Network:A network is any collection of independent computers that communicate with one another over a shared network medium.In simple terms, a computer network is a collection of two or more computers linked together for the purpose of sharing information and resources. When these computers are joined in a network, people can share files and peripherals such as modems, printers, backup drives, or CD-ROM drives.

Characteristics of a Network

1) A network is a group of devices connected with one another.
2) It ties things (Network hardware, computers, users etc.) together.

Example: - Cable Network, Television Network and Telephone Network etc.

Networking: Networking refers to the collection of computers and peripheral devices connected by communication links.

Characteristics of a networking:

1) Networking allows communication media or network components to work together.
2) In networking the components may be located at remote locations or within the same building.
3) In networking the size of the network is very vast i.e. a network can be of any size.

Network Terminologies: Some of the commonly used terminologies used with the network are as follows:-

1. **Node (Workstation)**:A node is a computer or any other device on a network that communicates with other devices. In other words we can say that when we connect our computer to a network using a cable or other communication media then the computer becomes a node or a workstation. Each user on a network works on a workstation. If there are no nodes there would be no network.

2. **Client**: Clients are single individual computer systems in the network from where the request is made to seek information.

3. **Server:** A server is a computer that facilitates sharing of data, software and hardware resources on the network.

   Characteristics of a server:
   1) A network can have more than one server.
   2) Each server has a unique name by which it is identified by all the nodes on the network.
   3) Servers can be of two types. Namely Dedicated Servers and Non-Dedicated Servers.

   - **Dedicated Servers:**These are generally used on big network installations where one computer isreserved for server's job. It helps all nodes access data, software and hardware resources. Since it doesnot double up as a workstation but only

manages the network, so it is known as a dedicated server andsuch type of networks are called master- slave networks.
Examples: News Server, Mail Server, Game Server etc.

- **Non dedicated servers:** In small networks, a workstation can double up as a server. These servers areknown as non dedicated servers. The small networks using such a server are known as Peer to Peernetworks.Also on a network there may be several servers that allow workstations to share specific resources – forexample a file server which takes care of files related requests, a printer server taking care of printing requirements and a modem server that helps group of users to use a modem.

4. **Internet:** Internet is a network of electronic devices and gadgets (Computers, Laptops, Tablets, and Mobiles etc.) all around the globe. It is also a network of networks spread across the globe, all of which are connected to each other.

    - **Application Areas of Internet**
        1. Searching information
        2. Communicating with family and friends located at far off places
        3. Meeting new people
        4. Entertainment and fun
        5. Discussion Forums
        6. Education and Learning
        7. E-Commerce
        8. Video Conferencing
        9. Social Networking
        10. Blogs.

    - **Internet Requirements**
        1. Computer System
        2. Modem
        3. Telephone
        4. Internet Service Provide
        5. Internet Access Software
        6. Internet Browser Software

5. **Internet Service Provider (ISP):** The companies that provide the internet facilities to the user are known as internet service providers.
Examples: BSNL, MTNL, Aircel, Tata Docomo, Vodafone, Idea, Reliance, Jio etc.

6. **World Wide Web (WWW):** The web in which all the companies of the world are connected through internet is called www. It is the world's largest library.

7. **Websites:** A website is a collection of web pages on the internet that provides information about a particular topic.

Examples:www.google.com, www.yahoo.com, www.facebook.com and many more.

8. **Web Page:** A web page is a single page of any website on internet that provides information about a particular topic. They are text documents that contain commands with extensions such as .html, .htm, .asp, .php, .xml etc.
   Examples:www.google.com/index.html, www.yahoo.com/home.htm and many more.

9. **Home Page:** The very first page or the index page of any website is known as home page.
   Examples:www.google.com/index.html, www.yahoo.com/home.htm and many more.
   Note: Every home page is a web page but every web page is not a home page.

10. **Search Engine:** Search Engines are websites/programs that are used to search information on the World Wide Web based on the keywords or characters specified by the user. The keywords may or may not bring the result or information. The information shown by the search engines may be a mix of web pages, images and other types.
    Some of the popular search engines are
    1) www.google.com
    2) www.yahoo.com
    3) www.msn.com
    4) www.bing.com
    5) www.ask.com
    6) www.baidu.com

    Note: Every search engine is a website but every website is not a search engine.

