3GPP TSG-RAN WG3 #119bis-e [R3-2](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)32004

Online, 17th April – 26th April 2023

Agenda Item: 10.2.1.

Source: Qualcomm Incorporated (moderator)

Title: Summary of Offline Discussion on CB: # SONMDT1\_SHRSPR

Document for: Approval

# Introduction

**CB: # SONMDT1\_SHRSPR**

**For Inter-RAT SHR:**

**- Forwarding mechanism for Inter-RAT SHR and R17 intra-NR SHR?**

**- Retrieval of UE context for intra-RAT and inter-RAT SHR?**

**- Correlate of inter-RAT SHR and RLF?**

**- NR to LTE HO - Addition of RACH related information?**

**- SHR collected during inter-RAT HO (LTE to NR)?**

**For SPR:**

**- Which node decides the trigger of T312/310 for MN-initiated classic PSCell change/CPC?**

**- The trigger of T304, whether the objective of SPR is to optimize PSCell change configuration during mobility or the RACH access issue or both?**

**- Which node will trigger PSCell change/CPC first, UE context retrieval while performing SPR optimizations, forwarding mechanism for SPR, the contents of SPR, the correlation between SPR and SCGFailureInformation, SPR availability indication**

**- Capture agreements and open issues**

**- Provide TPs if agreeable**

(moderator - Qualcomm)

Summary of offline disc [R3-231868](file:///D:\3GPP%20Standardization\RAN3\RAN3%23119bis\draft\SON%20SHR%20and%20SPR\Inbox\R3-231868.zip)

# For the Chair’s Notes

## For agreement in Phase-II

**R3-232021 (TPs for SON BLCRs for TS 38.413) Inter-RAT SHR and SPR – ZTE – To be Agreed**

**R3-232022 (TPs for SON BLCRs for TS 38.473) Inter-RAT SHR and SPR – ZTE – To be Agreed**

**R3-232002 TP for SON BLCR for 38.423) SON enhancement for SHR and SPR - Samsung– To be Agreed**

**R3-23xxxx LS to RAN2 inter-RAT SHR from LTE to NR and SPR – Huawei – To be Agreed**

## Agreed in SON/MDT online session

**Successful HO Report (SHR)**

**If a different NR node (different from source NR node) retrieves the SHR collected during an inter-RAT HO (NR 🡪 LTE), reuse *ACCESS AND MOBILITY INDICATION* message (over XnAP and F1AP) and Uplink/Downlink RAN configuration transfer procedures (over NGAP) to forward the SHR to the source NR node**

**WA: In case the SHR collected during an intra-NR HO is retrieved in a NR node different from source/target NR node, the receiving node forwards the SHR to corresponding node which generates the SHR trigger condition that triggered the SHR (i.e., Option 3 is agreed)**

**There is no need for UE to include the following RACH related information in SHR collected during inter-RAT HO (NR to LTE) as this information is already available in the RA Report:**

* **number of RACH attempts made for the successful handover**
* **a flag on whether contention was observed for the successful handover**

**No further discussion in RAN3 on above RACH related information.**

**Support collection of SHR during successful inter-RAT HO (LTE 🡪 NR) for T304 trigger without any LTE impacts in R18, if the following principles are used. Send LS to RAN2 to confirm the first 4 bullets:**

* **Target gNB can send SHR configuration (T304 trigger) to UE via NR container (*targetRAT-MessageContainer)* in *MobilityFromEUTRACommand***
* **UE stores this SHR configuration in NR format**
* **If T304 trigger is met, UE records SHR in NR format**
* **UE reports this SHR to only a gNB (either the target gNB or another gNB)**
* **NG-RAN node retrieving this SHR can forward this SHR to the target gNB for SHR optimizations**

**The SHR collected during inter-RAT HO (LTE🡪 NR) should include at least Source LTE cell and Target NR cell (assuming RAN2 confirms no LTE impacts based on the principles in the above proposal)**

**Successful PSCell Change Report (SPR)**

**WA: The triggers for SPR should be represented in terms of percentage values (similar to SHR)**

**In case the SPR is retrieved in a “new node” (different from the node that sent the SPR configuration to the UE i.e., “old MN”), the SPR is always sent from the “new node” to the “old MN” which then forwards to the respective node(s) which should perform the SPR optimization**

**To assist in the forwarding of SPR, UE shall include the following in SPR**

* **CGI of the PCell which sent the SPR configuration**
* **WA: Indication whether the PSCell change was MN-initiated or SN-initiated (RAN3 should discuss how the UE knows whether the PSCell change as MN-initiated or SN-initiated and will check with RAN2 on the mechanism)**

**Reuse ACCESS AND MOBILTY INDICATION to forward SPR over XnAP and F1AP and use Uplink/Downlink RAN Configuration Transfer for forwarding SPR over NGAP**

**To identify the UE context in the old source SN/old target SN when SPR is forwarded by old MN for SPR optimization, old MN identifies the UE context and sends the stored respective SN Mobility Information together with SPR to the old source SN/old target SN**

**To be continued in Phase-2**

**Issue 3: in case SPR is collected during MN-initiated PSCell change,**

* **Discuss whether “optimize lower layer issues of source PSCell” mean optimizing T310/T312 timer value, or T310/T312 SPR trigger, or both**
* **FFS whether SPR optimizations are done in both MN and source SN (e.g., MN has to optimize PSCell change configuration and source SN has to optimize T310/T312 timer values) for Option 1/2/3**

**To be continued in next meeting**

**Issue 1: Down selection among Option 1 vs. 2 for retrieval of UE context at source gNB during inter-RAT HO (NR🡪 LTE) and intra-NR HO**

* **Option 1: UE includes the “Source C-RNTI” and “Time between HO command and SHR retrieval”**
* **Option 2: Mobility Information is sent to the UE together with the SHR configuration, the UE includes the Mobility Information back in the SHR**

**Issue 2: Down selection among Option 1 vs. 2 to identify the UE context in the old MN when SPR is received**

* **Option 1: UE includes the “C-RNTI in old PSCell” and “Time between PSCell change and SPR retrieval”.**
* **Option 2: “Mobility Information in old PCell“ is sent to the UE together with the SPR configuration, the UE includes the Mobility Information back in the SPR**

**Issue 4: In case T304 trigger is met and SHR is collected, discuss whether the objective is to optimize RACH access issues in target cell or to optimize the mobility configuration or both**

**Issue 5: In case there is a RLF shortly after a successful inter-RAT HO from NR** 🡪 **LTE, RAN3 should discuss whether to support correlation of NR RLF and LTE SHR and if yes, whether any UE assistance is needed to support this correlation.**

# Phase-II Discussion

## Forwarding mechanism for intra-NR HO

**The following working assumption was agreed in the online session:**

**WA: In case the SHR collected during an intra-NR HO is retrieved in a NR node different from source/target NR node, the receiving node forwards the SHR to corresponding node which generates the SHR trigger condition that triggered the SHR (i.e., Option 3 is agreed)**

In the online session, a comment was raised on what should be the forwarding mechanism if a SHR can be collected due to **multiple SHR causes:**

The following text is copied from TS 38.331 for reference:

3>  if the ratio between the value of the elapsed time of the timer T304 and the configured value of the T304 timer, included in the last applied *RRCReconfiguration* message including the *reconfigurationWithSync*, is greater than *thresholdPercentageT304* if included in the *successHO-Config* received before executing the last reconfiguration with sync:

4>  set *t304-cause* in *shr-Cause* to *true*;

4>  set the*ra-InformationCommon* to include the random-access related information associated to the random access procedure in the target PCell, as specified in clause 5.7.10.5;

3>  if the ratio between the value of the elapsed time of the timer T310 and the configured value of the T310 timer, configured while the UE was connected to the source PCell before executing the last reconfiguration with sync, is greater than *thresholdPercentageT310* included in the *successHO-Config* if configured by the source PCell before executing the last reconfiguration with sync:

4>  set *t310-cause*in*shr-Cause* to *true*;

3>  if the T312 associated to the measurement identity of the target cell was running at the time of initiating the execution of the reconfiguration with sync procedure and if the ratio between the value of the elapsed time of the timer T312 and the configured value of the T312 timer, configured while the UE was connected to the source PCell before executing the last reconfiguration with sync, is greater than *thresholdPercentageT312* included in the s*uccessHO-Config* if configured by the source PCell before executing the last reconfiguration with sync:

4>  set *t312-cause*in*shr-Cause* to *true*;

3>  if *sourceDAPS-FailureReporting* included in the *successHO-Config* if configured by the source PCell before executing the last reconfiguration with sync is set to *true*, and if the last executed handover was a DAPS handover and if an RLF occurred at the source PCell during the DAPS handover while T304 was running:

