
Unit - 1 Introduction to Internet

1.1 Concepts of Internet

If there is one technology that caught up literally overnight and has affected more users than any others, it is the World Wide Web (WWW) or Web in short. The Internet is similar to the international telephone system – no one owns or controls the whole thing, but it is connected in a way that makes it work like one big network. The connections to the Internet can be obtained as either for individual users or clients, and connections for servers. And we can register our own Domain name to host our web page on the Internet.

1.1.1 Introduction to Internet

Two or more computers connected together with the capability of exchanging information is called as Network. The networks that usually take the form of a small office network are called as Local Area Network (LAN). The networks that cover a city or some other large physical distance can be called Metropolitan Area Network (MAN) or, more generally, Wide Area Network (WAN).

Typically, networks are created in the hope of saving money and increasing efficiency. Buying a laser printer for every computer in a large office, for example, would be cost prohibitive. A single laser printer shared across a network can save money and improve productivity.

Moving beyond a small office network to a large network, things get more complicated. Suppose a company has two LANs, one on the first floor of the building and one on the second that need to be joined together. This can be done by drilling a hole in the floor, setting up some network equipment, and wiring the two networks. The resulting

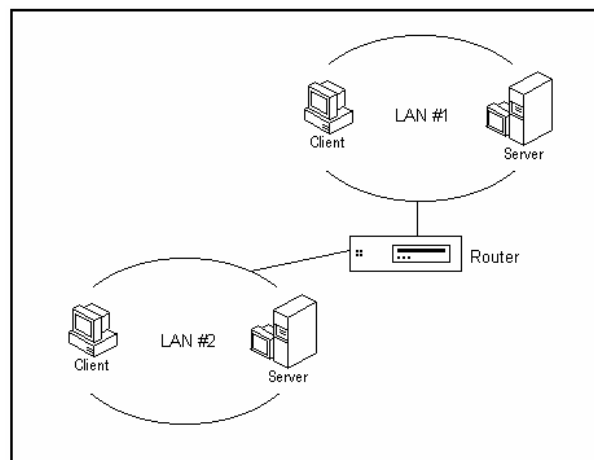


Figure 1.1 an Internetwork

combination of networks has a special name – an internetwork, or Internet in short. A diagram of an internetwork is shown in Figure 1.1

An internetwork, or Internet is a collection of two or more distinct networks joined together, typically using a router, to form a larger “network of networks.” A router is a system that runs software to manage the exchange of information between two different networks.

Though the network that contains two or more distinct networks can be called as Internet, this name (Internet) is given to the worldwide collection of networks. The Internet is similar to the international telephone system – no one owns or controls the whole thing, but it is connected in a way that makes it work like one big network.

Network of Networks can also form an Intranet. Unlike Internet, which is a global network, Intranet is a private network. But it uses the Internet communication standards and tools to provide information to the restricted users. For example, a company may setup a Web site that is accessible only to its employees who are geographically separated.

The Internet is the global level network system that is made of many interconnected computer networks of different types. The primary objective of Internet is to provide communication between computer networks and in turn between computers, smart phones, smart TVs and other computational devices.

So we can say that any smart device that is able to connect to any type of network, is enabled to communicate with any other available device all over the world using internet. Internet is a network of networks that consists of private, public, academic, business, and government networks of local to global level.

The result is a mass of cables, computers, data centers, routers, servers, repeaters, satellites and wifi towers that allows digital information to travel around the world. It is the infrastructure that lets us do online shopping, share our life on Facebook, stream youtube, netflix, send emails, and plenty of other stuff online.

1.1.2 Evolution of Internet

The Internet has a glorious history. It has come across a long way to reach its current position. When traditional circuit-switched telephone networks were considered too vulnerable, DoD (Department of Defense of USA) turned to its research arm, Advanced Research projects Agency (ARPA). ARPA was created in response to the Soviet Union’s launching Sputnik in 1957 and had the mission of advancing technology that might be useful to the military. This network is popularly known as ARPANET. In the late 1970s, NSF (The U.S. National Science Foundation) found the enormous impact the ARPANET was having on University research, allowing scientists across the country to share data and collaborate on research projects. However, to get on the ARPANET, a University had to have a research contact with the DoD, which many did not have. This lack of Universal

access prompted NSF to set up a virtual network, CSNET, centered around a single machine at BBN that supported Dial-up lines and had connections to the ARPANET and other networks. NSF also founded some (eventually about 20) regional networks that connected to the backbone to allow users at thousands of universities, research labs, and museums to access any of the supercomputers and to communicate with one another. The complete network, including the backbone and the regional networks, was called NSFNET. It connected to the ARPANET through a link between an Interface Message Processors (IMP) and fuzzball in the Carnegie-Mellon machine room.

The number of networks, machines, and users connected to the ARPANET grew rapidly after TCP/IP became the only official protocol on 1st January 1983. When NSFNET and ARPANET were interconnected, the growth became exponential. So finally a global network was created, which connected all the types of networks around the globe, it is popularly known as the Internet.

