

# Edge Transportation Exchange

Leveraging Verizon infrastructure to deliver the V2X vision

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# History of connected vehicles and intelligent transportation

- **2000s:** Wi-Fi-based V2X standards, DSRC, introduced on unlicensed, 5.9 GHz spectrum.
- **2010s:** Cellular vehicle connectivity for telematics services approaches critical mass, first generation autonomous vehicles.
- **2020s:** DSRC V2X lack of adoption, FCC re-allocates 45 MHz (of 75 MHz). New approach needed: rise of **cellular-based network V2X**.



**V2X technologies are anticipated to play an integral role in the continued improvement of automotive transportation and infrastructure in the 21st century, by enhancing safety, traffic efficiency and environmental impacts in the short term, and by laying a critical foundation for the continued proliferation of advanced technologies such as autonomous vehicles and smart, connected infrastructure in the future.”**

–ITS America

# Delivering on the V2X vision

The Verizon Edge Transportation Exchange is a Network-V2X approach to deliver on the V2X vision articulated by the Intelligent Transportation Society of America (ITS-A).<sup>1</sup>



The Edge Transportation Exchange leverages the Verizon wireless network infrastructure (MEC, 5G, HPL, etc.) enabling of near real time, low latency data exchange between vehicles and everything.

Industry-leading 19 public MEC locations with scale, know-how, experience and solutions.



Vehicle-to-Everything (V2X) communications describe the exchange of digital information between vehicles and the world around them.



V2X communications encompass a broad array of communication types, including connections between vehicles and other vehicles (V2V), pedestrians (V2P), infrastructure (V2I) and other networks (V2N).



The array of connections enables a whole new range of roadway safety solutions and automotive features, thereby opening the door for a paradigm change in the automotive space and broader transportation industry.

<sup>1</sup>- ITS-A Beyond 5.9 V2X Deployment Plan

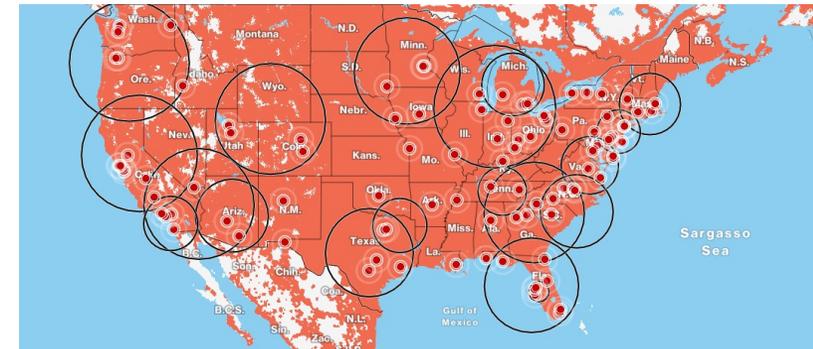
# Verizon brings advanced and unique capabilities that are critical to the success of V2X deployments

## Mobile Edge Compute (MEC)

Industry-leading 19 public MEC locations with scale, know-how, experience and solutions.

## 5G Wireless

Verizon delivers an award-winning network and leads 5G innovation with technologies like network slicing and quality of service.



MEC nationwide coverage [verizon.com/coverage-map/](https://www.verizon.com/coverage-map/)

## Hyper Precise Location (HPL)

High fidelity location service delivered on a national basis with centimeter level precision through Real Time Kinematic (RTK) and differential GPS technology.

## Automotive and Public Sector Leadership

Extensive automotive and public sector portfolio including leading automotive brands and federal, state and local government solutions.



