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Online, 10th Oct – 18th Oct 2022

Agenda Item: 10.2.1.

Source: Qualcomm (moderator)

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

Document for: Approval

# Introduction

**CB: # SONMDT1\_SHRandSPCR**

**Inter RAT SHR:**

**- Discuss whether Inter-RAT SHR has no RAN3 impact? (e.g, only NR configures trigger condition; only NR needs and fetches SHR; UE only generates NR format SHR after inter-RAT handover)**

**- HO from LTE to NR should be supported?**

**- Inter-RAT SHR format, SHR fetching, forwarding**

**SPCR:**

**- which node (MN or SN) generates the SPCR configuration? and whether the coordination between MN and SN is needed?**

**- SPCR fetching, forwarding**

**- Capture agreements and open issues, and provide CRs if agreeable**

**- LS to RAN2?**

(Qualcomm - moderator)

Summary of offline disc [R3-225907](file:///E:\3GPP%20Standardization\RAN3\RAN3%23117bis-e\draft\CB%20%23%20SONMDT1_SHRandSPCR\Inbox\R3-225907.zip)

# For the Chair’s Notes

# Phase-II Discussion

# Phase-I Discussion

## Inter-RAT SHR

### Triggers for inter-RAT SHR (NR to LTE)

HW, Observation 3a: For the HO from NR to LTE, the **T310 and T312** related SHR triggering condition(s) should be introduced in the NR handover message from NR to LTE

HW, Observation 3b: For the HO from NR to LTE, the introduction of the T304 related triggering condition in the NR handover message will impact LTE RAN2 specification. **FFS on the T304 related triggering condition.**

E///, Proposal 1.1: The gNB (but not the eNB) is allowed to supply configuration for Inter-RAT SHR from NR to LTE

E///, Proposal 1.2: Use only thresholds based on timers **T310 and T312** for Inter-RAT SHR from NR to LTE

QC, Proposal 8: Consider **only T310 and T312 thresholds** for inter-RAT SHR from NR to LTE. Source NR cell determines the T310/T312 thresholds. It is up to RAN2 whether to reuse the T310/T312 thresholds for SHR introduced in case of intra-NR handovers for the inter-RAT case

Intel, Proposal 1: The UE logs the SHR if, during NR to LTE HO, **T310 or T312 or T304 value** exceeds a threshold.

ZTE, Observation 2: In the case of gNB to ng-eNB handover, the NR cell may include SHR configuration in MobilityFromNRCommand message sent to UE, where the **T310 and T312 threshold** is configured by source RAT (NR), and the **T304 threshold** is configured by target RAT (LTE).

**Q1: Companies are requested to provide their preference among the following 2 options:**

* **Option 1:** Only T310 and T312 related triggers for inter-RAT SHR from NR to LTE
* **Option 2:** T310, T312 and T304 related triggers for inter-RAT SHR from NR to LTE

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| --- | --- | --- |
| Company | Option 1 or 2 | Comment |
| Samsung | Option 2 | We think T304 related triggers should be considered as well.  Firstly the configuration of T304 may bring the potential failures which will also impact the performance of inter-RAT handover from NR to LTE.  Secondly, the intention to only support T310 and T312 is to reduce the impact on LTE specification. Actually even if only supporting T310/T312, the store and reporting of the SHR may still have LTE specification impact.  Furthermore, RAN3 agreed to consider “*SHR for intra-system inter-RAT, HO from NR to LTE will be treated first*” firstly. HO from LTE to NR may be considered after HO from NR to LTE is done. With this in mind, it’s good to have a solution to cover both directions. If we define a sub-optimal solution for HO from NR to LTE just for reducing the impact on LTE and later we find the change cannot be avoided to support HO from LTE and NR, it’s not a good exercise. All the aspects including network performance, technical benefit and specification impacts should be considered in order to make a decision. |
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### Encoding of inter-RAT SHR (NR to LTE)

SS: Ifthe save of the SHR is due to the target configuration, UE saves SHR in target RAT format.

SS: If the store of the SHR is due to the source configuration, the UE saves SHR in source RAT format.

Len: Proposal 2: How to encode the SHR for intra-system inter-RAT HO depends on RAN2 progress.

