The Geodatabase: An Introduction

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Getting Started
The Geodatabase: An Introduction

• This is an intro session

• Please hold questions until the end

• Please silence cell phones
The Geodatabase: An Introduction

- Geodatabase Overview
- Inside the Geodatabase
- Advanced Behavior
Working with Geodatabases

Demo # 1: Kaitlin

• Hazardous Information WebApp
Geodatabase Overview

- What is and why use the geodatabase?
- The geodatabase as part of the ArcGIS platform
- Types of geodatabases
- Data management and editing
What is the Geodatabase?

Geodatabase Overview

• **A collection of geographic datasets of various types**
  - A comprehensive model for representing and managing GIS data

• **Scalable storage model supported across the platform**

• **You can programmatically access geodatabase functionality**
Why use the Geodatabase?
Geodatabase Overview

• It’s simple!

• Robust, customizable framework
  - Build and manage your own specific GIS solution

• Increased functionality over other data models

• Best way to use the complete ArcGIS platform
The Geodatabase as part of the ArcGIS Platform

Geodatabase Overview

Diagram:
- Desktop
- Web
- Device
- Portal
- Server
- Online Content and Services
### Types of Geodatabases

**Geodatabase Overview**

<table>
<thead>
<tr>
<th></th>
<th>File Geodatabase</th>
<th>Enterprise Geodatabase</th>
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</thead>
<tbody>
<tr>
<td><strong>OS Platform</strong></td>
<td>Cross Platform</td>
<td>DBMS dependent</td>
</tr>
<tr>
<td><strong>Number of Users</strong></td>
<td>Single Editor or Multiple Readers</td>
<td>Multiple Editor and Multiple Readers</td>
</tr>
<tr>
<td><strong>Storage Format</strong></td>
<td>System files in a file folder</td>
<td>Oracle, SQL Server, PostgreSQL, Informix, DB2</td>
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</table>

- **OS Platform**
  - File Geodatabase: Cross Platform
  - Enterprise Geodatabase: DBMS dependent

- **Number of Users**
  - File Geodatabase: Single Editor or Multiple Readers
  - Enterprise Geodatabase: Multiple Editor and Multiple Readers

- **Storage Format**
  - File Geodatabase: System files in a file folder
  - Enterprise Geodatabase: Oracle, SQL Server, PostgreSQL, Informix, DB2
Geodatabase Data Management
Geodatabase Overview

• Catalog window
  - Define feature classes, datasets, relationships
  - Import and convert data from other formats

• ArcGIS Online

• Use an Esri Solution
  - Industry specific data models available online
Editing
Geodatabase Overview

• Datasets in the geodatabase are editable
  - i.e. Modify building footprints in parcel management
  - i.e. Add water mains to a water network

• Editing in ArcGIS uses a transaction model
  - A series of edit operations constitutes a ‘transaction’

• Editing with an Enterprise Geodatabase
  - Versions or “snap-shots” of the data
Creating a Geodatabase

Demo # 2: Kaitlin

- Using the Catalog
- Create a Geodatabase
- Load existing data
- Editing data
Summary
Geodatabase Overview

- What is and why use the geodatabase?
- The geodatabase as part of the ArcGIS platform
- Types of geodatabases
- Data management and editing
Inside the Geodatabase

- Dataset Types
- Dataset Rules
Inside the Geodatabase

What can you store?

• **Datasets that represent real-world information**
  - Tables, feature classes, mosaics
  - Feature datasets
  - Relationship classes
  - Annotation and Dimensions

• **Datasets have associated rules**
  - Domains
  - Subtypes
  - Relationship Rules
Objects

Datasets Types in the Geodatabase

- Each row in the table is a unique object
- Each row has the same fields (called attributes)
- Does not need to have a geographic representation

![Table Image]

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Feature Classes
Datasets Types in the Geodatabase

- A feature is an object with a spatial representation
- Extends the relational model
- Like a table, each row has the same fields
- A feature class is a collection of features
Advanced Feature Classes and Features
Datasets Types in the Geodatabase

- **Multipart Features**

- **Text and surfaces**
- **Flexible coordinates**
  - XY, Z, M
Mosaics
Datasets Types in the Geodatabase

