[104-e-NR-R17-SL-03] Email discussion on 8.11.2 (remaining issues for sidelink evaluation methodology update for power saving) – Teng (CATT)

* 1st check point: Jan 28
* 2nd check point: Feb 3

This document is used to discuss the issues raised during the 1st round of discussion, which is considered to be necessary for further discussion and determination.

# Definition of different profiles for V2V/V2P/P2V

1 contribution proposes to define separate profiles for P2V, V2P and mixture case. In order to guarantee that the simulation results of companies can be compared with each other, 3 profiles are proposed with corresponding parameters.

* Profile 1-P2V: Evaluation on partial sensing.
* Profile 2-V2P: Evaluation on DRX.
* Profile 3-Mixture with P2V/V2P/V2V: Evaluation on co-existence of PUE and VUE with different RA schemes in the same resource pool.

Based on the clarification during GTW, companies agreed to further discuss on the definition of the profiles for V2V/V2P/P2V. I would like to use the proposal in R1-2100143 as the starting point of this discussion. Companies are welcome to provide comments about it.

***FL Proposal:***

* *The following profiles are defined:*
  + *Profile 1: P2V-only;*
  + *Profile 2: V2P-only;*
  + *Profile 3: Mixture of P2V, V2P and V2V.*

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| --- | --- | --- | --- |
|  | **P2V Only** | **V2P Only** | **Mixture(P2V,V2P,V2V)** |
| **Sidelink frequency (GHz)** | 6 | 6 | 6 |
| **Traffic models** | Periodic: Traffic model for P-UE’s transmission specified in TS 36.885  −The message size is fixed at 300 bytes and transmission frequency is 1 Hz  −‘100ms’ latency requirement  −100% vehicles generate packets.  Aperiodic: Aperiodic Model 1 specified in TR37.885 with following changes:  −Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms  −Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes  −Latency requirement: 100 ms  −100% vehicles generate packets.  Note:  All PUEs use the same traffic for simplicity.  Periodic and aperiodic traffic are simulated separately. | Periodic: Medium intensity; [50] ms inter-packet arrival, [50]% vehicles generate packets.  Aperiodic: Medium intensity, 100% vehicles generate packets.  Note:  All VUEs use the same traffic for simplicity  Periodic and aperiodic traffic are simulated separately. | Periodic traffic for VUE: Medium intensity; [50] ms inter-packet arrival, [50]% vehicles generate packets.  Aperiodic traffic for VUE: Medium intensity, 100% vehicles generate packets.  Periodic traffic for PUE:  Traffic model for P-UE’s transmission specified in TS 36.885  −The message size is fixed at 300 bytes and transmission frequency is 1 Hz  −‘100ms’ latency requirement  −100% vehicles generate packets.  Aperiodic traffic for PUE:  Aperiodic Model 1 specified in TR37.885 with following changes:  −Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms  −Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes  −Latency requirement: 100 ms  −100% vehicles generate packets.  Note:  All PUEs use the same traffic for simplicity.  All VUEs use the same traffic for simplicity  The traffic model of V2P and V2V is same for simplicity |
| **Cast type** | Broadcast | 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively. | VUE: 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively.  PUE: Broadcast |
| **Simulation environment, UE drop and mobility** | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids |
| **Channel model** | As defined | As defined | As defined |
| **SL simulation bandwidth (MHz)** | 20 MHz | 20 MHz | 40 MHz |
| **Resource selection scheme** | Full sensing  Partial sensing  Random selection  Each scheme is simulated separately (To compare with each other) | Full sensing (As a background to evaluate different DRX schemes) | VUE: Full sensing  PUE: Random selection or partial sensing  Note: All VUEs use the same resource selection scheme for simplicity  All PUEs use the same resource selection scheme for simplicity |

