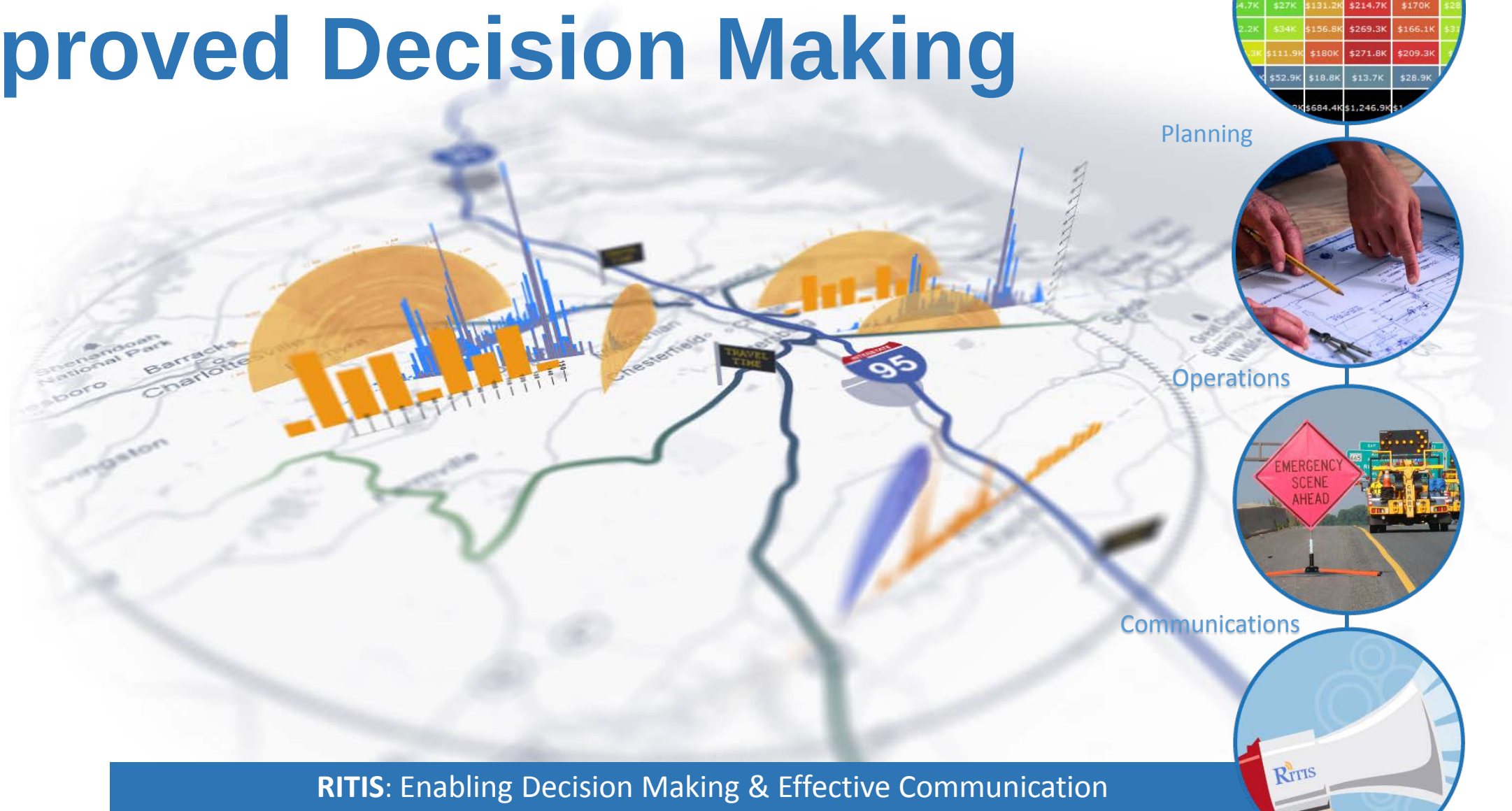
RWIS Data Integration for Improved Decision Making



