CS 445
Introduction to Database Design
E-R Diagrams

Chapter 2

Aug 30, 2007
Design Steps

• Read Chapter 2
  – homework: page 52: 2.2 (1-5) (Due Sept 13)

• 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?