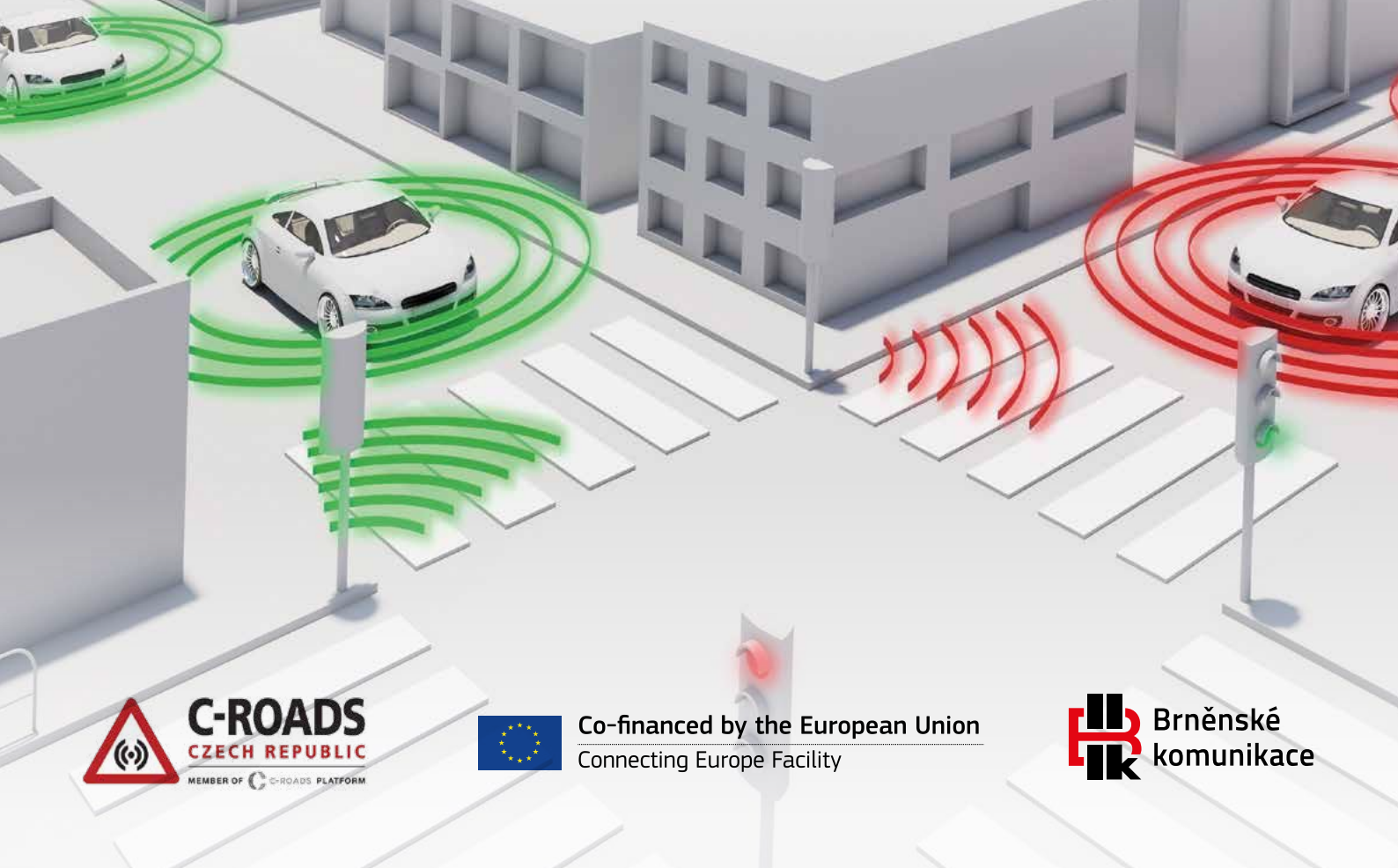


C-ROADS

Czech Republic



Coordinator's introductory word

With the C-ROADS Czech Republic project we want to change the widespread belief that road transport can no longer be significantly improved and allow drivers to reach their destination more safely.

The C-ROADS project is much more than a mere implementation of state-of-the-art, sophisticated technologies on European roads and highways, in conurbations, in public transport systems and on level crossings. During its realization it was, for the first time in the Czech Republic, possible to interconnect on such a scale the public, private and academic domains with the most important international partners and multinational companies in their field.

The aim of this international project, which is part of the European C-ROADS platform, is to create a functional, technically and organizationally harmonized system for cross-border use of services of cooperative intelligent transport systems (C-ITS) between individual European countries.

It is the first, but very important step for the introduction of cooperative and, hopefully in the near future, automated vehicles. New technologies will also contribute significantly to the safety of road users and to smoother and more efficient transport, while the reduction of emissions will be also meaningful.

Now we are at the beginning. And the path to successful implementation of C-ROADS will certainly not be easy. But we believe that we will succeed, tackle the initial skepticism and provide drivers with an improvement in more comfortable and safer travel, even if it is so far only on a European scale.



JUDr. Vladimír Kremlík
Minister of Transport

Mayor's introductory word

I simply like Brno for its rich history, beautiful present and I believe it has a great future too. The future has already come and it is up to us how we handle it.

As an university city, Brno has, in my opinion, all the prerequisites for creating a knowledge-based society, therefore it also supports innovation and technological transfer within the Brno exhibition grounds. I am pleased that our city companies are also proactive and involved in major European projects.

Mobility in the Brno metropolitan area is becoming a limiting factor for its further development. Therefore, I greatly appreciate the activity of the company Brněnské komunikace, a.s. within the C-ROADS CZ project, which together with other partners creates conditions for smoother and safer transport thanks to the development of cooperative intelligent transport systems. I like the fact that they also cooperate with Brno Public Transport Company and with the units of the Integrated Rescue System of the South Moravian Region, especially with the Fire Rescue Service.

I thank the Ministry of Transport Czech Republic for the coordination of this project and I wish all partners success in its finalization for the benefit of our public.



