ALASKA ITS

Vehicles and Observations in the cloud

Dan Schacher, Mark DeVries & Wilf Nixon

YOUR PRESENTERS

Wilf Nixon, Salt Institute

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Today's Agenda

- A Cloud Based Overview – connected and autonomous vehicles
- Cloud Based Observations – sensors and data gathering for useful tools
- Alaska's current and future program
- Wrap-up and questions

https://youtu.be/3mCfXnZ3rn4

A Cloud Based Overview

CV, AV and Winter Maintenance

- Primary – winter weather has major negative impact on road safety
- One of the promises of CV/AV is increased safety…
- Other issues –
  - May change required levels of service
  - Greater need for pavement markings to be visible
  - Implications for operations – information and control of snow plow vehicles
- No desire to guess at which systems will be the ones to “win”
  - Expectation that value of the data will fund deployment of systems…

- Annual Global Road Crash Statistics
  - Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day
  - An additional 20-50 million are injured or disabled.
- Annual United States Road Crash Statistics
  - Over 37,000 people die in road crashes each year
  - An additional 2.35 million are injured or disabled
- Road crashes are the single greatest annual cause of death of healthy U.S. citizens traveling abroad

Someone will get hurt or killed

Driverless cars

Source: Association for safe international road travel

Globally its equivalent to fifteen 737's crashing each day!















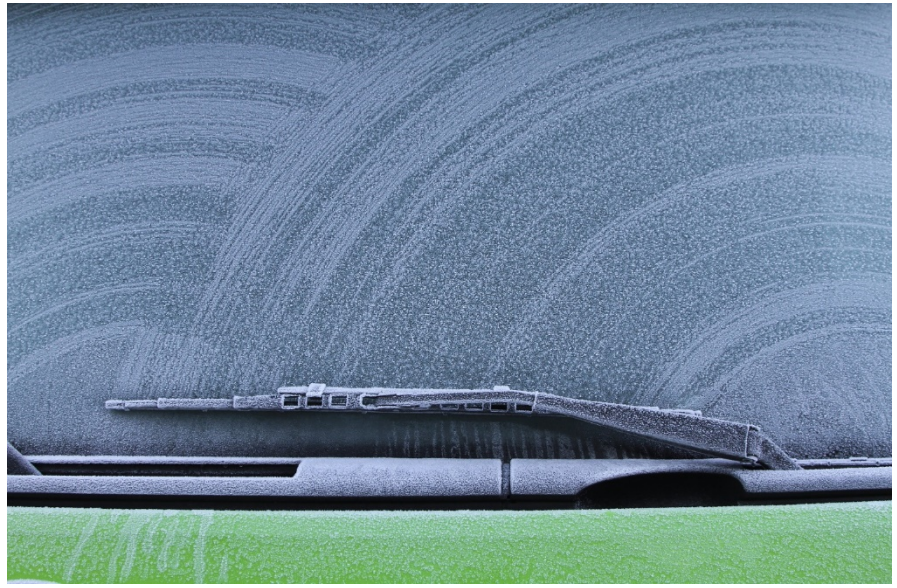
What could be the problem?

ABS activated ahead

Traction control activated ahead

ABS activated ahead

Caution snow or ice ahead



Reliable observations as a benchmark are key

"Wipers on" does not always equal something is falling.

