**3GPP TSG RAN WG2 Meeting #115-e R2-210xxxx
Electronic Meeting, 16th - 27th August 2021**

**Agenda item: 8.7.3.1**

**Source: CATT**

**Title: [AT115-e][617][Relay] Continuation of discussion on discovery (CATT)**

**Document for: Discussion and Decision**

# Introduction

This is email discussion for below offline discussion:

* [AT115-e][617][Relay] Continuation of discussion on discovery (CATT)

 Scope: Discuss the following questions on discovery:

* Whether the network can configure shared and dedicated pool for discovery simultaneously
* Resource allocation modes for discovery (P2/P3/P4/P5 of R2-2106994)
* Multiplexing in shared pool (P1 of R2-2107089)
* BSR for discovery transmission (P4/P5 of R2-2107089)

 Intended outcome: Report to comeback session, in R2-2108949

 Deadline: Tuesday 2021-08-24 2000 UTC

After the Weekend break and before the deadline, we fail to see the possibility to arrange a two-stage discussion as normal. Hence please pay attention, the current email discussion will be carried out by just only one stage, and the deadline for you to participate in this email discussion is 8/24 08:00 UTC.

# Discussion

## Whether the network can configure shared and dedicated resource pools for discovery simultaneously?

During the online discussion, regarding to the discovery, whether the network can configure shared and dedicated resource pools simultaneously was discussed and no common understanding was reached. In the voting, 11 companies support it while 9 companies do not support it. Since there is great divergence, hence, in this email discussion, this issue will be further discussed.

In order to gather companies’ view on this point, in the following question, we listed all the possible options on the resource pool configuration from the network perspective. Companies are encouraged to provide their arguments on why they select this option but not the others.

**Question 1-1: From the network perspective, in case of there is both sidelink communication and sidelink discovery UE in the network, which option is possible when configuring the Tx resource pool? Please give your comments.**

* **Option 1: Only shared resource pool(s);**
* **Option 2: Shared resource pool(s) and discovery dedicated resource pool(s);**
* **Option 3: Shared resource pool(s) and communication dedicated resource pool(s);**
* **Option 4: Only dedicated resource pool(s) for discovery and dedicated resource pool(s) for communication;**
* **Option 5: Shared resource pool(s), discovery dedicated resource pool(s) and communication dedicated resource pool(s).**
* **Option 6: (if any, please add here).**

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| **Companies** | **Option** | **Comments** |
| Qualcomm  | Option 1, Option 2 | First, we don’t fully understand what is “**communication dedicated resource pool(s)” in Option 3/4/5.** Does it mean shared pools which can only be used for communication but not discovery? If yes, we don’t think RAN2 agreed such kind of pool and it is conflicted with below agreement on mode 1 in last Friday: For mode 1, if agreed that both shared and dedicated resource pools can be configured, it is up to gNB which one the UE should use to transmit discovery message.Secondly, please note that “configuring the TX resource pool” should include configuration both via RRC and via SIB, as agreed in last RAN2 meeting:Proposal 3a (modified): RAN2 agree that for L2 remote UE which is out-of-coverage, but connected to network via a relay UE (i.e., either in RRC CONNECTED or RRC IDLE/INACTIVE), it should follow network configuration, i.e., SIB or dedicated signalling, if available.Then, because it is possible that the cell has both sidelink communication and sidelink discovery UE, NW can provide only shared pool (Option 1), or both shared pool and dedicated pool simutenously at least in SIB for IDLE/INACTIVE (Option 2). Thus, this scenario may happen. On whether NW can simutenously configure both shared pool and dedicated pool in RRC, we agree with some company that it seems no strong motivation, but prefer to leave the option to NW (i.e. not prohibit it in spec and up to NW whether to configure it). **[Rapp] For the above green marked question, yes, during the online session, some company raised this description then we captured into the current email discussion.** |
| OPPO | Option1/4 | Firstly, we do not think the Q is clear from network perspective, since whether a resource is “shared” by communication and discovery (ie., overlapping t/f resource(s) is used for communication and discovery by the same/different UEs) is not known/cared by UE.The UE only cares, the behavior w.r.t. the two types of resource pools:1. Shared pool: the pool where both communication and discovery can use;
2. Dedicated pool: the pool where only discovery can use;

