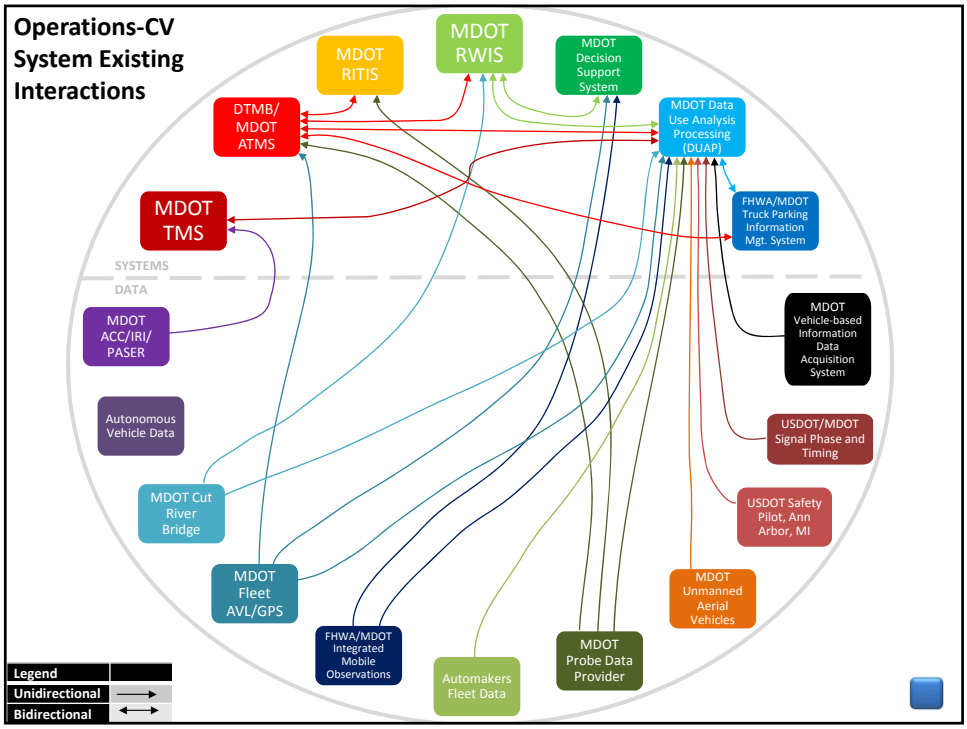
2013 Winter Maintenance Operations Conference

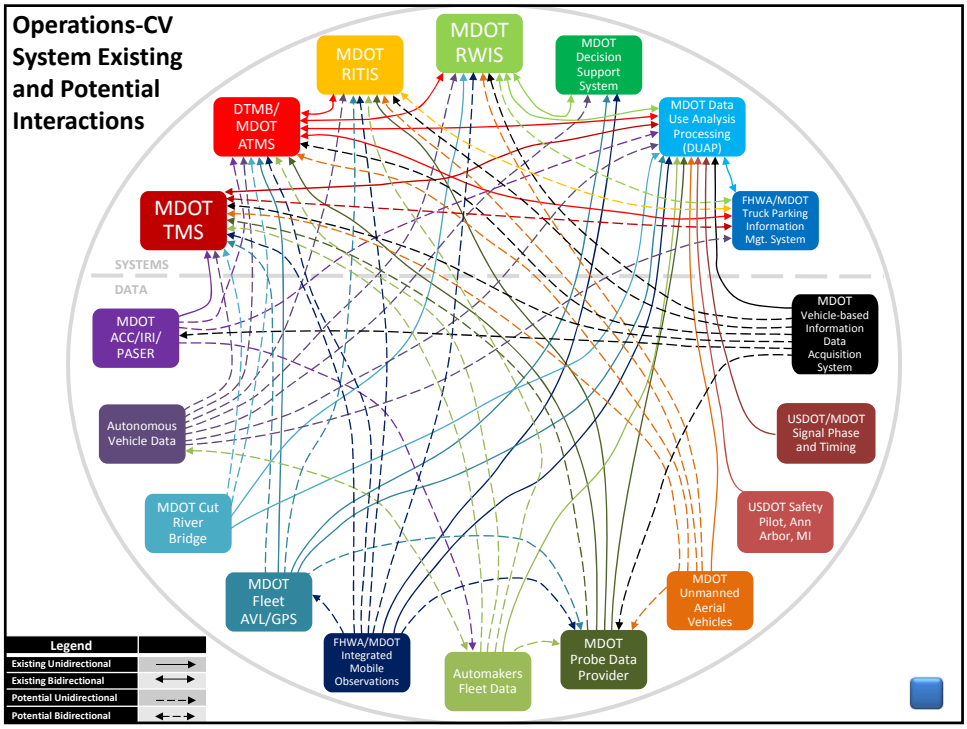
Connecting Technology for Weather Response Traffic Management