HPL nationwide coverage [verizon.cellmaps.com/iot.html](https://www.verizon.com/cellmaps.com/iot.html)

# The Verizon advantage



## Wireless Infrastructure

- MEC, 4G/5G, sizable Licensed spectrum, QoS, RTK, IoT, etc.
- Public and private MEC/5G
- E2E tuned solution, from 1 MNO provider, superior performance/low latency



## Leading the Network-V2X space

- **MEC:** Leading public MEC w/scale, experience, solutions, (19 US location), etc.
- **RTK:** Only tier 1 US mobile network operator with Hyper Precise Location (HPL)
- **API:** solution hosted on AWS-Wavelength with standards-based APIs
- **V2X software leader:** 6 years in development, trials, PoCs, pilots, etc.
- **Edge Transportation Exchange covers:** intersection and roadways; wherever there is Verizon wireless service
- **IoT offering and platforms:** ThingSpace, NB-IoT, LTE-M, Cat-x, partnerships, etc.
- **I2V/V2I platforms:** myriad of partners initiatives (SPaT, crossing, EV, cameras, etc.)



## Leading mobile network operator

- Verizon is a \$134 B company, ≈105k employees; wired, wireless
- Verizon operates w/Federal (DoT, DoD, DoE, etc.), state, county, city, operations, contracts, SIs, etc.

**MEC** Mobile Edge Compute  
**RTK** Real Time Kinematics



# Benefits



## Improves road safety

Edge Transportation Exchange can help reduce road hazards, car accidents and improves traffic flow by providing timely messages to all road users.



## Beyond onboard sensors

Edge Transportation Exchange augments and extends the vehicle's sensing capabilities beyond onboard sensors; high automation.



