



## Key concepts

- **History of the Internet**
- **Connecting the computer to the Internet**
- **Types of connectivity**
  - Dial up
  - Wired broadband
  - Wireless broadband
  - Internet access sharing methods
- **Services on Internet**
  - www
  - Search engines
  - E-mail
  - Social media
- **Cyber security**
  - Computer virus
  - Worm
  - Trojan horse
  - Spams
  - Hacking
  - Phishing
  - Denial of service attack
  - Man-in-the-middle attack
- **Preventing network attacks**
  - Firewall, antivirus scanners, cookies
- **Guidelines for using computers over Internet**

# Internet

In the previous chapter we saw that the Internet is the largest computer network in the world. We use the Internet to check SSLC results, to submit applications for higher secondary school admissions and check its status, to get information about various types of scholarships and to submit applications for receiving them, etc. Can you imagine life without the Internet today? It would be difficult for us to manage all the above tasks without it. Internet has definitely made life easier for us. It has influenced our daily life to a great extent. Because of its wide popularity and increase in use even the television sets with facilities for Internet connectivity have come up in markets.

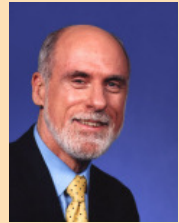
People generally use the Internet to search information, access e-mails, make bill payments, for online shopping, online banking, to connect with people in social networking sites, etc. The reach of Internet is very vast and it helps in reducing cost and time. Issues like online intrusion to privacy, online fraud, cyber-attacks, etc. are becoming common now. Apart from the Internet and its access methods, let us discuss the various services provided by the Internet like search engines, e-mail, social media and about the threats and preventive measures while using Internet in this chapter.

## 9.1 History of the Internet

The Internet started as a small network through a project by the United States Department of Defence by the name ARPANET (Advanced Research Projects Agency Network). During 1970s this military network was connected to the computers of Universities and companies that worked for the Department of Defence. In 1984 the military network split from ARPANET to form MILNET to be used by the American military only. ARPANET which used TCP/IP protocol for communication was thereafter used for scientific research and information sharing. Later, several other networks merged with ARPANET to form a large network. ARPANET is considered as the first wide area network (WAN). Vinton Gray Cerf who was instrumental in the development of Internet and TCP/IP protocol, is considered as the father of Internet.



Vinton Gray Cerf (1943 - ) popularly called Vint Cerf, an American computer scientist, is widely known as 'Father of the Internet'. He was instrumental in the initial development of Internet along with his fellow American computer scientist Bob Kahn. He worked for the United States Department of Defence Advanced Research Projects Agency (DARPA) and had a key role in the development of TCP/IP protocol. He was also involved in the formation of ICANN.



In 1989, Tim Berners Lee, a researcher, proposed the idea of World Wide Web (WWW). Tim Berners Lee and his team are credited with inventing Hyper Text Transfer Protocol (HTTP), HTML and the technology for a web server and a web browser. Using hyperlinks embedded in hypertext the web developers were able to connect web pages. They could design attractive webpages containing text, sound and graphics. This change witnessed a massive expansion of the Internet in the 1990s.



*Fig. 9.1 : Tim Berners Lee (1955 - )*

Various types of computers loaded with diverse operating systems in different organisations at geographically distant locations joined this network making it a global phenomenon. TCP/IP protocol is used as the communication protocol for Internet. Any computer that joins Internet should follow the TCP/IP protocol. In 1998, Internet Corporation for Assigned Names and Numbers (ICANN) was established. ICANN does not control the Internet content; rather it develops policies on the Internet's Uniform Resource Locators (URL). Today, Internet is the largest public network that connects billions of computers all over the world and provides several services like searching, e-mail, file transfer, social networking,



etc. The **Internet** is an interconnected system of computer networks that serves the users all over the world.

An **intranet** is considered as a private computer network similar to Internet that uses TCP/IP protocol to share information, software or services within an organisation. An intranet can host websites, provide e-mail service, file transfer and other services available on Internet.

When an intranet is made accessible to some computers that are not part of a company's private network it is called an **extranet**. A network that allows vendors and business partners to access a company resource can be considered as an example of extranet.

## 9.2 Connecting the computer to the Internet

As we know today, the Internet has become very popular and almost all organisations and people around the world are joining it. Earlier, people used the Internet to search for information and check e-mails only, but today it is used to book train tickets, recharge mobile phones, Internet banking and a lot more. Therefore almost all of us require an Internet connection in our computers or mobile devices.

The following are the hardware and software requirements for connecting a computer to the Internet:

- A computer with Network Interface Card (wired/wireless) facility and an operating system that supports TCP/IP protocol
- Modem
- Telephone connection
- An Internet account given by an Internet Service Provider (ISP)
- Software like browser, client application for e-mail, chat, etc.

Nowadays desktop computers or laptops are not the only devices that we use to connect to the Internet. People have also started using tablets, smart phones, etc. to browse the Internet. Some of these devices come with built-in modems, whereas others use a wireless dongle or wireless connection from a modem to access the Internet.

## 9.3 Types of connectivity

Today most websites use images and multimedia content to make webpages more attractive. Several websites provide videos that can be downloaded or viewed on the Internet. Instead of distributing software in CDs or other storage media, it is now distributed online by various vendors. The latest trend shows that software like word processors, spreadsheets, antivirus, etc. are used online on a rental basis instead of

installing it on each computer. In all these cases, a large volume of data is transferred online. Therefore the speed or data transfer rate of the Internet is an important aspect. **Data transfer rate** is the average number of bits transferred between devices in unit time.

1 kbps	= 1000 bits per second
1 Mbps	= 1000 kbps
1 Gbps	= 1000 Mbps



Difference between unit symbols b and B

b stands for bit

B stands for Byte

Difference between unit symbols k and K

k = 1000 =  $10^3$

K = 1024 =  $2^{10}$

Here 'k' is a decimal unit and 'K' is a binary unit of measurement. But for Mega, Giga and Tera, both decimal and binary units use 'M', 'G' and 'T' as symbols respectively. They are differentiated from the context in which they are used.

Note that data transfer rate is measured in decimal units and memory is measured in binary.

The main factor that decides Internet access speed is the type of connectivity we choose to link to the Internet. Internet connectivity is classified based on the speed of the connection and the technology used. They can be broadly classified as dial-up connectivity, wired broadband connectivity and wireless broadband connectivity. The data transfer rates of each type of connectivity may vary as technology advances.

### 9.3.1 Dial-up connectivity

A dial-up connection uses the conventional telephone line and a dial-up modem to dial and connect to the server at the Internet Service Provider (ISP). Figure 9.2 shows the dial-up connectivity system. As the connection is made by dialing, it takes time to connect to the server at the ISP. This connection commonly uses a 56 kbps modem that can transmit data up to a maximum speed of 56 kbps. This slow connection is comparatively less costly when compared to other types of connections. Another disadvantage is that a dial-up connection requires exclusive use of the telephone line, i.e., while accessing Internet, we cannot make or receive telephone calls (voice calls). Nowadays, broadband connections that have a higher speed are replacing dial-up connections.