4>  set *sourceDAPS-Failure*in*shr-Cause* to *true*;

SuccessHO-Report-r17 ::=                 SEQUENCE {

    sourceCellInfo-r17                       SEQUENCE {

        sourcePCellId-r17                        CGI-Info-Logging-r16,

        sourceCellMeas-r17                       MeasResultSuccessHONR-r17                       OPTIONAL,

        rlf-InSourceDAPS-r17                     ENUMERATED {true}                               OPTIONAL

    },

    targetCellInfo-r17                       SEQUENCE {

        targetPCellId-r17                        CGI-Info-Logging-r16,

        targetCellMeas-r17                       MeasResultSuccessHONR-r17                       OPTIONAL

    },

    measResultNeighCells-r17                 SEQUENCE {

        measResultListNR-r17                     MeasResultList2NR-r16                           OPTIONAL,

        measResultListEUTRA-r17                  MeasResultList2EUTRA-r16                        OPTIONAL

    }                                                                                            OPTIONAL,

    locationInfo-r17                         LocationInfo-r16                                    OPTIONAL,

    timeSinceCHO-Reconfig-r17                TimeSinceCHO-Reconfig-r17                           OPTIONAL,

    shr-Cause-r17                            SHR-Cause-r17                                       OPTIONAL,

    ra-InformationCommon-r17                 RA-InformationCommon-r16                            OPTIONAL,

    upInterruptionTimeAtHO-r17               UPInterruptionTimeAtHO-r17                          OPTIONAL,

    c-RNTI-r17                               RNTI-Value                                          OPTIONAL,

    ...

}

SHR-Cause-r17 ::=                    SEQUENCE {

    t304-cause-r17                       ENUMERATED {true}                                       OPTIONAL,

    t310-cause-r17                       ENUMERATED {true}                                       OPTIONAL,

    t312-cause-r17                       ENUMERATED {true}                                       OPTIONAL,

    sourceDAPS-Failure-r17               ENUMERATED {true}                                       OPTIONAL,

    ...

}

From the procedural text and ASN.1, shr-Cause-r17 is a SEQUENCE and not a CHOICE, so it should be **possible to have multiple SHR cause values at the same time.** Following cases are possible:

**Case a: SHR is collected due to T310/T312/source DAPS failure**

* **SHR optimization should be done at the source gNB**

**Case b: SHR is collected due to T304**

* **SHR optimization should be done at the target gNB**

|  |  |  |
| --- | --- | --- |
|  | **Scenario** | **SHR should be sent to which node for SHR optimization** |
| 1 | Case a  (e.g., only T310) | Source node |
| 2 | Case b  (only T304) | Target node |
| 3 | Case a + Case b  (e.g., T310 + T304) | Source node and Target node |
| 4 | Case a + Case a  (e.g., T310 + T312) | Source node |

In moderator’s view, we can just add the part for initial analysis as underlined below in the agreed WA to cover the multiple SHR trigger scenario and the following is proposed.

**Moderator Proposal 1: In case the SHR collected during an intra-NR HO is retrieved in a NR node different from source/target NR node, the receiving node performs initial analysis (identifies the node(s) to which the SHR is to be forwarded) and forwards the SHR to the corresponding node(s) which generates the SHR trigger condition that triggered the SHR (i.e., Option 3 is agreed)**

Other forwarding mechanisms such as receiving node blindly forwarding the SHR to source or target node is not optimal.

**Q1. Do companies agree with Moderator Proposal 1?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comment |
|  |  |  |
|  |  |  |

## SPR in case of MN initiated PSCell Change/CPC

### Optimizing lower layer issues of source PSCell

The following was agreed in R3#119:

If the trigger is T312/310, the objective of SPR is to **optimize lower layer issues of source PSCell** and to optimize PSCell change configuration during mobility

**Q2. Please comment whether “optimize lower layer issues of source PSCell” means**

1. **optimizing T310/T312 timer values**
2. **optimizing T310/T312 SPR triggers**

It is the moderator’s view that the objective here is A) i.e., to optimize T310/T312 timer values to mitigate “near-HO” failures in the future by adjusting the T310/T312 timer value. For example, if the gNB collects 100 SPR and observes that the T310/T312 SPR trigger is met 95 times, then it might want to increase the T310/T312 timer to a larger value to avoid these “near HO failure” in the future

Whereas some companies in Phase-1 via email were of the opinion that the objective is B). The moderator would like to mention here that fine-tuning SPR triggers will just ensure **when a UE collects SPR** and not resolve the “near failure” as such. For example, if SPR trigger is adjusted from 80% to 60%, it simply means UE will collect SPR even if 60% trigger is met. The actual “near failure” will not be resolved.

**Companies are requested to provide their view on Q2 below.**

|  |  |  |
| --- | --- | --- |
| Company | A) or B) or Both | Comment |
|  |  |  |
|  |  |  |

### Which nodes are involved in root cause analysis?

The following was agreed in R3#119:

If the trigger is T312/310, for MN-initiated classic PSCell change/CPC, at least the MN who sent the SPR configuration to the UE is involved in SPR related optimizations

The following principle was mentioned by moderator in Phase-1, but would like to check with the companies if they agree

**Moderator Proposal 2: Irrespective of option 1/2/3, in case SPR is collected during MN-initiated PSCell change, SPR optimizations are done in both MN and source SN**

* **MN is responsible to optimize PSCell change configuration**
* **Source SN is responsible to optimize T310/T312 timer values (if agreed in Q2)**

**Q4. Do companies agree with Moderator Proposal 2?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comment |
|  |  |  |
|  |  |  |

# Phase-I Discussion

## Inter-RAT SHR

### Xn and NG impacts for forwarding inter-RAT SHR

The following forwarding mechanism was agreed in R3#119 for inter-RAT SHR

The receiving node forwards the inter-RAT SHR to corresponding node which generates the SHR trigger condition that triggers the inter-RAT SHR

Regarding stage-3 signaling, the moderator notes that there is consensus in all contributions submitted this meeting to reuse the ACCESS AND MOBILITY INDICATION to forward the inter-RAT SHR over Xn. Further, it has been proposed in [3] and [12] to use Uplink RAN configuration transfer procedure and Downlink RAN configuration transfer for forwarding inter-RAT SHR over NG. The moderator therefore makes the following proposals:

**Moderator Proposal 1:** Reuse ACCESS AND MOBILITY INDICATION message to forward the inter-RAT SHR to the source NR node if a different NR node (different from source NR node) retrieves the SHR collected during inter-RAT HO (NR🡪 LTE)

**Moderator Proposal 2:** Use the Uplink RAN configuration transfer procedure and Downlink RAN configuration transfer for forwarding inter-RAT SHR over NGAP

**Q1: Are the moderator proposals 1 and 2 agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| Qualcomm | Yes |  |
| Nokia | Yes |  |
| Huawei | Yes |  |
| CMCC | Yes |  |
| NEC | Yes |  |
| Ericsson | Yes | Proposal 2 should be aligned with proposal 1. Or even better, we should merge it e.g. *Reuse ACCESS AND MOBILITY INDICATION message (over XnAP) or Uplink/Downlink RAN configuration transfer procedures (over NGAP) to forward the inter-RAT SHR to the source NR node if a different NR node (different from source NR node) retrieves the SHR collected during inter-RAT HO (NR🡪 LTE)* |
| Intel | Yes |  |
| ZTE | Yes |  |
| CATT | Yes |  |

**Summary:**

All companies agree. The moderator forgot to include F1AP in the question, but assumes that should be OK to include. Ericsson’s proposed rewording is used, and the following is proposed:

**Proposal 1: If a different NR node (different from source NR node) retrieves the SHR collected during an inter-RAT HO (NR 🡪 LTE), reuse *ACCESS AND MOBILITY INDICATION* message (over XnAP and F1AP) and Uplink/Downlink RAN configuration transfer procedures (over NGAP) to forward the SHR to the source NR node**

### Forwarding mechanism for intra-NR SHR

The forwarding mechanism for intra-NR SHR is not yet decided. The following options considered before are listed below:

* **Option 1:** The receiving node forwards the intra-NR SHR to source NR node, then source NR node can further forward the intra-NR SHR to target NR node (in case T304 SHR trigger is met)
* **Option 2:** The receiving node forwards the intra-NR SHR to target NR node, then target NR node can further forward the intra-NR SHR to source NR node (in case T310/T312 SHR trigger is met)
* **Option 3:** The receiving node forwards the intra-NR SHR to corresponding node which generates the SHR trigger condition that triggered the intra-NR SHR

