3GPP TSG RAN Meeting #72
Busan, South Korea, June 13- 16, 2016
Document for: Discussion
Agenda Item: 10.1.1

RP-161173
Revision of RP-161000

Motivation for WI on LTE-based V2X

Huawei, HiSilicon

BUILDING A BETTER CONNECTED WORLD

Background

- Study item "Feasibility Study on LTE-based V2X Services" will be completed in RAN#72.
  - TR 36.885 v2.0.0 was endorsed [1].
  - Status report claimed 100% completion level [2].

- SA WGs are making good progress on LTE-based V2X, with coordination with RAN WGs.

DL Multicast Enhancements

– Provision of V2X Services over SC-PTM [RAN1, RAN2]

- **Conclusion of Rel-13 SC-PTM Study Item (TR 36.890):** SC-PTM transmission without UL feedback performs significantly better than MBSFN transmission in the following 3 cases:
  - when the network is not synchronized;
  - when users receiving a service are all in 1, 2 or 3 cells;
  - when the MBSFN area is pre-defined and contains a number of cells with no user receiving the service.

- V2X is local area broadcast/multicast (e.g. area only contains 2-3 cells), this is because one vehicle is only required to delivery its V2X messages to other vehicles within the distance of 300m (Highway) or 150m(Urban), as per SA1 requirement. So, SC-PTM is a better choice for V2X compared to MBSFN in terms of DL capacity.

- Further SC-PTM enhancements will focus on the support of HARQ/CSI feedback and retransmissions：
  - For higher reliability, especially for vehicles in cell edge.
  - For higher spectrum efficiency

DL Multicast Enhancements (cont.)

- Signalling enhancements for control plane latency reduction (e.g., a common G-RNTI for V2X) [RAN2, RAN3]
  - To reduce the service interruption time due to cell change

- Delivery of V2X messages in a small broadcast area based on geographical information [RAN3]
  - Down select the candidate solutions on how to transmit different V2X messages in different broadcast areas, especially in overlapping areas (i.e. 3 solutions using single TMGI, and one solution using multiple TMGIs)
  - With necessary coordination with SA2.

- Localized MBMS architecture solution [RAN3]
  - Currently, BM-SC and MBMS-GW are located in Core Network, and the backhaul delay between BM-SC and eNB is non-negligible. To minimize the V2X latency, different localized MBMS solutions were listed.
  - Down select the solutions, depending on the outcome of SA2 work.

UL SPS Enhancements

– Enhancements to UL SPS transmissions for support of V2X services:

- Multiple SPS configurations [RAN2, RAN1]
- Reporting of UE assistance information for SPS transmissions [RAN2]
  - CAM generation periodicity could change when the vehicle speed changes exceeding a range, so that the SPS configuration should align with the CAM periodicity.
  - A speed change or heading change are likely to change the timing offset of a series of CAMs occasionally, and such timing offset change may lead to misalignment between SPS timing and CAM timing which further results in the risk of V2X delay requirement not being satisfied.

Sidelink Enhancements

– PC5 transport in E-UTRAN to support LTE-based V2X

  • Congestion control for PC5-based V2V if not completed in V2V WI [RAN1, RAN2, RAN4]
    – To guarantee end-to-end performance by reporting to APP layer for message generation rate adjustment and/or by reporting to network for more appropriate transmission parameters

  • Simultaneous sidelink transmission/reception in multiple carriers if not completed in V2V WI [RAN2, RAN1, RAN4]
    – To well utilize ITS spectrum (e.g. wider bandwidth than 20MHz)

  • Support of UE maximum transmission power up to 33 dBm for PC5 in 5855 MHz ~ 5925 MHz [RAN4, RAN1]
    – To have comparable PSD to DSRC/IEEE 802.11p services
    – Multi-cluster SC-FDM has not been extensively studied in RAN1

  • Simultaneous sidelink transmission/reception and uplink/downlink operations in multiple carriers if not completed in V2V WI [RAN4]

LTE-V2V and 802.11p co-channel co-existence

– RAN1 study concluded the followings:

  – For deployment of PC5-based LTE-V2V and 802.11p in the same geographical area, the ideal option is when they use different frequency channels.

  – PC5-based LTE-V2V and 802.11p can co-exist.

  – Standardization and/or regulatory actions need to be taken in other bodies in order to enable the co-existence.

– Suggestions:

  – 3GPP is suggested to not standardize the co-channel co-existence mechanism before clear decision is made in relevant bodies.

Others

- Support of inter-PLMN for PC5 and Uu[RAN2, RAN3, RAN1]
  - The UEs of different PLMNs should be able to communicate with each other
  - For PC5, different PLMN may have different carriers for SL V2X operation
  - For Uu, to reduce DL traffic load, the UE may need to receive DL broadcast of different PLMNs

- Support of QoS depending on the outcome of SA2 work [RAN2, RAN3]

Proposed WI

- WI on LTE-based V2X to be started from RAN#72
  - Core part to be finished by RAN#75
  - Performance part to be finished by RAN#77

References

[1] RP-160790, TR 36.885 v2.0.0 on Study on LTE-based V2X Services

[2] RP-160789, Status report of SI: Feasibility Study on LTE-based V2X Services

Thank you !