V2X Stacks & Applications

V2X Product

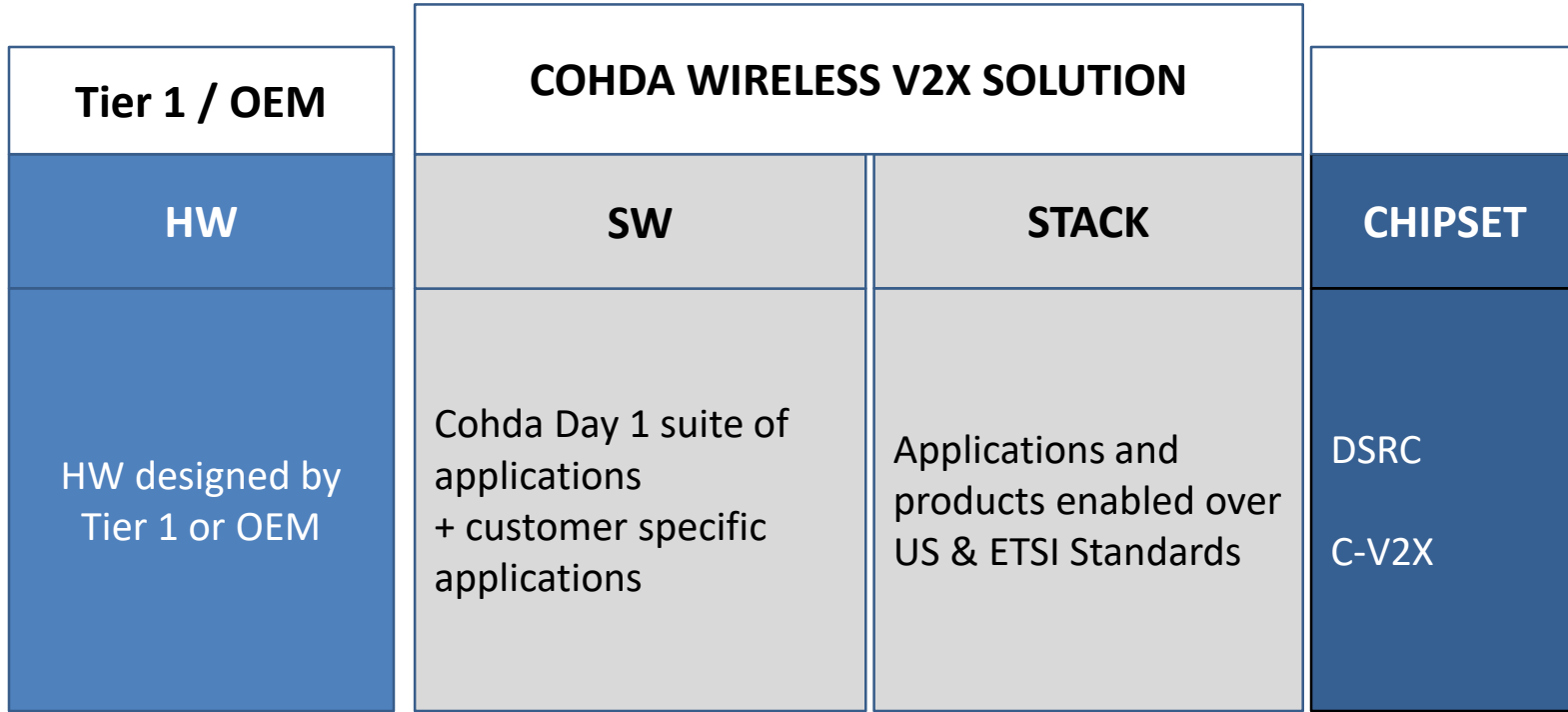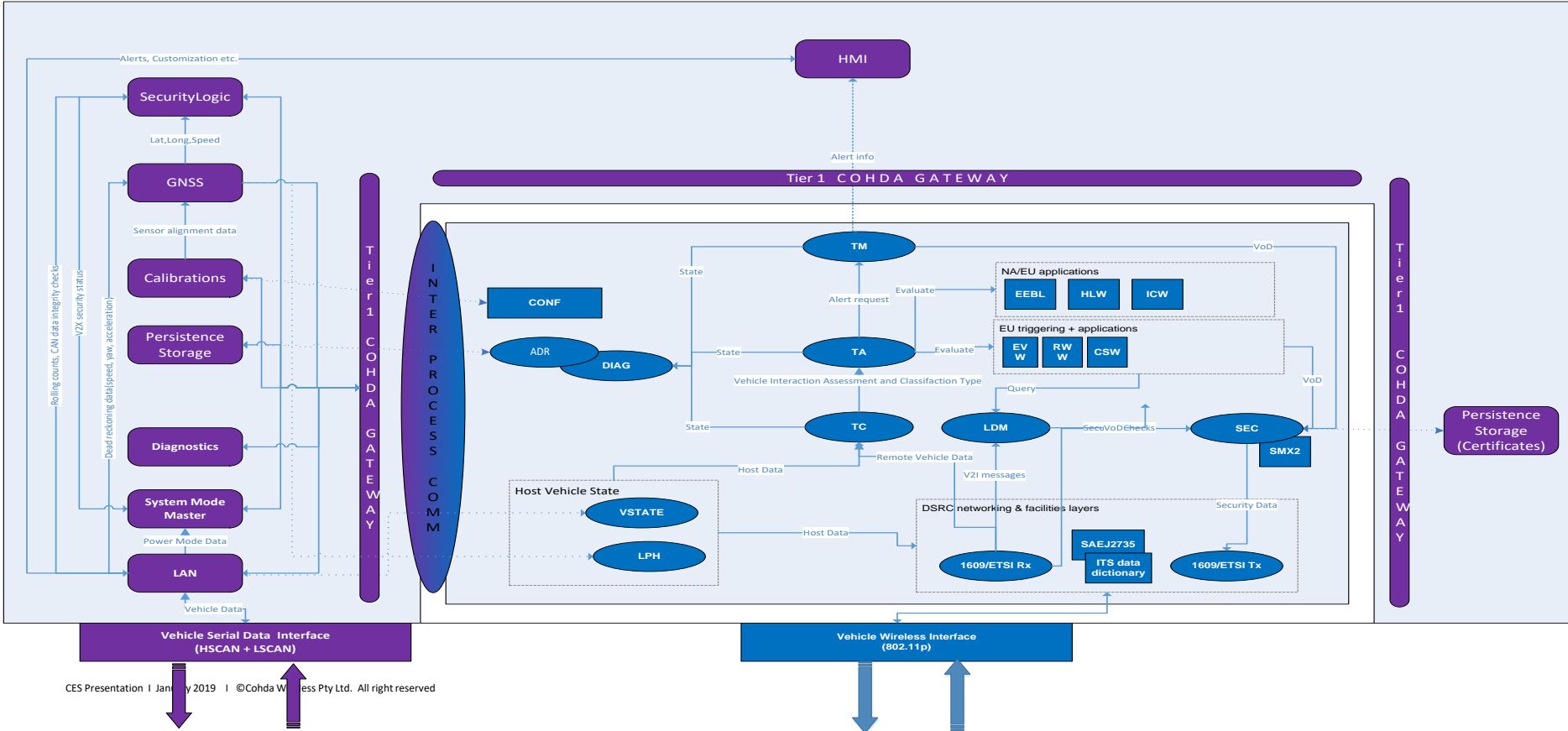| Tier 1 / OEM	COHDA WIRELESS V2X SOLUTION		
HW	**SW**	**STACK**	**CHIPSET**
HW designed by Tier 1 or OEM	Cohda Day 1 suite of applications + customer specific applications	Applications and products enabled over US & ETSI Standards	DSRC C-V2X