11. **Domain Name:** A domain name is the website name and the address where internet users can access a website. A domain name is used for finding and identifying server computers on the internet having webpage stored on them. Computers use IP Address, which are a series of numbers. However, it is difficult for humans to remember string of numbers. Thus, domain names were developed and used to identify websites on internet instead of using IP Address.
    Rules for creating a Domain Name: Rules to create a domain name are as follows:
    1) A domain name should be catchy and easy to remember.
    2) A domain name can be any combination of letters and numbers.
    3) It can be used in combinations of various domain name extensions such as .com, .net, .org, .in,.us,.uk,.au,.nz and many more.
    4) The domain name must be registered before you use it.
    5) Every domain name is unique.
    6) Two websites can have the similar domain names but not same.

12. **Web Server**: Servers are powerful computers connected to individual computers that stores files and information in the form of websites which can be accessed by different users from anywhere in the world using internet connection.
    Features of a server are:
    1) High Processing Speed
    2) High Storage Capacity(HDD)

3) High Memory(RAM)
4) Require Special Coolants
5) Run 24/7
6) Has a unique IP address and domain name.

13. **Web Space:** The amount of space on a server that is allotted to website owners to park/store their website and website content/resource is known as web space. It is allotted to websites by various web hosting companies.

14. **Web Hosting:** Web hosting is the process of uploading/saving the web content on a web server to make it available on WWW.In case an individual or a company wants to make its website available on the internet, it should be hosted on a web server.

15. **Uniform Resource Locator (URL):** URL is the address of a resource on internet. A URL indicated the location of resource as well as the protocol used to access it.
    A URL Contains following instructions:
    1) The protocol used to access the resource.
    2) The location of server.
    3) The port number on the server.
    4) The location of resource in directory structure of server.
    5) A fragment identifier.

    Uses of URL: A URL is mainly used to point a webpage, a component of a webpage or a program on website.

    Resource name consists of: Resource name consists of the following:
    1) Domain name identifying a server on the web service.
    2) A program name or a path to the file or server.

    It can specify:
    1) A path to a specific page or file within a domain.
    2) A network port to use to make the connection.
    3) A specific reference point within a file, such as a named anchor in an HTML; and
    4) A query or search parameters used –commonly found in URL's for search results.

16. **Text Editors:** A text editor is a software tool which is used to create or compose web pages.
    Examples: Notepad, WordPad, Notepad+ etc.

17. **Web Browser:** A web browser is an application software tool which is used to display and view WebPages stored on a server.
    Characteristics of a Web Browser:
    1) Web browser is used to navigate the web pages on the internet.
    2) A web browser interprets the coding language of the web page and displays it in the graphic form.

3) A web browser allows anyone to access the web page without even knowing the commands used in the software languages to design a web page.
4) A web browser is a client which requests the information from the web server and the server responds to it.
5) The web address of the web page/website on the address bar tells the web browser which page to access.

Web browsers are of two types:

1) Text Based Browsers: Lynx, Links, Line Mode Browser, WebbIE, Browsh etc.
2) Graphic Based Browsers: Netscape Navigator, Internet Explorer, Mozilla Firefox, Google Chrome, Opera, Apple Safari, UC Browser etc.

18. **Network User:** The person who uses a network and monitors the network activities is called a network user.

19. **Network Administrator:** The person who oversees all the administration for the network is called administrator.

20. **Resources:** The equipments and devices (Printers, Scanners, and Hard Disk etc.) that are connected in a network are termed as resources. Sharing of these resources reduces the cost of establishing a network.

21. **Bandwidth:** Bandwidth refers to the range of frequencies available for transmission of data. Wider the bandwidth of a communication system, greater is the capacity and hence greater is the amount of data that can be transmitted over a period of time.
    It is expressed as the difference in Hertz (Hz) between the highest frequency and the lowest frequency.
    Characteristics of Bandwidth
    1) Bandwidth is the amount of data that can be transmitted in a fix amount of time.
    2) For digital devices, (servers and web space) bandwidth is usually expressed in bits per second (bps).
    3) For analog devices, the bandwidth is expressed in cycles per second or hertz (hz).

    Example: A typical voice signal has a bandwidth of approximately 3 KHz.

