**3GPP TSG RAN2 #115-e R2-21xxxxx**

**Online, 16 – 27 August 2021**

**Agenda Item:**  **6.1.4.1.5 Other**

**Source: Huawei (email rapporteur)**

**Title:** **Report of [Post115-e][063][NR16] SCG failure information (Huawei)**

**Document for: Discussion and Decision**

### 1 Introduction

This is the email report of [Post115-e][063] SCG failure information:

* [Post115-e][063][NR16] SCG failure information (Huawei)

Scope: CRs for failure type in SCG failure information NR

Intended outcome: Agreed CRs

Deadline: Sept 3 1000 UTC

Please add company contact details into the following table.

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| --- | --- | --- |
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### 2 Discussion

Based on the email discussion [AT115-e][027][NR16] CP Other & LTE (Ericsson), 36.331 CR [3] and 38.331 CR [4] were updated. (NG)EN-DC is the main scenario for the issue, and some companies also mentioned NR-DC, so both (NG)EN-DC and NR-DC are listed and companies could provide the comments in relevant tables.

#### 2.1 EN-DC and NGEN-DC

For 36.331 CR [3], it seems stable after the email discussion [AT115-e][027][NR16].

**Question 1: Is 36.331 CR [3] agreeable?**

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| --- | --- | --- |
| **Company name** | **Is 36.331 CR [3] agreeable?** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| MediaTek | Yes, and | We understand that some company do want to have strict NW requirement. It is also fine to change the field descrition as below.  Indicates the cause of the SCG failure. When the field *failureType-v1610* is included, the network may ignore the field *failureType-r15*. |
| Lenovo | Yes wth comments | It is better to clarify in the field description of failureType that the UE shall never use the value dummy. |
| CATT | Yes | In principle we agree with this CR, but it may not be absolutely necessary anyhow, depending on the answer to the next question. |
| Nokia, Nokia Shanghai Bell | Yes with changes | We have proposed some changes to the CR cover page to better reflect the intent and inter-operability. These have been uploaded.  Also, please follow the drafting rules and use "draft" at the start of the filename. Otherwise the document becomes an official Tdoc. |
| NTTDOCOMO | Yes |  |
| Ericsson | Yes | Regarding Mediatek’s suggestion, we prefer to avoid “may ignore” since it open the door to multiple network implementations that may cause issues in inter-vendor scenarios. |
| QCOM | Yes |  |
| ZTE | Yes | We are fine with the updated CR cover page from Nokia. |
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**Summary:**

**Update 36.331 CR by including suggestions from companies.**

For 38.331 CR [4], one controversial part is how the UE sets the value for failureType-r15, when the UE includes failureType-v1610.

According to 36.331 CR [3], the value other-r16 is dummified, and the UE should set a value in failureType-r15 because the field is mandatory present. Both failureType-r15 and failureType-v1610 are listed below.

failureType-r15 ENUMERATED {

t310-Expiry, randomAccessProblem,

rlc-MaxNumRetx,

synchReconfigFailureSCG, scg-reconfigFailure,

srb3-IntegrityFailure, ~~other-r16~~dummy},

failureType-v1610 ENUMERATED {t312-Expiry, scg-lbtFailure,

beamFailureRecoveryFailure, bh-RLF-r16, spare4,

spare3, spare2, spare1} OPTIONAL

**So far, the following two scenarios were mentioned:**

* **Scenario#1: (NG)EN-DC, R15 eNB+R15 gNB**
* **Scenario#2: (NG)EN-DC, R15 eNB+R16 gNB**

In the email discussion [AT115-e][027][NR16], NTT DoCoMo’s views are as below, and it is understood that scenario#1 (i.e. R15 eNB+R15 gNB) is a possible scenario.

BFR failure is more possible for this issue happen since rel-15 gNB can configure BFR. Other failure event (scg-lbtFailure-r16, t312-Expiry-r16) are the function introduced in rel-16 that rel-15 gNB cannot configure which can be considered rare case.

