3GPP TSG-RAN WG2 #114-e Tdoc R2-210xxxx

**Electronic Meeting, May 19 – 27, 2021**

Agenda Item: 8.7.2

Source: OPPO

Title: Offline discussion xxx

Document for: Discussion, Decision

# Introduction

This report is targeting on the below offline discussion:

* [AT114-e][617][Relay] Open issues on discovery (OPPO)

      Scope: Handle open issues on relay discovery:

* Discuss P1a/P2a/P2b of R2-2106457
* Discuss the case of no network configuration available in P3a of R2-2106457 (preconfiguration vs. no discovery)
* Conclude on dedicated resource pool for discovery
  + If supported, consider if there is impact to resource allocation
* Discuss fixed vs. configurable priority of discovery messages
* Discuss whether to deprioritise discovery gaps in Rel-17

      Intended outcome: Report to CB session, in R2-2106586

      Deadline:  Tuesday 2021-05-25 1000 UTC (can extend if needed)

Also, please note that the offline discussion is based on the below agreement made:

Agreements:

Proposal 3b (modified): RAN2 confirm the SI conclusion that for L2 remote UE which is out-of-coverage, and is neither in RRC\_CONNECTED nor RRC\_IDLE/INACTIVE, it can rely on pre-configuration.

Proposal 4 (modified): RAN2 confirm the SI conclusion that for L3 remote UE which is out-of-coverage, and is neither in RRC\_CONNECTED nor RRC\_IDLE/INACTIVE, it should follow pre-configuration.

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.

Proposal 1b: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, in-coverage on the serving frequency, and the serving frequency is not shared with concerned frequency, if the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency

- If there is Uu deployed at the concerned SL frequency, UE shall 1) rely on the discovery related SIB, if any broadcasted in the concerned SL frequency; Or 2) if there is no discovery related SIB on the concerned SL frequency, UE does not perform SL discovery transmission/reception on the concerned frequency.

- If there is no Uu deployed at the concerned frequency, UE shall rely on pre-configuration.

Proposal 1c: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, in-coverage on the serving frequency，if the serving frequency is shared with concerned SL frequency

- If there is no discovery related SIB broadcasted on the serving carrier, UE does not perform SL discovery transmission/reception on the concerned frequency.

Proposal 6: RAN2 agrees to reuse Rel-16 power control mechanism for transmission of discovery messages.

Proposal 8: The same PDCP data PDU format as SL-SRB0 is used for sidelink discovery message (SL-SRB4), and the SDU type field is not used for SL-SRB4.

Proposal 9: RAN2 agrees to postpone the discussion related to resource allocation to after RAN#92-e. [FFS if impact from dedicated resource pool; to be revisited this meeting.]

Proposal 10: RAN2 to postpone the issue on network capability differentiation to stage 3 ASN.1 discussion.

Proposal 11: RAN2 rely on SA2 on the L2 ID design for discovery message. No LS is needed.

Proposal 13: De-prioritize additional condition for discovery transmission/reception in Rel-17.

# Discussion

## Discovery configuration

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| **Proposal 1a: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, and in-coverage on the serving frequency:**   * **If there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned SL frequency is included within the SIB of the serving frequency but the Tx resource pool configuration is absent, UE shall enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool.** |

The intention of proposal 1 is to address the scenario that for relay/remote UE in RRC IDLE/INACTIVE state and in-coverage on the serving frequency, if there is discovery related SIB broadcasted on the serving frequency and if the configuration of concerned SL frequency is included within the SIB of the serving frequency but the Tx resource pool configuration is absent, then UE shall enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool, which is the traditional UE behaviour from Rel-14 to Rel-16.

However, during the pre-meeting email discussion, one company raise the concern that LTE Prose mechanism shall also be considered as another alternative, that is, the UE can

* either enter RRC CONNECTED state to acquire dedicated configuration,
* or read SIB from concerned SL frequency as per network indication in the SIB.
* Or prohibited from transmission directly

Therefore, companies are encouraged to provide the view on which alternative to go for this scenario.

**Q1**: For relay/remote UE which are RRC IDLE/INACTIVE state and in-coverage on the serving frequency, if there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned SL frequency is included within the SIB of the serving frequency but the Tx resource pool configuration is absent, then what is the corresponding UE behaviour?

* Alt 1: there is only one UE behavior, i.e., UE will enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool
* Alt 2: besides the behavior of “UE will enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool”, there could be other UE behavior, e.g.,, 1) UE read SIBs on the concerned SL frequency as per network indication in the SIB; 2) Or prohibited from transmission directly, based on explicit indicator in SIB. (if this option is selected, please indicate what are the other UE behavior that should be allowed in this case), and which option the UE should adopted will follow the explicit indicator that is to be included in SIB.

