DEDICAT 6G

THIS PROJECT IS PART OF THE 5G PUBLIC AND PRIVATE PARTNERSHIP

5G PPP WWW.5G-PPP.EU

DEDICAT 6G

Societal Needs and Value Creation subgroup of 6G-IA

6G-IA KVI workshop
November 15, 2022

Drazen Ribar
Research and Innovation Project Manager
AIRBUS
Leader of DEDICAT 6G Proof of concept and demonstrators activities

The DEDICAT 6G project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 101016499

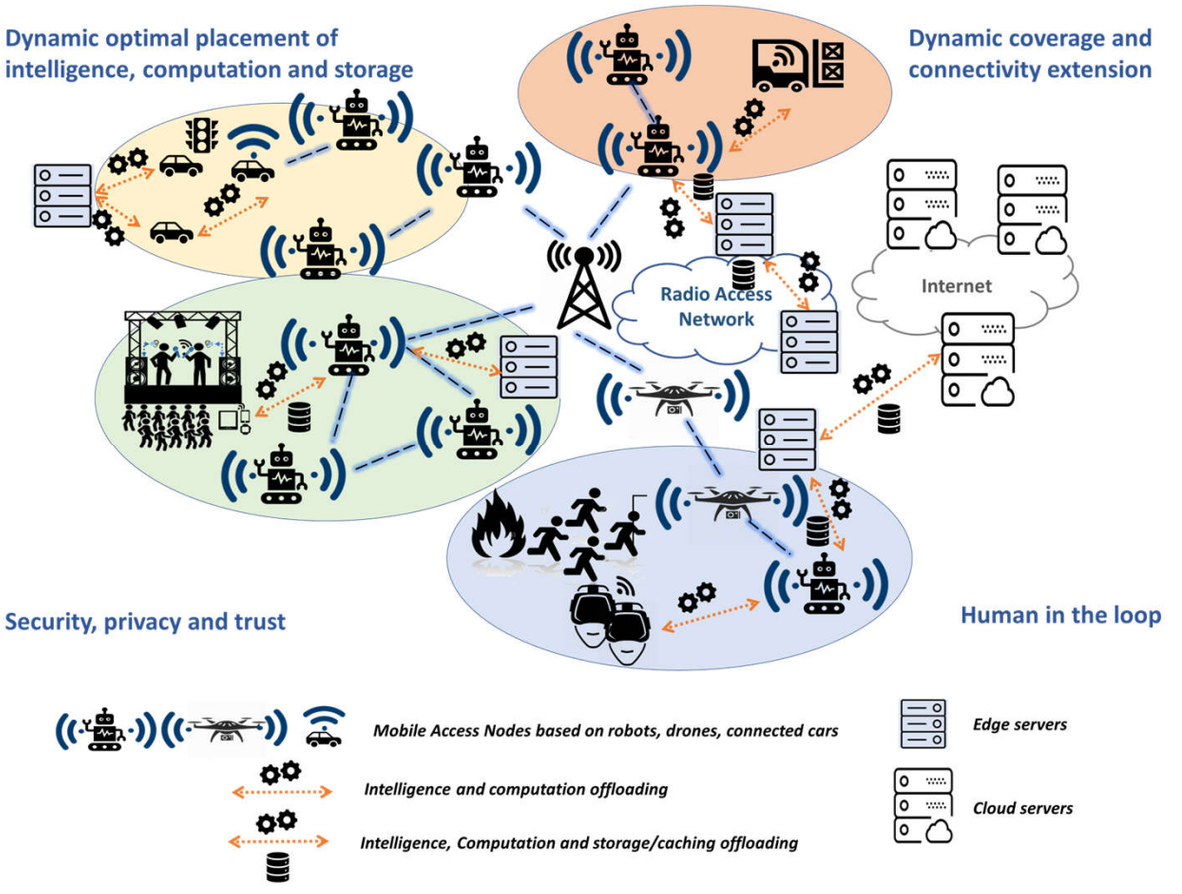
Overview

- Project overview
- Use cases
- Approach to KVIs and KPIs mapping
- Identification of KVIs
- Mapping of KVIs with project enablers
- Mapping of Societal Challenges with project KPIs
- Conclusion

DEDICAT 6G - Challenges and vision

Transform Beyond 5G networks into a smart connectivity platform that is dependable/resilient, highly adaptive, ultra-fast, green for supporting securely innovative, human-centric applications.

