

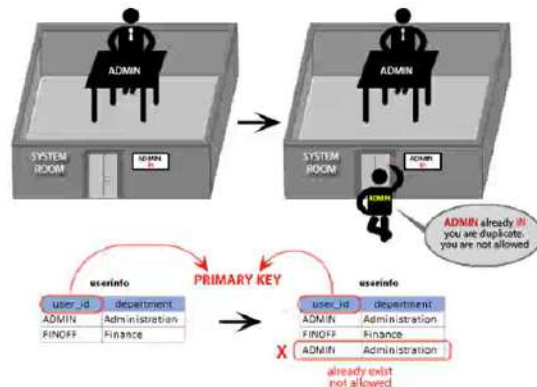
Primary key

- A primary key is a column -- or a group of columns -- in a table that uniquely identifies the rows of data in that table.
- A table can have only ONE primary key; and in the table, this primary key can consist of single or multiple columns (fields).
- Primary keys must contain UNIQUE values
- It cannot contain NULL values.
- In Table-1, Empid is a Primary Key.

Primary Key

Empid
1001
1002
1003

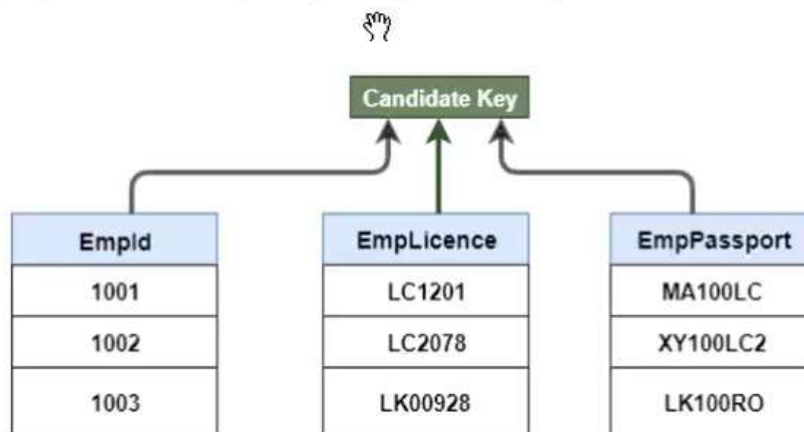
TABLE-1





Candidate Key

- Candidate Key can be defined as a set of one or more columns that can identify **a record uniquely in a table** and which can be selected as a primary key of the table.
- It contains UNIQUE values in column, and does not allow NULL values.
- In Table-1, Empid, EmpLicence and EmpPassport are candidate keys.



Foreign key



- Foreign creates a relationship between two or more tables, a primary key of one table is referred as a foreign key in another table.
- It can also accept multiple null values and duplicate values.





Alternate Key

- Alternate key can be defined as a key that can be work as a primary key if required but right now it is not Primary key
- *Example:*

In Table-1, Empid is primary key but we can use EmpLicence & EmpPassport as a primary key to get unique record from table, That's why EmpLicence & EmpPassport are Alternate keys but right now it is not primary keys

Composite Key

- Composite Key is a combination of more than one columns of a table. It can be a Candidate key and Primary key.
- *Example:*

In Table-1, we can combine Empid & EmpLicence columns to fetch the data from table.



