Federal GIS Conference 2014

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Geodatabase – An Introduction

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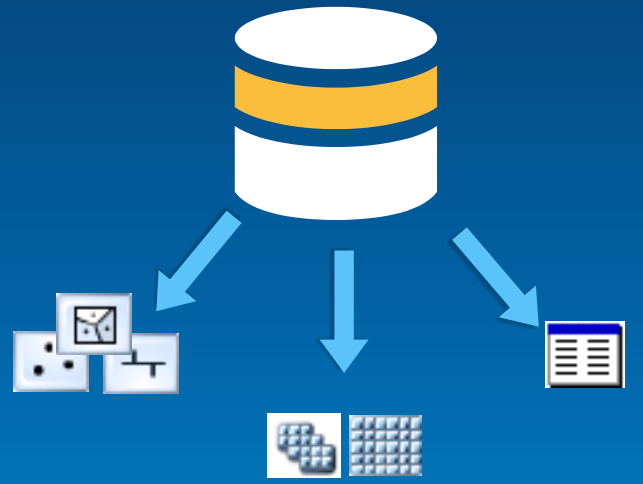
Session Path

- The Geodatabase
  - What is it?
  - Why use it?
  - What types are there?

- Inside the Geodatabase
- Advanced Behavior
- Additional Geodatabase Datasets

What is the Geodatabase?

- Core ArcGIS data model for the ArcGIS platform
  - A comprehensive model for representing and managing GIS data
- A physical container for storing geographic data
  - Scalable storage model supported on different platforms
- Fundamental elements of the geodatabase include feature classes, raster datasets and tables



Why use the Geodatabase?

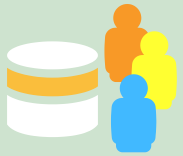
1. One centralized location for all of your geographic data
2. Model real work advanced spatial relationships
3. Smarter datasets with intelligence
4. Scalable (size and number of users)
5. Better maps

Why use the Geodatabase?

- **Simple!**
- **The model to best support the ArcGIS platform within an organization**

- **http://resources.arcgis.com/en/communities/geodata/**

3 Types of Geodatabases

	Personal GDB	File GDB	Multiuser gdb (3 Types)
			
Storage Format	Microsoft Access	Folder of binary files	DBMS
Storage capacity	2 GB	1 TB per table*	Depends on edition
Supported OS platform	Windows	Any platform	Depends on edition
Number of users	Single editor Multiple readers	Single editor Multiple readers	Multiple editors & readers

* By default; option to have 256 TB per table

Editing Geodatabases…

- Personal Geodatabases 

  - Mainly single user editing on small datasets
  - Multiple readers
  - Editing locks at geodatabase level

- File Geodatabase 

  - Mainly single user editing small to very large datasets
  - Multiple readers
  - Editing locks at the dataset level

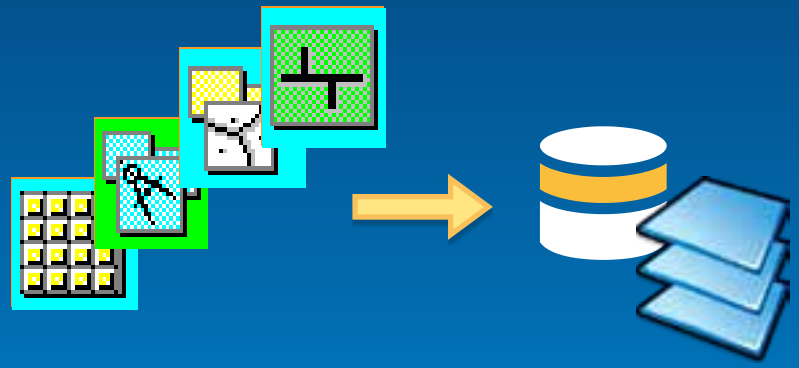
Editing Geodatabases…

- Multiuser Geodatabases
  - Editing with Versions
  - Multiuser editing without locking
  - Unique isolated view of the geodatabase

- Benefits of versioned editing
  - Multiple editors, editing over long periods of time
  - Archiving
  - Replication

Geodatabase Data Management

- Schema is defined in ArcCatalog
  - Define feature classes, datasets, relationships, etc
  - Import and convert data from other formats
  - Shapefile
  - Coverage
  - CAD
  - Raster
- Copy/Paste, Drag/Drop between geodatabases
- ArcGIS.com
  - Download layer and map packages from galleries, groups…