OEM Architecture

Application Layer

Cohda's V2X applications provide vehicles with '360-degree awareness', detecting hidden threats by extending the horizon of awareness beyond what the driver can see. By gathering and synthesising data from sensors Cohda's solutions are proven to create a much broader zone of awareness.
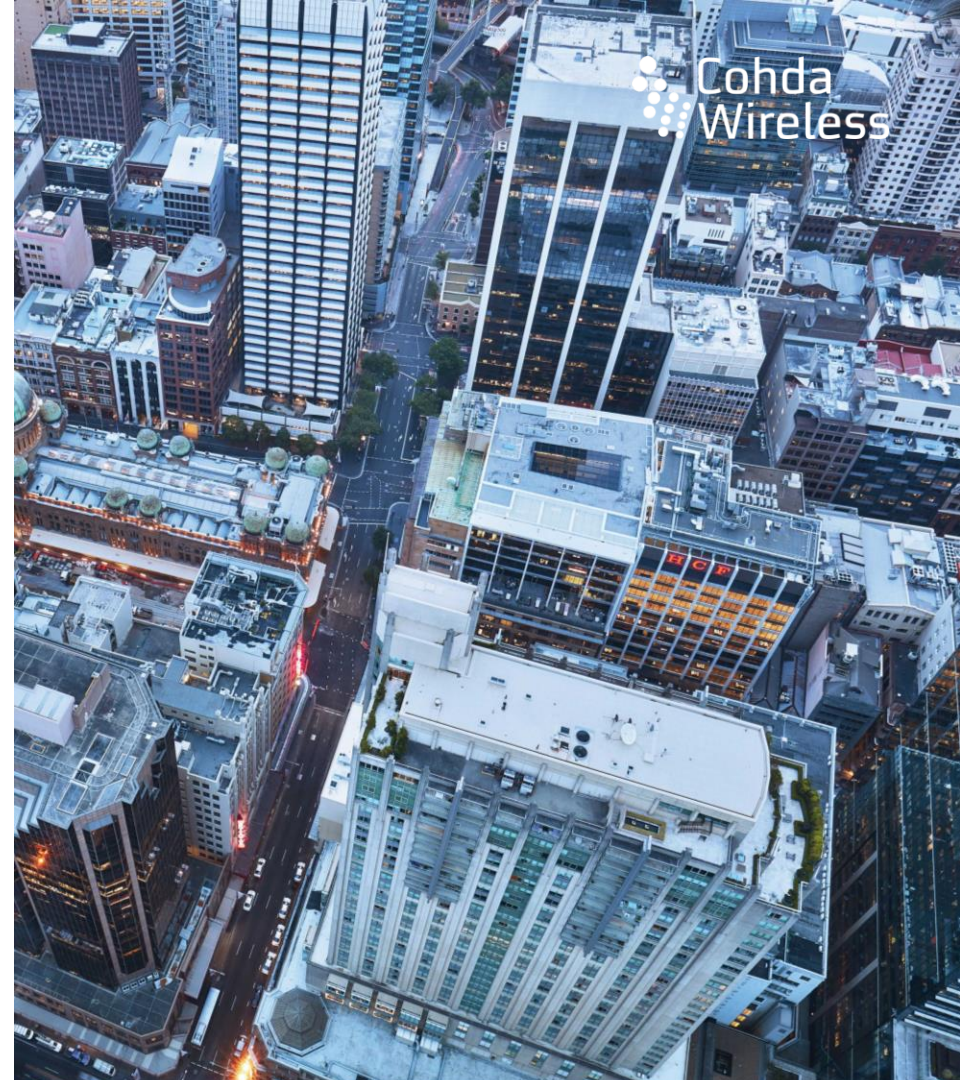
Some application have a different configuration to be able to handle the CAMP and the Car2Car triggering mechanism.

Vehicle-to-Vehicle
- Stopped Vehicle Ahead
- Emergency Elect. Brake Lights
- Intersection Collision Warning
- Emergency Vehicle Warning
- Traffic Jam Ahead
- Forward Collision Warning
- Blind Spot Warning
- Lane Change Assist
- Left Turn Assist
- Motorbike Approaching Warning
- Right turn in front of Bus