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| Company | Option | Comment |
| OPPO | Alt 1 | The mechanism described in alt-1 has been applied from Rel-14 to Rel-16. Thus, considering there is no big different on the scenario of Rel-17 NR sidelink relay, it is suggested to reuse the mechanism. |
| Qualcomm | Alt 1 | Alt-2 is LTE Rel-12/13 solution but was not included in LTE Rel-14/15 and NR Rel-16. We prefer a simple UE behaviour on top of NR Rel-16 V2X (i.e. Alt-1) so that most implementation in NR Rel-16 can be reused for sidelink relay. |
| InterDigital | Alt 1 |  |
| MediaTek | Alt 1 | We prefer Alt 1 to have less implementation complexity. And we share same view from Qualcomm. |
| CMCC | Alt 1 |  |
| ZTE | Alt1 | For LTE discovery, the *requestDedicated, acquireSI-FromCarrier and noTxOnCarrier* is specified in R13 to support different inter-carrier and inter-PLMN discovery resource acquisition scenarios since the eNB may not acquire the full resource configuration of other carriers or PLMN. When it comes to SL communication, it is always assumed that gNB should be able to provide the Tx resource pool configuration of concerned SL carrier if this SL carrier is indicated in SIB.  Since the relay discovery message is transmitted in the same way as SL communication and only one SL carrier is supported in R16/17, it is suggested to follow the SL communication operation. Alt 1 is enough. |
| Intel | Alt 1 | We agree with OPPO that there seems no strong reason to not follow legacy Rel-16 behavior. We understand that there can be other options possible, but they seem like enhancements and not essential to support at this stage |
| Huawei, HiSilicon | Alt 1 | Agree with above comments. |
| vivo | Alt 1 | The mechanism is to reuse LTE as baseline and we didn’t see any strong motivation to have different solution on this issue. |
| Ericsson | Alt 2 | Alt. 2 has particular advantages compared to Alt. 1,   1. If UE knows that discovery for an inter-carrier is not supported, UE can avoid entering RRC connected unnecessary so that reduce signaling overhead for the gNB. This is an important aspect for the gNB. 2. if the gNB indicates to the UE that the UE needs to read SIB of an inter-carrier, UE can avoid entering RRC CONNECTED unnecessary in the serving carrier so that reduce signaling overhead for the gNB. In addition, avoid unnecessary latency for the UE caused by unnecessary RRC state switch. One may argue that gNB may not include the inter-carrier in the SIB of the serving carrier, if gNB does not want the UE to enter RRC CONNECTED state unnecessary in the serving carrier. However, we cannot regulate how gNB would behave. The assumption on the gNB behaviors may be not always true. |
| Nokia | Alt-1 |  |
| Kyocera | Alt 1 | Agree with OPPO |
| Samsung | Alt 1 | We prefer to reuse the UE behaviour in NR Rel-16 SL communication. |
| CATT | Alt1 |  |
| Sharp | Alt 1 |  |
| Spreadtrum | Alt1 |  |
| LG | Alt1 |  |
| Convida | Alt1 |  |
| Apple | Alt1 |  |
| Xiaomi | Alt 1 |  |
| China Telecom | Alt1 |  |
| Philips | Alt 1 |  |

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| **Proposal 2a: RAN2 agree that RRC\_CONNECTED relay/remote UE which are in-coverage on the serving frequency, if there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned SL frequency is included within the SIB of the serving frequency, it can only use the SL discovery Tx resource configuration provided by dedicated signalling if provided, or not transmit discovery if it is not provided.** |

The intention of proposal 2a is to address the scenario that when relay/remote UE is under RRC\_CONNECTED state and in-coverage on the serving frequency, also the network is capable of relay service, in that case the UE shall perform relay discovery as per dedicated SL discovery Tx resource configuration from network if provided, otherwise, not transmit discovery. Since at the very late stage during the pre-meeting email discussion, some descriptive wording is added to differentiate the scenario between proposal 2a and 2b, rapporteur suggest companies to further check if proposal 2a can be supportive.

**Q2**: For relay/remote UE which are RRC\_CONNECTED state and in-coverage on the serving frequency, if there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned SL frequency is included within the SIB of the serving frequency, does company agree that the UE can only use the SL discovery Tx resource configuration provided by dedicated signalling if provided, or not transmit discovery if it is not provided?

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| Company | Option (Yes/No) | Comment |
| OPPO | Yes |  |
| Qualcomm | Yes | We understand it was agreed in LTE discovery due to political reason. Although we don’t see issue for UE to use configuration in SIB if dedicated signalling is not provided, we can accept to use LTE baseline. |
| InterDigital | Yes | The UE should follow dedicated ehaviour. |
| MediaTek | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes | As far as we know, the discovery Tx resource configuration in SIB can only be used by RRC\_IDLE/INACTIVE UE, and the discovery Tx resource configuration via dedicated ehaviour can only be used by RRC\_CONNECTED UE. Suppose the RRC\_CONNECTED relay UE/remote UE can not get the discovery Tx resource configuration from SL-capable gNB via dedicated ehaviour, it may be due to the failure of relay/remote UE authorization or SL resource congestion. In this case, the RRC\_CONNECTED relay/ remote UE should not use the discovery Tx resource configuration from SIB or pre-configuration and not transmit discovery message any more. |
| Intel | Yes | Ok to follow LTE discovery ehaviour as baseline |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
| Nokia | Yes |  |
| Kyocera | No | If the discovery resource is available in SIB, we prefer that the UE has the option to use SIB. |
| Samsung | Yes |  |
| CATT | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | Yes |  |
| Convida | Yes |  |
| Apple | Yes | We do not understand why NW will not provide discovery pool as it is already provided discovery configuration in SIB. The assumption is that NW will always provide TX resource pools in dedicated RRC signaling in this case. |
| Xiaomi | Yes |  |
| China Telecom | Yes |  |
| Philips | Yes |  |

