5G Automotive Association, pioneering digital transformation in the automotive industry

Connectivity for automotive: why 5GAA?

CONNECTIVITY is key to service capabilities, e.g.:
- Telephony/eCall
- Road safety (e.g., hazard warnings)
- Remote services
- Fleet monitoring & diagnostics
- Map and software updates
- Entertainment, video conferencing and gaming

CONNECTIVITY requires multi-stakeholder cooperation

CONNECTIVITY must be global…
- as vehicles are sold globally
- but regional flavours are required (e.g., China, US, EU, etc.)

OUR MISSION is to
- align all global stakeholders
- foster and initiate future connectivity solutions

Connected mobility for people, vehicles and transport infrastructure

5GAA bridges the automotive and telecommunication industries in order to address society's connected mobility needs, bringing inclusive access to smarter, safer and environmentally sustainable services and solutions, integrated into intelligent road transportation and traffic management.

AUTOMOTIVE INDUSTRY

Vehicle Platform, Hardware and Software Solutions

TELECOMMUNICATIONS

Connectivity and Networking Systems, Devices & Technologies

5GAA: a global cross industry association

10 of the top 15 OEMs   **8** of the top 10 MNOs   **2** top smartphone vendors

Today, 5GAA unites **117 members** from around the world working together on all aspects of C-V2X

Q3 2024

In September 2016, **8 companies** teamed to create the 5G Automotive Association (5GAA) to help develop, test, and promote 5G standards

SEPT 2016

5GAA strategic objectives and priority areas

SAFER

SMARTER

ENVIRONMENTALLY FRIENDLY

Services and Solutions

Digital Roads

Ensure traffic managers and other infrastructure owners are integrated in the V2X ecosystem and share data, information and services.

Digital Vehicles

Ensure vehicles get connected, share relevant data, and deliver safer, smarter and greener services to the drivers.

Digital Users

Ensure smart devices are integrated in the V2X ecosystem and contribute to protect Vulnerable Road Users.

Trust

Bring trust between people, vehicles, and infrastructure as well as markets, policymakers, and stakeholders.

### Connectivity and flexible Architecture

Ensure V2X fully embraces connectivity and architecture opportunities and help the V2X ecosystem to closely follow the evolution of radio and network technologies and standards.

C-V2X has two complementary communication modes

C-V2X Mobile Network Communications (Uu)

V2N/I2N/P2N in licensed spectrum bands designated for mobile network communication
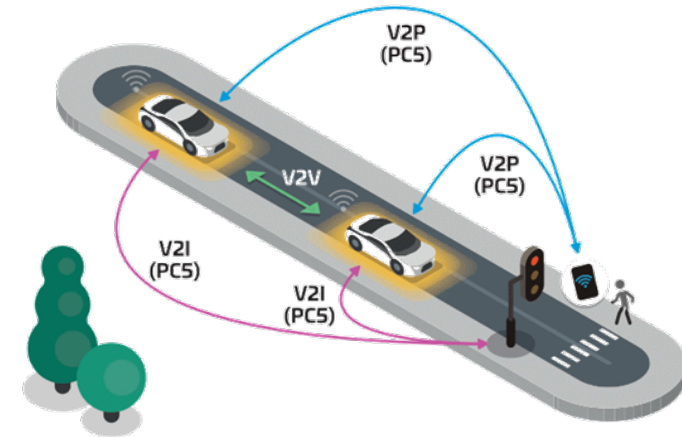
- ✓ Long range (>1 kilometer)
- ✓ Implemented over "Uu interface"
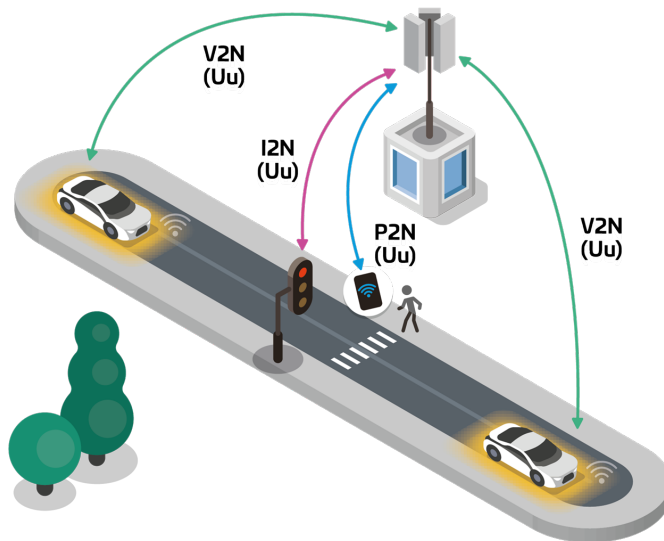
C-V2X Direct Communications (PC5)

