
Road Weather Management - Recent Research Results from the United States

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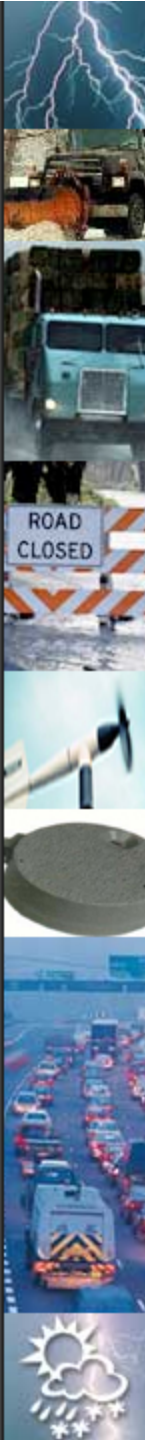
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Presentation Contents

- *Clarus* Overview and Results of the Regional Demonstrations
- Weather Responsive Traffic Management
- Road Weather and Connected Vehicle



The *Clarus* System

www.clarus-system.com

- A database management system for all surface transportation weather observations in North America
- One database removes borders
- Provides advanced quality checking for both atmospheric & pavement data
- Includes extensive metadata

Clarus System

2011-03-21 18:35 UTC

Reports and Subscriptions

Get Observations by:
[Contributor](#) [Geospatial Coordinates](#)

[View Metadata](#) [View Subscriptions](#)
[Quality Checking Descriptions](#)
[View User Guide](#) [Link to Archive Data](#)

United States

Alabama	Hawaii	Massachusetts	New Mexico	South Dakota
Alaska	Idaho	Michigan	New York	Tennessee
Arizona	Illinois	Minnesota	North Carolina	Texas
Arkansas	Indiana	Mississippi	North Dakota	Utah
California	Iowa	Missouri	Ohio	Vermont
Colorado	Kansas	Montana	Oklahoma	Virginia
Connecticut	Kentucky	Nebraska	Oregon	Washington
Delaware	Louisiana	Nevada	Pennsylvania	West Virginia
Florida	Maine	New Hampshire	Rhode Island	Wisconsin
Georgia	Maryland	New Jersey	South Carolina	Wyoming

Canada

Alberta	Quebec
British Columbia	Saskatchewan
Manitoba	Yukon Territory
New Brunswick	
Newfoundland & Labrador	
Northwest Territories	
Nova Scotia	
Nunavut	
Ontario	
Prince Edward Island	

The *Clarus* System is an experimental product and is being used for evaluation and demonstration purposes only. This is provided as a public service.
No warranties on accuracy of data are intended or provided.
See link to contributor's data disclaimer in metadata file [contrib.csv](#).

 Federal Highway Administration
Research & Innovative Technology Administration

[Clarus Contact Information](#) [Clarus Initiative](#)



