





Working with the Geodatabase

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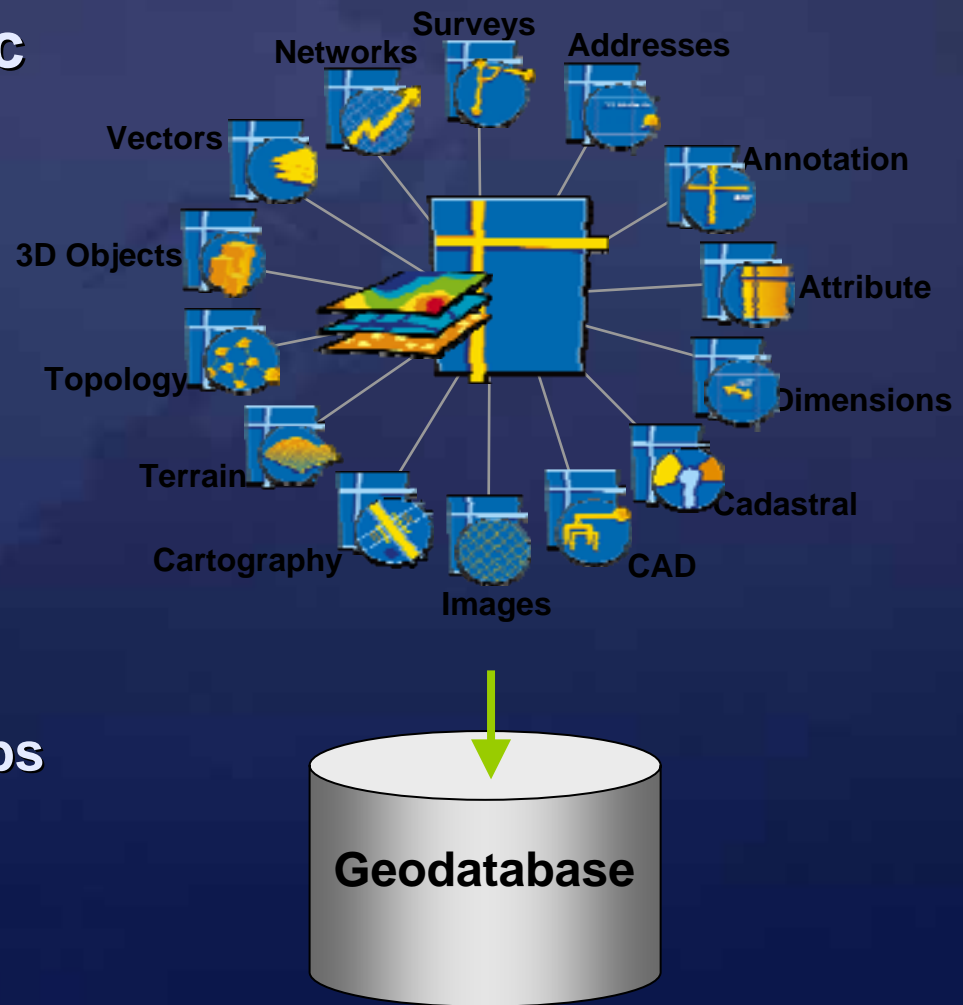
Agenda

- **What is a geodatabase?**
- **Types of geodatabases**
- **Editing concepts**
 - Versioning and Non-versioning
- **Capabilities of the Geodatabase**
 - Archiving and Replication



Defining the geodatabase

- **Collection of geographic datasets**
 - Feature classes
 - Raster data
 - Attribute tables
- **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
- **Scaleable**



Geodatabase elements

Geodatabase

Feature dataset



Spatial reference

Feature classes



Polygon



Route



Line



Dimension



Point



Annotation

Representations

Relationship classes



Geometric networks



Topology



Network datasets



Tables



Raster datasets



Raster catalogs



Behavior

Connectivity rules

Attribute defaults

Relationship rules

Attribute domains

Topology rules

Toolboxes



Tool



Model



Script

Additional geodatabase elements

Survey datasets

Terrain datasets

Schematics

Network datasets



Types of Geodatabase

■ Personal Geodatabase

- Since ArcGIS 8.0
- Implemented in a Microsoft Access file (**.mdb file**)

■ File Geodatabase

- New at ArcGIS 9.2
- Implemented as a collection of files in a directory (**.gdb folder**)
- Recommended that users of pGDB migrate to fGDB