- **Dynamic distribution of intelligence and computation** for reduced energy and resource consumption
- **Dynamic coverage and connectivity extension** in support of digital inclusion
  - *support service continuity also in more "remote" areas*
- **Enhanced security, privacy and trust**
- **Human in the loop**



Technical enablers

Mechanisms for dynamic distribution of intelligence and storage in conjunction with predictive caching

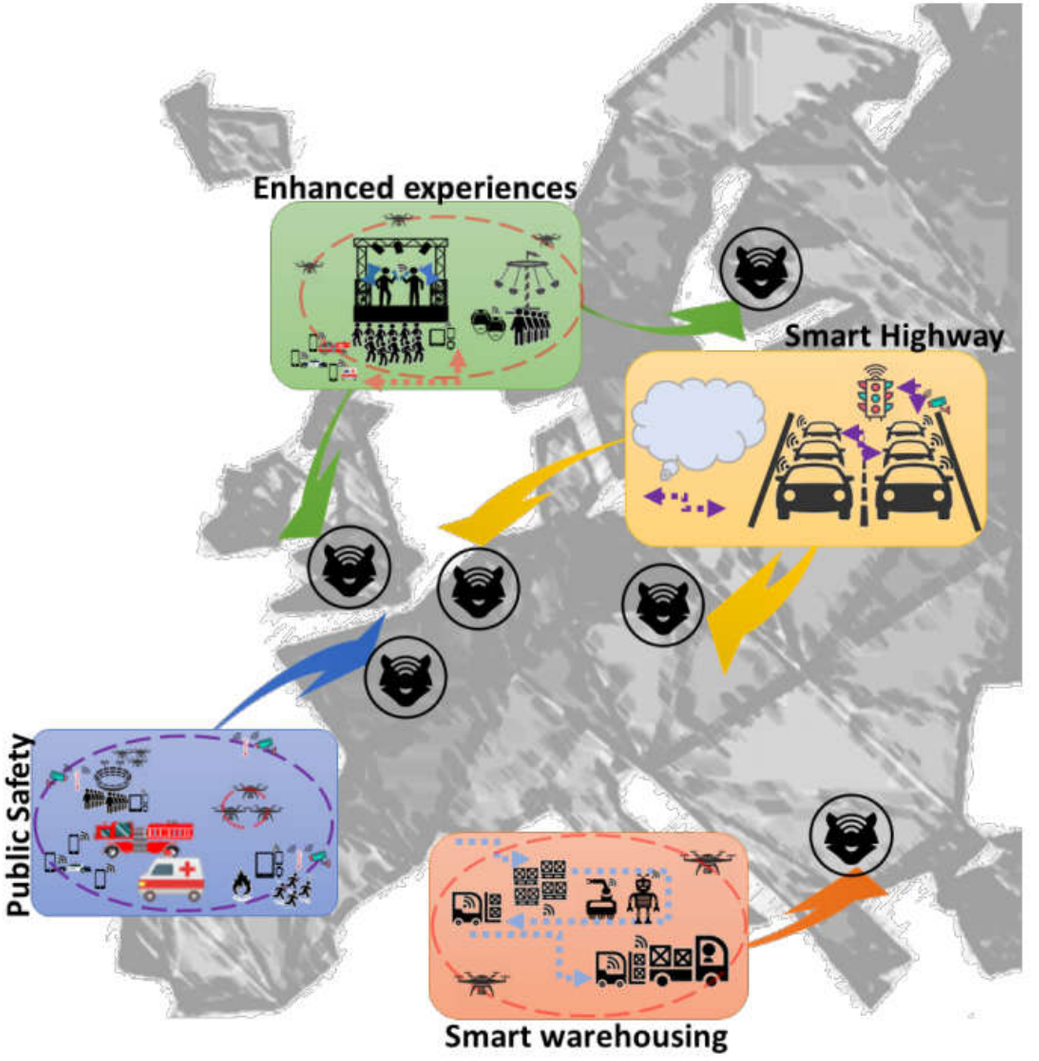
Mechanisms for dynamic coverage and connectivity extension