Technically a machine is on the Internet if it runs the TCP/IP protocol stack, has an IP address and has the ability to send IP Packets to all other machines on the Internet. The mere ability to send and receive the electronic mail is not enough, since e-mail is a gateway to many networks outside the Internet. However, this issue is clouded somewhat by the fact that many personal computers have the ability to call up an Internet service provider using a modem, be assigned a temporary IP address and send IP packets to other Internet hosts. It makes sense to regard such a machine being on the Internet for as long as they are connected to the service provider's router.

The Internet grew out of an earlier U.S. Department of Defense project, the ARPANET (Advanced Research Projects Agency Network) that was put into place in 1969 as a pioneering project to test packet-switching networks. Packet switching is a technique for transmitting packets of information through multiple linked networks. ARPANET provided links between researchers and remote computer centers. In 1983, the military communication portion of ARPANET was split off into MILNET (Military Network), although cross-communication was still possible. ARPANET was officially dismantled in 1990. Its successor, Internet, continues to grow. With tremendous growth, the old informal way of running the Internet no longer works. In January 1992, the Internet Society was set up to promote the use of the Internet and perhaps eventually taken over managing it.

→ We can summarize the Internet evolution as follows:

- Arpanet carried its first message on October 29, 1969, laying the foundation for today's networked world. The name Arpanet came from the U.S. military arm that funded it, the Advanced Research Projects Agency. When Arpanet was created, it connected five sites of US using a network.
- The first data message sent between the two of the five sites occurred on 29 October, 1969. This eventually led to the formation of the ARPANET (Advanced

Research Projects Agency Network), the network that ultimately evolved into what we now know as the Internet.

- ARPANET was a great success but membership was limited to certain academic and research organizations who had contracts with the Defense Department. In response to this, other networks were created to provide information sharing.
- January 1, 1983 is considered the official birthday of the Internet. Prior to this, the various computer networks did not have a standard way to communicate with each other. A new communications protocol was established called Transfer Control Protocol/Internetwork Protocol (TCP/IP). This allowed different kinds of computers on different networks to "talk" to each other. ARPANET and the Defense Data Network officially changed to the TCP/IP standard on January 1, 1983, hence the birth of the Internet. All networks could now be connected by a universal language.
- Arpanet was renamed as the Internet in 1984, when it linked 1,000 hosts at university and corporate labs.

1.1.3 Internet Services

The Internet provides four major types of services. These are communication, Information retrieval, Web services and World Wide Web (WWW). Communication services include electronic mail, USENET newsgroup, chatting, telnet, Internet telephony and Internet fax, etc. Information retrieval services include gophers, archie, WAIS, file transfer protocol and Veronica etc. Web service provides software application over the Internet. The WWW is an application that uses transport functions.

1.1.3.1 Communication Services

This type of service is most popular both for personal and business community. A tremendous variety of data can be accessed through the Internet. Users are no longer strictly dependent on telephony for one-to-one communication. Also some of these services enable interactive communication with individuals and groups around the world who share personal and professional information.

Electronic Mail

E-mail is the most widely used application of the Internet. It is an application that allows an electronic message to be sent between individuals through World Wide Web. E-mail is not limited to simple text messages. Users can embed sound and images in their message and can attach files that contain text documents, spreadsheets, graphs and executable programs. For sending a mail, you have to write the e-mail address and subject matter in the specified column. CC (Carbon copy) and BCC (by carbon copy) options also can enable one to send the same matter to many addresses.

Newsgroup

It is a protocol that delineates how groups of messages can be stored on and sent between computers. Users send e-mail messages on a specific topic to the USENET server machine, which acquires this information by following this protocol. Users can log on to the server to read messages or have the computer automatically download messages to be read at the user convenience. It provides a forum for the interested users on the Internet. This forum is divided into newsgroups. USENET newsgroups are international discussions groups in which people share information and ideas on a particular topic.

Chatting (Internet Relay Chat)

It allows two or more people who are at a time connected to the Internet to hold live (real-time), interactive, written conversation. Internet Relay Chat (IRC) is a general chat program for internet though nowadays so many chat programs are easily available in the market. Chat groups are divided into channels each assigned its own topic of conversation. It is the third most-used application in the Internet after e-mail and search.

Instant Messaging

It is an online, real time communication between two or more people who are connected to the Internet. Users can send instant text messages to other users who are logged on. A window appears on the screen of all the people engaged in the messaging. Each window displays what one person is typing, in real-time. A number of companies are providing Instant Messaging like Yahoo, Hotmail and India times, etc.

Telnet

It allows users to be on one computer while doing work on another. It is the protocol that establishes an error-free but not secure access from source to target computers provided the target server running the telnet services. Users can log on to their office computers while travelling or from their homes. Also users can log on and use third party computers that have been made accessible to the public, such as using the catalog of the U.S Library of Congress.

Internet Telephony (VoIP)

It is otherwise called as Voice over IP or VoIP. Here users talk across the Internet throughout the world to any personal computer as well as any phone line (Restricted by Law of any Country). It carries voice calls over the Internet, normally the data line and voice line communicate through the same communication media like cable with different frequency, VoIP can either partially or completely bypassing the public switched telephone networks. Sound quality may be poor due to Latency and Jitter.