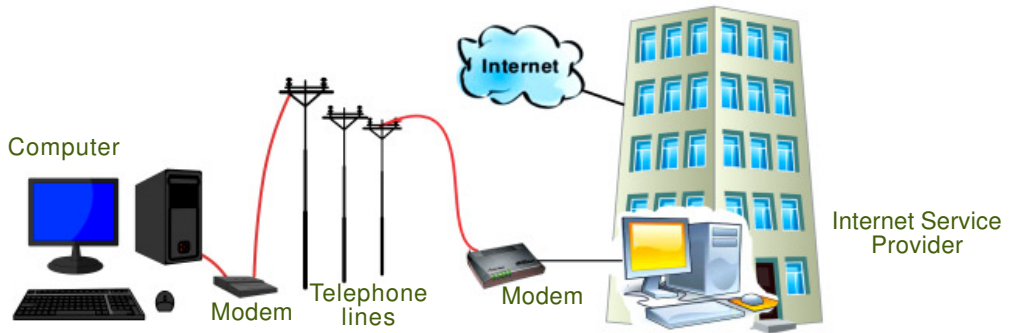


Fig. 9.2 : Dial-up connectivity

### 9.3.2 Wired broadband connectivity

The term broadband refers to a broad range of technologies that helps us to connect to the Internet at a higher data rate (speed). Wired broadband connections are ‘always on’ connections that do not need to be dialled and connected.



Fig. 9.3 : Broadband modem

Broadband connections use a broadband modem (refer Figure 9.3) and allow us to use the telephone even while using the Internet. Table 9.1 shows the comparison between dial-up and wired broadband connections.

Dial-up connection	Wired broadband connection
<ul style="list-style-type: none"> <li>• Slow connection, speed upto 56 kbps</li> <li>• Requires dialing to connect to ISP</li> <li>• Uses telephone line exclusively</li> <li>• Uses dial-up modem</li> </ul>	<ul style="list-style-type: none"> <li>• High speed connection, speed usually higher than 256 kbps</li> <li>• Always on connection</li> <li>• Simultaneous use of voice and Internet</li> <li>• Uses broadband modem</li> </ul>

Table 9.1 : Comparison between dial-up and wired broadband connections

Popular broadband technologies are Integrated Services Digital Network (ISDN), Cable Internet, Digital Subscriber Line (DSL), Leased Lines and Fiber to the Home (FTTH).

#### a. Integrated Services Digital Network (ISDN)

ISDN is a broadband service capable of transporting voice and digital data. Most ISDN lines offered by telephone companies give users two lines. The users can use one line for voice and the other for data, or they can use both lines for data. ISDN lines are capable of offering data transfer rates upto 2 Mbps.

#### b. Cable Internet

Cable Internet access provides Internet access using coaxial cables laid for television signal transmission to our homes. The service provider uses a cable modem at our

home to connect our computer to cable network. Cable TV systems are designed to carry large bandwidth and therefore cable Internet can provide speeds between 1 Mbps to 10 Mbps.

### c. Digital Subscriber Line (DSL)

DSL is another broadband service that provides connection to the Internet through standard telephone lines. DSL allows the user to use copper telephone lines for both Internet communication and for making voice calls simultaneously. It is composed of several subcategories, the most common being Asymmetric Digital Subscriber Line (ADSL). ADSL is a communication technology that allows faster flow of information over a telephone line. The down stream speed of ADSL services typically ranges from 256 kbps to 24 Mbps. This connection requires an ADSL modem at our homes/offices. ADSL is the most popular broadband service available in India.

### d. Leased Line

Leased lines are dedicated lines used to provide Internet facility to ISPs, business, and other large enterprises. An Internet leased line is a premium Internet connection that provides speed in the range from 2 Mbps to 100 Mbps and is comparatively costly. This is why leased lines are used only for connecting large campus of organisations like educational institutions to Internet.

### e. Fibre To The Home (FTTH)

Fibre to the Home (FTTH) uses optical fibers for data transmission. Optical fibres are laid from the ISP to our homes. FTTH technology has been accepted worldwide to implement high speed Internet to the home. Since optical fibres are known to have high bandwidth and low error rates, they provide very high speed connectivity. A Network Termination Unit (NTU) is installed in our homes, which is connected to our computer through an FTTH modem.

## 9.3.3 Wireless broadband connectivity

Wireless broadband connectivity provides almost the same speed as that of a wired broadband connection. The popular wireless broadband accesses are Mobile Broadband, Wi-MAX, Satellite Broadband and Wi-Fi. Some of the wireless modems available for use to connect to Internet are shown in Figure 9.4.



*Fig. 9.4 : Wireless broadband modems*

### a. Mobile broadband

Mobile broadband is wireless Internet access using mobile phone, USB wireless modem, tablet or other mobile devices. The modem is built into mobile phones, tablets, USB



dongles, etc. Mobile broadband offers the freedom to allow the user to access the Internet from anywhere on the move. This technology uses the cellular network of mobile phones for data transmission. The mobile technology for data transmission has been changing from 2<sup>nd</sup> Generation (2G) through 3<sup>rd</sup> Generation (3G) to the current 4<sup>th</sup> Generation (4G). The speed of data transmission increases with the progression of generations of mobile technology.

### b. Wi-MAX

In the previous chapter we learned that Worldwide Interoperability for Microwave Access (Wi-MAX) is used as an alternative for wired broadband. Wi-MAX offers a Metropolitan Area Network which can provide wireless Internet upto a distance of 50 Km. Connectivity is provided using devices like Wi-MAX handsets, USB dongles, devices embedded in laptops, etc. that have a Wi-MAX modem integrated in it. This technology provides a maximum connection speed of upto 70 Mbps.

### c. Satellite broadband

Satellite broadband technology is a method by which Internet connectivity is provided through a satellite. A Very Small Aperture Terminal (VSAT) dish antenna and a transceiver (transmitter and receiver) are required at the user's location. A modem at the user's end links the user's computer with the transceiver. Download speed is upto 1 Gbps for this technology. It is among the most expensive forms of broadband Internet access. They are used by banks, stock exchanges, governments, etc. and also for Internet access in remote areas.

## 9.3.4 Internet access sharing methods

An Internet connection can be shared among several computers using a LAN, Wi-Fi network or Li-Fi network.

### a. Using LAN

The Internet connected to a computer in a Local Area Network (LAN) can be shared among other computers in the network. This can be done either using features available in the operating system or using any proxy server software available in the market. Sharing can also be done by connecting computers directly to the router using a cable.

### b. Using Wi-Fi network

We have heard of Wi-Fi campuses in large educational institutions, coffee shops, shopping malls, hotels, etc. We also know that some of the broadband modems at our homes and schools offer Wi-Fi Internet access. Wi-Fi is a popular short distance data transmission technology that is used for network access, mostly Internet. Wi-Fi locations



Fig. 9.5 : Wi-Fi network

receive Internet connection through any one of the above mentioned wired or wireless broadband access methods, as discussed in the previous section. They provide us Internet connectivity through a Wi-Fi router or a wireless network access point. Such an access point, popularly called hotspot, has a range of about 100 meters indoors and a greater range outdoors. We access Internet in our Wi-Fi enabled devices like laptops, tablets, mobile phones, etc. through these hotspots. A drawback of Wi-Fi is that it is less secure than wired connections.

### c. Using Li-Fi network

Li-Fi (Light Fidelity) is a fast optical version of Wi-Fi, which uses visible light for data transmission. The main component of this communication is a bright LED (Light Emitting Diode) lamp that can transmit data and a photo diode that serves as the receiver. LEDs can be switched on and off to generate a binary string of 1s and 0s. The flickering of this LED is so fast that the human eye cannot detect it. A data rate of over 100 Mbps is possible using this technique as light offers very high bandwidth. Another advantage is that since Li-Fi uses light, it can be used in aircrafts and hospitals where radio waves may cause interference. It can also be used underwater where Wi-Fi does not work. It provides greater security as light cannot penetrate walls when compared to Wi-Fi. One of the shortcomings of Li-Fi is that it works only in direct line-of-sight. In future this technology can be further developed to use light bulbs as a source of Internet.



