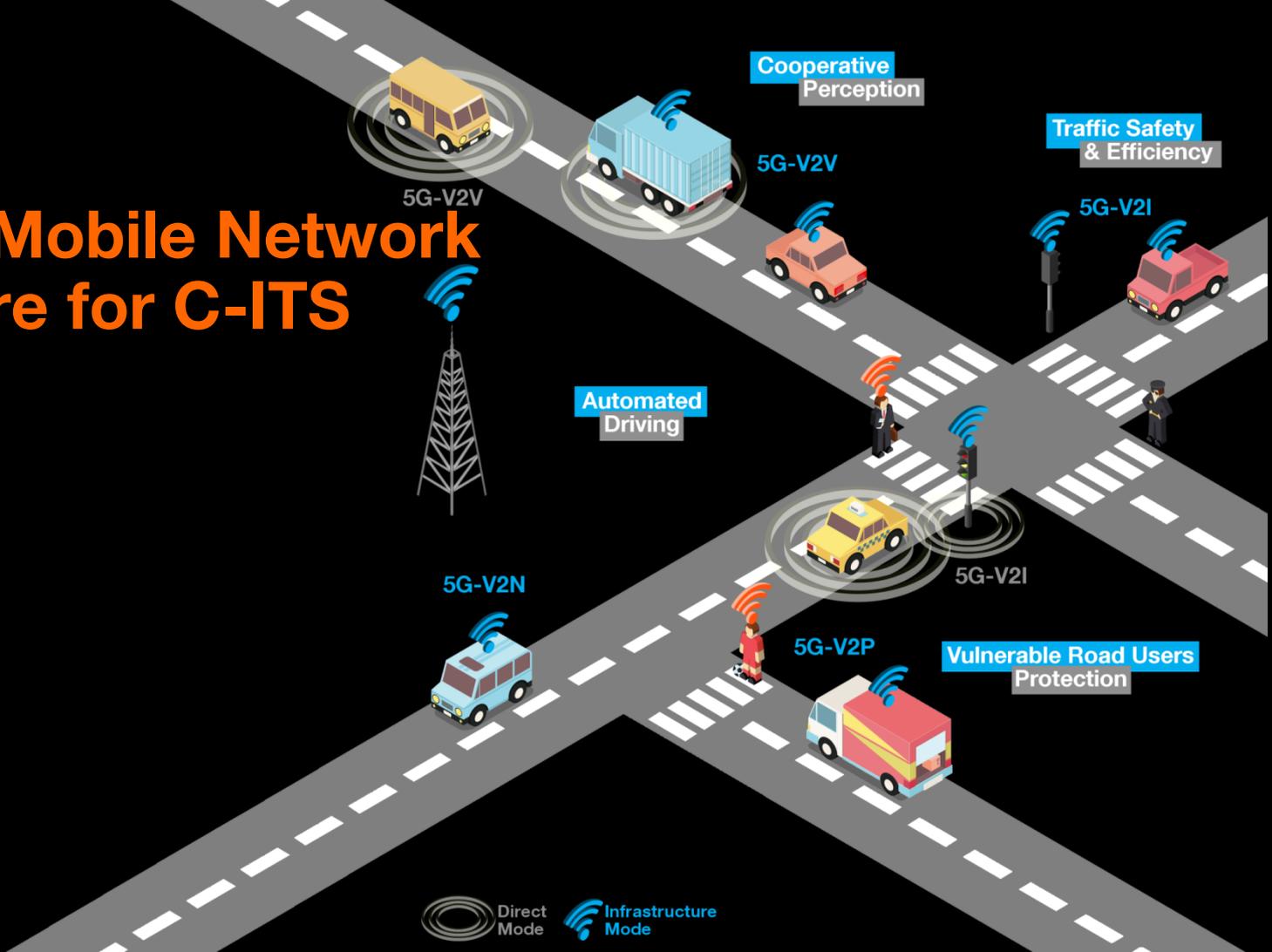


Orange

Leveraging Mobile Network Infrastructure for C-ITS

5GAA Event Paris
July 9th 2018



Orange Key Figures

IoT Connectivity for Automotive

€41 billion
in revenue in 2017



16
million
connected
objects



152,000
employees

220 countries
where Orange Business
Services is present

21,000
collaborators
dedicated
to corporate
activities

450,000 km
of undersea cables

enough to go around
the earth 10 times



45%
M2M SIMs
are in connected
cars



29 local
networks
in Europe
and Africa

4G in 18
countries

500+
roaming
networks

700
IoT and
Big Data experts



273m
customers
worldwide



1,600
Cloud
Experts



1,200
Cyber- Security
experts



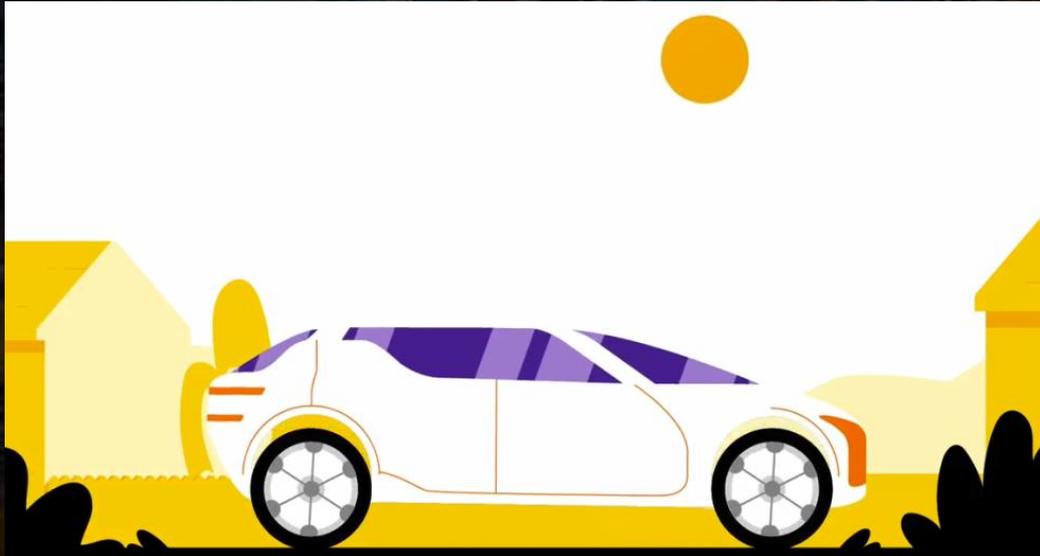
182
Start-ups
supported as
part of the Orange
Fab program

Orange Business Services IoT for Automotive

Orange IoT for Automotive

Our Vision for Mobility as a Service

Powering the connected
vehicles of the future:



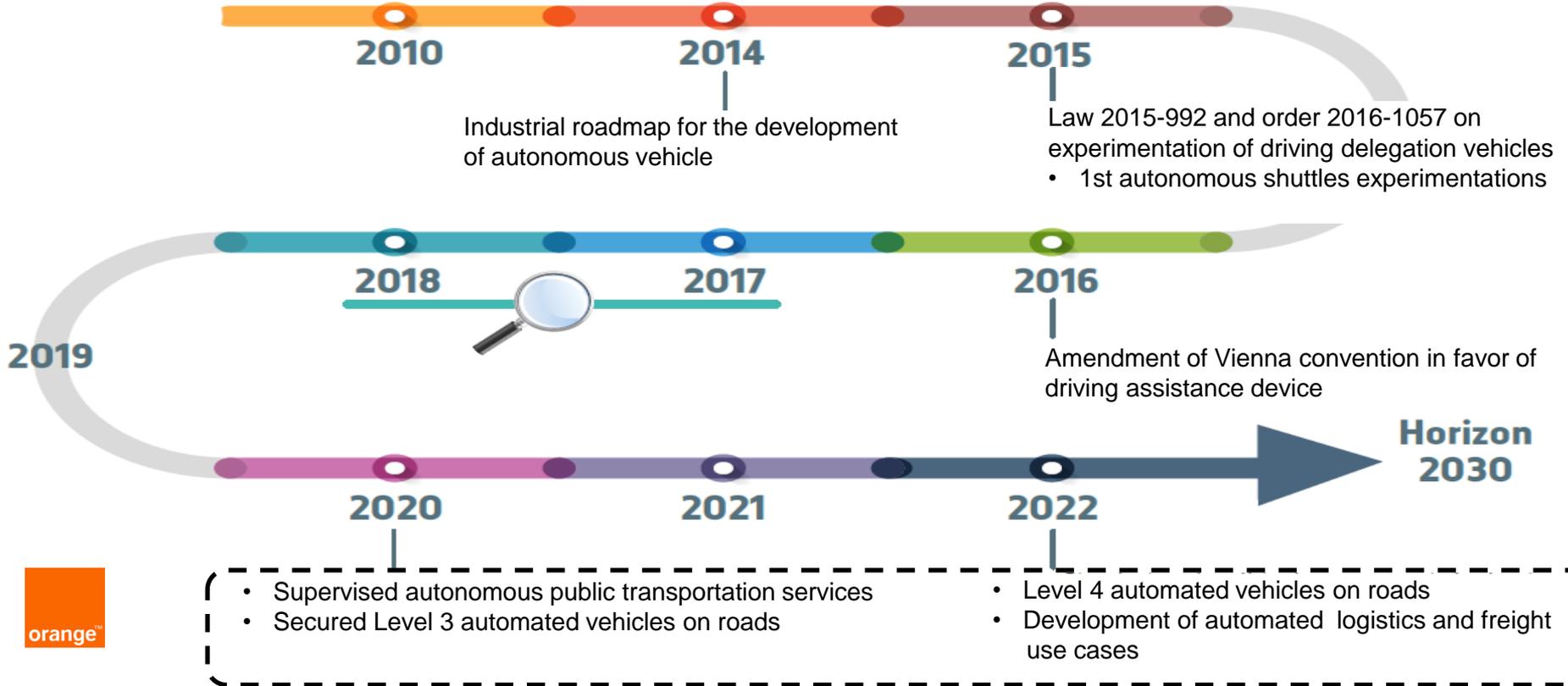
Wide Scope of Automotive Use Cases... ...Requiring Evolutive ITS Ecosystem

ITS service	Road Safety	Traffic Efficiency	Comfort/Mobility
	Danger warning on the road (vehicle stopped, vehicle in reverse, emergency braking, red light violation)	Dynamic information of road traffic	Multimodal Trabsport
	Collision avoidance (risk of intersection or longitudinal collision)	Contextual speed	Interactive POI (point of interest)
	Vulnerable User Protection	On board vehicle display	audio/video streaming
	CACC (cooperative assisted cruise control) platooning	Real time guiding	Fletet management
	EB (Emergency Breaking)	Traffic jam/information about alternative road	Smart cities services
	See through , bird's eye view	Road works	electro mobility
	Police signaling, firefighters and ambulances in emergency response	EV charging	ebusiness services
	Telediagnosics and remote maintenance for vehicles (real time / non real time)	Traffic Map (Dynamic Local mapping)	Public transportation services
	Lane insertion assistance, automated overtaking	GLOSA (green light optimal speed advice)	Interactive and cooperative parking

French Framework for Autonomous and Connected Vehicles

Strategic Directions for Public Action (by Anne-Marie IDRAC)

Source: Report of 05/14/2018 on « Development of Autonomous Vehicles »



How a MNO Can Help the ITS Ecosystemto Emerge in the Future

LTE-based V2N already covers many use cases

- Traffic information, notifications, incremental map updates, OTA firmware updates
- Wide expanding coverage

V2V and V2I will rollout in the coming years

- Low range and / or low latency use cases
- also available outside cellular coverage

Leverage on existing and future 4G/5G V2N evolutions to complement V2V /V2I and address most (all ?) of the use cases