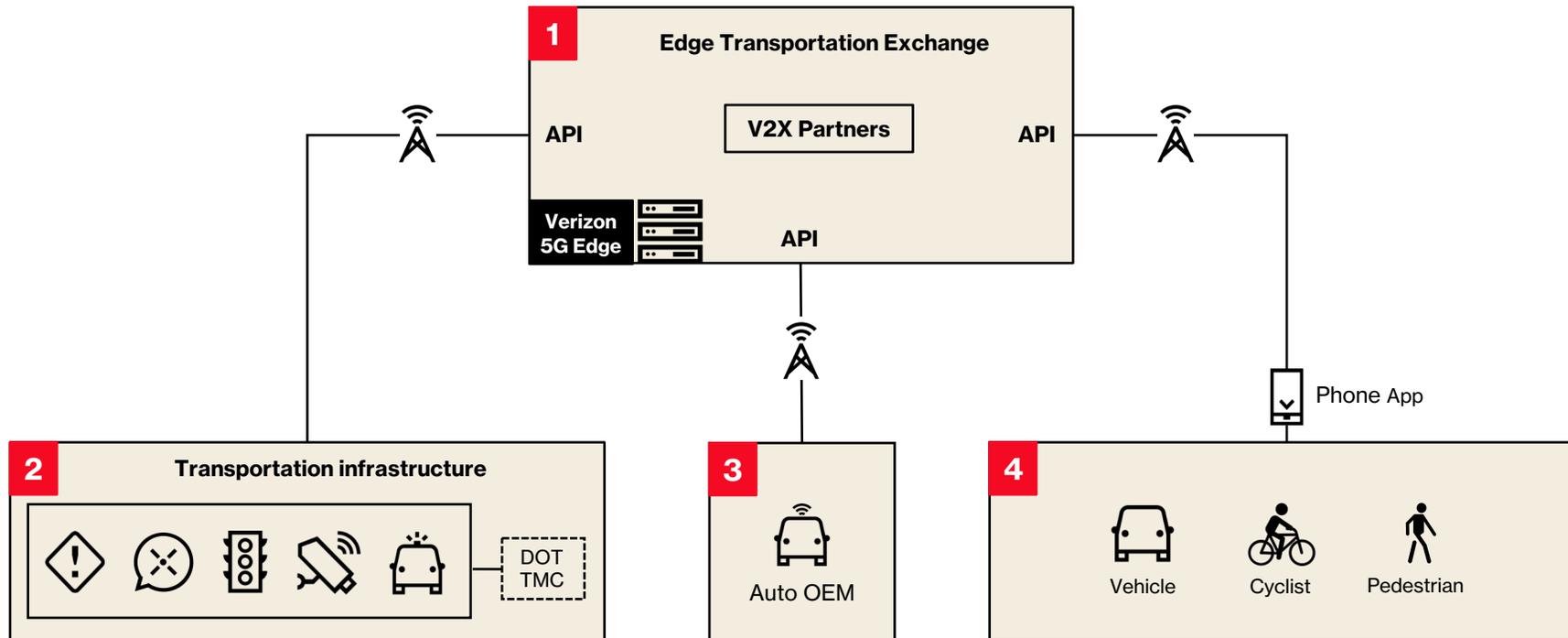
## Scalable nationwide coverage

Edge Transportation Exchange leverages Verizon's public MEC edge computing, 5G wireless network, along with Hyper Precise Location (HPL) services to deliver nationwide V2X coverage.

**Addresses road safety, creates new car experiences, services for consumers and enables vehicle efficiencies.**

# Solution overview

1-Edge Transportation Exchange enables intelligent transportation services by exchanging real-time V2X messages between 2-transportation infrastructure, 3-auto OEMs and 4-pedestrians using Verizon network as the infrastructure: MEC, 5G, HPL



DOT Department of Transportation  
TMC Transportation Management Center



# Edge Transportation Exchange delivers V2X services, scales quickly and economically

The Edge Transportation Exchange service is an AWS-Wavelength (MEC) hosted software platform that facilitates near real-time exchange of V2X data among clients. The service applies "geo filtering" to transmit messages to/from between clients that are geographically relevant. The Service includes:



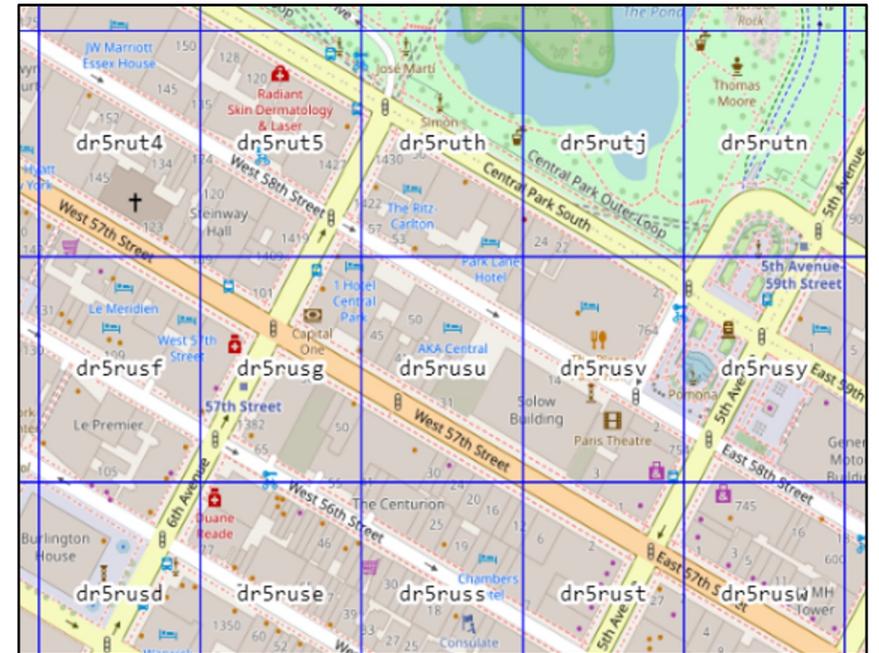
MEC-hosted software platform for exchanging V2X Data



APIs for accessing and using the platform using ThingSpace



Optional access to partner V2X Data (which may be subject to additional charges)



## Deploy and scale quickly and economically

- Cover intersections and roadways
- Connect to apps on both cars and phones
- Host partner applications
- Interface between systems and standards, with added security
- Interoperate across MNOs, technologies, products and vendors

