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CH#1

A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS). Together, the data and the DBMS, along with the applications that are associated with them, are referred to as a database system, often shortened to just database.

Database

"Database is a shared collection of logically related organized data that is designed to meet the information needs of multiple users in an organization."

→ Database is an excellent way of organizing data.

- A database may be of any size and complexity.

Data	Information
*-Stored representation of objects and events that have meaning and importance in the user's environment.	*-Data that have been processed in such a way to increase the knowledge of person who uses the data.
*-Data is unorganized.	*-Information is organized.
*-Independent	*-Dependent

Metadata

"Data that describes the properties or characteristics of end-user data and the context of those data."

* The properties include data names definitions, length and allowable values.

* Data context include the source of the data, where the data, ownership and usage

"Data about data is also called metadata"

File Processing System

"A file Processing System is a collection of programs that store and manage files in computer hard-disk."

→ Files are used to store various documents. All files are grouped based on their Categories

Disadvantages:

* Program-data dependence
* Duplication of data
* Limited data sharing
* Lengthy development times
* Excessive Program maintenance

(i). Program-data dependence:

File description are stored within each database application program that accesses a given file.

Database application ⇒ An application program that is used to perform a series of database activities on behalf of database users.

(ii) Duplication of Data:-

Because applications are often developed independently in file processing systems, unplanned duplicate data files are the rule rather than the exception.

The same data can be present in two or more files which takes up more disc space.

(iii) Limited Data Sharing:

With the traditional file processing approach, each application has its own private files and users have little opportunity to share data outside their own applications.

(iv). Lengthy Development Times:

Each new application requires that the developer essentially start from scratch by designing new file formats and descriptions and then writing the file access logic for each new program. The lengthy development times required are inconsistent.

(v) Excessive Program Maintenance:

The Preceding factors all combined to create a heavy program maintenance load in organizations that relied on traditional file processing system.

Database Approach Advantages:

(i) Program-data Independence:

"The Separation of data descriptions from the application programs that use the data."

→ Data descriptions are stored in a central location called the **repository.**

→ It allows an organization's data to change and evolve without changing the application programs.

(ii) Planned Data Redundancy:

"Redundancy is also called data duplication"

→ The data in a database appears only once and is not duplicated.

→ It does not eliminate redundancy entirely, but it enables the designer to control the type in amount of redundancy

(iii) Improved Data Consistency:

→ The data is consistent.

→ If a data item appears only at one place, it is easy to maintain.

→ The updation of data is performed at only one place.

(iv) Improved Data Sharing:

→ A database is designed as a shared corporate resource.

→ Once a database is developed, it can be used by several users in the organization.

→ It can also be shared by different applications.

User View

"A logical description of some portion of the database that is required by a user to perform some task."

(v) Increased Productivity Of Application Development:

→ It reduces the cost and time for developing new business

applications.

→ Many database management systems also provide several tools to assist in program development.

→ It provides a number of high level productivity tools, such as forms and report generators and high level languages.

(vi) Enforcement of Standards:

→ The database administration function should be granted single-point authority and responsibility for establishing and enforcing data standards.

→ These standards will include naming conventions, data quality standards and uniform procedures for accessing, updating and protecting data.

(vii) Improved Data Quality:

It provides a number of tools and processes to improve data quality:

* - Constraint

* Scrub / Clean up

Constraint

"A rule that cannot be violated by database users."

- Database designers can specify integrity constraints that are enforced by the DBMS

Scrub

"One of the objectives of a data warehouse environment is to clean-up operational data before they are placed in the data warehouse."

(viii) Improved Data Accessibility and Responsiveness:

With a relational database, end users without programming experience can often retrieve and display data, even when it crosses traditional departmental boundaries.

(ix) Reduced Program Maintenance:

→ In a database environment, data are more independent of the application programs that use them.

→ We can change either the data or the application programs that use the data without necessitating a change in the other factor.

