

Data Models

What is Data Model

- **Data Model:** A set of concepts to describe the *structure* of a database, and certain *constraints* that the database should obey.

Importance of Data Models

- Data models
 - Representations, usually graphical, of complex real-world data structures
 - Facilitate interaction among the designer, the applications programmer and the end user
- End-users have different views and needs for data
- Data model organizes data for various users

History of DBMS and Data Models

- Initially data was stored in simple text files.
- Hierarchical and Network system.
- Relational Database System.
- Obj Oriented Database Model.

Types of Data Models

1. Object Based Data Models
2. Physical Data Models
3. Record Based Logical Models

Object Based Models

Some of the more common types of object based data model are:

- Entity-Relationship

- Object Oriented
- Semantic
- Functional

Record Based Models

The three most widely accepted record based data models are:

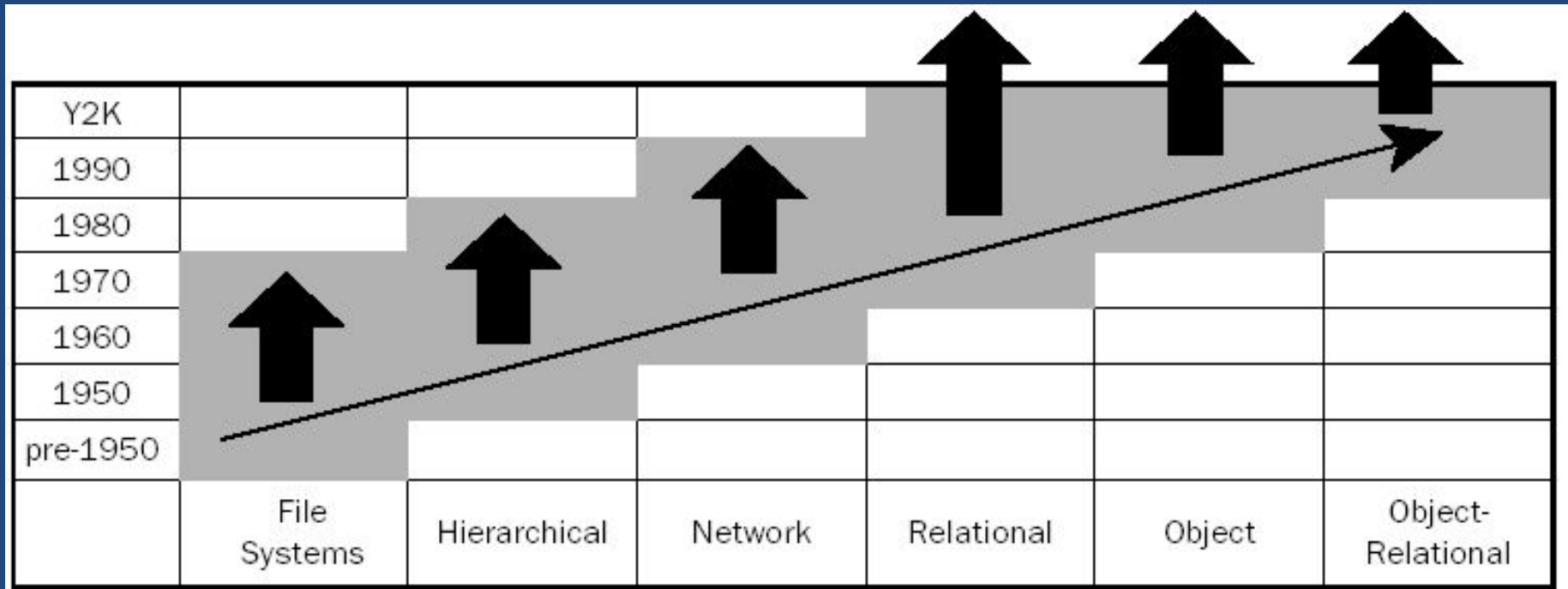
- Hierarchical Model
 - Network Model
 - Relational Model
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The relational model has gained favor over the other two in recent years. The network and hierarchical models are still used in a large number of older databases.

