City of Sacramento Dept of Utilities
GIS Data Migration to the LGIM

Ryan Kirkham
Dara O’Beirne
Rong Liu
Points we’ll cover

• General information about the city
• GIS at the Dept of Utilities and the city
• Our LGIM migration project
  – Data schema transformation
  – Migrating existing integrated systems to the new LGIM model
  – Project management: Keeping everything rolling on schedule
City of Sacramento

Population: ~ 486,000, Area: ~ 100.1 mi²

Utilities Department

- water, wastewater and drainage system
- has combined wastewater and drainage systems
- 1,596 miles of water transmission and distribution mains
- 1,666 miles of wastewater and drainage mains
- in the middle of a water meter installation program
Historical use of GIS at the Department of Utilities (2000-2016)

- Converted from AutoCAD 17 years ago
- Purpose was to support 1:200 paper map books used by Operations & Maintenance field crews
- Data model hasn’t be updated or evaluated since the conversion
- No longer support the business needs and asset management requirements
GIS at the city and the Dept of Utilities

• Citywide GIS team is consolidated under IT
• 4 GIS positions are dedicated to Dept of Utilities
  = 1 GIS supervisor + 3 GIS analysts
  = 1 more GIS analyst added in 2017
• Enterprise GIS systems, separate transactional & publication SDEs, with simple model of gdb replication
• GIS integration with many business systems in the city
• Multiuser editing & versioning for Utilities data
• Directly integrated with Cityworks AMS 2014 and a custom Data Warehouse with GeoCortex based web maps
Data Migration (ETL)

- Review and document current model
- Research and design new model
- Build ETL process
- Test and refine process
- Run ETL and implement new model
Review Current Model

• Export schema using X-ray for ArcCatalog
• Document every field name, data type and its’ accuracy
  – Identify fields used by 3rd party applications (Cityworks, etc.)
  – List all Domains and Subtypes used
  – Iterate over each field and document how much NULL, incomplete or non-standardized data within each field
• Work with engineers to get historical perspective on how and why data existed as it did
• Don’t pass judgement, just look for perspective…or you’ll lose your mind.
Design New Model

• Downloaded ESRI’s LGIM as a starting template
• Met with members from all major groups in Utilities (O&M, Asset Management, Engineering, etc.)
  – Focus groups with SMEs in each group to understand needs.
  – Finding out what is missing is just as important as identifying what can be removed
  – Document EVERYTHING…more on that later
• Created a data mapping between old and new data
• Standardized values for most fields & domains
• Recategorized some fields into subtypes, and vice versa
  – This was done based on rules desired in Geometric Network
Build ETL Process

- Originally looked at using Gizinta
  - Free, but not quite what we were looking for
- Downloaded 60-day trial of Safe FME Desktop
  - Never used before, but had a working sewer/drainage model ready in less than 30-days
- Project success helped validate purchase
Test and Refine Process

• The first runs of the processes failed often because of bad or invalid data
  – Gave us a good list of things to fix before the final ETL
• First iteration of ETL complete ~10/2016
• Project broken into phases
  – Address current data for phase 1 and push any new data layer compilation or creation to phase 2 (Turnouts, Interties, Cathodic Protection, Pump Station details)
Implement New Model

• Final ETL ran on 3/28/2017 and converted 40 feature classes (763,122 features) into 37 feature classes (722,157 features) in 15 minutes.
  – Conversion data copied from fgdb into Oracle SDE
“Integration” with Department Wide Applications

• Department of Utilities Enterprise Applications Integration (EAI)

• Existing Geocortex apps and workflows

• Cityworks work order management system
EAI

• Solution designed by consultant years ago.
• Used custom built workflows.
• Reverse engineer workflows to meet new schema
• Coordinate, plan, meet and test test test.
Geocortex Apps

- 4 Applications in production
- Silverlight to HTML5 capabilities
- Modified schema and tools
Cityworks Integration

• Update and maintain work order history with new schema.
  • Required fields (FacilityID and Location)

• Worked with consultant on tight timeline (1 month to implement)

• Lessons learned:
  • Start planning early and get stakeholders involved as early as you can.
  • Test your implementation.