#### Check yourself

1. ARPANET stands for \_\_\_\_\_.
2. Who proposed the idea of www?
3. The protocol for Internet communication is \_\_\_\_\_.
4. What do you mean by an 'always on' connection?
5. A short distance wireless Internet access method is \_\_\_\_\_.



Let us do

*Prepare a comparison chart on the different methods of Internet connection.*





## 9.4 Services on Internet

The internet offers a variety of services. Services like WWW, e-mail, search engines, social media, etc. are widely used throughout the globe. In this section we shall discuss some of the services of Internet.

### 9.4.1 World Wide Web (WWW)

The World Wide Web (WWW) is a system of interlinked hypertext documents accessed via the Internet. It is a service on the Internet that uses Internet infrastructure. WWW is a huge client-server system consisting of millions of clients and servers connected together. Each server maintains a collection of documents and they can be accessed using a reference called Uniform Resource Locator (URL). These documents may contain, text, images, videos and other multimedia content. It may also contain hyperlinks to documents on different servers. Selecting a hyperlink results in a request to fetch that document/web page from the server and display it. The WWW works by establishing hypertext links between documents anywhere on the network. Clients can access the documents on the servers using software called browser. A browser is responsible for properly displaying the documents.

#### a. Browser

A web browser is a software that we use to retrieve or present information and to navigate through web pages in the World Wide Web. The document to be displayed is identified using a URL. A URL consists of its DNS name and the file name to be retrieved. It also specifies the protocol for transferring the document across the network. A browser is capable of displaying text, images, hypertext links, videos, sounds, scripts (program code inside a web page), etc. in a web document/page. Most of WWW documents are created using Hyper Text Markup Language (HTML) tags and are called web pages. The web browser interprets these tags and displays a formatted page. It allows us to navigate through web pages using the hyperlinks available in web pages. Some common browsers are Google Chrome, Internet Explorer, Mozilla Firefox, Opera, and Safari. Icons of some popular browsers are shown in Figure 9.6. Some of these browsers have a mobile version that can be used in mobile operating systems.



Fig. 9.6 : Icons of popular browsers

## b. Web browsing

All of us have visited web sites by entering the website address (URL) into web browsers and then using the hyperlinks in it to move through the web pages. Traversing through the web pages of World Wide Web is called web browsing. Major operations performed while web browsing are shown in Figure 9.7.

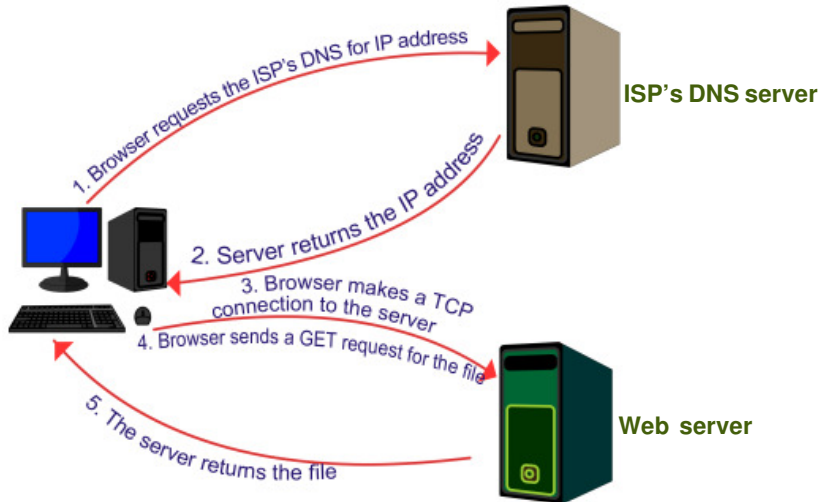


Fig. 9.7 : Web browsing

Suppose you wish to visit the website 'www.kerala.gov.in'. What will you do? You will enter this URL in the address box of the web browser and press **Enter** key. The steps a browser will follow to display a webpage may be summarised as follows.

1. The browser determines the URL (<http://www.kerala.gov.in>) entered.
2. The browser then sends a request to the DNS server of the user's ISP to get the IP address of the URL.
3. The ISP's DNS server replies with the IP address.
4. The browser then makes a TCP connection to the web server at the IP address ([www.kerala.gov.in](http://www.kerala.gov.in)).
5. Then it sends a GET request for the required file (web page) to the web server.
6. The web server returns the web page.
7. The TCP connection is released.
8. The browser processes the contents of the webpage and displays it.



### 9.4.2 Search engines

There are millions of pages available on the Internet that contain information on a variety of topics. But it is very difficult to search for a topic in this large collection of web pages. Internet search engine websites are special programs that are designed to help people to find information available in World Wide Web. Search engine programs search documents available on World Wide Web for specified keywords and return a list of the documents/web pages matching the keywords.

Let us discuss the technology behind these websites. Search engine web sites use programs called web crawlers or spiders or robots to search the web. Web crawlers search the web pages stored in the different web servers and find possible keywords. The search engine website stores these keywords along with their URLs to form an index in the search engine's web servers. When we use the search engine website to search a particular topic (keyword), it does not search the World Wide Web. It only searches the index, which the web crawler programs have created in the search engine's web server for the topic/keyword. Search engines

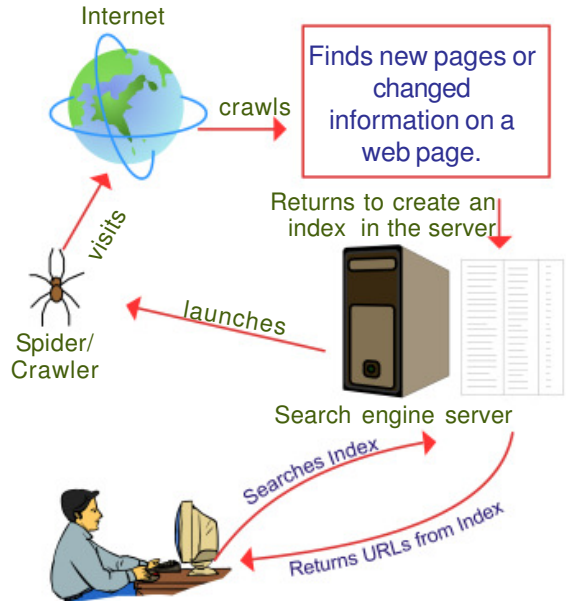


Fig. 9.8 : Working of a search engine

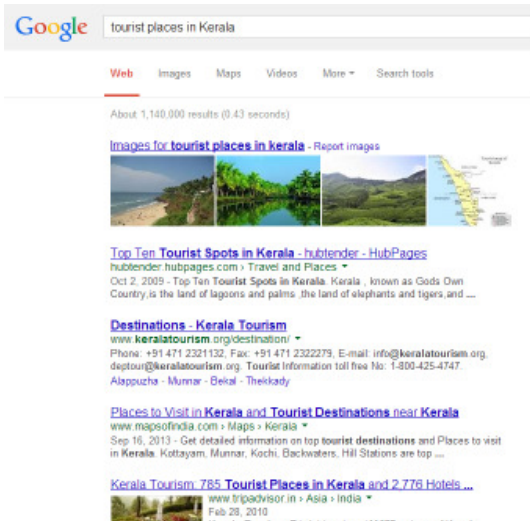
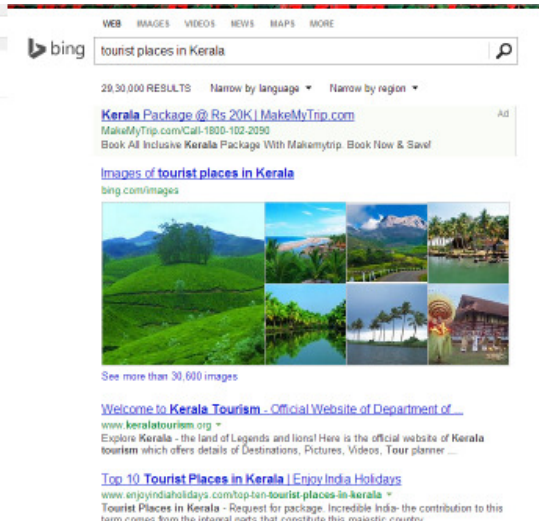


Fig. 9.9 : Search results of different search engines



select a list of URLs where the particular topic is found from the index and displays it as the result. Figure 9.8 shows the working of a search engine.

