Annotation of the Pilot Project on V2X Deployment on Shota Rustaveli Avenue in Tashkent

The pilot project is aimed at the deployment of Vehicle-to-Everything (V2X) technology along Shota Rustaveli Avenue in Tashkent to enhance the efficiency and safety of public transport operations, as well as to improve the protection of pedestrians, cyclists, and users of personal mobility devices. As part of the corridor modernization, dedicated central lanes for public buses will be established, providing the foundation for implementing public transport priority through V2X-enabled infrastructure.

https://www.gazeta.uz/media/img/2025/05/z5TDzr17478347890158_l.webp

V2X technology is based on short-range wireless communication and its integration with the Adaptive Traffic Signal Control System within the Urban Traffic Management System (UTMS). It is the only solution capable of ensuring the reliability, responsiveness, and adaptability of priority traffic management when operating with central dedicated lanes.

In real time, the system processes multiple priority requests received from vehicles traveling in different directions and potentially in conflict with each other. In addition, data from infrastructure sensors — AI-enabled video cameras, radars, and others — are incorporated to prevent traffic accidents, particularly at pedestrian crossings, including scenarios of sudden pedestrian entry and the presence of Personal Mobility Devices (PMDs) entering the roadway.

A key advantage of V2X technology is its ultra-low data transmission latency — within just a few milliseconds — combined with data processing at computing nodes located in close proximity to the data sources (Multi-Access Edge Computing, MEC). This significantly outperforms the capabilities of conventional 3G/4G/5G mobile networks and traditional telematics systems for public transport

monitoring. Such an architecture is critical for applications requiring traffic safety and priority management.

Traffic signal phase adjustments for granting Public Transport Priority (PTP) will be performed with an accuracy of several tens to hundreds of milliseconds, based on predictive calculations of the exact time a specific vehicle is expected to pass through the intersection. At the same time, the system minimizes the negative impact on competing traffic flows.

To ensure cost efficiency and interoperability with the city's infrastructure, the technical architecture for cooperative priority management must be defined during the modernization of the Shota Rustaveli Avenue corridor. This approach will prevent costly redesigns and reduce negative effects on other traffic flows.

Within the pilot project, V2X equipment testing, algorithm validation, and Key Performance Indicator (KPI) assessment will be carried out. Based on the results, a technical and economic justification will be prepared for scaling up the deployment of V2X-enabled infrastructure citywide.

Global Best Practices and Expected Outcomes

Experience from similar international C-ITS deployments (Brno, Ludwigsburg, Ulm, Ahmedabad, St. Petersburg) demonstrates substantial improvements in public transport travel times, traffic safety, and intersection throughput.

Key expected impacts of V2X-enabled deployment include:

- Reduction of public transport travel time by up to 5 minutes on a 20 km corridor;
- Decrease in overall vehicle idling time at signalized intersections by 6–12% during peak hours;
- Increase in intersection capacity by 8–12%;
- Reduction in collisions involving Vulnerable Road Users (VRUs) (pedestrians, cyclists, micromobility);
- Mitigation of negative impacts of Public Transport Priority (PTP) on general traffic flows;
- Reduction of emissions and environmental improvements through less idling at traffic signals;
- Increased attractiveness of public transport and reduced reliance on private cars.

The pilot project foresees a phased V2X rollout: first for public transport, followed by emergency vehicles, road maintenance fleets, electric vehicles, and logistics operators. Special emphasis is placed on cooperation with OEMs operating in Uzbekistan to enable factory-installed connectivity for new vehicles, ensuring seamless integration into the city's V2X infrastructure and organic subscriber base growth.

Without the deployment of adaptive, cooperative traffic management technologies, investments in road modernization risk becoming ineffective, leaving the digital infrastructure unprepared for future challenges and vehicles disconnected from urban ITS platforms.

Importance of Defining the Technical Approach Now

Determining the technical framework for PTP at this stage is critical to:

- Enable harmonized integration with the existing ATMS (АСУДД) without costly redesigns;
- Avoid economic losses from inefficient or poorly adapted solutions;
- Leverage the expertise of leading V2X solution providers and ensure scalability.
- V2X-based priority control further ensures that public transport priority has minimal negative impact on competing flows, balancing transit speed with smooth general traffic operations.

Future V2X-Enabled Services for Tashkent

- GLOSA (Green Light Optimal Speed Advisory): informs drivers of the optimal speed to pass intersections on green, reducing stops, saving fuel, and lowering emissions.
- Emergency Vehicle Preemption: automatic priority granted to ambulances, police, and fire brigades through cooperative signal control, reducing response times and improving operational efficiency.
- Support for Automated and Autonomous Vehicles (AVs): enabling safe integration of AVs into urban traffic through cooperative perception and V2X-assisted driving.

Scientific References

- "A Survey on V2X Technologies and Applications for Intelligent Transportation Systems" (IEEE Communications Surveys & Tutorials, 2020) – comprehensive overview of V2X technologies, including PTP.

- “Cooperative Traffic Signal Control with V2X Communication: A Review” (Transportation Research Part C, 2019) – cooperative signal control methods for improving intersection throughput.
- “Evaluation of V2X-Based Transit Signal Priority Using Field Operational Tests” (Transportation Research Record, 2018) – field test results proving V2X reliability and reduced delays.
- “Green Light Optimal Speed Advisory (GLOSA) Systems: State of the Art and Future Directions” (Sensors, 2021) – review of GLOSA and its emissions reduction potential.

Conclusion

Research and real-world deployments confirm that V2X-based priority control on central public transport corridors delivers substantial benefits in efficiency, safety, and environmental performance. Global projects show successful integration of V2X with ATMS and adaptive signal control, providing a robust foundation for scaling such solutions in other cities, including Tashkent.

V2ROADS.UZ and its partners are ready to deliver a full V2X system package for deployment on Shota Rustaveli Avenue, including Roadside Units (RSUs), Onboard Units (OBUs), RSU management software, ITS integration (including ATMS), and V2X data analytics platforms. All solutions are fully productized and deployment-ready.

More details: https://v2roads.uz/