3GPP TSG-RAN WG3 #117bis-e [R3-22](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23113-e.exe/Meetings/RAN3%23113/chairnotes/Inbox/R3-214141.zip)5954

Online, 10th Oct – 18th Oct 2022

Agenda Item: 16.3

Source: Qualcomm (moderator)

Title: Summary of Offline Discussion on CB: # SLRelay2\_ServiceContinuity

Document for: Approval

# Introduction

**CB: # SLRelay2\_ServiceContinuity**

**- Discuss on source gNB node or target gNB decides the new path type, i.e., either indirect or direct? Source gNB or target gNB selects the target cell?**

**- Discuss on the preference on options for selection of target Relay UE, e.g. option 1/2/3.**

(Qualcomm - moderator)

Summary of offline disc [R3-225928](file:///C:\Users\shakrish\OneDrive%20-%20Qualcomm\Desktop\Dropbox\Pentari%20Systems\RAN3\117-bis-e%20Oct%202022\CB\CB%20%23%20SLRelay2_ServiceContinuity\Inbox\R3-225928.zip) rev in [R3-225954](file:///C:\Users\shakrish\OneDrive%20-%20Qualcomm\Desktop\Dropbox\Pentari%20Systems\RAN3\117-bis-e%20Oct%202022\CB\CB%20%23%20SLRelay2_ServiceContinuity\Inbox\R3-225954.zip)

# For the Chair’s Notes

**Agreements from 2nd round:**

TBD

**Agreements from 1st round:**

WA: Source gNB selects the target path type (direct or indirect)

For direct/indirect to indirect path switching, enhance Xn: HANDOVER REQUEST to include at least the Remote UE L2 ID and Relay UE L2 ID. FFS whether to include a single Target Relay L2 ID or a list of Target candidate Relay L2 ID.

For inter-gNB path switching scenarios, RAN3 should specify mechanisms to support service continuity for L2 U2N relays in NG based handovers as well after supporting service continuity for L2 U2N relays in Xn based handovers, If there is some conclusion from SA2, and then to support NG based HO.

# Phase-II Discussion

## Which node selects the target U2N relay UE?

FFS on the selection of target relay UE during inter-gNB direct/indirect to indirect path switching:

* Option 1: source gNB selects one target Relay UE and sends the ID related information to the target gNB
* Option 2: source gNB sends a list of candidate target Relay UE information to the target gNB for selection
* Option 3: source gNB provides also the measurement information of Remote UE to the target gNB for selection of target Relay UE

This are the companies’ preferences from 1st round:

* Option 1 (6/11): QC, NOK, CT, CATT, ID, HW
* Option 2 (1/11): E///
* Option 3 (2/11): ZTE, LGE
* Option 1 or 2 (1/11): CMCC
* Option 2 or 3 (1/11): SS

Besides the pros/cons listed by moderator in Phase-1 in section 4.1, the moderator captures below some other comments and counter-comments from the Phase-1 discussion to see if companies can change their option preferences and in order to make progress.