so our response is base on the understanding above, and here we did not touch the part for exceptioanl pool but focusing on the pools for normal use case (we understand the exceptional pool may need separate discussion)To us, option 1 is the baseline solution for transmission of both data and discovery message transmission.For option 4, we think if legacy resource pools and dedicated resource pool for discvoery are both configured, legacy pool anyway shall be configured to transmit data for communication only, and discovery dedicated resource pool shall be used to transmit discovery message only. I.e., the “**dedicated resource pool(s) for communication**” in option-4 in our view is the legacy resource pool configuration.**[Rapp]For the above yellow marked parts, we think that discovery dedicated resource pool must include indication，shared resource pool will be the legacy resource pool，hence， we think shared/dedicated resource pool can be known by UE.** |
| Nokia  | Option 1 mandatory (Option 2 optionally) | Our understanding is inline with Qualcomm. RAN2 agreed during the SI phase that shared resource pool is the baseline, i.e. sidelink communication and sidelink discovery are multiplexed/shared within one shared resource pool (regardless whether mode 1 or mode 2) – hence option 1 is mandatory according to our understanding. Since RAN2 also agreed to have in adition to shared pool also dedicated resource pool for discovery only in mode 1, option 2 is possible for mode 1. |
| vivo | Option-1 and option-2 | Agree with Qualcomm. We discussed the shared pool and dedicated discovery pool based on the intention to have seperated resources for discovery messages but we never agreed that there exists some kind of ‘dedicated communication pool’, which means the pools that discovery message cannot use...So at least in this moment, only option-1/2 should be further evaluated with clear agreements. Also we don’t actually see benefits for ‘dedicated communication pool’.  |
| Ericsson | Option 1 and 2 | If there are both discovery and SL commnunication, it may be sufficient to have shared resource pool, however, if the network would like to configure dedicated shared resource pool for discovery for better discovery performance, option 2 is also ok. |
| Huawei, HiSilicon | Need clarification | Not sure all companies have the same view on “Shared resource pool(s)” and “dedicated resource pool(s) for communication”;Can we try to discuss the motivation or gain to allow the network to configure shared and dedicated pool for discovery simultaneously, instead to make it more complicated at UE side? |
| Apple  | Option 1 and Option 4 | Our understadning is that if dedicated discvovery pool is provided, then the share pool is not used for discovery purpose, so it is a pool dedicated for non-disovery purpose. |
| InterDigital | Option 1 and option 2 | We question the need for option 3/4/5 since “communication dedicated” resource pool was not discussed previously, and does not apply to this discussion. The discussion is whether there is a motivation to configure a pool for transmission of discovery only, simultaneously with a pool which allows transmission of both discovery and data.Here, we believe the motivation is to allow the NW to control the amount of resources that can be used for discovery only (and hence benefiting UE power savings) without the possibility that these resources are either congested or have to be overallocated by the NW. So it should be a NW decision whether both pools can be configured simultaneously.  |
| Xiaomi | Option 1 and option 2 | Regarding the specific question and options discussed in RAN2 Option 1 is the baseline, and Option 2 reflects understanding in regards to agreement to adopt optional network configuration of dedicated pool for discovery only. The benefits to simultaneously configuring both resource pool types remains unconvincing although apart of the current agreed optional network configuration.Option 4 seems to presume that shared pools will no longer support discovery resources if dedicated discovery pool is configured. This has not been discussed nor agreed, and of course this configuration no longer identifies as “simultaneous shared and dedicated resource pools”.  |
| MediaTek | Option 1/3/4 | For option 2 and 5, we don’t see the need for network to configure shared resource pool(s) and discovery dedicated resource pool(s) simultaneously from power saving perspective. A UE anyway needs to monitor both shared resource pool(s) and discovery dedicated resource pool(s).We think option 1, 3, and 4 provide sufficient NW configuration flexibility: if UE power saving gain is not a concern, NW could confgure option 1; otherwise, NW could configure option 3 and option 4 considering the tradeoff between UE power saving and system resource utilization.  |
| LG | Option 1/4 with comments | We think that only option1 or only option4 is available at a time. If shared resource pool and dedicated discovery resource pool are configured simultaneously, we cannot find the technical benefits of it. The RX UE has to monitor the full resource pool and the whole available resource becomes segmented. When the shared resource pool and dedicated discovery resource pool are configured simultaneously, the remote UE cannot save power and the resource pool usage efficiency becomes low. So, we suggest that spec can support shared resource pool and dedicated discovery resource pool, but gNB configures only one resource configuration by its implementation. |
| CATT | Option 1 and option 2 | We share the same view as Ericssion, shared resource pool is mandatory supported, and discovery dedicated resource pool is optional configured by network. |
| Spreadtrum | Option 1 and 2 | Agree with Ericsson, and NW decision whether both Shared resource pool(s) and discovery dedicated resource pool(s) can be configured simultaneously. |
| ZTE | Option 1 and Option 2 | Firstly, we think shared resource pool should anyway be configured if sidelink communication is to be supported. In addition, as agreed during previous RAN2 meetings, shared resource pool shall be the baseline for discovery message transmission/reception. So it is possible that only shared resource pool is configured (i.e. option 1). On the other hand, RAN2 has agreed that dedicated discovery resource pool is supported besides shared resource pool configuration, whether it is configured is based on network implementation. So it is possible that both dedicated discovery resource pool and shared resource pool are configured by network. |
| Intel | Option 1 and option 2 | It should be clear that when we talk about shared and dedicated pools, we are specifically talking about the usage of pools with regard to discovery message transmission. Then, similar to other companies’ view, we understand that option 1 is baseline. Option 2 is up to NW to configure in addition, and we have agreed accordingly in the last meeting. Therefore, in case dedicated pool for discovery is defined, the UE may be configured with the dedicated pool for discovery, in which case it can use either the dedicated or the aforementioned shared pool for discovery message transmissions. Since discovery uses communication resources, we understand that legacy communication resource pool can be used by discovery as well (shared).  |
| Sharp | Option1 (and Option2) | Option 1 aligns with the previous agreements. If the majority would like to support Option 2, we are also fine. |
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During the online discussion, we made the following agreements:

For mode 1, if agreed that both shared and dedicated resource pools can be configured, it is up to gNB which one the UE should use to transmit discovery message.

For mode 2, if agreed that both shared and dedicated resource pools can be configured, downselect from the following options:

* Left to UE implementation
* Dedicated pool should be prioritised
* Shared pool should be prioritised

The above agreements is based on the pre-condition that both shared and dedicated resource pool can be configured (Option 3 in Question 1-1), Hence for companies who do not support Option 3 in Question 1-1, we want to further gather their view why this option is not selected, please give your detailed arguments for the objection.

**Question 1-2: From the network perspective, if you don’t support option2 in Q1-1, please give your detailed arguments for the objection.**

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| **Companies** | **Comments** |
| OPPO | With the following FFS point in agreementFFS if the network can configure shared and dedicated pool simultaneously.We understand this pre-condition needs to be further checked,We do not think the online discussion defines the “shared”/”dedicated” resource pool in a rigorous way, and As replied to Q1-1, we understand it is more rigorous to define dedicated/shared pool from UE perspective, i.e., the pool is dedciated (or shared) if the resource pool can only be used for discovery traffic (or both discovery and communication traffic).From that perspective, our preference is that it is only necessary to configured 1) either resource pool(s) shared by communication and discovery (i.e., no dedicated resource pool), 2) or resource pool(s) dedicated to communication traffic only, and resource pool(s) dedicated to discovery traffic only.We do not see the need for configuring both shared pool(s) and dedicated pool(s) yet. |
| Apple | Same understanding as OPPO |
| MediaTek | If we configure both shared and dedicated pool simultaneously, UE may not get power saving gain from dedicated resource pool because a UE anyway needs to monitor both kind of resource pools for discovery messages. |
| LG | We still don’t understand what’s the benefit to configure of both shared and dedicated resource pool. As the HW’s comments in Q1, we need to discuss why both shared and dedicated resource pool is required on the gNB and UE side.  |
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## Resource allocation mode for sidelink discovery

In this meeting, contributions [1], [3] and [4] discussed the issue of discovery resource allocation mode. The corresponding proposals were summarized as below:

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| **Company** | **Proposals** |
| R2-2106994 | **Proposal 2: For relay UE, when performing sidelink discovery, both mode 1 and mode 2 resource allocation modes can be supported, and which one will be used can be determined based on legacy Rel-16 resource allocation mode selection mechanism.****Proposal 3: For IC remote UE which has not been connected to network via a relay UE, both mode 1 and mode 2 resource allocation modes can be supported, and which one will be used can be determined based on legacy Rel-16 resource allocation mode selection mechanism.**Proposal 4: For IC remote UE which has already been connected to network via a relay UE, it is slightly prefers that only resource allocation mode 2 can be used to transmit the sidelink discovery message. **Proposal 5: For OOC remote UE, it is slightly prefers that only resource allocation mode 2 can be used to transmit the sidelink discovery message.** |
| [R2-2107313](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202108%20-%20RAN2_115-e%2C%20Online%5CExtracts%5CR2-2107313.docx) | **Proposal 2: RAN2 to discuss and confirm that the dedicated resource pool for discovery shall support both mode-1 and mode-2 resource allocation.** |
| [R2-2108152](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202108%20-%20RAN2_115-e%2C%20Online%5CExtracts%5CR2-2108152-Relay%20Discovery%20for%20stage%203.docx) | **Proposal 2: Relay UE supports SL mode1 and mode2 for discovery message transmission.****Proposal 3: We need to discuss whether to supports that Remote UE transmits discovery messages using mode 1 operation after the Remote UE becomes in RRC CONNECTED via Relay UE****Proposal 4: After the Remote UE becomes in RRC CONNECTED via Relay UE, Remote UE can be allowed to use only mode2 for transmitting discovery messages. It may reduce complexity and latency.** |

For relay UE, since it is IC, hence when the relay UE performing sidelink discovery transmission, it is reasonable to follow the legacy Rel-16 mechanism that is both mode 1 and mode 2 resource allocation modes can be supported.

For IC remote UE, two cases should be considered:

* Case 1: IC remote UE which has not been connected to network via a relay UE.
* Case 2: IC remote UE which has already been connected to network via a relay UE.