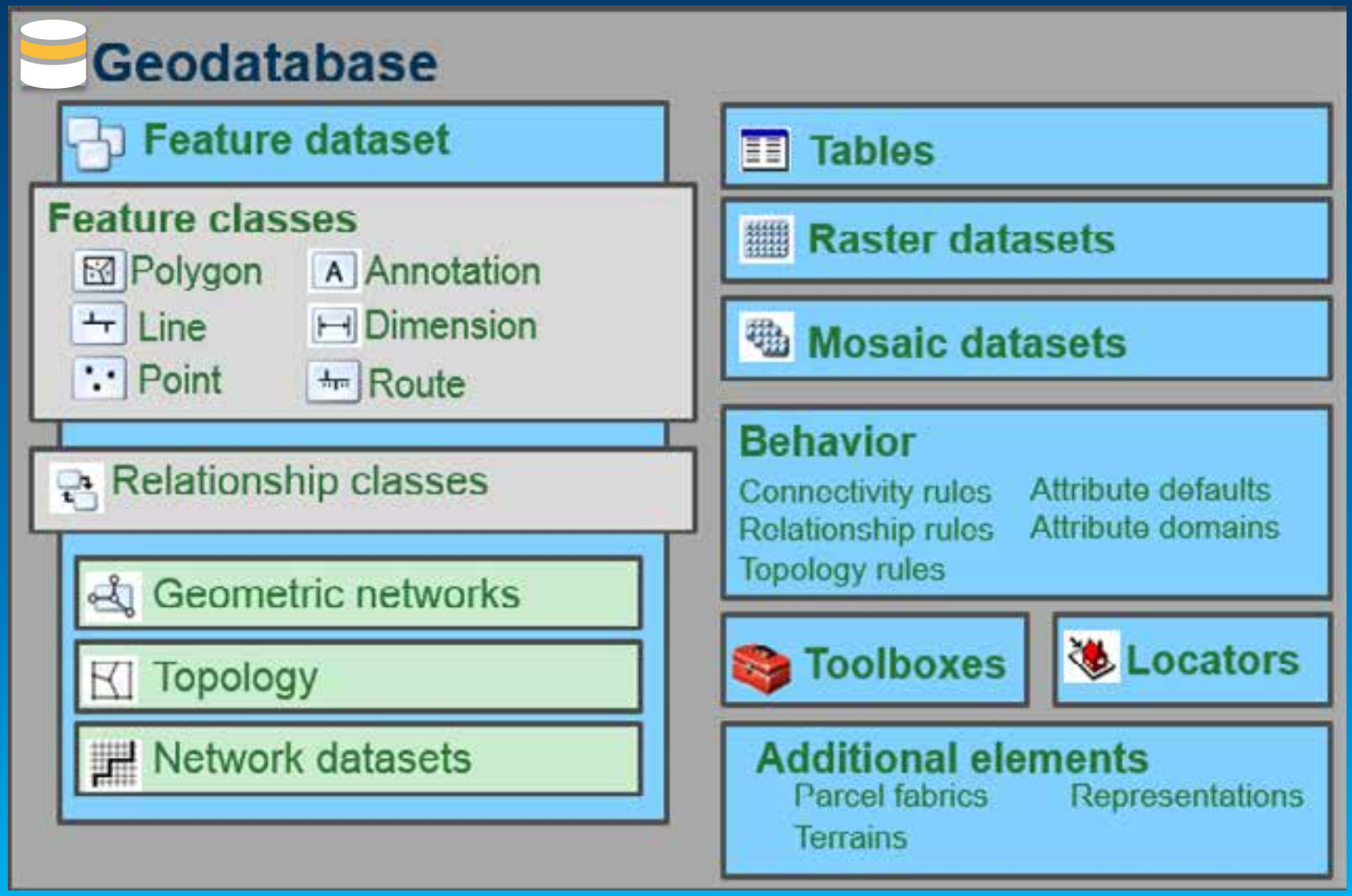
Creating a Geodatabase

- Creating a Geodatabase
- Loading existing data (shapefile, coverage, geodatabase)