Security, privacy and trust assurance especially for mobile edge services

Applications with novel interaction between humans and digital systems through innovative interfaces and devices (AR, smart glasses, connected cars, robots, drones)

Use case pilots

- **Smart warehousing**
  - AI based optimization of warehousing operations
  - assisting training and maintenance through 3D augmented reality
  - enhancing safety of personnel and goods
  - remote inspection and diagnostics;
  - identification and tracking of goods throughout value chains
- **Enhanced Experiences**
  - *Live streaming with extremely low latency locally in public events and remotely (virtual participation)*
- **Public Safety**
  - *Reliable and efficient connectivity everywhere and anytime to drive the digital transformation plan for Augmented First Responders*
    - *demonstrated through natural disasters in non-urban settings and man-made in urban settings*
- **Smart Highway**
  - Connected and autonomous mobility with the smallest possible delay and ultra-reliability for live alerts



Approach to KVIs and KPIs mapping

1) Identification of KVIs: H2020 Societal Challenges
2) Mapping of Technical enablers to H2020 Societal Challenges
3) Identification of KVIs: United Nations Sustainable development goals (UN SDG)
4) Mapping of Technical enablers to UN SDGs
5) Mapping of Industrial impact KPIs in DEDICAT 6G use cases to societal challenges and UN SDGs
6) Mapping of DEDICAT B5G/6G KPIs to societal challenges and UN SDGs

Identification of KVIs: H2020 Societal Challenges (Gateways) and Mapping of DEDICAT 6G Technical enablers

- Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy
- Secure, Clean and Efficient Energy
- Smart, Green and Integrated Transport
- Health, Demographic Change and Wellbeing
- Climate Action, Environment, Resource Efficiency and Raw Materials
- Europe in a changing world - Inclusive, innovative and reflective societies
- Secure societies: protecting freedom and security of Europe and its citizens

Climate action, environment, resource efficiency and raw materials

- Development of mechanisms for intelligence distribution that contribute to **improving energy efficiency** of mobile networks

Europe in a changing world - inclusive, innovative and reflective societies

- Development of mechanisms for extended coverage and connectivity

Secure societies - protecting freedom and security of Europe and its citizens

- Development of mechanisms for security, privacy and trust assurance especially for mobile edge services
- human-centric solutions in the scope of the Public Safety use case

Identification of KVIs: United Nations Sustainable development goals (UN SDG)relevant to DEDICAT 6G

Mapping of DEDICAT 6G Technical enablers to UN SDGs

Mechanisms for dynamic distribution of intelligence and storage in conjunction with predictive caching

Mechanisms for dynamic coverage and connectivity extension

Security, privacy and trust assurance especially for mobile edge services

Applications with novel interaction between humans and digital systems through innovative interfaces and devices

Mapping of Industrial impact KPIs in DEDICAT 6G use cases to H2020 societal challenges

Europe in a changing world - inclusive, innovative and reflective societies

Secure societies - protecting freedom and security of Europe and its citizens

DEDICAT 6G UCs	KPIs and target value
Smart Warehousing	-Advanced warehouse automation. Reduction of time required to certain operations: 15% -Enhancing safety in warehouses. An incident reduction of more than 10% is envisioned when a high level of automation is deployed.
Enhanced Experience	-Offloading the computation into edges will decrease the power and processing costs for service providers in the content origin 20% and enable faster response time for video users. -Dynamic adaptation and video streaming will increase the overall user quality of experience, decrease the network costs 40%, and enable greener networking. -Smart guidance will increase the operational efficiency both for event personnel as well as for users and reduce the navigation time at least 30%.
Public Safety	- Increase of operational efficiency of public safety by 20% - Reduction of emergency response time by 30% - Increase of public safety user quality experience
Smart Highway	The baseline is the current situation where car drivers are only warned about dangerous situations in front of them, based on a local sensor in the car. The DEDICAT 6G technology will be an enabler to go to a next level of automation: - Increased road safety with a reduction in number of traffic deaths and injuries by 20%: - Catalyst to increase the level of automation from 4 (high automation) to 5 (full automation)

Climate action, environment, resource efficiency and raw materials

Mapping of Industrial impact KPIs in DEDICAT 6G use cases to UN SDGs

DEDICAT 6G UCs	KPIs and target value	
Smart Warehousing	-Advanced warehouse automation. Reduction of time required to certain operations: 15% -Enhancing safety in warehouses. An incident reduction of more than 10% is envisioned when a high level of automation is deployed,	
Enhanced Experience	-Offloading the computation into edges will decrease the power and processing costs for service providers in the content origin 20% and enable faster response time for video users. -Dynamic adaptation and video streaming will increase the overall user quality of experience, decrease the network costs 40%, and enable greener networking. -Smart guidance will increase the operational efficiency both for event personnel as well as for users and reduce the navigation time at least 30%.	
Public Safety	- Increase of operational efficiency of public safety by 20% - Reduction of emergency response time by 30% - Increase of public safety user quality experience - Increase protection of First Responders or PPDR users during the response to the crisis	
Smart Highway	The baseline is the current situation where car drivers are only warned about dangerous situations in front of them, based on a local sensor in the car. The DEDICAT 6G technology will be an enabler to go to a next level of automation: - Increased road safety with a reduction in number of traffic deaths and injuries by 20%: - Catalyst to increase the level of automation from 4 (high automation) to 5 (full automation)	

Mapping of DEDICAT B5G/6G KPIs* to societal challenges and UN SDGs

KPI name	Use cases	Target value
E2E Service Latency	All	1 ms - 10ms
E2E Application Latency - for Video processing services	Enhanced Experience	E2E 200ms at application level
Mission critical QoS of services - latency related	Public Safety	MC-PTT access time less than 300 ms for 95% of all requests; End-to-End MC-PTT access time less than 1000 ms for all MCX mobile application under the same network coverage; Mouth-to-ear latency less than 300 ms for 95% of all voice bursts Max late call entry time shall be 150 ms for 95% of all late call request. End-to-End Delay (time required for IP packets to be transmitted) shall be less than 10 ms; User Data Rate shall be 100 Mbps in downlink and 50 Mbps in uplink 99.999% of success for the transmission of a packet of 32 bytes within 1ms

Europe in a changing world - inclusive, innovative and reflective societies

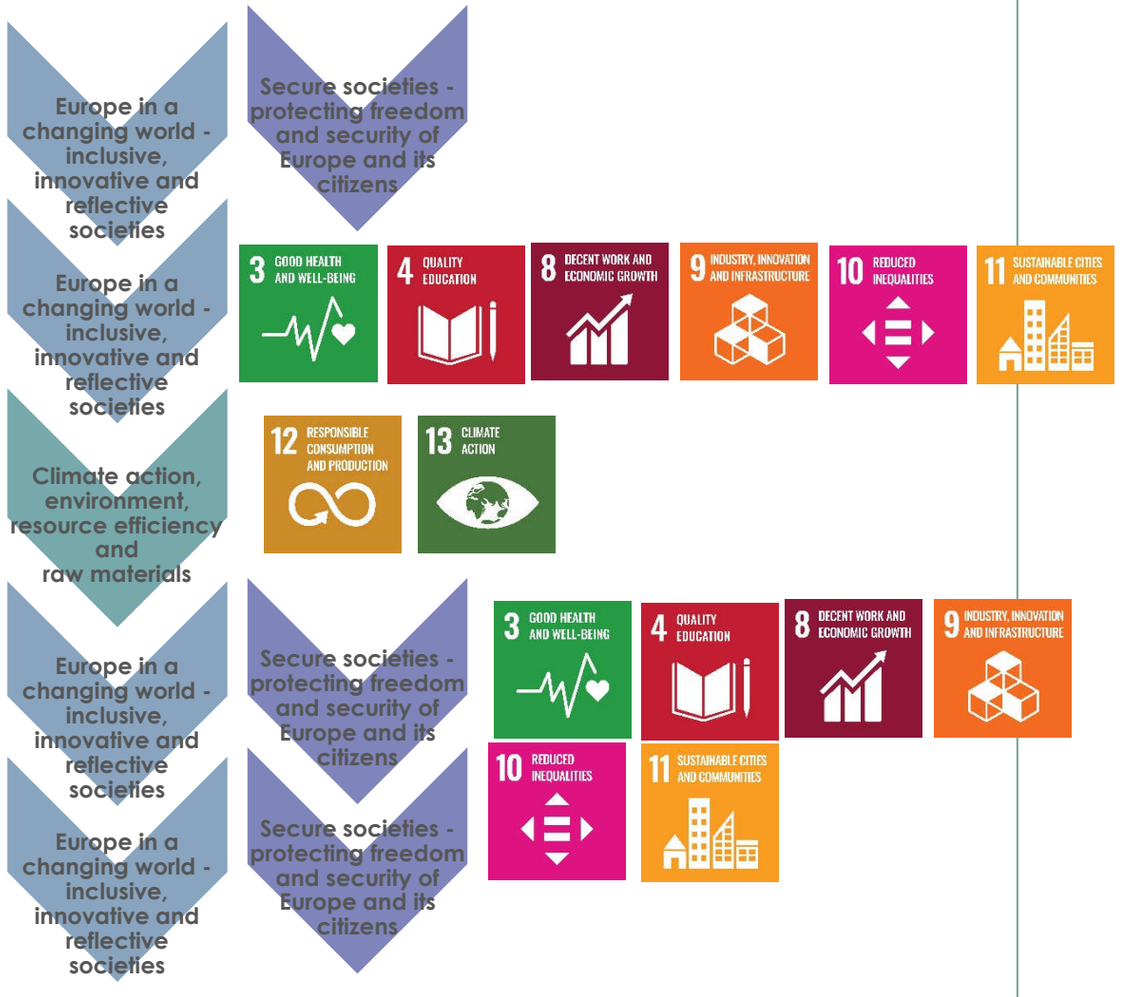
Europe in a changing world - inclusive, innovative and reflective societies

Secure societies - protecting freedom and security of Europe and its citizens

** KPIs provided as input on Beyond 5G/6G KPIs and Target Values to the 5G PPP KPI Cartography (link) and the corresponding white paper of the 5G PPP Test, Measurements and KPIs validation working group (link)*

Mapping of DEDICAT B5G/6G KPIs to societal challenges and UN SDGs

KPI name	Use cases	Target value
User data rate	Smart warehousing, Enhanced experience	Minimum user data rate (5th percentile) in bit/s: 100 Mbit/s (DL); 50 Mbit/s (UL).
Network Capacity	Smart warehousing, Enhanced experience	Area traffic capacity in Mbit/s/m^2: 10 Mbit/s/m^2 (DL) (Bandwidth: 100MHz)
Network energy efficiency and Device energy efficiency	All	Reduction of energy consumption by a factor of 10
Service reliability	All	Packet Loss Rate < 10^{-3} Public Safety: 99.999% of success for the transmission of a packet of 32 bytes within 1ms
Location accuracy	Smart Warehousing, Smart Highway	10 cm to 20 cm



DEDICAT 6G towards Societal Challenges

- Inclusivity:
  - *Access to information from anywhere, anytime and when needed;*
- Safety:
  - *Protection of users by sharing rich information and increase user experience;*
- Connectivy:
  - *Maintain access to the network even network failure or overload;*
- Environment:
  - *Contribute to energy saving and sustainability by efficient resources management based on needs or on demand*

DEDICAT 6G

Thank you!

https://decicat6g.eu/

The DEDICAT 6G project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No XXX

DEDICAT 6G

BACK UP SLIDES

https://decicat6g.eu/

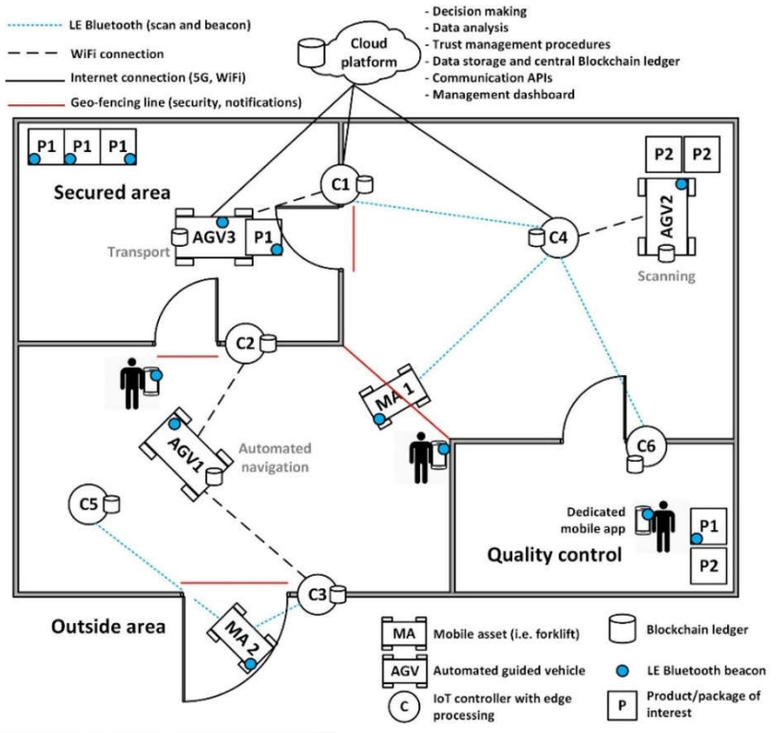
The DEDICAT 6G project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No XXX

UC1: Smart Warehousing

Need for B5G/6G

- **Low latency** and **high reliability** for timely delivery of data and interactions with robots
- **High throughput** for video streaming for remote surveillance
- **High location accuracy** to guarantee correct positioning of robots and assets

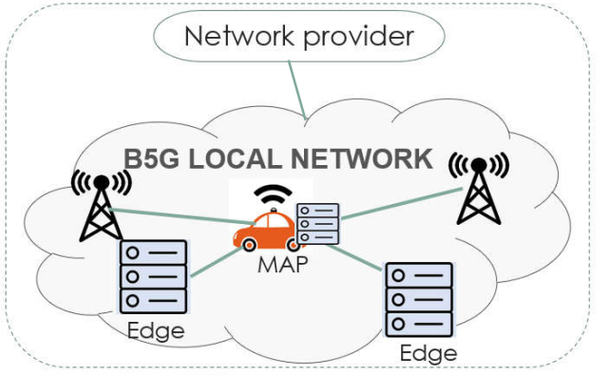
- **Enhance warehouse automation towards significant increase of operations' efficiency** (elimination of time wastes, decrease of product damages)
- **Enhance safety and security of goods and personnel** with indoor positioning and asset tracking
- **Increase efficiency in use of resources** (AVs, humans, other equipment) through predictive analytics by distributed AI and data analytics functionalities.
- **Assisting training and maintenance through 3D augmented reality**
- **Enable remote monitoring** of processes and remote handling by a human operator in case of equipment failure through multiple UHD streams
- **Identification and tracking of goods**

