Chapter 8: Emerging Technologies and Virus

Different Communication methods.

(1) GIS
(2) GPS
(3) CDMA
(4) GSM

1] GIS

- A GIS **(Geographic Information System)** is a tool that uses for the answer of the geographic question.
- By using GIS tool, user can arrange and display the data about places on the earth in variety of ways including maps, charts and tables.
- We can store, analyse and manage the data about places on the earth with the help of GIS tool.
- A GIS is a computer system that capable of storing, editing, analysing, sharing and displaying geographically referenced information.
- User can zoom in and out of maps, charts and tables freely and study in details.
- By using GIS tool, we can create maps, charts and tables and also we can solve the complicated problems and develop the effective solutions.
- This type of tool is used in the organizations, schools, governments and businesses industry for solving the problems.

There are 5 types components of a GIS

1) Hardware
2) Software
3) Data
4) People
5) Method

A GIS is a powerful tool that used in various areas as following:

1) In Agriculture
2) In Business
3) In Electric/Gas utilities
4) In Environment
5) In Forestry
6) In Military
7) In Land use planning
8) In Site Planning
9) In Water/waste water Industry
10) In Geology
11) In Hydrology
12) In Mapping
13) In Transportation
14) In Risk Management

2] GPS

- GPS means **Global Positioning System** and it is a system that can provide a position at any point on the Earth's surface to a very high degree of accuracy.
- GPS provides the position information of the earth.
- GPS is a system that measures the distances from the satellites that are in orbit around the Earth.
- By knowing the distance from the satellites, it is possible to calculate the position on the Earth's surface.
- The satellite sends all the timing and position information to the receiver so the receiver knows when the message was sent and also the receiver is able to calculate the distance from the satellite about their position.
- The satellite contains an atomic clock so that the satellite sends the timing information to the receiver that is very accurate.
- The satellite uses their own power through their solar panels and these extend to about 17 feet and it provides 700 watts power.
- Each satellite is in circular orbit around the earth and it sends the data on two frequencies like L1 (1600 MHz) and L2 (1300 MHz).
- A GPS (Global Positioning System) is the satellite-based system that provides accurate information about position, speed and time of the earth.
- There are 24 satellites in GPS that orbits the earth at a height of about 12000 miles.
- Each of this satellite are constantly moving and making two complete orbits in less than 24 hours.
- The speed of satellite is 7000 miles per hour.
- A GPS contains 3 types of segments like User, Control and Space.
- User segment changes according to the requirements of application but Control and Space segments do not change for all applications.

A GPS is a powerful tool that used in various areas as following:

1) In Agriculture
2) In Air Traffic Control
3) In Space Shuttle
4) In Tourism

3] CDMA

- Basically there are three access schemes for radio systems for providing access to multiple users.
  1. Frequency Division Multiple Access (FDMA)
  2. Time Division Multiple Access (TDMA)
  3. Code Division Multiple Access.

- CDMA is a spread-spectrum technology that allows many users to occupy the same time and frequency allocations in a given band/space.
- As the name implies, CDMA assigns unique codes to each user to differentiate it from others in the same spectrum.

- It is the platform on which 2G and 3G advanced services are built.
- Application of CDMA technology is digital cellular phone technology operating in 800 MHz and 1.9 Hz PCs bands.
- After the speech code converts voice into digital, CDMA spreads the voice stream over the full 1.25MHz bandwidth of the CDMA channel, coding each stream separately so it can be decoded at the receiving end.
- The rate of the spreading signal is known as the 'chip rate,' as each bit in the spreading signal is known as 'chip'.

o **Benefits**

- CDMA phones give very good quality and low power consumption.
- It provides more than ten times the capacity of the analogue cell phone system and five times the calling capacity of GSM and TDMA.
- It requires fewer cell sites than he GSM and TDMA digital cell phone systems.
- This technology provides good resistance to fading problems.
- It avoids interceptions.

4] GSM

- GSM (Global System for Mobile Communication: originally from Groupe Special Mobile) is the most popular standard for mobile phones in the world.
- Its promoter, the GSM Association, estimates that 80% of the global mobile market uses the standard.
- GSM is used by over 3 billion people across more than 212 countries and territories.
- It makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world.

o **Advantage**

- GSM standard has been advantage to both consumers and also to network operators.
- It also pioneered a low-cost alternative to voice calls, the short message service, which is now supported on other mobile standards as well.
- The standard includes one worldwide emergency telephone number, 112, this makes it easier for international travelers to connect to emergency services without knowing the local emergency number.

