3rd Indo-European Conference on Standards and Emerging Technology
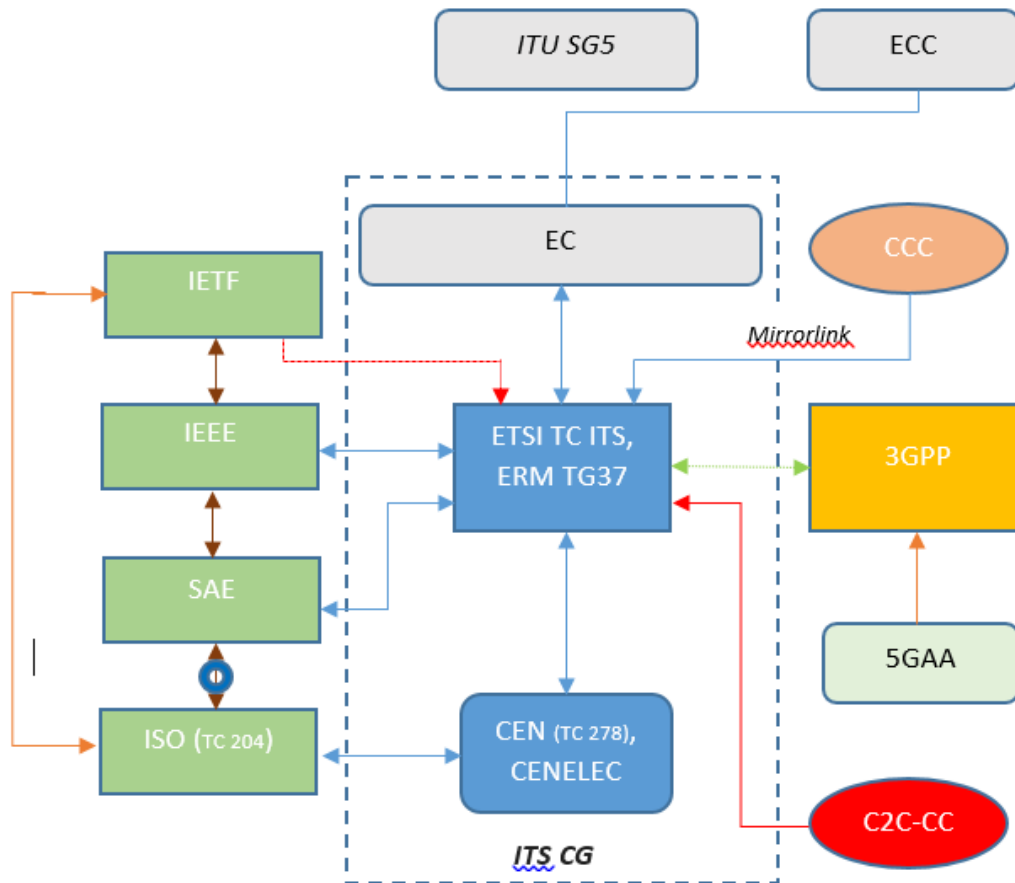
26th April, 2018 – New Delhi

ITS TECHNOLOGY CHOICES FOR EUROPE

Presented by Adrian Scrase (ETSI)