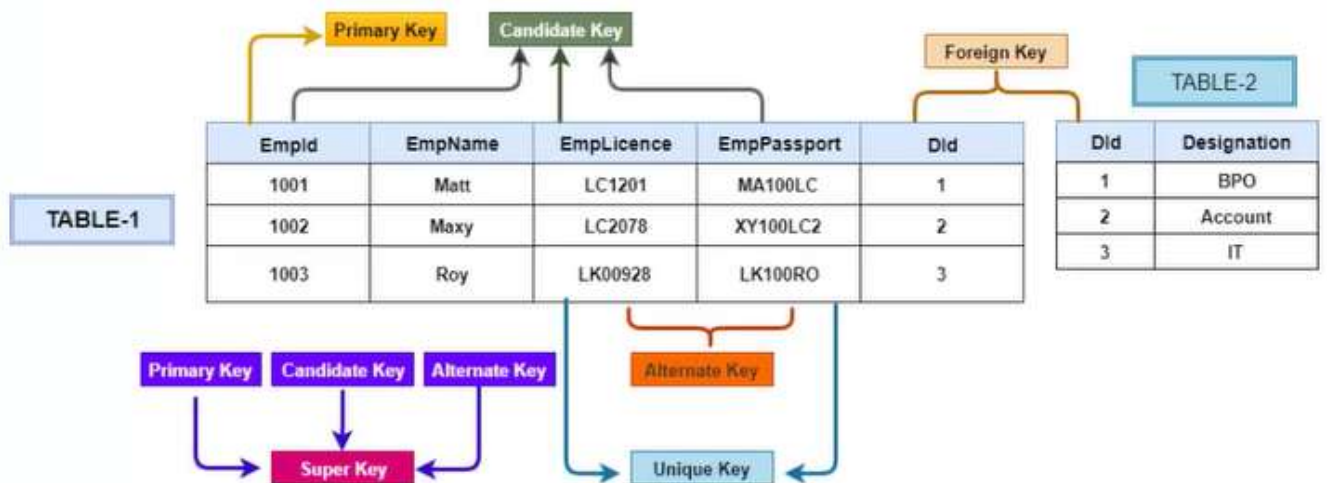
Super Key



- A super key is a group of single or multiple keys which identifies rows in a table.
- Example:
 - In Table-1, Primary key, Unique key, Alternate key are a subset of Super Keys.
 - {Empid, Empname}, {Empid, EmpPassport, Empname}, {EmpLicence, Empname}
 - Any set of column which contains EmpLicence or EmpPassport or Empid is a super key of the table.



Key example



Relationships

- A relationship relates two or more distinct entities with a specific meaning
- Relationships of the same type are grouped or typed into a relationship type
 - Example:
 - the MANAGES relationship type in which EMPLOYEES and DEPARTMENTS participate
 - the WORKSON relationship type in which EMPLOYEES and PROJECTs participate
- Relationships can have attributes, which describe features pertaining to the association between the entities in the relationship
- Degree of a relationship is the number of entity types that participate in it.
 1. Unary relationship
 2. Binary relationship
 3. Ternary relationship

Cardinality of Relationships

- The number of entity instances that may participate in a relationship instance.

- One-to-one (1:1)**

- Each entity in the relationship will have exactly one related entity



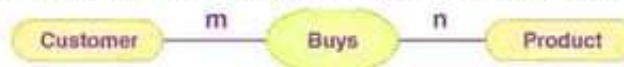
- One-to-many (1:N) or Many-to-one (N:1)**

- An entity on one side of the relationship can have many related entities, but an entity on the other side will have a maximum of one related entity