22. **Data Transfer Rate (DTR):** The data transfer rate (DTR) is the amount of data in digital form that is moved from one place to another in a given time on a network. As we already know that, the greater the bandwidth of a given medium, the higher isthe data transfer rate. Data transfer rate is often measured in bits per second (bps), althoughthe unit baud, which is one bit per second, is also used. It is commonly used to measure how fast data istransferred from one location to another.
    For example: The ISP may offer an Internet connection with a maximum data transfer rate of 4Mbps.

23. **Cookies:** Cookies are messages that a web server transmits to a web browser so that the web server can keep track of the user's activity on a specific website.
    Cookies have six parameters that can be passed to them:
    1) The name of the cookies.

2) The value of the cookies.
3) The expiry date of the cookies.
4) The path of the cookies is valid for.
5) The domain the cookie is valid for.
6) The need for a secure connection.

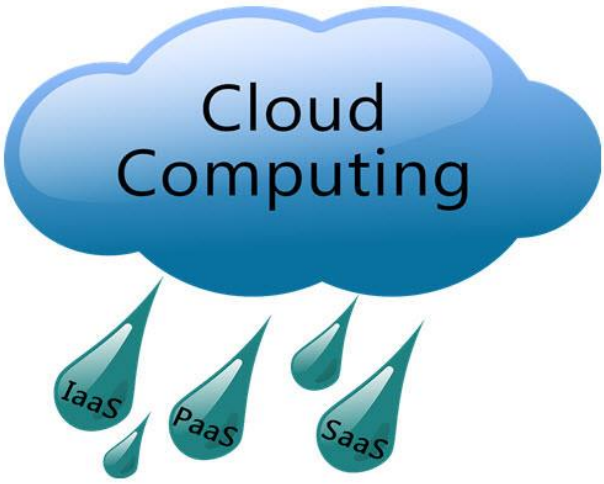
24. **Session:** A session is defined as a semi-permanent interactive information (dialogue/conversation/meeting) interchange between a computer and user that occur during the span of a single connection. A session begins when a user logs in to or accesses a particular program or a webpage and ends when the user logs out or shut down the computer, closes the program or webpage.

25. **Switching Techniques:**

26. **Inter space:** It is a client/server software program that allows multiple users to communicate online with real time audio, video and text chat in dynamic 3D environments. It provides the most advanced form of communication technology available today. It is a vision of what internet will become tomorrow. The user will be able to communicate in multiple ways and from multiple sources instantly.

27. **Cloud Computing:** Cloud computing is the technology that uses the internet to maintain data and applications. Cloud Computing provides software, data access and storage services to the user as per the location of their preferences, duration to their liking and application of their choice. In other words we can say that cloud computing can be defined as delivering computing power(CPU, RAM, Network Speeds, Storage OS software) a service over a network (usually on the internet) rather than physically having the computing resources at the customer location.

