Automated Change Notification Keeps Everyone in the Know!

The Knoxville, Knox County, Knoxville Utilities Board (KGIS) Experience
Presentation Topics

• KGIS
• GIS Community Served
• Drivers for Change Notification
• Capabilities
• Architecture
• Lessons Learned
Who is KGIS?

- Knoxville, Knox County, Knoxville Utilities Board GIS (KGIS)
- Chartered in 1985
- Responsible for maintaining single, shared GIS infrastructure and basemap data
- Promotes GIS to support respective agency business needs
KGIS Serves a Large and Diverse GIS User Community

• Public mapping data consumers through web GIS plus data sales, spatial analysis, and custom cartographic services

• Hundreds of agency GIS users rely on KGIS systems to access data vital to their workflows

• Over 50 GIS data editors across 10 departments in 4 agencies
Change Notification Supports Inter-Department Workflows

- Property Assessor
  - Parcels
- City Engineering
  - City Boundary
- KGIS
- Metropolitan Planning Commission
  - Addresses
Property Assessor Responsible for Edits such as Parcel Splits
Address Editors Need to be Notified of Parcel Split

Boundaries Adjusted; New Parcel Identifiers Assigned
Create New Address and Associate Addresses with Correct Parcels

Address Shifted

New Address Assigned

Associated to Respective Parcels
Stakeholder Groups Need to Know When Addresses and Parcels Modified

Notification to South Knoxville Waterfront Association
Other Data Owners Need Notification

City Boundary Adjusted
Previous Notification Handled Manually

A better way?
Automated Change Notification Supports Inter-Department Workflows

Property Assessor
Parcels
KGIS
City Engineering
City Boundary
Notify
Notify
Metropolitan Planning Commission
Addresses
Automated Change Notification Supports External Agency Notification
Change Notification Envisioned to Support a Number of Scenarios

- Individuals that share data maintenance responsibility for a feature class or dataset
- Assess spatial data integrity between dependent classes not in the same feature dataset
- Administrators of other systems that maintain similar data (such as addresses) but without an automated interface with the GIS
- Not intended to replace existing tools that support very linear workflows
  - For example, reviewer approvals of edits for example
Users Subscribe to an Event
Notification System Evaluates Data Changes Against Rule Criteria

- **ArcSDE/Oracle**
  - CHANGE_NOTIFICATION_AUDIT
    - tname: varchar2(30)
    - pkey: varchar2(30)
    - cname: varchar2(30)
    - invtgr: varchar2(30)
    - timestamp: date

- CHANGE_NOTIFICATION_RULES
  - id: number(30)
  - tname: varchar2(30)
  - rule: varchar2(30)
  - name: varchar2(30)
  - dscrt: varchar2(30)
  - cnfg: varchar2(30)

- RULE_SUBSCRIPTIONS
  - user_id: varchar(30)
  - rule_id: number(30)
  - email: varchar(30)

1. Windows Scheduled Task
2. Run ArcObjects Executable
3. Run Each Change Against Subscribed Rules
4. Determine Pass/Fail
5. Handle Rule Exception: Fail → Pass/Fail (Repeat)
6. Success → Remove Record From Audit
E-mail Notification Lists Edits Conforming to Event Subscriptions
Users Access List of Data Changes Through ArcMap Utility
Users Can Update Event Status Through ArcMap Utility
How Does Change Notification Work?

• **Components**
  1. System Tables
  2. Oracle Triggers and Stored Procedures
  3. Change Evaluator

• **User Interfaces**
  1. Subscription Form
  2. E-mail
  3. ArcMap Reviewer Utility
Administrator Establishes Rules

• Adds rule to Rules Table
  – This is the list of rules users may subscribe to

• Establishes Oracle database triggers and stored procedures for tables that participate in the rule
Evaluator Compares Data Edits Against Rule Criteria

1. Edit to Address Feature Class
2. Entry Made in Audit Log
3. Evaluate Audit Records
4. Edit Meets Rule Criteria?
   - Remove Audit Record
   - Add Status Record for Subscriber
5. E-mail Subscriber
How is it Being Used Today?

• New Parcels (and Address Alignment)
• New Stormwater Outfall Locations (and Data Attribution)
• New Subdivisions (and Utility Service Connection Alignment)
How Can it be Used?

- Public Land Inventory
- Street Name Changes
- Re-Zoning Applications
- City Boundary Changes
- Maintenance of routing dataset
Lessons Learned?

- Versioned feature classes difficult to deal with
  - Developed approach dependent on Archive Class
  - Tradeoff is additional administration when modifying feature class schema
- Approach that relies on database triggers and stored procedures is difficult to administer
- Need to balance frequency of evaluation process to manage size of audit and subscription tables
Changes for the Future…

• Allow users to select notification frequency
  – Daily, weekly, immediately, etc.
• Allow users to specify an area of interest
  – Currently administrator can establish rules for a specific area
• Improve error handling
  – Service can fail without appropriate error message capture or administrator notification
• Add ability to update status through web map
• Migrate to use ArcGIS Server license
Successes?

- Flexible design handles complexity of inter-department workflows and data relationships
- Minimizes need for intensive and infrequently executed batch processing / topology checks
- Overcomes lack of institutional workflow checks / balances with a technical workaround
- Supports enhanced management oversight