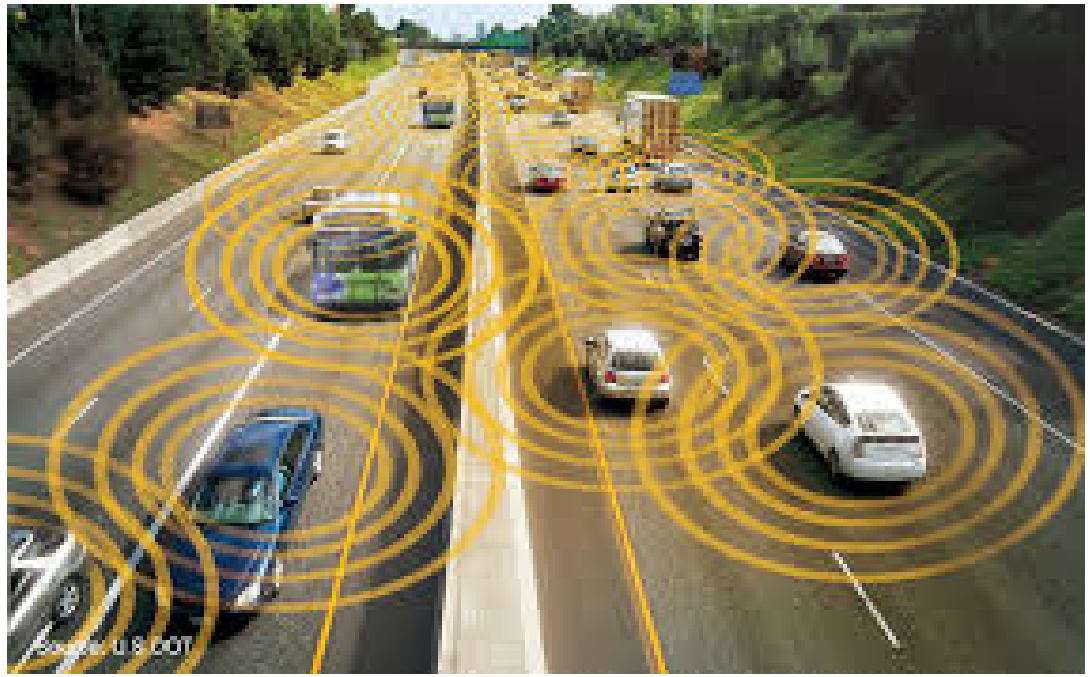
Connected Vehicles

Cloud Based Observations

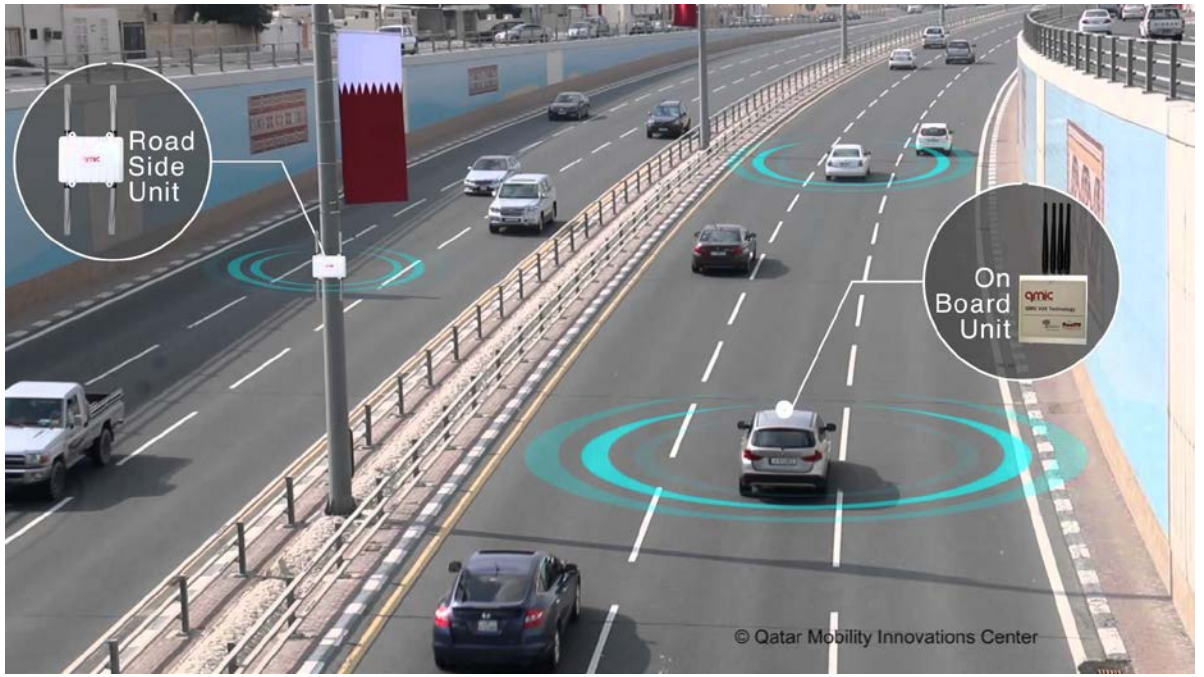
Connected Vehicles

- Google maps, Waze and other tools are examples of crowd sourcing not connected vehicles

Connected Vehicles



Vehicle to Vehicle



Vehicle to infrastructure

What is Integrating Mobile Observations (IMO)?

Weather and road condition data collection from fleet vehicles for a more comprehensive view of network conditions

Advanced, vehicle-based technologies are deployed to **collect, transmit,** and **use** weather, road condition, and related vehicle data

Source: Wyoming DOT

Intended Outcome – Utilizing enhanced data for more informed system management

(maintenance, traffic, asset, performance)

Why implement IMO?

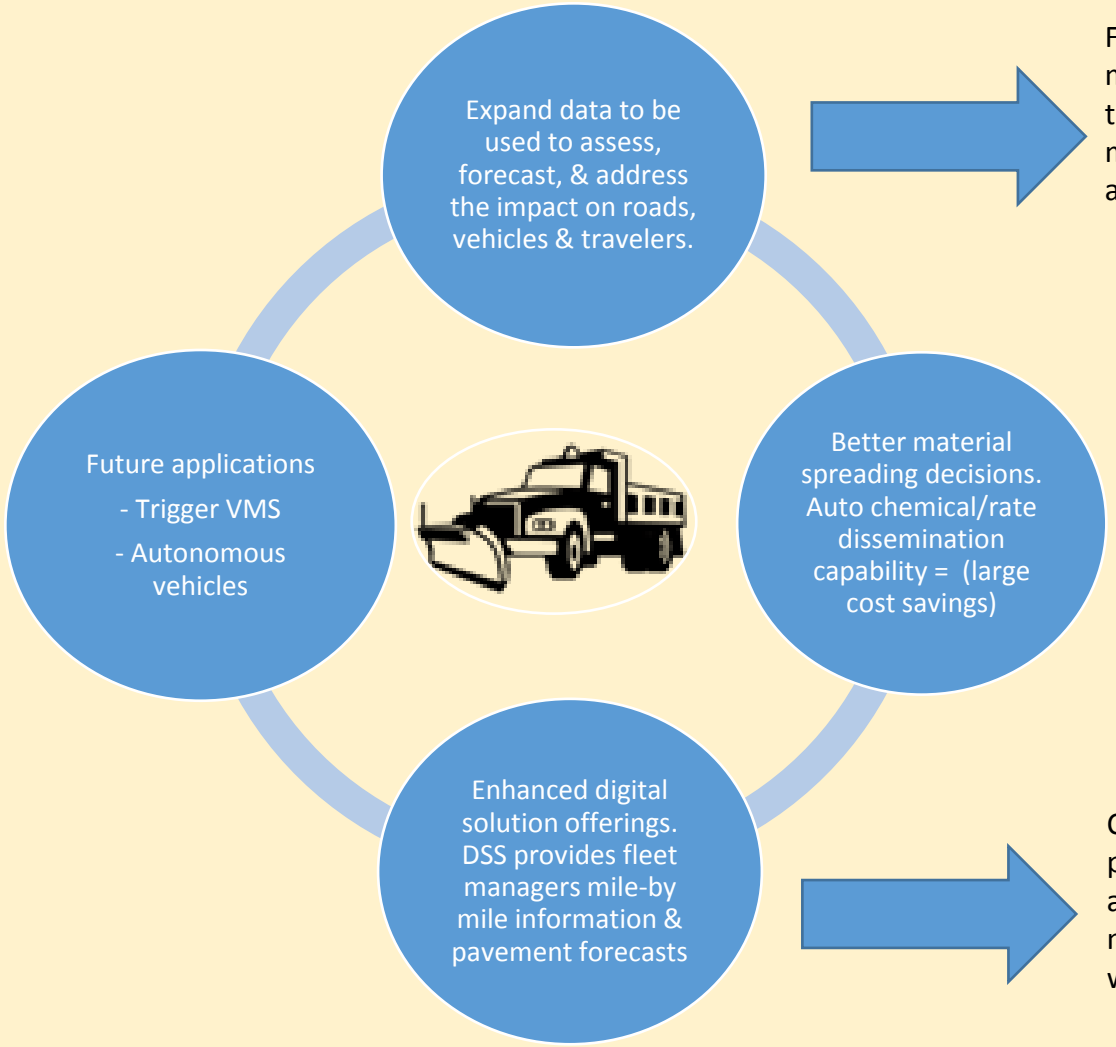
Improve efficiency, enhance effectiveness, increase accountability

- Fill gaps in road weather observations
- Spur development of new applications
- Dramatically enhance existing systems

