

Database Management System

Relational Data Model

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Relational Data Model

Relational Data Model:

The relational model represents the database as a collection of relations. A relation is nothing but a table of values. Every row in the table represents a collection of related data values. These rows in the table denote a real-world entity or relationship.

The table name and column names are helpful to interpret the meaning of values in each row. The data are represented as a set of relations. In the relational model, data are stored as tables. However, the physical storage of the data is independent of the way the data are logically organized.

Some popular Relational Database management systems are:

DB2 and Informix Dynamic Server - IBM

Oracle and RDB – Oracle

SQL Server and Access - Microsoft



Relational Data Model

Relational Model Concepts:

- ❑ **Attribute:** Each column in a Table. Attributes are the properties which define a relation. e.g., Std_Rollno , NAME , etc.
- ❑ **Tables:** In the Relational model the, relations are saved in the table format. It is stored along with its entities. A table has two properties rows and columns. Rows represent records and columns represent attributes.
- ❑ **Tuple:** It is nothing but a single row of a table, which contains a single record.
- ❑ **Relation Schema:** A relation schema represents the name of the relation with its attributes.
- ❑ **Cardinality:** Total number of rows present in the Table.



Relational Data Model

Relational Model Concepts:

Degree: The total number of attributes which in the relation is called the degree of the relation.

Column: The column represents the set of values for a specific attribute.

Relation instance: Relation instance is a finite set of tuples in the RDBMS system. Relation instances never have duplicate tuples.

Relation key: Every row has one, two or multiple attributes, which is called relation key.

Attribute domain: Every attribute has some pre-defined value and scope which is known as attribute domain.



Relational Data Model

Table also called **Relation**

Primary Key

Domain
Ex: NOT NULL

CustomerID	CustomerName	Status
1	Google	Active
2	Amazon	Active
3	Apple	Inactive

Tuple OR Row

Total # of rows is **Cardinality**

Column OR Attributes

Total # of column is **Degree**

The diagram illustrates a table in a Relational Data Model. The table has three columns: CustomerID, CustomerName, and Status. The first column, CustomerID, is marked as the Primary Key. The second column, CustomerName, is marked with a Domain constraint (Ex: NOT NULL). The table contains three rows of data: (1, Google, Active), (2, Amazon, Active), and (3, Apple, Inactive). Annotations explain that a row is also called a Tuple, and the total number of rows is the Cardinality. Similarly, a column is also called an Attribute, and the total number of columns is the Degree.

Relational Data Model

Relational Integrity constraints:

Relational Integrity constraints is referred to conditions which must be present for a valid relation. These integrity constraints are derived from the rules.

There are many types of integrity constraints. Constraints on the Relational database management system is mostly divided into three main categories are:

- **Domain constraints**
- **Key constraints**
- **Referential integrity constraints**



Relational Data Model

Domain Constraints:

Domain constraints refers to the rules defined for the values that can be stored for a certain attribute. This is specified as data types which include standard data types integers, real numbers, characters, Booleans, variable length strings, etc.. Attributes have specific values in real-world scenario. Every attribute is bound to have a specific range of values. For example, age cannot be less than zero and telephone numbers cannot exceed 10 digits.



Relational Data Model

Key Constraints:

An attribute that can uniquely identify a tuple in a relation is called the key of the table. Key constraints are also referred to as Entity Constraints.

Key constraints force that:

➤ *In a relation with a key attribute, no two tuples can have identical values for key attributes.*

➤ *A key attribute can not have NULL values.*

For example, in the **Employee** table we can use the attribute ID to fetch data for each of the employee. No value of ID is null and it is unique for every row, hence it can be our **Key attribute**.



Relational Data Model

Referential integrity Constraints:

Referential integrity constraints work on the concept of Foreign Keys. A foreign key is a key attribute of a relation that can be referred in other relation.

Referential integrity constraint states that if a relation refers to a key attribute of a different or same relation, then that key element must exist.



Relational Data Model

Example:

CustomerID	CustomerName	Status
1	Google	Active
2	Amazon	Active
3	Apple	Inactive

Customer

InvoiceNo	CustomerID	Amount
1	1	\$100
2	1	\$200
3	2	\$150

Billing

In the above example, we have 2 relations, Customer and Billing. Tuple for CustomerID =1 is referenced twice in the relation Billing. So we know CustomerName=Google has billing amount \$300

Relational Data Model

Operations in Relational Model:

Four basic update operations performed on relational database model are **Insert, update, delete** and **select**.

