



Databases & 4GLs

OVERVIEW OF DATABASE

What is Data ?





Definition of Data

- Data is the plural of *datum*.
- Distinct pieces of information, usually formatted in a special way.
- Data can exist in a variety of forms - as numbers or text on pieces of paper, as bits and bytes stored in electronic memory, or as facts stored in a person's mind.



Data Structure & Data Type

- Method to deal with ***Organization*** and ***Manipulation*** of data inside computer.
- Data type refers to the **classification** of a particular type of information.
 - integer.
 - floating point.
 - char, string
 - date
 - student record
 - blob (binary large object)



Definition of Database

“ **Database** is a shared collection of logically related **data**, designed to meet the **information** needs of multiple users in an organization ”

- Database represents some aspects of the real world, **miniworld** or **Universe of Discourse (UoD)**.
- Database is **designed, built, and populated** with data for a specific purpose. It has an intended group of users and preconceived applications in which these users are interested.



Database Management System (DBMS)

- A collection of programs that enables users to **create** and **maintain** a database.
- General-purpose software system that facilitates the processes of **defining**, **constructing** and **manipulating** databases for various applications.

Defining - specifying data types, structures, constraints.

Constructing - storing of data

Manipulation - querying, updating and reporting.



Popular DBMS In The Market

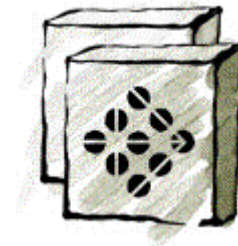


Informix

Informix Dynamic Server



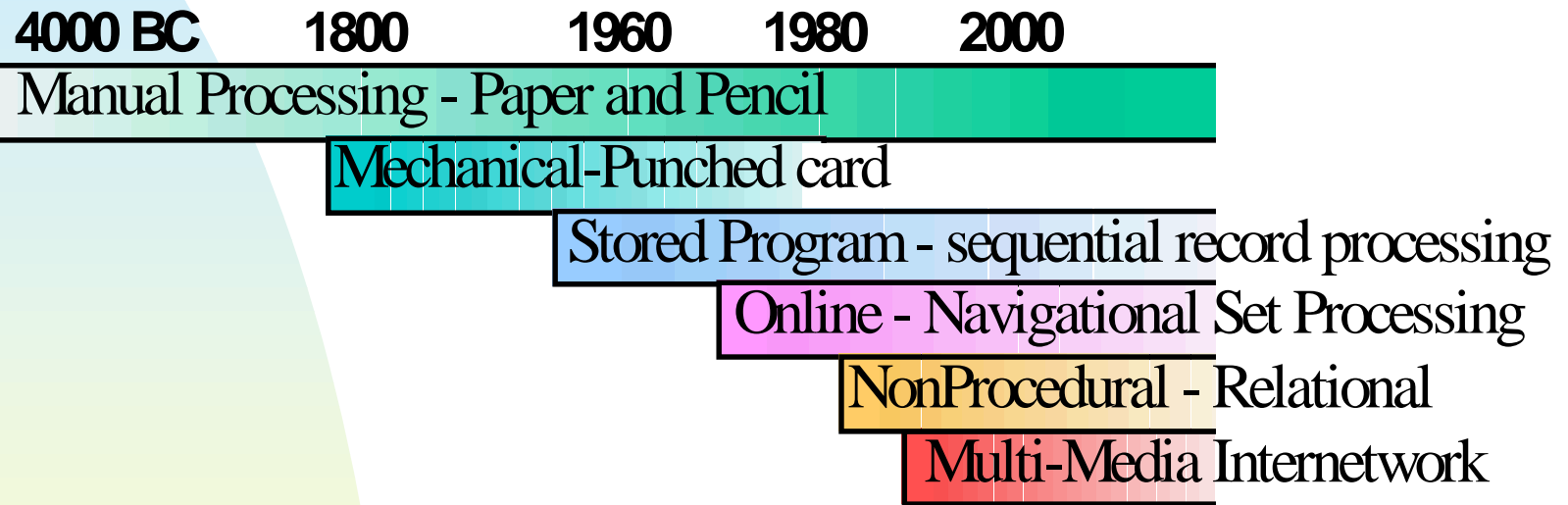
Paradox



Borland Interbase



Evolution of Data Management



The six generations of data management, evolving from manual methods, through several stages of automated data management.