**Round 1 comment on 1/27 – 1.29**

**Q1: Do you think it necessary to define the profile for P2V/V2P/V2V? (Y/N)**

**Q2: If Q1 is Yes, do you support all the three profiles, or some of them? (Profile 1/2/3)**

**Q3: If Q1 is Yes, and Q2 is also supported, please provide your suggested profiles below the comments table.**

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| --- | --- | --- | --- |
| **Company** | **Q1** | **Q2** | **Views** |
| vivo | comment | comment | It would be good to limit the variations between results from different sources.  The problem of these profiles for P2V-only and V2P-only is on the interference link. For example, in P2V-only profile, the only interference / collision sources are TX from other PUEs. Such modelling is too optimistic to get a meaningful observation.  Thus, at least V2V should be modelled together for P2V case, while P2P should be modelled together for V2P case, in order to have meaningful results.  But then the P2V and V2P profiles require a similar cost of simulations as mixture profiles, and become questionable why we should define these two profiles. Note that it is also possible to evaluate the P2V and V2P performance in a single mixture scenario. |
| **Qualcomm** | **No** |  | **In our view, companies can select their scenario(s) of interest and perform evaluations. There is no need to start an alignment effort at this point.** |
| OPPO | YES | YES | We support the above three profiles. The scenario of P2V only is used to evaluate the performance of different partial sensing algorithms in a relatively ideal scenario. In the meanwhile, the scenario of V2P only is used to evaluate the performance of different DRX schemes. Finally, the mixture scenario is the most complicated one. Considering the workload of simulation, we have to make some assumptions for simplicity, e.g., all of VUEs have the same traffic model and only perform one type of RA schemes in one simulation. |
| ZTE,Sanechips | Yes | Yes | See table below. |
| CATT, GOHIGH | Yes | Some of them | For P2V evaluation, we think at least P2V+V2V should be evaluated. In P2V only cases with current evaluation assumption, the resources for P-UE transmission is over-provided, maybe all the partial sensing schemes could achieve better and similar performance gain.  For V2P evaluation, similar with P2V, we think at least V2P+V2V should be evaluated. |
| Huawei, HiSilicon | No |  | We think companies can select the scenarios and perform evaluations they prefer. No common profile is needed. |
| Fujitsu | Yes | See comments | It would be convenient to compare simulation results from different companies with a uniform profile.  Aside from the above three profiles, profile for P2P should also be defined. In RAN#90e, the Rel.17 sidelink WID was updated to consider the impact of sidelink DRX when specifying power saving resource allocation (e.g., partial sensing). One of the major impacts of DRX on partial sensing is expected to be in P2P use case. Without the P2P scenario, the evaluation of DRX impact would be incomplete. |
| Samsung | Comment | Comment | Having the three simulation profiles is OK, but the details should follow previous agreements. There is no need to repeat the details in the table that have been previously agreed. |

[ZTE,Sanechips]

|  |  |  |  |
| --- | --- | --- | --- |
|  | **P2V-only** | **V2P-only** | **Mixture of P2V/V2P/V2V** |
| **Cast type** | Broadcast | All VUEs use the same cast type for simplicity  Optional: 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively. | PUE: Broadcast  All VUEs use the same cast type for simplicity  Optional: 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively. |
|  |  |  |  |

***Observations on the 1st round of discussion:***

* Totally 8 companies replied on the definition of profile.
  + 2 companies [Qualcomm, Huawei, HiSilicon] do not prefer to have this profile.
  + 2 companies [vivo, Samsung] think it is good to have a profile for simulation results comparison among companies. [vivo] think that V2P and P2V requires similar consumptions in mixture scenarios. [Samsung] think that there is no necessary to copy the agreements into such a table as duplicated work.
  + 4 companies [OPPO, ZTE/Sanechips, CATT/GOHIGH, Fujitsu] support to have such a simulation profile for better comparison on the results. Following to address some comments:
    - P2V-only, V2P-only should consider V2V. Without V2V, purely P2V-only or V2P-only is to optimized for evaluation, which cannot reflect the practical scenarios.
    - P2P is also another important scenario. However, the evaluation should follow the agreements on P2P during last two meetings. It is all up to companies’ option for evaluation. Additional discussion on how to involve P2P in the simulation is not expected.