Some of the most popular web search engine sites are Google, Bing, Yahoo Search, Ask, etc. Figure 9.9 shows the search results of different search engines.

### 9.4.3 E-mail

E-mail enables us to contact any person in the world in a matter of seconds. Billions of e-mail messages are sent over the Internet every day. **Electronic mail** or **e-mail** is a method of exchanging digital messages between computers over Internet.

E-mail has become an extremely popular communication tool. The e-mail will be delivered almost instantly in the recipient's mail box (Inbox). Apart from text matter, we can send files, documents, pictures, etc. as attachment along with e-mail. The same e-mail can be sent to any number of people simultaneously. Figure 9.10 shows a sample e-mail message.

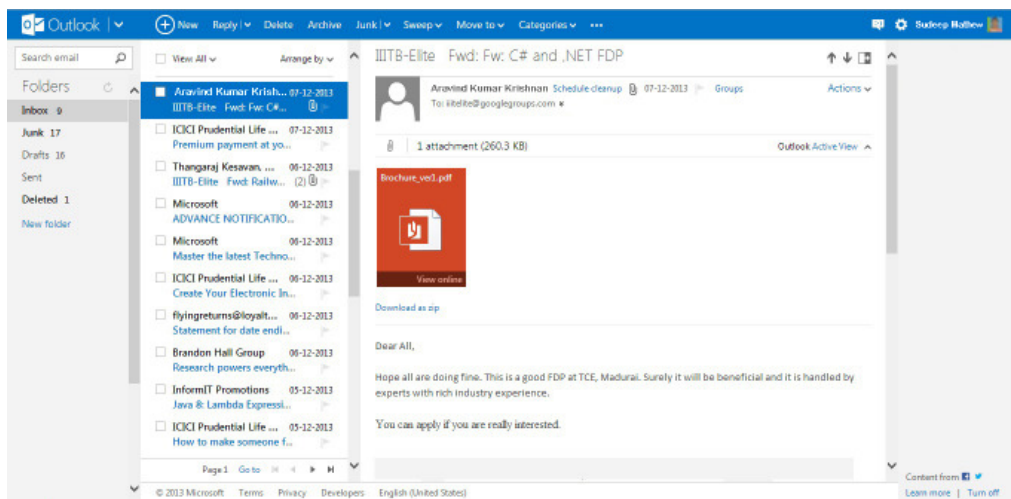


Fig. 9.10 : A sample e-mail message

Most of you will have an e-mail address. The structure of an e-mail address is: user name@domain name. An example of an e-mail address is

[scertkerala@gmail.com](mailto:scertkerala@gmail.com)

An e-mail address consists of two parts separated by @ symbol. The first part *scertkerala* is the username that identifies the addressee and the second part *gmail.com* is the domain name of the e-mail server, i.e., the name of the e-mail service provider.

E-mails can be accessed using websites like *gmail.com*, *hotmail.com*, etc. that provide web applications consisting of functions to send, receive, forward, reply and organise emails. Such a facility is popular and is commonly referred to as web mail.



E-mails can also be accessed using e-mail client software that is installed in our computers. Such software uses our e-mail address and password to retrieve e-mails from the e-mail service provider's server and store it in our computer. An e-mail client allows to send, receive and organise e-mail. The messages sent when the computer is offline are stored in the program and send later when computer is online. For receiving messages, e-mail client applications usually use either the Post Office Protocol (POP) or the Internet Message Access Protocol (IMAP). The popular e-mail client applications are Microsoft Outlook and Mozilla Thunderbird.

### a. Sections of an e-mail

A client software gives provisions to enter the following sections.

**To** (Receipient Address) – A box to provide the e-mail addresses of the primary recipients to whom the e-mail has to be sent.

**Cc** (Carbon copy) – Write the e-mail addresses of the secondary recipients to whom the message has to be sent.

**Bcc** (Blind carbon copy) – Write the e-mail addresses of the tertiary recipients who receive the message. When the message is received the primary and secondary recipients cannot see the email addresses of the tertiary recipients in the message. Depending on e-mail service used, the tertiary recipients may only see their own e-mail address in Bcc, or they may see the e-mail addresses of all recipients.

**Subject** – Provide a meaningful subject for your conversation here. This helps you to identify a conversation with a particular person when you search your e-mails later.

**Content** – Type your message here. Today most of the e-mail service providers offer features to create an attractive message by giving colours, changing font styles, size, etc.

Attachment facility allows us to send files like documents, pictures, etc. along with an e-mail. The 'Send' button is used to send the message to the recipients. 'Reply' button allows you to send a reply back to the sender of the message received. 'Forward' button helps you to send a message received by you to other people. Figure 9.11 shows the major sections of an e-mail.

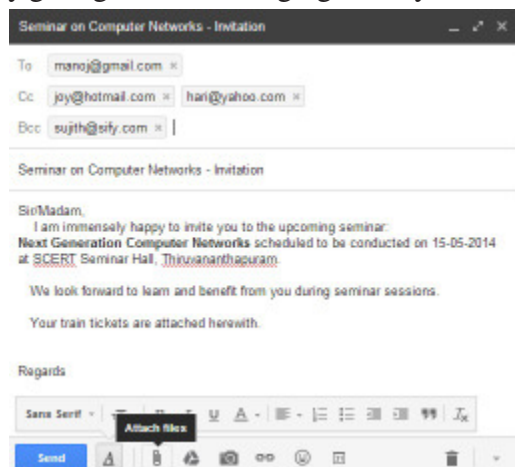


Fig. 9.11 : Composing an e-mail

## b. Working of e-mail

Have you ever wondered how e-mail is sent from your computer to a friend on the other side of the world? When an e-mail is sent from your computer using web mail or e-mail client software, it reaches the e-mail server of our e-mail service provider. From there the message is routed from sender's e-mail server all the way to the recipient's e-mail server. The recipient's e-mail server then delivers the e-mail to the recipient's mail box (inbox), which stores the e-mail and waits for the user to read it. Simple Mail Transfer Protocol (SMTP) is used for e-mail transmission across Internet. Figure 9.12 shows the working of e-mail.

