**[100b-e-NR-5G\_V2X\_NRSL-SYNC-03]**

**Email discussion/approval related to sync procedure**

[100b-e-NR-5G\_V2X\_NRSL-SYNC-03] Email discussion/approval related to sync procedure –

SL SSIDs/sync resources for each priority and

Lower SLSS ID with higher priority for P6/P6’ UE

(a,k.a. issues 4-1 & 4-2) by 4/24, with potential TPs by 4/29 (CATT, Teng)

**Issue 4-1 SL SSIDs/sync resources for each priority**

4/30

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| **Conclusion:*** The ambiguity of SSID(SSID=337) between P2 and P6 exists when the GNSS is the highest priority, and it can be resolved by proper configuration (e.g. only configure 2 synchronization resources).
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4/20-4/23

According to the responses 4/20-4/23, it seems like most of the companies admit the priority ambiguity issue in the current sync procedure, but majority views is that this issue can be solved by proper configuration, and it is an optimation than a solution.

From my perspective, this issue is inevitable among different priority if no proper solution is given, unless we leave it as UE implementation. So I would like to leave a little bit more time for further clarification and discussion.

4/23-4/24

According to the responses 4/23-4/24, majority companies still think that the following proposal is an optimization to the current sync procedure. It is clear that the companies are well know about this problem technically which can be solved properly by configuration.

***Proposal 5: the following corrections shall be applied in current synchronization mechanism to solve the issues of ambiguity:***

* ***Reserve a SL-SSID for InC UE directly synch with GNSS, e.g. SL-SSID=1.***
* ***Then the SL-SSID set for In\_C UE directly synch with gNB/eNB is SL-SSID= [2,335].***
* ***For UE OoC sync to UE OoC, distinguish 2 cases:***
* ***If sync Ref UE is directly sync to GNSS (i.e., SL-SSID=0, and transmitting on resource 3).***
* ***Resource 2: InC = 0. SL-SSID=0.***
* ***Other cases:***
* ***Resource 1 or 2 (different from Sync Ref):***
* ***If the SL-SSID of Sync Ref UE is 0, SL-SSID = 336 and InC = 0;***
* ***Else, SL-SSID is from Sync Ref and InC = 0.***

FL comment:

* I would like to report the situation and discussion result to Chairman.

**Email responses in 4/20-4/23**

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| **Company** | **Views** |
| vivo | **Regarding the 1st and 2nd bullet:** Whether there would be ambiguity in identifying the sync priority of UEs using SSLID=337 depends on the number of sync resource sets (pre-)configured. If only two resource sets are provided, there is no ambiguity and SLSSID=1 still can be used by UE synced to NW. If three sets are used, there could be some ambiguities, but note that a similar issue also exists in LTE V2X, and it can be avoided by proper configuration, there is no need to always reserve SLSSID=1 for InC UE directly synch with GNSS.**Reading the 3rd bullet:**This bullet is the same as the LTE sync procedure except that 168 is replaced by 336. The relevant description has been already captured in 38.331, I am not sure why this bullet is needed?[CATT]Thank you for admit about this ambiguious issue. Yes, it is existed in LTE V2X but not be solved. We also did not see any configuration solution to avoid the ambiguity. We do not want to see the same problem happen in NR V2X sync procedure since we are reusing the same procedure (38.331 almost copy everything from 36.331). The above table is quite clear to express the issue, and a solution can be discussed by us. |
| Nokia, NSB | We don’t support the proposal. We think that further agreements are not needed. Potential ambiguities can be avoided by proper configuration.[CATT] Please see the explanation to vivo. |
| Ericsson | Do not agree with the proposal. The table of priorities agreed in [98-NR-09] only distinguishes between direct and indirect synchronization to GNSS. We did not consider any optimization for the case of more than 2 hops. We do not see the need to have it now, specially at this point in time of the release (maintenance phase). Additionally, the proposed procedure adds the potential issue of having a two different UE sending SLSS with different SL-SSID in the same resource (creating interference at the receiver) which does not occur in the current procedure without the modification.[CATT]The agreements in sync procedure has the table with P6 as the remaining UEs, how to express the remaining UEs have to be clear in the spec. obviousely, UEs with >=2 hops will suffer the ambiguous issue according to the current spec. P6 is always contains all of the rest kind of UEs expect P0~P5 UEs. If we ignore this issue, it is always there from LTE to NR. |
| LGE | FL proposal is not supported.The current agreement on SL-SSID that follows the LTE rule does not need further optimization.[CATT] Please see the explanation to Ericsson. |
| CATT | The above proposal is supported.The ambiguity does happen in both LTE and NR sync procedure. UE in P6’ and P6 with more than 1 hops are allocated with SL SSID 169/337 have the same priority level with P5’ and P6, respectively. Especially in GNSS-based sync procedure, P2 and P6 have the same sync resource, InC indicator and SSID 337. P2 and P6 have large gap in the priority but suffer the ambiguity issue, which can lead to ignorable problem. The issue is obvious, and also a solution is needed. P6’ and P6 include not only standalone UEs but also >=2 hops UEs. The proposal above is not a simple optimization, it is a solution to eliminate the ambiguity.**Table 7: GNSS-based synchronization priority levels for NR V2X**

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| **Priority****level** | **GNSS-based synchronization** | **Sync resource** | **In-coverage indicator** | **NR V2X SL-SSID range** |
| P0 | GNSS | 　 | 　 | 　 |
| P1 | InC UE1 directly sync with GNSS | R1 | TRUE | 0 |
| OoC UE2 directly sync with GNSS | R3 | FALSE | 0 |
| P2 | UE3 indirectly sync with GNSS by InC UE(UE1) | R2 | FALSE | 0 |
| UE4 indirectly sync with GNSS by OoC UE(UE2) | R2 | FALSE | 337 |
| P3 | gNB/eNB | 　 | 　 | 　 |
| P4 | InC UE5 directly sync with gNB/eNB | R1 | TRUE | [1,335] |
| P5 | UE6 indirectly sync with gNB/eNB by InC UE(UE5) | R2 | FALSE | [1,335] |
| P6 | UE7(>=2 hops  sync with GNSS by InC UE) | R1/R2 | FALSE | 336 |
| UE8(>=2 hops  sync with gNB/eNB by InC UE) | R1/R2 | FALSE | [337,671] |
| UE9(>=2 hops sync with GNSS by OoC UE) | R1/R2 | FALSE | 337 |
| UE10(standalone) | R1/R2 | FALSE | [338,671] |