- C-V2X as a promising enabler to make the « glue » between V2N and V2V/V2I
- leveraging on V2X evolutions brought by 5G : incremental approach from 4G to 5G, network slicing

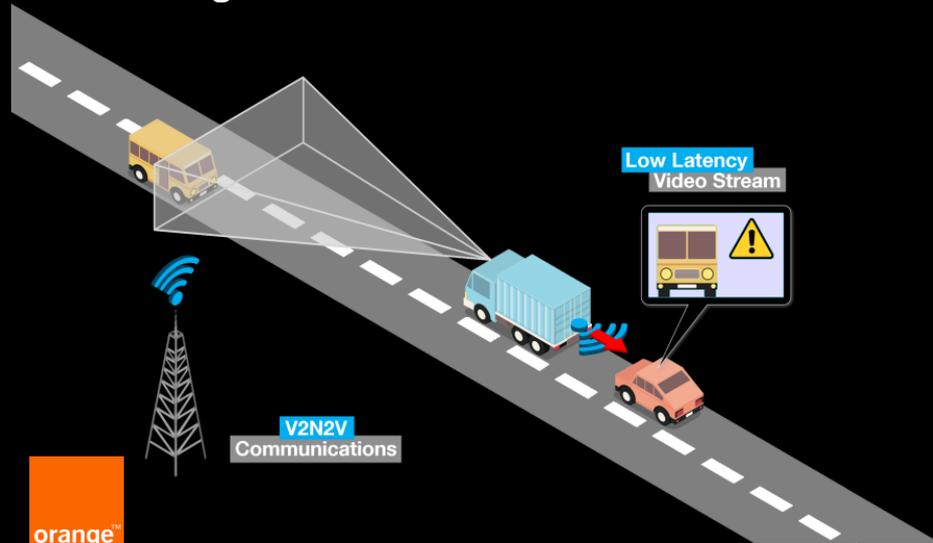
Testing 5G Network Technologies for V2N Use Cases & Applications

V2N / V2V Complementarity: « See Through » Example (V2N2V)

Experimentation performed on the French test track: partnership between Orange and Ericsson

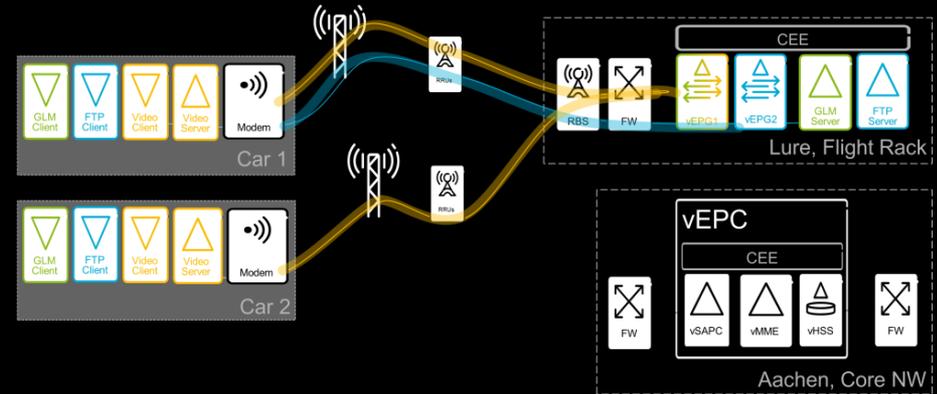
Use case

see through, an overtake assistant based on real time high definition video transmission