For Case 1, since the remote UE has direct Uu link, similar as the IC relay UE, it is reasonable to support both mode 1 and mode 2. For Case 2, since the remote UE is connected to network via a relay UE, it is naturally that resource allocation mode 2 can be used, but it is doubtable whether resource allocation mode 1 can be supported. In addition, considering mode 1 includes both dynamic scheduling, type 1 configured grant and type 2 configured grant, if mode 1 can be supported, it should further discuss whether all of these three scheduling strategies can be supported or only type 1 configured grant can be supported.

Similarly, for OOC remote UE, there are also two cases should be considered:

* Case 1: OOC remote UE which has not been connected to network via a relay UE.
* Case 2: OOC remote UE which has already been connected to network via a relay UE.

For Case 1, it is obvious that only resource allocation mode 2 can be supported. For Case 2, same as the analysis for IC remote UE, it should further discuss whether both mode 1 and mode 2 can be supported.

**Question 2-1: In case of sidelink discovery, for IC relay UE or remote UE with direct Uu link, which resource allocation mode can be supported? Please give your comments.**

* **Option 1:** **Only mode 1 can be supported.**
* **Option 2: Only mode 2 can be supported.**
* **Option 3: Both mode 1 and mode 2 can be supported.**

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| **Companies** | **Option** | **Comments** |
| Qualcomm | Option 3 | It is same as Rel-16 V2X |
| OPPO | Option3 | We assume the “**remote UE with direct Uu link**” means the “IC remote UE which has not been connected to network via a relay UE”. |
| Nokia | Option 3 |  |
| vivo | Option 3 with comments | Agree with OPPO, it has to be ‘IC remote UE which has NOT been connected to network via a relay UE’. Otherwise, as dual connection has not been supported yet, mode-1(on direct link) plus mode-2(on indirect link)cannot be supported. |
| Ericsson | Option 3 |  |
| Huawei, HiSilicon | See comments | If this is R16 priciple, no need to revisit it. |
| Apple | Option 3 |  |
| InterDigital | Option 3 (see comments) | We should use R16 principle. The principle is based on the RRC state of the UE. An RRC\_IDLE/INACTIVE UE uses mode 2. An RRC\_CONNECTED UE can use either mode 1, or mode 2, depending on NW decision. |
| Xiaomi | Option 3 | as for Rel-16 V2X |
| MediaTek | Option 3 | With direct Uu link, a IC remote/relay UE should be able to transmit discovery message using either mode 1 or mode 2 as in Rel-16 V2X, if the relay/remote UE is RRC\_CONNECTED. |
| LG | Option 3 | Agree with OPPO and vivo. After remote UE connects with gNB via relay UE, it can be hard to support that remote UE operates mode1. It’s a too complicated operation. |
| CATT | Option 3 | Same principle as Rel-16. |
| Spreadtrum | Option 3 |  |
| ZTE | Option 3 |  |
| Intel | Option 3 | Assuming IC remote UE with direct Uu link refers to case 1 above (not yet PC5 connected to relay UE). Note that this is based on legacy Rel-16 behavior |
| Sharp | Option 3 |  |
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During the online discussion, regarding to the resource allocation for sidelink communication, it was agreed that:

Proposal 17: [Easy] In this release, for L2 U2N relay, remote UE can be configured to use resource allocation mode 2 if relay connection has been setup. FFS for CG type 1.

Regarding to the resource allocation of sidelink discovery, for IC or OOC remote UE which relay connection has been setup, it is obvious that the same rule can be applied.