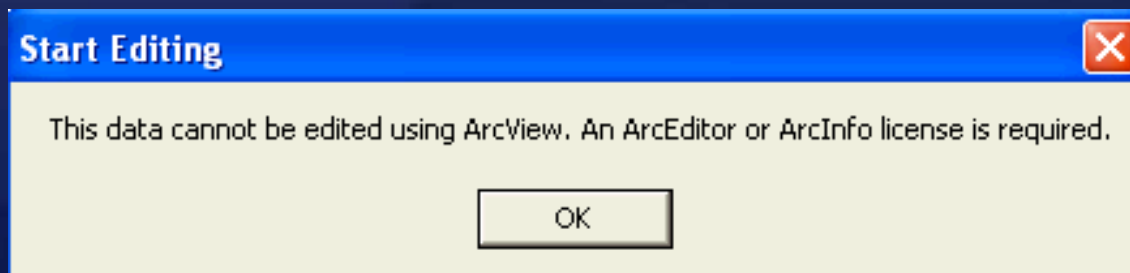
■ ArcSDE Geodatabase

- Stored in a RDBMS
- Employs ArcSDE Technology
- Three kinds: **Enterprise, Workgroup, and Personal**



ArcGIS Desktop licensing

- **Geodatabase functionality based on license**
 - **ArcView**
 - ArcGIS Desktop geodatabase creation and editing
 - Some behavior creation (subtypes, domains)
 - **ArcEditor/ArcInfo (includes all from ArcView)**
 - ArcGIS Server Workgroup and Enterprise editing and managing
 - Create additional elements (topology, networks, relationship classes)
 - Additional behavior creation (connectivity rules, relationship rules)

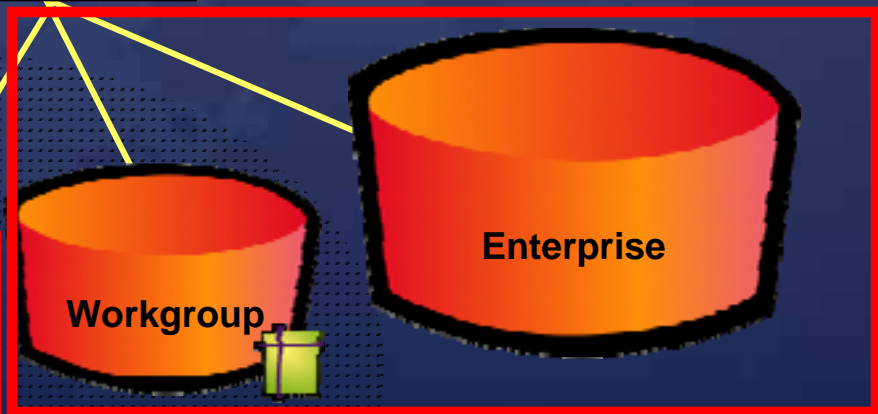
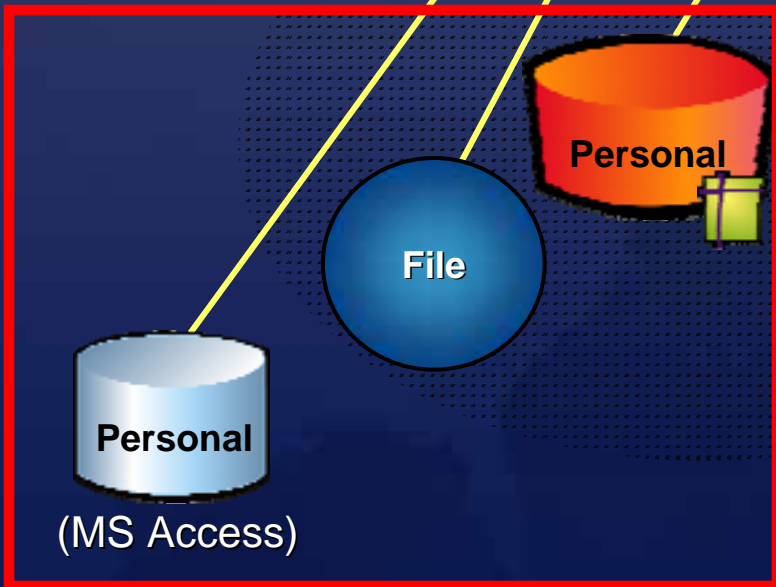