QC, Proposal 9: For inter-RAT SHR from NR to LTE, UE should encode the Inter-RAT SHR in the source RAT (i.e., NR) format and should indicate its availability (and further report it) only upon coming back to the same RAT (NR)

**Q2: Companies are requested to provide their preference among the following 2 options (this can also be confirmed with RAN2):**

* **Option 1:** Inter-RAT SHR is encoded in source RAT format
* **Option 2:** Inter-RAT SHR is encoded based on the SHR trigger (SS’s proposal)

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| Company | Option 1 or 2 | Comment |
| Samsung | Option 2 | Option 2 is reasonable from technical point of view. If the store of SHR is due to the source configuration, it should be the source node to make the optimization. Inter-RAT SHR should be encoded in the source RAT format so that the source node can decode and analyze it, then make the optimization. If the store of the SHR is due to the target configuration, it should be the target node to make the optimization. So Inter-RAT SHR should be encoded in the target RAT format so that the target node can decode and analyze it, then make the optimization.  Actually, Option 1 follows the principle of Option 2. Option 1 proposed by QC is based on the assumption that only T310 and T312 thresholds are considered. T310/T312 are configured by the source so Inter-RAT SHR is encoded in source RAT format. So we think we can check whether the following principle could be agreed by RAN3:  Inter-RAT SHR is encoded based on the SHR trigger. |
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### Reporting NR SHR to LTE node

E///, Proposal 1.3: Inter-RAT SHRs are fetched by gNBs but not eNBs

Intel, Proposal 3: The target LTE node transfers the receiving SHR to the source NG-RAN node by triggering the DOWNLINK RAN CONFIGURATION TRANSFER procedure over NG or ACCESS AND MOBILITY INDICATION procedure over Xn.

CATT, Proposal 1: It is proposed to send SHR directly to source RAN node in case that only source cell needs optimization after SHR is retrieved by NR RAN.

QC, Proposal 9: For inter-RAT SHR from NR to LTE, UE should encode the Inter-RAT SHR in the source RAT (i.e., NR) format and should indicate its availability (and further report it) only upon coming back to the same RAT (NR)

Len, Proposal 5: Reuse the ACCESS AND MOBILITY INDICATION message to transfer intra-system inter-RAT SHR.

CT, Proposal 1: Change the current SHR to a CHOICE structure to include both NR SHR and LTE SHR for NGAP, XnAP and F1AP.

SS: Similar like RLF report, LTE SHR can be reported to a gNB

**Q3: Companies are requested to provide their preference among the following 2 options:**

* **Option 1:** It is sufficient to report the inter-RAT SHR collected during a successful NR🡪 LTE handover once UE is back to NR (no need to report to LTE node)
* **Option 2:** Inter-RAT SHR collected during a successful NR🡪 LTE handover can be retrieved by the target LTE node and forward it to source NR node via Xn/NG signaling.
  + In this option, UE needs to include the Source NR Cell Id outside the SHR container in the inter-RAT SHR sent to the target LTE node
* **Option 3:** The same principle as RLF Report: NR SHR and LTE SHR could be reported to NR node, LTE SHR is reported to LTE node.

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| Company | Option 1 or 2 or 3 | Comment |
| Samsung | Option 3 | It’s straight forward that NR SHR is reported to NR node, LTE SHR is reported to LTE node. For RLF Report, RAN2 has agreed that LTE RLF report can be reported to NR node. This gives more flexibility for the network node to get the report on time. The same principle could be used for SHR reporting. |
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### Parameters for inter-RAT SHR (NR to LTE)

SS: The parameters defined for intra-NR SHR can be reused for inter-RAT SHR except the Timer from CHO configuration to execution which is only used for intra-NR handover case.

HW, Observation 5: For the HO from NR to LTE, RAN2 is requested to provide the following successful handover information in LTE:

• Source NR cell info and target LTE cell info

• Measurement results for source, target and neighbours

• Shr-cause to indicate which triggering condition was met

• UE information, e.g., C-RNTI

**Q4: Companies are requested to provide their views on which parameters to include in inter-RAT SHR (NR🡪 LTE). This can be confirmed with RAN2 via an LS.**

1. Source NR cell info and target LTE cell info
2. Measurement results for source, target and neighbours
3. Shr-cause to indicate which triggering condition was met
4. UE information, e.g., C-RNTI, location
5. Time from CHO configuration to execution
6. SHR cause

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| --- | --- | --- |
| Company | Support among a) to f) | Comment |
| Samsung | a, b, c, d, f | e is not valid because CHO is only used for intra-NR handover. |
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### Inter-RAT SHR (LTE to NR)

HW, Proposal 1: For intra-system inter-RAT SHR, HO from LTE to NR should be supported.