RITIS: Enabling Decision Making & Effective Communication

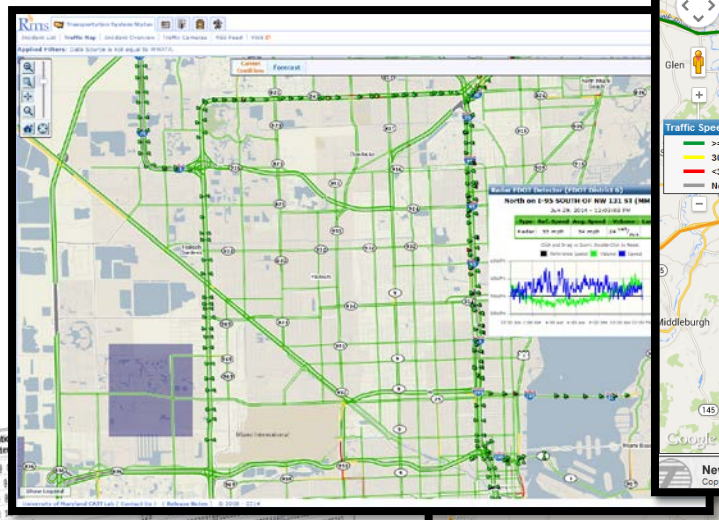
Learning Objectives

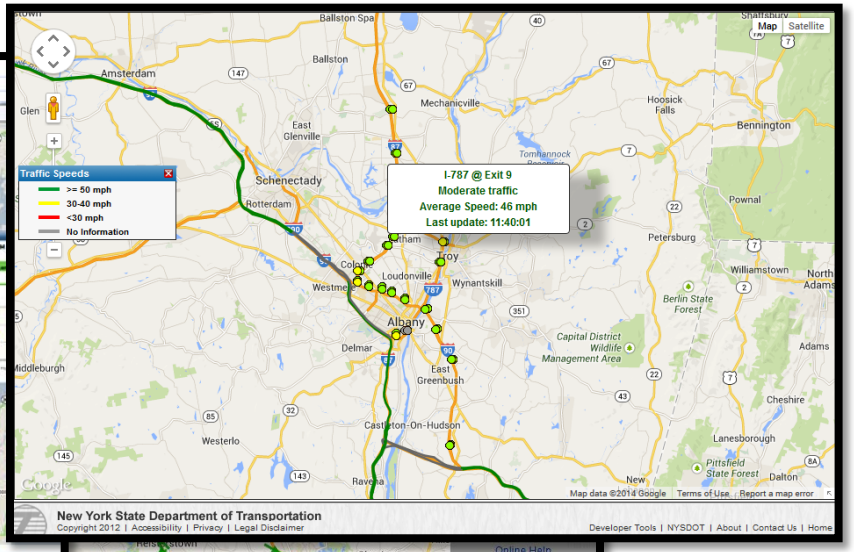
At the end of this presentation the participants will be able to:

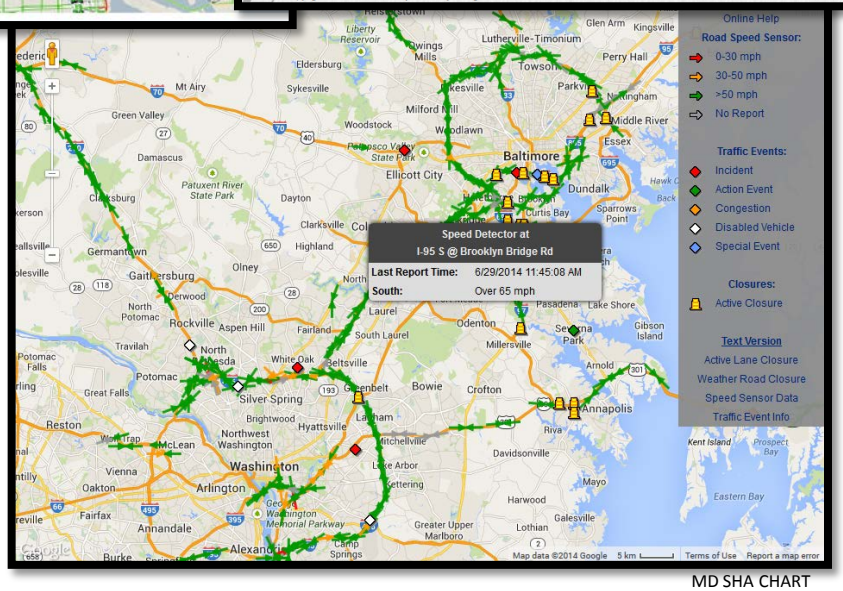
- Understand the importance of RWIS data integration for operations.
- Discuss use of technology to improve winter weather operations.
- Explore other uses of RWIS data in combination with other data sources.

Goal: Translate Data into Actionable Information

	lane_id integer	speed double precision	volume double precision	occupancy double precision	quality integer	measurement_start timestamp with time zone
1	8978	57	14	5	0	2014-06-29 11:37:57.698-04
2	8978	58.8	26	8	0	2014-06-29 11:36:56.818-04
3	8978	62.4	16	6	0	2014-06-29 11:35:56.863-04
4	8979	56.4	11	7	0	2014-06-29 11:36:56.818-04
5	8979	58.2	17	9	0	2014-06-29 11:37:57.698-04
6	8979	53.4	14	8	0	2014-06-29 11:35:56.863-04
7	8980	57	27	19	0	2014-06-29 11:36:56.818-04
8	8980	52.8	31	17	0	2014-06-29 11:35:56.863-04
9	8980	65.4	22	11	0	2014-06-29 11:37:57.698-04
10	8981	51.6	13	6	0	2014-06-29 11:36:56.818-04
11	8981	54	9	6	0	2014-06-29 11:37:57.698-04
12	8981	49.8	10	9	0	2014-06-29 11:35:56.863-04
13	8982	56.4	18	13	0	2014-06-29 11:36:56.818-04
14	8982	52.8	16	8	0	2014-06-29 11:35:56.863-04
15	8982	52.8	14	7	0	2014-06-29 11:37:57.698-04
16	8983	65.4	21	7	0	2014-06-29 11:36:14.944-04
17	8983	67.8	25	7	0	2014-06-29 11:37:17.753-04
18	8983	65.4	26			
19	8983	68.4	24			
20	8984	55.2	31			
21	8984	55.2	24			
22	8984	55.8	23			
23	8984	55.8	31			
24	8985	58.2	10			
25	8985	57	14			
26	8985	55.8	12			
27	8985	55.8	9			
28	8986	63.6	20			
29	8986	63.6	18			
30	8986	63	28			
31	8986	63	27			
32	8987	57	13			
33	8987	57	10			
34	8987	57	6			
35	8987	58.8	5			