**Q2: Which of the above options should be adopted as the forwarding mechanism for intra-NR SHR?**

|  |  |  |
| --- | --- | --- |
| Company | Option 1, 2 or 3 | Comment |
| Samsung | Option 3 | To have a consistent forwarding solution for intra-NR SHR and inter-RAT SHR. |
| Lenovo | Option 3 | We prefer to use the same forwarding mechanism for SHR in intra-NR HO and inter-RAT HO. |
| Qualcomm | Start with Option 3 | We also need to consider how correlation of NR SHR and NR RLF Report will be done with Option 3 (section 4.1.4 only focuses on correlation for inter-RAT HO). We are OK with Option 3 if   * Correlation of NR SHR and NR RLF Report shall be done at the **source gNB** for T310/T312 trigger * Correlation of NR SHR and NR RLF Report shall be done at the **target gNB** for T304 trigger |
| Nokia | Option 3 | OK – it is fine to re-use the inter RAT forwarding mechanism. |
| Huawei | slightly prefer opt2 | Opt 2 will reuse the existing R17 SHR, while opt 1 and opt3 **need source C-RNTI provided in the SHR**. |
| CMCC | Option3 | We prefer to use the same forwarding mechanism with Inter-RAT SHR. |
| NEC | Option 3 | Prefer to reuse the same forwarding mechanism with inter-RAT SHR |
| Ericsson | See comments | In general, prefer a solution where receiving node sends the SHR only once.  For option 3: Aligning with inter-RAT can only be decided once we’ve agreed about T304 and LTE to NR. If only NR to LTE is supported for T310/312, the node generating SHR trigger condition is always the source. |
| Intel | Option 3 |  |
| ZTE | Option 3 | Prefer to reuse the same forwarding mechanism with inter-RAT SHR. |
| CATT | See comments | For option 3, if SHR is to optimize RACH configure for T304 trigger, it may be both target node and source node.  For example, too early handover, UE is not in the coverage of target cell when handover execution which leading to UE cannot access to target cell. It is not caused by RACH resource configured by target. It is the source node to optimize handover configuration. |

**Summary:**

Option 3 (8/11), Unclear (2/11), Option 2 (1/11),

The moderator proposes to follow the majority and hence the following is proposed

**Proposal 2: In case the SHR collected during an intra-NR HO is retrieved in a NR node different from source/target NR node, the receiving node forwards the SHR to corresponding node which generates the SHR trigger condition that triggered the SHR (i.e., Option 3 is agreed)**

### Retrieval of UE context at source gNB during inter-RAT HO (NR🡪 LTE) and intra-NR HO

The following FFS was agreed last meeting

Whether the source node needs to know the UE context while performing root cause analysis for inter-RAT SHR and if so, how?

The contributions in [2], [3] and [6] discuss about the benefits of UE context retrieval while performing root cause analysis for both inter-RAT HO (NR🡪 LTE) and intra-NR HO.

From the contributions, mainly three different options have been considered

* **Option 1:** UE includes the “Source C-RNTI” and “Time between HO command and SHR retrieval”. The source gNB can figure out the UE context (up to implementation) with the above information.
* **Option 2:** Mobility Information is sent to the UE together with the SHR configuration, the UE includes the Mobility Information back in the inter-RAT SHR as mentioned in [2]
* **Option 3:** The source node sends C-RNTI or/and Mobility Information to the target node in HANDOVER REQUEST, the target node sends it back to the source node when the target node forwards SHR to the source node **(only in scope for intra-NR SHR)**

**Q3: Which of the above options do you prefer for UE context retrieval at source gNB during inter-RAT HO (NR 🡪 LTE) and intra-NR HO?**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Option 1 or 2 for inter-RAT SHR | Option 1,2 or 3 for intra-NR SHR | Comment |
| Samsung | Option 2 | Option 2 | Option 1 has the following drawbacks.   * The source node has to save the UE context for each UE until 48hrs after the UE moves away, which bring burden for the source node. * The C-RNTI of the UE has been re-assigned to other UEs after the UE moves away. The source node cannot identify a right UE context with the UE reported source C-RNTI. * The source node has to maintain an additional table on the mapping of C-RNTI and time window. E.g. CRNTI:10, UE Context 1 at 10:00-10:05,   UE Context 2 at 10:05-10:15,  UE Context 3 at 10:15-10:35,  …  So Option 1 will bring complex handling in the source node.  For Option 2, the source node does not need to save the individual UE context after the UE has moved away. There is no issue even if the C-RNTI is re-assigned for other UEs. The optimization of SHR is not for this specific UE because this UE has moved away. The optimization of SHR is for group of UEs which use the same HO strategy. So Mobility Information is enough for identifying the mobility related context.  It’s better to use the same solution for inter-RAT SHR and intra-NR SHR. |
| Lenovo | Option 1 | Option 1 | We prefer to use same solution for UE context retrieval at source node during inter-RAT HO and intra-NR HO.  To down-select between Option 1 and Option 2, Option 2 needs to enhance SHR configuration configured to the UE, it introduces more RAN2 work, since source C-RNTI may also be used to corelate SHR and RLF report, Option 1 is preferred. |
| Qualcomm | Option 1  Open to Option 2 if for a generic framework for UE context retrieval | Option 1  Open to Option 2 if for a generic framework for UE context retrieval | If the network is interested in knowing the UE context while performing SON/MDT optimizations, the network **has to** store some kind of pointer to UE context (either using *Mobility Information* to store in the target node and retrieve later or store locally via implementation), so that it can identify the UE context from the “assistance” UE is providing i.e., the C-RNTI and the timer.  **So we think we can use Option 1 for UE context retrieval for SHR (similar to RLF Report).**  We are open to Option 2 if this can be a generic framework to identify UE context in all SON/MDT reports (not just SHR), thereby avoiding UE to report network configuration back to the network in other SON/MDT reports as well. Please see our comment in the CB on RACH for a similar comment as well. |
| Nokia | Option 2 | Option 2 | OK – No need to store individual UE context. The SHR optimization is not for this specific UE but for group of UEs which use the same HO strategy. So, Mobility Information is enough for identifying the mobility related context. |
| Huawei | Opt1 | Option 1 or Opt3 (see above) | For the Context retrieval, the general solution is that the UE provides the information to identify the UE. Therefore, we prefer opt1 for inter-RAT SHR.  For opt2, we would need new signaling to send the mobility info to the UE. **This would impact both NR and LTE RRC**  When is this sent? Is it sent from target or from source? If this is used for grouping, **we may also need to update** the mobility information in case the UE changes properties while being connected (similar as for network solution and CHO).  For intra-NR SHR, the option is related to the answer of Q2. If in Q2, opt 2 is selected, here it should be opt3. |
| CMCC | Option 1 | Option 1 | Similar view as Lenovo. |
| NEC | Option 1 | Option 1 | Firstly, it is preferrable to apply a unified solution for both intra-RAT and inter-RAT SHR.  Secondly, we do not see it is a drawback that network should store UE context for 48 hours if the network is really interested to perform SON/MDT optimization, also it can benefit to save signalling overhead. |
| Ericsson | Option 1 | Option 1 | Same comments as Huawei for inter-RAT. For intra-NR, option would force the target to keep UE context (at least the parts received from the source), just for the sake of forwarding it to the source, even if SHR has been triggered by T310/T312 only. |
| Intel | Option 1 | Option 1 | We prefer not sending the mobility config back to gNB. Instead, “time” is ok to be used as a reference for source gNB to get the UE context. But it’s totally up to gNB to implement. |
| ZTE | Opt1 | Option 1 or Opt3 (see above) | We prefer unify solution for both intra and inter cases. |
| CATT | Option 1 | Option 1 | We think this issue is up to forwarding mechanism.  For example, option 3 is feasible only for forwarding mechanism option 2, i.e. first send SHR to target node and then source node.  Option 1 is better if SHR is first sent to source (based on Q2) because source node can fetch UE context according to the “Source C-RNTI” and “Time between HO command and SHR retrieval”. |

**Summary:**

* **Option 1 for both inter-RAT and intra-RAT HO (9/11)**
* **Option 2 for both inter-RAT and intra-RAT HO (2/11)**
* **Option 3 was also supported as an alternative if Option 1 was not agreed**

**Following questions/concerns were raised on Option 1 (but moderator is not sure why this is a concern now considering the same method has been used to identify UE context for RLF optimizations):**

* **C-RNTI might be reused and gNB has to maintain a mapping table between C-RNTI and time window**
* **gNB might have to store the UE context for 48 hours**
* **SHR optimization is not a specific UE but for a group of UEs which use the same HO strategy.**

**Following questions/concerns were raised on Option 2:**

* **When is this *MobilityInformation* sent to UE? Is it sent from target or from source? There would be impacts to NR (and LTE?) RRC**
* **If this is used for grouping UE contexts, gNB may need to update the *MobilityInformation* in case the UE changes properties while being connected**
* **Can this *MobilityInformation* be used as a generic framework for UE context (and network configuration) retrieval in all SON/MDT reports and not just SHR? (e.g., identifying UE context in SPR, for knowing RACH partitioning configuration in RA report, for knowing *LBTFailureRecoveryConfig* in RLF Report)**

**Since there are many questions raised, moderator proposes to discuss this in Phase-II and then decide.**

**To be continued in Phase-2**

### Correlation of NR SHR and LTE RLF Report

In case there is a RLF shortly after a successful inter-RAT HO from NR 🡪 LTE (where the T310 or T312 SHR trigger is met), UE generates both LTE RLF Report and NR SHR.

