5G Automotive Association

Maxime Flament, CTO

07 Sept 2018

5GAA brings together automotive, technology and telecommunications companies to work closely together to develop end-to-end solutions for future mobility and transportation services

AUTOMOTIVE INDUSTRY

Vehicle Platform, Hardware and Software Solutions

TELECOMMUNICATIONS

Connectivity and Networking Systems, Devices and Technologies

End-to end-solutions for intelligent transportation, mobility systems and smart cities

5GAA: A Global Cross Industry Association

September 2016

- "Audi, BMW Group, Daimler AG are teaming with Ericsson, Huawei, Intel, Nokia, and Qualcomm to create the 5G Automotive Association (5GAA), which will help develop, test, and promote 5G standards"
- "Scope of the alliance is focused on bringing connectivity solutions to market addressing technical, business, and regulatory challenges"

Q3 2018

- 5GAA unites 90+ members working together to:
  - Deliver innovation for road safety, connectivity and sustainability
  - Accelerate cooperative, connected, automated mobility
  - Develop 360º solutions for SMART mobility services
  - Pave the way towards 5G mobility

5GAA Automotive Association

Airgain
AMERICAN TOWER
ANALOG DEVICES
ALPINE
Anritsu
envision:ensure
AT&T
Audi
Bai 百度
BAIC GROUP
Bell
BlackBerry
BMW GROUP
BOSCH
CETECOM
千方科技
CHINA TRANSINFO
中国移动
China Mobile
China unicom
Continental
The Future in Motion
Cohda Wireless
commsignia
DAIMLER
DANLAW
DEKRA
DENSO
Dt&C
ERICSSON
Faraday Future
FAREASTONE
FEV
Ford
Fraunhofer
GEELY
gemalto
security to be free
Hirschmann Car Communication
TE
HITACHI
Inspire the Next
HUAWEI
HONDA
HYUNDAI
MOTOR GROUP
iDIRECT
Infineon
intel
INTERDIGITAL
JAGUAR
LAND ROVER
JUNIPER
NETWORKS
KDDI
KEYSIGHT
TECHNOLOGIES
kt
Laird
LG
LEAR
CORPORATION
Imt
MITSUBISHI ELECTRIC
Changes for the Better
muRata
NAVINFO
Neusoft东软
NIO
NISSAN
MOTOR CORPORATION
NOKIA
noris network
NTT docomo
OKI
orange
P3
Panasonic
proximus
PSA
GROUPE
QUALCOMM
ROHDE&SCHWARZ
ROHM
SAMSUNG
SAVARI
SAIC 上汽集团
SAIC MOTOR
SGS
SK telecom
嘉定·上海国际汽车城
Anting · Shanghai International Automobile City
SKYWORKS
SMART MOBILE LABS
SoftBank
SUMITOMO ELECTRIC
T
Telefónica
A1 Telekom Austria Group
TELUS
TERRANET
TÜVRheinland
Valeo
VENIAM
verizon
VIAVI
vodafone
Volkswagen
VOLVO
WNC
Wistron NeWeb Corp.
ZF
ZTE

Semiconductor suppliers

大唐电信科技产业集团
HUAWEI
intel
muRata
ROHM SEMICONDUCTOR
SKYWORKS
QUALCOMM
SAMSUNG

Wireless Radio Suppliers

ANALOG DEVICES
Cohda Wireless
commsignia
DANLAW
gemalto
HITACHI Inspire the Next
HUAWEI
INTERDIGITAL
LEAR CORPORATION
Laird
Neusoft东软
OKI
SAVARI
P3
TERRANET

Automotive Tiers Telematics

ALPINE
BOSCH
Continental The Future in Motion
DENSO
infineon
LG
MITSUBISHI ELECTRIC Changes for the Better
Panasonic
Valeo
ZF

Mobile Device manufacturers

HUAWEI
SAMSUNG

Vehicle Manufacturers

Audi
北汽集团 BAIC GROUP
BMW GROUP
DAIMLER
Ford
GEELY
HONDA
HYUNDAI MOTOR GROUP
JAGUAR
LAND ROVER
NISSAN MOTOR CORPORATION
PSA GROUPE
SAIC 上汽集团 SAIC MOTOR
Volkswagen
VOLVO
Faraday Future

Mobile network operators

SoftBank
千方科技 CHINA TRANSINFO
SK telecom
China unicom中国联通
AT&T
T··
中国移动 China Mobile
Telefónica
KDDI
FAR EASTONE 遠傳
kt
TELUS
A1 Telekom Austria Group
orange
vodafone
verizon
proximus
NTT docomo

Mobile network suppliers

ERICSSON
HUAWEI
NOKIA
noris network
JUNIPER NETWORKS
iDIRECT
Panasonic
VIAVI
SUMITOMO ELECTRIC
AMERICAN TOWER
WNC Wistron NeWeb Corp.

