**3GPP TSG-RAN WG2 Meeting #119bis R2-221xxxx**

**Electronic, 10th – 19th Oct, 2022**

**Source: CATT**

**Title:****[AT119bis-e][422][Relay] Remaining proposals on discovery and (re)selection (CATT)**

**Agenda Item:** **6.7.2.4**

**Document for:** **Discussion and Decision**

# Introduction

This is the trigger of the following email discussion:

* [AT119bis-e][422][Relay] Remaining proposals on discovery and (re)selection (CATT)

 Scope: Discuss P3a/P3b/P5a/P5b of R2-2210777.

 Intended outcome: Report to CB session

 Deadline: Friday 2022-10-14 1000 UTC

Companies are invited to provide comments for Phase 1 of this email discussion by 2022-10-13, 1000 UTC.

# Discussion

### 2.1 SL CG for discovery message

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| R2-2210111[1] | Support of SL CG for discovery message  | Huawei, HiSilicon, Nokia, Kyocera |

This issue (SL CG for discovery message) had been discussed in [AT119-e][418][Relay] but without conclusion. During the last RAN2 meeting, some companies expressed their concern that there is no traffic pattern defined for discovery message, so it is not suitable for UE to provide any assistance information for SL CG for discovery message to gNB. In this meeting, the proponent companies have shown that the discovery message transmissions for both Model A and Model B are indeed periodic from the very beginning of the Proximity-based services design and this is already captured in sections 5.3.1.2 and 5.4.4.1 of 23.303 [3], which is listed below with highlighted text:

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| **5.3.1.2 ProSe Direct Discovery Models**The following models for ProSe Direct Discovery exist:**Model A ("I am here")**This model defines two roles for the ProSe-enabled UEs that are participating in ProSe Direct Discovery.- Announcing UE: The UE announces certain information that could be used by UEs in proximity that have permission to discover.- Monitoring UE: The UE that monitors certain information of interest in proximity of announcing UEs.In this model the announcing UE broadcasts discovery messages at pre-defined discovery intervals and the monitoring UEs that are interested in these messages read them and process them.NOTE: This model is equivalent to "I am here" since the announcing UE would broadcast information about itself e.g. its ProSe Application Code in the discovery message. |

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| 5.4.4 Direct communication via ProSe UE-to-Network Relay5.4.4.1 GeneralA ProSe UE-to-Network Relay capable UE may attach to the network (if it is not already connected) and connect to a PDN connection enabling the necessary relay traffic, or it may need to connect to additional PDN connection(s) in order to provide relay traffic towards Remote UE(s). PDN connection(s) supporting UE-to-Network Relay shall only be used for Remote ProSe UE(s) relay traffic.….After being connected to the ProSe UE-to-Network Relay, the Remote UE keeps performing the measurement of the signal strength of the discovery message sent by the ProSe UE-to-Network Relay (i.e. the UE-to-Network Relay Discovery Announcement message in Model A or a UE-to-Network Relay Discovery Response message in Model B) for relay reselection as defined in TS 36.300 [17]. For Model B, to measure the PC5 link quality, the Remote UE sends a UE-to-Network Relay Discovery Solicitation message periodically. The message may contain a ProSe Relay UE ID of its serving ProSe UE-to-Network Relay. If the ProSe Relay UE ID is included in the message, then only the ProSe UE-to-Network Relay, which owns this ProSe Relay UE ID, shall respond to the UE-to-Network Relay Discovery Solicitation message. |

**Question 1: Do companies agree that for NR sidelink discovery message, transmissions will be performed periodically (see highlighted text from 23.303 [3]** **above) and for such periodical PC5-S signalling/message transmission, it is beneficial to support discovery transmissions via SL CG ? If no, please provide the reason/comments.**

