



V2X-technology and interfaces

Emergence, advantages and practical application

Vehicle-to-Everything technology (V2X) has become a central topic in the public transport sector. This article examines the emergence, advantages and practical application of this technology. We also look at funding possibilities for transport operators.

Functionality and advantages of V2X

V2X permits cooperative interaction between vehicles and also with the stationary infrastructure, as indicated in the synonym "Cooperative Intelligent Transport Systems". Standardised messages are exchanged to inform vehicles about traffic disruptions or hazardous situations. The sensors in a vehicle react to hindrances, congestion or icy roads and pass on corresponding information to other vehicles in the vicinity so that they can take evasive action or brake in time.

What is V2X?

V2X is a global standard that originated in North America. Both American and European standards define an air interface so that messages can be exchanged between vehicles, or between vehicles and stationary infrastructure. The communication technology used for this purpose is either a Wi-Fi variant (ITS G5) or the Public Land Mobile Network (C-V2X).

Possible uses and potential for urban public transport

ebblo is working intensively on the advantages and possibilities for using V2X in urban public transport. Integrating C-ITS in trams and buses facilitates the real-time exchange of information about traffic situations, traffic light phases, roadworks or accidents, thus achieving more efficient use of urban traffic space. V2X enhances safety and improves the flow of traffic. Based on V2X, our pioneering solution for traffic light preemption and driver assistance also permits an energy-optimised approach to traffic lights and time-optimised departure from the stop. ebblo helps transport operators to reduce environmental pollution, boost passenger satisfaction and save money.

Current situation: introducing V2X

Numerous projects demonstrating the diversity of V2X use cases have already been implemented in Germany. These extend from using vehicle data to giving a warning when emergency vehicles are approaching. One particularly interesting feature is a traffic light phase assistant based on V2X information. ebblo has short- and medium-term plans to implement initial projects with interested transport operators in order to test the advantages of V2X in practical situations.



We recommend that transport operators get involved in the discussions about V2X to develop a funding concept and hold early talks with the public works departments in their area of operation. Restructuring analogue radio frequencies used hitherto for traffic light preemption could give an incentive for digitalisation, changing over to V2X instead of purchasing new analogue equipment.

Use cases

In urban public transport, interest focuses initially on services referring to traffic lights. The TSP service (Traffic Signal Priority) prioritises public transport, while the GLOSA service (Green Light Optimal Speed Advisory) provides information about the optimum speed for reaching a green light.

Traffic light preemption

The previous solution for traffic light preemption is based on the VDV420 specification, but does not support bidirectional communication between vehicles and traffic lights. On the other hand, V2X allows such bidirectional communication, so that vehicles receive information about the traffic light phases and can adjust their speed accordingly.

It will still be possible, as before, to request priority from the junction controller. What is new, is that the junction controller replies to the vehicle and tells the bus which lane to use to approach the junction.

Time-optimised departure from stops before a junction

Today, passengers often find themselves standing before closed vehicle doors, because the driver has already cancelled the door release and requested priority at the traffic light. This situation will now happen less frequently, thanks to V2X. The driver is told in good time when the next green phase begins and can deactivate the door release at the right moment to drive off “just in time”. This improves the passenger experience, with the doors staying open longer to let passengers on board.

Energy-optimised approach to junctions

A vehicle saves energy if it can keep moving and cross the junction with as much momentum as possible. V2X lets drivers know about the next green phase in good time. They can reduce speed or even brake gently to reach the junction at the right moment in time for the green phase, thus minimising the energy needed to accelerate again after the junction.

Other use cases

Depending on the surroundings and conditions, C-ITS can have a range of up to several hundred metres. V2X facilitates a continuous exchange of information between vehicles and infrastructure elements, working with a frequency of up to 10 Hz. This provides a basis for other interesting use cases.

One example is “indicating round the corner”, which improves traffic safety by detecting unprotected road users in the blind spot. Another example is detecting dynamic speed restrictions.

Funding possibilities

Various funding instruments are available to mobility service providers in German-speaking countries for introducing V2X technologies. By making specific use of these funding instruments, mobility service providers can forge ahead with introducing V2X technologies and benefit from the diverse advantages that the technology offers.

1. European Union (EU)

The EU offers various funding programmes for the traffic sector that also encompass the implementation of V2X technologies. For example, "Horizon Europe" is a programme that provides funds for research and innovation projects.

Horizon Europe - European Commission (europa.eu)

2. German government/Federal Ministry of Transport (Germany)

The German government has various funding programmes and possibilities for obtaining financial support to use V2X technologies in public transport. These include, for example, grants for pilot projects or infrastructure investment.

BMDV - mFUND im Überblick (bund.de)

3. Regional and local authorities

Regional and local authorities also provide funding for the implementation of V2X projects. These include regional development programmes, innovation funds or specific funding programmes for the traffic sector.

4. Specific programmes and initiatives

There are sector-specific funding projects, for instance, that help mobility service providers to integrate V2X technologies.

ebblo is planning initial projects

ebblo sees great potential for using V2X in urban public transport and is therefore aiming to implement initial projects. Our aim is to link third-party V2X vehicle units (OBUs) to our on-board computers with an MQTT-based interface.

The specification for this interface is already available. It is based on use cases that are relevant to the urban public transport sector. The V2X OBU bridges the gap between the V2X world and the urban public transport world, thus concealing the hugely complex V2X air interface from the urban public transport world.

We are already holding talks with two potential partner companies to plan how this solution can be implemented. Together we are for practical implementation of the advantages offered by V2X, with seamless integration of the technology in our portfolio. Our long-standing experience in the public transport sector and our commitment to innovative solutions puts us in an ideal position to forge ahead with using V2X in urban public transport.

We are convinced that integrating V2X will make a significant contribution to the efficiency, safety and sustainability of public transport, and look forward to working with our customers and partners in order to achieve this future vision.



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