There was a discussion last meeting whether RAN3 should specify mechanisms to correlate the NR SHR and LTE RLF Report in the above scenario (i.e., identify that both reports are originating from the same UE) so that the network doesn’t perform conflicting optimizations for SHR and RLF Report. For example, the network can discard SHR if it knows that there was an RLF shortly after the successful HO.

[2], [3], [5], [6], [9] has provided different solutions on how to correlate the NR SHR and LTE RLF Report in the above scenario whereas the [7], [10], [12] mentioned that there is no need to correlate, some of the reasons mentioned as follows:

* The node performing correlation might not know the presence of both reports and hence might not know how long to store the reports
* The network can decide whether or not to consider SHR based on statistical information e.g., if handover to wrong cell failure type have been detected 100 times from cell A to cell B and SHR due to T310/T312 trigger have also been detected from cell A to cell B 80 times during the same time period, the network might assume that the SHR is due to the frequent HOFs and hence not consider SHR and only perform MRO optimization.

The moderator would like to point out here that the that Rel-17 already supports correlation of NR SHR and NR RLF report (via inclusion of Target C-RNTI in RLF Report and SHR), irrespective of the forwarding mechanism chosen for intra-NR SHR. And hence it is the moderator’s view that Rel-18 should also try to support mechanisms to correlate NR SHR and LTE RLF Report and therefore make the following proposal:

**Moderator Proposal 3:** RAN3 should provide mechanisms to correlate NR SHR and LTE RLF Report in case there is a RLF shortly after a successful inter-RAT HO from NR 🡪 LTE. It is up to network’s implementation how to support correlation (e.g., how long it stores the reports or wait for the other report if retrieved separately)

Further, the moderator notes that majority of the companies supporting correlation prefers the correlation to be done at source gNB. [13] further proposes a UE based solution for correlation e.g., by reporting the time elapsed between NR SHR generation (SHR trigger condition is met) and RLF report generation (RLF occurs in target LTE node) and a correlation indication to the network.

Consider the majority views, the moderator makes the following proposals as well:

**Moderator Proposal 4**: Correlation of NR SHR and LTE RLF Report shall be done at the source gNB

**Moderator Proposal 5**: In order to assist correlation of NR SHR and LTE RLF Report at source gNB, UE shall include Target C-RNTI in SHR collected during inter-RAT HO (NR🡪 LTE), so that it can be used as a reference ID to identify that the SHR and RLF Report are originating from the same UE

**Q4: Are the moderator proposals 3-5 agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No to moderator proposals 3-5 | Comment |
| Samsung | Yes to 3-5 (some clarification on proposal 5). | In Moderator Proposal 5, it says “…, UE shall include Target C-RNTI in SHR collected during inter-RAT HO (NR🡪 LTE),…”  Actually, RAN2 agreed that the UE records the SHR for inter-RAT mobility in the VarSuccessHO-Report (copied below FYI). Target C-RNTI is already defined in VarSuccessHO-Report. So there is no addition requirement for the UE reporting to support correlation at the source gNB. 3: For HO from NR to LTE, UE records the SHR for inter-RAT mobility in the VarSuccessHO-Report.  Regarding the UE based solution for correlation proposed in [13], the third node receiving RLF Report from the UE should forward it to the source gNB, then to the target ng-eNB. This contradicts the RLF Reporting mechanism in the specification. RLF Report should be forwarded to the last serving node first (it is the ng-eNB in case of RLF shortly after successful handover from gNB to en-eNB). The last serving en-gNB make root cause analysis then sends Handover Report message to the source node (i.e. gNB).  Another drawback of the UE based solution is that new information should be reported from the UE. |
| Lenovo | Yes to Proposal 4 | For Proposal 3, we agree to support correlation, but we’d like to remove the second sentence “It is up to network’s implementation how to support correlation (e.g., how long it stores the reports or wait for the other report if retrieved separately)”, since Proposal 4 and 5 are discussing about the details for correlation at network side.  No to Proposal 5, source gNB can’t understand target C-RNTI, we prefer to include source C-RNTI in the inter-RAT SHR to enable the correlation. |
| Qualcomm | Yes to all |  |
| Nokia | Yes to 3-4, NO to 5. | Proposal 3,4 are OK. Proposal 5 is NOK as   * In case of inter-RAT HO (NR🡪 LTE), the SHR is reported after UE is back in NR. * The C-RNTI of the UE could be re-assigned to other UE (with SHR but no RLF) which may move to NR earlier and report SHR which in this case would be incorrectly correlated with the RLF Report.   So the correlation of NR SHR and LTE RLF Report based only on Target C-RNTI in source gNB is not possible. |
| Huawei | Yes for P3, P4  P5 can be discussed | Our understanding of P5 after Samsung’s comment is that no new information is needed to correlate target cell C-RNTI. So nothing to capture for P5.  Agree with NOK that delayed reporting cause one additional problem since C-RNTI can be reassigned. Note that in order to do correlation, we also need to know the time between the event and reporting. This is known in RLF report. But should be included in SHR as well  Regarding whether to use source or target C-RNTI - it is also possible to use source cell C-RNTI if this is also included in SHR (as being proposes), since this can also be provided in HO report for the RLF. So for implementations choosing to retrieve context in source, it is simpler to correlate using source C-RNTI.  This is also one good argument to leave this completely up to implementation |
| CMCC | No  See comments | For Moderator Proposal 3, we agree to support the mechanism to correlate NR SHR and LTE RLF Report. According to the concerns from some companies for the solution in [13], we would further introduce here.  UE generates both NR SHR and LTE RLF report and could know for sure if there is a RLF after a successful inter-RAT HO. In the case there is a RLF **shortly** after a successful inter-RAT HO from NR to LTE,   * Opt 1: UE reports NR SHR and RLF report together to the receiving node, that is a implicit indication on the correlation between NR SHR and LTE RLF report. (No new information reported from UE. And the source NR node can receive these two correlated reports together, it is more easy for the source NR node to analyze the root cause.) * Opt 2: UE reports a correlation indication and correlation related information if needed to the network. That enable the network to know there are NR SHR and LTE RLF report for the specific UE. After the source node receive one report generated by this UE, it will wait for the other for root cause analysis and optimization. For other UE, which does not report the correlation indication, the source node no need to wait for the other one. (Opt 2 can follow the existing RLF Reporting mechanism in the specification.)   We kindly ask RAN3 to consider the solution above for correlation mechanism of NR SHR and LTE RLF Report for inter-RAT SHR from NR to LTE.  We see some drawbacks of Proposal 4:   * The target LTE node receiving RLF Report but it could not know if there is inter-RAT SHR generated for source NR node, it needs to forward RLF Report to source NR node every time after receiving RLF Report even if the LTE RLF after the successful inter-RAT HO for a long time (That means there is no correlation between NR SHR and LTE RLF report at all). Or the target LTE node perform the initial analysis and decide if it need to forward RLF Report to source NR node. But these two operations will both bring the LTE node impact since there is no mechanism for too early Inter-RAT HO from NR to LTE by now. In our understanding, that means the target LTE node could not sent RLF report to source NR node when there is RLF occurs after Inter-RAT HO for NR to LTE. * Although the source NR node could receive Inter-RAT SHR and LTE RLF report respectively, the time between the two reports received maybe a long time. The source node has to save one report for a long time to wait for the other, but it doesn’t know the present of the report it waiting for. |
| **NEC** | No to all | As mentioned in our paper, both correlation in target eNB and correlation in source gNB are not perfect solutions. Also, in Rel-18, only T310/T312 is supported for the source NR node. The inter-RAT SHR from NR to LTE is mainly to optimize RLM/BFD configuration in the source NR node, so tight correlation is not needed. |
| **Ericsson** | No | Agree with NEC. This is not critical at this moment, and has drawbacks whatever the solution we choose. Prefer not to take this aspect into consideration. |
| **Intel** | Yes to all | As we only agreed to support T310 and T312 triggers which are configured by source NR node, the SHR will be forwarded to the source NR node for root cause analysis. And the LTE RLF Report, if available, also needs to be forwarded to source NR node for configuration optimization. So we think the correlation can be done at source NR node.  Target C-RNTI is already included in both SHR and RLF, so enhancement is needed. |
| **ZTE** | No | Agree with NEC, and also mentioned in our contribution, we don’t think correlation bring much benefit but with the pain to have to decode other RAT’s report. |
| **CATT** | No | Currently, there is still no clear benefit on supporting correlation of NR SHR and NR RLF report. Network performs MRO based on statistical information, not a single UE. We propose to first confirm the benefit. It is not an easy work to make correlation. So, we do not want to support correlation just to align with R17. |

