3GPP TSG-RAN WG2 #105 Tdoc R2-19xxxxx

Athens, Greece, 25th February – 1st March 2019

Agenda Item: x.x.x

Source: Ericsson

Title: Email discussion summary [104#64][NR] Running 38.331 CR for Late drop (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document reports the following e-mail discussion:

[104#64][NR] Running 38.331 CR for Late drop (Ericsson)

To progress running CR with further Late drop details on e.g. bearer handling, measurements, SCG failure, SCG resource release, INM, UE capabilities etc. Identify and try to progress any smaller issues raised.

      Rapporteur provides baseline document based on Dec 2018 version, RAN2#104 agreements and selected Tdocs submitted to RAN2#104.

      Kick-off:  Monday 2019-01-07

      Outcome: Agreeable CR

      Deadline:  Thursday 2018-02-07

# 2 MR-DC Issues

This section lists issues that may require further discussion before capturing in the running CR. The listed issues are either extracted from the previous e-mail discussion on the running CR for 38.331 Late drop [1], or related to TDocs submitted to RAN2#104.

## 2.1 Entering MR-DC at resume

From previous e-mail discussion on the running CR for 38.331 Late drop [1], the following FFS was captured:

**FFS: Whether it is supported to configure *secondaryCellGroup* at Resume.**

It is still open whether it should be possible to configure an NR or EUTRA SCG at resume. If this behavior is enabled, it will be possible to configure an SCG blindly already in MSG 4. The only expected impact on RRC is the addition of *secondaryCellGroup* IE in *RRCResume* message, along with the according procedures, upon resuming, to handle the added IE.

An example of the changes required to support this behavior are captured in Annex A , based on our previous submitted CR [3]. It can be seen that supporting this would have a small impact to the specification.

**Question 1: Should it be possible for the network to setup SCG upon resuming?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No?** | **Comments** |
| **Huawei, HiSilicon** | No | Assuming that in Rel-15 we don't support early measurements and we stick to the existing resume failure procedure (re-establishment), there is no use to support SCG setup at resume in Rel-15. |
| **MediaTek** | No | We prefer not to introduce new feature in R15 unless it is essential for MR-DC operation. The SCG addition upon resume could only be a blind addition (i.e. no measurement result available), so we think this may not be so useful. Although the change of SPEC is not huge, it may introduce lots effort in UE implementation. We suggest to discuss this feature in R16 in DC/CA enhancement work item. |
| **DOCOMO** | No | We also prefer to address this FFS in Rel-16 eCA/DC WI. |
| **LG** | No | We prefer to treat this functionality in Rel-16 eCA/DC |
| **CATT** | No | In RAN2 103bis meeting, we agreed: “A UE releases its lower-layer SCG configuration in RRC\_INACTIVE” and” RAN2 understand that discussion on keeping the lower layer SCG configuration in Inactive would fit within the existing scope of the DC/CA enhancements WI”. We stick to the agreements and discuss it in the DC/CA enhancement WI in R16. |
| **Ericsson** | Yes | We prefer to include the functionality in Rel-15, e.g. in case of frequent intermittent transitions between RRC\_CONNECTED and RRC\_INACTIVE, where postponing the SCG configuration would introduce delays and impact the performance.  However, for the sake of completing the delayed late drop before RAN#83, we are fine with pushing this to Rel-16 eCA/DC WI. |
| **vivo** | No | We already agreed that this should be reconsidered in Rel-16 work frame. We do not see any how to support SCG set up upon resuming without early measurement. |
| **Apple** | No | It’s an enhancement, and we can discuss it in R16 DC/CA enhancement WI. |

Rapporteur summary: 7 companies prefer to not enable SCG setup upon resuming; 1 company would prefer this behavior enabled for Rel-15.

1. **SCG setup upon resuming is not enabled in Rel-15.**

## 2.2 SCG release

From previous e-mail discussion on the running CR for 38.331 Late drop [1], the following FFS was captured:

**FFS: UE actions upon SCG release for NR-DC and NE-DC.**

Therefore, it should be discussed how to cover the signaling needed to perform release actions. Another related aspect is when the UE should release the SCG configuration in suspend/resume operation, e.g. upon receiving *RRCRelease* message including *suspendConfig* field or upon receiving *RRCResume* message.

