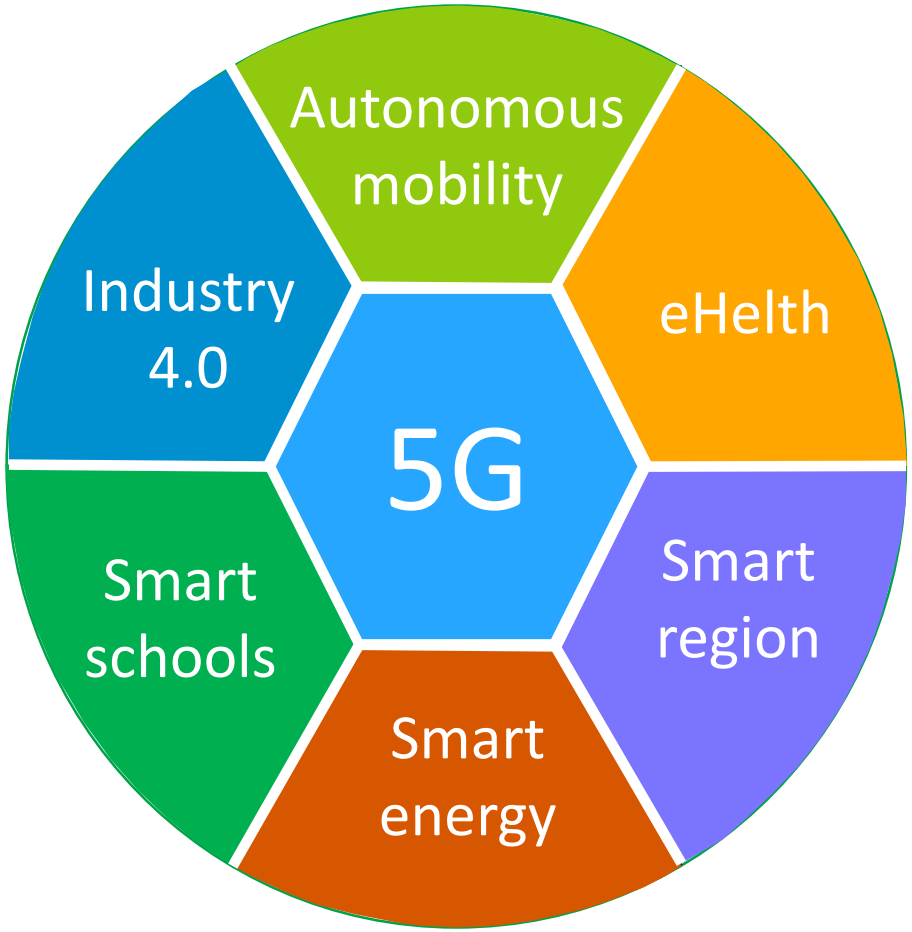
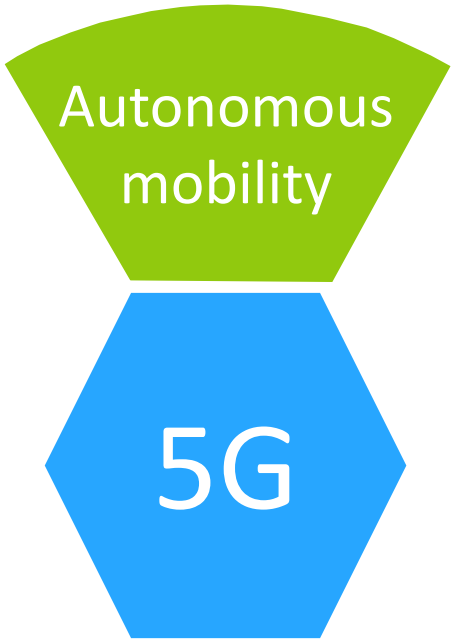
5g as an enabler of autonomous mobility in the city of Pilsen

Ambition of 5g usage in city of Pilsen



5g key element of autonomous mobility



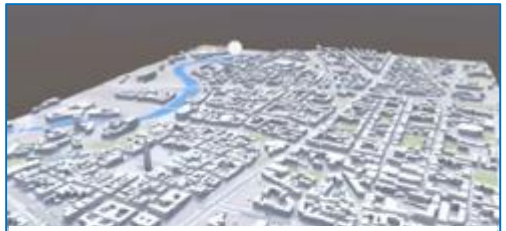
Our vision

- Create a centre of excelence in form of **Living LAB** in area of **5g** and **autonomuos mobility**
- Create complex **5g CONNECTED & SMART** platform
- Develop necessary **Digital infrastructure** containing 5g networks, mobile edge computing, virtual twins of the entire envinronment and vehicles
- Built secure and safe envinronment for real operation of **Connected & autonomous vehicles**
- Evaluation of possible **Knowledge transfer** of autonomous tram to other public transport modes and otherwise.
- Evaluate two aproached of the autonomous driving eco system „**Edge computing**“ vs „**Central systems** “

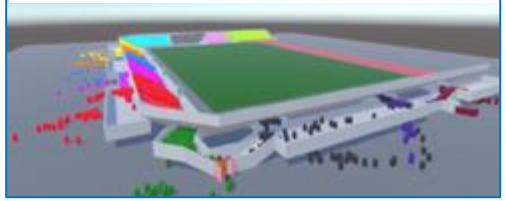
Why Pilsen?

Czech Republic
The Country For The Future

soutěž_5G
O2



Digital and 3D maps



Real time data

C-ROADS
CZECH REPUBLIC
MEMBER OF C-ROADS PLATFORM

Mobility Innovation Hub

ZÁPADOČESKÁ UNIVERZITA V PLZNI

5G Koridor Praha – Mnichov

Evropská unie
Evropský sociální fond
Operační program Zaměstnanost

Město Plzeň

Strategie Smart City Plzeň

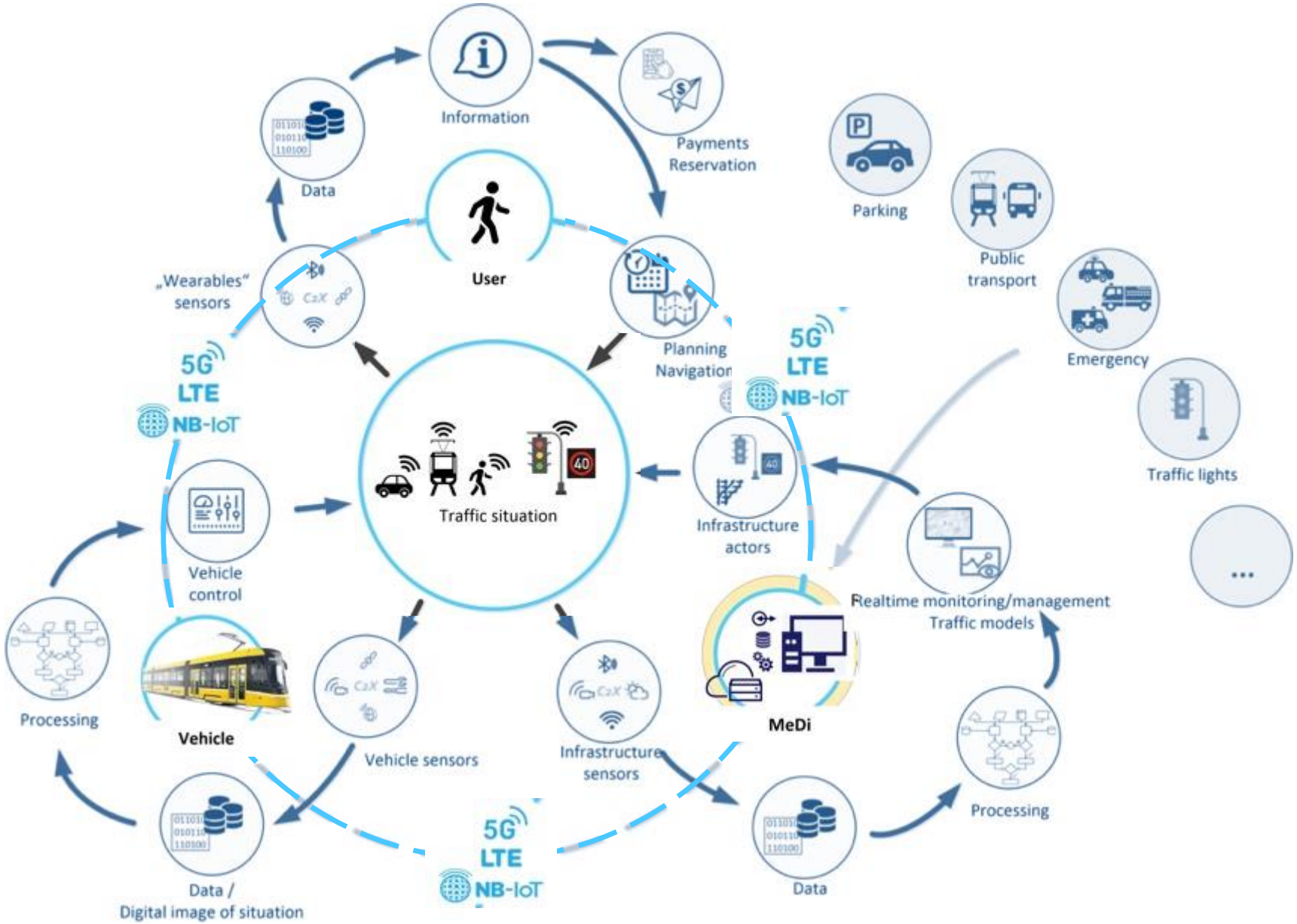
A. Analytická část
B. Návrhová část
C. Implementační část