    Example: Amazon Wed Services (AWS), Azure, Google Cloud

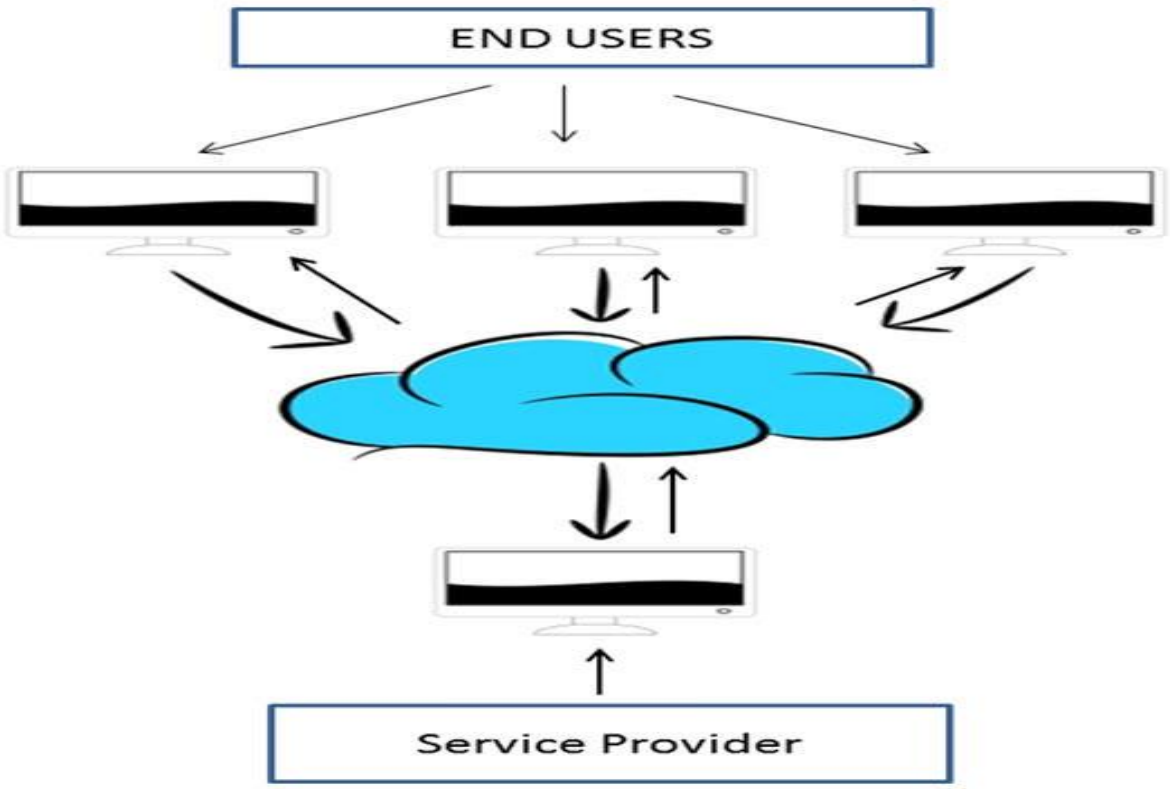


Let’s learn Cloud computing with an example -

Whenever you travel through a bus or train, you take a ticket for your destination and hold back to your seat till you reach your destination. Likewise other passengers also takes ticket and travel in the same bus with you and it hardly bothers you where they go. When your stop comes you get off the bus thanking the driver. Cloud computing is just like that bus, carrying data and information for different users and allows to use its service with minimal cost.

Why the Name Cloud?

The term "Cloud" came from a network design that was used by network engineers to represent the location of various network devices and there inter-connection. The shape of this network design was like a cloud.



Why Cloud Computing?

With increase in computer and Mobile user's, data storage has become a priority in all fields. Large and small scale businesses today thrive on their data & they spent a huge amount of money to maintain this data. It requires a strong IT support and a storage hub. Not all businesses can afford high cost of in-house IT infrastructure and back up support services. For them Cloud Computing is a cheaper solution. Perhaps its efficiency in storing data, computation and less maintenance cost has succeeded to attract even bigger businesses as well.

Cloud computing decreases the hardware and software demand from the user's side. The only thing that user must be able to run is the cloud computing systems interface software, which can be as simple as Web browser, and the Cloud network takes care of the rest. We all have experienced cloud computing at some instant of time, some of the popular cloud services we have used or we are still using are mail services like gmail, hotmail or yahoo etc.

While accessing e-mail service our data is stored on cloud server and not on our computer. The technology and infrastructure behind the cloud is invisible. It is less important whether cloud services are based on HTTP, XML, Ruby, PHP or other specific technologies as far as it is user friendly and functional. An individual user can connect to cloud system from his/her own devices like desktop, laptop or mobile.

Cloud computing harnesses small business effectively having limited resources, it gives small businesses access to the technologies that previously were out of their reach. Cloud computing helps small businesses to convert their maintenance cost into profit. Let's see how?

In an in-house IT server, you have to pay a lot of attention and ensure that there are no flaws into the system so that it runs smoothly. And in case of any technical glitch you are completely responsible; it will seek a lot of attention, time and money for repair. Whereas, in cloud computing, the service provider takes the complete responsibility of the complication and the technical faults.

Benefits of Cloud Computing

The potential for cost saving is the major reason of cloud services adoption by many organizations. Cloud computing gives the freedom to use services as per the requirement and pay only for what you use. Due to cloud computing it has become possible to run IT operations as a outsourced unit without much in-house resources.

Following are the benefits of cloud computing:

1. Lower IT infrastructure and computer costs for users
2. Improved performance
3. Fewer Maintenance issues
4. Instant software updates
5. Improved compatibility between Operating systems
6. Backup and recovery
7. Performance and Scalability
8. Increased storage capacity
9. Increase data safety

Types of Clouds

There are four different cloud models that you can subscribe according to business needs:

1. **Private Cloud:** Here**,** computing resources are deployed for one particular organization. This method is more used for intra-business interactions. Where the computing resources can be governed, owned and operated by the same organization.
2. **Community Cloud:** Here**,** computing resources are provided for a community and organizations.
3. **Public Cloud:** This type of cloud is used usually for B2C (Business to Consumer) type interactions. Here the computing resource is owned, governed and operated by government, an academic or business organization.
4. **Hybrid Cloud:** This type of cloud can be used for both type of interactions - B2B (Business to Business) and B2C (Business to Consumer). This deployment method is called hybrid cloud as the computing resources are bound together by different clouds.

