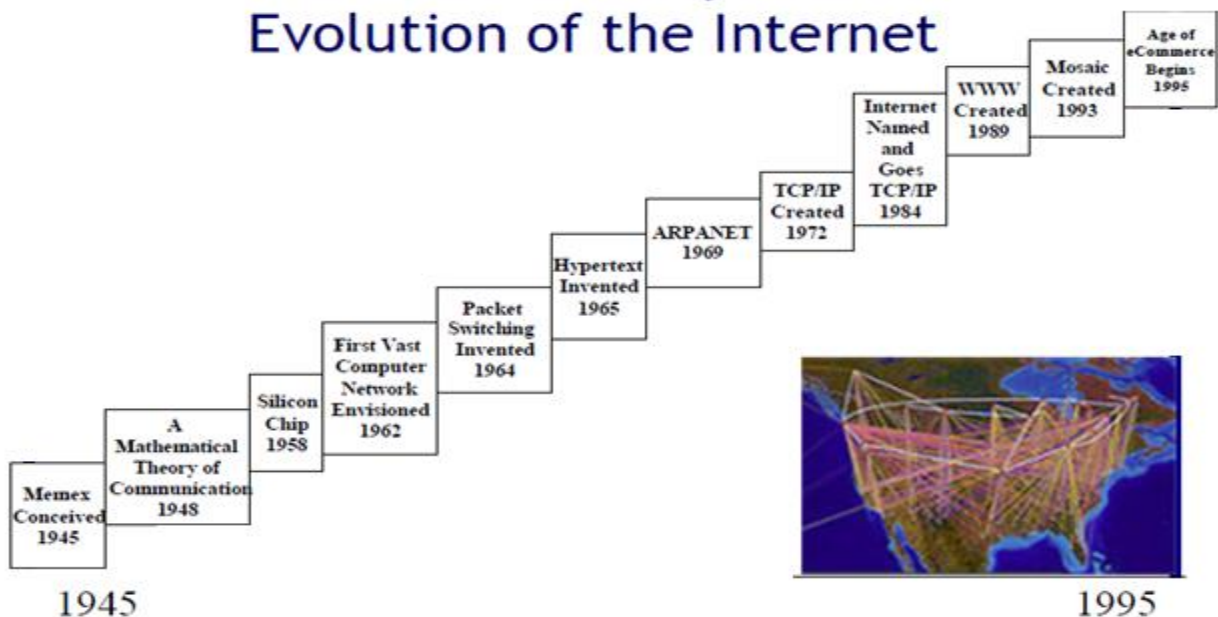
- The origin of Internet devised from the concept of **Advanced Research Project Agency Network (ARPANET).**

- **ARPANET** was developed by United States Department of Defense.

- Basic purpose of ARPANET was to provide communication among the various bodies of government.

- Initially, there were only four nodes, formally called **Hosts.**

- In 1972, the **ARPANET** spread over the globe with 23 nodes located at different countries and thus became known as **Internet.**

- By the time, with invention of new technologies such as TCP/IP protocols, DNS, WWW, browsers, scripting languages etc.,Internet provided a medium to publish and access information over the web.

BRIEF HISTORY OF THE INTERNET

- 1968 - DARPA (Defense Advanced Research Projects Agency)
- contracts with BBN (Bolt, Beranek & Newman) to create
- ARPAnet
- 1970 - First five nodes:
- UCLA
- Stanford
- UC Santa Barbara
- U of Utah, and
- BBN
- 1974 - TCP specification by Vint Cerf
- 1984 – On January 1, the Internet with its 1000 hosts
- converts en masse to using TCP/IP for its messaging

A Brief Summary of the Evolution of the Internet

Age of eCommerce Begins 1995

Mosaic Created 1993

WWW Created 1989

Internet Named and Goes TCP/IP 1984

TCP/IP Created 1972

ARPANET 1969

Hypertext Invented 1965

Packet Switching Invented 1964

First Vast Computer Network Envisioned 1962

Silicon Chip 1958

A Mathematical Theory of Communication 1948

Memex Conceived 1945

1945   1995

INTERNET SERVICES

Internet Services enables us to access a tremendous amount of information such as text, graphics, sound, and software over the internet.

Some of the internet services are as follows:

1.Communication Services:

There are multiple Communication Services available that allow the transfer of information with individuals or groups, some of them are: Electronic Mail; for sending an electronic message / information across the internet, Telnet; for remote login and more, Internet Relay Chat; real - time communication all over the world.