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| **Proposal 2b: RAN2 agree that RRC\_CONNECTED L3 relay/remote UE which are in-coverage on the serving frequency, and the serving frequency is not shared with concerned frequency, if the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency, follow the behaviour for RRC IDLE/INACTIVE in this case (i.e., P1b).** |

The intention of proposal 2b is to address the scenario that for RRC\_CONNECTED L3 relay/remote UE which are in-coverage on the serving frequency, and the serving frequency is not shared with concerned frequency, on the other hand, network is not capable of relay, in that case, there could be one step further, i.e.

* If there is Uu deployed on the concerned SL frequency, the UE shall either relay on the discovery related SIB from concerned SL frequency if broadcasted, otherwise the UE does not perform SL discovery on the concerned SL frequency.
* Or if there is no Uu deployed on the concerned SL frequency, the UE shall rely on pre-configuration.

Since the case was previously missing in the summary report and added at a late stage during pre-meeting email discussion, rapporteur encourages companies to have some time to further check the intention of the proposal.

**Q3a**: For L3 relay/remote UE which are RRC\_CONNECTED state and in-coverage on the serving frequency, and the serving frequency is not shared with the concerned frequency, if the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency, and if there is Uu deployed at the concerned SL frequency, does company agree that the UE shall:

1. Rely on the discovery related SIB, if any, broadcasted in the concerned SL frequency
2. If there is no discovery related SIB on the concerned SL frequency, UE does not perform SL discovery transmission/reception on the concerned frequency

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| Company | Option (Yes/No) | Comment |
| OPPO | Yes |  |
| Qualcomm | Yes |  |
| InterDigital | Yes |  |
| MediaTek | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| Ericsson | comments | 1. We have a concern that the current wording doesn’t cover the scenario that the UE is out of coverage towards the SL carrier. In this case, the UE is only able to use pre-configuration. Therefore, we propose two options to address this.  Option 1: change the wording “deployed” to “coverage”. In this case, we need to update both P2b and P1b.  Option 2: we add a new proposal to cover the case where the UE is out of coverage towards the SL carrier while connecting to a serving gNB which is not capable of SL relay.  2.  In addition, we also suggest the new wording to cover L2 remote UE:  **L3 relay UE or L3/L2 remote UE**  During the SI phase, RAN2 has already agreed that  -     Remote UE supporting UE-to-Network Relay is allowed to transmit discovery message based on at least pre-configuration when it is directly connected to a gNB which is not capable of sidelink relay operation, in case its serving carrier is not shared with SL carrier.  in that agreement, we did not distinguish between L2 relaying and L3 relaying, we didn’t distinguish RRC state either.  In my understanding, some part of the intention of P2b is to double confirm SI agreement. I don’t see strong reason why we don’t follow SI agreement |
| Nokia | Yes | Our understanding is that Q3a is for “in-coverage” scenario |
| Kyocera | Yes |  |
| Samsung | Yes |  |
| CATT | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | Yes |  |
| Convida | Yes |  |
| Apple | Yes |  |
| Xiaomi | Yes |  |
| China Telecom | Yes |  |
| Philips | Yes |  |

**Q3b**: For L3 relay/remote UE which are RRC\_CONNECTED state and in-coverage on the serving frequency and the serving frequency is not shared with the concerned frequency, if the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency, and if there is no Uu deployed at the concerned SL frequency, does company agree that the UE shall rely on pre-configuration?

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| Company | Option (Yes/No) | Comment |
| OPPO | Yes |  |
| Qualcomm | Yes |  |
| InterDigital | Yes |  |
| MediaTek | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes | We can follow legacy LTE relay and NR sidelink mechanism. If there is no Uu deployed at the concerned SL frequency, the UE shall rely on pre-configuration. |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| Ericsson | comments | See comments for Q3a |
| Nokia | Yes |  |
| Kyocera | Yes |  |
| Samsung | Yes |  |
| CATT | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | Yes |  |
| Convida | Yes |  |
| Apple | Yes |  |
| Xiaomi | Yes |  |
| China Telecom | Yes |  |
| Philips | Yes |  |

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| **Agreement:**  **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.** |

During the online session, the L2 remote UE, which is out-of-coverage, but connected to network via a relay UE, its behaviour is defined clearly when network provide the discovery configuration. But one left issue is when network does not provide configuration, what is the exact UE behaviour. Basically, there are two major solutions for this issue,

* some companies thought remote UE can use pre-configuration to perform discovery;
* others thought remote UE in this case cannot perform discovery.

Rapporteur suggests to further discuss based on these two alternatives.

**Q4**: In the case 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), what is the remote UE behaviour when network configuration, i.e., SIB or dedicated signalling, is not available?