Internet Fax

It is just similar to general fax techniques but it is possible only through the computer having Internet and Fax software. This application is useful because faxes can be sent long distances at local call rates and delivery can be guaranteed through store and forward mechanism.

Streaming Audio and Video

It allows the Internet users to see and hear data as it is transmitted from the host server instead of waiting until the entire file is downloaded. For Example, real network's real audio allows a web site to deliver an on-demand audio over the Internet and can work over connections. Streaming audio enables the broadcast of radio programs, music, press conference, speeches, and new programs over the Internet. It is well predicted that streaming audio and Internet telephony use will overlap and complement one another.

1.1.3.2 Information Retrieval Services

It allows the users to access through the Internet, thousands of huge online library catalogs, as well as millions of databases that have been opened to the public by corporations, Government, and agencies and non-profit organizations. Apart from that, many users download free, high quality software made available by the developers over the Internet. This chapter will focus on five methods of accessing the computers and locating files. These are free to any Internet user. The Internet is a voluntary, decentralized collection of Networks with no central listing of sites and no central listing of the data located at those sites.

File Transfer Protocol (FTP)

It enables the users to access a remote computer and retrieve files from it. After the users have logged on to the remote computer, they can search the directories that are accessible to FTP, looking for the files they want to retrieve.

Gophers

It is an Internet protocol that enables the users to locate the information stored on the Internet gopher servers through a series of hierarchical menus. Most files and digital information that are accessible through FTP are also available through gophers.

Search engines

A program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, used especially for finding particular sites on the World Wide Web. A search engine is a web-based tool that enables users to locate information on the World Wide Web. Popular examples of search engines are Google, Yahoo, Bing, Gopher, Duckduckgo, etc.

1.1.3.3 Web Services

These are the unique pieces of computer codes (components) accessed through a web site that delivers a specific type of function. Web service allows us to transparently access the rich software content from any site on the web. In Web services the application code normally deployed to one or more web server but controlled by the app server. Web services accept the information as a input from the called program and return the output like XML format.

Sun's JSP is a Java platform tool which is mostly used for making Java based active server pages. It is also an object-oriented language that enables the programmers to build wide range of applications for the JAVA platform.

1.1.3.4 The World Wide Web

This concept has changed the way in which the Internet used to work earlier. It is not the same as the Internet today. The Internet functions as the transport mechanism and the WWW is an application that uses those transport functions. It is a system with universally accepted standards for storing, retrieving, formatting, and displaying information via a client/server system. The web handles all types of digital information including text, hypermedia, graphics, and sound. It is very easy to use as it uses the graphical user interface.

The web is based on a standard hypertext language called Hypertext Markup Language (HTML), which formats documents and incorporates dynamic hypertext links to other documents stored on the same or different computers. HTML is simpler subset of Standard Generalized Markup Language (SGML), and incorporates tables, applets, text flow around images, superscripts and subscripts. Using this hypertext links, (which are typically blue and underlined), the user points at a highlighted word, clicks on it and is transported to another document. Users are able to navigate around the web freely with no restrictions, following their own logic, needs, or interests.

Offering the information through the web needs establishing a home page, which is a text and a graphical screen display that usually welcomes the user and explains the organization that has created the page. In most cases, the home page will lead the users to other pages too. All the pages of a particular company or individual are known as Web site. Most web pages provide a way to contact the organization or the individual. The person in-charge of an organization's web site is its web master.

For accessing a web site, the user must specify a uniform resource locator (URL), which points to the address of a specific resource on the web. For example, the URL for Indira Gandhi National Open University is <http://www.ignou.ac.in>. HTTP stands for Hypertext Transport Protocol, which is the communication standard used to transfer a page across the WWW portion of the Internet.

1.1.4 Advantages and Disadvantages of Internet

Advantages

The Internet is one of the powerful creations that offer people endless knowledge and entertainment. Today the Internet plays a critical role in many areas. There are multiple advantages of the Internet, below is given a list of benefits of the Internet.

1. Connectivity, communication, and sharing

In the past days, if you sent a letter or someone sent you, it could take days and sometimes even months to reach a letter at the destination. In modern times, you can send a letter or important information to anyone in the e-mail all over the world through the Internet. And, it often will be delivered to the destination in less than a minute.

You can also use other forms of communication, such as VOIP and chat, they also enable you to send any information instantly to anyone in the world. With the Internet, online forums also allow people to connect with each other where they can share common interests and talk about what they enjoy. Furthermore, you can share your ideas or views with anyone by making an online video call through applications like skype, line, etc.

2. Information, knowledge, and learning

The Internet allows people to learn information about any topic and offers an answer to any type of question, as it contains endless knowledge and information. Using a search engine like Google Chrome, Mozilla Firefox, and more, they all allow users to ask any question and find a web page with an answer about that question. You can also watch videos about any topic on sites like YouTube, which contain millions of videos of several topics. Also, you can learn online courses in many different subjects.

3. Address, mapping, and contact information

The Internet can help users to provide information almost every place in the world on the map with the help of GPS technology. You can find businesses in your area or the quickest route to your location. Although, today's search engines are most powerful to know the user's location and help offer the relevant searches for your area. Also, it can provide you the contact information or address of any showroom or other services man. For example, if you want to get the address of an electrician, you can search for an electrician and get a list of local electricians in your area with their address.

