



Snowplow Preemption in Utah

NWP Operations Task Force

Phillip Castro, P.E.

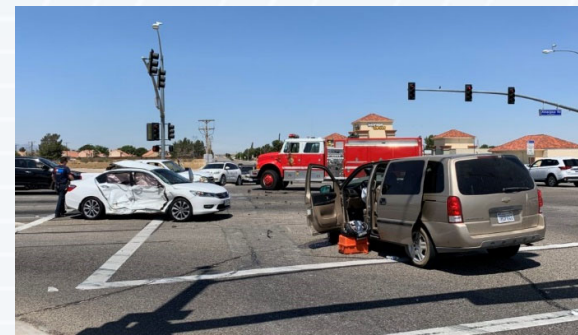
Transportation Technology Project Manager, UDOT



TRANSPORTATION TECHNOLOGY

The Challenge

- Long-term goal is safety
 - Reduced crashes, injuries, fatalities by warning drivers
 - V2X is a “**digital seatbelt**” – and will save lives
 - V2I requires participation of the auto manufacturers
- Secondary goal is mobility
 - Improved transit performance
 - More efficient snowplow and emergency vehicle operations
- Two big systemic challenges to solving this problem:
 - National deployment of interoperable V2X systems
 - This needs to work seamlessly, everywhere
 - Chicken-and-egg problem with the OEMs
 - Who deploys first?



Vehicle to Everything (V2X)



- V2X is the technology that enables two-way communication between a vehicle and the roadside infrastructure or another vehicle

Vehicle to Everything (V2X)

- Direct V2X

- Low-latency, two-way, direct communication in the 5.9GHz spectrum
- No communication towers – direct communication
- Requires specialized radios (was DSRC, now C-V2X) – this is NOT 5G
- No airtime charges

- Network V2X

- Higher latency, cellular communication through towers
- Compatible with cell phones
- Requires network charges
- Includes “telematics” systems built into today’s cars



V2X Use Cases

- Current use cases:
 - Transit Signal Priority (TSP)
 - Snowplow and emergency vehicle preemption
 - Vehicle insights (weather / hard braking)
 - Driver warnings: Curve Speed, Weather Impact
 - Disabled Vehicle / Emergency Vehicle Alert
 - RTCM Position Correction
- Use cases in development:
 - Variable Speed Limits (in development)
 - Vulnerable Road User Warning using LiDAR (in development)
 - Work Zone Alert (in development)



Snowplow Preemption

- Utilizes wireless V2X (Vehicle-to-everything) connected vehicle technology
- Snowplows can request signal preemption from an upcoming traffic signal

