

## Database Management System (DBMS)

### Q1. Database:-

Database is a collection of interrelated information which is used for different aspects of real life problem. The telephone directory is the best example of database.

ER model and Relational model in database E-R model and relational model both are the types of data model. Data Model describes a way to design database at physical, logical and view level.

(a) E-R model → It represents the collection of objects called entities and relation between those entities. E-R model (Entity Relationship model) describe data as entity set, relationship set and attribute. E-R model is easier to understand the relationship between entities. It describes mapping cardinalities.

(b) Relational model → It represents the collection of tables and the relation between those tables.

Relational model describes data in a table as Domain, Attributes, Tuples. In comparison to E-R model it is less easy to derive a relation between tables in relational model. Relational model does not describe mapping cardinalities.

\* Explain different levels of database service  
Describe meaning use and purpose of each level.

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## 2. Applications of database:-

Following are the some applications where we use database management system.

- i) Telecom → There is a database to keep track of the information regarding calls made, network usage, customer details etc. Without the data systems it is hard to maintain that huge amount of data that keeps updating every millisecond.
- ii) Banking → For storing customer information, tracking day to day credit, debit transactions etc. all this work has been done with the help of database management system.
- iii) Sales → To store customer information, product lists, purchase information, production information etc. is done with the help of database management system.
- iv) Airlines → To travel through airlines we make early reservations, this reservation information along with flight schedule is stored in database.
- v) Universities → Database systems are frequently used in universities to store and retrieve the data about course details, exam details, staff details, fees details etc. Also to keep record of students, courses, marks of students etc.

vii) Online shopping:- Online shopping stores like Amazon, Flipkart etc. store the product information, address of buyer, credit details and provide the relevant list of products based on customers query. All this involves a database management system.

### 3. Database Management System (DBMS):-

A database management system is a system software for creating and managing databases. The DBMS provides users and programmers with a systematic way to create, retrieve, update and manage data.

Database language → The languages that are used to read, update and store data in database are called database language.

for e.g. SQL (Structured Query Language).

#### Types

#### ① DDL (Data Definition Language):-

DDL is used for specifying the database schema. It is used for creating tables, indexes, constraints etc. in database. It can perform operations like create, alter, drop, rename, drop objects, delete tables, to comment etc.

### i) DML (Data Manipulation Language):

DML is used for accessing and manipulating data in database. The operations like read records from table i.e. select, to insert records into tables, update data on table, delete all records from table come under DML.

### ii) DCL (Data Control language):-

DCL is used for granting and revoking user access on database.

### iv) Transaction Control language (TCL) :-

The changes in the database that we made using DML commands are either performed or rolled back using TCL.

### Database Administrator (DBA):-

A database administrator (DBA) is a specialized computer systems administrator which maintains a successful database environment by directing or performing all related activities to keep the data secure. The top responsibility of a DBA professional is to maintain data integrity. This means that DBA will ensure that data is secure from unauthorized access but is available to users. A DBA will often have working knowledge and experience on data management products such as Oracle, SQL etc.

#### 4. Advantages of DBMS:-

The main advantages of DBMS are as follows:-

- i) Reduction of data redundancy and inconsistency;  
The main purpose of DBMS is to reduce the repetition of data and maintain the consistency. In file processing system different programmers can create different files and application programs to access those files. After some period of time, there may be many files with different formats and update made to one file may leads the database in inconsistent state.
- ii) Data share → In database the data is shared between different users. It is difficult to share data in file based system.
- iii) Provide easy access to data → In file processing system, we cannot easily access required data stored in particular file. For each new task we have to write a application program. File processing system cannot allow data to be retrieve in convinient and efficient manner. DBMS provide efficient access to data.
- iv) Provide concurrent access :- DBMS provides the controlled concurrent access to the data. Concurrency increases the overall performance of system by allowing the faster response to the user.

- vi) Data security:- DBMS has enhanced security mechanism. DBA can define different security levels so that all users are not allowed to access all the parts of database.
- vii) Maintain integrity:- Data integrity is easily maintained in database which is difficult in file system.
- viii) Support backup and recovery:- DBMS maintains the backup system. After failure has occurred the system is recovered in consistent state from backup.

## 5. Database system architectures / Types of Database:-

### a) Centralized Database system →

It works in a client server system. The centralized database has one central computer, which is called database server to store all the data and files as well as, it provides the services to all the client in the network. Server is responsible for processing the data. In the simple word, centralized database system is a system which stores the entire information as well as whole database in a main server and all other computers accesses the data from server computer. Database system used by schools, colleges, banks etc. are centralized database system.