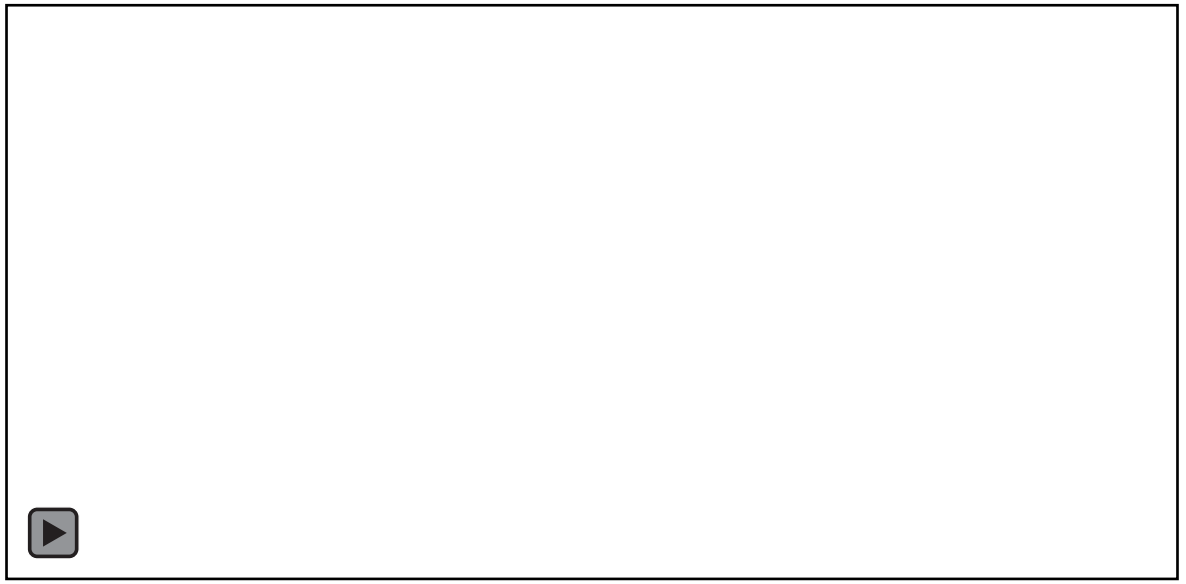




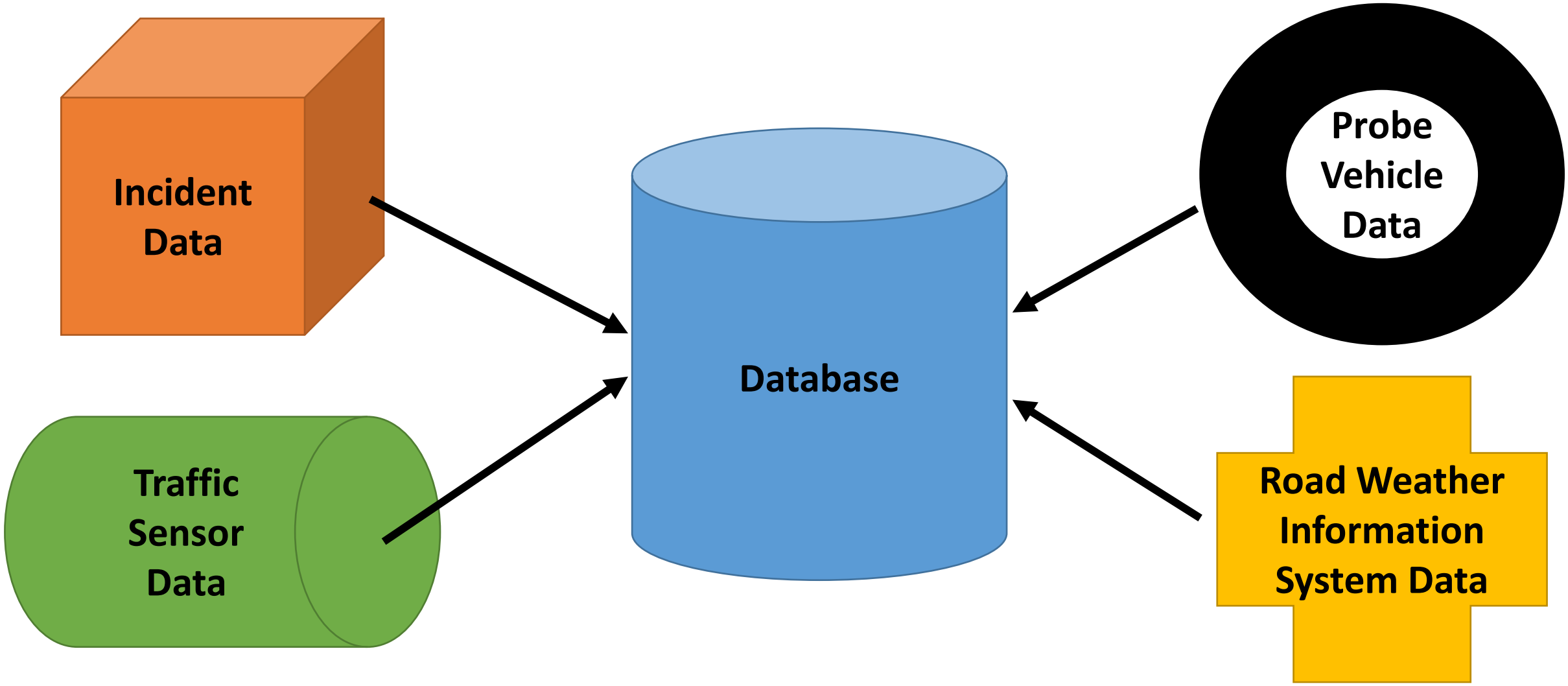
MD SHA CHART

Challenge #1 – Big Data

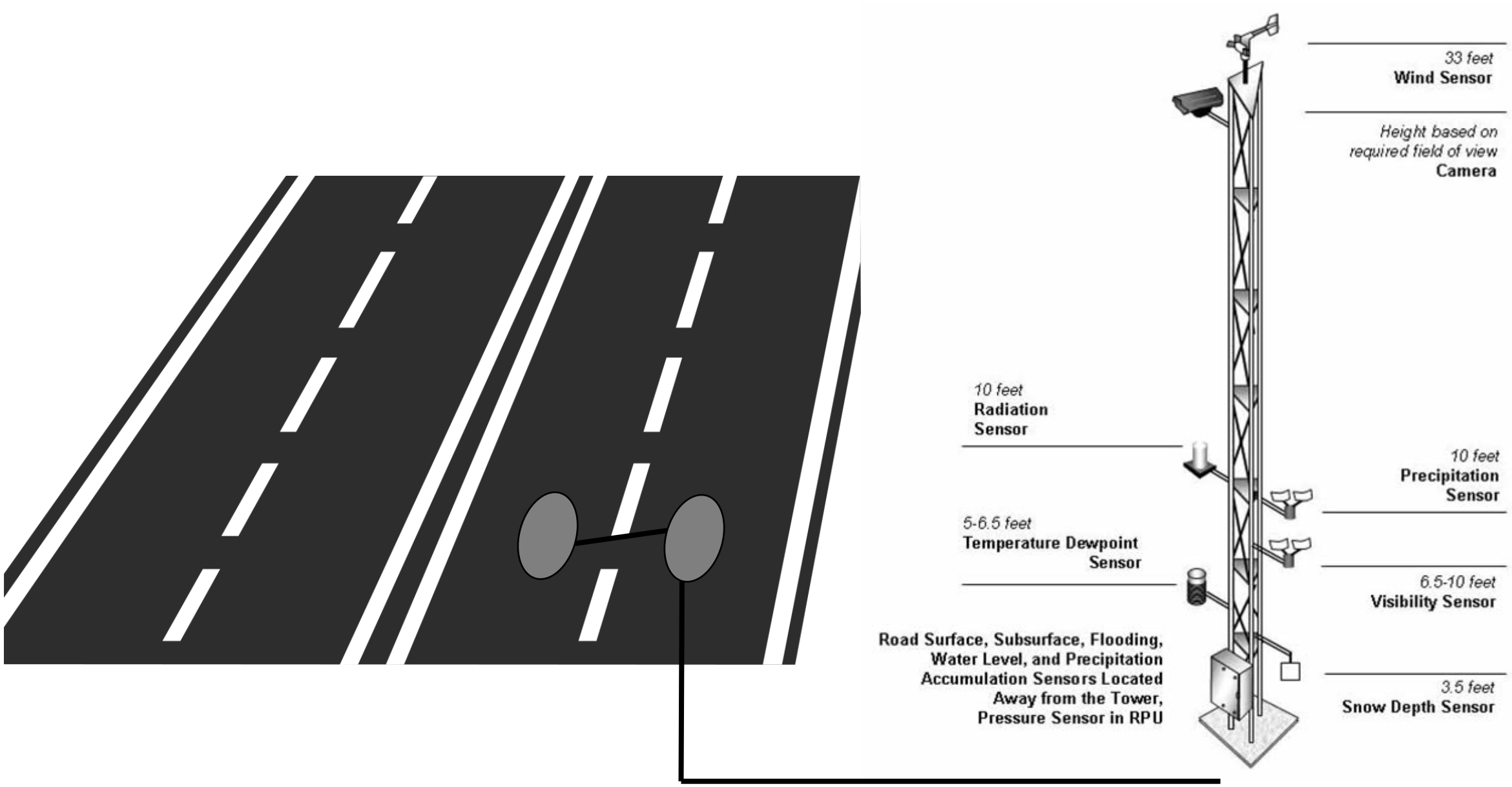
- Traffic accidents: 40,000 records per day: 0.001 Gb/day
- Traffic detectors: 35,000,000 records per day: 5 Gb/day
- Probe vehicle data: 4,200,000,000 records per day: 550 Gb/day
- CCTV, weather, radio, etc: NO,STA,TSK,EPT records per day: ??? Tb/day
- V2X & Automation data: ?,???,???,???,??? records per day: ??? ?b/day



Challenge #2 – Disparate Data Formats



What is RWIS?


33 feet
Wind Sensor
Height based on required field of view
Camera
10 feet
Radiation Sensor
10 feet
Precipitation Sensor
5-6.5 feet
Temperature Dewpoint Sensor
6.5-10 feet
Visibility Sensor
Road Surface, Subsurface, Flooding, Water Level, and Precipitation Accumulation Sensors Located Away from the Tower, Pressure Sensor in RPU
3.5 feet
Snow Depth Sensor