CATT, Proposal 3: Without impact on LTE, SHR configuration of thresholdPercentageT304 can be sent to UE and SHR can be generated during HO from LTE to NR. We may wait for RAN2’s progress for SHR for intra-system inter-RAT, HO from LTE to NR.

**Q5: Companies are requested to provide their views on whether to support inter-RAT SHR (LTE🡪 NR)**

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| Company | Yes/No | Comment |
| Samsung | Yes | Seamless handover should be supported in the whole network, not only one direction. Some users may prefer to access NR with priority whenever possible e.g. for better throughput. It’s important to guarantee good QoE of the UE for handover from LTE to NR. |
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## Successful PSCell Change Report (SPCR)

RAN3 agreed on the following scope for SPCR in R3#117e:

SPCR for NR-DC, including: ​

* SN- and MN-initiated classic PSCell change / CPC​
* intra-SN classic PSCell change / CPC​
* classic Addition / CPA​
* HO with SN change are not prohibited, but possibly addressed once the basic solution for SPCR is known.​

In this meeting, we will discuss further details on SPCR in the following sections.

### LS to RAN2 on triggers for SPCR and contents of SPCR

**Triggers for SPCR**

QC, Proposal 1: Similar to successful handover report, RAN3 agrees to optimize RLM timers (T310/T312) of SCG and detect near PSCell change failures (optimize T304 timer of SCG) for optimizing successful PSCell change scenarios in NR-DC

QC, Proposal 2: **LS RAN2** to check whether similar thresholds as defined for SHR (T310/T312/T304 thresholds) can be defined for optimizing successful PSCell change scenarios in NR-DC

HW, Observation 6: SPCR triggering conditions should be **considered in RAN2.**

**Contents of SPCR**

E///, Proposal 2.1: Source PSCell, PCell and target PSCell Cell Global Identities (CGI) are included in the SPR. RAN2 should be informed of this decision

E///, Proposal 2.2: SPR includes information that PSCell change was MN-initiated or SN-initiated. RAN2 should be informed of this decision

HW: Send LS to RAN2 to discuss the potential information provided in the SPCR

o Source PSCell information, in case of PSCell change/CPC

o target PSCell information

o SPCR cause

o Latest measurement results

o PCell information, in case of MN initiated PSCell change/CPC

o Time elapsed between the CPC execution and the reception of the CPAC configuration in case of CPC

**Q6: Whether RAN3 can send an LS to RAN2 to check further on the following regarding SPCR:**

1. Triggers for SPCR (e.g., T310/T312/T304 of SCG)
2. The reporting of SPCR (delayed or immediate)
3. Potential contents of SPCR (final decision up to RAN2)
4. Source PSCell information, in case of PSCell change/CPC
5. Target PSCell information
6. SPCR cause
7. Latest measurement results
8. PCell information, in case of MN initiated PSCell change/CPC
9. Time elapsed between the CPAC execution and reception of CPAC configuration, in case of CPAC
10. Information that PSCell change was MN-initiated or SN-initiated
11. Location information of the UE

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| --- | --- | --- |
| **Company** | **Yes/No for 1, 2 and 3a)- 3g)** | **Comment** |
| Samsung | Yes for 1), 2) and 3a, 3b), 3c), 3d), 3f), 3g), 3h) | For 3e), it’s depending on whether the reporting of SPCR is immediate or delayed. If the reporting is immediate i.e. similar as SCGFailureInformation, then 3e) is not needed. |
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### Configuring T310 and T312 triggers for SPCR

Observation 2-3: MN cannot configure a meaningful T310 and T312 threshold in SPCR configuration, as MN is unaware of T310 and T312 timer value configured by the SN during connection establishment.

NOK, Proposal 1: Coordination between MN and SN is needed for the MN to properly configure SPCR.

NOK, Proposal 2: SN may provide the MN with the currently used values for T310/T312 by means of the MN-initiated modification (S-NODE MODIFICATION REQUEST ACKNOWLEDGE) or SN-initiated SN Change (S-NODE CHANGE REQUIRED).

NOK, Proposal 4: SN may indicate its preferences in terms of T310/T312 thresholds to the MN via the SN change required message in case of SN initiated PSCell change

NOK, Proposal 5: MN may inform the SN with regard to the used SPCR configuration via the SN Change Confirm message

ZTE, Proposal 4: Source SN or SN provides SPCR configuration (e.g., Thresholds of T312/T310) in the following user cases: SN initiated classic PSCell change, SN initiated CPC, MN-initiated classic PSCell change, MN-initiated CPC, intra-SN classic PSCell change, intra-SN CPC.

