Editing Strategies for Enterprise Geodatabases

Brent Pierce
Shawn Thorne
Assumptions

- Basic knowledge of relational databases
- Basic knowledge of the Geodatabase data model
  - Many other session that focus on this
- We’ll hold all questions till end

Please Turn Off Cell Phones
Session Path

- Introduction to the Enterprise Geodatabase
  - What is the Geodatabase?
  - The Geodatabase Management Approach
  - Different types of Geodatabases
  - What are the benefits of a Enterprise Geodatabase?
- Versioning
- Types of Editing
- Archiving
- Geodatabase Replication
What is the Geodatabase?

- A physical store of geographic data
  - Scalable storage model supported on different platforms

- Core ArcGIS data model
  - A comprehensive model for representing and managing GIS data

- A transactional model for managing GIS workflows

- Set of COM components for accessing data
Geodatabase Data Management Approach

• The Geodatabase is built on an extended relational database.
  - Base relational model
  - Base short transaction model
  - Relational integrity
  - Reliability, Flexibility, Scalability

• Simple features + logic
  - All geographic data stored as tables in a DBMS
  - Functionality is consistent across DBMS’

  - Extend functionality and data integrity
Geodatabase Data Management Approach…

• Editing and data compilation
  - Rich set of editing tools
  - Maintain spatial and attribute integrity
  - Undo and redo edits
  - Multiple users editing the same data

• Robust, customizable framework
## Three Types of Geodatabases

<table>
<thead>
<tr>
<th></th>
<th>Personal GDB</th>
<th>File GDB</th>
<th>Enterprise GDB (3 editions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage format</strong></td>
<td>Microsoft Access</td>
<td>Folder of binary files</td>
<td>DBMS</td>
</tr>
<tr>
<td><strong>Storage capacity</strong></td>
<td>2 GB</td>
<td>1 TB per table*</td>
<td>Depends on edition</td>
</tr>
<tr>
<td><strong>Supported O/S platform</strong></td>
<td>Windows</td>
<td>Any platform</td>
<td>Depends on edition</td>
</tr>
<tr>
<td><strong>Number of users</strong></td>
<td>Single editor Multiple readers</td>
<td>Single editor Multiple readers</td>
<td>Multiple editors &amp; readers</td>
</tr>
<tr>
<td><strong>Distributed GDB functionality</strong></td>
<td>Check out/check in One way replication</td>
<td>Check out/check in One way replication</td>
<td>Replication (all types) &amp; versioning</td>
</tr>
</tbody>
</table>
What is an Enterprise Geodatabase?

• Also referred to as an ArcSDE Geodatabase

• ESRI’s technology for accessing and managing geospatial data in relational databases

• Enterprise Geodatabases are unique in their support of the following capabilities:
  - Open and interoperable across many supported DBMSs
  - Offers support for full, open SQL access to geodatabases
  - Versioning, Replication and Archiving
How is ArcSDE technology included in ArcGIS?

- ArcGIS
- Geodatabase
- ArcSDE
- DBMS
- Operating system

Enterprise Geodatabase
### Which Enterprise Geodatabase edition?

<table>
<thead>
<tr>
<th>ArcGIS Product</th>
<th>ArcSDE for ArcGIS Desktop</th>
<th>ArcSDE for ArcGIS Server Workgroup</th>
<th>ArcSDE for ArcGIS Server Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ArcGIS Product</strong></td>
<td>ArcGIS and Desktop Engine*</td>
<td>ArcGIS Server Workgroup</td>
<td>ArcGIS Server Enterprise</td>
</tr>
<tr>
<td><strong>Number of users</strong></td>
<td>Max 3 users, 1 editor at any one time</td>
<td>Max 10 clients at one time No limit to the number of connections</td>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Supported DBMS</strong></td>
<td>SQL Server Express 2005</td>
<td>SQL Server Express 2005</td>
<td>Oracle, SQL Server, DB2, Informix, PostGreSQL</td>
</tr>
<tr>
<td><strong>Database limits</strong></td>
<td>Max database size 4 Gig 1 GB RAM on a single cpu</td>
<td>Max database size 4 Gig 1 GB RAM on a single cpu</td>
<td>No limits</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>ArcGIS Desktop (ArcCatalog)</td>
<td>ArcGIS Desktop (ArcCatalog)</td>
<td>ArcGIS Desktop, Command line tools, DBMS admin software</td>
</tr>
</tbody>
</table>

- Scale from small, personal systems up to workgroups and very large enterprises.
## Which Enterprise Geodatabase edition?