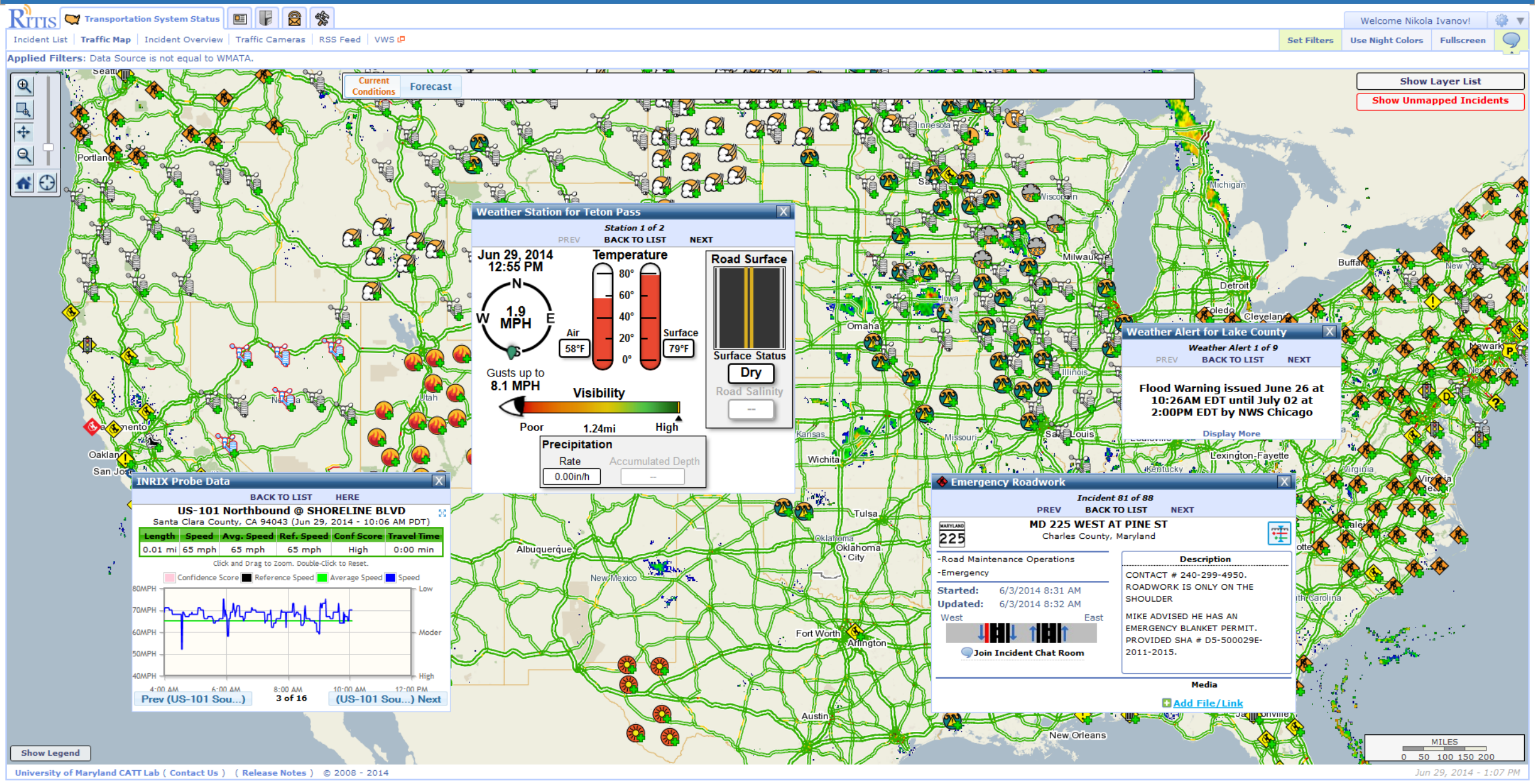
Why Does it Matter?

Road Weather Conditions	Weather-Related Crash Statistics		
	Annual Rates (Approximately)	Percentages	
Wet Pavement	1,170,000 crashes	18% of vehicle crashes	75% of weather-related crashes
	544,700 persons injured	17% of crash injuries	81% of weather-related crash injuries
	5,700 persons killed	13% of crash fatalities	77% of weather-related crash fatalities
Rain	739,200 crashes	12% of vehicle crashes	47% of weather-related crashes
	357,300 persons injured	11% of crash injuries	53% of weather-related crash injuries
	3,400 persons killed	8% of crash fatalities	47% of weather-related crash fatalities
Snow/Sleet	232,600 crashes	4% of vehicle crashes	15% of weather-related crashes
	75,700 persons injured	2% of crash injuries	11% of weather-related crash injuries
	900 persons killed	2% of crash fatalities	12% of weather-related crash fatalities
Icy Pavement	197,300 crashes	3% of vehicle crashes	13% of weather-related crashes
	67,300 persons injured	2% of crash injuries	10% of weather-related crash injuries
	700 persons killed	2% of crash fatalities	10% of weather-related crash fatalities
Snow/Slushy Pavement	168,400 crashes	3% of vehicle crashes	11% of weather-related crashes
	49,500 persons injured	2% of crash injuries	7% of weather-related crash injuries
	600 persons killed	2% of crash fatalities	9% of weather-related crash fatalities
Fog	38,700 crashes	1% of vehicle crashes	2% of weather-related crashes
	16,300 persons injured	1% of crash injuries	2% of weather-related crash injuries
	600 persons killed	2% of crash fatalities	9% of weather-related crash fatalities
Weather-Related *	**1,561,400 crashes**	**24% of vehicle crashes**	
	673,200 persons injured	**22% of crash injuries**	
	7,400 persons killed	**17% of crash fatalities**	