Session Path

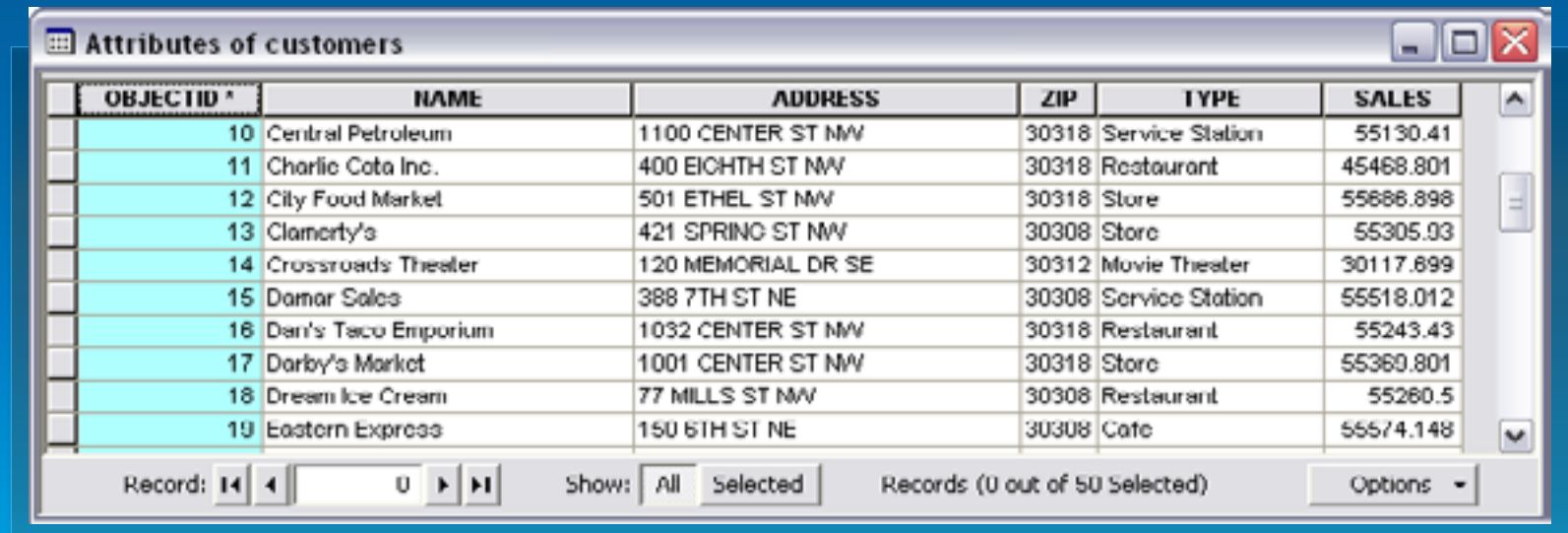
- The Geodatabase
- Inside the Geodatabase
  - Tables, Feature Classes, Rasters
  - Feature Datasets
  - Validation Rules
  - Domains, Subtypes, Relationship Classes
  - Annotation, Dimensions
- Advanced Behavior
- Additional Geodatabase Datasets

Geodatabase Elements



Tables

- Collection of data records organized by columns and rows
- Each row represents a single record
- All records in a table have the same attribute fields and behavior



Feature Classes

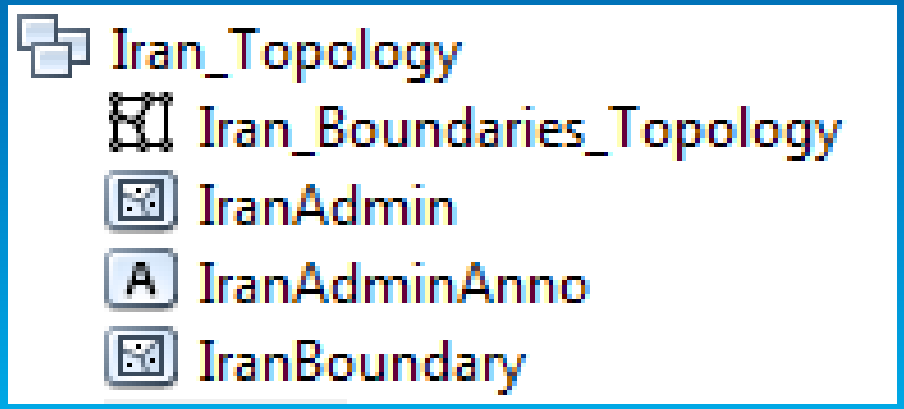
- Collection of man made or natural features
- Each record in the table corresponds to a feature
- All features have the same geometry and attribute fields
- The Shape field stores the geometry

IranAdmin

	OBJECTID *	Shape *	ADMIN_NAME	CNTRY_NAME	POP_ADMIN	SQKM	Shape_Length	Shape_Area
▶	1	Polygon	Kohkiluyeh va buyer Ahmadi	Iran	534668	13456.26	5.714665	1.267466
	2	Polygon	Bushehr	Iran	794785	24970.41	9.722385	2.306167
	3	Polygon	Esfahan	Iran	4277722	111115.33	18.542057	10.742026
	4	Polygon	Fars	Iran	4146405	128279.14	16.669143	11.902208
	5	Polygon	Mazandaran	Iran	4439267	80264.21	16.028797	8.13271
	6	Polygon	Semnan	Iran	541428	88762.32	15.024519	8.840354
	7	Polygon	Tehran	Iran	11310730	19465.29	8.896229	1.938298
	8	Polygon	Yazd	Iran	745249	68450.3	12.34858	6.520496

Feature Datasets

- A container for feature classes other datasets
  - Same spatial reference
- Contain geometric networks, topologies, terrains, etc…
  - Optionally relationship classes



Domains

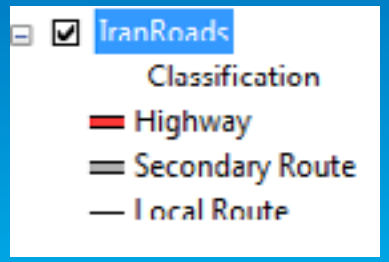
- Describe the legal values of a field type
  - Used to ensure attribute integrity
- Defined at the geodatabase level
- Types of domains:
  - Range
    - Valid values between a min / max range
    - A road can have between one and eight lanes
    - A highway can have speeds between 50 and 70 miles per hour
  - Coded Value
    - Valid values chosen from a set list
    - A road can be made of dirt, asphalt, or concrete