→ Program maintenance can be significantly reduced in a modern database environment.

(x) Improved Decision Support:

Some databases are designed expressly for decision support applications.

Example:

Some databases are designed to support customer relationship management.

Cautions About Database Benefits:

4- Cost and risks of the database approach

- **New, Specialized Personnel:**
  Organization that adopt the database approach need to hire or train individuals to design and implement databases, provide database administration services and manage a staff of new people.
- **Installation and management cost and complexity:**
  A multiuser database management system is a large and complex suite of software that has a high initial cost, requires a staff of trained personnel to install and operate and has substantial annual maintenance and support costs.
- **Conversion Cost:**
  → The conversion cost of older systems into modern database

technology measured in terms of dollars, time and organizational commitment.

→ The cost of conversion is very high.

- **Need For Explicit Backup & recovery:**

→ A shared corporate database must be accurate & available at all times.

→ This required backup copies of data and for restoring a database when damage occurs.

- **Organizational Conflict:**

→ A shared database requires a consensus on data definitions and ownership as well as responsibilities for accurate data maintenance.

→ Conflicts on data definitions, data formates and coding difficult to resolve.

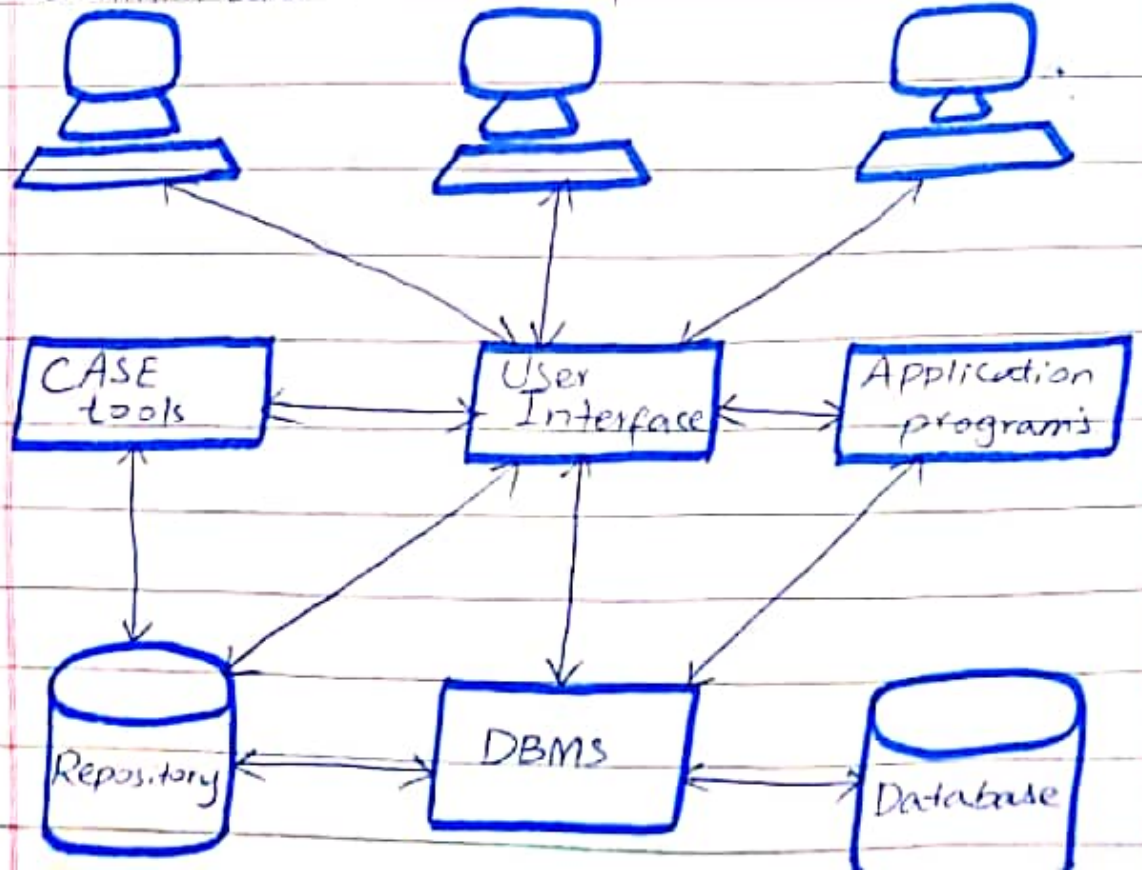
Components Of the Database Environment

(ix) Computer-aided Software engineering:

→ Case tools are automated tools used to design databases and application programs.

"Software tools that provide automated support for some portion of the system development process."

→ It help with creation of data models and also generate the code.



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Components Of Database Environment:

(i) Repository:

