# Procuring, Funding and Estimating V2X Deployments

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UDOT Keeping Utah Moving
TRANSPORTATION TECHNOLOGY

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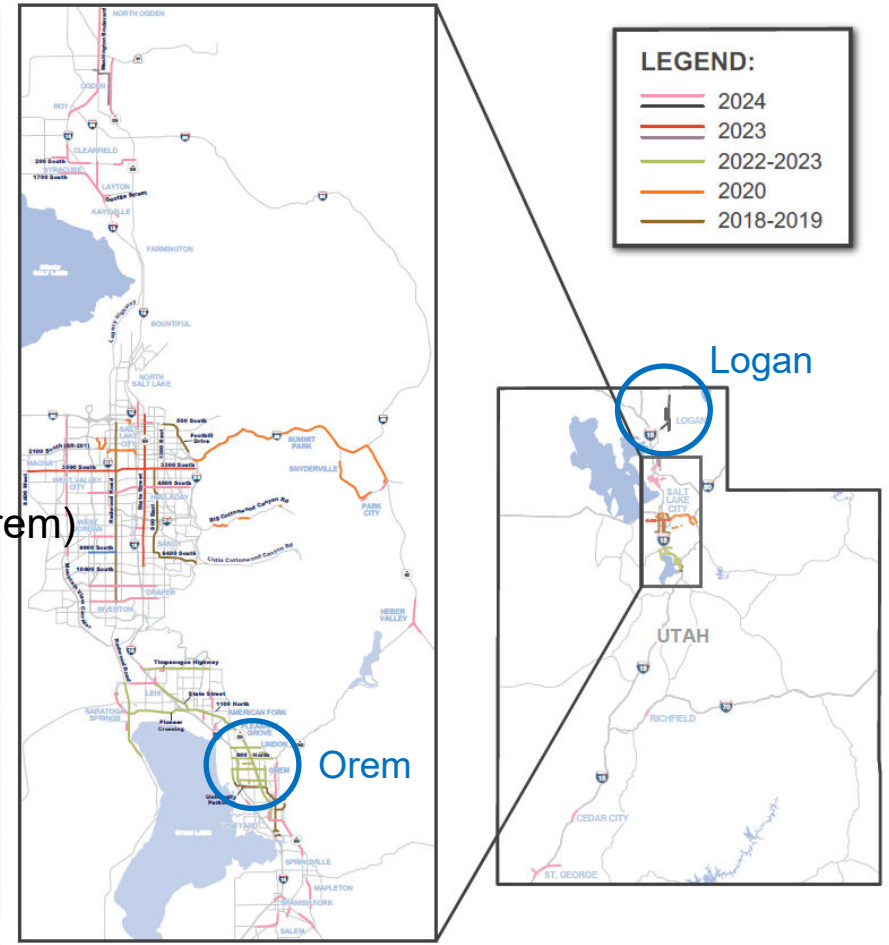
# Big Picture Issues

- Procurement / Deployment Isn’t Easy
  - Systems are not yet ‘plug and play’
  - Devices and standards are maturing
  - There are subtle differences between products
  - There is a learning curve
- But - This Can Be Done – Don’t Be Afraid Of It
- Start Small
  - Make sure your intersections are ready
  - Explore ‘trial procurement’ options
  - Procurement might need to keep scalability in mind, however
- Phone a Friend