Others (research, etc)

Airgain
Anritsu envision:ensure
FEV
Bell
SMART MOBILE LABS
Fraunhofer
Hirschmann Car Communication
TE
VENIAM
KEYSIGHT TECHNOLOGIES

Test and verification

TÜVRheinland
Dt&C
DEKRA
CETECOM
ROHDE&SCHWARZ
SGS

Public bodies & Testbeds

嘉定·上海国际汽车城

5GAA Automotive Association

*5GAA CTO membership slide – not-binding

Set up 5GAA - Our Organisational Structure

BOARD

EXECUTIVE COMMITTEE

GENERAL ASSEMBLY

WG1	WG2	WG3	WG4	WG5
Use Cases and Technical Requirements	System Architecture and Solution Development	Evaluation, Testbeds and Pilots	Standards and Spectrum	Business Models and Go-To-Market Strategies

Recent 5GAA WI reports and other documents

WG1

- T-170215 Use Case and KPI requirements: Prioritization and Timeline; Interims Status – V1.0
- R1-1809720 LS on Prioritised Use Cases and Requirements for consideration in Rel-16 NR-V2X

WG2

- A-170209 Regional upper-layer specification alignment with 3GPP ITS-Cellular lower layers
- A-170222 Evaluation of available architectures
- A-170272 Sensor data sharing technical report for V2X applications
- A-170277 ETSI-ITS V2X application specification alignment with C-V2X access layer (RASAC-ETSI); Part 1: Upper layers specifications; Part 2a: C-V2X Access layer ; Part 2b: C-V2X Congestion Control
- A-180174 E2E evaluation of V2X Use Cases

WG3

- P-170125 High Level Plan for C-V2X Trials in North America
- P-170155 Simulated Radio Link and System Level Performance Comparison between C-V2X and DSRC
- P-170165 Survey on ITS Testbeds, Trials, Simulation Frameworks
- P-170166 Survey Report on ITS Activities
- P-180038 V2X Functional and Performance Test Procedures – Selected Assessment of Device to Device Communication Aspects
- P-180065 General Aspects and Strategy to Assess System Performance, Interoperability, and Conformance

WG4

- S-170116 A Standardisation Roadmap to 3GPP and other SDOs
- S-180167 ITS spectrum utilization in the Asia Pacific Region

WG5

- B-170109 Roadmap of monetiseable features and business models for LTE V2X – timeline for introduction of LTE V2X (V2V)
- B-180030 Timeline for deployment of LTE-V2X

Recent 5GAA White papers and Studies

White Papers

- ITS spectrum utilization in the Asia Pacific Region
- NGMN white paper on V2X
- Deployment of LTE-V2X
- Edge computing for advanced automotive communications

Studies

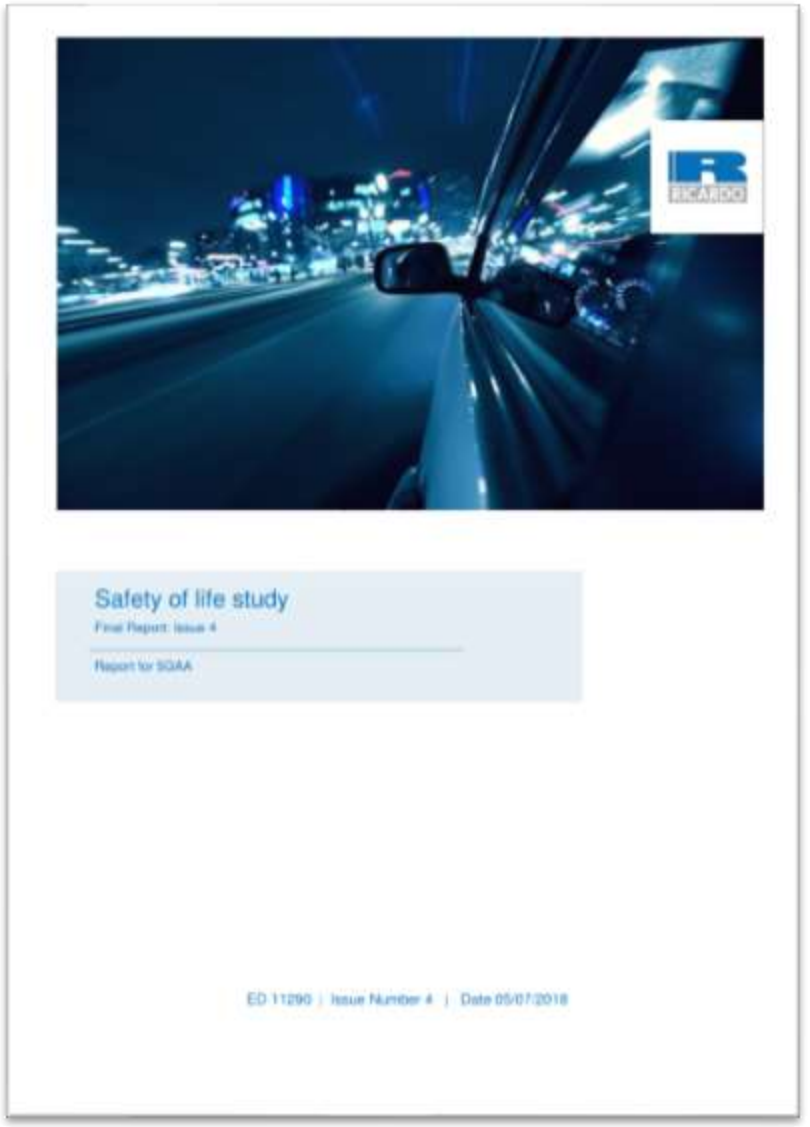
- The cost-benefit analysis on cellular vehicle-to-everything (C-V2X) technology and its evolution to 5G-V2X
- An assessment of LTE-V2X (PC5) and 802.11p direct communications technologies for improved road safety in the EU
- The Case for Cellular V2X for Safety and Cooperative Driving