4. Online Buying and Selling

If you want to sell products and services or run a business, the Internet is the best place to sell goods. Because anyone can find and access your website all over the world with the help of the Internet. With online business, you are able to sell goods every day at all times as the Internet is always on and always available. Also, the Internet provides the advantage to promote your business online in the world through advertising. Additionally, there are several ways to earn money online by performing other online services.

5. Banking, bills, and shopping

If you want to view your bank balance without leaving your home, the Internet offers you the benefit to access your bank account to view the balance. Also, you can send money, pay bills electronically, or many other services can complete through the Internet.

Another advantage of the Internet is online shopping, which allows people to find products of interest and buy them without having to visit a store. You can compare prices between companies for any product through the Internet. Also, you can get help to make better purchasing decisions by online reviews, which describes what others think about a product.

6. Donations and funding

With the help of an Internet connection, anyone can help fund projects and ideas that interest them or quickly donate to their favorite charity. Also, if you want to donate and looking for charity services, you can find many online services on the Internet that help make it easier to support their causes or help donate.

7. Entertainment

The Internet provides people to access endless entertainment. With the Internet, you can watch movies, videos, play games online, listen to music, etc. There are many sites available on the Internet, which contain different entertainment material like music, videos, and more. Also, you can watch online videos on a platform like YouTube. Furthermore, you can download any movies, videos, or other entertainment material via the Internet on devices like computers or mobile phones that can be played anytime without an Internet connection.

8. Work from home, collaboration, and access to a global workforce

The Internet offers people benefit to connect with others around the world. There are various online services that help you to communicate and work with other people all over the world. Also, it can make services and producing new products faster.

An Internet connection offers many people an option to create a virtual office by allowing them to work from home. Sometime, there could be a condition for any organization to allow their employees to work from home using their computer. In this condition, the Internet plays the most important role as it provides connectivity between all employees, through which they all can communicate and discuss with each other regarding any project.

9. Internet of Things

The Internet makes smarter your device in your home and giving them access to the Internet. For instance, to control the heating and cooling in your home, the Nest thermostat can connect to the Internet. When devices have been connected to the Internet, they can be controlled remotely with the help of your smartphone or computer. The devices can become smarter and more efficient and help save time, money, and energy by connecting IoT (Internet of Things). The main benefit to connect devices to the Internet of Things is that if you are far from your home, you can control your device remotely.

10. Cloud computing and cloud storage

One of the biggest advantages of the Internet offers connectivity to your computer and Internet-enabled devices to connect with cloud services, such as cloud storage and cloud computing. A device can have access to more powerful computers to perform complex tasks with cloud computing whereas your business works on other tasks.

With cloud computing, you can access your data anywhere as cloud storage synchronizes data across any of your Internet-connected devices. It makes your data more secure because your files are stored in a professionally-maintained server. Therefore, if you are using a cloud storage backup service, you will not lose all your valuable data.

Disadvantages

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

Addiction, time-waster, and causes distractions

If any person is spending much time on the Internet connected devices, he can be addicted to the Internet. An Internet addictive person can lead to spending his precious time on the Internet, rather than doing something productive. Thus, anyone who is addicted to surf the Internet can hamper workplace productivity as well.

Bullying, trolls, stalkers, and crime

A person who uses the Internet very frequently can face abusive or trolls' people. Another issue cyber bullying is also increasing rapidly over the years. Sometimes, you can be tracked on the Internet by hackers or unauthorized persons; they can be harmful to you by stealing your personal information. If you are spending your more time on the Internet, so it will be easier for hackers to find your personal information through various means. To run business without as much fear of being caught, the web deep, and the hidden places on the internet can also be a place for criminals. Additionally, there are several people that provide criminals more ways to solicit their goods.

Spam and advertising

The Internet is the best place to advertise any service or product as compared to traditional advertising methods (for example, TV, newspaper, and radio). But you might see more spam in your inbox than junk mail in real life because digital advertising can be sent on a massive scale.

Pornographic and violent images

In modern times, there is a huge amount of content available on the Internet. Also, there are various resources that contain a large amount of data, such as Wikipedia, and some sites are also available that have less desirable content. Accordingly, users can see pornographic or violent images that they may not want to see while using sites.

Never being able to disconnect from work

The Internet is the best creation to offer connectivity and enable people to work from anywhere. Therefore, anyone can expect you to be available any time to work, even if you are not available to work there. For instance, you have received an important work-related e-mail while you may be at home and then without getting paid, end up working on the content of that e-mail.

Identity theft, hacking, viruses, and cheating

There are various malicious users and computer hackers that can steal your personal information and hack accounts, which can be used for identity theft and can be harmful to you personally. As the Internet connects all computers to each other, so hackers can quickly identify what computers are vulnerable to attack by scanning millions of computers. Additionally, the Internet also enables students to find others to do their homework and offers ways to cheat on their studies.

Affects focus and patience

The sites have an instant gratification effect that we use on the Internet every day. On-demand, they also offer a large amount of menu of things to experience and think at any moment. Getting information this way can affects your interactions and make you more impatient and less focused on your activities. To solve this problem, try to focus on more productive real-life activities like exercise or cleaning, and balance this natural effect with time away from social media.