**Question 2-2: In case of sidelink discovery, for IC or OOC remote UE which relay connection has been setup, do companies agree to use the same rule as sidelink communication? That is resource allocation mode 2 can be used, FFS for CG type 1? Please give your comments.**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | No (Mode 2 only) | As discussed online last Friday, dynamic scheduling and CG type 2 can’t work because Uu L1 signaling (i.e. UL grant and DCI to activate/deactivate CG type 2) can’t be forwarded in at least in this release.For CG type 1, we agree PUCCH can be disabled to make it work. However, this is not a complete CG type 1, and thereby its impact/issue should send LS to RAN1 for issue checking if RAN2 agree to support it. From our perspecitve, we think mode 2 is sufficient in this release, and prefer to make life eaiser (i.e. Mode 2 only).  |
| OPPO | Yes | There is no difference for remote UE to transmit discovery traffic or communication traffic in this case. |
| Nokia | No | The question is formulated a bit confusing as it mixes up discovery with CG type 1. We share Qualcomm’s view, that for the remote UE only mode 2 RA works, since dynamic scheduling (L1 Uu) and the activation of CG type 2 (DCI) will not work.  |
| Lenovo, MotM | Not clear what is “same rule” | Agree with QC.The question is unclear – is FFS for CG type 1 assumed as resolved or? |
| vivo | Yes | As the question is talking about supporting mode-2 when FFS for CG type-1, we are fine with it. Whether we need to support CG type-1 can be FFS as suggested by the question in next meetings, we don’t expect we can have a conclusion on that part now.  |
| Ericsson | No (Mode 2 only) | share the same view as QC |
| Huawei, HiSilicon | See comments | We can wait for the conclusion on normal data transmission. |
| Apple | No (Mode 2 only) | Same view as Qualcomm. Also, why we want to specify mode 1 relay discovery transmission for RRC\_CONENCTGED remote UE? Seems not very useful. Model-B discovery tends to be aperiodic.  |
| InterDigital | Yes | We can treat communication and discovery the same. |
| Xiaomi | No  | Mode 2 only |
| MediaTek | No (Mode 2 only) | It’s not clear to us how the base station of the relay UE can support mode-1 scheduling for a remote UE for discovery message transmision. If we support this, some RAN1 enhancement is anyway needed and thus it seems we cannot support it in this release. |
| LG | No (mode2 only) | The same view as QC. |
| CATT | No | Mode 2 only |
| Spreadtrum | No | Mode 2 only |
| ZTE | Yes | The same rule can be used for sidelink discovery and sidelink communication. |
| Intel | Yes | Agree with OPPO’s view. |
| Sharp | No | Mode 2 only |
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**Question 2-3: In case of sidelink discovery, for OOC remote UE which has not been connected to network via a relay UE, do companies agree only resource allocation mode 2 can be supported? Please give your comments.**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| OPPO | Yes |  |
| Nokia | Yes |  |
| Lenovo, MotM | Yes | Why talk about a “remote” UE that is not yet using a relay? |
| vivo | Yes |  |
| Ericsson  | Yes |  |
| Huawei, HiSilicon | See comments | If this is R16 priciple, no need to revisit it. |
| Apple | Yes |  |
| InterDigital | See comments | This is R16 behavior and there is nothing new here when the remote UE is not using the relay. |
| Xiaomi | Yes |  |
| MediaTek | Yes | A OOC remote UE cannot get gNB scheduling for mode-1 transmission. |
| LG | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| ZTE | Yes |  |
| Intel | Yes  |  |
| Sharp | Yes |  |
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## Sidelink discovery and communication data multiplexing

In [2] and [4], the multiplexing issue of sidelink discovery and communication was discussed:

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| **Company** | **Proposals** |
| [R2-2107089](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202108%20-%20RAN2_115-e%2C%20Online%5CExtracts%5CR2-2107089%20-%20Remaining%20issues%20on%20relay%20discovery.doc) | **Proposal 1: RAN2 confirm that discovery and data can’t be multiplexed in same TB in shared pool** |
| [R2-2107313](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202108%20-%20RAN2_115-e%2C%20Online%5CExtracts%5CR2-2107313.docx) | Therefore, in the context of discovery message transmission, it implies that discovery message may not be multiplexed with data from non-discovery related LCHs within a MAC PDU.**Proposal 4: The need of any additional discovery procedure specific LCP restrictions needs to be further discussed.** |

As indicated in R2-2107089 [2], the justifications of Proposal 1 are listed below:

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| First, transmissions with different cast-type can’t be multiplexed. Therefore, discovery at least can’t be multiplexed with unicast PC5 data. Secondly, RAN2 has agreed L2 ID design of discovery is up to SA2. Therefore, it may be different from L2 ID of broadcast transmission |

Hence, the following issues should be discussed:

**Question 3-1: Do companies agree that the sidelink discovery message and the sidelink communication data cannot be multiplexed into one MAC PDU in shared resource pool? Please give your comments.**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | Yes  | Please note that it has been specified in TS 23.304 that L2 destination ID will be used:

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| **Copy from Clause 5.2.1.2 of TS 23.304:**2) Parameters used for 5G ProSe Direct Discovery:- The mapping of ProSe services (i.e. Application IDs) to Destination Layer-2 ID(s) for sending/receiving initial signaling of discovery messages.NOTE 2: The same Destination Layer-2 ID for 5G ProSe Direct Discovery can be mapped to more than one ProSe services. |