**Summary:**

* **Can consider correlation (7/11)**
  + **Correlation at source gNB based on target C-RNTI (3/11)**
  + **Correlation at source gNB based on source C-RNTI (2/11)**
  + **Correlation at source gNB but not mentioned how (1/11)**
  + **UE based solution (1/11)**
* **No need of correlation (4/11)**

There is no consensus among companies whether to even support correlation.

The motivation by proponents to support correlation of SHR and RLF Report

* There are advantages in identifying that both reports are originating from the same UE so that the network doesn’t perform conflicting optimizations for SHR and RLF Report. For example, the network can discard SHR if it knows that there was an RLF shortly after the successful HO.
* Rel-17 already supports correlation of NR RLF and NR SHR and RAN2 introduced Target C-RNTI just for this purpose

But the following concerns were raised

* gNB can rely on statistical information based on MRO/SHR and no need to identify that the reports are originating from the same UE
* Not critical to consider (all solution have drawbacks)

If correlation is supported, there seems to be consensus among the supporting companies to perform correlation at the source gNB. FFS how to perform (based on source C-RNTI or target C-RNTI or some other mechanism). The moderator proposes to discuss this further in 2nd phase:

**Issue 1: In case there is a RLF shortly after a successful inter-RAT HO from NR 🡪 LTE, RAN3 should discuss whether to support correlation of NR RLF and LTE SHR and if yes, whether any UE assistance is needed to support this correlation.**

### RACH related information in inter-RAT SHR (NR🡪 LTE)

[11] has further proposed to include some RACH related information in inter-RAT SHR (NR🡪 LTE) for improving the handover performance of the target (LTE) cell during inter-RAT HO (NR 🡪 LTE).

**Q5: Whether UE should additionally include the following in inter-RAT SHR (NR🡪LTE)**

1. number of RACH attempts made for the successful handover
2. a flag on whether contention was observed for the successful handover

|  |  |  |
| --- | --- | --- |
| Company | Yes/No for a) and b) | Comment |
| Samsung |  | Maybe RACH report could solve it already? |
| Lenovo | Not needed for a and b | The two parameters are not included in the intra-NR SHR, there seems no reason to include them in the inter-RAT SHR. |
| Qualcomm | Not needed for a and b | In intra-NR SHR, we include ra-InformationCommon-r17 as seen below:  3>  if the ratio between the value of the elapsed time of the timer T304 and the configured value of the T304 timer, included in the last applied *RRCReconfiguration* message including the *reconfigurationWithSync*, is greater than *thresholdPercentageT304* if included in the *successHO-Config* received before executing the last reconfiguration with sync:  4>  set *t304-cause* in *shr-Cause* to *true*;  4>  set the*ra-InformationCommon* to include the random-access related information associated to the random access procedure in the target PCell, as specified in clause 5.7.10.5;  Instead of including *ra-InformationCommon-r17*, the proposal here is to include a subset of RA information e.g., a) or b). But we think it is NOT needed for the following reasons:   * UE would collect LTE RA Report upon inter-RAT HO (NR🡪LTE) and this can be used to optimize RACH access issues in the target cell. As SS mentioned, RA Report is sufficient to optimize and no need to enhance SHR. * In Rel-17, *ra-InformationCommon* is included in RLF Report **only for intra-RAT HO** and not for inter-RAT HO as shown below. So similar principles can be used for SHR   1>  if *connectionFailureType* is *hof* and if the failed handover is an intra-RAT handover:  2>  set the *ra-InformationCommon* to include the random-access related information as described in clause 5.7.10.5; |
| Nokia | No | The new information (if really needed) of the target LTE side could be only used as an indicator for the source gNB not to initiate HO to this side in case of significant RACH issue. However, the information cannot be forwarded to LTE side to fix the issue. However, there shall be RACH optimization in target cell based on LTE RA Report to fix the issue directly in LTE target side. |
| Huawei | No | The above information can be provided in the LTE RA report. We don’t see any necessity to redundantly include them in the SHR. |
| CMCC | Not needed for a and b |  |
| NEC | No |  |
| Ericsson | Yes | Could wait further progress in RAN2 |
| Intel | No | As for inter-RAT HO (NR 🡪 LTE), we only agreed to support T310 and T312 triggers and the SHR will be sent to source NR node for root cause analysis. The RACH-related information for target LTE node is useless for optimization in source NR side. |
| ZTE | No | Don’t see the benefit to provide the information in the report. |
| CATT | No for a) and b) | We think RACH related information shall be included in RACH Report. |

**Summary:**

No (9/11), Tending No (1/11), Yes (1/11)

**Proposal 3: There is no need for UE to include the following RACH related information in SHR collected during inter-RAT HO (NR🡪 LTE) as this information is already available in the RA Report:**

* **number of RACH attempts made for the successful handover**
* **a flag on whether contention was observed for the successful handover**

### Inter-RAT SHR (LTE🡪 NR)

The following working assumptions and agreements were achieved in the previous meetings:

WA: Support inter-RAT SHR from LTE to NR at least for T304 if no impact on LTE

WA: The content of inter-RAT SHR from LTE to NR includes at least Source LTE cell, Target NR cell

RAN3 sees benefits to support inter-RAT SHR from LTE to NR for T304 trigger with no impact on LTE in Rel-18.

The contributions in [3], [6], [7], [10] propose to support inter-RAT SHR (LTE🡪 NR) and convert the above WAs into agreement.

[6] further identified the principles needed to ensure that there are no impacts to LTE. The moderator summarizes the proposal in [6] and have the following proposal.

**Moderator Proposal 6:** Rel-18 can support collection of SHR during successful inter-RAT HO (LTE 🡪 NR) for T304 trigger without any LTE impacts, if the following principles are used:

* Target gNB can send SHR configuration (T304 trigger) to UE via NR container (*targetRAT-MessageContainer*) in MobilityFromEUTRACommand
* UE stores this SHR configuration in NR format
* If T304 trigger is met, UE records SHR in NR format
* UE reports this SHR to only an NG-RAN node (either the target gNB or another gNB)
* NG-RAN node retrieving this SHR can forward this SHR to the target gNB for SHR optimizations

**Q6a: Is Moderator Proposal 6 agreeable?**

**Q6b: If yes to Q6a, can we convert the WA “The content of inter-RAT SHR from LTE to NR includes at least Source LTE cell, Target NR cell” into agreement?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No to Q6a and Q6b | Comment |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| Qualcomm | Yes |  |
| Nokia | Yes |  |
| Huawei | Yes, but … | We prefer to change the wording “NG-RAN node” in bullet 4 and 5 as “NR node”. As we all know, for the cross-RAT reporting, NR format RLF report can only be reported to NR node. |
| CMCC | Yes |  |
| NEC | Yes |  |
| Ericsson | No | Q6a: Most of these bullets (i.e. 1 to 4) are RAN2 discussion  Q6b: Need RAN2 progress first |
| Intel | Yes |  |
| ZTE | Yes |  |
| CATT | Yes, but | We also think Rel-18 can support collection of SHR during successful inter-RAT HO (LTE ->NR) for T304 trigger without any LTE impacts. But we do not think target NR node can optimize RACH resource based on SHR because T304 may be caused by source handover configuration, for example, triggering handover too early, i.e. UE is not in the coverage of target cell when handover execution. So, we think target cannot detect this failure type and do know whether to optimize RACH resource.  So, we think first to confirm the objective of SHR for 304. |

If the above in Q6a/Q6b is agreed, whether to further enhance inter-RAT SHR (LTE 🡪 NR) with additional information can be discussed later e.g., in Phase-2.