**[FL]**

The intention of having a simulation profile is good, which is to be used for better comparison on the evaluation results from different companies by applying the same parameters/scenarios. No additional evaluation workload is expected to be introduced to companies’ current simulation work, especially at this stage. The evaluations should follow the agreements, and companies can also select additional scenario(s) they are interested for evaluations.

This profile is that it can be a guidance of evaluation work for future results comparison rather than an extra burden. I would like to suggest companies to update the following profiles based on the agreements and their preference of evaluation assumptions.

**Updated proposal (1.29)**

***FL Proposal:***

* *The following profiles are defined:*

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| --- | --- | --- | --- |
|  | **P2V Only** | **V2P Only** | **Mixture(P2V,V2P,V2V)** |
| **Sidelink frequency (GHz)** | 6 | 6 | 6 |
| **Traffic models** | Periodic: Traffic model for P-UE’s transmission specified in TS 36.885  −The message size is fixed at 300 bytes and transmission frequency is 1 Hz  −‘100ms’ latency requirement  −100% vehicles generate packets.  Aperiodic: Aperiodic Model 1 specified in TR37.885 with following changes:  −Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms  −Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes  −Latency requirement: 100 ms  −100% vehicles generate packets.  Note:  All PUEs use the same traffic for simplicity.  Periodic and aperiodic traffic are simulated separately. | Periodic: Medium intensity; [50] ms inter-packet arrival, [50]% vehicles generate packets.  Aperiodic: Medium intensity, 100% vehicles generate packets.  Note:  All VUEs use the same traffic for simplicity  Periodic and aperiodic traffic are simulated separately. | Periodic traffic for VUE: Medium intensity; [50] ms inter-packet arrival, [50]% vehicles generate packets.  Aperiodic traffic for VUE: Medium intensity, 100% vehicles generate packets.  Periodic traffic for PUE:  Traffic model for P-UE’s transmission specified in TS 36.885  −The message size is fixed at 300 bytes and transmission frequency is 1 Hz  −‘100ms’ latency requirement  −100% vehicles generate packets.  Aperiodic traffic for PUE:  Aperiodic Model 1 specified in TR37.885 with following changes:  −Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms  −Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes  −Latency requirement: 100 ms  −100% vehicles generate packets.  Note:  All PUEs use the same traffic for simplicity.  All VUEs use the same traffic for simplicity  The traffic model of V2P and V2V is same for simplicity |
| **Cast type** | Broadcast | All VUEs use the same cast type for simplicity  Optional: 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively. | PUE: Broadcast  All VUEs use the same cast type for simplicity  Optional: 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively. |
| **Simulation environment, UE drop and mobility** | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids |
| **Channel model** | As defined | As defined | As defined |
| **SL simulation bandwidth (MHz)** | 20 MHz | 20 MHz | 40 MHz |
| **Resource selection scheme** | Full sensing  Partial sensing  Random selection  Each scheme is simulated separately (To compare with each other) | Full sensing (As a background to evaluate different DRX schemes) | VUE: Full sensing  PUE: Random selection or partial sensing  Note: All VUEs use the same resource selection scheme for simplicity  All PUEs use the same resource selection scheme for simplicity |

