**3GPP TSG-RAN WG2 Meeting #126 *R2-2405824***

**Fukuoka, Japan, May 20th – 24th 2024**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.331** | **CR** | **4814** | **rev** | **1** | **Current version:** | **18.1.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Misclassification of RLF reports as Too Early HO failure |
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| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | NR\_ENDC\_SON\_MDT\_enh2-Core |  | ***Date:*** | 2024-05-21 |
|  |  |  |  |  |
| ***Category:*** | A |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | In Rel-17 RRC TS, the procedural text for logging RLF report leads to wrong classification of the HO failure and hence leads to wrong tuning of mobility control parameters. An excerpt from the RRC TS 38.331 (version 17.7.0) is shown in the following.2> if an *RRCReconfiguration* message including the *reconfigurationWithSync* was received before the connection failure:3> if the last successfully executed *RRCReconfiguration* message including the *reconfigurationWithSync* concerned an intra NR handover and it was received while connected to the previous PCell to which the UE was connected before connecting to the PCell where radio link failure is detected; and3> if T311 was not running before entering the PCell in which the radio link failure was detected:4> include the *nrPreviousCell* in *previousPCellId* and set it to the global cell identity and the tracking area code of the PCell where the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was received;4> if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a DAPS handover:5> set *lastHO-Type* to *daps*;4> else if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a conditional handover:5> set *lastHO-Type* to *cho*;4> set the *timeConnFailure* to the elapsed time since the execution of the last *RRCReconfiguration* message including the *reconfigurationWithSync*;As shown above, the procedural text for the radio link failure is written to avoid logging the *previousPCellId* and *timeConnFailure* for the cases that RLF is detected shortly after the following scenarios:* RLF after a successful re-establishment
* RLF after a successful CHO recovery
* RLF after RRC connection (transition from IDLE mode to connected mode)

However, there is still one scenario missing in the current procedural text that is RLF shortly after fast MCG recovery. According to the current procedural text the UE logs *previousPCellId* and *timeConnFailure* when RLF occurs shortly after a fast MCG recovery procedure. This creates problem at the network side when analysing the RLF-report as the above information is logged to detect the Too Early HO failure. In other words, the above information creates confusion for the network in adjusting the HO parameters, which should be avoided. Therefore, similar to the other scenarios mentioned above the procedural text should be corrected to avoid logging *previousPCellId* and *timeConnFailure* in the mentioned scenario. |
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| ***Summary of change:*** | The procedural text is updated to avoid logging the previous PCell ID and timeConnFailure in case the RLF occurred after a successful fast MCG recovery.**Impact analysis****Impacted functionality:**RLF-report**Inter-operability analysis:**If the change is implemented by the UE, and not by the network, there is no inter-operability issue.If the change is implemented by the NW, and not by the UE, the information of the previous PCell and the time connection failure may misslead the network to wrongly conclude the RLF as too early HO and change the mobility cotrol parameters (e.g., CIO) while the failure was due to an MCG recovery (not a Too Early HO). |
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| ***Consequences if not approved:*** | The UE includes previousPcellId and timeConnFailure in the RLF report in case of failure after fast MCG recovery which can be missleading for the network when classifying the failure as a Too Early HO. |
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| ***Clauses affected:*** | 5.3.10.5 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR …CR …  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

Start of the CHANGE

#### 5.3.10.5 RLF report content determination

The UE shall determine the content in the *VarRLF-Report* as follows:

1> clear the information included in *VarRLF-Report*, if any;

1> if the UE is not in SNPN access mode, set the *plmn-IdentityList* to include the list of EPLMNs stored by the UE (i.e. includes the RPLMN);

1> else if the UE is in SNPN access mode, set the *snpn-IdentityList* to include the list of equivalent SNPNs stored by the UE (i.e., registered SNPN identity);

1> set the *measResultLastServCell* to include the cell level RSRP, RSRQ and the available SINR, of the source PCell (in case HO failure) or PCell (in case RLF) based on the available SSB and CSI-RS measurements collected up to the moment the UE detected failure;

1> if *measRSSI-ReportConfig* is configured for the *measObject* indicated as the *servingCellMO* of the source PCell (in case HO failure) or PCell (in case of RLF), set the *measResultLastServCell-RSSI* to the linear average of the available RSSI sample value(s) provided by lower layers for the frequency of the source PCell (in case HO failure) or PCell (in case of RLF) up to the moment the UE detected the failure;