V2V, **V2I**, and **V2P** operating in ITS bands (e.g. 5.9 GHz) independent of cellular network

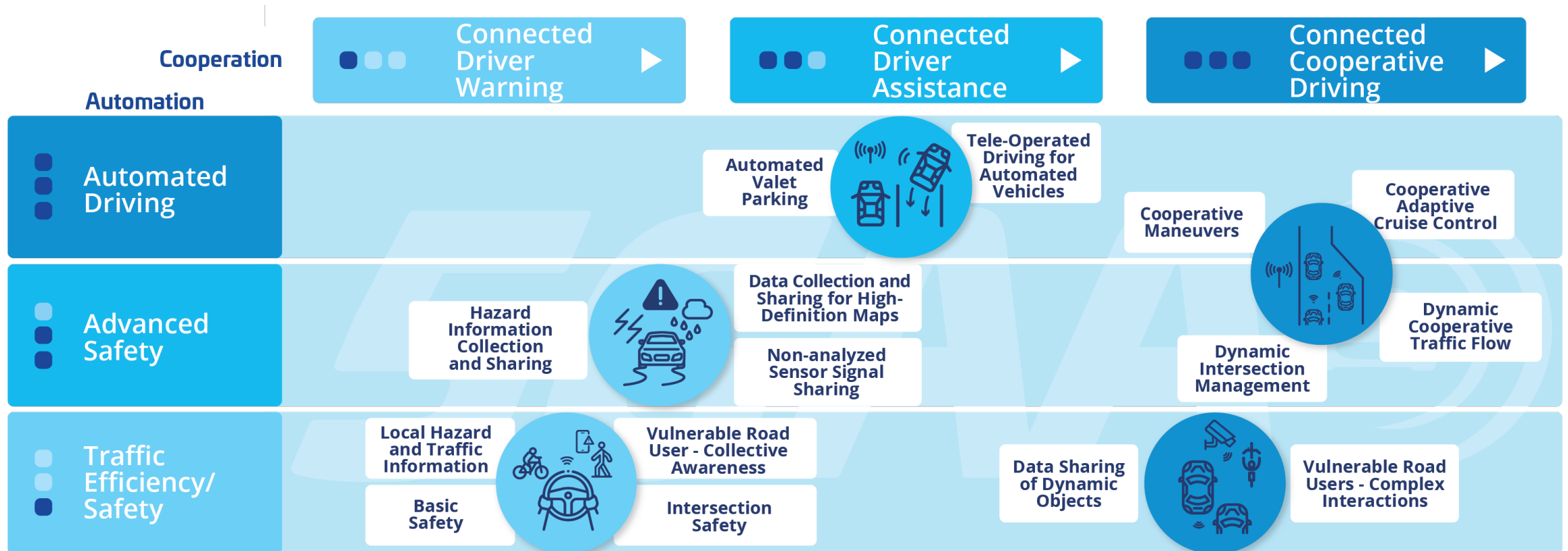- ✓ Short range (<1 kilometer)
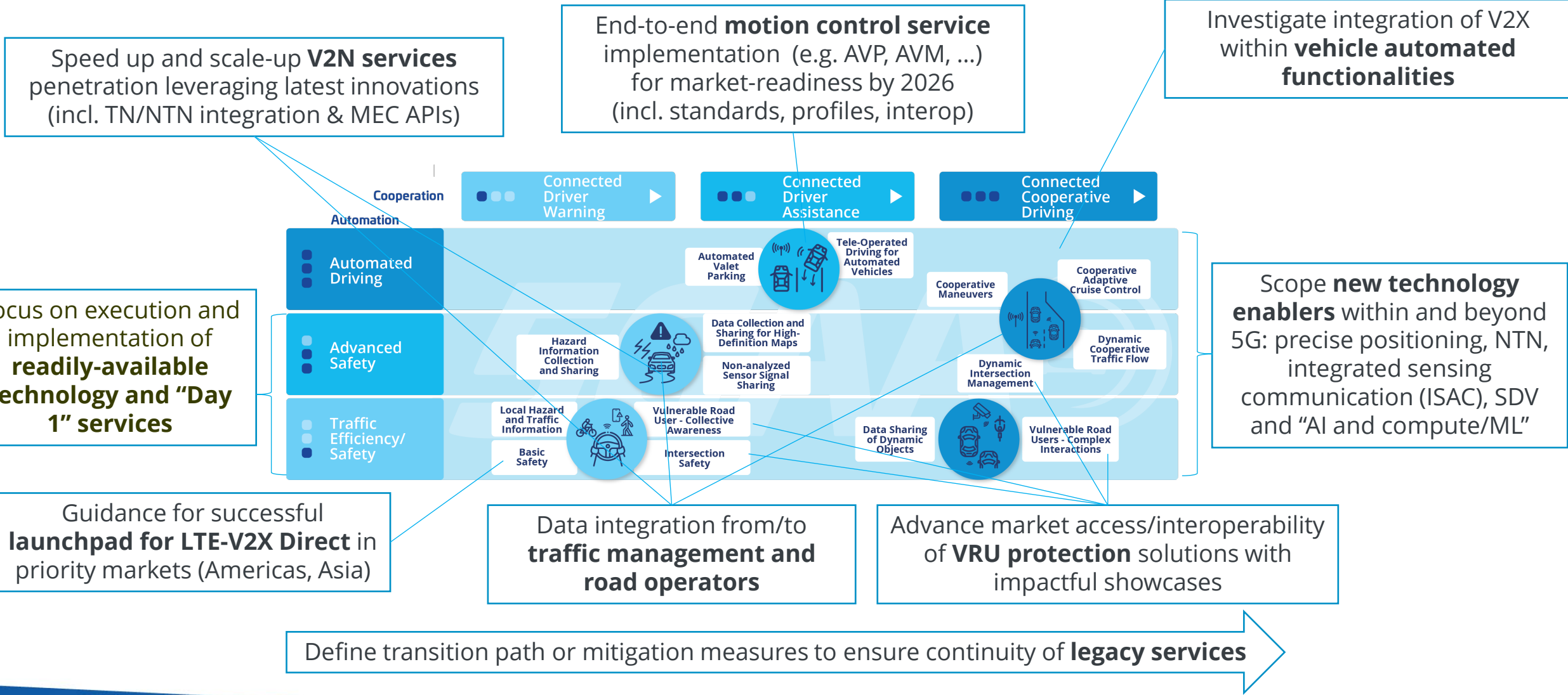- ✓ Implemented over "PC5 interface"

5GAA Visionary Roadmap and Use Cases

Evolution of C-V2X use cases towards connected cooperative driving

5GAA work programme 2024-2025 priorities based on C-V2X Roadmap

Speed up and scale-up **V2N services** penetration leveraging latest innovations (incl. TN/NTN integration & MEC APIs)

End-to-end **motion control service** implementation (e.g. AVP, AVM, …) for market-readiness by 2026 (incl. standards, profiles, interop)

