

3GPP SA WG2 Meeting #110
06 - 10 July 2015, Dubrovnik, Croatia

S2-152306

Agenda item: 7.1
Document for: Discussion

LTE support for V2X services



Wide interest on V2X

Various V2X related Organizations (Automotive Industries & Governments)

CEN, ETSI, ISO, IEEE, SAE, CALM, CAMP, C2C-CC, CVRIA and etc (including each country's C-ITS bodies).

Various V2X R&D Projects, Assessments and (Pre-)deployment Programs

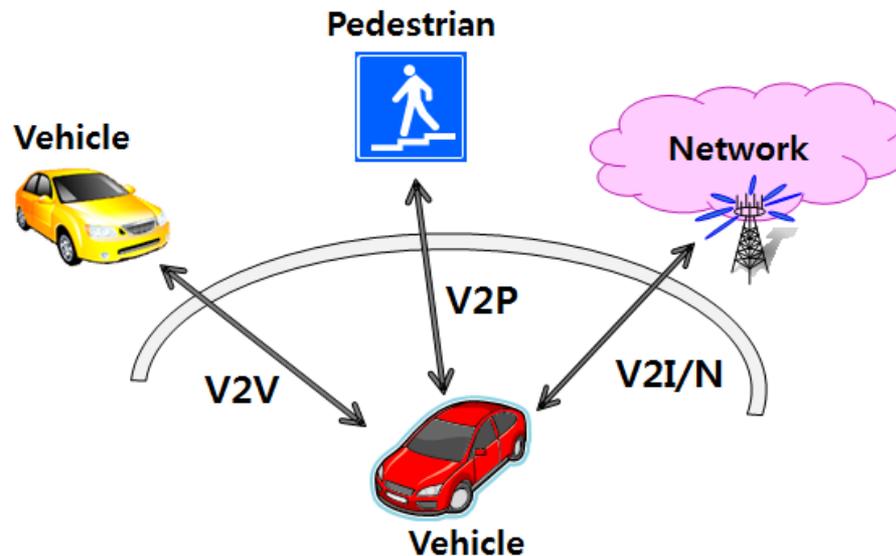
Lots of Interests in LTE V2X Technologies for Connected or Smart Car

Current status of LTE V2X in 3GPP

- At SA1#68 (November 2014), V2X was introduced and proposed to progress study in Rel-14 [1]. A lot of interest was expressed during the discussion.
- Strong interest in V2X study was identified in RAN#66 (December 2014) as captured in RAN report [2].
 - Considering the interest in RAN and urgency of RAN V2X, RAN#66 sent an LS [3] to SA1 in order to trigger SA1 study on requirements as early as possible.
- SA1#69 (February 2015) agreed a new Rel-14 ‘Study on LTE support for V2X services (FS_V2XLTE)’ [4] to identify use cases and requirements for LTE V2X (V2V, V2I and V2P).
 - Immediately after the approval of FS_V2XLTE at SA#67 (March 2015), SA announced the start of V2X study activity in 3GPP to external organisations [5].
- At SA1#70 (April 2015), SA1 completed 50% of the Study with a plan for consolidation of the potential requirements in preparation for its transition to the normative phase, and SA1 sent a Reply LS [6] which includes outcome of their study on the use cases and requirements.
- ✘ At RAN#68 (June 2015), RAN approved a new Rel-13 ‘Feasibility Study on LTE-based V2X Services (FS_LTE_V2X)’ [7] to evaluate new functionalities needed to operate LTE-based V2X (V2V, V2I/N and V2P), and to investigate potential enhancements for vehicular services defined in SA1 TR 22.885.

Types of V2X

- Three V2X communication types
 - V2V (vehicle-to-vehicle): LTE-based communication between vehicles.
 - V2I/N (vehicle-to-infrastructure/network): LTE-based communication between a vehicle and a roadside unit/network. A roadside unit (RSU) is a transportation infrastructure entity (e.g. an entity transmitting speed notifications) implemented in an eNodeB or a stationary UE.
 - V2P (vehicle-to-pedestrian): LTE-based communication between a vehicle and a device carried by an individual (e.g. handheld terminal carried by a pedestrian, cyclist, driver or passenger).



