Migrating 20-years of Spatial Data and Applications to a Modern GIS

The Knoxville, Knox County, Knoxville Utilities Board (KGIS) Experience
Welcome to KGIS

KGIS is now 20 years old, having been established in 1985 by the City of Knoxville, Knox County, and the Knoxville Utilities Board. The KGIS Office is responsible for maintaining the centralized GIS servers, databases and network that is shared by the various departments and users.

While KGIS is funded by and for these local agencies, it also provides GIS services and products to the Knox County, Tennessee community (see Map Products or Digital Products), including the KNOX net Where? InterNet mapping site.
M2E Project

• Objective - design, construct and implement an enterprise GIS solution to support the spatial information needs of KGIS member agencies & the public.

• Migrating GIS applications and data from Intergraph MGE GIS platform to ESRI ArcGIS platform.
M2E Tasks

1. Project Management
2. Business Process Analysis
3. System Requirements
4. System Architecture Planning
5. Database Design and Data Migration
6. Application Development
7. System Deployment
8. Post-deployment Support and Warranty
Project Management

- Five major stakeholders
  - KGIS, City, County, MPC, KUB
- Prime contractor (CH2M HILL) with plus 4 subcontractors
  - ESRI
  - Sidwell Company
  - RAMTeCH Corp.
  - University of Tennessee
- 3-year schedule
  - 1,000+ activities
- Activity-level cost control tool
Project Charter

- 5 Organizations
- 100+ Participants
- 15 Departments
  - Property Assessor
  - Public Works
  - Engineering
  - Addressing
  - Register of Deeds
  - County Trustee’s Office
  - IT
  - Police/Sherriff
  - Fire
  - Planning
  - Health
  - Utilities (electric, gas, water, sewer)
  - Others

KGIS M2E GIS UPGRADE PROJECT
PROJECT CHARTER
MARCH 2006

VISION
Design, migrate and deploy a modern integrated GIS framework that will allow KGIS to provide its stakeholders with high-quality products and services for the next decade and beyond.

MISSION
- Deliver systems and tools that meet today’s requirements and provide flexibility to meet future needs
- Encourage partnerships between KGIS member organizations, customers, and stakeholders through open communication, collaboration, and support for combined projects and shared work
- To improve the efficiency of stakeholder operations by understanding and automating workflows
- Provide fast access to current data to support technical, non-technical, mobile, and desktop users
- Provide deployment, training, and support to ensure sustainable maintenance of a reliable system following acceptance
- Support KGIS in being recognized as a model organization for spatial data

CRITICAL SUCCESS FACTORS
- Understand relationships between existing workflows, databases, and users to promote development of an effective enterprise solution
- Capitalize on opportunities to improve workflows through use of efficient data management and tools
- Maintain or improve support for existing stakeholder systems and their ability to interact with GIS
- Deliver a GIS solution that provides more rapid access to current data, consistent user interface and improved user satisfaction
- Complete documentation on the KGIS enterprise solution and promote improvements to metadata
- Streamline administrative processes related to updates, backup or distribution of applications and data
- Improve capabilities toward sharing data - especially the volume of data available through the internet
- Recognize and manage change to meet the best interests of KGIS and its stakeholders
- Maintain enthusiasm, satisfaction, and overall confidence in the project and its outcomes
- Provide a smooth transition to the enterprise solution through frequent collaboration with end users and phased training
Business Process Analysis

• Business process interviews conducted
  – 80 hours of interviews
  – Over 60 participants
  – Organized by department

• 100+ processes documented
  – Document existing conditions
  – Interaction between departments and agencies
  – External systems that must interact with GIS
  – Identify process deficiencies and suggest enhancements
System Requirements

- 856 requirements for 25 applications
- Captured during interviews

<table>
<thead>
<tr>
<th>PHASE</th>
<th>USE-CASE/ FUNCTIONAL CATEGORY</th>
<th>REF.</th>
<th>NAME</th>
<th>NOTES</th>
<th>AUTHOR</th>
<th>SOFTWARE</th>
<th>PRIORITY</th>
<th>AUDIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future</td>
<td>Attribute Editing</td>
<td>1.0</td>
<td>The application will provide custom attribute editing screens for the parcel, parcel document, condo, owner, and owner document attribute information. These screens must work external to the GIS &quot;graphical&quot; editing environment. Is this a complete list? Presumably, this functionality replaces apps like parcels.exe. EXPLANATION: Development of custom attribute editing screens to &quot;replace&quot; existing KGIS app data entry forms was not scoped in the proposal.</td>
<td>Workshop</td>
<td>Custom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future</td>
<td>Attribute Editing</td>
<td>1.0.1</td>
<td>Previously typed in attribute information can be propagated to the next parcel record and/or parcel document record. The intent is to cut down on typing and re-typing the same information into the data entry screens. Need to identify the specific attribute fields for which information should be propagated. EXPLANATION: As per 1.0, this application behavior would be developed as part of the custom attribute editing screens.</td>
<td>Workshop</td>
<td>Custom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial</td>
<td>Attribute Editing</td>
<td>1.0.2</td>
<td>The application will set the necessary &quot;modification flags&quot; for the CAMA transfer. The flags need to be identified in the database design.</td>
<td>RFP</td>
<td>Custom, ArcSDE, ArcMap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial</td>
<td>Attribute Editing</td>
<td>1.0.3</td>
<td>The application will provide support for modifying the tax batch year. Could be a special form or form menu option.</td>
<td>Workshop</td>
<td>ArcMap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial</td>
<td>Attribute Editing</td>
<td>1.0.4</td>
<td>The application will automatically populate a tax year attribute.</td>
<td>Workshop</td>
<td>ArcMap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future</td>
<td>Attribute Editing</td>
<td>1.0.5</td>
<td>Provide a &quot;populate attribute forms by similarity&quot; in the attribute forms, pre-populate the form information via the database.</td>
<td>Workshop</td>
<td>Custom</td>
<td></td>
<td></td>
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</tr>
</tbody>
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System Architecture