Full allingment with national and EU visions

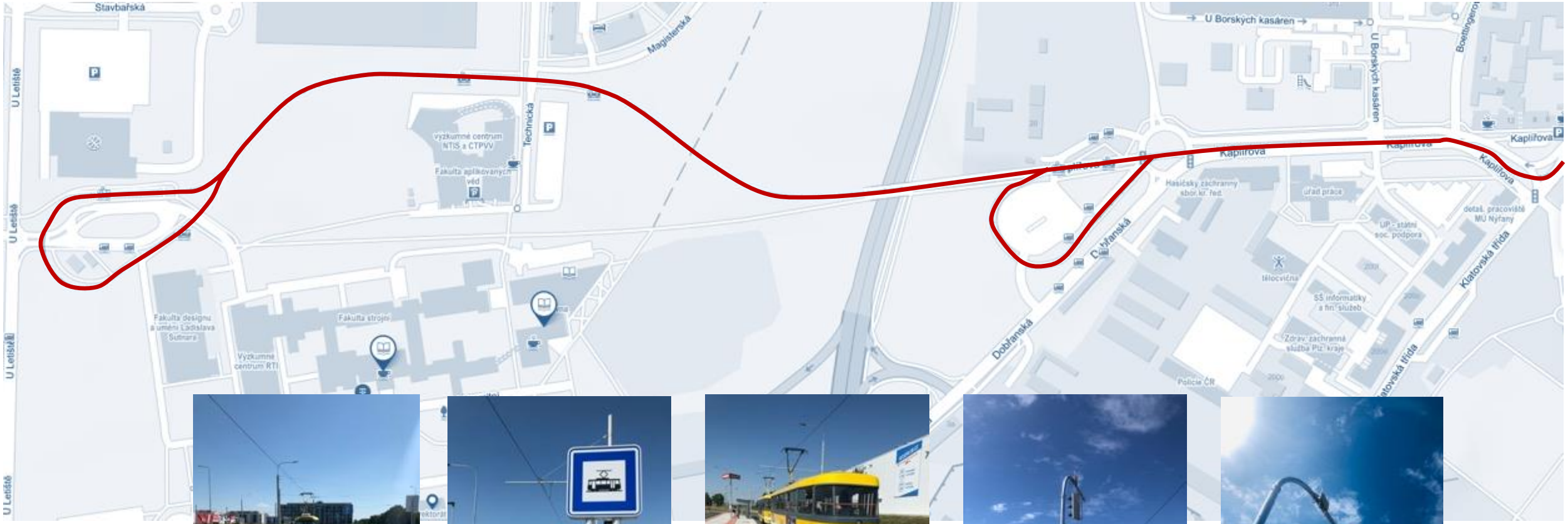
Directive 2010/40/EU **The framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport**
COM(2019) 640 final: **The European Green Deal**
COM(2016) 766 final: **A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility**
COM(2020) 789 final: **Sustainable and Smart Mobility Strategy – putting European transport on track for the future**
Vision of autonomous mobility development (governemnet approval from 11.10.2017)
Action plan for autonomous driving deployment (government action required by above document)

Automated and interconnected multimodal mobility will play an increasingly important role, together with intelligent traffic management systems that use digitization. The EU's transport system and infrastructure will be adapted to support new sustainable mobility services that reduce traffic congestion and pollution, especially in urban areas. Through its funding instruments, such as the Connecting Europe Facility, the Commission will help develop intelligent traffic management systems and mobility solutions as a service.

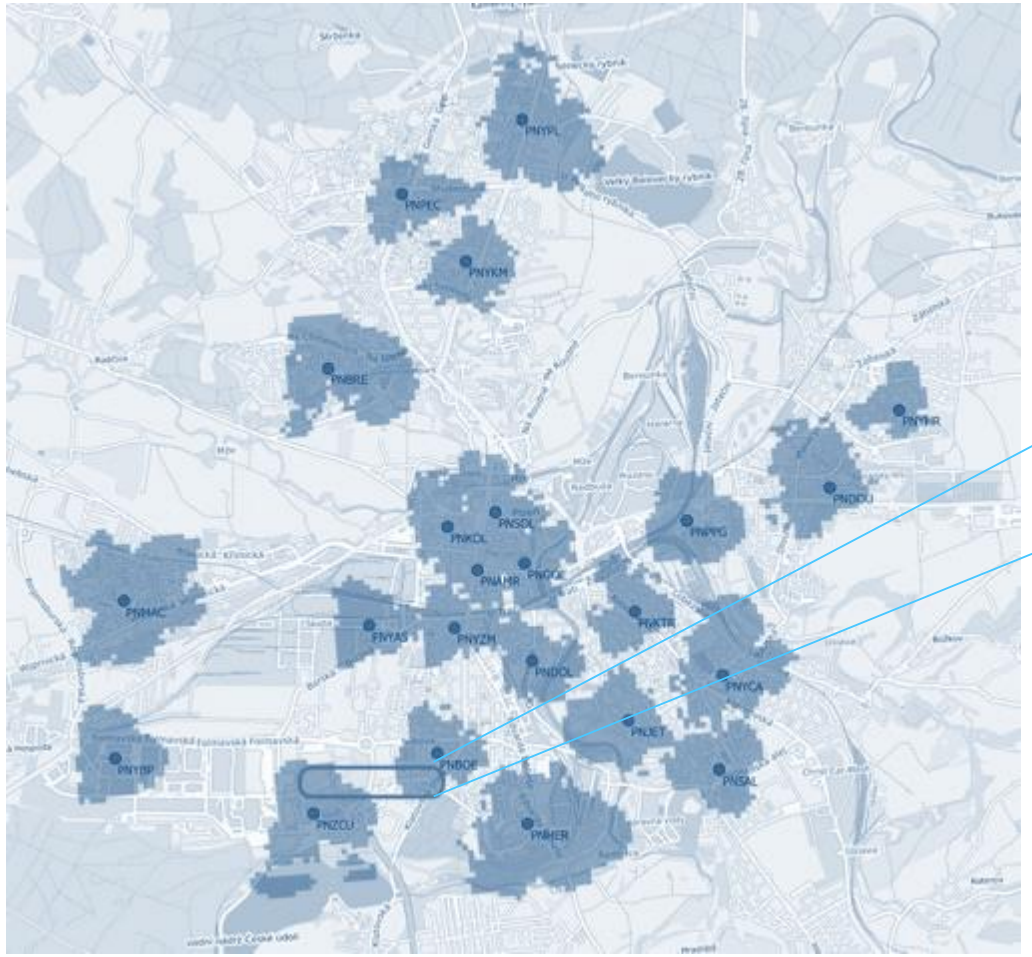
Connected and informed city



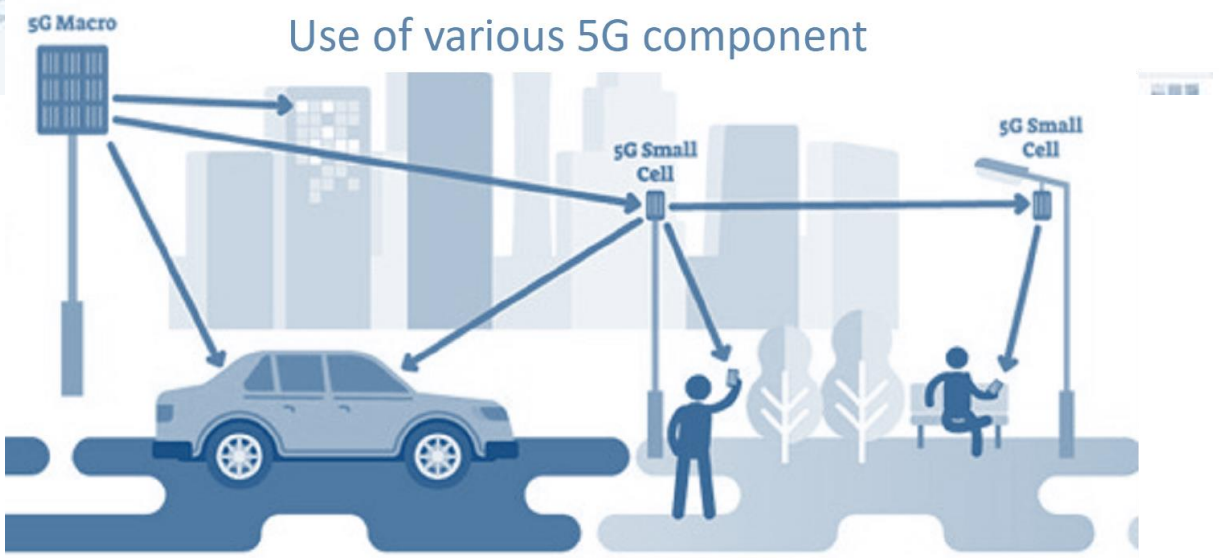
Autonomous tram location



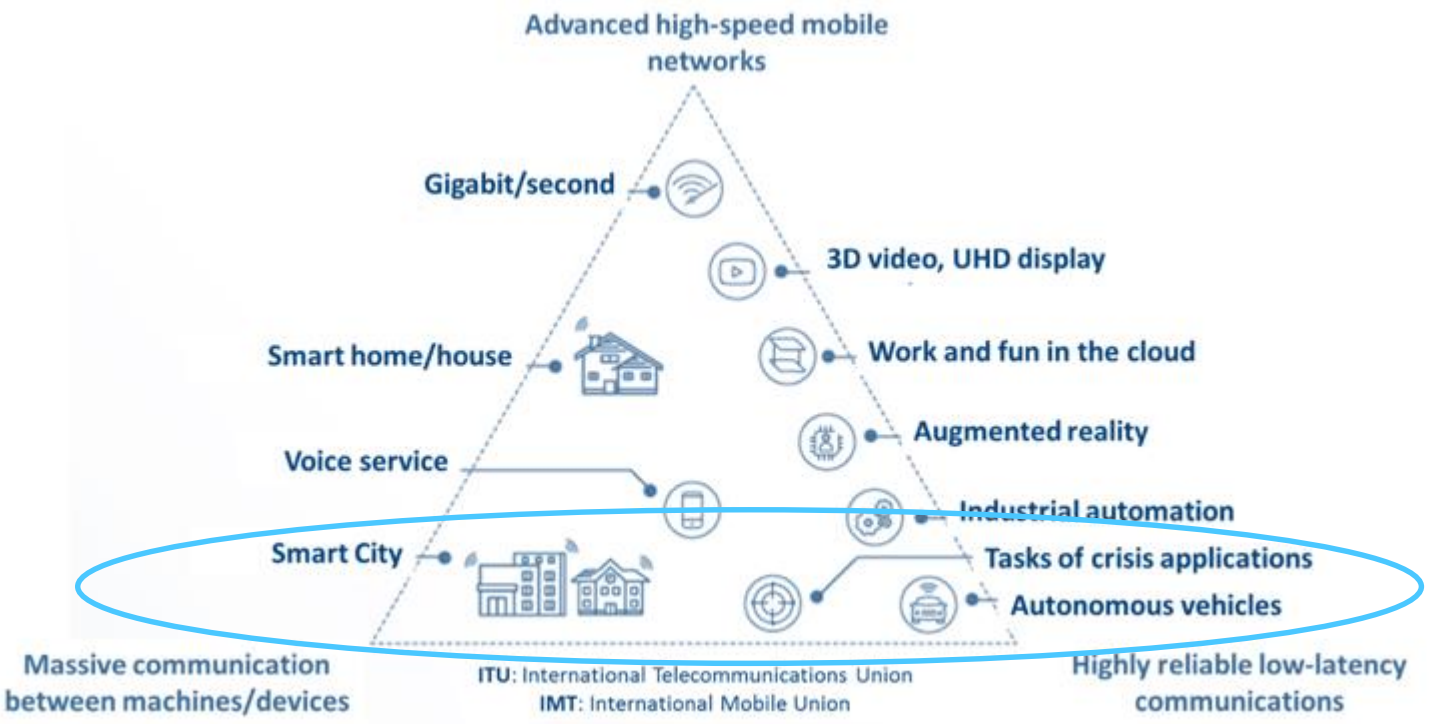
5G signal coverage



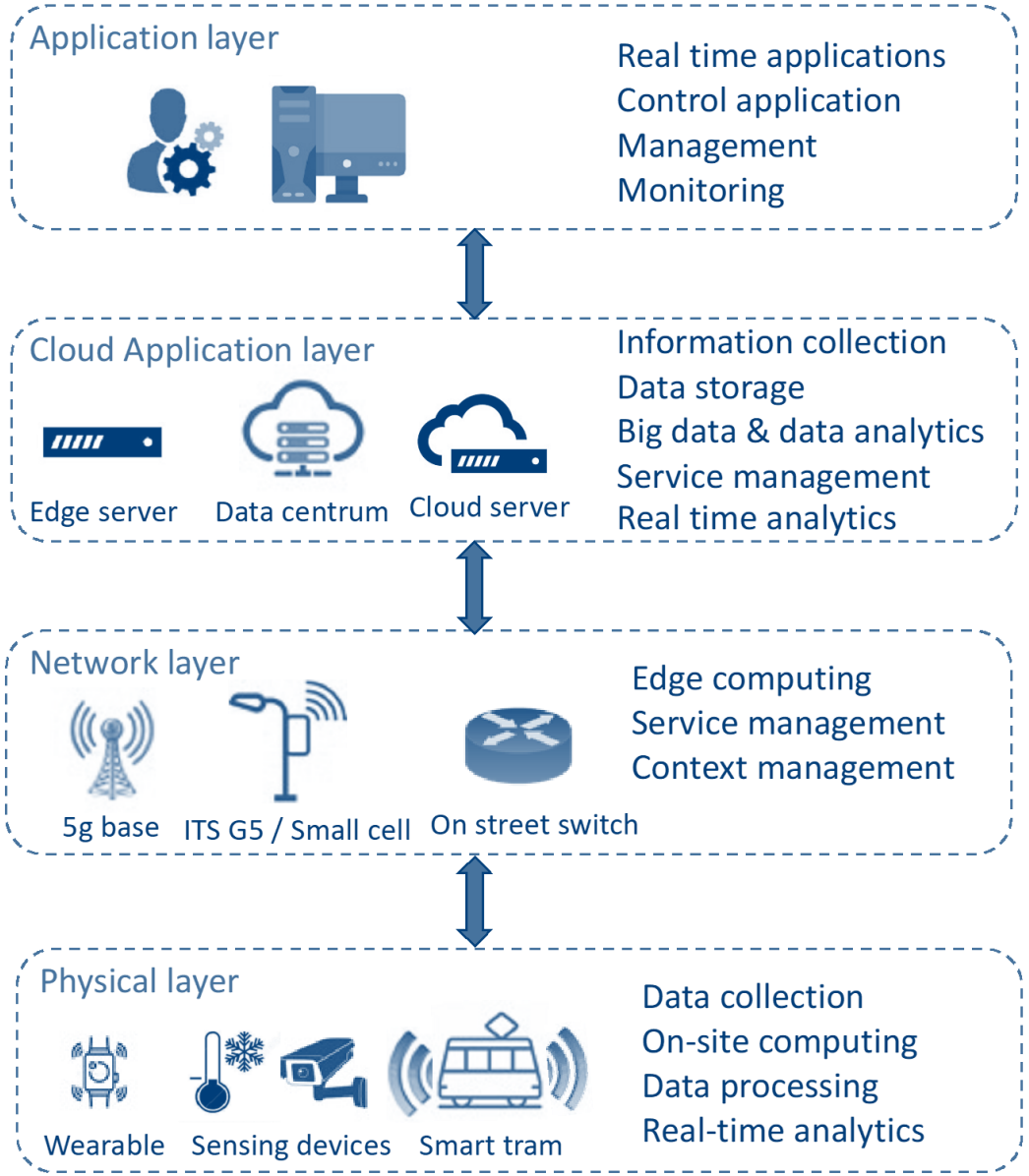
Use of various 5G component



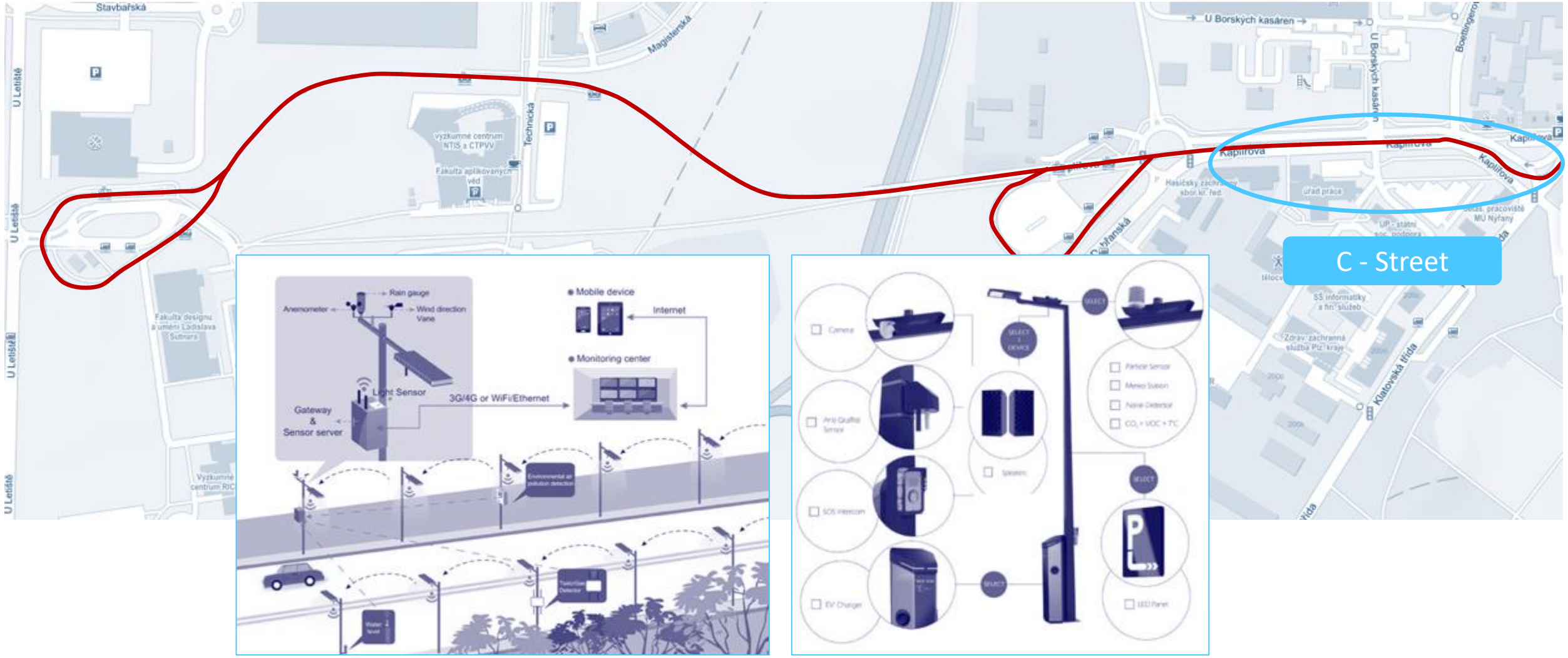
5g network requirements



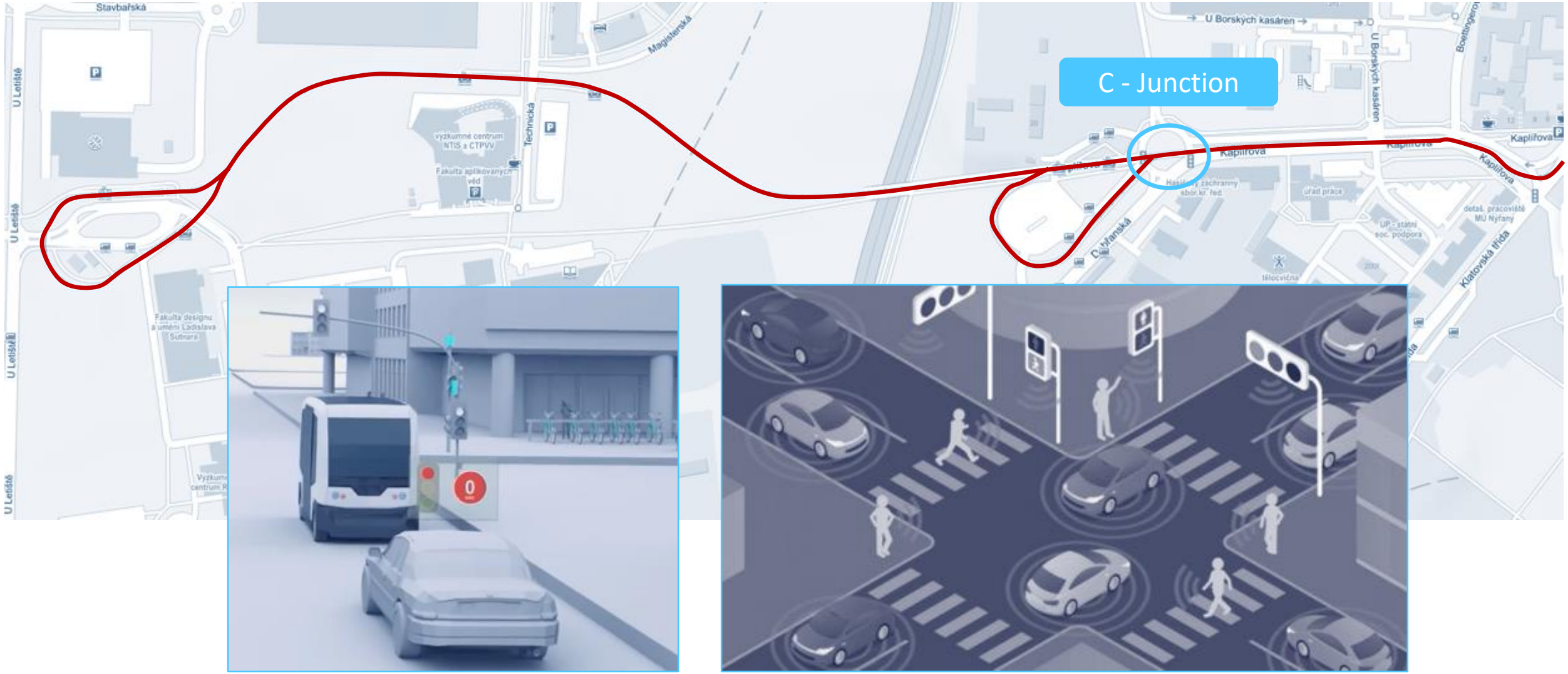
One 5G network with three multi-purpose IoT connectivity segments		
Massive IoT	Broadband IoT	Critical IoT
Low-cost devices Small data volume Extreme coverage	High data rate Large data volumes Low latency (best effort)	Bounded latencies Ultra-reliable data delivery Ultra-low latency
Network slicing, network exposure, network data analytics, device positioning, device battery life		



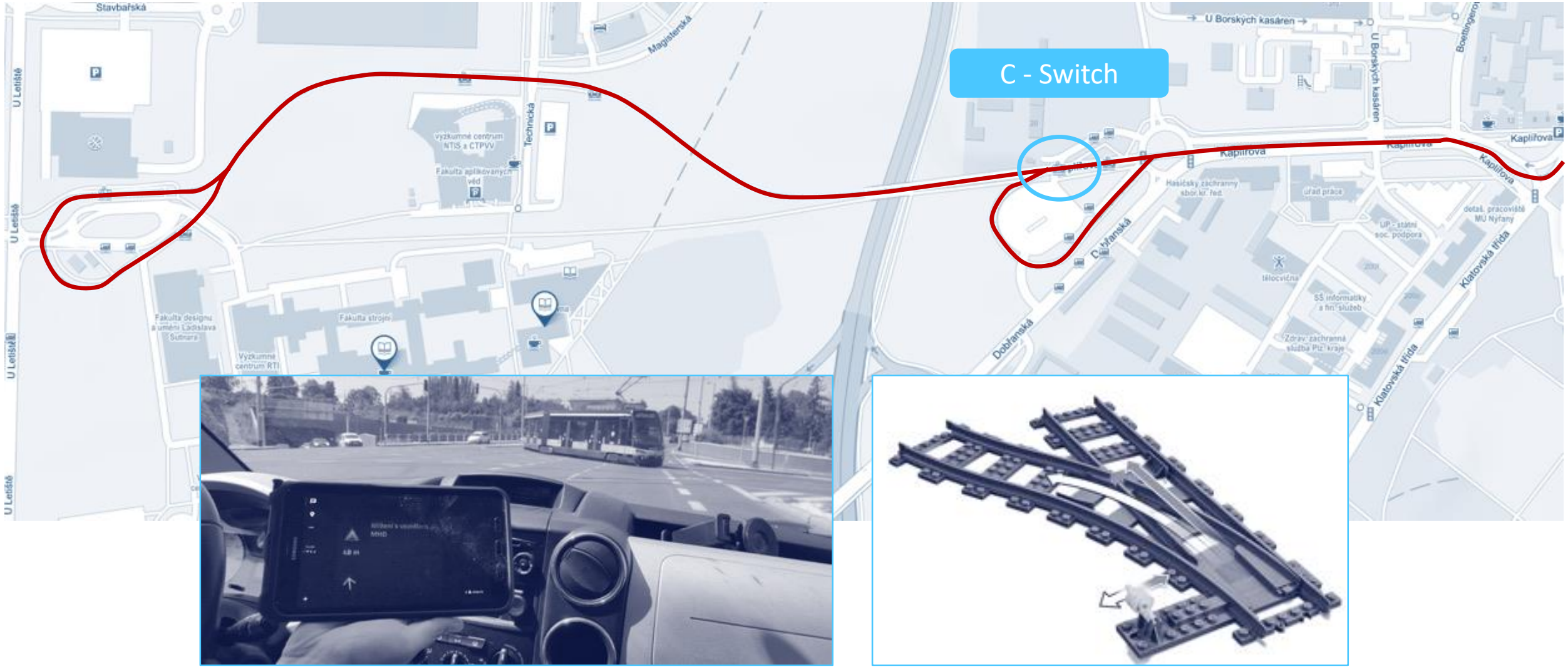
Smart & connected components: C-X concept



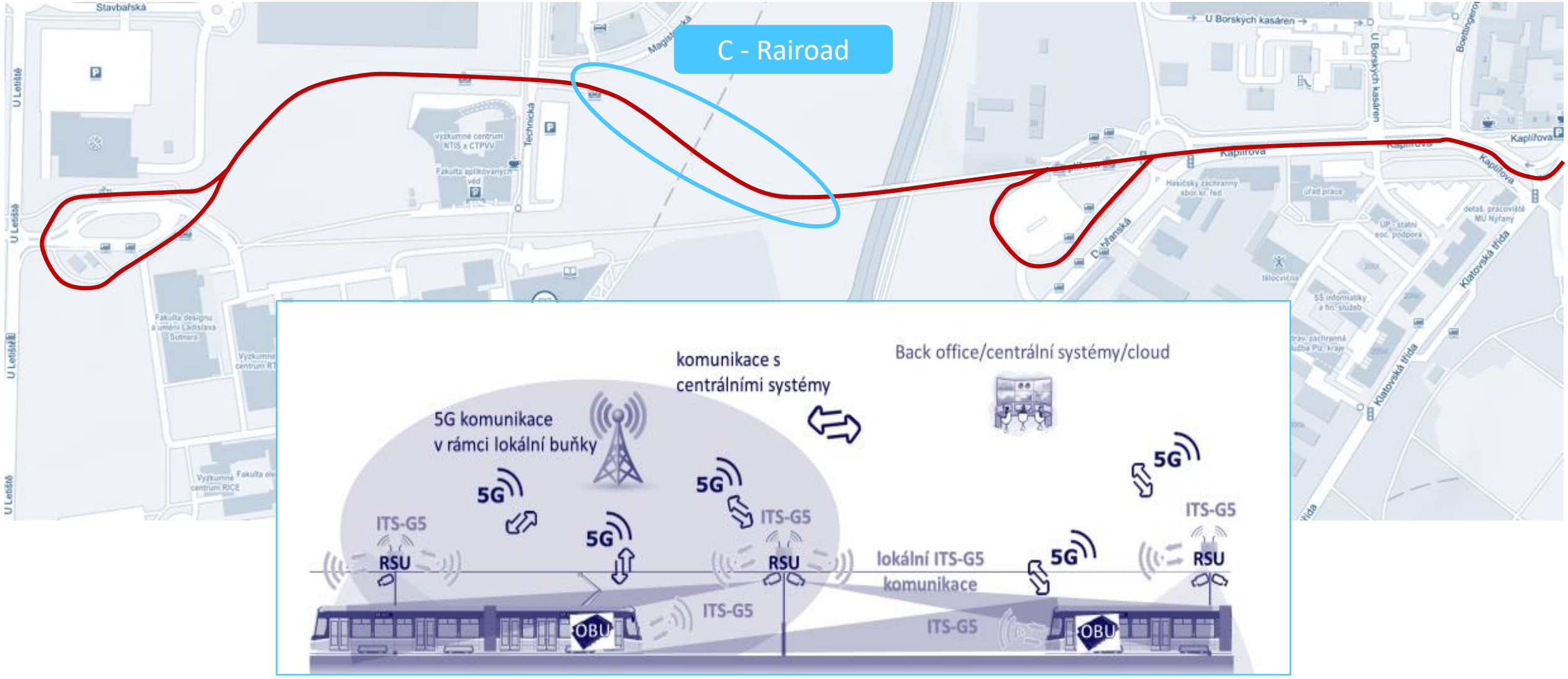
Smart & connected components: C-Junction



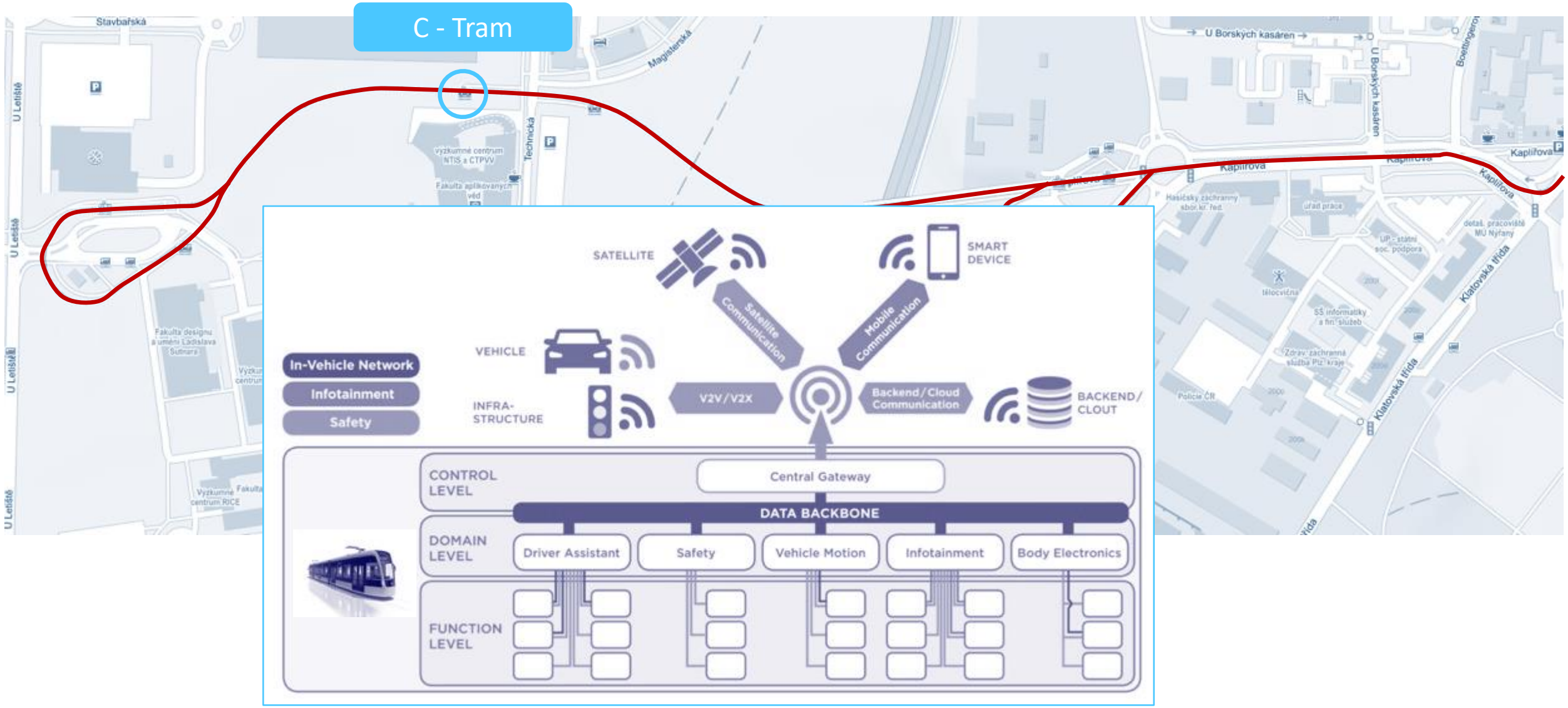
Smart & connected components: C- Switch



Smart & connected components: C- Railroad

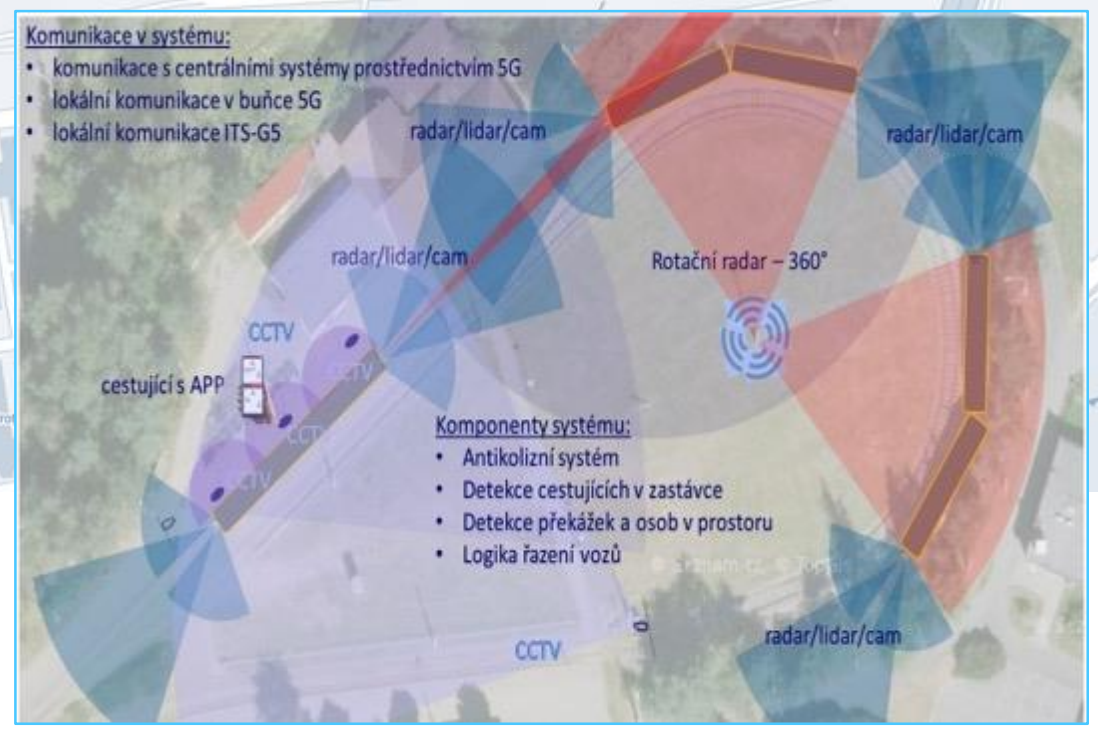


Smart & connected components: C- Tram



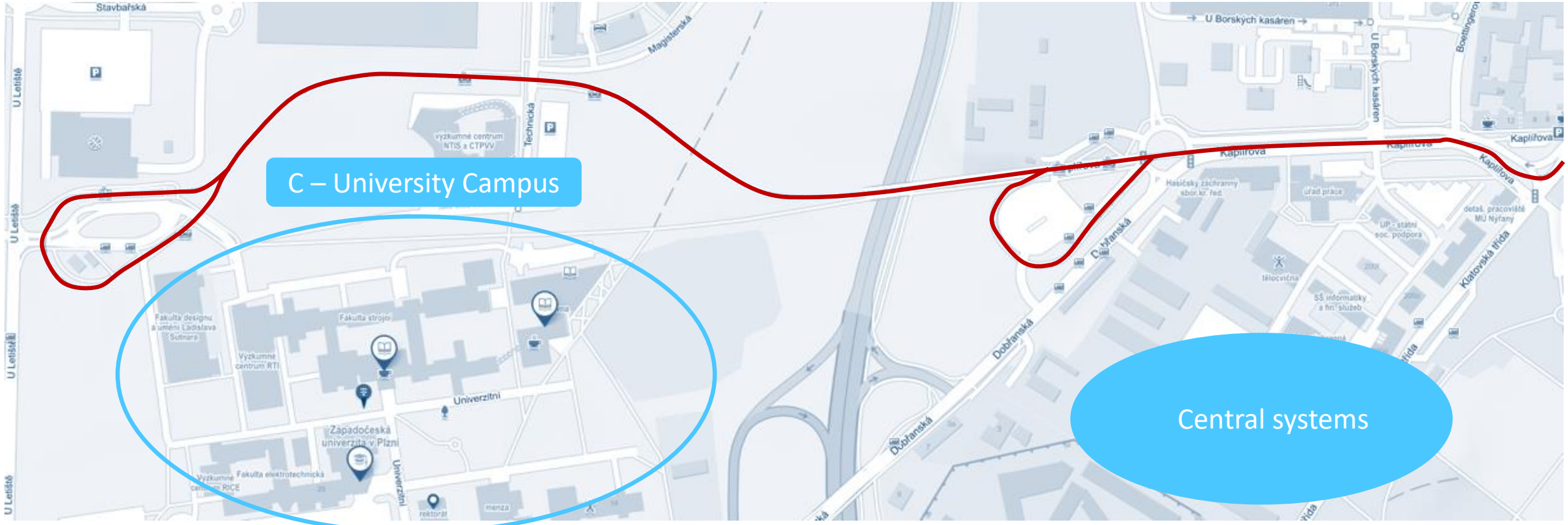
Smart & connected components: C- Turnable

