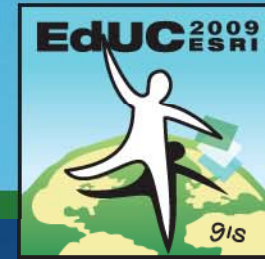


# 2009 ESRI Education User Conference

July 11–14, 2009



## Working with the Geodatabase Data Model

*Robert LeClair*

***Please!***  
***Turn OFF cell phones  
and paging devices***

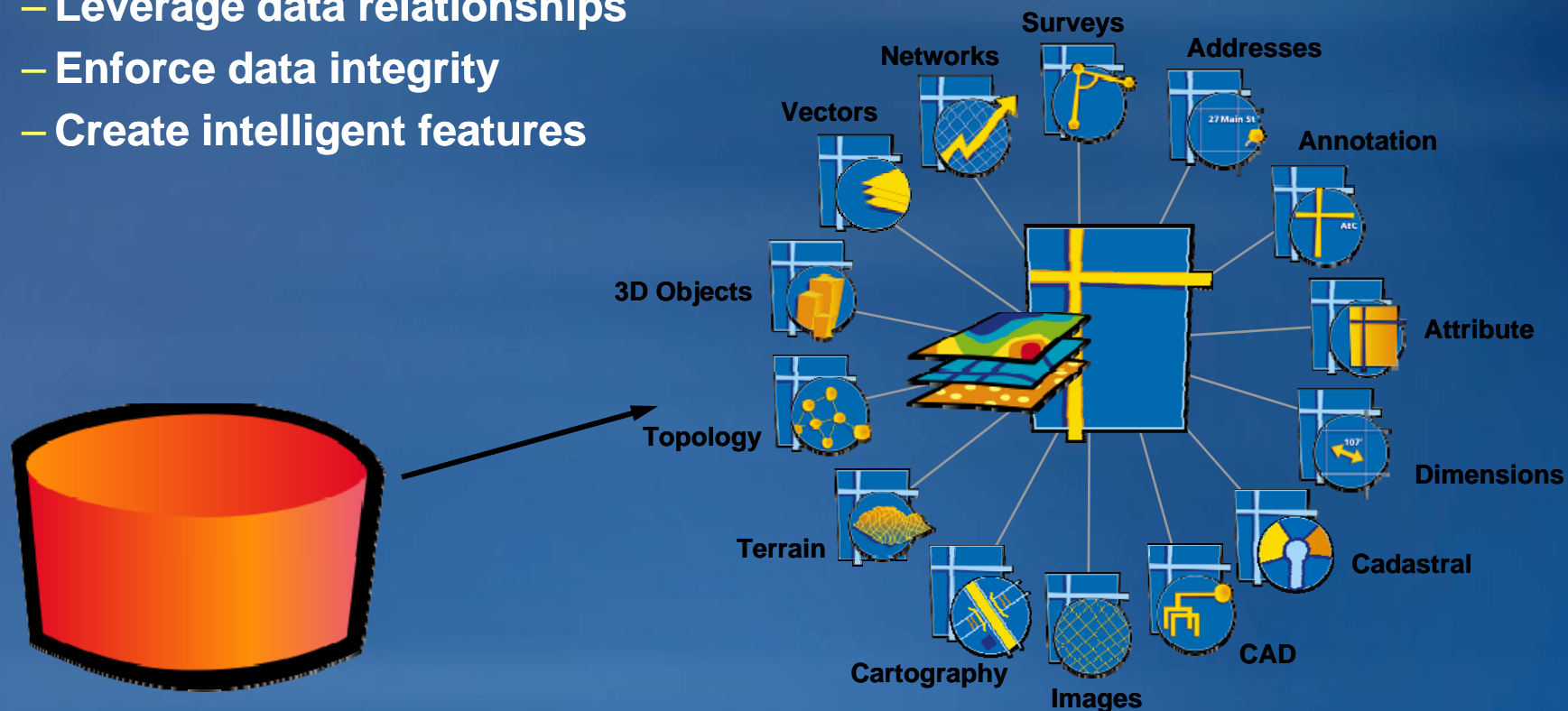


# Learning Objectives

- List elements found within a geodatabase
- Differentiate between types of geodatabase available
- Discover strengths of the file geodatabase
- Examine geodatabase storage