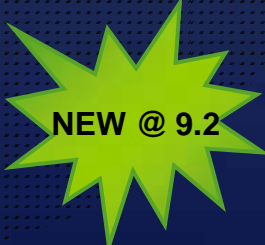
The Scalable Geodatabase



Single-User GDBs



Multi-User GDBs



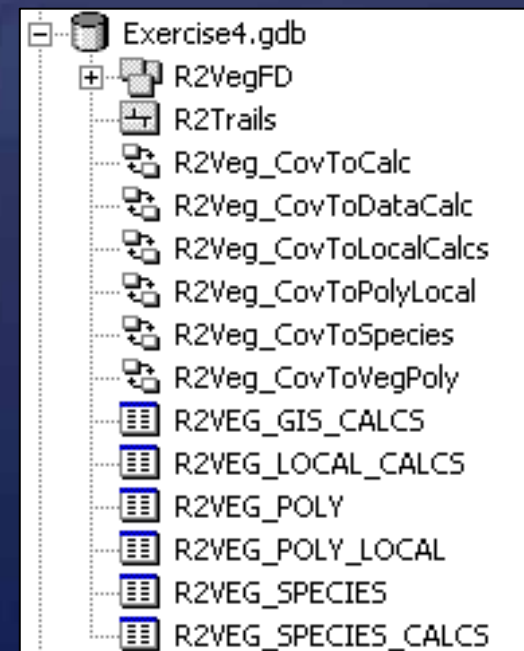
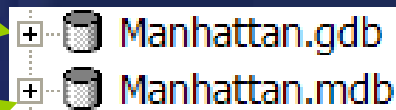


File geodatabase

- Enhanced desktop geodatabase
- Stored in the file system as a folder
- Supports all geodatabase elements
- Has .gdb extension, not .mdb

File geodatabase

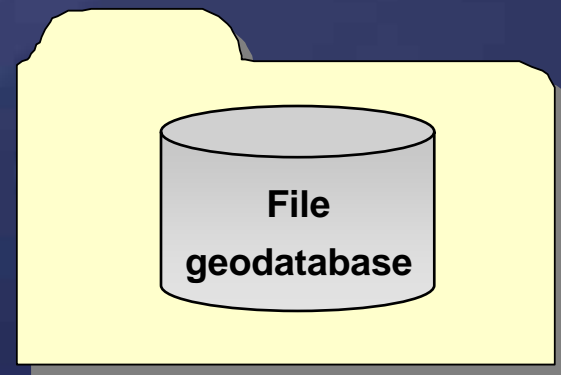
Personal geodatabase





Advantages of file geodatabase

- No storage size limit on database
 - 1 terabyte per feature class or table
- Takes up less disk space
- Improved performance
- Customize storage
 - Compression of vector data
 - Faster query and display
- Less restrictive editing locks
- Cross platform
 - Windows and UNIX (Solaris and Linux)

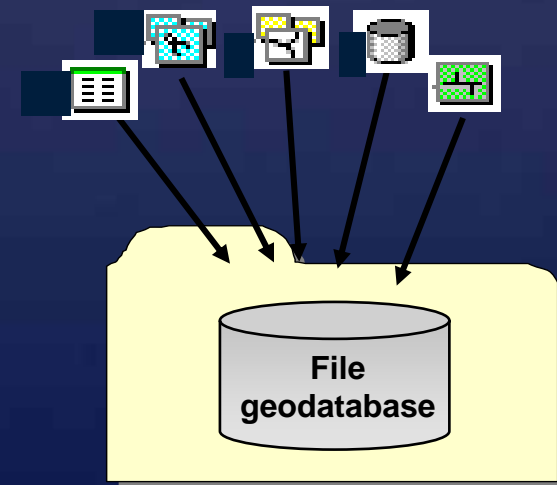
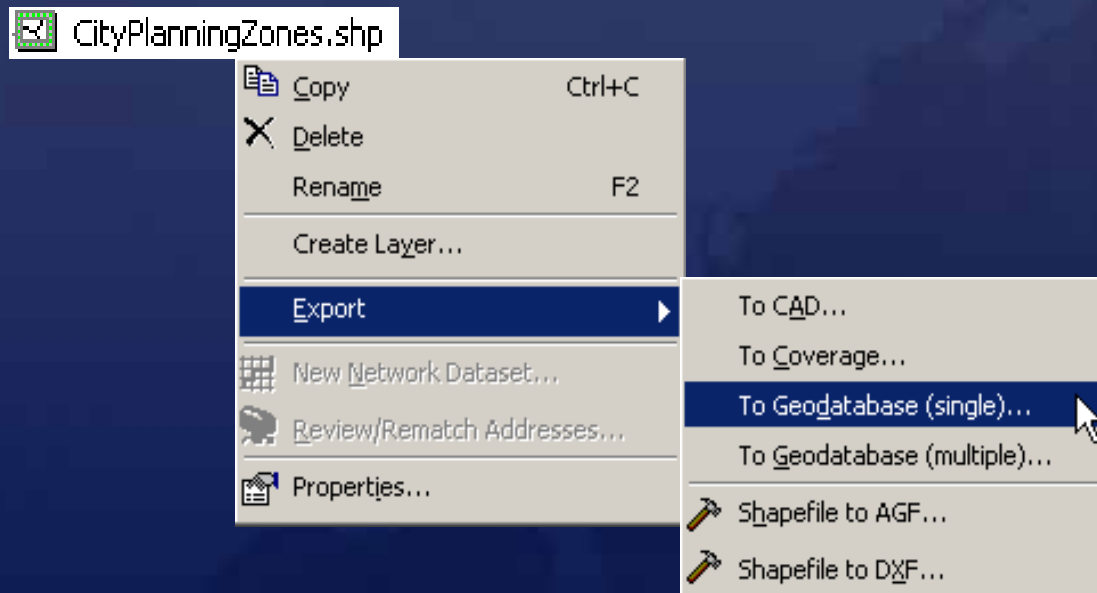