Cloud Computing Services

The three major Cloud Computing Offerings are

- **Software as a Service (SaaS):** SaaS or software as a service is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network (internet). SaaS is becoming an increasingly prevalent delivery model as underlying technologies that supports **Service Oriented Architecture (SOA) or Web Services**. Through internet this service is available to users anywhere in the world.

  Traditionaly, software application needed to be purchased upfront &then installed it onto your computer. SaaS users on the other hand, instead of purchasing the software subscribes to it, usually on monthly basisvia internet.

  Anyone who needs an access to a particular piece of software can be subscribe as a user, whether it is one or two people or every thousands of employees in a corporation. SaaS is compatible with all internet enabled devices.

  Many important tasks like accounting, sales, invoicing and planning all can be performed using SaaS.

- **Platform as a Service (PaaS):**Platform as a service, is referred as PaaS, it provides a platform and environment to allow developers to build applications and services. This service is hosted in the cloud and accessed by the users via internet.

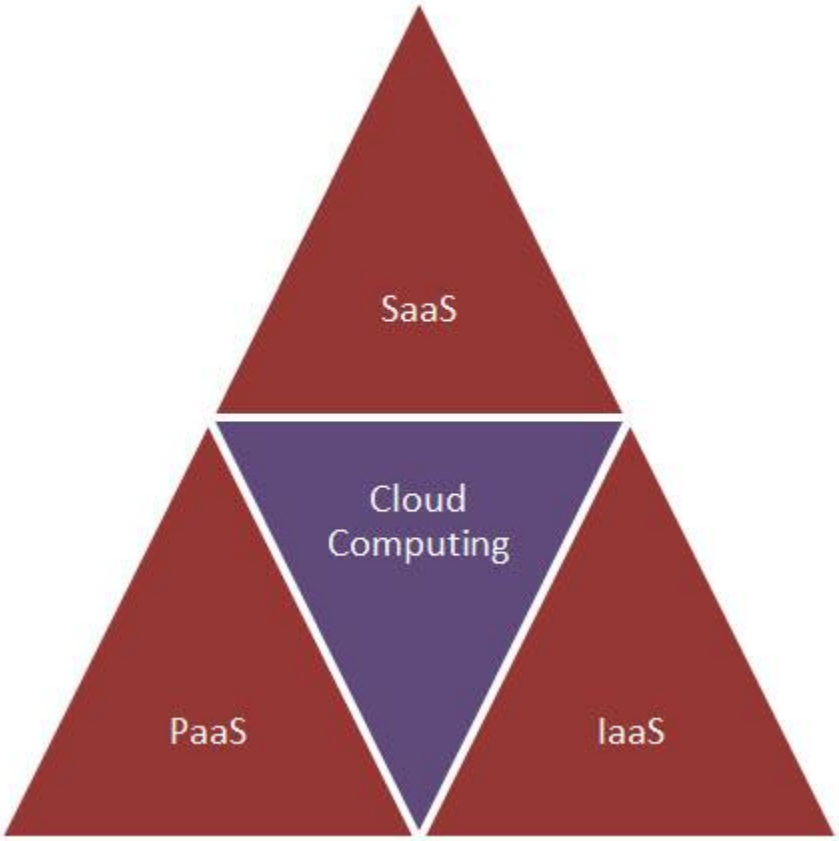
  To understand in a simple terms, let compare this with painting a picture, where you are provided with paint colors, different paint brushes and paper by your school teacher and you just have to draw a beautiful picture using those tools.

  PaaS services are constantly updated & new features added. Software developers, web developers and business can benefit from PaaS. It provides platform to support application development. It includes software support and management services,

storage, networking, deploying, testing, collaborating, hosting and maintaining applications.

- **Infrastructure as a Service (IaaS)**

Different business use some or all of these components according to their requirement.