• Published services required less configuration
Project Management

- Aggressive timeline with limited resources:
  - Started: Nov 18th 2016
  - Completed: March 24th 2017

- Coordination between several teams:
  - Utilities GIS
  - Citywide GIS infrastructure
  - IT server, security and DBA
  - Cityworks admin + consultants
  - Data warehouse support team
Keep things rolling

• Get a (powerful) project sponsor!
  – Keep the sponsor updated with progress and milestones
  – Supply the sponsor with facts and justification when asking for funding and resource allocation
  – Ask for help directly when needed

• Clearly define expectation and project goals:
  1. Transform the existing GIS model to align with LGIM
  2. Migrate existing systems integrated with GIS (Cityworks and data warehouse) to the new GIS model
• A project plan with clear roles and responsibilities

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**DOU GIS Data Model Migration Project**

**Project Plan & Status**

*Updated: 3/17/2017*

**Project Summary:**
The DOU GIS data model has not been updated since its migration from AutoCAD in 2000. The old data model was designed for supporting paper map book production and no longer satisfies the departments growing needs for asset management, systems integration, and easier access to data. This project is to migrate the DOU GIS data model to align with the industry standard Local Government Information Model (LGIM), and enhance it to support our department’s business objectives. This project builds the GIS foundation and is crucial for further deployment of tools and services.

**Project Goal:**
1. Transform the existing GIS model to align with LGIM
2. Migrate existing systems integrated with GIS (Cityworks and EAI) to the new GIS model

**Project Champion:** Brian McKee
**Project Manager:** Rong Liu
**Project Complete:** March 24, 2017

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rong Liu</td>
<td>Coordinate with section leads on timeline and deliverables to ensure project success</td>
</tr>
</tbody>
</table>
| GIS | 1. Lead GIS section, allocate resources to ensure GIS tasks are completed on time  
2. Primary on GIS servers allocation to host the new GIS model  
3. Secondary on Cityworks map services migration, recreate Cityworks data views and map services  
4. Secondary on EAI map services migration, help to recreate the map services for EAI |
| Ryan Kirkham | 1. Lead data model transformation, design and develop processes to transform current GIS data to the new model – critical for the overall project  
2. Secondary on Cityworks map services and EAI map services migration |
| Dara O’Beirne | 1. Lead GIS map services migration, recreate data views and map services for EAI and Cityworks  
2. Primary on GeoCodes applications (EAI maps) migration  
3. Secondary on data model transformation |
| Sheel Adams | 1. Lead Cityworks system integration, select and manage consultants to integrate Cityworks with the new GIS model  
2. Coordinate user acceptance test for Cityworks |
| Charley Wang | 1. Cityworks integration support  
2. Reporting support |
| EAI | 1. Lead EAI integration with the new GIS model, plan and allocate resources needed  
2. Coordinate user acceptance test for EAI |
| Charles Lei | 1. Primary on ETL process migrating EAI to use the new GIS model  
2. Coordinate user acceptance test for EAI |
| Joe Jamilosa | 1. Integration support  
2. Reporting support |
| Jim Cotton | 1. Cityworks integration support  
2. Reporting support |
- Bi-weekly project touch base meetings to keep major tasks & milestones on schedule

