2019 GIS-T
One Maryland One Centerline
April 25, 2019

Marshall L. Stevenson III
GIS Program Management Support

Jesse M. Day
Senior Project Manager, Transcend

Michel Ney Sheffer, GISP, CFM
Data Services Division – Assistant Chief
Discussion Topics

• OMOC Project Overview
  • Phase I – Esri Roads & Highways, complete in production
  • Phase III – Deploy new data analysis & visualization tools
    Competed in February of 2018
• Phase II – Integrate local centerline data
  • Data source discovery, data integration req’s & design
  • Prototype integration strategies with local jurisdictions
  • Two pilot projects
OMOC Project Drivers

- Drivers for OMOC are rooted in the need to comply with federal and state mandates, requirements, and initiatives:
  - **FAST**: New Federal Surface Transportation Funding Program, Fixing America’s Surface Transportation Act. Continuation of **MAP-21** (previous Federal Surface Transportation Funding Program, the Moving Ahead for Progress in the 21st Century Act)
  - **HPMS**: Federal Highway Administration’s Highway Performance Monitoring System
  - **ARNOLD**: All Roads Network Of Linear referenced Data (2014) (ARNOLD) is each state’s LRS of all public roads
  - **MIRE**: Model Inventory of Roadway Elements for supporting safety analysis (initiated 2007, implement by 2026)
  - **NG911**: Next Generation 9-1-1 updates the infrastructure to better support wireless and data technology advancements.
Phase I – Implement Esri Roads & Hwys

• Iterative approach
• Migration of legacy data
• Data modeling
• Software training
• Workflows & business processes
Phase III – Data Analysis & Viz

Tools

• Tools to analyze & visualize route & road inventory data
  • Data segmentation (Segment Analyzer)
  • Data validation (Validation Assistant)
  • Data reporting (Report Engine)
  • Data visualization (Road Analyzer)
Phase III – Data Analysis & Viz Tools
Welcome to the Report Engine dashboard!
Create a new report, download an existing, or view a live report.
Report Engine – Designer
Phase II – Discover, review, communicate

• *Centerline data discovery* (county, jurisdiction, state)

• Historically, the centerline data has flowed from the county governments to MDSHA

• *Introductory letter* sent to all county governments outlining next steps for local integration effort

• *Survey questionnaire* sent to solicit current datasets, to determine centerline data maintenance processes, to ascertain user base

• On-site meeting at participating jurisdictions.

• Initial Pilot Garrett County, second pilot with Anne Arundel County
Phase II – Discover, review, communicate

Maryland SHA County Road Show

Date    ID    Location     County    County People
Wed, Apr 26 1 Oakland Garrett 7
Wed, Apr 26 2 Hagerstown Washington 10
Thu, Apr 27 3 Ellicott City Howard 10
Thu, Apr 27 4 Westminster Carroll 10
Fri, Apr 28 5 Elkton Cecil 7
Fri, Apr 28 6 Bel Air Harford 6
Mon, May 8  7 Snow Hill Worcester 9
Mon, May 8  8 Princess Anne Somerset 5
Tue, May 9  9 Cumberland Allegany 9
Tue, May 9 10 Frederick Frederick 9
Wed, May 10 11 Prince Frederick Calvert 5
Wed, May 10 12 Leonardtown St. Mary’s 5
Thu, May 11 13 Largo Prince George’s 19
Thu, May 11 14 Annapolis Anne Arundel 14

Date    ID    Location     County    County People
Wed, May 17 15 Rockville Montgomery 12
Mon, May 22 16 Chestertown Kent 4
Mon, May 22 17 Centreville Queen Anne’s 9
Tue, May 23 18 Denton Caroline 5
Tue, May 23 19 Easton Talbot 7
Wed, May 24 20 Baltimore City Baltimore City 9
Wed, May 24 21 Towson Baltimore County 9
## Salisbury Wicomico
## Cambridge Dorchester
## La Plata Charles
Phase II – OMOC Objective, Approach and Status

- A Composite Centerline file that meets the needs of both local government and MDSHA
- Develop metric required to determine the cost for state wide implementation
- Two pilots, one simple low density county and a complex high density county with existing LRS
- 100% Complete with 1st pilot
- 2nd Pilot at Anne Arundel November 18, to be completed June 19
OMOC Problem Summary