|  |  |
| --- | --- |
| **Argument** | **Counter-Argument** |
| **ZTE**: Suppose there are two candidate relay UEs (UE1 and UE2) served by target gNB, and if candidate relay UE1 is in RRC idle state while candidate relay UE2 is in RRC connected state, if the PC5 link quality of the two candidate relay UEs are good and nearly the same as reported in measurement report. **The source gNB is not aware of the RRC state of the candidate relay UEs in other gNBs.** So, it is better to send the two candidate relay UEs to the target gNB and the target gNB selects a target relay UE.  **LGE**: For example, the source gNB selects the UE in RRC\_IDLE or RRC\_INACTIVE as the target relay UE in Option 1. Then, the radio link failure may be occurred during the state transition to RRC\_CONNECTED, thus resulting in handover failure. Also, it **causes additional latency due to state transition to RRC\_CONNECTED**, thus increasing possibility of handover failure. So, at least, Option 1 is excluded. | **NOK**: Even in case 2 candidate relay with 1 is IDLE and 1 is CONNECTED, **it may be better to select the CONNECTED candidate relay in one scenario, but it is better to select the other IDLE candidate relay (e.g., the CONNECTED relay/DU is overloaded) in another scenario**. So, we would prefer a simple solution, and possible enhancement can be discussed later.  **CATT**: Even for intra-CU path switch in R17, the gNB may select a relay UE in RRC\_IDLE or RRC\_INACTIVE, and the **specification does not say that RRC\_CONNECTED relay UE has higher priority**. |
| **Samsung**: In addition, with the help of Option3, the target node can make more proper selection on the candidate relay UEs. Regarding con#1 for Option3, our understanding is that **what would be included in the measurement report from remote UE to RAN is in the remit of RAN2**, and as far as we know RAN2 has not ruled out the possibility to include anything new in the MeasurementReport. So we also support Option3. | **E///:** Option 3 relies on RAN2’s discussion. In the pre-meeting discussion, **they leave the decision to RAN3.** |
| **ZTE**: For option 2/3, though the candidate relay UEs are satisfied the threshold criteria, **PC5 measurement results are further helpful to select a target relay UE with a even better PC5 link quality than other candidate relay UEs**. So it is useful to provide PC5 measurement results to target gNB. | **CMCC**: Measurement information of Remote UE mentioned in option 3 seems unnecessary, because the **same criteria and threshold can be configured to source gNB if the measurement information has effect on the candidate relay UE selection.** |
| **E///:** Companies would **prefer to follow legacy handover, so the principle will be the target gNB making final decision** since it knows its own resources.  In that case first Option 1 should be opted out, since it gives no choice to the target gNB but only to accept directly or reject the whole procedure. | Moderator: In legacy HO, **source gNB** selects the target cell (and target gNB) and initiates HO preparation towards that gNB (target gNB can of course reject the HO preparation if needed). Not sure why E/// is saying if we prefer follow legacy behavior, **target gNB** should make final decision  Similar to legacy HO, source gNB can select target gNB (and target cell), but can also select the target relay UE right?  **Are you then saying source gNB will select target gNB (and target cell) but target gNB will select target relay UE?** |
|  |  |

Based on the points above, the following is proposed:

**Moderator proposal 1:** For inter-gNB indirect/direct to indirect path switching, the RRC state of candidate relay UEs need not be considered to determine the target relay UE.

Considering (7/11) companies seem to prefer (or OK with) Option 1, the moderator requests the companies NOT supporting Option 1 (**E///, ZTE, LGE, SS**) to comment whether they are satisfied with the counter arguments provided by companies in Phase-1 and are willing to change their preferences. Also other companies are requested to comment if they want to add something.

**Q1: Companies are requested to comment whether Moderator Proposal 1 is acceptable and provide their preference among Options 1-3**

|  |  |  |
| --- | --- | --- |
| Company | P1 (yes/no) &  Option 1/2/3 | Comment |
|  |  |  |

## Further enhancements to HANDOVER REQUEST in Xn

FFS whether to also include the following in Xn: HANDOVER REQUEST during direct/indirect to indirect path switching:

1. Serving cell of the relay UE
2. PC5 link quality of the relay UE

In Phase-1, some companies mentioned that c) is already supported. From TS 38.423, the moderator also confirms that HANDOVER REQUEST in Xn already includes Target Cell Global ID.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Target Cell Global ID | M |  | 9.2.3.25 | Includes either an E-UTRA CGI or an NR CGI | YES | reject |

Regarding c), therefore the following is proposed

**Moderator Proposal 2:** During inter-gNB path switching, source gNB can signal the serving cell of the relay UE to target gNB via existing IE *Target Cell Global ID* (no need of any enhancements)

Regarding d), this depends on discussion in section 3.1, but the following way forward is proposed by the moderator

**Moderator Proposal 3:**

* If source gNB determines the target relay UE (Option 1), there is no need to signal PC5 link quality of candidate relay UEs i.e., d) is not needed if Option 1 is selected
* If target gNB determines the target relay UE (Option 2), we can discuss whether d) is to be supported i.e., whether the PC5 link quality of candidate relay UEs is to be signaled in addition to sending a list of candidate relay UE IDs.

|  |  |  |
| --- | --- | --- |
| Company | P2-P3 (Yes/No) | Comment |
|  |  |  |

## Target path type selection

WA: Source gNB selects the target path type (direct or indirect)

In phase 1, 9 out of 11 companies support the source gNB to select the target path type. The moderator wants to check with the 2 opposing companies (**SS and LGE**) if we can turn this WA into agreement considering the points provided in section 3.1?