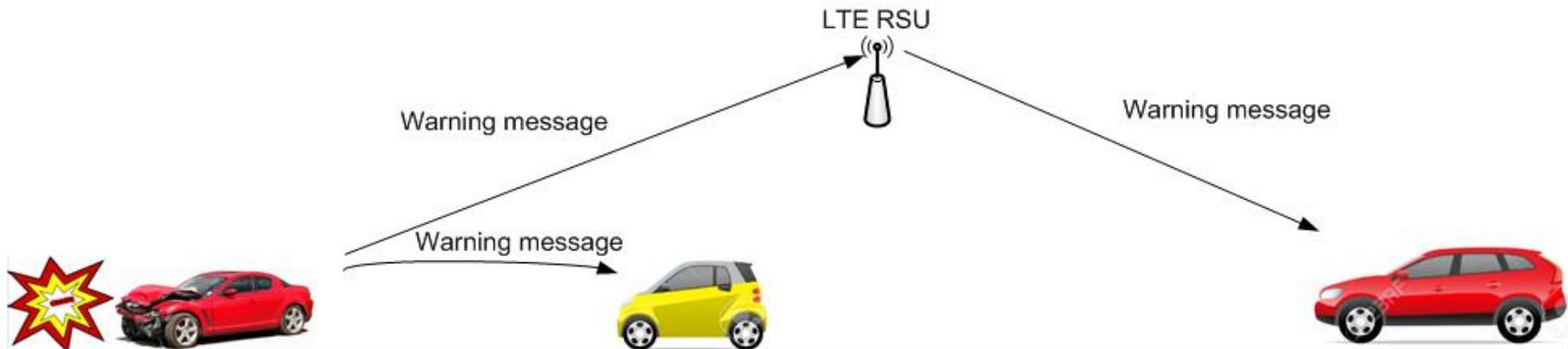
Summary of SA1 study status

- SA1 study item is scheduled to be completed in SA1#72 (November 2015).
 - The current progress is 50% (as of SA1#70: April 2015) [8].
 - At SA1#71 (August 2015), it is expected to make consolidations of Potential Requirements in preparation for transition to Normative phase.
- The study outcome in TR 22.885 [9] contains
 - 18 use cases and corresponding requirements
 - All the three types are covered in these use cases.
 - Both safety and non-safety applications are included.

1. Forward Collision Warning
2. Control Loss Warning
3. V2V Use case for emergency vehicle warning
4. V2V Emergency Stop Use Case
5. Cooperative Adaptive Cruise Control
6. V2I Emergency Stop Use Case
7. Queue Warning
8. Road safety services
9. Automated Parking System
10. Wrong way driving warning
11. V2V message transfer under operator control
12. Pre-crash Sensing Warning
13. V2X in areas outside network coverage
14. V2X Road safety service via infrastructure
15. V2I / V2N Traffic Flow Optimisation
16. Curve Speed Warning
17. Warning to Pedestrian against Pedestrian Collision
18. Vulnerable Road User (VRU) Safety

Example of V2V service

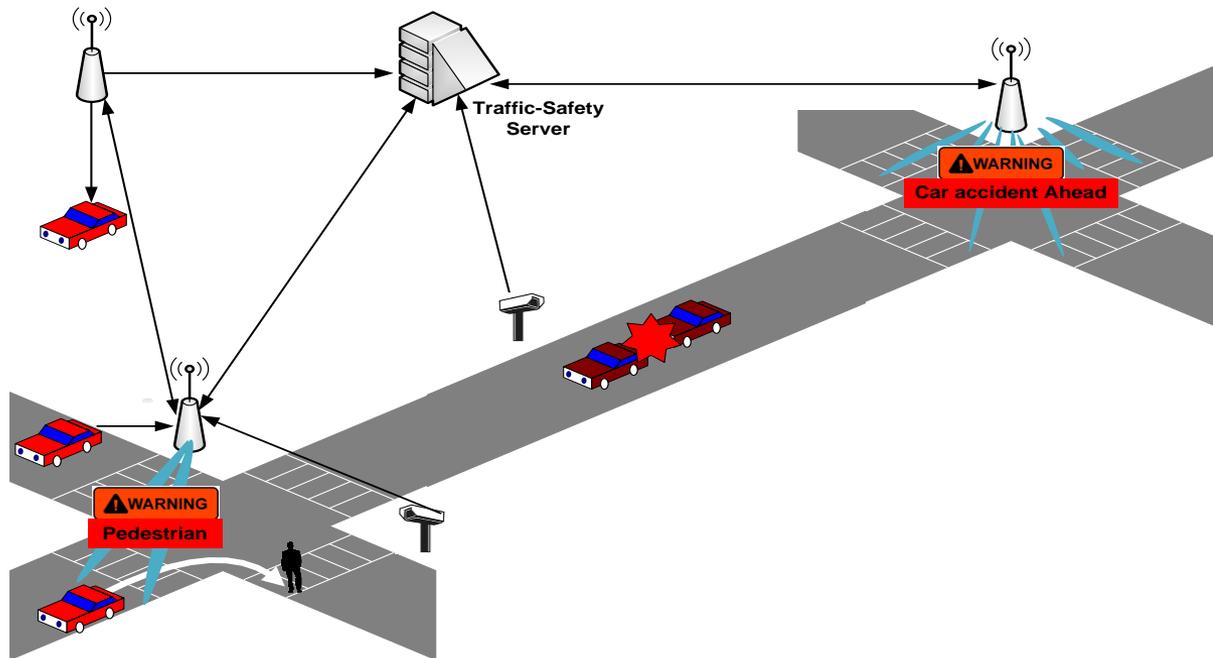
- V2V services provide delivery of V2X messages such as CAM/DENM between vehicles via direct interface and RSU respectively.
 - V2V services (i.e. inter-vehicle message delivery) can be realized not only by PC5 transport but also by Uu transport [9].
 - A reference point for direct communication in LTE support for V2X services may be named/defined differently than PC5.