2. Information Retrieval Services:

There exist numerous Information retrieval services allowing easy access to information present on the internet for example the File Transfer Protocol (FTP) for transferring the files.

3. Web Services: allows the transfer of information between applications on the web.

4. World Wide Web (WWW): offers a way to reach documents (texts, graphics, audio, video, hyperlinks, etc) spread over several servers over the internet.

5. Video Conferencing: for video and audio transmission with help of telecommunication technologies.

Anatomy of the Internet

The Internet is a vast collection of computers linked by cable and satellites, not controlled by any one authority, but all operating under common network protocols. The term 'Internet' includes both the hardware (satellites, cable, routing devices and computers) and the software (programs and network protocols) that enable computers to communicate with each other.

When information is sent across the Internet, the Transmission Control Protocol (TCP: the networking-language computers use when communicating over the Internet) first breaks the information up into packets of data. The client computer sends those packets to the local network, Internet service provider (ISP), or online service. From here, the packets travel through many levels of networks, computers, and communications lines until they reach their final destinations. Many types of hardware help the packets on their way. These are:

Hubs, which link groups of computers together and let them intercommunicate through multiple ports.
Bridges, which link local area networks (LANs) with each another.
Gateways, which act like bridges, but also convey data between dissimilar networks.
Repeaters, which amplify the data at intervals so that the signal doesn't weaken.
Routers, which ensure packets of data arrive at their proper destination across different technologies, media, and frame formats.
Servers, which deliver web pages and other services as requested.
Client computers, which make the initial request for Internet services, and run applications to handle those services.
Cables and/or satellite communications, which make the hardware connections.

All hardware units need common operating methods, basic instructions called protocols that specify to all parties how the data will be handled.

HOW DOES INTERNET WORKS?

The **Internet** is the backbone of the Web, the technical infrastructure that makes the Web possible. At its most basic, the Internet is a large network of computers which communicate all together.

It began in the 1960s as a US-army-funded research project, then evolved into a public infrastructure in the 1980s with the support of many public universities and private companies. The various technologies that support the Internet have evolved over time, but the way it works hasn't changed that much: Internet is a way to connect computers all together and ensure that, whatever happens, they find a way to stay connected.

A simple network

When two computers need to communicate, you have to link them, either physically (usually with an Ethernet cable) or wirelessly (for example with WiFi or Bluetooth systems). All modern computers can sustain any of those connections.

Note: For the rest of this article, we will only talk about physical cables, but wireless networks work the same.
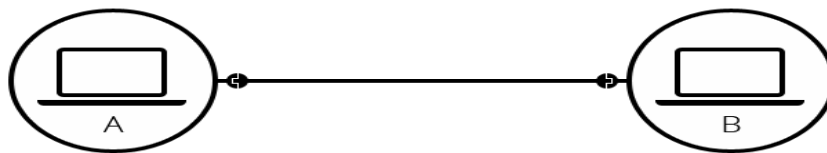

Such a network is not limited to two computers. You can connect as many computers as you wish. But it gets complicated quickly. If you're trying to connect, say, ten computers, you need 45 cables, with nine plugs per computer!
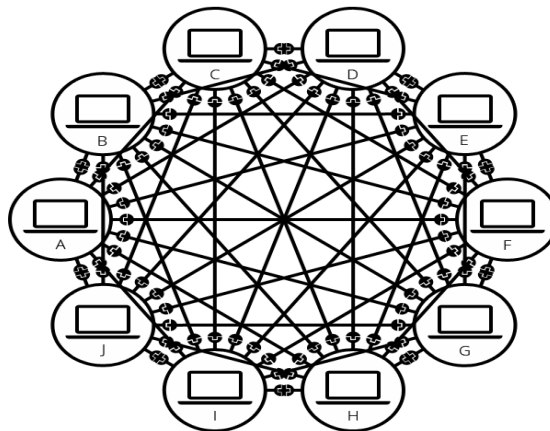