<table>
<thead>
<tr>
<th>ArcGIS Product</th>
<th>ArcSDE for ArcGIS Desktop</th>
<th>ArcSDE for ArcGIS Server Workgroup</th>
<th>ArcSDE for ArcGIS Server Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>ArcGIS Product</td>
<td>ArcGIS and Desktop Engine*</td>
<td>ArcGIS Server Workgroup</td>
<td>ArcGIS Server Enterprise</td>
</tr>
<tr>
<td>Number of users</td>
<td>Max 3 users, 1 editor at any one time</td>
<td>Max 10 clients at one time No limit to the number of connections</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Supported DBMS</td>
<td>SQL Server Express 2005</td>
<td>SQL Server Express 2005</td>
<td>Oracle, SQL Server, DB2, Informix, PostgreSQL</td>
</tr>
<tr>
<td>Database limits</td>
<td>Max database size 4 Gig 1 GB RAM on a single cpu</td>
<td>Max database size 4 Gig 1 GB RAM on a single cpu</td>
<td>No limits</td>
</tr>
<tr>
<td>Administration</td>
<td>ArcGIS Desktop (ArcCatalog)</td>
<td>ArcGIS Desktop (ArcCatalog)</td>
<td>ArcGIS Desktop, Command line tools, DBMS admin software</td>
</tr>
</tbody>
</table>

Scale from small, personal systems up to workgroups and very large enterprises
## Which Enterprise Geodatabase edition?

<table>
<thead>
<tr>
<th>ArcGIS Product</th>
<th>ArcSDE for ArcGIS Desktop</th>
<th>ArcSDE for ArcGIS Server Workgroup</th>
<th>ArcSDE for ArcGIS Server Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>ArcGIS and Desktop Engine*</td>
<td>Max 3 users, 1 editor at any one time</td>
<td>Max 10 clients at one time No limit to the number of connections</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Supported DBMS</td>
<td>SQL Server Express 2005</td>
<td>SQL Server Express 2005</td>
<td>Oracle, SQL Server, DB2, Informix, PostGreSQL</td>
</tr>
<tr>
<td>Database limits</td>
<td>Max database size 4 Gig 1 GB RAM on a single cpu</td>
<td>Max database size 4 Gig 1 GB RAM on a single cpu</td>
<td>No limits</td>
</tr>
<tr>
<td>Administration</td>
<td>ArcGIS Desktop (ArcCatalog)</td>
<td>ArcGIS Desktop (ArcCatalog)</td>
<td>ArcGIS Desktop, Command line tools, DBMS admin software</td>
</tr>
</tbody>
</table>

Scale from small, personal systems up to workgroups and very large enterprises
Session Path

• Introduction to the Enterprise Geodatabases
• Versioning
  - What is it?
  - Why Use Versioning?
• Types of Editing
• Archiving
• Geodatabase Replication
Versioning: What is it?

- Technology that allows multiple users to edit and view data at the same time
  - Appears to users as if they have their own copy of a table
  - Does not apply locks or duplicate data
What is a Version?

- An alternative view of the Geodatabase that has:
  - an owner
  - a description
  - a permission
  - a parent version

- Versions are not affected by changes occurring in other versions of the database
What is a Version?

- An alternative view of the Geodatabase that has:
  - an owner
  - a description
  - a permission
  - a parent version

- Versions are not affected by changes occurring in other versions of the database
Why Use Versioning?

• Multiple Editors Accessing Data

• Need Different Views of the Data

• Editing Complex Data (e.g. Geometric Networks)

• Replication and Archiving
Why Use Versioning?...

- Editing with long transactions
  - Isolate work across multiple sessions
  - Edits do not impact others

- Model what-if scenarios
  - Simulate situations with versions

- Workflow management
  - Create versions for project stages
Session Path

- Introduction to the Enterprise Geodatabase
- Versioning
  - Types of Editing
    - Versioned Editing
    - Non-Versioned Editing
    - Editing through SQL
- Archiving
- Geodatabase Replication
Editing Geodatabases

• Short Transactions
  - Small number of operations completed quickly
  - E.g., ATM transactions, Library records, Timecards
  - Concurrent transactions are isolated

• Long Transactions
  - Large number of operations over a long time period
  - E.g., Parcel updates, General geographic editing
  - Multiuser editing without locking or data duplication
  - Editors work with unique isolated view of the geodatabase

• GIS editors need both short and long transactions
Three different ways of editing Geodatabases

• Editing in a version through ArcGIS
  - Versioned Editing (Long Transactions)

• Editing the data directly through ArcGIS
  - Non-Versioned Editing (Short Transactions)

• Editing the data directly through SQL
  - Editing through SQL (Short Transactions)
Versioned Editing

• Versioned Edit Sessions
  - Editing done through a version
  - Support concurrent editing with long transactions (hours/days)
  - Undo/redo editing experience
  - No locking or data extraction required
How Versioning Works