**Moderator Proposal 4:** Turn the following WA into agreement:

WA: Source gNB selects the target path type (direct or indirect)

|  |  |  |
| --- | --- | --- |
| Company | P4 (Yes/No) | Comment |
|  |  |  |

# Phase-I Discussion

## Which node selects the target U2N relay UE?

This is the open issue from last meeting:

Continue analyzing the following options for selection of target Relay UE:

* Option 1: source gNB selects one target Relay UE and sends the ID related information to the target gNB
* Option 2: source gNB sends a list of candidate target Relay UE information to the target gNB for selection
* Option 3: source gNB provides also the measurement information of Remote UE to the target gNB for selection of target Relay UE

To assist the discussion, the moderator has tried to summarize a few pros/cons for the above options based on a few submitted papers:

**Option 1:**

**Pros**: Option 1 has the following advantages: 1) alignment with legacy HO; 2) alignment of the direct/indirect to indirect and indirect to direct procedures 3) simplified Xn signaling (**Interdigital**)

**Cons:** If the source node decides the path type/the target relay UE, it may **increase the possibility to cause handover failure**, while the target node option could avoid such problem. If the decision on the path type/ the target relay UE is up to the target node, the potential HO failure problem and the potential Too-Late handover problem brought by the source node option could be avoided, with limited spec impact (**Samsung**)

**Option 2:**

**Pros:** We believe that Option-1 is a subset of Option-2 if there was only one U2N relay UE candidate in the list. In addition, the target gNB would perform the admission control procedure to check if the path switch procedure can be allowed in the target gNB. Therefore, Option-1 could result in high chances of rejection as compared to **Option-2 where are more candidates to choose from**. Thereby Option-1 increases the latency in the path switch procedure as the source gNB initiates new signaling to another candidate target gNB (**Ericsson**)

**Cons:** There is not much benefit in Option 2 i.e., source gNB sending a list of candidate target Relay UE information to the target gNB for selection as all the candidate relay UEs proposed by source gNB can still be rejected by target gNB and this might mean split responsibilities (source to select path type and target to select relay UE) (**Qualcomm**)

**Option 3:**

**Pros:** Target gNB selects the target relay UE, since it is **more clear about the status of candidate relay UEs in its coverage** (**ZTE**)

Cons:

* The measurement information in Option-3 **does not provide any additional information** to the target gNB. This is because, the measurement report to initiate a path switch procedure is triggered based on measurement events and the report itself **consists of only those U2N relay UEs which satisfy a certain threshold criterion**. Hence, reporting such measurements to the target gNB cannot help in discerning between them and are unnecessary **(Ericsson, QC…)**
* In options 2 and 3, the network cannot decide between path switch/HO to a cell vs path switch to a relay because such **decisions would be made in different nodes** **(Interdigital)**
* In options 2 and 3, how to handle the case where the potential target relay UEs are under the coverage of different (more than one) target gNBs is not clear and **could further complicate Xn signalling** (**Interdigital**)
* Measurements of the Uu link by the target relay UE are only available at the target gNB for target relay UEs **which are in RRC\_CONNECTED** (**Interdigital**)

