Introduction to Database Management Systems

**Database Concepts**
- Data Models
- DBMS Basics
- ANSI/SPARC Architecture
- Data Independence
- Centralized/Distributed DBMS

**Database Concepts 1**

**Data Models**
- Formal representation for describing
- Entities -- An object, concept or an event about which the org. chooses to collect and store information about
- Relationships -- Associations among data
- Operations -- Activities involved
- Integrity constraints -- Data integrity and business rules

**Data model classification in a DB**
- Physical data model
- Deals with physical storage and access
- Conceptual data model
- Deals with conceptual structure and access

**Data Models 2**

**DBMS - Basics**
- Database schema (Definition):
- Description of the structure of a database
- Organization of application data in a database
- Database state:
- Data values stored in a database at a specific point of time.
- Changes over time (Rev.)
- Database languages
- Data definition language (DDL) -- Defines the database schema
- Data manipulation language (DML)
  - Creates, deletes, modifies, and retrieves data in application programs
- Data query language (e.g. SQL) -- For retrieval of data

**DBMS - Basics 2**
Data Dependence

Search (name-asked : char[30]);
  s : Student-Record;
  . . .
Begin
  open (student-file);
  while not end of file do
  begin
    read-a-record (s);
    if s.name = name-asked then
    begin
      print (s);
      stop;
    end;
  end;
print ( "No such a student."
End.

Search (name-asked : char[30]);
root-record  : student-record;
begin
  root-record := root-record;
  Find-It (name-asked, root-record);
end.

Find-It (name-asked : char[30];
  root : student-record);
begin
  if root = null then
  begin
    print ( "No such a student."
    stop;
  end;
  if root.name = name-asked then
  begin
    print (root);
    stop;
  end
  else if root.name < name-asked then
  find-it (name-asked, root.left);
  else
  find-it (name-asked, root.right);
end.

Data Independence

WHY do we have to modify our program after the data structure is changed?

Data Independence:
  The capability to change the lower level structure of data without having to change the application programs at the next higher level.
Introduction to Database Management Systems

ANSI/SPARC Architecture

Three Schema Levels

- Internal level (schema)
  - Describes the physical storage structure and access paths
  - Uses a physical data model

- Conceptual level (schema)
  - Describes the logical structure and access paths of the whole database
  - Hides the physical storage structure and access paths from the user
  - Uses a conceptual data model

- External level (schema)
  - Describes individual user views
  - An external view is a part of the DB
  - Uses an appropriate data model

ANSI/SPARC Architecture...

Data independence is achieved by inter-level mappings

- Queries are translated between levels automatically
- Physical data independence
  - The capability to change the internal schema without having to change the conceptual and external schemas
- Logical data independence
  - The capability to change the conceptual schema without having to change the external schemas
Centralized DB Systems

Distributed DB Systems

Client/Server DB Systems