Steven J. Cook, P.E.
Operations & Maintenance Engineer

Discussion Topics

- MDOT Connecting Technology Implementation
- MDOT Automatic Vehicle Locator (AVL/GPS) Program
- Performance Measures - Weather


Operations-CV System Existing Interactions
MDOT RITIS
MDOT RWIS
MDOT Decision Support System
DTMB/ MDOT ATMS
MDOT Data Use Analysis Processing (DUAP)
MDOT TMS
FHWA/MDOT Truck Parking Information Mgt. System
SYSTEMS
DATA
MDOT ACC/IRI/ PASER
MDOT Vehicle-based Information Data Acquisition System
Autonomous Vehicle Data
USDOT/MDOT Signal Phase and Timing
MDOT Cut River Bridge
USDOT Safety Pilot, Ann Arbor, MI
MDOT Fleet AVL/GPS
MDOT Unmanned Aerial Vehicles
FHWA/MDOT Integrated Mobile Observations
Automakers Fleet Data
MDOT Probe Data Provider
Legend
Unidirectional
Bidirectional


Operations-CV System Existing and Potential Interactions
MDOT RITIS
MDOT RWIS
MDOT Decision Support System
DTMB/ MDOT ATMS
MDOT Data Use Analysis Processing (DUAP)
MDOT TMS
FHWA/MDOT Truck Parking Information Mgt. System
SYSTEMS
DATA
MDOT ACC/IRI/ PASER
MDOT Vehicle-based Information Data Acquisition System
Autonomous Vehicle Data
USDOT/MDOT Signal Phase and Timing
MDOT Cut River Bridge
USDOT Safety Pilot, Ann Arbor, MI
MDOT Fleet AVL/GPS
MDOT Unmanned Aerial Vehicles
FHWA/MDOT Integrated Mobile Observations
Automakers Fleet Data
MDOT Probe Data Provider
Legend
Existing Unidirectional
Existing Bidirectional
Potential Unidirectional
Potential Bidirectional

Weather Response Decision Making

Common Data Sets Used

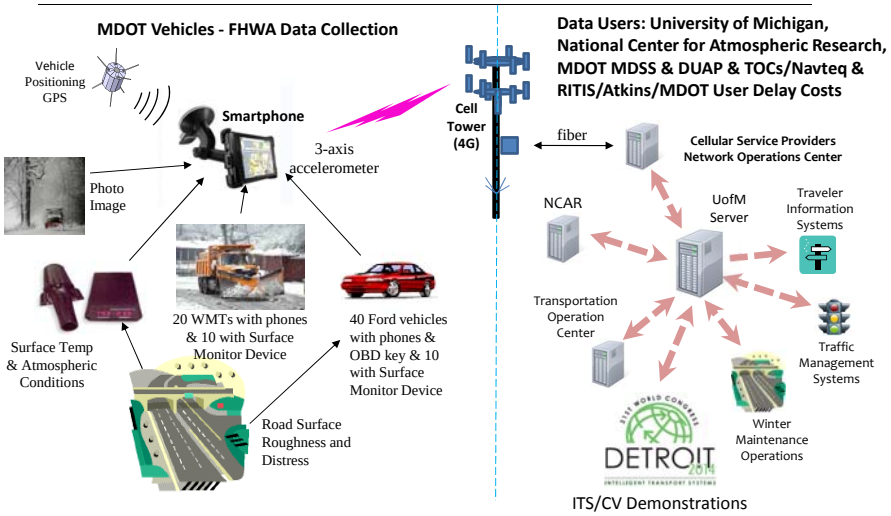
- Local weather and radar
  - Local news
  - Internet sites (NWS, etc.)
  - iPhone Apps
- Communicate with adjacent agencies
- Pavement temperature (in-cab display)
- Traffic cameras (MiDrive website)
- RWIS (50 ESS)
- MDSS (if available)

Other Useful Data Sets

- Subsurface temperature
- Surface weather conditions
  - Air and pavement temp
  - Dew point
- Mobile vehicle data
  - GPS (time/location)
  - Vehicle speed
  - Vehicle dynamics
  - ABS brake activation
  - Differential wheel speeds (TCS)
  - Camera images/pictures

MDOT

FHWA/MDOT Integrated Mobile Observations (IMO) Architecture
Weather Response Traffic Information (WxTINFO) Data Collection



FHWA

MDOT

FHWA/MDOT WxTINFO

Potential Applications

Time (how long?), What are my choices & the problem? Early Notification (motorist, first responders, hospitals, etc.)!!