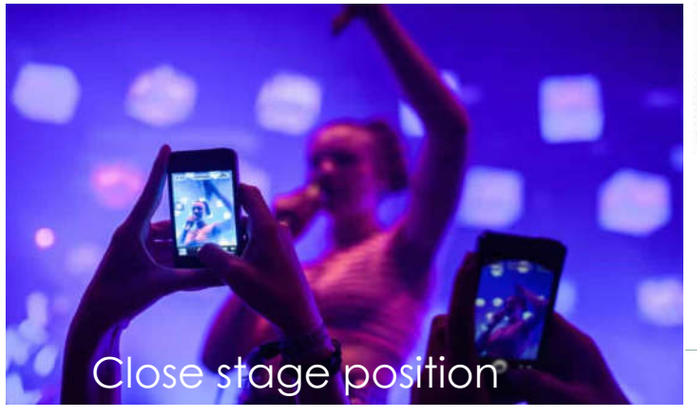


UC2: Enhanced Experience

Enhance video streaming in live events with key innovations

- ✓ Smart user devices and applications in public events from enhanced viewpoints
- ✓ Network AI/ML algorithms and resource allocation for improved video service availability and energy efficiency (simulations interconnecting with other WPs)
- ✓ Dynamic video adaptation and edge placement for computation offloading
- ✓ Extending the coverage in the event site
- ✓ **Enhanced user experience**

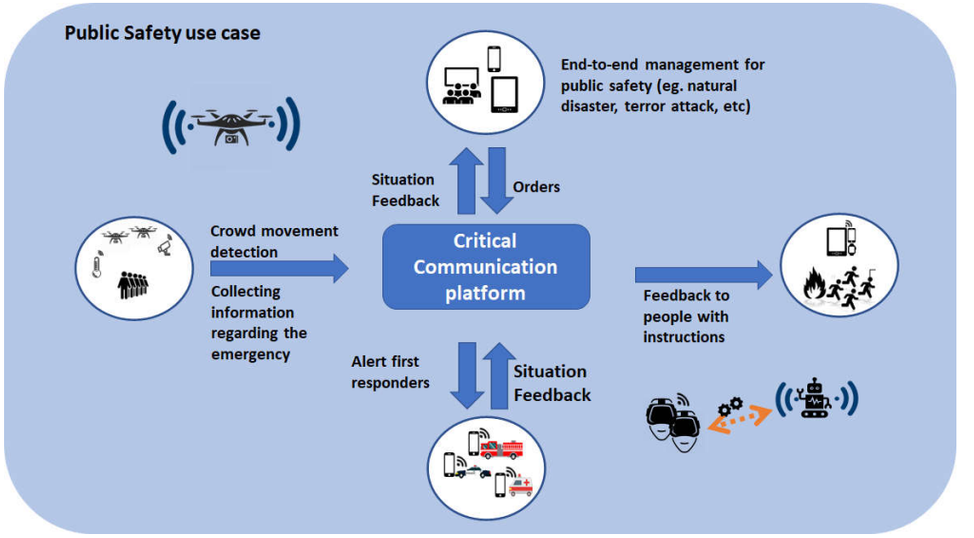




UC3: Public Safety

Need for B5G/6G

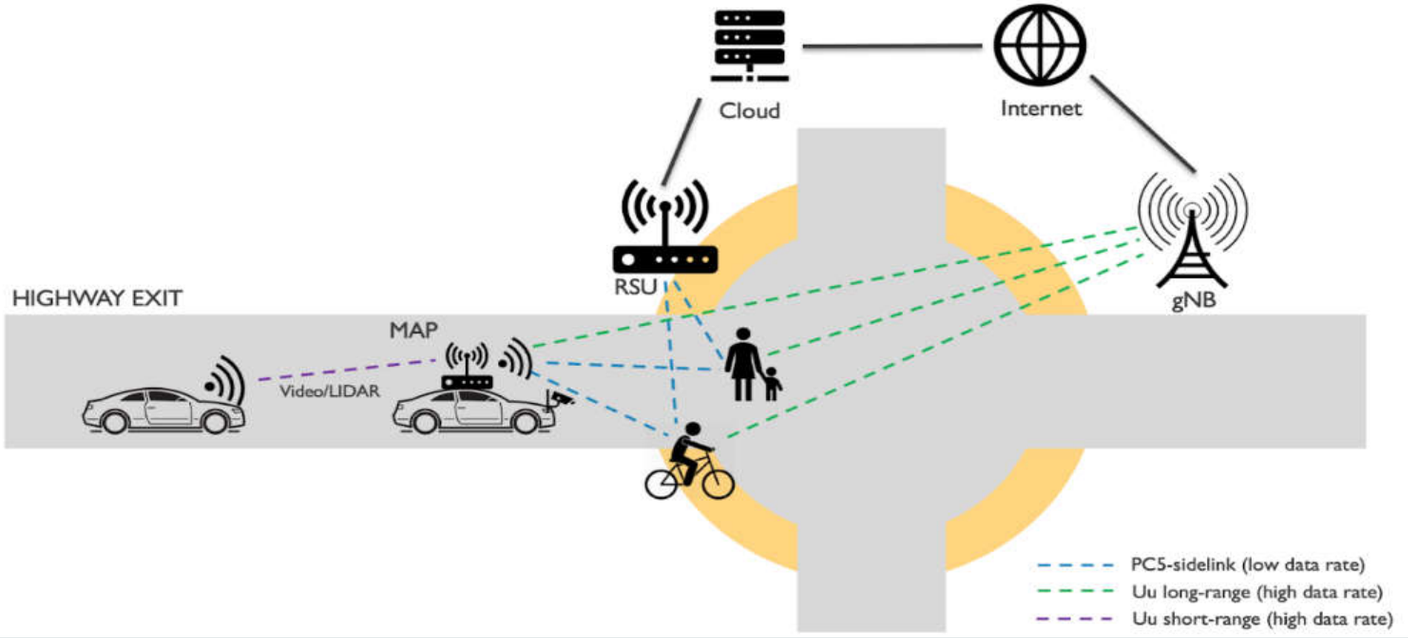
- *Need for **extremely** reliable and efficient **communications*** to respond to natural or man-made disasters.
- Infrastructure **availability anytime, anywhere**



- **Mobile access points (MAPs)** deployed in the area of interest in order to create an ad-hoc mobile network for dynamic coverage and connectivity extension.
  - **Monitoring** of the area of interest while alleviating the congestion of public networks
- **End-to-end management** of events threatening public safety
- **Innovative devices and human interfaces**, such as AR vision, and AI enabled applications to provide First Responders with augmented connectivity and interactions capabilities for situational awareness and mission efficiency.

UC4: Smart Highway

Smart Highway is a use case that benefits from beyond 5G connectivity for connected and autonomous mobility. In this use case, the **smallest possible delay and ultra-reliability in communications between road users are expected to allow safety on the roads**. This use case will leverage the use of cars and roadside infrastructures as edges. In addition, cars that are by nature mobile, will also be exploited as *Mobile Access Points* (MAPs).



Safety at the intersection

Need for B5G/6G
Imperceptible end-to-end latency and response time
Minimal energy and resource consumption
Smart distribution of road services in a multi-level edge infrastructure
Expansion of the communication environment in an ultra-real time