- Class must be registered as Versioned
  - Creates Adds and Deletes tables for tracking edits
How Versioning Works

• Adding Features
  - Record added to the Adds Table
  - Version will be referenced (SDE_State_ID Field)
How Versioning Works

- **Deleting Features**
  - Record added to Deletes Table
  - Version will be referenced (Deleted_At field)
How Versioning Works

- **Updating Features**
  - Record added to both Adds and Deletes table
  - Version will be referenced (SDE_State_ID Field)
How Versioning Works

• Versioned representation of a feature class is a combination of records in:
  - Base Tables, Adds Tables & Deletes Tables
Versioned Editing – Reconcile and Post

- How can versions be merged?
  - Through a process called reconcile and post
Versioned Editing – Reconcile

- Reconcile pulls any changes from the target version into the edit version
  - Any conflicts will be detected
Reconcile and Conflicts

- Versioning does not lock data when it is edited
  - Because of this we must make sure data is not overwritten
  - We do this through conflict detection during a reconcile
- A feature will be in conflict any time it has changed on both versions
- Conflict Resolution Dialog
Versioned Editing – Post

• Posting versions merges any changes in the edit version into the target version
  - After a post versions are identical
Versioned Editing - Move to Base Option

• What is it?
  - Versioned editing with the ability to move changes made in the Default version into the base tables
  - Changes made in non-Default versions are still stored in the delta tables

• Designed for IT integration
  - Edits visible to 3rd part applications as soon as they are saved

• Simple data only
  - Points, lines, polygons, annotation, relationship classes
  - No Topology, Geometric Networks…etc
Versioned Editing - Move to Base

- Why would I use the move to base option?
  - Want version editing experience but…
  - Need to integrate with 3rd party applications
  - Use of database constraints when editing DEFAULT version
Non-Versioned Editing

- Directly editing the database tables
  - Not editing in a version
  - Designed for IT integration
    - Suggested for Non-ESRI client interaction
  - Database integrity rules
  - Simple data only (Points, Lines, Polygons), No Topology, Geometric Networks…etc
**SQL Editing**

- SQL can be used to update data directly

- Geometry editing possible through spatial types
  - All supported databases have spatial types

- **Spatial Types**
  - Why are they useful?
  - ESRI Client not necessary to edit data
  - SQL access to geometries
Geodatabase Editing Summary

• Three ways to edit data
  1. Editing through a version in ArcGIS (Versioned Editing)
  2. Editing data directly in ArcGIS (Non-Versioned Editing)
  3. Editing directly through SQL (SQL Editing)

• Which one do I use?
• Depends on behavior desired
  - Short vs Long Transactions
  - Is data being accessed by non-ESRI applications?
  - Are many editors editing the same data?
Session Path

• Introduction to the Enterprise Geodatabases
• Versioning
• Types of Editing
• Archiving
  - What is it?
  - How is it used?
• Geodatabase Replication
Geodatabase Archiving: What is it?

- Historical archiving of all edits made to the Default version
  - Maintain a record of a feature classes representation over time

- Ability to query historical representations of a feature, can be queried based on date information

- Extends versioning
  - Classes must be versioned before they can be archive enabled
Geodatabase Archiving: How it works

- Class must be enabled for archiving
  - This creates an archive table in the geodatabase
  - Size of archive table depends on size of class being archived
Geodatabase Archiving: How it works

- When edits are made on the Default version
  - These changes are added to the archive table
Geodatabase Archiving: How it works

- Archive table is used to satisfy historical queries

- Can navigate through history in two ways
  - Through specific date query
  - Through a historical marker
Geodatabase Archiving Demo
Session Path

• Introduction to Enterprise Geodatabases
• Versioning
• Types of Editing
• Archiving
  - Geodatabase Replication
Synchronizing Data

- What is Replication?
Work off-line or in the field

• To work off-line
  - Replicate a subset (Check-out) from enterprise GDB
  - Make edits
  - Check in

• Intermittently connected

• Supports
  - Full geodatabase model
  - desktop add ins
Synchronize copies of a Geodatabase

- Make edits and synchronize multiple times
- Configurations
  - Changes are sent in one direction to a read-only copy
  - Changes are sent in both directions
Geodatabase Replication - Summary

- The ability to synchronize two or more geodatabases
- Different Replication workflows
  - One time synchronizations
    - Work offline or in the field
  - Long standing synchronizations
    - Changes sent in one direction
    - Changes are sent in both directions
Session Path - Summary

- Introduction to the Enterprise Geodatabases
- Versioning
- Types of Editing
- Archiving
- Geodatabase Replication
Thanks for attending
Questions?

Please fill out session surveys
www.esri.com/sessionevals