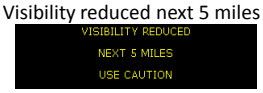
- Data Quality checks (ground truth - RWIS stations & third party speed data)
- Targeted individual messages (augments DMS & MDOT MiDrive website)
- Provide travel times and incident updates
- Performance Measure/Management
- Regain Times or in-the-storm performance (how well are you managing the event)
- Maintenance Decision Support System
- Remote imaging and physical monitoring of environment (camera photos)
- Visibility monitoring (i.e.: snow squalls, localized lake effect white outs, fog, rain, etc.)
- Slippery surface notification (ABS lockup & differential wheel speed)
- Pin point icy road conditions (driver & maintenance staff)
- Early notification to First responders, Hospitals, Work place, Schools, Community events, etc.
- Regional and cross jurisdictional alerts (Great Lake Regional Transportation Operations Coalition ties into the Northwest Passage and other regional coalitions
- Provide in-vehicle alerts
- Vehicle/device health monitoring (are devices installed on vehicles working?)
- Vehicle diagnostics (fleet monitoring and management (miles, hours, routine maintenance, etc.)

FHWA MDOT

Potential Motorist Advisory Warning Messaging

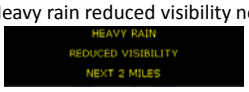
- Travel Times

- Visibility reduced next 5 miles

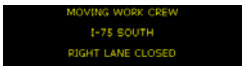


- Road icy next 3 miles

- Heavy rain reduced visibility next 2 miles



- Maintenance trucks next 10 miles – Drive with care



- High Wind Warning

- Road closed ahead – use alternate route

Automated Vehicle Location (AVL) Fleet Instrumentation Program

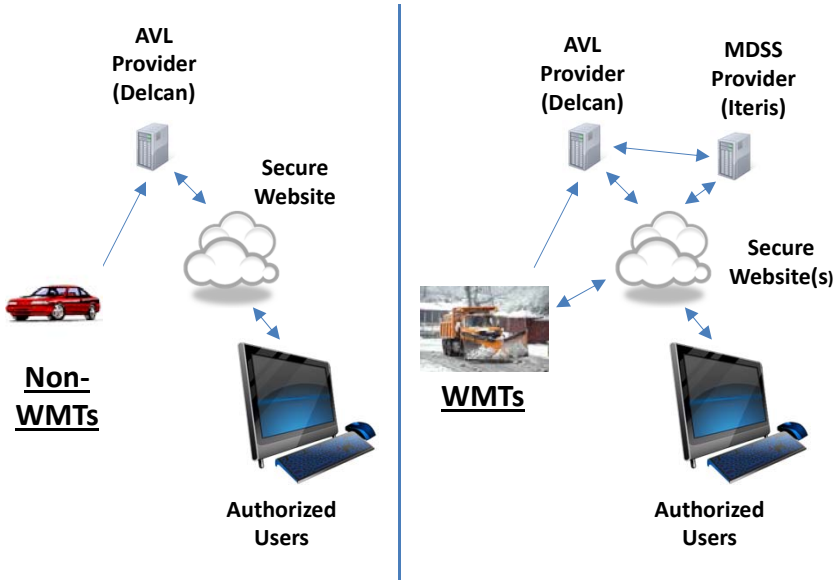
- Tim Croze, Justin Droste, Mark Crouch, Matt Pratt (Operations Field Services)
- Background and others using this system (12 states & 9 Michigan local agencies)

- Benefits
- MDOT Fleet Instrumentation: ~280 WMTs and ~2300 light/medium/heavy duty
- Vendors:

Delcan ITERIS DICKEY-john verizon

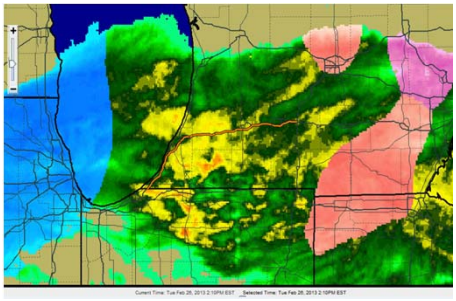
- Vehicle Information Collection
  - Time, lat/long. Heading, speed, miles driven, engine hours, air & pavement temp, humidity, blade up/down, wing plow usage, spreader information (material type, application rate & amount used)

