

DATA MODELS

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Data Modeling

Process of creating a **logical representation** of the structure of the database

Data Model

A model is a representation of 'real world' objects and events, and their associations.

Represents the framework of what the relationships are within a database.

Data Model

A data model can be thought of as comprising three components:

1. a **structural part**, consisting of a set of rules according to which databases can be constructed;
2. a **manipulative part**, defining the types of operation that are allowed on the data (this includes the operations that are used for updating or retrieving data from the database and for changing the structure of the database);
3. possibly a set of **integrity constraints**, which ensures that the data is accurate.

Data Model Basic Building Blocks

- **Entity**: anything about which data are to be collected and stored
- **Attribute**: a characteristic of an entity
- **Relationship**: describes an association among entities
 - One-to-many (1:M) relationship
 - Many-to-many (M:N or M:M) relationship
 - One-to-one (1:1) relationship
- **Constraint**: a restriction placed on the data

Business Rules

- Descriptions of policies, procedures, or principles within a specific organization
 - Apply to any organization that stores and uses data to generate information
- Description of operations to create/enforce actions within an organization's environment
- Must be in writing and kept up to date
- Must be easy to understand and widely disseminated
- Describe characteristics of data as viewed by the company

Translating Business Rules into Data Model Components

- Generally, **nouns** translate into entities
- **Verbs** translate into relationships among entities
- Relationships are bidirectional
- Two questions to identify the relationship type:
 - How many instances of B are related to one instance of A?
 - How many instances of A are related to one instance of B?

Types of Data Models

Object based: Describe data at the conceptual and external levels.

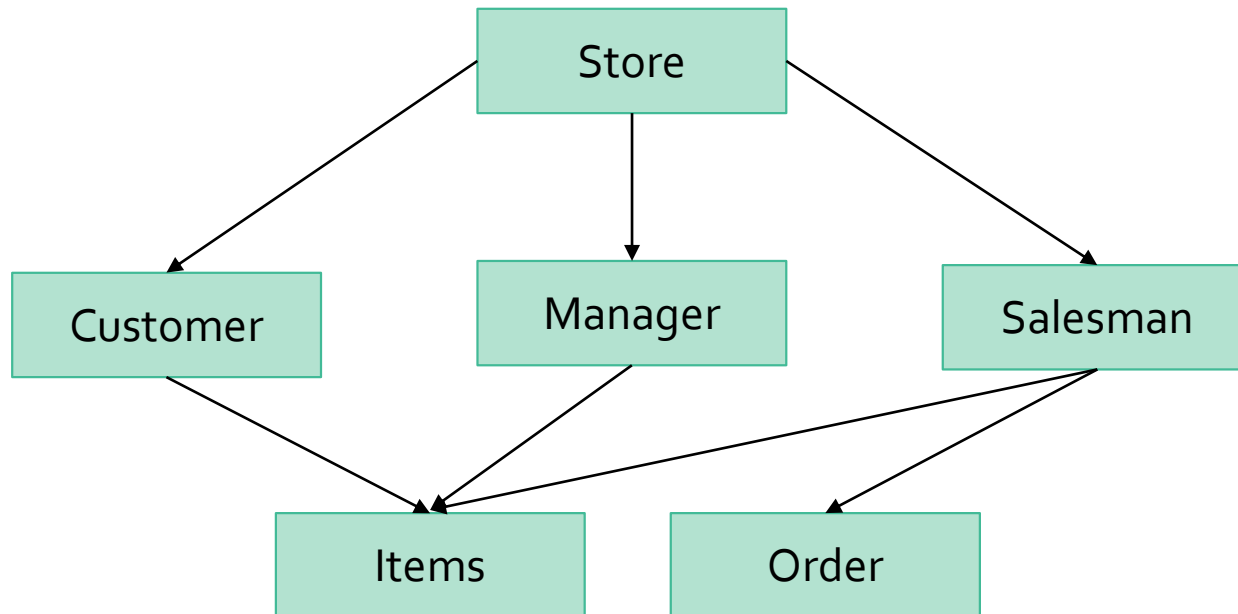
- Entity-Relationship, Object-Oriented

Record based: specify logical structure of database with records, fields and attributes.