### 2.2.1 RRC signalling for SCG release

As detailed in Annex B, in EN-DC, it is possible to release the entire NR SCG configurations by setting the *nr-Config* IE to release which will trigger the release of all configurations and resources associated with the SN and SCG. A similar behavior should be introduced for MR-DC with 5GC, since it has been agreed that control plane architecture for MR-DC with 5GC is based on EN-DC. Two options to introduce this behavior are discussed below.

**Option 1: For NR-DC and NE-DC, include in *RRCReconfiguration* message a SetupRelease structure for SCG configuration, which contains a release and add field.**

In NR-DC and NE-DC, to trigger the release of the SCG, a new indication needs to be signaled in e.g. the *RRCReconfiguration* message. As noted, in EN-DC, there are two separate indications for: release of the NR SCG configuration; and for the release and add of EN-DC. This could thus be a signaling option for NR-DC and NE-DC, which was captured for NE-DC in [4], and an example is added below, based on [4], but expanded for NR-DC as well.

*RRCReconfiguration message*

-- ASN1START

-- TAG-RRCRECONFIGURATION-START

RRCReconfiguration ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcReconfiguration RRCReconfiguration-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCReconfiguration-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

secondaryCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

measConfig MeasConfig OPTIONAL, -- Need M

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCReconfiguration-v1530-IEs OPTIONAL

}

RRCReconfiguration-v1530-IEs ::= SEQUENCE {

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

fullConfig ENUMERATED {true} OPTIONAL, -- Cond FullConfig

dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message OPTIONAL, -- Cond nonHO

masterKeyUpdate MasterKeyUpdate OPTIONAL, -- Cond MasterKeyChange

dedicatedSIB1-Delivery OCTET STRING (CONTAINING SIB1) OPTIONAL, -- Need N

dedicatedSystemInformationDelivery OCTET STRING (CONTAINING SystemInformation) OPTIONAL, -- Need N

otherConfig OtherConfig OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v1540-IEs OPTIONAL

}

RRCReconfiguration-v1540-IEs ::= SEQUENCE {

otherConfig-v1540 OtherConfig-v1540 OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v15xy-IEs OPTIONAL

}

RRCReconfiguration-v15xy-IEs ::= SEQUENCE {

mrdc-SecondaryCellGroupConfig SetupRelease { MRDC-SecondaryCellGroupConfig } OPTIONAL, -- Need M

nonCriticalExtension SEQUENCE {}

OPTIONAL

}

MRDC-SecondaryCellGroupConfig ::= SEQUENCE {

mrdc-ReleaseAndAdd-r15 ENUMERATED {true},

OPTIONAL, -- Cond SCG

mrdc-SecondaryCellGroup CHOICE {

nr-SCG OCTET STRING,

eutra-SCG OCTET STRING

} OPTIONAL, -- Need M

}

MasterKeyUpdate ::= SEQUENCE {

keySetChangeIndicator BOOLEAN,

nextHopChainingCount NextHopChainingCount,

nas-Container OCTET STRING OPTIONAL, -- Cond securityNASC

...

}

-- TAG-RRCRECONFIGURATION-STOP

-- ASN1STOP

|  |
| --- |
| ***RRCReconfiguration-IEs field descriptions*** |
| ***mrdc-ReleaseAndAdd-r15***  A one-shot field indicating whether the UE releases the stored SCG related configuration (e.g. *secondaryCellGroup*, *eutra-SecondaryCellGroup*, SRB3 and SCG *measConfig*). |

|  |  |
| --- | --- |
| **Conditional Presence** | **Explanation** |
| *SCG* | For NR-DC and NE-DC, the field is optionally present, need N. It is not present otherwise. |

**Option 2: For NR-DC and NE-DC, include in *RRCReconfiguration* message independent fields for SCG release and SCG configuration.**

However, the UE behavior upon reception of these two indications are identical and there seems to be no need to introduce this redundancy in NR for release of MR-DC. It would be sufficient to add a field to enable the release of SCG while having a separate field for SCG configuration, as in the example below, which is based on [5] and uses the same structure as the late drop running CR [2]. In this manner, whenever release and add operation would be needed, an *RRCReconfiguration* message can include both *mrdc-SecondaryCellGroup* field and *mrdc-Release* field set to true.