PaaS (Platform as a Service)

IaaS (Infrastructure as a Service)

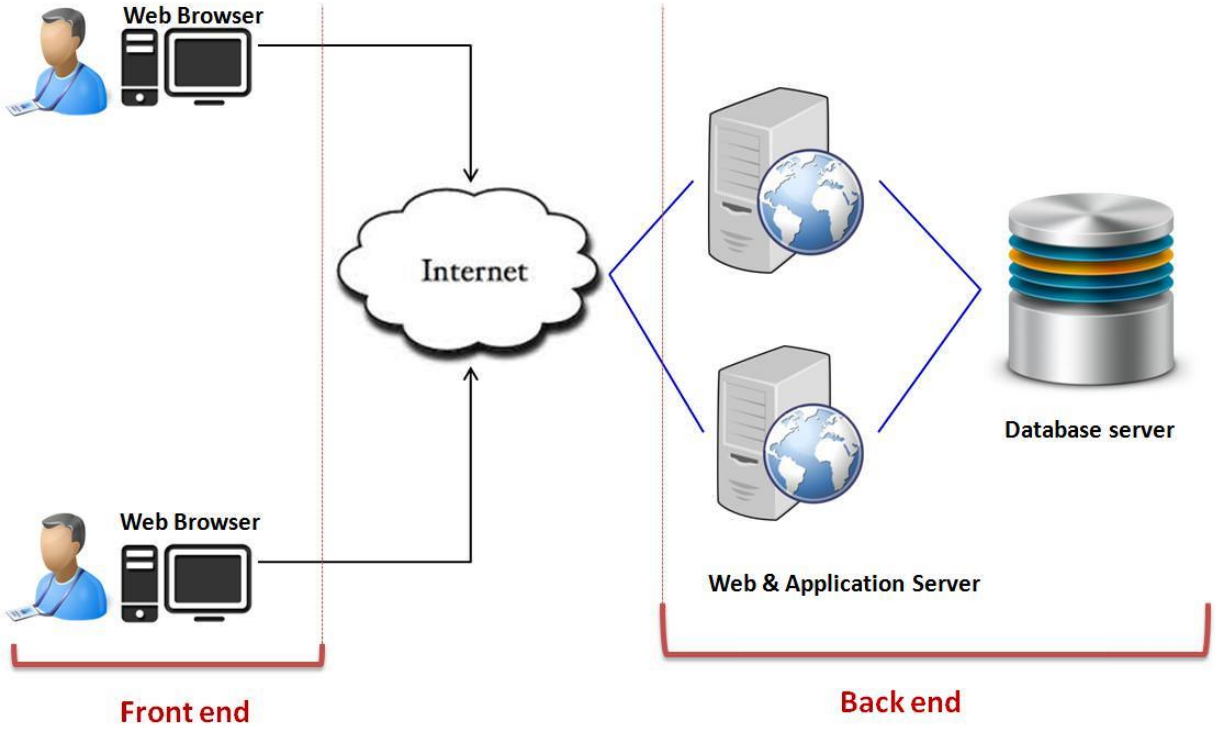
IaaS (Infrastructure As A Service) is one of the fundamental service model of cloud computing alongside PaaS(Platform as a Service). It provides access to computing resources in a virtualized environment "the cloud" on internet. It provides computing infrastructure like virtual server space, network connections, bandwidth, load balancers and IP addresses. The pool of hardware resource is extracted from multiple servers and networks usually distributed across numerous data centers. This provides redundancy and reliability to IaaS.

IaaS(Infrastructure as a service) is a complete package for computing. For small scale businesses who are looking for cutting cost on IT infrastructure, IaaS is one of the solutions. Annually a lot of money is spent in maintenance and buying new components like hard-drives,

network connections, external storage device etc. which a business owner could have saved for other expenses by using IaaS.

What is Cloud Computing Architecture?

Let's have a look into Cloud Computing and see what Cloud Computing is made of. Cloud computing comprises of two components front end and back end. Front end consist client part of cloud computing system. It comprise of interfaces and applications that are required to access the cloud computing platform.