**Summary:**

Yes (10/11), No (1/11)

RAN2 is not discussing SHR for inter-RAT HO (LTE🡪 NR). RAN3 being the leading WG has to make progress and LS RAN2 for the support. So far we have only agreed things like “RAN3 sees benefits to support…”, “…if there is no LTE impacts”

**Proposal 4: RAN3 believes that Rel-18 can support collection of SHR during successful inter-RAT HO (LTE 🡪 NR) for T304 trigger without any LTE impacts, if the following principles are used (RAN2 can confirm the first 4 bullets):**

* **Target gNB can send SHR configuration (T304 trigger) to UE via NR container (*targetRAT-MessageContainer)* in *MobilityFromEUTRACommand***
* **UE stores this SHR configuration in NR format**
* **If T304 trigger is met, UE records SHR in NR format**
* **UE reports this SHR to only an NG-RAN node (either the target gNB or another gNB)**
* **NG-RAN node retrieving this SHR can forward this SHR to the target gNB for SHR optimizations**

**Proposal 5: The SHR collected during inter-RAT HO (LTE🡪 NR) should include at least Source LTE cell and Target NR cell (assuming RAN2 confirms no LTE impacts based on the principles in Proposal 5)**

## Successful PSCell Change Report (SPR)

### SPR triggers

In order to help us decide which node decides the T310/T312 related SPR triggers in section 4.2.2, the moderator proposes to first converge on the representation of SPR triggers in this section.

**Q7. Which of the following representation should be considered for SPR triggers?**

* Option 1: Percentage values similar to SHR (e.g., 20%, 40%)
* Option 2: Absolute values (e.g., 100 ms, 200 ms)
* Option 3: Just a Boolean as proposed in [11]

|  |  |  |
| --- | --- | --- |
| Company | Option 1/2/3 | Comment |
| Samsung | Option 1 | We see the benefit to have similar mechanism for SHR and SPR. |
| Lenovo | Option 1 | We can follow SHR to provide percentage value as the SPR trigger. |
| Qualcomm | Option 1 | Option 3 takes out the flexibility from both gNB and UE in when to collect/store the SHR. Also, UE should know in advance “when” (i.e., after crossing what threshold), it should start collecting the SHR. A 1-bit Boolean indication would simply mean UE has to collect SHR “always”! |
| Nokia | Option 1 | It is OK to re-use SHR solution. Option 3 is NOK as its principle when UE shall generate SPR is not clear . |
| Huawei | Opt1 | We prefer to align with the value configuration of R17 SHR triggers. |
| CMCC | Option 1 | Percentage value is enough for SPR triggers. |
| NEC | Option 1 |  |
| Ericsson | 3 | Configuration considering 3 nodes (MN, source/target SN) is much more complex than SHR. That’s why a different solution can be considered. |
| Intel | Option 1 | Existing trigger *thresholdPercentage* can be re-used for SPR. Not see the need to adopt a new one. |
| ZTE | Option 1 | We prefer the same mechanism as Rel-17 for SHR and SPR. |
| CATT | Option 1 |  |

**Summary:**

**Option 1 (10/11), Option 3 (1/11).**

**Companies have preferred to reuse SHR trigger mechanism. Also, companies have shown concerns on Option 3 e.g., UE would have to collect SHR always rather than only when a certain threshold is met. So, the moderator proposes to use Option 1.**

**Proposal 6: The T310/T312 triggers for SPR should be represented in terms of percentage values (similar to SHR)**

### Which node decides the trigger of T310/T312 for MN-initiated classic PSCell change/CPC?

The following different options were identified last meeting:

* Option 1: MN autonomously decides the T310/T312 SPR triggers
* Option 2: Source SN node decides the T310/T312 SPR triggers
* Option 3: MN decides the T310/T312 SPR triggers based on source SN inputs (e.g., after getting assistance from SN regarding the configured T310/T312 timer values)

Further, [6] has the following observations and **proposes to not consider Option 1**.

Observation 6: **MN doesn’t know the actual values of T310/T312 of SCG** configured by source SN

Observation 7: In case of Option 1 (MN autonomously decides the T310/T312 related SPR triggers), **MN can only provide a blind T310/T312 related SPR trigger which is not optimal for SPR collection at UE**

Proposal 11: Option 1 (MN autonomously decides the T310/T312 related SPR triggers) should not be considered while deciding which node decides the SPR triggers in case of MN initiated PSCell change.

Further, [6] also provides the comparison b/w Option 2 and Option 3:

|  |  |
| --- | --- |
| Option 3 | Option 2 |
| MN decides the T310/T312 related SPR triggers after getting assistance from SN regarding the configured T310/T312 timer values in case of option 3 **(Xn impact for coordination)** | Source SN autonomously decides the T310/T312 related SPR triggers **(no Xn coordination needed)** |
| MN sends T310/T312 related triggers directly over MN RRC but sends the T304 related SPR trigger via SN container to UE **(RRC signaling is slightly complex)** | Source SN can send all SPR triggers (T310/T312/T304) to UE either via SN container over SRB1 or via SRB3 **(simpler RRC signaling)** |
|  |  |
| Only MN needs to perform root cause analysis **(root cause analysis in just one node)** | Both MN and source SN need to perform root cause analysis. MN optimizes the PSCell change configuration during mobility (as this was MN-initiated) and source SN optimizes the lower layer issues of source PSCell (as source SN decides the T310/T312 SHR triggers) **(root cause in two nodes)** |

**Q8: Which option discussed above should be adopted for deciding the T310/T312 SPR triggers in case of MN-initiated classic PSCell change/CPC?**

|  |  |  |
| --- | --- | --- |
| Company | Option 1/2/3 | Comment |
| Samsung | Option 2 | The timer T310/T312 itself is configured by the source SN. The source SN knows the criterial to decide the value. So the source SN could give a more reasonable T310/T312 triggers.  Option1 should not be considered because the blind decision in the MN.  Option 2 has benefits in terms of no Xn coordination and simpler RRC signaling comparing with Option 3.  In the Moderator’s analysis, one drawback of Option 2 is that “**less flexibility in when to send SPR configuration**”. This drawback is not true because The source SN sends the T310/312 triggers to the MN in SgNB Release Request Ack. Message.  One thing we want to remind is that the similar issue was discussed in Rel-17 i.e. whether the source node or the target node decides T310/T312/T304 trigger for handover case. The conclusion is that the node who configure the actual value configure the triggers as well. Because that node have the best knowledge to decide the percentage. With the same logic, it should be the source SN to decide the triggers for T310/T312. |
| Lenovo | Option1 | In R17 MRO for SCG failure, it is the node that initiates the PSCell change performs root cause analysis, this principle can be applied for SPR, e.g. for MN-initiated classic PSCell change or CPC, it is MN performs root cause analysis. Based on this principle, for MN-initiated classic PSCell change or CPC, it is suitable for the MN to decide T310/T312 trigger threshold for SPR.  To compare Option 1 with Option 3, Option 1 is preferred, since T310/T312 trigger threshold of SPR may be a percentage value rather than an absolute value, MN can decide the percentage value (e.g. 40%, or 60%) by itself without knowing the exact timer value of T310/T312, there is no issue even the MN does not know the exact timer value, signalling coordination between MN and source SN to achieve the timer value of T310/T312 is not needed. |
| Qualcomm | Prefer Option 2  Option 3 is also OK | Similar view as SS. We prefer Option 2 because there is no Xn coordination needed and simpler RRC signaling.  If we agree on percentages for SPR triggers in Q7, MN can of course blindly provide a percentage without knowing the actual values (as some other companies are proposing), **but the SPR optimizations can’t be done properly**  RAN3 agreed on this last meeting:  *If the trigger is T312/310, the objective of SPR is to optimize lower layer issues of source PSCell and to optimize PSCell change configuration during mobility.*  As part of optimizing lower layer issues of source PSCell, the T310/T312 timer values might have to be adjusted. **MN doesn’t even know the T310/T312 values configured by source SN, then how can MN achieve optimization of lower layer issues of source PSCell?**  If Option 2 is not agreed, we think MN needs to at least know the actual configured values of T310/T312 (i.e., Option 3) so that it can perform SPR optimizations by itself. |
| Nokia | Option 2,3 | OK – in principle both options are acceptable. |
| Huawei | Opt1 preferred  Opt 3 acceptable | We have different opinion for complexity analysis on the Xn and RRC signalling in the table. The possible procedures of option 2 and 3 are showed below:  1) the source SN sends the T310/312 triggers(opt2) or configured T310/T312 timer values(opt3) to MN;  2) the MN then sends them to UE (opt 2 and 3)  If the SPR triggers need to be changed, the loop starts from step 1 in opt2, while from step 2 in opt3. |
| CMCC | Option 1 | If percentage is used for T312/T310 thresholds configuration for SPR, Option 1 can be used for MN-initiated classic PScell change /CPC. |
| NEC | Option 3 |  |
| Ericsson | Option 1 | For MN-initiated, PSCell change optimization is important if we want reduce SCGFailure due to e.g. wrong PSCell change triggers . Therefore, MN should decide if SPR is needed or not. SPR can still be sent to SN for analysis, if needed.  Option 1 doesn’t have drawbacks if percentage or Boolean is used for configuration. |
| Intel | Option 1 | The existing T310/T312 triggers configured to UE are *thresholdPercentageT310*/ *thresholdPercentageT312* which are a ratio in percentage between the elapsed T310/T312 timer and the configured value of the T310/T312 timer. For MN-initiated classic PSCell change/CPC, we think MN can configure UE these T310/T312 triggers without involving source SN. |
| ZTE | Option 3 | For option 1, MN does not aware the SN’s actually Timer configuration.  For option 2, actually SN control the SPR even MN may not want to trigger SPR in case of MN initiated PSCell change. |
| CATT | Option3 | For the RAN2 agreement:  4 For Q8, RAN2 agree following options: depends on which of nodes initiates SPR, i.e.:  For the MN-initiated PSCell Change/Addition, MN sends the SPR config to the UE  RAN2 has decided MN sends SPR config to UE.  If option 2 is agreeable, it is source SN decides T310/T312 SPR triggers. The following procedure should be source SN provide T310/T312 SPR triggers to MN in XN interface and MN configures SPR config to UE by OtherConfig i.e. Xn coordination is also needed for option2.  So, we think option3 is better if Xn coordination is needed for both option2 and option3. |