Therefore, the discovery destination L2 ID is preconfigured. For data broadcast (typecal discovery cast-type), the destination L2 ID is configured and passed from higher layer which should be aware of the preconfigured destination L2 ID for discovery. Thus, we don’t think higher layer shares the L2 ID between discovery and communication.  |
| OPPO | See comment | Here for “shared” resource pool, we understand it can be used for a UE to carry both communication and discovery traffic. Then whether both can be multiplexed into one MAC PDU depends on the L2 ID space.If the L2 ID space for discovery and communication is separate, they cannot be multiplexed since so far SL-SCH MAC PDU only support LCH of the same L2 ID.Else, it can be multiplexed into the same PDU.We understand the L2 ID space separation is being discussed in SA2, so RAN2 can just wait for decision by SA2. |
| Nokia | No | There is no need to make such a restriction. It depends on what L2 DST ID is configured for discovery message communication over SL. If common L2 DST ID is configured for discovery message transmission and e.g. other broadcast SL communication, then multiplexing is possible. |
| Lenovo, MotM | Yes | Agree with QC |
| vivo | See comments | Agree with above comments. Whether it can be multiplexed much depends on the L2 ID design in SA2. According to SA2 TS 23.3046.4.3.6 Layer-2 link establishment over PC5 reference point for 5G ProSe UE-to-Network RelayThe 5G ProSe Remote UE (UE-1) initiates the unicast communication setup with the selected 5G ProSe UE-to-Network Relay (UE-2) over PC5 reference point using the procedure of UE oriented Layer-2 link establishment as described in the clause 6.4.3.1, with the following differences and clarifications:- This procedure is applicable to both ProSe Communication via 5G ProSe Layer-2 UE-to-Network Relay and ProSe Communication via 5G ProSe Layer-3 UE-to-Network Relay.- In step 1, the 5G ProSe Remote UE determines the destination Layer-2 ID for PC5 unicast link establishment based on the unicast source Layer-2 ID of the selected 5G ProSe UE-to-Network relay (as specified in clause 5.8.3) during UE-to-Network Relay discovery as specified in clause 6.3.2.3.So in our understanding the L2 ID can actually be same. We need to further check this with SA2 before we make any agreement on multiplexing issue. |
| Ericsson | See comments | Share the same view as OPPO. |
| Huawei, HiSilicon | Yes | We understand the L2 ID will be different for discovery and data. |
| Apple | Depends | UP to SA2 to decide whether ProSe relay discovery and ProSe communication will use the same L2 ID or not. |
| InterDigital | See comment | Agree with OPPO and Vivo – this depends mostly on SA2 conclusions. |
| Xiaomi | See comments | Agree with others above, if SA2 do resolve to use separate L2 ID for discovery and data then multiplexing is not supported. We should await SA2 response before concluding.  |
| MediaTek | Yes | Discovery messages and sidelink traffic are for different purposes, and thus it is preferred that UE can distinguish them as early as possible, and drop the MAC PDU if the MAC PDU is considered NOT needed. Thus, it is preferred not to allowing multiplexing data and discovery message in the same MAC PDU, which means a UE performing normal sidelink communication has to unnecessarily receive discovery messages.  |
| LG | Yes with comments | If the L2 destination address of the discovery message is different from the data, the discovery message will not mux with other data messages. However, we think exceptionally, if there is data for the initial setup of PC5-S/PC5-RRC connection, multiplexing can be allowed. For example, in discovery model B, the response discovery message for the solicitation message can be multiplexed with the PC5-S message. In this case, the destination address of the response discovery message and PC5-S message can be the same. |
| CATT | See comment | We understand the L2 ID will be different for discovery and data. If different L2 ID is used, it is obvious that discovery and communication will not be multiplexed, no further RAN2 restriction is needed. Consideirng SA2 is discussing this issue, we can wait SA2 conclusion before we made final decision. |
| Spreadtrum | See comments | Same view as OPPO. |
| ZTE | Yes | We think separate L2 ID should be assigned for the broadcast discovery message and broadcast/groupcast sidelink communication service, which may be further confirmed by SA2. With this understanding, the sidelink discovery message and the sidelink communication data cannot be multiplexed into one MAC PDU in shared resource pool.  |
| Intel  | See comment | Agree with OPPO view. Although for model A discovery, the Destination L2 ID is perceivably different based on TS 23.304 as shown by other companies above, for model B discovery response message (which we understand is unicast), the destination layer 2 ID may be shared for SL communication between relay and remote UE as it is set to the source Layer 2 ID which is self-assigned by the remote UE; therefore, we can either wait for SA2 view to confirm this understanding or assume that at least model B discovery and data could potentially be multiplexed in same MAC PDU.**TS 23.304 5.8.3.1**“The following parameters are used in the UE-to-Network Relay Discovery Response message (Model B), where Source Layer-2 ID and Destination Layer-2 ID are used for sending and receiving the message, and Discoveree Info and Relay Service Code are contained in the message:- Source Layer-2 ID: the 5G ProSe UE-to-Network Relay self-selects a Source Layer-2 ID for UE-to-Network Relay Discovery, and uses it in the UE-to-Network Relay Discovery Response message.- Destination Layer-2 ID: set to the Source Layer-2 ID of the received UE-to-Network Relay Discovery Solicitation message. “ |
| Sharp | See comments | Agree with OPPO. And if the sidelink discovery message and the sidelink communication data is multiplexed into one MAC PDU, not sure whether it will impact to derive SD-RSRP. |
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If the answer of Question 3-1 is yes, it should further discuss whether there is any enhancement is needed in LCP as discussed in [4]. The first step of LCP is destination selection, but currently, it is still unclear whether the discovery and communication can share the same L2 destination ID. If different L2 destination ID is used for discovery and communication, there is no need to enhance the LCP procedure; otherwise, it should clarify that the data from logical channel of sidelink discovery and data from logical channel of sidelink communication cannot be multiplexed. But how L2 destination ID is allocated depends SA2, considering SA2 is discussing this issue, we can wait until there is SA2 conclusion.

