Boyce-Codd normal form

A relation (table) is called Boyce-Codd normal fom if

for any $A_1, A_2, \ldots A_n \rightarrow B_1, B_2, \ldots B_m$

$A_1, A_2, \ldots A_n$ is a key

That is: $A_1, A_2, \ldots A_n$ determines the whole tuble

Student(S-id, Name, address, U-id, U-Name, U-city, Bac, Rating)

Bac $\rightarrow$ Rating

S-id $\rightarrow$ Name, adress, Bac

U-id $\rightarrow$ U-Name, U-city

U-Name, U-city $\rightarrow$ U-id

Multivalued dependency

Relation $R(A, B, C)$

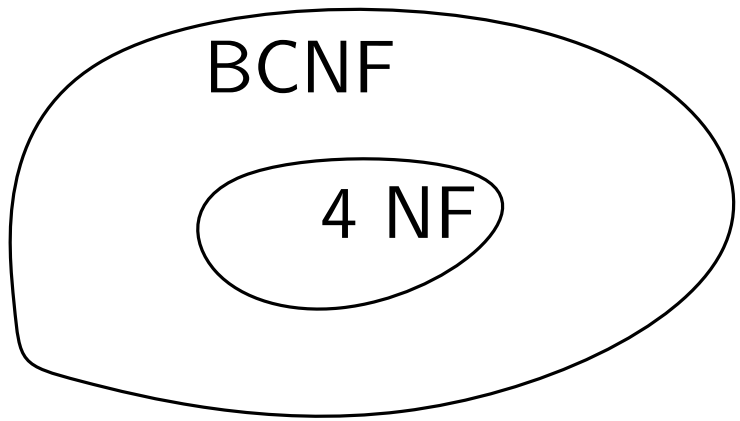
$A \twoheadrightarrow B$ if

for all L_1, L_2 in R with
$R_1[A] = R_2[A]$, then

there exists L_3 in R such that
$R_3[A] = R_1[A]$ and
$R_3[B] = R_1[B]$ and
$R_3[C] = R_2[C]$

4th Normal form

A realation is in 4th normal form, if for any $A \twoheadrightarrow B$, we have that A is a key



Bad points of BCNF and 4 NF

1. Over-decomposition
2. Query workload

Consider a relation R(A,B,C,D). For which of the following sets of FDs is R in Boyce-Codd Normal Form

$A \rightarrow B$ and $B \rightarrow C$ and $C \rightarrow D$ and $D \rightarrow A$

$C \rightarrow B$ and $D \rightarrow A$ and $C \rightarrow D$ and $A \rightarrow C$

Example

Can apply to each college once for one major

Universities have non-overlapping application dates

Apply(sID, U-Name, date, discipline)

FDs

Keys

BCNF

Good design?

Example 2

every student might have several Bac or English scores

Student(sID, s-name, Bac score, English score)

FDs and Keys sID $\rightarrow$ sname

MVDs sID , sname $\rightarrow$ Bac score

4NF? No

Good design?

Example 3

A student might apply to several universities. Result is determined by Bac score

Student(sID, U-name, Bac score,Result)

FDs $\text{sID} \rightarrow \text{Bac}$ $\text{Bac} \rightarrow \text{Result}$ $\text{sID} \rightarrow \text{Result}$

Keys

BCNF?

Good design?