

DATA MODELS

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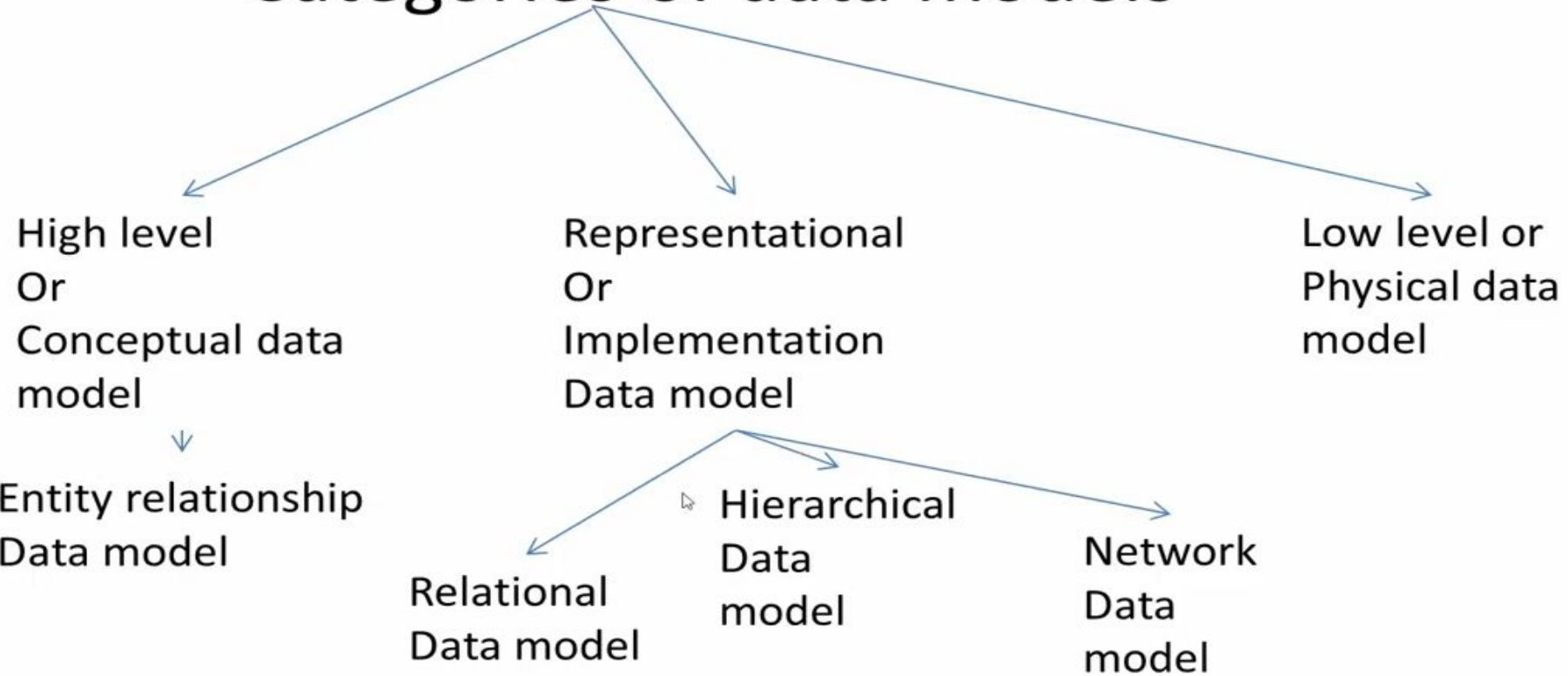
A database model is a specification describing how a database is structured and used.

A **database model** organizes data elements and standardizes how the data elements relate to one another.