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| ZTE, Sanechips | We share the view that there is an issue of ambiguity between the UE sync to gNB/eNB indirectly with no less than 2 hops and the UE sync to GNSS indirectly or with more than 2 hops if the SL-SSID = 1is used by InC UE. However, we think the potential collision can be avoided by add a note in specification that ***InC UE is not expected to be assigned SL-SSID =1***[CATT]Thank you for admit about this ambiguious issue. Any proper solution should be added no matter it is a note or some modification on the current SSID range for some priorities. |
| Samsung | We share the view with vivo, Nokia, Ericsson and LGE. There may exist an ambiguity but it can be resolved by proper configuration as in LTE V2X. Also, we don’t think that synchronization procedure over more than 2-hop is often necessary. Having said that, this proposal is further optimization and we don’t support this proposal.[CATT] Please see the explanation to vivo. |
| Huawei, HiSilicon | *Not necessary*. For the first sub-bulletin (i.e.: ‘Reserve a SL-SSID for InC UE directly synch with GNSS, e.g. SL-SSID=1’), even for LTE-V2X, we haven’t the agreement said SLSSID dedicated to 1 for UE which is sync to GNSS when under the coverage of network. Hence, this newly added proposal need more justification.Then the second sub-bulletin is related to the first one.For the third sub-bulletin, this also is different from LTE-V2X. In LTE-V2X, SLSSD 169 is used if the third sync source is introduced. So we need to first discuss whether to support the third sync source. If the answer is yes, then we need to check whether the LTE-V like mechanism can be reused or not. If not, some new rules like above can be discussed further. In general, this maintenance stage is not suitable to discuss nonessential issues. Please notice, we have made the agreement as following: *Agreements****:****672 SL-SSIDs are divided into 2 sets to indicate different synchronization priorities following a similar approach as in LTE-V2X:* * *Set id\_net {0, 1, …, 335}*
* *Set id\_oon{336, 337, 338, …, 671}*
* *The usage of 0 is the same as 0 as in LTE*
* *The usage of 336 is the same as 168 as in LTE*

*The usage of 337 is the same as 169 as in LTE*[CATT]Thanks for providing the agreements. In the agreement, the last bullet said that the usage of 337 is the same as 169 in LTE. This is why we have the ambiguious issue. The above solution can be discussed and modified, but this issue cannot be ignored. |
| MediaTek | *Maybe not necessary in the maintenance stage. Besides, It may be more like a corner case that both P6 and P2 (close to each other) can be detected by the other UEs.*  |

**Email responses in 4/23-4/24**

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| **Company** | **Views** |
| LGE | FL proposal is NOT supported. It’s hard to understand why the same proposal is discussed repeatedly in the maintenance phase though majority views are against the proposal. The proposal is reverting the existing agreement as Huawei mentioned. I’m not sure whether the issue is critical, but even if it’s the case, the operator can simply choose to configure 2 sync resources. |
| Ericsson | Do not support the proposal. In our view, and the majority of the companies, this proposal looks like an optimization to the synchronization mechanism already agreed for NR and LTE-V2X and we think we are beyond that point in the current release. As we commented in our previous reply, we see that the proposed optimization brings some potential interference issues which do not appear in the current mechanism while bringing some benefit in a quite cornecase as some other companies also indicated.  |
| CATT | From our understanding, this issue is very important, sicne it will lead to ambiguous between P2 and P6, which is different with that in LTE V2X(P3 and P4 in GNSS based sync). Otherwise the synchronization procedure will be broken. It is ture this issue can be avoided by configuration, i.e. 2 sync resources. But do we want to limit the synchronization only into 2 sync resources scenario? If this is the situation, what’s the point to introduce 3 sync resources. Again, this is not optimation issue, this is the critical issue for our synchronization procedure. |
| Samsung | Only single company has said that the proposal is not an optimization issue but majority companies have commented that the proposal is an optimization. This discussion seems never end. What can we do? |
| vivo | As we mentioned before, this is more like an optimization and can be avoided by configuration. Not necessary. |
| Huawei, HiSilicon | We still think the FL proposal is not needed. Current agreement is enough.  |

**Issue 4-2 Lower SLSS ID with higher priority for P6/P6’ UE**

4/30

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| Dear all,Thanks for the continued discussion. Since this issue has been discussed for a while, I don’t think it will add much value if we discuss any further in May. So, let’s conclude that this issue is not to be discussed any further in Rel-16. Thanks for your efforts and understanding. The email thread is thus closed.BR,-Wanshi |

4/20-4/23

We had long time discussion on this issue for several meetings, and there are two companies still have concerns on this issue. So I would like to give it a little bit more time further discussion.

4/23-4/24

The proponent companies and opposite companies had deeply discussion on technical details on this issue, but it is obvious they cannot convince each other. I think it will be endlessly discussed by companies, because we had long time debating for several meetings. I whish I could make a progress, but I am afraid not.

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| **Views** | **Companies** |
| Support | [Qualcomm] [LGE] [Panasonic] [NTT DOCOM] [Fraunhofer] [FirstNet] [Volkswagen] [BOSCH] |
| NOT support | [Huawei, HiSilicon] [MediaTek] [Sharp] |

***FL Proposal:***

* ***If (pre)-configured in a carrier, the mechanism given below replaces the RSRP-based SynchRefUE selection only for P6 and P6’ priority case.***
* ***For the prioritization among references of the same priority for P6/P6’ UE, UEs select the lowest SLSS ID SynchRefUE among the SyncRefUEs with RSRP>threshold.***