To solve this problem, each computer on a network is connected to a special tiny computer called a *router*. This *router* has only one job: like a signaler at a railway station, it makes sure that a message sent from a given computer arrives at the right destination computer. To send a message to computer B, computer A must send the message to the router, which in turn forwards the message to computer B and makes sure the message is not delivered to computer C.
Once we add a router to the system, our network of 10 computers only requires 10 cables: a single plug for each computer and a router with 10 plugs.
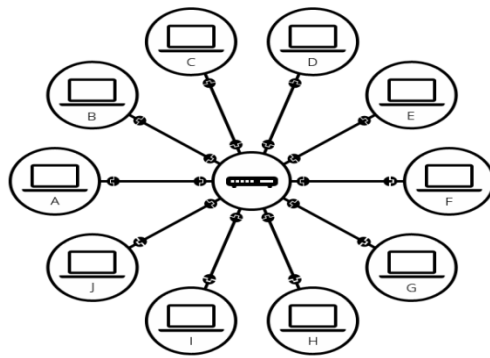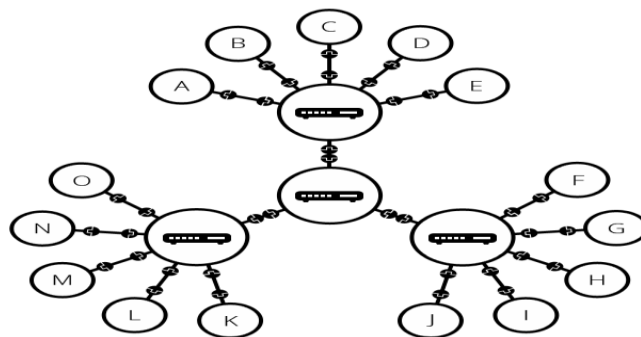
A network of networks

So far so good. But what about connecting hundreds, thousands, billions of computers? Of course a single *router* can't scale that far, but, if you read carefully, we said that a *router* is a computer like any other, so what keeps us from connecting two *routers* together? Nothing, so let's do that.
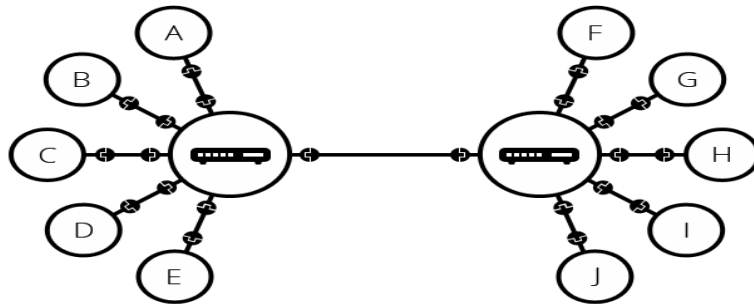

By connecting computers to routers, then routers to routers, we are able to scale infinitely.

Such a network comes very close to what we call the Internet, but we're missing something. We built that network for our own purposes. There are other networks out there: your friends, your neighbors, anyone can have their own network of computers. But it's not really possible to set cables up between your house and the rest of the world, so how can you handle this? Well, there are already cables linked to your house, for example, electric power and telephone. The telephone infrastructure already connects your house with anyone in the world so it is the perfect wire we need. To connect our network to the telephone infrastructure, we need a special piece of equipment called a *modem*. This *modem* turns the information from our network into information manageable by the telephone infrastructure and vice versa.
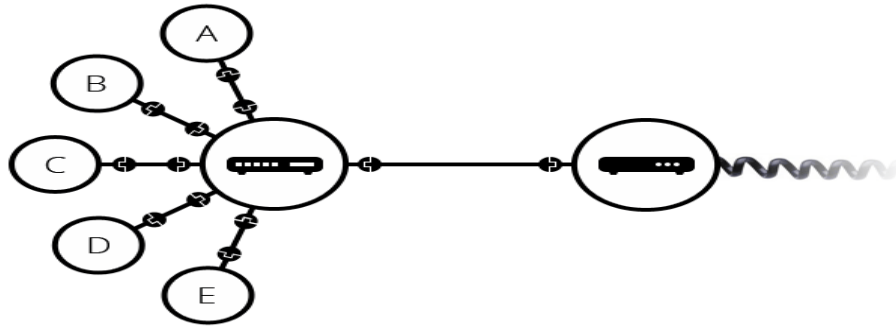
So we are connected to the telephone infrastructure. The next step is to send the messages from our network to the network we want to reach. To do that, we will connect our network to an Internet Service Provider (ISP). An ISP is a company that manages some special *routers* that are all linked together and can also access other ISPs' routers. So the message from our network is carried through the network of ISP networks to the destination network. The Internet consists of this whole infrastructure of networks.
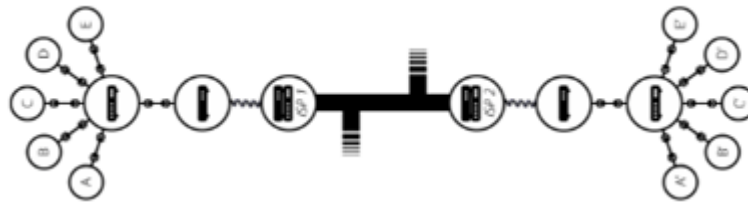
INTERNET ADDRESSING

TCP/IP ADDRESSING

TCP/IP includes an Internet addressing scheme that allows users and applications to identify a specific network or host with which to communicate.