Health issues and obesity

If you are surfing the Internet frequently, playing games and spending too much time on the computer, it can also lead to obesity and an unhealthy lifestyle. Also, a person who spends too much time on the computer can face a problem like carpal tunnel syndrome as a computer requires a lot of repetitive movement. You are required to move your body parts to operate the computer, for example, typing and moving hand to the mouse are repetitive actions that can cause injuries. Understanding computer ergonomics, keeping the proper posture, and taking breaks can all help delay or prevent these injuries.

Depression, loneliness, and social isolation

The Internet also becomes a reason lead to depression as many people tend to compare their lives with others on social networking sites. Social networking sites provide users the option to make thousands of friends and communicate with each other. There are also available online games that allow players to communicate with others. Although social networking sites can give you benefits to find new connections all over the world, you may find yourself disconnected from your real-life friends.

Buying things that you don't need

The Internet provides advantages for consumers to make purchasing, so users can purchase products frequently without putting much thought into whether they should. Also, some people can be addicted to buying items on the Internet that can cause serious debt.

Not a safe place for children

The Internet may not be more useful for children as they are spending much time on the Internet. Also, there are many unethical and pornography communities are available on the Internet that can cause to distract their mind. Therefore, the Internet is not beneficial for children as they can bypass parental protection with the help of different tools available on the Internet. Furthermore, if children are allowed to use the Internet, they can be addicted to it, which is also very dangerous.

Viruses/Malwares

The frequently use of the Internet may infect your system from viruses that can damage your valuable data, which is difficult to recover. These viruses enter into the system through USBs, CIDs, and the Internet. Also, because of viruses, your system can become totally worthless.

1.2 Internet Connections

1.2.1 Types of Internet Connections

Internet connections are of following types–

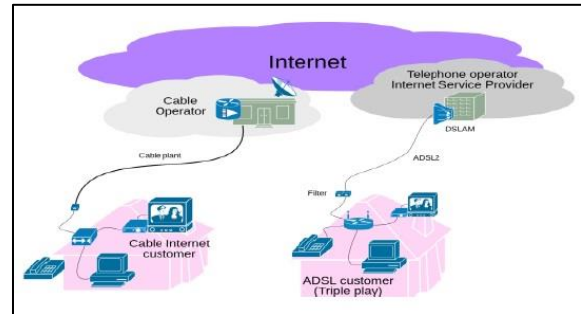
Dial-up Connections

In dial-up connection, computer uses its modem to dial a telephone number given to the user by an Internet Service Provider. This launches a connection between personal computer and ISP server. The process begins when the ISP server answers, and ceases when your computer or the server "hangs up". This is similar to a traditional telephone call. Most ISP servers disconnect automatically after a certain period of inactivity. Once a connection is configured on the user's computer, he/she can use the connection. It is secure and de-allocates unused memory automatically.



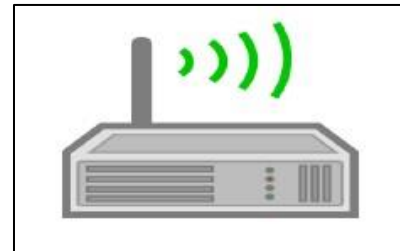
Broadband Connection

Broadband connections are considered as high speed connections, as they use modes that can handle several signals at once, such as fiber optics, twisted pair cables, coaxial cable and other technologies. Even with hundreds of users on the network, these connections allow large files and complex web pages to download quickly. To be considered as a broadband, the connection must be able to transmit data at a rate faster than is possible with the fastest dial-up connection. Downloading and uploading content will be fast.



Wireless LAN (WLAN) Connections

Wireless LAN connections are very common these days, which are based on the technology that is often cited as Wi-Fi (Wireless Fidelity). The distance covered by WLAN is usually measured in meters rather than miles. Therefore, this is not a technology that connects directly to an ISP but can be used to connect to another LAN or device through which internet access is achieved.



- To connect to internet, the wireless access point is connected to a wired LAN like any other devices, and then computers with wireless NICs can access the wired LAN.
- "Wireless access point" is a device that acts as a hub or switch.
- "NIC" refers to a Network Interface Card which helps to identify a computer on a network.

Wireless WAN (WWAN) Connections

A WWAN is a digital network that spans over a large geographical area. A WWAN accepts and transmits data using radio signals via cellular sites and satellites. At the switching center, the WWAN divides off into segments and then connects to either isolated or public network through telephone or other high speed communication links. The data is then linked to an organization's existing LAN/WAN infrastructure. The coverage area for WWAN is normally measured in miles (kilometers) with a data transmission rate of 100 Mbps.



A wireless network uses radio waves, just like cell phones, televisions and radios do. In fact, communication across a wireless network is a lot like two-way radio communication. Here's what happens:

1. A computer's wireless adapter translates data into a radio signal and transmits it using an antenna.
2. A wireless router receives the signal and decodes it. The router sends the information to the Internet using a physical, wired Ethernet connection.