# Edge Transportation Exchange vs. C-V2X

## C-V2X: PC5, DSRC, physical RSU, Direct-V2X

 **Limited coverage** – short range, intersections

 **Expensive** – Capex \$7-\$50 K per intersection

 **New infrastructure** – 5.9 GHz overlay radio network limited public spectrum, 20 MHz

 **Device** – New hardware required  $\approx$  \$50-\$150 added COGS/vehicle

 **Broadcast** – message to everyone, limits service creation

 **Complex** – difficult to scale, to deploy RSU, right of way contracts, powering, network management, etc.

 **Latency** – very low, collision avoidance use cases

## Edge Transportation Exchange: Uu, virtual RSU, Network-V2X

 **Great coverage** – long range, intersections and open roadway

 **Low cost** – minimal Capex uses existing MEC, 5G paired infrastructure

 **Existing infrastructure** – Leverage MEC, 5G, HPL abundant licenses spectrum > 100 MHz

 **Device** – existing vehicles, mobile phones, devices

 **Unicast** – target services to individual clients, enables service monetization

 **Simple** – MEC/Network scale from day 1, no RSU, no power sourcing, no truck rolls, no maintenance

 **Latency** – low, applies to majority of use cases

Value proposition

# Use cases

Edge Transportation Exchange enables use cases related to enhanced safety, traffic efficiency, and provides the low latency edge compute required for advanced and high automation use cases. Use cases are available today from Verizon, others with partners, and more are being added.

**Based on industry standards and designed for privacy and security; Edge Transportation Exchange supports SAE J2735 messages including:**

Signal Phase and Timing (SPaT)	Roadside Alert (RSA)	Basic Safety Message (BSM)	Personal Safety Message (PSM)
Traveler Information Message (TIM)	Signal Request Message (SRM)	Signal Status Message (SSM)	Emergency Vehicle Alert (EVA)

**Integrating to the Edge Transportation Exchange interface enables a customer or system integrator to develop applications and V2X use cases such as, but not limited to:**

Cross-Traffic Left-Turn Assist	Intersection Movement Assist	Emergency Brake Warning	Time to Change - Traffic Light
Mid-Block Crossing	School Zone	High-Definition Sensor Sharing	Vulnerable Road User (VRU)
Autonomous Vehicle Disengagement Report	High-Definition Map Collecting and Sharing	Tele-Operated Driving	Tele-Operated Driving Support

# APIs for vehicle/OBU or mobile application integration

The Edge Transportation Exchange interface is a collection of RESTful APIs and MQTT endpoints which provide secure client registration and message exchange based on ThingSpace authentication.

## 1 ThingSpace Session Initiation (HTTPS)

## 2 Client Registration and Connection (HTTPS)

## 3 MQTT Pub/Sub V2X messages (v3.1.1)

The screenshot shows the ThingSpace API documentation for the 'Register ETX Device' endpoint. The page includes a title, a description of the API's purpose, a list of key points, a note about authentication, a curl command for the request, an authentication dropdown menu, and an API code playground section with a 'body' field and a 'Client Type' dropdown menu. The right sidebar shows a request and response preview with a curl command and a JSON response.

```
curl -X POST \
--url 'https://lmp.thingspace.verizon.com/api/v2/clients/' \
-H 'Accept: application/json' \
-H 'Content-Type: application/json' \
-H 'Authorization: Bearer {AUTH_ACCESS_TOKEN}' \
--data-raw '{
  "ClientType": "TrafficLightController",
  "ClientSubtype": "Scooter",
  "VendorID": "VerizonETX",
  "DeviceID": "04fcd16a-343d-4527-8203-2f46e3e4ff4b",
  "IMEI": "12-345678-901234-5",
  "ICCID": "89345678901234567890"
}'
```

Note: The API documentation is deployed on [ThingSpace.com](https://thingspace.com)

# Resources

## For further information contact the product owners:

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- [V2X white paper](#)
  - [ADOT-MAG Case Study](#)
  - [Verizon-Honda youtube](#)
  - [Verizon-Cisco-NeutronEdge-QFree youtube](#)
  - [Verizon Mcity youtube](#)
  - [ITS-A Beyond 5.9 V2X Deployment Plan](#)

**verizon**  
**business**