ZTE, Proposal 5: MN provides SPCR configuration (e.g., Thresholds of T312/T310) in the following user cases: Classic Addition, CPA.

QC, Proposal 4: In case of MN initiated successful PSCell Change/CPC and classical Addition/CPA, MN generates the Successful PSCell Change configuration and configures the UE with SPC configuration. MN is also responsible for performing the SPC related optimizations

QC, Proposal 5: In case of SN initiated successful PSCell Change/CPC, SN (whether S-SN or T-SN depends on the timers) generates the Successful PSCell Change configuration, forwards it to the MN, which then configures it to the UE. SN is also responsible for performing the SPC related optimizations

QC, Proposal 6: Even in case of intra-SN initiated successful PSCell Change, SN (whether S-SN or T-SN depends on the timers) generates the Successful PSCell Change configuration, forwards it to the MN, which then configures it to the UE via SRB1. SN is also responsible for performing the SPC related optimizations

Considering the above proposals, the moderator would like to propose the following options for configuring T310 and T312 triggers for SPCR (assuming RAN2 supports it) for different SN addition/change scenarios. T304 triggers can be discussed later (e.g., in Phase-II or next meeting).

**Case 1: Classic Addition/CPA:**

Option 1: MN decides the T310 and T312 triggers for SPCR autonomously (without any SN coordination) and configures it to the UE

Option 2: SN provides MN with the currently configured values of T310/T312 for SCG e.g., during SN addition (S-NODE ADDITION REQUEST ACKNOWLEDGE). MN then decides the T310 and T312 triggers for SPCR and configures it to the UE

Option 3: Source SN decides the T310 and T312 thresholds, forwards it to the MN over a transparent container, which then configures it to the UE.

**Case 2: MN-initiated classic PSCell change / MN-initiated CPC**

Option 1: MN decides the T310 and T312 triggers for SPCR autonomously (without any SN coordination) and configure it to the UE

Option 2: SN provides MN with the currently configured values of T310/T312 for SCG e.g., by means of the MN-initiated modification (S-NODE MODIFICATION REQUEST ACKNOWLEDGE). MN then decides the T310 and T312 triggers for SPCR and configures it to the UE

Option 3: Source SN decides the T310 and T312 thresholds, forwards it to the MN over a transparent container, which then configures it to the UE.

**Case 3: SN initiated classic PSCell change / SN initiated CPC**

Option 1: Source SN decides the T310 and T312 thresholds, forwards it to the MN over a transparent container, which then configures it to the UE

Option 2: SN provides MN with the currently configured values of T310/T312 for SCG by means of SN-initiated SN Change (S-NODE CHANGE REQUIRED). SN may further indicate its preferences in terms of T310/T312 thresholds to the MN, but MN has the final say in deciding the T310/T312 triggers for SPCR and informs SN on the configured triggers

**Case 4: Intra-SN classic PSCell change / intra-SN CPC**

Can be discussed once there is consensus on Case 1-3.

**Q7: Companies are requested to provide their views and preferences (Option 1 or 2) on how to configure T310 and T312 triggers for SPCR in Case 1-3:**

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| --- | --- | --- |
| Company | Option 1 or 2 for Cases 1-3 | Comment |
| Samsung |  | For Case 3, our preference is Option 1  For Case 1 and Case 2, we need to consider more about whether Option 2 or Option 3. To decide which option is better, the main question is that the nearly failure is brought by the inappropriate timer setting or the SN addition/change is not triggered in proper time. |
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### Root cause analysis for SPCR

Len, Proposal 3: If successful PSCell addition/change report is triggered due to T304 trigger threshold is fulfilled, MN may forward the successful PSCell addition/change report to target SN for root cause analysis.

Len, Proposal 4: In case of MN initiated PSCell change or CPC, if successful PSCell change report is triggered due to T310 or T312 trigger threshold is fulfilled, MN performs root cause analysis.

Len, Proposal 5: In case of SN initiated PSCell change or CPC, if successful PSCell change report is triggered due to T310 or T312 trigger threshold is fulfilled, MN may forward the successful PSCell change report to source SN for root cause analysis.