Position papers

- CEO letter to the European Commission on Connected Car Legislation (24 CEO/CTO signatures)
- Coexistence of C-V2X and 802.11p at 5.9 GHz
- C-V2X to advance towards the next generation of North America's transportation network

NEW: Safety of Life Study

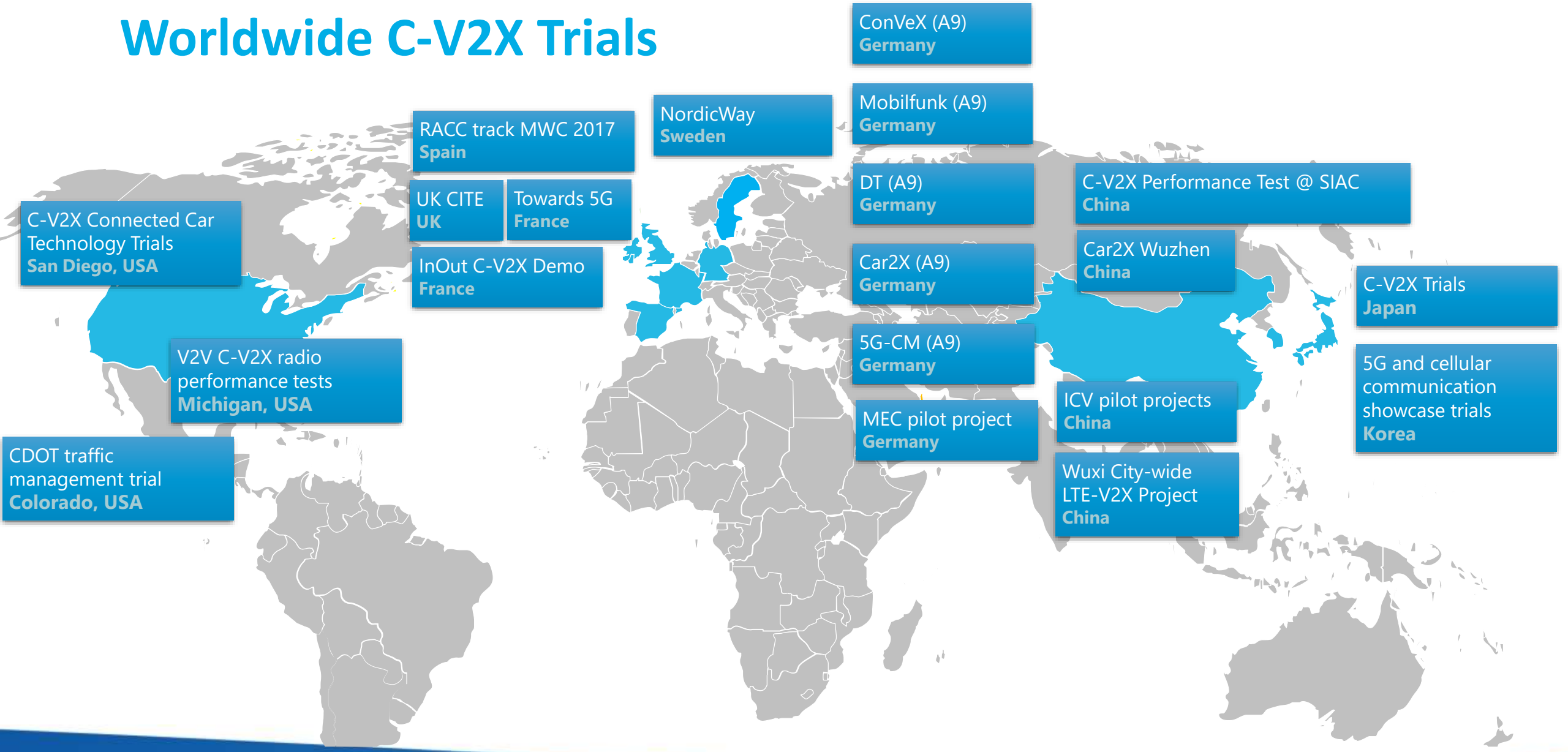
- Aim: explore the impact of different technical solutions for Cooperative Intelligent Transport Systems (C-ITS) communication solutions on EU road safety over time.
- Compare impact of LTE-PC5, LTE-Uu, and 802.11p
- Two major potentially live saving services:
  - Red signal violation/intersection safety,
  - Vulnerable Road User (VRU) protection.
- Highest impact are on LTE-Uu with 114,066 avoided fatalities and serious injuries by 2040
- Combined deployment of PC5 and Uu is very likely
- 802.11p shows lower impact as VRU protection is most likely not supported through smartphones