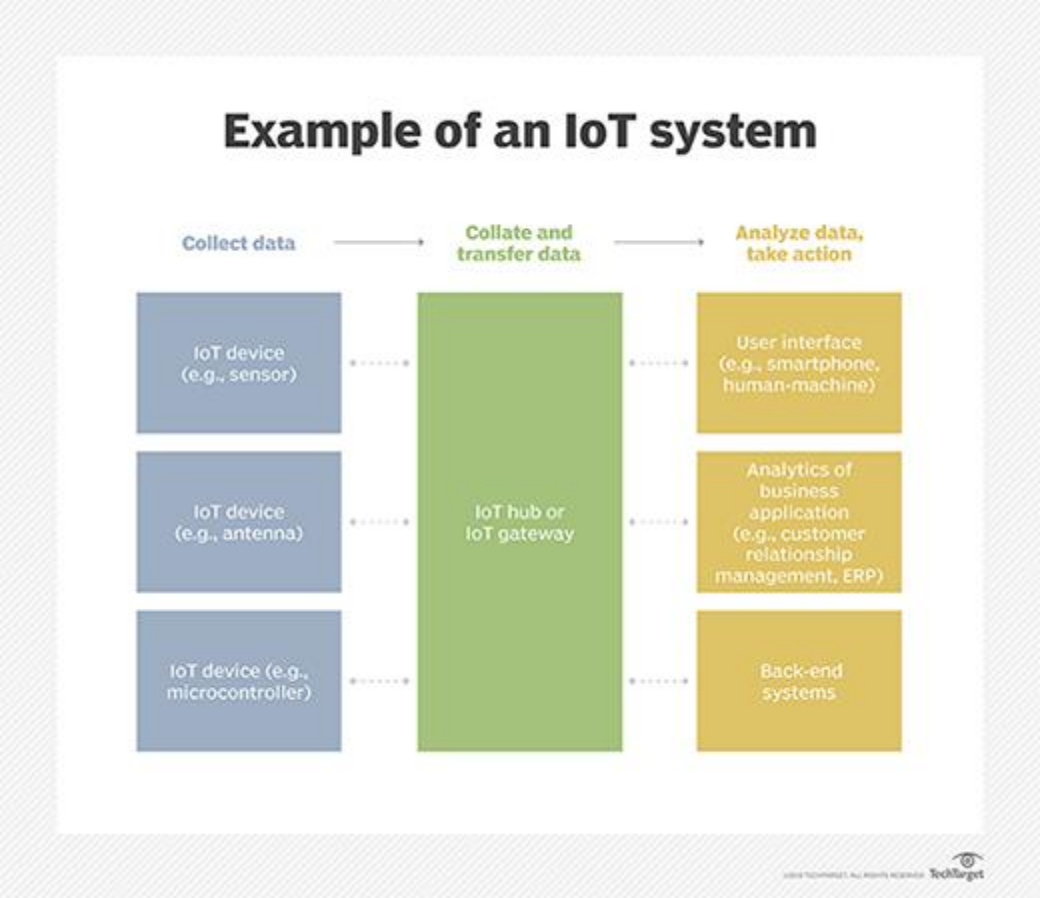


While back end refers to the cloud itself, it comprises of the resources that are required for cloud computing services. It consists of virtual machines, servers, data storage, security mechanism etc. It is under provider's control.

Cloud computing distributes the file system that spreads over multiple hard disks and machines. Data is never stored in one place only and in case one unit fails the other will take over automatically. The user disk space is allocated on the distributed file system, while another important component is algorithm for resource allocation. Cloud computing is a strong distributed environment and it heavily depends upon strong algorithm.

28. **IoT:** The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without

requiring human-to-human or human-to-computer interaction.



The internet of things offers a number of benefits to organizations, enabling them to:

- Monitor their overall business processes;
- Improve the customer experience;
- Save time and money;
- Enhance employee productivity;
- Integrate and adapt business models;
- Make better business decisions; and
- Generate more revenue.

Networking can be classified on the basis of three major categories.

1) On the basis of size
2) On the basis of nature
3) On the basis of transmission medium

1) On the Basis of Size: Size based networking can be classified on the following basis:-
   A. Personal Area Network (PAN): A personal area network is a network in used for communication among various electronic devices such as personal computers and mobile phones in close proximity.
      Characteristics of PAN:
      (i) The area of a PAN is typically upto 10 meters or 30 feet.
      (ii) It can be wired as well as wireless.
      (iii) If it is wired then it uses USB and FireWire technologies.
      (iv) If it is wireless then it uses Bluetooth or Wifi or infrared technologies.
      (v) It is used to transfer files including emails, calendar appointments, digital photos music etc.

