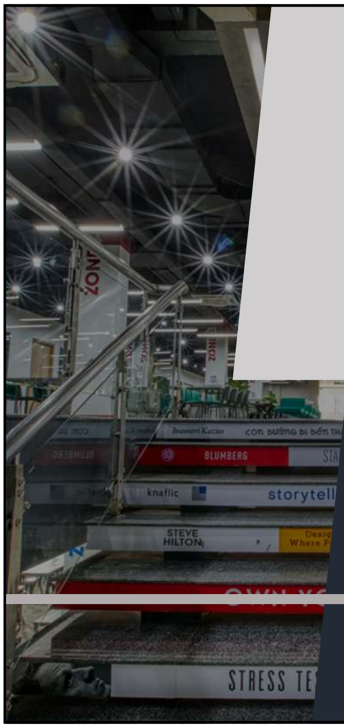

TRƯỜNG ĐẠI HỌC QUỐC TẾ MIỀN ĐÔNG
EASTERN INTERNATIONAL UNIVERSITY

CSE301 – DATABASE

Normalization (Conts)

Mobile programming

1

Boyce-Codd Normal Form (BCNF)

- A given relation is called in Boyce-Codd Normal Form (BCNF) if and only if
  - ✓ Relation already exists in 3NF..
  - ✓ For each non-trivial functional dependency A → B, A is a super key of the relation.

Introduction: 1-2

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Boyce-Codd Normal Form (BCNF)

- Example: The following relation is in BCNF:
- R (A , B , C) FD: {A → B, B → C, C → A}
- Find candidate key =?
  - So, Candidate keys are A , B , C.
- Now, we can observe that LHS of each given functional dependency is a candidate key.
- Thus, we conclude that the given relation is in BCNF.

Boyce-Codd Normal Form (BCNF)

- Example: The following relation is not in BCNF:
- R(ABC), FD: {AB → C, C → B}
- Find candidate key =?
  - So, Candidate key is = AB, AC
- Now, we can observe that LHS of each given functional dependency.
- In AB → C, AB is a candidate key but C → B, C is not a candidate key.
- So this relation is not in BCNF.

Boyce-Codd Normal Form (BCNF)

- Example: How to decompose this relation into BCNF?
- If a given functional dependency LHS is not a candidate key,
- we remove the given functional dependency from the relation by placing them in a new relation (Create a new table for each functional dependency which is not in BCNF).
- R(ABC), FD: {AB → C, C → B} will be,
  - R_1(ABC), FD: {AB → C} here AB is candidate key
  - R_2(CB), FD: {C → B} here C is candidate key

Introduction: 1-5

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Boyce-Codd Normal Form (BCNF)

- R(ABC), FD: {AB → C, C → B} will be,
  - R_1(ABC), FD: {AB → C} here AB is candidate key
  - R_2(CB), FD: {C → B} here C is candidate key

A	B	C
A	1	X
B	2	Y
C	2	Z
C	3	W
D	3	W
C	3	W

A	B	C
A	1	X
B	2	Y
C	2	Z
C	3	W
D	3	W
C	3	W

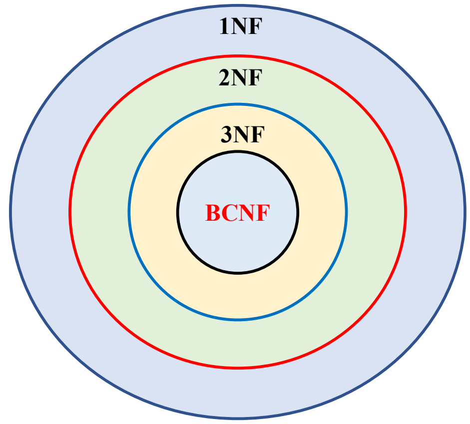
B	C
1	X
2	Y
2	Z
3	W

Introduction: 1-6

6

1NF, 2NF, 3NF, BCNF

- Steps to find a relation in which normal form:
  - ➢ First Check a relation is in BCNF or not?
  - ➢ If it is not in BCNF then, Check it is in 3NF or not?
  - ➢ If it is not in 3NF then, Check it is in 2NF or not?
  - ➢ If it is not in 2NF then, it is definitely in 1NF.



Find the Normal Forms

- ❑ Example: R(ABCDEFGH), FD's: {AB → C, A → DE, B → F, F → GH}
- ❑ Candidate key: AB, Prime attributes: A, B and Non- prime attributes: C, D, E, F, G, H
- ❑ First step, check given relation is in BCNF or not?
  - ➢ Check LSH of all FD's: Is it a super key or not?
  - ➢ In AB → C, LSH is a super key.
  - ➢ But, in {A → DE, B → F, F → GH} LSH is not a super key.
  - ➢ So, the relation is not in BCNF. (If an FD fails, the whole relationship fails.)

If the relation is not in BCNF, then check given relation is in 3NF or not?

Find the Normal Forms

- Example: R(ABCDEFGH), FD's: {AB → C, A → DE, B → F, F → GH}
- Candidate key: AB, Prime attributes: A, B and Non- prime attributes: C, D, E, F, G, H
- Second step, If the relation is not in BCNF, then check given relation is in 3NF or not?
  - Check all FD's: either LHS is a super key or RHS is a prime attributes?
  - In AB → C, LSH is a super key.
  - In {A → DE, B → F, F → GH} LSH of every FD's are not a super key or RHS are not a prime attribute.
  - So, the relation is not in 3NF.
  - If the relation is not in 3NF, then check given relation is in 2NF or not?

Find the Normal Forms

- Example: R(ABCDEFGH), FD's: {AB → C, A → DE, B → F, F → GH}
- Candidate key: AB, Prime attributes: A, B and Non- prime attributes: C, D, E, F, G, H
- Third step, If the relation is not in 3NF, then check given relation is in 2NF or not?
  - Check all FD's: Is there any Prime → Non-prime exist or not? If exist then, it is not in 2NF
  - In A → DE, Prime → Non-prime exist. A is prime attribute and D and E are non-prime attributes. So, the relation is not in 2NF.
  - If the relation is not in 2NF, then check given relation is in 1NF.

Find the Normal Forms: Exercises

- R(ABCDE), FD: $\{CE \rightarrow D, D \rightarrow B, C \rightarrow A\}$
- R(ABCDEF), FD: $\{AB \rightarrow C, DC \rightarrow AE, E \rightarrow F\}$
- R(ABCDE), FD: $\{AB \rightarrow CD, D \rightarrow A, BC \rightarrow DE\}$
- R(ABCDE), FD: $\{BC \rightarrow ADE, D \rightarrow B\}$
- R(ABCDEGHI), FD: $\{AB \rightarrow D, BD \rightarrow B, AD \rightarrow GH, A \rightarrow I\}$
- R(VWXYZ), FD: $\{X \rightarrow YV, Y \rightarrow Z, Z \rightarrow Y, VW \rightarrow X\}$
- R(ABCDEF), FD: $\{ABC \rightarrow D, ABD \rightarrow E, CD \rightarrow F, CDF \rightarrow B, BF \rightarrow D\}$
- R(ABC), FD: $\{A \rightarrow B, B \rightarrow C, C \rightarrow A\}$