**Q1: Companies are requested to provide their preference among Options 1-3 and justify against the cons provided by the moderator.**

|  |  |  |
| --- | --- | --- |
| Company | Option 1, 2 or 3 | Comment |
| Qualcomm | Option 1 | We don’t see much benefit in Option 3 mainly because of con#1 listed by moderator (only those U2N relay UEs which satisfy a certain threshold criterion are anyway reported in measurement report and don’t think target gNB selecting the relay UE based on its Uu signal strength would help much in reducing HO failures).  Regarding Option 2, we are not sure whether/why a target relay UE would be rejected due to admission control so frequently thereby necessitating to send a list of candidate relay UEs for down-selection? Also, if we agree source gNB selects target path type (in section 4.2) and target gNB selects the final relay UE, this would result in split responsibilities and seems a little convoluted.  Option 1 seems sufficient, and we don’t think this would result in increase of HO failures due to incorrect target relay UE selection. |
| ZTE | Option 3 | For Option 1, suppose there are two candidate relay UEs (UE1 and UE2) served by target gNB, and if candidate relay UE1 is in RRC idle state while candidate relay UE2 is in RRC connected state, if the PC5 link quality of the two candidate relay UEs are good and nearly the same as reported in measurement report, it is better to select the candidate relay UE2 in RRC connected state as the target relay UE, considering that a target relay UE in RRC idle state needs more time to enter into RRC connected state, even worse the RRC connection setup may be failed. However, the source gNB is not aware of the RRC state of the candidate relay UEs in other gNBs. So, it is better to send the two candidate relay UEs to the target gNB and the target gNB selects a target relay UE.  For option 2/3, though the candidate relay UEs are satisfied the threshold criteria, PC5 measurement results are further helpful to select a target relay UE with a even better PC5 link quality than other candidate relay UEs. So it is useful to provide PC5 measurement results to target gNB. |
| LGE | Option 3 | For example, the source gNB selects the UE in RRC\_IDLE or RRC\_INACTIVE as the target relay UE in Option 1. Then, the radio link failure may be occurred during the state transition to RRC\_CONNECTED, thus resulting in handover failure. Also, it causes additional latency due to state transition to RRC\_CONNECTED, thus increasing possibility of handover failure. So, at least, Option 1 is excluded..  We think that in Option 3, the target gNB can have a knowledge of whether the candidate relay UE may be in RRC\_IDLE or RRC\_INACTIVE and also get the Uu measurement result between the selected relay UE (if the selected relay UE is RRC\_CONNECTED) and the target gNB. So, the target gNB can make the better decision on the target relay UE based on the additional knowledge for the relay UE. We prefer Option 3. |
| CMCC | Option 1 or 2 | With option2, source gNB performs basic selection based on the measurement report and selects the candidate target relay UE that fulfill the criteria. In the target gNB side, it can further do down selection with the itself selection criteria, wherein the RRC state and/or payload and other transmission conditions of relay UEs can be taken into account. Measurement information of Remote UE mentioned in option3 seems unnecessary, because the same criteria and threshold can be configured to source gNB if the measurement information has effect on the candidate relay UE selection. |
| Nokia | Option 1 | It is arguable that Option 2 is better than Option 1, since there are many conditions that can cause the HO failure. Even in case 2 candidate relay with 1 is IDLE and 1 is CONNECTED, it may be better to select the CONNECTED candidate relay in one scenario, but it is better to select the other IDLE candidate relay (e.g. the CONNECTED relay/DU is overloaded) in another scenario. So we would prefer a simple solution, and possible enhancement can be discussed later. |
| China Telecom | Option 1 | Same view with QC.  Potential target candidate relay UEs may be located under different gNBs, the relay UE in the RRC\_IDLE / RRC\_INACTIVE state also brings uncertainty, not sure how much benefit Option 2/3 can bring. At the same time, there may be some confusion in the division of gNB responsibilities(source gNB needs to select the a target node first). Option 1 seems sufficient and simple enough. |
| Samsung | Option2/3 | As mentioned by companies, the advantages of Option 2/3 compared to Option1 is as follows,   * The target node has more knowledge on the candidate relay UEs, including the RRC state of candidate relay UEs and/or the uu measurement results of candidate relay UEs, which enables the RAN to make the best choice and reduce the HO failure as much as possible.   So at least Option2 is more preferable than Option1.  In addition, with the help of Option3, the target node can make more proper selection on the candidate relay UEs. Regarding con#1 for Option3, our understanding is that what would be included in the measurement report from remote UE to RAN is in the remit of RAN2, and as far as we know RAN2 has not ruled out the possibility to include anything new in the MeasurementReport. So we also support Option3. |
| CATT | Option 1 from RAN3 perspective. | Source gNB selects target relay UE follow the legacy principle i.e., source gNB selects one target cell in Xn handover request. Note that the relay UE only can be a relay UE when conditions are met e.g., load, Uu link.  Target gNB selects target relay UE is an optimization. It can be discussed/supported in RAN2. Even for the candidate cell list, it is also included in *HandoverPreparation* rather than conveyed in Xn handover request explicitly.  Even for intra-CU path switch in R17, the gNB may select a relay UE in RRC\_IDLE or RRC\_INACTIVE, and the specification does not say that RRC\_CONNECTED relay UE has higher priority. |
| InterDigital | 1 | As stated in our paper option 1 aligns to legacy HO. It is not clear how a split decision process (option 2/3) would work if there are candidate cells/relay UEs under more than 1 target gNB. Also, since  the target relay UE is configured to transmit discovery only when in acceptable network coverage failure when moving to a target relay UE is less of an issue. |
| Huawei | Option 1 | We think preserving legacy principles has a large benefit in itself. We do not see a big advantage of the other options. |
| E/// | Option 2 | Companies would prefer to follow legacy handover, so the principle will be the target gNB making final decision since it knows its own resources.  In that case first Option 1 should be opted out, since it gives no choice to the target gNB but only to accept directly or reject the whole procedure.  Option 2 and 3 would have some coordination between source gNB and target gNB. Option 2 avoids transferring measurement results to the target gNB, instead it gives the preference of candidate target relay UEs list.  Option 3 relies on RAN2’s discussion. In the pre-meeting discussion, they leave the decision to RAN3. |

