An Iterative Approach to Intelligent Traffic Systems Asset Management

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Nevada Department of Transportation
Agenda

- Background
- Assessment
- Should we swing for the fence?
- Selecting a partner
- Journey
- Take aways
- Future
Background

What we do

• Provide, operate, and maintain Intelligent Transportation Systems (ITS) & Public Safety Radio Systems to enhance the operations and maintenance of Nevada roadways.
Background

Diverse equipment

- 118 radio system sites
- 600 intelligent traffic system sites
- 1000 solar warning devices
- 1400 miles of fiber
- Shared user base
  - NDOT
  - Highway patrol
  - Washoe County
  - FAST (Las Vegas)
- Limited budget
Background

Quick Nevada Facts

- 7th in overall area
- 44th in population density
- Diverse climate
- 5,400 centerline miles
- ITS needs dominated by two major cities

Source: U.S. Census Bureau Census 2000 Summary File 1 population by census tract.
Assessment

Known asset information

- Network representation
- Associated documentation
- Asset attributes (e.g., type, model, configuration)

Our Belief

<table>
<thead>
<tr>
<th>Reality</th>
<th>Known</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>Under control</td>
<td>Risk</td>
</tr>
<tr>
<td>Unknown</td>
<td>Risk</td>
<td>Surprise</td>
</tr>
</tbody>
</table>
Assessment

Unknown asset information

• Exact asset spatial location
• Maintenance history
• Total cost of ownership
• Associated GIS and topographical information
Assessment

Missing capabilities

• Work order tracking
  – Historical
  – Prioritization
• Resource allocation
• Attribute updating
• Location mapping
• Associated information in the field
• Manage inventory
Assessment

Internal dynamics

• Existing software platforms
  – Central systems
  – Orion

• Distributed organization
  – Three districts with different needs
  – Matrixed IT organization
  – Technology poor maintenance crews
Assessment

Defined asset management requirements

- Platform agnostic (mobile, desktop, phone)
- Map-based (GIS, location information)
- Easily configurable (meet our unique needs)
- Distributed administration
- Dynamic reporting
- Real-time dashboard
- Offline map
- Hosted environment
- Security architecture
Assessment

Established asset management metrics

• Maintenance costs
• Maintenance frequency
• Resource efficiency
• Asset life cycle
Should we swing for the fence?

No

• Budget
• Change management
  – Internal politics
  – Independent districts
  – Asset management politics
• The unknown unknown
• Not sure what we wanted
## Selecting a Partner

### ITS & Radio

Survey software solutions

<table>
<thead>
<tr>
<th>Feature</th>
<th>MobileMMS</th>
<th>Commshop 360</th>
<th>Trackit</th>
<th>Econolight</th>
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</thead>
<tbody>
<tr>
<td>Technical</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Inventory Management</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Work Order Management</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Accounting Billing</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Reporting</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Security</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Configuration</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Y = Supports Requirements  N = Does Not Support Requirements
Selecting a Partner

Selected MobileMMS
Selecting a Partner

Why MobileMMS

• Self configuration
• GIS-based
• Diverse customer background
• Real time reporting
• Sophisticated API (SDK)
• Hosted
The Journey

Determined asset information

- Determined required asset attributes
- Gathered various spreadsheet sources
- Combined existing information
- Corrected spatial location
- Assembled associated documentation
- Collected relevant GIS data

<table>
<thead>
<tr>
<th>Device Name</th>
<th>Naming Convention</th>
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<tr>
<td>C2-1870PershierYard-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870PR7DowntownFremontW4174-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870RGS9AmorFremontW4575-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870RGS9AmorFremontW4575-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-Switch5532PershierMcCarrenFH-L3</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870Fremont-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870PershierYard,216Hz</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870Las Vegas Yards,59Ghz</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870MogulW471-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870YellowstoneHill</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870SparkleWetRemote-RWIS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870FoothillRPO-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870Rogers-Daniel-RWIS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870Sweetwater-RWIS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870Highland-Flat-RWIS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870Rogue550-RWIS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870LonePeak-RWIS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870CountryClubDrW420-DMS</td>
<td>Okay</td>
</tr>
<tr>
<td>C2-1870InclineVillage-RWIS</td>
<td>Okay</td>
</tr>
</tbody>
</table>
The Journey