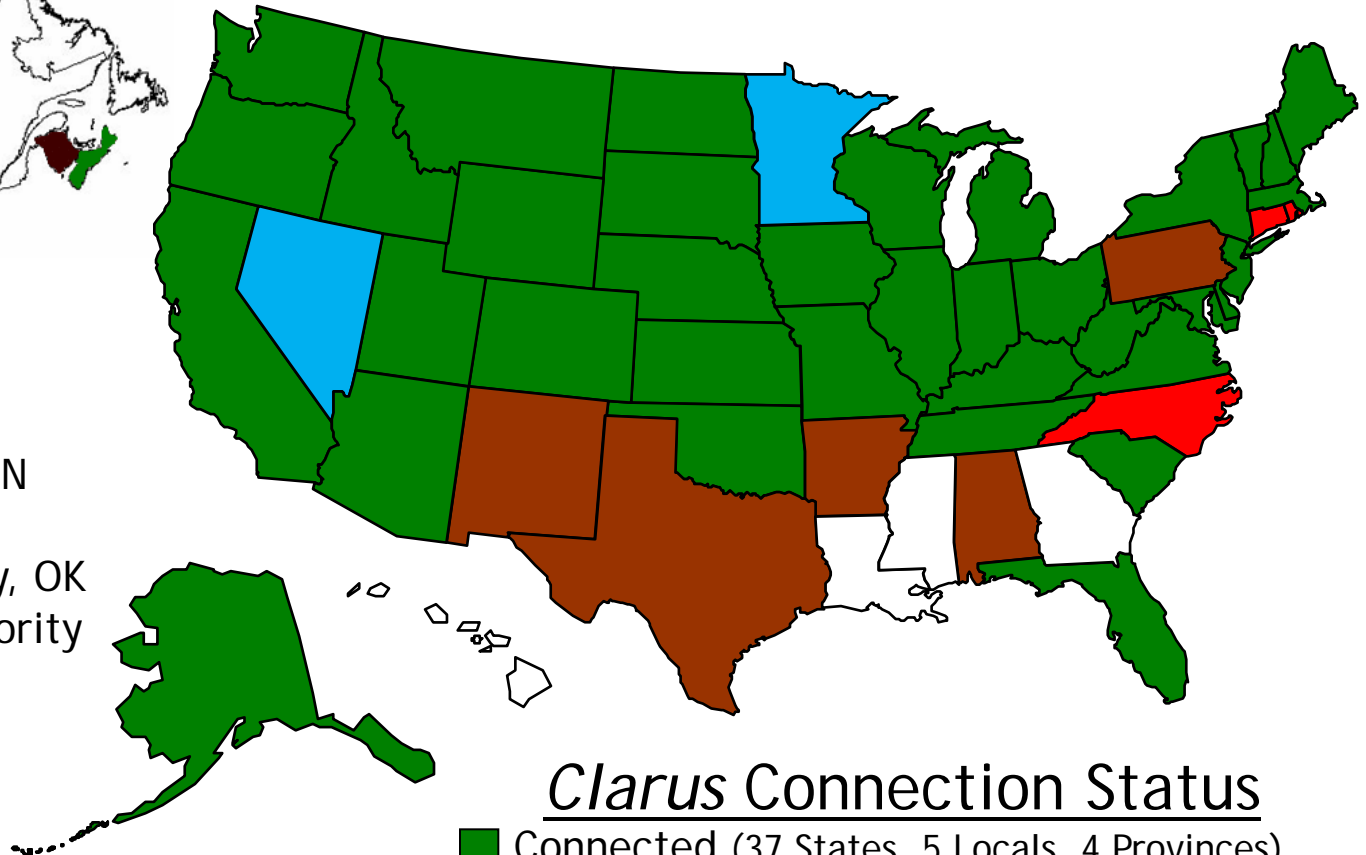
Participation Status for *Clarus* as of April 25, 2012



- Local Participation
- City of Indianapolis, IN
 - McHenry County, IL
 - City of Oklahoma City, OK
 - Kansas Turnpike Authority
 - Parks Canada

Sensor & Station Count

2,435	Sensor Stations (ESS)
54,195	Individual Sensors
178	Vehicles



Clarus Connection Status

- Connected (37 States, 5 Locals, 4 Provinces)
- Connected plus vehicles (2 states)
- Pending (5 States, 3 Locals, 1 Province)
- Considering (3 States, 1 Local)