**Email responses in 4/20-4/23**

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| **Company** | **Views** |
| Qualcomm | Yes, RAN1 should discuss and agree on the proposed mechanism. Merging independent synchronization clusters is a critical issue that needs to be addressed in NR V2X; otherwise, NR V2X performance can be significantly degraded. This view is shared by the primary users of NR V2X/Sidelink technology (the public-safety community, car manufacturers, and industrial OEMs) and the many companies who co-sourced R1-2002540.We tested alternative proposals that came up in prior RAN1 discussions and provided results in our companion contribution R1-2002543, where we observed that they do not address the issue. |
| LGE | FL proposal is supported.Support the following for details:UE is (pre-)configured to use either RSRP-based or SLSSID-based SyncRefUE selection for P6 and P6’ priority. If SLSSID-based SyncRefUE selection is (pre-)configured, UE selects SyncRefUE with a lower SLSSID. |
| FirstNet | Yes. FirstNet recommends RAN1 to discuss and agree to the proposed technique. As we have said many times thus far in several meetings, as long as there is a finite amount of benefit to public safety personnel, however small it might be, FirstNet requests the 3GPP community to endorse the solution. Merging independent synchronization clusters is a critical issue that needs to be addressed now in NR V2X and not postpone the problem to the future. |
| Huawei, HiSilicon | Not necessary to discuss anymore, as has already consumed substantial amounts of time without reaching consensus. We have nevertheless looked into the proposal again, and found that our concerns only seem to grow. We reiterate with repeating them all here, our points made during email [99-NR-10], since the proposal is only a repeat of that, and we also expand our analysis below. 1. The proposal mainly is used in the P6/P6’ where UE is without GNSS or network coverage. From our understanding, most ITS related traffic is location-dependent traffic. If a UE loses its GNSS signal, it may obtain its location based on its implementation within a short time (e.g. estimate its moving direction and speed, then can get its further location), and emergency message(s) can be sent then. While the proposal will require 20s (at least: it is doubtfulwhether 20s is enough to finish the merging in realities) time to merge the sync cluster. But after 20s long time, all the location information estimated by UE cannot be relied on. Thus P6/P6’ is more useful for public safety.
2. There is not a clear benefit to public safety if all network is broken from the above proposal.Quickly sending the message out to network is more important than to let everyone communicate with each other in some certain area. Then RSRP based sync source selection based on P6/P6’ can make the UE choose the best sync source and connect to the available network more quickly.
3. The main point raised in the proposal is: for RSRP based solution will form different e.g. 2 timing cluster, while the proposed solution attempts to merge into one single timing cluster. The proponent think the RSRP based solution cannot communicate with each other if UEs are located in different timing cluster. While the assumption is that: the UE cannot support more than one sidelink timing. Both in LTE-V and NR-V, there are more than one Rx resource pool, e.g. 16 for NR-V. And the sync source is separately configured in the Rx resource pool. This mean, if the different Rx resource pool is configured by different sync source, e.g. some by GNSS, the other by gNB. And even all are configured as gNB (or eNB), different gNB will have different timing according to RAN4 discussion on this issue. Then the result will be, the UE have to support more than one sidelink timing. Since the UE support multiple timing, under P6/P6’ cases, the sidelink UE can communicate simultaneously with different UEs within different timing cluster. No issue come out for the RSRP based P6/P6’s solution.
4. There are more critical issues identified during the email discussion, including:
	1. Even merged into one single timing by the proposal, different UEs may or may not communicate with each other for the multiple hops timing will beyond the CP length, since the adjacent UEs would be from 4 hops or 1 hop to the sync source.
	2. After multiple hops (e.g. 4 hops), the timing error (0.4us per hop) and frequency error (e.g. 0.1PPM per hop) will be very large, this will beyond the UE capability which is defined by RAN4 for Uu link. 0.3 to 0.4 ppm frequency error will give big challenging to the UE communication with each other. When the UE with 4hops and the UE with single hop communication with each other, the will be big frequency error, timing error and timing delay. This will result big interference and even make it cannot be communicate since the receiver think they are timing and frequency aligned while actually not. The proposal is likely to degrade the sidelink synchronization quality to the extent that public safety can no longer be assured.
	3. How long to achieve the single cluster merging? Considering from the performance requirement from 36.133, one syncRef UE selection/resection will cause around 8.8s, the current 20s claim is doubtful. For the proposed solution, since every UE will select one SLSSID random, at the beginning, every UE will choose different SLSSID, and which one is the lowest one need a long time to stable (some UE gives up its own SLSSID or change its sync source to another one etc.). Were the proposal used, the real-world stability of the system is low.
	4. The stability is much worse than the RSRP based solution. Even after some UEs have spent the time to merge into a cluster, the SyncRef UE may leave or power off for some reason. The merged timing will be broken again, since the second lowest SLSSID UE does not know how many UE sync to it, and it may not know whether it's the lowest SLSSID UE now. While the RSRP based solution does not have this problem. UE will always choose the largest RSRP sync source as its reference UE.
	5. Under the single timing, the chosen lowest SLSSID syncRef UE’s RSRP will be much lower than the RSRP based solution. This will degrade the system performance.
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| MediaTek | The proposal seems not necessary and unclear. Actually this issue has been discussed for a long time in the last meeting. So it is unclear on the implication of “should be discussed”. Anyway, any discussion can be allowed. Besides, (pre-)configurion between RSRP-based or SLSSID-based SyncRefUE selection for P6 and P6’ priority is not preferred. If one of them works, why do we need to support the other one and make them configurable? |
| Volkswagen AG | The formation of synchronization clusters can lead to vehicles within the communication range not being able to communicate between each other. From a car OEM’s perspective this a situation which needs to be avoid or at least the propability of occurrence needs to be minimized: The negative impact (loss of packets) on the communication between UEs while some of these UEs are in the transition between different synchronization sources needs to be minimized.Examples of these scenarios are a needed communication * Between cars driving in a tunnel and eg. not synchronized to a GNSS synchronization source and vehicles outside of this tunnels being connected to a GNSS synchronization source.
* Of vehicles in an underground parking lot eg. not connected to a GNSS synchronization source and vehicles outside on the street being connected to a GNSS synchronization source.

A discussion on this matter should lead to an enhancement and not be potentially postpone to the next release. |

**Email responses in 4/23-4/24**

***Proposal 6: RAN1 should discuss whether UE can be (pre-)configured with P6 sync source with SSID-based selection as the alternative of RSRP-based mechanism in Rel-16.***