SurfaceType	SpeedLimit
<Null>	55
<Null>	60
Asphalt	70
Concrete	50
Dirt	50

Subtypes

- Categorize records or features into groups
  - Share the same attributes
- Defined at the class level
- Select a field to base the subtype on
  - Short or long integer field
  - Can have different default values and domains for each field
  - Can define behavior rules between subtypes

Descriptions



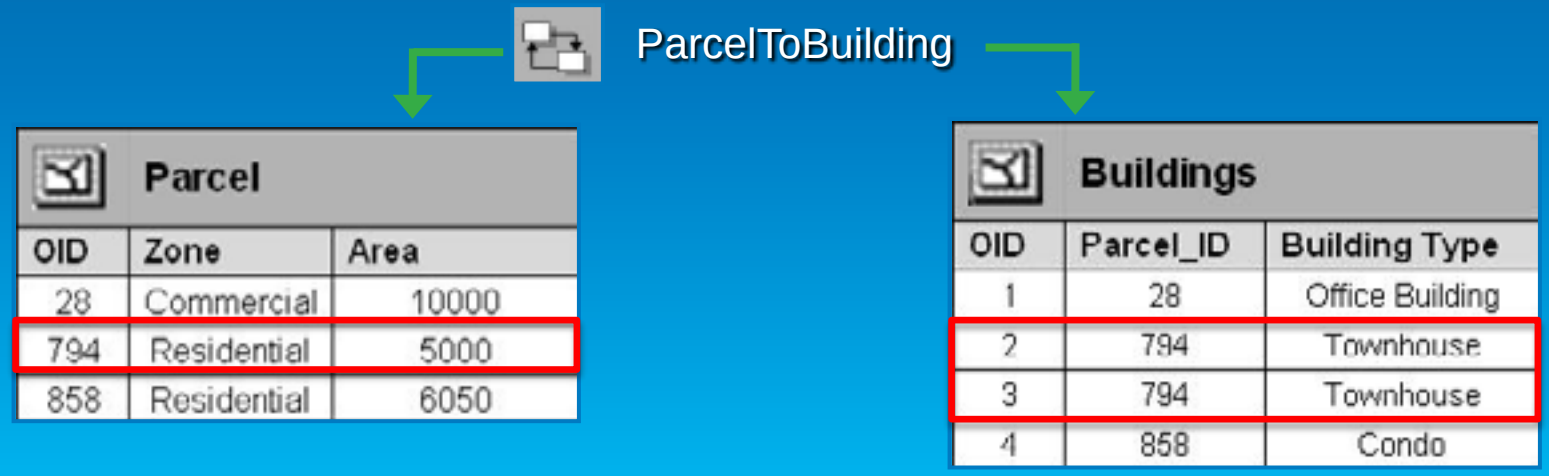
Codes

IranRoads

OBJECTID *	Shape *	SurfaceType	SpeedLimit	Classification
1	Polyline	Asphalt	60	1
2	Polyline	Asphalt	60	1
3	Polyline	Asphalt	50	2
4	Polyline	Asphalt	40	3

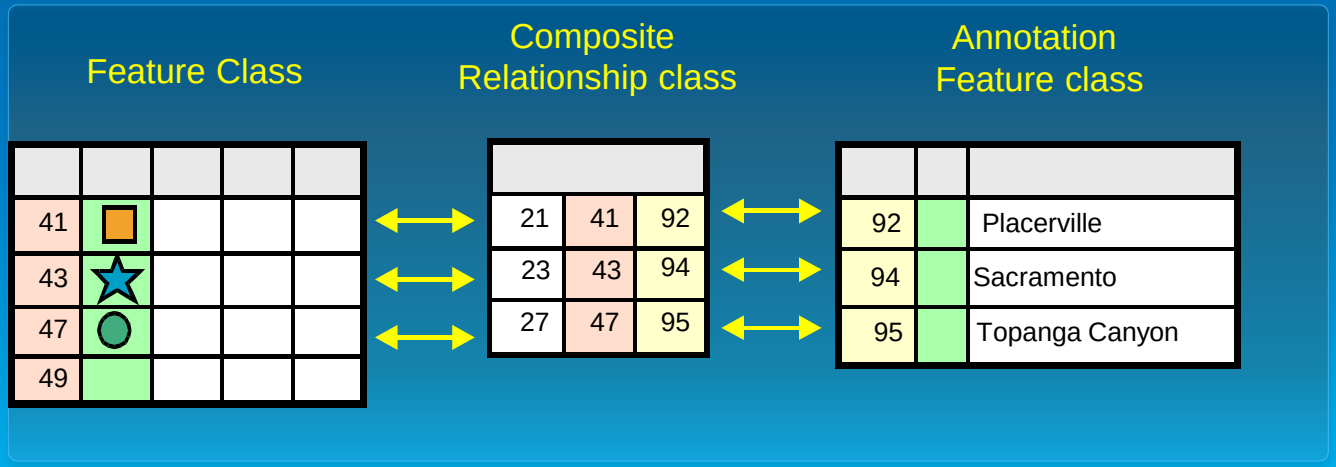
Relationship Classes

- Association between objects in one class and another
  - A class may participate in multiple relationship classes
- Simple relationships
- Composite relationships
  - Related objects can message each other
  - Can trigger behavior (cascade delete, move to follow, custom, etc.)
- Associate rules with relationship classes
  - Each Parcel can have between 1 to 3 Buildings