GSM, which means that mobile connect to it by searching for cells in the immediate vicinity.

- There are five different cell sizes in GSM network- macro, micro, Pico, femto and umbrella cells.
- The longest distance the GSM specification supports in practical use is 35 kilometers.
- Indoor coverage is also supported by GSM and may be achieved by using an indoor Pico cell base station.

Communication Devices

1] Cell Phone

- Cell phones originated from the concept of Radio in the year 1920.
- Later on these features were put into radios and it was used by the Police in the year 1940.
- The concept of the modern cellular phone was developed in 1947 which originated from the mobile car phone.
- The first actual cell phone was made in 1973 by Martin Cooper of Motorola and his teammates who used the idea of the car phone and applied this technology to make a portable cell phone.
- Cell phones were first made available to the public in 1984.
- Cellular telephones also known as mobile or cell phones are short-range, portable electronic device used for mobile voice over network of specializes base stations known as cell sites.
- Today, cell phones are most common and they have become a way of life.
- The working of a cell phone is based on “frequency reuse”.
- The cellular frequencies are the sets of frequency ranges within the UHF (Ultra High Frequency) band that have been allocated for cellular phone use.
- All cellular phone networks worldwide utilize a portion of the radio frequency spectrum designated as Ultra High Frequency (UHF), for the transmission and reception of their signals.

2] Modem

- Originally engineers called it the 'Modulation - Demodulation' box.
- But it was such a mouthful that naturally they ended up calling it the MODEM.
- A modem converts the digital data from the computer into a continuous analogue wave form that the telephone system is designed to deal with (Modulation).

- The reason for this is that the telephone system was originally designed for the human voice i.e. continuous signals.
- The modem also converts the analogue signal from the telephone network back into digital data that the computer can understand. (Demodulation).
- Standard modems come in two forms.
- An external box that links to your computer either through a serial or USB port, or an internal modem that is plugged directly to the motherboard inside the computer.
- Up to quite recent times, modems connected to the standard telephone line at speeds up to 56 kilobits per second.
- This was OK until broadband became available which offers ten times the speed.
- However many people still have to use a 56Kb modem to connect to the internet because their local exchange has not been converted to broadband as yet.

3] Bluetooth

- Bluetooth is a wireless technology.
- It allows devices to share information over a maximum range of 10 meters.
- It enables computers, phones, and peripherals to communicate with one another without cables.
- Devices need not be within line-of-sight and may even connect through walls or other non-metal objects.
- As long as two blue tooth devices are close enough to each other, it's possible to make a connection.
- It can simultaneously handle both data and voice transmissions.
- It is "Bluetooth is low cost, short range, radio frequency devices that is used to establish wireless link between them".
- It consumes very little power so it is ideal for small handled device, both voice & data can exchange between different Bluetooth enabled devices without any wire communication.
- That makes Bluetooth technology suitable for transferring smaller files such as text documents and cell-phone contacts, as well as lower-quality images and audio.

Network topology

- Bluetooth devices are generally organized into groups of two to eight devices called Pico nets, consisting of a single master device and one or more slave devices.
- A Pico net is an ad-hoc computer network, using Bluetooth technology protocols to allow one master device to interconnect with up to seven active devices.

- **Advantage**
  (1) Easy and efficient to use.
  (2) Safe, secure connections.
  (3) Video conferencing and video clips on cell phone is possible using this technology.
  (4) Connecting devices without the need for cables.
  (5) Reduced power consumption

- **Disadvantage**
  (1) Slow transfer rate
  (2) Susceptibility to interference

Bluetooth	Wireless LANs
Bluetooth has lower distance range (less than 30 feet)	Wireless LANs (up to 200 feet)
Bluetooth has generally lower speed	Comparatively higher speed.
Components (chips and radios) and device adapters are cheaper.	Components (chips and radios) and device adapters are comparatively costly.
Bluetooth chips have low power	Wireless LANs chips have higher power
It is more appropriate and affordable technology for communication between smart phones and other accessories or between PDAs (personal digital assistant).	It is not comparatively appropriate and affordable technology for communication between smart phones and other accessories or between PDAs
It is younger technology and therefore is less mature.	It industry is smaller but more mature.