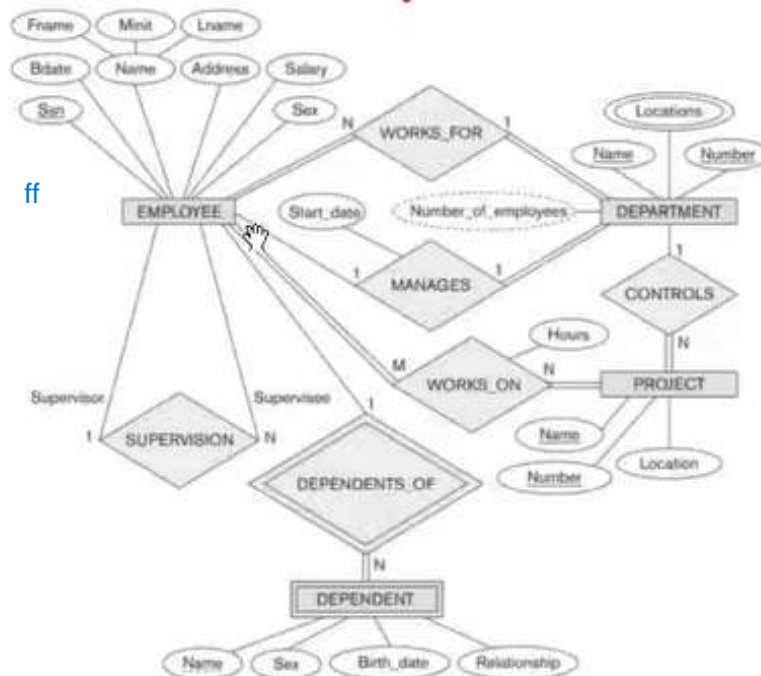


- Many-to-many (M:N)**

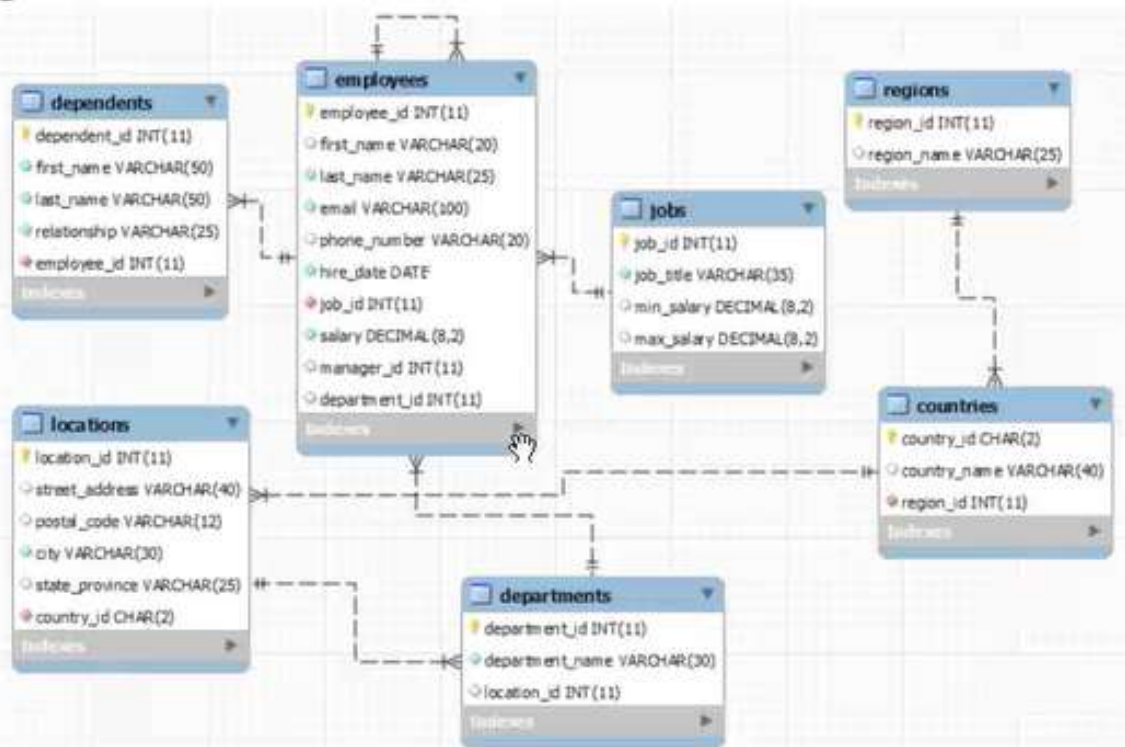
- Entities on both sides of the relationship can have many related entities on the other side



ER Diagram Example



ER Diagram



What is Normalization?