Iterative asset representation

• Hierarchy
• Site naming convention
• Map-based representation
• Spatial and mile marker reconciliation
The Journey

Developed maintenance work flow

• Strike team
  – District communication experts
  – Network management
  – Radio and ITS

• Implementation Details
  – Collected information
  – Users
  – Routing
  – Approval
  – Tracking
The Journey

Customizing the system

- Distributed administration
- Customized dashboard
-Disconnected capability
The Journey

Using the system

• Requesters
  – Emergent work order requests
  – Request status

• Users
  – Current work orders
  – Field information
  – Asset updating
  – Inventory management

• Management
  – Preventative maintenance scheduling
  – Dashboard
  – Status and other metrics

• Administrators
  – Form, workflow, notification modification
The Journey

Expanded use beyond traffic management

• Service request tracking for maintenance districts
  – Replaced legacy request system
  – Includes service on all state assets
• Storm system maintenance
  – Loads field inspections and tracks maintenance
  – Private culvert tracking
• Water meter reading
  – Automatic state reporting
• Solar sign yearly inspections
  – Ability to add new signs
• Gate tracking
  – Private gate contact information
The Journey

Workflows
The Journey

Timeline

- January 1, 2012: Radio Requirements
- January 1, 2013: ITS Requirements
- January 1, 2014
- January 1, 2015
- January 1, 2016
- January 1, 2017: Deployment

2012

2013

2014

2015

2016

2017
Take Aways

Cost

• $25,000 yearly hosting and licensing
• $25,000 implementation
  – Loading (reloading) assets
  – Workflow configuration
  – Form development
  – GIS integration
• $100,000 customization
  – Disconnected App
  – Customized reporting dashboard
  – Segmented back-end administration
  – Map-based asset creation and editing
Take Aways

What we learned

• We would have never gotten it right swinging for the fence
Take Aways

It works

• Task tracking
• Asset updating
• Inventory management
• Work force efficiency
• Product life cycle determination
• Resource planning
• Total cost of ownership determination
• Outsource considerations
The Journey

Technical presentation

- [https://app.mobile-mms.com](https://app.mobile-mms.com)
- Contact
  - Sean Dingman (sean.dingman@websoftdev.com)
Demonstration
Map-based, mobile platform
Demonstration
Integrated GIS (ArcGIS or Autodesk)
Demonstration

Form-based asset view and update
Demonstration

Authorized editing
Demonstration
Linked trouble tickets
**Demonstration**

**Historical listing**

![Image of Mobile CRS interface](image)

### ITS Trouble Ticket/Work Order

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linked Device</td>
<td>D3-I80-CardinTCab3</td>
</tr>
<tr>
<td>ID</td>
<td>317</td>
</tr>
<tr>
<td>Reporting Party (Registered)</td>
<td>Gregg Thompson</td>
</tr>
<tr>
<td>Problem Location</td>
<td>Cardin Tunnel East Portal Median</td>
</tr>
<tr>
<td>Detailed Problem Description</td>
<td>Please update Firmware to the Control Switch, <a href="http://122.30.6.68/index.html">http://122.30.6.68/index.html</a></td>
</tr>
<tr>
<td>Due Date (Date Time)</td>
<td>4/19/2017 6:19 AM</td>
</tr>
<tr>
<td>Work Comment</td>
<td>Ajay 4/19/17, Firmware upgrade to 3.0 successful.</td>
</tr>
<tr>
<td>Assigned Tech</td>
<td>Traffic Operations Technology Section</td>
</tr>
<tr>
<td>Ticket status</td>
<td>Closed</td>
</tr>
</tbody>
</table>

*Gregg Thompson  © Wed 04/19/2017 06:20:40 AM*
Demonstration
Technician field view
Demonstration

