Expanding DSS Functionality:

Maintenance and Operations Decision Support System, MODSS

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September 16-17, 2009
Charlotte, North Carolina
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Expanding DSS Functionality: Possibilities

- **Clarus** Regional Demonstrations #1 & 3
  - Teams of transportation agencies are sharing a common corridor to develop new Business-to-Government solutions enabled by Clarus & focused on road weather

- Through more MDSS deployments
  - As shown in current meeting presentations

- MDSS and MMS Integration
  - Future initiative
Expanding DSS Functionality through *Clarus* Demonstrations

- **Clarus Use Case #1**
  - Provide enhanced *Clarus*-enabled forecasts for the duration of the project for utilization in the Non-winter Maintenance and Operations Decision Support Tool and the Multi-state Control Strategy Tool.

- **Forecasts**
  - Gridded background field
  - Site-specific atmospheric
  - Site-specific pavement
Use Case #3: Non-winter Maintenance and Operations Decision Support Tool

Objective:
Expand decision support beyond snow and ice control and to incorporate Clarus data to assist maintenance, operations, and construction-related scheduling decisions. Expansion will provide the framework to bridge the current gap between the road weather information and the proactive decision-making process.
How will enhanced forecasts be used; MODSS Potential Capabilities

• Strategic Planning
  - Maintenance Scheduling
  - Construction Scheduling
  - Inspection Scheduling

• Tactical Response
  - Incidents, Requests and Response
  - Scheduling Changes
  - Viewing Current Weather
    • Radar, Satellite, Lightning, and Observations
Examples of MODSS Supported Maintenance Activities

- vegetation management
  - herbicide management
  - pruning and trimming
  - planting
  - mowing
- pavement
  - striping
  - resurfacing
  - application and curing
  - crack sealing
  - pothole repair
  - surveys
- shoulders
  - drainage remediation
  - edge/drop-off repair
  - guardrail repair
  - sign deployment
  - sign repair
- inspection
  - bridge
  - construction
  - foundation
Use Case #3: Non-winter Maintenance and Operations Decision Support Tool

Legend:  
- **Existing**
- **New**
- **System Boundary**

Weather Service Provider  
*Clarus System*  
Other Data Provider  
Non-winter DSS Tool  
Input Configuration  
System Configuration  
Output Configuration  
User Workstations
Potential Users of the Tool

• Departments of Transportation
  - State
  - Local
• Law Enforcement
• Emergency Management

More than Multi-State
Multi-Jurisdictional
2008 Flooding of I-80

Photo Courtesy of Iowa DOT
Systems Engineering Approach

- Scenario Description (Concept)
- High-Level System Requirements
- Detailed System Requirements
- Design
- Build
- Test
- Implement
- Evaluate
UC #3 - Activity Planner

• Activity with subset
  - Mowing
  - Herbicide Application
    • Herbicide Material

• Location
  - Bounding Box

• Location Entry
  - Manually Entered
  - Generated from Map Selection
  - Predefined (project or area name)
UC #3 - Activity Planner Example

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>Thu, Aug 6</th>
<th>Fri, Aug 7</th>
<th>Sat, Aug 8</th>
<th>Sun, Aug 9</th>
<th>Mon, Aug 10</th>
<th>Tue, Aug 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Humidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Wind Speed (mph)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°F)</td>
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<td>90</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>Surface Wind Speed (mph)</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>
UC #3 - Activity Planner

• Options
  - Tweak Rule Variables and Regenerate
  - Select Time for Activity
  - Establish Notification List
    • Default (creator of plan)
    • Ad hoc (manually enter email address)
    • User Groups (work team, surveyors)
  - Save Schedule (or exit)
Maintenance Activities with Clarus

• Data monitoring programs should include periodic human inspection and the use of automated computer programs for when you’re not looking.

• Clarus is great for both!
## UC #3

- The System will analyze weather data based on the weather-related practices established for the activity. (i.e. - airTemp > 70)
- The System will display available times to perform the activity.
- The System will save the selections (activity, location, activity time, and notification list).

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<th>Temperature (°F)</th>
<th>Relative Humidity</th>
<th>Surface Wind Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed, Aug 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thu, Aug 6</td>
<td></td>
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<tr>
<td>Fri, Aug 7</td>
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<tr>
<td>Sat, Aug 8</td>
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<td></td>
</tr>
<tr>
<td>Mon, Aug 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tues, Aug 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Weather Data Chart]

7th Clarus & 11th MDSS Stakeholder Meetings, September 14-17, 2009, Charlotte, NC
UC #3

- The System will begin evaluating the scheduled activity.
- The System will notify the “list” when observations are outside the weather related practice range.
- Planner has three options: reschedule activity, cancel activity, or keep original schedule.
UC #3

- Weather Displays
  - Display current observations
    - Clarus
    - AWOS
    - ASOS
    - Earthquake
  - Display Forecasts
  - Display NWS Watches, Warnings, Advisories
  - Display NWS Radar and Satellite
Use Case #4 Multi-state Control Strategy Tool

Legend:
- **Existing**
- **New**
- **System Boundary**

Roadway Management Data Provider
Weather Service Provider
Clarus
Other Data Provider

Input Configuration
System Configuration
Output Configuration

Multi-state Control Strategy Tool

User Workstations
Next Steps - UC #4

• Recipient of Notification
  - Evaluate whether or not recommendation can be implemented
  - Implement response to recommendation
    • Perform requested action
    • Perform alternative action
    • Do nothing
  - Respond via MSCST with implementation disposition
• System sends message based on notification list
Practices - UC #4

• Operational
  - Example - If an accident in Illinois has occurred within 5 miles of the Indiana state line on I-70

• Notifications
  - District Personnel (IL & IN) with recommendations to “display accident message on DMSs” and “publish accident information on HAR”
Practices - UC #4

• Weather Related
  - Example - If wind gusts are detected on I-80 > 60 mph between Ottawa and Moline

• Notifications
  - Motor Carrier Services Personnel (IL & IA) with recommendation to “send high wind message to trucking companies”
  - District Personnel (IL & IA) with recommendation to “display high wind message on DMSs”
Vehicle Sensor Data: location, speed, air temp., pavement temp., pavement friction, plow position, chemical application rate, etc.

MMS Database

Separate storage if needed

MDSS Interface

Maintenance Office Computer with MMS and MDSS software

Maintenance Vehicles in Field
Results to Date and Ongoing Activities

• Raising Road Weather Capabilities through MODSS
  - Getting Decision Support Systems deployed
    • Maintenance Decision Support System (MDSS) prototype developed
    • Extensive MDSS outreach via RoadShows and with AASHTO
    • Conducting MDSS Regional Demonstrations and Evaluations
    • Expanding decision support beyond winter maintenance

• Ensuring Investments Improve Performance
  - Defining performance measures
  - Baselining road weather information products

Illinois Comment; Forecast Consultation is a key to success...
MDSS and MODSS: Where do we go from here? - Other States; Indiana, etc....

• MDSS and future MODSS will need executive support

• Training Plan will need to be developed

• Create Experts by using past saved storms for training

• States Should name Project Manager or hire Consultant to Manage MDSS Implementation

• To see full realization of savings - should implement statewide - costs will be paid for by the savings