INCOG Transportation Planning Division
Spatial Data Management Workflow
GIS-T 2008

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Indian Nations Council of Governments (INCOG) provides local and regional planning services to several government agencies in Creek, Osage, Tulsa, Rogers, and Wagoner counties.

INCOG’s Transportation Planning Division, in cooperation with the Oklahoma Department of Transportation (ODOT) and Metropolitan Tulsa Transit Authority (MTTA), is responsible for the development of regional transportation plans and programs for the Tulsa Transportation Management Area (TMA).
Spatial Data Migration Project

In August 2003, the INCOG Transportation Planning Division started using ArcIMS v4 webmaps as a method of enabling public access. This successful pilot project lead to a re-evaluation of the original GIS dataset organization and subsequent decision to migrate from a file-based system to an ArcSDE/SQL Server enterprise geodatabase which includes aerial Raster Mosaics.

We are primarily a **spatial data warehouse** with 90% of the vector datasets contributed by INCOG members, and Federal or State agencies, with the final 10% developed by in-house production.

Aerials are purchased annually through commercial vendors.
Spatial Data Management Workflow

The INCOG Data Migration Project goal is Data Integrity

Develop procedures to collect and manage spatial data that will support the business objectives of INCOG by enabling the creation of high-quality GIS maps, eliminate feature duplication, promote metadata authoring, encourage data sharing and cooperation between departments, local governmental members, and enable public access to regional geographic information.

The Spatial Data Management Workflow is the primary procedural element that enables us to check the accuracy, authenticity, and usefulness of each GIS dataset before it becomes an ArcSDE production dataset.

Current Data Migration Status:

A total of 3105 aerials (130GB) from 1999 through 2007 have been loaded into ArcSDE raster mosaics by year (example: mosaic1999BW18, mosaic2007C12)

Over 1370 vector features have been loaded comprising about 1GB of the original 12GB of spatial data candidates slated for migration (7105 shapefiles in 482 directories). The volume of spatial data collected by INCOG since the early 1990s and stored in a file-based system had exceeded a level that could be managed effectively which inevitably lead to stale datasets, duplication, and lack of metadata.
Spatial Data Management Workflow

INCOG uses only three (3) ArcSDE/SQL Server database roles:

1) **BROWSER** - READ ONLY permissions for 25 ArcView users and ArcIMS webmap features

2) **EDITOR** - READ & WRITE permissions including Reconcile and Post functions for Versioned Features. Five (5) ArcINFO users: Senior GIS Analyst and Senior GIS Specialists.

3) **ADMINISTRATOR** is responsible for the overall integrity of the ArcSDE geodatabase, user access, and the creation and maintenance of the ArcIMS webmaps.

Dual server configuration: (a) ArcIMS Webmaps, (b) ArcSDE/SQL Server Geodatabase.

Each server is loaded with both applications and is able to run in a stand-alone mode to minimize any downtime due to hardware failure or ESRI application upgrades.
Spatial Data Management Workflow

Spatial Dataset From INTERNAL Sources

Spatial Dataset From EXTERNAL Sources: INCOG members, State, Federal, and Commercial

NOTES - 6/6/2004
1) Use only 3 ArcSDE database roles: BROWSER, EDITOR, ADMIN
2) BROWSER permissions: READ ONLY
3) EDITOR permissions: READ & WRITE (Reconcile & Post versioned feature)
4) ADMIN is responsible for the integrity of the ArcSDE geodatabase, user access, and creation and maintenance of the ArcIMS webmaps.

INCOG
**Process**  **Role**  **Description**

**Step 1:**  **EDITOR**  **(Spatial Data Acquisition)**

Stage the spatial dataset candidates in a consistent location for QA Review and Loading
Process | Role | Description
---|---|---
Step 2A: | EDITOR | (QA Review of the Spatial Data Candidate)

ArcCatalog – Review projection, attributes (data integrity), metadata, etc
Step 2B: EDITOR          (QA Review of the Spatial Data Candidate)

Check Geometry:  ArcSDE is very intolerant of spatial geometry irregularities
Process  Role  Description

Step 2C:  EDITOR  (Repair Geometry - SUCCESS)

Repair Geometry : (as needed) All geometry errors identified in the previous step must be repaired before loading the spatial dataset into ArcSDE
<table>
<thead>
<tr>
<th>Process</th>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2C:</td>
<td>EDITOR</td>
<td>(Repair Geometry - FAIL)</td>
</tr>
</tbody>
</table>

