

# Normalization

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# Normalization

- It is the technique to remove or reduce the redundancy from the table.

Row level duplication

(Remove by using primary key)

SN	S_name	Age
1	Ram	20
2	Varun	25
1	Ram	20

Column level duplication

S_id	S_name	C_id	C_name	F_id	F_name	salary
1	ram	c1	DBMS	f1	john	30000
2	ravi	c2	JAVA	f2	bob	40000
3	niti	c1	DBMS	f1	john	30000

# Column level duplication –Problem

- Insertion Anomaly
- Update Anomaly
- Deletion Anomaly

# Column level duplication -- Insertion Anomaly

S_id	S_name	C_id	C_name	F_id	F_name	salary
1	ram	c1	DBMS	f1	john	30000
2	ravi	c2	JAVA	f2	bob	40000
3	niti	c1	DBMS	f1	john	30000

- No problem if s\_name insertion
- But if we want to add c\_id or f\_id then there is a problem
- Insertion cannot be done directly so called insertion anomaly

# Column level duplication --Updation Anomaly

S_id	S_name	C_id	C_name	F_id	F_name	salary
1	ram	c1	DBMS	f1	john	30000
2	ravi	c2	JAVA	f2	bob	40000
3	niti	c1	DBMS	f1	john	30000

- Update student set s\_name = "niti pal" where s\_id = 3 (no problem)
- Change salary of f1 from 30,000 to 40,000  
(there occurs a problem/duplicate problem )

# Column level duplication--Deletion Anomaly

S_id	S_name	C_id	C_name	F_id	F_name	salary
1	ram	c1	DBMS	f1	john	30000
2	ravi	c2	JAVA	f2	bob	40000
3	niti	c1	DBMS	f1	john	30000

- Delete from student where s\_id = 1 (doesnot cause any problem)
- Delete from student where s\_id = 2 (cause the problem ,it remove course and faculty)

# Database Normal Forms

- 1NF (First Normal Form)
- 2NF (Second Normal Form)
- 3NF (Third Normal Form)
- BCNF (Boyce-Codd Normal Form)
- 4NF (Fourth Normal Form)
- 5NF (Fifth Normal Form)

# 1NF (First Normal Form)

- **1NF (First Normal Form) Rules**

- Each table cell should contain a single value.
- Each record needs to be unique.

FULL NAMES	PHYSICAL ADDRESS	MOVIES RENTED	SALUTATION
Janet Jones	First Street Plot No 4	Pirates of the Caribbean, Clash of the Titans	Ms.
Robert Phil	3 <sup>rd</sup> Street 34	Forgetting Sarah Marshal, Daddy's Little Girls	Mr.
Robert Phil	5 <sup>th</sup> Avenue	Clash of the Titans	Mr.



FULL NAMES	PHYSICAL ADDRESS	MOVIES RENTED	SALUTATION
Janet Jones	First Street Plot No 4	Pirates of the Caribbean	Ms.
Janet Jones	First Street Plot No 4	Clash of the Titans	Ms.
Robert Phil	3 <sup>rd</sup> Street 34	Forgetting Sarah Marshal	Mr.
Robert Phil	3 <sup>rd</sup> Street 34	Daddy's Little Girls	Mr.
Robert Phil	5 <sup>th</sup> Avenue	Clash of the Titans	Mr.



# 2NF (Second Normal Form)

- 2NF (Second Normal Form) Rules
  - Rule 1- Be in 1NF
  - Rule 2- Single Column Primary Key that does not functionally dependent on any subset of candidate key relation (ie no partial dependency ; only functional dependency)

# 2NF (Second Normal Form)

FULL NAMES	PHYSICAL ADDRESS	MOVIES RENTED	SALUTATION
Janet Jones	First Street Plot No 4	Pirates of the Caribbean	Ms.
Janet Jones	First Street Plot No 4	Clash of the Titans	Ms.
Robert Phil	3 <sup>rd</sup> Street 34	Forgetting Sarah Marshal	Mr.
Robert Phil	3 <sup>rd</sup> Street 34	Daddy's Little Girls	Mr.
Robert Phil	5 <sup>th</sup> Avenue	Clash of the Titans	Mr.



MEMBERSHIP ID	MOVIES RENTED
1	Pirates of the Caribbean
1	Clash of the Titans
2	Forgetting Sarah Marshal
2	Daddy's Little Girls
3	Clash of the Titans

MEMBERSHIP ID	FULL NAMES	PHYSICAL ADDRESS	SALUTATION
1	Janet Jones	First Street Plot No 4	Ms.
2	Robert Phil	3 <sup>rd</sup> Street 34	Mr.
3	Robert Phil	5 <sup>th</sup> Avenue	Mr.

# 3NF (Third Normal Form)

- **3NF (Third Normal Form) Rules**
  - Rule 1- Be in 2NF
  - Rule 2- Has no transitive functional dependencies

# 3NF (Third Normal Form)

MEMBERSHIP ID	FULL NAMES	PHYSICAL ADDRESS	SALUTATION ID
1	Janet Jones	First Street Plot No 4	2
2	Robert Phil	3 <sup>rd</sup> Street 34	1
3	Robert Phil	5 <sup>th</sup> Avenue	1

MEMBERSHIP ID	MOVIES RENTED
1	Pirates of the Caribbean
1	Clash of the Titans
2	Forgetting Sarah Marshal
2	Daddy's Little Girls
3	Clash of the Titans

SALUTATION ID	SALUTATION
1	Mr.
2	Ms.
3	Mrs.
4	Dr.

# BCNF (Boyce-Codd Normal Form)

- Even when a database is in 3<sup>rd</sup> Normal Form, still there would be anomalies resulted if it has more than one **Candidate** Key.
- Sometimes is BCNF is also referred as **3.5 Normal Form**

# 4NF (Fourth Normal Form) Rules

- If no database table instance contains two or more, independent and multivalued data describing the relevant entity, then it is in 4<sup>th</sup> Normal Form.

# 5NF (Fifth Normal Form) Rules

- A table is in 5<sup>th</sup> Normal Form only if it is in 4NF and it cannot be decomposed into any number of smaller tables without loss of data.

# Summary

- Normalization in DBMS is a process which helps produce database systems that are cost-effective and have better security models.
- Functional dependencies are a very important component of the normalize data process
- Most database systems are normalized database up to the third normal forms in DBMS.
- A primary key uniquely identifies a record in a Table and cannot be null
- A foreign key helps connect table and references a primary key