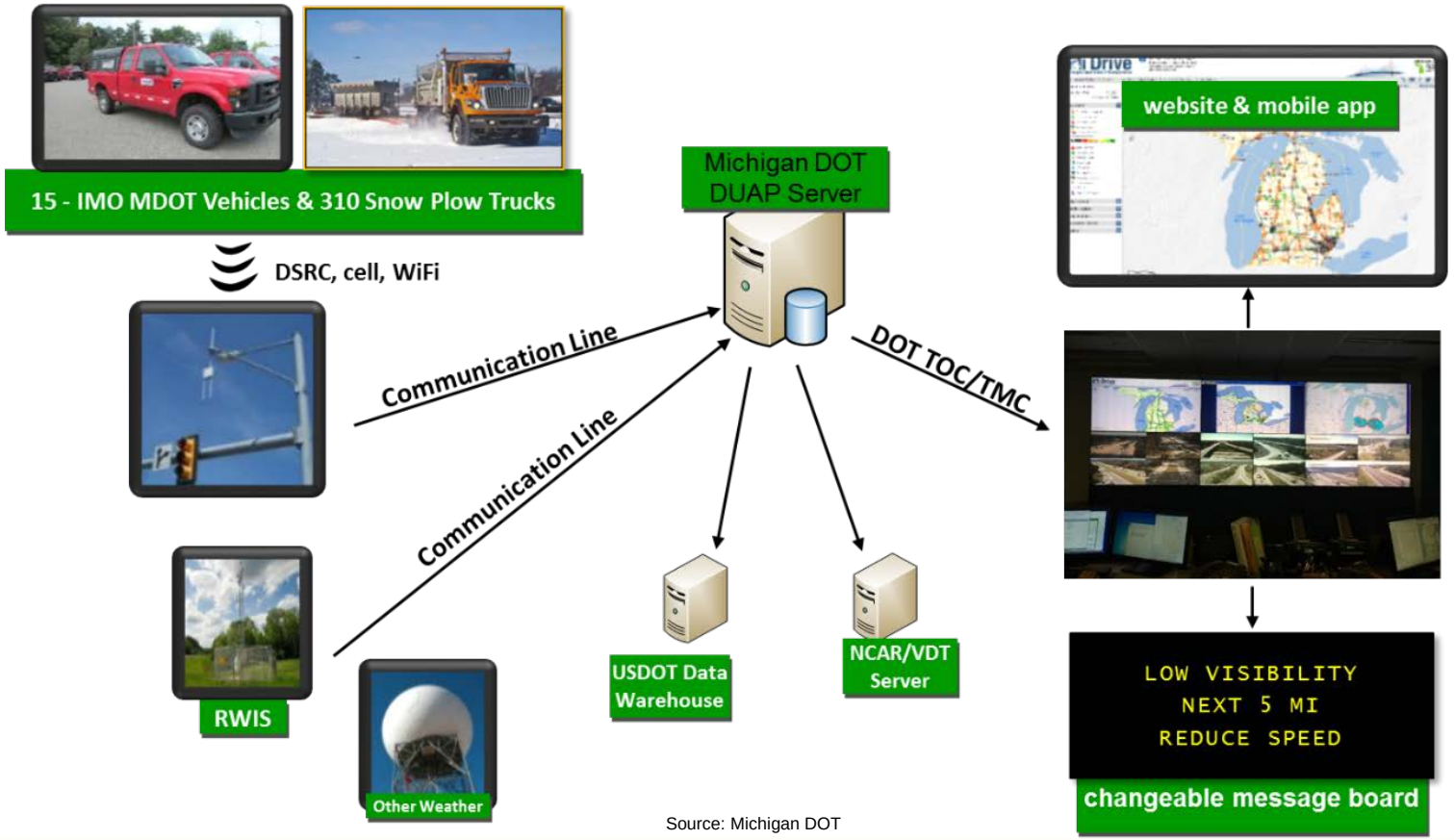
- Aid salt reduction strategies
- Optimize maintenance resources
- Generate actionable, automated alerts and messages
- Provide traveling public timely and valuable information

Mobile Pavement/Weather Monitoring & The Future

FHWA initiative to use fleet/patrol vehicles, as roving weather stations. These fleet vehicles will provide road and atmospheric conditions covering large areas of roadways, and in many instances merge with traditional weather information and traffic data.



Michigan IMO System Framework

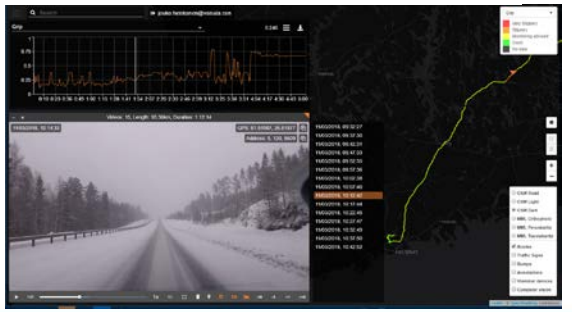


Source: Michigan DOT

New Developments

- **Point mobile sensing**
  - Vaisala were the 1st innovator to bring mobile surface state measurements to market - We have learnt a great deal since then
  - This now incorporated to our latest sensor MD30 designed for both snow-plow and patrol vehicle mounting
  - Parameters include air/pavement temperature, pavement state and grip

- **Mobile all lane assessment**
  - We have developed a full road observation available in conjunction with the MD30
  - Uses Computer Vision and AI applied to video taken from the vehicle to give an assessment of full road state
  - Output is a fully digitised map of total road state with point measurements of layer thickness

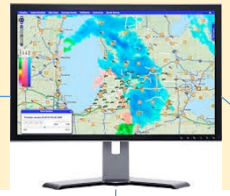


Mobile Data and Observation Sharing

Snow plow truck
Road maintenance

Truck driver
Typically needs to see mobile data

Truck systems
Integration to spreader & Data transfer with AVL



Maintenance decision support system (MDSS)
3rd party systems with road salting recommendations

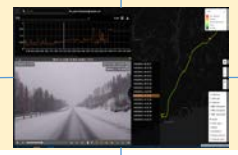
MD30
Road condition sensor (air/pavement, pavement state, grip, ice/water layer, and R/H.)

Patrol car
Road condition checking

Car driver
Must see mobile data

Bluetooth module
Serial-to-bluetooth

Tablet app
Video + mobile data



Web page
MD30 / Video visualization & Image recognition

Other vehicles
24/7 moving fleets; bus, taxi, postal vehicles, etc.

Visualization & Route Based assessment Maps RWS station (+ MD30) data visualization

CUSTOMER
Road maintenance decision maker

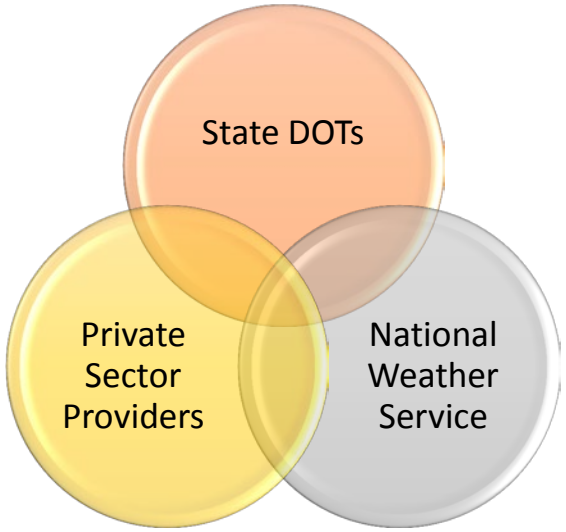
What is Pathfinder?