- Different Data Models
  - LRS / Normalized vs Segmented
- Different Business Requirements
- Different Spatial Requirements
  - MDSHA businesses requirements for ramps
  - Local business requirements for intersections
### Phase II – First Pilot

| 1.1 Phase II Work Order 11 Pilot Initiation |
| 1.2 Pilot Jurisdiction Coordination |
| **1.3 MDOT SHA Roadway ID Conflation** |
| 1.4 Local Jurisdiction and MDOT SHA Centerline Delta Evaluations |
| 1.5 Development of Insertions and Replacement Tool and Workflow |
| 1.6 MDOT SHA Centerline Insertion and Replacement Process |
| 1.7 MDOT SHA Calibration Point Conflation |
| 1.8 Consolidated Centerline QC Analysis and Clean up |
| 1.9 Consolidated Centerline Migrations to R&H |
| 1.10 MDOT SHA Business Data Network Registration and QC |
| 1.11 Consolidated Centerline Maintenance Env and Workflow |
| 1.12 Pilot Assessment |
## Conflation Tool

![Conflation Tool](image)

### Table Of Contents
- NAVSTREETS Network
- NCDOT Network
- State Boundary

### User Matching Interface

<table>
<thead>
<tr>
<th>LinkID</th>
<th>Route ID</th>
<th>Confidence Level</th>
<th>Verified Match</th>
<th>False Match</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>22926248</td>
<td>80002625099</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22926248</td>
<td>80002625099</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22926267</td>
<td>60002627089</td>
<td>User Confirmed</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102932061</td>
<td>80002623099</td>
<td>No Match</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>102932061</td>
<td>80002624099</td>
<td>User Confirmed</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22926247</td>
<td>80002625099</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22926203</td>
<td>80002621099</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22926203</td>
<td>80002621099</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22926157</td>
<td>80002622099</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Zoom to Link
- Zoom to Route

### Verify Match Candidate
- Match Candidate Table
- HERE Link Feature
- DOT Route Feature
- Confidence Level Threshold
  - All
    - All
    - No Match
    - Low
    - Medium
    - High
    - User Confirmed
- OK
- Cancel
- Environment
- Show Help >>
## Phase II: Pilot

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Phase II Work Order 11 Pilot Initiation</td>
</tr>
<tr>
<td>1.2 Pilot Jurisdiction Coordination</td>
</tr>
<tr>
<td>1.3 MDOT SHA Roadway ID Conflation</td>
</tr>
<tr>
<td><strong>1.4 Local Jurisdiction and MDOT SHA Centerline Delta Evaluations</strong></td>
</tr>
<tr>
<td>1.5 Development of Insertions and Replacement Tool and Workflow</td>
</tr>
<tr>
<td>1.6 MDOT SHA Centerline Insertion and Replacement Process</td>
</tr>
<tr>
<td>1.7 MDOT SHA Calibration Point Conflation</td>
</tr>
<tr>
<td>1.8 Consolidated Centerline QC Analysis and Clean up</td>
</tr>
<tr>
<td>1.9 Consolidated Centerline Migrations to R&amp;H</td>
</tr>
<tr>
<td>1.10 MDOT SHA Business Data Network Registration and QC</td>
</tr>
<tr>
<td>1.11 Consolidated Centerline Maintenance Env and Workflow</td>
</tr>
<tr>
<td>1.12 Pilot Assessment</td>
</tr>
</tbody>
</table>
MDSHA Reviews:

Geometric Difference results

- Compares route length to accumulated conflated Garrett County centerline length by route ID
- Tolerance of 200 feet applied – results with greater than 200 foot difference are output
  - 182 total records – 18% of total routes conflated
- Routes that fall within the tolerance are output as a separate table for reference
  - 802 total records - 82% of total routes conflated
- Both tables contain the geometric difference in feet, geometric difference by percentage of route, and the summarized length for both the Garrett County centerlines and MDSHA routes

Unconflated Centerline results

- All Garrett County centerlines not associated with an MDSHA route after conflation are selected and output to a table for review
- 1528 total records – primarily Private roads, approx. 30 other route types; three records tagged as State maintained – listing sorted by type. The MAINTENANCE field contains ownership attribution, which can be queried to determine priority centerlines to review
  - There are 4719 total records in the final conflated centerline data
  - The unconflated centerlines represent ~32% of the overall centerline records
### Phase II – First Pilot