**Summary:**

* Option 1 (5/11). Of which, Option 3 is also acceptable for 1 company
* Option 2 (2/11). Of which, Option 3 is also acceptable for 1 company
* Option 3 (3/11)
* Option 2 or 3 (1/11)

Considering this is a long-standing issue and still no consensus, the moderator proposes to agree on some common understanding before down selection:

This was agreed in last meeting:

*If the trigger is T312/310, the objective of SPR is to* ***optimize lower layer issues of source PSCell*** *and to optimize PSCell change configuration during mobility.*

**Proposal 7: In order to assist in down selection among Option 1/2/3, the following principles are proposed to have a common understanding regarding SPR optimization in case of MN-initiated PSCell change**

1. **Optimizing lower layer issues of source PSCell while performing SPR optimization means optimizing the T310/T312 timer values.**
2. **In option 1, as MN send the T310/T312 triggers blindly without knowing the actual T310/T312 values**
   * **Optimizing T310/T312 timer values should happen in source SN (as only source SN knows the actual configured values)**
   * **UE knows the T310/T312 timer values and will collect SPR only when a certain percentage is met; so there should be no issue in MN blindly configuring the triggers**
3. **In case of option 2, the SPR triggers can be sent transparent to MN (in a SN container) as the T310/T312 optimization happens in source SN**
4. **In case of option 1 and 2, SPR optimizations are done in both MN and source SN (i.e., MN has to optimize PSCell change configuration and source SN has to optimize T310/T312 values)**
5. **In case of option 3, SPR optimizations are done in just MN (i.e., MN can optimize both PSCell change configuration and T310/T312 values)**
6. **RAN2 agreement “MN sends the SPR config to the UE” doesn’t preclude the case where MN sends the SPR config as an SN container to the UE**

### Forwarding mechanism for SPR

RAN2 made the following agreement last meeting:

UE stores SPR at most 48 hours after the last successful PSCell addition/PSCell change report is stored at UE if not fetched.

The above RAN2 agreement means that the SPR can be stored at the UE and can be retrieved in a “new” MN (different from the MN that sent the SPR configuration to the UE). Mainly two different options have been proposed in [4], [6], [11], [12] regarding the forwarding mechanism of SPR when retrieved in this “new” MN and summarized below.

|  |  |
| --- | --- |
| **Option 1:** SPR is sent directly from the “new” MN to the node(s) which should perform the SPR related optimization | **Option 2:** SPR is always sent to the “old” MN which then forwards to the node(s) which should perform the SPR related optimization |
| - | New MN 🡪 old MN (always) |
| New MN 🡪 old target SN (if SPR is collected due to T304 trigger being met) | Old MN 🡪 old target SN (if SPR is collected due to T304 trigger being met) |
| New MN 🡪 old source SN (if SPR is collected due to T310/T312 trigger being met and if it’s **SN-initiated**) | Old MN 🡪 old source SN (if SPR is collected due to T310/T312 trigger being met and if it’s **SN-initiated**) |
| New MN 🡪 old MN (if SPR is collected due to T310/T312 trigger being met and if it’s **MN-initiated**)  New MN 🡪 old source SN (if old source SN also is involved in root cause analysis e.g., if option 2 is selected in section 4.2.2) | Old MN performs root cause analysis (if SPR is collected due to T310/T312 trigger being met and if it’s **MN-initiated**)  Old MN can also forward to old source SN for root cause analysis if option 2 is selected in section 4.2.2 |

**Q9a: In case the SPR is retrieved in a “new” MN (different from the MN that sent the SPR configuration to the UE i.e., “old” MN), the following options are possible for forwarding the SPR**

* Option 1: SPR is sent directly from the “new” MN to the node(s) which should perform the SPR related optimization
* Option 2: SPR is always sent from the “new” MN to the “old” MN which then forwards to the node(s) which should perform the SPR related optimization

|  |  |  |
| --- | --- | --- |
| Company | Option 1 or 2 | Comment |
| Samsung | Option 2 | If the old MN retrieves the SPR, it may forward the SPR to the source SN or the target SN depending on the scenarios. The message from MN to the source SN and the target SN should be defined anyway.  Then the only additional signaling for option 2 is the message from new MN to the old MN.  For option 1, the new MN may have no interface with the source SN or target SN, then all the signaling has to be routed via CN. |
| Lenovo | See comments | Until now, RAN2 does not have such an agreement that SPR can be retrieved in a “new” MN (different from the MN that sent the SPR configuration to the UE), we suggest waiting for RAN2’s progress on SPR request/response procedure before discussing the forwarding mechanism of SPR. |
| Qualcomm | Option 2 | Similar view as SS. |
| Nokia | Option 2 | Similar view as Samsung |
| Huawei | Both are OK |  |
| CMCC | Option 2 | Similar view as Samsung |
| NEC | Both |  |
| Ericsson | Option 2 | In case SPR is fetched when UE is still connected to the “old” MN, RAN2 agreed that only MN can fetch it. Which means that a forwarding mechanism, including initial analysis of SPR, needs to be implemented in this MN. It would be logical to reuse this functionality if SPR is fetched by a different node. |
| Intel | Option 2 |  |
| ZTE | Option 2 |  |
| CATT | See comments | UE context may have been removed in old MN when new MN fetching SPR. So, It seems there is no difference for the old MN and old SN. But if we decide to save UE context to assist MRO, SPR may be first send to the node which UE context is saved. If MN is responsible to keep UE context, option 2 is preferred. If the initiating node keeping UE context, option 1 is OK. |

**Summary**

Option 2 (8/11), Both options are fine (2/11), depends on how UE context is stored (1/11)

The moderator proposes to follow the majority and use option 2

**Proposal 8: In case the SPR is retrieved in a “new” MN (different from the MN that sent the SPR configuration to the UE i.e., “old” MN), the SPR is always sent from the “new” MN to the “old” MN which then forwards to the node(s) which should perform the SPR related optimization**

**Q9b: To assist in the forwarding of SPR, which of the following should the UE include in SPR?**

1. CGI of the PCell which sent the SPR configuration
2. Indication whether the PSCell change was MN-initiated or SN-initiated

* FFS how UE knows whether the PScell change as MN-initiated or SN-initiated (e.g., network indication in RRCReconfig with sync) and can be discussed in 2nd phase or later

|  |  |  |
| --- | --- | --- |
| Company | a), b) or Both | Comment |
| Samsung | a) | Open to b). |
| Lenovo | See comments | It depends on Q9a, we suggest waiting for RAN2’s progress. |
| Qualcomm | Both |  |
| Nokia | Both |  |
| Huawei | At least b);  For a), it depends on Q9 | If opt 1 is selected in Q9, the a) is included only in case of MN-initiated PSCell change. If opt 2 is selected, a) should always be included. |
| CMCC | Both |  |
| NEC | Both |  |
| Ericsson | Both |  |
| Intel | a) | b) 1st to disc how UE knows which node initiates the Pscell change. |
| ZTE | Both |  |
| CATT | Both |  |