Network configuration

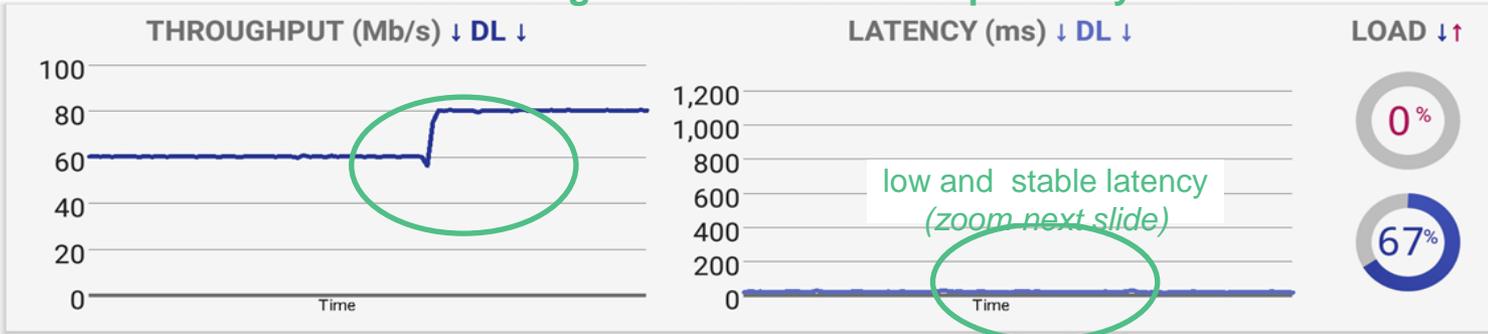
Slice 1: uRLLC in local breakout for see through
Slice 2: Mobile broadband background traffic