Map-based routing
Demonstration
Ad-hoc reporting
## Demonstration

### Excel view

<table>
<thead>
<tr>
<th>System ID</th>
<th>Parent/System</th>
<th>Attached To</th>
<th>Linked Device</th>
<th>Problem Location</th>
<th>Detailed Problem Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1716876</td>
<td>D3-80CarlinTCab3WB</td>
<td>D3-800CarlinTCab3WB</td>
<td>Carlin Tunnels</td>
<td>Get Blue Star generator online. Check fluids. Order Keys.</td>
<td></td>
</tr>
<tr>
<td>163401</td>
<td>D3-810WellHub</td>
<td>D3-810WellHub</td>
<td>Well FH</td>
<td>Need to redo DC power for CCTV and put onto LVD.</td>
<td></td>
</tr>
<tr>
<td>1634114</td>
<td>D3-810Pilot</td>
<td>D3-810Pilot</td>
<td>Pilot</td>
<td>Replace CCTV with COHU HD PTZ camera.</td>
<td></td>
</tr>
<tr>
<td>1613089</td>
<td>D3-810ElkoWest</td>
<td>D3-810ElkoWest</td>
<td>Elko West 298</td>
<td>Install Radwin 1E Microwave at W/B CST and Golconda site.</td>
<td></td>
</tr>
<tr>
<td>1613115</td>
<td>D3-810Golconda</td>
<td>D3-810Golconda</td>
<td>Golconda East Side</td>
<td>Order 12&quot; LCD lights. Repair flashing yellow lights.</td>
<td></td>
</tr>
<tr>
<td>1606215</td>
<td>D3-810Osino/CheckLights</td>
<td>D3-810Osino/CheckLights</td>
<td>Osino OLS Lights W/B</td>
<td>No PTZ. CCD sensor is failing. Replace COHU camera with COHU HD. Redo power.</td>
<td></td>
</tr>
<tr>
<td>1606427</td>
<td>D3-810PequopSMT</td>
<td>D3-810PequopSMT</td>
<td>Pequop CCTV</td>
<td>Install Elko PMP Redline system. Find hardware for mounting and precut all needed.</td>
<td></td>
</tr>
<tr>
<td>1606470</td>
<td>D3-810DeethWest</td>
<td>D3-810DeethWest</td>
<td>Deeth East Side WIS</td>
<td>Install 12V Wind Generator on pole.</td>
<td></td>
</tr>
<tr>
<td>1606472</td>
<td>D3-810LamolileSummit</td>
<td>D3-810LamolileSummit</td>
<td>Lamolile Summit</td>
<td>Remove COHU CCTV once new AXIS cameras are installed.</td>
<td></td>
</tr>
<tr>
<td>1606472</td>
<td>D3-810LamolileSummit</td>
<td>D3-810LamolileSummit</td>
<td>Lamolile WIS</td>
<td>Install 2 AXIS cameras on the 80' Pole on the Summit. Install JS10X1 switch.</td>
<td></td>
</tr>
<tr>
<td>1606472</td>
<td>D3-810LamolileSummit</td>
<td>D3-810LamolileSummit</td>
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<td></td>
</tr>
</tbody>
</table>

*Note: The above table contains simplified problem descriptions for demonstration purposes.*
Demonstration
Calendar-based scheduling
Demonstration
User administration
Demonstration
Form administration

<table>
<thead>
<tr>
<th>Properties</th>
<th>Fields</th>
<th>Map Settings</th>
<th>Reports</th>
<th>Workflow</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Send initial email (Registered user only)</strong></td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Additional notification email (comma separated)</strong></td>
<td>Textbox</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reporting Party (if not registered)</strong></td>
<td>Textbox</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reporting Party phone</strong></td>
<td>Textbox</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Problem Notification Sent To</strong></td>
<td>AJ Kuntz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Due Date</strong></td>
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</tr>
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<td></td>
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<td>AJ Kuntz</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Problem Location</strong></td>
<td>Textbox</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Detailed problem description</strong></td>
<td>Text area</td>
<td></td>
<td></td>
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</table>
Demonstration

Group administration
Demonstration
Workflow scripting
Demonstration
Self-styled reporting
Future

Additional Development & Software

• Dashboard
Future
Additional Development & Software

• Mobile App
Future

Additional Development & Software

• Barcode Reader
• Enterprise Asset Management