Extending MDSS Beyond Winter Maintenance

...introducing the Maintenance & Operations Decision Support System (MODSS)

National Rural ITS Conference, Traverse City, MI
Session C1, Monday October 8, 2007

Ray Murphy, ITS Specialist
Operations Technical Service Team
Federal Highway Administration
Resource Center
Weather and Societal Impacts

• Safety
  - Approx 1.57 million weather-related crashes/year
    • 7,400 fatalities; 690,000 injuries
  - 24% of all crashes occurred under adverse weather

• Mobility
  - About 25% of non-recurrent delays on freeways is due to weather; system delay is 1 billion hrs/yr.

• Productivity
  - Weather-related delay adds $3.4 billion to freight costs annually

• Environment
  - Chemical anti-icing and deicing materials effect air quality and infrastructure
Advanced Decision Support

Transportation Resources & System Status

Weather Forecast Models

Observing Systems

Decision Support Systems

Management Decisions

Policy Decisions

Societal Benefits

On-going feedback to optimize value and reduce gaps
Maintenance DSS

- MDSS merges road-specific weather predictions with computerized rules of practice
- Provides treatment recommendations for application type, amount & timing
- Excellent tool for training & post-storm review of maintenance actions
- Has potential to improve efficiency, reduce costs and save lives (improved LOS)
MDSS: Success Story

The MDSS recipe

- **Leverage technologies created by Nat'l labs**
- **Utilize practitioners to guide & develop & graphics**
- **Educate both the users and the providers so that everyone communicates their needs**
- **Provide a service that raises the bar for the entire enterprise and is seen as an important resource for practitioners**
MDSS: Success Story

Stakeholder Meetings
2000 - 2007

Since 2000, 41 State DOTs & DC have participated in one or more MDSS meetings

Local & Int’l Stakeholders
Ontario Ministry of Transportation
Environment Canada
City of Grand Prairie, TX
Dallas Area Rapid Transit
City/County of Denver, CO
New York State Thruway Authority
MDSS: Success Story... creating new markets

MDSS Pooled-Fund Study 2007
Led by South Dakota DOT
Provider: Meridian Environmental Technology, Inc.

MDSS Pilot Project 2006-07
Provider: DTN/Meteorlogix

13 States

11 States
Technology Transfer & Outreach

**Promote Deployment** - ultimately helping operating agencies achieve safety and mobility goals while decreasing, or at a minimum holding steady, operating expenses through:

- RoadShow
- AASHTO TIG
- Software
- Deployment Guide
- Stakeholder Meeting
MDSS RoadShow

Agenda

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<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
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<tbody>
<tr>
<td>9:00 AM</td>
<td>Session 1  System Development</td>
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<td>9:45 AM</td>
<td>Session 2  Functionality &amp; State DOT Perspectives</td>
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<td>10:30 AM</td>
<td>Break</td>
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<tr>
<td>10:45 PM</td>
<td>Session 3  Vendor Capabilities</td>
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<tr>
<td>11:30 PM</td>
<td>Session 4  Next Steps... Making the Investment</td>
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MDSS...
A Smart Investment in Winter Maintenance

Benefit Areas:

- Safety
- Mobility
- Productivity
- Efficiency
- Energy & Environment
- Customer Satisfaction

...Return On Investment (ROI)

http://www.ops.fhwa.dot.gov/weather/seminars/mdss_roadshow
Activities include all necessary labor, equipment, & materials used for applying salt, other chemicals, or sand to the roadway during or after weather events; for plowing snow, ice, and slush from roadways and bridges; & for plowing areas adjacent to the roadway.
Getting the Word Out!

The MDSS RoadShow has made its way through 15 States...

Upcoming Sessions:

- New York State DOT, Maintenance Managers' Meeting - Corning
- Utah DOT, Utah Engineering Conference - Salt Lake City
Maintenance Decision Support System
Focus Technology

MDSS TIG Members

- David Huft (South Dakota) (lead)
- Phillip Anderle (Colorado)
- Tony McClellan (Indiana)
- David Cornett (Kentucky)
- Steve Palmer (Michigan)
- Allen Williams (Virginia)
- Ray Murphy (FHWA)
- Keith Platte (AASHTO Staff)
MDSS Outreach

- Enhanced PowerPoint Presentation
- Presentation CD/DVD Takeaway
- General Information Brochure
- Case Studies/Printed Testimonials
- Deployment Guide
- Regional Workshops

(Product Demonstration Showcase - Nebraska region May 08)
MDSS Users & Software Requests

Software Requests
- Release 1 (9/02) - 40
- Release 2 (1/04) - 22
- Release 3 (11/04) - 49
- Release 4 (1/07) - 82
- Release 5 (by 12/07)

- Meridian (pooled fund study)
- DTN/Meteorlogix
- Other
New for MDSS Release 5.0