Generation of Programming Languages

- 1. First Generation Language**
 - Machine Code
- 2. Second Generation Language**
 - Assembly Language
- 3. Third Generation Language**
 - High Level Programming Language
 - Pascal, Cobol, C, Fortran...
- 4. Fourth Generation Language**
 - Query Languages
 - Form Generators & Report Writers
 - Graphics & Application Generators



Comparison of File Based Processing & Database System

File Based Processing System





File-based Systems

A collection of application programs that perform services for the end users such as the production of reports.

Each program defines and manages its own data.

Reasons for studying them

- Understanding problems will help to avoid repeating same problem.
- Better ways of handling data can be learned.
- Ease the conversion process from file-based to database system.



Problems In File-based Systems

Lot of efforts required to handle the data or to get the required information

Centralized Data Storage - All the data reside in a common area

Decentralized approach - each department stored and controlled its own data

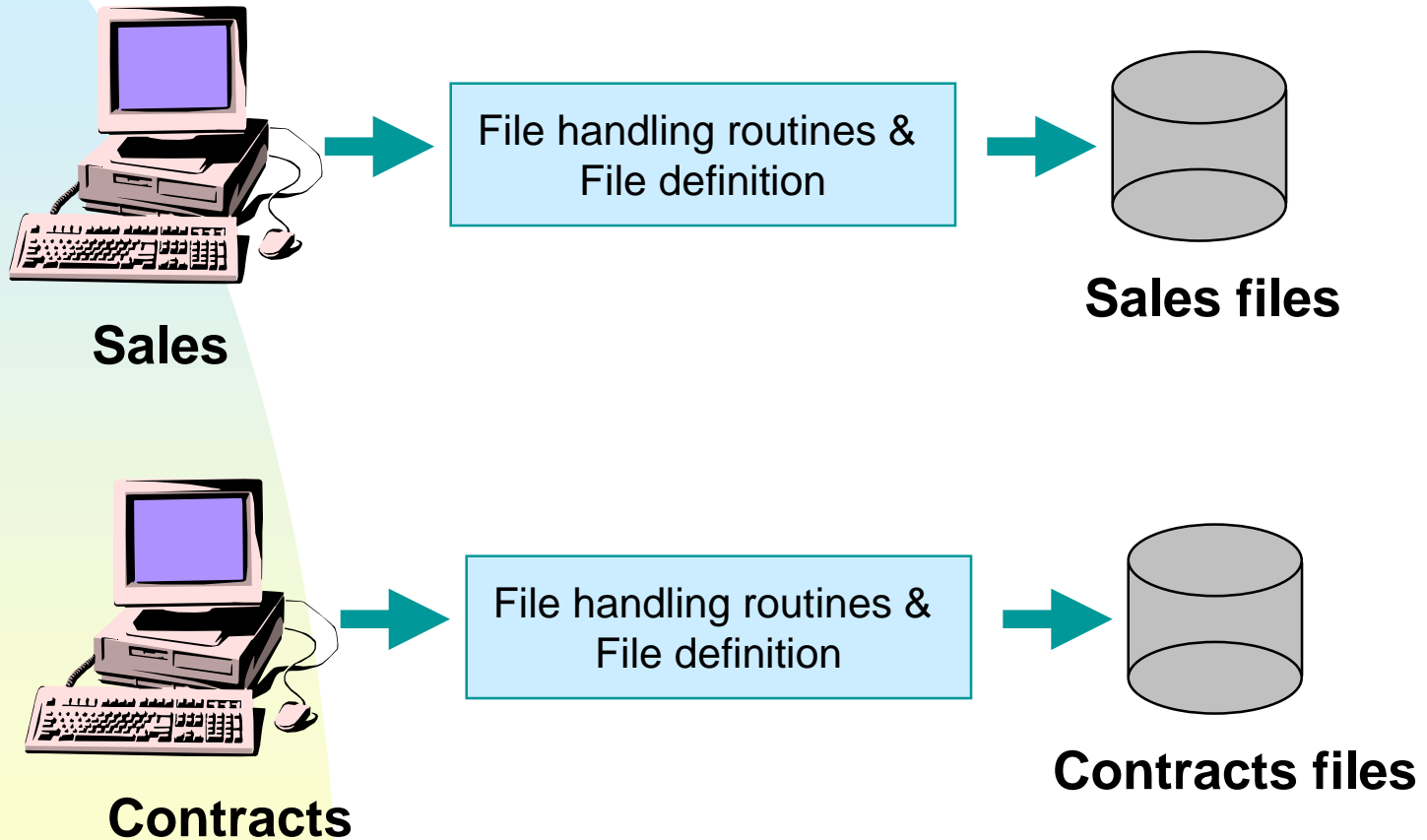
Chances more for duplication

Hard to maintain the physical structure of the file

Storage of the data file

Application code

File-based Processing





Limitation of File-based Approach

- **Separation and Isolation of data.**
 - Each program maintains its own set of data.
 - Users of one program may be unaware of potentially useful data held by other programs.
- **Duplication of data**
 - Same data is held by different programs.
 - Results in wasted space, and potentially different values for the same item or even different formats.
- **Data dependence**
 - File structure is defined in the program code.