An Internet address works like a postal address, allowing data to be routed to the chosen destination. **TCP/IP** provides standards for assigning addresses to networks, subnetworks, hosts, and sockets, and for using special addresses for broadcasts and local loopback.

Internet addresses are made up of a network address and a host (or local) address. This two-part address allows a sender to specify the network as well as a specific host on the network. A unique, official network address is assigned to each network when it connects to other Internet networks. However, if a local network is not going to connect to other Internet networks, it can be assigned any network address that is convenient for local use.

The Internet addressing scheme consists of Internet Protocol (IP) addresses and two special cases of IP addresses: broadcast addresses and loopback addresses.

Internet addresses
The Internet Protocol (IP) uses a 32-bit, two-part address field.

Subnet addresses
Subnet addressing allows an autonomous system made up of multiple networks to share the same Internet address.

Broadcast addresses

The TCP/IP can send data to all hosts on a local network or to all hosts on all directly connected networks. Such transmissions are called *broadcast messages*.

Local loopback addresses

The Internet Protocol defines the special network address, 127.0.0.1, as a local loopback address.

INTERNET VS INTRANET
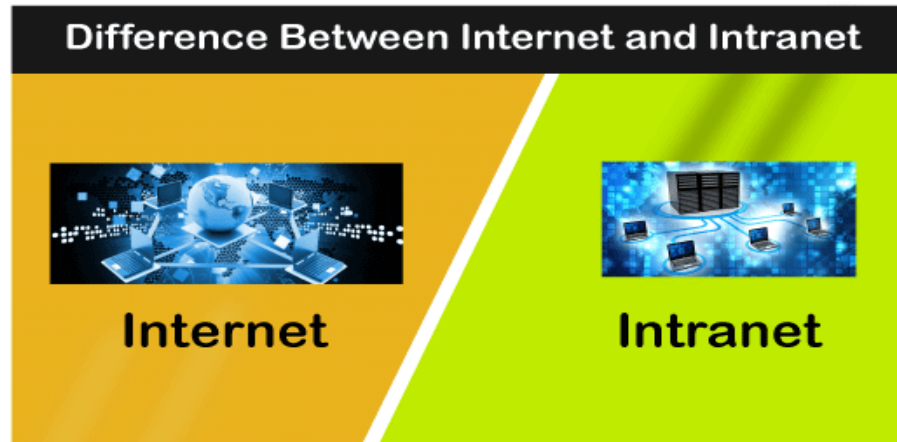
What is the Internet?

The Internet is a global interconnection of computer systems. It is a massive collection of networks sharing information publicly in the form of interlinked web pages. IP or Internet Protocol defines a site's unique location on the World Wide Web.

Some of the essential applications of the Internet are listed below:

- File sharing
- Downloading media files and software
- Sending and receiving emails
- Browsing any information
- Using social media platforms, forums, and communities
- E-Commerce, bill payments, online purchasing of food and medicines
- Voice Calls, Video Conferencing, and Chatting with friends, family members, and colleagues

The other common protocols used by the connected networks are

- HTTP
- FTP
- and SMTP
- Besides, the protocols and applications like Telnet, Gopher, WWW
- Usenet News, Internet Relay Chat, etc. are also used throughout the working of the Internet.

Advantages of Internet

Few advantages of the Internet are listed below:

- The Internet establishes a network of devices from different locations all around the world.
- It allows people to communicate easily from any location worldwide.
- The Internet is helping people to get information easily on different topics.
- It keeps the people updated on what's happening worldwide with the latest news and technologies.
- It connects people through communities, forums, social networking sites and helps them work together digitally.
- The Internet has made selling and purchasing of products and services easier.
- The Internet is the best platform for people to show their talent, such as singing, dancing, drawing, etc.

What is Intranet?

An intranet network is only accessible to a small group of people. Intranets are mainly used within businesses and organizations to provide access to files and applications on networked computers and servers. Intranets are sometimes defined as a private Internet.