## BSR for sidelink discovery transmission

In this meeting, contributions [2], [5] and [6] discussed the BSR for sidelink discovery transmission. The corresponding proposals are as below:

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| **Company** | **Proposals** |
| [R2-2107089](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202108%20-%20RAN2_115-e%2C%20Online%5CExtracts%5CR2-2107089%20-%20Remaining%20issues%20on%20relay%20discovery.doc) | **Proposal 4: For Mode 1 RA, no spec change on BSR is required. Instead, AMF to forward the discovery destination L2 ID to RAN via NGAP message, and gNB can differentiate whether the BSR is for discovery or SL data based on the SL destination ID in SL-BSR****Proposal 5: If Proposal 4 is agreed, RAN2 send LS to SA2 to request introducing the signaling**  |
| [R2-2107212](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202108%20-%20RAN2_115-e%2C%20Online%5CExtracts%5CR2-2107313.docx) | Proposal 5: A specific LCGID should be used to indicate the necessity of discovery message transmission when reporting SL-BSR MAC CE towards the network. |
| R2-2108143 | **Proposal 2: In order for the gNB to differentiate the buffer size of discovery message and other PC5 signalling, one new logical channel group should be set for SL-SRB4.** |

According to the current SR design, once gNB receives the SR, it cannot differentiate whether the received SR is for discovery message or sidelink communication data. In order to perform proper scheduling, the following enhancements can be considered:

* **Alt-1:** Enhance SL-BSR to differentiate buffer size for discovery and data traffic, by introduce a dedicated LCG for discovery message. [2][5][6]
* **Alt-2:** Allow AMF to forward the discovery destination L2 ID to RAN, so that gNB can differentiate based on the SL destination L2 ID in SL-BSR. [2]

For Alt-1, SA2 does not need to be involved, and RAN2 can solve the issue by RAN2 itself, but a new discovery-specific LCG ID should be defined.

For Alt-2, it should first make clear whether the L2 destination ID of sidelink discovery message and sidelink communication data can be shared? SA2 should be involved.

**Question 4-1: In case of mode 1 resource allocation for relay UE, in order to let gNB differentiate the buffer status of sidelink discovery message and sidelink communication, which option do companies prefer? Please give your comment.**

* **Option 1: Introduce discovery-specific LCG ID.**
* **Option 2: Using different L2 destination ID to identify the SL-BSR of discovery message.**
* **Option 3: Others (Please give the detailed description).**