Limitation of File-based Approach

- **Incompatible file formats**
 - Programs are written in different languages
 - Cannot easily access each others files.
- **Fixed Queries/Proliferation of application programs**
 - Programs are written to satisfy particular functions.
 - Any new requirement needs a new program.



Problem with File-based Systems

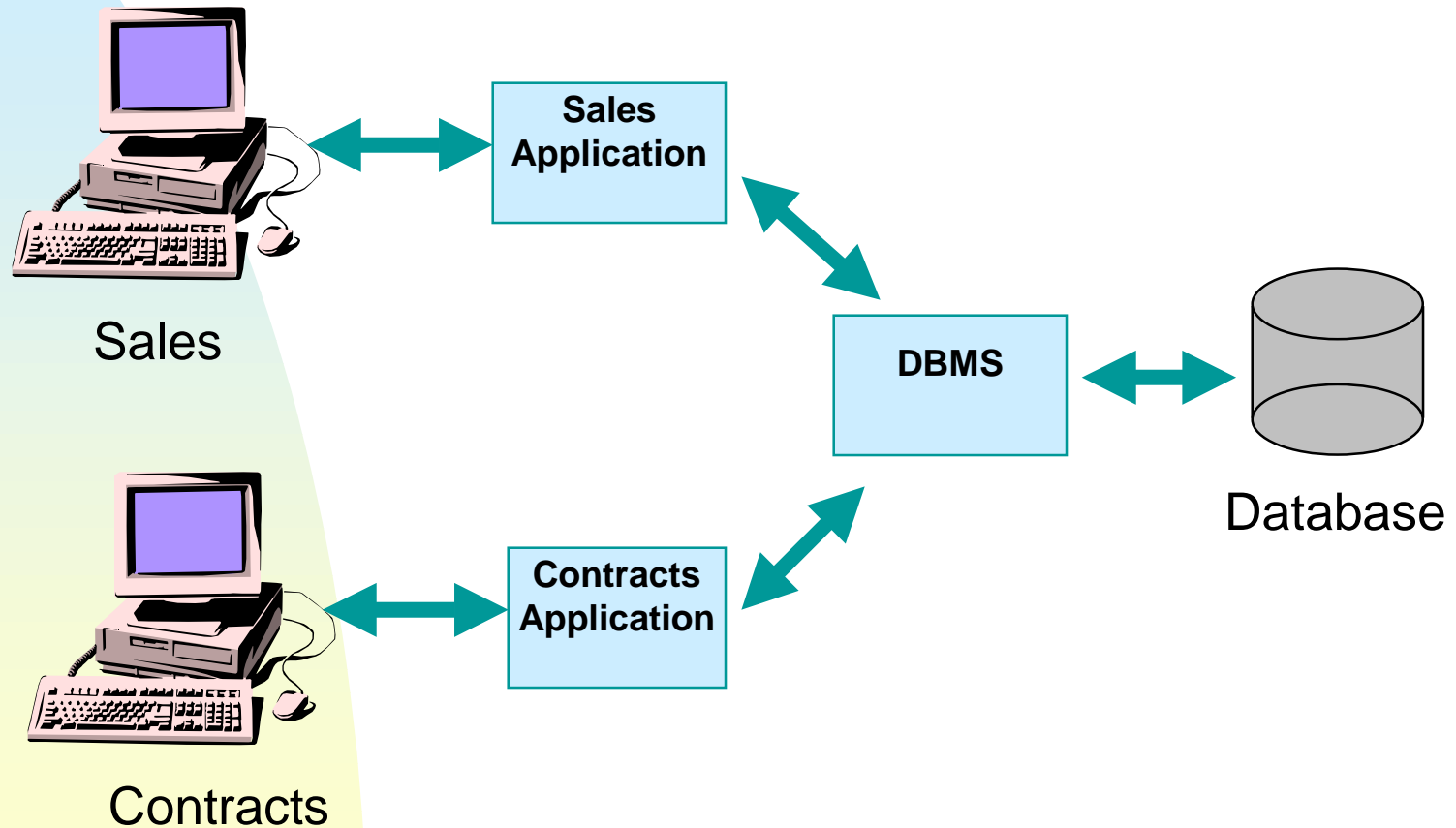
Problems arose because:

- Definition of data was embedded in application programs, rather than being stored separately and independently.
- No control over access and manipulation of data beyond that imposed by application programs.