- *Insert is used to insert data into the relation*
- *Delete is used to delete tuples from the table.*
- *Modify allows you to change the values of some attributes in existing tuples.*
- *Select allows you to choose a specific range of data.*

Whenever one of these operations are applied, integrity constraints specified on the relational database schema must never be violated.



Relational Data Model

CustomerID	CustomerName	Status
1	Google	Active
2	Amazon	Active
3	Apple	Inactive



INSERT

CustomerID	CustomerName	Status
1	Google	Active
2	Amazon	Active
3	Apple	Inactive
4	Alibaba	Active


CustomerID	CustomerName	Status
1	Google	Active
2	Amazon	Active
3	Apple	Inactive
4	Alibaba	Active




UPDATE

CustomerID	CustomerName	Status
1	Google	Active
2	Amazon	Active
3	Apple	Active
4	Alibaba	Active

Relational Data Model

CustomerID	CustomerName	Status		CustomerID	CustomerName	Status
1	Google	Active		1	Google	Active
2	Amazon	Active		2	Amazon	Active
3	Apple	Active		4	Alibaba	Active
4	Alibaba	Active				

In the above-given example, CustomerName= "Apple" is deleted

CustomerID	CustomerName	Status		CustomerID	CustomerName	Status
1	Google	Active		2	Amazon	Active
2	Amazon	Active				
4	Alibaba	Active				

In the above-given example, CustomerName="Amazon" is selected



Database Management System

DBMS Keys

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Relation Keys

Relation Keys:

A DBMS key is an attribute or set of attributes which helps you to identify a row(tuple) in a relation(table). They allow you to find the relation between two tables. Keys help you uniquely identify a row in a table by a combination of one or more columns in that table.

DBMS has following types of Keys:

- **Primary Key**
- **Candidate Key**
- **Alternate Key**
- **Foreign Key**
- **Compound Key**
- **Composite Key**



Relation Keys

Why we need a Key?

Here, are reasons for using Keys in the DBMS system.

- ❑ Keys help you to identify any row of data in a table. In a real-world application, a table could contain thousands of records. Moreover, the records could be duplicated.
- ❑ Keys ensure that you can uniquely identify a table record despite these challenges.
- ❑ Allows you to establish a relationship between and identify the relation between tables.
- ❑ Help you to enforce identity and integrity in the relationship.



Relation Keys

What is a Primary Key?

A column or group of columns in a table which helps us to uniquely identifies every row in that table is called a primary key. This DBMS can't be a duplicate. The same value can't appear more than once in the table.

Rules for defining Primary key:

- ☐ Two rows can't have the same primary key value
- ☐ It must for every row to have a primary key value.
- ☐ The primary key field cannot be null.
- ☐ The value in a primary key column can never be modified or updated if any foreign key refers to that primary key.



Relation Keys

What is a Candidate Key?

An attribute or set of attributes that can qualify as unique key in a table is called candidate key.

The Primary key should be selected from the candidate keys. Every table must have at least a single candidate key.

Properties of Candidate key:

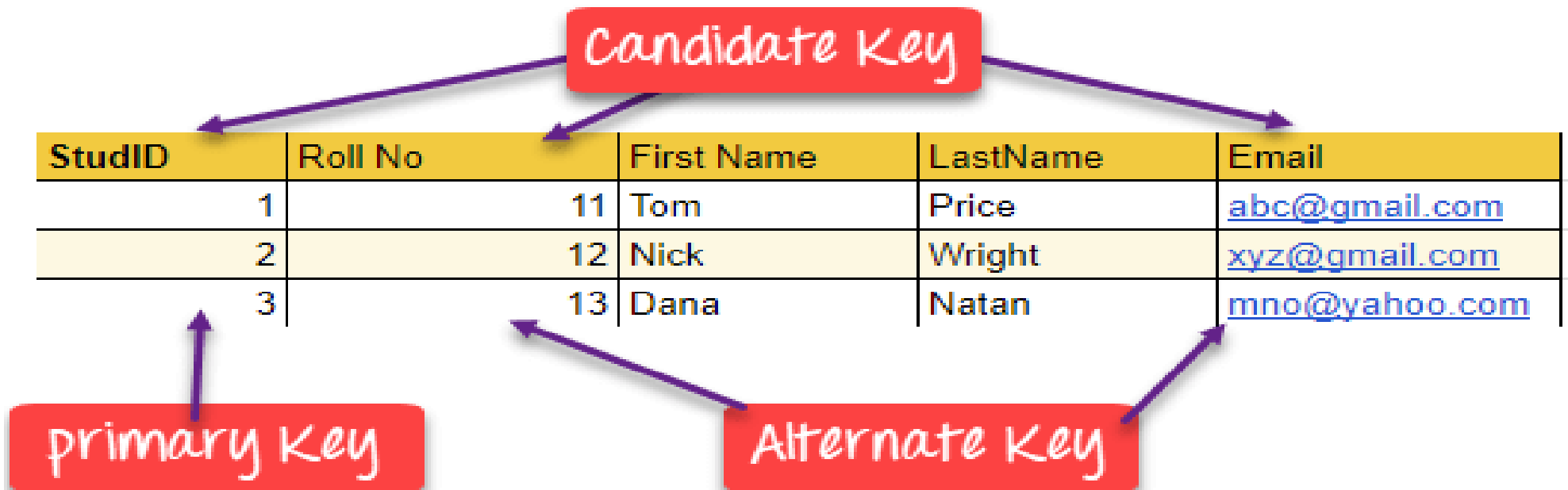
- ☐ It must contain unique values
- ☐ Candidate key may have multiple attributes
- ☐ Must not contain null values
- ☐ It should contain minimum fields to ensure uniqueness
- ☐ Uniquely identify each record in a table