- **Support for many different Raster formats**
  - GRID, Tiff, MrSID etc…

- **Mosaic dataset**
  - Manages multiple rasters
  - Stored as a catalog, viewed as a mosaic
  - Advanced querying and processing
Feature Dataset

Datasets Types in the Geodatabase

- Contains a group of datasets
  - All have the same spatial reference

- Necessary for functionality like:
  - Geometric Networks
  - Topology
  - Terrains

Subdivision
- ParcelCorner
- Parcel
- ParcelAnno
- LotLines
- Parcel_Topo
- LotDimensions
- BoundryLines
Maintaining Data Integrity
Dataset Rules in the Geodatabase

• To help promote data correctness:
  - Attribute rules
    - Domains
    - Subtypes
  - Relationship rules
  - Connectivity rules
  - Topology rules

• Stored on objects as part of the geodatabase
• Can programmatically perform custom validation
Domains
Dataset Rules: Attribute Rules

• **Describes the allowable values in a field**
  - Used to ensure attribute integrity
Domains

Domain Rules: Attribute Rules

- Describes the allowable values in a field
  - Used to ensure attribute integrity

- Two types of domains:
  - Range: values between a min and max
    - The pole height is between 10 – 70
  - Coded Value: values chosen from a set list
    - The LandUse attribute may be [Commercial, Industrial or Residential]
Subtypes

Categorize objects or features into groups
  - Share the same attributes

Select an integer field to base the subtype on
  - Can have different default values and domains for each field
  - Can define behavior rules between subtypes
Relationship Classes
Dataset Rules: Relationships

• Association between objects
  - Objects may participate in multiple relationship classes

• Simple relationships and Composite relationships

• Associate rules with relationship classes
  - Each Parcel can have between 1 to 3 Buildings
Annotation
Datasets in the Geodatabase

- Annotation feature classes
  - Placing text and graphics on the map
  - Feature linked or non-feature linked
- Composite relationship manages link
- Visible scale range
Dimension Features

Datasets Types in the Geodatabase

- An annotation that displays distances on a map

- Graphic features stored in a dimension feature class
  - Can be created automatically from features
  - Set of editing tools
  - Define a style, description of symbology
Exploring with a Geodatabase

Demo # 3: Sarah

- Feature Classes
- Subtypes
- Domains
- Relationship Classes
Summary
Inside the Geodatabase

• Dataset Types
  - Objects, Feature Classes, Mosaics
  - Feature Datasets
  - Annotation and Dimensions

• Dataset Rules
  - Domains
  - Subtypes
  - Relationship Classes
Advanced Behavior

- Attachments
- Geometric Networks
- Network Datasets
- Topology
Attachments

Advanced Behavior

- Associate any type of file with a feature
- Can see attachment through the feature Identify tool
  - File types recognized by the OS, can be viewed in ArcMap
Geometric Networks
Advanced Behavior

- Uses edges and junctions to model network systems
  - Electric, gas, water, sewer, telecommunications, etc.

- Connectivity between features in the network
  - Based on geometric coincidence
  - May use connectivity rules
  - Connectivity is maintained on the fly

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Credit: http://www.smarthometrackerguide.org/images/pic_find_water_meter.jpg
**Network Datasets**

Advanced Behavior

- **Models transportation networks using edges and junctions**
- **Account for characteristics such as travel time, restrictions and speed**
- **Multimodal scenario capabilities**
  - Points span multiple connectivity groups
  - Used to create connectivity between lines in different groups
Geodatabase Topology
Advanced Behavior

- Topology manages how features share geometry
- Enforces data integrity using rules
  - Define rules to constrain how features share geometry
  - Validate features against rules
- Topological errors
  - Rule violations are expressed as red features

Rule: Must not overlap
Rule: Must be contained
Advanced Geodatabase Behavior

Demo # 4: Kaitlin & Sarah

- Attachments
- Geometric Network
- Topology
Summary

Advanced Behavior

- Attachments
- Geometric Networks
- Network Datasets
- Topology
Demo Review
The Geodatabase: An Introduction

- Downloaded free data as shapefiles
- Imported data into a file geodatabase
- Created domains to constrain allowable values
- Applied subtypes and domains to subtypes
- Created a relationship class to relate 2 feature classes
- Attached a file to a feature class
- Modelled water network data to trace flow
- Created a topology to create rules to model geometric relationships