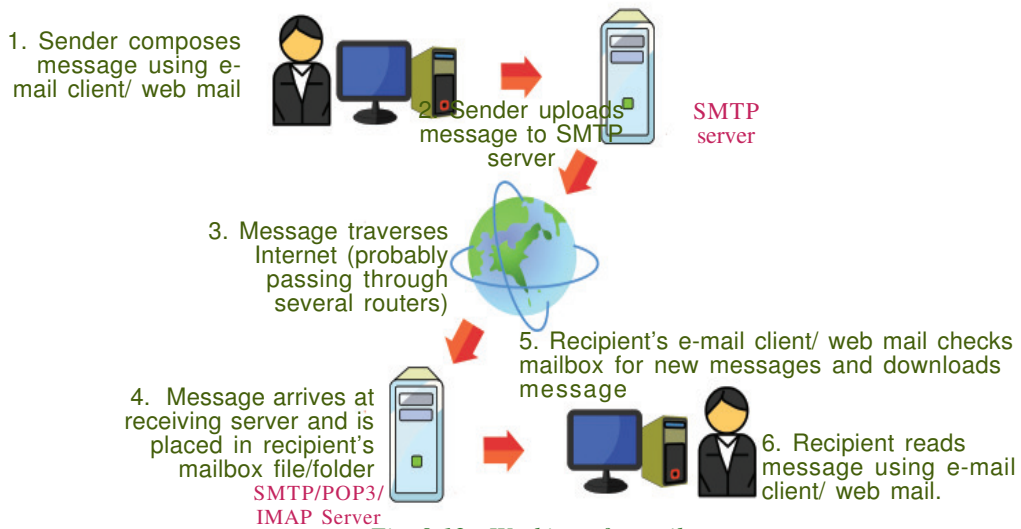


Fig. 9.12 : Working of e-mail

## c. Advantages of using e-mail

The benefits of using e-mail facility are listed below.

- **Speed:** An e-mail is delivered instantly to any location across the globe. We can send the same e-mail to multiple users simultaneously.
- **Easy to use:** We can send and receive e-mails, organise our daily conversations and save them easily on our computer.
- **Provision of attachments:** The attachment feature allows to send pictures, files, documents, etc. along with e-mail.
- **Environment friendly:** E-mails do not use paper and save a lot of trees from being cut down.
- **Reply to an e-mail:** When we need to reply to an e-mail, we can use the provision of attaching previous e-mails as reference. It helps to refresh the recipient about the subject.



- **Cost-effective:** When compared to fax or conventional mail, e-mail is less expensive.
- **Available anywhere anytime:** Messages can be read at user's convenience. Access to mail box is available anytime.

The e-mail service, though beneficial in our daily life, can be misused in different ways as listed below.

- **E-mails may carry viruses:** Viruses send along with e-mail can harm our computer system. Viruses can also illegally access our e-mail address book and spread virus infected messages to all email addresses in it.
- **Junk mails:** Checking and deleting unwanted mails consume a lot of time.



### Internet of Things (IoT)

Can you imagine a fridge which checks its egg tray and reminds you to buy eggs in your mobile phone or orders the nearby grocery store to supply eggs to your home; an air conditioner that can be switched on or off using your mobile phone; or a car that automatically reminds you about filling fuel as you approach a fuel pump? This is being made possible using Internet of Things (IoT). IoT is the concept of connecting all devices like mobile phones, fridges, cars, air conditioners, lamps, wearable devices, etc. to the Internet. Each device is provided with a unique IP address which identifies it and allows it to transfer data over Internet without human intervention. The huge increase in the number of IP addresses due to the implementation of IPv6 supports the introduction of this technology. The IoT can be used to monitor health of patients and inform the doctor about an urgency, applied to things which help us reduce wastage like power, water, etc. and improve the way we work and live.

#### 9.4.4 Social media

All of us are familiar with wikipedia, the free encyclopedia in Internet. We have also heard about people responding to social issues through facebook, twitter, etc. Also we know that people use youtube to share videos and for promotion of products or business. All of these are part of social media which is changing the way we communicate, entertain and live. Social media refers to the use of mobile and web-based technologies through which individuals and communities can create, share, discuss and modify content.

In social media, interactions among people happen in virtual communities and networks over Internet. These digital technologies influence the formation and activities of civil communities to a great extent.

## a. Classification of social media

The various types of social media that exist on the Internet are: Internet forums, social blogs, microblogs, wikis, social networks, content communities and a lot more. Figure 9.13 displays logos of popular social media websites. Here we discuss the most popular classifications of social media.

### 1. Internet forums

An Internet forum is an online discussion web site where people can engage in conversations in the form of posted messages. Each Internet forum will have sub forums which may have several topics. Each discussion on a topic is called a thread. People can login and start a thread or respond to discussion in a thread. Some forums allow anonymous login also. Discussions can be about programming, social/political issues, fashion, etc. These discussions help us to learn and find solutions to problems. Ubuntu Forum – a community that provides help on Ubuntu is a popular forum.

### 2. Social blogs

A blog (web log) is a discussion or informational website consisting of entries or posts displayed in the reverse chronological order i.e., the most recent post appears first. Some blogs provide comments on a particular subject; others function as personal online diaries and some others as online brand advertising for a particular individual or company. Initially blogs were created by a single user only. But now there are multi-author blogs that are professionally edited. Blogger.com and Wordpress.com are popular sites that offer blogging facility.

### 3. Microblogs

Microblogs allow users to exchange short sentences, individual images or video links. People use microblogs to share what they observe in their surroundings – information about events and opinions about topics from a wide range of fields. Microblogging offers a communication mode that is spontaneous and can influence public opinion. Twitter.com is a popular microblogging site.

### 4. Wikis

Wikis allow people to add content or edit existing information in a web page, to form a community document. Wiki is a type of content management system. Editing done by



Fig. 9.13 : Logo of popular social media websites





users is very closely monitored by other editors and therefore incorrect information, advertising, etc. are removed immediately. wikipedia.org – the free online encyclopedia is the most popular wiki on web.



Wikipedia is a free online encyclopedia to which anyone can add content and edit. Wikipedia was formally launched on 15th January 2001 by Jimmy Wales and Larry Sanger using the concept and technology



of a wiki. Wikipedia consists of over 3 crore articles in around 300 languages. The English edition alone includes around 44 lakh articles and is one of the most visited websites on Internet. Articles on topics range from very broad to highly specific. Each article consists of a number of links to Wikipedia itself and other external resources. Since users are able to create and edit articles, the quality of the content in the articles depends on the person who contributes and edits it. The Malayalam edition of Wikipedia is available at [ml.wikipedia.org](http://ml.wikipedia.org).

### 5. Social networks

Social networking sites allow people to build personal web pages and then connect with friends to communicate and share content. We can share text, pictures, videos, etc. and comment to the posts. A social networking site can be for general topics or for a specific area like professional networking. Public opinion is greatly influenced by the discussions and posts in these websites. Popular social networking sites are [facebook.com](http://facebook.com) and [linkedin.com](http://linkedin.com).

### 6. Content communities

Content communities are websites that organise and share contents like photos, videos, etc. [Youtube.com](http://Youtube.com) is a popular video sharing site and [flickr.com](http://flickr.com) shares pictures.

Most of today's social media websites offer more than one type of service, i.e., social networking and microblogging; blogging and internet forum; etc. Studies have revealed that social media is now recognised as a social influencer.

#### b. Advantages of social media

- **Bring people together:** Social networking allows people to find long-lost childhood friends and make new ones.
- **Plan and organise events:** These sites help users to organise and participate in events.

- **Business promotion:** Social media offers opportunities for businesses to connect with customers, implement marketing campaigns, manage reputation, etc.
- **Social skills:** These sites allow people to express their views over a particular issue and become an agent for social change.