Alt 1: Remote UE shall rely on pre-configuration to perform discovery.

Alt 2: Remote UE shall not perform discovery.

Alt 3: Others (if this option is selected, please clarify the detailed behaviour)

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| Company | Option | Comment |
| OPPO | Alt1 |  |
| Qualcomm | Alt1 | This is a case different from LTE. We think RAN2 should be careful. For example, for a OOC remote UE in CONNECTED state, if PC5 RLF is detected by remote UE, we are not sure whether it is regarded as CONNECTED because its UE context is still maintained in gNB. If we don’t allow it to use pre-configuration, this OOC remote UE can’t trigger discovery any more. |
| InterDigital | Alt2 | For a remote UE in RRC\_CONNECTED, it should follow NW configuration, regardless if it is OOC (it is still under NW control). |
| MediaTek | Alt1 |  |
| CMCC | Alt1 |  |
| ZTE | Alt1 | It would be better to follow the network configuration for RRC\_Connected L2 remote UE. If the remote UE detects link RLF, it is not clear if the remote UE could still use the exceptional resource pool or mode 2 resource pool configured via dedicated signalling to perform RRC re-establishment with newly selected relay UE. If yes, the network configuration could still be followed. Otherwise, only pre-configured SL resource could be used. Nevertheless, to simplify the design, we think the usage of pre-configured SL resource should not be prohibited for OOC remote UE. |
| Intel | Alt1 | Based on our proposal, we think that it is ok for the remote UE to rely on pre-configuration to perform discovery in this scenario |
| Huawei, HiSilicon | Alt1, see comments | For IDLE/Inactive, alt 1 is quite straight forward.  For connected, there is no reason for NW to forbid remote UE to perform discovery, since NW has already accept the access and data service of this remote UE. NW implementation may always provide the configuration. So, maybe this question is just really concern case in bad NW implementation. We may skip this case entirely.  For remote UE’s re-establishment case, the traditional principle is at least some dedicate configuration can be used for a while, before the recovery failure. |
| vivo | Alt-1 for IDLE/INACITVE,  Alt-2 for CONNECTED | For IDLE or INACTIVE, we think it is straightforward to rely on pre-configuration. But for CONNECTED, if the dedicated signalling is not available then it seems it can be interpreted as the NW does not want the UE to perform discovery, so we think alt-2 can be applied here. Maybe we can have different principle for different RRC state of UE. |
| Ericsson | Alt1 | If the SL carrier is shared with the current serving carrier, it would just mean that the remote UE has already applied preconfiguration to find the relay UE. If the remote UE needs to do discovery on other SL carrier (e.g., due to RLF) which is different from the current serving carrier, the remote UE may be out of coverage of the other SL carrier, the remote UE shall be allowed to use preconfiguration. As a compromise, I suggest to reword Alt. 1 as  Alt 1: Remote UE is allowed to use pre-configuration to perform discovery. |
| Nokia | Alt2 for RRC\_CONNECTED, Alt1 for RRC\_INACTIVE/IDLE | Agree with vivo |
| Kyocera | Alt 1 | We assume pre-configuration was used when the remote UE initiated selected the relay UE, for the remote UE to be in the RRC CONN/INACTIVE states. |
| Samsung | Alt2 with comment | If Remote UE is already connected to gNB via Relay UE then the Remote UE shall be controlled by gNB.  It seems not clear the meaning of “NW configuration unavailability” in this questioned case. Should we interpret the case as Remote UE has lost its connection to gNB and it is in OOC or the case as gNB does not provide NW configuration for SL discovery?  If it is for the former one, then Alt1 should be. Otherwise, it should be Alt2. |
| CATT | Alt1, see comments | Agree with HW. |
| Sharp | Alt 1 |  |
| Spreadtrum | Alt1 |  |
| LG | Alt2 | If Remote UE is already connected to gNB via Relay UE, the remote UE is considered as in-coverage. So, the Remote UE should follow the control of gNB.  If Alt1 is allowed, how about the other cases except for the discovery configuration? For example, does the Remote UE in OoC can follow pre-configuration for SL even though it is connected via Relay UE to gNB if gNB doesn’t provide SL configuration? We think the case of discovery configuration should not be distinguished from other cases of SL configurations. In this aspect, the same rule should be applied to the Discovery configuration. |
| Convida | Alt-1 for IDLE/INACTIVE,  Alt-2 for CONNECTED | We agree with Nokia, vivo, and InterDigital. In RRC CONNECTED, NW should control discovery. |
| Apple | Alt-1 | Remote UE has to follow preconfiguration in this case. |
| Xiaomi | Alt-1 with comment | If the Remote UE initiated the relay connection whilst in-coverage and then moved out-of-coverage it is not clear that preconfiguration has previously been used to attain the SL concerned frequency.  Also, what it means if the configuration is not provided in this scenario, in particular the interpretation following link failure and whether a previously available configuration is now not available. At least for this scenario it may be preferred that the Remote UE tries to use the previously available configuration to re-connect to a Relay UE, but if this fails then falls back to preconfiguration.  We note the rewording Alt-1 proposed by Ericsson could allow for this behaviour. |
| China Telecom | Alt-2 | As the UE is still connected to network via a relay UE (i.e., either in RRC CONNECTED or RRC IDLE/INACTIVE), the UE should under NW’s control. The UE can utilize the preconfiguration when it totally loses connection from the network. |
| Philips | Alt-1 for IDLE/INACITVE,  Alt-2 for CONNECTED | Agree with Vivo |