*RRCReconfiguration message*

-- ASN1START

-- TAG-RRCRECONFIGURATION-START

RRCReconfiguration ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcReconfiguration RRCReconfiguration-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCReconfiguration-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

secondaryCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

measConfig MeasConfig OPTIONAL, -- Need M

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCReconfiguration-v1530-IEs OPTIONAL

}

RRCReconfiguration-v1530-IEs ::= SEQUENCE {

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

fullConfig ENUMERATED {true} OPTIONAL, -- Cond FullConfig

dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message OPTIONAL, -- Cond nonHO

masterKeyUpdate MasterKeyUpdate OPTIONAL, -- Cond MasterKeyChange

dedicatedSIB1-Delivery OCTET STRING (CONTAINING SIB1) OPTIONAL, -- Need N

dedicatedSystemInformationDelivery OCTET STRING (CONTAINING SystemInformation) OPTIONAL, -- Need N

otherConfig OtherConfig OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v1540-IEs OPTIONAL

}

RRCReconfiguration-v1540-IEs ::= SEQUENCE {

otherConfig-v1540 OtherConfig-v1540 OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v15xy-IEs OPTIONAL

}

RRCReconfiguration-v15xy-IEs ::= SEQUENCE {

en-dc

mrdc-Release ENUMERATED {true} OPTIONAL, -- Cond SCG

mrdc-SecondaryCellGroup CHOICE {

nr-SCG OCTET STRING,

eutra-SCG OCTET STRING

}

OPTIONAL, -- Need M

nonCriticalExtension SEQUENCE {}

OPTIONAL

}

MasterKeyUpdate ::= SEQUENCE {

keySetChangeIndicator BOOLEAN,

nextHopChainingCount NextHopChainingCount,

nas-Container OCTET STRING OPTIONAL, -- Cond securityNASC

...

}

-- TAG-RRCRECONFIGURATION-STOP

-- ASN1STOP

|  |
| --- |
| ***RRCReconfiguration-IEs field descriptions*** |
| ***mrdc-Release***  A one-shot field indicating whether the UE releases the stored SCG related configuration (e.g. *secondaryCellGroup*, *eutra-SecondaryCellGroup*, SRB3 and SCG *measConfig*). |

|  |  |
| --- | --- |
| **Conditional Presence** | **Explanation** |
| *SCG* | For NR-DC and NE-DC, the field is optionally present, need N. It is not present otherwise. |

**Option 2a: Include separate fields for NR-DC and NE-DC (for configuration and release).**

*RRCReconfiguration message*

-- ASN1START

-- TAG-RRCRECONFIGURATION-START

RRCReconfiguration ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcReconfiguration RRCReconfiguration-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCReconfiguration-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

secondaryCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

measConfig MeasConfig OPTIONAL, -- Need M

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCReconfiguration-v1530-IEs OPTIONAL

}

RRCReconfiguration-v1530-IEs ::= SEQUENCE {

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

fullConfig ENUMERATED {true} OPTIONAL, -- Cond FullConfig

dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message OPTIONAL, -- Cond nonHO

masterKeyUpdate MasterKeyUpdate OPTIONAL, -- Cond MasterKeyChange

dedicatedSIB1-Delivery OCTET STRING (CONTAINING SIB1) OPTIONAL, -- Need N

dedicatedSystemInformationDelivery OCTET STRING (CONTAINING SystemInformation) OPTIONAL, -- Need N

otherConfig OtherConfig OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v1540-IEs OPTIONAL

}

RRCReconfiguration-v1540-IEs ::= SEQUENCE {

otherConfig-v1540 OtherConfig-v1540 OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v15xy-IEs OPTIONAL

}

RRCReconfiguration-v15xy-IEs ::= SEQUENCE {

... nr-SCG OCTET STRING OPTIONAL, - Cond MCG

nr-SCG-Release ENUMERATED { release } OPTIONAL, -- Cond MCG

...eutraSCG OCTET STRING OPTIONAL, - Cond MCG

eutra-SCG-Release ENUMERATED { release } OPTIONAL, -- Cond MCG

}

MasterKeyUpdate ::= SEQUENCE {

keySetChangeIndicator BOOLEAN,

nextHopChainingCount NextHopChainingCount,

nas-Container OCTET STRING OPTIONAL, -- Cond securityNASC

...

