3GPP TSG-RAN WG2 Meeting #116 electronic R2-211xxxx

Online, Nov,1st – Nov, 12th, 2021

Agenda: 8.7.3.1

Source: OPPO

Title: Summary on non-relay discovery

Document for: Discussion, Decision

# Introduction

During RAN# 93-e, the WID of sidelink relay has been revised to cover the part of work on non-relay discovery[1]. However, the principle is to take the agreement for relay-based discovery achieved as baseline, which is specified in a detailed way in the following:

|  |
| --- |
| RP-212601 – revised WID on SL RelaySecondly, the objective of this work item also covers the non-relay discovery (i.e. 5G ProSe Direct Discovery). 1. Specify mechanisms for 5G ProSe Direct Discovery [RAN2, RAN3, RAN4];

NOTE 1: RAN requests RAN2 to strive for completion of the common parts (objective 1) by RAN#92 (June). RAN understands that RAN2 will also initially work on other aspects that have cross-group dependencies. NOTE 2: For L2 UE-to-Network Relay, it is assumed that the Remote UE has a single active connection towards gNB via only a single Relay UE at a given time in this release.NOTE 3: Only NR Uu interface, i.e. gNB, and 5GC is considered, and it is limited to NR SA scenario in this release.NOTE 4: Work specific to the mobility scenario of “between indirect (via a first Relay UE) and indirect (via a second Relay UE)”, and the group mobility is not supported in this release.NOTE 5:  RAN2 prioritizes completion of relay discovery work, and for 5G ProSe Direct Discovery (Objective 7) takes the agreement for relay-based discovery achieved as baseline while enhancements and optimizations beyond basic functionality for the 5G ProSe Direct Discovery scenario are not considered. |

Therefore, in this email discussion, we will follow the instruction to be focused on the non-relay discovery specific aspect and determine a way forward for handling.

* [AT116-e][612][Relay] Non-relay discovery (OPPO)

      Scope: Evaluate the spec impact of non-relay discovery specific aspect and determine a way forward for handling this objective.

      Intended outcome: Report to CB session

      Deadline:  Tuesday 2021-11-09 0800 UTC (report available)

# Discussion

During the stage-2 WI 5G\_ProSe in SA2, when ProSe discovery function is addressed, both relay and non-relay related discovery are captured in TS 23.304 to define the discovery usage (including both relay-based discovery and non-relay-based discovery).

On the other hand, RAN2 so far has almost finished the L2/3 common design for sidelink relay, including relay discovery and relay (re-)selection. Therefore, in the following, we will dig into the previous agreements to check their availability for non-relay discovery.

## Applicable Agreements

For the following agreements related to security and integrity protection of discovery message, resource pool configuration of discovery message, as well as discovery configuration, rapporteur thinks non-relay discovery should follow the same principle as the baseline since they are actually not only limited to relay-specific use case or architecture.

|  |  |
| --- | --- |
| Index | Agreements |
| 1 | One new SL-SRB4 is used for all discovery messages. Its parameters will be fixed and defined as SCCH configuration in 38.331. (FFS on the LCH priority in Proposal 8b) |
| 2 | No ciphering and integrity protection in PDCP layer is needed for the discovery messages. |
| 3 | Shared resource pool shall be the baseline for discovery message transmission/reception. |
| 4 | Relay UE and remote UE (IC) in RRC CONNECTED can use the discovery configuration provided via dedicated signalling if available. |
| 5 | Relay UE and remote UE (IC) in RRC IDLE or RRC INACTIVE shall use the discovery configuration provided via SIB if available. |
| 6 | L2 relay UE will always use the discovery configuration provided by gNB (either via SIB or dedicated signalling). |
| 7 | 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. |
| 8 | 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. |
| 9 | 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. |
| 10 | 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 deployedcoverage 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 deployedcoverage at the concerned frequency, UE shall rely on pre-configuration. |
| 11 | 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. |
| 12 | RAN2 agrees to reuse Rel-16 power control mechanism for transmission of discovery messages. |
| 13 | 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. |
| 14 | RAN2 rely on SA2 on the L2 ID design for discovery message. No LS is needed. |
| 15 | De-prioritize additional condition for discovery transmission/reception in Rel-17. |
| 16 | RAN2 agrees 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. |
| 17 | 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 not provided. |
| 18 | RAN2 agree that RRC\_CONNECTED L3 relay/remote UE or layer 2 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, - If there is Uu coverage 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. |
| 19 | RAN2 agree that for L2 remote UE which is out-of-coverage, but connected to network via a relay UE and in RRC IDLE/INACTIVE state, if the network configuration is not available, i.e., SIB, remote UE shall rely on pre-configuration to perform discovery. |
|  | RAN2 agrees to down-prioritize discovery specific resource allocation optimization in this release. |
| 20 | RAN2 agrees to down-prioritize the support of discovery gaps in this release. |
| 21 | RAN2 agree that for L2 remote UE which is out-of-coverage, but connected to network via a relay UE and in RRC CONNECTED state, if the network configuration is not available, i.e., SIB or dedicated signalling, remote UE shall rely on pre-configuration to perform discovery. |
| 22 | RAN2 agrees dedicated discovery resource pool is supported besides shared resource pool configuration, whether it is configured is based on network implementation. And PHY layer parameters and design shall reuse the Rel-16 legacy resource pool design (including resource allocation design). |
| 23 | RAN2 agrees to fix the priority value as 1 of sidelink discovery message in the specification. |
| 24 | No ciphering and integrity protection in PDCP layer is needed for the discovery messages. |
| 25 | Shared resource pool shall be the baseline for discovery message transmission/reception. |
| 26 | 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 implementationDedicated pool should be prioritisedShared pool should be prioritised |