Types of data models

1. Entity-Relationship model
2. relational data model
3. Network model
4. Hierarchical model

Categories of data models



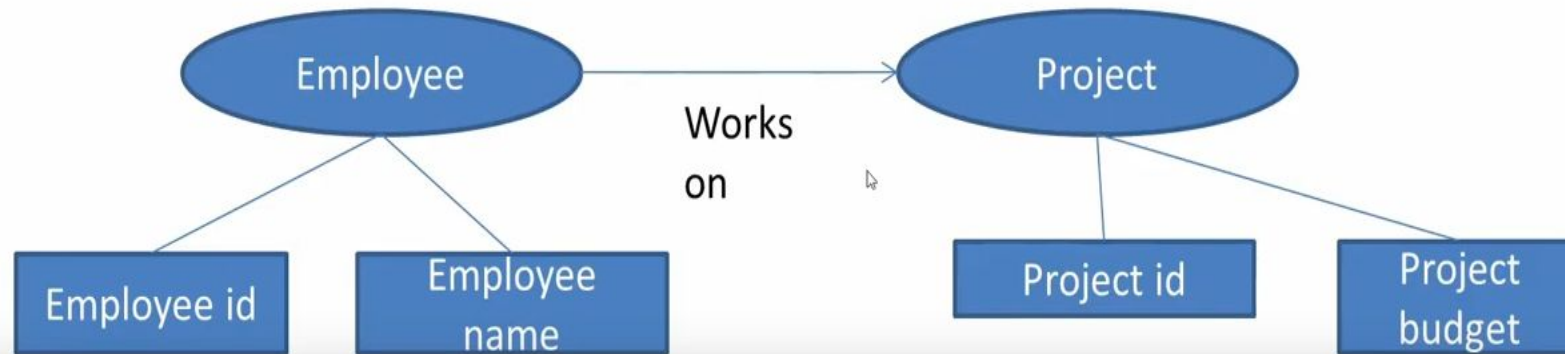
**Types
Of data
model**

Entity-Relationship model

- In entity relation data model, an entity represents a real world object or concept such as an employee or a student.
- Every entity has its characteristics, which are represented as attributes.
- The connection between different entities are represented with relations.

Example

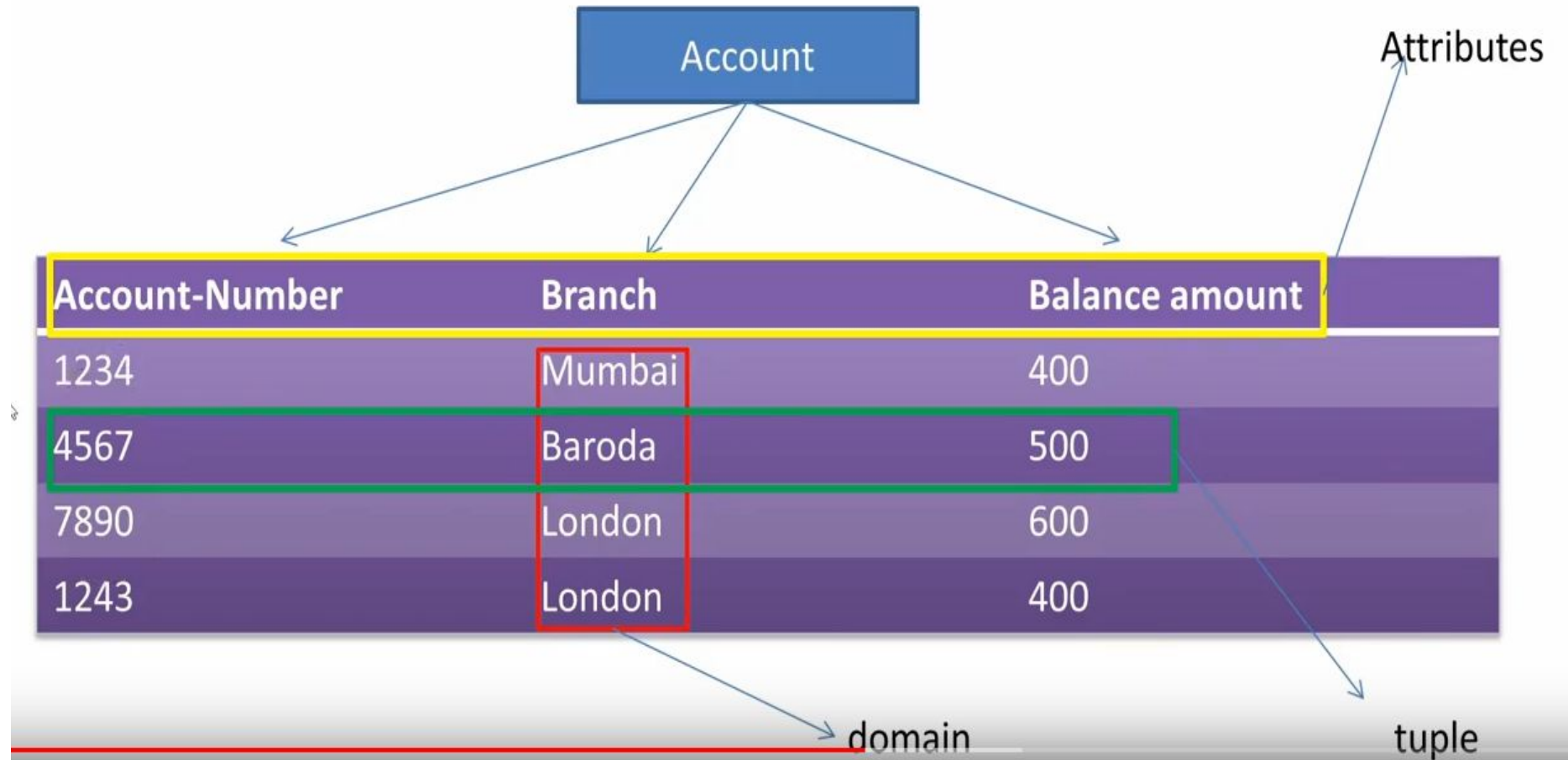
- Lets say we have two entities:
- Employee and project
- These two entities are represented like this:



Relational data model

- Relational data model uses the concepts of database as a collection of tables, where each table can be stored separately as a file.
- All the database operations are done with relations between the tables.
- Most relational databases use high level language like SQL.

Example



Database Concepts

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RELATIONAL MODEL - CONCEPT

Tables: In relation data model, relations are saved in the format of Tables. This format stores the relation among entities. A table has rows and columns, where rows represent records and columns represents the attributes.

Tuple: A single row of a table, which contains a single record for that relation is called a tuple.

Attribute : columns are referred as attributes.

Domain: A pool of values from which the actual values appearing in a given column are drawn.

Database Concepts

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RELATIONAL MODEL - CONCEPT

What does *Primary Key* mean?

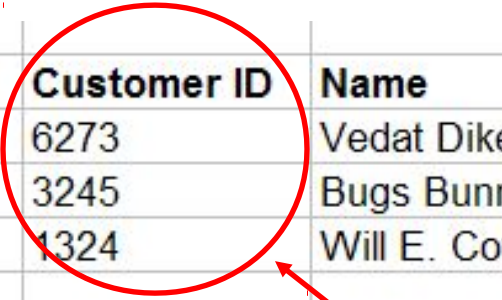
- A primary key is a special relational database table column (or combination of columns) designated to uniquely identify all table records.
- A primary key's main features are:
 - ☐ It must contain a **unique value** for each row of data.
 - ☐ It **cannot contain null values**.
- A primary key is either an existing table column or a column that is specifically generated by the database according to a defined sequence.

Database Concepts

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RELATIONAL MODEL - CONCEPT

PRIMARY KEY - TABLE - CUSTOMERS



Customer ID	Name	Company	Phone Number	E-mail Address
6273	Vedat Diker	CLIS/UMD	(301) 405 9814	vedat@umd.edu
3245	Bugs Bunny	Acme, Inc.	(123) 555 9876	bugs@acme.com
1324	Will E. Coyote	Acme, Inc.	(123) 555 9821	will@acme.com

primary key field

Primary key is a unique identifier of records in a table.