Investigate integration of V2X within **vehicle automated functionalities**

Focus on execution and implementation of **readily-available technology and "Day 1" services**

Scope **new technology enablers** within and beyond 5G: precise positioning, NTN, integrated sensing communication (ISAC), SDV and "AI and compute/ML"

Cooperation

Automation

| Connected Driver Warning ▶ | Connected Driver Assistance ▶ | Connected Cooperative Driving ▶ |

Automated Driving
- Automated Valet Parking
- Tele-Operated Driving for Automated Vehicles
- Cooperative Maneuvers
- Cooperative Adaptive Cruise Control

Advanced Safety
- Hazard Information Collection and Sharing
- Data Collection and Sharing for High-Definition Maps
- Non-analyzed Sensor Signal Sharing
- Dynamic Intersection Management
- Dynamic Cooperative Traffic Flow

Traffic Efficiency/ Safety
- Local Hazard and Traffic Information
- Basic Safety
- Vulnerable Road User - Collective Awareness
- Intersection Safety
- Data Sharing of Dynamic Objects
- Vulnerable Road Users - Complex Interactions

Guidance for successful **launchpad for LTE-V2X Direct** in priority markets (Americas, Asia)

Data integration from/to **traffic management and road operators**

Advance market access/interoperability of **VRU protection** solutions with impactful showcases

Define transition path or mitigation measures to ensure continuity of **legacy services**

C-V2X Definition

C-V2X

(direct & mobile network communications)

| LTE-V2X	5G-V2X
4G-LTE mobile network communications (starting with Rel-8)	**5G-NR mobile network communications** (starting with Rel-15)
LTE-V2X direct communications (starting with Rel-14)	**NR-V2X direct communications** (starting with Rel-16)

C-V2X
(direct & mobile network communications)

LTE-V2X	5G-V2X
4G-LTE mobile network communications (starting with Rel-8)	**5G-NR mobile network communications** (starting with Rel-15)
LTE-V2X direct communications (starting with Rel-14)	**NR-V2X direct communications** (starting with Rel-16)
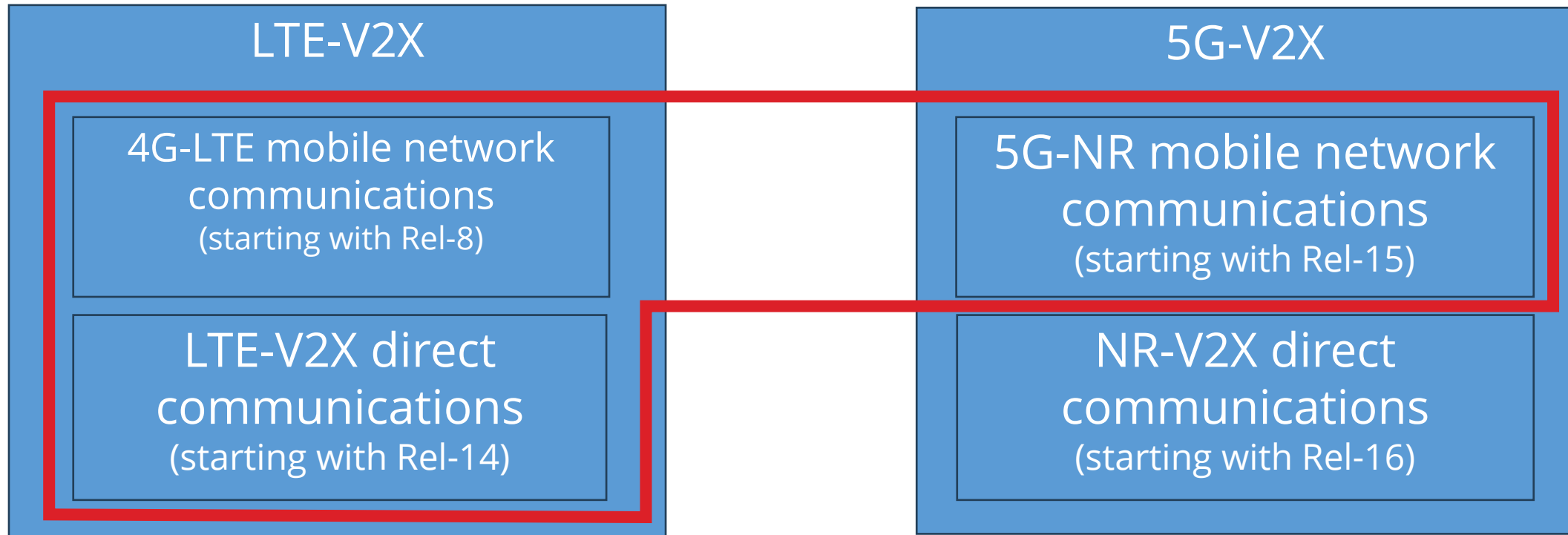
Current China Deployment Scenario with only 20 MHz allocated to LTE-V2X Direct