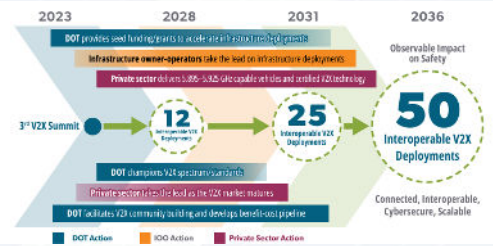
# Existing V2X Systems

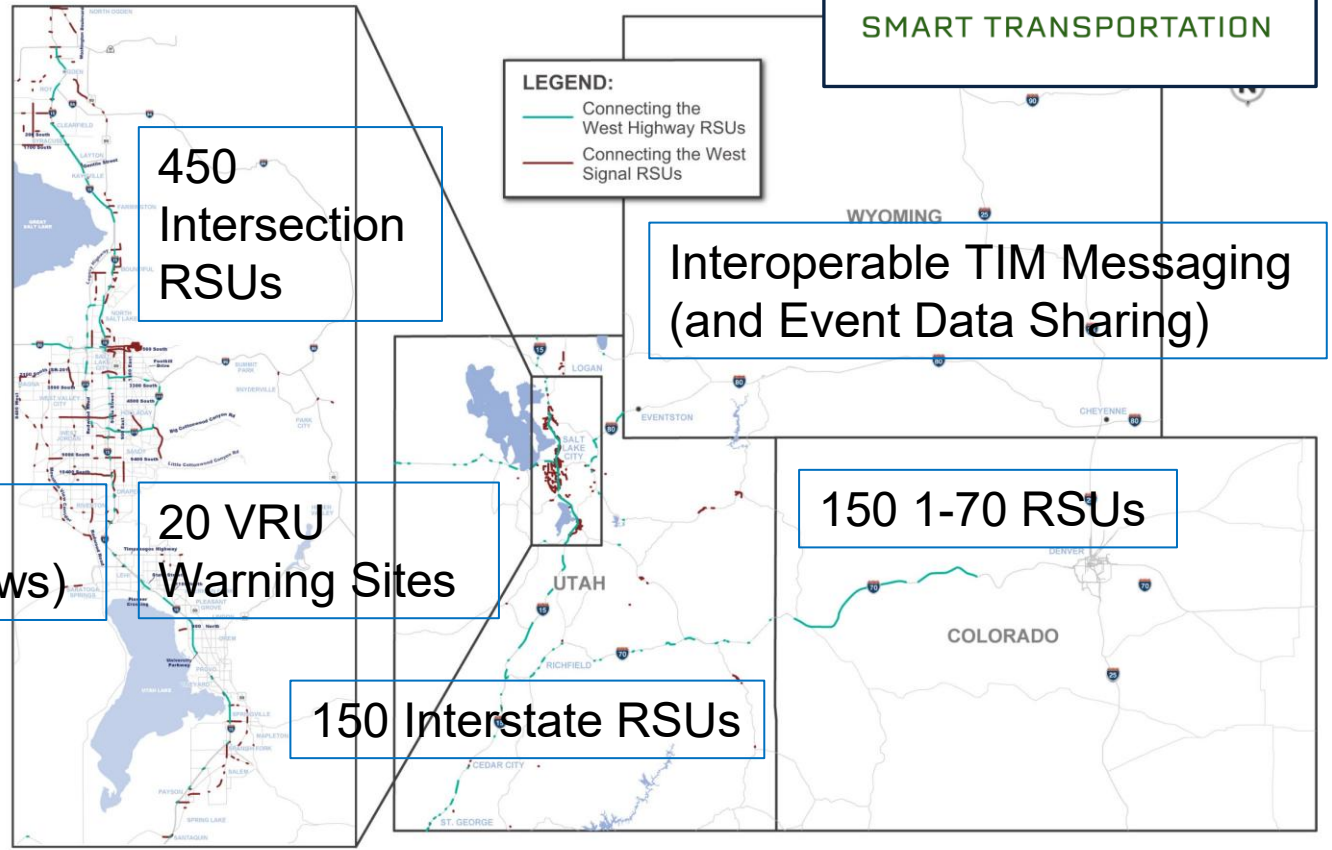
- 521 RSUs
  - 452 at signalized intersections
    - 46 non-UDOT (Orem, Logan)
  - 69 along roadways
- 327 OBUs
  - Buses (UTA)
  - Snowplows, Fleet vehicles (UDOT, Orem)
  - Emergency vehicles (Orem, WFD)
- 345 RSUs Being Installed
  - 300 at intersections
  - 45 along roadways
- 200 OBUs Being Installed
  - Buses (UTA, Cache Valley Transit)
  - Snowplows, etc. (Logan City)



# Accelerating V2X Deployment

CONNECTING THE WEST
SMART TRANSPORTATION




450 Intersection RSUs

Interoperable TIM Messaging (and Event Data Sharing)

215 OBUs (buses, plows)

20 VRU Warning Sites

150 1-70 RSUs

150 Interstate RSUs

COLORADO Department of Transportation

DENVER THE MILE HIGH CITY

UTA

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# What Do We Need to Procure?