Primary key values may be generated manually or automatically.

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RELATIONAL MODEL - CONCEPT

What does *Foreign Key* mean?

- A foreign key (**REFERENTIAL INTEGRITY**) is a column or group of columns in a relational database table **that provides a link between data in two tables.**
- It acts as a **cross-reference** between tables because it references the primary key of another table, thereby establishing a link between them.

FOREIGN KEY

Primary key
field

Parent table

Directors

Director ID	Name	Date of Birth	Place of Birth	Biography
785	John Frankenheimer	19-Feb-30	New York, NY	Born in New York and raised in Queens, ...
235	Ridley Scott	30-Nov-37	South Shields, UK	Education: Royal College of Art, London...
976	James Foley	28-Dec-53	Brooklyn, NY	Attended the USC Film School...

Relationship

Movies

Child table

Movie ID	Title	Director ID	Genre	...
4532	Gladiator	235	Action	
8357	Swwet and Lowdown	497	Comedy	
7465	Confidence	976	Drama	

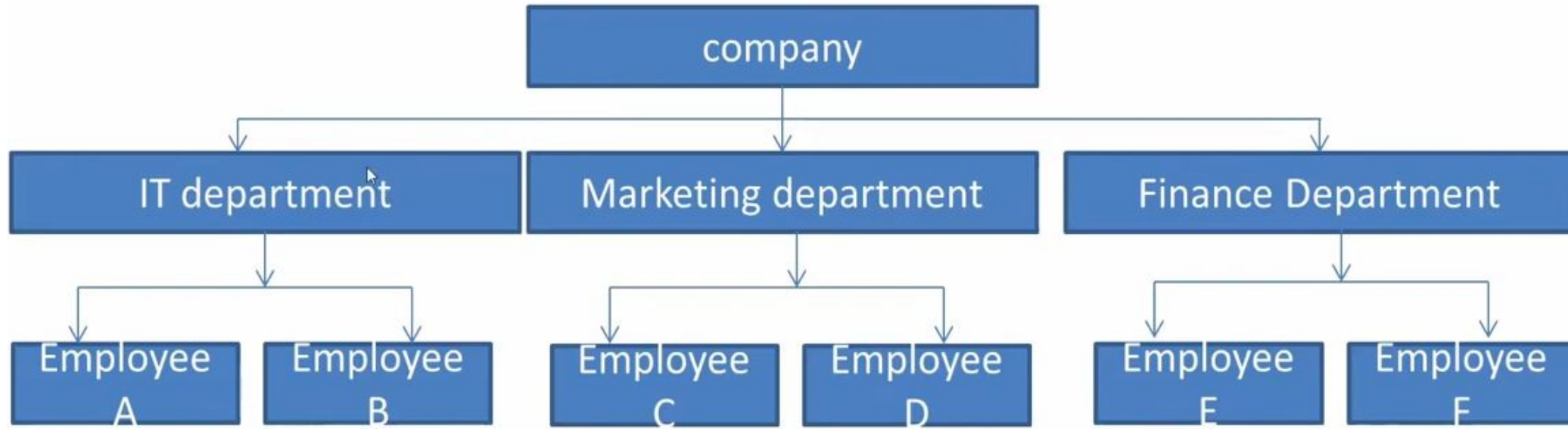
Foreign key field

Hierarchical data model

- Hierarchical data model organises data in a tree like structure.
- Let's say, we have a company and that company has multiple departments. Each department has multiple employees.
- But one important factor of Hierarchical data model is that each child node will have a single parent node.

e.g. Census data organized by state, within state by city, within city by census.