US Deployment Scenario with 30 MHz allocated to LTE-V2X Direct

Korean Deployment Scenario with 20 MHz allocated to LTE-V2X Direct

5GAA Automotive Association

C-V2X status in Europe and US

USA:

- US V2X Deployment Plan published; aiming at 50% V2X connected urban intersections and highways by 2029

- US FCC decided on new allocation of 5.9GHz ITS spectrum in favor of C-V2X, after reducing ITS spectrum from 75 MHz to 30 MHz

- Ongoing deployment of C-V2X infrastructure across states, e.g., Colorado, Virginia, Georgia, Texas, etc.

- DSRC equipment sunset mid-2024

- Increasing interest behind cellular connectivity called "beyond 5.9 GHz"

EU:

- License exempt tech neutral 5.9 GHz spectrum for safety-related services

- C-ITS Delegated Act was rejected by EU Council (member states) in 2019 to support tech neutrality

- Cross-OEM/operator/border 5G corridor projects

- Exchange of safety related information between OEMs: Data for Road Safety

- 5G Spectrum regulations in some countries with obligations on road coverage

C-V2X status in Japan, Korea and China

JAPAN:
- ITS spectrum (760 MHz, 5.8 GHz etc.) is in use for V2V and ETC
- The 5.9 GHz spectrum is currently not for ITS, utilised by the broadcast industry
- Study due 2026 on harmonisation of ITS spectrum with other global regions

KOREA:
- 70MHz allocated as ITS spectrum in 5.9GHz band
- MOLIT and MIIT made final technology decision in 2023 in favor of LTE-V2X (20 MHz)
- Full scale national wide deployment plans are pending

CHINA:
- 20 MHz in 5.9GHz spectrum allocated for commercial deployment of LTE-V2X
- Up to 30 Largest C-V2X field tests in many provinces –100.000s vehicles involved
- Major Chinese OEMs committed to launch C-V2X
- 14 new models released with C-V2X since end of 2021 (FAW, GM/SAIC, Ford, …)
- C-NCAP includes test cases related to C-V2X as of 2024

Role of NCAP to generalise adoption of C-V2X Direct

# V2X Global NCAP activity

China
- C-NCAP China New Car Assessment Program has been released on Jan 2024 with implementation on July 2024. The next protocol will be then in 2027.
- C-V2X is mentioned in 2 use cases.

US
- V2X is still not part of the NHTSA NCAP document.
- Automotive industry would perceive V2X introduction in NHTSA as a concrete sign.