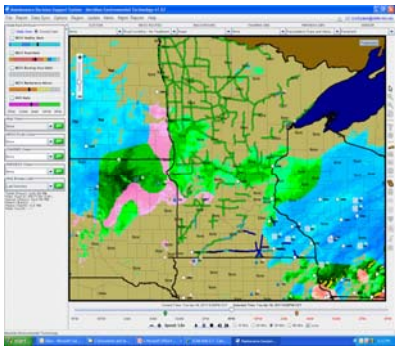
Data Transfer



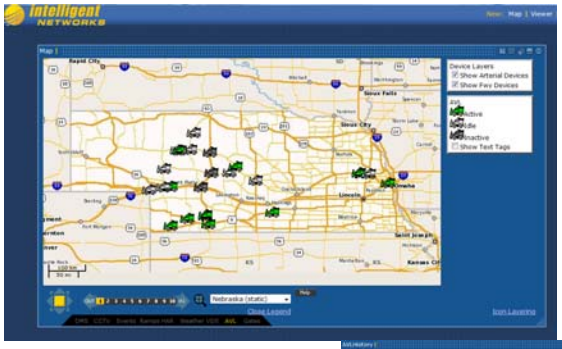
Maintenance Decision Support System (MDSS)

- Weather Forecasting Service Catered to Road Agencies.
- Offers treatment recommendations based on the user parameters, and weather.
- MDOT piloted a version of MDSS last winter along I-94 in SW region (applied treatments had to be input from an office computer because we had no AVL).
- Now, AVL units will automatically feed a MDSS, making operations more efficient and real-time.



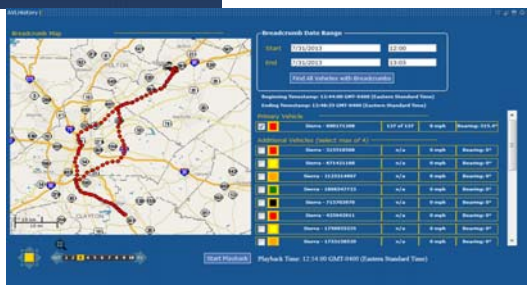


Mapping

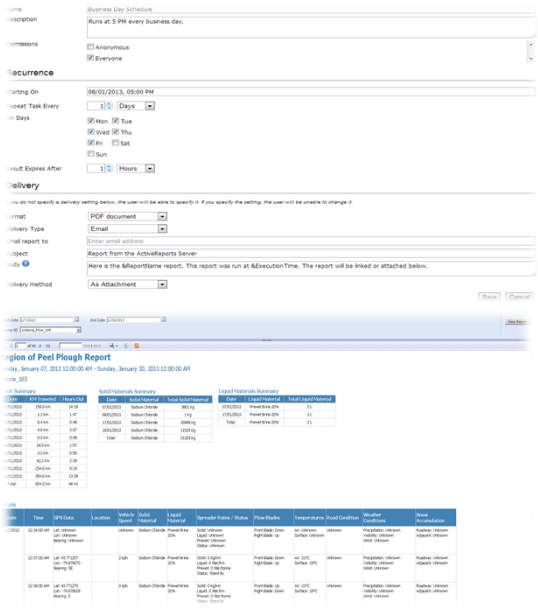


- Secure Web-based maps
- Playback Features.
- Detailed Truck/Route Info such as: Location, Speed, Spreader Rate, Temperature readings, & Camera Images (if equipped)

- "Geofences" and landmarks
- "Breadcrumbs" are used to show where a vehicle has been.



Reporting



- Can be accessed from the map site
- Can be run manually by a user for specified criteria
- Alerts can be triggered automatically, when set thresholds are surpassed

- Standard Reports include material summary reports, engine run times, and detailed vehicle sensor summary
- Custom Reports can be created for data gathered by the system

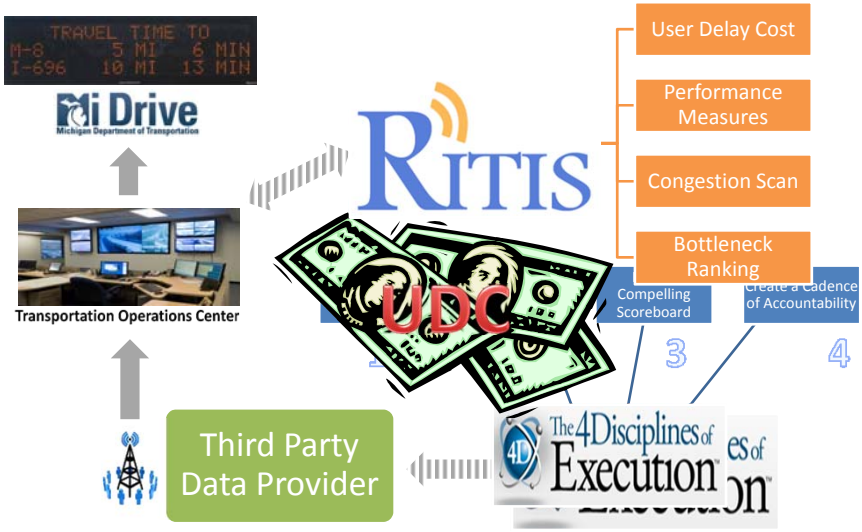
Roles & Responsibilities for AVL Contract