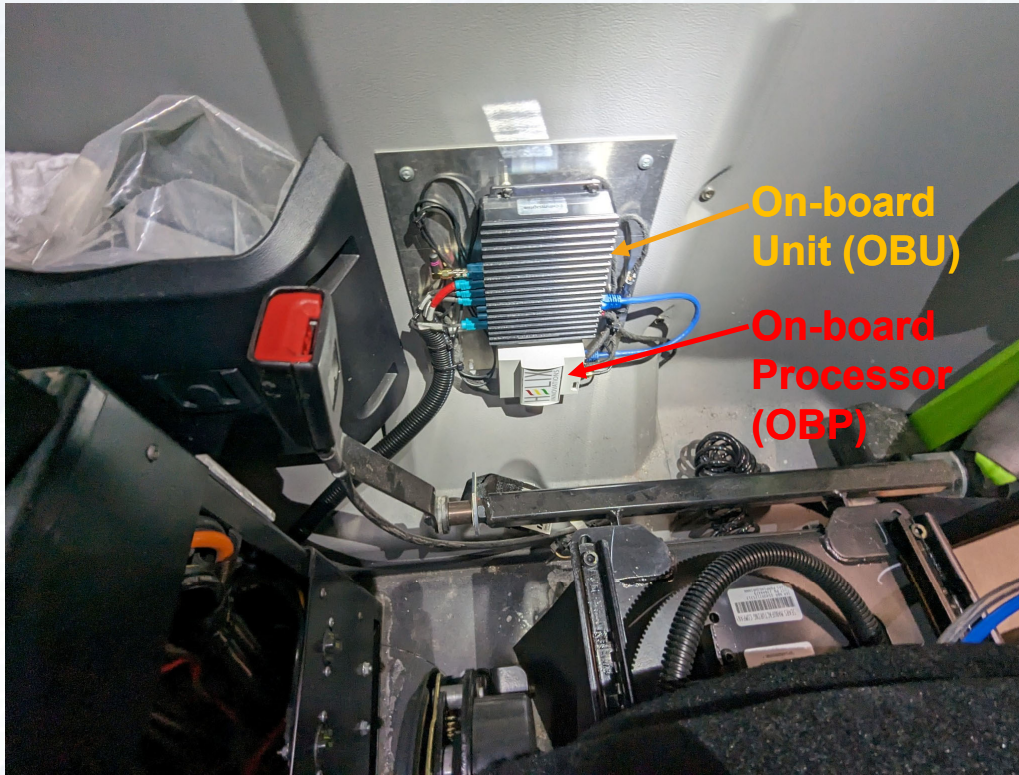


Roadside
Unit (RSU)

How does this technology work?



How does this technology work?



Direct V2X System Components



V2X Radio
"Roadside Unit"



Signal Command Module
Communicates with signal
controller and fiber

Benefits

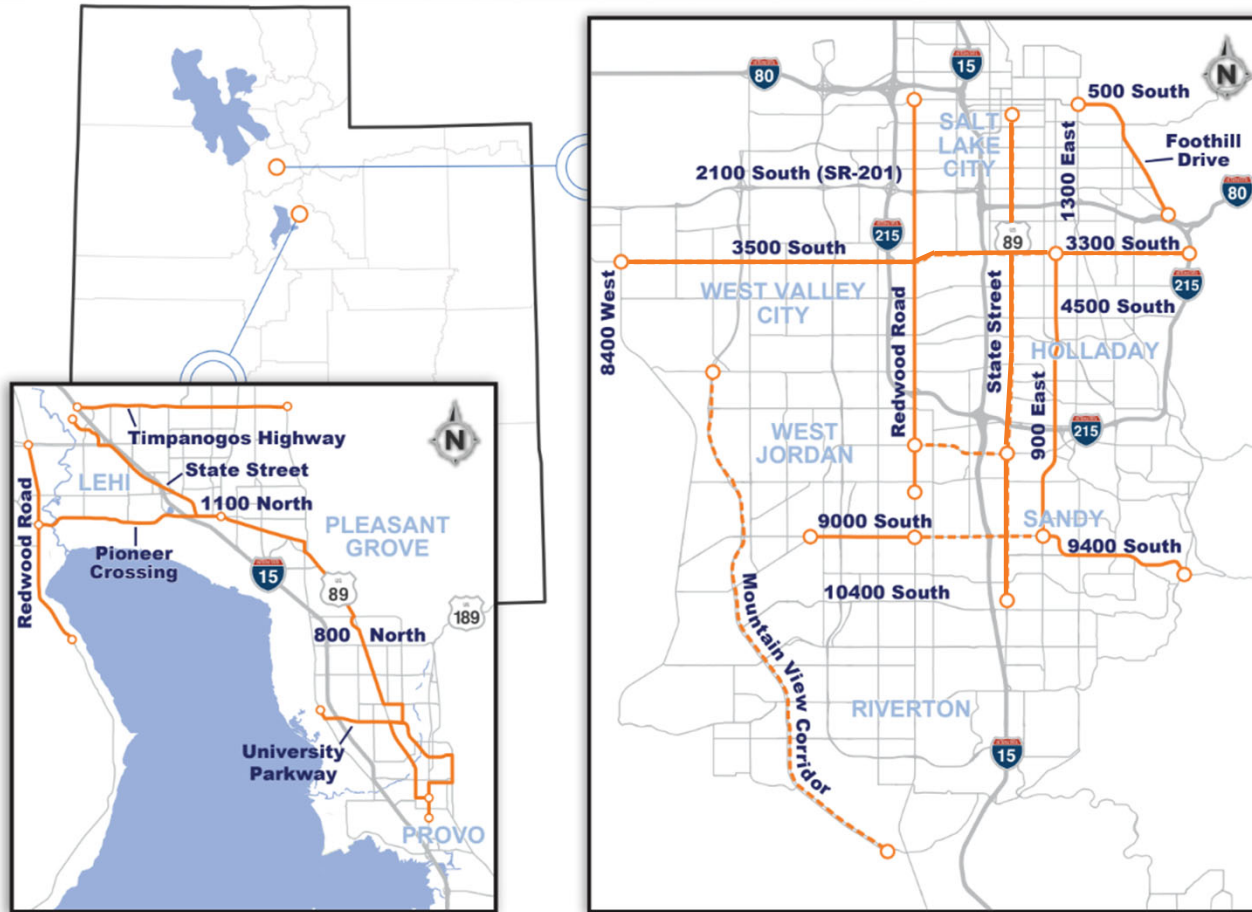
- Allows plowing operations to be more efficient
- 2018 Study on five urban corridors in Salt Lake valley
 - 89 crashes each year when roads are snowy, icy, and slushy.
- Reduces crashes caused by winter weather conditions