Vehicle-to-Infrastructure
- Hazard Location Warning
- Road Work Warning
- Green Light Violation
- Signal Violation Warning (red light violation warning)
- In-Vehicle Signage
- Curve Speed Warning
- Ice Road Warning
- SPaT/MAP visualization (not an APP)
- SCMS/PKI Interface
- Vehicle Situation Awareness (2014)
- Speed Compliance (SC, SPD-COMP, SPD-COMP / Work Zone)
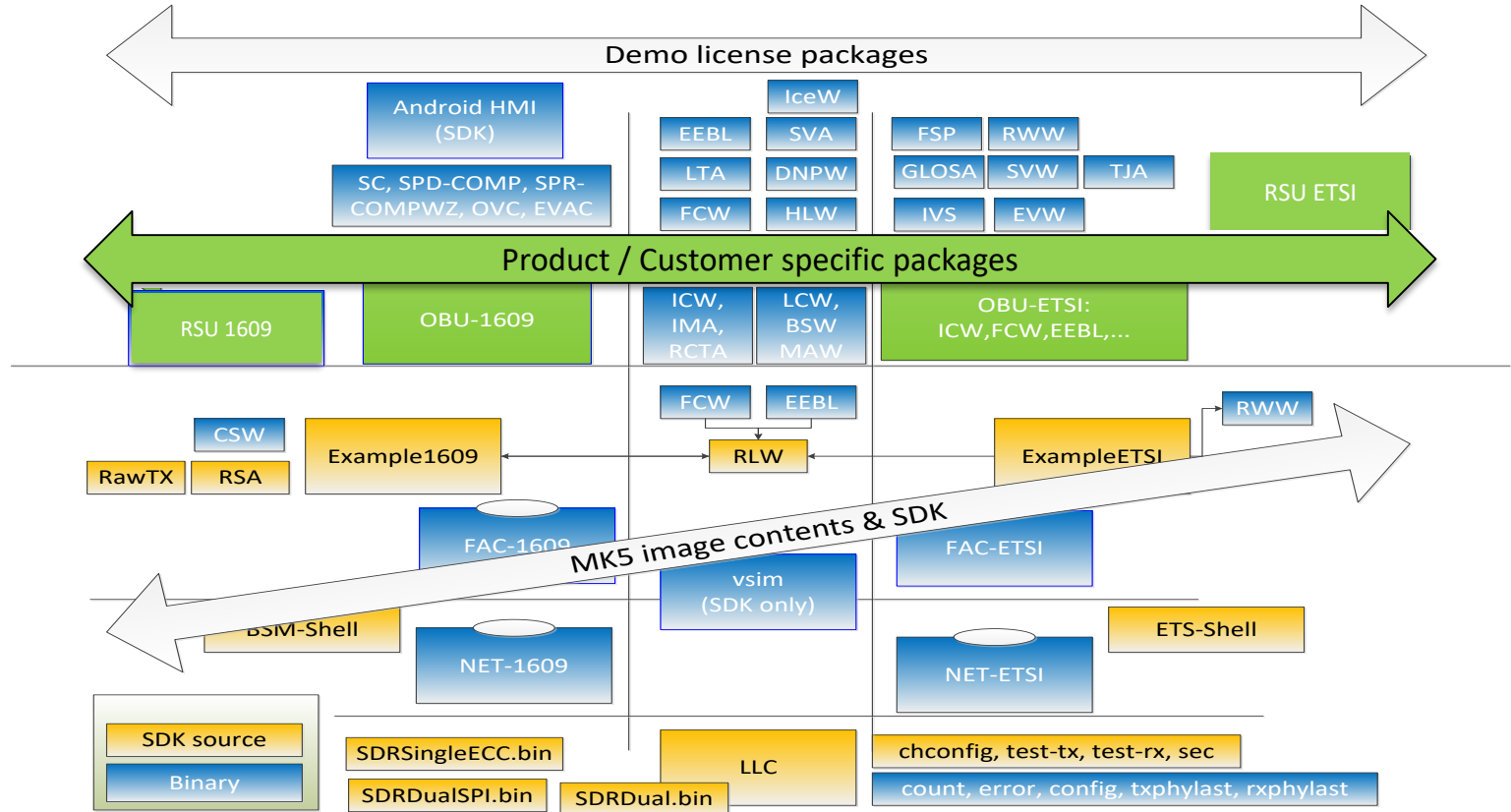- Oversize compliance
- Evacuation Notification

Cohda's Applications

Cohda's V2X applications provide vehicles with '360-degree awareness', detecting hidden threats by extending the horizon of awareness beyond what the driver can see. By gathering and synthesising data from sensors Cohda's solutions are proven to create a much broader zone of awareness.

V2X Applications	NA/EU	Maturity
• Emergency Electronic Brake Light (EEBL)	NA+EU	Production
• Stationary Vehicle Ahead (SVA)	NA+EU	Production
• Hazard Location Warning (HLW, CAMP definition) / Adverse weather Warning (C2C definition)	NA+EU	Production
• Intersection Collision Warning (ICW)	NA+EU	Production
o Intersection movement Assist (IMA)	NA+EU	Production
o Rear Cross Traffic Assist (RCTA)	NA+EU	Development
• Forward Collision Warning (FCW)	NA+EU	Field trial + OEM demo
• Left/Right Turn Assist (LTA)	NA+EU	OEM demo
• Lane Change Warning (LCW)	NA+EU	OEM demo
o Blind spot Warning (BSW)	NA+EU	OEM demo
o Motorcycle approaching Warning (MAW)	NA+EU	OEM demo
• Do Not Pass Warning (DNPW)	NA+EU	OEM demo
• Speed Compliance (SC, SPD-COMP, SPD-COMP / Work Zone)	NA	Field trial
• Curve Speed Warning (CSW)	NA	Field trial
• Oversized compliance (OVC)	NA	Field trial
• Evacuation/Emergency notification	NA	Field trial
• Spot Specific Weather Warning (ICE)	NA	Field trial
• Transit/Freight Signal Priority (TSP) (FSP)	EU	Field Trial
• Road Work Warning (RWW)	EU	Production
• Green Light Optimization Speed Advisory (GLOSA)	NA+EU	Production
• Signal Violation Warning (SVW)	NA+EU	Production
• In Vehicle Signage (IVS)	EU	Production
• Traffic Jam Ahead (TJA)	EU	Production
• Emergency Vehicle Warning (EVW)	EU	Production