JUDr. Markéta Vaňková,
Mayor of the Statutory City of Brno

C-ROADS

This project is part of the European C-ROADS Platform, which aims to create a technically harmonized functional system among particular European projects for cross-border use of services of cooperative intelligent transport systems (C-ITS), thus creating an environment for the arrival of cooperative and, in the near future, automated vehicles. The use of new technologies will contribute to higher safety of road users and smoother and more efficient transport, with noticeable emission reduction. Changes will have a positive impact on European economy that needs a safe, reliable and efficient transport system.

Main Goals

In cooperation with other European countries, we aim to harmonize providing services for data communication between vehicles and with intelligent roadside infrastructure.

This harmonization is necessary for the interoperability of systems from individual countries.

To ensure the initial implementation of the C-ITS systems on a large scale and to verify their function practically and their impact on traffic and transport safety.

Cooperative Systems

C-ITS systems allow vehicles to directly communicate with other vehicles, with roadside infrastructure as well as with traffic management or information centers, either through mobile networks, or via ITS units located at the transport infrastructure. Thus, C-ITS systems contribute to an improvement of road safety, inform the driver of the traffic situation in a timely and accurate manner and warn against dangerous sites and other possible problems relating to them. In addition, traffic management and information centers will receive accurate and comprehensive information on the current traffic situation directly from the vehicles, making it possible to efficiently influence the traffic flow and thereby improve the safety and flow and reduce its negative impacts on the environment.

Communicating and Danger Predicting Roads

Modern vehicles generate considerable quantities of data during a journey. The basic idea of C-ITS systems is to use this data and pass on information on the current traffic situation, making the driver readily perceptive to the road traffic and focused on a possible problem, either between vehicles themselves (so called V2V communication), or between vehicles and relevant equipment located on road network or at railway level crossings (so called V2I communication). Cooperative systems provide drivers with up-to-date information regarding road traffic situation, will contribute to greater driver discipline and will make a significant contribution to both free-traffic flow and reduction of the number of accidents and their consequences, especially the serious ones. Receiving information in timely and accurate fashion is a necessary prerequisite for making the driver readily perceive the road traffic and focus on a possible problem.

DT6

CROSS-BORDER TESTING

The aim of this stage is to verify whether the built systems and services provided in the Czech Republic are mutually interoperable with the systems in the surrounding European countries.

DT5

RAILWAY CROSSINGS

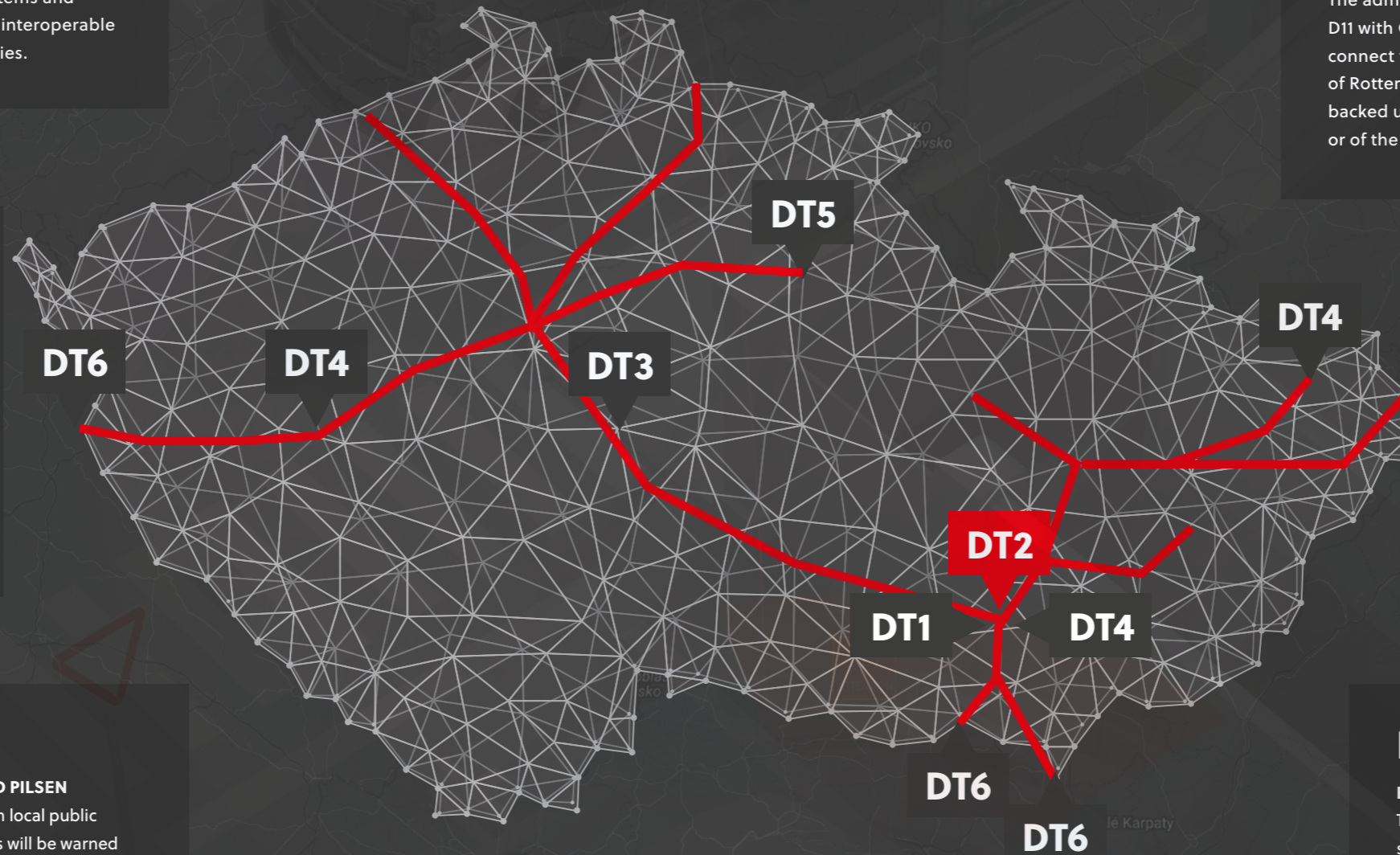
Four selected railway level crossings in the Pardubice and Ústí region will be equipped with C-ITS technologies. Directly into the vehicle, drivers arriving to the level crossing will get information about railway crossing ahead incl. warning that they must stop due to activation of level railway crossing warning devices (approaching train).