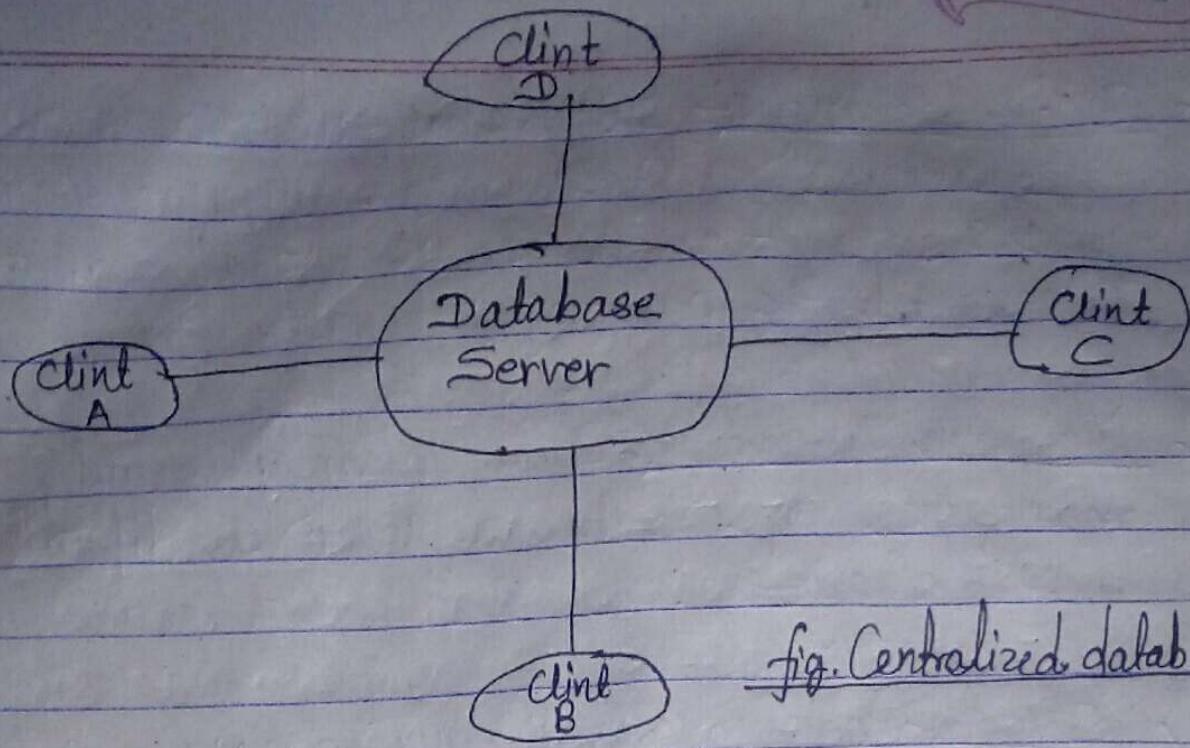


fig. Centralized database system

### b) Distributed database system:-

It is a set of database stored on multiple computer on multiple location that appear to application as a single database. The user can simultaneously access and modify that data in several database in a network. The computer in a distributed system communicates with each other through various communication media, like Internet, telephone line etc. In simple word, distributed database systems are those systems, which distribute database in different computers. It means multiple users can access the same database simultaneously.