Database Processing System



Database Processing





Database Approach

A DBMS typically provides:

- **Data Definition Language (DDL)**
 - Permits specification of data types, structures and any data constraints.
 - All specifications are stored in the database.
- **Data Manipulation Language (DML)**
 - Provides general enquiry facility
- **Data Control Language (DCL)**
 - Controls the access to database : security, integrity, concurrency control, recovery, user-accessible catalog.



Components of DBMS Environment

1. Hardware

Can range from a PC to a network of computers.

2. Software

DBMS itself and operating system, including any network software if network is being used.

3. Data

Includes actual data used by the organization, and description of this data (**schema**). Also a system catalog contains data such as the names of authorized users.



Components of DBMS Environment

4. Procedures

Instruction and rules that should be applied to the design and use of the database, and the use of the DBMS.

5. People

Data & Database Administrator

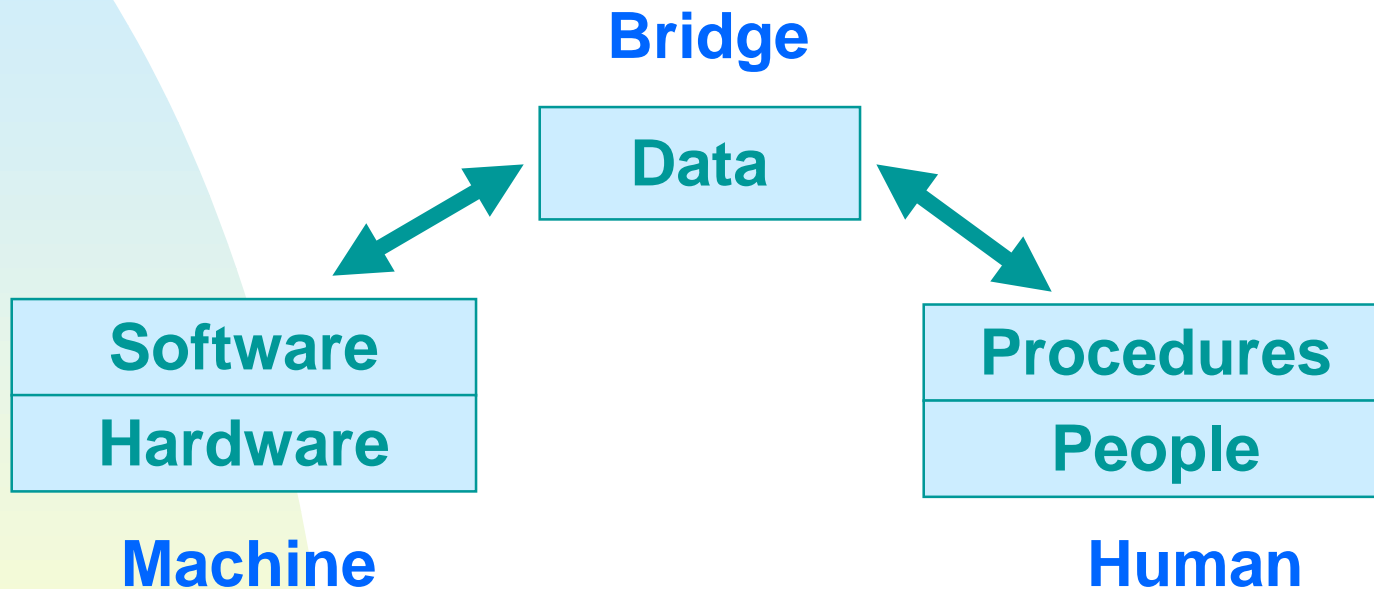
Database Designer :- Logical & Physical

Application Programmers

End Users