DT4

PUBLIC TRANSPORT COMPANY IN BRNO, OSTRAVA AND PILSEN

The use of C-ITS systems will be tested in cooperation with local public transport companies for PT purposes. Road vehicle drivers will be warned of the risk of collision with the passing tram, of the increased danger of pedestrian movement on the road near tram stops and attention will also be paid to public transport preference at intersections.

Ecological
park
Przemkowski
Park
Krajobrazowy



DT3

HIGHWAYS D1, D5, D11, I/52/D52

The administrator equips the selected motorways D1, D5 and D11 with C-ITS systems, thanks to which the Czech Republic will connect to the international C-ITS corridor, connecting the cities of Rotterdam, Frankfurt and Vienna. Drivers will be warned of e.g. backed up traffic, of approaching emergency vehicle on mission or of the occurrence of adverse weather conditions.

DT2

THE CITY OF BRNO

In the conurbations of the city of Brno, the drivers will be warned of e.g. approaching emergency vehicle or of a vehicle passing through an intersection on a red light. In addition, the city gets a better overview of the current traffic situation throughout the city.

DT1

BRNO D1

This stage concerns the section of D1 motorway in Brno surroundings. Drivers will be warned about road works, stationary or slow-moving vehicles and information from variable traffic signs will be sent to them directly to their vehicles.

Národní park

Danube

Danube

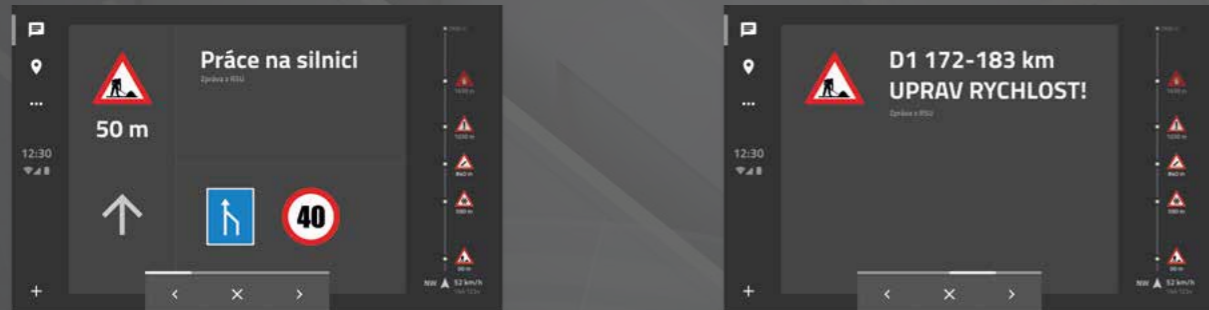
le Karpaty

Danube

Duna-Ípoly
Nemzeti Park

Road Works Warning (RWW)

This service warns the drivers of road works that are ahead of them on the anticipated route. Drivers are informed about the extent of road works and its related traffic restrictions before they are physically able to notice the works.



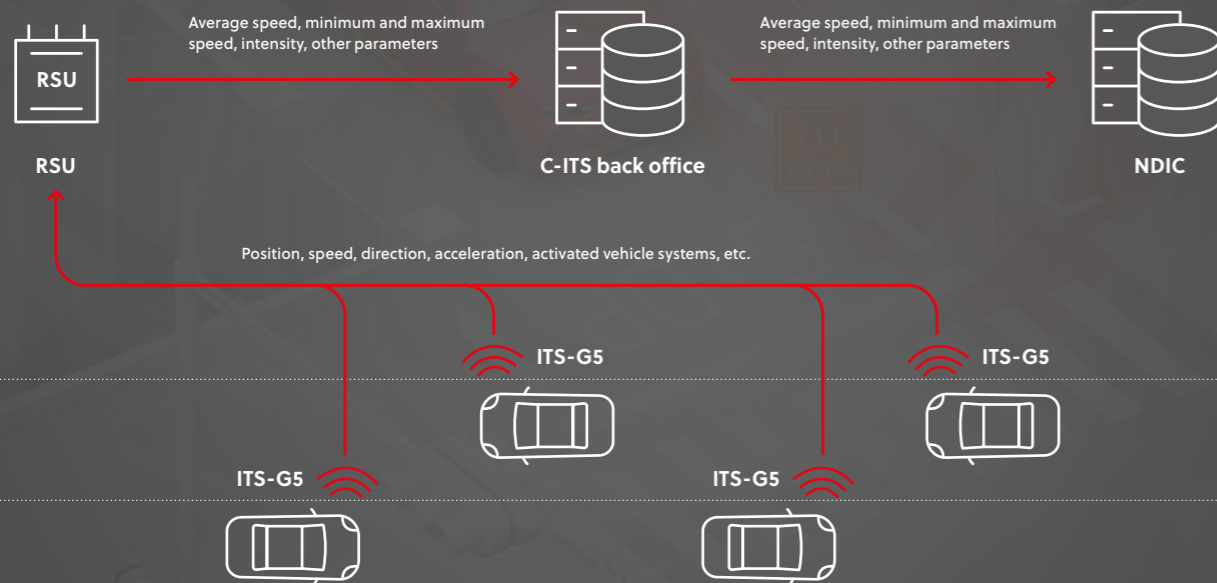
In-Vehicle Information (IVI)

This service emphasizes information intended for the driver, directly in the vehicle (by displaying traffic information on the HMI device in the vehicle). Such information is mainly the variable traffic sign.