- **Collaboration** between the National Weather Service (NWS), State DOTs, and support contractors to share and translate forecasts into consistent public transportation impact statements
- Disseminates road weather information that is:
  - **clear,**
  - **concise,**
  - **impact-based, and**
  - **consistent**

Intended Outcome -
Drivers are well informed and able to make safe and efficient travel decisions

Why Pathfinder and its Core Partners

- **National Weather Service:** Experts at weather forecasts
- **Private Sector Weather Providers:** Experts at road weather forecasts
- **State DOTs:** Experts at operating and maintaining the roadways – knowledgeable about the state of the roadways and the impact to the traveling public
- **State Emergency Managers:** coordinate activities during high impact events
- **Local Agencies:** Cities, counties, and other local governments serve in a critical role to operate and maintain a significant portion of the roadway network



Source: FHWA

Travelers need to know:

- Timing, location and duration of weather event
- Impact of weather on road conditions
- Impact of agency maintenance and traffic management actions
- And they need to hear a consistent message from multiple sources

New Developments

- Currently difficult to assess what is happening on road network between road weather stations

- Vaisala collects data from multiple sources to generate a **route-based assessment** providing:
  - Full situational awareness by viewing road temperature and road surface conditions across your entire network

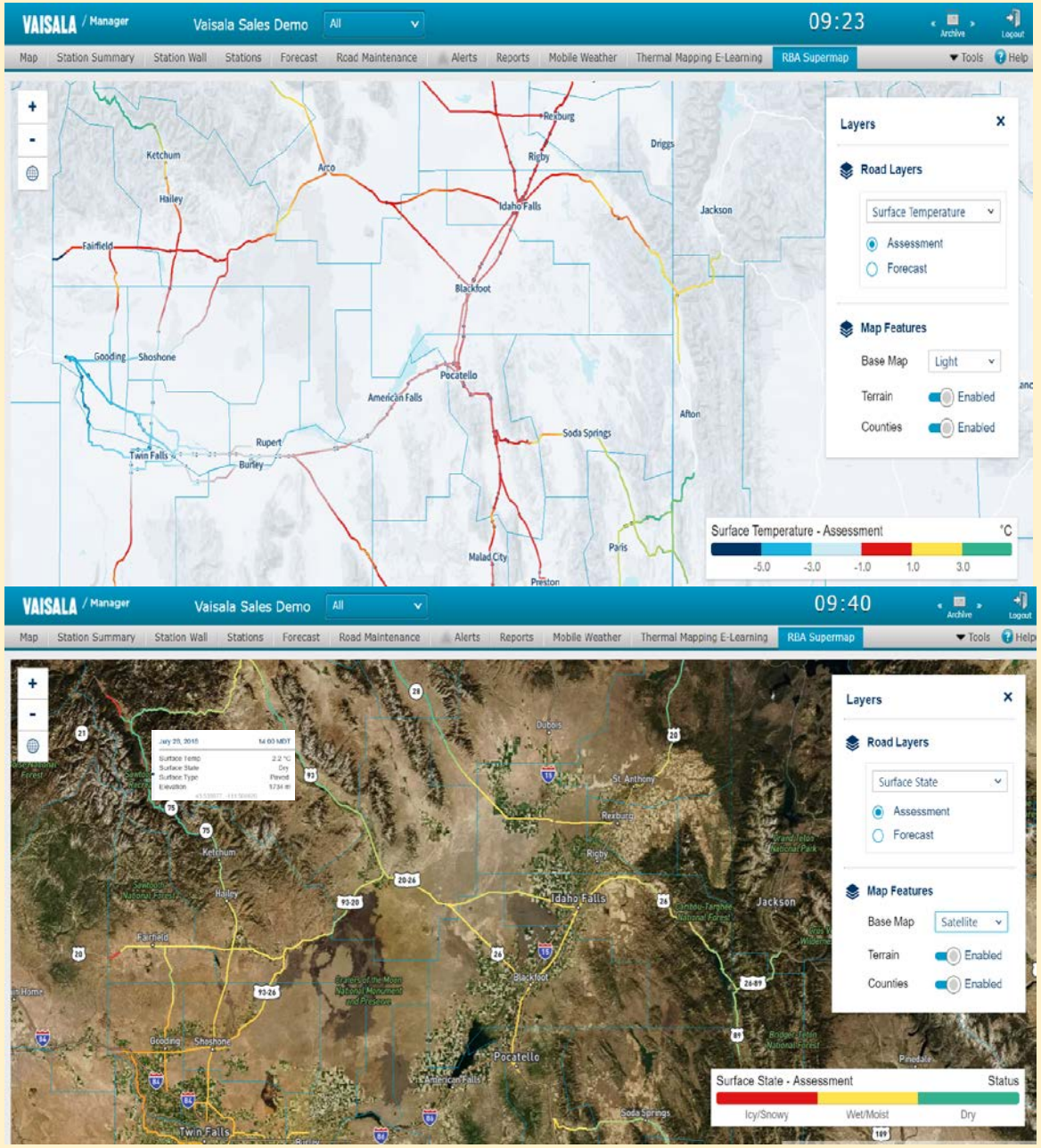
✓ *Instant knowledge of potential hazards on the road network*

✓ *Reduced need for staff to perform visual inspections*

✓ *Roadway accident reduction using data for notification, maintenance and closures*

✓ *Reduced equipment use, lower material costs through efficient application of materials and lower labor costs through reduced hours of winter maintenance operation*

✓ *Better understanding of impact of winter weather events and how treatment plans are working*