Relation Keys

What is the Alternate key?

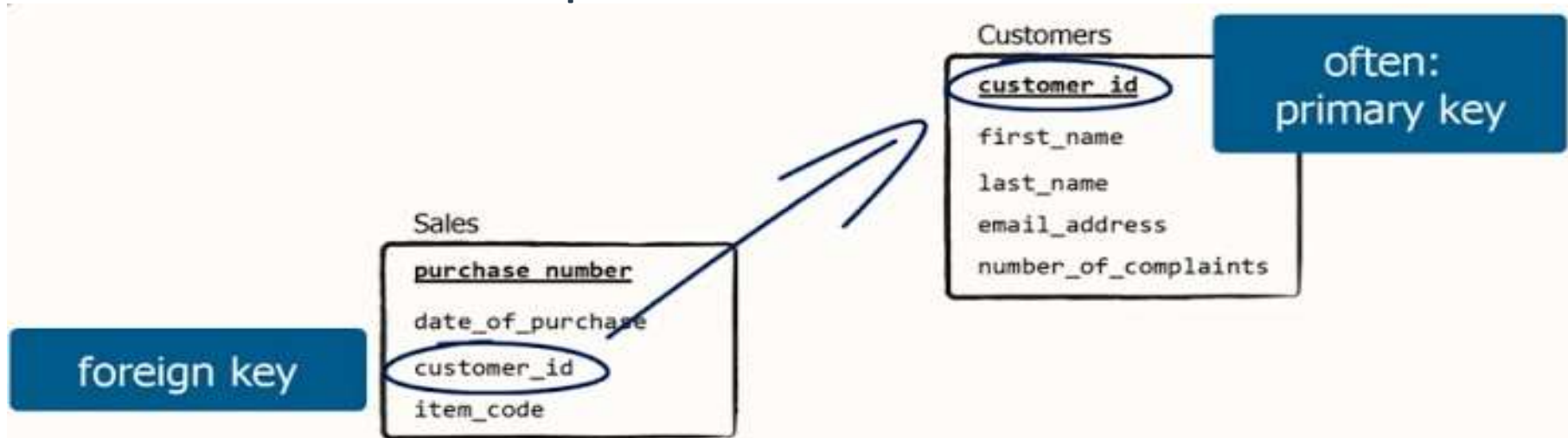
All the keys which are not primary key are called an alternate key. It is a candidate key which is currently not the primary key. However, A table may have single or multiple choices for the primary key.



Relation Keys

What is the Foreign key?

A foreign key is an attribute in a relation that points to the primary key of another relation in the same database. In other words the foreign key is defined in a dependent table or child table, but refers to the primary key in the parent table. A relation may contain many foreign keys. The foreign key is used to establish relationship between two tables.



Relation Keys

What is the Compound key?

Compound key has many fields which allow you to uniquely recognize a specific record. It is possible that each column may be not unique by itself within the database.



Relation Keys

What is the Composite key?

A key which has multiple attributes to uniquely identify rows in a table is called a composite key. The difference between compound and the composite key is that any part of the compound key can be a foreign key, but the composite key may or maybe not a part of the foreign key.



Relation Keys



THANK YOU

ANY QUERY???