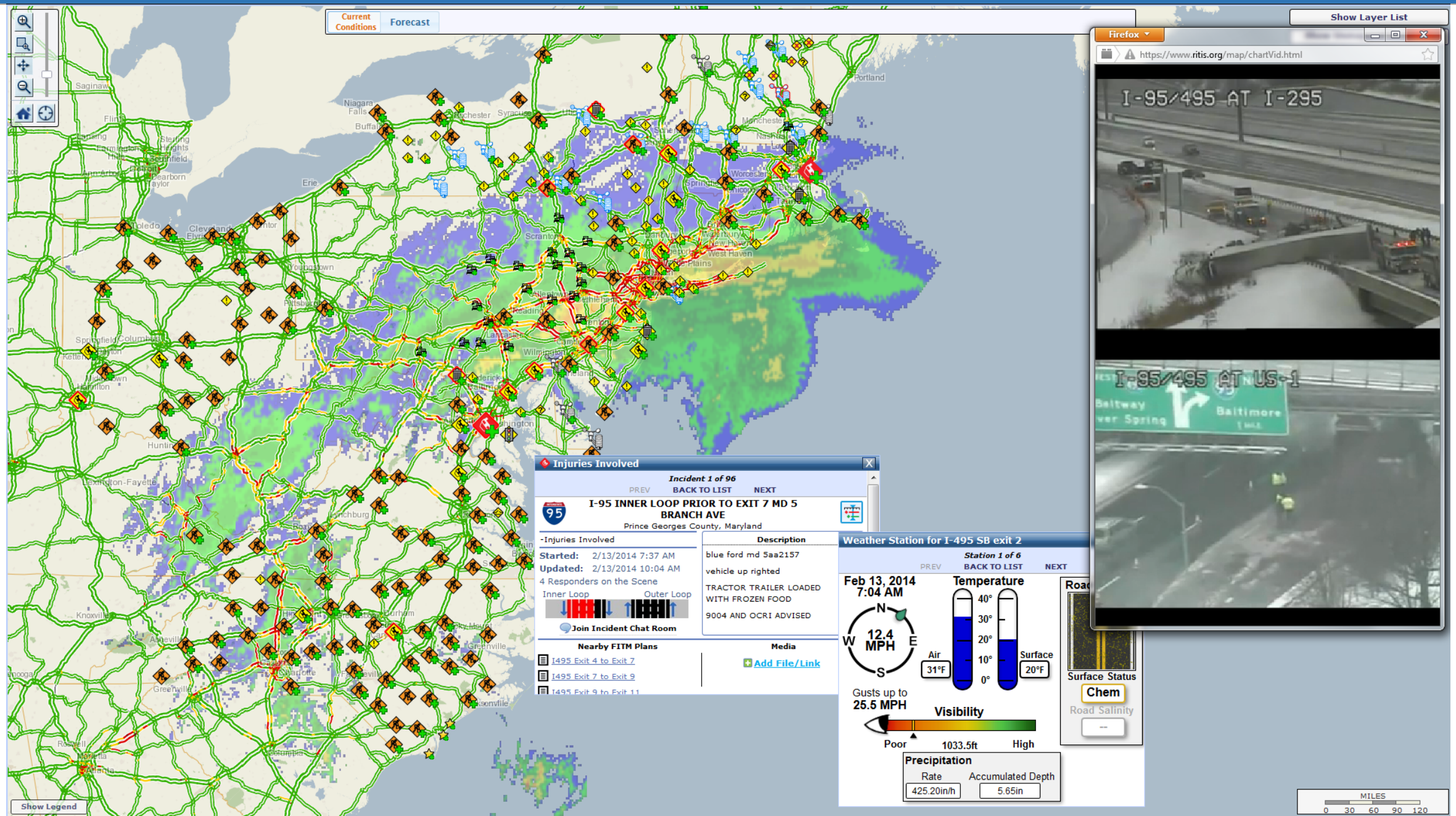
What Can Be Done?

Road Weather Variables	Roadway Impacts	Traffic Flow Impacts	Operational Impacts
Air temperature and humidity	N/A	N/A	▪ Road treatment strategy (e.g., snow and ice control) ▪ Construction planning (e.g., paving and striping)
Wind speed	▪ Visibility distance (due to blowing snow, dust) ▪ Lane obstruction (due to wind-blown snow, debris)	▪ Traffic speed ▪ Travel time delay ▪ Accident risk	▪ Vehicle performance (e.g., stability) ▪ Access control (e.g., restrict vehicle type, close road) ▪ Evacuation decision support
Precipitation (type, rate, start/end times)	▪ Visibility distance ▪ Pavement friction ▪ Lane obstruction	▪ Roadway capacity ▪ Traffic speed ▪ Travel time delay ▪ Accident risk	▪ Vehicle performance (e.g., traction) ▪ Driver capabilities/behavior ▪ Road treatment strategy ▪ Traffic signal timing ▪ Speed limit control ▪ Evacuation decision support ▪ Institutional coordination
Fog	▪ Visibility distance	▪ Traffic speed ▪ Speed variance ▪ Travel time delay ▪ Accident risk	▪ Driver capabilities/behavior ▪ Road treatment strategy ▪ Access control ▪ Speed limit control
Pavement temperature	▪ Infrastructure damage	N/A	▪ Road treatment strategy
Pavement condition	▪ Pavement friction ▪ Infrastructure damage	▪ Roadway capacity ▪ Traffic speed ▪ Travel time delay ▪ Accident risk	▪ Vehicle performance ▪ Driver capabilities/behavior (e.g., route choice) ▪ Road treatment strategy ▪ Traffic signal timing ▪ Speed limit control
Water level	▪ Lane submersion	▪ Traffic speed ▪ Travel time delay ▪ Accident risk	▪ Access control ▪ Evacuation decision support ▪ Institutional coordination