Europe
- V2X is part of 2024 document but direct. communication is not needed for the test cases
- V2X is not part of 2026 milestone.
- EuroNCAP is waiting for more concrete V2X deployment and integration into ADAS/ADS before considering it for 2029 roadmap.
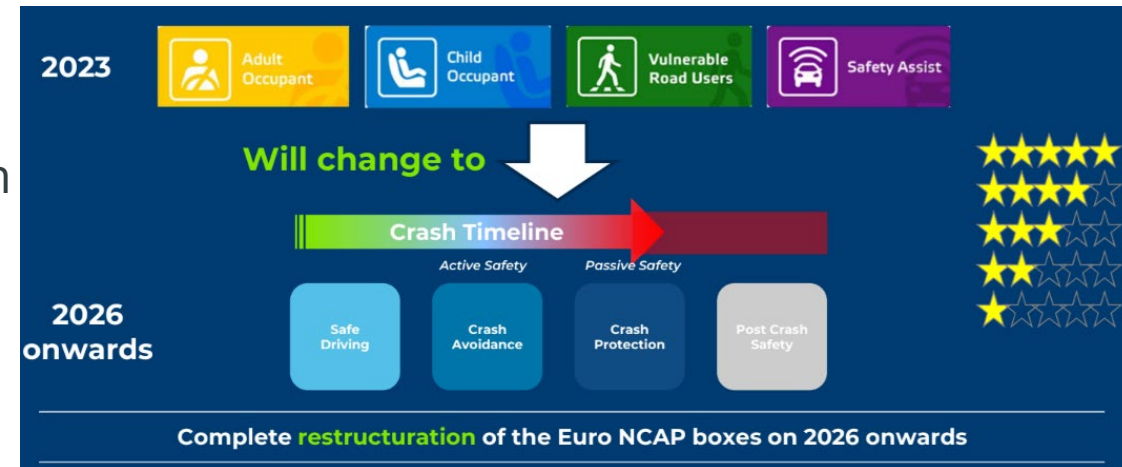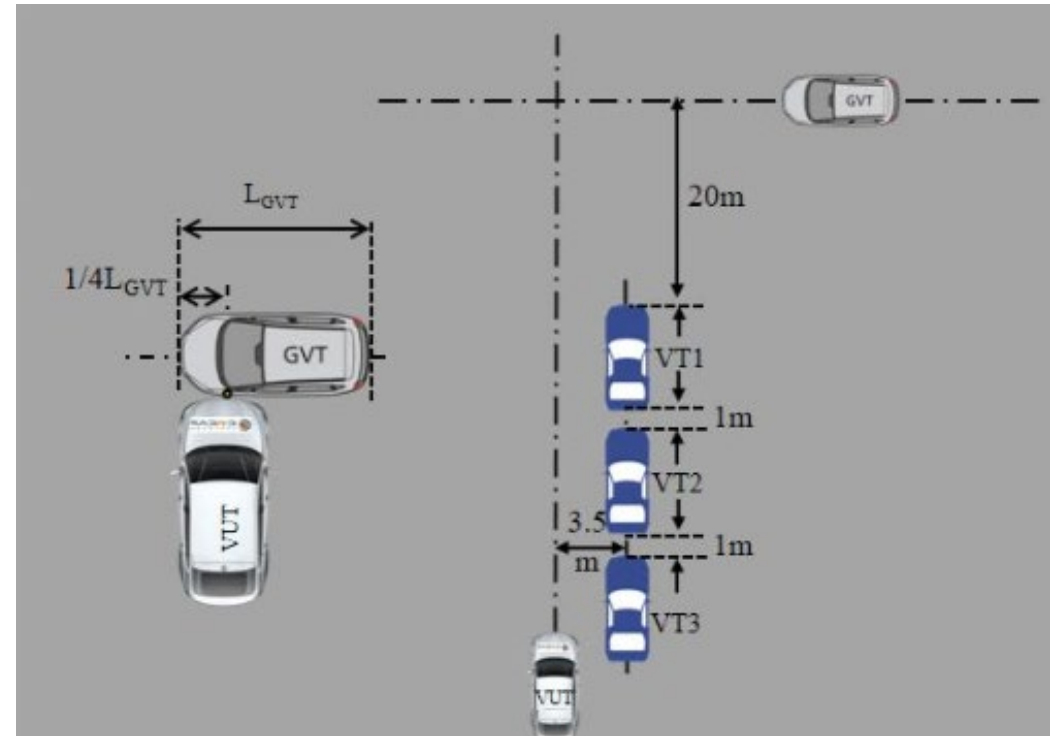
China C-NCAP MANAGEMENT REGULATION 2024