Data Model - Timeline

A data model is a model that describes in an abstract way how data is represented in an information system or a database management system (DBMS).

Entity Relation Model introduced in early seventies.



Working on Data Models

- Business Rules
- Building Blocks.
- Abstraction

Business Rules

- Brief, precise and unambiguous descriptions of policies, procedures or principles within the organization
- Apply to any organization that stores and uses data to generate information
- Description of operations that help to create and enforce actions within that organization's environment

Data Model Basic Building Blocks

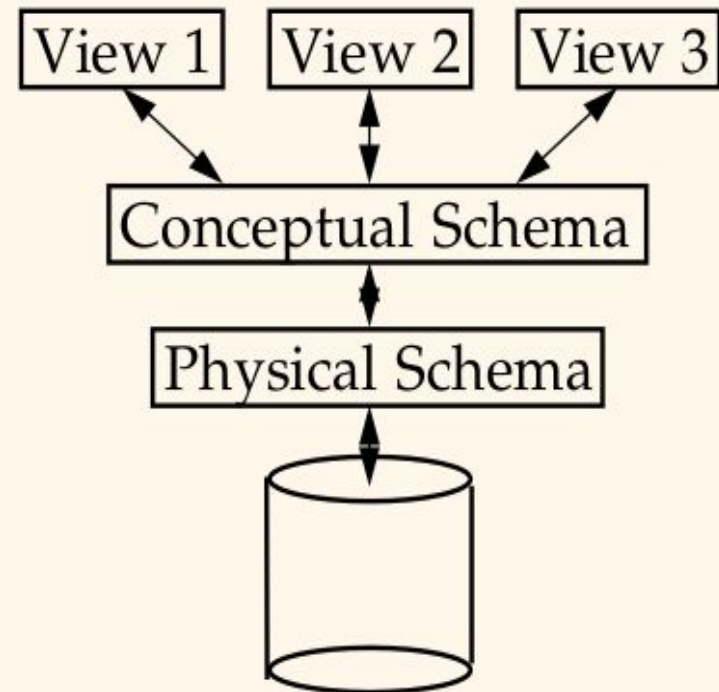
- Entity
 - Anything about which data will be collected/stored
- Attribute
 - Characteristic of an entity
- Relationship
 - Describes an association among entities
 - One-to-one (1:1) relationship
 - One-to-many (1:M) relationship
 - Many-to-many (M:N or M:M) relationship
- Constraint
 - A restriction placed on the data

Abstraction

- Physical level. How data is stored.
- Logical Level. How tables and views are related.
- View level . How users see the data.