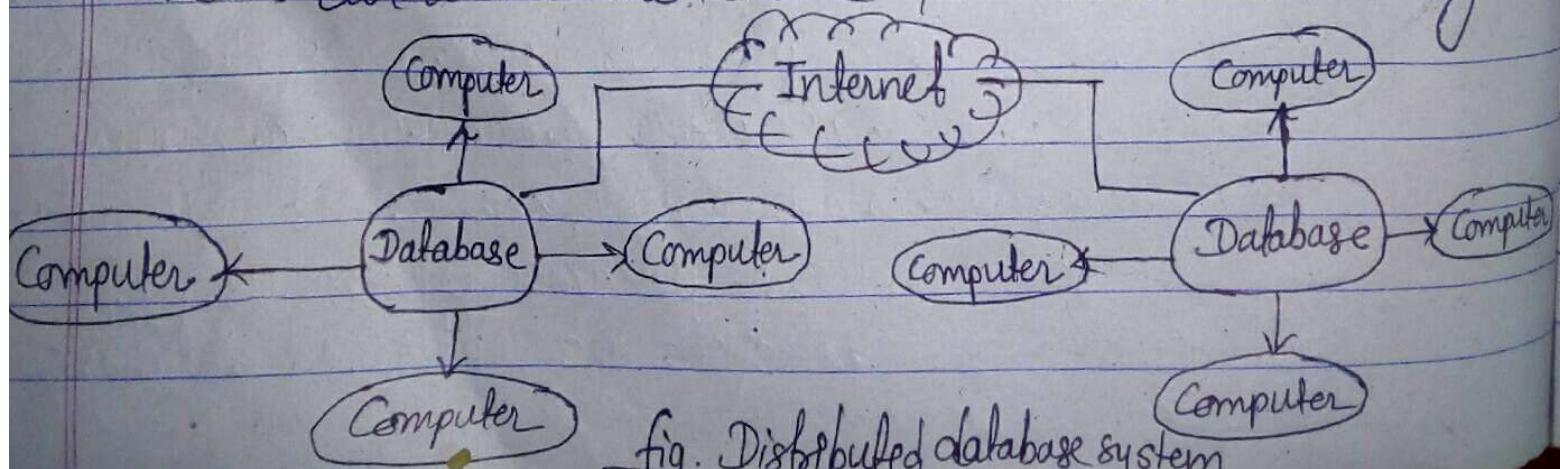
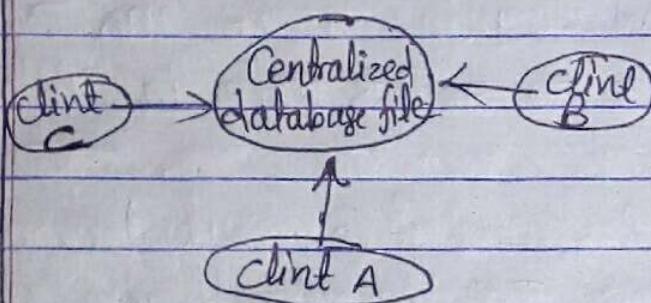


fig. Distributed database system

\* Differences between centralized databases and distributed databases:-

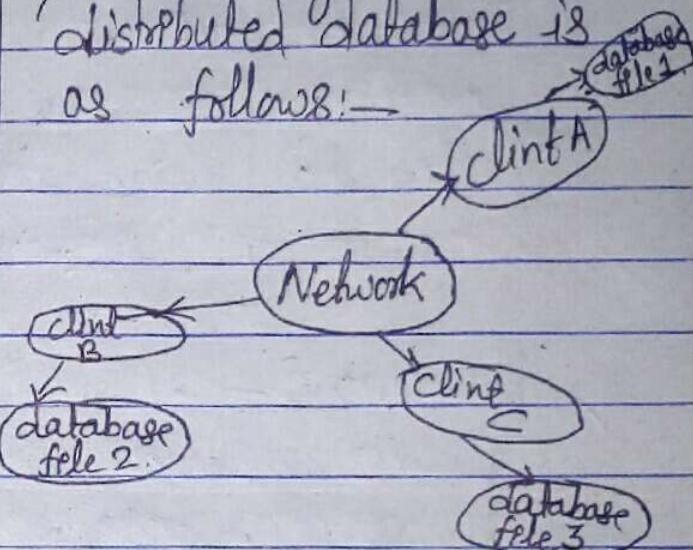
### Centralized Databases

- i) It is a single database located at 1 site on a network.
- ii) Block diagram for centralized database is as follows:-



### Distributed Databases

- iii) It consists of 2 or more files located at different sites on a network.
- iv) Block diagram for distributed database is as follows:-



### Advantages

- Since there is only 1 database file it is easier to
  - Get a complete view of data.
  - Manage, update and backup data.

### Advantages

- Having multiple database files means,
  - Users won't interfere with each other when accessing data.
  - If one site fails, the system can still run.

## 6. Components of DBMS:-

DBMS has several components, each performing very significant tasks in the database management system environment. Below is a list of <sup>some</sup> components within the database and its environment.

