Geodatabase: Best Practices
Robert LeClair, Senior Instructor
Agenda

- Geodatabase Creation
- Data Ownership
- Data Model
- Data Configuration
- Geodatabase Behaviors
- Data Validation
- Extending
- Performance
Geodatabase Life Cycle

- Maintain
- Extend
- Manage Privileges
- Consume
- Create
- Configure
- Load Data
- Share Data
Geodatabase: Extending the Database

- **Database**
  - Tables and Native geometry types
  - Short transaction/Security model

- **Geodatabase**
  - Information model, short/long transaction model, metadata tables, and a SDK

- **Benefits**
  - Improved data quality
  - Editing efficiency
  - Web model (WebGIS/services)
  - ArcGIS Pro Software Developer Kit (SDK)
Geodatabase: Transaction Models & Archiving

- **Transaction models:**
  - Single User: 1 editor, many readers at a time
  - Multi-user: Many editors, many readers at a time

- **Archiving**
  - The mechanism for capturing, managing, and analyzing data change over time.
  - Enable archiving in versioned or non-versioned data.
  - Enables a time slider in ArcGIS Pro to view historical moments.
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Geodatabase Types

- **What type to use?**
  - Single User
    - File Geodatabase
  - Multi-user
    - Enterprise Geodatabase

- **Considerations**
  - Size
  - Security
  - Concurrent viewers/editors
  - Storage format
  - Versioning support
Geodatabase Creation

- **Single user geodatabases**
  - Create File Geodatabase

- **Multiuser geodatabases**
  - Create Enterprise Geodatabase
    - All in one (creates database, geodatabase admin account, etc.)
    - Requires access to DBA account

- **Enable Enterprise Geodatabase**
  - No access to DBA account
  - Two steps: DBA sets up database and SDE enables the geodatabase
Best Practice – Geodatabase Creation

- For File Geodatabases
  - Use the “Create File Geodatabase” GP tool – supported across the platform

- For Enterprise Geodatabases
  - Use the “Create Enterprise Geodatabase” GP tool
  - Fallback to the “Enable Enterprise Geodatabase” GP tool
Enterprise Geodatabase Administration

- Geodatabase Administration tasks
  - Geodatabase Creation/Upgrade
- Geodatabase configuration tasks
  - Configure Geodatabase Log File Tables
  - Import/Export GDB Configuration Keywords
- Database/Geodatabase admin tasks
  - Create Database User/Create Role
  - Rebuild Indexes
  - Analyze Datasets
  - Change Privileges
  - Compress
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Data Ownership Considerations

▪ POLP – Principle of least privilege
  ▪ Database Admin / Geodatabase Admin / Data Owner / End User

Geodatabase admin responsibilities:
▪ Ownership and maintenance on repository
▪ Manages the DEFAULT version
▪ Runs the COMPRESS GP tool
▪ Performs maintenance tasks
▪ Manages geodatabase configuration
▪ Configures DBTUNE

Data owner Responsibilities:
▪ Manage privileges
▪ Manages indexes
▪ Manages fields
▪ Register data as versioned
Best Practices – Data Ownership

- Grant the fewest permissions to the fewest number of users
- Have a unique Geodatabase Admin user (i.e. SDE)
- Have a non-Geodatabase Admin create data (i.e. Data Owner or End User)
Demo

Geodatabase Creation
Agenda

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- **Data Model**
- Data Configuration
- Geodatabase Behaviors
- Data Validation
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Data Model

▪ **What is a Data Model?**
  ▪ Collection of elements in a Geodatabase
  ▪ Feature classes, attributes, subtypes, domains, etc.

▪ **Picking a Data Model**
  ▪ Jump start your work!
  ▪ What data are you representing
  ▪ ArcGIS Data Models
Best Practices – Data Model


- Use a Data Model provided by an Esri business partner
Agenda

- Geodatabase Creation
- Data Ownership
- Data Model
- **Data Configuration**
  - Feature Datasets
  - Feature Classes
  - Fields
- Geodatabase Behaviors
- Data Validation
- Extending
- Performance
What is a Feature Dataset?

- Logical container of feature classes
- Enforces a common Spatial References to all Feature Classes within
- Enforces a common database privilege level
- Required for Geodatabase behaviors (i.e. topology, parcel fabrics, networks, etc.)
What is a Feature Class?