ITS Standardisation world

- Coordination and international harmonization of standards with IEEE 802.11 and IEEE 1609 as well as SAE
- Coordination with CEN in ITS-CG
- Link to the EC via ITS-CG
- Link to CCC and C2C-CC
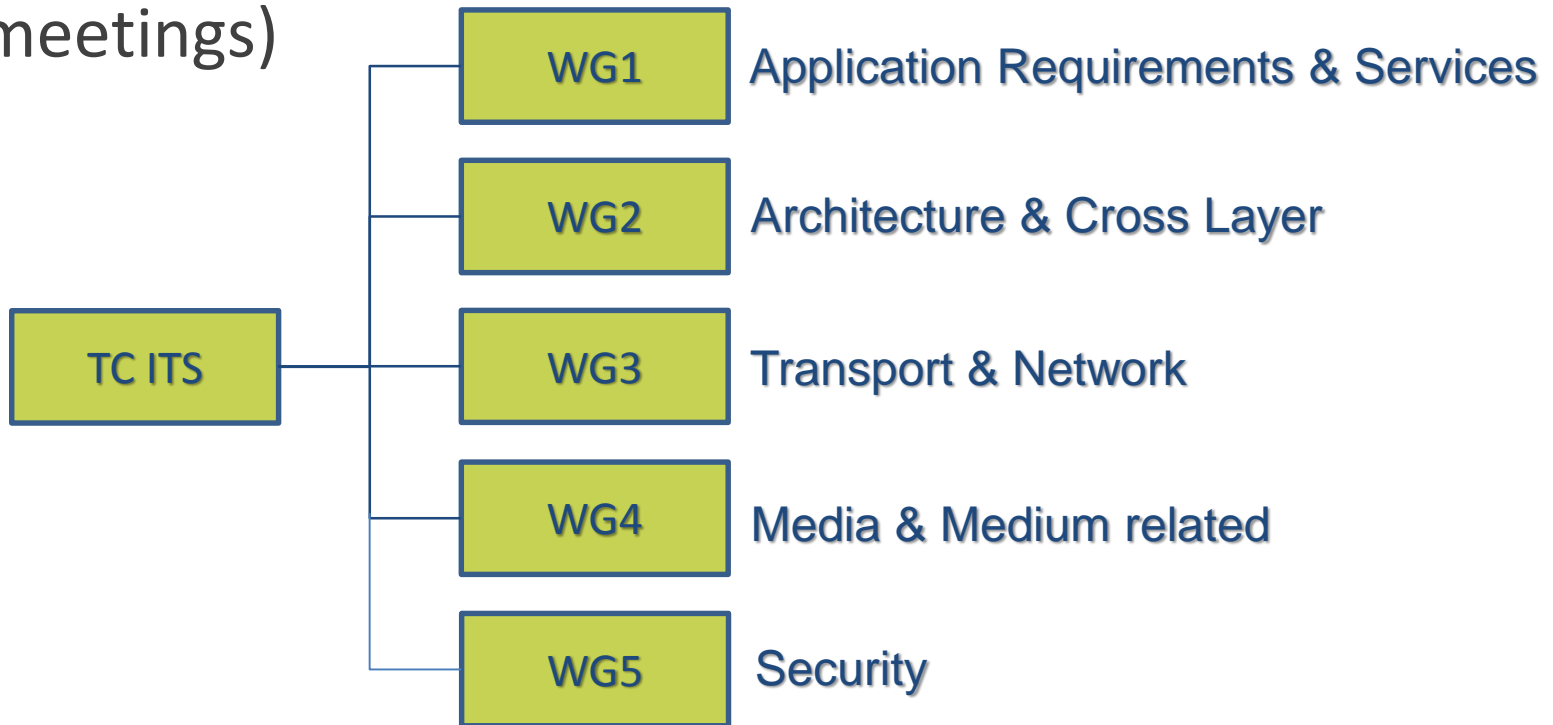- Link to IETF WG IPWAVE (IP Wireless Access in Vehicular Environments)

CCC: Car Connectivity Consortium

C2C-CC: Car 2 Car Communication Consortium

5GAA: 5G Automotive Association

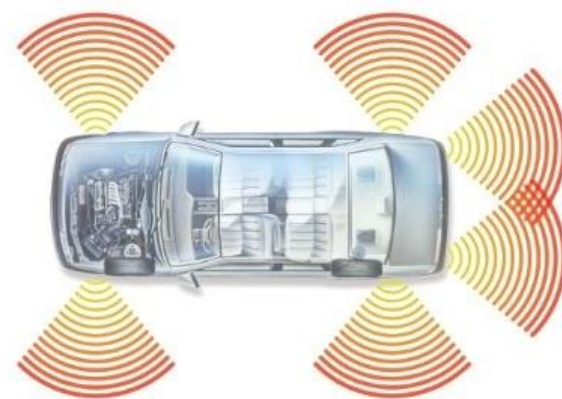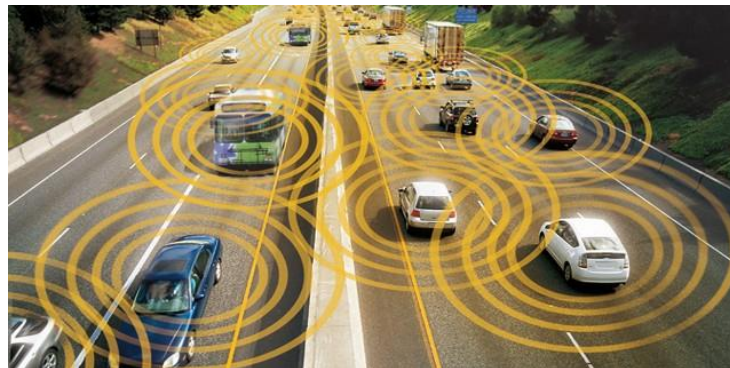# Road Transport: ETSI TC ITS