# Defining the geodatabase

- Collection of geographic datasets
  - Feature classes, raster data, attribute tables, etc.
- Native data structure for ArcGIS
- Provides the ability to:
  - Leverage data relationships
  - Enforce data integrity
  - Create intelligent features



# Advantages of geodatabase

- **Central location for features and attributes**
- **Ability to create behavior**
  - Grouping features into subtypes
  - Creating spatial and attribute validation rules
- **Persistent relationships between records**
  - Referential integrity
- **Stored connectivity between lines and points**
- **Many users editing database at one time**
  - File geodatabase and enterprise geodatabase
- **Scalable**

# 3 Types of Geodatabases

- **Personal Geodatabase**

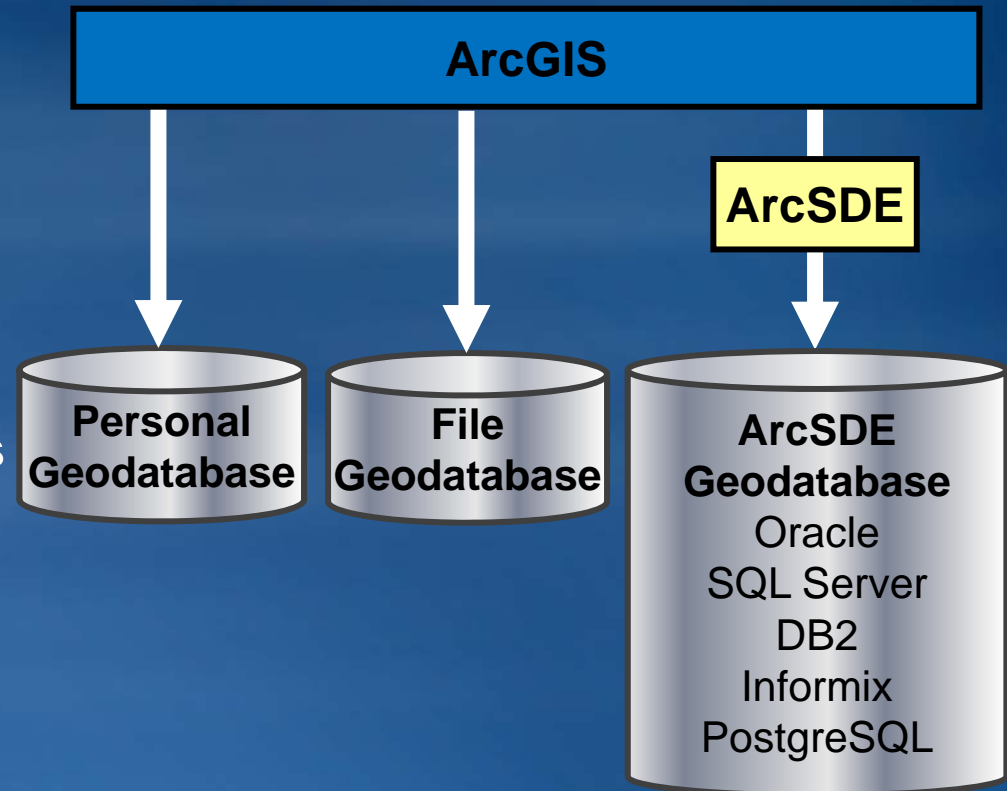
- Single user editing
- Stored in MS Access
- Size limit of 2 GB

- **File Geodatabase**



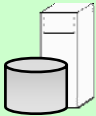
- 1 TB per table
- Reduced storage requirements

- **ArcSDE Geodatabase**

- Stored in an enterprise DBMS
- Supports multiuser editing via versioning
- Requires ArcEditor or ArcInfo to edit



# 3 Types of Geodatabases...

	<b>Personal GDB</b> 	<b>File GDB</b> 	<b>ArcSDE GDB (3 editions)</b> 
<b>Storage format</b>	Microsoft Access	Folder of binary files	DBMS
<b>Storage capacity</b>	2 GB	1 TB per table*	Depends on edition
<b>Supported O/S platform</b>	Windows	Any platform	Depends on edition
<b>Number of users</b>	Single editor Multiple readers	Single editor Multiple readers	Multiple editors & readers
<b>Distributed GDB functionality</b>	Check out/check in and One-way replication	Check out/check in and One-way replication	Replication (all types) & versioning