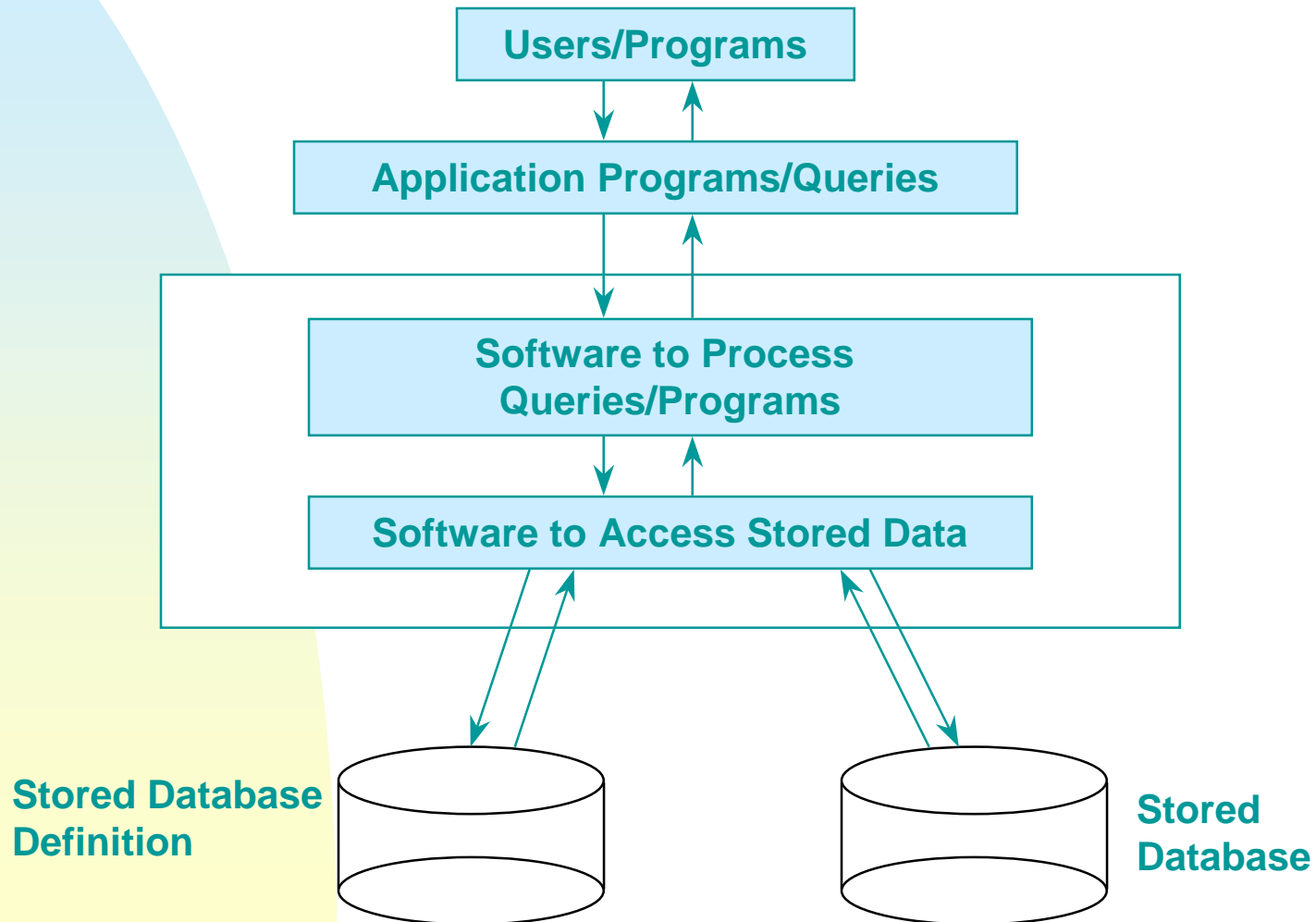


DBMS Environment





Database System Environment





Advantages of DBMS

- 1. Control of data redundancy.**
- 2. Data consistency.**
- 3. More information from the same amount of data.**
 - Data Warehousing, Data mining**
- 4. Sharing of data.**
- 5. Improved data integrity.**
- 6. Improved security.**



Advantages of DBMS

- 7. Enforcement of standards.**
- 8. Improved data accessibility and responsiveness.**
- 9. Increased productivity.**
- 10. Improved maintenance through data independence.**
- 11. Increase concurrency.**
- 12. Improved backup, recovery and data availability.**



Disadvantages of DBMS

- Increase complexity.
- Growing of size.
- Cost of DBMS.
- Additional hardware costs.
- Cost of conversion.
- Performance issue.
- Higher impact of a failure.



Critical Success Factors to Using DBMS

Database Design

- **Determines the structure of the database.**
- **Can be extremely complex and requires the data to be considered first, and the application second.**
- **Failure to achieve a good design can lead to substantial problems when developing additional applications. It may necessitate a complete redesign.**