→ A repository is a collection of all data definitions, data relationships, output styles and report formats etc.

→ All this information is the metadata that is important to manage database.

(ii) Database Management System:

"A Collection of programs that are used to create and maintain a database."

(iii) Database:

"An organized collection of related data."

→ The word "organized" means that data is stored in such a way that the user can store, manipulate and retrieve data

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The word "related" means that a database is normally created to store the data about a particular topic.

(iv) Application Program:

→ It is a program that is used to send commands to the database management system to manipulate database.

→ These commands are sent to the DBMS through graphical user interface.

(v) User Interface:

→ It is a visual environment that is used by the user to communicate with the Computer.

→ It consists of menus, buttons, forms and reports etc.

→ All window based software use graphical user interface.

(vi) Data & Database Administrators:

Data administrators are the persons who are responsible of whole information system.

They authorize access to the database as well as coordinate

and monitor the use of database.

(vii) System Analyst & Application Programmers:

→ System analyst determine the requirements of end users and develop specifications for transactions.

→ Application programmers implement these specifications in programs.

(viii) End User:

→ End users are those persons who interact with the application directly.

→ They are responsible to insert, delete and update data in the database.

THE RANGE OF Database Applications

There are several methods for people to interact with the data in the database.

→ First, users can interact directly with the database using the user interface provided by the DBMS.

→ The second and more common mechanism for accessing the database is using application programs.

The range of database is divided into three categories:

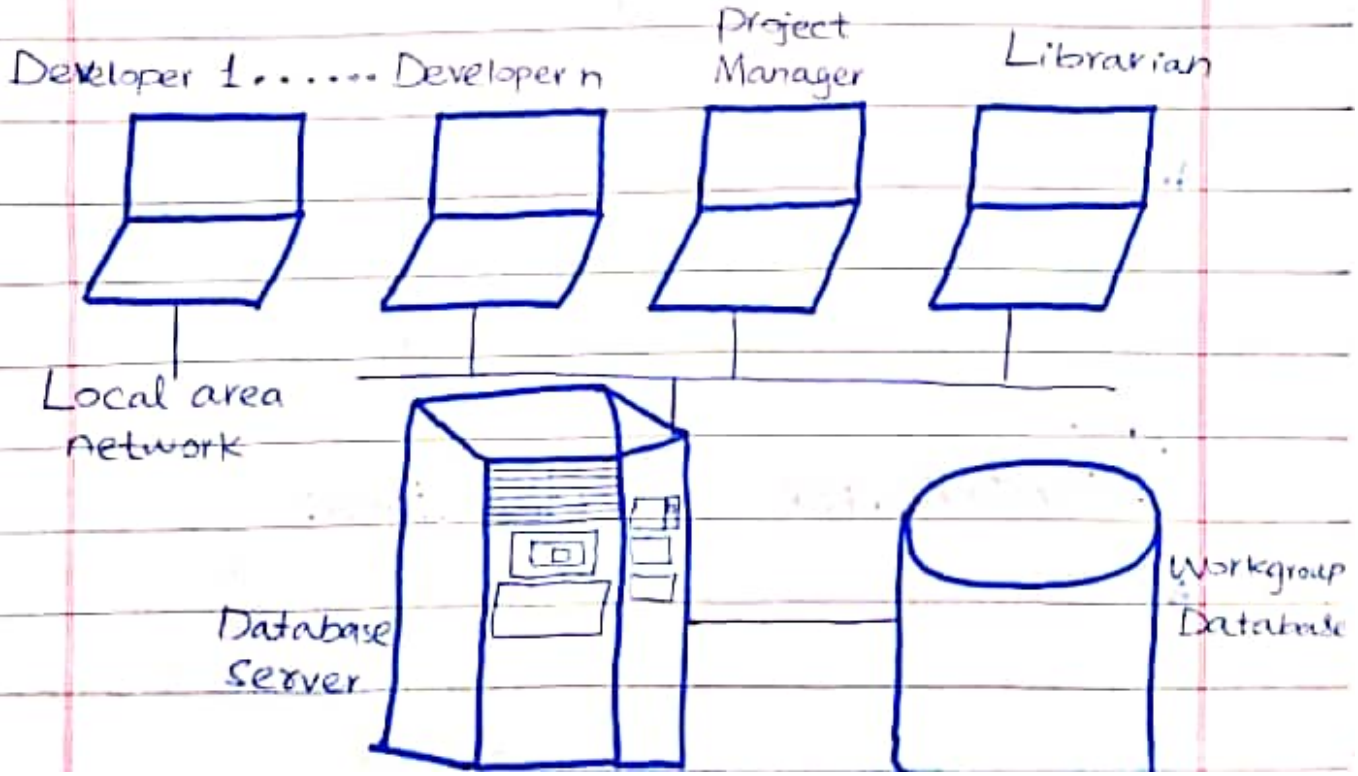
* Personal database
* Two-tier database
* Multitier database

(i) Personal Database:

* Personal databases are designed to support one user.
* Personal databases have long resided on personal computers, including laptop, and increasingly on smart phones and PDAs.
* It provide the user with ability to manage small amounts of data in an efficient manner.
* They improve personal productivity.
* A database of customers can enable the salesperson to determine the best combination of quantity and type of items for the customer to order.

(ii) Two-Tier Client/Server Database

* In two-tier application, each member of the workgroup has a computer and the computers are linked by means of network.
* Each computer has a copy of specialized application which provides the user interface as well as the business logic.
* It provides data security and data integrity when multiple users attempt to change and update data at the same time.
* Each member has access to the shared data.



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Multi-tier Client/server Database:

* It supports large number of users.
* These applications are intended to support a department or a division which is generally larger than a workgroup.
* In this architecture, the user interface is accessible on the individual user's computer.
* It provide ease of separating the development of the database and the modules that maintain the data from the information system modules that focus on business/ Presentation logic.
* This architecture allow us to improve performance and maintainability of the application and database.

Enterprise Applications:

* An enterprise database is one whose scope is the entire organization and enterprise.

* These databases are intended to support organization-wide operations and decision making

The evolution of enterprise databases has resulted in two major developments:

* Enterprise Resource Planning (ERP)
* Data Warehousing implementations

(i) Enterprise Resource Planning:

"A business management System that integrates all functions of the enterprise, such as manufacturing, Sales, finance, marketing, inventory, accounting and human resources. ERP systems are software applications that provide the data necessary for the enterprise to examine and manage its activities."

(ii) Data Warehouse

An integrated decision support database whose content is derived from

the various operational databases.

Data warehouse provide users with the opportunity to work with historical data to identify patterns and trends and answers to strategic business questions.

Summary of Database App

Types	No. of users	Size of database
Personal	1	Megabytes
Two-tier	5-100	Mega-gigabytes
Three-tier	100-1000	Gigabytes
ERP	>100	Giga-terabytes
Data Ware-housing	>100	Tera-petabytes