If the Repair Geometry Tool fails, then the Candidate dataset will be rejected and the Author will be notified of deficiencies and encouraged to resubmit.
<table>
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</thead>
<tbody>
<tr>
<td>Step 3:</td>
<td>EDITOR</td>
<td>(Present Spatial Data Candidate at the monthly GIS meeting)</td>
</tr>
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</table>

Identify the Pros and Cons of the Candidate feature dataset

<table>
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<tbody>
<tr>
<td>Step 4A:</td>
<td>EDITOR</td>
<td>(Accept or Reject the Spatial Data Candidate)</td>
</tr>
</tbody>
</table>

**IF** the Candidate feature is **Accepted**

**THEN** stage for ArcSDE import (Step 5)

<table>
<thead>
<tr>
<th>Process</th>
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<tbody>
<tr>
<td>Step 4B:</td>
<td>EDITOR</td>
<td>(Accept or Reject the Spatial Data Candidate)</td>
</tr>
</tbody>
</table>

**ELSE IF** the Candidate feature is **Rejected**

**THEN** Notify applicant of deficiencies and encourage to re-submit
### Process | Role | Description
--- | --- | ---
Step 5A: | EDITOR | (Load the approved feature)

**ArcCatalog:** Load the “approved” Spatial Dataset into ArcSDE
<table>
<thead>
<tr>
<th>Process</th>
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<tbody>
<tr>
<td>Step 5A:</td>
<td>EDITOR</td>
<td>(Preview feature)</td>
</tr>
</tbody>
</table>

**ArcCatalog:** Preview the “approved” ArcSDE Spatial Dataset
**Process** | **Role** | **Description**
--- | --- | ---
Step 5B: | EDITOR | (Author Metadata)

ArcCatalog: Author Metadata manually or import a vendor supplied metadata file
**Process** | **Role** | **Description**
---|---|---
Step 5C: | EDITOR | (Publish Metadata)

**ArcCatalog**: Publish to the previously configured Metadata Service
**Process**

**Role**

**Description**

Step 5D: EDITOR  
(Version feature – one time only)

**ArcCatalog:** Register as Versioned – (only for “in-house” production features)
**Process**  |  **Role**  |  **Description**  
---|---|---
Step 5E: | EDITOR | (Assign Privileges)

**ArcCatalog:** Assign privileges to the ArcSDE Administrator and notify by email.
<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADMIN</td>
<td>(Set access to all spatial features)</td>
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</table>

**ArcCatalog**: Set privileges for the geodatabase role “Browser” which covers ArcIMS WebMap publication, in-house map creation and Metadata Explorer searches.
Step 6A:

**Process**

Step 6A: USER (Search INCOG Metadata)

**Description**

**Metadata Explorer** “Out-of-the-Box” functionality is currently being tested on the INCOG intranet and will be developed in the future for the INCOG website.
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</tr>
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<tbody>
<tr>
<td>Step 6A</td>
<td>USER</td>
<td>(Metadata Explorer – detail window)</td>
</tr>
</tbody>
</table>

**Metadata Explorer:** Detail screen after selecting a dataset from the search results
Process | Role | Description
---|---|---
Step 6B: | USER | (Webmaps available to the public)

**ArcIMS Webmap:** Available through the INCOG Transportation Planning webpage
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<tbody>
<tr>
<td>Step 6C:</td>
<td>USER</td>
<td>(Reference aerials)</td>
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</table>

**ArcSDE Raster Mosaics**  Aerials from 1999 through 2007 in both Black/White and Color, with an 18” or 12” resolution and covering 1911 square miles.
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<tr>
<td>Step 6D:</td>
<td>USER</td>
<td>(Personal Geodatabase - Example)</td>
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</tbody>
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Metropolitan Tulsa Transit Authority Bus Routes feature are maintained in-house
Spatial Data Management Workflow

Lessons Learned:

1) Data Integrity. It is much more cost effective to build a clean database from the start than grooming it after the fact.

2) ArcSDE and SQL Server (out-of-the-box) provides a common data storage and management framework that promotes data integrity, organization and access while supporting INCOG’s products and services to the public and private sectors.

3) This spatial data workflow has been developed with respect to the “data warehousing” role that INCOG provides and helps minimize data redundancy and functional duplication.

4) Metadata keywords have been pre-defined by feature category in order to discourage any attempts at “creative writing” that may obstruct a successful Metadata Explorer search request.

5) Raster Mosaics: everybody loves them.
Spatial Data Management Workflow

Questions?