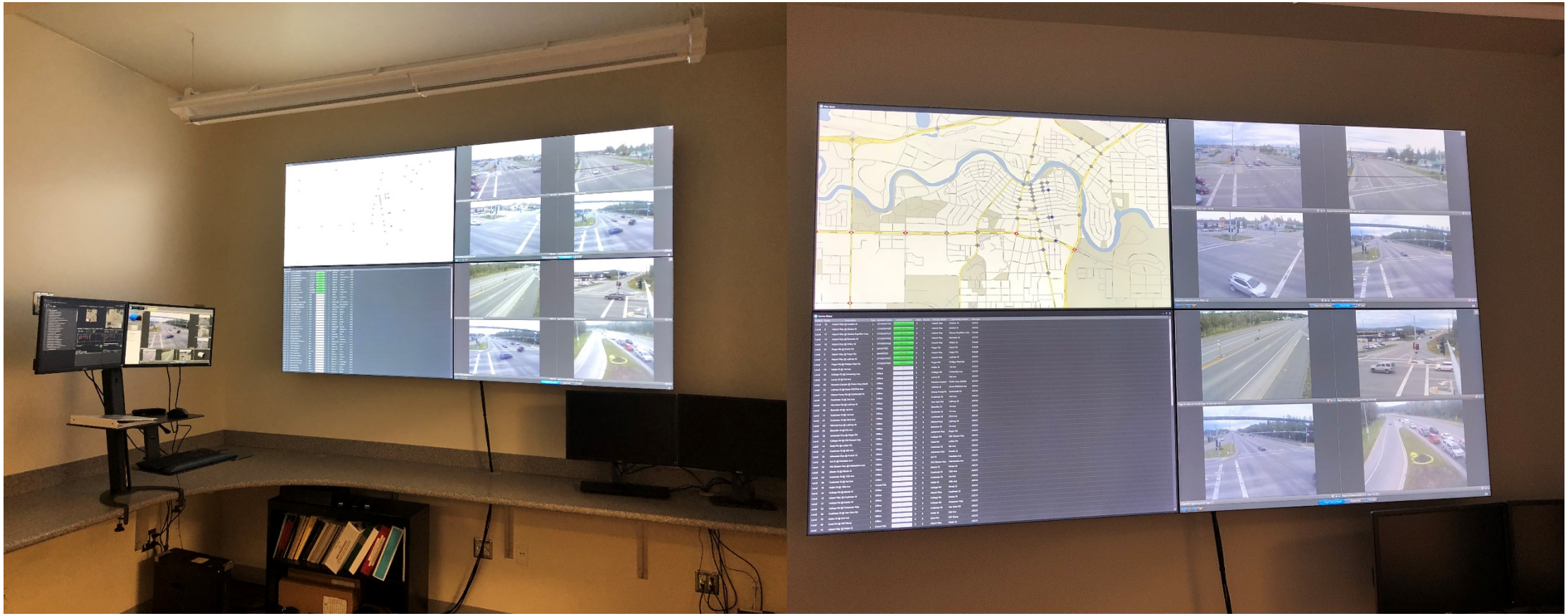


Alaska's current and future program

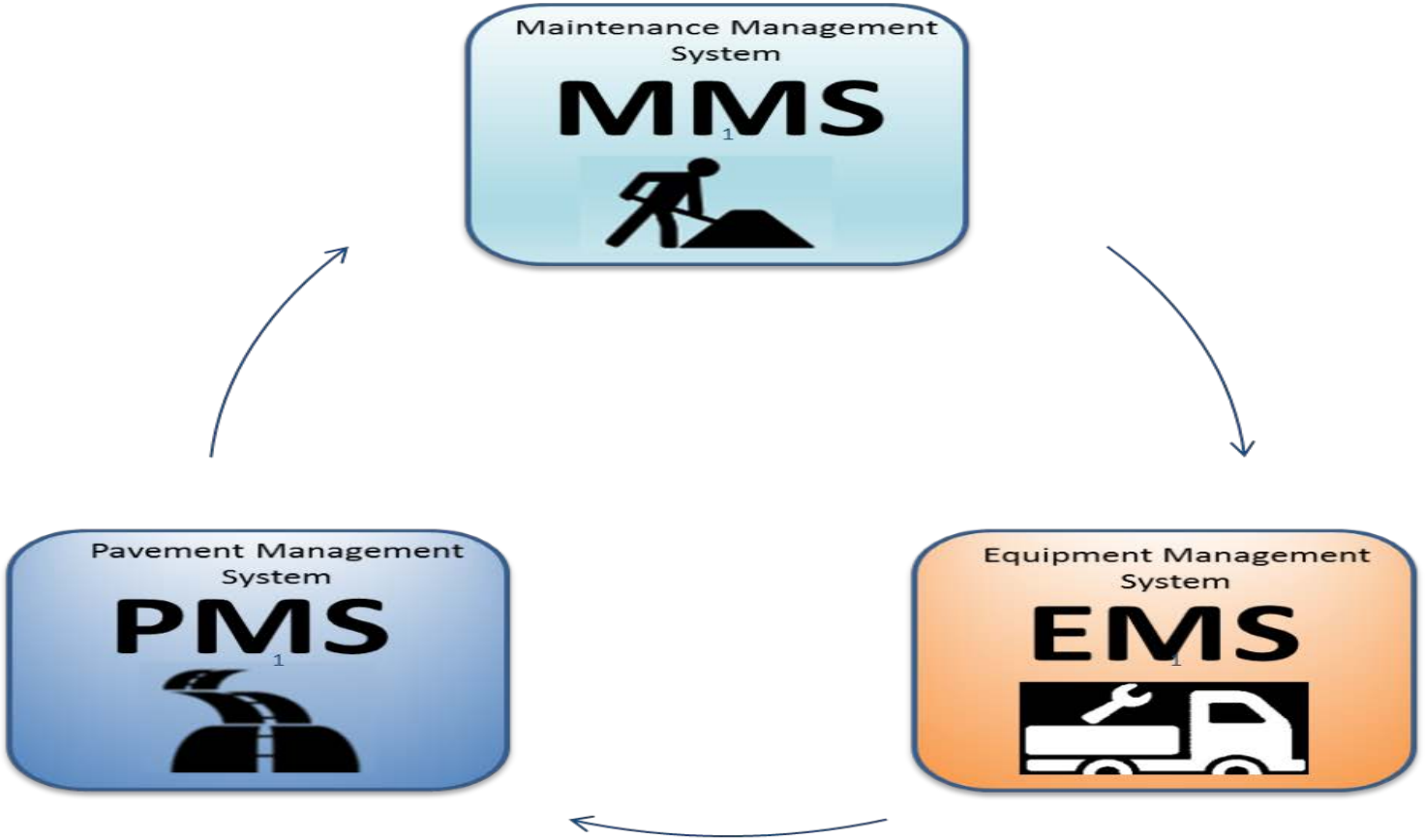
Fairbanks Traffic Operations Center

- FHWA funded (CMAQ)
- Signal Interconnect terminates in TOC.
- PTZ Cameras at each connected intersection
- Change signal timings based on live action feed
- Signals give priority to snow removal Operations