<table>
<thead>
<tr>
<th>#</th>
<th>Tasks</th>
<th>Lead</th>
<th>State Date</th>
<th>Target End Date</th>
<th>Actual Complete</th>
<th>Progress</th>
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<tbody>
<tr>
<td>1</td>
<td>Design and build new GIS servers</td>
<td>Rong</td>
<td>10/9/16</td>
<td>12/15/16</td>
<td>12/8/16</td>
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<tr>
<td>2</td>
<td>Design and develop new GIS data model</td>
<td>Ryan</td>
<td>7/15/16</td>
<td>12/20/16</td>
<td>12/13/16</td>
<td>100%</td>
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<tr>
<td>3</td>
<td>Post RFP for choosing Cityworks consultant firm</td>
<td>Mohit</td>
<td>11/14/16</td>
<td>11/28/16</td>
<td>11/23/16</td>
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<td>4</td>
<td><strong>Milestone: New GIS model is ready in Dev GIS</strong></td>
<td>--</td>
<td>7/15/16</td>
<td>12/31/16</td>
<td>12/13/16</td>
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<tr>
<td>5</td>
<td>Migrate Hawkley’s report to EAI data source</td>
<td>Charley</td>
<td>12/2/16</td>
<td>2/28/16</td>
<td>3/15/17</td>
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<tr>
<td>6</td>
<td>Select Cityworks consultant firm for testing</td>
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<td></td>
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<tr>
<td>7</td>
<td>Develop/unit test ETL changes</td>
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<td>8</td>
<td>Recreation Cityworks data view</td>
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<td>9</td>
<td>Recreation GIS map services and indexing</td>
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<tr>
<td>10</td>
<td>EAI user acceptance test (HDG)</td>
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<tr>
<td>11</td>
<td>Cityworks consultant firm start</td>
<td></td>
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<tr>
<td>12</td>
<td>Work with Rebecca &amp; Elizabeth on Cityworks machine</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>and Re-Inspection maps work</td>
<td></td>
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<tr>
<td>13</td>
<td>Migrate other DOU and Citywide map services to use the new GIS model (Dfirm, DOU Address Finder, Spill Notification, etc.)</td>
<td>Ryan + Dara</td>
<td>1/23/17</td>
<td>2/28/17</td>
<td>3/16/17</td>
<td>100%</td>
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<tr>
<td>14</td>
<td>Test existing GIS tools/extensions with the new model</td>
<td>Ryan</td>
<td>1/2/17</td>
<td>2/28/17</td>
<td>3/10/17</td>
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<td>15</td>
<td><strong>Milestone: Complete Cityworks Integration discovery and test</strong></td>
<td>Sheri+EEC</td>
<td>1/23/17</td>
<td>2/28/17</td>
<td>3/17/17</td>
<td>100%</td>
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<td>16</td>
<td><strong>Milestone: Complete EAI Integration test</strong></td>
<td>Charles</td>
<td>1/1/17</td>
<td>2/28/17</td>
<td>3/16/17</td>
<td>100%</td>
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<tr>
<td>17</td>
<td>Create go-live check lists for GIS</td>
<td>Dara</td>
<td>3/1/17</td>
<td>3/15/17</td>
<td>3/14/17</td>
<td>100%</td>
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<tr>
<td>18</td>
<td>EAI Unit and system testing, user acceptance testing</td>
<td>Charles</td>
<td>3/1/17</td>
<td>3/15/17</td>
<td>3/16/17</td>
<td>100%</td>
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<tr>
<td>19</td>
<td>Cityworks unit and system testing, user acceptance testing</td>
<td>Sheri,</td>
<td>3/1/17</td>
<td>3/17/17</td>
<td>3/17/17</td>
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<tr>
<td></td>
<td>Charles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>20</td>
<td>Review and adjustment, confirm go-live plan</td>
<td>All</td>
<td>3/1/17</td>
<td>3/17/17</td>
<td>3/17/17</td>
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<td>21</td>
<td><strong>Milestone: New GIS data model go-live</strong></td>
<td>Rong</td>
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<td>3/24/17</td>
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<tr>
<td>22</td>
<td>Production EAI Integration Complete</td>
<td>Charles</td>
<td>3/24/17</td>
<td></td>
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<td></td>
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<tr>
<td>23</td>
<td>Production Cityworks Integration Complete</td>
<td>Sheri+EEC</td>
<td>3/24/17</td>
<td></td>
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</table>
### Keep an itemized task list for GIS