》 Currently 5 Working Groups

》 65-80 participants per meeting(Plenaries and/or WG meetings)

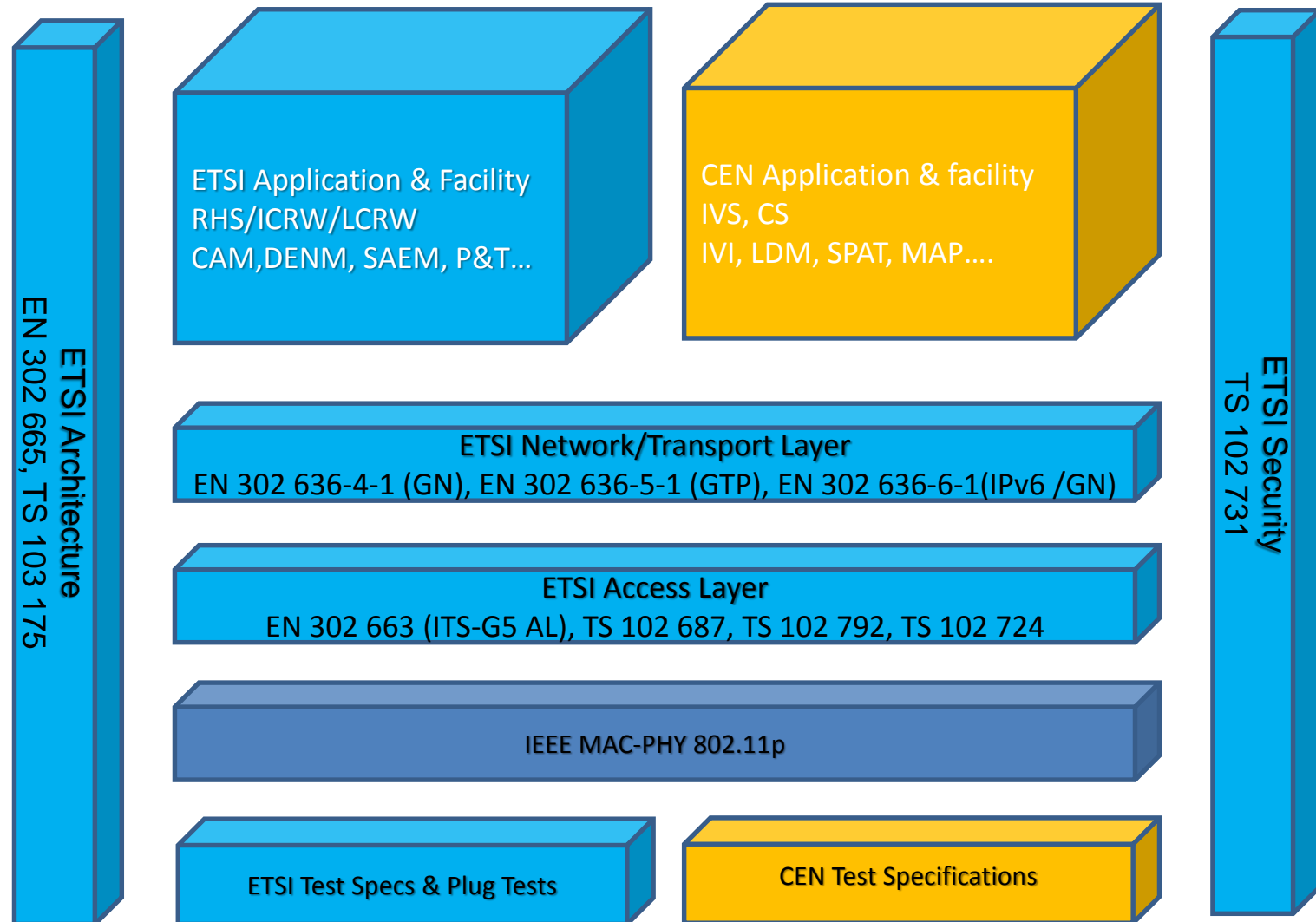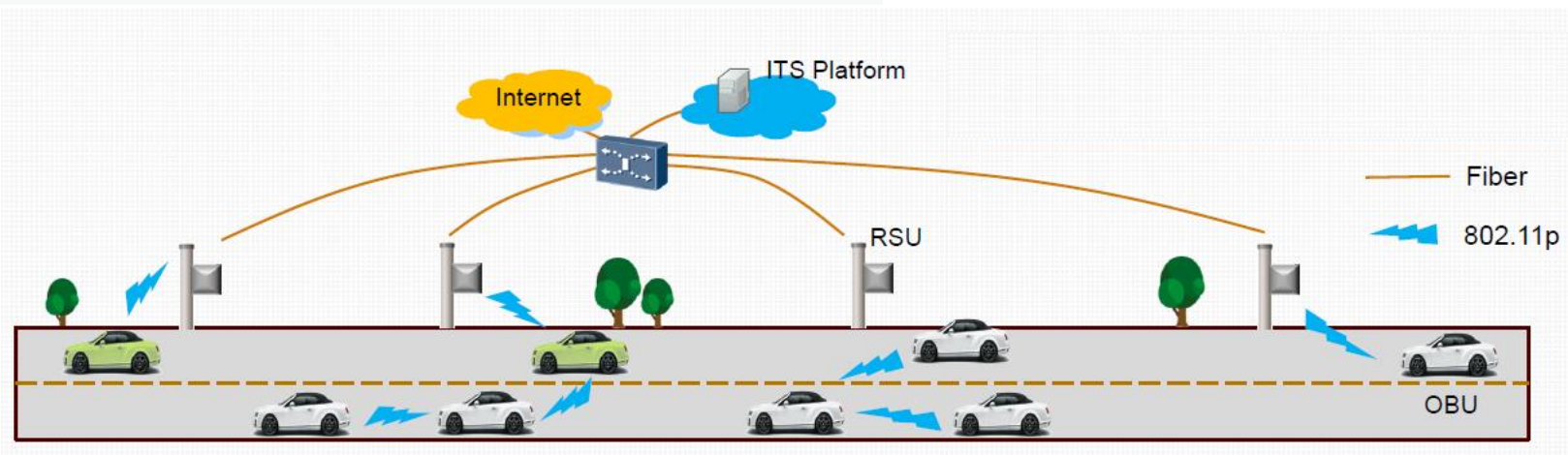|		
	WG1	Application Requirements & Services
	WG2	Architecture & Cross Layer
TC ITS	**WG3**	Transport & Network
	WG4	Media & Medium related
	WG5	Security