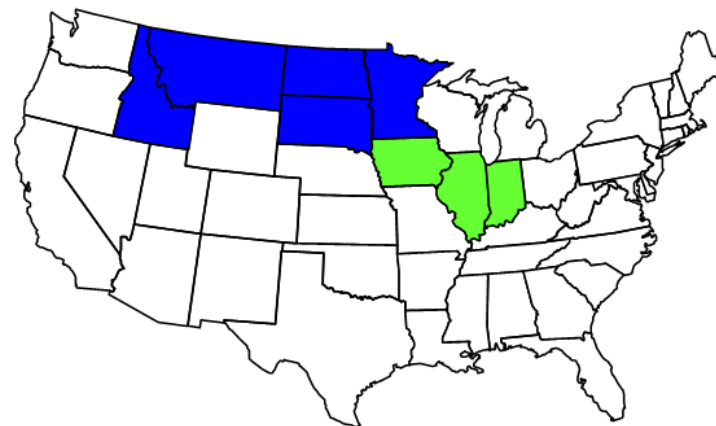
Clarus Regional Demonstration

5 Use Case Scenarios

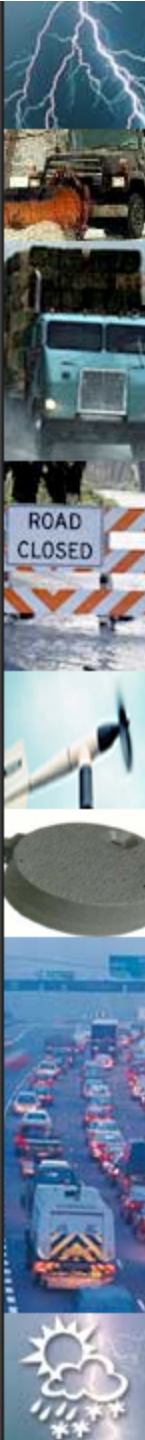
1. Enhanced Road Weather Forecasting Enabled by *Clarus*
2. Seasonal Weight Restriction Tool
3. Non-winter Maintenance & Operations Tool
4. Multi-state Control Strategy Tool
5. Enhanced Road Weather Content for Traveler Advisories

Meridian Team
Scenarios 1, 2, 5

Mixon Hill Team
Scenarios 1, 3, 4



State Transportation Agency Partners



UC #1:

Enhanced Road Weather Forecasting

- *Clarus* observations improved the Local Analysis and Prediction System
 - 65% improvement estimating surface temperature
30% of the time
- *Clarus* observations neither helped nor hurt atmospheric weather models (WRF)
- *Clarus* observations improved the performance of road condition models
- Mixed results when used in a precipitation estimation tool



UC #2:

Seasonal Weight Restriction Tool

- Advance notification of sub-surface conditions was recognized by the State DOT managers as a real and new benefit
- They did not impose restrictions for 14 days following an early warming spell in February
- They placed restrictions at least 7 days in advance
- Commercial vehicle operators see value in better timing decisions



UC #3:

Non-winter Maintenance & Operations Tool

- No major differences were observed in schedule adjustments
- Iowa DOT and Illinois DOT noted that the tool and the concept should be easy to adopt if some software issues were resolved
 - Maintenance supervisors provided numerous suggestions that led to software enhancements, though the tool was not fully refined for operational use
- Focusing on high-priority maintenance activities can help generate support for the tool



UC #4:

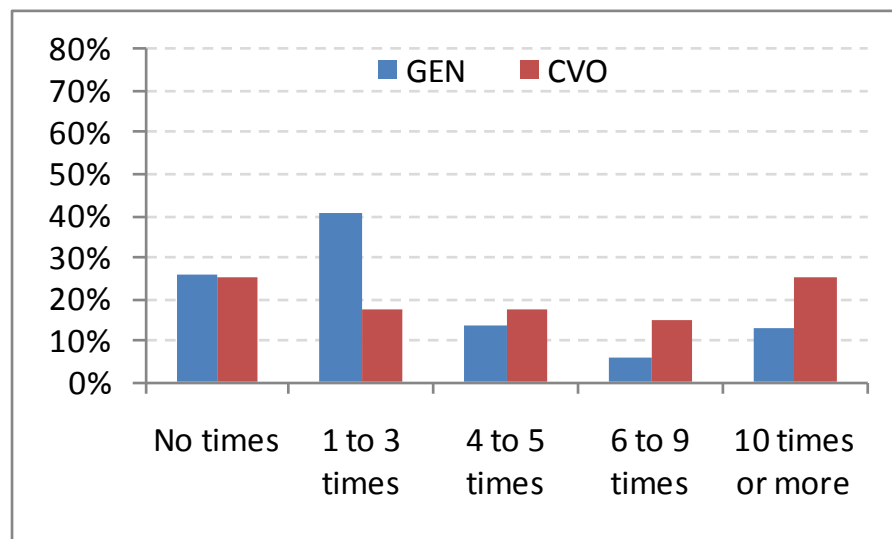
Multi-state Control Strategy Tool

- Best suited for use in dispatch centers
- Agencies want information about forecasted impacts of weather
- Interviewees unclear on the value of the tool when compared to several existing interfaces between stakeholders that promote information sharing
- Value of weather information is greater when integrated with existing processes and tools



