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# Autonomous Shuttles & Co. in the digital urban traffic test bed

## The Project coordination

Federal state of Berlin, represented by the Senate Department for the Environment, Transport and Climate Protection

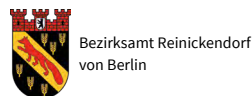
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## Project consortium



Senatsverwaltung für Umwelt, Verkehr und Klimaschutz

Zentrum Technik und Gesellschaft

Verkehr Mobilität Zukunft

## Associated partners



## Project management



## Project budget

€ 12.77 million (€ 9.78 million thereof in funding from the BMVI)

## Project duration

01/2020 – 12/2021

## Gefördert durch:



Bundesministerium für Verkehr und digitale Infrastruktur

aufgrund eines Beschlusses des Deutschen Bundestages

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## What is it?

In the future, networking and autonomous driving can play an integral part for a sustainable urban mobility and contribute to bringing passengers safely and dependably to their destinations. Intelligent technologies raise transport safety and provide an essential contribution to an environmentally conscious and city-compatible transport system. The state of Berlin is already testing these technologies in order to gain experience and create the necessary conditions. The Shuttles & Co project aims to investigate

- how highly automated electric minibuses can be integrated into the regular public transportation network as a useful addition to an optimised and economical mobility system,
- how detection of the surroundings in automated and networked vehicles and the exchange of necessary information can be improved, and how digital maps can be created and continuously updated,
- how acceptance and trust in new technologies can be increased within society.

## What's being done?

### Passenger Services

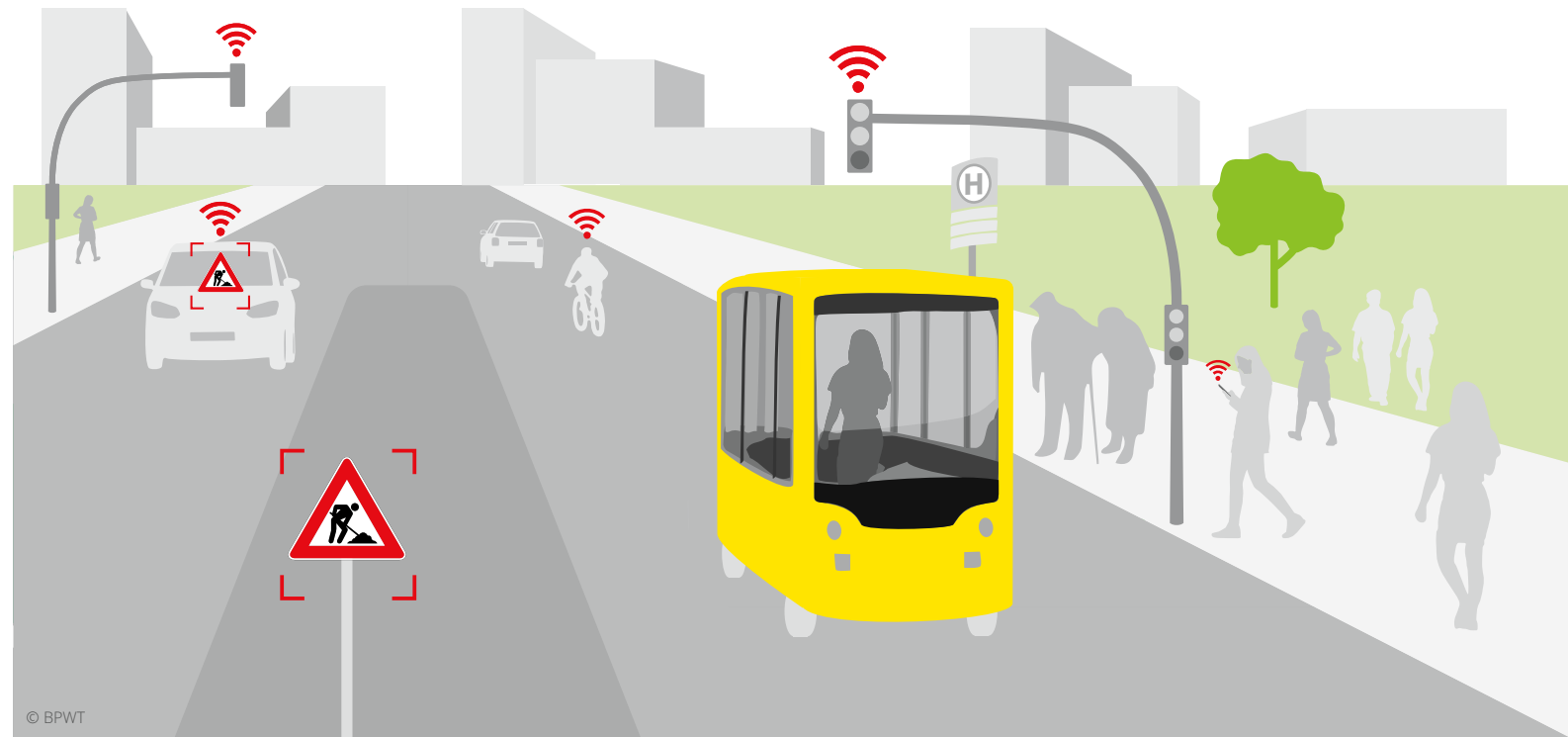
Between winter 2020 and the end of 2021, the Berliner Verkehrsbetriebe (BVG) will introduce a fleet of up to three highly automated minibuses to the passenger service in Berlin's Reinickendorf district. The route from Tegel U-Bahn station to the Tegeler Seeterrassen, which was already tested in the previous project See-Meile, will be significantly expanded with an addition of several extra streets. The buses will face challenges such as cobblestones and narrow streets. One goal will be to cross a main street that has a speed limit of 50 km/h and traffic lights. Operating data generated will serve to generate a technically secure mobility service that is accepted by customers and both economical and user friendly.