<table>
<thead>
<tr>
<th>1.1 Phase II Work Order 11 Pilot Initiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Pilot Jurisdiction Coordination</td>
</tr>
<tr>
<td>1.3 MDOT SHA Roadway ID Conflation</td>
</tr>
<tr>
<td>1.4 Local Jurisdiction and MDOT SHA Centerline Delta Evaluations</td>
</tr>
<tr>
<td><strong>1.5 Development of Insertions and Replacement Tool and Workflow</strong></td>
</tr>
<tr>
<td>1.6 MDOT SHA Centerline Insertion and Replacement Process</td>
</tr>
<tr>
<td>1.7 MDOT SHA Calibration Point Conflation</td>
</tr>
<tr>
<td>1.8 Consolidated Centerline QC Analysis and Clean up</td>
</tr>
<tr>
<td>1.9 Consolidated Centerline Migrations to R&amp;H</td>
</tr>
<tr>
<td>1.10 MDOT SHA Business Data Network Registration and QC</td>
</tr>
<tr>
<td>1.11 Consolidated Centerline Maintenance Env and Workflow</td>
</tr>
<tr>
<td>1.12 Pilot Assessment</td>
</tr>
</tbody>
</table>
Centerline Insertion and Replacement
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase II – Pilot</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.1 Phase II Work Order 11 Pilot Initiation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.2 Pilot Jurisdiction Coordination</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.3 MDOT SHA Roadway ID Conflation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.4 Local Jurisdiction and MDOT SHA Centerline Delta Evaluations</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.5 Development of Insertions and Replacement Tool and Workflow</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.6 MDOT SHA Centerline Insertion and Replacement Process</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.7 MDOT SHA Calibration Point Conflation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.8 Consolidated Centerline QC Analysis and Clean up</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.9 Consolidated Centerline Migrations to R&amp;H</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.10 MDOT SHA Business Data Network Registration and QC</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.11 Consolidated Centerline Maintenance Env and Workflow</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1.12 Pilot Assessment</strong></td>
<td></td>
</tr>
</tbody>
</table>
Calibration Point Conflation
Calibration Point Conflation
### Phase II – Pilot

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Phase II Work Order 11 Pilot Initiation</td>
</tr>
<tr>
<td>1.2</td>
<td>Pilot Jurisdiction Coordination</td>
</tr>
<tr>
<td>1.3</td>
<td>MDOT SHA Roadway ID Conflation</td>
</tr>
<tr>
<td>1.4</td>
<td>Local Jurisdiction and MDOT SHA Centerline Delta Evaluations</td>
</tr>
<tr>
<td>1.5</td>
<td>Development of Insertions and Replacement Tool and Workflow</td>
</tr>
<tr>
<td>1.6</td>
<td>MDOT SHA Centerline Insertion and Replacement Process</td>
</tr>
<tr>
<td>1.7</td>
<td>MDOT SHA Calibration Point Conflation</td>
</tr>
<tr>
<td>1.8</td>
<td>Consolidated Centerline QC Analysis and Clean up</td>
</tr>
<tr>
<td>1.9</td>
<td>Consolidated Centerline Migrations to R&amp;H</td>
</tr>
<tr>
<td>1.10</td>
<td>MDOT SHA Business Data Network Registration and QC</td>
</tr>
<tr>
<td>1.11</td>
<td>Consolidated Centerline Maintenance Env and Workflow</td>
</tr>
<tr>
<td>1.12</td>
<td>Pilot Assessment</td>
</tr>
</tbody>
</table>
Centerline Morphology

Flowchart:

1. Source Local Centerlines
2. Source MDSHA Routes
3. Task 1.3 Conflation Process
4. Task 1.4 Delta Analysis
5. Task 1.6 Insert and Replace Tools
6. Conflated Centerlines
7. Unmatched Routes
8. Identify Routes to Retire
9. Conflated Centerlines
10. Create Temporary Routes
11. Task 1.7 Calibration Point Conflation
12. Task 1.9 Migrated Centerlines/Routes/Calibration Points
13. Consolidated NGS11 Centerline
14. Unassigned Centerlines
15. Assign Route ID
16. Manual Route ID Assignment
17. Unmatched Centerlines
18. Delete Rejected
Phase II – Pilot Maintenance Work/Data Flow
Phase II – Pilot Maintenance Work/Data Flow
External Business Data Integrations

- Oversize/Over Weight Truck Permitting
- CHART Emergency Patrol Routes
- ADA
- Scenic By-Ways
- Roadway Improvement Log
- Bike Routes
- Sound Walls
- Work Safety Zones
- Roadway Dedications
- Rumble Strips
- Railroad Crossings (Location and Approach)

- Line Striping
- Pavement Condition
Thank You!

Marshall L. Stevenson III  
GIS Program Management Support  
Office of Planning & Preliminary Engineering  
MDSHA  
mstevenson@sha.state.md.us

Michel Ney Sheffer, GISP, CFM  
Data Services Division – Assistant Chief  
Office of Planning and Preliminary Engineering  
MDSHA  
msheffer@sha.state.md.us

Jesse M. Day  
Transcend Spatial Solutions  
Senior Project Manager  
jday@tssgis.com