1> if the SS/PBCH block-based measurement quantities are available:

2> set the *rsIndexResults* in *measResultLastServCell* to include all the available measurement quantities of the source PCell (in case HO failure) or PCell (in case RLF), ordered such that the highest SS/PBCH block RSRP is listed first if SS/PBCH block RSRP measurement results are available, otherwise the highest SS/PBCH block RSRQ is listed first if SS/PBCH block RSRQ measurement results are available, otherwise the highest SS/PBCH block SINR is listed first, based on the available SS/PBCH block based measurements collected up to the moment the UE detected failure;

1> if the CSI-RS based measurement quantities are available:

2> set the *rsIndexResults* in *measResultLastServCell* to include all the available measurement quantities of the source PCell (in case HO failure) or PCell (in case RLF), ordered such that the highest CSI-RS RSRP is listed first if CSI-RS RSRP measurement results are available, otherwise the highest CSI-RS RSRQ is listed first if CSI-RS RSRQ measurement results are available, otherwise the highest CSI-RS SINR is listed first, based on the available CSI-RS based measurements collected up to the moment the UE detected failure;

1> for each of the configured *measObjectNR* in which measurements are available:

2> if the SS/PBCH block-based measurement quantities are available:

3> set the *measResultListNR* in *measResultNeighCells* to include all the available measurement quantities of the best measured cells, other than the source PCell (in case HO failure) or PCell (in case RLF), ordered such that the cell with highest SS/PBCH block RSRP is listed first if SS/PBCH block RSRP measurement results are available, otherwise the cell with highest SS/PBCH block RSRQ is listed first if SS/PBCH block RSRQ measurement results are available, otherwise the cell with highest SS/PBCH block SINR is listed first, based on the available SS/PBCH block based measurements collected up to the moment the UE detected failure;

4> for each neighbour cell included, include the optional fields that are available;

NOTE 0a: For the neighboring cells included in *measResultListNR* in *measResultNeighCells* ordered based on the SS/PBCH block measurement quantities, UE also includes the CSI-RS based measurement quantities, if available.

2> if the CSI-RS based measurement quantities are available:

3> set the *measResultListNR* in *measResultNeighCells* to include all the available measurement quantities of the best measured cells, other than the source PCell (in case HO failure) or PCell (in case RLF), ordered such that the cell with highest CSI-RS RSRP is listed first if CSI-RS RSRP measurement results are available, otherwise the cell with highest CSI-RS RSRQ is listed first if CSI-RS RSRQ measurement results are available, otherwise the cell with highest CSI-RS SINR is listed first, based on the available CSI-RS based measurements collected up to the moment the UE detected radio link failure;

4> for each neighbour cell included, include the optional fields that are available;

NOTE 0b: For ordering the neighboring cells based on the CSI-RS measurement quantities, UE includes measurements only for the cells not yet included in *measResultListNR* in *measResultNeighCells* to avoid overriding SS/PBCH block-based ordered measurements.

2> for each neighbour cell, if any, included in *measResultListNR* in *measResultNeighCells*:

3> if the UE supports RLF-Report for conditional handover and if the neighbour cell is one of the candidate cells for which the *reconfigurationWithSync* is included in the *masterCellGroup* in the MCG *VarConditionalReconfig* at the moment of the detected failure:

4> set *choConfig* in *MeasResult2NR* to the execution condition for each *measId* within *condTriggerConfig* associated to the neighbour cell within the MCG *VarConditionalReconfig*;

4> if the first entry of *choConfig* corresponds to a fulfilled execution condition at the moment of handover failure, or radio link failure; or

4> if the second entry of *choConfig*, if available, corresponds to a fulfilled execution condition at the moment of handover failure, or radio link failure:

5> set *firstTriggeredEvent* to the execution condition *condFirstEvent* corresponding to the first entry of *choConfig* or to the execution condition *condSecondEvent* corresponding to the second entry of *choConfig*, whichever execution condition was fulfilled first in time;

5> set *timeBetweenEvents* to the elapsed time between the point in time of fullfilling the condition in *choConfig* that was fulfilled first in time, and the point in time of fullfilling the condition in *choConfig* that was fulfilled second in time, if both the first execution condition corresponding to the first entry and the second execution condition corresponding to the second entry in the *choConfig* were fullfilled;

1> for each of the configured *measObjectNR* associated with neighboring cellsif the associated *reportConfigNR* includes *measRSSI-ReportConfig*:

2> set the *measResultNeighFreq-RSSI* in the *measResultNeighFreqList-RSSI* to the linear average of the available RSSI sample value(s) provided by lower layers for the frequencies other than the frequency of the source PCell (in case HO failure) or of the PCell (in case RLF), up to the moment the UE detected failure;

1> for each of the configured EUTRA frequencies in which measurements are available;

2> set the *measResultListEUTRA* in *measResultNeighCells* to include the best measured cells ordered such that the cell with highest RSRP is listed first if RSRP measurement results are available, otherwise the cell with highest RSRQ is listed first, and based on measurements collected up to the moment the UE detected failure;

3> for each neighbour cell included, include the optional fields that are available;

NOTE 1: The measured quantities are filtered by the L3 filter as configured in the mobility measurement configuration. The measurements are based on the time domain measurement resource restriction, if configured. Exclude-listed cells are not required to be reported.

1> set the *c-RNTI* to the C-RNTI used in the source PCell (in case HO failure) or PCell (in case RLF);

1> if the failure is detected due to reconfiguration with sync failure as described in 5.3.5.8.3, set the fields in *VarRLF-report* as follows:

2> set the *connectionFailureType* to *hof*;

2> if the UE supports RLF-Report for DAPS handover and if any DAPS bearer was configured while T304 was running:

3> set *lastHO-Type* to *daps*;

3> if radio link failure was detected in the source PCell, according to clause 5.3.10.3:

4> set *timeConnSourceDAPS-Failure* to the time between the initiation of the DAPS handover execution and the radio link failure detected in the source PCell while T304 was running;

4> set the *rlf-Cause* to the trigger for detecting the source radio link failure in accordance with clause 5.3.10.4;

2> if the UE supports RLF-Report for conditional handover and if configuration of the conditional handover is available in the MCG *VarConditionalReconfig* at the moment of the handover failure:

3> if the UE executed a conditional handover toward target PCell according to the *condRRCReconfig* of the target PCell:

4> set *timeSinceCHO-Reconfig* to the time elapsed between the execution of the last *RRCReconfiguration* message including *reconfigurationWithSync* for the target PCell of the failed conditional handover, and the reception in the source PCell of the last *conditionalReconfiguration* including the *condRRCReconfig* of the target PCell of the failed conditional handover;

3> else:

4> set *timeSinceCHO-Reconfig* to the time elapsed between the execution of the last *RRCReconfiguration* message including *reconfigurationWithSync* for the target PCell of the failed handover, and the reception in the source PCell of the last *conditionalReconfiguration* including the *condRRCReconfig*;

3> set *choCandidateCellList* to include the global cell identity, if available, and otherwise to the physical cell identity and carrier frequency of each of the candidate target cells for conditional handover included in *condRRCReconfig* within the MCG *VarConditionalReconfig* at the time of the failed handover, excluding the candidate target cells included in *measResultNeighCells*;

2> if the UE supports RLF-Report for conditional handover and if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a conditional handover:

3> set *lastHO-Type* to *cho*;

2> set the *nrFailedPCellId* in *failedPCellId* to the global cell identity and tracking area code, if available, and otherwise to the physical cell identity and carrier frequency of the target PCell of the failed handover;

2> include *nrPreviousCell* in *previousPCellId* and set it to the global cell identity and tracking area code of the PCell where the last *RRCReconfiguration* message including *reconfigurationWithSync* was received;

2> set the *timeConnFailure* to the elapsed time since the execution of the last *RRCReconfiguration* message including the *reconfigurationWithSync*;

1> else if the failure is detected due to Mobility from NR failure as described in 5.4.3.5, set the fields in *VarRLF-report* as follows:

2> set the *connectionFailureType* to *hof*;

2> if last *MobilityFromNRCommand* concerned a failed inter-RAT handover from NR to E-UTRA and if the UE supports Radio Link Failure Report for Inter-RAT MRO EUTRA (NR to EUTRA):

3> set the *eutraFailedPCellId* in *failedPCellId* to the global cell identity and tracking area code, if available, and otherwise to the physical cell identity and carrier frequency of the target PCell of the failed handover;

2> include *nrPreviousCell* in *previousPCellId* and set it to the global cell identity and tracking area code of the PCell where the last *MobilityFromNRCommand* message was received;