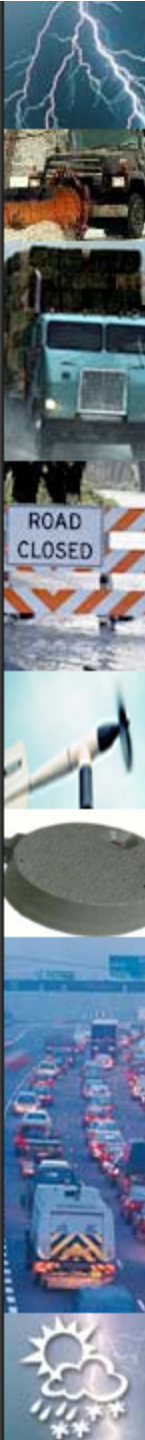
UC #5: Enhanced Road Weather Content for Traveler Advisories

- Travelers valued pavement condition forecasts
- Visual images preferred; travelers liked the radar loop (trend) forecast
- CVOs desire 12-24 hour advance notice for planning
- Uniformity of information across states is important to CVOs
- Number of times that respondents said they used information to change their travel (see chart)
- 74% said they adjusted travel plans or execution based on the road weather information

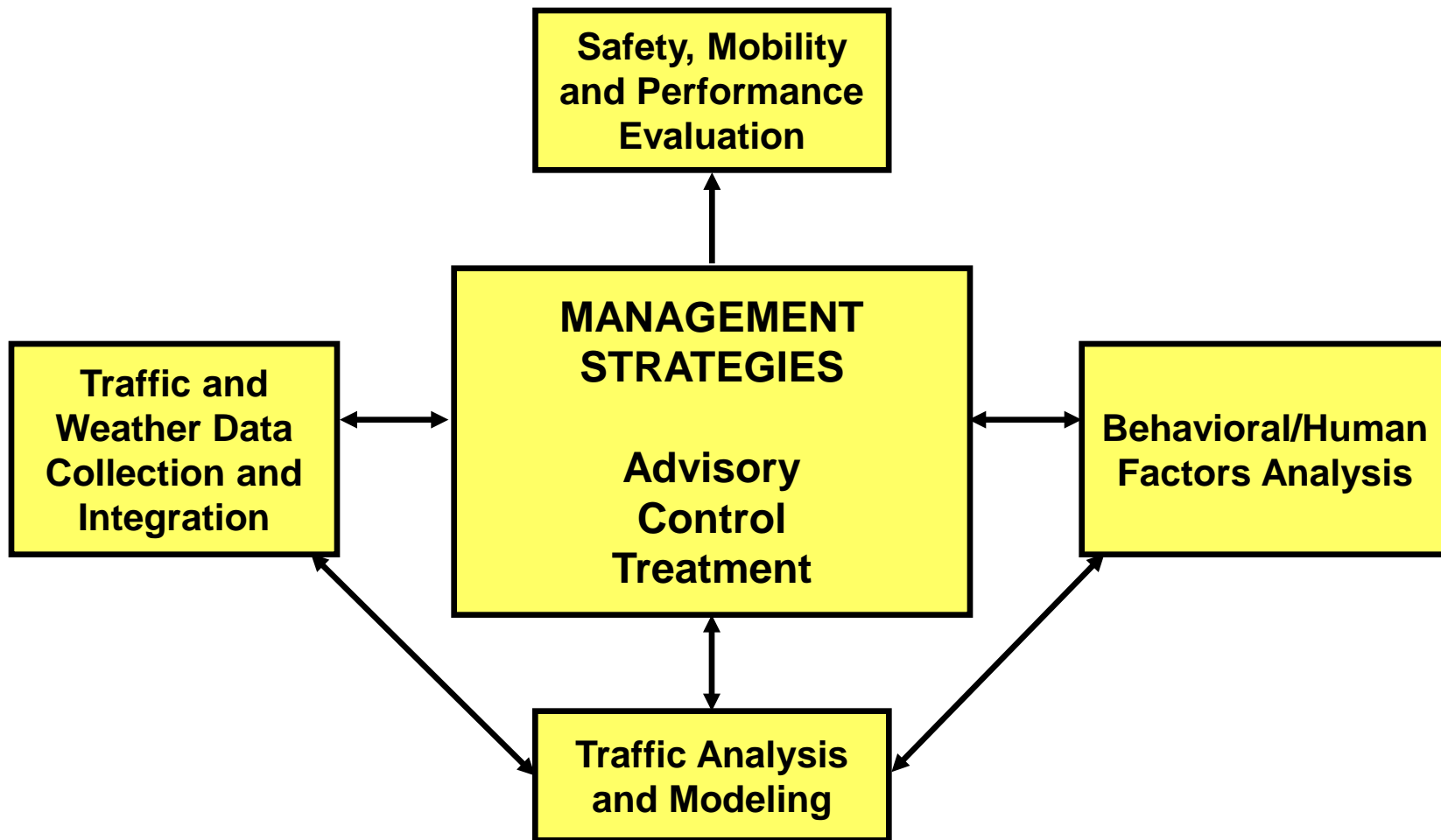


Clarus Regional Demonstrations - Overall Conclusions

- The value of road weather observations is clearly quantified
- Generally, state DOTs participating in the evaluation have positive reactions to the tools
 - Some of the tools are closer to operational and deployment readiness than others
- Layering of information is critical. Users prefer to be able to choose the information being displayed
- Developing an effective end-user interface is critical to the success of the applications