- i) Software → This is a set of programs used to control and manage the overall database. This includes the DBMS software itself, the operating system, the network software being used to share the data among users and the application programs to access data in DBMS.
- ii) Hardware → Consists of a set of physical electronic devices such as computers, I/O devices, storage devices etc, this provides the interface between computers and the real world systems.
- iii) Data → DBMS exists to collect, store, process and access data, the most important component. The database contains both the actual or operational data and the metadata.
- iv) Procedures → These are the instructions and rules that assist on how to use the DBMS, and in designing and running the databases.

- ⇒ Database Access language → Different languages like SQL are used to access the data to and from the database to enter new data, update existing data or retrieve required data from databases.
- ⇒ Data Manager → It is also called cache manager. This is responsible for handling of data in the database, providing a recovery to the system that allows it to recover the data after a failure.

## 7. Data Warehouses, Data Mining and Big data:

Data Warehouses → A collection of data from various sources stored under common schema is known as data warehouse. It stores current and historical data in one single place and are used for analysis, reporting and mining. It is separated from operational database system and updated according to transaction performed on operational system.

~~Imp~~ Data Mining :- Data mining is the extraction of hidden information from large database. It is one of the powerful and new technology with great potential to help companies focus on the most important information in their data warehouse. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use.

~~Imp~~ Big data :- Big data is an evolving term that describes a large volume of structured, semi-structured and unstructured data that has the potential to be mined for information and used in machine learning projects and other advanced analytics applications.

## 8. Normalization:-

Normalization is the process of building database structures to store data. Normalization is a formal process of developing data structures in a manner that eliminates redundancy and promotes integrity. Data normalization is a corner stone of the relational theory. In relational database design, the process of organizing data to minimize redundancy is called normalization.

Normalization usually involves dividing a database into two or more tables and defining relationships between the tables. The objective is to isolate data so that additions, deletions and modifications of a field can be made just one table.

There are three main normal forms each with increasing levels of normalization: First Normal Form (1NF), Second Normal Form (2NF) and Third Normal form (3NF). Normalization makes databases more efficient to maintain.

First Normal Form (1NF):- Each field in a table contains different information. For example, on an employee list, each table would contain only one birth date field. First normal form deals with the "shape" of a record type. First normal form excludes variables repeating fields and groups.

## Second Normal Form (2NF) :-

Each field in a table that is not a determiner of the contents of another field must itself be a function of the other fields in the table. Second normal form is violated when a non-key field is a fact about a subset of a key. It is only relevant when the key is composite i.e. consists of several fields.

## Third Normal Form (3NF) :-

No duplicate information is permitted. So, for example, if two tables both require a birthdate field, the birthdate information would be separated into a separate table and the two other tables would then access the birthdate information via an index field in the birthdate table. Third Normal Form is violated when a non-key field is a fact about another non-key field.

There are additional normal forms such as Boyce-Codd Normal Form (BCNF), fourth normal form (4NF) and Fifth Normal Form (5NF).

## Unit 8 (less imp chapter) can be escaped.

### Data Communication and Computer Networks:-

\* What is data communication? What is computer network?

Ans: The exchange of data between a source and a receiver through form of transmission media such as a wire cable.

A computer network is a group of computer systems and connected together for the purpose of sharing resources via internet.

#### Transmission media:

Transmission media is a pathway that carries the information from sender to receiver.

We use different types of cables or waves to transmit data. Data is transmitted normally through electrical or electromagnetic signals.

There are two types of transmission media which are as follows:-

#### a) Wired or Guided Media or Bound Transmission Media:

Guided Media are the cables that are tangible or have physical existence and are limited by the physical geography. Popular guided media in use are twisted pair cable, co-axial cable and optical fibre cable. Each of them has its own characteristics like transmission speed, effect of noise, physical appearance, cost etc.

## b) Wireless or Unguided Media or Unbound

### Transmission Media:

Unguided media are the ways of transmitting data without using any cables. These media are not bounded by physical geography. This type of transmission is called wireless communication.

Nowdays wireless communication is being popular.

Wireless LANs are being installed in office and college campuses. This transmission uses

Microwave, Radio wave, infrared are some of popular unguided media.

### Different uses of computer network.

The main uses of computer network are, described below:-

a) Information and Resource Sharing → Computer networks allow organizations sharing units which are placed apart from each other, to share information in a very effective manner. Programs and software in any computer can be accessed by other computers linked to the network. It also allows sharing of hardware equipment, like printers and scanners among varied users.

b) Retriving Remote Information → Through computer networks, users can retrive remote information

on variety of topics. The information is stored in remote databases to which the user gains access through information systems like the World Wide Web.