   B. Local Area Network (LAN): A local area network is the most common type of network which connects computers and devices located close to one another, such as in one building.
      Characteristics of LAN:
      (i) The area of a LAN is typically upto 10 meters or 30 feet.
      (ii) It can be wired as well as wireless.
      (iii) If it is wired then it uses USB and FireWire technologies.
      (iv) If it is wireless then it uses Bluetooth or Wifi or infrared technologies.
      (v) It is used to transfer files including emails, calendar appointments, digital photos music etc.

   C. Campus Area Network (CAN):
   D. Metropolitan Area Network (MAN):
   E. Wide Area Network (WAN):
   F. Storage Area Network (SAN):

VIRUS stands for **Vital Information Resources Under Seize**. They are actually computer programs deliberately written by bad guys called virus Programmers to infect vulnerable systems, gain admin control and steal user sensitive data.

Characteristic of a Virus

1) A virus is not always harmful.
2) Any program that cause harm to a computer system is not always a virus.
3) A virus requires a host and is designed to make a system sick, just like a real virus.
4) They are computer programs which copy itself to different locations.
5) Some viruses gain the admin control of various computers or servers.
6) Some viruses steal user sensitive data their knowledge.
7) Some viruses corrupt user's important and sensitive data stored on computers and prevents users from accessing their own system or personal files and demands ransom payment in order to regain access.

History of Viruses:

1) Traditional computer viruses emerged in the 1980's.
2) In 1982 Rich Skrenta created the virus called Elk Cloner that attached itself to the Apple DOS 3.3 operating system and spread by floppy disk.
3) In 1986 the first PC virus was created by two brothers Basit and A.F. Alvi to prevent piracy of their own software. It was a boot sector virus and was named as (c) Brian.
4) In 1990's macro viruses become common which were written in the scripting languages for Microsoft programs such as Ms-Word and Ms Excel.
5) In 2000 most common means of virus infection was through instant messaging or internet chat software.
6) In 2010 emails became the biggest means to spread viruses worldwide.

Symptoms of a virus include

1) Computer lockups
2) Screen distortions
3) Valuable data loss
4) Unusual messages
5) Reduced computer performance

Sources through which we get computer viruses

1) Through an infected CD or pen drive.
2) Through e-mail attachments.
3) Visiting malicious websites and downloading infected files.
4) Starting an infected application as it infects other running applications.

Harms caused by computer Viruses

1) Some computer viruses are created to irritate the users instead of causing damage.
2) Viruses can fill up the disk space of a computer by copying itself endless times.
3) They can modify or corrupt important files.
4) They can delete important files.
5) They can steal our account number and password and them to other people through internet.

Types of Viruses

1) Bombs: They are the viruses which activate themselves after a specific time period and cause damage to the computer system.
2) Boot Sector: Boot sector is the area of a hard disk that store valuable information. Boot sector viruses affect this area and cause damages. These are very harmful viruses. Example: (c) Brain
3) Email Viruses: These viruses transmit through email and the attached files. When the person opens the attached file, the virus copies itself to his/her computers hard disk and cause damage.
4) Trojans: These viruses at first appear to be friendly but are very malicious programs. They steal information from the computer. They can be of any type. Even some computer viruses are Trojan viruses.
5) Worms: A worm is a malicious program that duplicates itself. They eventually fill up the disk space with copies of itself and thereby make a computer system to work very slowly.
6) Ransomware: These viruses lock and encrypt a user's computer data, prevent users from accessing their own system or personal files and demands ransom payment in order to restore access. Example: WannaCry Ransomware

How to protect your computer from computer viruses:

1) Do not use the CD or the pen drive received from another person until you are certain that the device does not contain a virus.
2) Do not download programs or other information from non-reputed sources on the internet.
3) Be careful of the attached files you receive in your emails. Open only those files sent by people you trust.
4) Restrict access to your computer system by applying username and password to it.
5) Install an antivirus program on your computer system and update it regularly.

Antivirus: Antivirus programs are computer utility programs which check the files on our computer to detect the viruses and also remove them.
Some of the popular antivirus programs are:

1) Norton
2) AVG
3) Quick Heal
4) F-Secure
5) Mc Afee
6) Avast
7) Kaspersky
8) PC-Cillin

People Involved in Cyber Crime:

1) Virus Programmers:
2) Hackers:
3) Crackers:
4) Breachers:
5) Information Warriors: