# Third Normal Form (3NF)

- A relation will be in 3NF if it is in 2NF and not contain any transitive partial dependency.
- o 3NF is used to reduce the data duplication. It is also used to achieve the data integrity.
- If there is no transitive dependency for non-prime attributes, then the relation must be in third normal form.

A relation is in third normal form if it holds at least one of the following conditions for every non-trivial function dependency  $X \to Y$ .

- 1. X is a super key.
- 2. Y is a prime attribute, i.e., each element of Y is part of some candidate key.

### **Example:**

### **EMPLOYEE\_DETAIL** table:

EMP_ID	EMP_NAME	EMP_ZIP	EMP_STATE	EMP_CITY
222	Harry	201010	UP	Noida
333	Stephan	02228	US	Boston
444	Lan	60007	US	Chicago
555	Katharine	06389	UK	Norwich
666	John	462007	MP	Bhopal

### Super key in the table above:

 $\{ {\sf EMP\_ID} \}, \, \{ {\sf EMP\_ID}, \, {\sf EMP\_NAME} \}, \, \{ {\sf EMP\_ID}, \, {\sf EMP\_NAME}, \, {\sf EMP\_ZIP} \}.... so \, on \,$ 

Candidate key: {EMP\_ID}

Non-prime attributes: In the given table, all attributes except EMP\_ID are non-prime.

Here, EMP\_STATE & EMP\_CITY dependent on EMP\_ZIP and EMP\_ZIP dependent on EMP\_ID. The non-prime attributes (EMP\_STATE, EMP\_CITY) transitively dependent on super key(EMP\_ID). It violates the rule of third normal form.

That's why we need to move the EMP\_CITY and EMP\_STATE to the new <EMPLOYEE\_ZIP> table, with EMP\_ZIP as a Primary key.

### **EMPLOYEE** table:

EMP_ID	EMP_NAME	EMP_ZIP
222	Harry	201010
333	Stephan	02228
444	Lan	60007
555	Katharine	06389

666	John	462007

## EMPLOYEE\_ZIP table:

EMP_ZIP	EMP_STATE	EMP_CITY
201010	UP	Noida
02228	US	Boston
60007	US	Chicago
06389	UK	Norwich
462007	MP	Bhopal

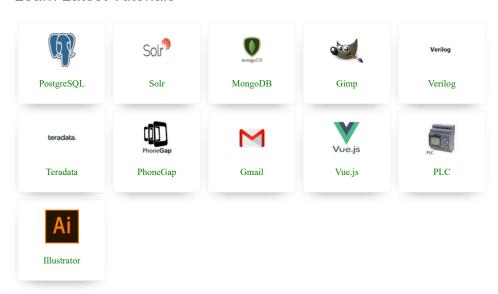
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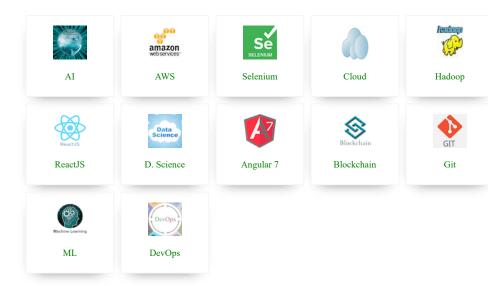








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