**Q1. Which of the agreements above (made for relay-related discovery) are also applicable to non-relay discovery？**

|  |  |  |
| --- | --- | --- |
| Company | Applicable agreements (index) | Comment |
| OPPO | 1-26 |  |
| Qualcomm  | 1-26 | These agreements should be common to relay and non-relay discovery |
| Ericsson | 1-26 | Agree with OPPO and Qualcomm |
| InterDigital | 1-26 |  |
| Samsung | 1-26 |  |
| ZTE | 1-26 |  |
| Nokia | 1-26 |  |
| vivo | 1-26 |  |
| Huawei,HiSilicon | 1-26 |  |
| Sharp | 1-26 |  |
| Spreadtrum | 1-26 |  |
| CATT | 1-26 |  |
| Lenovo | 1-26 |  |
| Xiaomi | All except 6, 9, 19 & 21 see comments  | The applicability of the following to non-relay discovery is not clear, is there a need to re-write these proposals for this case?6 – is applicable to a Relay UE specifically9, 19, 21 – all specify connection via a relay UE to a NW |
| Apple | 1-26 | For Xiaomi’s concern, I think those relay-specific agreements means even if the UE is a L2 relay UE or L2 remote UE, it can still perform the non-relay discovery based on gNB configuration or based on pre-configuration |
| MediaTek | 1-26 |  |

## Inapplicable agreement

Considering the relay specific architecture, i.e., relay/remote UE should determine when to trigger relay discovery message transmission according to the RSRP threshold in Uu interface, it is not applicable for non-relay discovery since how to trigger the non-relay discovery message transmission. In details, rapporteur thinks the following agreement shall be dropped when considering non-relay discovery:

|  |  |
| --- | --- |
| Index | Agreements |
| 1 | As in LTE, the RRC\_IDLE/RRC\_INACTIVE relay UE is able to perform discovery message transmission, in case:- Uu RSRP is above a configured minimum threshold by a hysteresis and below a configured maximum threshold by a hysteresis, or- only minimum threshold is provided and Uu RSRP is above the minimum threshold by a hysteresis, or- only maximum threshold is provided and Uu RSRP is below the maximum threshold by a hysteresis |
| 2 | As in LTE, the RRC\_IDLE/RRC\_INACTIVE remote UE is able to perform discovery message transmission, if and only if Uu RSRP of serving cell is below a configured minimum threshold by a hysteresis. |
| 3 | Define threshHighRelay and threshLowRelay for relay UE and threshHighRemote for remote UE. The value range for the three thresholds can be half of RSRP-Range specified in TS 38.331. |
| 4 | For determining whether remote UE and/or relay UE in RRC CONNECTED can trigger discovery message transmission, i.e., the remote UE and relay UE in the RRC\_CONNECTED can use the threshold based methods as in IDLE/INACTIVE, to determine whether it is allowed to perform discovery message transmission. |

**Q2. Which of the agreements above (made for relay discovery) are INAPPLICABLE to non-relay discovery?**

|  |  |  |
| --- | --- | --- |
| Company | Inapplicable agreements (index) | Comment |
| OPPO | 1-4 | Since for non-relay discovery, we do not need to use Uu RSRP to monitor whether the transmission would be triggered |
| Qualcomm | 1-4 | For non-relay, we think it is only up to upper layer to trigger it. No need to define AS layer trigger condition |
| Ericsson | 1-4 | Agree with OPPO and Qualcomm |
| InterDigital | 1-4 |  |
| Samsung | 1-4 |  |
| ZTE | 1-4 |  |
| Nokia | 1-4 |  |
| vivo | 1-4 |  |
| Huawei, HiSilicon | 1-4 |  |
| Sharp | 1-4 |  |
| Spreadtrum | 1-4 |  |
| CATT | 1-4 |  |
| Lenovo | 1-4 |  |
| Xiaomi | 1-4 |  |
| Apple | 1-4 |  |
| MediaTek | 1-4 |  |