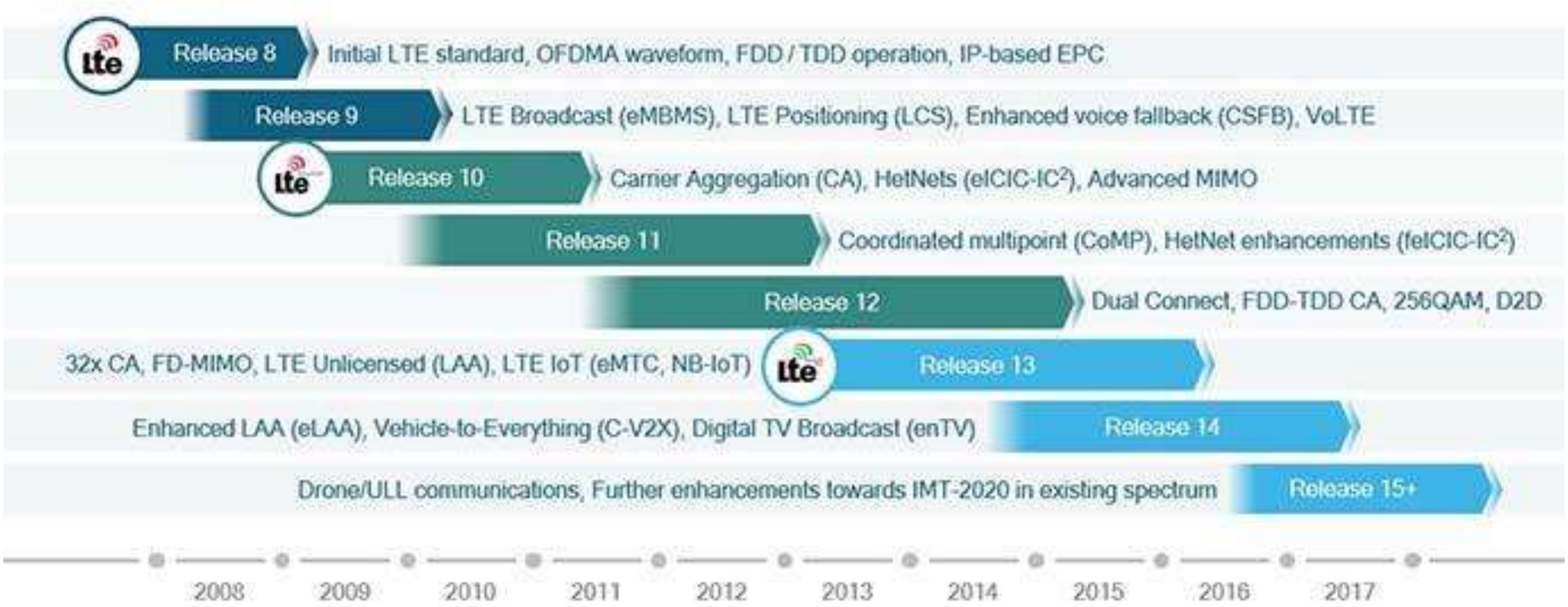
http://5gaa.org/wp-content/uploads/2018/07/Safety-of-life-study_Final_Issue-4.pdf