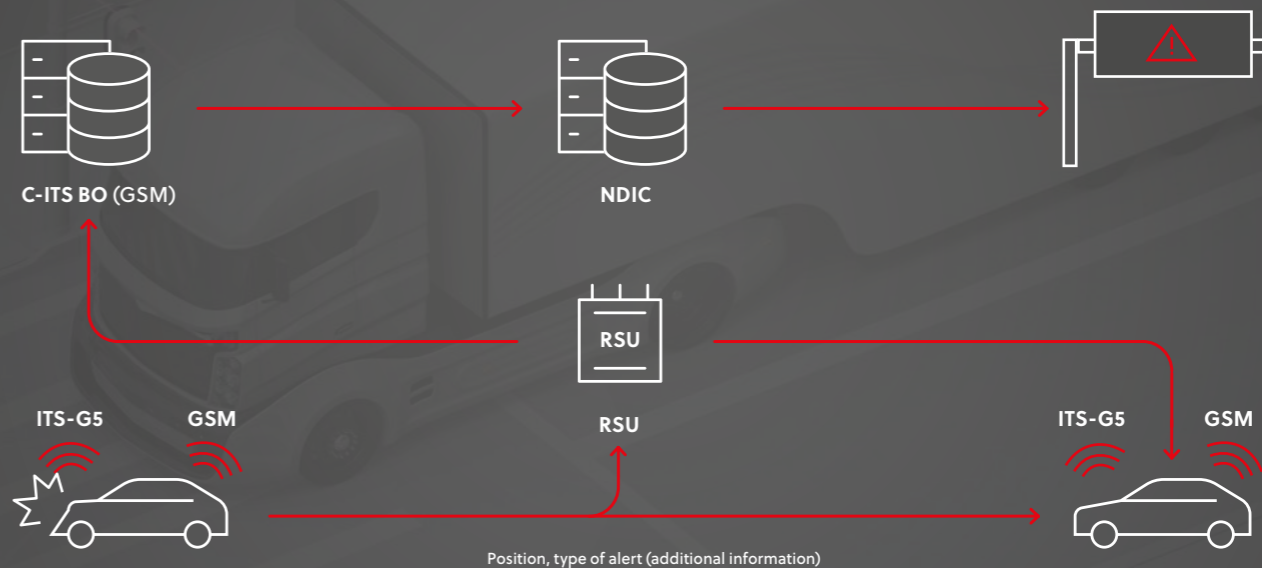
Probe Vehicle Data (PVD)

The service Probe Vehicle Data is primarily used by the road administrator as an additional source of traffic information. RSU units collect anonymous data from passing vehicles along the way.



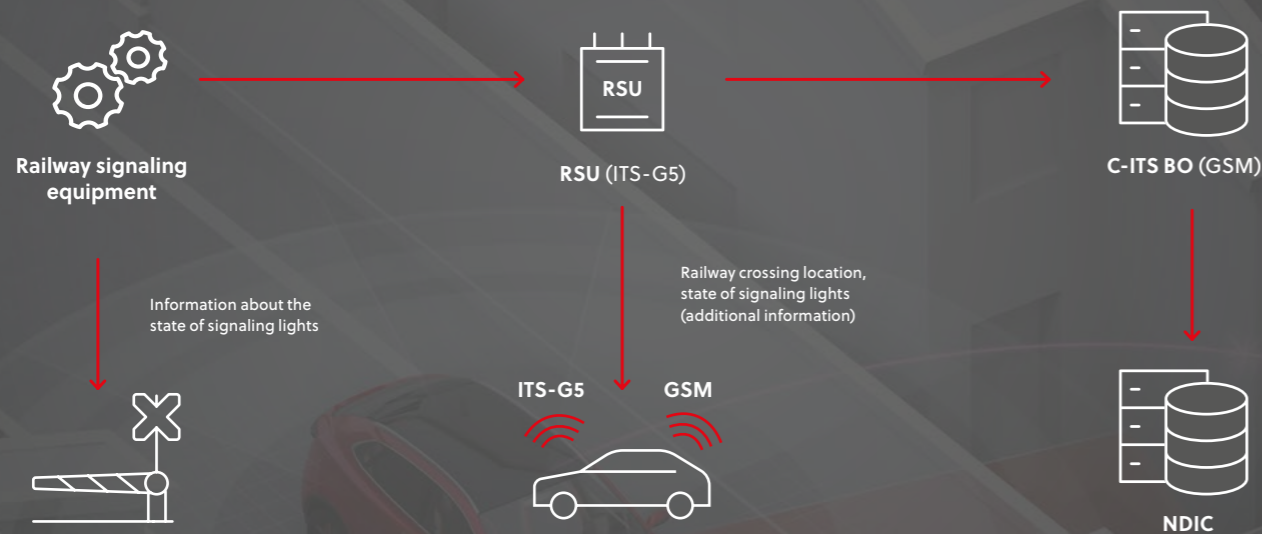
Slow and Stationary Vehicle (SSV)

This service warns the driver of a slow-moving or stationary vehicle on an anticipated route, especially when the stationary or slow-moving vehicle is not well visible due to poor visibility conditions.



Railway Level Crossing (RLX)

Railway Level Crossing is a service warning the driver of an approaching railway level crossing, or eventually, with information about an approaching train (activation of level railway crossing warning device).



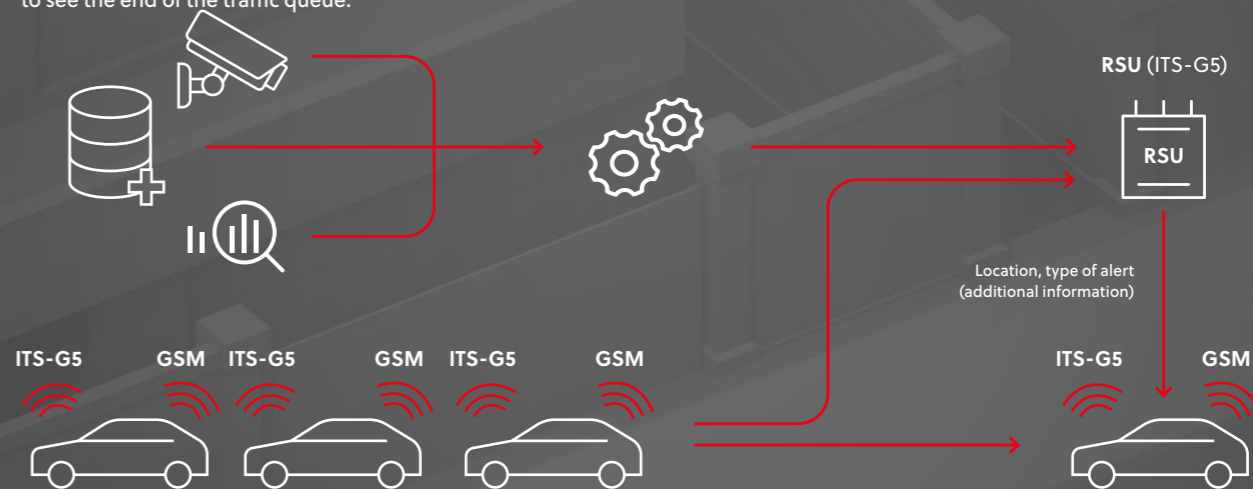
Emergency Vehicle Approaching (EVA)