- A table which stores spatial data
- Stores attributes in fields about features
  - Many data types supported
- Single Geometry representation (point, line, polygon, annotation, dimension, multipoint and multipatch)
- Used throughout the ArcGIS Platform
Best Practices – Data Configuration

Use a Feature Dataset when you want to:
- Apply geodatabase behaviors
- Group similar themed classes

Minimize the number of Feature Classes
- Group together similar features
- Find a balance between grouping and null or empty attributes

Field data types and field order:
Understand your data when choosing field types:
- Consider field order during creation
- Keep text fields short, expand later
- Will data be entered via web/mobile clients
Demo

Geodatabase Configuration
Agenda

- Geodatabase Creation
- Data Ownership
- Data Model
- Data Configuration
- **Geodatabase Behaviors**
  - Subtypes
  - Default values
  - Domains
  - Relationship Classes
- Data Validation
- Extending
- Performance
Subtypes

• Modeling multiple types of features in a single feature class

• Features that share similar attributes

• Short or Long Integer field types
Default Values

- Most fields in a feature class or table support a default value
  - This is a value entered during editing, if the user does not specify a value
  - NOTE: Raster fields do not support default values

- Default values can be configured at the attribute field level or subtype level

- Once subtypes are created – default values should be configured at subtype level
Domains

- Constrain attribute values allowed for any particular attribute
- Range Domains
  - A range domain specifies a valid range of values for a numeric attribute (minimum and maximum valid values)
  - May be applied to numeric and date attribute types
- Coded Value Domains
  - Can be applied to text, numeric, and date fields
  - Uses a Code & Description
  - Editor sees a drop down with valid attributes
  - Field calculation – code can be used
- Validation will compare actual values against their domain to determine if the entries are correct
Best Practices – Geodatabase Behaviors

- **Subtypes**
  - Use subtypes where possible, instead of adding additional feature classes
  - If features share a large majority of their attributes with other features
  - Group the features into a single class differentiated by subtype

- **Default Values**
  - Always set up default values to limit the <Null> entries in a table
  - Editing using web/mobile
  - Limits the amount of data entry required

- **Domains**
  - Use Domains to simplify attribute editing
  - Use Domains to make sure valid attribute values are being entered
Relationship Classes

• A persisted relationship between objects in different feature classes or tables
• Visible using the Attribute Pane or Attribute Table in ArcGIS Pro
• Support rules for data integrity

• No relationship rules (constraints) = no validation
  - Business logic by defining constraints on the classes’ objects or features that is accessed during validation
  - Setup after relationship class creation
Best Practices - Relationship Classes

- Use relationship classes for those relationships that will enforce some data integrity

- Create rules to further ensure data integrity
  - These rules are not reactively checked

- Avoid creating relationship classes between two feature classes residing in separate feature datasets
Data Loading - Tools

- **Loading new objects**
  - Import/Export XML Workspace Document GP Tool
  - Feature Class to Feature Class GP Tool
  - Feature Class to Geodatabase GP Tool
  - Copy/Paste or Drag/Drop functionality

- **Updating existing objects**
  - Append GP Tool
Data Loading - Tools

- Load all data before registering as versioned – loads directly into the BASE table

- If you need to load data into a versioned system, consider unregistering as versioned prior to loading the data to prevent state doubling.
Demo

Geodatabase Behaviors and Data Loading
Attribute Editing while Editing

- The Geodatabase provides functionality to help maintain attribute quality while editing
  - Attribute domains
  - Subtypes
  - Default attribute values
  - Relationship classes
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Attribute Assistant
- Editor Add-In from the Esri Solutions team
- Reduced # of mouse clicks during editing
- Standardizes editing procedures
Attribute Editing while Editing

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  - Subtypes
  - Default attribute values
  - Relationship classes
Demo

Editing and Data Validation
Maintain – Enterprise Administration

- In order to maximally compress the geodatabase:
  - Remove locks (disconnect users, stop services)
  - Reconcile, Post, and delete Versions
  - Synchronize any geodatabase replicas
Rebuild indexes / Analyze datasets

- Data owner can analyze the tables they own
- GDB Admin can analyze all tables, including system tables
Best Practice - Performance

- Fat/Wide feature classes vs. narrow feature classes
- Subtypes vs. new feature classes
- Lumping feature classes together
- Relationship class messaging – turn off for simple relationship classes
- Layers in a map
- Prototyping – What you are actually going to do with the data!
- Definition Query
Additional Geodatabase Technical Workshops

- **Geodatabase: An Introduction (Room 150B)**
  - Wednesday, March 21 – 1:30 PM – 2:30 PM

- **Geodatabase: Best Practices (Room 150B)**
  - Tuesday, March 20 – 4:15 PM - 515 PM
  - Wednesday, March 21 – 2:45 PM – 3:45 PM

- **Geodatabase Programming with Python (Room 147A)**
  - Thursday, March 22 – 10:00 AM – 10:45 AM

- **Accessing your Enterprise Geodatabase Using SQL (Room 147B)**
  - Thursday, March 22 – 11:00 AM – 11:45 AM
Print Your Certificate of Attendance
Print stations located in the 140 Concourse

Tuesday
12:30 pm - 6:30 pm
GIS Solutions Expo
Hall B

5:00 pm - 6:30 pm
GIS Solutions Expo Social
Hall B

Wednesday
10:30 am - 5:15 pm
GIS Solutions Expo
Hall B

6:30 pm - 9:00 pm
Networking Reception
Smithsonian National Portrait Gallery
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