Database Design Concepts and Practices
IT4GIS
Keith T. Weber, GISP
GIS Director
ISU-GIS Training and Research Center

Basic Steps in Database Design
- Understand and document the business’ needs.
  - Problem statement
  - Business object types
  - Business relationships
  - Business constraints
- Create an ERM
- Data and process inventory
- Develop tuple types
- Tuple types to tables
- Integrity
- Implement the database

Today’s goal
- Become more familiar with database design.
- Learn to read and interpret a database design (aka, schema).
Database Design

• Why spend so much time and effort?
  – Efficiency (speed, storage)
  – Client satisfaction
  – Flexibility
  – Cost savings realized

Design Considerations

• Basic steps (described earlier)
• Data types
• Normalization
• With >1 table, relationships must be examined

Relationships

• Determine where relationships exist between tables
• Determine the type of relationship that exists
  – One-to-one
  – One-to-many
  – Many-to-one
  – Many-to-Many
Generic Design Symbology

= Database
= Table

Generic Table Symbology

<table>
<thead>
<tr>
<th>Parcels</th>
<th>Parcels_ID</th>
<th>TRS</th>
<th>Value</th>
<th>Zoning</th>
</tr>
</thead>
</table>

Table name
Divider
List of all attributes stored in this table as they will appear in the table

Generic Relationship Symbology

Table A
A_ID
Relate_field

Table B
B_ID
Relate_field

• Draw schema of RDB
• Determine relationship fields
• Connect
Symbolizing Relationship Type

- One-to-one: 1..1 1..1
- One-to-many: 1..1 1..M
- Zero?: 1..1

The Relationship Type...

- Also known as
  - Cardinality (ArcGIS terminology)
  - Multiplicity (UML terminology)

Object Oriented Design

How does it fit?
Process

• Inception
• Elaboration
  • Construction
  • Transition

Elaboration Exercise

You will be building a new database listing and describing all things that are RED in color. Let’s start with a brainstorming list!

Questions?

• Your assignment
  – Follow the ReadMe.txt document in this week’s exercise file.
  – Use the exercise handout as a guideline to reading and interpreting a relational database design.