Example of V2V service (Vehicle Collision Warning)

Example of V2I/N service

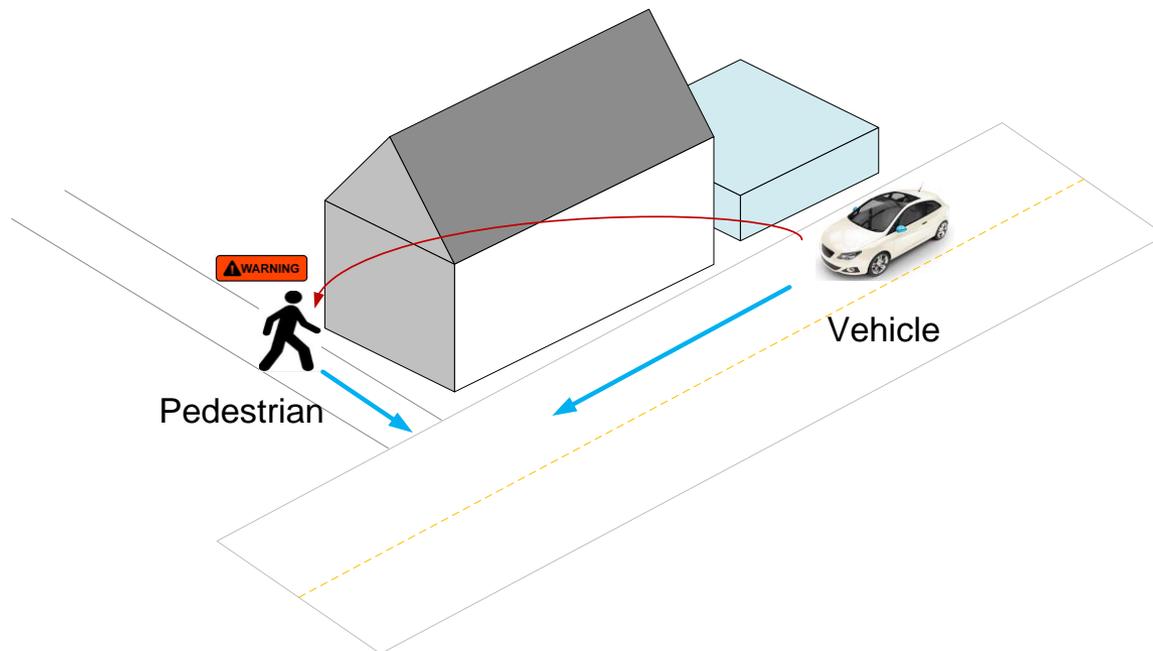
- V2I/N services provide delivery of V2X messages between a vehicle and a RSU/network.
 - The SA1 study considers the possibility of using existing LTE technologies for unicast/multicast/broadcast communication [4].



Example of V2I/N service (V2X Road safety service via infrastructure)

Example of V2P service

- V2P services provide delivery of V2X messages between a vehicle and a pedestrian (a device carried by an individual).
 - V2P services can cover not only a pedestrian but also a cyclist, a driver or a passenger in the SA1 study [9].
 - V2P services can be realized not only by PC5 transport but also by Uu transport.



Example of V2P service (Pedestrian Collision Warning)

- At SA1#70 (April 2015), SA1 discussed Rel-14 V2X work item schedule for normative work [10] and bringing a WID to SA1#71 (August 2015) was considered fine [11].
- We propose to have SA2 Rel-14 work item based on the work item that will be generated in SA1 for system level work, e.g. architecture enhancement for V2X to satisfy service requirements to be specified in SA1.
- Our plan is to bring a Rel-14 WID on LTE support for V2X services at SA2#111 (October 2015).



Join us for a ride? 😊



References

- [1] S1-144422, Introducing a New Set of Features for V2X over LTE, LG Electronics, General Motors
- [2] RP-150002, Report of 3GPP TSG RAN meeting #66.
- [3] RP-142312, LS to SA1 on LTE based Vehicular Communication, TSG RAN.
- [4] S1-150284(=SP-150051), SID for Study on LTE support for V2X services, LG Electronics.
- [5] SP-150166, LS on information regarding V2X study in 3GPP, TSG SA.
- [6] S1-151629(=RP-150557), Reply LS to RP-142312 on LTE based Vehicular Communication, SA1.
- [7] RP-151109, SID for Feasibility Study on LTE-based V2X Services, LG Electronics, CATT and Huawei.
- [8] SP-150266, SA1 Report to TSG SA#68, SA WG1 Chairman.
- [9] 3GPP TR 22.885 v0.2.0: Study on LTE support for V2X services. S1-151330.
- [10] S1-151093, Proposed plan for V2X (Stage 1), LG Electronics.
- [11] S1-151557, Report for the FS_V2XLTE Drafting Session, FS_V2XLTE Rapporteur (LGE)