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| Company | Yes/No | Comments |
| Ericsson | No | CG is mainly designed to reduce the latency due to dynamic scheduling. Since discovery message has no QoS profile, we see no reason to couple discovery to CG. |
| Apple |  | We agree that PC5 Discovery messages are periodic. But the PC5-S signalling like “keepalive” messages are also periodic in NR SL Rel-16. So, I think this is not a completely new problem. |
| Samsung | See comment | We agree that discovery message can be transmitted in periodic and share the view from Apple that RAN2 did not treat SL CG configuration specifically for periodic PC5-S signalling. |
| vivo | See comments | No matter beneficial or not, we understand the support of discovery transmissions via SL CG is already there. |
| MediaTek | See comments | Agree with vivo, and it is too late for Rel-17. |
| Kyocera | Yes | We think it’s already clear from SA2 that the discovery messages are periodic and SL CG should be supported. |
| Nokia | Yes |  |
| Qualcomm | See comments | Agree that discovery messages are periodical and so are some of the other PC5-S messages like “keep-alive” as mentioned by Apple. Current spec already allows the use of SL CG and we think that we can rely on smart NW implementation to configure the SL CG optimally and not introduce further changes at this stage of Rel-17.  |
| Sharp | See comments | We agree that PC5 Discovery messages are periodic. However, we share the view with Ericsson, there is no strong reason to couple discovery to CG. |
| LG | See comments | We agree that discovery message transmits periodically. And we have the same view as Apple. The periodic PC5-S message has not been handled specially for SL CG configuration. |
| Xiaomi | See comment | Agree with the majority views above that discovery is transmitted periodically, as are other PC5-S messages. In as much that there hasn’t been any identified urgent need to enhance the existing SL CG framework beyond its current specification for these messages, we see no urgent need to introduce this optimisation specifically for discovery in this release.  |
| Lenovo | Yes |  |
| Huawei, HiSilicon | Yes | **Response to Ericsson, Sharp** - The other well-known benefit for introducing CG was to reduce the control channel overhead for the case the traffic pattern is known to be is periodic. Since the discovery messages are always periodic it in our opinion it should be transmitted using the CG allocated resources.**Response to Apple, Samsung, LG and Qualcomm** – Firstly “Keep Alive” messages are only transmitted when there is no data to transmit. Hence even though the keep alive message may be periodic but the overall traffic pattern (Data + keep alive ) will not be periodic so allocating CG resources based on keep alive message periodicity will not be appropriate in our view. Secondly we don’t think that the network will have the knowledge to configure the SL CG optimally without assistance information from UE. **Response to Vivo MediaTek & Xiaomi -** The way SL CG functionality for discover messages is currently stands is incomplete and if this missing bit to to assist gNB to configure SL CG type 1 for discovery is not added the whole SL CG functionality the will be ineffective in our view. The ASN 1 addition is straight forward and adds the new assistance information which is very similar to existing SL-TrafficPatternInfo.Considering the above aspects, we firmly believe that we need to introduce the UE assistance information for the discovery message to properly allocate resources for SL CG in R17.  |

In rapporteur’s view, the framework for support of discovery transmissions via SL CG is already specified in Rel-17. The proponent companies propose to add the missing bit to this framework/procedure by introducing the new assistance information, which is very similar to SL-TrafficPatternInfo in UEAssistanceInformation message, to assist gNB to configure SL CG resources for discovery message transmission with minimal spec impacts. Otherwise, the whole effect of introducing SL CG for discovery transmissions in the specification will reduced.

**Question 2: Considering the framework for supporting of discovery transmissions via SL CG has already specified in Rel-17, do companies agree to add the missing bit to this framework/procedure by introducing the new assistance information, very similar to existing SL-TrafficPatternInfo in UEAssistanceInformation message to assist gNB to configure SL CG type 1 for discovery with minimal spec impacts? If no, please provide the reason/comments.**

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| Company | Yes/No | Comments |
| Ericsson  | No | See comments for Q1 |
| Apple  | Prefer no | We have concern about ASN.1 impact in this late stage. |
| Samsung | No | There is no critical issue for SL discovery message transmission without this feature. |
| vivo | No | we wonder whether smart gNB implementation could figure out the discovery msg transmission parameters without the UE report if the period of discovery message is fixed. We are also concerned about the ASN.1 impact. |
| MediaTek | No |  |
| Kyocera | Yes | We think it’s helpful to the gNB to receive assistance information from the UE with SL CG configuration.  |
| Nokia | Yes |  |
| Qualcomm | No | See comments for Q1 |
| Sharp | No |  |
| LG | No | Without this feature, discovery message may be transmitted by CG configuration. We have concern about the ASN.1 impact. |
| Xiaomi | No  | See comments for Q1. We are also concerned at the introduction of changes for new functionality requiring ASN.1 impact. |
| Lenovo | No strong view |  |
| Huawei, HiSilicon | Yes | Since the framework for transmitting the discovery message using SL CG has already been specified it is better to add the missing bit to this framework/procedure to assist gNB to configure SL CG type 1 for discovery with minimal spec impacts. Otherwise the whole point of introducing SL CG for discovery transmissions will be ineffective in reality  |

**Question 3: If the answer to Question2 is yes, Can TP in** [**R2-2210111**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119-e/Docs/R2-2208228.zip) **be agreed as baseline?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No |  |
| Kyocera | Yes |  |
| Nokia | Yes |  |
| Huawei, HiSilicon | Yes | As indicated earlier, the TP is straight forward and just adds the new assistance information which is very similar to existing SL-TrafficPatternInfo which will help the network to appropriately configure SL CG type 1 for discovery |
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### 2.2 Resource allocation scheme when sensing result is not available for NR sidelink discovery

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| R2-2210633[2] | Discussion on Resource Allocation for Sidelink Discovery | CATT |

When mode2 is selected for NR sidelink discovery transmission, the UE will perform resource pool selection and perform resource selection mechanism selection based on the sl-AllowedResourceSelectionConfig of the selected resource pool.