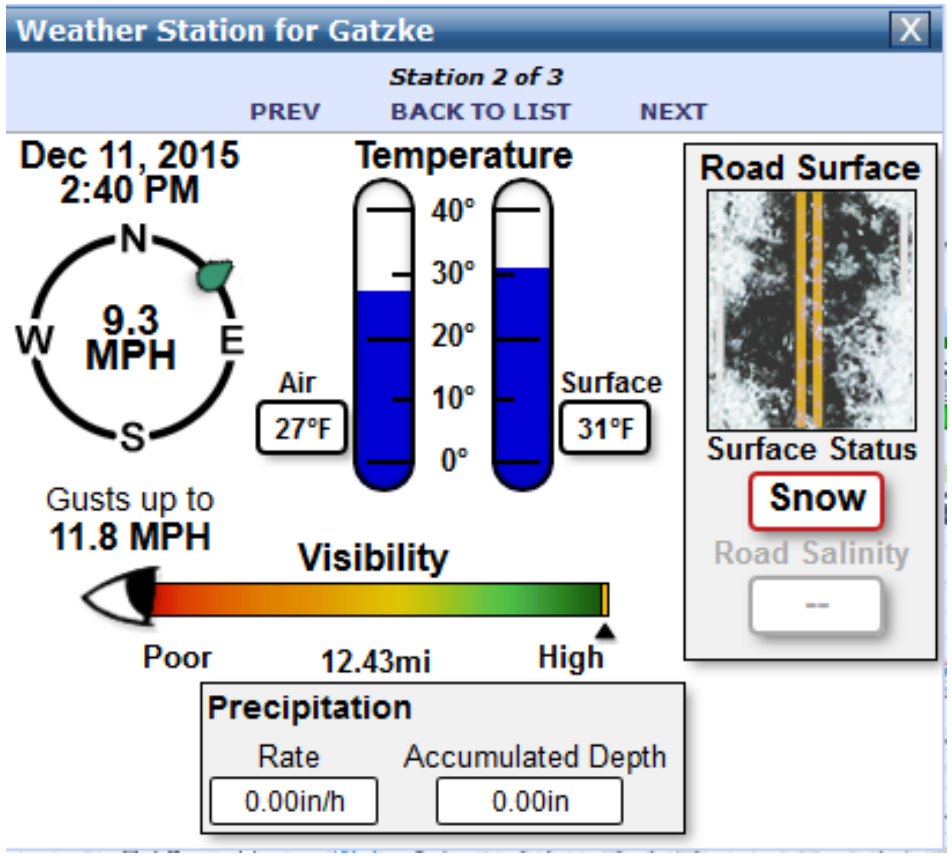
National Weather/Speed/Incident Integration