Some other essential applications of the Intranet are listed below:

- Sharing the updates regarding the company's rules and regulations
- Accessing employees details
- Onboarding of employees and customer details
- Sharing project details
- Submission of projects and reports
- Submitting feedback or complaints
- Corporate telephone directories

Advantages of Intranet

Few advantages of the Intranet are listed below:

- The intranet is helping organizations to access internal and external information securely.
- The intranet is fast, easy-to-use, and low-cost to implement.
- It enables employees to connect with other systems throughout the organization.
- The intranet is based on open standards.
- It has added improved communication and enhanced productivity to the operational business processes.
- It encourages collaboration and reduces the error rate.
- It helps cut down the administration and the processing time.

DIFFERENCE BETWEEN INTERNET V/S INTRANET

Attributes	Internet	Intranet

Definition	The Internet is a network of several computers connected worldwide using the Internet protocol suite (TCP/ IP).	An Intranet is a private network of computers designed for a certain group of people and owned by a particular firm or organization. It can include several local area networks and also uses leased lines in the wide-area network.
Users	As stated above, the Internet is a globally connected network; users' number is comparatively much higher than Intranet.	Because of a limited range, the total numbers of users on Intranet are limited. When compared to the Internet, Intranet has very few users.
Accessibility	Anyone can access and use it.	Only certain people are authorized to use Intranet because it is a company's internal network, so accessible by the employees or admin who have login credentials.
Type of Network	The Internet is a type of public network.	The intranet is a type of private network installed mainly for any organization operations.
Security	Because the internet is a public network, it is a considerably less secure network. Cybercriminals usually target people using the Internet.	Due to limited access, there is no such possibility or very less possibility of cyber threats in Intranet, making it more secure compared to that of the Internet.
Information and Data	Due to a wider range, the availability of information and the data is unlimited. People are free to use the Internet and their knowledge. That is why more and more data is being added to different fields on the Internet regularly.	The intranet is limited to group-specific information. That means the Intranet information and data are limited to any specific company's records, operations, inventory, etc. In this case, only certain people with admin privileges are allowed to add or modify the information.
Traffic	Due to a higher number of users and a public network, the total visitor's traffic very high. It is almost uncountable.	Intranet has limited users, and so visitor's traffic is limited and comparatively less than the Internet. In the case of Intranet, traffic is countable.

Characteristic	The Internet includes several intranets.	The intranet is like a subset of the Internet. Intranet can only be used using the Internet but with certain restrictions and security practices.

IMPACT OF INTERNET

The internet is the guiding technology of the IT Age just as the electrical engine was of the Industrial Age. The internet is a global network of inter-linked networks that mainly provide wireless interactive communication. Though the internet was first deployed in 1969, it was only in the 1990s that it became available to the public.

From there onwards, its use has diffused rapidly throughout the world with there being around 7 billion users of wireless devices currently that employ internet technology. With about 7.7 billion people in this world and with limited use among those under 5 years of age, it's almost safe to say that the entire humanity is now connected to the internet! There are however variations in the bandwidths available, the efficiency and cost of its use.

It's been postulated that about 95% of all information available has been digitized and made accessible via the internet. The internet has also led to a complete transformation in communication, availability of knowledge as well as social interaction. However, as with all major technological changes, there are positive and negative effects of the internet on the society too.

The positive impacts of the internet include the following:

- It provides effective communication using emailing and instant messaging services to any part of the world.
- It improves business interactions and transactions, saving on vital time.
- Banking and shopping online have made life less complicated.
- You can access the latest news from any part of the world without depending on the TV or newspaper.
- Education has received a huge boost as uncountable books and journals are available online from libraries across the world. This has made research easier. Students can now opt for online courses using the internet.
- Application for jobs has also become easier as most vacancies are advertised online with online applications becoming the norm.
- Professionals can now exchange information and materials online, thus enhancing research.

The negative impacts of the internet on society include:

- Easy availability of illegal or inappropriate materials online that isn't age-suitable.
- Addiction to social networks can disrupt an individual's life, both personally and professionally.
- Some miscreants use the internet to hack into people's accounts for spurious activities including stealing data or banking information.
- Yet others have been known to misuse the internet for spreading hate and terrorism, two dangerously catastrophic scenarios.

GOVERNENCE OF INTERNET

DEFINITION

Internet governance is **the development and application by Governments, the private sector and civil society**, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet.

What are the issues of Internet governance?

Internet governance comprises of both issues: **of freedom, privacy, access to knowledge and other aspects of the internet affecting human rights**- what is known as internet public policy, as well as technical governance, one of whose aspects is the management of CIRs, and of which ICANN oversight is an important part.

Who is responsible for Internet governance?

No one person, company, organization or government runs the Internet. It is a globally distributed network comprising many voluntarily interconnected autonomous networks. It operates without a central governing body with each constituent network setting and enforcing its own policies.