Road Transport: ETSI ERM TG37 & SRR

》 ERM TG37 covers ITS (road transport) Harmonised Standards and other relevant deliverables

  》 Close coordination with TC ITS, in particular ITS WG4

  》 Meetings in conjunction with TC ITS meetings

🌐 ERM TGSRR covers, among other things, Automotive radar systems Harmonised Standards

ITS: European Standards and specifications

ETSI Architecture
EN 302 665, TS 103 175

ETSI Application & Facility
RHS/ICRW/LCRW
CAM,DENM, SAEM, P&T…

CEN Application & facility
IVS, CS
IVI, LDM, SPAT, MAP….

ETSI Network/Transport Layer
EN 302 636-4-1 (GN), EN 302 636-5-1 (GTP), EN 302 636-6-1(IPv6 /GN)

ETSI Access Layer
EN 302 663 (ITS-G5 AL), TS 102 687, TS 102 792, TS 102 724

IEEE MAC-PHY 802.11p

ETSI Test Specs & Plug Tests

CEN Test Specifications

ETSI Security
TS 102 731

C-ITS protocol stack

Applications	Other applications	Safety and traffic efficiency app		TS 102 539 (RHS, ICRW, LCRW) EN 302 637 (CAM, DENM)
Facilities	C-ITS messages			TS 19 091 (SPAT/MAP), TS 19321 (IVI),. (CEN/ISO)
Networking and transport	TCP/UDP (IETF RFC 793/768)	BTP GeoNetworking		EN 302 636 (GN, BTP, GN6)
	IPv6 (RFC 2460)	GN6		TS 103 097 (security), TS 102 941 (Privacy)
Access technologies	MAC extensions			EN 302 663 (ITS-G5) TS 102 727 (Multi-channel) TS 102 687 (DCC framework) TS 103 175 (DCC management)
	MAC			
	PHY			