## Discovery resource pool configuration

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| **Proposal 5: RAN2 discuss whether to support dedicated discovery resource pool besides shared resource pool configuration.** |

During last meeting, it has already agreed that shared resource pool configuration for sidelink discovery will be the baseline solution. In this meeting, quite a lot of companies raised that dedicated discovery resource pool configuration shall also be supported. Besides, during online session, a round of showing hand had been performed and it seems that majority companies support to have dedicated resource pool.

Show of hands: (1) support dedicated resource pool for discovery, (2) common pool only.

1. 13 hands
2. 6 hands

Before going into the final decision on whether to support dedicated resource pool or not, some resulted detailed issue from supporting dedicated resource pool needs to be checked.

Firstly, during the online discussion, Apple raised the issue that UE behavior on resource pool usage should also be clarified if dedicated resource pool is configured. Rapporteur considers that it is a nature principle UE should only use dedicated discovery resource pool, if configured by network, otherwise, UE should use shared resource pool.

**Q5**: Assuming R17 spec support dedicated resource pool, do you agree that UE should

* Either only use dedicated discovery resource pool, if configured by network.
* Or, otherwise, i.e., if dedicated discovery resource pool is not configured, UE should only use shared resource pool.

So, there is no case where both dedicated and shared resource pool are available for a UE.

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| Company | Option (Yes/No) | Comment |
| OPPO | Yes | To simplify the UE behaviour and minimize spec impact, we think it is the optimized way to go. |
| Qualcomm | Yes | If Network configures dedicated discovery for a UE, it means Network reserves resource only for discovery. So, UE should only use dedicated resource pool. We don’t see benefit to configure both dedicated pool and shared pool simultaneously for one UE.  In addition, we assume a main use case of dedicated pool is for public safety UE which is only interested in non-relay discovery message other than data. This simple solution is sufficient |
| InterDigital |  | If we agree to such limitation, there seems to be not much advantage of supporting both shared and dedicated pools, and so it may be preferrable to simply rely on shared pool design only. |
| MediaTek | Yes | Agree with OPPO. |
| CMCC | Yes |  |
| ZTE | See comments | For mode 1, the serving cell shall provide only one SL Tx resource pool used for discovery. The Tx resource pool could be either dedicated or shared. For mode 2, both dedicated and shared Tx resource pool may be configured. If both are available for a UE, which resource pool is selected can be up to UE implementation. |
| Intel | Yes | If dedicated resource pool is supported and configured, then UE should prioritize using it; otherwise, shared pool is used for discovery |
| Huawei, HiSilicon | Yes | As commented by InterDigital, it seems dedicated RP only cause more complexity but bring less gain. |
| vivo | Yes | If dedicated pool is configured then the UE should use it, otherwise of course shared pool can be used. |
| Ericsson | No with comment | Suggest to add a new question on whether dedicated resource pool is needed.  Our view is that, shared resource pool is sufficient. No need to support dedicated resource pool. |
| Nokia | No, with comments | Agreement in the SI phase was “shared resource for discovery as baseline” – so that agreement means shared resource pool for discovery is always supported (regardless if dedicated resource pool will be agreed or not). Q5 can not be raised here in RAN2 without RAN1 consent. |
| Kyocera | Yes | We would prefer to just leave this to NW configuration, but if condition described in the two sub-bullets under Q5 is needed then we’re fine with it. |
| Samsung | Yes |  |
| CATT | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | No with comments. | We agree with Ericsson and Nokia.  And we are not sure about the technical advantage to use a dedicated resource pool for discovery messages. We think the shared resource pool is sufficient to support the discovery message. |
| Convida | No, see comment | We have the same interpretation as Nokia- based on SI agreements, shared resource pool is always supported.  Consequently, we do not see the need to support dedicated resource pool. |
| Apple | Yes with comment | the TX pool configuration have to be symmetric and matching RX pool. If we go with the assumption to always use dedicated pool first, then RAN2 need to understand that the dedicated discovery pool configuration has to be homogenous in the neighboring cells and also in the pre-configurations, i.e., in a whole geographical area. So, the shared pool, even configured, will not be used by TX UE at all. In other words, if a relay UE transmit in a dedicated pool and a remote UE listen to a shared pool (given that no dedicated pool is configured), the ProSe discovery will not work. There is some risk that incompatible NW configurations may cause remote or relay UE to miss some discovery messages. |
| Xiaomi | Yes | On the assumption that dedicated resource pools are agreed. However we note this is not the purpose of Q5 (to agree or not agree adoption of dedicated resource pools). |
| Philips | Yes |  |

Secondly, there is a left issue in P9.