### c. Limitations in use of social media

- **Intrusion to privacy:** The personal information of users can be used for illegal activities. Information like the e-mail address, name, location and age can be used to commit online crimes.
- **Addiction:** Addiction to these sites wastes our valuable time. It will negatively affect our mental states and may lead to depression and tension. It can reduce the productivity of workers in an organisation. Students may lose concentration and this in turn may affect their studies.
- **Spread rumours:** Social media will spread the news very quickly. It can facilitate or worsen a crisis by spreading negative information or misinformation at an incredible speed.

### d. Social media interaction – Best practices

- Avoid unnecessary uploading of personal data like e-mail address, telephone number, address, pictures and videos.
- Setting time schedule for using these sites can save wastage of time.
- In social media websites like wikis and blogs, photo and video sharing are public. What you contribute is available for all to see. Be aware of what you post online. Avoid posting content you may regret later.
- Set your privacy levels in such a way that you know exactly who can see your posts and who can share them. The three basic privacy levels in social media are private, friends and public.



- *Prepare a chart on the different social networking websites and their uses.*
- *Create a blog of your class and update the activities like achievements in sports, arts, class tests, assignments, etc.*
- *Conduct a survey in your school to find the most popular Internet browser. Also prepare a chart based on the collected data.*





### Check yourself

1. Give an example for an e-mail address.
2. Which of the following is not a search engine?  
(a) Google (b) Bing (c) Facebook (d) Ask
3. Name the protocol used for e-mail transmission across Internet.
4. What is a blog?
5. Name two services over Internet.
6. Each document on the web is referred using \_\_\_\_\_.

## 9.5 Cyber security

Today, we know that people use Internet to transfer personal and confidential information or make payments, organisations like banks perform all their financial transactions using their computer network, railways do business – selling tickets, information on running trains, etc. using the railway's computer network. Can you imagine the volume of financial loss and other issues that may occur if these computer networks are not available, even for a short time?

Security to computer networks is vital because important data can be lost and privacy can be violated. Further, work or business can be interrupted for several hours or even days if a network comes under attack. With the arrival of the Internet, security has become a major concern as people started using Internet as a tool for communication and doing business. Every organisation should monitor its network for possible intrusion and other attacks. Here we discuss the common threats that affect a computer network.

### 9.5.1 Computer virus

A computer virus is a program that attaches itself to another program or file enabling it to spread from one computer to another without our knowledge and interferes with the normal operation of a computer. A virus might corrupt or delete data on our computer, replicate itself and spread to other computers or even erase everything in the hard disk. Almost all viruses are attached to executable files. A virus may exist on a computer, but it cannot infect the computer unless this malicious program is run or opened. Viruses spread when the file they are attached to, is transferred from one computer to another using a portable storage media (USB drives, portable hard disks, etc.), file sharing, or through e-mail attachments. Viruses have become a huge problem on the Internet and have caused damage worth billions.

### 9.5.2 Worm

A computer worm is a stand alone malware (malicious software) program that replicates itself in order to spread to other computers. Worms spread from computer to computer on its own. Unlike a virus, it does not need to attach itself to a program to propagate. A worm takes advantage of the data transport features of the computer system to travel without help. Worms always slow data traffic on the network by consuming bandwidth, whereas viruses almost always corrupt or modify files on a computer. The most destructive effect that a worm can cause is through e-mails. A worm can send a copy of itself to every address in an e-mail address book. Then, the worm sends itself to everyone listed in each of the receiver's address book and so on.



#### I LOVE YOU worm

This worm affected computers in 2000 by overwriting most of the files. Users received this worm as an e-mail with a subject line "ILOVEYOU" and with a file attachment LOVE-LETTER-FOR-YOU.TXT.vbs. Those who clicked the attachment got their computers affected by the worm and lost their files.

### 9.5.3 Trojan horse

A Trojan horse, will appear to be a useful software but will actually do damage once installed or run on the computer. Users are typically tricked into loading and executing it on their systems. When a Trojan is activated on a computer, they can cause serious damage by deleting files and destroying information on the system. Some Trojans create a backdoor on the computer. This gives malicious users access to confidential or personal information in the computer through the network. Unlike viruses and worms, Trojans do not reproduce by infecting files nor do they self-replicate.



#### Ie0199.exe Trojan

E-mail users received a message that offered a free upgrade to Internet Explorer that contained an executable file Ie0199.exe as attachment. This e-mail instructed the user to download and install this program for the upgrade. The users who followed these instructions got their files infected.

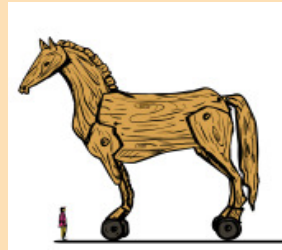




### Trojan War

In Greek mythology, the Trojan War was waged against the city of Troy by the Greeks after Prince Paris of Troy stole away the Greek Queen Helen. The Greeks fought a battle with the city of Troy for ten long years. The Greek soldiers got fed up and wanted to return to their homes. Then, Athena, the Goddess of war gave the Greeks an idea to end the war.

According to the plan, they built a big hollow wooden horse. The hollow horse was filled with soldiers and they left it as a gift for the Trojans. All other soldiers pretended to abandon their camp. Trojans thought that they had won the war. They pulled the huge horse to their city. They started celebrations of their victory. In the night when everyone was asleep, the Greek soldiers opened the horse and came out. They killed the sleeping soldiers of Troy and rescued Queen Helen.



### 9.5.4 Spams

Spams or junk mails are unsolicited e-mails sent indiscriminately to persons to promote a product or service. Spammers collect e-mail addresses from chat rooms, websites, customer lists, newsgroups, etc. Clicking on links in spams may send users to websites that host certain viruses. Today most e-mail service providers provide e-mail filters that can successfully separate genuine email from spams as indicated in Figure 9.14.

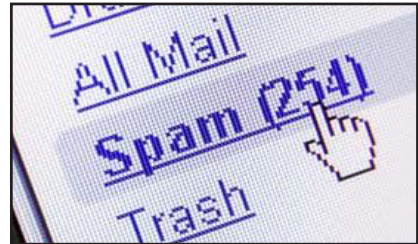


Fig. 9.14 : Collection of spams in the e-mail menu

### 9.5.5 Hacking

In computer networking, hacking is a technical effort to manipulate the normal behavior of network connections and connected systems. Hacking is performed both by computer security experts and by computer criminals. Computer experts perform hacking to test the security and find the vulnerabilities in computer networks and computer systems. Such computer experts are often called 'white hats' and such hacking is called ethical hacking.

Computer criminals break into secure networks to destroy data or make the network unusable for those who are authorised to use the network. They do this with the intent of stealing confidential data or destroying files. Such criminals are called 'black hats'.

There is another category of hackers called grey hat hackers, who fall between white and black hackers. They sometimes act illegally, though with good intentions, to identify the vulnerabilities. Grey hat hackers do this to achieve better security.

### 9.5.6 Phishing

Phishing is a type of identity theft that occurs online. Phishing is an attempt to acquire information such as usernames, passwords and credit card details by posing as the original website, mostly that of banks and other financial institutions. Phishing websites have URLs and home pages similar to their original ones. The act of creating such a misleading website is called spoofing. People are persuaded to visit these spoofed websites through e-mails. Users are tempted to type their usernames, passwords, credit card numbers, etc. in these web pages and lose them to these websites. These frauds use this information to steal money. Phishing is currently the most widespread financial threat on the Internet. The URL in Figure 9.15 indicates that it is a phishing website.

