Relational Database Design Theory

Introduction to Databases

CompSci 316 Fall 2014

DUKE
COMPUTER SCIENCE

Announcements (Thu. Sep. 11)

- Homework #1 due next Tuesday (11:59pm)
- Course project description posted
  - Milestone #1 right after fall break
  - Teamwork required: 4 people per team

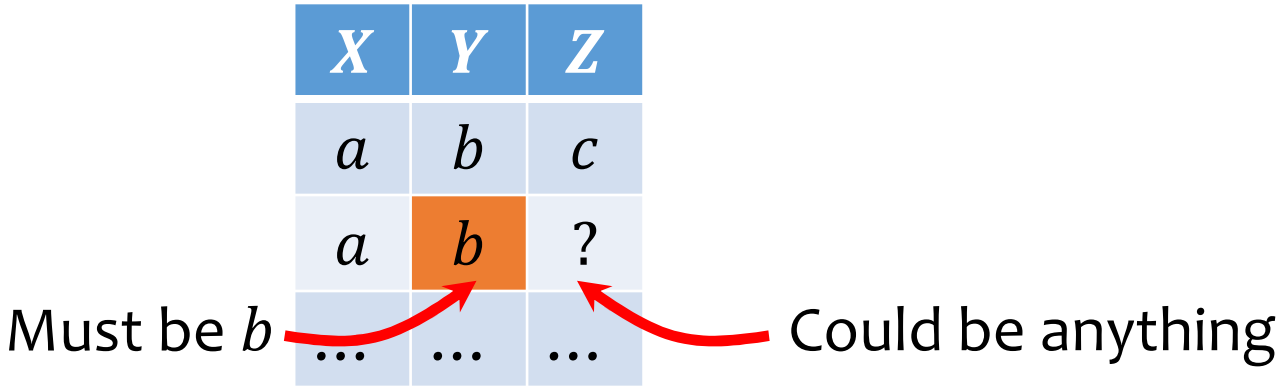
Motivation

uid	*uname*	*gid*
142	Bart	dps
123	Milhouse	gov
857	Lisa	abc
857	Lisa	gov
456	Ralph	abc
456	Ralph	gov
…	…	…

- Why is *UserGroup* (*uid*, *uname*, *gid*) a bad design?
  - It has redundancy—user name is recorded multiple times, once for each group that a user belongs to
    - Leads to update, insertion, deletion anomalies
- Wouldn't it be nice to have a systematic approach to detecting and removing redundancy in designs?
  - Dependencies, decompositions, and normal forms

Functional dependencies

- A functional dependency (FD) has the form $X \rightarrow Y$, where X and Y are sets of attributes in a relation R
- $X \rightarrow Y$ means that whenever two tuples in R agree on all the attributes in X, they must also agree on all attributes in Y



FD examples

Address (*street_address*, *city*, *state*, *zip*)

- *street_address*, *city*, *state* → *zip*
- *zip* → *city*, *state*
- *zip*, *state* → *zip*?
  - This is a trivial FD
  - Trivial FD: LHS ⊇ RHS
- *zip* → *state*, *zip*?
  - This is non-trivial, but not completely non-trivial
  - Completely non-trivial FD: LHS ∩ RHS = ∅