(Management — Security)

Internet — ITS Platform

Fiber — 802.11p

RSU — OBU

C-V2X Technology

Vehicle-to-infrastructure (V2I)
e.g. traffic signal timing / priority

Vehicle-to-network (V2N)
e.g. real-time traffic / routing, cloud services

Vehicle-to-vehicle (V2V)
e.g. collision avoidance safety systems

Vehicle-to-pedestrian (V2P)
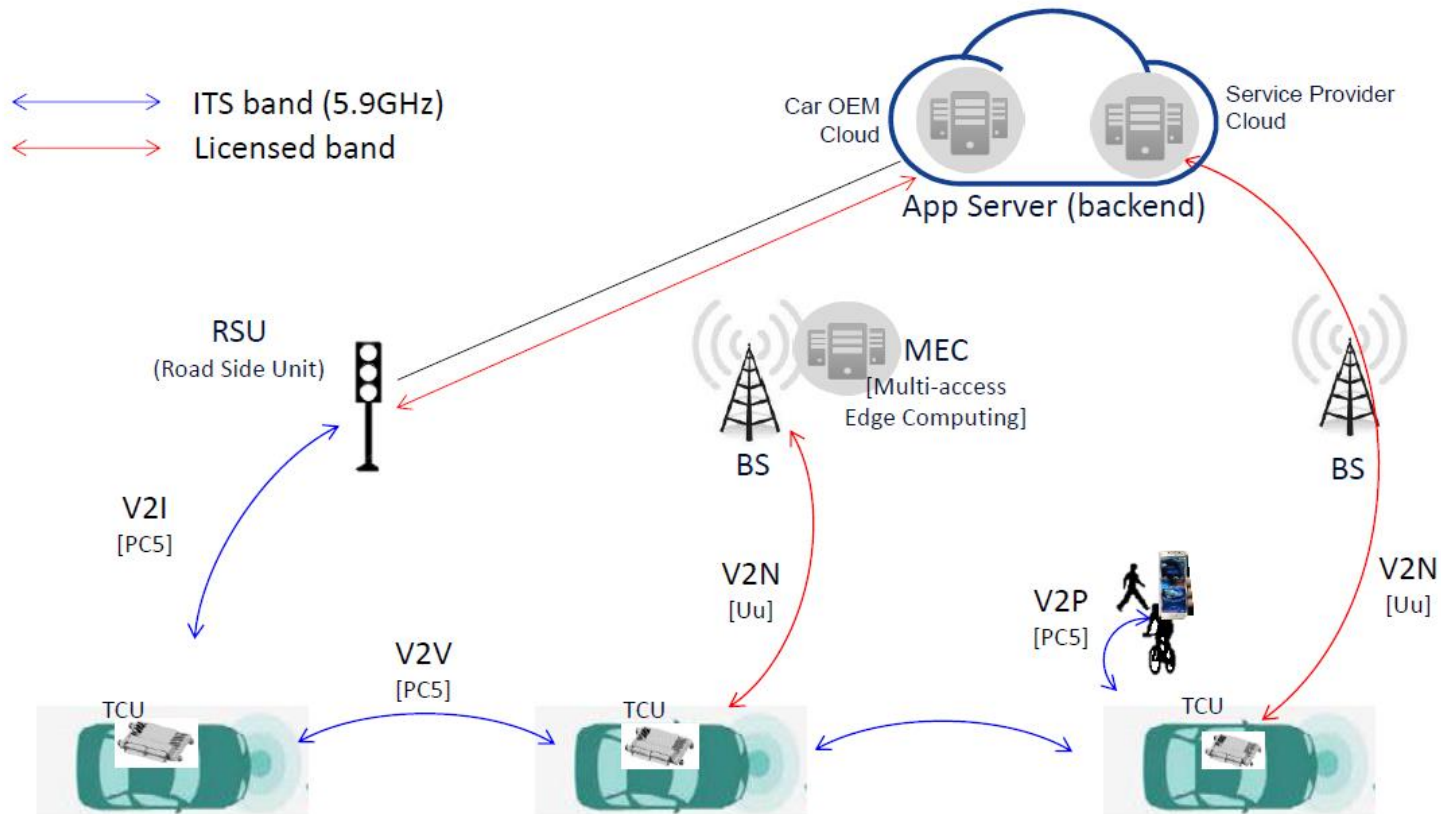e.g. safety alerts to pedestrians, bicyclists