### c) Speedy Interpersonal Communication: →

Computer networks have increased the speed and volume of communication like never before.

Electronic Mail (email) is extensively used for sending texts, documents, images and videos across the globe.

Unit Online communications have increased by manifold times through social networking services.

### d) E-commerce → Computer networks have planned way for a variety of business and commercial transactions online, popularly called e-commerce.

Users and organizations can buy or sell items, pay bills, manage bank accounts, pay taxes, transfer funds and handle investments electronically.

### e) Highly Reliable systems → Computer networks allow systems to be distributed in nature, by the virtue of which data is stored in multiple sources. This makes the system highly reliable. If a failure occurs in one source, then the system will still continue to function and data will still be available from the other sources.

f) VoIP → VoIP or Voice over Internet Protocol has revolutionized telecommunication systems. Through this, telephone calls are made digitally using Internet Protocols instead of the regular analog phone lines.

\* Explain different types of computer network?

Ans. Computer networks are of different types some of which (main types) are as follows:-

a) Local area network (LAN) → A computer network spanned inside a building and operated under single administrative system is generally termed as Local Area Network (LAN). Usually LAN covers an organization, offices, schools or universities.

Number of systems connected in LAN may vary from at least 2 to as much as 16 million.

b) Metropolitan Area Network (MAN) → The MAN generally expands throughout a city such as cable TV network. It can be in the form of Ethernet, ATM or Fiber Distributed Interface - Data Interface (FDDI).

c) Wide Area Network (WAN) → It covers a wide area which may span across provinces and even a whole country. Generally telecommunication networks are Wide Area Network. These networks provide connectivity to MANs and LANs.

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④ What is network topology? Describe its type as bus, ring, star, tree, mesh and hybrid topologies.

Ans. Network topology refers to the physical or logical layout of a network. It defines the way different nodes are placed and interconnected with each other.

Alternatively network topology may describe how the data is transferred between these nodes. There are two types of network topologies: physical and logical. Physical topology emphasizes the physical layout of the connected devices and nodes, while the logical topology focuses on the pattern of data transfer between network nodes.

Both physical and network topologies can be categorized as follows:

- a) Bus topology → All the devices/nodes are connected sequentially to the same backbone or transmission line. This is a simple, low-cost topology, but its single point of failure presents a risk.
- b) Ring topology → All network devices are connected sequentially to a backbone as in bus topology except that the backbone ends at the starting node, forming a ring. Ring topology shares many of bus topology's disadvantages so its use is limited to networks that demand high throughput.

\* What do you understand by OSI reference model? Explain all the layers of OSI reference model. Also discuss suitable communication protocols.

Ans: - Open Systems Interconnection (OSI) is a reference model for how applications communicate over a network.

A reference model is a conceptual framework for understanding relationships. The purpose of the OSI reference model is to guide vendors and developers so the digital communication products and software programs they create can interoperate, and to facilitate a clear framework that describes the functions of a networking or telecommunication system.

Most vendors involved in telecommunications make an attempt to describe their products and services in relation to the OSI model. The TCP/IP protocol suite, which defines the internet, does not map cleanly to the OSI model. The OSI architecture was officially adopted as an international standard by the International Organization for Standardization (ISO).

## OSI model layers:

The main concept of OSI is that the process of communication between two endpoints in a network can be divided into seven distinct groups of related functions, or layers. Each communicating user or program is on a device that can provide those seven layers of function.

In this architecture, each layer serves the layer above it and, in turn, is served by the layer below it. The seven layers of function are provided by a combination of application, operating systems, network and device drivers and networking hardware that enable a system to transmit a signal over a network Ethernet or Wi-Fi or other wireless protocols.

The seven OSI layers are as follows:

- 1) Layer 7: The application layer → This is the layer at which communication partners are identified — Is there someone to talk to? — network capacity is assessed — Well the network let me to talk them right now? — and where

the data and application is presented in a visual form the user can understand. This layer is not the application itself, it is the set of services any application should be able to make use of directly, although some applications may perform application-layer functions.

2) Layer 6 : The presentation layer → This layer is usually part of an operating system and converts incoming and outgoing data from one presentation format to another. For example — From clear text to encrypted text at one end and back to clear text at the other.

3) Layer 5 : The session layer → This layer sets up, coordinates and terminates conversations. Its services include authentication and reconnection after an interruption. On the internet, Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) provide these services for most applications.

