Tracking Snow & Ice Vehicles In Real-Time

Rick Garrabrnant - City of Columbus, Department of Public Service
Jesse Glascock - T&M Associates
Darlene Magold Scott - T&M Associates
Erick Lobao - T&M Associates

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Start

Project Background / Goals

Technical Background

Final Product
THE CITY OF COLUMBUS
MICHAEL B. COLEMAN, MAYOR
Department of Public Service
Department of Technology

- Snow & Ice Removal
- Replace Existing C.O.M.B.A.T. System
  - Managed by a third party
  - Not integrated with City's Enterprise GIS
  - Difficult to update and or expand as needs change
Project Team

- networkfleet
- AVL Vendor
- GeoEvent Processor
- Web Application
  Design & Deployment
- esri
Real World

111 Snow Operations Vehicles

- GPS Sensor
- Plow Sensor
- Spreader Sensor
Technology

GPS Message Delivery

GPS Message Processing

Web Application
GeoEvent Anatomy

Connectors (Inputs)
- Socket (TCP / UDP)
- File (.csv, .json)
- RSS
- Web (REST endpoint, Poll site for JSON)

Processors
- Filters
- Enrichment

Output
- .CSV
- Featureclass
- WebSocket
- Instant Message
- Email

Technology

GPS Message Delivery

GPS Message Processing

Web Application
Networkfleet

- Truck Sensors
  - GPS
  - Plow
  - Spreader

- Reports every 15 seconds
- RECORDED "ON Event"
- DELIVERED in bundles every 2 minutes

NF: Dataconnect
All message types in single stream

Dataconnect

Port 6180 Open (Locked)
Port 80 Open (External API)
Port 6080 Open (External)

GeoEvent Processor

NF Connector

*Custom Connector
Dataconnect message types in single stream

Firewall

Port 6180 Open (Locked via IP for Network Fleet)
Port 80 Open (External Access to IIS)
Port 6080 Open (External Access to REST Endpoint)
GeoEvent Processor

**G**
- Filter Message Type = GPS
  - Enrich Stream:
    - Brass Tagg
    - Home Outpost
    - On VIN Match to Lookup Table
  - Field Mapper:
    - Last Known Location
    - Historic Breadcrumb

**P**
- Filter Message Type = Sensor
  - Enrich Stream (Plow Sensor):
    - Sensor 1 = "On"
    - Set to INTEGER 1
    - On DESC Match to Lookup Table
  - Field Mapper:
    - Last Known Location
    - Historic Breadcrumb

**S**
- Filter Message Type = Spreader
  - Enrich Stream (Spreader Sensor):
    - Sensor 2 = "On"
    - Set to INTEGER 1
    - On DESC Match to Lookup Table
  - Field Mapper:
    - Last Known Location
    - Historic Breadcrumb

DataConnect

Spreader
- RECORDED "ON Event"
- DELIVERED in bundles every 2 minutes

*Custom Connector

Remove Geometry
Field Mapper: Last Known Location  
Field Mapper: Historic Breadcrumb

Enrich Stream (Plow Sensor):  
- Sensor 1 = "Off"  
- Set to INTEGER 0  
On DESC Match to Lookup Table

Enrich Stream (Spread Sensor):  
- Sensor 2 = "Off"  
- Set to INTEGER 0  
On DESC Match to Lookup Table

Field Mapper: Last Known Location  
Field Mapper: Historic Breadcrumb

Remove Geometry

Feature Classes Stored in ArcSDE Database (SQL Server)

Plow Last Known Location (Websocket)  
Provides "real-time" (15 Second)  
Networkfleet messages to application

Plow Last Known Location (Feature Service)  
Provides "real-time" (15 Second or 2 minutes)  
Networkfleet messages to Database

Plow Historic Breadcrumb (Feature Service)  
Stores all "Last Known Locations" in Database  
Used for search history and Reports

Sensor Last Known Status (Websocket)  
Provides "real-time" (2 Minutes)  
Networkfleet messages to application

Geoprocessing:  
Populate breadcrumbs with attributes from closest street centerline segment.
Geoprocessing:
Population: Breadcrumbs with attributes from closest street centerline segment.

(Window Scheduler Runs Python Script every 1 minute)

Truck 1
- Speed

Truck 2
- Speed
Geoprocessing: Populate breadcrumbs with attributes from closest street centerline segment.

(Window Scheduler Runs Python Script every 1 minute)

<table>
<thead>
<tr>
<th>Truck</th>
<th>TimeStamp</th>
<th>Plow Status</th>
<th>Spreader Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>24561</td>
<td>2013-07-19 12:55</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>24569</td>
<td>2013-07-19 12:55</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

Application makes requests to third party wemap services via Port 80 (Arcgisonline.com - street basemap - satellite basemap)
Technology

GPS Message Delivery

GPS Message Processing

Web Application
Web Application

- Display "Real-Time" Truck Information
- Search Truck Activity (via Map or Form)
- Generate Standard Reports
  - (Geo-processing Service)

Support Dispatchers and Supervisors Decision Making
Developer Details

- JavaScript & HTML 5
- Twitter Bootstrap
- Windows Server 2008 R2
- SQL Server 2012
- ArcGIS Server 10.2 (GeoEvent Processor)
- Python for geoprocessing
Web Application

- Display "Real-Time" Truck Information
- Search Truck Activity (via Map or Form)
- Generate Standard Reports
  - (Geo-processing Service)

Support Dispatchers and Supervisors Decision Making
Performance Metrics

Graph 1: Geoprocessing Activity

Graph 2: GEP Input Count
Future Development

- Mowers
- Street Sweepers
- Public
Demo Time!

Live Trucks, Search History, Standard Reports

Fast

Flexible
Questions?

Rick Garrabrant
CRGarrabrant@columbus.gov

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JGlascock@tandmassociates.com

Darlene Magold
DMagold@tandmassociates.com

Erick Lobao
ELobao@tandmassociates.com