ADOT’s Enterprise LRS

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Overview

- LRS Implementation
- Product Enhancements
- Best Practices
- Roadway Characteristics Editor (RCE)
- Future Endeavors
ADOT’s Linear Referencing Systems

<table>
<thead>
<tr>
<th>Legacy System</th>
<th>Current System - Roads and Highways</th>
</tr>
</thead>
<tbody>
<tr>
<td>q  Multiple linear referencing methods</td>
<td>q  Measure based system</td>
</tr>
<tr>
<td>q  Route and Event editing within ArcMap</td>
<td>q  Route and event edits done separately</td>
</tr>
<tr>
<td>q  Robust geocoder/reverse geocoder</td>
<td>q  Custom geocoder/reverse geocoder</td>
</tr>
<tr>
<td>q  Tailored specifically for Multimodal Planning Division</td>
<td>q  Tailored for all of ADOT</td>
</tr>
<tr>
<td>q  Used to maintain the LRS and submit HPMS</td>
<td>q  Used to maintain the LRS and working on submitting HPMS</td>
</tr>
<tr>
<td>q  Required GIS/LRS knowledge</td>
<td>q  Requires GIS/LRS knowledge</td>
</tr>
<tr>
<td>q  No Temporality</td>
<td>q  Temporality</td>
</tr>
</tbody>
</table>

So Then Why Did ADOT Change its LRS?
New LRS - Business Advantages

- Local agencies
- Local coordination
- Geocoding/editing in the RCE
- Start maintaining data spatially
- Easier to quality check data
- Take ownership of their data

Tabular
New LRS - Business Advantages

- ADOT
  - Allow for data stewards to maintain their data spatially
  - Break down internal data silos
  - Same LRS for all of ADOT
  - Facilitate the possibility of bringing HPMS in house

Data Strong – Information Weak
LRS Implementation

- Build vs Buy
- Agile/Scrum Development Methodology
- Over 200 user stories collected
- Project Resulted - Mix of COTS and custom dev
- Two phase project
  - MPD LRS updates
  - Data Warehouse updates
Desktop Product Enhancement

- Referents
  - To support data requests and HPMS
  - Maintain the human understood referents – Decision Makers
  - Measure is translated into a referent – not automated

*Do you have a need for this?*
RCE Product Enhancement

- Photo Log Viewer – ADOT
RCE Product Enhancement

- Photo Log Viewer – ADOT
- RCE Geocoder/Reverse Geocoder – ADOT
- Conflict resolver
RCE Product Enhancement

- Photo Log Viewer – ADOT
- RCE Geocoder/Reverse Geocoder – ADOT
- Custom Linear Referencing Methods – ADOT/ESRI
  - Engineering Stations
  - Routes with Routes
RCE Product Enhancement

- Photo Log Viewer – ADOT
- RCE Geocoder/Reverse Geocoder – ADOT
- Custom Linear Referencing Methods – ADOT/ESRI
- Versioning – ADOT
Best Practice - Desktop

q Event Behaviors
  q Understanding these behaviors is key to success
  q More complexity for the LRS editor
    q Edits to the centerline affect the events
    q Cartographic realignment – no temporality
    q Lack of Snap behavior for RealignRoute
Temporality

Temporality is Maintained using the FromDate

- Project A: OTT date is 1-11-2014
- Project B: OTT date is 1-12-2014
Re-align according to Plan B
Plan B Realignment
Re-align according to Plan A
We can see new alignment for Project B but not for Project A. Project A is retired according to RH.
Referent information in events

- Gain accurate referent information in RCE, lose them in desktop after editing routes
- **Before**

<table>
<thead>
<tr>
<th>OBJECTID</th>
<th>FromDate</th>
<th>ToDate</th>
<th>EventID</th>
<th>Routed</th>
<th>FromMeasure</th>
<th>ToMeasure</th>
<th>FunctionalSystem</th>
<th>FromReferentLocation</th>
<th>ToReferentLocation</th>
<th>FromReferentOffset</th>
<th>ToReferentOffset</th>
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<td>3/23/2015</td>
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<td>PARK</td>
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<td>Vapor Collector</td>
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<td>0</td>
<td>0</td>
<td>02382-35F</td>
<td>02382-35F</td>
</tr>
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- **After**

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Highway Performance Monitoring System (HPMS)

- Converting spatial data to tabular
  - There is not an easy way to reassign events on overlapping routes
Best Practice - Data Conversion

- New Data Structure
- Broke out events (i.e. Auxiliary Lanes)
- Quality control for overlaps/duplicates
- Organized domains per HPMS requirements
- To support straight line diagramming
Best Practice – Workflows

q Workflow Manager

1. Check that AOI is defined, construction plan PDF is attached, TRACs # is in job name. Priority is set, and Job is assigned to RTE editor (NOTE: Save workflow after assigning Job).
Best Practice – Workflows

Workflow Manager
Best Practice – Workflows

q Workflow Manager
Best Practice – Workflows

q Workflow Manager
Best Practice – Workflows

Event Groupings
Best Practice – Roadway Characteristics Editor

- Browser Specific
- No Undo Button
- Limited capabilities for GIS staff
  - May require customization
- Useful for non-GIS staff (local agencies)
Future Plans

- Continue to refine process
- Clean up data
  - Measure issues
  - Overlapping event records
- Submitting HPMS
  - Plan Extraction
  - Sample Panels
  - Geoprocessing Models
- Working with local agencies (Cities, Counties, COGs/MPOs)
- Support FHWA Requirement – ARNOLD, FMIS, NBI, MIRE
Phase II - Data Warehouse

- Duplication of legacy QA/QC processes
  - QA/QC done via SQL database views
  - Evaluate data errors - Assign Ownership
- Determine DW ability to detect changes
  - Web Services
  - Use of Delta tables
- Creation of LRS/GIS functionality in DW
  - Data lookups for Applications
  - Replacement of GIS DataMarts in applications
  - All functions must be “batch mode” compatible
Final Thoughts

- Linear Referencing is a complex topic
- Roads & Highways is on the way to becoming an industry standard tool
- New LRS will support all of ADOT
- New LRS will become more robust with time
- ADOT is still discovering new methods to improve the system
Questions?

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