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| **Agreement:**  **Proposal 9: RAN2 agrees to postpone the discussion related to resource allocation to after RAN#92-e. [FFS if impact from dedicated resource pool; to be revisited this meeting.]** |

During online session, Interdigital raised the concern that there may be some potential impact caused if dedicated resource pool is configured. By reading the paper in R2-2104869, rapporteur understand the related proposal is as follows

Proposal 1: Restrictions on resource selection by the UE are introduced to ensure frequency diversity by a mode 2 UE.

Proposal 2: Data from the discovery LCH is mapped to a grant which satisfies the frequency diversity requirement for discovery.

Yet from rapporteur perspective, given the limited time on objective-1 in the WID, this kind of discovery specific optimization has to be down-prioritized in this release.

**Q6**: Assuming R17 spec support dedicated resource pool, do you agree to down-prioritize discovery-specific resource allocation optimization in this release?

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| Company | Option (Yes/No) | Comment |
| OPPO | Yes |  |
| Qualcomm | Yes | First, we don’t think Proposal 1 and 2 in R2-2104869 are for dedicated pool. They were proposed for shared pool according to InterDigital’s old submission R2-2100522:  Proposal 7: *For the shared pool scenario, resource selection rules for the retransmission resource are used to ensure frequency diversity by a mode 2 UE. Details can be discussed in the WI phase.*  Secondly, we think it is majority view that for dedicated pool, PHY layer parameters and design will reuse the R16 legacy resource pool design. As far as we see, no specific RAN1 impacts are identified by companies, and no company proposal to enhance dedicated pool in this meeting. |
| InterDigital |  | We think it is too early to rule out any resource allocation aspects. This is not limited to only proposal 7 pointed out by Qualcomm but also:   * Whether discovery and data can be transmitted in the same TB in the shared pool scenario? * Whether discovery pool is overlapped with data pool? * ….   By agreeing to Q6, are we saying that RAN2 does not need to answer these questions? Our intention is we prefer to complete discussion on discovery design before we can make such generic conclusions that resource allocation in general (both discovery and data) has no impacts.  We would be ok to keep the original wording of the proposal (and remove the FFS). In any event, this was already agreed online, and so we think there is no need to further discuss this proposal (apart from removing the FFS). |
| MediaTek | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes |  |
| Intel | Yes | We are fine to down-prioritize this optimization and just assume shared pool. Regarding QC’s comment, it seems quite strange that we rush to agree that no RAN1 specific impact is identified for the case of dedicated resource pool without even flagging it for RAN1 first. |
| Huawei, HiSilicon | Yes | Maybe we can formulate the proposal in another way, like :  **The resource allocation for discovery reuses R16 SL data as baseline.** |
| vivo | Yes |  |
| Ericsson | Yes |  |
| Nokia | comment | The question is misleading. Supporting both shared and dedicated resource pools for discovery is adding unnecessary complexity already. Dedicated resource pool must result in resource fragmentation and some form of optimization is needed. We tend to observe from the past that RAN2 interpretation of “down-prioritized” rather means “will-be-specified-whatever-it-takes”. |
| Kyocera | Yes |  |
| Samsung | Yes | Same view as Qualcomm |
| CATT | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | Yes |  |
| Convida | Yes | Agree with Intel |
| Apple |  | Agree with Huawei to rephrase P9. |
| Xiaomi | Yes |  |
| Philips | Yes |  |

Finally, on the support of dedicated resource pool: if start from the standpoint of majority view, i.e., support dedicated resource pool, and with the understanding that the final decision is anyway to be done in the online discussion, rapporteur would like to use this email discuss to seek for possible compromise wording to reach consensus. Otherwise, if we finally fail to reach consensus on a WF, rapporteur understands we need to down-prioritize dedicated pool in this release due to lack of time.

So, we can start from way-forward wording as follows to collect companies’ view on it.

|  |
| --- |
| **WF: Dedicated discovery resource pool is allowed besides shared resource pool configuration, whether it is configured is based on network implementation.** |