Annotation

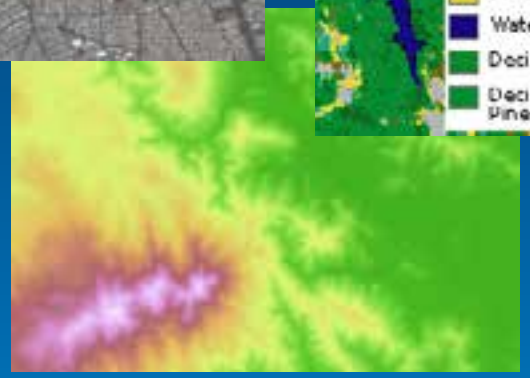
- Annotation feature classes
  - Placing text and graphics on the map
  - Feature linked or Non-feature linked
- Composite relationship manages link
- Can store text as well as other graphics
  - Lines, arrows, boxes, etc…
  - Visible scale range

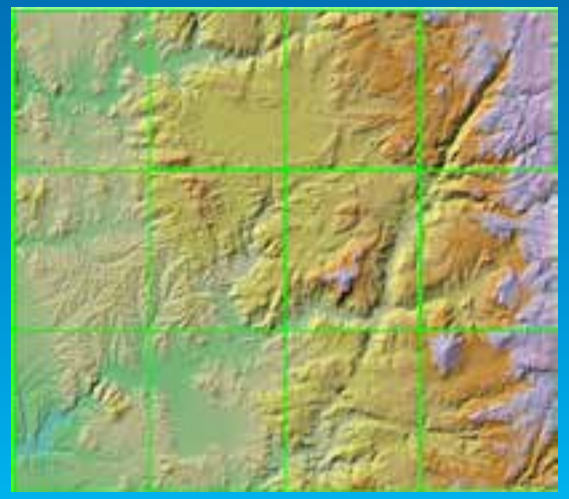


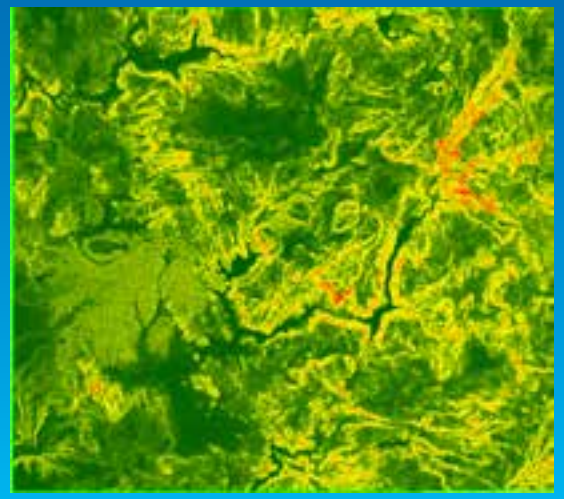
Raster Data

- Support for many formats
  - Tiff, bmp, GRID, among others

- Attribute field in a table
- Raster dataset
- Mosaic dataset
  - Data model for managing raster collections
  - Stored as a catalog, viewed as a mosaic
  - Advanced querying and on the fly processing







Exploring a Geodatabase

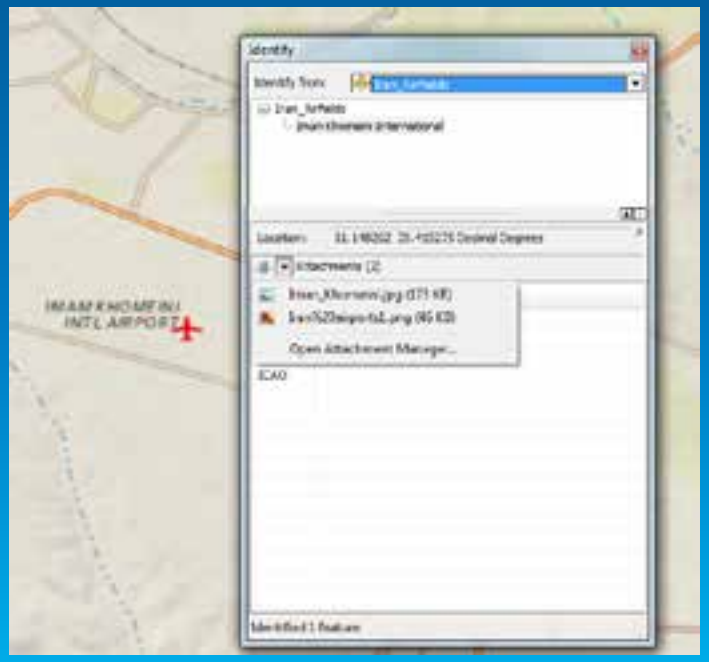
- Feature Class
- Feature Dataset
- Domains
- Annotation
- Mosaic Dataset