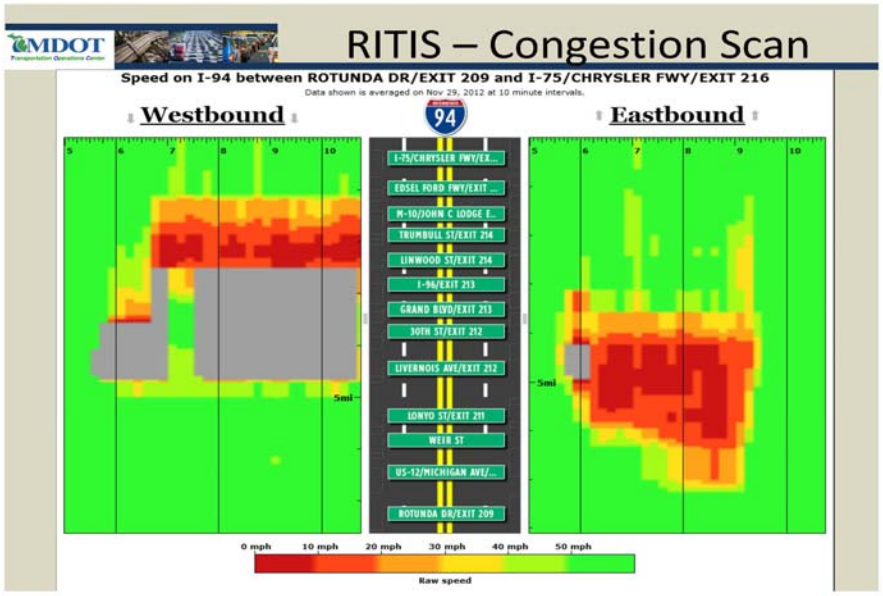
- Delcan:
  - Provide all necessary AVL components
  - Be responsible for cellular communication services
  - Host all data collected on non state-owned server(s)
  - Integrate information WMT data with MDSS (Iteris)
  - Provide a secure web site authorized MDOT users
  - Provide technical support, manuals, and training
- Device installations: MDOT AVL trained mechanics
- OFS coordinates additional training and technical, ensures statewide alignment

Tasks Completed & Next Steps

- Mechanics training completed
- First 20 WMTs instrumented (2-4 WMTs per region)
- 80 more equipment packages for Superior & North Regions, installation week of November 1st
- 40 more equipment packages per week until all WMTs are instrumented (completed by mid-December)
- Vendor to have live feed by November 15th (log into AVL/equipment usage web site, display in cab, MDSS)

Performance Measures – User Delay Costs





Managing UDC with 4DX

WIG: Limit 2013 User Delay Cost to $304.4 Million by 12/31/13

Winter Weather Lag:

Regain Time < 2 hours 80% of time

- Lead 1: Perform After Storm Huddles 80% of the time
- Lead 2: Compliance with Salting Policies 80% of the time

TIM Lag:

Limit the number of traffic incidents closing 1+ lanes lasting longer than 2 hours to 203

- Lead 1: Perform Post Incident Reviews 50% of the time

Work Zone Lag:

Limit Non-Recurring Construction UDC to $80.3M

- Lead 1: Perform WZ Reviews 80% of the time
- Lead 2: Compare Predicted vs. Actual UDC

Continue to Improve

- Previous goal – Regain normal speeds in two hours or less, 80% of the time for winter weather events
- Proposed goal – During a winter event, maintain an average speed of traffic within 10 mph of normal speeds, 80% of time.

	% Speeds within 10 mph			
Location	All Day	AM Peak(6-9)	PM Peak(3-7)	6am-6pm
Grand Region	74%	45%	67%	68%
US-127(Isabella Co.)	91%	82%	100%	89%
I-94(Jackson TSC)	79%	75%	80%	80%
I-94(Taylor TSC)	51%	41%	65%	58%
I-94(Marshall TSC)	68%	73%	57%	74%

Thank You

Steven J. Cook, P.E.
(517) 636-4094
cooks9@michigan.gov

MDOT Michigan Department of Transportation