4) Layer 4: The transport layer → This layer manages packetization of data, then the delivery of the packets, including checking for errors in the data once it arrives. On the internet, TCP and UDP provide these services for most applications as well.

5) Layer 3: The network layer → This layer handles addressing and routing the data. — sending it in the right direction to the right destination on outgoing transmissions and receiving incoming transmissions at the packet level. IP is the network layer for the internet.

6) Layer 2: The data-link layer → This layer sets up links across the physical layer network, putting packets into network frames. This layer has two sub-layers: the logical link control layer and the media access control layer (MAC). MAC layer types include Ethernet and 802.11 wireless specifications.

# Layer 1: The Physical layer → This layer conveys the bit stream across the network either electrically, mechanically or through radio waves. The physical layer covers a variety of devices and mediums, among them cabling, connectors, receivers, transceivers and repeaters.

## Communication Protocols:

A communication protocol is a set of established rules that dictates how to format, transmit and receive data so computer network devices from servers and routers to endpoints—can communicate regardless of the differences in their underlying infrastructures, designs or standards.

Standardized network protocols provide a common language for network devices. Without them, computers wouldn't know how to engage with each other. As a result, except for specialty networks built around a specific architecture, few networks would be able to function, and the internet as we know it wouldn't exist.

Following are some communication protocols:

### 1) Transmission Control Protocol (TCP):

It is a standard that defines how to establish and maintain a network conversation via which application programs can exchange data.

TCP works with Internet Protocol (IP), which defines how computers send packets of data to each other.

TCP is a connection-oriented protocol, which means a connection is established and maintained until the application programs at each end have finished exchanging messages.

### 2) File Transfer Protocol (FTP):

The file Transfer Protocol (FTP) is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

FTP is built on a client-server model architecture using separate control and data connections between the client and the server. It is commonly used protocol for exchanging files over the internet.

### 3) HyperText Transfer Protocol (HTTP):

HTTP is the underlying protocol used by the World Wide Web and this protocol defines how messages are formatted and transmitted and what actions web servers and browsers should take in response to various commands.

For example, when we enter a URL in our browser, this actually sends an HTTP command to the Web server directing it to fetch and transmit the requested Web page.

### 4) Internet Protocol address (IP address):

IP address is a numerical label assigned to each device connected to computer network that uses the Internet Protocol for communication. As IP address serves two principal functions: host or network interface identification and location addressing.

IP address are usually written and displayed in human-readable notations such as 172.16.254.1 in IPv4 and 2001:db8:0:1234:0:567:8:1 in IPv6. The IP address space is managed globally by the Internet Assigned Numbers Authority (IANA).

## Multimedia

Def<sup>n</sup> → Multimedia is the use of computer to present and combine text, graphics, audio, and video with links and tools that let the user navigate, interact, create and communicate.

### Characteristics of a multimedia system:-

A multimedia system has four basic characteristics:

- ⇒ Multimedia systems must be computer controlled.
- ⇒ Multimedia systems are integrated.
- ⇒ The information they handle must be represented digitally.
- ⇒ The interface to the final presentation of media is usually interactive.

### Elements of multimedia:-

Following are the some main elements of multimedia.

- ⇒ Text → It is most fundamental element and most effective way to communicate in multimedia. Text is used as headlines, subtitles and slogans. Its purpose is to express specific information in other media. It involves the use of text types, sizes, colours and background colour. For example, we can choose the font and its size and colour to set a tone, or project an image.

ii) Graphics → Graphics are important part of multimedia because humans are visually oriented. Images including photographs, illustrations, drawings, clip art, icons or any other non-text elements on a website or in social media are an example of graphics. There is no movement in these types of pictures.

iii) Animation → Animated elements are common multimedia applications. Animation is a series of images put together to give the effect of movement. In multimedia, 2D and 3D digital animation is used. Movement, rather than just viewing a still image. Animation is used to add visual interest or bring attention to important information or links. It present information in entertaining ways.

iv) Audio → It is multimedia application that uses dialogue, recorded narration, music and sound effects. Sound can enhance website design and social media platforms. It increases attention of visitors to any website or social media.

v) Video → Video is a visual multimedia application that combines a sequence of images to form moving pictures and sound. Video can have an impact on websites and on social media platforms in a very unique and powerful way.