- Roadside Units (RSU)
- Onboard Units (OBU)
- Mounting hardware (poles, cable, connectors)
- OBU Antennas
- External Control Local Application (ECLA)
  - In UDOT's case, a Signal Command Module (SCM)
- Onboard Processor (OBP)
- Human Machine Interface (HMI)
- Applications
- Security Certificates

# What Do We Need to Procure?

- Fiber switch
- Power over Ethernet (PoE) Injector
- Surge Protector
- Signal controller
- Management / Maintenance / Data Platforms
  - Cloud costs for data / platform hosting
- Technical Services:
  - System design, MAP creation, FCC registration, installation, integration, validation
  - CAN connection / decoding
  - Maintenance and operations services
- LiDAR / Cameras

# Challenges with V2X Procurement

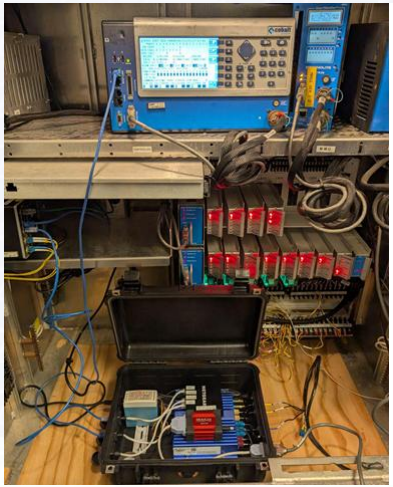
- Agency procurement rules and staff are used to mature products
  - Asphalt, guard rail, plow blades, signal poles
  - Federal / state “made in the US” rules
- How to describe the product
  - Do we know enough about the product to specify it?
  - Some products vary; do you want certain features and not others?
  - Get examples from your peers (get engaged in national working groups) – but these may vary from what you need
  - Include certification (OmniAir, etc) – this is also evolving
- Which standards to refer to
  - Standards are evolving
  - Some standards ‘require’ features that aren’t yet available in the market

# Challenges with V2X Procurement

- Features and costs are not always consistent
  - Tough to compare apples to oranges
  - Different products have varying cost models
- Delivery time
  - Some vendors have product in stock
  - Seemingly simple things (like mounting brackets) may have long lead times
- Determining that the product does what it promises to do
  - Consider a ‘multiple award’ procurement - flexibility
  - Purchase a small quantity first
  - Build in time for compliance testing
- Tariffs!

# V2X Costs

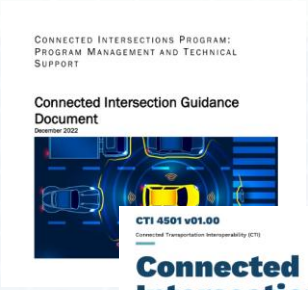
- Costs vary based on approach
  - How much you do, how much you expect others to do
  - Hardware configuration (ECLA or not?)
  - Risk assignment / maintenance / replacement
  - Quantity discounts
- Cost Components:
  - Planning and Design
  - Training
  - Bench testing
  - Getting set up / learning curve – getting your hands dirty
  - FCC Licensing
  - Security Certificate provisioning
  - Documentation
  - Field evaluation after installation / Intersection verification



# V2X Costs

- RSUs: $3800 - $5100
  - Installed Cost: $7500 - $15,000 (with all hardware)
  - Installing 100 intersections: $1.5 to $2.7 million (ITSA V2X Deployment Plan)
- OBUs: $2600 - $3200
  - Installed Cost: $4800 – $6500
  - CAN connection / decoding extra (up to $3500)
- ECLA  $800 - $1900 (depending on features)
- HMI (installed): $2500
- Security Certificates: $60-$80 per year per device
  - Management Platform might have a license / fee
- Upgrading the Signalized Intersection: $20,000 - $40,000

# Resources





- CV PFS Connected Intersection Guidance Document
  - https://engineering.virginia.edu/labs-groups/cvpfs
- CV PFS MAP Guidance Document
- CV PFS Procurement Guidance (in progress)
- CTI 4501: Connected Intersections Implementation Guide
  - https://www.ite.org/technical-resources/standards/rsu-standardization/
- CTI 4001: Roadside Unit Standard
- USDOT Turner-Fairbanks Highway Research Center (TFHRC)
  - https://highways.dot.gov/turner-fairbank-highway-research-center/labs/STOL
- ITS America V2X Resources
  - https://itsa.org/s/connected-transportation/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