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| **sl-AllowedResourceSelectionConfig** | **Allowed resource selection mechanism(s)** |
| c1 | only full sensing  |
| c2 | only partial sensing |
| c3 | only random selection  |
| c4 | full sensing + random selection  |
| c5 | full sensing + partial sensing  |
| c6 | partial sensing + random selection  |
| c7 | full sensing + partial sensing + random selection  |

According to the current RRC spec, UE will use exceptional pool in the following two cases:

* Case1: when discovery pool is configured, if partial/full sensing is selected and is allowed by sl-AllowedResourceSelectionConfig, and the sensing result is not available.
* Case2: when discovery pool is not configured, if partial/full sensing for common pool is selected and is allowed by sl-AllowedResourceSelectionConfig, and the sensing result is not available.

For the resource pool, if c1/c2/c5 is configured for sl-AllowedResourceSelectionConfig, the current spec procedure is clear. But if c4/c6/c7 is configured for
sl-AllowedResourceSelectionConfig, when the sensing result is not available, besides limiting the UE to use exceptional pool, [2] raised that UE can also use random selection with the merit of reducing the pressure on the exceptional pool.

**Question 4: For the selected resource pool, if the configured value of sl-AllowedResourceSelectionConfig is c4/c6/c7, do companies agree that UE can use random selection on the selected resource pool instead of using exceptional pool when the sensing result is not available?**

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| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| OPPO | No | currently, in R17 eSL, the selection of full/partial/random (if allowed by the pool) is fully up to UE implementation, so our view is it is OK for UE to select random in normal pool if it is allowed, yet we do not see the need to pursue spec impact for “**UE can use random selection on the selected resource pool instead of using exceptional pool when the sensing result is not available**” |
| Apple | No | Having no sensing results is a temporary situation. So, it is proper to deal with this behaviour in the exceptional pool, instead of normal TX pool. Adding more random transmissions in a normal TX pool has negative impact on other UEs selecting resources based on sensing schemes in the same pool.Even in LTE V2X, the UE is configured to support random selection and partial sensing in a P2X TX pool is still allowed to use exceptional pool when partial sensing results are not available. If it works in LTE SL, it could work in NR SL.So, we are not sure there is a need to support this additional enhancement.  |
| Samsung | No | We share the view from OPPO and Apple. No further enhancement is needed for discovery message transmission. |
| vivo | No | Our assumption is that the UE should decide one of the allowed resource allocation schemes from the start and should not change the selected resource allocation scheme within the selected normal pool. Based on this assumption, we prefer that UE will rely on the exceptional pool when the sensing result is not available for the corresponding data transmission. Also, the proposed solution may allow the UE’s implementation to stop sensing procedure and turns to random selection within the selected normal pool.  |
| MediaTek | No |  |
| Kyocera | No | We assume it’s sufficient just to allow the UE to use exceptional pool when sensing result is not available. Since the gNB configures the case # for *sl-AllowedResourceSelectionConfig,* it can always allocate additional resources for exceptional pool knowing that such UEs won’t be using random selection for the selected resource pool. |
| Nokia | No | No  |
| Qualcomm | No | Agree with the above comments |
| Sharp | No | We prefer to always use exceptional pool for discovery transmission in the case **c4/c6/c7** which is clear for UE behaviour. If both random selection in normal pool and exceptional pool could be used, the subsequent question could be if UE always firstly tries random selection in normal pool or selects in exception pool which should be avoided. |
| LG | No | If UE performs full/partial sensing and the sensing result is not available, the UE can use an exceptional pool. And if the UE performs random selection, the UE can select a random pool. It seems to be an enhancement for the resource pool selection mechanism. We think it does not need to make a special enhancement for the discovery message. |
| Xiaomi | No | Agree with the comments above, and introducing random selection in the normal pool adds further confusion and already there is a clear solution to use the exceptional pool.  |

**Question 5: If the answer to Question4 is yes, Can TP in** [**R2-2210633**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119-e/Docs/R2-2208228.zip) **be agreed as baseline?**

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| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| OPPO | No | The specification from R17 eSL is sufficient already. |
| Apple | No |  |
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# Conclusion

Based on the input from all companies, the rapporteur proposes that:

# Reference

1. R2-2210111 Support of SL CG for discovery message Huawei, HiSilicon, Nokia, Kyocera
2. R2-2210633 Discussion on Resource Allocation for Sidelink Discovery CATT
3. TS 23.303 Proximity-based services (ProSe); Stage 2 V17.0.0