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| **Company** | **Views** |
| Qualcomm | As mentioned by Volkswagen, scenarios where the UE is without GNSS or network coverage occur and need to be addressed and FirstNet already commented on the benefit to public safety. A large number of companies also view those scenarios as important to address (R1-2002756).The complexity of supporting multiple sync sources is substantially larger than a simple SLSSID comparison. A solution to reduce the number of independent sync cluster in the first place is more efficient than attempting to deal with them after the fact. Even, if the UE supported multiple sync sources, it would still benefit from having fewer sync sources to follow and track.There will always be cases when UEs cannot communicate with each other, the proposal here is removing/reducing the impact of synchronization as a compounding factor.20 second was chosen to show that even after such a long time, the RSRP-only approach failed to merge into a single cluster, leading to significant performance loss.In terms of stability, SLSS-ID selection is only performed above an RSRP threshold as has been discussed previously, i.e. the SLSS-ID is only used the signal from both potential sync sources is good enough.It’s our preference to have only the SLSS-ID-based solution based on the performance gains. However, (pre)configuration was introduced as a potential compromise a few meetings ago.For reference, this is the proposal in R1-2002756:**Proposal 1:** If (pre)-configured in a carrier, the mechanism given below replaces the RSRP-based SynchRefUE selection only for P6 and P6’ priority case.* For the prioritization among references of the same priority for P6/P6’ UE, UEs select the lowest SLSS ID SynchRefUE among the SyncRefUEs with RSRP>threshold.
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| LGE | Following proposal is reiterated:UE is (pre-)configured to use either RSRP-based or SLSSID-based SyncRefUE selection for P6 and P6’ priority. If SLSSID-based SyncRefUE selection is (pre-)configured, UE selects SyncRefUE with a lower SLSSID.Regarding Huawei’s comments,1. The proposal is about selecting a SyncRefUE as a synchronization source. I don’t see any fundanmental difference between different kinds of SyncRefUEs in terms of searching and selection time. In this regards, there should be no difference between SSID-based and RSRP-based mechanism.2. There is not reason why RSRP-based selection is beneficial in selection and connection to the available network more quickly than SSID-based method. Both methods requires a series of process of comparsion (RSRP or SSID) and selection. Also the proposal is not targeting the priority above P6/P6’, such as connection to network.3. The issue of multiple synchronization sources are out of scope of this discussion. It was discussed for long time and there is no conclusion on standardizing this issue. In this sense, multiple synchronization capability is just an implementation issue.4. a) The concern pointed out is not only an issue for SSID-based but also for RSRP-based. Please note that if the neighbor UEs have same SSID, the RSRP will be the reference for sync selection.b) Because of the same reason described in a), there is no such significant timing/frequency error issue with the SSID. The condition is exactly same as that for RSRP-based method.c) As stated in 2 above, there should be no fundamental difference in time for searching, comparing and selection for both SSID-based and RSRP-based. Please note that UE needs not to search all the UEs of the entire region. UE only needs to compare its neighbors, as same as in RSRP-case. Therefore there should be no stability difference in both methods. Achieving an ultimate goal of a single cluster merge over a wide range of area may require more time, but it does not mean the UEs in neighbor cannot communicate at all. The cluster merging will gradually progress. The important difference is that after some time, SSID-based method will succeed in merging while RSRP-based method may not. This is the key of the proposal.d) I don’t see a fundamental difference here again. Even with RSRP-based method, the same situation happens. UEs moving fast has the same potential of frequent reselection of the SyncRefUE. The stability level is same for both methods.e) I disagree with this point. As a prerequite condition, the RSRP of a lower SSID UE should be greater than the requried threshold that RSRP-based method uses. If such condition is met, there should be no big difference in synchronization performance. |
| Panasonic | We support the proposal to allow more UEs in the communication ranges able to have the communication. This is much simpler than UEs have multuiple timing references to be synchronized. |
| NTT DOCOMO | We support the proposal provided by QC above. It is noted that (pre-)configuration will be introduced for which mechanism is used. If service proviers/operators/etc. have concern to use the proposed mechanism, they can select the current one. If they do not have the concern, the new one can be used for better connectablitiy. |
| Huawei, HiSilicon | **We think it’s the right time to close the discussion on this issue. None of our concerns have been really settled.** **As summary, we think:**1. **Neither the motivation nor the benefits and necessity have been justified.**
2. **The logic of LGE’s proposal make me confused completetly. What’s the motivation to configure using the current RSRP based solution or lower SLSSID based solution ? If LGE thinks the RSRP based solution is good enough, why we need another one. There does not seem a real benefit of this configuration.**

Please note, we just listed some of our concerns, actually, we have more concerns behind. For example, some concerns for evaluation methodologies, like* How to modeling the simulation (using wrap around puts clusters next to each other which are far separated; clustering does not suit wrap around fundamentally);
* How to set the scenarios;
* How to model the impact on the timing, frequency error;
* How to couple the impact both from the system and link level togother, both from the SINR of the selected sync source to the receiver decoding SINR;
* How to set the metric to objectively evaluate different solutions performance, etc. Actually, RAN1 hasn’t any serious discussion on these aspects.

This is beyond what can be done in the maintenance phase.For better understanding, we give further response to the related inputs:For QC’s input:1. We still do not know how the ITS traffic can work in NR-V2X if vehicle loses its location information for more than 20 secoonds time. In our previous reply, we think the the UE can do some location estimation when the UE loses its GNSS signal in a short time, e.g. around several seconds. But we don’t think it’s practical to predict its location with more than 20 seconds. If the UE’s location is unreliable, then the message is also unuseable at all in ITS application.
2. For public safety, we think S-SSB based transmisson and reception is useful. But we haven’t seen the additional benifts for the proposed solution comparing the RSRP based solution. And, because of the loss of sync quality it can even work against the stability needed for safety.
3. For the support multiple sync source, from our understanding, it is there for LTE-V2X and also should be supported for NR-V2X since the sync source is indepedently configured in the Rx resource pool. This complexity has to be paid according to the specification not for RSRP based solution either according to the related UE capabilities or UE implenetation. Under the P6/P6’s scenarios, we just use this UE capability. As in the simulation shown, if the UE can support at least two sidelink timing, we can’t see any performance loss from RSRP soltuion compared to the lower SLSSID proposal. Actually, we think under this real multiple timing supported assumption, the proposed solution will come some performance loss, considering the timing exteneded and frequency error issues for multiple hops sync below.
4. ‘the proposal here is removing/reducing the impact of synchronization as a compounding factor’. Please note, the proposed solution is only applied for P6/P6’. In the cases with GNSS/eNB-gNB or S-SSB forward from GNSS/eNB-gNB, no this issue at all. So this is just some very concer cases and the related proposal for these concer cases if UE support multiple sync source, then no issues at all as pointed in C.
5. For 20s time, from the RAN4 8.8s requirement for sync source selection and reselection, we still double the value. According to C and D, no performance loss at all since UE has to support multiple sources.
6. For stability, some RSRP threshold would be used to select the lower SLSSID sync source. This will result in more critical issues. According previous discucsion, it was pointed the threshold would be per resource pool like common parameter. But how to set the suitable value ? If it is too large, then many sync sources will be filtered, if too small the link will be very weak to the selected sync source. More seriously, if the threshold is configured per resource pool, then if the UE moves, the sync source will be changed. For example if the lowest or senod lower SLSSID become lower than the threshold, what will happen ? The sync source will be reselected again ! More time will be needed to make the whole timing stable again. While the RSRP based solution is more stable without this issue, since the best RSRP sync source will be chosen always, the nearest UE will sync together. This kinds of sync will be faster and more stable with better link level quality. Furthermore, as stated, if the lowest SLSSID UE leaves or power offset, this will be disaster to the whole single timing cluster. The cluster need to recreate again, for which a long time is needed. While almost no impact on the RSRP based solution.
7. For the lower SLSSID based solution, there would be still two cluster of timing. If there is two group of UE with different local timing to the lowest SLSSID. For example, both group with the SLSSID as: 338->339->340. Then two groups UE with the same SLSSID 340 will meet at the egde of two groups, but the timing is different. Then this two group of timing can not be merged still. Two timing still there.