Approaches in the various regions in the world

Worldwide C-V2X Trials



Status LTE-V2X and 5G

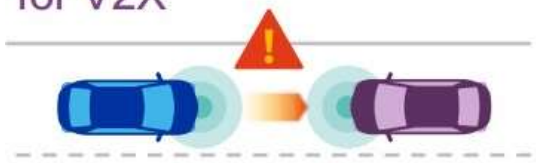

Release 8
Initial LTE standard, OFDMA waveform, FDD / TDD operation, IP-based EPC
Release 9
LTE Broadcast (eMBMS), LTE Positioning (LCS), Enhanced voice fallback (CSFB), VoLTE
Release 10
Carrier Aggregation (CA), HetNets (eICIC-IC²), Advanced MIMO
Release 11
Coordinated multipoint (CoMP), HetNet enhancements (feICIC-IC²)
Release 12
Dual Connect, FDD-TDD CA, 256QAM, D2D
32x CA, FD-MIMO, LTE Unlicensed (LAA), LTE IoT (eMTC, NB-IoT)
Release 13
Enhanced LAA (eLAA), Vehicle-to-Everything (C-V2X), Digital TV Broadcast (enTV)
Release 14
Drone/ULL communications, Further enhancements towards IMT-2020 in existing spectrum
Release 15+
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

And careful spectrum planning to support this evolution

Evolution to 5G,
while maintaining backward compatibility

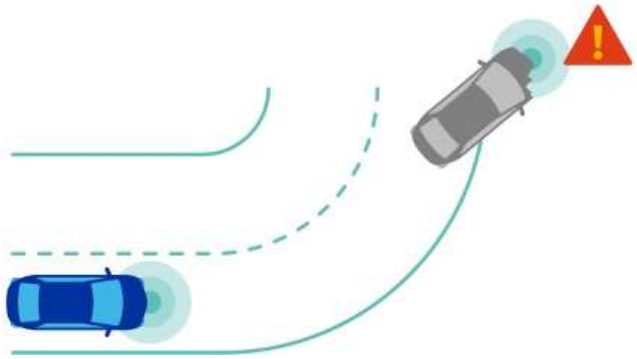
Basic safety
802.11p or C-V2X R14

Established foundation for V2X



Enhanced safety
C-V2X R14/15

Enhanced range and reliability



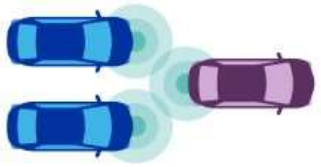
Advanced safety
C-V2X R16 (building upon R14)