C - Turnable

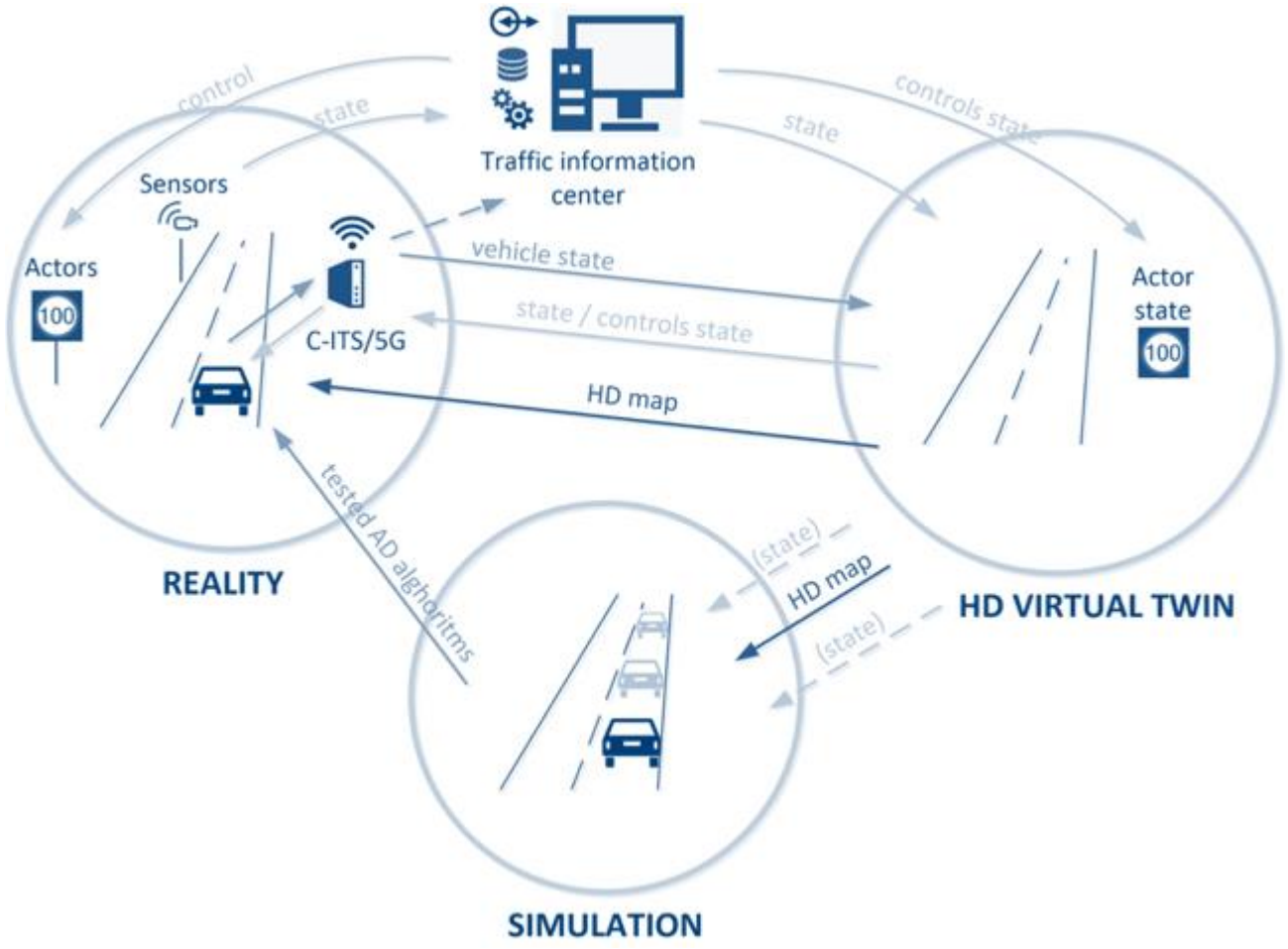


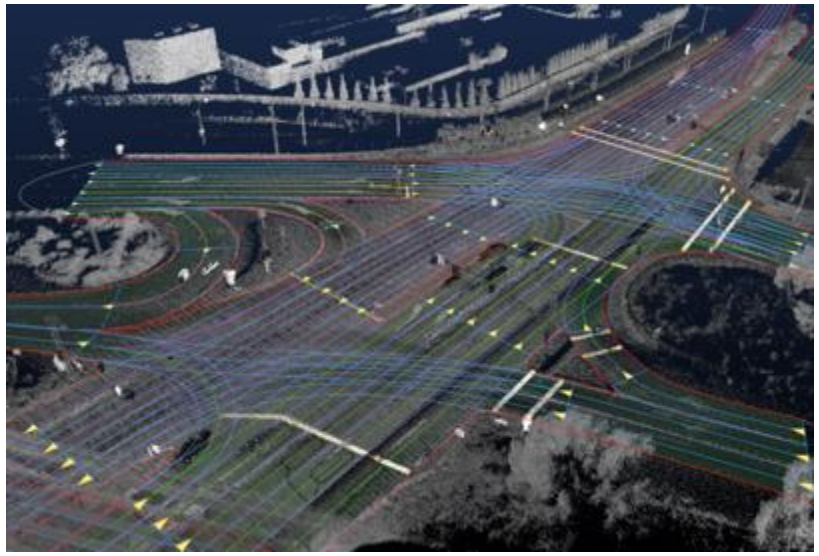
Smart & connected components: C- Stop

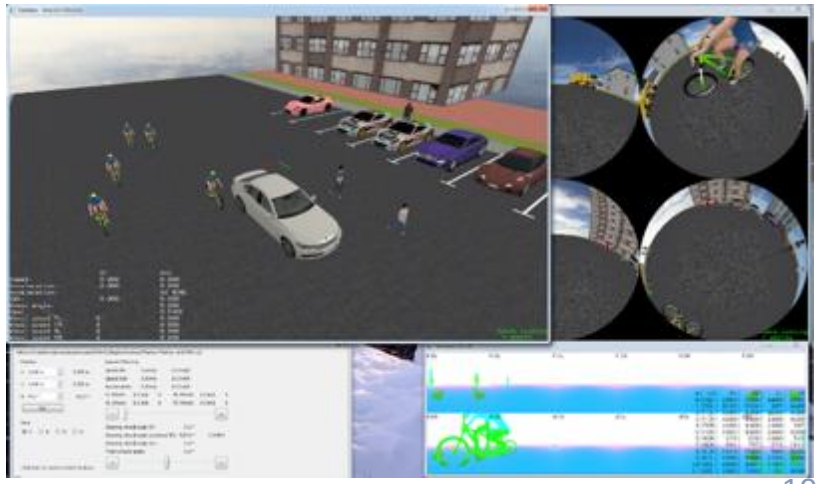
Smart & connected components: C- Campus & C – central systems



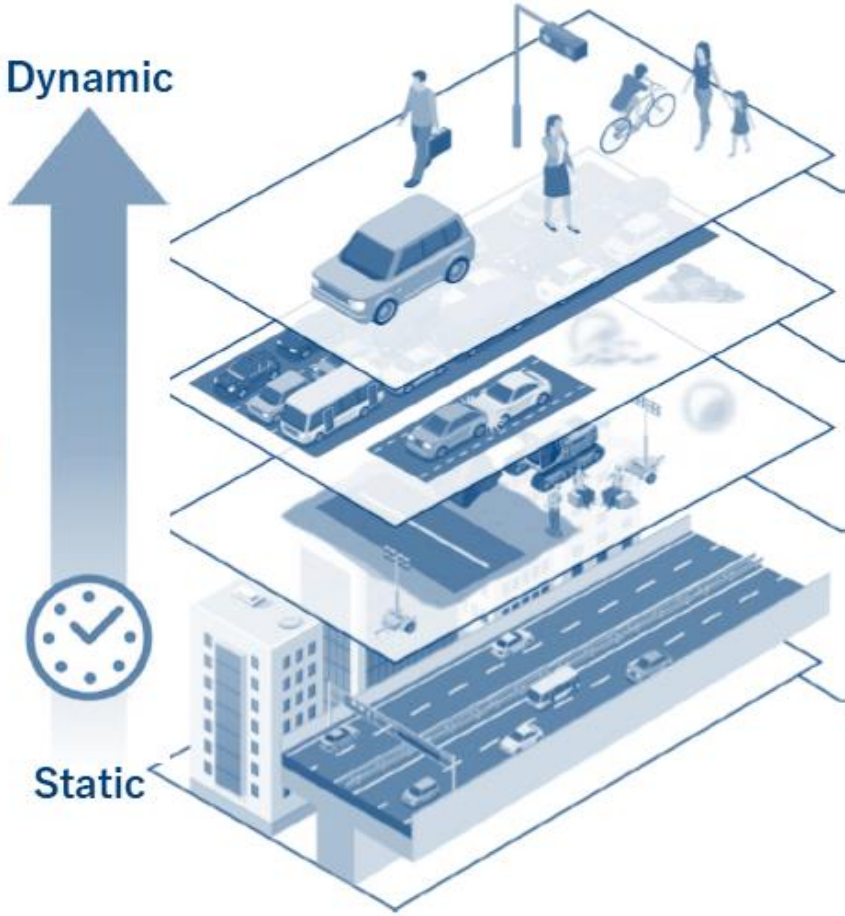
Central system components







Digitalization and virtualization



Dynamic information

Information on surrounding vehicles, pedestrians, traffic lights, etc.

