CSCI 2141
January 14, 2013

Homework was:
- Read the SFU tutorial 3: An introduction to data modeling (http://sfubusiness.ca/areas/mis/tutorials/2np/lessons/model.pdf)
- Take a stab at creating an ER diagram for our bus example – we will fully work through it together on Monday

Activity 3:
Develop the conceptual model with an Entity-Relationship Diagram (ERD)
1. What are the entities in our database (nouns – these will be the tables)
   - Draw these as squares
2. What are their attributes? (properties/characteristics of an entity that we want to collect and store in the DB) – think about what would uniquely identify a particular instance of the entity)
   - Draw these as bubbles off the square
   - Underline the attribute(s) that uniquely identifies instance
3. What are the relationships between entities? (what is the cardinality of that relationship? (1-1? 1-many? Etc.)
   - Draw lines between entities – put a label on the line in a diamond
   - Indicate by crow’s feet (or #'s) the cardinality at each end of the relationship
ER Diagram Basics:

Entity: Real-world object, distinguishable from other objects. An entity is described using a set of attributes.

Entity Set: A collection of similar entities (e.g., all employees). All entities in an entity set have the same set of attributes (except if hierarchies). Each entity set has a key (underlined). Each attribute has a domain (integers, alphanumeric, etc.)

Relationship: An association between 2 or more entities. Relationships can have their own attributes.

**Graphical Representation in E-R diagram**

![Diagram of Person Entity with attributes: First, Last, SSN, Address, Birthdate, Age, Hobbies, Name]

- **Rectangle** -- Entity
- **Ellipses** -- Attribute (underlined attributes are [part of] the primary key)
- **Double ellipses** -- multi-valued attribute
- **Dashed ellipses**-- derived attribute, e.g. age is derivable from birthdate and current date
Keys:

- **Superkey**: an attribute or set of attributes that uniquely identifies an entity—there can be many of these.

- **Composite key**: a key requiring more than one attribute.

- **Candidate key**: a superkey such that no proper subset of its attributes is also a superkey (minimal superkey—has no unnecessary attributes).

- **Primary key**: the candidate key chosen to be used for identifying entities and accessing records. Unless otherwise noted "key" means "primary key".

- **Alternate key**: a candidate key not used for primary key.

- **Secondary key**: attribute or set of attributes commonly used for accessing records, but not necessarily unique.

- **Foreign key**: term used in relational databases (but not in the E-R model) for an attribute that is the primary key of another table and is used to establish a relationship with that table where it appears as an attribute also. So a foreign key value occurs in the table and again in the other table. This conflicts with the idea that a value is stored only once; the idea that a fact is stored once is not undermined.
OUR EXAMPLE

Candidate entities (potential attributes) (**note: these are not necessarily correct or the best way of thinking of things – ER diagrams can need lots of iterations!)

- Bus Rider (type or personal characteristics/preferences)
- Fares (rider class, route type)
- Route (Type, set of stops)
- Bus stop (location)
- Route timing schedule (key stop times, start time for each loop)
- Schedule type (week day, weekend, holiday)
- Bus Driver (employee #)
- Driver schedule (weekly schedule, date, route, time)

Strategy:
1. Holistic:
   - Having read all the scenarios and thought about the data needed to support them, start with the basics: bus route, bus stop, bus schedule
   - Keep building and linking entities with relationships
   - Go back to scenarios and see if have captured all aspects of data needed
2. Scenario approach:
   a. First scenario: work out the ER diagram
   b. For rest of scenarios:
      i. Add to ER diagram if does not support scenario

Let’s start with bus routes and stops and work from there.
Bus Scheduling ER Diagram
Bus Scheduling ER Diagram