### Perception and prediction

The high-precision map of the state of Berlin created for previous projects is used here as a reference map to be expanded with dynamic geo-referenced information for a Local Dynamic Map (LDM). The LDM also shows the real-time traffic situation as well as the current state of the surrounding area. In addition to status messages, this includes information about construction sites and hazardous situations. Linking all information enables a highly accurate perception of the area (localisation, free space and object recognition) and allows for intelligent behaviour prediction. This means that complex, dynamic and often unstructured traffic conditions can be made manageable for vehicles beyond the capabilities of their own sensors and mapped areas.

### Traffic control with V2X infrastructure

Connected and automated vehicles (CAV) can communicate with other vehicles and the infrastructure (known as V2X communication). This data enables vehicles to recognise and react earlier to changing traffic lights. In addition, evaluating V2X information supplies real-time traffic information, such as alerts for construction sites or double-parked cars. Shuttles & Co also aims to demonstrate new approaches to traffic-adaptive control by prioritising emergency vehicles and public transport vehicles via V2X messages. The possibility of better demand-adapted traffic light changes based on V2X messages are also being tested.



Connected users and transportation systems form a network which is an important basis for autonomous driving.

### Digital maps

Objects identified in the surrounding area can be used for regular updates to digital maps by comparing them with map data from the state of Berlin. Current digital maps of Berlin are to be exchanged, updated and improved using map data from automobile manufacturers and map service providers. In addition, self-update as a continuous process will investigate the types of data sources needed, how to achieve an automated digital process while accounting for administrative structure. Additionally, efficient, decentralised map exchange and update processes via V2X are analysed, in order to provide map updates during a failure of a vehicle's internet connection.

### Acceptance and trust

When testing highly automated minibuses, various user groups' specific expectations of the technology are considered. Acceptance from users, residents and other interest groups regarding the range of highly automated minibus services is also analysed. In addition, the state of Berlin aims to meet the demand for optimal citizen participation. A dialogue with citizens in the form of a citizens' conference intends to develop recommendations for action on this politically and technically relevant topic. The general public is involved through information forums. Along with the use of appropriate fleets in other application scenarios, accompanying workshops address the question of optimising the state of Berlin's mobility system and implementing its use in other regional settings.