**Q7**: Do you agree with the WF as above?

|  |  |  |
| --- | --- | --- |
| Company | Option (Yes/No) | Comment |
| OPPO |  | If RAN2 can close the open issues in Q5 and Q6 quickly, i.e.,  - For Q5, if the majority view is yes  - For Q6, if the majority view is yes  OPPO would support the WF. Otherwise, we tend to down-prioritize the support of dedicated resource pool in this release, in order to meet the required deadline of objective-1 in the WID. |
| Qualcomm | Yes | To address OPPO’s concern, we have below wording suggestion:  **WF: Dedicated discovery resource pool is allowed besides shared resource pool configuration, whether it is configured is based on network implementation. The UE can only use dedicated discovery resource pool, if configured by network. RAN2 assume PHY layer parameters and design will reuse the R16 legacy resource pool design.**  Again, since both shared and dedicated pool were agreed to support in SI phase, we don’t think it can be regarded as optimization. Otherwise, why RAN2 can agree it in SI phase? Generally, RAN2 only revert SI conclusion when big technique issue is identified. However, we don’t even see any technique issue of dedicated pool was raised by companies. If limited TU is real concern, isn’t agreed P9 indicated RAN2 will study enhancement for shared pool after RAN#92? So, we don’t understand why RAN2 need to discuss dedicated pool to be precluded in WI. |
| InterDigital | Yes | We are fine with the proposed WF. |
| MediaTek | Yes | We understand that dedicated discovery resource pool and shared resource pool configuration both have their own pros and cons. So, the WF proposed by the rapporteur (i.e. up to network implementation) is already a compromised way to go. |
| CMCC | Yes |  |
| ZTE | Yes |  |
| Intel | No | We have a different understanding on the discussion. From technical standpoint, the question can be asked differently: We wonder if there is a real issue with using just the shared resource pool for discovery. If we really want to support a dedicated pool for discovery (which we do think is an optimization, since the NW may choose to not configure it at all and just rely on shared pool), we do not agree that RAN2 can just assume that the same PHY layer parameters and design can be reused from Rel-16 without checking with RAN1 first. Therefore, we prefer to rely on shared resource pool for discovery for this release only |
| Huawei, HiSilicon | Yes, but | We should add “**RAN2 assume PHY layer parameters and design will reuse the R16 legacy resource pool design.**”, as suggested by QC.  If companies still have concern on this assumption (e.g. as commented by Intel), there is no really benefit to support dedicated RP.  Please also note the SI agreement in TR is only to say both option are studied as feasible candidates, rather than both will be specified. “*Resource pool to transmit discovery message can be either shared with or separated from resource pool for data transmission.*” |
| vivo | Yes | We understand that Rel-16 configuration mechanism can be reused to configuration dedicated/shared pool and there is no much spec impact. Therefore we support to leave it to network implementation.  But, we agree that we can consult RAN1 first and to see if they have concerns. And if they do, we can of course reconsider the issue. |
| Ericsson | No | We think shared resource pool is sufficient. with dedicated resource pool, it would lead to unnecessary resource fragmentation, since the discovery resource pool will not be reused for data transmission. Meanwhile, discovery message has relatively small size, and long transmission periodicity. A separate resource pool would also cause low resource utilization efficiency. It was also highlighted that there will be a risk of unnecessary signaling overhead due to the support of dedicated resource pool for discovery. |
| Nokia | No | Agree with Intel. |
| Kyocera | Yes |  |
| Samsung | Yes |  |
| CATT | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | No | Agree with Intel |
| Convida | No | Our view is that for this release, we should rely only on shared resource pool. |
| Apple | No strong view | Given that dedicated discovery resource pool creates some additional burden for NW (pre)configuration and coordination, we are fine to left this for NW vendors to decide. |
| Xiaomi | Yes with comment | For dedicated resource pool we understand Rel-16 Phy resource pool design can be reused. If this is not the case then we would have concerns including this in REL-17. This should be checked with RAN1. |
| Philips | Yes |  |

## Configure the priority of sidelink discovery message

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| **Proposal 7: RAN2 discuss on how to configure the priority of sidelink discovery message.** |

During last meeting, it has already agreed that one new SL-SRB4 is used for all discovery messages and its parameters will be fixed except the LCH priority. Therefore, in this meeting, quite a lot of companies providing their views on this issue. Generally speaking, there are two major views providing from each camp, that is either fix the LCH priority as other SL-SRBs or network configures the LCH priority. Thus, rapporteur suggests to involve more companies to provide their views on the issue.

**Q8**: How to configure the priority of sidelink discovery message?

* Alt 1: fix the priority value in specification (if this option is selected, please indicate the preferred value of priority)
* Alt 2: Network configure the priority value

|  |  |  |
| --- | --- | --- |
| Company | Option | Comment |
| OPPO | Alt 1 | There is no big issue to reuse the specified priority as other SL-SRBs. Considering limited time for closing objective 1. Therefore it is preferred to follow legacy principle. |
| Qualcomm | See comments | Although we see benefit of configurable priority value for discovery, we can compromise to use fixed priority to close this issue. |
| InterDigital | Alt2 | NW controlling the priority seems more flexible without adding significant complexity. |
| MediaTek | Alt 1 | For simplicity, we prefer fixed priority value, e.g. LCH priority 0 (the highest priority). |
| ZTE | Alt1 | As far as we know, all the legacy SL-SRBs use specified configuration. the logical channel priorities of SL-SRB0/1/2/3 are all fixed to 1. We can follow the same design for the SL-SRB4, i.e. use specified configuration with logical channel priority as 1. |
| Intel | Alt 2 | Agree with InterDigital |
| Huawei, HiSilicon | Alt 1 | Is this a really big issue?  We can decide when we draft the running CR.  BTW, if no further agreement is made, fixed priority should be the baseline. |
| vivo | Alt 1 | We don’t think there is strong motivation to differentiate the discovery SRB with other SL-SRB. |
| Ericsson | Alt 2 | Agree with InterDigital and Intel |
| Nokia | Alt 2 | Flexible priority value for discovery message does not add any complexity or specification issue but comes with the benefit of increased flexibility for SL relay. |
| Kyocera | Alt 1 | We’re fine to make it fixed to 1 as the priority value. |
| Samsung | Alt1 | Agree with OPPO |
| CATT | Alt1 | Alt2 is not suitable, e.g.:  -For relay UE, it may need to periodically transmit the sidelink discovery message in order to let the remote UE can detect it. If the priority of this sidelink discovery is configurable, it is hard to decide when to configure higher priority and when to configure lower priority. In addition, if it is configured with lower priority, the sidelink discovery message may be always dropped when there is UL or other SL-SRB transmission, which will lead to the result that no remote can find this relay UE.  -For remote UE, if sidelink discovery is triggered when the UE is in RRC\_CONNECTED (either directly connected to network or connect to network via a relay UE), in order to reduce the data interruption time, the priority of the sidelink discovery message should be higher. And if sidelink discovery is triggered when the UE is in RRC\_IDLE/INACTIVE or OOC, it means the UE needs to establish the U2N connection. In order to reduce the RRC connection setup latency, the priority of the sidelink discovery message should also be higher. |
| Sharp | Alt 1 |  |
| Spreadtrum | Alt1 |  |
| LG | Alt 2 | Flexible priority for discovery message does not add spec issue and complexity. We think it’s better to leave a configurable value from NW. |
| Convida | Alt 2 | Agree with InterDigital, Intel, Ericsson |
| Apple | Alt 2 |  |
| Xiaomi | Alt 1 | Agree with others here to align with other SL-SRBs |
| Philips | Alt 2 |  |