\* By default; option to have 256 TB per table

# File geodatabase benefits

- **High performance**
- **Less storage demand than Access or shapefile**
- **Easier management**
  - Locks held at feature dataset or class level
- **Compressed format**
  - Feature class, feature dataset, or geodatabase level
  - Read-only
  - Compression ratios 2:1 to 25:1
  - Display and query several times faster than Personal for Access

# Elements within the geodatabase

**Table**



**Feature dataset**



**Feature class**



**Polygon**



**Annotation**



**Line**



**Dimension**



**Point**



**Route**

**Relationship class**



**Topology**



**Geometric network**



**Network dataset**



**Terrain**



**Raster dataset**



**Raster catalog**



**Schematic dataset**



**Survey dataset**



**Project folder**



**Project**

**Toolbox**



**Tool**



**Model**



**Script**

**Behavior**

**Attribute domains**

**Relationship rules**

**Attribute defaults**

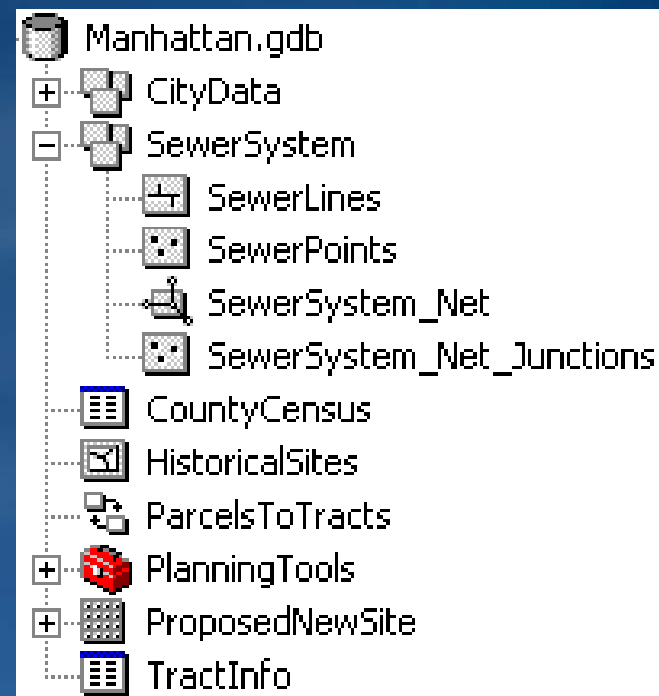
**Connectivity rules**

**Split/merge policy**

**Topology rules**

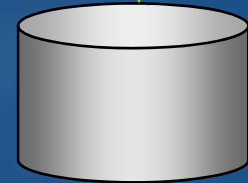
# Geodatabase storage

- **Feature class**
  - Table storing shape and attributes for single geometry features
  - Contains spatial reference
- **Feature dataset**
  - Store spatially related feature classes
  - Required for some behaviors
- **Table**
  - Store attributes but not geometry
- **Raster (dataset, catalog, attribute)**
  - Images and grids stored in various image formats



# Geodatabase behavior

- Build real world relationships into GIS
  - Unique to Geodatabase
  - Assist edit operations
  - Speeding up data entry (rules)
- 
- Two types of behavior
    - Attribute
    - Spatial



**Create real-world  
feature behavior  
in geodatabase**

# Attribute behavior

- **Functionality that helps:**
  - Locate and prevent errors
  - Automate data
  - Treat features in same feature class according to different rules
- **All behaviors:**
  - Create a more efficient GIS
  - Increase data integrity
- **Three types of attribute behavior:**
  - Subtypes
  - Domains
  - Relationship class rules

# Subtypes

- Categorize features into groups for management
  - Integer field required
- Within one feature class or table
- Defined by the value of a subtype field
  - Have the same attribute\behavior schema
  - Can have different default values and domains for each field
  - Can define topology rules between subtypes

## Editing

## Descriptions

<input checked="" type="checkbox"/>	Parcel
	ZoneCode
<input type="checkbox"/>	Residential
<input type="checkbox"/>	Commercial
<input type="checkbox"/>	Industrial
<input type="checkbox"/>	Agricultural

## Codes

OBJECTID*	SHAPE*	APN	ZoneCode
213	Polygon	70605	201
218	Polygon	70611	201
228	Polygon	70621	201
231	Polygon	70668	201
363	Polygon	70860	202
429	Polygon	70745	202
430	Polygon	70746	202
435	Polygon	70751	203
1278	Polygon	70473	203
1279	Polygon	70474	203