**Q3. Is there any missing agreement made for relay-related discovery needs to check on applicability to non-relay-related discovery?**

|  |  |
| --- | --- |
| Company | Missing agreement and comment |
| CATT | We wonder whether the below proposal needs to check on applicability to non-relay-related discovery.RAN2#112-eProposal4: Discovery messages should be treated equally in terms of channel prioritization in LCP within the separate resource pool. |
| Xiaomi | In response to CATT above in as much the agreement applies to handling for discovery messages with the same priority within a resource pool we see no differentiation between relay related discovery and non-relay related discovery should occur  |
| Apple | I think the 112-e agreement is made for dedicated discovery pool, and I agree with Xiaomi that this is applicable to non-relay discovery. |

## Group-based discovery

One issue being touched during RP is on the group member discovery.

Although group-based discovery requires an additional cast-type for discovery message delivery, when recalling SL-SRB0, which is used to transmit direct communication request message in either unicast manner or broadcast manner, it seems that the usage of SL-RB is agnostic of cast type. Therefore, rapporteur would like to suggest companies to provide feedback for the below question.

Q3. Does company agree that the SL-SRB4 is also applicable the group-based discovery?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| OPPO | Yes | We think the usage of SL-SRB shall be de-coupled with the cast type. An example shown is the usage of SL-SRB0, which is applicable for both broadcast and unicast. |
| Qualcomm | Yes | Same view as OPPO. We can follow the similar principle of SL-SRB0 (for unicast and broadcast).In addition, if the UE needs to have both unicast and groupcast discovery, our understanding is that the UE will establish two PC5 links with different L2 destination ID:* In the PC5 link with L2 destination ID corresponding to unicast, SL-SRB4 is established with cast-type of unicast.
* In the PC5 link with L2 destination ID corresponding to groupcast, SL-SRB4 is established with cast-type of groupcast.

In all, we don’t see any AS spec impact to support groupcast discovery |
| Ericsson | Yes | Same as OPPO and Qualcomm |
| InterDigital | Yes | Same view as other companies. |
| Samsung | Yes |  |
| ZTE | Yes | Agree with QC that multiple SL-SRB4 may be setup corresponding to different cast type and L2 destination ID.  |
| Nokia | Yes |  |
| vivo | Yes | Same view as OPPO, there is no need to limit SL-SRB4 for certain cast type. |
| Huawei, HiSilicon | Yes |  |
| Sharp | Yes |  |
| Spreadtrum | Yes |  |
| CATT | Yes | According to the current status, we wonder whether we can agree that the cast-type of SL-SRB4 can be unicast, broadcast and groupcast. Because there has related issues are under discussion in summary of Agenda item 8.7.3.1. |
| Lenovo | Yes |  |
| Xiaomi | Yes | this seems not specific to non-relay discovery (e.g. has a wider application), is it anticipated that this is only for non-relay discovery? |
| Apple | Yes |  |
| MediaTek | Yes |  |

Besides the check on SRB4 applicability, rapp understand there is no further specific aspect / delta part that RAN2 has to look into in order to support GC-based discovery.

**Q4: Besides the SRB4 applicability issue, is there any other specific aspect / delta part that RAN2 has to look into in order to support GC-based discovery? If yes, what is the view?**

|  |  |
| --- | --- |
| Company | Additional issue and comment |
| ZTE | For the groupcast based discovery, it is not clear whether the HARQ feedback should be supported. If yes, how to enable the HARQ feedback, via fixed configuration or network configuration? |

## Range-based discovery

On one hand, companies mentioned that range-based discovery message need to be considered. According to the description in TS 23.304, the range-based requirement is mentioned in the non-relay discovery section only. Thus, to help complete SA2’s work, it is suggested to introduce range-based discovery in RAN2.

But on the other hand, when introducing range-based discovery, at AS-layer, the impact could be the spec impact on the maximum transmission power configuration as Rel-12 LTE D2D, also it has been discussed and proposed in [3]. However, from the opponent’s perspective, RAN1 impact cannot be avoided if to support to use range to configure the maximum transmission power, whereas it will somehow lag the progress of the completion of the whole work item. Therefore, rapporteur suggests companies to consider both the benefit and the impact of introducing range-based discovery in AS layer and provide feedback for the below question.

