Digital Infrastructure

Planning for Autonomous Vehicles

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Vehicle-to-Everything (V2X) Technology

- Goals
  - Zero roadway fatalities (USDOT).
  - Mobility enhancement.
 - Environmental sustainability.
- Objectives
  - "All-directional" communication between vehicles, road users, and infrastructure.
  - Compensate for line-of-sight limitations of autonomous vehicle sensors.
  - Enable cooperative operation and collective intelligence among all types of vehicles.

Source: USDOT ITS 2023

USDOT Plan to Accelerate V2X Deployment (August 16, 2024)

- ## NHTSA: IMA and LTA alone can
  - Prevent more than 439 thousand crashes annually.
  - Reduce crash severity.
  - Save more than 1000 lives annually.
  - Reduce costs by up to $74 billion.

- ## V2X
  - Improve fuel efficiency by reducing unnecessary stops, maintaining optimal traffic flow and lane usage.
  - Reduce CO_2 emissions by up to 16%.

NHTSA: National Highway Traffic Safety Administration
IMA: Intersection Movement Assist
LTA: Left Turn Assist

Cover photos courtesy of iStock

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Saving Lives with Connectivity:

A Plan to Accelerate V2X Deployment
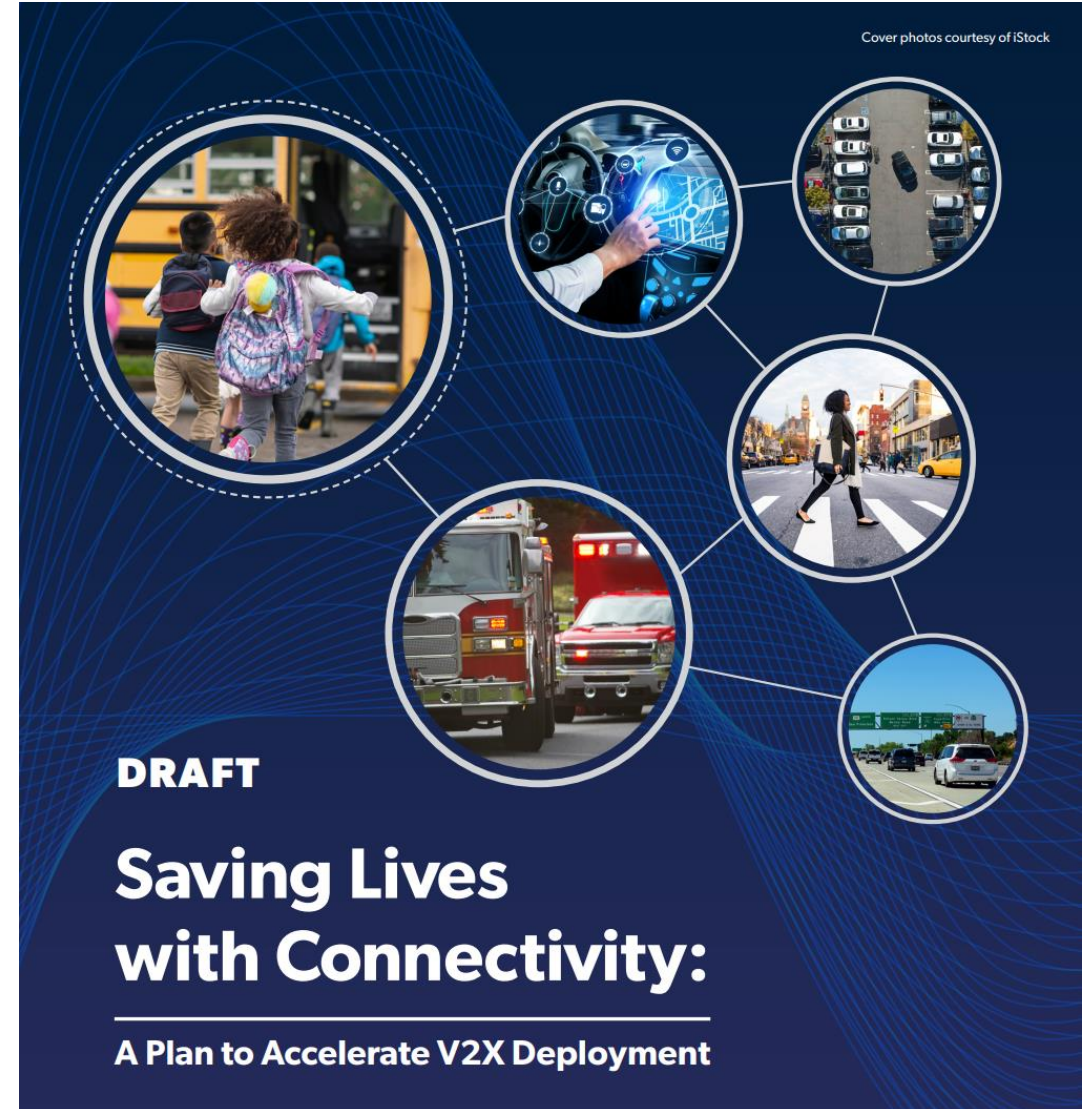
Source: USDOT ITS 2023

Challenges

- Spectrum Allocation
  - 5.9 GHz band in all 50 states.
  - FCC reduced dedicated spectrum from 75 MHz to 30 MHz in 2020.
  - Compensate with cellular networks.
- Interoperability
  - V2X requires a secure communication framework that operates across vehicles, infrastructure, and systems without interference.
- Public Agency Capacity
  - V2X deployment requires coordinated efforts and federal support, especially where state and local agencies lack the necessary expertise and funding.
  - Cybersecurity

Systems Engineering Processes
Critical for risk management and ensuring the right system is being developed to meet transportation needs.