It warns the driver of an approaching IRS (integrated rescue system) vehicle or to the location of an IRS intervention. Within this use case, a priority ride scenario of IRS vehicles at intersections controlled by light-signaling device was further defined.



Traffic Jam Ahead Warning (TJA)

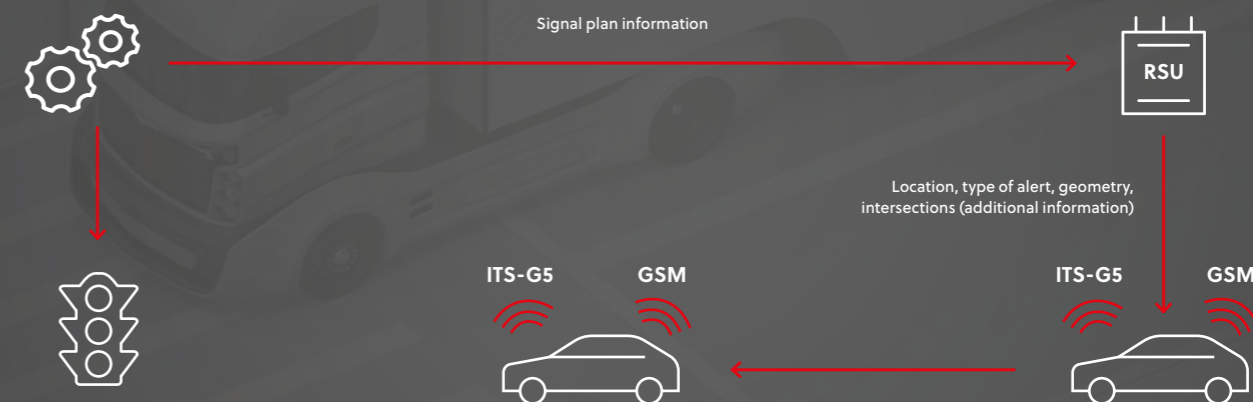
The driver will be presented with information about the beginning of a traffic queue and its length even before he is physically able to see the end of the traffic queue.



Intersection Signal Violation (ISV)

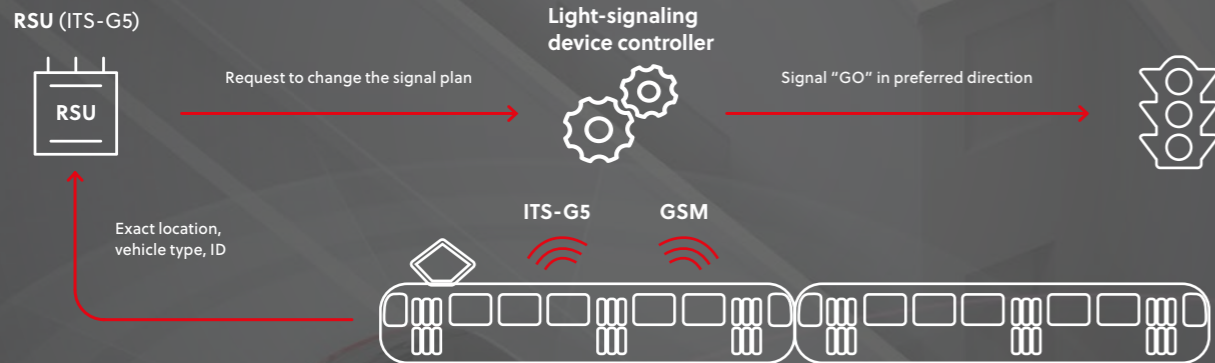
A driver approaching an intersection controlled by a light-signaling device is warned of the "STOP" signal on a display in the vehicle. In case the driver is not responding (does not slow down), this vehicle will start sending a message warning other drivers.

Light-signaling Device Controller



Public Transport Preference (PTP)

This presents an alternative solution to the prioritization of public transport vehicles at intersections controlled by light-signaling device using the ITS-G5 technology. In case a public transport vehicle is detected in one of the detection zones, a request of a signal plan modification is sent.



Hazardous Location Notification (HLN)

Warns of places that are potentially dangerous for any reason and does so before the driver is physically able to notice these places.

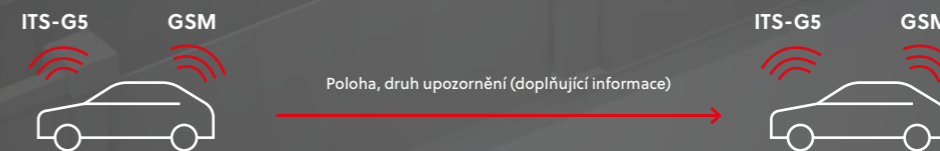


Weather condition warning (WCW)

Targets warnings against places that are, for some reason, potentially dangerous (weather conditions only).

