3GPP TSG-RAN WG2 Meeting #121bis-e R2-2304303

Electronic Meeting, April, 2022

Agenda: x.x.x

Source: InterDigital

Title: Summary of [AT121bis-e][430][Relay] Multi-path relay idle/inactive cases (InterDigital)

Document for: Discussion, Decision

# 1 Introduction

The following email discussion was initiated at RAN2#121bis-e [1]:

* [AT121bis-e][430][Relay] Multi-path relay idle/inactive cases (InterDigital)

 Scope: Discuss and attempt to converge on the candidate agreements from the multi-path discussion:

Multi-path at the remote UE is not maintained when the relay UE is moved to RRC\_IDLE/RRC\_INACTIVE in this release.

A remote UE in multipath that is released to RRC\_IDLE/RRC\_INACTIVE can apply legacy cell/relay selection behaviour, thus moving to single-path operation on either path according to implementation.

 Intended outcome: Report to CB session

 Deadline: Monday 2023-04-24 2359 UTC

This document summarizes the discussion of this email.

# 2 Contact Information

Respondents to the offline discussion are kindly asked to fill in the following table.

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| Company | Contact: Name (E-mail) |
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# 3 Discussion

## 3.1 Relay UE in IDLE/INACTIVE

The first discussion based on the proposals in [2] was on the allowable RRC states of the relay UE while the remote UE is in multipath. The attempt was to converge on the following candidate agreement which is effectively to not maintain multipath at the remote UE:

*Multi-path at the remote UE is not maintained when the relay UE is moved to RRC\_IDLE/RRC\_INACTIVE in this release.*

Some of the difficulty in agreeing to the above was based on different interpretation of what is meant by not maintaining multipath. Specifically, when the relay UE moves to RRC\_IDLE/RRC\_INACTIVE, the remote UE can release the configuration associated to multipath and operate in legacy Uu, or it may maintain the configuration for the purposes of being able to re-use it when the relay UE moves back to RRC\_CONNECTED.

**Q1.1) Which option(s) do you prefer for how to handle the multipath configuration at the remote UE when the relay UE moves to RRC\_IDLE/RRC\_INACTIVE?**

* **A) The remote UE releases the multipath configuration (i.e., release SL-RLC entities, SRAP, and bearers having only indirect path).**
* **B) The remote UE maintains the multipath configuration but suspends the SL-RLC path. The remote UE can re-use the suspended indirect path when the relay UE moves back to RRC\_CONNECTED.**
* **C) The remote UE maintains the multipath configuration but suspends the SL-RLC path. The remote UE can re-use the suspended indirect path based on UE decision (e.g., UL data arrival).**
* **D) Other**

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A similar situation may occur when the relay UE experiences Uu RLF. In this case, based on Rel17 behavior, the relay UE should informs the remote UE using the NoticationMessageSidelink. However, depending on whether the relay UE recovers or not (i.e., successful re-establishment), the relay UE may not move to RRC\_IDLE, and releasing the multipath configuration at the remote UE may be unnecessary.

**Q1.2) Which option(s) do you prefer for how to handle the multipath configuration at the remote UE when the relay UE informs the remote UE of Uu RLF?**

* **A) The remote UE releases the multipath configuration (i.e., release SL-RLC entities, SRAP, and bearers having only indirect path).**
* **B) The remote suspends the multipath configuration and may continue to use it in case the relay UE does not move to RRC\_IDLE/RRC\_INACTIVE (i.e., recovery following Uu RLF)**
* **C) Other**

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Finally, the only other notification by the relay UE that would be relevant to the multipath case is the relay UE HO.

**Q1.3) Which option(s) do you prefer on how to handle the multipath configuration at the remote UE when the relay UE informs the remote UE of HO?**

* **A) The remote UE releases the multipath configuration (i.e., release SL-RLC entities, SRAP, and bearers having only indirect path).**
* **B) The remote continues to use the multipath configuration in some cases (e.g., intra-gNB HO) and releases the configuration in other cases (e.g., inter-gNB HO, HO failure, etc)**
* **C) Other**

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The remote UE may determine the change in state of the relay directly from the network itself. While this may be straightforward for the case of explicit release, it may be more difficult for cases where the state change is triggered by an error at the relay UE since waiting for the network to detect the condition may incur unacceptable delays. Two such cases are Uu RLF, and expiry of the DataInactivityTimer at the relay UE. In this case, the NotificationMessageSidelink may be preferrable. Use of NotificationMessageSidelink may also be more scalable to the inter-gNB case.

**Q1.4) How does the remote UE determine the that the relay UE moved to IDLE/INACTIVE in the explicit release case (e.g., relay UE receives a release from the network)?**

* **A) Relay UE informs the remote UE (e.g., using NotificationMessageSidelink)**
* **B) NW reconfigures each remote UE before it releases the relay UE to IDLE/INACTIVE**
* **C) Other**

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**Q1.5) How does the remote UE determine the that the relay UE moved to IDLE/INACTIVE in the case where the relay UE experiences Uu RLF without recovery or DataInactivityTimer expires?**

* **A) Relay UE informs the remote UE (e.g., using NotificationMessageSidelink)**
* **B) NW reconfigures remote UE after it determine the relay UE is no longer accessible**
* **C) Other**

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## 3.2 IDLE/INACTIVE remote UE following a release

The second issue discussed based on proposals in [2] is how to handle the NW initiated release to a remote UE in multipath. In this case, during online session, companies were mostly of the opinion that legacy behaviour can apply which resulted in the following proposed agreement from the chairman.

*A remote UE in multipath that is released to RRC\_IDLE/RRC\_INACTIVE can apply legacy cell/relay selection behaviour, thus moving to single-path operation on either path according to implementation.*

However, it is not clear what legacy behaviour in the case of multipath really means:

* In legacy Uu, a UE that receives a release message on Uu starts by camping on that cell and reselecting to another cell when the conditions related to cell reselection are triggered.
* In legacy relays, a remote UE that receives a release message maintains the PC5-RRC connection to the relay and only triggers cell/relay reselection when the conditions related to cell/relay reselection are triggered.

There is therefore some ambiguity as to which of the above two behaviours is considered as “legacy” for a remote UE in multipath. If both cases are considered value for the UE in multipath, legacy behaviour indicates that the path maintained correspond to the path where the UE received the release message from.

Some companies mentioned that the preferred approach would be for the UE to always camp on Uu, since the PCell is on Uu. However, the relayed path may be the best path, and camping on the direct path upon release may result in releasing the PC5-RRC connection, only to immediately establish it again if the IDLE/INACTIVE remote UE ends up triggering relay selection.

For this reason, [2] proposed to have a NW-based decision (similar to a release with redirection) to remove the ambiguity and avoid path ping-pong during the release. In this case, the network releases the remote UE to the most reliable path, and can also know how to deliver SI and paging to the remote UE following this.

**Q2.1) Upon reception of a release message, how does the remote UE decide between i) camping on Uu and releasing the PC5-RRC connection, or ii) maintaining the PC5-RRC connection and behaving as a Rel17 remote UE in IDLE/INACTIVE?**

* **A) Release message indicates whether to perform i) or ii)**
* **B) Always perform i)**
* **C) Follow legacy behavior (if release is received via Uu, perform i, if the release is received from the relay, perform ii).**
* **D) Other**

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# 4 Conclusion

# 5 References

1. RAN2#121bis-e Chairman Notes
2. R2-2302924