Picture courtesy of Qualcomm

C-V2X Technology

》 V2N, V2V, V2I, V2P but also V2N2V, V2N2I, V2N2P

》 PC5: LTE sitelink Interface

》 Uu: LTE eNB-UE Interface

C-V2X: main features

》 V2V, V2I, V2P, V2N (PC5 & Uu)

》 V2N2V, V2N2I, V2N2P (Uu)

》 PC5 (V2V) operates on 5.9 GHz ("ITS band" in Europe)

  》 Semi-persistent transmission with relative energy-based selection

  》 SC-FDM

  》 FDM & TDM

  》 Synchronous

  》 No "SIM"

》 Uu operates on standard "commercial frequencies"

C-V2X Protocol Stack
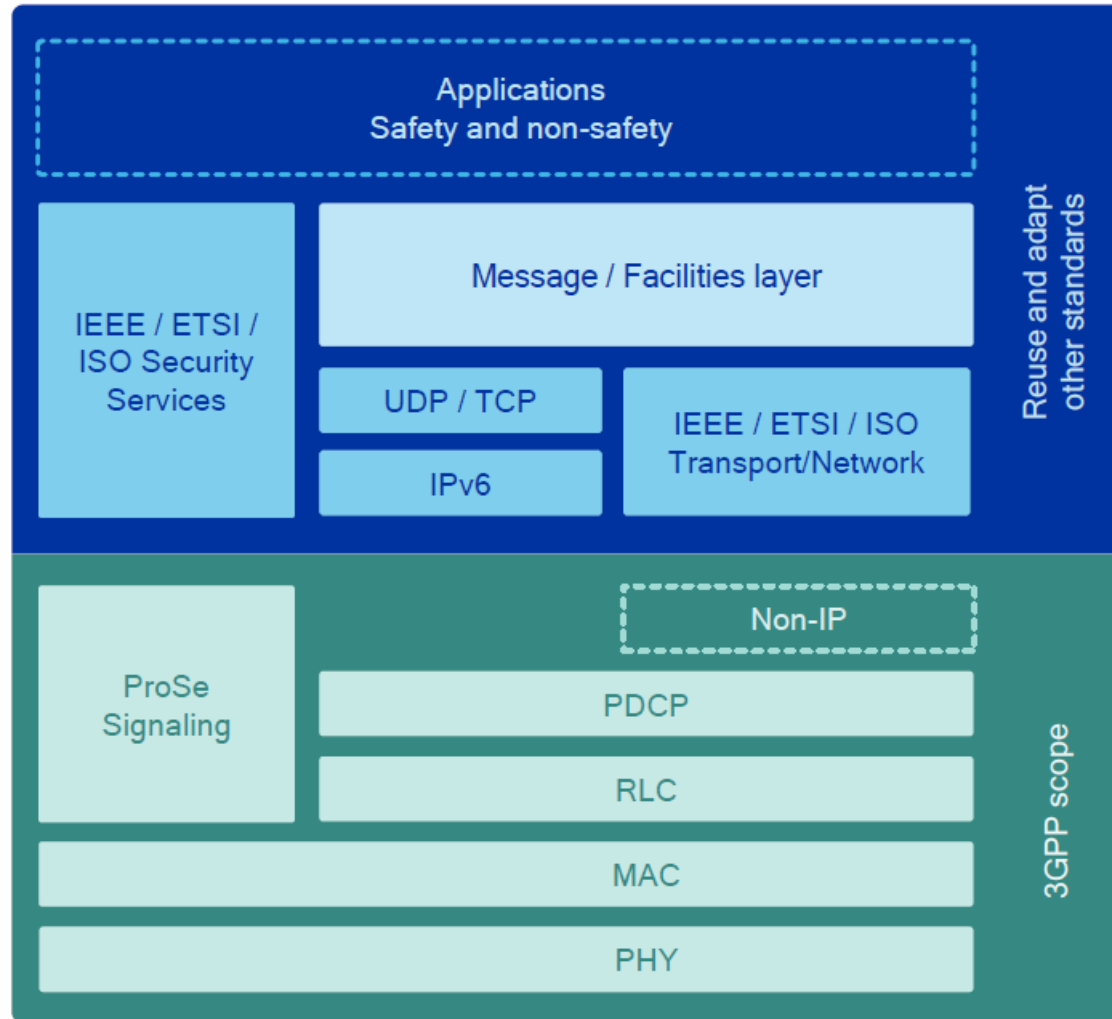
3GPP V2X standardisation timeline