Electronic Emergency Brake Light (EEBL)

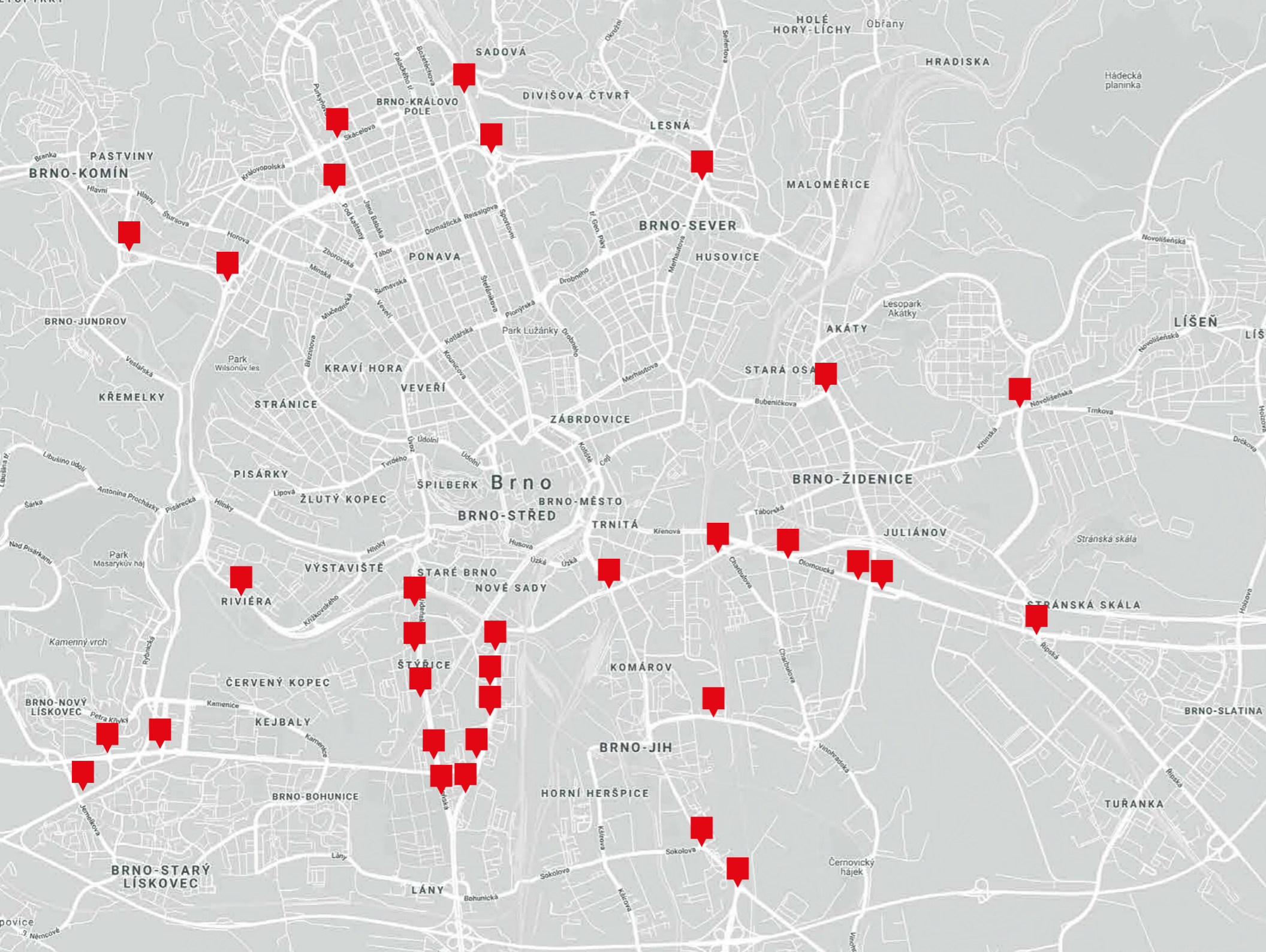
This service warns drivers to a sharply braking vehicle in front of them, before the driver is physically able to notice it.



Public Transport Safety (PTS)

A use case is divided into two scenarios. The "Crossing" scenario aims to minimize collisions between public transport vehicles and other road vehicles at area of crossing or merging lines in places where traffic is not coordinated by traffic lights, and the "Vehicle at the Stop" scenario deals with traffic safety when the vehicle is standing at a bus/tram stop (especially when passengers get on and/or get off bus/tram into road lanes).





C-ITS

Within the project, the company Brněnské komunikace a.s. will focus on building a C-ITS urban system on selected backbone streets/roads. This will include, for example, warning drivers of the „STOP” signal on the light signaling device or warning against another vehicle passing the red light.

Brno, the pilot location

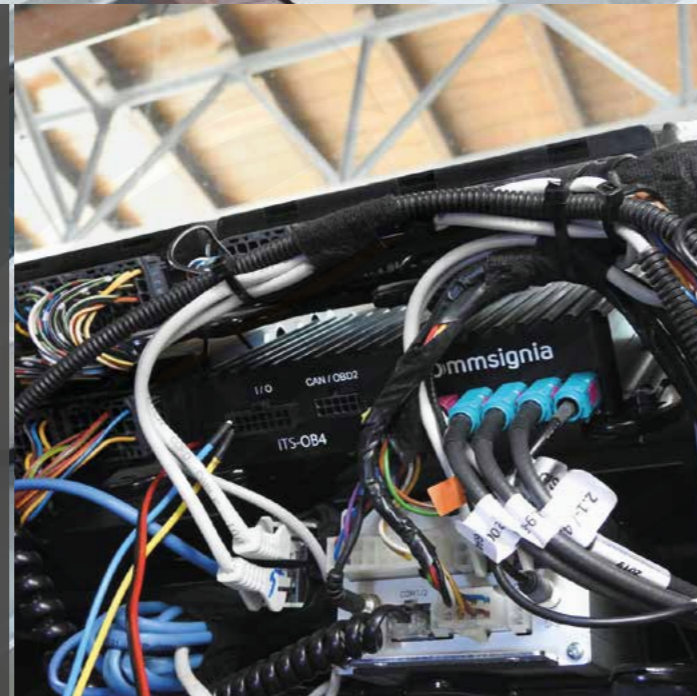
- In 2016–2018, the company Brněnské komunikace a.s. participated as one of the project partners in the preparation of technical documentation for the C-ROADS project.
- In 2018, the public contract “Implementation of C-ITS systems in the City of Brno” was prepared and announced, the contractor was chosen.
- At the end of 2018, cooperation with the contractor was commenced for the performance of the contract.
- In 2019, the system was delivered for Czech and cross-border testing.
- Based on the testing results, in 2020, documents will be processed for the needs of further implementation of C-ITS in the EU.

