Functional Dependency

Rule of Data Consistency

- EMP_DEPT should obey RULE:
  - Same DNum goes with same DName & MSSN
  - Otherwise, data is inconsistent
  - Cannot enforce rule in this table with Key constraint
Restate the Rule

For any 2 tuples Ta, Tb,
- IF Ta[DNUM] = Tb[DNUM],
- THEN Ta[MSSN] = Tb[MSSN]

DNUM Functionally Determines MSSN

In symbols: DNUM → MSSN

Consider the Key

For any 2 tuples Ta, Tb,
- IF Ta[SSN] = Tb[SSN],
- THEN Ta[ENAME] = Tb[ENAME]
Nature of the Key

• Max of ONE tuple with given key in a table
• Therefore, if two tuples share a KEY they are the same tuple!
  – And will have the same attributes
    (this is not rocket science)
  – KEY Functionally Determines all attributes.

NOTES

• Start with all attributes in relation R.
• Schema like R = \{A,B,C,\ldots,Z\}
• FD is between 2 SUBSETS of R
  – Left Hand Subset (LHS)
  – Right Hand Subset (RHS)
Notes: Notation

- In Logical Form LHS determines RHS:
  \[ \forall Ta \forall Tb ( \begin{array}{c}
  Ta \in R \land Tb \in R \land \\
  Ta[LHS] = Tb[LHS] \rightarrow \quad // \text{if } a \& b \in R \\
  Ta[RHS] = Tb[RHS]) \quad // \text{and have same LHS} \\
  \end{array} \]  

- Shorter: \{\text{Left Hand Subset}\} \rightarrow \\
  \{\text{Right Hand Subset}\}
- Example: \{A,B,C\} \rightarrow \{W,X\}
- Even shorter, with 1-char names: ABC \rightarrow WX

More NOTES

FD is a matter of SEMANTICS:
- a RULE for the data in the DB
- an integrity constraint on R.

An Instance \( r \) of \( R \) that satisfies all FDs is
- legal relation instance
- legal extension