The process also works in reverse, with the router receiving information from the Internet, translating it into a radio signal and sending it to the computer's wireless adapter. The radios used for WiFi communication are very similar to the radios used for walkie-talkies, cell phones and other devices. They can transmit and receive radio waves, and they can convert 1s and 0s into radio waves and convert the radio waves back into 1s and 0s.

WiFi has a lot of advantages. Wireless networks are easy to set up and inexpensive. They're also unobtrusive -- unless you're on the lookout for a place to watch streaming movies on your tablet, you may not even notice when you're in a hotspot. In this article, we'll look at the technology that allows information to travel over the air. We'll also review what it takes to create a wireless network in your home.

Mobile Hotspot

Basically, a hotspot is a blend of software, hardware and back-end network data services that combine to transform a phone into the equivalent of a broadband modem and router. In other words, it can distribute a internet connection to nearby systems via Wi-Fi. This not only lets us connect laptop and tablet to internet, but we can share it with co-workers, as long as they're in range and they know the password.

How it Works? To use a phone as a hotspot, the device treats its online connection to the data network as if it were a broadband data source. It then transmits this data locally like a mini-Wi-Fi router using the 802.11ac or 802.11ax protocol with the newest handsets. The net result is that those Wi-Fi devices that are within range can connect to the data signal as if it were a regular old Wi-Fi network (WLAN).

We can use our mobile data in shared mode for accessing the internet in the laptop devices. All we need is to turn on the portable hotspot under our mobile. We can set the SSID and password for sharing the internet connection with other devices. We can also share QR code of the connection information to other devices. It is also possible to restrict the data sharing limit. The hotspot sharing is possible through USB tethering as well as bluetooth tethering.

How much Secure: Using a phone hotspot can increase your security profile by letting you avoid the use of insecure public hotspots in coffee shops and hotels. At the phone end of the

equation, it's just as secure and private as making a phone call or web surfing with your phone, because 4G data traffic is generally encrypted using the Snow Stream cipher with a 128-bit encryption key.

For those able to tap into one of the emerging 5G networks, the protection is increased with 256-bit encryption; the ability to block fake mobile network transmission sites, known as stingrays; and encryption of your identity and location to thwart identity thieves. This is only the case if the network implements these defenses, though.

With any mobile network, a VPN (Virtual Private Network) can build a stronger wall around your communications with AES 256-bit encryption, but it often comes at the cost of performance.

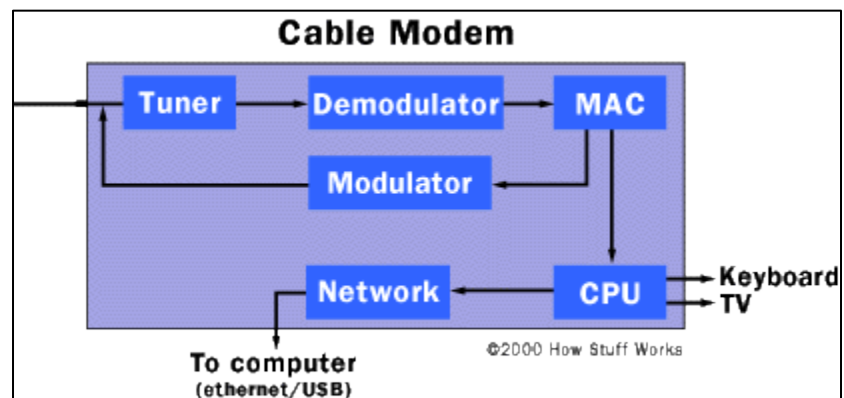
Internet through Cable (Cable modem connection)

Cable modems can be either internal or external to the computer. In some cases, the cable modem can be part of a set-top cable box, requiring that only a keyboard and mouse be added for Internet access. In fact, if your cable system has upgraded to digital cable, the new set-top box the cable company provides will be capable of connecting to the Internet, whether or not you receive Internet access through your CATV connection. Regardless of their outward appearance, all **cable modems contain certain key components**:

Tuner, Demodulator, Modulator, Media Access Control (MAC) device, Microprocessor.

The tuner connects to the cable outlet, sometimes with the demodulator. The tuner simply receives the modulated digital signal and passes it to the demodulator for further processing.

Demodulators have **four functions**:



1. A Quadrature Amplitude Modulation (**QAM**) **demodulator** takes a radio-frequency signal that has had information encoded in it by varying both the amplitude and phase of the wave, and **turns it into a simple signal** that can be processed by the analog-to-digital (A/D) converter.
2. **The A/D converter** takes the signal, which varies in voltage, and **turns it into a series of digital 1s and 0s**.
3. An **error correction module** then **checks the received information** against a known standard, so that problems in transmission can be found and fixed.

4. In most cases, the network **frames**, or groups of data, are in MPEG format, so an **MPEG synchronizer** is used to make sure the **data groups** stay in line and in order.

In cable modems that use the cable system for upstream traffic, a **modulator** is used to convert the digital computer network data into radio-frequency analog signals for transmission. It consists of three parts:

- A section to insert information used for error correction on the receiving end
- A QAM (Quadrature Amplitude Modulation) modulator
- A digital-to-analog (D/A) converter

The **MAC** sits between the upstream and downstream portions of the cable modem, and acts as the interface between the hardware and software portions of the various network **protocols**. All computer network devices have MACs.