ESRI will continue to support the personal geodatabase, but users are encouraged to migrate for these benefits



Migrating to file geodatabase

- ArcCatalog and ArcToolbox import/export tools
 - Personal geodatabase, shapefiles, coverages, etc.
- Drag/drop or copy/paste
 - Personal geodatabase for Access to file or enterprise geodatabase





DEMONSTRATION

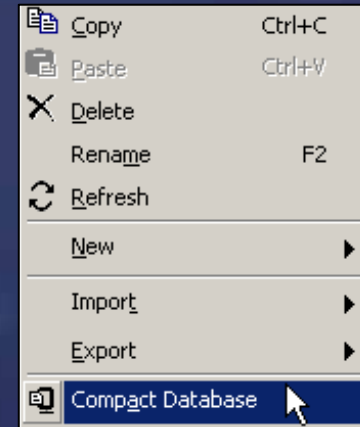
Create file geodatabase

*Migrate a shapefile and Personal Access GDB elements
to File Geodatabase Feature Classes*



Migration considerations

- Leave sufficient disk space
- Occasionally defragment hard drive
- Compact regularly
- Different SQL syntax
 - In queries, delimit fields with “ ” (not [])
 - Where clause in Python will change
 - String searches case sensitive
 - Wildcards _ and % (not ? and *)
 - UPPER and LOWER (not UCASE and LCASE)
 - Precede dates with *date* (not #)



Personal geodatabase fields

```
[OBJECTID]  
[FID_Parcels]  
[PID]  
[ACRES]  
[SYMBOL]  
[PARCELNUM]
```

File geodatabase fields

```
"OBJECTID"  
"FID_Parcels"  
"PID"  
"ACRES"  
"SYMBOL"  
"PARCELNUM"
```



ArcSDE Geodatabases

- **Personal ArcSDE**
 - Free with ArcEditor and ArcInfo
- **ArcGIS Server Workgroup**
 - Ten concurrent users – all can be editing
- **Personal ArcSDE and ArcGIS Server Workgroup**
 - Microsoft SQL Server Express 2005
 - 4 GB database limit
- **ArcGIS Server Enterprise**
 - IBM DB2, Informix, Oracle, SQL Server
 - No size limit of database



Comparing ArcSDE editions



	ArcSDE Personal	ArcSDE Workgroup	ArcSDE Enterprise
Supported DBMS	SQL Server Express	SQL Server Express	DB2, Informix, Oracle, SQL Server
Supported O/S platforms	Windows	Windows	Windows & UNIX (LINUX, Solaris)
Management interface	ArcCatalog	ArcCatalog	ArcCatalog, SDE command line, & DBMS
Supported Storage capacity	4 GB	4 GB	Unlimited
Licensing availability	ArcEditor/ArcInfo ArcGIS Desktop	ArcGIS Server for Workgroups	ArcGIS Server for Enterprises
Number of users	3 concurrent users (1 editor)	10 concurrent editors & readers	Unlimited concurrent editors & readers
Application	Individual desktop and mobile use	Intranet & internet	Intranet & internet



What happened to ArcSDE at 9.2?