4] Infrared

- Infrared are widely used for short-range communications.
- For short distance line of sight communication Infra-Red light (IR) can be used to transmit data.
- Distance is about to only 1 meters range.
- The most common IR device used is the hand held remote control of consumer goods such as TV, VCRs, Audio Systems, Air conditioners , etc all used in infrared communications.
- IR is in the frequency range 1000 to 3000 GHz and allows high speed data communication up to around 50 Mbps over a few meters in experimental systems.
- The most common use is thus in Local Networks.
- Infrared is used for indoor wireless LANs.
- A portable computer with an IR communication interface can communicate with a stationary computer a few meters away provided there are no walls or similar obstructions in the line of sight part.
- They are directional, cheap and easy to build but do not pass through solid objects.
- The main advantage of IR is that it has a restricted range and thus the same frequency can be used in adjacent rooms without interference.

Two types of infrared given below:
(1) Point to point
(2) Broadcast

(1) Point to point
- It systems requires direct alignment between devices.
- Many laptop systems and PDAS use point-to-point transmission.

(2) Broadcast
- Broadcast infrared transmissions use a spread signal.
- One broadcast in all directions instead of a direct beam.
- This help to reduce the problems of proper alignment & obstructions.
- It allows multiple receivers of a signal.

4] Wi-Fi Technology
- Wi-Fi stands for Wireless Fidelity and is used to define any of the wireless technology in the IEEE 802.11.
- It is useful to get Internet access.
- Wi-Fi is the wireless way to handle networking.
- It is also known as 802.11 networking and wireless networking.
- The big advantage of Wi-Fi is its simplicity.
- You can connect computers anywhere in your home or office without the need for wires.
- Using these technology computers up to 100 feet can be connected into network using radio signal.

Working
- Wi-Fi networks use radio technologies called IEEE 802.11 to provide secure, reliable, fast wireless connectivity.
- A Wi-Fi setup contains one or more Access Points (APs) and one or more clients.
- An AP broadcasts its SSID (Service Set Identifier) via packets that are of relatively short duration and therefore do not have a significant effect on performance.
- Based on the settings (e.g. the SSID), the client may decide whether to connect to an AP.
- If two APs of the same SSID are in range of the client, the client firmware might use signal strength to decide with which of the two APs to make a connection.
- Wi-Fi cannot do collision detection, and instead uses an acknowledgement packet for every data packet sent.

- If no acknowledgement is received within a certain time a retransmission occurs.

- **Advantage**
  - Allows LANs to be deployed without cabling.
  - Wi-Fi a very economical networking option.
  - Wi-Fi products are widely available in the market.
  - Wi-Fi is a global set of standards. As it works in different countries around the world.
  - Widely available in more than 250,000 public hot spots and tens of millions of homes and corporate and university campuses worldwide.
  - New protocols for Quality of Service (WMM) and power saving mechanisms (WMM Power Save) make Wi-Fi even more suitable for latency-sensitive applications such as voice and video and small Form-Factor.

- **Disadvantage**
  - Compared to Bluetooth, power consumption is high.
  - Wi-Fi networks have limited range.
  - Wi-Fi devices do not presently pick channels to avoid interference.
  - Wi-Fi networks that are open that can be monitored and used to read and copy data transmitted over the network.

❖ **Application**
  - Most common usage is for laptop users to gain Internet access in locations such as airports, coffee shops, and so on, where Wi-Fi technology can be used to help consumers in their pursuit of work-based or recreational Internet usage.

Virus

- VIRUS stands for **Vital Information Resource Under Siege**.
- It is a computer program that can copy itself and infect a computer without permission or knowledge of the user.
- A virus is a small piece of software that damages the real programs.
- A virus can only spread from one computer to another when its host is taken to the uninfected computer, for instance by a user sending it over a network or the internet, or by carrying it on a removable medium such as a floppy disk, CD, or USB drive.

- It can spread to other computers by infecting files on a network file system or a file system that is accessed by another computer.