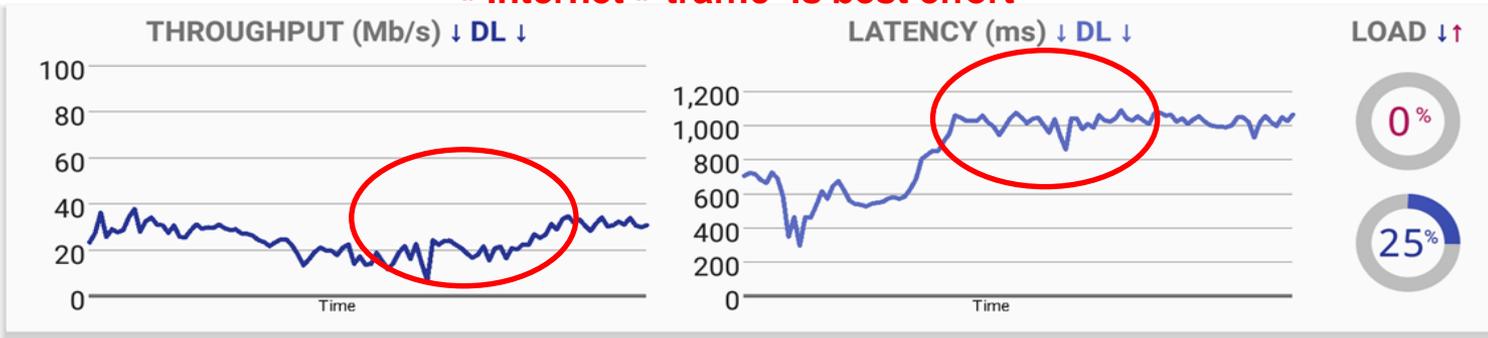
Network Performances in V2N2V

Throughput & Latency per Slice

« See through » is considered as priority traffic



« Internet » traffic is best effort

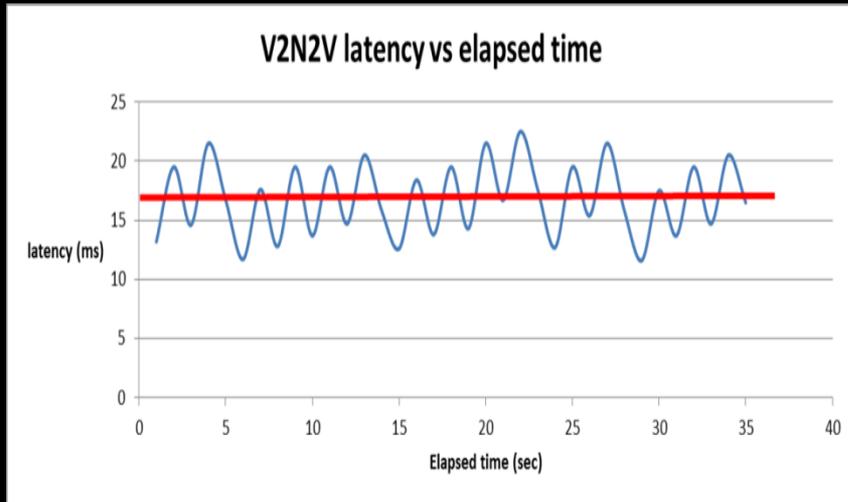


Network Performances in V2N2V

Some Results for Latency & Throughput in V2N2V

Measurements of latency and throughput in V2N2V communications

Average V2N2V latency of 17ms and downlink throughput of 100Mbps (cat. 3 UE)



V2N2V latency *versus* elapsed time



3D curve for V2N downlink throughput

Main Outcomes & Stakes

V2N Augmenting and Complementing V2V and V2I

Main Outcomes

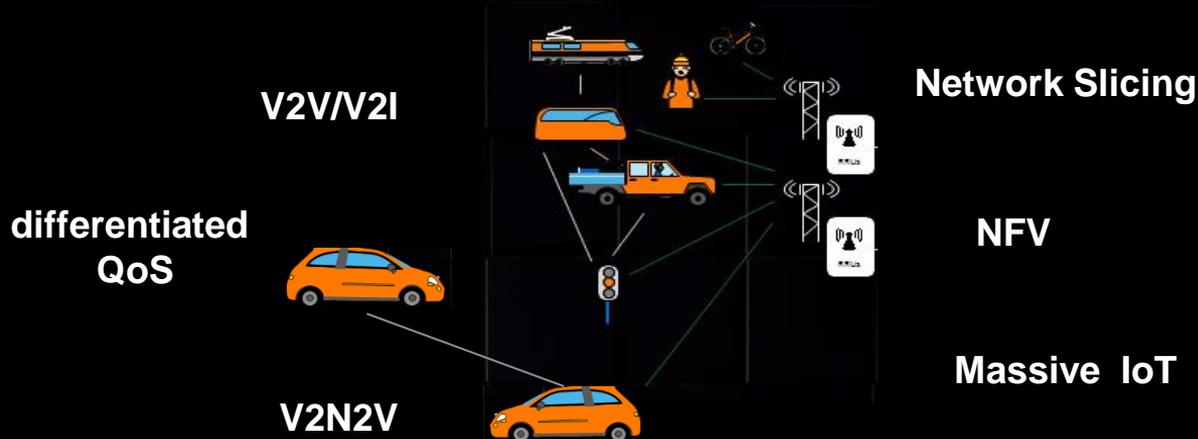
- **Network Functions Virtualization** provides flexibility and enables edge deployment
- Split of data and control plane with **local breakout** reduces the delay
- **Network slicing** brings **advanced QoS** in the management of the differentiated traffic

What's at stake?

- QoS preservation for demanding automotive use cases
- **Interworking** in roaming conditions with **standardized** architectures
- Integration/**Cooperation** of C-V2X ecosystem with MNO Infrastructure

Next Steps (2/2) :

- Continue the work with **telecom & automotive regulatory bodies, automotive industry, road operators and telecom industry** in order to co-build the most suitable conditions for C-ITS
 - Technology neutrality in the 5,9 GHz band is a good approach to take into account current uncertainties on business models
 - Actors' models need to be further discussed/tested among all interested parties
- Understand how **V2N and MNO infrastructures can efficiently help ITS ecosystem**



Next Steps (2/2) :

- **Evaluation of C-V2X ecosystem:**
 - Connectivity, Security and Services
 - Contribute and disseminate results of European Projects such as 5G Car (end by mid-2019)
- **Cooperation** (OEMs, Tiers-1, SOC makers) for the testing and the deployment of V2X scenarii and autonomous driving in a realistic managed environment such as CEVA (Centre d'Essai pour Véhicules Autonomes) at Montlhéry
- Assess the **opportunity** of field trials in public domain for advanced V2X scenarii