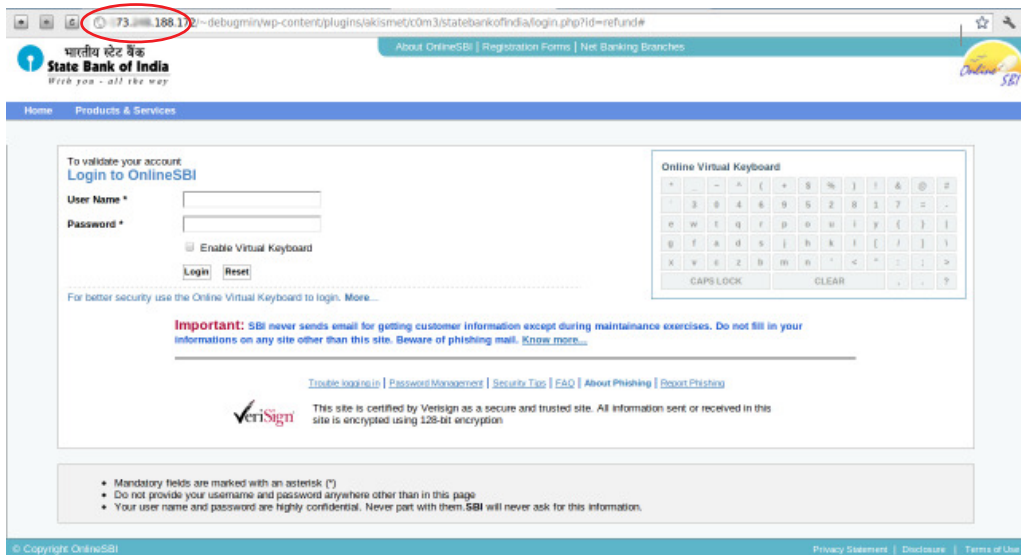


Fig. 9.15 : A phishing website

### 9.5.7 Denial of Service (DoS) attack

A Denial of Service (DoS) attack is usually aimed at a web server. Such an attack forces the server/computer to restart. An attack in which the attackers' goal is to shut down the target server rather than stealing data is called DoS attacks. This prevents genuine users of a service/website on the web server from using that service. This attack can be done using a single computer called Denial of Service (DoS) attack or using more than one computer called Distributed Denial of Service (DDoS) attack.



We have learned that when we type a website address in the browser and press the **Enter** key, the browser requests for that web page from the server. DoS attacks send a large number of such requests to the server until it collapses under the load and stops functioning. A DoS attack using a computer on a network slows down the network by flooding a server with a large number of requests. A DDoS attack uses multiple computers in the network that it has previously infected. These infected computers called ‘zombies’, work together and send out large quantities of fake messages/requests to the target server. Figure 9.16 shows the Distributed Denial of Service attack. This increases the amount of data traffic to the target server. This leads to server overload and the server is unable to provide services to its users. The target computer is thus forced to reset / restart leading to unavailability of its service for a period of time. A DoS attack interrupts network service for some period, but it does not cause severe damage to files as in the case of a virus attack.

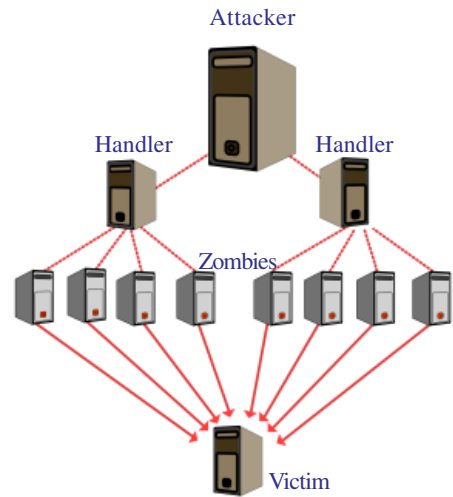


Fig. 9.16 : Distributed Denial of Service (DDoS) attacks

### 9.5.8 Man-in-the-Middle attacks

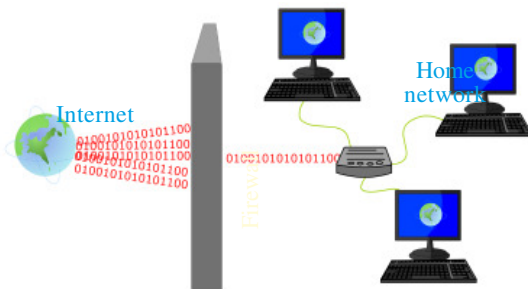
A man-in-the-middle attack refers to an attack in which an attacker secretly intercepts electronic messages between the sender and the receiver and then captures, inserts and modifies messages during message transmission. If sender transmits messages without appropriate security, the attacker may exploit the vulnerabilities in the network to capture and modify the messages and send the modified messages to the receiver. Since the network transmission still works properly, both the sender and receiver will find it difficult to notice that the messages have been trapped or modified by an intruder. If we use such a computer for online transactions, the man in the middle may capture our bank account number and password to steal money, leading to financial loss. Encrypted connections such as HTTPS (HTTP Secure), SFTP (Secure FTP), etc. should be used for secure transactions, so that intruders cannot modify the messages.

## 9.6 Preventing network attacks

Threats to computers and networks are a major issue as long as information is accessible and transferred across the Internet. Different defense and detection mechanisms are developed to deal with these attacks.

### 9.6.1 Firewall

A firewall is a system of computer hardware and software that provides security to the computer network in an organisation. A firewall controls the incoming and outgoing



network traffic by analysing the data and determining whether they should be allowed through or not, based on a rule set. Firewalls deny malicious data from entering into the computer networks as shown in Figure 9.17.

Fig. 9.17 : Firewall



#### Sandboxing

Sandboxing is a technique through which programs that are suspected to be infected with a virus can be run. Through sandboxing such programs are run in a separate memory area and therefore cannot damage our operating system.

### 9.6.2 Antivirus scanners

Viruses, worms and Trojan horses are all examples of malicious software (malware). Antivirus tools are used to detect them and cure the infected system. Antivirus software scans files in the computer system for known viruses and removes them if found. The antivirus software uses virus definition files containing signatures (details) of viruses and other malware that are known. When an antivirus program scans a file and notices that the file matches a known piece of malware, the antivirus program stops the file from running, and puts it into 'quarantine'. Quarantine is a special area for storing files probably infected with viruses. These files can later be deleted or the virus can be removed. For effective use of antivirus software, virus definitions must be updated regularly.

### 9.6.3 Cookies

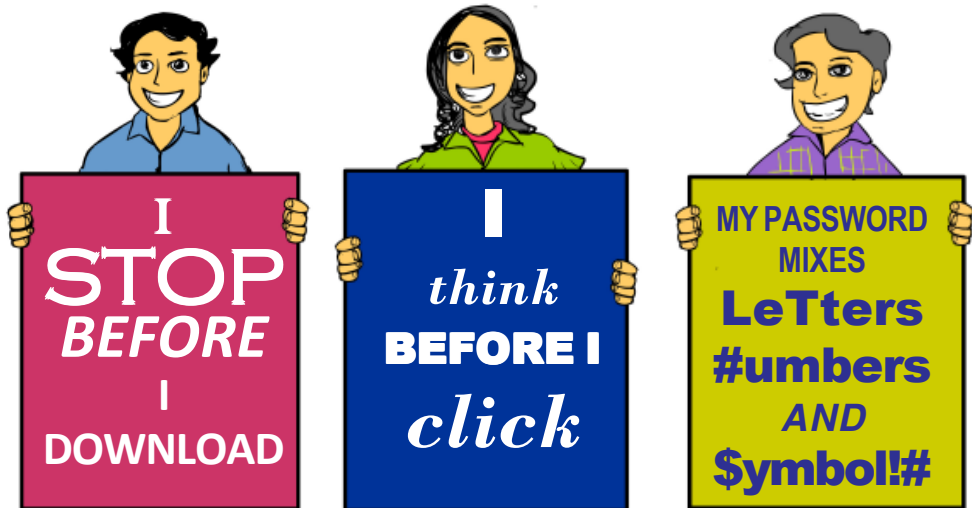
Cookies are small text files that are created when we use a browser to visit a website. Cookies keep track of our movements within the web site – remembers our user name, preferences, e-mail address, etc. Browsers store cookies for an interval of time, usually in a cookie folder on the client's computer. Cookies are text files and so they are not executable programs. Web sites use cookies mainly because they save time and make browsing efficient.

