

- Let's create situation for BCNF non-satisfaction with **Favorites** schema

<u>person</u>	<u>fav_type</u>	loves
Olzhas	Electronic	PS5
Aibek	Movie	Avengers: Final

Satisfies 1NF since all the data is atomic

Satisfies 2NF since **{person, fav_type} -> loves** depends on primary key

Satisfies 3NF since there is only one non-key attribute without transitive dependency

But **does not satisfy BCNF** since **part of a composite primary key depends on non-key attribute**

{loves} -> fav_type, where attribute "**loves**" is not a super-key or has not trivial dependency

Possible decomposition is {person} -> {loves} and {loves} -> {fav_type}

<u>person</u>	loves	<u>loves</u>	<u>fav_type</u>
Olzhas	PS5	PS5	Electronic
Aibek	Avengers: Final	Avengers: Final	Movie

But clearly the dependency **{person, fav_type} -> loves** is lost.

Proved.

Why BCNF?

Boyce Codd Normal Form is a slightly stronger version of the third normal form. It addresses certain types of anomalies not dealt with by 3NF. If a relational schema is in BCNF then all redundancy based on functional dependency has been removed.

2. First Normal Form (1NF):

UnitID	StudentID	Date	TutorID	Topic	Room	Grade	Book	TutEmail
U1	St1	23.02.03	Tut1	GMT	629	4.7	Deumlich	tut1@fhbb.ch
U2	St1	18.11.02	Tut3	Gln	631	5.1	Zehnder	tut3@fhbb.ch
U1	St4	23.02.03	Tut1	GMT	629	4.3	Deumlich	tut1@fhbb.ch
U5	St2	05.05.03	Tut3	PhF	632	4.9	Dümmlers	tut3@fhbb.ch
U4	St2	04.07.03	Tut5	AVQ	621	5.0	SwissTopo	tut5@fhbb.ch

Second Normal Form:

UnitID	StudentID	Grade
U1	St1	4.7
U2	St1	5.1
U1	St4	4.3
U5	St2	4.9
U4	St2	5.0

UnitID	Date	TutorID	Topic	Room	Book
U1	23.02.03	Tut1	GMT	629	Deumlich
U2	18.11.02	Tut3	Gln	631	Zehnder
U5	05.05.03	Tut3	PhF	632	Dümmlers
U4	04.07.03	Tut5	AVQ	621	SwissTopo

Third Normal Form:

Topic	Book
GMT	Deumlich
Gln	Zehnder
PhF	Dümmlers
AVQ	SwissTopo

TutorID	TutEmail
Tut1	tut1@fhbb.ch
Tut3	tut3@fhbb.ch
Tut5	tut5@fhbb.ch

UnitID	Date	TutorID	Topic	Room
U1	23.02.03	Tut1	GMT	629
U2	18.11.02	Tut3	Gln	631
U5	05.05.03	Tut3	PhF	632
U4	04.07.03	Tut5	AVQ	621



- All the blue tables are included as normalization to the 3NF

3. First Normal Form (1NF):

<u>ProjectName</u>	<u>ProjectManager</u>	Position	Budget	TeamSize
Project1	Manager1	CTO	1 kk \$	15
Project2	Manager2	CTO2	1.5 kk \$	12

Second Normal Form (2NF):

First Solution,

If Budget does not depends on Manager

<u>ProjectManager</u>	Position	<u>ProjectName</u>	Budget	TeamSize
Manager1	CTO	Project1	1 kk \$	15
Manager2	CTO2	Project2	1.5 kk \$	12

<u>ProjectName</u>	<u>ProjectManager</u>
Project1	Manager1
Project2	Manager2

4. Group -> Specialty -> Faculty

<u>Group</u>	<u>Specialty</u>	<u>Specialty</u>	<u>Faculty</u>
Basic of IS	IS	IS	FIT
FEE 2	AC	AC	FIT

5.

<u>ProjectID</u>	<u>Department</u>	Curator	TeamSize	ProjectGroupsNumber
1	IT	Asem	100	5
2	IT	Asem	20	1
1	Finance	Aisulu	120	6
2	Finance	Asem	200	10

BCNF:

<u>TeamSize</u>	<u>ProjectGroupsNumber</u>
100	5
120	6

<u>ProjectID</u>	<u>Department</u>	<u>Curator</u>
p1	d1	e1
p2	d2	e2

<u>ProjectID</u>	<u>TeamSize</u>
p1	100
p2	120

6.

The three design goals are:

1. Minimization of repetition of information. Repetition is a bad because it increases the storage required for the relation and it makes updating the relation more difficult.

2. Losslessness (lossless-join decompositions) Loss is bad because certain questions cannot be answered using the reconstructed relation

3. Dependency preservation (dependency preserving decompositions)

They reach them so we can maintain an accurate result, data integrity. Moreover, we can check correctness of updates quickly, and consume as less space as possible.

Pointless decomposition

<u>c_id</u>	p_id	c_name	c_dob
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<u>c_id</u>	p_id	c_name
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<u>c_id</u>	c_dob
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Lossless-join decomposition

A	B	C
1731	43	10
1731	42	10
1414	43	10
3443	42	10

{A, B} {A, C} {B, C}
{B, A} {C, A} {C, B}

{A, B} and {B, C} or {A, B} and {A, C} but not {B, C} and {A, C}

A	B
1731	43
1731	42
1414	43
3443	42

B	C
43	10
42	10



A	B	C
1731	43	10
1731	42	10
1414	43	10
3443	42	10

A	B
1731	43
1731	42
1414	43
3443	42

A	C
1731	10
1414	10
3443	10

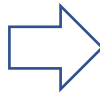


A	B	C
1731	43	10
1731	42	10
1414	43	10
3443	42	10

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A	<u>C</u>
1731	10
1414	10
3443	10

B	<u>C</u>
43	10
42	10



A	B	C
1731	43	10
1731	42	10
1414	43	10
1414	42	10
3443	42	10
3443	43	10

Another Example:

Lending schema

<u>bank_id</u>	name	city	customer_name	loan
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Bank schema

<u>bank_id</u>	name	city
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Loan schema

<u>bank_id</u>	<u>customer_name</u>	loan
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