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| **Companies** | **Option** | **Comments** |
| Qualcomm | Option 1 preferred | We think both Option 1 and Option 2 can work.We slightly prefer Option 1 where the specific LCG ID can be either configured by RRC or fixed in Spec.For Option 2, because gNB is not aware of discovery L2 destination ID, there is some extra signaling change. And it may need to invovle SA2. But we are also fine with Option 2 if majority prefer.  |
| OPPO | Option 1, and option 2 dependent on SA2 conclusion | We assume this Q is related to the outcome of Q1-1, if options other than option-1 of that Q is selected, then there is a need for network to differentiate target resource for discovery.Option-1 is feasible no matter whether L2 ID space for discovery and communication is overlapping. While option-2 relies on the validity of separated L2 ID space for discovery and communication.So option-1 is a feasible way-out, and option-2 depends on the SA2 conclusion of L2 ID space separation, which is dependent on SA2 conclusion as replied to Q3-1. |
| Nokia | comments | With respect to proposal 4 in [R2-2107089](file:///C%3A%5C%5CUsers%5C%5Cmtk16923%5C%5CDocuments%5C%5C3GPP%20Meetings%5C%5C202108%20-%20RAN2_115-e%2C%20Online%5C%5CExtracts%5C%5CR2-2107089%20-%20Remaining%20issues%20on%20relay%20discovery.doc%22%20%5Co%20%22C%3AUsersmtk16923Documents3GPP%20Meetings202108%20-%20RAN2_115-e%2C%20OnlineExtractsR2-2107089%20-%20Remaining%20issues%20on%20relay%20discovery.doc) it is not AMF to provide discovery L2 DST ID. It is upper layer in UE side. When gNB schedules a mode 1 grant, legacy way can be reused. With respect to proposal 5 in R2-2107212 for SL mode 1, gNB doesn't need to know discovery or SL traffic for scheduling resources. It only need to differentiate LCG as in legacy way.  |
| Lenovo, MotM | Option 1 | L2 ID allocation is not in RAN2 domain. |
| vivo | Option-2 with comments | Although option-2 may depend on SA2 and we need to check with them, we think new LCG ID may bring backward compatibility issue. Also it is kind of strang to allocate new LCG ID just for discovery meesage. We may first check with SA2 whether L2 ID (or with potential enhancement on L2 ID) can be workable to differentiate the discovery message then come back to this issue.  |
| Ericsson | Option 1 and 2 | In case a discovery message uses a different L2 ID as SL communication, then Option 2 applies. However, in case there is a discovery message sharing a same L2 ID as SL communication. Then, option 1 applies. Perhaps we need to support both. |
| Huawei, HiSilicon | Option 2 | We undersatnd the L2 ID for discovery will be different for normal data.UE will report its discovery purpose with L2 ID included in the SUI message, which means the gNB know the L2 ID for discovery.Then the legacy SL-BSR is sufficient to identfiy the discovery purpose.In addition, the LCG of discovery message is fixed in the specification. No sure there is enough space of LCG to have one discovery dedicated LCG value. |
| Apple | Depends | UP to SA2 to decide whether ProSe relay discovery and ProSe communication will use the same L2 ID or not. |
| InterDigital | Option 1  | Both options may work. However, option 2 depends on SA2 defining a L2 ID specific to discovery. To remove dependance on SA2, and avoid any restrictions which may avoid that same IDs can be used on the future for discovery and data, we can right away adopt option 1 in RAN2. |
| Xiaomi | See comments | If SA2 decide on always using separate L2 ID for discovery than for data then option 2 may be enough. However if they do not always use this then option 1 would be more dependable. We should try to avoid using both solutions if possible. |
| MediaTek | Option 1 | We agree that both option 1 and option 2 work. Option 2 involves with SA2 decision on whether to have separate L2 ID for discovery. In contrast, option 1 could be controlled by RAN2 w/o SA2 involvement. |
| LG | Option 1 | Option-1 and option-2 is feasible. We think option-1 is simplist way to inform discovery message to gNB for BSR. If we select to use option-2, we think it need to be confirmed from SA2 as other companies already mentioned. |
| CATT | See comments | Up to SA2 decision on whether separate destination L2 ID is used for discovery and communication. If separate destiantion L2 ID is used, option 2 can be considered. |
| Spreadtrum | Option 1 | We prefer Option 1, option-2 mainly depend on SA2. |
| ZTE | Option 1 | The logical channel group of SL-SRB4 may be set to 1 exclusively. By doing so, the gNB is able to know the buffered discovery message size based on the BSR for LCG 1. This option introduce fewer specification impacts.  |
| Intel | Option 2  | We agree with Huawei that the UE can report the SL destination L2 ID and purpose in the SUI message for gNB to become aware of the L2 ID to be used for discovery and reutilize the legacy SL-BSR. This can then potentially be within RAN2 realm.   |
| Sharp | Option 2 | First whether gNB needs to differentiate BSR should be discussed. If it is needed, Option 2 can be considered. |
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# Conclusion

# References

1. R2-2106994 Leftover Issues for Sidelink Discovery CATT

1. [R2-2107089](file:///C%3A%5C%5CUsers%5C%5Cmtk16923%5C%5CDocuments%5C%5C3GPP%20Meetings%5C%5C202108%20-%20RAN2_115-e%2C%20Online%5C%5CExtracts%5C%5CR2-2107089%20-%20Remaining%20issues%20on%20relay%20discovery.doc%22%20%5Co%20%22C%3AUsersmtk16923Documents3GPP%20Meetings202108%20-%20RAN2_115-e%2C%20OnlineExtractsR2-2107089%20-%20Remaining%20issues%20on%20relay%20discovery.doc) Remaining issues on relay discovery Qualcomm

1. [R2-2107313](file:///C%3A%5C%5CUsers%5C%5Cmtk16923%5C%5CDocuments%5C%5C3GPP%20Meetings%5C%5C202108%20-%20RAN2_115-e%2C%20Online%5C%5CExtracts%5C%5CR2-2107313.docx%22%20%5Co%20%22C%3AUsersmtk16923Documents3GPP%20Meetings202108%20-%20RAN2_115-e%2C%20OnlineExtractsR2-2107313.docx) Leftover aspects of Relay discovery Intel

1. [R2-2108152](file:///C%3A%5C%5CUsers%5C%5Cmtk16923%5C%5CDocuments%5C%5C3GPP%20Meetings%5C%5C202108%20-%20RAN2_115-e%2C%20Online%5C%5CExtracts%5C%5CR2-2108152-Relay%20Discovery%20for%20stage%203.docx%22%20%5Co%20%22C%3AUsersmtk16923Documents3GPP%20Meetings202108%20-%20RAN2_115-e%2C%20OnlineExtractsR2-2108152-Relay%20Discovery%20for%20stage%203.docx) Relay Discovery transmission for stage 3 LG
2. R2-2107212 Discussion on remaining issue of relay discovery OPPO
3. R2-2108143 Further discussion on Relay discovery ZTE, Sanechips