Benefits



Where is this technology deployed?



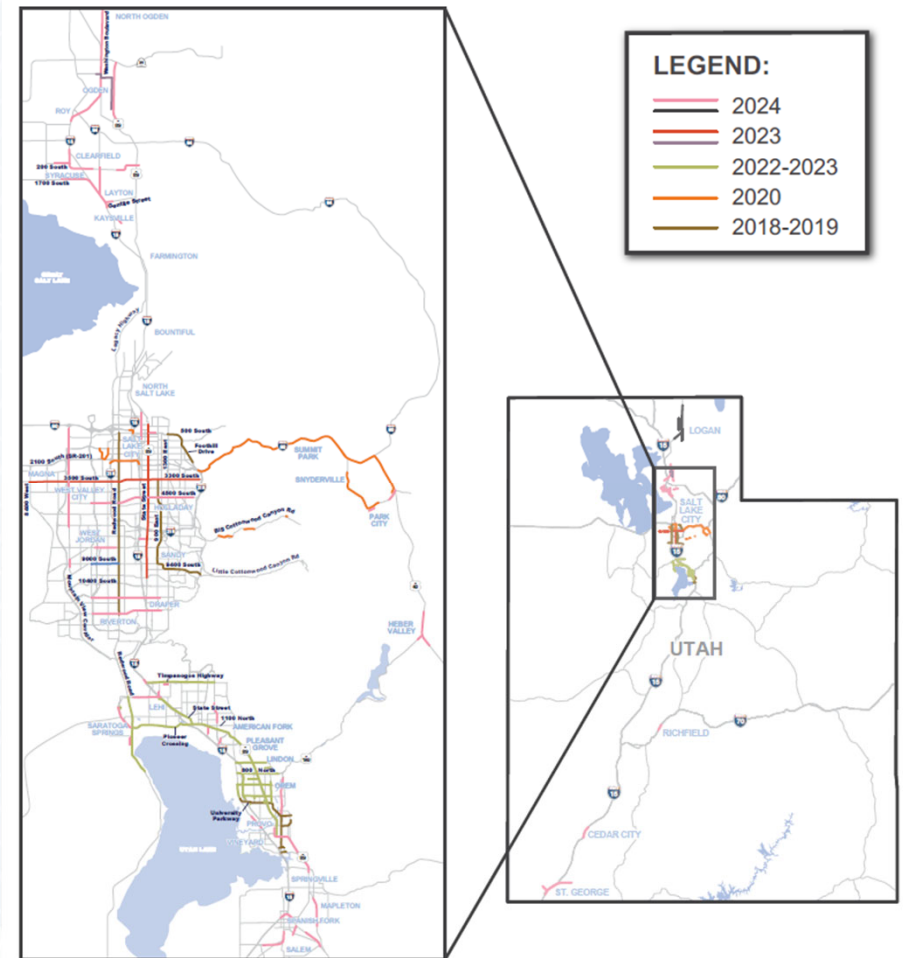
LEGEND:

- Existing Snowplow Routes
- Future Snowplow Routes

- 89 snowplows
- 12 corridors

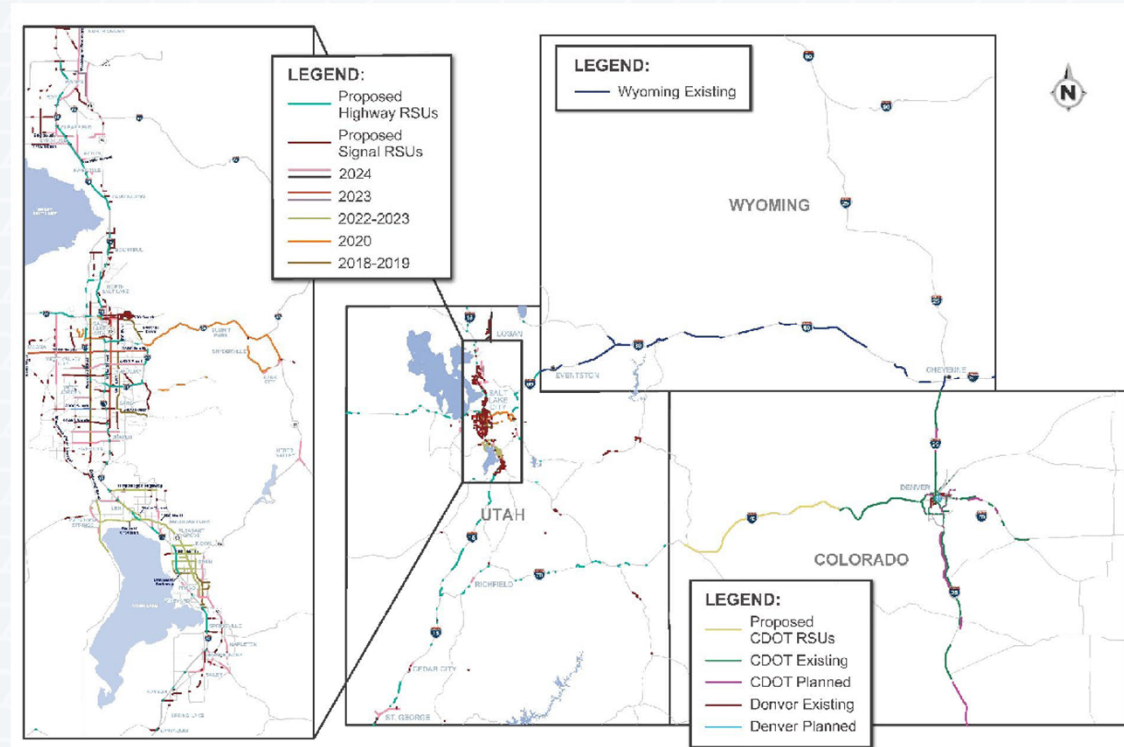
Connected Vehicle Deployment

- 866 Roadside Units (RSUs)
 - 752 at signalized intersections
 - 46 non-UDOT (Orem, Logan)
 - 50% of UDOT-owned signals
 - 114 along roadways
- 527 OBUs
 - Snowplows, fleet vehicles
 - Buses (UTA, Connect Transit)
 - Emergency vehicles (Orem, Logan, WFD)
- Generating 2.5 billion data points / week



Accelerating V2X: Connecting the West

- 750 RSUs
 - 450 at Signalized Intersections (Utah)
 - 300 along Interstates (Utah / Colorado)
- 215 OBUs
 - Buses, snow plows, fleet vehicles
- 20 VRU Warning sites (LiDAR)
- Interoperable messaging
 - TIM / SDX – weather / work zones
- Rigorous Validation Testing



Contact Info

Blaine Leonard
Transportation Technology Engineer
801-887-3723
bleonard@utah.gov

Phillip Castro
Transportation Technology Project Manager
801-867-5071
prcastro@utah.gov