QC, Proposal 4: In case of MN initiated successful PSCell Change/CPC and classical Addition/CPA, …..MN is also responsible for performing the SPC related optimizations

QC, Proposal 5: In case of SN initiated successful PSCell Change/CPC, SN… is also responsible for performing the SPC related optimizations

ZTE, Proposal 6: NG-RAN nodes should transport report to the MN where SPCR occur.

ZTE, Proposal 7: MN should transport report to the source SN in the following user cases: SN initiated classic PSCell change, SN initiated CPC, MN-initiated classic PSCell change, MN-initiated CPC, intra-SN classic PSCell change, intra-SN CPC.

QC, Proposal 7: In case of SN initiated successful PSCell Change (including intra-SN case), MN forwards the SPCR to the SN via Xn upon receiving the SPCR from UE. It is FFS whether to reuse an existing Xn message or define a new Xn message

HW, Proposal 6: The forwarding of SPCR depends on the reporting scheme to be decided in RAN2.

CT, Proposal 3: For SN-initiated PSCell change, the RRC TRANSFER message can be reused to transmit the SPCR over Xn interface from MN to the Source SN.

Based on the above proposals, the moderator proposes the following on which node should perform root cause analysis in different SN addition/change scenarios:

**Moderator Proposal 1:** In case of classic SN addition or CPA, if SPCR is triggered due to T310 or T312 trigger threshold being fulfilled, MN performs root cause analysis

**Moderator Proposal 2**: In case of MN initiated PSCell change or MN initiated CPC, if SPCR is triggered due to T310 or T312 trigger threshold being fulfilled, MN performs root cause analysis

**Moderator Proposal 3:** In case of SN initiated PSCell change or SN initiated CPC, if SPCR is triggered due to T310 or T312 trigger threshold being fulfilled, MN may forward the SPCR to Source SN for root cause analysis

**Q8: Companies are requested to provide their views on Moderator Proposals 1-3 and whether they agree or not (Yes/No)?**

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| --- | --- | --- |
| Company | Yes/No on Mod Proposals 1-3 | Comment |
| Samsung | Yes for P3. | For SN addition or CPA or MN initiated PSCell change, the nearly failure could be brought by the inappropriate setting of the T310/T312? In this case, the (source) SN should be involved for root cause analysis? |
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### Retrieving SPCR

CATT, Proposal 5: It is proposed for RAN3 to discuss which RAN node can retrieve PSCell SHR (MN or SN)?

E///, Proposal 2.3: If UE is still in DC operation, only the MN is allowed to fetch the SPR

E///, Observation 2.3: MN is not aware that an SPR is available in the UE

E///, Proposal 2.4: SN signals SPR availability to the MN via Xn interface, at reception of the RRCReconfigurationComplete indicating that an SPR is available at the UE

The moderator apologizes for going over the limit of 8 questions. But feel free to reply to Q9 if you can.

**Q9: Companies are requested to provide their views on which node (MN or SN) should retrieve SPCR from UE?**

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| --- | --- | --- |
| Company | MN or SN | Comment |
| Samsung |  | It depends on which message the UE will indicates the availability and which message is used for the reporting. We prefer to leave this issue to RAN2. |
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# Conclusion, Recommendations

If needed

# References

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| --- | --- | --- |
|  |  |  |
| [1] | [R3-225384](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225384.zip) | SON enhancement for Successful Handover Report and Successful PSCell Change Report (Samsung) |
| [2] | [R3-225393](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225393.zip) | [TP to 38.423, SON] Configuration coordination for the successful PSCell change report (Nokia, Nokia Shanghai Bell) |
| [3] | [R3-225405](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225405.zip) | Successful PSCell Change Report and inter-RAT Successful Handover Report (Qualcomm Incorporated) |
| [4] | [R3-225424](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225424.zip) | Discussion on support of SHR and SPCR (China Telecommunication) |
| [5] | [R3-225472](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225472.zip) | SON enhancements for successful PSCell change report (Lenovo) |
| [6] | [R3-225473](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225473.zip) | Successful Handover Report for inter-RAT HO (Lenovo) |
| [7] | [R3-225543](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225543.zip) | SHR and SPCR (Huawei) |
| [8] | [R3-225550](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225550.zip) | Inter-RAT SHR and SPR discussion (Ericsson) |
| [9] | [R3-225772](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225772.zip) | SHR for NR to LTE HO (Intel Corporation) |
| [10] | [R3-225789](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225789.zip) | Discussion on SON enhancement for SHR and SPCR (CATT) |
| [11] | [R3-225866](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225866.zip) | Discussion on inter-RAT SHR and SPCR (ZTE) |