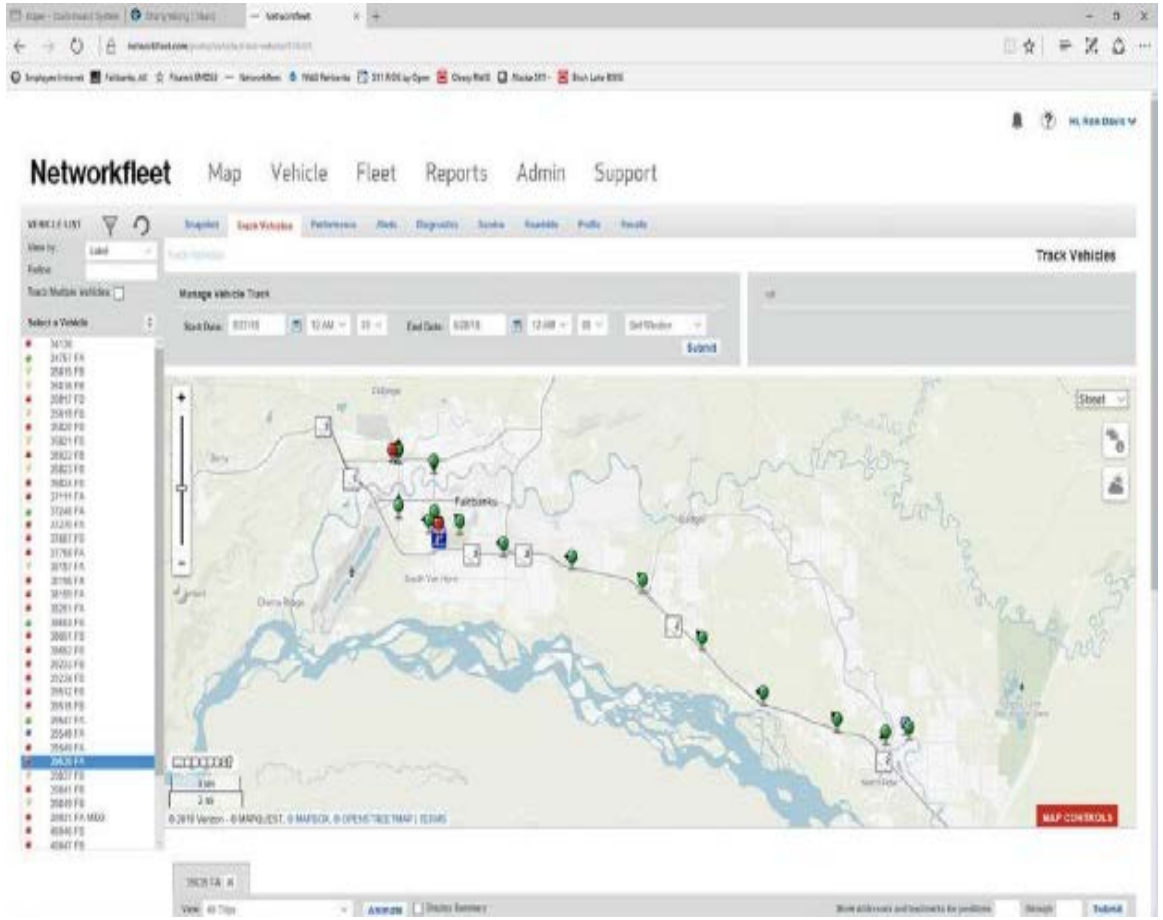
Live Feed



Asset Management

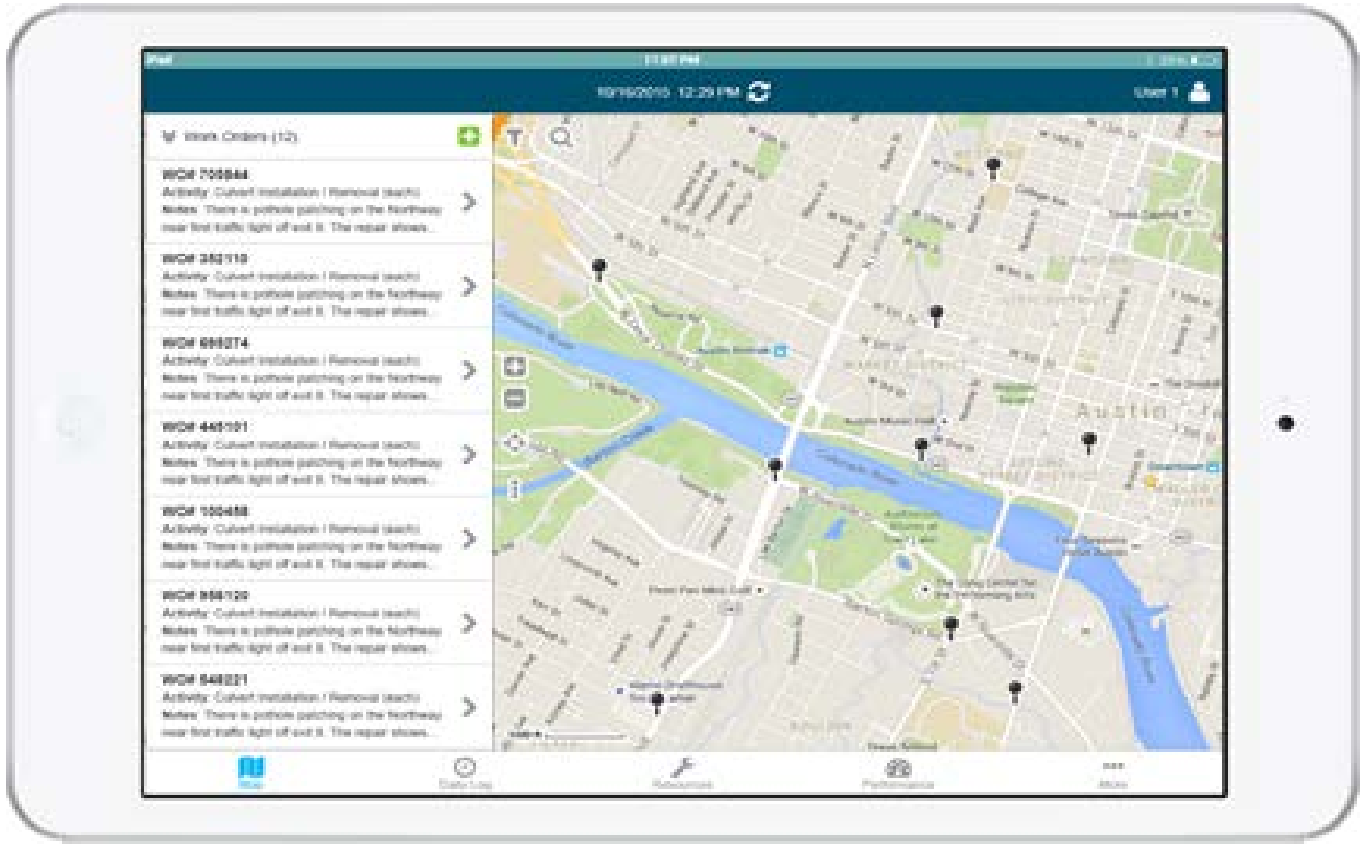


Direct Telematics feed to MMS and EMS



- Multiple Vendors Required
  - Verizon
  - GPSInsite
- Communication Challenges
  - Cell phone coverage gaps
  - Satellite communication to Agile
- Service and trouble alerts