**Moderator Summary:**

* Option 1 (6/11)
* Option 2 (1/11)
* Option 1 or 2 (1/11)
* Option 2 or 3 (1/11)
* Option 3 (2/11)

No consensus in Phase-1 email discussion, To be continued in 2nd round:

Proposal 1: FFS on the selection of target relay UE during inter-gNB direct/indirect to indirect path switching:

* Option 1: source gNB selects one target Relay UE and sends the ID related information to the target gNB
* Option 2: source gNB sends a list of candidate target Relay UE information to the target gNB for selection
* Option 3: source gNB provides also the measurement information of Remote UE to the target gNB for selection of target Relay UE

## Which node should decide on the new path type i.e., direct or indirect path?

E///, Observation 1: The source gNB already has all the Uu measurements to the target cells and PC5 measurements to all the candidate relay UEs to decide on the path type.

E///, Proposal 1: For d2i, i2d and i2i scenarios, the source gNB should decide on the new path type i.e., direct or indirect path.

ZTE, Proposal 9: If both Uu measurements and candidate relay measurements of a same target gNB are available, path switching to direct path shall be prioritized if the Uu measurement is good.

HW, Proposal 1b: **Source gNB will select the target cell if it decides to switch the UE to a direct path** or select the target relay UE if it decides to switch the UE to an indirect path.

QC, Proposal 3: In case of inter-gNB path switching, **source gNB should decide the target cell** (and hence target gNB) in case there are multiple candidates for the path switching

Consider an example provided in [2], where a UE is connected via direct path to cell 1 (gNB1) and configured with RRM measurement configurations. Say the RRM event is met, and the UE sends measurementReport with multiple candidates for path switching

* Alt 1: switch to a direct path in cell 2 (gNB2)
* Alt 2: switch to an indirect path via relay UE A in cell 3 (gNB2)
* Alt 3: switch to an indirect path via relay UE B in cell 3 (gNB2)
* Alt 4: switch to an indirect path via relay UE B in cell 4 (gNB3)

**Q2:** If both Uu measurements and candidate relay measurements towards **different** target gNBs are available and there are multiple suitable candidates (as shown in Alt 1-4), how is target gNB and target path type selected? In other words, **what is the order among i)** **target gNB selection, ii) target path type selection and iii) target relay UE selection?**

|  |  |  |
| --- | --- | --- |
| Company | Order among i), ii) and iii) | Comment |
| Qualcomm | i) 🡪 ii) 🡪 iii) | i) Source gNB first selects the target gNB (e.g., gNB2)  ii) Source gNB then selects the target path type (e.g., indirect)  iii) Source gNB then selects the target relay UE (e.g, relay UE A) |
| ZTE | Ii) -> i) -> iii) | ii) Source gNB first decides the target path type, if there is a direct path with good Uu link quality, the direct path is prioritized(Alt 1). Otherwise, if there is no direct path available, source gNB can only select an indirect path.-> i) select a target gNB of an indirect path.   1. Source gNB decides the target gNB. It’s source gNB implementation to select a target gNB among which gNBs that a decided path type is available (e.g. indirect path, gNB2/gNB3). Generally, a gNB with more the decided path type is preferred (gNB2). Suppose gNB2 is selected as the target gNB, the Source gNB could provide the candidate relay Ues to target gNB for the target gNB to select the target relay UE.   iii) The target gNB selects the target relay UE. |
| LGE | i) 🡪 ii) 🡪 iii) | i) Source gNB first selects the target gNB.  ii) Target gNB selects the target path type.  iii) If the indirect path is selected in ii), target gNB then selects the target relay UE. |
| CMCC | ii）-> i）-> iii) |  |
| Nokia | i) 🡪 ii) 🡪 iii) |  |
| China Telecom | i) 🡪 ii) 🡪 iii) |  |
| Samsung | i)-> ii)&iii) | Firstly, Source gNB selects the target gNB.  Then, Target gNB decides the path type and the target relay UE, and the order of ii and iii can be up to target gNB implementation. |
| CATT |  | Is it up to implementation? Source gNB will weigh the direct/indirect, gNB load, target relay UE performance when performing handover. But may be i)-> ii) -> iii) would be more reasonable. |
| InterDigital |  | It is implementation, In option 1 the source gNB fully decides between direct path to a target gNB or indirect paths to relay Ues in the that same target gNB or another gNB so the choice is solely in the source gNB. But if having to choose an implementation it would be i) 🡪 ii) 🡪 iii) |
| Huawei |  | This is up to implementation – source selects |
| E/// |  | We don’t have to specify in the standards, this is implementation related. |

**Moderator Summary:**

Proposal 2: The order in which target gNB selection, target path type selection and target relay UE selection (in case indirect path is selected) is performed is up to gNB implementation

**Q3.** Which node (source gNB or target gNB) selects the target path type?

|  |  |  |
| --- | --- | --- |
| Company | Source gNB or Target gNB | Comment |
| Qualcomm | Source gNB | Target gNB selecting target path type would mean Option 3 in Q1 and need signaling of PC5 measurements between remote UE to each candidate relay UE over Xn |
| ZTE | Source gNB | In legacy HO, the source gNB selects a target cell based on measurement results from UE and sends a HO request message to the target gNB including the target cell ID. Following the legacy procedures, the target cell shall be decided by the source gNB if a UE is switched/handed over to a target Uu cell/direct path, no matter the UE is a normal UE or a L2 U2N remote UE and no matter the original path is direct Uu path or indirect path. Target gNB decision on new path type is not applicable to all cases and target gNB decision on target cell ID breaks legacy procedures. |
| LGE | Target gNB | As mentioned in Q1, we prefer Option 3.  Based on the additional knowledge for the relay UE (e.g., Uu measurement result from candidate relay UE, the current RRC state and load status of the candidate relay UE), the target gNB can make the better decision on the target path type as well as the target relay UE. |
| CMCC | Source gNB | For resource gNB, it has the measurement information about the candidate relay UE, which includes PC5 link quality. For target gNB, it can obtain the uu quality between remote UE and target gNB, and uu quality between potential target relay UE and its serving gNB. However, considering that the condition for relay UE to transmit discovery message as described in TS38.300, the value of uu RSRP is between the the maximum Uu RSRP threshold and minimum Uu RSRP threshold, the uu quality of candidate relay Ues is acceptable. So, the detail uu quality between potential target relay UE and its serving gNB seems redundant for candidate relay UE selection. In addition, if the path switching decision is left to target gNB, the source gNB need deliver measurement information to target gNB, which may bring too much spec impact in Xn AP. |
| Nokia | Source gNB |  |
| China Telecom | Source gNB |  |
| Samsung | Target gNB | Share view with LGE. And we do not think extra signaling on PC5 measurement will bring too much overhead compared to the entire inter-node RRC meassage. |
| CATT | Source gNB | Even for option 3, the target gNB only select target relay UE considering the PC5 measurement reports from source Gnb e.g., target gNB selects target relay UE within the relay UE contained in PC5 measurement report. Include PC5 measurement report in RRC message means indirect path is selected by source.  We do not see the benefit that target gNB selects path type compared with source gNB. |
| InterDigital | Source gNB |  |
| Huawei | Source | Related to Q1 |
| E/// | Source gNB |  |

