Introduction

- Difference between Data and Information

- What is Metadata (Table 1.1)

- Difference between sequential access and random access to a file

Historical

- Historical databases
  - File processing system – page 4 in book
    - what were the limitations (Slides from day 1… part 2)
  - Relational Databases
    - From the 1970s
    - Most successful
  - The rest of these, just know they exist
    - Networking databases
    - Hierarchical databases
    - Object Oriented database
- Big Data
  - Exposing the limits of the relational database systems
  - Google and Amazon have their own

Databases

- Define database system – page 11
  - includes data and metadata, etc
- Compare figure 1.1 to figure 1.6
- Advantages of using a database – page 15
- Disadvantages
  - Higher upfront program costs
  - Higher upfront program complexity
- Data management operations
  - CRUD

Databases

- What drives a database design?
  - Requirements! The business, the organization
- Difference between database and database system
- Components of a database system

Foundations – Entity type

- What is a Model?
  - What are the types of models we will do
- Entity Type
  - A collection of attributes

Foundations - Attribute

- Attribute characteristics
  - Name (unique to entity type)
  - Type (or data type)
    - Numeric
    - Alphanumeric
    - Alphabetic
    - Date/time
    - logical (true or false)
    - binary
  - Optionality
- Uniqueness Constraints
- Domain Constraints
  - can includes the size of the attribute data types

Foundations - Relationship Type

- Can have attributes
- Relationship Type degrees
  - Binary
  - Ternary
  - Quarternary
  - Recursive
- Participation Constraints
  - Total (or mandatory)
  - Partial (or optional)
- Cardinality Constraints
  - 1:n (also called parent-child)
  - 1:1
  - m:n

Foundations - Additional

- Weak Entity Type
  - often have partial keys
- Cluster Entity Type
- Deletion Constraints
  - Restrict
  - Cascade
  - Set null
  - Set default
- Associative Entity Type
  - Relationship type that becomes a weak entity type

Instance Diagrams

- Understand how to read one

ER Models

1. Presentation Layer
2. Design-Specific
   - Determine all data types, sizes
   - Adds (min, max) for Relationship Structural Constraints
     - Optional participation becomes a min of "0"
   - Multi-values attributes become entity types
   - Resolve m:n Relationship constraints
     - Convert them to weak entity type with 1:n or 1:1
   - Remember: some domain constraints and other business rules are listed separately
   - Best to list domain constraints in a tabular format (similar to page 105)
3. Page 353 - # 32… start with an interns relationship type

Enhanced Entity Relationship Model

- New Construct: **SubClass/SuperClass** Relationship
  - for "Is A" relationships
    - Disjoint (d)
      - VEHICLE is either SUV or VAN
    - Overlapping (o)
      - ATHLETE can be either BASEBALL_PLAYER or FOOTBALL_PLAYER or BOTH
  - Aggregation (a) – of subclasses – "Is part of a"
    - page 167
  - Union (u) – of superclasses – categorization
- Review Vignette 3.2
  - Emphasize the subset notation

Relational Data Model

- A type of Logical Data Model
- Based on *Relations*
- Relation:
  - Mathematical term approximately equivalent to a 2-D table
  - This table has a heading – with attribute names
    - each attribute name must be unique in that relation
      - Naming convention
    - each attribute is atomic… compound or molecular attributes go away
    - Some domain constraints on attributes become entity types
      - SHIP.classification
      - referred to as look-up tables
    - derived values are not captured… but they are derivable
  - Each row in the relation is called a **tuple**
    - every tuple in a relation MUST be unique
      - therefore, at least one unique identifier is needed
  - A relation **schema** has just the headings of the relation