**Q5. Is there a need to support range-based discovery for non-relay discovery in R17?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| OPPO | No | When recalling the range requirement in Rel-16 NR V2X and LTE-ProSe, the potential AS layer impact would be using range to to configure maximum transmission power. In either way, some RAN1 impact might be caused. Considering the limited time for the completion of Rel-17, there may not be enough time for LS discussion between RAN1/RAN2. Therefore, we suggest to not consider range for non-relay discovery. |
| Qualcomm | No | 1. In LTE, the range parameter is used for power control of discovery. However, in NR Rel-16, the range parameter was re-specified to control the ACK/NACK feedback transmission of groupcast, i.e., out of range UE won’t send HARQ NACK. Because it is such late stage of Rel-17, we don’t think it is necessary to discuss whether to bring range based power control back again. Please note that RAN2 has claimed that stage 2 spec work of discovery has been completed, which means RAN2 should not introduce new functionality beyond what were agreed in stage 2 or SI for discovery.
2. Based on above understanding, for the range-based requirement mentioned in TS 23.304, we understand it only applies to LTE discovery rather than NR discovery
 |
| Ericsson | No | Agree with OPPO and Qualcomm |
| InterDigital | Yes (see comments) | While we understand that it is quite late in the work, we also want to point out that in all aspects of discovery, LTE was used as baseline, and this should be no different here. It should be possible to at least ask RAN1 whether this work can be completed or not in this release considering LTE baseline should be applied, and then decide based on their response whether or not to include it in R17. |
| Samsung | No | Agree with OPPO and Qualcomm |
| ZTE | No | Considering limited time in R17, it is suggested not to specify the discovery range R18.  |
| Nokia | No | We agree with majority not to specify discovery range for Rel-17. |
| Vivo | Yes | Although we understand the other companies ‘views that it is late and requiring inter-WG work, this issue needs to be addressed because the range requirement in TS 23.304 (which is for Rel-17 Prose) shouldn’t just be ignored. As Interdigital mentioned, if we don’t consider the range-based power control, it would be much different for LTE and this needs to be discussed. We should at least send LS to RAN1 to clarify this issue and further consider whether/how to support it in RAN2. By reusing range classes, there shouldn’t be much specification work in RAN2 because we can simply inherit LTE principles. |
| Huawei, HiSilicon | No | We share similar views with many others that range-based power control for discovery is not essential to be supported also considering the limited time. |
| Sharp | No | Agree with many companies that range-based discovery for non-relay is not supported in R17. |
| Spreadtrum | No | We agree not to support range-based power control for non-relay discovery in this release. |
| CATT | No | We share the same view as OPPO. |
| Lenovo | neutral |  |
| Xiaomi | yes | We do not expect much RAN1 impact by re-use of range classes as per LTE although additional RAN2 complexity could be considered as higher. An LS to confirm RAN1 impact would be useful to allay concerns, or confirm omission if RAN1 is impacted. We also understand the use of LTE-range is to limit premises advertisement range based on transmit power through authorisation parameters. In as much that not limiting transmit range will impact this SA2 feature if RAN2 does not proceed then an LS to SA2 needs to inform them in order that the lack of support can be catered for in SA2 specifications.  |
| Apple | No | Agree with OPPO’s concern on RAN1 impact |
| MediaTek | No | Considering limited time in Rel-17, we share same view with OPPO. |

Even in case companies would like to support it in R17, it would be good to limit the impact to avoid additional change more than what LTE-ProSe specified, i.e.,



**Q6: if one answers yes to the Q5 above, do you agree to limit the impact to maximum transmission power limit as specified in LTE-ProSe?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| InterDigital | Yes | It seems natural to follow what is done in LTE. The only difference would be to define a possibly configurable range of distances (based on range requirement) and the associated P-max parameter to be used. |
| vivo | Yes with comments | We can take LTE as baseline to reuse range classes as much as possible but the final spec impact should be evaluated after we consult RAN1. |
| Xiaomi | yes | As much as possible LTE baseline should be followed and remain aligned with SA2 specifications (no new behaviours). |

# Conclusion

During this meeting, the remaining issues of relay discovery have been pointed out and discussed， the following proposals are given out:

# Reference

[1] RP-212601 New WID on NR sidelink relay OPPO

[2] R2-2110501 Discussion on non-relay discovery OPPO, Apple, Samsung, Ericsson, Qualcomm

[3] R2-2110749 Discovery Range for 5G ProSe Direct Discovery Beijing Xiaomi Mobile Software