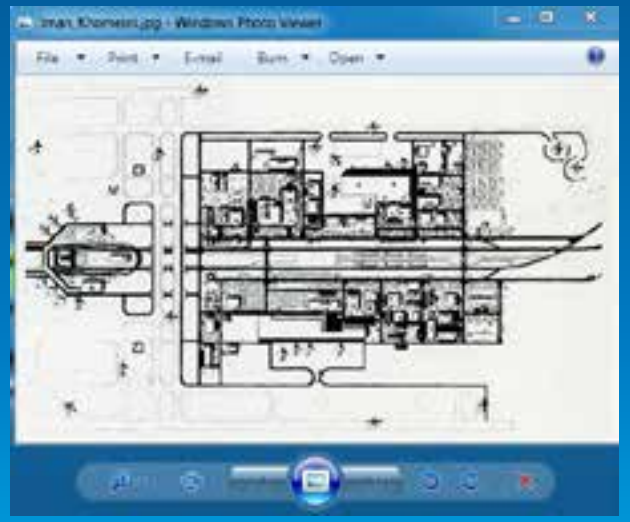
Session Path

- The Geodatabase
- Inside the Geodatabase
- Advanced Behavior
  - Attachments
  - Geodatabase Topology
  - Geometric Networks
  - Network Datasets
- Additional Geodatabase Datasets

Attachments

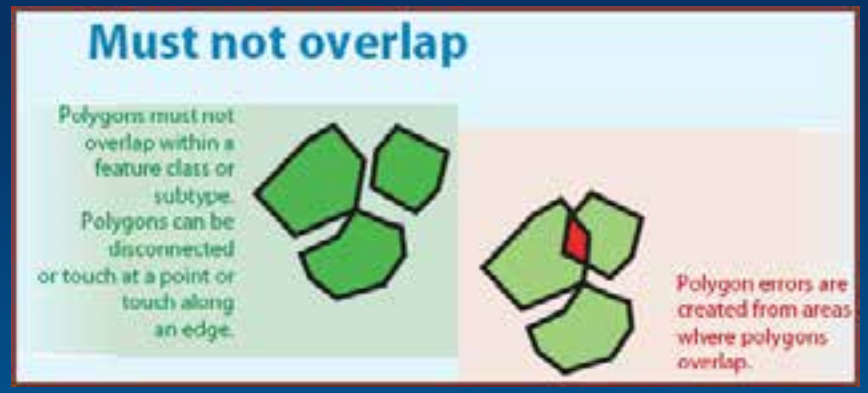
- Associate any type of file with a feature
- Available on a Feature Identify, attribute table and as HTML pop-up windows
- In ArcMap if the file type is known by Windows it can be directly accessed.

