CS 445
Introduction to Database Design
E-R Diagrams

Chapter 2

September 2, 2009
Design Steps

• Read Chapter 2
  – homework: page 52: 2.2 (1–5) (Due Sept 14)

• How do we model the data?
  – what do we need to identify?
Design Steps

• Requirement Analysis
  – talk to the user!

• Conceptual Database Design
  – E–R Diagram

• Logical Database Design
  – logical schema

• Schema Refinement
  – normalization

• Physical Database Design
  – performance tuning

• Application and Security Design
  – GUI / end user software
Bits of Data

• Entity
  - some particular object in the real world

• Entity Set

• Attribute
  - domain
  - key
  - candidate key
  - primary key
Doing interesting things with data

- Relationship
  - association among two or more entities

- Relationship Set

- Descriptive attribute

- Roles
Constraints

• What limits are placed on how entities are involved in a relationship
  - Key Constraints
    • One to many
    • Many to many
    • One to one
  - Participation Constraints
Weak Entities

- Entities without keys!
- Identifying owner

- Identifying relationship
Class Hierarchy

• Some entities may be related
  – similar to Object Oriented class hierarchy
  – C++/Java
  – superclass
  – specialized subclasses

• Inheritance
  – ISA

• Overlap constraints
Aggregation

• View a set of entities/relationships as one big entity
  – meta-entity
How do we use all this?

• When do we use an entity vs an attribute to represent data?
  – it all depends on how you want to use the data
  – how many other bits of data will reference it?
  – how will they reference it?
    • will our model allow that?

• Example: Name and Address
How do we use all this?

- When do we use an entity vs a relationship?
Tool Support

• E–R diagram builders
  – Microsoft Visio
  – MySQL Workbench (alpha, buggy, promising)

• Unified Modeling Language (UML)
  – used to model all kinds of data interactions
  – Object Oriented code design
  – database design
    • think of entities and relationships as classes
  – Use cases (process flow)
  – http://argouml.tigris.org/
Key Constraints

- emp MANAGES dept
- each emp can manage more than one dept
- each dept is managed by only one emp
  - Each dept key appears in ONE MANAGES relationship
  - ONE TO MANY
  - one employee can be associated with MANY depts
  - each dept associated with ONE emp
  - what if each emp ONLY managed ONE dept? (ONE TO ONE)

- emp WORKSIN dept
  - each emp can work in several depts
  - each dept has several emp
  - MANY TO MANY
  - what is each emp worked in only one DEPT?