The **microprocessor's** job depends somewhat on whether the cable modem is designed to be part of a larger computer system or to provide Internet access with no additional computer support.

Mobile Broadband

While normal fixed-line broadband is delivered through cables, mobile broadband works a bit differently. It connects to a mobile network and sends data through 4G or 5G services - exactly the same as the internet you get on your smart phone.

Mobile broadband can come in the form of...

- **A dongle** - A little thumb-sized gadget that plugs into the USB port of your computer and connects it to the internet.
- **A personal Wi-Fi device** - Also known as a mi-fi device, pocket Wi-Fi, or portable hotspot, this is a small gadget that acts as a mini router. Switch it on, and it'll connect to 4G and broadcast Wi-Fi so you can hook up your computer, tablet, or phone while you're on the go. See our guide to mobile Wi-Fi for more.
- **In-car Wi-Fi** - A special Wi-Fi device designed to plug into a car. Perfect for streaming music on your phone on a long journey. See our guide to car Wi-Fi for more.
- **Data-only SIM cards** - These work exactly like SIM cards for your mobile phone, except they only have a data allowance with no calls or texts. Put one in the SIM card slot of certain iPads and tablets, and it'll get it online.

What are the advantages of mobile broadband?

The main advantage of mobile broadband is that it's **portable**. Once you have a dongle or Wi-Fi device, you can take it wherever you want, and as long as you have 4G signal you can use the internet.

For very light users who only want to use the internet to check email every now and then, it can even work out cheaper than fixed-line broadband.

It's not perfect though. Compared to fixed-line, mobile broadband tends to have much higher latency (lag), stricter download limits, and usually slower speeds.

5G also isn't as widely available, and, with the exception of those very light users, it's more expensive. See our guide to mobile broadband vs fixed line broadband for more info.

Leased (dedicated) internet connection

A leased line is a private telecommunications network between two or more locations provided according to a commercial contract. Typically, leased lines are used by businesses to connect geographically distant offices.

Unlike traditional telephone lines in the public switched telephone network (PSTN), leased lines are generally not switched network, and therefore do not have an associated telephone number. Each side of the line is permanently connected, always active and dedicated to the other. Leased lines can be used for telephone, Internet, or other data communication services.

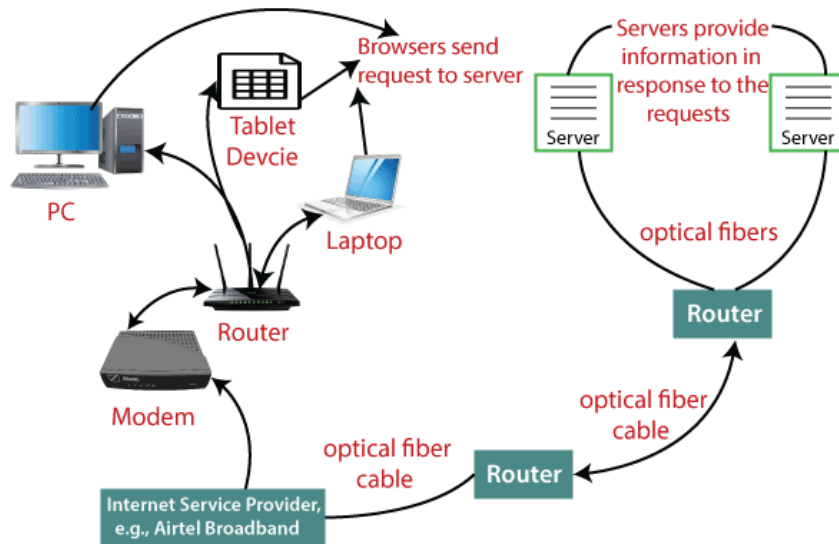
The primary **factors affecting the cost** of such line are the **distance** between end stations and the **bandwidth** of the network. Since the connection does not carry third-party communications, the carrier/ISP can assure a specified level of quality.

Advantages: An Internet leased line is a **premium Internet connectivity** product, normally delivered over fiber optic cable, which provides **uninterrupted, symmetrical bandwidth with full-duplex** (bidirectional at the same time) communication. It is also known as an Ethernet leased line, dedicated line/data circuit/network or private line.

Generally, the leased lines are used for-

- Carry phone calls
- Link servers and PCs in different offices
- To connect to the internet
- Make it possible for staffs to their work PCs from home

1.2.2 Working of Internet



The internet works with the help of **clients and servers**. A device such as a laptop, which is connected to the internet is called a client, not a server as it is not directly connected to the internet. However, it is indirectly connected to the internet through an **Internet Service Provider (ISP)** and is identified by an **IP address**, which is a string of numbers. Just like you have an address for your home that uniquely identifies your home, an IP address acts as the shipping address of your device. The IP address is provided by your ISP, and you can see what IP address your ISP has given to your system.

A server is a large computer that stores websites. It also has an IP address. A place where a large number of servers are stored is called a **data center**. The server accepts requests sent by the client through a **web browser** over a network (internet) and responds accordingly.