## Uses / Applications of multimedia:-

- i) Education → Multimedia in education field is used to instruct as a guide nowadays, multimedia CD are used instead of textbooks. Knowledge can be easily obtained by using multimedia CD in computer because multimedia CD includes text, pictures, sound which helps the students to understand easily and clearly.
- ii) Business → Multimedia is used in business for training employees, presenting sales, educating customers etc. It helps for the promotion of business and new products.
- iii) Entertainment → Multimedia is mostly used in games. It is also used in movies for entertainment.
- iv) Health Sector/Hospital → For virtual surgery doctors are trained by using multimedia and different internal surgeries are done with the help of multimedia.
- v) Research → Multimedia in research is used to investigate through the materials available on the Internet.

## Chapter → 10

### The Internet and Internet Services

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The global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols, is called internet.

#### History of Internet

The history of computer begins with the development of electronic computers in 1950's. Different kinds of data and informations sent from one person to another at that time was not confidential since different physical medias like letters were used at that time. So, to keep them confidential a project was started in 1960s as ARA ARPANET project directed by Robert Taylor and managed by Lawrence Roberts.

Initially it was used by government only for governmental data and informations to keep secret. Later it was developed globally and go on developing with time as development of TCP/IP, ISPs and much more. to the modern world internet.

## TCP / IP:-

Transmission Control Protocol / Internet Protocol (TCP/IP) is a suite of communication protocols used to interconnect network devices on the internet.

TCP / IP can also be used as a communication protocols in a private network. TCP / IP specifies how data is exchanged over the internet by providing end-to-end communications that identify how it should be broken into packets, addressed, transmitted, routed and received at the destination. TCP defines how applications can create channels of communication across a network and IP defines how to address and route each packet to make sure it reaches the right destination.

## The Internet Architecture

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The architecture of internet is ever-changing due to continuing changes in the technologies as well as the nature of service provided. The overall architecture can be described as follows:-

- 1) Client → A computer network in which one centralized, powerful computer (called the server) is a hub to which many less powerful personal computers or workstations (called clients) are connected. The clients runs programs and access data that are stored in the server.

- i) ISP → An Internet service provider (ISP) is an organization that provides services for accessing, using or participating in the internet. It includes domain-name registering, web hosting, Usenet service and much more.
- ii) Regional ISP → ISP's provided in certain small regions like provinces is called regional ISP. These ISPs would be ones which have only small intra-region/state presence. For example, Telecommunication provided by Nepal Telecom in Nepal.
- iii) Backbone → A backbone is a part of computer networks that interconnects various pieces of network, providing a path for the exchange of information between LANs or subnetworks. Normally, the backbone's capacity is greater than the networks connected to it.

### Internet of Things (IoT):

IoT is a network in which all physical objects are connected to the internet through network devices or routers and exchanging exchange data.

## Applications of IoT:-

- 1) Personal Home Automation System.
- 2) Enterprise.
- 3) Utilities → smart metering, smart grid and water monitoring system.
- 4) Energy Management
- 5) Medical and Health care.
- 6) Transportation.
- 7) Large scale development etc.

Wearable computing → Wearable computing is a term that refers to computer-powered devices that can be worn by user like watches, glasses, shoes, clothing and similar items.

Wearable computing devices can range from providing very specific, limited features like heart rate monitoring and pedometer capabilities to advanced smart functions similar to smartphones or smartwatches offers.

Cloud computing → The practice of using the Internet to store, manage and process data, rather than local server or a personal computer is called computing. We can store different kinds of data over internet and can retrieve on need.

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Q. What is e-commerce? Describe types of e-commerce.

Ans. - The buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions is called e-commerce, also known as electronic commerce or internet commerce.

### Types of Ecommerce Models:-

There are four main types of ecommerce models that can describe almost every transaction that takes place between consumers and businesses.

- 1) Business to Consumer (B2C):- When a business sells a good or service to an individual consumer then it is called business to consumer. for e.g. We buy a pair of shoes from an online retailer.
- 2) Business to Business (B2B):- When a business sells a good or service to another business then it is called business to business. for e.g. If we sell our old house on eBay to another consumer. a business sells software as a service for other businesses to use.
- 3) Consumer to Consumer (C2C):- When a consumer sells a good or service to another consumer is called consumer to consumer. for e.g. for e.g. If we sell our old furniture on ebay to another consumer.

iv) Consumer to Business (C2B): When a consumer sells their own products or services to a business or organization then it is called consumer to business. for e.g. A photographer licenses their photo for a business to use.