Some additional response to LGE’s input as below: 1. They are different. For example, if two group UEs come togehether in the tunnel, for the lower SLSSID solution, these two groups of UE should adjust the sync source into a unified one. The group 1 or group 2 all UE need reselect its sync source. While for RSRP based solution, the UE just take the best RSRP’s sync source. The UE just monitors the detected S-SSB, no necessary to change until the best RSRP sync source updated. Hence more time will be required for the lower SLSSID based solution.
2. For the timing and frequency error issues:
	1. Timing extending for multiple hops. From the shown figure 3 in R1-2002756, there are many adjacent UEs with 3 hops (or 4 hops) and 1 hop to the same sync source. Even the single timing is used, but the two adjacent UE timing will large than the CP. The adjacent UEs can not communicate or with worse performance accordingly (the time extending would large to around 3us which is large than the 1.2 us CP window). There are many these kinds of UE pairs, if we observed the figures 3. This mean the system performance will become not work or very bad in whole.
	2. Timing error and frequency error impact from multiple hops. The timing error for n hops would be n\*Te. The frequency error for n hops will be n\*fe. According to sync simulation assumption, Te = 0.4us, fe = 0.1ppm. When a 4 hops UE communicates with 1 hops UE, the timing error would be 5\*Te = 2.0us, the frequency error would be 4\*fe=0.5ppm=3kHz. If we further considering the timing extending, the timing error would be 5\*Te+sum(di)/c, which will be 5.3us at least if 1k coverage is assumed. Please note, the CP length can be used under sidelink uses will be half CP/2 since the signal can come from opposite directions. For 30kHz SCS, the usable CP/2 length will be around 1.2us. Hence, for the timing 5.3us timing error and 3kHz frequency error (still without including the impact from the dual speed), the single timing cluster does not work at all. This is also the key issue why the overall design is limited to just agreed two hops from GNSS UE type sync source has higher priority. And to emphasis: the RSRP based solution does not have this issue. It can keep the adjacent UE communicate very well since they directly sync with each other.
 |
| MediaTek | We have the concerns on the (pre-)configuration for the RSRP-based or SLSS-ID based syncRefUEs. Technically, only one solution is enough to address the same issue. It is not nice for UE implementation to support multiple solutions just because of unclear use cases or benefits. For practical operation, it also doesn't make sense for the different UEs to have the different (pre-)configurations. On the other hand, if all of them have the same (pre-)configurations, why do we need to support two solutions? The conditions or the use cases for such (pre-)configuration is unclear. Besides, we are open to have more discussion firstly on the problems themselves raised by Volkswagen. |
| Fraunhofer | We support the proposal suggested by QC above, where the SLSS-ID-based solution is used to reduce the number of independent sync sources. If the compromise is to introduce a (pre-)configuration for a carrier to use this solution or not, we can accept this.  |
| Sharp | We won’t repeat our detailed comments in email discussion [99-NR-10] here, but would like to say that our concerns in that email discussion remain (e.g. on the modelling of sync source selection/reselection procedure, and on the inconsistent assumptions used for describing the problem). And we share point F in Huawei’s comments. |

**Email responses in 4/24-4/29**

***FL Proposal:***

* ***If (pre)-configured in a carrier, the mechanism given below replaces the RSRP-based SynchRefUE selection only for P6 and P6’ priority case.***
* ***For the prioritization among references of the same priority for P6/P6’ UE, UEs select the lowest SLSS ID SynchRefUE among the SyncRefUEs with RSRP>threshold.***

By now, the latest responses of supporting/objecting on issue 4-2 can be summarized as follows,

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| **Views** | **Email response Companies** |
| Support | [Qualcomm] [LGE] [Panasonic] [NTT DOCOM] [Fraunhofer] [FirstNet] [Volkswagen] [BOSCH] [Kyocera] [Continental Automotive GmbH] [FORD] [OPPO] |
| NOT support | [Huawei, HiSilicon] [MediaTek] [Sharp] |

|  |  |
| --- | --- |
| **Company** | **Views** |
| LGE | Agreed.As stated in our previous arguments, this issue is quite important for enabling SL communication, the gain was shown with the simulation results, and it’s supported by the majority of companies including the car manufacturers. |
| Volkswagen AG | Agreed.As stated it is important to merge synchronization cluster to have as little separate clusters as possible. The benefits of the SLSS ID approach compared to the RSRP approach have been shown by simulation results.   |
| Qualcomm | Agree.The primary users of NR sidelink (automotive industry, public safety) have indicated that this is a critical issue to resolve and support the proposal and so did many other companies. The proposed solution is low complexity and backed by simulation results.**<responding to opponent>**To add to the comments on the 20 second interval. I mentioned in our earlier reply that this value was chosen to show that the RSRP-only mechanism did not merge the clusters even after such a long time. In our simulations, the SLSSID based approach merged the clusters in < 4 SL-SSB periods. As mentioned by Volkswagen, operating V2X when GNSS coverage is unavailable is a very important case to address.Even if the UE supported multiple synchronization sources, reducing the number of synchronization clusters will help reduce complexity since there would be fewer clusters to handle.We’ve already answered questions about stability, but again, the SLSSID criterion is only used when RSRP is above a threshold, i.e. both signals are good enough. The argument about a sync reference UE leaving applies to any hierarchical scheme, including the RSRP-only one.The need to merge synchronization clusters was emphasized on this thread from both the automotive industry and from the public safety community, in addition to many others. It shouldn’t be dismissed. |
| Bosch | Agree.I would like to indicate that this is a critical issue that needs resolution in Rel16. I would like also to clarify some concerns raised regarding this proposal here:-          Regarding pre-configuring two alternatives, RSRP and lowering SL-SSID: the latter alternative can be pre-configured to be used in the potential use-cases when the GNSS signal is not available. In 5GAA LS R1-2002941, two very important scenarios are considered: in long tunnels or in underground parking lots, i.e., when ITS communication is still needed.-          ITS traffic after the 20 seconds timeout of losing the GNSS location information: We believe that the positioning accuracy and SL synchronization are two decoupled issues. In our understanding, the UE position after the 20s (in the use cases mentioned above) is required to be compensated by application layer and/or corrected by any available local location services at these spots (e.g., parking lots and tunnels), e.g., using the vehicle internal sensors. However, throughout the time when the vehicle is driving through these spots, V2X sync/communication is still is needed all the time, e.g., carrying basic safety messages.   -          Multiple sync sources as a solution: we agree that this can be an additional solution if it can be used at P6 and P6’. However, this requires reducing the number of clusters to reduce complexity. In our understanding, lowering SL-SSID mechanism can at least achieve few clusters (if not only 1). Yet, the multiple sync sources capability can additionally handle communication between any remaining (unmerged) clusters if needed with low complexity.**<responding to opponent>**Avoiding clusters formation is one of the main Rel16 concerns/enhancements raised by 5GAA in their new LS ([R1-2002941](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Inbox/R1-2002941.zip), RAN1 inbox). Yet, if clusters formation cannot be completely mitigated at the moment, then minimizing the number of resulting clusters is what we should opt for now. According to our understanding, the current FL proposal (lowering SL-SSID) provides a technical solution that can actively merge synchronization clusters, i.e., minimizing the number of clusters, compared to RSRP-based solution. Further clarifications to some of the concerns raised by Chao Li in his previous email are captured in the table below after VW and QC. |
| FORD | Agree.As an automaker with keen interest in this technology, we are in support of resolving this issue in Rel-16 and we oppose postponing it to later releases. We strongly support RAN1 discussing and reaching an agreement that would enhance synchronization in Rel-16, and make the technology robust enough for automotive usage. |
| Kyocera | Agree.Regarding the issue 4-2 Kyocera supports the solution presented in R1-2002540. Furthermore, as Chair mentioned in his email, we also believe the group must consider the fact that the public safety community supports this feature as well before making this decision. |
|  |  |
| Huawei, HiSilicon | Disagree. For issue 4-2, the proposal has not changed since RAN1#99 and earlier, and therefore our view is not changing. We give below a re-summary of most of our previous points. In addition, we would point out to the public safety and auto-manufacturer community that LTE V2X allows a UE a capability of supporting more than one concurrent synchronization reference. We assume you can support adding the same capability in NR V2X, which would then give you a robust addition to what has been agreed so far wrt using RSRP-based selection (and it does not then matter whether we mutually agree any is needed).I think the summary is very clear. We have raised some issues/questions/concerns with very detailed information. But they haven’t been well addressed. Some summary for quick reading as following:-          What’s the logic to configured between two alternative, since the RSRP and lower SLSS ID solutions are not related to different scenarios. Especially, for pre-configuration cases, there are no unified information about the potential use cases.-          The necessary is not clear, include:o    We still do not know how the ITS traffic can work in NR-V2X if vehicle loses its location information for more than 20 seconds time.o    We haven’t seen the additional benefits for the proposed solution comparing the RSRP based solution.-          No necessary for lower SLSSID solution, since according to current 38.331, the UE has to support multiple sync source. Under the P6/P6’s scenarios, the capability to support multiple sync sources can be used to treat the two cluster of sidelink timing for RSRP solution. -          The proposed lower SLSSID solution is not stable when the UE moves or the lowest SLSSID Ref source UE leaves, then the whole single timing cluster need to rebuild. While RSRP based solution no this issue.-          Worse link performance between sync source UE and the other UEs for the lower SLSSID solution. While RSRP based solution will always choose the best sync source with the best RSRP. -          The proposed lower SLSSID solution cannot work in the system, considering the time extending, timing error, frequency error since there are many UEs with 4 hops need to communicate with single hops UE. While the RSRP based solution hasn't this issue, since the adjacent UEs can communicate each other by the selected sync source.-          The proposed lower SLSSID solution, there are still cases with more than single timing.-          The 20s cluster stable time may not be practical considering RAN4 8.8s requirement for sync source selection and reselection.-          Even for the simulation modeling, methodologies and performance metric need more discussion to align companies understanding before any valid conclusions.  -          Notes: There are very details analysis on the above issues in the FL summary. By the way, this is not a new issue, actually, there was a huge discussion in [99-NR-10], no consensus has been achieved there. And from our observation, there still are issues listed in that discussion which haven’t been solved yet. Now we reopened it again without changes with the identified issues in previous discussion but with more additional issues have been pointed out. Hence considering the situation under the current special stage in Rel-16 CR, we think it’s time to close this discussion now. **<responding to proponent>**Our concerns haven’t been really treated yet. For the details, please see our input in the summary and email please.Firstly, let me justify a bit more:1.       We never said a single timing is not important. Actually, We insisted on that the GNSS and SSB sync should be the basic feature during the UE feature discussion. And we think, in reality, the main cases would be GNSS coverage and/or S-SSB transmission with one or two hops to GNSS. Actually, we just said the proposal to achieve the single timing is not good, and we found there are so many issues (please check our email below and input in the FL summary) such that we cannot accept it before our concerns have been really treated. 2.      Again, since NR-V2X UE will support multiple sync source as what has been done in LTE-V, there is no any issues with multiple timing under P6 scenarios. And if UE support multiple sync source, no complexity reduced at all since the UE already has the related capability to support multiple sync source. a)        And please notice, we have agreed gNB sync source should be support as a basic feature. Then UE has to support multiple sync source timing since RAN4 has pointed the gNB can be asynchronous with each other. 3.      For UE loses GNSS signal after 20s cases, we think it is not suitable for V2X because we think it’s difficult to accurately derive the vehicle locations for example in tunnel or in the underground park uses cases etc. For a relative speed of 160km/h in the tunnel deriving, 20s will be 888 meters distance. For 10km/h speed in the underground park, 20s would be around 60 meters distance. You may estimate the location in some special cases, but I am not sure how we can reliably get the vehicle location considering the potential random deriving trajectory and complex varied scenarios. Please note, estimation error of the location will result in accidents and even life loss. Here, the key issue would be how to get a good UE location or relative distance between vehicle and vehicle, or between vehicle and pedestrians when GNSS signal is lost. Actually, 5GAA asked 3GPP to do sidelink positioning study for several times. But now, we have not good answer to it.4.      By the way, by the UE implementation and RSRP based solution also can support well when UE loses its GNSS signal. And the potential methods from the application layer can also be used together with the RSRP based synchronization.5.      For the configuration between RSRP and lower SLSSID solution, we still haven’t received the solid technical explain why we need to do that. 6.      There are still many issues listed by us haven’t been answered yet…… |
| MediaTek | Disagree.As pointed by Bosch, there is an useful LS from 5GAA on the sync issue which mentioned two problematic scenarios as below.•             Necessary communication between vehicles just driving into or out of a tunnel and vehicles still being outside•             Vehicles which are about to leave an underground parking lot and to enter a road with ongoing traffic and therefore the need to communicate with the vehicles in the ongoing trafficThe root cause identified by 5GAA is that the hierarchical design of synchronization sources for the sidelink communication creates the risk of forming clusters with UEs using different synchronization sources.In short, the key problem is the communication between P6 and the non-P6 vehicles, but not the communications between P6 vehicles. For the problem of communication between P6 and non-P6 vehicles, the proposed SLSSID based solutions doesn’t help. Instead, it sounds that the multi-sync references tracking at UE may address the issues. Or we can further discuss the potential solutions to address the scenarios/issues raised in LS.On the other hand, as commented early we did not see the point of (pre-)configuration between RSRP-based and SLSSID-based solutions. If it is believed that one of them can work well, there is no need to support the other one. (Pre-)configuration will just cause the difficulty on operation and unnecessary complexity for implementation. Moreover, SLSS-ID based solution may also lead to more work in RAN4 and more challenging on practical operation, .e.g., how to select the suitable threshold which can work in all scenarios and whether/how the threshold is configured depending on the scenario/vendors.So in general, there seems more open issues later for SSLS-ID based solutions. Meanwhile, it may not really address the concern raised by LS from 5GAA.Anyway, we are open for any solution/discussion which can address the critical issues/scenarios raised by LS from 5GAA. |
| Sharp | After all the discussions since [99-NR-10] and up to now, we still have the following technical comments which in our understanding have not been addressed,  and based on these comments we are very concerned about adopting the proposal, especially considering that we are already in the maintenance phase of Rel-16.  The first comment is about whether it is really possible to converge to a single SLSS ID, and how. Our understanding is that this is very difficult to achieve.In our understanding of the specs, o    The SLSS transmission procedure performed in different time occasions is independent, i.e. if the UE performs the procedure respectively at time t1 and t2 and t2 > t1, the corresponding UE actions at time t2 does not depend on whether/how the UE performs the procedure at time t1. o    For an “independent sync source” (i.e. a UE who does not have a SyncRefUE), the SLSS ID is randomly selected among the set of SLSSIDs. In other words, when generating a SLSS ID, the UE does not “remember” and does not care about which SLSS ID was used in the last run of the SLSS transmission procedure.o    Given the above, for an “independent sync source”, as time evolves, the generated SLSS ID is almost always different than the previously generated one. Therefore, even if the timing “associated with” a SLSS ID has been smoothly populated to a group of other UEs, in the next run of the SLSS transmission procedure it may happen that another, possibly smaller SLSS ID is generated, and cause another round of update. Things are even worse when multiple “independent sync source” exist, and they randomly generate SLSS IDs, sometimes small, and sometimes large. – if the SLSS ID based approach is adopted.  Note that the “fluctuation” of SLSSID has no impact on the timing spread for the RSRP based approach, where the SLSS ID value is not used in this way as a condition to choose sync source. o    Below is some text taken from the specs which we think is relevant here.

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| 2> else (i.e. no SyncRef UE selected):3>  if triggered by V2X sidelink communication, randomly select, using a uniform distribution, an SLSSID from the set of sequences defined for out of coverage except SLSSID 168 and 169, see TS 36.211 [21];3>  else, randomly select, using a uniform distribution, an SLSSID from the set of sequences defined for out of coverage, see TS 36.211 [21];3>  select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* (arbitrary selection between these) included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* or *v2x-CommPreconfigSync* in *SL-V2X-Preconfiguration* defined in 9.3); |

  The second comment is also about whether it is really possible to converge to a single SLSS ID, but we look at  it from the perspective of whether/how a UE becomes an independent sync source.o    According to the spec, every UE can be an “independent sync source” (e.g. consider “time zero”), and whether it remains as an independent sync source depends on whether it finds a sync source (with good enough RSRP), or the measured RSRP of its current sync source is low enough.o    Taking the figure 1 in R1-2000964 as an example, let’s say the left side cluster (cluster#1) has a lower SLSS ID, and the leftmost UE in the right cluster (cluster#2) does merge to cluster#1, but as long as that UE has a SyncRefUE of its own with sufficient RSRP it won’t become a SyncRefUE on its own, therefore, even though a few edge UEs in cluster#2 are dragged to cluster#1, it is possible that none of these UEs becomes a SyncRefUE for cluster#1, and consequently the timing of cluster#1 cannot be populated to the rest UEs in cluster#2. In that case, aligning the timing between UEx and UEy also means the timing of UEy and UEz become different, which may be just undesirable. For example,  In case of the leftmost UE in cluster#2, it has a SyncRefUE, so whether it becomes a SyncRefUE on its own depends on whether it is far away enough from its \***new**\* SyncRef UE (i.e. the rightmost UE in cluster 1). The condition may or may not hold depending on the drop of UEs.  As to the leftmost UE’s previous SyncRefUE in cluster#2, the condition for stopping to be an SyncRefUE is that it finds a SyncRefUE. In this case, yes, as long as the leftmost UE fulfills the RSRP threshold it will be selected (due to lower SLSSID), but there is also a probability here, because in any case UE A having a measured RSRP = x for UE B does not necessarily mean that UE B has a same or larger measured RSRP = x for UE A.cid:image003.png@01D61E5F.5A455D30  The third comment is about whether an “independent sync source” can remain acting as independent sync source for a very long time (besides using a same SLSSID as raised in the second question). In our understanding, an “independent SyncRefUE” (UE#1) might (re)select to another SyncRefUE (UE#2), and UE#2 may be o    Case 1: another “independent SyncRefUE” (using its own internal clock), oro    Case 2: an x-hop SyncRefUE sync’ed to another “independent SyncRefUE”.o    Case 3: UE#1’s child SyncRefUEAccording to the specs, regardless a UE is a sync source or not, the sync source selection/reselection procedure triggered at different time occasions is independent, and in the procedure the UE will first try to find a sync source and only if no sync source can be found (or it is far enough away from its sync source) it falls back to act as a sync source. Therefore, it is certainly possible in our understanding that a “independent sync source” finds a good enough SyncRefUE candidate, and selects to that UE. Looking in a bigger picture, there should be change of role between an independent sync source and a “non-sync source/non-independent sync source” from time to time. The consequence is that multi-hop scenario is a normality due to the network’s ad-hoc nature.  The fourth comment is about the implication to the quality of sync sources. As we also discussed in [99-NR-10], with the SLSSID-based approach, the possibility of choosing the lowest RSRP SyncRefUE candidate (among a number of candidates with RSRP reaching the configured threshold) may be significantly increased. Note that the threshold is normally configured with rough estimation based on field experience, meaning that a candidate with RSRP just reaching the threshold may be more vulnerable than another candidate with much higher RSRP, in terms of acting as a SyncRefUE. The implication is that the probability of not selecting the highest RSRP seems to increase systematically (comparing with the RSRP based approach). Overall this may cause more frequent switch of a UE’s SyncRefUE which in our understanding does have negative and systematic impacts to SL communications. |