To access the internet we need a **domain name**, which represents an IP address number, i.e., each IP address has been assigned a domain name. For example, youtube.com, facebook.com, paypal.com are used to represent the IP addresses. Domain names are created as it is difficult for a person to remember a long string of numbers. However, internet does not understand the domain name, it understands the IP address, so when you enter the domain name in the browser search bar, the internet has to get the IP addresses of this domain name from a huge phone book, which is known as **DNS (Domain Name Server)**.

For example, if you have a person's name, you can find his phone number in a phone book by searching his name. The internet uses the DNS in the same way to find the IP address of the domain name. DNS servers are managed by ISPs or similar organizations.

When you turn on your computer and type a domain name in the browser search bar, your browser sends a request to the DNS server to get the corresponding IP address. After getting the IP address, the browser forwards the request to the respective server.

Once the server gets the request to provide information about a particular website, the data starts flowing. The data is transferred through the optical fiber cables in digital format or in the form of light pulses. As the servers are placed at distant places, the data may have to travel thousands of miles through optical fiber cable to reach your computer.

The optical fiber is connected to a router, which converts the light signals into electrical signals. These electrical signals are transmitted to your laptop using an Ethernet cable. Thus, you receive the desired information through the internet, which is actually a cable that connects you with the server.

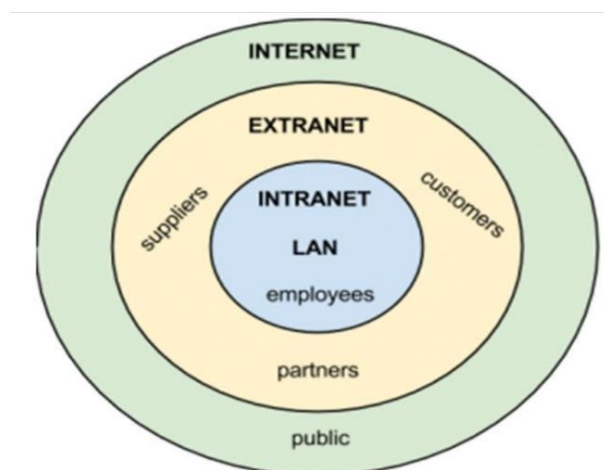
Furthermore, if you are using wireless internet using wifi or mobile data, the signals from the optical cable are first sent to a cell tower and from there it reaches to your cell phone in the form of electromagnetic waves.

The internet is managed by **ICANN (Internet Corporation for Assigned Names and Numbers)** located in the USA. It manages IP addresses assignment, domain name registration, etc.

The data transfer is very fast on the internet. The moment you press enter you get the information from a server located thousands of miles away from you. The reason for this speed is that the data is sent in the binary form (0, 1), and these zeros and ones are divided into small pieces called **data packets**, which can be sent at high speed.

1.2.3 Difference between Internet, Intranet & Extranet

Intranet is a private local network that belongs to a single organization. When such private networks of two or more partner organizations are combined, they create an **Extranet**.



BASIS OF COMPARISON	INTERNET	INTRANET	EXTRANET
Description	Internet can be described as a global system of interconnected computer network.	Intranet can be described as a network of computers or a private network designed for a specific group of users (organization).	Extranet can be described as a private network that uses public network to share information with clients (suppliers and vendors).
Size Of The Network	Internet is the largest network in as far as the number of connected devices is concerned.	It is a small network with a few number of connected devices.	It is a small network but comparatively larger than intranet , with a few number of connected devices.
Purpose	Internet is a means of sharing information throughout the world .	Intranet is a means of sharing sensitive or confidential information within the organization .	Extranet is a means of conveying information between members of the organization and external members .
Regulation / management	It is not regulated by any authority.	It is regulated by a specific organization.	It is regulated by multiple organizations.
Content accessibility On The Network	Content in the network is readily accessible by everyone who is connected.	The content in the network is accessible only to members of the organization .	The content on the network is accessible to members of the organization and external members with access to the network.
Ownership	Internet has no single owner .	Ownership of intranet is by a single organization .	Ownership of extranet is a single or multiple organizations.
Mechanism Of Regulation / management	Internet is unregulated and uncensored.	Intranet is regulated by the organization policies .	Extranet is also regulated by contractual agreements between organizations .
Access	Users have unrestricted access	An intranet may be accessible from the	An intranet may be accessible from the

	and can access internet anonymously (without disclosing identity).	internet, but it is protected by a password and accessible only to authorized users .	internet, but it is protected by a password and accessible only to authorized users .
Security	Security is dependent of the user of the device connected to network.	Security of the network is enforced through a firewall .	Security of the network is enforced through a firewall that separates internet and extranet.
Information	Internet contains different source of information and is available for all .	Intranet contains only specific group information .	Extranet contains only specific group information .
User Training	Users need no special training on how to work with the internet.	Time is required to train users on how to work with the network.	Time is required to train users on how to work with the network.
Example	An example of internet is the network you use to Google words with.	An example intranet is a company like ExxonMobil using internal network for its business operations.	Example of extranet is when companies like HP, Intel and Lenovo decide to use the same network for related business operations.