Support for Field Devices



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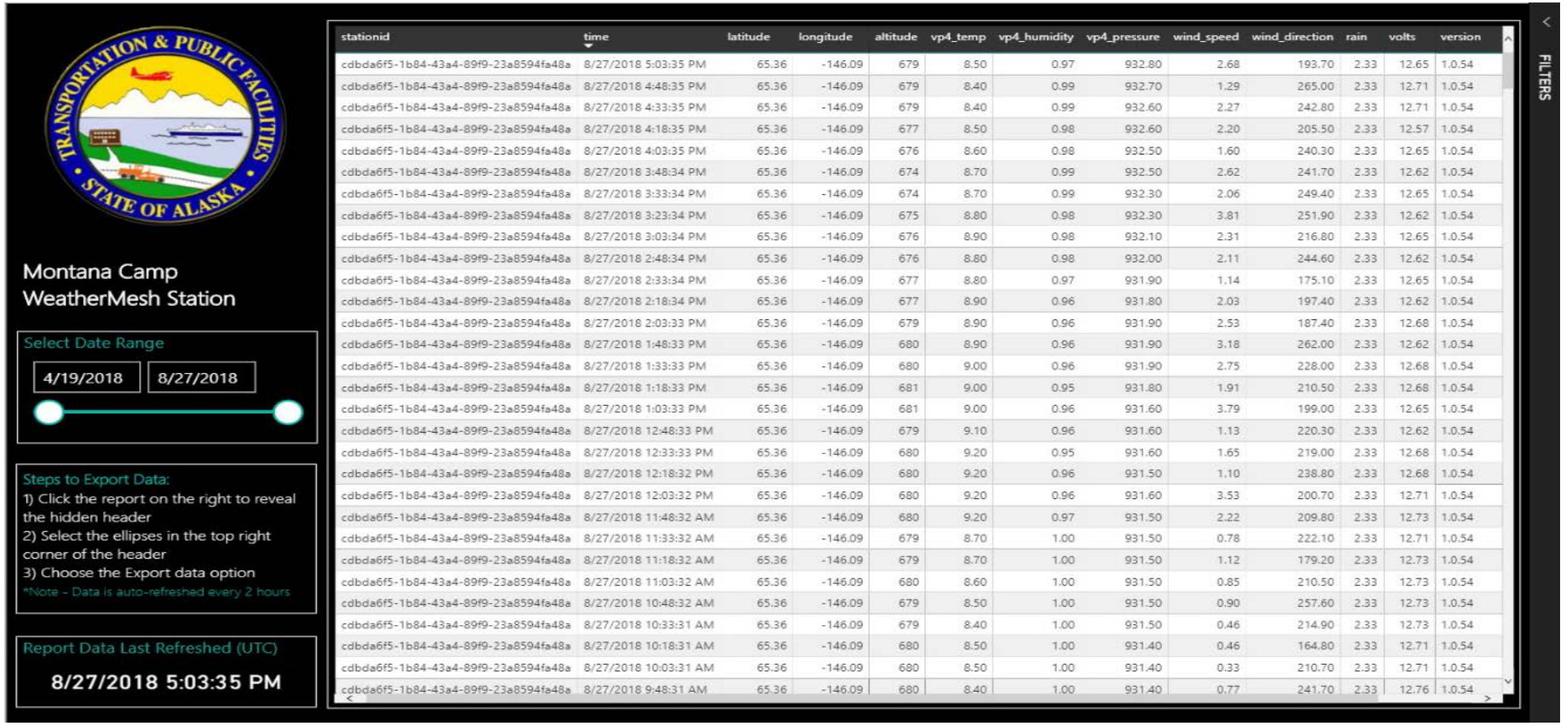
Road Weather Information Systems (RWIS)

Valuable Data



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cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 4:48:35 PM	65.36	-146.09	679	8.40	0.99	932.70	1.29	265.00	2.33	12.71	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 4:33:35 PM	65.36	-146.09	679	8.40	0.99	932.60	2.27	242.80	2.33	12.71	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 4:18:35 PM	65.36	-146.09	677	8.50	0.98	932.60	2.20	205.50	2.33	12.57	1.0.54
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cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 3:48:34 PM	65.36	-146.09	674	8.70	0.99	932.50	2.62	241.70	2.33	12.62	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 3:33:34 PM	65.36	-146.09	674	8.70	0.99	932.30	2.06	249.40	2.33	12.65	1.0.54
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cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 2:48:34 PM	65.36	-146.09	676	8.80	0.98	932.00	2.11	244.60	2.33	12.62	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 2:33:34 PM	65.36	-146.09	677	8.80	0.97	931.90	1.14	175.10	2.33	12.65	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 2:18:34 PM	65.36	-146.09	677	8.90	0.96	931.80	2.03	197.40	2.33	12.62	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 2:03:33 PM	65.36	-146.09	679	8.90	0.96	931.90	2.53	187.40	2.33	12.68	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 1:48:33 PM	65.36	-146.09	680	8.90	0.96	931.90	3.18	262.00	2.33	12.62	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 1:33:33 PM	65.36	-146.09	680	9.00	0.96	931.90	2.75	228.00	2.33	12.68	1.0.54
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cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 12:03:32 PM	65.36	-146.09	680	9.20	0.96	931.60	3.53	200.70	2.33	12.71	1.0.54
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cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 10:48:32 AM	65.36	-146.09	679	8.50	1.00	931.50	0.90	257.60	2.33	12.73	1.0.54
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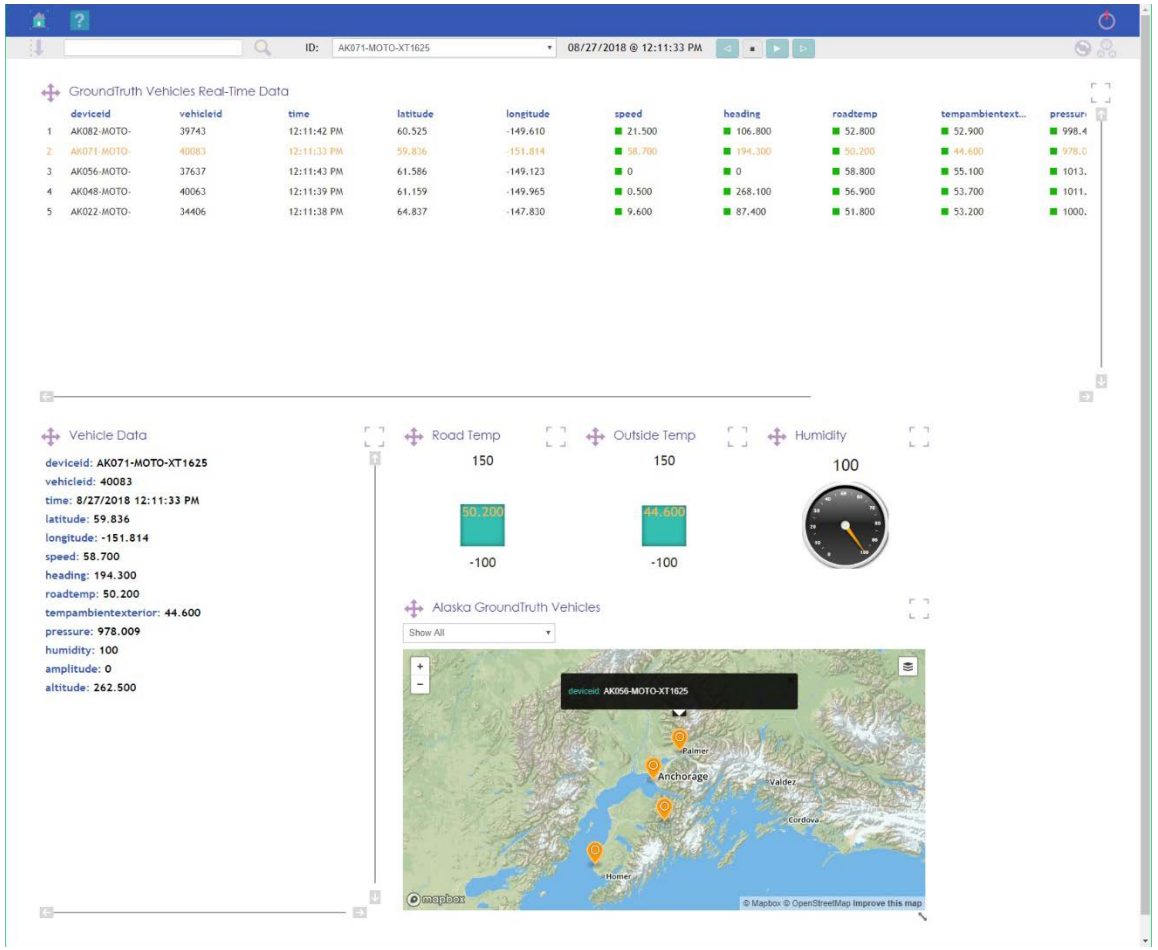
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 10:18:31 AM	65.36	-146.09	680	8.50	1.00	931.40	0.46	164.80	2.33	12.71	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 10:03:31 AM	65.36	-146.09	680	8.50	1.00	931.40	0.33	210.70	2.33	12.71	1.0.54
cdbda6f5-1b84-43a4-89f9-23a8594fa48a	8/27/2018 9:48:31 AM	65.36	-146.09	680	8.40	1.00	931.40	0.77	241.70	2.33	12.76	1.0.54