**Summary:**

Both (7/11), a) (2/11), b) (1/11), Wait for RAN2 progress (1/11)

Based on the above preferences, the moderator makes the following proposal:

**Proposal 9: To assist in the forwarding of SPR, UE shall include the following in SPR**

* **CGI of the PCell which sent the SPR configuration**
* **WA: Indication whether the PSCell change was MN-initiated or SN-initiated (RAN3 should discuss how the UE knows whether the PSCell change as MN-initiated or SN-initiated)**

Similar to inter-RAT SHR, it has been proposed to reuse ACCESS AND MOBILITY INDICATION to forward SPR over Xn and use Uplink/Downlink RAN Configuration Transfer for forwarding SPR over NGAP

**Moderator Proposal 7:** Reuse ACCESS AND MOBILTY INDICATION to forward SPR over Xn and use Uplink/Downlink RAN Configuration Transfer for forwarding SPR over NGAP

**Q9c: Is Moderator Proposal 7 agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| Qualcomm | Yes |  |
| Nokia | Yes |  |
| Huawei | Yes |  |
| CMCC | Yes |  |
| NEC | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| ZTE | Yes |  |
| CATT | Yes |  |

**Summary**:

All companies agree. The moderator forgot to include F1AP in the question, but assumes that should be OK to include. The following is proposed:

**Proposal 10: Reuse ACCESS AND MOBILTY INDICATION to forward SPR over XnAP and F1AP and use Uplink/Downlink RAN Configuration Transfer for forwarding SPR over NGAP**

### UE context retrieval while performing SPR optimizations

Several contributions have proposed solutions to identify the UE context while performing SPR optimizations. The moderator therefore wants to first agree the following:

**Moderator Proposal 8**: RAN3 should provide mechanisms to identify UE context in the node performing SPR optimizations (could be old MN, old source SN or old target SN)

If the above moderator proposal is agreeable, we can discuss further details to identify UE context in old MN, old source SN and old target SN.

|  |  |
| --- | --- |
| Q10a | To identify the UE context in the **old MN** when SPR is received, which of the following information can be included by UE in SPR   1. C-RNTI allocated by old MN 2. Time between PSCell change and SPR retrieval 3. Mobility Information in old PCell |
| Q10b | To identify the UE context in the **old source SN** when SPR is forwarded for T310/T312 related SPR optimizations,   * **Option 1:** Old MN identifies the UE context and sends the stored SN Mobility Information together with SPR to the old source SN * **Option 2:** UE includes the C-RNTI allocated by old source SN in SPR (time between PSCell change and SPR retrieval is considered in Q10a already) |
| Q10c | To identify the UE context in the **old target SN** when SPR is forwarded for T304 related SPR optimizations   * **Option 1**: Old MN identifies the UE context and sends the stored SN Mobility Information together with SPR to the old target SN * **Option 2:** UE includes the C-RNTI allocated by old target SN in SPR (time between PSCell change and SPR retrieval is considered in Q10a already) |

**Q10: If Moderator Proposal 8 is agreeable, please provide your preference for Q10a, Q10b and Q10c.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Q10a – a), b) or both**  **Q10b – Option 1 or 2**  **Q10c – Option 1 or 2** | **Comment** |
| Samsung | Q10a: c)  Q10b: Option 1  Q10c: Option 1 | For Q10a, the same reasoning as in 4.1.3.  For Q10b and Q10c, the same mechanism has been agreed for SCG Failure case. |
| Lenovo | See comments | For Q10a, the UE may report the SPR directly to the MN that sent the SPR configuration to the UE, if so, old MN has the UE context, nothing new needs to be reported by the UE.  For Q10b and Q10c, Option 2 is preferred if Option 1 in Q9a is adopted, otherwise, Option 1 is preferred.  It somehow depends on Q9a, we suggest waiting for RAN2’s progress on SPR request/response procedure. |
| Qualcomm | Q10a: a), b)  Q10b: Option 1  Q10c: Option 1 | Q10a – This is similar discussion as Q3 for SHR. We think timer + C-RNTI can be used  Q10b/Q10c – As SS mentioned, same mechanism has been used for SCG failure case. During PSCell change, source SN sends SN Mobility Information in SN CHANGE REQUIRED and that is stored at MN which can be used to identify the UE context when SPR is received.  **But one clarification is needed – what happens to SN Mobility Information upon inter-MN handover? Should SN Mobility Information be propagated to new MN in HANDOVER REQUEST (currently it is not propagated) or should this be kept stored at old MN?** |
| Nokia | Q10a: c)  Q10b: Option 1  Q10c: Option 1 | The same view as Samsung. |
| Huawei | Q10a: a,b  Q10b, Q10c: see comments | We agree with Lenovo on the relation with Q9a.  The difference between the identities is that C-RNTI/time maps to a unique UE whereas the mobility info can either map to a unique UE and/or to a group. Mapping to a group would mean that a node can choose to not store context on a per-UE basis. But this mapping to group is only possible in the node that assigns the mobility info (source SN)  For opt1 in Q10c, the benefit of mobility info is limited. This anyway needs to be stored on a per-UE basis since it is not the target SN that set the mobility info (no grouping possible)  Opt 1 also requires that we send the mobility info to the target during PSCell change.  Therefore, when Q9A is settled and if we send to old MN, we prefer:  Q10b: 1 or 2  Q10c: 2 |
| CMCC | Q10a: a), b)  Q10b: Option 1  Q10c: Option 1 |  |
| NEC | Q10a: c)  Q10b: Option 1  Q10c: Option 1 |  |
| Ericsson | Q10a : a), b)  Q10b : Option 1  Q10c : Option 1 |  |
| Intel | Q10a: a), b)  Q10b: Option 1  Q10c: Option 1 | Prefer to use the same logic as UE context retrieval for SHR |
| ZTE | Q10a: a), b)  Q10b: Option 1  Q10c: Option 1 |  |
| CATT | Q10a: a), b)  Q10b: Option 1  Q10c: Option 1 | For SN-initiated or MN-initiated CPAC, MN always keep UE context may be suitable. |

**Summary :**

**Q10a – a&b (7/11), c (3/11), none (1/11)**

**Q10b – Option 1 (10/11), Option 1 or 2 (1/11)**

**Q10c - Option 1 (10/11), Option 2 (1/11)**

**On Q10a, it is proposed to discuss it together with the UE context retrieval for SHR.**

**Based on the preferences for Q10b and Q10c, Option 1 is proposed by the moderator.**

**Proposal 11: To identify the UE context in the old source SN/old target SN when SPR is forwarded by old MN for SPR optimizations, old MN identifies the UE context (FFS how) and sends the stored SN Mobility Information together with SPR to the old source SN/old target SN**

# Conclusion, Recommendations

If needed

# References

|  |  |  |
| --- | --- | --- |
|  |  |  |
| [1] | [R3-231189](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231189.zip) | [TP to 38.423, SON] Configuration coordination for the successful PSCell change report (Nokia Netherlands) |
| [2] | [R3-231200](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231200.zip) | (TP for SON BLCR for 38.423) SON enhancement for SHR and SPR (Samsung) |
| [3] | [R3-231269](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231269.zip) | (TPs for SON BLCRs for TS 38.300) SHR (Huawei) |
| [4] | [R3-231270](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231270.zip) | (TPs for SON BLCRs for TS 38.300) SPR (Huawei) |
| [5] | [R3-231299](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231299.zip) | Inter-RAT SHR and SPR (Intel Corporation) |
| [6] | [R3-231339](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231339.zip) | Successful Handover Report and Successful PSCell Change Report (Qualcomm Incorporated) |
| [7] | [R3-231372](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231372.zip) | Discussion on related issue of inter-RAT SHR (NEC) |
| [8] | [R3-231423](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231423.zip) | SON enhancements for SPR (Lenovo) |
| [9] | [R3-231424](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231424.zip) | SON enhancements for SHR (Lenovo) |
| [10] | [R3-231552](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231552.zip) | Discussion on SON enhancement for SHR and SPR (CATT) |
| [11] | [R3-231584](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231584.zip) | Inter-RAT SHR and SPR discussion (Ericsson) |
| [12] | [R3-231708](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231708.zip) | (TPs for SON BLCRs for TS 38.300 TS 38.413 TS 38.473 and TS 38.423)Inter-RAT SHR and SPR (ZTE) |
| [13] | [R3-231791](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231791.zip) | SON enhancement for Inter-RAT SHR (CMCC) |
| [14] | [R3-231792](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231792.zip) | SON enhancement for SPR (CMCC) |