For scenario#2, it may be also possible, but so far few operators have expressed their views on the scenario. In other words, one view from operators is that the deployments for (NG)EN-DC should be R15 eNB+R15 gNB, or R16 eNB+R16 gNB, i.e. both LTE and NR should be upgraded to the same release.

**Issue description**

In scenario#1, as mentioned by NTT DoCoMo, a R16 UE can only report the value beamFailureRecoveryFailure in failureType-v1610, and other values are impossible to be set. In this scenario, R15 gNB can configure BFR.

In scenario#2, as mentioned in [5], a R16 UE may report some values in failureType-v1610. In this scenario, R16 gNB can configure R16 features (relevant to failureType-v1610).

For R15 eNB, the network behaviours may be different depending on the value set in failureType-r15, and the analysis can be found in the table below.

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| **R15/R16 UE behaviours** | **R15 eNB (e.g. R15 eNB+R15/R16 gNB)** |
| R15 UE: include failureType-r15 | No problem |
| R16 UE: include both failureType-r15 + failureType-v1610 | R15 eNB only decodes failureType-r15, but the UE actually suffers R16 failures in SCG |

In general, for the case “a R16 UE accesses to R15 eNB+R15 gNB or R15 eNB+R16 gNB”, if the UE suffers a R16 SCG failure and sets the field failureType-r16, there may be a gap between the actual failure in the UE and network handling, and it also depends on scenario#1 and scenario#2 as mentioned above.

**Proposed solutions**

In the email discussion [AT115-e][027][NR16], companies proposed some candidate solutions, and there are three directions:

* Direction 1: the UE sets “any value” in failureType-r16 (by UE implementation) if including failureType-v1610
* Direction 2: for some some values in failureType-v1610, the UE selects an appropriate value in failureType-r15. As mentioned by NTT DoCoMo, it works in scenario#1
* Direction 3: the UE always sets a fixed value (a rare value) in failureType-r15 if including failureType-v1610

The following table summarizes all options as well as some details (based on the email discussion [AT115-e][027][NR16]).

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| **Options** | **Description of the option** | **Concerns from companies** |
| **Option 1:**  The UE sets “any value” (by UE implementation) | As mentioned by some other companies, the failure case should not be common in real networks, and this kind of network handling only happens in “R15 eNB+R16 gNB”. Due to the continuous evolution on LTE and NR (in case of R16 eNB for EN-DC), this situation will not happen anymore as R16 eNB will anyway use failureType-v1610. In addition, some companies mentioned that the network can and should always do what it is able to do with encodings, and thus RAN2 does not need to have any opinions on eNB implementations. | It allows a UE to set different values at different times. From network side, it would be better if the value was always the same for all UEs.  It may impact KPI statistic collected from R15 eNBs, because there may be some inappropriate inputs. In other words, some companies preferred to let UE set a fixed value so that it is easier for the network to recognize the failures. |
| **Option 2:**  The UE sets “randomAccessProblem” if failureType-v1610 is set as “beamFailureRecoveryFailure”, and the UE sets “any value” for other cases | BFR failure is more possible for this issue happen since rel-15 gNB can configure BFR. Other failure event (scg-lbtFailure-r16, t312-Expiry-r16) are the function introduced in rel-16 that rel-15 gNB cannot configure which can be considered rare case. | Network will configure specific RA parameters for BFR purpose using beamfailurerecoveryconfig IE. The failuretype of beamfailurerecoveryconfig can be used to assist eNB/gNB to identify the failure RA is for BFR purpose, then eNB can optimize the configuration in beamfailurerecoveryconfig in the specification. If we fill randomAccessProblem when including Rel-16 BFR failure, rel-15 eNB cannot identify whether it is regular RA failure or BFR RA failure. Then, eNB will incorrectly optimize the RA parameter for regular RA. |
| **Option 3:**  The UE always sets failureType-r15 as “synchReconfigFailureSCG” | For this option, it is suggested to set failureType-r15 as **synchReconfigFailureSCG** when including any Rel-16 failure type (scg-lbtFailure-r16, beamFailureRecoveryFailure-r16, t312-Expiry-r16, bh-RLF-r16).  synchReconfigFailureSCG is sent in the mobility failure case. For SN initiated PSCell change without MN involved, the MN may transfer the received failure type to SN since the follow-up optimization should be done in SN.  For this option, R15 eNB needs to forward the received failure type to SN after R15 eNB receives failure type with "synchReconfigFailureSCG" (rel-15 eNB is aware that itself did not send reconfigurationwithsync). SN will ignore the received failure type because SN did not send Reconfigurationwithsync. | Some companies think that the issue of the “inappropriate” failure cause can be solved by network implementation. |
| **Option4:**  UE always sets failureType-r15 as “srb3-IntegrityFailure” | For this option, it is suggested to set R15 failureType as **srb3-IntegrityFailure** when including any Rel-16 failure type (scg-lbtFailure-r16, beamFailureRecoveryFailure-r16, t312-Expiry-r16, bh-RLF-r16). The reasons are:  1) No UE supports SRB3 so far, even if SRB3 is supported, MN knows whether SRB3 is established or not. So (in most cases) MN can recoginze whether reported failure type is "inappropriate" or not.  2) SRB3 integrity failure happens very rarely (compared to other reasons). So it is safer to use it, also to avoid impacting the KPI statistic of other failure types.  3) About using "synchReconfigFailureSCG", if RRC reconfiguration with sync message is sent by SN via SRB3, it is transparent to MN. So eNB does not always know if there was a RRC message sent to UE.  4) For BFR failure, we would like to differentiate it from normal RACH failure (in order to do proper RACH enhancement), so we would prefer to also use srb3-IntegrityFailure failure type. | Some companies think that the issue of the “inappropriate” failure cause can be solved by network implementation. |