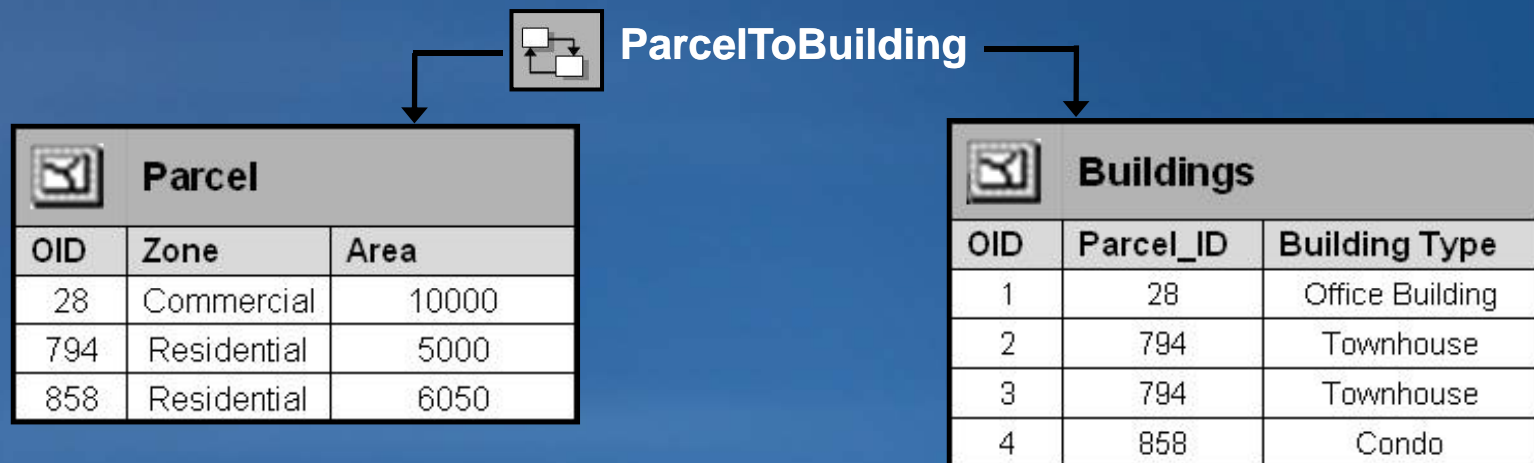
Property	Value
OBJECTID	396245
VEG_LINK	DEVLXX 569
PARTITION_TYPE	Watershed
PARTITION	<Null>
POLY_ID	Watershed
ENTERED_BY	Allotment
ENTERED_DATE	Location
MODIFIED_BY	Compartment
MODIFIED_DATE	Grassland
LF_SUBTYPE	Sub-compartment
LF_GSC	District
LAYER	Forest
SPECIES	POTR5
SIZE_CLASS	Large
COVER_PCT	3
DISTRIB_PCT	100

# Domains

- **Describe the legal values of a field type**
  - Used to ensure attribute integrity by preventing and locating attribute errors
- **Property of geodatabase**
- **Applied to fields or subtypes**
- **Types of domains:**
  - **Range**
    - User can enter any value and use validation to locate errors
    - A tree can have a height between 0 and 300 feet
    - A road can have between one and eight lanes
  - **Coded Value**
    - User chooses from list when editing field
    - A tree can be of type oak, redwood, or palm
    - A road can be made of dirt, asphalt, or concrete