**Email responses in 4/30**

***FL Proposal (4/29)***

* ***If (pre)-configured in a carrier, the mechanism given below replaces the RSRP-based SynchRefUE selection only for P6 and P6’ priority case.***
* ***For the prioritization among references of the same priority for P6/P6’ UE, UEs select the lowest SLSS ID SynchRefUE among the SyncRefUEs with RSRP>threshold.***
* ***It is not mandatory for a UE to support this function.***

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| **Company** | **Views** |
| Sharp | Thank you Teng for the update, but in our view the added bullet makes things even worse, e.g. in a scenario with a mix of supporting and non-supporting UEs, it may happen that for each of many UEs, the timing is not aligned with UE(s) very close to it but is aligned with UE(s) farther away. We don’t think we can support the updated FL proposal.Regarding SLSS ID generation, there seems to be different understandings on how SLSS ID is generated for a SyncRefUE. We don’t think some implementations (rather than the specs) could be used to interpret the “common understanding”. In our understanding there is no such a requirement that the SLSS ID should be randomly generated once and then maintained as a constant. |
| Huawei, HiSilicon | To us, the proposed additional words helpless.As discussed, our concerns haven’t been solid addressed at all.  Furthermore, as Luo Chao pointed, the added additional wordings  actually make the situation worse, at least in the following aspects:  -          First, The logic seems strange. The proposal definitely has impact on the sync procedure specification which have been captured in 38.331. This kinds of specification should be supported by all UEs.  As a complete sync procedure, it is hard to say some of UE will not support part of them. -          Second, if some UEs support the proposal and other UEs just follow the RSRP based solution, then the good performance from the RSRP based solution will be deteriorated.  -          Third, the added wording will make the claimed benefits disappeared, since different sidelink timing will be separately determined according to different UE behaviors. To me, the proposed updated words further confirm our understanding: the original proposal 4-2 is not essential issue !Hence, we cannot support the updated FL proposal.  |
| MediaTek | We share the similar concern. If SLSS-ID based selection is supported, there should be no need of (Pre-)configuration and UE capability.The mixing operation doesn’t help to address the issues.The conditions on how to (pre-)configure it are also unclear, which may also lead to the mixing operation… |
| LGE | I also think that the added sentence in red of the new proposal is not a good way. If such operations are configured, UE needs to follow the procedure for stable SL communication. And please note that the proposal itself is a result of compromise to incorporate both mechanisms.Regarding the Sharp’s comment on the random SL-SSID generation, I don’t think it’s common understanding on the LTE-V2X sync procedure. If a new random SL-SSID is generated at every S-SSB transmission, there is no stable SyncRefUE having a constant SL-SSID among such “self-sync” UEs. Then, the RSRP measurement on a specific SL-SSID will be unstable, which results in severe problem in forming a sync clusters among the self-sync UEs in LTE-V2X.In LTE-V2X, the RSRP is measured during some time duration. L3 filtering is used for this purpose, and the relevant timing requirement is also specified in RAN4 specification. Considering all these aspects, the LTE-V2X SL-SSID is intended to be maintained as constant once a self-sync UE randomly selected a SL-SSID. As a result, I see no issue with the proposal concerning the random SL-SSID generation.For the other arguments, I see only the fact that the RSRP-based method is not helpful for merging into a single sync cluster. The RSRP-based method seems targeted for short-term stability between adjacent UEs (through best RSRP). On the other hand, SL-SSID-based method provides opportunity to make UEs converged into a single sync cluster. In this sense, the SL-SSID-based method are targeted for long-term formation of a global unified sync cluster among UEs of a wide area (through merging to a lower SL-SSID).As I commented in my previous email, the same questions and answers are repeated with different view point. Nevertheless forming a single cluster as an ultimate goal is quite necessary and important issue to be addressed. In this regard, we still prefer to support the proposal. |
| Qualcomm | I don’t follow the jump from the feature lead proposing a compromise to deciding that the cluster merging is not necessary, despite the vocal support from the automotive industry and the public-safety community.Another aspect I’m confused by is that the requirement of using multiple synchronization references is being brought up as a given. Meanwhile, it is only being proposed as an optional feature, and one that is facing opposition due to lack of study and work on it in Release 16. Even more surprising is the support for the high complexity multiple-sync reference support as an alternative to the low complexity SLSSID approach, when even a UE that supports multiple sync references would benefit from cluster merging. This benefit would be in terms of complexity, since the number of independent sources is reduced, and in system performance as shown in our simulations.One point was brought up on the call earlier today about the synchronization reference UE  being required to change its SLSSID every SSB period. We share LG’s view that this would disrupt the synchronization procedure regardless of whether SLSSID-based cluster merging is adopted or not. The SSLSID and synchronization offset must remain stable for multiple SSB periods; otherwise, this UE cannot be used as a synchronization reference for others. |
| Volkswagen | We don’t support to add the red-marked text to the proposal since this worsens the situation: With an optional implementation you will see different synchronization prioritizations on the road. No one has yet analyzed which effects this will have on ITS communication. May be this leads to different synchronization clusters per car manufacturer which is not for the sake of increasing road safety - which should be our goal in this discussion. I would like to reiterate, that the formation of independent synchronization clusters within the communication range needs be avoided. The lower SLSSID solution has shown that it enhances the merging of clusters (so the reduction of clusters) more than the RSRP based solution. For the time being the lower SLSSID solution seems to be a better fitting solution to reduce the amount of synchronization sources, though it is favored by representatives of the public safety and automotive domain. |
| BOSCH | Unfortunately, for technical reason I couldn't add my comments to the table. Therefore, I would like to note our view here. We do not support the added bullet point "in red" as it means having a mixture of synchronization behaviors within the same probability. We aren't sure how this may solve the multi-cluster problem, if within a cluster we have multiple UEs with different synchronization preferences. We do support mandating lowering SL-SSID at least when (pre)configured. |