- At version 9.2, ArcSDE is no longer separately sold
- ArcSDE still has its own installation & service packs
 - Enterprise ArcSDE updated via the ArcSDE SPs
 - Personal and Workgroup ArcSDE are updated via the ArcGIS Desktop SPs
- ArcGIS Server license file contains ArcSDE license info
 - File must be used twice (during ArcGIS Server and ArcSDE post-installations)





Editing Concepts

*Versioning
And
Non-versioning*



Editing in a geodatabase

- Use tools to maintain data integrity while editing
- Personal and file geodatabase: single editor
- Multiuser geodatabase: many editors

WilsonCnty_NC (dbo.DEFAULT)
WilsonCnty_NC.DBO.roads



Attributes	
Property	Value
OBJECTID	4568
ID	1271
OBJECTID	4568
MONTH_	0
YEAR_	1900
NAME	EDGECOMBE RD
NAME2	SR 1512
NAME3	
LEFT_ADDRESS_FROM	0
LEFT_ADDRESS_TO	0

21 features



Multiuser geodatabase editing

- Supports a variety of editing **workflows**
- **Essential** to devise data maintenance strategies
 - Non-versioned editing
 - Versioned editing
 - Archiving
 - Geodatabase replication
- Consider the following:
 - Business needs
 - Non-ESRI client access
 - Necessity of schema and behavior changes





Transaction models

- Short transaction

- Implemented through non-versioned editing
- Traditional DBMS model
- Locks applied to edited rows
- Often **impractical** for GIS edits



- Long transaction

- Implemented through **versioning**
- Work is isolated
- **Extends multiuser editing capabilities**





Multiuser Editing Options

■ Non-versioned

- No undo/redo functionality
- Edits are visible to all geodatabase users once saved
 - No conflict detection mechanism

■ Versioned

- Undo/redo capability
- Edits are isolated in the edit session or version
- Many users edit the same feature class at the same time*
 - Same version or different versions
 - Built-in mechanism for detecting and resolving conflicts

***Except in personal ArcSDE geodatabases**



Non-versioned editing

- Uses DBMS short transaction model
 - Save – **saves all edits**, updates visible to the outside world
 - Exit without saving – **loses all edits** made since the last save
- Changes visible to geodatabase users upon refresh
 - Zoom, pan, map refresh
- Benefits:
 - Non-ESRI applications can read and modify same data
 - Very simple to implement