**Moderator Summary:**

Source gNB (9/11), Target gNB (2/11)

Proposal 3: WA: Source gNB selects the target path type (direct or indirect)

**Q4:** If both Uu measurements and candidate relay measurements towards the **same** target gNB are available, should the path switching to a direct path be prioritized if the Uu measurement is good?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Not sure | Not sure how we can categorize if the Uu measurement is “good” (define an absolute RSRP threshold?). Also, wouldn’t such kind of path type prioritization be up to implementation and there need not be any spec impacts, right? |
| ZTE | Yes | Similarly as candidate relay Ues are satisfied certain threshold criteria (measurement report events), Uu measurement of (candidate) direct path actually also meets certain measurement events. After receiving measurements results from remote UE, it could be the source gNB implementation to judge which direct Uu path is better than others. Anyway, we also think such prioritization is gNB implementation without any spec impact. |
| LGE | Not sure | Same view with Qualcomm.  This should be up to implementation. |
| CMCC | Yes | We understanding it is reasonable, but that can be left to gNB implementation. |
| Nokia | Not sure | Agree with Qualcomm. This should be up to implementation. |
| China Telecom | Not sure | This can be up to implementation. |
| Samsung | No | Whether to use direct or indirect path can be up to target gNB’s implementation. |
| CATT | No | Up to implementation. |
| InterDigital |  | Up to implementation |
| Huawei |  | This is up to implementation |
| E/// |  | We don’t have to discuss algorithm and implementation here. |

**Moderator Summary:**

Proposal 4: If both Uu measurements and candidate relay measurements towards the same target gNB are available, it is up to target gNB implementation whether the path switching to a direct path be prioritized if the Uu measurement is good

## Enhancements to HANDOVER REQUEST in Xn

For direct/indirect to indirect path switching, several signaling enhancements to Xn: HANDOVER REQUEST has been proposed in [1]-[12].

**Q5: Companies are requested to provide their preference among the following to be included in Xn: HANDOVER REQUEST:**

1. Remote UE L2 ID
2. Target relay L2 ID. FFS if single or multiple
3. Serving cell of the relay UE
4. PC5 link quality of the relay UE

|  |  |  |
| --- | --- | --- |
| Company | Yes/No for  a)-d) | Comment |
| Qualcomm | a), b) | For b), single relay L2 ID is sufficient (Option 1 in Q1) |
| ZTE | a), b), c), d) | For c), different candidate relay UE may be served by different cells of the same target gNB, it is helpful to also include it.  For d), see our comments in Q1. |
| LGE | a), b), c), d) | For b) list of candidate relay UE IDs is needed (i.e., Option 2 in Q1)  For d) PC5 measurement results are also needed (i.e., Option 3 in Q1) |
| CMCC | a), b), c) |  |
| Nokia | a, b, c | For c), it is useful, e.g. when target relay is IDLE/INACTIVE. But this may be already supported by the Target cell ID in the HO signaling. |
| China Telecom | a), b) | For c), the current HO signaling already includes Target cell ID.  For d), whether PC5 measurement result is included depends on RAN2. |
| Samsung | abcd | Agree with LGE. |
| CATT | Abc | Agree with Nokia that Target cell ID already in the HO signaling. |
| InterDigital | A B | Agree with Qualcomm |
| Huawei | b | Also related to previous discussion |
| E/// | a b | b for list of candidate relay UE IDs |