- Updated **road temperature** model
- Added **new tactical graphics** (radar & satellite) including dynamic maps and panning/zooming
- Added **real-time truck AVL data**
- Added **road temperature & freezing precipitation alerts**
- Enabled **archive browsing** from real-time display
- Available end of 2007
MDSS DEPLOYMENT GUIDE

Functional Specification Template and Procurement Guidance

Science Applications International Corporation

9th Annual MDSS Stakeholder Meeting

Kansas City, MO
September 18-19, 2007

NOAA’s National Weather Service Training Center
State DOT Participation at the 2007 MDSS & Clarus Stakeholder Meetings

- Both (24)
- MDSS only (4)
- Clarus only (3)

**MDSS Participants**
- 42 State DOT personnel from 28 states
- 30 people from 27 private sector orgs.
- Toll Roads (E-470 Colorado, NY State Thruway)
- Municipal (City/County of Denver)
- Academic (NJ Inst of Technology, Univ of OK, Univ of North Dakota, TTI)

**Clarus Participants**
- 31 State DOT personnel from 27 states
- 24 people from 16 private sector orgs.
- Toll Roads (NY State Thruway)
- Municipal (City/County of Denver)
- Academic (NJ Inst of Technology, Univ of OK, Univ of North Dakota, TTI)
- International guests from Canada & UK
MDSS Modules: Data Input

National Weather Service Data
- Surface Observations (METAR)
- National Weather Models
- Regional Weather Models
- Model Statistics

State DOT Data
- RWIS/ESS Observations
- Road Characteristics
- Route Metadata

MDSS Graphical User Interface

Road Weather Forecast System
- Forecast Module 1
- Forecast Module 2
- Forecast Module 3
- Forecast Module 4
- Post Processor
- Forecast Product

Road Cond & Treatment Module
- Road Temperature Prediction Model
- Chemical Concentration Algorithm
- Rules of Practice for Anti- and Deicing
- Blowing Snow Algorithm
- Bridge/Road Friction Algorithm
MDSS Modules: Data Fusion

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- Forecast Module 4
- Forecast Module N
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- Post Processor
- Forecast Product

**MDSS Graphical User Interface**

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MDSS Modules: Customization

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MDSS Modules: GUI

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MDSS Graphical User Interface
Transition to MODSS

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**Graphical User Interface**

**New Customized Modules**
- Maintenance beyond Snow & Ice
- Traffic Management
- Construction
What exactly is MODSS?

- **MODSS = Maintenance & Operations Decision Support System**
- Leverages lessons learned & software developed for MDSS
- Expands DSS functionality beyond snow & ice control to other areas of transportation maintenance & operations
Basic MODSS Requirements

- **Rapid updates** should be provided (minutes not hours)
- Extreme **quality control** should be employed
- **Historical data** should be available (event review)
- **Data export** should support common formats (xml, shape files, etc.)
- **Automated alerts** should be provided (user defined thresholds)
- Design should support **tactical** (0-3 hrs) and **planning** horizons (1 to 5 days)
- An **event planner** feature should be provided
MODSS: High-level View

**Meteorology**
- Environmental Sensor Stations (ESS)
- Vehicle-based Observations (VII)
- Supplemental Wx Obs (ASOS, Radar, Satellite)
- Numerical Weather Forecast Data

**Surface Transportation Weather Management System (Clarus)**

**Operations**
- Traffic Monitoring Systems Cameras, Loops
- Traffic Analysis Tools
- Standard Operating Procedures (e.g. Rules of Practice)

**Maintenance & Operations Decision Support System (MODSS)**
- Winter Maintenance Decision Support System (MDSS)
- Maintenance Beyond Snow & Ice Control Decision Support System
- Traffic Management Decision Support System
- Construction Management Decision Support System
- Other Surface Transportation Decision Support Systems

**Strategies & Guidance to aid Surface Transportation Decision-Makers**
Stakeholder Meeting - March 2007

State DOT Participants - Traffic Management

MODSS: Traffic Management
Traffic Management Activities

Outcomes from the initial stakeholder meetings:

- **Traveler information** -
  alert drivers to road weather conditions (e.g., flooded roads) for improved route choice and trip timing

- **Incident management** -
  resource allocation based on local weather events

- **Signal control** -
  - modify signal timing due to traffic flow changes under adverse weather
  - Provide tactical information to assist repair crews (e.g., radar, lightning detection)
Next Steps...

• **MODSS Prototype Development** -
  Task NCAR to develop a MODSS prototype based on requirements contained in the ConOps

• **Engage Stakeholders** -
  Create possible task force groups
  - Graphical User Interface configuration
  - Customization Issues
  - Prototype Evaluation

• **MODSS Release 1.0 package** -
  Provide limited tech transfer support (via NCAR) to assist in implementing the MODSS prototype
QUESTIONS/COMMENTS

Thank you!

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Resource Center Operations TST
http://www.fhwa.dot.gov/resourcecenter/teams/operations/

Road Weather Management Program
http://www.ops.fhwa.dot.gov/weather/