- Hierarchical, Network, Relational

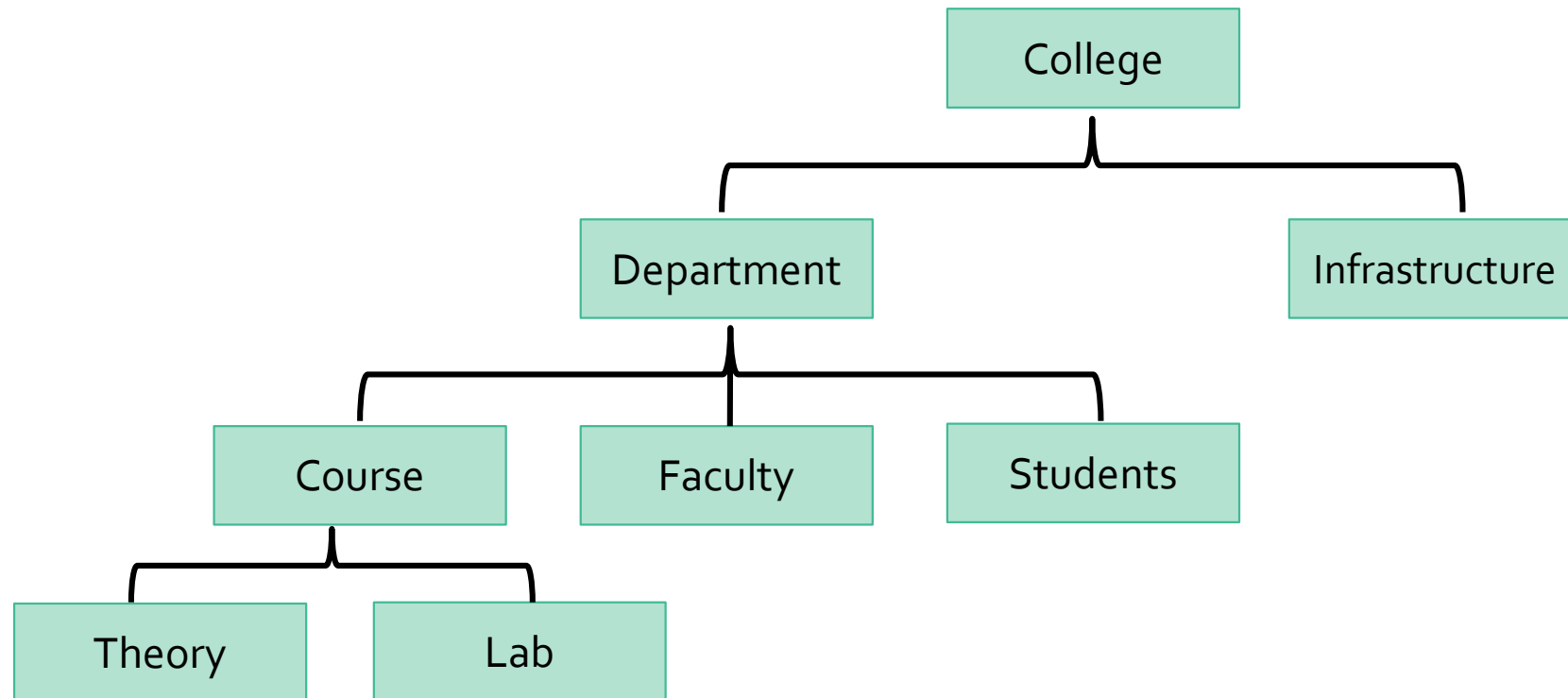
Network DB Model

The network contains **logical information** such as connectivity relationships among nodes and links, directions of link and costs of nodes



Hierarchical Model

The data is stored hierarchically using a [tree](#). It contains levels or segments – Segment analogous to a record type – Set of one-to-many relationships between segments.



Entity–relationship model (ER model)