Levels of Abstraction

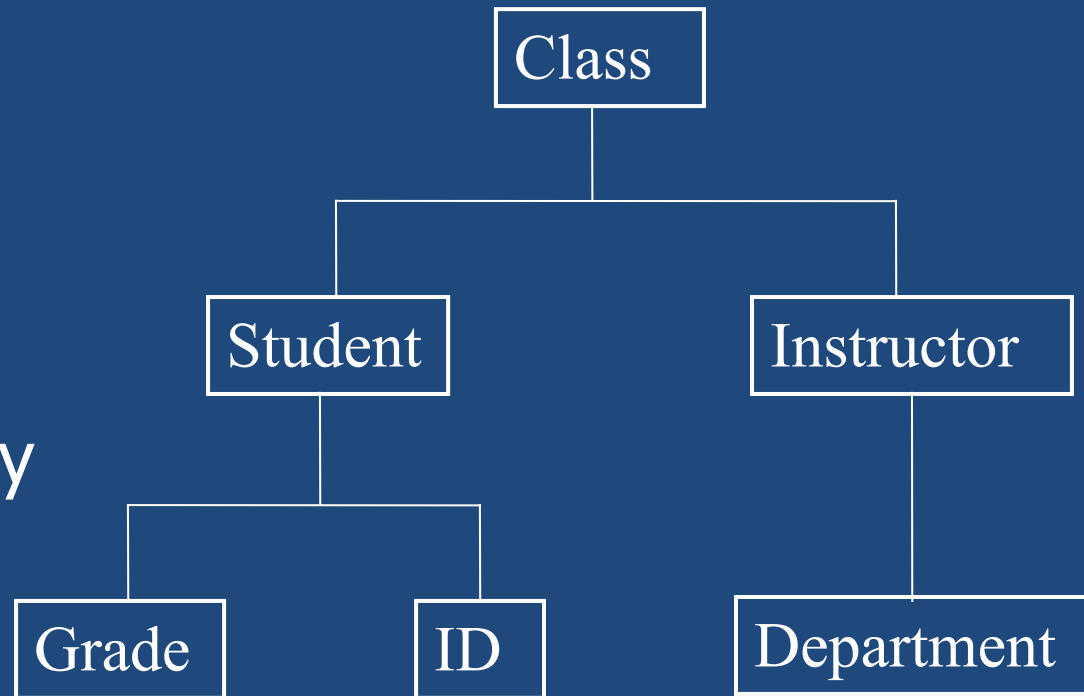
- ❖ Many views, single conceptual (logical) schema and physical schema.
 - Views describe how users see the data.
 - Conceptual schema defines logical structure
 - Physical schema describes the files and indexes used.



☛ Schemas are defined using DDL; data is modified/queried using DML.

Hierarchical data model

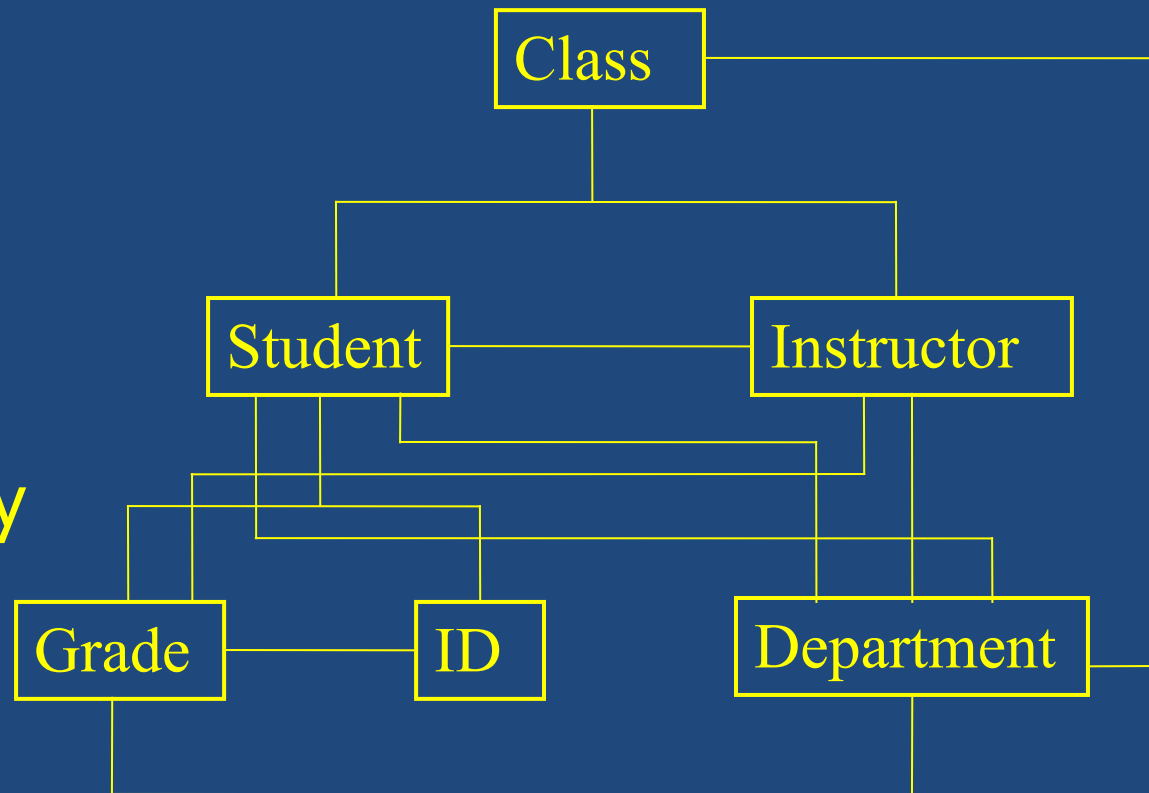
- Parent-child relationship:
 - one-to-one
 - one-to-many