Quasi-dynamic information

Traffic accident information, traffic regulation information, traffic congestion information, narrow area weather information, etc.

Quasi-static information

Traffic regulations, road construction schedules, wide-area weather forecast information, etc.

Static information (High-Precision 3D Map data (HD Map))

Information for traffic lanes, traffic signs, traffic lights etc.

Central system componets

- C2X modul
- HD maps / Live maps
- Security
- Automation control
- Data integration platform
- Dispatching
- Payment and reservation

Infrastructure

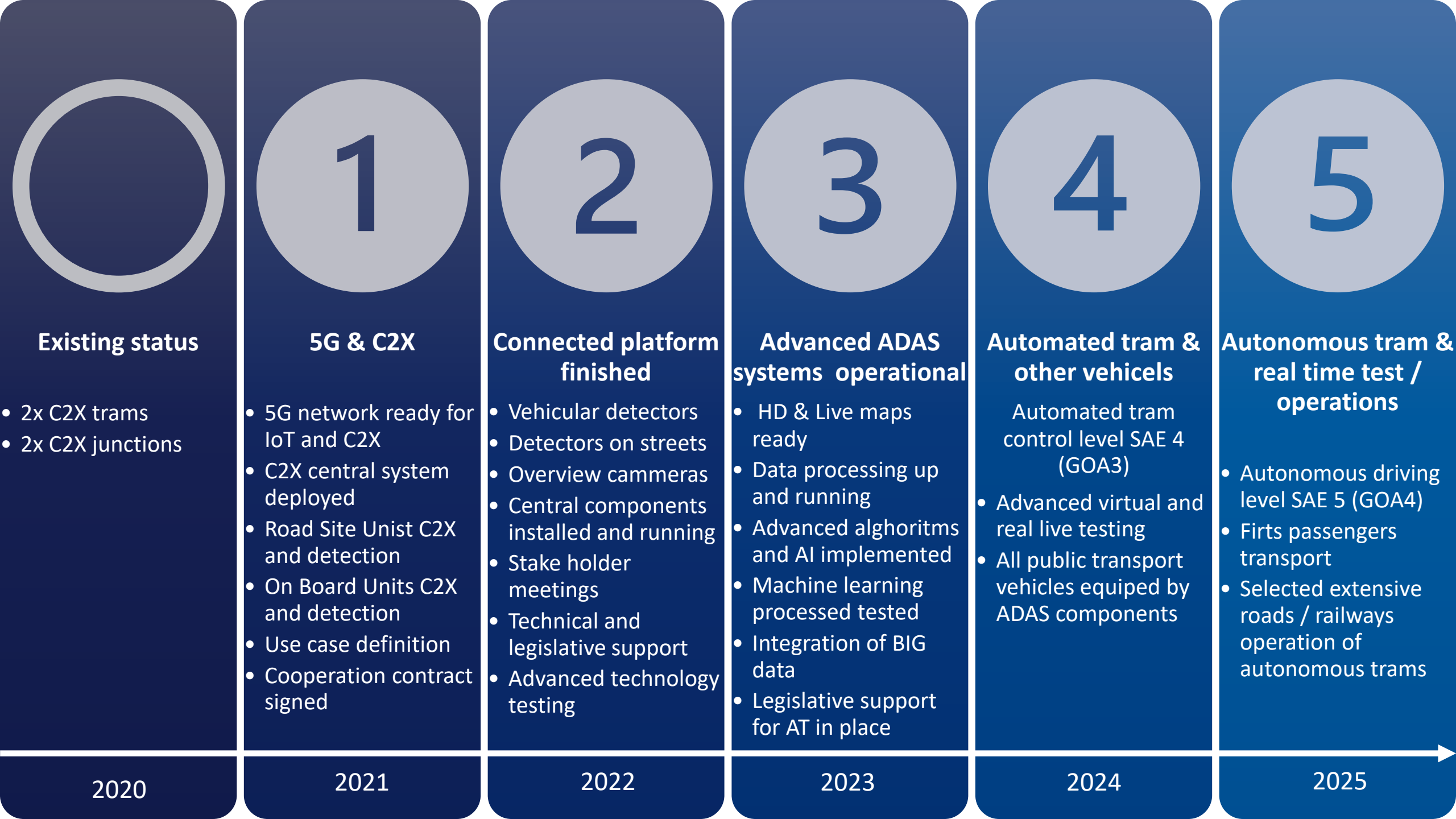
- C2X
- C2X on traffic light
- C2X on switch
- Cameras
- Radars
- Lidars
- 3D radar
- Meteo
- Magnetometrs
- IOT street dection

Vehicle

- C2X – Tram
- C2X - Car
- HMI
- Vehicular detection
- Cameras
- Externí detektory

User

- Mobile phone + app
- Priority button
- Wearable devices
- SOS and health application


0
1
2
3
4
5
Existing status
2x C2X trams
2x C2X junctions
5G & C2X
5G network ready for IoT and C2X
C2X central system deployed
Road Site Unist C2X and detection
On Board Units C2X and detection
Use case definition
Cooperation contract signed
Connected platform finished
Vehicular detectors
Detectors on streets
Overview cammeras
Central components installed and running
Stake holder meetings
Technical and legislative support
Advanced technology testing
Advanced ADAS systems operational
HD & Live maps ready
Data processing up and running
Advanced alghoritms and AI implemented
Machine learning processed tested
Integration of BIG data
Legislative support for AT in place
Automated tram & other vehicels
Automated tram control level SAE 4 (GOA3)
Advanced virtual and real live testing
All public transport vehicles equiped by ADAS components
Autonomous tram & real time test / operations
Autonomous driving level SAE 5 (GOA4)
Firts passengers transport
Selected extensive roads / railways operation of autonomous trams
2020
2021
2022
2023
2024
2025

Město příležitostí Plzeň	Pilsen succeeded in the tender from Ministry of trade in 5g for 5 cities and these is possible to test 5g technology and their use cases.
Plzeňské městské dopravní podniky PMDP; Správa informačních technologií Plzeň	City organizations providing public transport and information technologies for the city of Pilsen.
Západočeská univerzita v Plzni; Vědeckotechnický park Plzeň	Scientific, R&D and professional capacity
ŠKODA	Czech manufacturer of railway carriages, tramways, trolleybuses with long tradition and modern background in Pilsen.
O2	Strong telecommunication company with technical know-how in the area of building and operation of radio-based telecommunication and services. Member of C-ROADS project.
intens	Innovative transport solutions in area of ITS a C-ITS system. Member of C-ROADS project.
SIEMENS	Local partner for traffic management in the city of Pilsen, providing traffic controller, network optimization system, road site equipment.
Other local partners	Providing complete portfolio of works in construction, service, engineering networks in telecommunication, energy, construction, transport and security.

We are looking for funding opportunities to secure the Cetre of competence

CURRENT STATUS: CENNECTED VEHICLES

ITS G5 (5,9GHz)
3G & 4G

ŠKODA O2 intens INNOVATIVE. INTELLIGENT. INTEGRATED. Plzeň Plzeňské městské dopravní podniky PMDP Správa informačních technologií Plzeň ZÁPADOČESKÁ UNIVERZITA V PLZNI

5G
ITS G5 (5,9GHz)

FUTURE PLAN: AUTONOMOUS VEHICLES

Thank you your attention.

Martin Volný
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www.intens.cz

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INNOVATIVE. INTELLIGENT. INTEGRATED.