## Configuration of discovery gaps

A few companies raise the issue on whether to adopt discovery gap in Rel-17. In LTE, sidelink discovery gap was introduced to handle limited UE capability on Tx/Rx chain. For NR, as observed, it is anyway infeasible for shared resource pool which has been agreed already, regardless whether dedicated resource pool can be agreed or not. So, rapporteur would like to check companies’ view on whether to introduce discovery gaps if dedicated resource pool is configured.

**Q9**: Do you agree to down-prioritize the support of discovery gaps in this release?

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| --- | --- | --- |
| Company | Option (Yes/No) | Comment |
| OPPO | Yes |  |
| Qualcomm | No strong view |  |
| InterDigital | Yes |  |
| MediaTek | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
| Nokia | No strong view |  |
| Kyocera | No | We assume there are no changes to the requirement for UE capability on Tx/Rx chain so we also think the need for gap is unchanged from LTE.  As in Q3a, inter-frequency discovery is assumed to be supported. In this case, gNB’s scheduling may not be appropriate without gap information.  Furthermore, although the rapporteur assumed gap is infeasible for shared pools, for Tx Gap, the UE may know when it sends discovery within the shared pool; thus, the UE can determine a reasonable Tx Gap. For Rx Gap, it may be assumed the gap may be same with the shared pool on different frequency, which become much larger for Rx Gap. However, with gap, the UE can determine when it would monitor inter-frequency discovery, which is a part of shared pool, i.e., the UE does not need to monitor discovery all the time in the shared pool on different frequency. |
| Samsung | No strong view |  |
| CATT | Yes | In LTE Rel-13, sidelink discovery gap was introduced for sidelink discovery transmission. But in NR, sidelink discovery uses the same protocol stack as sidelink communication protocol in AS layer. Hence, it can be treated similar as the other SL-SRBs, no sidelink discovery specific gap should be introduced. The UL/sidelink discovery message prioritization can follow the legacy Rel-16 V2X UL/SL prioritization rule. |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| LG | Yes |  |
| Convida | Yes |  |
| Apple | Yes | From RX UE perspective, we assume that a dedicated RX chain will be used for NR SL relay, as similar to NR V2X. Otherwise, there is no guarantee that UE can still receive discovery message while receiving Uu traffic at the same time. |
| Xiaomi | No strong view |  |
| Philips | Yes |  |

# Conclusion

The summarized proposals are given below:

# References

[1] R2-2104736 Remaining issues on relay discovery Qualcomm Incorporated

[2] R2-2104746 Leftover Issues on Sidelink Discovery CATT

[3] R2-2104869 Discovery Procedure for sidelink relay InterDigital

[4] R2-2104892 Discussion on remaining issues of NR sidelink relay discovery OPPO

[5] R2-2104958 Remaining issues on Relay discovery procedure vivo

[6] R2-2104976 Discussion on Relay discovery in Sidelink Relay ZTE, Sanechips

[7] R2-2105022 Open aspects on relay discovery Intel Corporation

[8] R2-2105342 Remaining issues for SL relay discovery Samsung

[9] R2-2105390 Discovery resources for sidelink relaying Kyocera

[10] R2-2105491 Left issues for SL discovery Ericsson

[11] R2-2105535 Discussion on Ralay discovery Spreadtrum Communications

[12] R2-2105740 Remaining issues on discovery for sidelink relay Huawei, HiSilicon

[13] R2-2105742 Use of Pre-configuration and collocated neighbour cell carrier Xiaomi Mobile Software

[14] R2-2105807 Relay Discovery for L2 and L3 relay Lenovo, Motorola Mobility

[15] R2-2106266 Left issues for relay discovery message transmission LG Electronics Inc.

[16] R2-2106435 Consideration on remaining issues of NR sidelink relay discovery China Telecom

[17] R2-2106437 Remaining issues on Relay Discovery MediaTek Inc.