**Round 2 comments 1/29-2/2**

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| **Company** | **Views** |
| vivo | As commented before, the proposed P2V and V2P profiles are meaningless given only impractical interference modelling. The mixture profile is somewhat better, but still not representing, given the broadcast traffic is simulated for PUE.  Moreover, all the profiles here are for V2X scenarios. Then the evaluation results may not be meaningful for public safety/commercial.  Thus, we start to doubt the benefit of these profiles, and do not support this proposal. |
| Qualcomm | We do not support this proposal. In addition to issues raised by vivo, we would like to emphasize that there had been other proposals by the companies to include other scenarios for evaluation; however, they were not included on the basis that the companies could consider other scenarios too and report their assumptions. We think, for consistency, the same approach can be taken here. |
| Huawei, HiSilicon | As our previous reply here, we still think it is less necessary to set up common profiles at this stage. Companies can select scenarios they prefer and perform simulation.  We nevertheless make the following comments, regarding the proposed content for why even if we continue discussing them we have several concerns:   * + For the V2P-only profile, simulation of full sensing would be a baseline for different SL DRX schemes comparison, but the dedicated DRX design is up to RAN2 which is out of RAN1 scope and RAN1 does not need simulate them. Thus this profile’s justification does not seem suitable to define it.   For the mixture profile, the intention of the scenario is simulating the performance of UEs using different resource allocation schemes. For P2V link, pedestrian UE can select reduced sensing RA schemes. For both V2P and V2V links, vehicle UEs select resource based on full sensing. To balance the work load of simulation and performance, selecting only one type of link using full sensing is enough. So either V2V or V2P can be chosen. Considering the capability of reception UE and to have a uniform type for receiver in the pool, vehicle UE may have better performance and thus V2V would be the better candidate.  For the cast type of profile 3, it is better to use same cast type for all types of UE as baseline, e.g. broadcast. This is primarily for isolating the system impact from different parameters variation, and it would also simplify the simulations.  The intention to have common profiles might be related to comparisons, but it should also provide enough flexibility for simulation to verify different schemes. For the UE drop of profile 3, a fixed number of P-UE does not give enough room to take the channel congestion into account which could have serious impact on the PRR performance using different RA schemes. A feasible way is to set a range for the number of P-UE, companies can support one or multiple values within the range and claim them when simulation results are provided. Based on our understanding, a range between 50 and 500 is reasonable. |
| Samsung | We do not support this proposal. Companies can refer to earlier agreements as a basis for their simulation scenarios. |
| CATT, GOHIGH | We do not support the proposed traffic model for V2P-only/P2V-only cases. We have already reached the agreements on V2P and P2V traffic model in RAN1#103-e meeting, there is no need to further discuss it. Companies can perform evaluations based on these agreements.  We also think it is more reasonable to introduce V2V traffic as interference when performing V2P or P2V evaluation. For V2P evaluation, each Tx V-UE can perform either V2V traffic specified in TR37.885 or V2P traffic defined in the following agreements. For P2V evaluation, each or part of V-UE perform V2V traffic, while each Tx P-UE perform P2V traffic defined below. Further details can up to company's implementation.  Agreements:   * For P2V link, at least following traffic model is supported: * Option 1: Traffic model for P-UE’s transmission specified in TS 36.885   + The message size is fixed at 300 bytes and transmission frequency is 1 Hz   + ‘100ms’ latency requirement * Option 4: Aperiodic Model 1 specified in TR37.885 with following changes:   + Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms   + Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes   + Latency requirement: 250 ms or 100 ms   Agreements:   * For V2P link, V2V traffic model and the following options for traffic model are supported. Companies declare which traffic model is used for their V2P evaluation. * Option 7: Periodic Model 2 specified in TR 37.885 with following change:   + Inter-packet arrival time: 500ms   + Latency requirement: 500 ms or 100 ms * Option 8: Aperiodic Model 1 specified in TR 37.885 with following change:   + Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms   + Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes   + Latency requirement: 250 ms or 100 ms |
| OPPO | Support FL’s proposal. We also see that some companies want to introduce the interference of V2V in the profile of P2V only and V2P only, i.e. P2V+V2V and V2P+V2V. But we think the above two scenarios are the special cases of the mixture one. Therefore, it is also ok for us to define the only one profile for the mixture scenario and add a note that this profile can also be used as a reference for P2V+V2V, V2P+P2V. |

***Observations on the 2nd round of discussion:***

* Totally 6 companies replied on the definition of profile.
  + 5 companies [vivo / Qualcomm / Huawei, HiSilicon / Samsung / CATT, GOHIGH] do not support the proposed profile.
    - [Qualcomm / Huawei, HiSilicon / Samsung] are with strong concerns. There is no necessary to have such a profile to restrict the flexibility of evaluation parameter selection by companies. The agreements can be the applied as the basis.
    - [vivo / CATT, GOHIGH] V2P-only or P2V-only is meaningless for evaluation because of the impractical interference modeling. V2V should be added as the interference to V2P or P2V modeling to make the evaluation more practical.
  + 1 company [OPPO] support to have the above profile for sidelink evaluation, and it is also acceptable to only define the mixture scenario.