OEM status: C-Samples Production / B-Samples Field trial / A-Samples OEM Demo

SDK Contents

Smart Cities Product

HW Trial	HW Deployment	COHDA WIRELESS SMART CITY SOLUTION		CHIPSET
		SW - Phases	STACK	
MK5 RSU MK5 OBU Siemens EsCos Roadmap: MK6 OBU MK6 RSU	Partner OBU & RSU Siemens Escos Cisco 8x9 family w/DSRC Danlaw OBU	1) Foundation Applications currently: - Freight Signal Priority - Tram Signal Priority - Emergency Services Pre-emption 2) Expand V2I applications from Cohda Day 1 suite of applications 3) CAV V2I applications	Applications and products enabled over US & ETSI Standards	DSRC C-V2X

Cohda C-V2X

1. Cohda has a Telstra LTE demonstration

2. Cohda has a C-V2X SDK for Snapdragon development kit 9150

   1. Re-use of the V2X SDK environment

   2. Vsim available

   3. Did run in car demo in San Diego within 2 days!!!

3. Huawei is developing a C-V2X dev kit and Cohda will work on this platform in the future

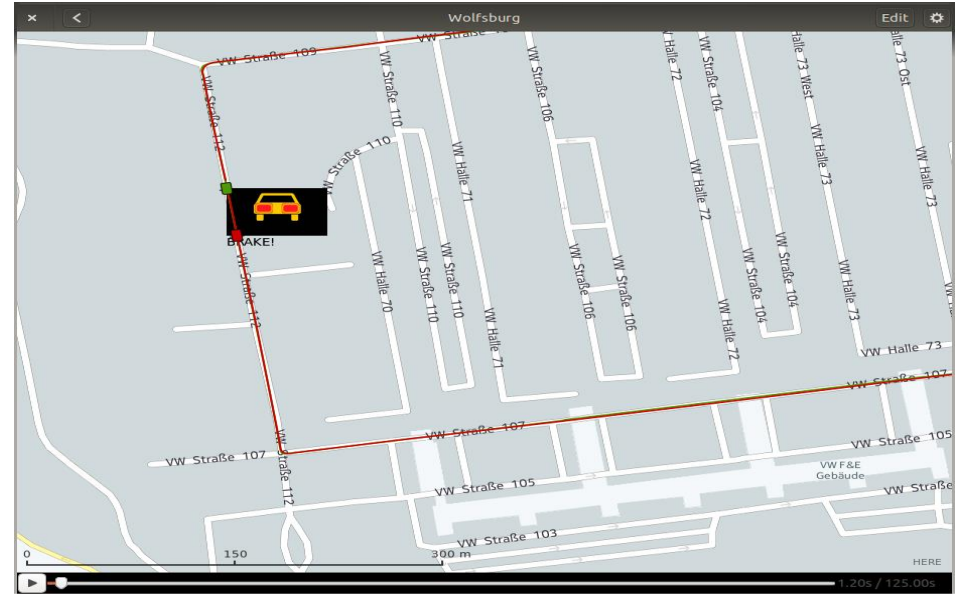Cohda Wireless V2X production stack is available now on C-V2X.