CCRH (High Speed Car to Car Rear)
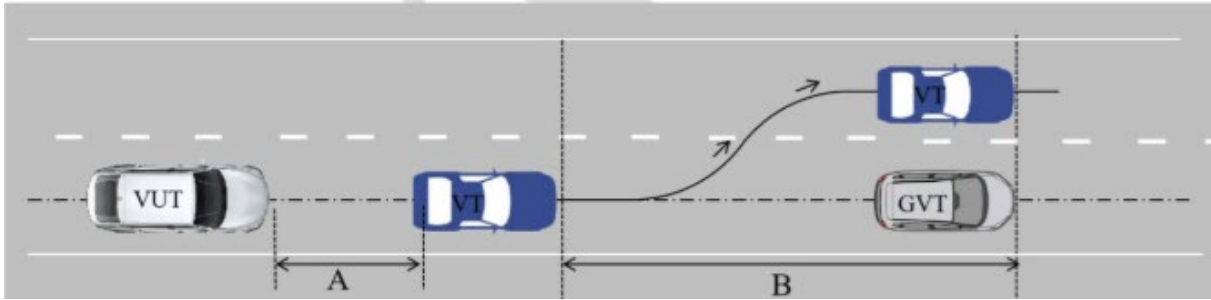
C2C SCPO (Car-to-Car Straight Crossing Path with Obstruction)

5GAA is monitoring attentively at the effect of the new C-NCAP test cases on V2X market uptake

The role of satellite-based communications

NTN – a crucial topic for 5GAA

- Connectivity as a key enabler

- 7 work groups and up to 20 work items (= internal projects)

- Intelligent transport systems for traffic safety and other digital services

- <u>Main added value of NTN:</u> Service Resilience:

  Mission critical services are benefitting from extended coverage, e.g.:
  - – Telephony / eCall
  - – Road safety
  - – Remote services
  - – Fleet monitoring & diagnostics
  - – Map & software updates
  - – Entertainment, video conferencing & gaming
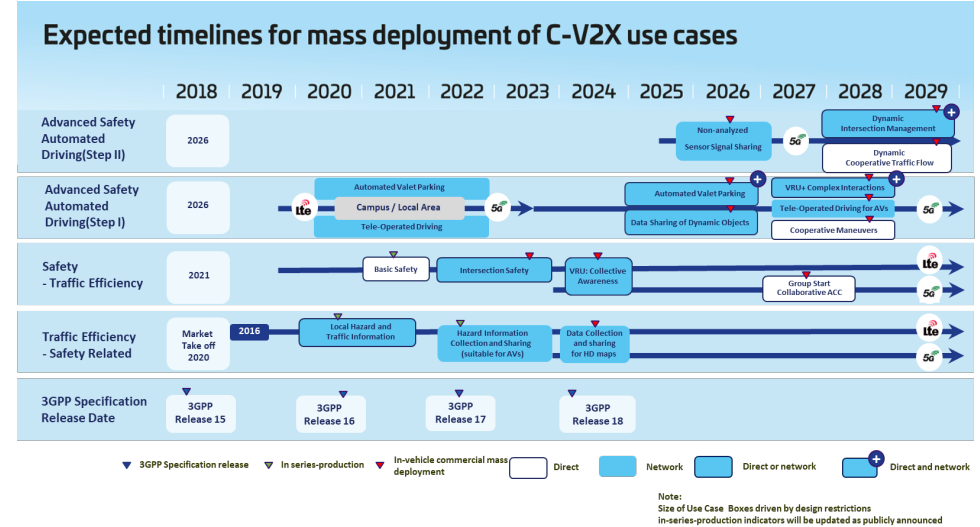
Courtesy of VOLVO Car Corporation