### E-governance :-

Electronic governance or e-governance is the application of information and communication technology (ICT) for delivering government services, exchange of information and communication transactions within the entire government framework.

### Applications of E-governance / Types :-

a) Government to citizen (G2C) → In this type of e-governance, government directly provides information to the public through the use of ICT such as Internet. Example of this type of e-governance is public notice of opening vacancies, online form distribution, instant opinion voting, etc.

b) Government to Employee (G2E) →

This delivery model uses various tools to improve the relationship with employees. With this techniques employee can communicate with government and gets

own company to perform various tasks efficiently even if they are far from each other. Such as employee can check his bill online, can transfer his salary to another account etc.

→ Government to Government (G2G) → It is the interaction between various department, authorities and agencies of government. It helps in government departments, agencies, organizations and authorities joining up multiple government IS systems etc.

→ Government to Business (G2B) → It is the non-commercial online interaction between government, government agencies and business companies.

For example providing new tax rate, and new policies of government for business and financial sectors and exchanging the different documents between trading company and government with the help of Internet.

# Security and Ethical Challenges (Computer Security)

Q) What is security threat? Security attack and its types

Ans A computer threat is a possibility of danger that might harm the vulnerability of a computer system and break the security to cause damage.

The security attack is an information security threat that involves an attempt to obtain, alter, destroy, remove, without authorized access or permission.

Following are some of the types of security attacks:-

i) Malware → Malware refers to various forms of harmful software, such as viruses and ransomware. Attackers will use a variety of methods to get malware to our computer.

ii) Phishing → It is an attack via email. In phishing attack, an attacker may send us an email that is sent by someone which seems of urgency.

iii) SQL Injection Attack → A SQL injection attack is related to malicious code to attack private customer information from the website.

iv) Cross-Site Scripting (XSS) → It is similar to SQL-injection attack. In this attacker runs at user's browser and follows the user.

ii) Credential Reuse → In this attackers have usernames and passwords from ~~a~~ breached website or service in which people use same credentials on other websites they log in.

### Malicious software

- i) Virus → A computer virus is a malicious program that self-replicates by copying itself to another program.
- ii) Worm → A computer worm is a type of malware program which infects other systems by making multiple copies of itself and spreading itself onto other computers within the network.
- iii) Trojan horse → A trojan horse is a program that appears harmless, but is in fact malicious. It causes unexpected changes to computer settings and unusual activity.

### Security Services

- i) Confidentiality → Confidentiality is the allowing ~~unauthorized~~ users to access sensitive and protected data. It ~~closes~~ blocks or closes for unauthorized users.
- ii) Authentication → Authentication is a process that ensures and confirms a user's identity.
- iii) Integrity → Integrity refers to ensuring the authenticity of information that information is not altered, and the source of the information is genuine.

Q. What is security mechanism?

Ans. Security mechanism is a technical tool and technique that are used to implement security services. For e.g. Cryptography, Digital signatures.

Q. What is cryptography?

Ans. The art of protecting information by transforming it (encrypting it) into an unreadable format, called cipher text is called cryptography.

Only those who possess a secret key can decrypt the message into plain text.

Secret key and Public key cryptography

A secret key (private key) is a variable that is used with an algorithm to encrypt and decrypt code. It plays important roles in both symmetric and asymmetric cryptography.

A public key is a variable that is used with an algorithm to decrypt code.

Hash function and Digital Signature

A hash function is a mathematical function that converts a numerical input value into another compressed numerical value. The input to hash function is of arbitrary length but output is always of fixed length.

secret key  
public key  
imp  
read in  
detail.

A digital signature is a mathematical scheme for verifying the authenticity of digital messages or documents. A valid digital signature, where the prerequisites are satisfied, gives a recipient very strong reason to believe that the message was created by a known sender and that the message was not altered in transit.

## Firewall

A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules.

A firewall typically establishes a barrier between a trusted internal network and untrusted external network, such as the internet.

### Functions

- It helps to protect confidential information from those who do not explicitly need to access it.
- It protects our network and its resources from malicious users and accidents that originate outside of our network.

### Types

- Hardware firewall → It is a physical device installed between the modem and computer. It protects an entire network. It is usually more expensive and harder to configure.  
E.g. Cisco pix, Watchguard, NetScreen etc.

→ Software firewall → It is a software application installed onto the computer system that you wish to protect. It protects a single computer. It is usually less expensive and easier to configure.

E.g. Norton internet security, MacAfee security etc.