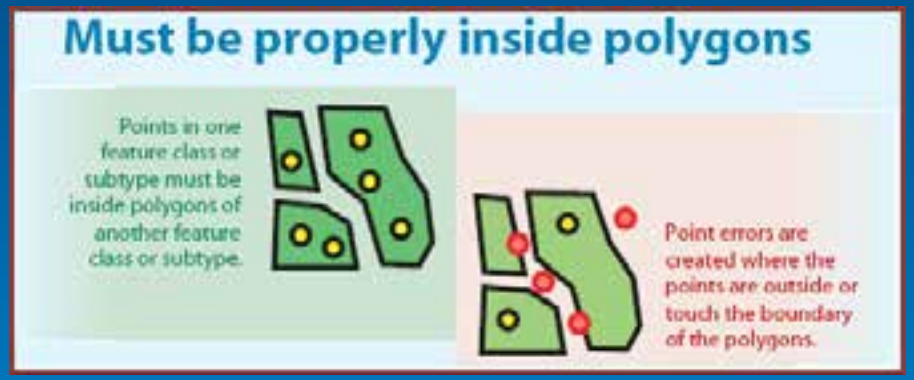


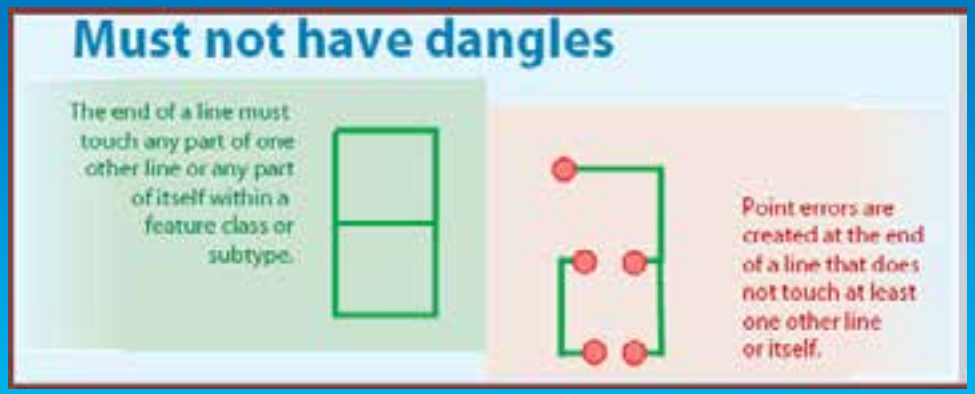


Geodatabase Topology

- A topology manages a set of simple feature classes that share geometry
- Topology is used to:
  - Constrain how features share geometry
  - Define data integrity rules
  - Ensure the quality of your data
- Rules enforced to maintain topological integrity
  - 30+ topology rules in ArcGIS

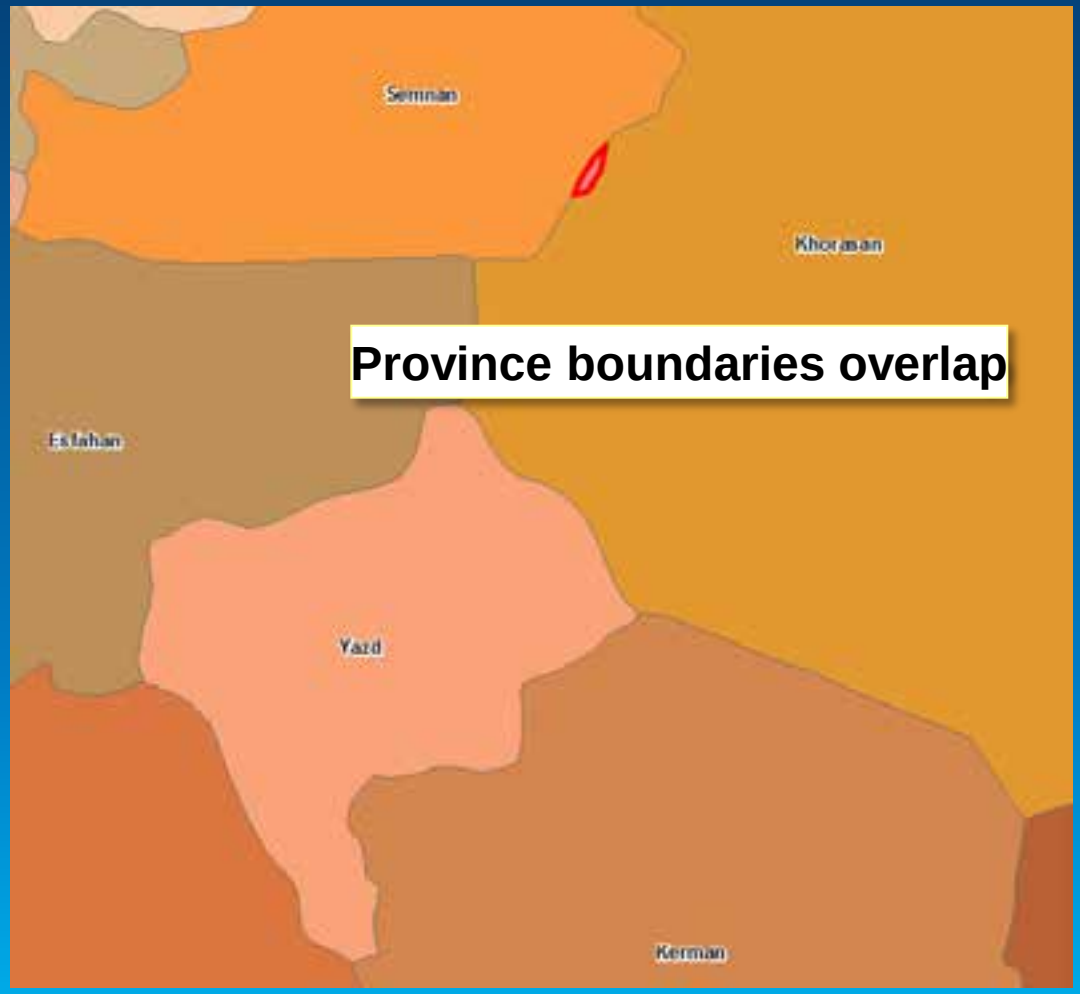






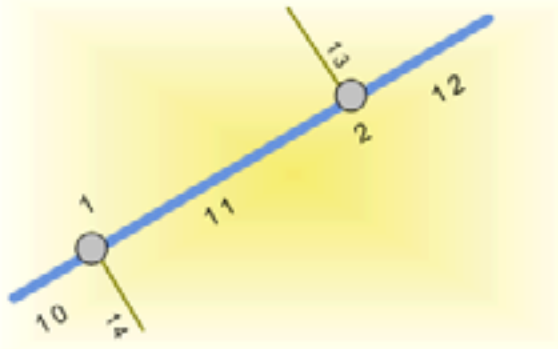
Topological Integrity

- Create topologies in a feature dataset
  - Participating feature classes / subtypes
  - Cluster tolerance, ranks and rules
- Define rules when creating the Topology
  - Rules are evaluated during validation
- Violations are expressed as error features
  - Managed in the database as a part of the topology
  - Examine and Fix errors in ArcMap