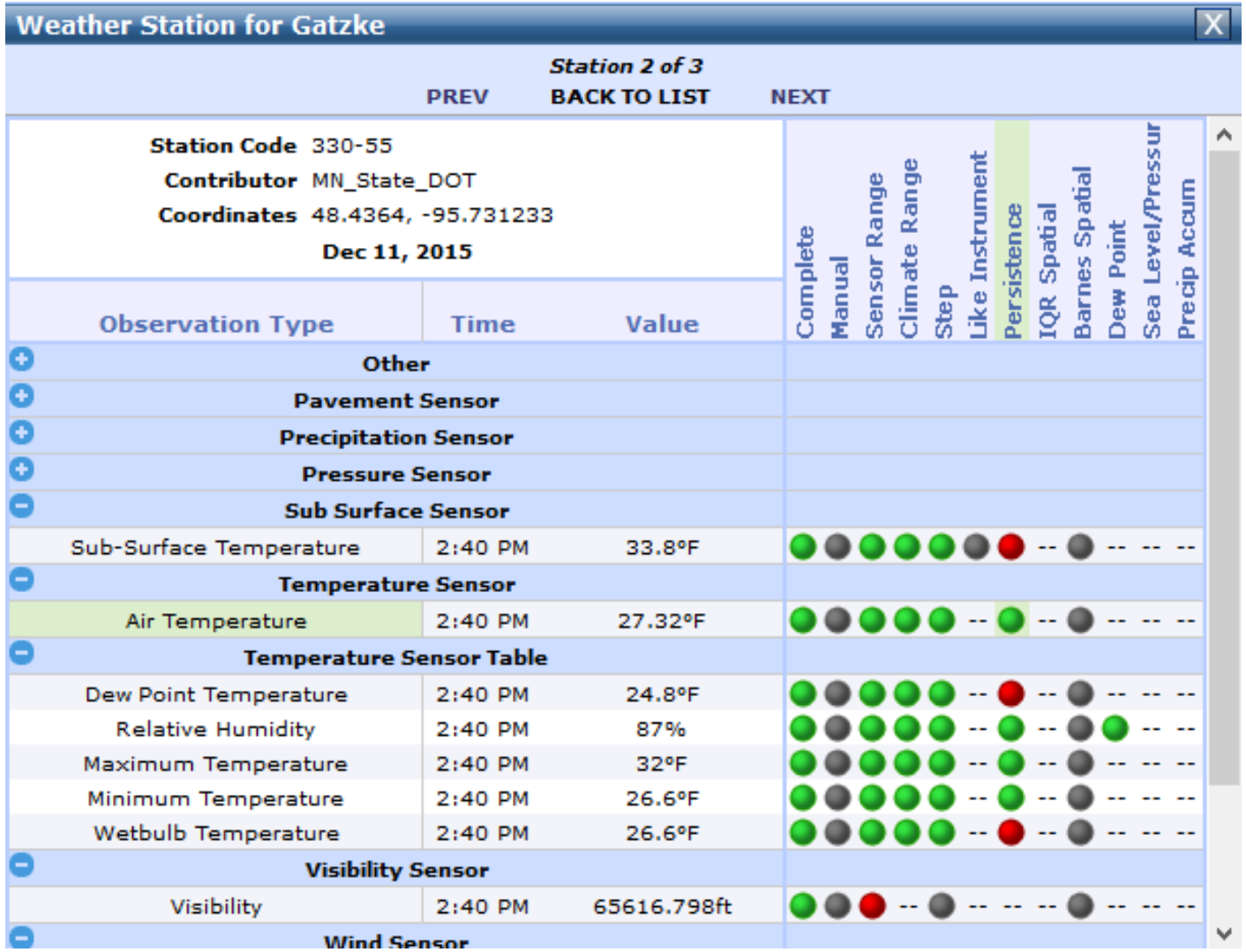


Real-Time Situational Awareness

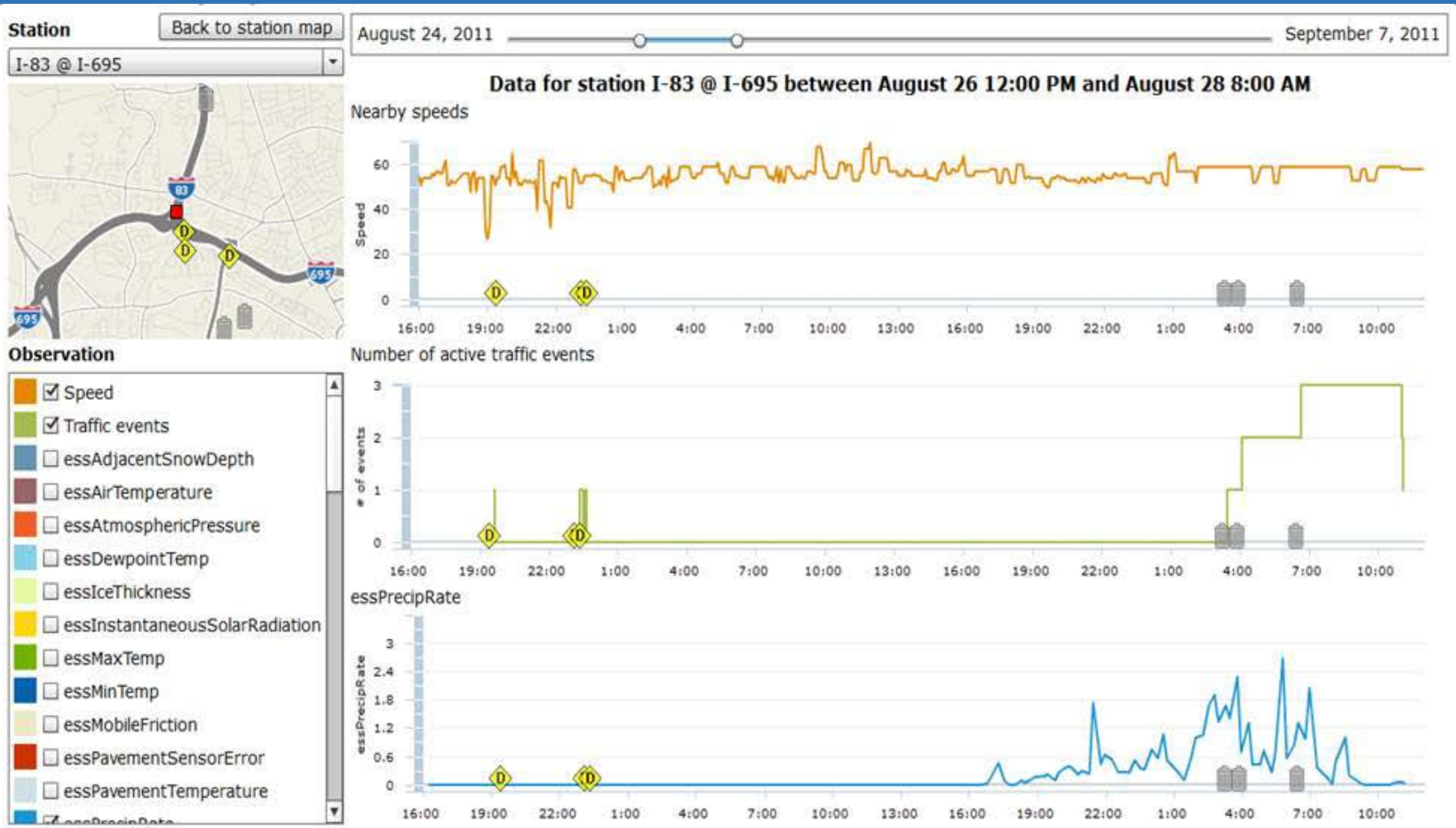


RWIS Measurements





Relationship View



Learning Outcomes

- Understand the importance of RWIS data integration for operations.
- Discuss use of technology to improve winter weather operations.
- Explore other uses of RWIS data in combination with other data sources.

Thank You!

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