**[FL]**

It is clear that 5 of 6 companies have concerns on defining such a simulation profile, especially on V2P-only and P2V-only. A mixture scenario can be flexibly considered by companies, even though some companies do not prefer to have any profile for restriction. By eliminating the most negative part from the proposal, V2P-only and P2V-only are removed. By taking majority companies’ views into consideration, a restrict profile is even not necessary. However, the mixture scenario did not have a chance for any discussion in previous meeting. For a way forward, I would like to suggest considering the mixture scenario and having the following proposal rather than a simulation profile. Both V2P link and P2V link can follow the agreements to do evaluations including traffic models. V2V traffic is considered as interference to either V2P evaluation or P2V evaluation to have more practical modeling.

* For V2P evaluation, each transmitting V-UEs can perform either V2V or V2P traffic for simplicity in evaluation effort.
* For P2V evaluation, it is more like a clarification by supporting mixture scenario, because when adding P-UEs in V2V traffic, all V-UEs perform V2V traffic by default.

**Updated proposal (2.2)**

***FL Proposal:***

* *For V2P evaluation, the mixture of V2P traffic and V2V traffic is supported.*
  + *Each Tx V-UE performs either V2V traffic or V2P traffic.*
* *For P2V evaluation, the mixture of P2V traffic and V2V traffic is supported.*
  + *All Tx V-UEs perform V2V traffic.*

**Updated proposal (2.3)**

***FL Proposal: (rev-1)***

* *For V2P evaluation, the mixture of at least V2P traffic and V2V traffic is supported.*
  + *Each Tx V-UE performs either only V2V traffic or only V2P traffic.*
* *For P2V evaluation, the mixture of at least P2V traffic and V2V traffic is supported.*
  + *All or portion of Tx V-UEs perform V2V traffic.*

**Round 3 comments 2/2-2/3**

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| **Company** | **Views** |
| Qualcomm | We still prefer to let the companies pick the evaluation scenarios and report them. However, we could accept the updated FL proposal too with the following clarification:   * **Each Tx V-UE performs either only V2V traffic or only V2P traffic.** |
| OPPO | Support FL’s proposal and OK with Qualcomm’s clarification. |
| vivo | We could accept the proposal with the following updates (based on QC’s update), so that additional interference link (such as P2P) is not precluded:   * *For V2P evaluation, the mixture of at least V2P traffic and V2V traffic is supported.*   + *Each Tx V-UE performs either only V2V traffic or only V2P traffic.* * *For P2V evaluation, the mixture of at least P2V traffic and V2V traffic is supported.*   + *All Tx V-UEs perform V2V traffic.* |
| Fujitsu | We support with vivo’s updates. The interference from P2P link should not be omitted. |
| Huawei, HiSilicon | It’s probably fine to leave companies to decide and report the detail of these issues at this point. An example is that, the mixture of P2V traffic and V2V traffic, however, the sub-bullet of it is too restricted to mandate all Tx V-UEs to perform V2V traffic.  The amount of Tx-UEs in V2V traffic is determined based on the vehicle UE speed. The number could be as high as hundreds for a specific speed. For example, if the vehicle speed is 60km/h, the quantity of UEs is around 560. If all Tx V-UEs are required to perform V2V traffic, the interference level for P2V evaluation may be quite high. The PRR performance curves possibly roll-off rapidly regardless of the resource allocation schemes used.  Therefore, we suggest portion of Tx V-UEs are allowed to perform V2V traffic. That will control the interference level within a reasonable range and have more flexibility on simulation. The dedicated amount of V-UEs to perform V2V traffic can be decided by companies.  The second bullet of proposal can be changed as following:   * *For P2V evaluation, the mixture of P2V traffic and V2V traffic is supported.*   + *All or portion of Tx V-UEs perform V2V traffic.* |