- Solution plan that addresses system requirements
  - Document users/audience
  - Software solution
  - Data Management
  - Hardware, backup, recovery
  - Security
  - Network

- Recommended 17 applications
IT Infrastructure to Support System
System Architecture Goals

• Standardize on Oracle
  – Consistent with stakeholder agencies
  – All content – portal and map

• Single system for all
  – editors and viewers
  – internal and external audiences

• Single sign-on capability through integration with active directory trusted external domains

• Decision to maximize use of web mapping application over desktop
Database Design

• Source Data Inventory
  – Spatial, tabular & raster data collected during 20 years of operations
  – Landbase, streets, signs, parcels, zoning, utilities...
  – Microstation, Oracle, various ESRI formats
  – 300 GB
  – 11,755 Files
  – 96 Groups
  – 580 source MGE Feature Types
  – 350 source SDE Feature Classes
  – Miscellaneous DBs
Database Design

- **Target Database Design**
  - ESRI Geodatabase
  - 600+ feature classes
  - Industry standard models customized to existing customer data & requirements
  - Leverage ESRI Oracle ST_Geometry data type

- **Logical Design**
  - MS-Visio and CASE tool
  - Graphical representation of database design
  - Efficient design technique

- **Physical database built from XML export from Visio**
Data Migration

• Conducted in five phases
  – Pilot
    • Critical data sources
      – Edited frequently
      – Final migration must be executed quickly
    • Entire geographic extent of data
  – Phase 1: static data
    • Planimetric, topographic, etc.
  – Phase 2
    • Archive data sets (not used in production)
  – Phase 3
    • Addressing and Cadastral (parcels)
    • Migration schedule coordinated with data maintenance application roll-out
  – Phase 4
    • City sign, ward, storm utility, etc.
    • Migration schedule coordinated with data maintenance application roll-out
Data Maintenance Applications

• Built on the ESRI ArcGIS 9.2 Desktop platform
  – Configured Task Assistant to guide user through application workflow
  – MX Edit for forms-based editing
  – Custom ArcObjects plugins to automate data entry and data integrity checks

• Used by primary data editors
  – Approximately 40 spatial data editors
Data Maintenance Applications
Data Maintenance Applications

- Address data maintenance
- Property data maintenance
  - Sidwell Company Parcel Builder
- Subdivision data management using COGO tools
- Sign data maintenance
- Outfall data maintenance
- SPAP Permit data maintenance
- Planning Commission agenda case maps application
Reverse Migration Application

- Migrate data maintained in new ESRI Geodatabase format to the legacy MGE format
- Ensure continued use of legacy applications during transition
- SAFE Software FME with custom wrapper
Web Mapping Applications

• Multi-component web mapping solution
  – Administer map content and security
  – Manage user profile
  – Map navigation
  – Spatial data queries and reporting
  – Metadata access
  – Geocoding
  – Measure, Selections, and Markups
  – Printing
  – MORE!
KGIS Portal Home Page

Administrator manages map content same as non-map content through portal.

Agency (domain) users automatically authenticated.

Portal provides access to all content.
Web Map Viewer

Change Map Themes
Address, Parcel, or Owner quick search
Toolbar

Console:
- Results
- Tasks
- Contents

MAP

KGIS

CH2MILL
Quick Access to Property Information

Search Results

Property Details
- Address info
- Owner info
- Parcel info
- School zones
- Voting info

Kgis
CH2M HILL
Owner Card Report

Presents historic ownership and owner mailing address
Address Search Builder allows users to find a valid address.
Map Content Organized in Themes

Zip Codes Map Theme

Base Map Theme
Share Your Map!

E-mail a friend or colleague a URL that will open the map to the same location and with same content.
Tasks

- Select tools
- Markup tools
- Print
- Advanced address tools
Users Can Personalize their Maps Using Profile Settings

My Profiles to store personal
- Spatial Bookmarks
- Map Themes
Deployment

- Required close collaboration between KGIS and CH2M HILL
- KGIS responsible for hardware and network deployment
- Jointly deployed custom applications
- Training
  - admin training
  - user training in classroom, individual, and open-house forums
Lessons Learned

- Communicate with stakeholders early and often
  - Open and frequent communications
- Maximize use of COTS tools
  - Sidwell Parcel Builder
  - ESRI Task Assistant
- Don’t drink the technology kool-aid
  - Leverage only a couple new things at one time
- Create seamless team with contractor
  - Leverage each members’ specific expertise
Other KGIS Presentations

- Developing a Comprehensive Local Government Web GIS Solution
  - Wednesday July 15
  - 1:30PM - 2:45PM

- Automated Change Notification Keeps Everyone in the Know!
  - Thursday July 16
  - 1:30PM - 2:45PM