2> set the *timeConnFailure* to the elapsed time since the initialization of the handover associated to the last *MobilityFromNRCommand* message;

2> if the UE supports RLF report for inter-system handover for voice fallback and if *voiceFallbackIndication* is included in the last *MobilityFromNRCommand*:

3> include the v*oiceFallbackHO;*

1> else if the failure is detected due to radio link failure as described in 5.3.10.3, set the fields in *VarRLF-report* as follows:

2> set the *connectionFailureType* to *rlf*;

2> set the *rlf-Cause* to the trigger for detecting radio link failure in accordance with clause 5.3.10.4;

2> set the *nrFailedPCellId* in *failedPCellId* to the global cell identity and the tracking area code, if available, and otherwise to the physical cell identity and carrier frequency of the PCell where radio link failure is detected;

2> if an *RRCReconfiguration* message including the *reconfigurationWithSync* was received before the connection failure:

3> if the last successfully executed *RRCReconfiguration* message including the *reconfigurationWithSync* concerned an intra NR handover and it was received while connected to the previous PCell to which the UE was connected before connecting to the PCell where radio link failure is detected; and

3> if T316 was not running before entering the PCell in which the radio link failure was detected; and

3> if T311 was not running before entering the PCell in which the radio link failure was detected:

4> include the *nrPreviousCell* in *previousPCellId* and set it to the global cell identity and the tracking area code of the PCell where the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was received;

4> if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a DAPS handover:

5> set *lastHO-Type* to *daps*;

4> else if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a conditional handover:

5> set *lastHO-Type* to *cho*;

4> set the *timeConnFailure* to the elapsed time since the execution of the last *RRCReconfiguration* message including the *reconfigurationWithSync*;

3> else if the last *RRCReconfiguration* message including the *reconfigurationWithSync* concerned a handover to NR from E-UTRA and if the UE supports Radio Link Failure Report for Inter-RAT MRO EUTRA:

4> include the *eutraPreviousCell* in *previousPCellId* and set it to the global cell identity and the tracking area code of the E-UTRA PCell where the last *RRCReconfiguration* message including *reconfigurationWithSync* was received embedded in E-UTRA RRC message *MobilityFromEUTRACommand* message as specified in TS 36.331 [10] clause 5.4.3.3;

4> set the *timeConnFailure* to the elapsed time since reception of the last *RRCReconfiguration* message including the *reconfigurationWithSync* embedded in E-UTRA RRC message *MobilityFromEUTRACommand* message as specified in TS 36.331 [10] clause 5.4.3.3;

2> if configuration of the conditional handover is available in the MCG *VarConditionalReconfig* at the moment of declaring the radio link failure:

3> set *timeSinceCHO-Reconfig* to the time elapsed between the detection of the radio link failure, and the reception, in the source PCell, of the last *conditionalReconfiguration* including the *condRRCReconfig* message;

3> set *choCandidateCellList* to include the global cell identity if available, and otherwise to the physical cell identity and carrier frequency of each of all the candidate target cells for conditional handover included in *condRRCReconfig* within the MCG *VarConditionalReconfig* at the time of radio link failure, excluding the candidate target cells included in *measResultNeighCells*;

1> if *connectionFailureType* is *rlf* and the *rlf-Cause* is set to *randomAccessProblem* or *beamFailureRecoveryFailure*; or

1> if *connectionFailureType* is *rlf* and the *rlf-Cause* is set to *lbtFailure* and the radio link failure is detected during the random access procedure; or

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;

1> if *connectionFailureType* is *rlf* and the *rlf-Cause* is set to *lbtFailure*, and the radio link failure is not detected during the random access procedure:

2> set the *locationAndBandwidth* and *subcarrierSpacing* in *bwp-Info* associated to the UL BWP in which the consistent uplink LBT failure was detected;

1> if the *rlf-Cause* is set to *t310-Expiry* or *t312-Expiry*:

2> set the *ssbRLMConfigBitmap* and/or *csi-rsRLMConfigBitmap* in *measResultLastServCell* to include the radio link monitoring configuration of the last serving cell, if available;

1> if available, set the *locationInfo* as in 5.3.3.7.

The UE may discard the radio link failure information or handover failure information, i.e. release the UE variable *VarRLF-Report*, 48 hours after the radio link failure/handover failure is detected.

NOTE 2: In this clause, the term 'handover failure' has been used to refer to 'reconfiguration with sync failure'.

End of the CHANGE