3GPP TSG-RAN WG3 Meeting #110-e R3-206967

E-meeting, 2 – 12 November, 2020

**Agenda item: 9.3.7.1**

**Source: Ericsson (moderator)**

**Title: CB: # 95\_InsuffUEcapCauseValue**

**Document for: Approval**

# 1 Introduction

This paper provides summary of discussions at RAN#110-e on:

**CB: # 95\_InsuffUEcapCauseValue**

**- clarify usage**

(E/// - moderator)

# 2 For the Chairman’s Notes

[To be completed]

# 3 Discussion

R3-206763 presents the need to add two new cause values, listed as follows:

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| Radio Network Layer cause | Meaning |
| Insufficient UE Capabilities | The procedure can’t proceed due to insufficient UE capabilities. |
| Normal Release | The release is due to normal reasons. |

The first cause value “Insufficient UE Capabilities” is needed for those cases where a UE cannot be served by a node due to the fact that the node capabilities and the UE capabilities are not compatible.

A typical example is the one of EN-DC. We describe this case with an example.

A UE supports Frequency Band 1 for LTE and Frequency Band 2 and 3 for NR.

An MeNB supports Frequency Band 1 and serves the UE on such band. A potential SgNB PSCell supports Frequency Band 4 and 5.

The MeNB attempts to add the SgNB PSCell, but the SgNB will reject the addition because the UE capabilities (support for Band 2 and 3) do not match the PSCell capabilities (support for Band 4 and 5).

Note that the MeNB is not mandated to decode the NR capabilities of the UE and it cannot prevent the failure by avoiding to add the PSCell.

A similar scenario can be built for MR-DC in NG-RAN.

During online discussions it was questioned whether other cause values can be used to correctly express this failure. This option does not seem to exist. In fact, the failure in question would mean that the MeNB should never try to add the same PScell again for the same UE. On the contrary, if for example cause value “No Radio Resources Available” is used for the failure, the MeNB will understand that it is possible to re-try the PSCell addition at a later stage, when radio resource availability will improve.

**Conclusion: the purpose of introducing the “Insufficient UE Capabilities” cause value is that of triggering a behaviour in the receiving node for which it will not be attempted to connect the UE to the cell/node for which the failure occurred.**

**In light of the above companies are invited to provide their view on the introduction of the new cause value “Insufficient UE Capabilities” and if this is not believed needed, how can it be ensured that the node receiving the failure message derives a correct behaviour**