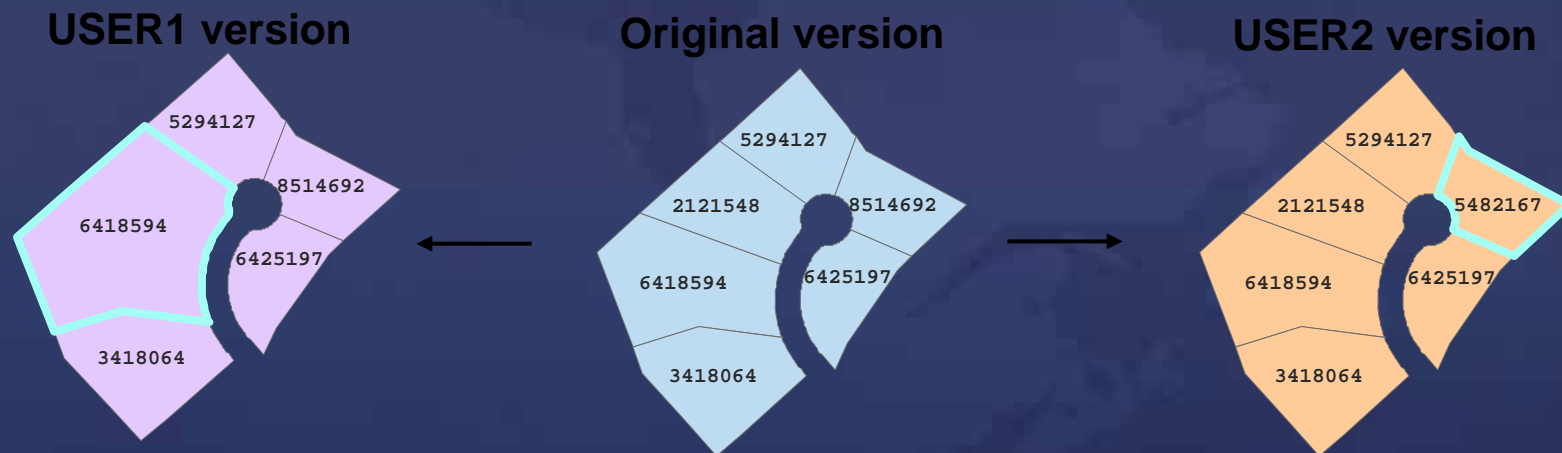


Property	Value
OBJECTID	2279
TRNL_	11778
TRNL_ID	22677
PREFIX	
NAME	Yarrow
TYPE	Ln

1 features



Overview of versioned editing



- Method of **presenting and tracking** changes to tables
 - Groups of changes accessed as self-consistent versions
- **Multiple**, alternate versions may coexist
 - Appears to users that they have their own copy of table
- Includes mechanisms for **reconciling** versions
 - Integrates changes into one version
 - Clients offered tools to resolve **conflicts**



Versioned editing

■ Benefits:

- Can edit simple and complex geodatabase data
- Versions can help isolate work
- Conflict detection and resolution between editors and versions
- Undo/redo ability
- Support for geodatabase replication and archiving

■ Limitations:

- Non-ESRI applications do not understand edits in delta tables
 - Can provide access with multiversions views or alternate workflow
- DBMS behavior is restricted



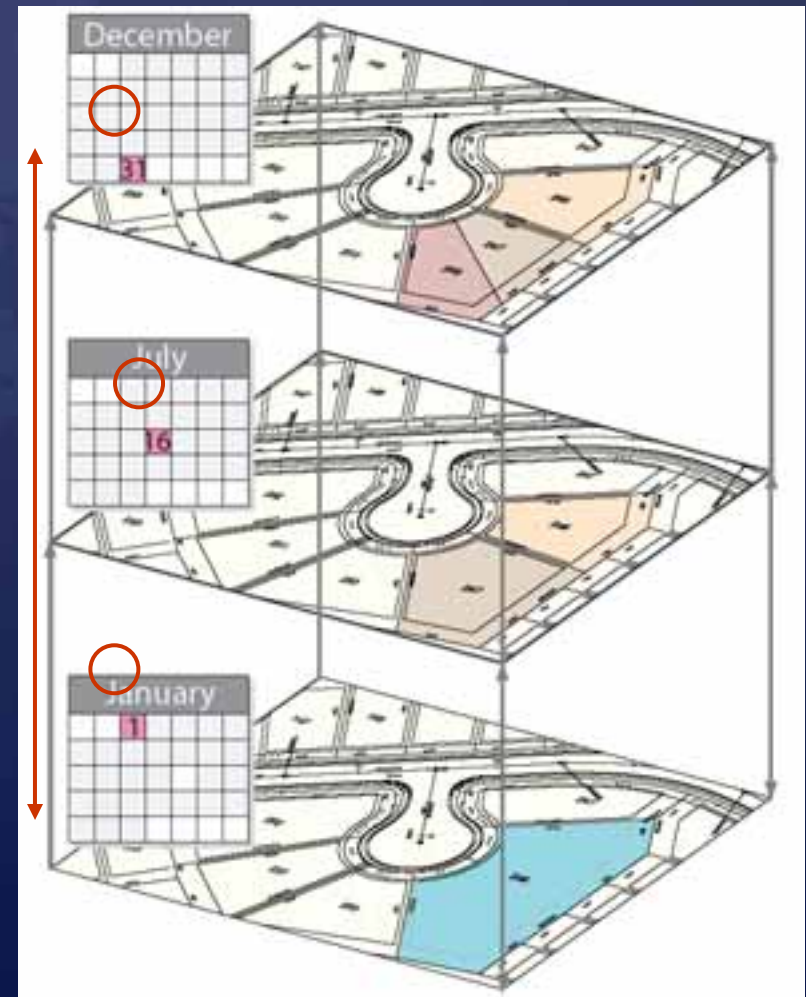
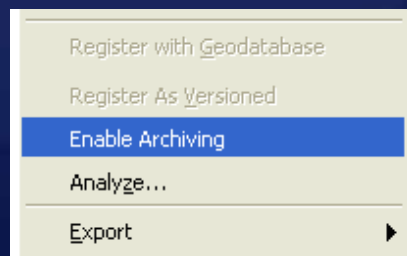
Capabilities of the Geodatabase