Cohda C-V2X

- A software development kit for V2X that currently supports the Qualcomm C-V2X 9150 Development Platform

- Build just as you would for MK5 platforms with the usual Cohda SDK, transfer files over to the target and execute

- Today a separate instance of the SDK (i.e. different VM)

- In future will be merged into the standard SDK as Cohda MK6 supports C-V2X

- Future chipset support: Huawei, Autotalks, Intel, Datang, …

- The same APIs are presented to you for building applications - thereby you are **chip agnostic with the Cohda SDK**

SDK Contents: vsim – Vehicle Simulator

- SDK contains a powerful application validation tool in addition to V2X libraries
- Perform synthetic drive tests for a number of vehicles
  - GPS simulator
  - VSC3 CAN simulator
- HERE & OpenStreetMap integration
- HMI integration to show alerts in real time
- Drive test import via ADR pcap
- Live drive UI via ADR UDP and HMI
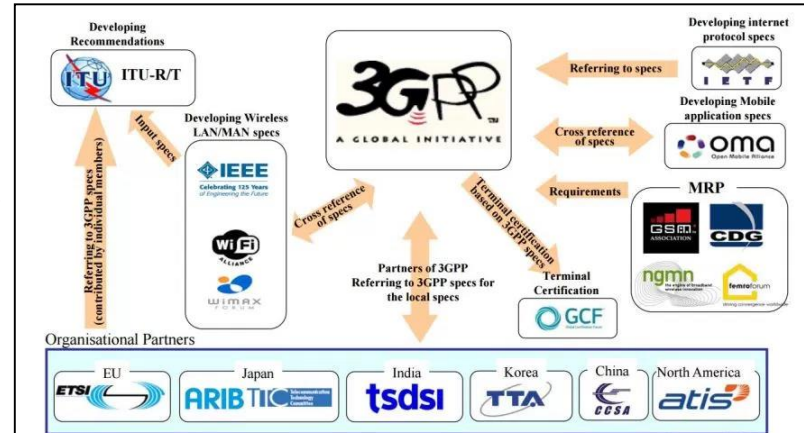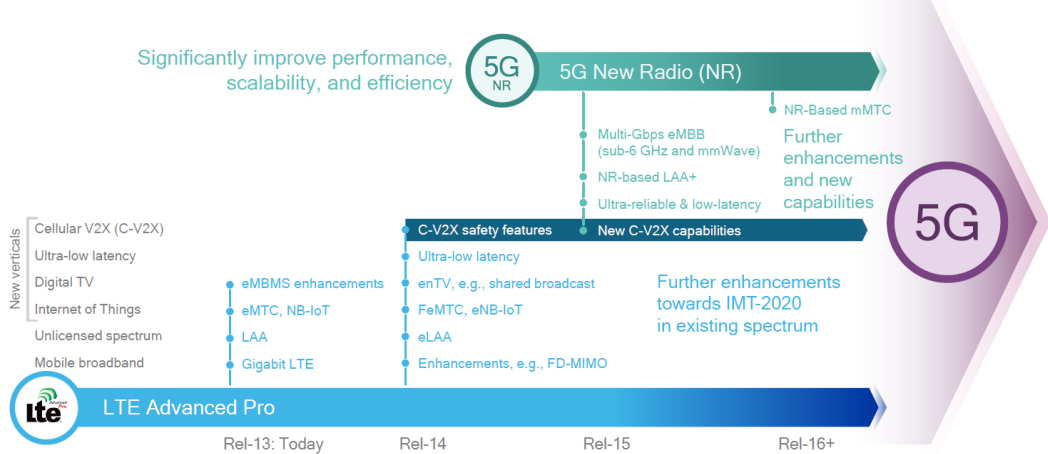- Drive test import from gps.pcap captures

Qualcomm and Consortiums

LTE Advanced Pro establishes the foundation for 5G
Pioneering 5G NR technologies and verticals

Significantly improve performance, scalability, and efficiency

5G NR — 5G New Radio (NR)

NR-Based mMTC

Multi-Gbps eMBB (sub-6 GHz and mmWave)

Further enhancements and new capabilities

NR-based LAA+

Ultra-reliable & low-latency

5G

C-V2X safety features — New C-V2X capabilities

Ultra-low latency

Further enhancements towards IMT-2020 in existing spectrum

New verticals			
Cellular V2X (C-V2X)			
Ultra-low latency	eMBMS enhancements	enTV, e.g., shared broadcast	
Digital TV	eMTC, NB-IoT	FeMTC, eNB-IoT	
Internet of Things	LAA	eLAA	
Unlicensed spectrum	Gigabit LTE	Enhancements, e.g., FD-MIMO	
Mobile broadband			

LTE Advanced Pro

Rel-13: Today   Rel-14   Rel-15   Rel-16+