Cookies are treated as data and so it is not a virus, but it is always possible for a hacker to use it for malicious purposes. Cookies can be used to act as a spyware. There are





harmful cookies that are used by different websites to compromise our privacy. Such websites store a special cookie in our computer that will keep track of our activities like, websites visited, products purchased or the forms that are filled. Most browsers provide facilities to manage/delete harmful cookies. Frequent deletion of cookies helps to prevent illegal access and use of personal information.



## 9.7 Guidelines for using computers over Internet

Following are the major guidelines for using computers over Internet.

- Most of the computer viruses are spread through e-mail attachments. Do not open any e-mail attachment that you are not sure about the sender.
- Download files only from reputed sources. Do not use/copy software that you cannot confirm the origin.
- Avoid clicking on pop-up advertisements. Close them instead.
- Use USB drives with caution. Plugging someone else's USB storage into your computer or plugging your own USB storage into a computer at an Internet cafe/unsafe computer, can spread an infection through the USB storage.
- Make sure the firewall is set and turned on.
- Use strong passwords. Change passwords at regular intervals.
- Update the virus definitions of your antivirus program periodically online.
- Keep a regular backup of your important files (on DVD, another hard disk, etc.)



### Guidelines for Setting up a Strong Password

- A password should have atleast 8 characters.
- A password should contain
  - Upper case letters
  - Lower case letters
  - Numbers
  - Symbols like @, #, \$, etc.
- A password should not be personal information like name, date of birth, etc. or common words.
- Never disclose your password to others.
- Do not write it on a paper or store it in a file in your computer.
- Do not use the same password for all logins.
- Change password often.

- Be careful about giving personal data online. If you see e-mail message requests for personal data such as telephone number, address, credit card number, etc. from unknown persons, ignore it.
- Visit banks' websites by typing the URL into the address bar. Do not click on links within e-mails to go to bank websites. Banks or any of its representatives never sends you e-mail/SMS or phone calls to get your personal information, usernames or password. Never reveal your passwords or ATM card details to anyone.
- Check whether the website you are visiting is secure while performing financial transactions. The web address in the address bar should start with 'https://'. Also look for a lock icon on the browser's address bar.
- Keep a regular check on your online accounts. Regularly login to your online accounts, and check your statements. If you see any suspicious transaction, report them to your bank or credit card provider.

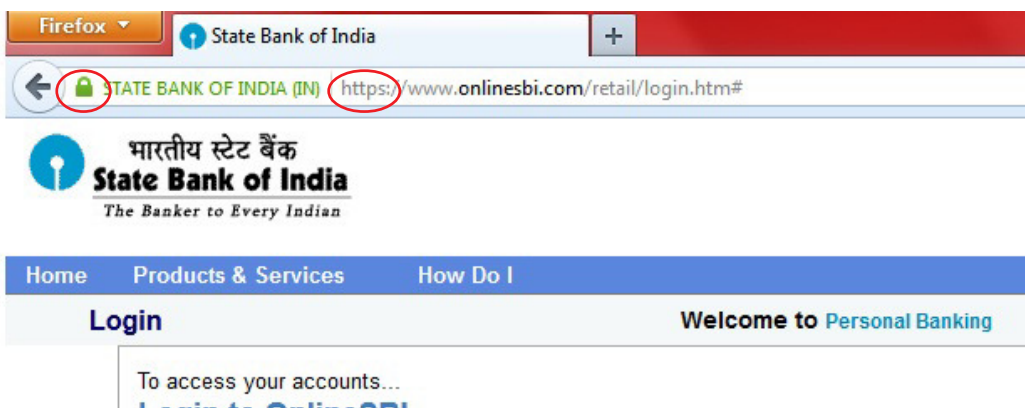


Fig 9.18 : Secure banking - lock icon and https





Let us do

- Conduct a group discussion on the topic “security threats / cyber attacks to your system”, and draw a bar diagram based on information arrived in the event.
- List the names of various viruses and their features in the form of a chart.



### Check yourself

1. What is a virus?
2. What do you mean by phishing?
3. The small text files used by browsers to remember our email id's, user names, etc are known as \_\_\_\_\_.
4. The act of breaking into secure networks to destroy data is called \_\_\_\_\_ hacking.
5. What is quarantine?



### Let us sum up

The Internet, which was started as a defence project of the US government has become a part of our life. Today the Internet is accessed using mobile devices like mobile phones, tablets, etc. than using a desktop computer. Therefore speed of Internet access has become an important factor. New technologies connect to Internet focus on data transmission speed. Internet services like e-mail, social media, searching etc. have changed the way we communicate. Each of the above services has its own benefits and risks. Computer networks today play an important role in providing the above services. It has increased the risk factors for networks, like viruses, worms, Trojan horse, phishing, etc. Antivirus software, firewalls, etc. are used to protect computer networks from different kinds of attacks. The risks for a network attack can be reduced by following certain guidelines while using computers on Internet.



### Learning outcomes

After the completion of this chapter the learner will be able to

- recognise the people behind the evolution of Internet.
- identify the hardware and software requirements for Internet connection.
- use the services available on Internet.
- classify the different types of social media.
- judge the risks while interacting with social media.
- recognise the threats to network security.

## Sample questions

### Very short answer type

1. Why is the invention of HTTP and HTML considered as an important land mark in the expansion of Internet?
2. Compare intranet and extranet.
3. Write short notes on
  - a. Mobile broadband
  - b. Wi-MAX
4. Explain the terms web browser and web browsing.
5. Compare blogs and microblogs.
6. What are wikis?
7. What is firewall?

### Short answer type

1. Your neighbour Ravi purchased a new PC for his personal use. Mention the components required to connect this PC to Internet.
2. What are the advantages of using broadband connection over a dial-up connection?
3. XYZ engineering college has advertised that its campus is Wi-Fi enabled. What is Wi-Fi? How is the Wi-Fi facility implemented in the campus?
4. Madhu needs to prepare a presentation. For this, he uses [www.google.com](http://www.google.com) to search for information. How does google display information when he types 'Phishing' in the search box and clicks search button?
5. Manoj's e-mail id is [manoj@gmail.com](mailto:manoj@gmail.com). He sends an e-mail to Joseph whose e-mail id is [joseph@yahoo.com](mailto:joseph@yahoo.com). How is the mail sent from Manoj's computer to Joseph's computer?
6. How does a Trojan horse affect a computer?
7. Explain a few threats that affect a computer network.

### Long answer type

1. Suppose you wish to visit the website of kerala school kalolsavam, [www.schoolkalolsavam.in](http://www.schoolkalolsavam.in) and you have entered the URL in the address bar. Write the steps that follow until the home page is displayed.
2. Write the disadvantages of social media. What are the different ways to avoid the disadvantages of social media?
3. Explain the various broadband technologies available for Internet access.