**Moderator Summary:**

a – 10/11, b- 11/11, c – 6/11, d – 3/11

Proposal 5: For direct/indirect to indirect path switching, enhance Xn: HANDOVER REQUEST to include at least the Remote UE L2 ID and Target Relay L2 ID. FFS whether to include a single or list of Target Relay L2 ID.

Proposal 6: FFS whether to also include the following in Xn: HANDOVER REQUEST during direct/indirect to indirect path switching:

1. Serving cell of the relay UE
2. PC5 link quality of the relay UE

## Enhancements to NG based handovers

QC, Proposal 1: For inter-gNB path switching scenarios, RAN3 should specify mechanisms to support service continuity for L2 U2N relays in both Xn and NG based handovers

NOK: For NG-HO, add target Relay UE ID in the Source NG-RAN Node to Target NG-RAN Node Transparent Container IE.

**Q6: Companies are requested to provide their view whether to specify mechanisms to support service continuity for L2 U2N relays in NG based handovers as well?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes | WID is not clear. But SA2 is studying NG based handovers as well, so RAN3 should also support this. |
| ZTE |  | Xn based HO is prioritized, while NG based HO can be postponed and wait for more SA2 progress/conclusion. |
| LGE | Yes | First, we need to define the basic principle to support the service continuity for L2 U2N relay. Then, this principle can be applied to both Xn and NG based handovers. |
| CMCC | With comments | We agree with ZTE and wait for progress of other group. |
| Nokia | Yes |  |
| China Telecom | Yes |  |
| Samsung |  | We are open to further discuss. |
| CATT |  | Not sure whether SA2 already support NG based handover. |
| Huawei | Yes | This makes sense |
| E/// |  | Focus on XnAP in RAN3 now |

**Moderator Summary:**

Proposal 7: For inter-gNB path switching scenarios, RAN3 should specify mechanisms to support service continuity for L2 U2N relays in NG based handovers as well after supporting service continuity for L2 U2N relays in Xn based handovers.

# Conclusion, Recommendations

If needed

# References

|  |  |  |
| --- | --- | --- |
|  |  |  |
| [1] | [R3-225355](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225355.zip) | Inter-gNB aspects of Service Continuity for L2 U2N Relays (Ericsson) |
| [2] | [R3-225416](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225416.zip) | Service continuity enhancements for L2 relays (Qualcomm Incorporated) |
| [3] | [R3-225426](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225426.zip) | Inter-node path switching for U2N relays (China Telecommunication) |
| [4] | [R3-225457](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225457.zip) | Discussion on Support Service Continuity Enhancements (Nokia, Nokia Shanghai Bell) |
| [5] | [R3-225500](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225500.zip) | Selection of the target relay UE for service continuity (InterDigital) |
| [6] | [R3-225546](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225546.zip) | SL relay: Inter-gNB mobility (Huawei) |
| [7] | [R3-225708](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225708.zip) | (TP to TS 38.401) Further discussion on service continuity enhancement (Samsung) |
| [8] | [R3-225755](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225755.zip) | (TP to TS 38.401) Consideration on service continuity enhancement for L2 U2N relay (LG Electronics) |
| [9] | [R3-225794](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225794.zip) | Discussion on Service Continuity Enhancements for SL relay (CATT) |
| [10] | [R3-225802](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225802.zip) | Service continuity on U2N relay (CMCC) |
| [12] | [R3-225467](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225467.zip) | Further study on multi-path relay and service continuity of L2 U2N relay (ZTE) |