

## AS/A2 Computing: Database Management System (DBMS)

- A database is the name for the raw data file.
- Databases facilitate efficient processing.

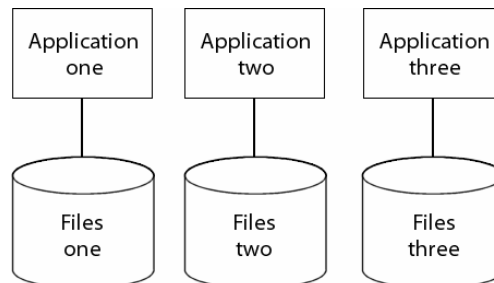
There are two models now used for database design (others have now been abandoned), these are:

- Relation-linked tables and
- Object orientated.

Terms related to databases:

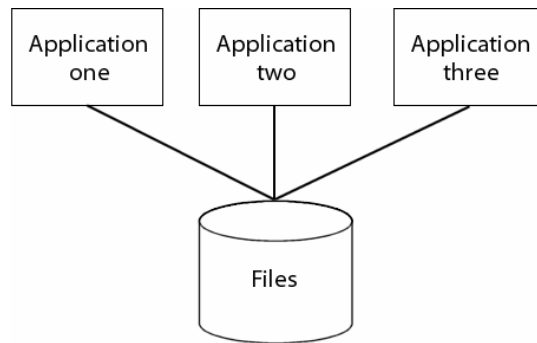
- **Relation:** a table in a database where details of entities are stored.
- **Entity:** a collection of objects that share the same attributes.
- **Attribute:** part of a row (tuple).
- **Field:** a group of characters that represent a single item of data in a file.
- **Record:** a self contained part of a file consisting of one or more fields.
- **File:** a set of related records stored together.
- **Relationship:** a link between two entities.
- **Primary key:** a field in a record that uniquely identifies every record in a relation (table).
- **Secondary key:** a unique field not the primary key for a relation (table).
- **Foreign key:** a reference held in one table to a primary key in another table.
- **Index:** a reference used to locate records by a given field quickly. All primary keys are automatically indexed.
- **Referential integrity:** form of validation routine that enforces rules about referring to records - they must exist.

### Separate file approach



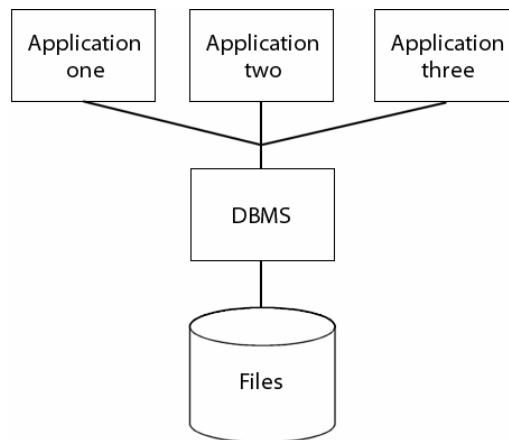
- No sharing of data (each program directly accesses the files it needs).
- Duplication and redundancy exist as data exists in many files.
- This leads to inefficiency and may lead to inconsistency.

### Database approach



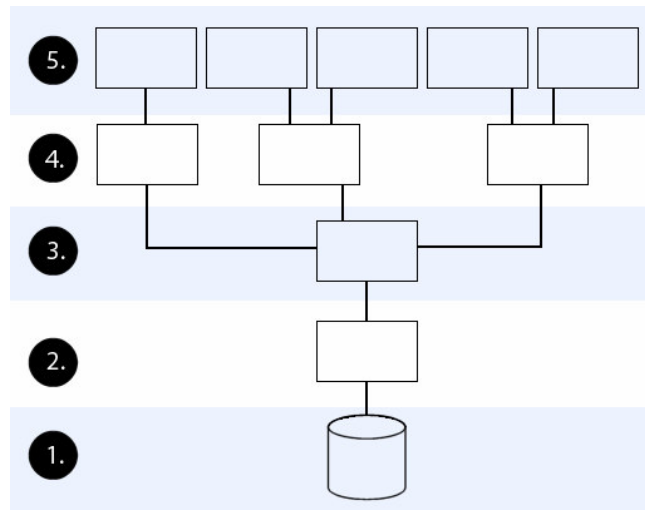
- The programs are now sharing data from a single file so data is consistent.
- However, problems still exist if a change is made to one program to the size, type or format in which data is stored the other programs will need re-writing as the programs communicate directly with the files. This is called program-data dependence as the applications are dependent on the physical structure of the files.
- This causes "unproductive maintenance" as to change one application requires all applications to be changed.

### DBMS approach



- The DBMS approach provides an interface (layer of software) between physical data and the applications.
- Programs no longer refer to file names or structures.
- This means the problems of redundancy, inconsistency and program-data dependence are solved.
- The DBMS also:
  - facilitates sharing of data between software.
  - manages security and access rights.
  - manages mapping between logical and storage schemas.
  - maintains data dictionary (a description of the logical schema).
  - manages sharing of data.

The DBMS has a distinct structure:



1. **Raw data:** stored as a database.
2. **Storage schema:** how data is stored and accessed for a given DBMS. Here is the view of software writers such as those at Microsoft who write Microsoft Access.
3. **Logical schema:** types and length of fields stored in a logical way (the entire database is available here). The logical schema answers the question "what is data and how is it stored?" This is a data dictionary and where the designer of software sets access rights for different users.
4. **Schema:** The view of data for a particular user/application, see part of the database (the bits it needs).
5. **Applications:** the user or applications that view, manipulate or process the data.

These notes are from a lesson on 22/06/2004.