**Question 2: Which of the above options is acceptable or not acceptable?**

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| **Company name** | **Which of options are acceptable?** | **Which of options are NOT acceptable?** | **Comments** |
| Huawei, HiSilicon | 1, 2 | 3, 4 | When failureType-r15 was initially introduced, the functionality only focused on R15 failure type. For the compatibility issue due to failureType-v1610, we think there is no perfect solution, and in principle a R16 failure type value should be “mapped” to an appropriate R15 failure type value by best effort. It is expected that this issue could be completely solved by upgrading LTE side for (NG)EN-DC deployments.  Follow our principle, we support option 1 and 2. |
| MediaTek | 1,2,3,4 |  | General comment  We think this is not a critical decision as there will be no issue after network upgrading to Rel-16.  On UE implementation  There is additional implementation effort, but we don’t see any difficulty to implement either of the options.  On NW implementation  There is no NW requirement on how to handle SCG failure according to different failure cause. The UE should not expect any kind of NW behavior based on particular failure cause. With this understanding, we hardly find there will be any IOT problem for UE to report any cause value.  On statistic for KPI  This belong to implementation and is not so suitable to be discussed in 3GPP. If we want to make sure the statistic is 100% correct, the network has to update to R16 so that they get correct value. If this is an important issue, the operator should request NW to upgrade while R16 UE is popular enough. |
| Lenovo | Option3 or Option 4 | Option 1 and Option 2 | For option1: According to the cover sheet, we also need to solve the issue of problem identification. If any value is added in the failuretype-r15, network can not identify the correct failure cause. In contrast, the incorrect failure type will be used to optimize the network, which will degrade the network performance.  For option2: beamFailureRecoveryFailure is specified to optimizte the RA configuration for BFR. There are two types of RA configuration including regular RA and BFR RA. Therefore, ‘beamFailureRecoveryFailure’ can not be replaced by ‘randomAccessProblem’. |
| CATT | Any | None | Each option is accepble for us.  But Option 3/4 seemingly implies an upgrading at the (en-)gNB side. And if network entities are to be upgraded, maybe some other options are more suitable, e.g. Solution 1-1 in R2-2108679. |
| Nokia, Nokia Shanghai Bell | Any, but see comments |  | We don't have a strong view as all of the options can work but we see option 2 and 3 as perhaps the most network-friendly. It would be also fine to e.g. just always set the same value for all cases, as that could make life easier for the network in these cases. |
| NTTDOCOMO | 1st priority: option2  2nd priority: option1 |  | We mainly concern the Scenario#1: (NG)EN-DC, R15 eNB+R15 gNB since rel-15 gNB possibly configure rel-16 UE with BFR, in such case as rel-15 eNB cannot detect the rel-16 failure type, so rel-16 UE is expected to report rel-15 failureType with a similar cause of “randomAccessProblem” to imply network with this failure.  For other rel-16 failureType(scg-lbtFailure-r16, t312-Expiry-r16, bh-RLF-r16), since rel-15 gNB does not configure them, UE would not report. Therefore we don’t see big issue for it.  For Scenario#2: (NG)EN-DC, R15 eNB+R16 gNB, as rel-16 gNB could config lbt, T312, rel-16 UE may report these failure to rel-15 eNB, though solution (option3, option4) provides smart consideration on it, they are network implementation dependent and not perfect solution. Generally, operator upgrades the eNB and gNB from rel-15 to rel-16 at the same time, so rel-15 eNB + rel-16 gNB can be considered a short period of transition phase. Therefore we think scenario#2 can be deprioritized |
| Ericsson | 1 | 3,4 | Since the network ignores the Rel-15 fields anyway, it does not matter which failure cause the UE will include.  Option 3 and Option 4 may give wrong indication to the network that then can perform wrong or not correct actions. Also, these options are not future proof and may need to be revised as more functionalities are added in future released.  On top of this, this may be a temporary problem as, by network implementation, the eNB may be upgraded to read the -r16 fields of the SCGFailureInformationNR message. |
| QCOM | 2 then 1 |  |  |
| ZTE | 4> 2>3>1 |  | In our view, fake value is anyway fake, the reason we prefer Option 4 because we hope network can be able to distinguish the fake inputs as much as possible, in order to reduce the impact to system optimization.  For Option 3, the failure type is also visible to MN, but from MN perspective, it is hard to distinguish whether the value is fake or not.  Option 1 is least preferable, because it is impossible for R15 network to recongize any fake inputs. |
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**Summary:**