Implementation of the C-ITS systems in Brno



Stage 1 – Installation

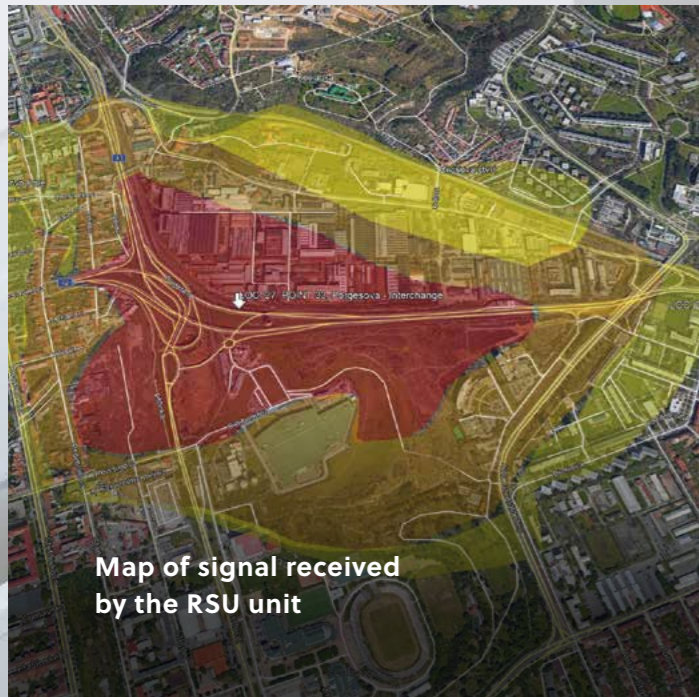
The delivery of the C-ITS system itself has been realized at selected 31 locations in the city of Brno, mainly on the large city ring road and radial roads that connect it with the D1 highway. The center of the whole system is located in the headquarters of the company Brněnské komunikace a.s.



Stage 2 – Testing

In cooperation with the project partners from the Faculty of Transportation Sciences at CTU in Prague and Intens Corporation and with the participation of the supplier and the Fire Rescue Service of the South Moravian Region (HZS JMK), the functionality of the system as a whole and its compliance with C-ROADS project documents have been tested.