Weather Responsive Traffic Management



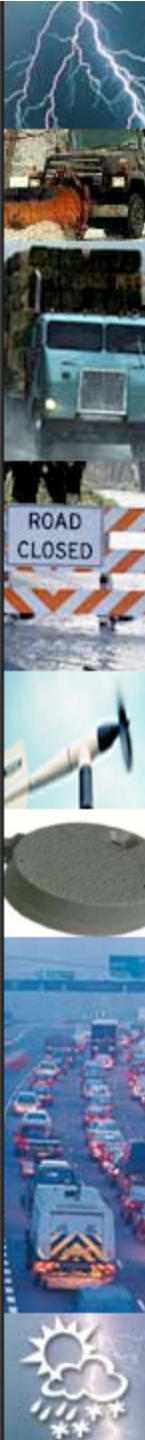
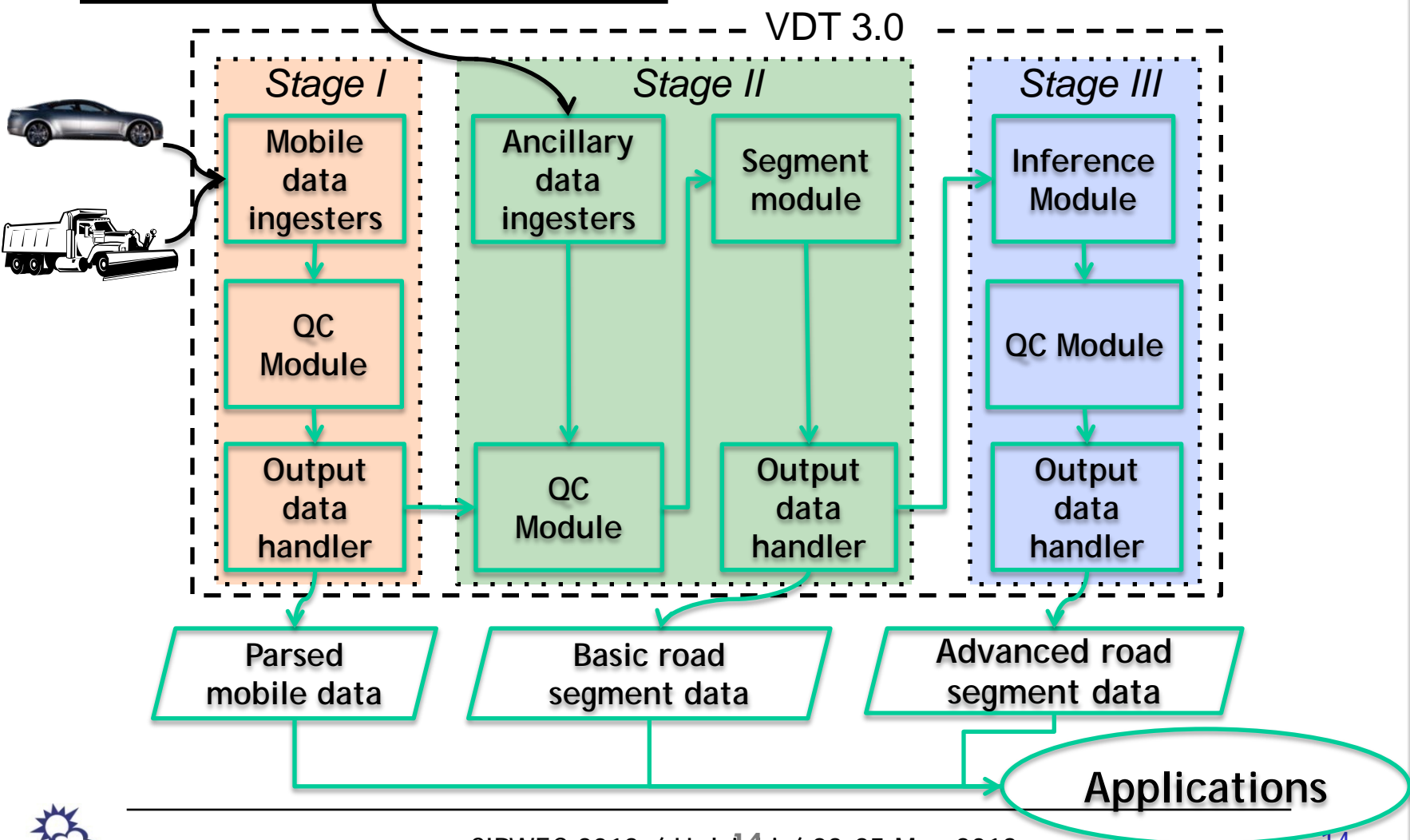
Connected Vehicles & Weather: Research Goals

- **COLLECT:** Identify and explore a range of mobile platforms as a source of robust data
- **PROCESS:** Develop algorithms and processing capabilities to translate the mobile data into useable weather and road condition observations
- **DISSEMINATE:** Incorporate these observations into useful applications (e.g., management systems and decision support tools)



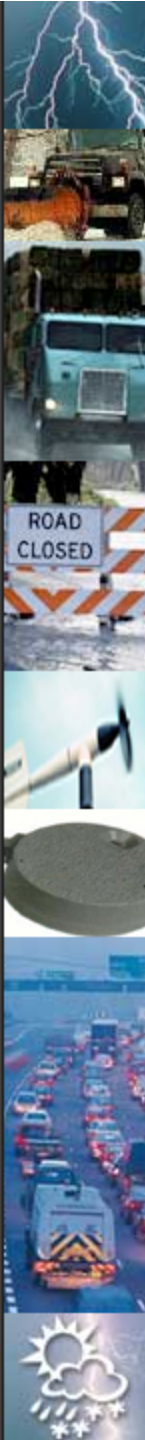
Vehicle Data Translator

Ancillary: Radar, Satellite, RWIS, Etc.



Connected Vehicles & Weather: Applications

- Road weather alerts and warnings
 - Short time horizon (e.g., minutes)
 - Medium and long horizon alerts and warnings
- State DOT-based applications
 - Maintenance Decision Support Systems (MDSS)
 - Maintenance & Fleet Management Systems
 - Weather Responsive Traffic Management
- Freight-specific applications
- EMS/First Responder applications



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