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|  | **Option 1** | **Option 2** | **Option 3** | **Option 4** |
| **Acceptable** | **8** | **7 (1st priority for 2 companies)** | **5** | **5 (1st priority for 1 company)** |
| **Not acceptable** | **1 (in addition, 1 company commented that the option is least preferable)** | **1** | **2** | **2** |

**So it is proposed to go with Option 2, and 38.331 CR will be updated correspondingly and suggestions from companies are to be incorporated.**

#### 2.2 NR-DC

During email discussion [AT115-e][027][NR16], NR-DC where the MN is R15 and the SN is R16 was mentioned by some companies. For this scenario, it may happen that the UE will report the failureType with codepoint “other-r16” (that the Rel-15 MN will not be able to read) and the failureType-v1610 that also will not be read by the Rel-15 MN. If this is the case, the MN will report only the measurements to the SN without any failure case. But this happens also for the case of (NG)EN-DC where the MN is Rel-15 and SN is Rel-16.

Some companies think that MN is not able to forward the right failure type to SN. Instead, and MN will report measurements and a "inappropriate" failure type to SN (because R15 failureType in CG-ConfigInfo is not optional field. And MN has to decide which inappropriate value is included. Some companies think it would be better to align the (NG)EN-DC behavior with the one we have for the NR-DC.

Since NR-DC discussion was late during the email discussion [AT115-e][027][NR16], it is suggested to collect opinions regarding the issue, and solutions if possible.