Virus Origin

- Computer viruses are called viruses because they share some of the traits of biological viruses.
- A computer virus passes from computer to computer like a biographical virus passes from person to person.
- Unlike a cell, a virus has no way to reproduce by itself.
- A computer virus must attach on top of some other program or document in order to launch.
- Once it is running, it can infect other program or documents.
- People write computer viruses. A person has to write the code, test it to make sure it spreads property and then release it.

o **Virus Histroy**

- Actual history of virus started in the early 1970s when 'creeper' virus was first detected in ARPANET.
- It would display message: 'I M THE CREEPER: CATCH ME IF YOU CAN'.
- The first virus in the wild was a boot sector virus called Brain, created in 1986.
- Traditional computer virus emerged in the 1980s, driven by the spread of personal computers and the resultant increase in bulletin boards and modem use, and software sharing.
- In 1988, programmer Robert Morris unleashes a worm that invades ARPANET computers.
- Since the mid-1990s, macro viruses have become common.
- The notorious "Melissa" virus infects thousands of computers in the year 1999.
- In year 2000, the "I Love You" virus infects millions of computers, using a method similar to the Melissa virus.
- In 2001, the Code Red worm infects tens of thousands of systems running Microsoft Windows NT and Windows 2000 server software.
- The "Klez" worm sends copies of itself to all of the e-mail addresses in the victim's Microsoft Outlook directory in 2002.
- In 2003, the "Slammer" worm infects hundreds of thousands of computers in less than three hours.
- In 2004, the "MyDoom" worm becomes the fastest-spreading e-mail worm.
- The newest species of the virus family is the cross-site scripting virus in 2005.

Types of Virus

- Generally, there are four main classes of viruses

1) File Infectors

- This type of virus infects program files.
- Normally they infect executable codes, such as .COM or .EXE files.
- Some can infect any program for which execution is requested, including .SYS, .OVL, .PRG, and .MNU files.
- When the program is loaded, the virus is loaded as well.

2) Boot Sector Viruses

- These viruses infect executable code found in certain system areas on a disk
- They attach to the DOS boot sector on diskettes or Master Boot Record on hard disks.
- All floppy disks and hard disks contain a small program in the boot record that is run when the computer starts up.
- Boot sector virus attaches themselves to this part of the disk and activate when the user attempts to start up from the infected disk.

3) Multi-partite Viruses

- Multi partite viruses are also known as poly-partite.
- They infect both boot and records and program files.
- These are particularly difficult to repair.
- If the boot area is cleaned, but files are not, the boot area will be re-infected.

4) Macro Viruses

- These are among the most common viruses, and they tend to do the least damage.
- These types of virus infect data files, such as it can infect your Microsoft Word application and typically insert unwanted words or phrases.

5) Stealth Viruses

- These viruses use certain techniques to avoid detection.
- They may either redirect the disk head to read another sector instead of the one in which they reside or they may alter the reading of the infected file's size shown in the directory listing.

Problems of virus infection

1. Programs take longer to load.

2. A change in dates against the filenames in the directory. When the virus modifies a file the operating system changes the date stamp.

3. The floppy disk or hard disk is suddenly accessed without logical reasons.

4. Increased use of disk space and growth in file size-the virus attaches itself to many files.

5. Abnormal write-protect errors. The virus trying to write to a protected disk.

6. Strange characters appear in the directory listing of filenames.

7. Strange messages like "Type Happy Birthday Joshi" (Joshi Virus) or "Driver Memory Error" (kak.worm) appear on the screen and in documents.

8. Strange graphic displays such as falling letters or a bouncing ball appear on screen.

9. Program may hang the computer or not work at all.

10. Junk characters overwrite text in document or data files.

❖ **Protection from Virus**

1. Write-protect your floppy disks when using them on other computers.

2. Remove floppy disks from drives while booting.

3. Change a setting in the BIOS that enables you PC to boot from the C-drive first.

4. Use a good anti-virus program to scan floppy disks and Pen drive before copying files.

5. Install software only from original write-protected disks with the publisher's label.

6. Do not install pirated software, especially computer games.

7. Scan files downloaded from the Internet or those transferred through a network.

8. Prepare a rescue disk with critical system files.

9. Use more secure operating system like UNIX, as its security features keep viruses away from your hard disk.

10. You should make sure that Macro Virus Protection is enabled in all Microsoft applications, and you should NEVER run macros in a document unless you know what they do.

11. You should never double-click on an e-mail attachment that contains an executable.