Geospatial Weather Decision Support for Transportation Applications

ACGM 2012
June 11th, 2012
Agenda

- Weather & Transportation Effects
- Combining
  - Weather Information
  - Non-Weather Assets
- Transportation Applications
- Case Study – NY511
- Questions?
Weather & Safety

Average Annual Fatalities (2000-2010)

Source:
2. http://www.ops.fhwa.dot.gov/weather/q1_roadimpact.htm
WRTM Strategies

- Advisory
  - Warning Systems
  - Traveler Info. Systems

- Control
  - Signal Timing
  - Ramp Metering
  - Variable Speed Limits
  - Road/Lane Closures

- Treatment
  - Maintenance
  - Obstruction Removal

*Developments in WRTM Strategies. Final Report. FHWA-JPO-11-086*
Weather Information

- Point Data
- Atmospheric Observations
- RWIS Observations

Weather Information

TELVENT is part of Schneider Electric
Weather Information

Where is it extremely windy right now?
Weather Information

Where is the pavement wet? Or below freezing?
Why is RWIS data so valuable?

- Observations from Airports…
  - Typically 1-3 miles (or more) from a major roadway
  - Report atmospheric (non-roadway) variables only
    - Air Temperature, Wind Speed & Direction…
Why is RWIS data so valuable?

Observations from RWIS…
- Located on the roadway
- Report atmospheric and surface (roadway) variables
  - Air Temperature, Wind Speed & Direction…
  - Road Temperature, Road Condition…

Clarus System
What if we stopped there?
Where is heavy snow falling?
Weather Information

Which storms have a potential tornado? Where is it moving?
Weather Information

Click on a coloured region for the latest warning.

Where are Blizzard Warnings posted?

- **Warning**
- **Watch**
- **Ended warning or watch**
- **No warning or watch**
- **No forecast service**
Weather Information

Where has lightning occurred? Is it threatening my position?
Weather Information Coverage

Point Data

Anchor Points

Obs
Radar
RWIS
Storm Corridors
Met Service Bulletins
Lightning

Spatial Data

Fill in Gaps
Assets

Fixed Points

Lines

Polygons

Mobile Points

Assets
Assets

- Maintenance Garage
- Headquarters
- Traffic Intersections
- Home
- Cabin

Smart Information for a Sustainable World
Assets

- Road Segments (Trans-Canada Hwy 117 at Hwy 309)
Assets

- District Boundaries
- Maintenance Regions
- Suburbs
Assets

Mobile Points

- Plow Trucks
- Mowers
- Other Fleet Vehicles
- Any Public Vehicle
- Smartphones
Alert: High winds observed!

Action: Unexpected lane change hazard possible. Hang on to steering wheel.
Alert: Heavy snow in District 3

Action: Contact Supervisor & ensure plans are underway.
Alert: Tornado possible!

Action: Take cover, head back to garage.
Alert: Lightning 5mi. to the south!

Action: Head back to garage.

FHWA-JPO-11-086
Alert: Heavy snow at this intersection!

Action: Lengthen yellow light timing.
Alert: Blizzard Warning!

Action: Delay travel or find another route.
Transportation Applications

Alert: Heavy snow ahead!

Action: Be prepared for slow traffic.

Developments in WRTM Strategies. Final Report. FHWA-JPO-11-086
Case Study

NYSDOT & 511NY
Project Background

- Project part of the Federal Highway Administration (FHWA) Broad Agency Announcement
  - Research on *Clarus* System Data
  - Winter/Spring 2010
  - Solicitation Number DTFH61-10-R-00015

- “…develop new or improved road weather management/operations procedures, create innovative user interfaces, and develop new applications including weather-responsive traffic management tools.”
Project Goals

Collect and integrate *Clarus* observations and disseminate road-segment alerts for use in the New York 511 system and Connected Vehicle Program.
Weather Information

Defined by:
- Highway segments
- Landmarks
NYSDOT Road Network

Project coverage – Two New York transportation corridors

- I-87 west of the Hudson River to the Canadian Border
- Long Island Expressway (I-495)
Weather Information

- Storm Corridors
- Watches & Warnings
- Radar
- Road Observations
- Air Observations
- Road Network
About 511NY

www.511ny.org
About 511NY

Incidents & Closures
Special Events
Cameras
Traffic Speed
About 511NY

Road segment shading...

Road Segment Alerts

Winter Travel Advisory

A pre-production version of 511NY was used for the Clarus project
Two Demonstration Scenarios

- March 7\textsuperscript{th}, 2011
  - Snow storm
- April 28\textsuperscript{th}, 2011
  - Severe weather outbreak
Scenario #1 – March 7th, 2011

Moderate to heavy snow affecting I-87 north of Albany
**Scenario #1 – March 7th, 2011**

**Albany Toll Plaza**

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**essSurfaceStatus**

- **6 = chemicallyWet**

**essSurfaceTemperature**

- **-3.3°C = 26°F**

**Notes:**

- Temperature units are °C for Celsius and °F for Fahrenheit.
- Humidity is given in percent (%).
- Wind speed is in meters per second (m/s).
- Sensor data is marked with a green circle (○), yellow triangle (▲), red cross (×), or orange square (□) for completeness and manual status.
Road segments shaded with "Snow/Ice" color north of Albany
Scenario #2 – April 28th, 2011

Line of severe thunderstorms
Scenario #2 – April 28th, 2011

Crosses I-87 near Queensbury

Tornadic Vortex Signature Detected
Scenario #2 – April 28th, 2011

I-87 near Queensbury
End user = Travelling Public
- Brings information down to the roadway level (*Clarus* & RWIS)
- Insight into weather in-between sensors
- Insight into developing weather situations that will affect the region
From the Traveler’s Perspective

“I see nothing falling from the sky but is the road slick?”

“It is sunny now. Am I about to drive into a developing blizzard?”

“Which portion of my route is or will be affected by high winds?”

“I see where the severe weather is now. Which roads will it affect in the next 15-30 minutes?”
Smart Information for a Sustainable World

Where Are We Going?

1. Point Data
   - Atmospheric Observations
   - RWIS Observations
   - Lightning

2. Spatial Data
   - Radar
   - Storm Corridors
   - National Weather Service Bulletins

Weather Information

Storm Report Summary
Station: Phoenix/WFO (KPSR)
Valid Time: 10:30 AM CDT 4/4/12
Event Type: TSTM WND DMG
Near: 3 NE LAKE CHARLES
Source: NWS EMPLOYEE
Description: OFF DUTY NWS EMPLOYEE REPORTED SEMI BLOWN OFF THE ROAD NEAR I-210 AND HIGHWAY 14. LOCAL REPORTS AND RADAR ESTIMATES WIND GUSTS TO 50 MPH.
Magnitude: not reported
Where Are We Going?

Point Data
- Atmospheric Observations
- RWIS Observations
- Lightning
- Local Storm Reports

Spatial Data
- Radar
- Storm Corridors
- National Weather Service Bulletins
- Weather Information
- Lightning
- Fog
Questions?

- Final Report
- [www.its.dot.gov/index.htm](http://www.its.dot.gov/index.htm)
- Integrating *Clarus* Data with the 511 New York Traveler Information System
- FHWA Publication Number: FHWA-JPO-11-112

Thank You