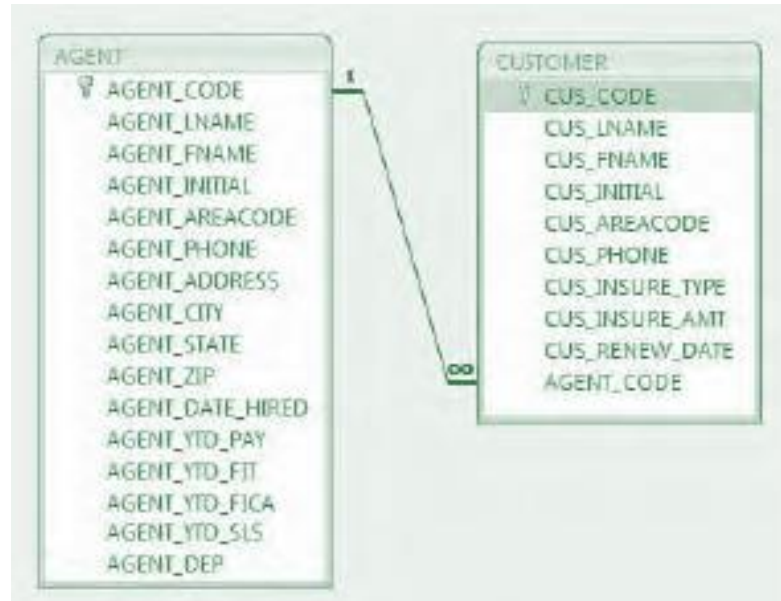
Describes the structure of a database with the help of a diagram, which is known as **Entity Relationship Diagram** (ER Diagram).

An ER model is a **design** or blueprint of a database that can later be implemented as a database.



Relational model

The data and relationships are represented by collection of **inter-related tables**. Each table is a group of column and rows, where column represents attribute of an entity and rows represents records.

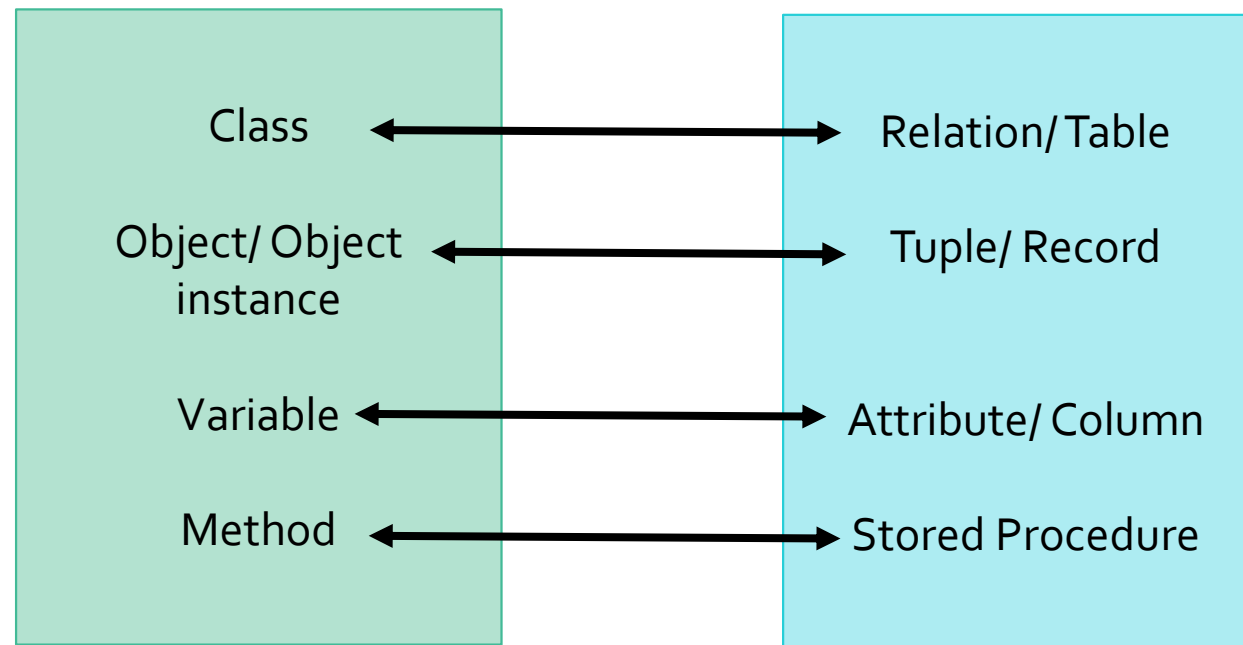


Object Oriented DM

Define a database in terms of objects their properties and their operations.

Object Oriented Model

Relational Model



The Convergence of Data Models

Extended relational data model (ERDM)

- Semantic data model developed in response to increasing complexity of applications
- Includes many of OO model's best features
- Often described as an object/relational database management system (O/RDBMS)
- Primarily geared to business applications

Database Models and the Internet

- Internet drastically changed role and scope of database market
- Focus on Internet makes underlying data model less important
- Dominance of Web has resulted in growing need to manage unstructured information
- Current databases support XML
 - XML: the standard protocol for data exchange among systems and Internet services

Degrees of Data Abstraction