Higher throughput

Higher reliability

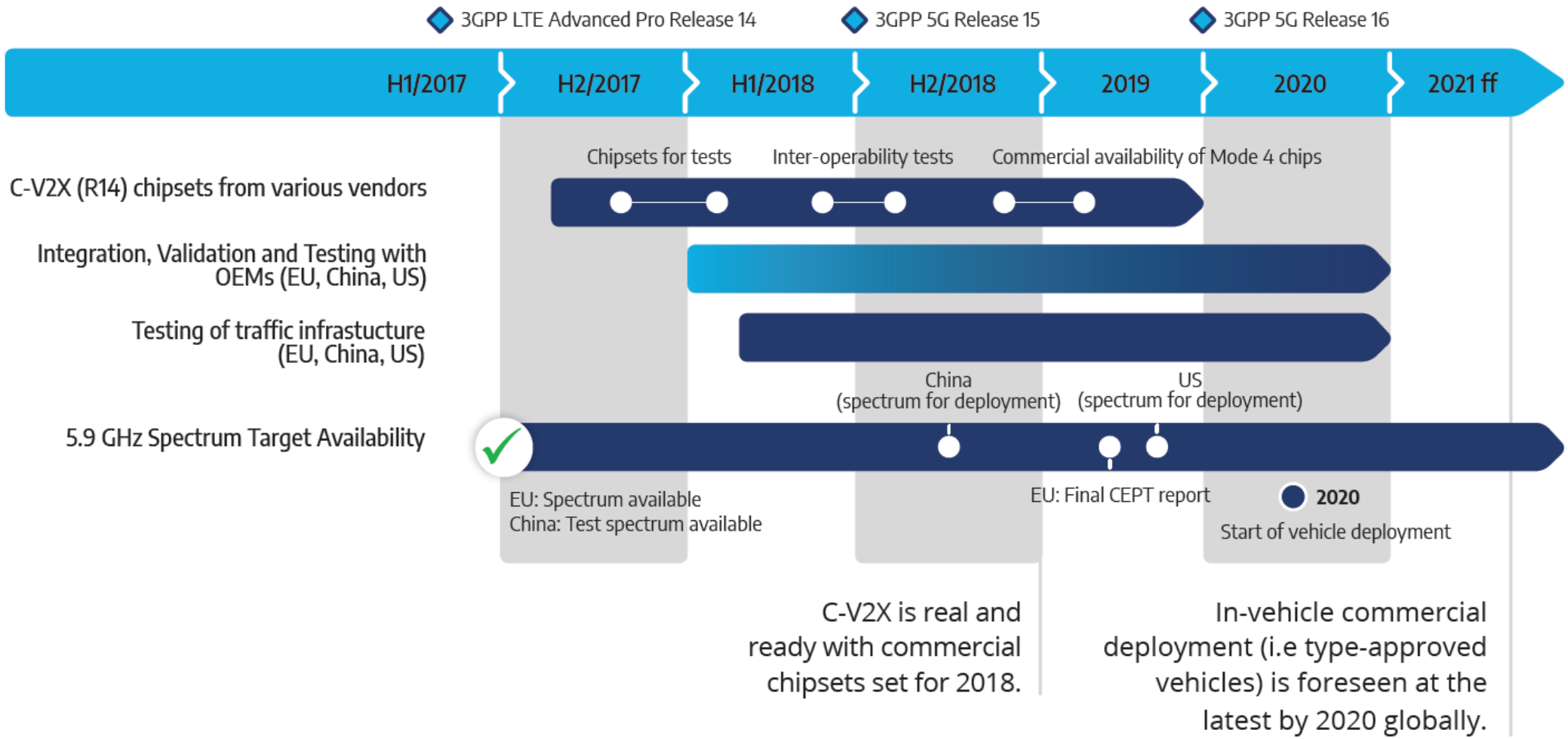
Wideband ranging and positioning

Lower latency

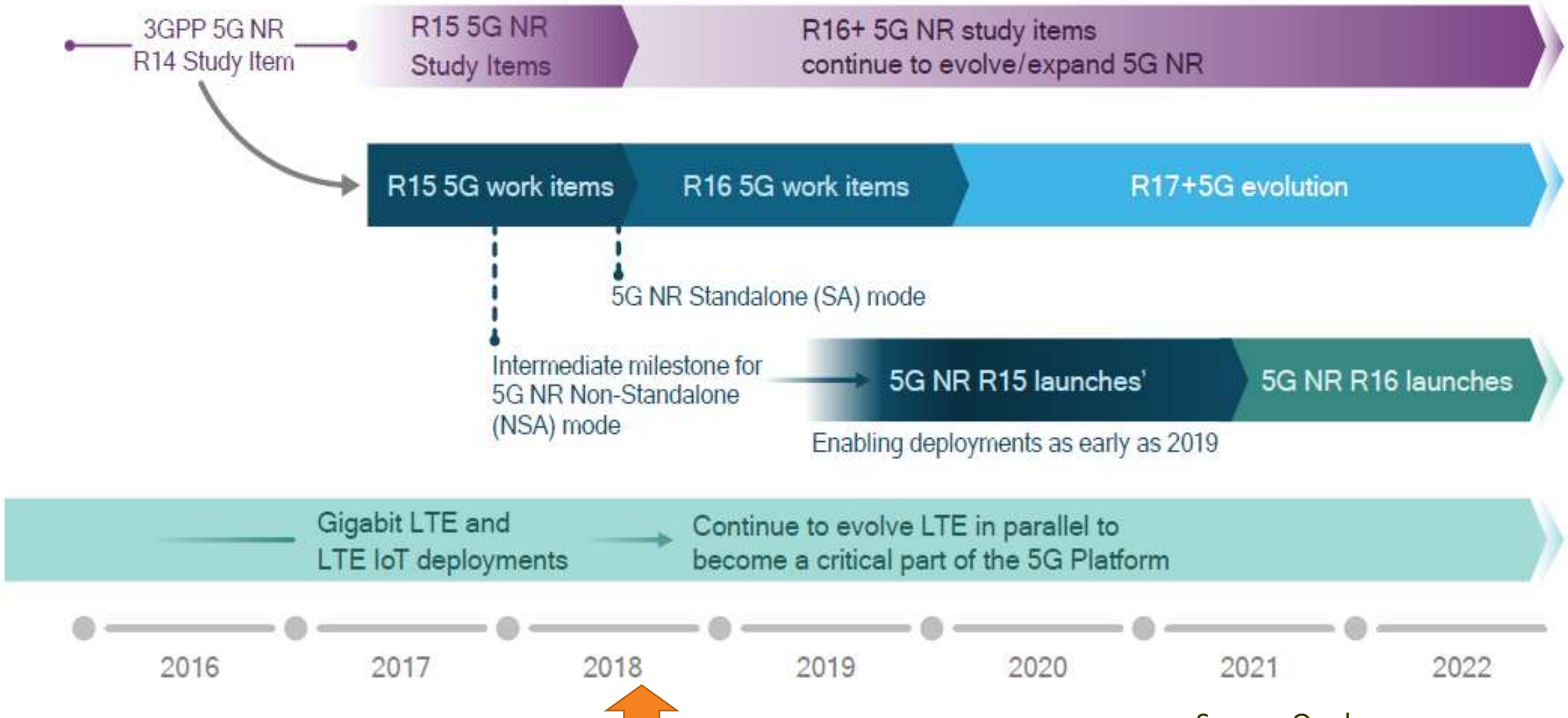


Source:Qualcomm

Timeline for deployment of C-V2X (V2V/V2I)



Accelerating 5G NR, the global standard for 5G



1. Forward compatibility with R16 and beyond

Source:Qualcomm

NR-V2X requirement as defined by 3GPP SA1 (TS22.186)

General requirements

Including lateral positioning, density, relaying, security, unicast

Platooning	Advanced Driving	Extended sensors	Remote driving
enables the vehicles to dynamically form a platoon travelling together	*enables semi-automated or full-automated driving*	*enables the exchange of raw or processed data gathered through local sensors or live video images*	*enables a remote driver or a V2X application to operate a remote vehicle*