- Overall objective on normalization is to reduce redundancy
- Redundancy – Data repeatedly stored
- Normalization recommends to divide the data across multiple tables to avoid redundancy
- When data is added, altered or deleted in one table, it helps to maintain the data consistency.
- Three important forms of normalization
 - First normal form (1NF)
 - Second normal form (2NF)
 - Third normal form (3NF)



First Normal Form (1NF)

- "The domain of each attribute contains only atomic values, and the value of each attribute contains only a single value from that domain"
- We Cannot have multiple values for a particular attribute (field) in a single record
- No two records should be exactly similar

Against 1NF Employee

Name	Skill
Raj	C++, C#, MS SQL
Arun	Java, Oracle

Compliance with 1NF Employee

Name	Skill
Raj	C++
Raj	C#
Raj	MS SQL
Arun	Java
Arun	Oracle



Second Normal Form (2NF)

- "a table is in 2NF if and only if it is in 1NF and no non-prime attribute is dependent on any proper subset of any candidate key of the table"
- Prime - Key field used to identify the entire record (eg. Emp ID)
- Non - Prime - Field that depends on Prime Key (eg. DOB)
- Composite Key - When two fields combine to form primary key

Against 2NF

Employee

Name	Skill	Location
Raj	C++	Chennai
Raj	Python	Chennai
Arun	Java	Bangalore
Arun	Oracle	Bangalore

Compliance with 2NF

Employee Skill

Name	Skill
Raj	C++
Raj	C#
Arun	Java
Arun	Oracle

Employee Location

Name	Location
Raj	Chennai
Arun	Bangalore



Third Normal Form (3NF)

- "the entity is in second normal form and all the attributes in a table are dependent on the primary key and only the primary key"

Against 3NF

Employee

Name	City	PIN
Raj	Chennai	600033
Arun	Bangalore	400028
Arjun	Chennai	600033

Compliance with 3NF

Employee Pin

Name	PIN
Raj	600033
Arun	400028
Arjun	600033

Compliance with 3NF

Pin

PIN	City
600033	Chennai
400028	Bangalore

Characteristics of good database system



- Good database is identified by ACID properties
- A – Atomicity
- C – Consistency
- I – Isolation
- D – Durability





Atomicity

- Atomicity refers to combining multiple transaction into single transaction
- A group of transaction can be considered as a atomic (single) transaction
- So the database system have to do all or do nothing

Example:

- A is transferring Rs.1000 to B"s account

Steps:

- Deduct 1000 from A"s account balance
- Add 1000 to B"s account balance.
- If first step is done and due to some factors 2nd is not done, will lead to serious error. So we should do all steps or do nothing

Consistency

- System will provide the user to define some rules regarding the data. (eg. Unique Key)
- Once rules defined, they are consistently maintained until the database is deleted



Isolation

- Database systems are accessed by multiple users simultaneously.
- Every request is isolated from each other.
- Eg: -
 - Single Credit card account having two credit cards.
 - Two cards are swiped simultaneously for amount equal to the credit limit.
 - Two requests reach the server simultaneously.
 - But the requests are processed one by one (each request is isolated from another)



Durability

- Once data is stored and committed. And it was retrieved at a later time, durability confirms that we will get the same data which was stored earlier.

What is SQL?



- Structure Query Language(SQL) is a database query language used for storing and managing data in Relational DBMS.
- SQL was the first commercial language introduced for E.F Codd's Relational model of database.

MySQL Datatype



DATE TYPE	SPEC
CHAR	String (0 - 255)
VARCHAR	String (0 - 255)
TINYTEXT	String (0 - 255)
TEXT	String (0 - 65535)
BLOB	String (0 - 65535)
MEDIUMTEXT	String (0 - 16777215)
MEDIUMBLOB	String (0 - 16777215)
LONGTEXT	String (0 - 4294967295)
LOBLOB	String (0 - 4294967295)
TINYINT	Integer (-128 to 127)
SMALLINT	Integer (-32768 to 32767)
MEDIUMINT	Integer (-8388608 to 8388607)

DATA TYPE	SPEC
INT	Integer (-2147483648 to 2147483647)
BIGINT	Integer (-9223372036854775808 to 9223372036854775807)
FLOAT	Decimal (precise to 23 digits)
DOUBLE	Decimal (24 to 53 digits)
DECIMAL	"DOUBLE" stored as string
DATE	YYYY-MM-DD
DATETIME	YYYY-MM-DD HH:MM:SS
TIMESTAMP	YYYYMMDDHHMMSS
TIME	HH:MM:SS
ENUM	One of preset options
SET	Selection of preset options
BOOLEAN	TINYINT(1)