

Multivalued dependency (MVD)

$$X \twoheadrightarrow Y \quad \left. \begin{array}{l} \text{ } \end{array} \right\} \begin{array}{l} X \text{ multivalues } Y \\ \text{multi determines } Y \end{array}$$

If multivalued dependency $X \twoheadrightarrow Y$ specified on scheme R where X and Y are both subsets of R , specifies the following constraint on any relation state r of R : If two tuples t_1 and t_2 exist in r such that $t_1[X] = t_2[X]$, then two tuples t_3 and t_4 should also exist in r with the following properties:

- * $t_3[X] = t_4[X] = t_1[X] = t_2[X]$
 - * $t_3[Y] = t_1[Y]$ and $t_4[Y] = t_2[Y]$
 - * $t_3[Z] = t_2[Z]$ and $t_4[Z] = t_1[Z]$
- where $Z = (R - (X \cup Y))$

EMP

<u>Cname</u>	<u>Pname</u>	<u>Dname</u>
Smith	X	John
Smith	Y	Ana
Smith	X	Ana
Smith	Y	John

project and dependence

Multivalued dependency

Trivial

Non-trivial

Does not produce significant effect on constraint on the relationship schema.

Conditions for being trivial multivalued dependency

1) Y is a subset of X

2) $X \cup Y = R$

8.11 Key relation schema

- devoid of any FD
- in BCNF
- has multivalued dependency

4NF

A relation schema is in 4NF with respect to a set of dependencies F (that includes functional dependencies & MVDs) if, for every non-trivial MVD $X \twoheadrightarrow Y$ in F^+ , X is a superkey for R .

EMP_PROTECTS

Empname	Pname
Smith	X
Smith	X

EMP_DEPENDENTS

Empname	Pname
Smith	John
Smith	Ann

Now since only 2 attributes remain, so $X \cup Y = R$ condⁿ is readily satisfied. So $\text{Empname} \rightarrow \text{Pname}$ and $\text{Empname} \twoheadrightarrow \text{Dname}$ are trivial dependencies.