Wireless Technologies
Need to utilize current licensed (5.9 GHz, cellular, satellite) and unlicensed (Wi-Fi) spectrum and stay abreast of future advancements.

Standards & Architecture
Protocols for transmitting and processing messages need to be defined clearly and with documented specifications.

Cybersecurity
A cybersecurity profile must be maintained that enables planned interoperable connectivity deployment.

Trust & Credential Management
A Security Credential Management System is needed to authenticate and sign messages to establish trust.

V2X Certification
Devices must be tested to ensure conformity to key industry standards, requirements, and functionality.

Policies
Evolving policies include standards, communications, security, privacy, and data governance.

Spectrum Governance
The licensed ITS band and additional spectrum options may be governed differently.

**Outcome / Benefit Framework**
The network effect and the technology adoption life cycle are critical factors for advantageous benefit/cost ratios.

Source: USDOT ITS 2023

USDOT V2X Roadmap

- Final Release
  - National Deployment Plan in 2024.
- Short Term (2024-2026)
  - 20% of the National Highway System
  - 25% of signalized intersections
  - In the top 75 metro areas.
- Medium Term (2027-2029)
  - 50% of highways
  - 50% of intersections
  - 5 vehicle models incorporate V2X.
- Long Term (2030-2034)
  - Nationwide deployment on highways.
  - 75% of intersections
  - V2X-enabled production vehicles across major OEMs.
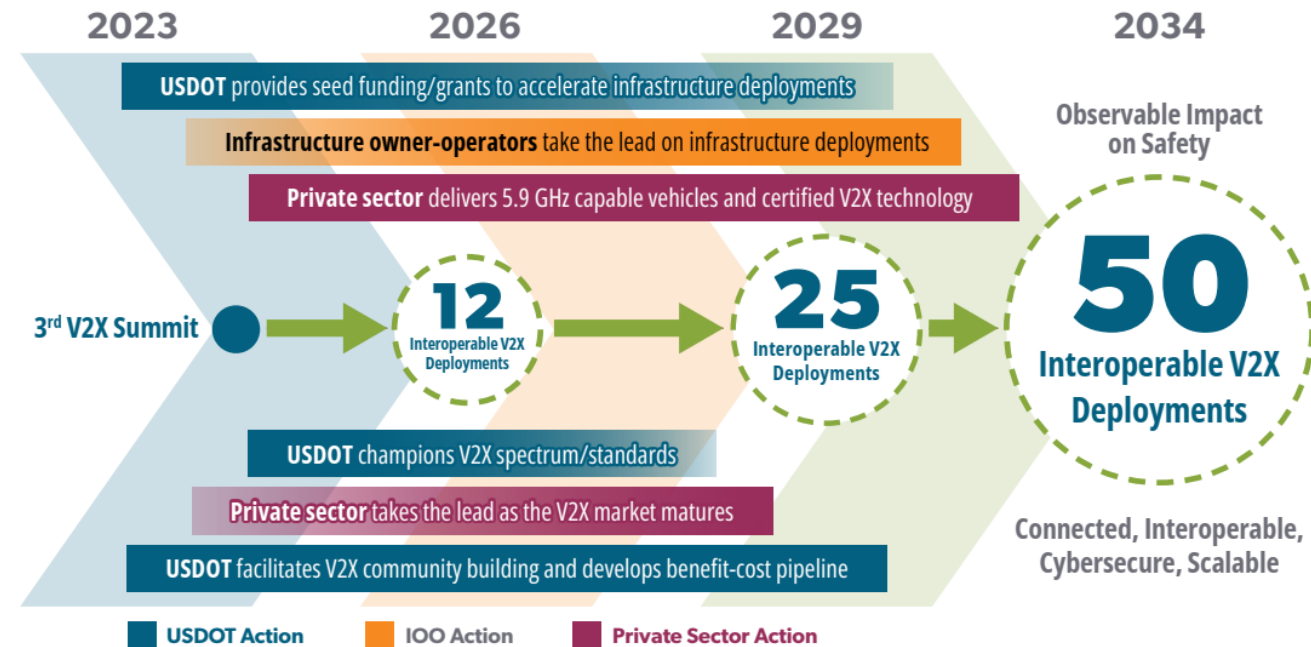
Source: USDOT ITS 2023

Conclusion

- Autonomous Vehicles
  - Must co-exist with human driven vehicles.
  - Need V2X to coordinate with human driven vehicles and to see beyond its sensor capabilities.

- USDOT
  - Actively promoting V2X deployments through grants.
  - Supporting standards and policy development.
  - Relying on the private sector to deliver capable vehicles.

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