RAN-related Summary

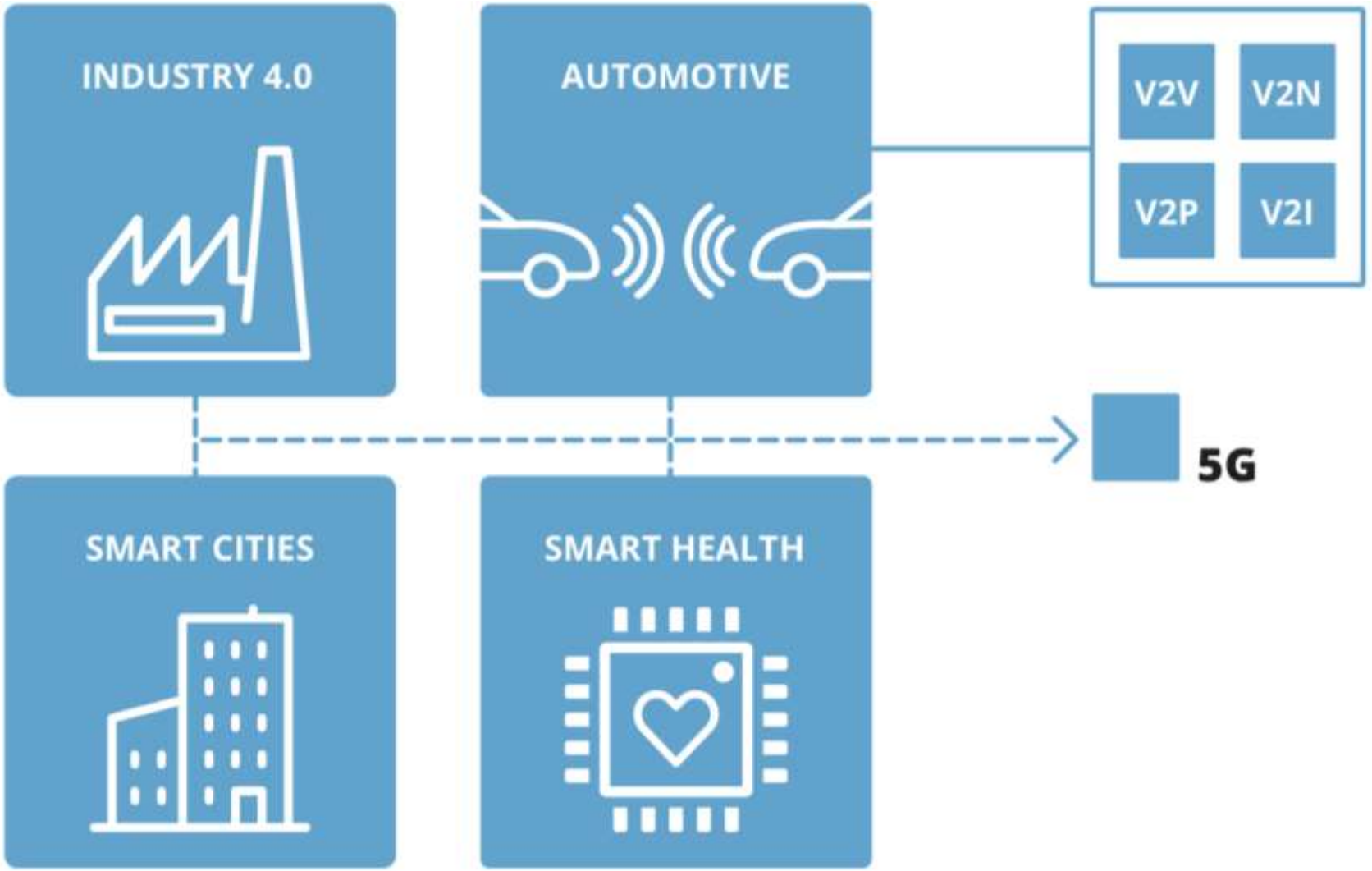
Based on SA1 KPIs

Higher Tx Rate	• 50 messages per second
Lower Latency	• 20ms for low degree of automation • 10 ms for high degree of automation • 5ms Uu for remote driving
Larger payload	• Up to 6500bytes for platooning, advanced driving
Higher data rate	• 10Mbps @ 1000m / 700Mbps @ 500m / 1Gbps @ 50m
Higher reliability	• 90 – 95% for low degree of automation of safety applications • 99.99 – 99.999% for high degree of automation of safety applications
Longer range	• Up to 1000m

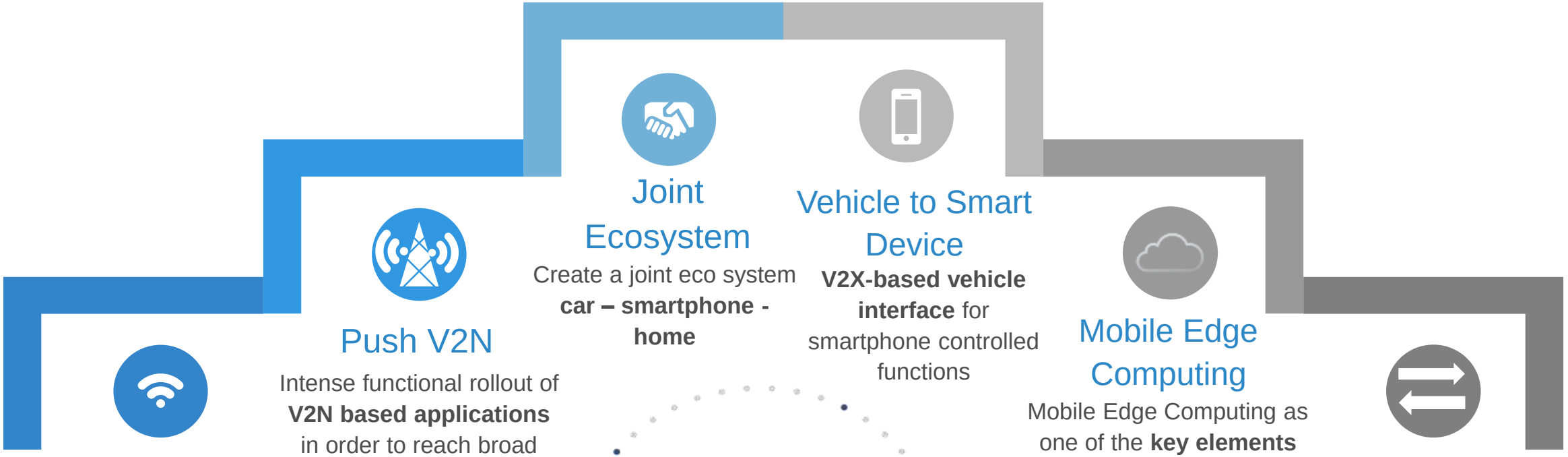
Strategic views on 5G

5G for Major Industry Verticals

C-V2X and its evolution to 5G V2X will foster synergies between the automotive industry and other verticals which are moving to 5G



Expanding 5GAA's strategy



New Radio

"Define the next step" - accelerate definition of **5G-V2X** based on 5G New Radio

Push V2N

Intense functional rollout of **V2N based applications** in order to reach broad penetration fast

Joint Ecosystem

Create a joint eco system **car – smartphone - home**

Vehicle to Smart Device

V2X-based vehicle interface for smartphone controlled functions

Mobile Edge Computing

Mobile Edge Computing as one of the **key elements of the connected future**

Interoperability

Make sure that **cross OEM** cars and **cross operator** networks **can „speak" with each other**

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Thank you!