*Archiving
And
Replication*



Geodatabase archiving

- Built on versioning architecture
- Maintain record of edit transactions
- Edits are preserved in a history class
 - Denoted with FROM and TO dates
 - **Transaction time** is recorded – may not be the time of the event





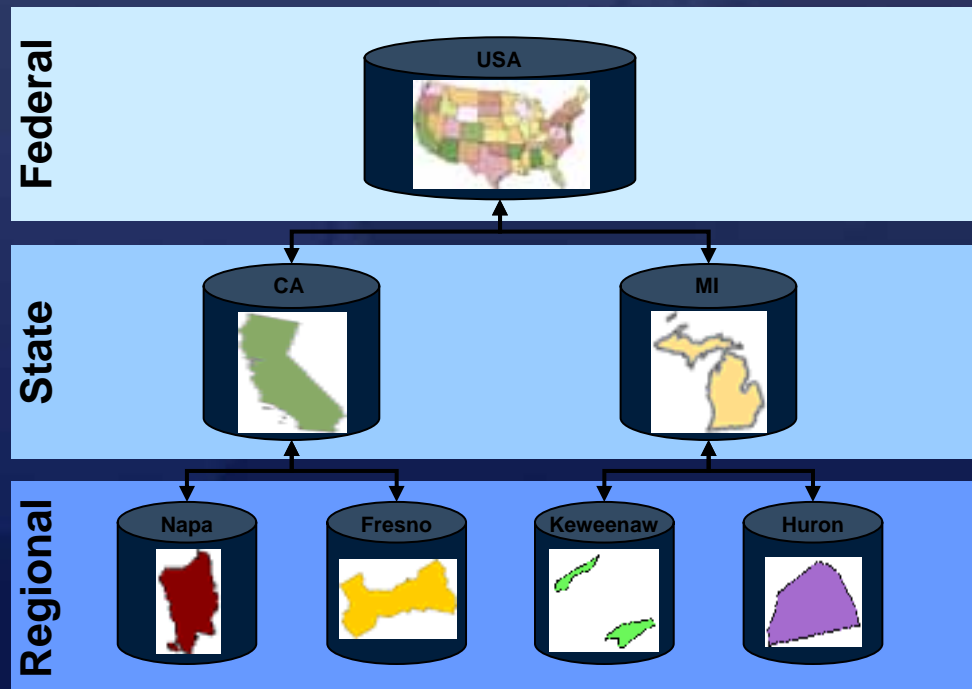
DEMONSTRATION

Geodatabase Archiving



Geodatabase replication

- Copies of data distributed among geodatabases
 - Users at different locations can edit the same data
 - Founded on versioning
- Changes can be synchronized across geodatabases





Single-generation replication

- Replica type: **checkout/check-in**
 - Prior to ArcGIS 9.2, known as *disconnected editing*
- Only **one** synchronization allowed
 - Example: mobile crew replicates data for field updates
- **Parent: must be ArcSDE geodatabase**
- **Child: any geodatabase**



One synchronization



Multigeneration replication

- Two replica types based on synchronization options:
 - **One-way** (read-only)
 - Example: county offices update state offices, state updates federal
 - **Two-way** (read/write)
 - Example: edits done in different offices, updates sent back and forth
- **Multiple** synchronizations possible
- Parent and child: must be **ArcSDE** geodatabase



One-way: multiple synchronizations



Two-way: multiple synchronizations



Wrap-up



Summary

- **Types of geodatabases**
- **Geodatabase elements and behaviors**
 - Types of geodatabases
 - Subtypes, domains, ...
 - Topologies, networks, ...
- **Editing Options**
- **Capabilities**
 - ArcSDE – Versioning, replication, archiving
- **So, why should you use the geodatabase?**
 - Model advanced spatial relationships, enforce data integrity, multi-user access, ...

ESRI Geodatabase Training (by job role)



■ End User

- Building Geodatabases
- Introduction to the Multi-User Geodatabase

■ Geodatabase Administrator

- Data Management in the Multi-User Geodatabase
- Managing Editing Workflows in the Multi-User Geodatabase

■ DBA

- ArcGIS Server Enterprise Configuration & Tuning - SQL Server
- ArcGIS Server Enterprise Configuration and Tuning – Oracle



**Thank you
for attending!**

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