#### New GIS Data Model Migration Plan - GIS Task Details

<table>
<thead>
<tr>
<th>#</th>
<th>Sequence</th>
<th>Main Task</th>
<th>Subtask</th>
<th>Lead</th>
<th>Start</th>
<th>Target Complete</th>
<th>Actual Complete</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>Create draft model</td>
<td>Secure funding for FME</td>
<td>Rong</td>
<td>05/01/16</td>
<td>07/14/16</td>
<td>100%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Create draft model and draft FME process</td>
<td>Rong</td>
<td>05/01/16</td>
<td>08/01/16</td>
<td>100%</td>
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<tr>
<td>4</td>
<td>1</td>
<td>Discuss Citywide GIS Architecture</td>
<td>Discuss pro/cons with Dan McCoy on setting up a new database</td>
<td>all</td>
<td>09/19/16</td>
<td>09/20/16</td>
<td>100%</td>
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<tr>
<td>5</td>
<td>2</td>
<td>Get feedback on data model</td>
<td>Setup workshops</td>
<td>Rong</td>
<td>05/26/16</td>
<td>10/31/16</td>
<td>100%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Document feedback for the draft data model</td>
<td>Rong</td>
<td>05/26/16</td>
<td>11/20/16</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Build new DOU database servers</td>
<td>Secure funding for new SDE servers, Identity server specs</td>
<td>Rong</td>
<td>09/20/16</td>
<td>10/26/16</td>
<td>100%</td>
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<td></td>
<td></td>
<td></td>
<td>Send server request form to Jim Regg</td>
<td>Rong</td>
<td>10/28/16</td>
<td>11/16/16</td>
<td>100%</td>
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<td></td>
<td></td>
<td></td>
<td>Transaction server (ELSDETRN01) ready</td>
<td>Peggy</td>
<td>11/01/16</td>
<td>11/14/16</td>
<td>100%</td>
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<td></td>
<td></td>
<td></td>
<td>Vijay to install Oracle on ELSDETRN01</td>
<td>Vijay</td>
<td>11/15/16</td>
<td>11/23/16</td>
<td>100%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Vijay to install Oracle on ELSDEPUD01</td>
<td>Vijay</td>
<td>12/01/16</td>
<td>12/06/16</td>
<td>100%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Vijay to install Oracle on ELSDETRN01</td>
<td>Vijay</td>
<td>12/12/16</td>
<td>12/16/16</td>
<td>100%</td>
<td></td>
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<tr>
<td>8</td>
<td>3</td>
<td>Create db-links</td>
<td>Document all db-links needed on PUB01 (for Cityworks and EAI apps)</td>
<td>Rong</td>
<td>12/02/16</td>
<td>12/13/16</td>
<td>100%</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Remind Peggy to install MS SQL UDBC driver on PUB01</td>
<td>Rong</td>
<td>12/12/16</td>
<td>12/25/16</td>
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<td></td>
<td></td>
<td></td>
<td>Vijay to create db-links on PUB01 (from Cityworks PRO, PUB02, etc) as soon as PUB01 is done</td>
<td>Rong</td>
<td>12/13/16</td>
<td>12/16/16</td>
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</tbody>
</table>

### Milestone: New GIS model is ready in GIS

- 12/09/16

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**City of SACRAMENTO Information Technology**

**Sacramento Department of Utilities**
• Evaluate project risks, have plan B (and plan C); Resolve challenges along the way

Some unforeseen challenges we resolved:

– Needed new ArcGIS servers
– Changed Cityworks project manager – a major stakeholder in the project
– Delayed Cityworks consultant starting time
– Strict field mapping requirement for LegacyID and Location fields in Cityworks
– Last-minute server security requirement
Final Implementation

- Utilities GIS LGIM data model go-live: March 24th, 2017
  - ArcSDE 10.4.1 with AGS 10.3.1
  - Separate transaction and publication SDEs, with simple model gdb replications
  - Implemented 28 SDE views to support Cityworks
  - Customized workflows for GeoCortex with HTML5 viewer

- Cityworks migration go-live: March 24, 2017
- EAI (data warehouse) migration go-live: March 30th 2017
Benefits of the LGIM Migration

- Customized LGIM that meets our business needs
- Captured asset attributes that had no place to be stored before
- Streamlined and simplified processes for building web apps:
  - Have already developed Web AppBuilder maps on portal for internal uses
  - Able to utilize out of box solutions more efficiently
- More effectively integrate with other systems in the future
Questions?

Contact Information

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• Dara O’Beirne
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• Rong Liu:
  rliu@cityofsacramento.org