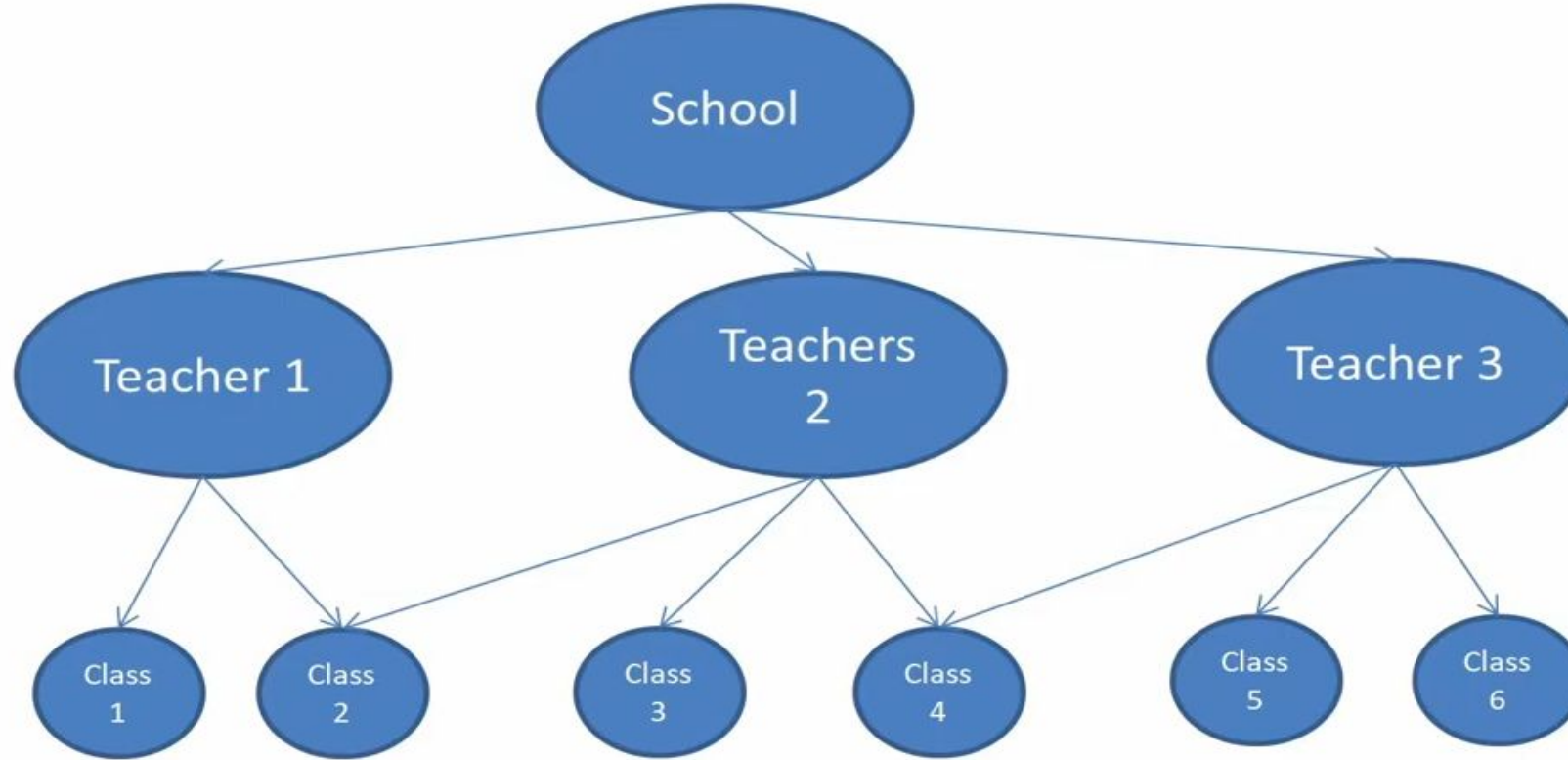
Example



Network data model

- Network data model is like a graph and the difference between the Hierarchical data model and Network data model is that in Network data model, a child node can have multiple parent node.

Example



VIVA QUESTIONS

- DIFFERENCE BETWEEN NETWORK AND HIERARCHICAL DATA MODEL.
- WHAT IS PRIMARY AND FOREIGN KEY IN ENTITY RELATIONSHIP MODEL?