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| Company | Comment |
| Ericsson | In order to ensure a correct node behaviour and avoid re-attempts of the UE connection with the cell for which the failure occurred, we support the introduction of the new cause value. |
| ZTE | Seems unnecessary.UE-EUTRA-Capability-v1510-IEs ::= SEQUENCE { irat-ParametersNR-r15 IRAT-ParametersNR-r15 OPTIONAL, featureSetsEUTRA-r15 FeatureSetsEUTRA-r15 OPTIONAL, pdcp-ParametersNR-r15 PDCP-ParametersNR-r15 OPTIONAL, fdd-Add-UE-EUTRA-Capabilities-v1510 UE-EUTRA-CapabilityAddXDD-Mode-v1510 OPTIONAL, tdd-Add-UE-EUTRA-Capabilities-v1510 UE-EUTRA-CapabilityAddXDD-Mode-v1510 OPTIONAL, nonCriticalExtension UE-EUTRA-Capability-v1520-IEs OPTIONAL}IRAT-ParametersNR-r15 ::= SEQUENCE { en-DC-r15 ENUMERATED {supported} OPTIONAL, eventB2-r15 ENUMERATED {supported} OPTIONAL, supportedBandListEN-DC-r15 SupportedBandListNR-r15 OPTIONAL}From 36.331, the MeNB could be aware of the NR capabilities(for EN-DC case) of the UE. In this case, the MeNB could decide whether the UE capabilities match the PSCell capabilities to prevent the failure by avoiding to add the PSCell. |
| Huawei | Not sure about the benefits. Firstly there are already some specified cause value, like target cell not available, raido resource related and transport resource related cause value, which actually informs the sending side not to repeat the request; secondly, actually there are basic capabilities enabling source eNB to understand if EN-DC operating could be performed or not, then it is up to target gNB to match the UE NR capability to establish SN leg. |
| Nokia | In general, we could agree such cause – but it has to be clarified that ZTE’s consideration above is not correct. |
| Ericsson | Some replies:@ZTE, Huawei: The SupportedBandListNR-r15 is defined as follows:SupportedBandListNR-r15 ::= SEQUENCE (SIZE (1..maxBandsNR-r15)) OF SupportedBandNR-r15Namely, this is a simple list of supported bands. This was introduced because a similar IE was signalled at inter RAT HO between UTRAN and LTE, when UE capabilities were still rather simple. In NR the UE capabilities have expanded dramatically. The NR capabilities of a UE are defined in full in 38.331, in the *UE-NR-Capability* IE. This IE is contained in the *ueCapabilityRAT-Container* IE in 36.331 and an eNB is not supposed to decode it.The *UE-NR-Capability* IE contains a large amount of capabilities that needs to be checked by the SgNB to determine if the UE has sufficient capabilities to be served. As an example, the following capabilities are contained in the *UE-NR-Capability* IE and are not known to the MeNB:UE-NR-Capability-> featureSets-> featureSetsDownlink-> featureSetsDownlinkPerCC -> SEQUENCE { supportedSubcarrierSpacingDL SubcarrierSpacing, supportedBandwidthDL SupportedBandwidth, channelBW-90mhz ENUMERATED {supported} OPTIONAL, maxNumberMIMO-LayersPDSCH MIMO-LayersDL OPTIONAL, supportedModulationOrderDL ModulationOrder OPTIONAL}Without knowing this capability (and many others) the MENB cannot anticipate that a UE has insufficient capabilities to be served at an MeNB. Hence a failure due to Insufficient UE capabilities may occur.@Huawei: the current cause values mentioned point at failure conditions that are temporary. E.g. a radio resource availability issue is temporary and will disappear with time. Hence, the MeNB may retry the addition after a given time, believing that the resource condition has improved. Instead, the failure condition is permanent and it will return again failures if the addition is re-attempted. |
| Verizon | We agree to the cause value. This would likely help resolve any interoperability issue due to NR UE capability mismatch that might come up in multi-vendor scenarios.  |

The Normal Release cause value is already present over the F1AP, as reported below:

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| Normal Release | The action is due to a normal release of the UE (e.g. because of mobility) and does not indicate an error. |

However, this cause value is not present over the Xn and X2 interfaces. In order to be able to communicate over the Xn and X2 that a release is not due to any issue, but due to a normal release condition, it is suggested to introduce the Normal Release cause also in the Xn and X2 protocols.

**In light of the above companies are invited to provide their view on the introduction of the new cause value “Normal Release” over the Xn and X2 interfaces**

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| Company | Comment |
| Ericsson | We support the introduction of this cause value  |
| ZTE | No Strong view, just wonder whether the cause value”Unspecified” has similar function. |
| Huawei | Not sure if we have to align Xn with F1. For F1, this normal release may refer to the cause of an SN release, but for Xn, we have a dedicated procedure to indicate the release of SN, from the name of procedure we know that this is a normal operation. |
| Nokia | We are more sceptical about this Cause: what actually “normal release” means? So far, the principle kept since Rel.15 (and even more for earlier forms of DC) is that there is always some reason for a release. If the sender can’t provide it (internal error?), then the “unspecified” is indeed used. Please consider, that “normal” is very ambiguous: practically any controlled release is “normal”, even if the underlying cause is e.g. overload or no traffic. So, we would prefer to avoid creating such ambiguities like this. |
| Ericsson | Answers below:@ZTE: cause value unspecified is already used to cover all the cases not covered by the existing cause values. We think the normal release should be captured via a dedicated caue as done over F1@Huawei: the SN release procedure may be due to many reasons, for example it may be due to insufficient radio resources, for RRM purposes, for transport resources shortage. Hence it is not possible to deduce that the release is “normal”, i.e. due to normal operation, from the procedure that is run@Nokia: We have reused the cause value definition in F1, but we can find a better formulation if this helps. All we want to achieve is that we are not forced to use a cause value pointing at reasons that are not the ones triggering the release. The cause value unspecified is already used by implementations to cover many other cases not covered by the current cause value range. |
| Verizon | Would like to align F1/X2/Xn interfaces w.r.t Normal cause value. At the same time, the meaning of “Normal” should be better clarified.  |

# 4 Conclusion, Recommendations [if needed]

If needed