**Question 3: For NR-DC where the MN is R15 and the SN is R16, do you agree that there is an issue for failure type functionality defined in TS 38.331?**

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| --- | --- | --- |
| **Company name** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | For the UL RRC message *SCGFailureInformation*, the other-r16 was introduced in failureType via a BC way, i.e. it used a spare value. So we do not think there is an ASN.1 compatibility issue (compared with failureType-r15 in TS 36.331). |
| MediaTek | No | Tend to agree with Huawei that there is no real issue. Note that Rel-16 is frozen, we should do functional NBC only if there is real critical bug to fix. |
| Lenovo | See comments | There is still problem based on the current CR, which any value can be selected. Specifically, the R15 MN will include only the R15 failureType in CG-ConfigInfo which was received from the UE. If any value can be set for failuretype-r15, the R16 SN does not know this situation, SN may optimize the parameter based on the received failure indication. |
| CATT | Yes | As rapporteur mentieond ‘and MN will report measurements and a "inappropriate" failure type to SN (because R15 failureType in CG-ConfigInfo is not optional field.’  This is true. It seems a valid issue. |
| Nokia, Nokia Shanghai Bell | No | It's usually best to align LTE and NR but here weagree with Huawei that we had a spare in NR so no problems with comprehension. Therefore, the problem from LTE RRC doesn't exist in NR RRC nothing seems to be needed for NR-DC. |
| NTTDOCOMO | No | For ASN.1, agree no issue for ASN.1 compatibility issue. For UE procedure, The 38.331 CR is for the following subclause, UE selects any value for failureType only in case of (NG)EN-DC (i.e. in SCGFailureInformationNR message), no issue is found for NR-DC.  5.7.3.3 Failure type determination for (NG)EN-DC |
| Ericsson | No with comments | From an ASN.1 syntax point of view, there is no issue. From the functionality point of view, the MN will still forward a “random” failure cause but this may not be a big issue since the measurements may be enough to take same action. |
| QCOM | No | Spare was used |
| ZTE | No for Uu interface; Yes for inter-node operation | There is no ASN.1 syntax error problem for Uu interface, because the code point of “other-r16” was “spare”.  There is issue for inter-node operation when MN forwards failure type to SN, because MN has to send a fake R15 failure type to SN. |
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**Summary:**

**No: 7**

**Yes: 2**

**There are not enough supports on studying issues, so the disucssion is just noted.**

**Question 4: If Yes for Q3, how to solve it?**

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| **Company name** | **Comments on possible solutions and specification impacts** |
| Lenovo | If option 3 or option 4 can agreed, there is no problem in Uu. Namely, the UE set a ‘fake’ failuretype-r15 e.g synchReconfigFailureSCG. After SN receives the ‘fake’ failuretype and there is no reconfigurationwithsync sent by SN, SN will ignore it. |
| CATT | We are not sure.  Maybe the cleanest and most aligned solution is reusing Solution 1-1 in R2-2108679, i.e. adding a new codepoint into the Rel-15 *failureType* field in the *CG-ConfigInfo* structure.  But anyway, other solutions are also feasible, e.g. the MgNB in NR-DC should do the mapping exactly the same as what the UE should do in (NG)EN-DC, the latter of which depends on the answer to Q2. This solution may not have any impact on specs but an agreement captured in the Chairman’s notes should be necessary at least. |
| ZTE | For inter-node operation, we are not sure whether spec change is needed, but as long as we make decision on Q2, MN can follow the same operation.  But on the other hand, if MN can upgrade to support Option1/2/3/4 in INM, MN can also upgrade to support forwarding R16 failure type. |
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**Summary:**

**There are no consensues on the issue, so there are no agreements on solutions.**

### 3 Conclusion

For 38.331 CR, regarding how the UE sets the value for failureType-r15 when the UE includes failureType-v1610, option 2 is selected:

**Option 2: The UE sets “randomAccessProblem” if failureType-v1610 is set as “beamFailureRecoveryFailure”, and the UE sets “any value” for other cases**

36.331 CR and 38.331 CR will be updated correspondingly.

For NR-DC, there are not enough supports on studying issues, so the discussion is just noted.

### 4 References

[1] R2-115e Chair Notes EOM

[2] R2-2109095, [AT115-e][027][NR16] CP Other & LTE (Ericsson), Ericsson

[3] R2-2109174, CR to 36.331 on correcting Rel-15 failure type definition, Huawei, HiSilicon

[4] R2-2109175, CR to 38.331 on correcting Rel-15 failure type definition, Huawei, HiSilicon

[5] R2-2108569, Discussion on compatibility issue and solutions for Rel-15 failure type definition, Huawei, HiSilicon