» LTE based V2X (Phase 1) specification completed in March 2017

   » LTE Uu and PC5 enhancement for enabling V2V and V2X communication

» C-V2X standardization ongoing with backward/forward compatibility

   » Phase 2 to support 8 carriers aggregation, 64QAM, TX diversity, and latency reduction

   » Phase 3 to address advanced use cases and evaluate additional requirements with 5G New Radio (5G-V2X)
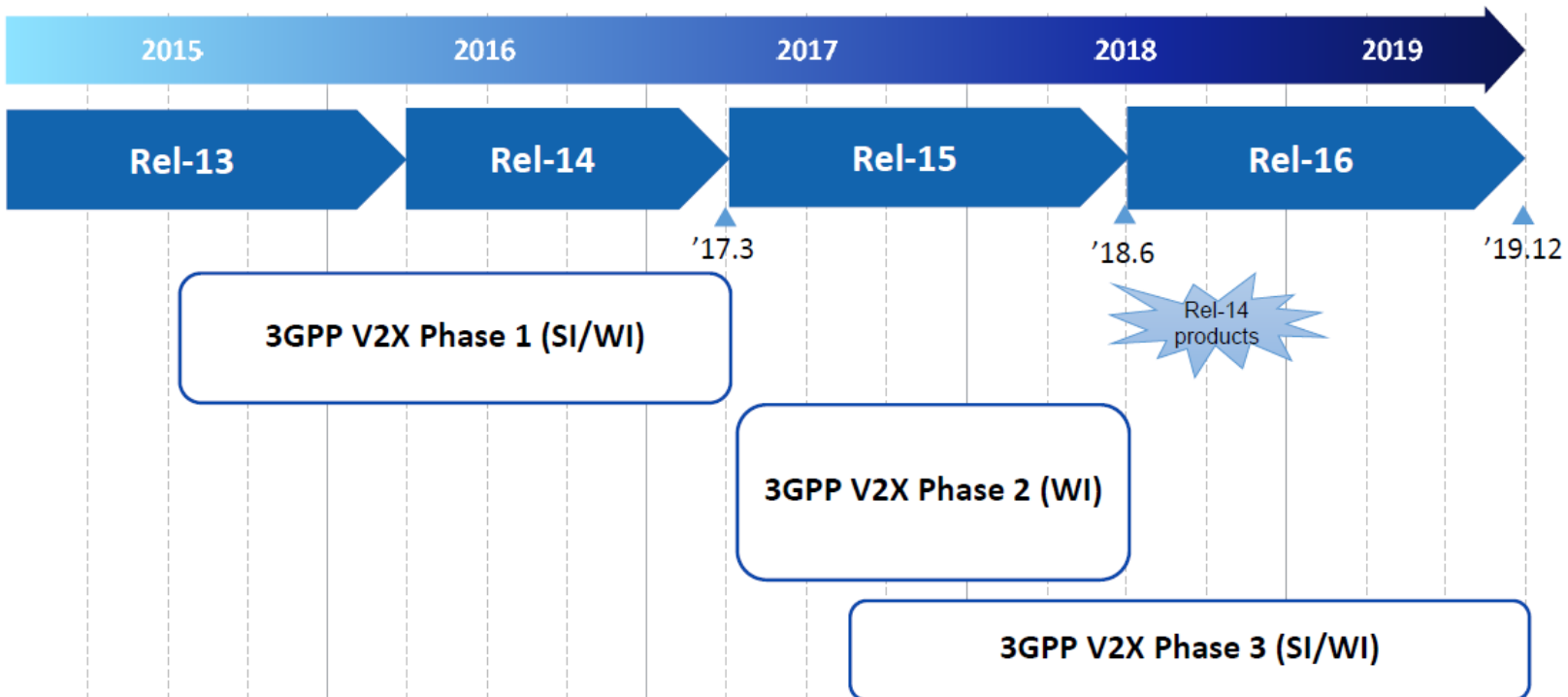
Four Guiding Principles for ITS in Europe

1) Uncompromised safety services for all users in case of multiple technologies implementation;

2) Technology neutrality of spectrum use;

3) Efficient spectrum use;

4) Introduction in the longer-term of 5G for the further development of Connected, Cooperative and Automated Mobility (CCAM).