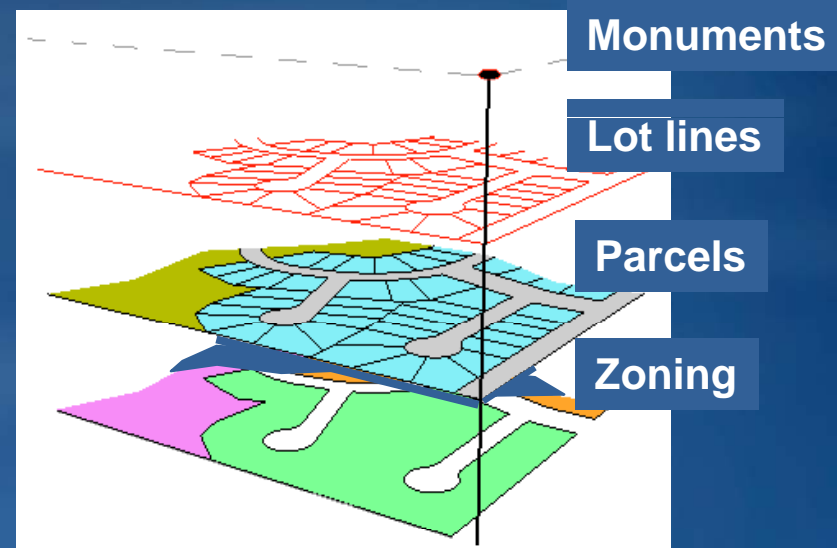
# Relationship Classes

- An association between two object classes
  - A class may participate in multiple relationship classes
- Simple relationships
- Composite relationships
  - Can trigger behavior (cascade delete, move to follow, custom, etc.)
- Associate rules with relationship classes
  - Each Parcel can have between 1 to 3 Buildings



# Spatial behavior

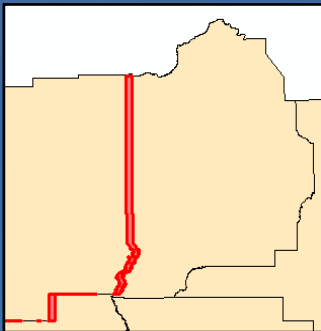
- **Topology rules**
  - Behavior that locates and prevents spatial data errors
- **Connectivity rules**
  - Determine proper connections between network features
  - One-way directed flow



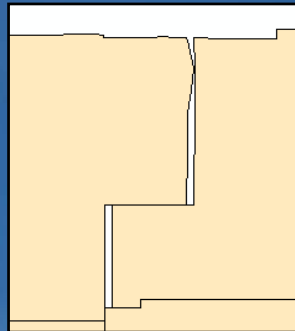
# Topology

- Creates and enforces topological (spatial) relationships
- Stored as element in feature dataset
- References participating feature classes
- Snaps feature vertices during validation
- Contains rules that determine proper spatial behaviors

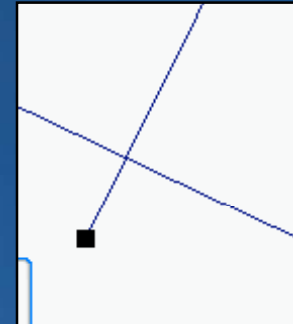
**Must not overlap**



**Must not have gaps**



**Must not have dangles**



# Summary

- **Detailed the different geodatabase flavors:**
  - Desktop geodatabase options
  - Multiuser geodatabase options
- **Looked at File geodatabase benefits and storage**
- **Learned about the spatial data stored in the geodatabase**
- **Examined built in data validation**
  - Attribute behavior
  - Spatial behavior

# Additional Resources

- **User Conference Technical Sessions**
  - **Geodatabase Essentials Part 1 – An Introduction to the Geodatabase**
    - **Tuesday, July 14, 8:30 AM - 9:45 AM (Room 6C)**
    - **Friday, July 17, 9:00 AM - 10:15 AM (Room 4)**
  - **Geodatabase Essentials Part 2 - An Introduction to ArcSDE Geodatabases**
    - **Wednesday, July 16, 8:30 AM - 9:45 AM (Room 4)**
    - **Friday, July 17, 9:00 AM - 10:15 AM (Room 3)**
- **Virtual Campus Courses**
  - **Basics of the Geodatabase Data Model**
  - **Working with Geodatabase Subtypes and Domains**
- **Books**
  - **Designing Geodatabases (ESRI Press)**

**Get a free 45-minute hands-on lesson at the  
Hands-On Learning Center**

Topics include:

- **Introduction to ArcGIS Desktop**
- **Creating a Map In ArcGIS**
- **Basics of the Geodatabase Model**
- **and more**

Location: **ESRI Showcase**

# GIS Training and Education Survey

<http://www.esri.com/training>

- **Brief online survey to get your feedback**
  - All survey takers get a free one-module Web course
- **Helps us develop training products that:**
  - Support your workflows
  - Cover the ESRI products you use
  - Focus on most common GIS tasks and roles
- **Survey available at:**
  - ESRI Showcase: Training and Education Island
  - ESRI Training Web site (until July 20th)