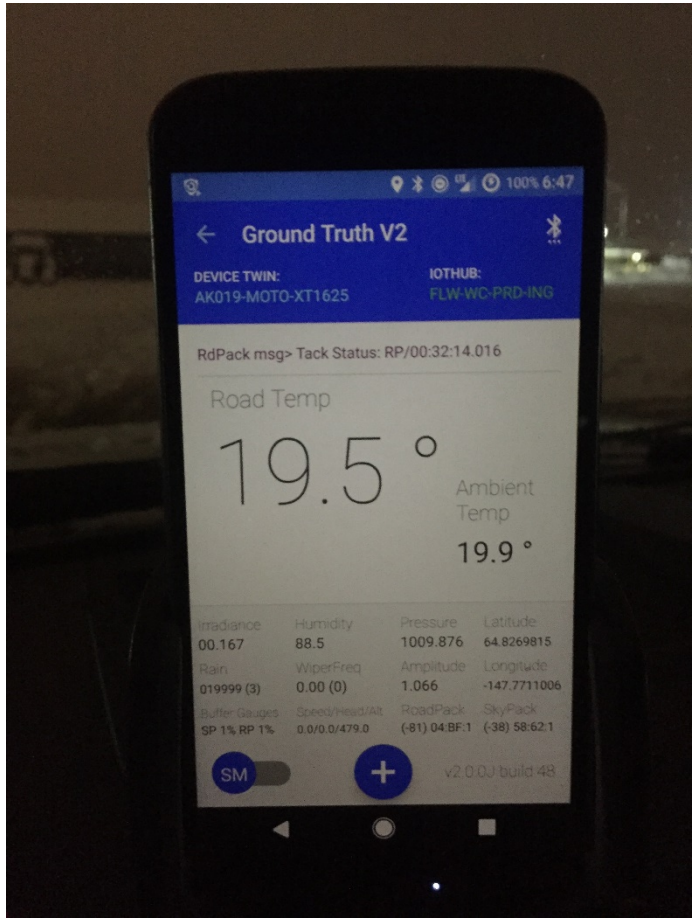
Maintenance Decision Support System (MDSS) Enhancements & Upgrades

Dan Schacher, Mark DeVries & Wilf Nixon

Data in the Cloud

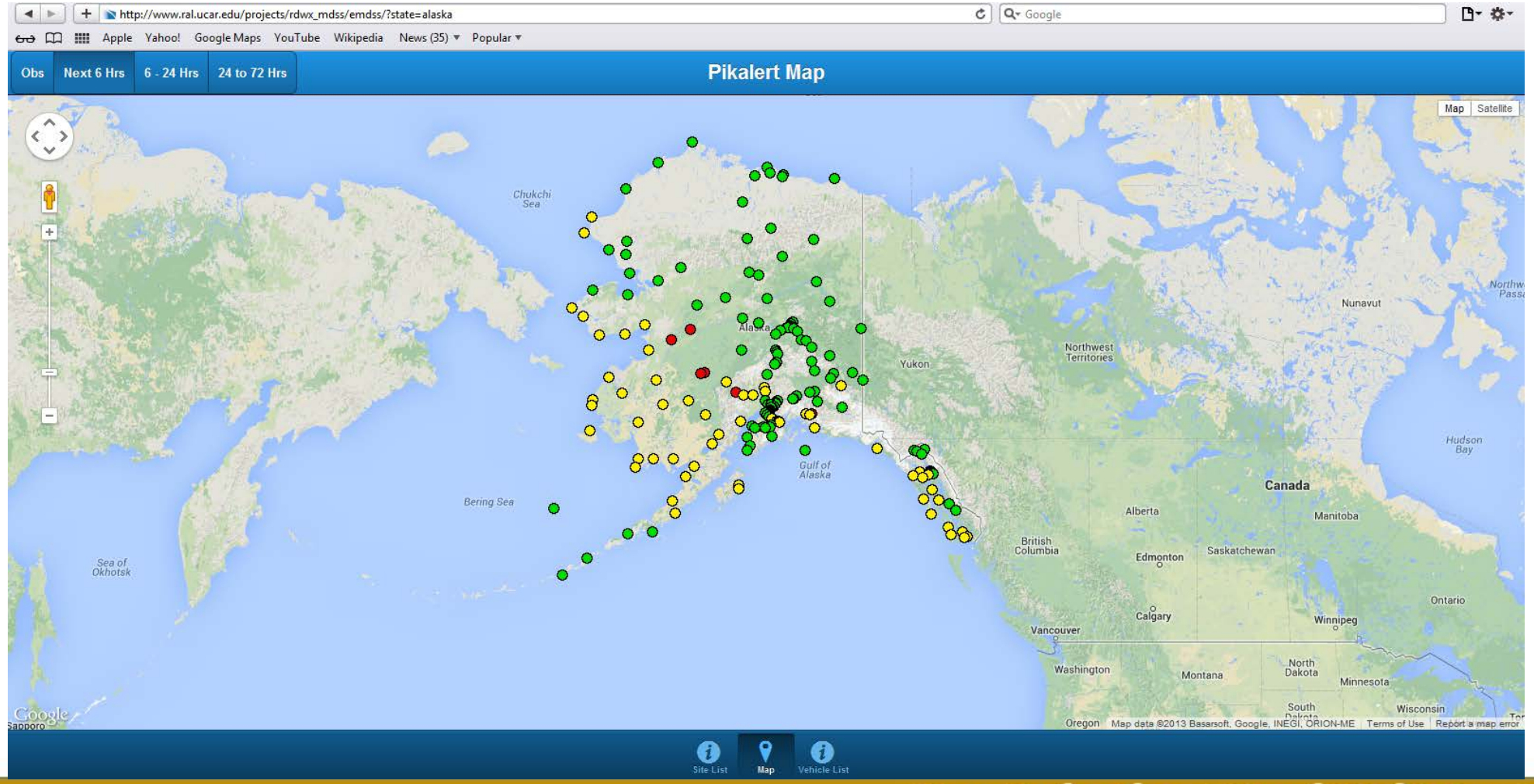


Integrated Mobile Observations (IMO)



- Upgrade and build out 2017-18
- Currently Deployed
  - Anchorage
  - Fairbanks
  - Kenai Peninsula
- Future build out depends on funding availability
- Cant keep up with pace of advancing technology

Alaska MDSS home page



Questions? Thank you!