Network data model

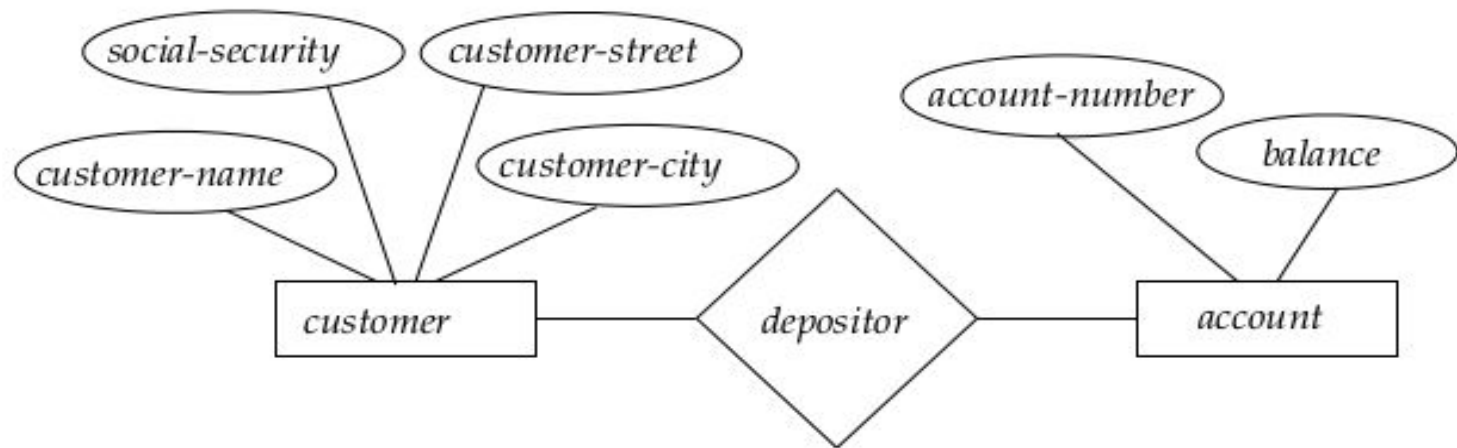
Relationships:

- one-to-one
- one-to-many
- many-to-one
- many-to-many



Entity-Relationship Model

Example of entity-relationship model



Relational Model

Example of tabular data in the relational model:

<i>customer-name</i>	<i>social-security</i>	<i>customer-street</i>	<i>customer-city</i>	<i>account-number</i>
Johnson	192-83-7465	Alma	Palo Alto	A-101
Smith	019-28-3746	North	Rye	A-215
Johnson	192-83-7465	Alma	Palo Alto	A-201
Jones	321-12-3123	Main	Harrison	A-217
Smith	019-28-3746	North	Rye	A-201

<i>account-number</i>	<i>balance</i>
A-101	500
A-201	900
A-215	700
A-217	750

One Last word

- ER Model is easier to understand , particularly for a layman.
- RDBM Data Model is easier to understand for Database admin and programmers.
- RDBM model is just the implementation of ER Diagram, though for simpler projects one can go directly for RDBM Model.