Geometric Networks

- Used to model non-decision based networks such as water, gas, oil, electric and telephone services
- Built in a feature dataset
- Geometric networks are comprised of two types of features: edges and junctions



Water junction fittings (Points)

OID	Shape	Equip ID	Valve Type
1		816-32	T203
2		816-45	Y53

Water mains (Lines)

OID	Shape	Diameter	Material
10		8	Concrete
11		10	PVC
12		8	Concrete

Water services (Lines)

OID	Shape	Service ID	Material
13		1001	Cast iron
14		1002	Copper

Downstream Trace

Find Path Trace

Network Datasets

- Network designed for the transportation industry
- Multimodal scenarios
- Edges & Junctions
- Attributes
  - Properties to control traversability
  - Travel time, restrictions, speeds
  - On-the-fly calculation of costs

Exploring a Geodatabase

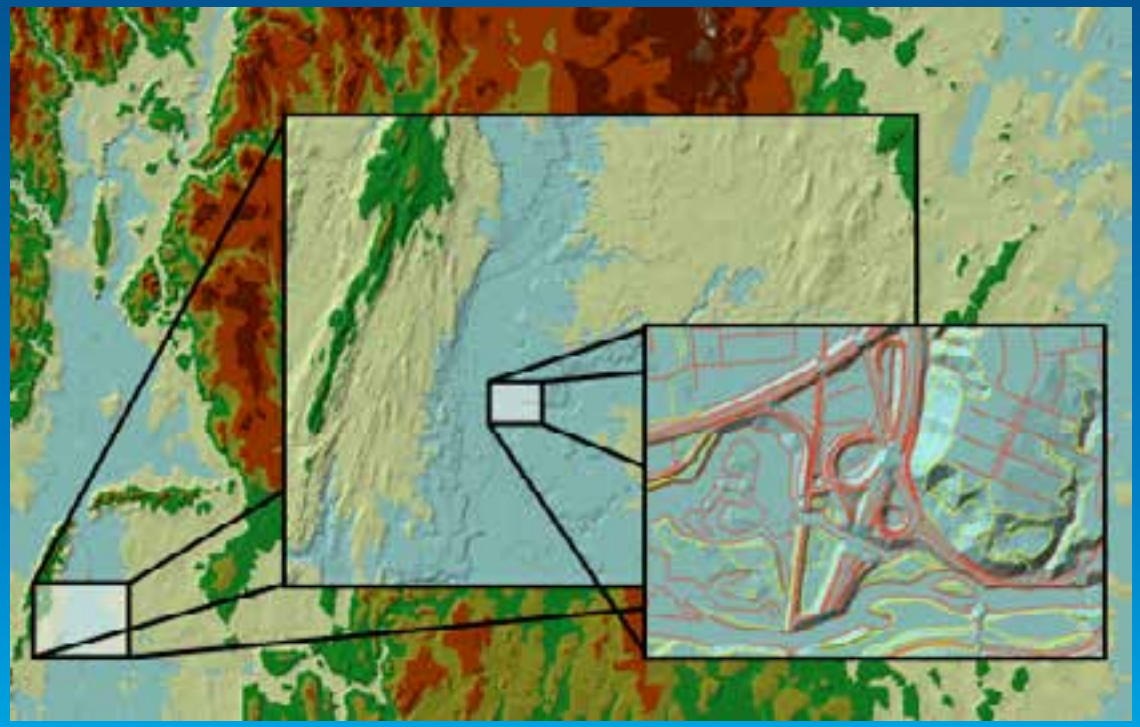
- Attachments
- Topology
- Geometric Network

Session Path

- The Geodatabase
- Inside the Geodatabase
- Advanced Behavior
- Additional Geodatabase Datasets
  - Terrains
  - Cartographic representations

Terrains

- Massive point datasets, multi-resolution, on-the-fly TIN
  - Dataset for modeling 3D surfaces
  - Modeled within a feature dataset
  - User defined terrain (pyramid) levels
- Requires 3D Analyst
  - Extension to define & edit
  - No license needed to view



Cartographic Representations

- Property of a feature class
  - Stores feature symbology
- One feature class – multiple representations
- Representation Management Toolset

Symbology for internal customers

Symbology for external customers

Exploring a Geodatabase

- Terrains
- Cartographic Representations

Notes from the Field

Questions?

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Tuesday, 6:30 PM–9:30 PM

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Tuesday, 10:45 AM–4:00 PM

- Exhibitors
- Hands-On Learning Lab
- Technical & Extended Support
- Demo Theater
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