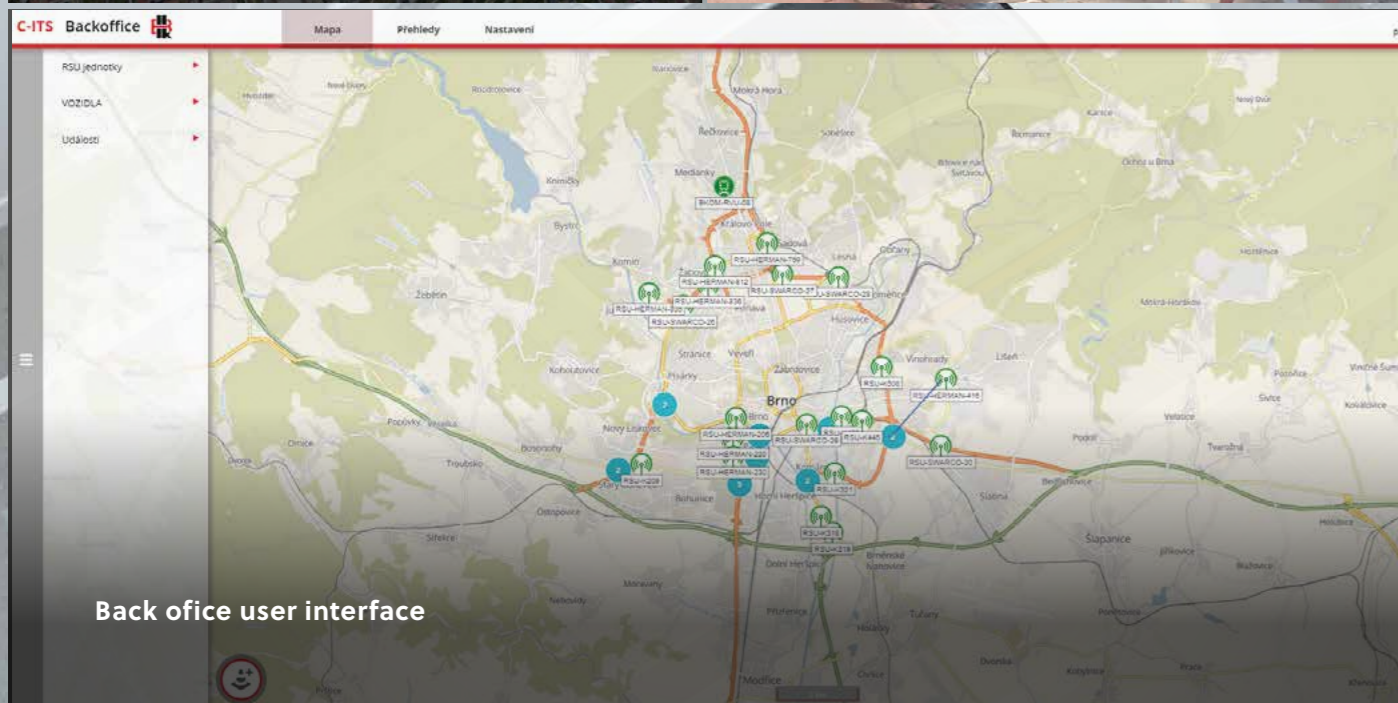


Map of signal received by the RSU unit



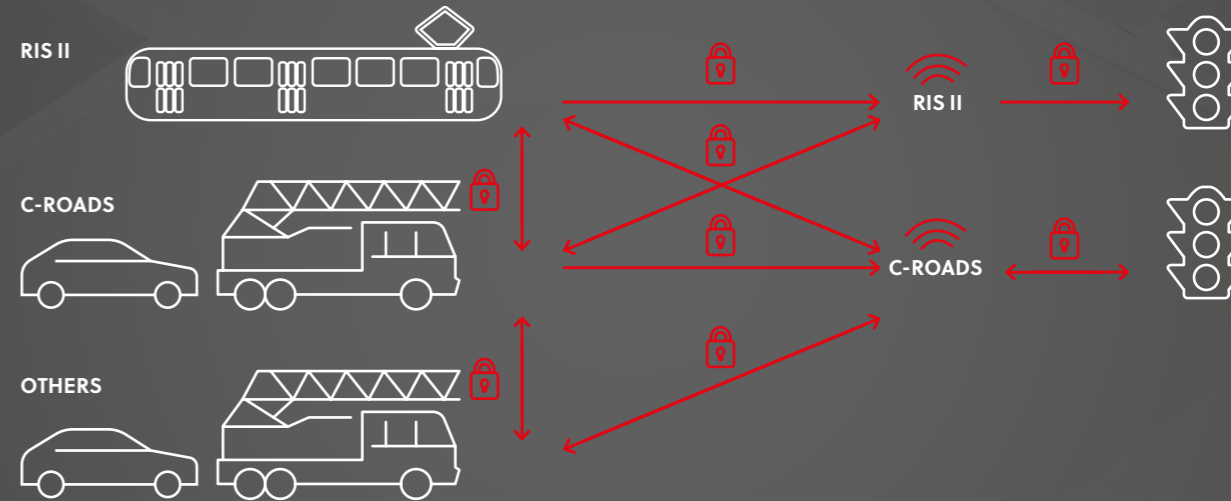
Stage 3 – Long-term operation of the system

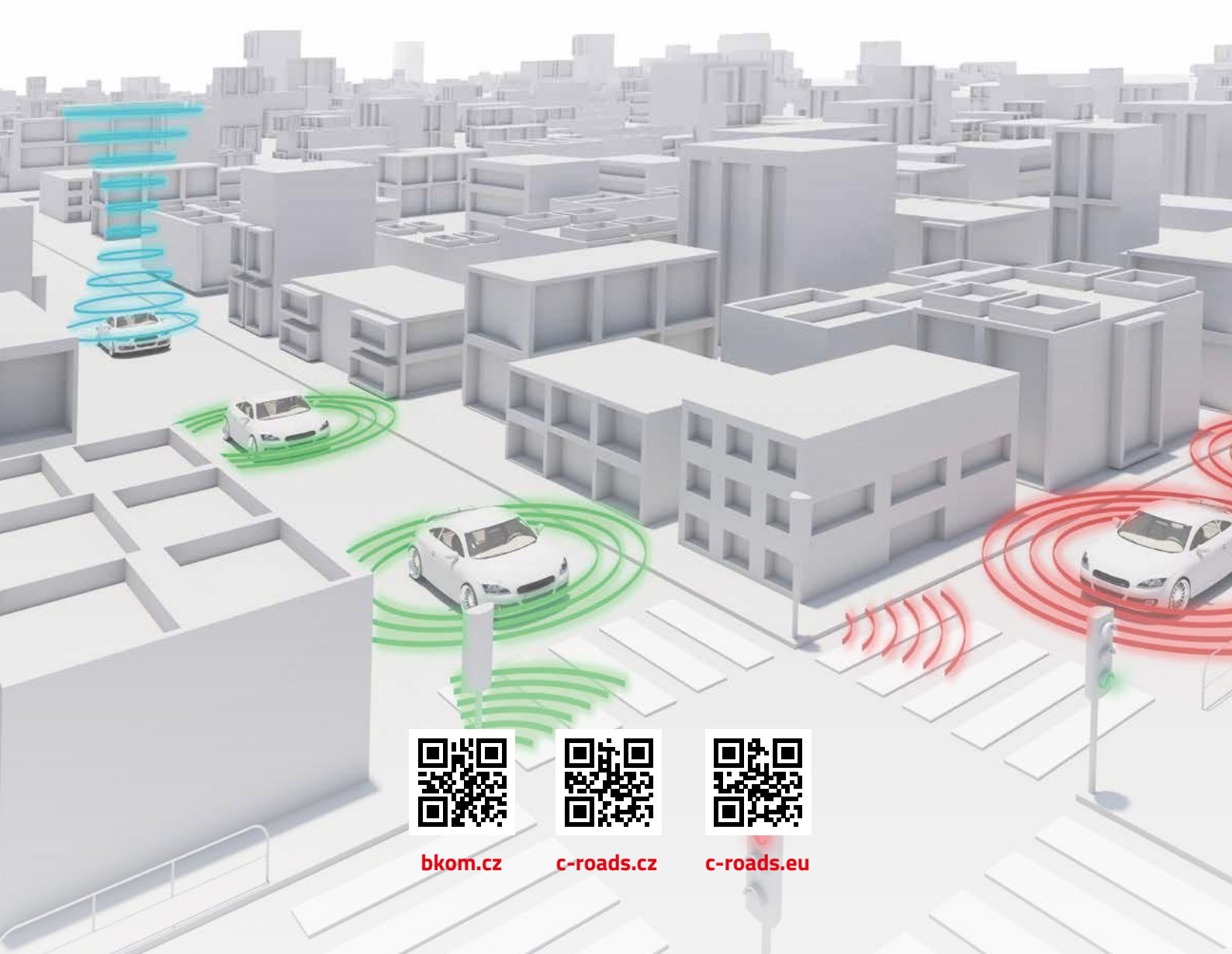
Providing information to ordinary drivers. During this stage, a set of functionality tests of preference of passage of HZS JMK vehicles at crossroads will take place. Furthermore, the expansion of the system has been underway; it will include the preference of public transport vehicles in cooperation with the company Dopravní podnik města Brna, a. s.



Back office user interface

Target status of implementation





bkom.cz



c-roads.cz



c-roads.eu

Project Coordinator



Partners of the Project



Associated Partners