}

-- TAG-RRCRECONFIGURATION-STOP

-- ASN1STOP

|  |
| --- |
| ***RRCReconfiguration-IEs field descriptions*** |
| ***eutra-SCG***  Contains an *RRCConnectionReconfiguration* message to create or modify the E-UTRA SCG configuration. |
| ***eutra-SCG-Release***  Indicates the UE to release the E-UTRA SCG configuration resulting from *RRCConnectionReconfiguration* messages, as specified in TS 36.331 [10], previously received in the *eutraSCG*. |
| ***nr-SCG***  Contains an *RRCReconfiguration* message to create or modify the NR SCG configuration (including CellGroupConfig with cellGroupId 1 and possibly an associated MeasConfig). |
| ***nr-SCG-Release***  Indicates the UE to release the NR SCG configuration (i.e. CellGroupConfig and MeasConfig) resulting from *RRCReconfiguration* messages previously received on SRB3 and within *nr-SCG* on SRB1. |

|  |  |
| --- | --- |
| **Conditional Presence** | **Explanation** |
| *MCG* | The field is optionally present need N in an *RRCReconfiguration* message transmitted on SRB1, it is absent in the *nr-SCG* of an *RRCReconfiguration* message transmitted on SRB1 and in an *RRCReconfiguration* message transmitted on SRB3. |

**Option 2b: For NR-DC and NE-DC, use ToAddModList/ToAddReleaseList.**

*RRCReconfiguration message*

-- ASN1START

-- TAG-RRCRECONFIGURATION-START

RRCReconfiguration ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcReconfiguration RRCReconfiguration-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCReconfiguration-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

secondaryCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

measConfig MeasConfig OPTIONAL, -- Need M

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCReconfiguration-v1530-IEs OPTIONAL

}

RRCReconfiguration-v1530-IEs ::= SEQUENCE {

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

fullConfig ENUMERATED {true} OPTIONAL, -- Cond FullConfig

dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message OPTIONAL, -- Cond nonHO

masterKeyUpdate MasterKeyUpdate OPTIONAL, -- Cond MasterKeyChange

dedicatedSIB1-Delivery OCTET STRING (CONTAINING SIB1) OPTIONAL, -- Need N

dedicatedSystemInformationDelivery OCTET STRING (CONTAINING SystemInformation) OPTIONAL, -- Need N

otherConfig OtherConfig OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v1540-IEs OPTIONAL

}

RRCReconfiguration-v1540-IEs ::= SEQUENCE {

otherConfig-v1540 OtherConfig-v1540 OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v15xy-IEs OPTIONAL

}

RRCReconfiguration-v15xy-IEs ::= SEQUENCE {

... scg-ToAddModList SEQUENCE (SIZE (1..maxNR-SCG) OF SCG OPTIONAL, - Cond MCG

scg-ToReleaseList SEQUENCE (SIZE (1..maxNR-SCG) OR SCG-Id

OPTIONAL, -- Cond MCG

}

maxNrOfSCG INTEGER ::= 1

MasterKeyUpdate ::= SEQUENCE {

keySetChangeIndicator BOOLEAN,

nextHopChainingCount NextHopChainingCount,

nas-Container OCTET STRING OPTIONAL, -- Cond securityNASC

...

}

-- TAG-RRCRECONFIGURATION-STOP

-- ASN1STOP

|  |
| --- |
| ***RRCReconfiguration-IEs field descriptions*** |
| ***scg-ToAddModList***  E-UTRA or NR SCG(s) to be (re)configured. In this release, the network only configures one SCG (E-UTRA or NR). |

#### – *SCG*

The IE SCG is used to configure an NR or an E-UTRA Secondary Cell Group (SCG).

*SCG information element*

-- ASN1START

-- TAG-SCG-START

EUTRA-SCG ::= SEQUENCE {

scg-Id EUTRA-SCG-ID,

scg-Configuration CHOICE {

eutra-SCG OCTET STRING

nr-SCG OCTET STRING

}

}

-- TAG-SCG-RESOURCE-STOP

-- ASN1STOP

|  |
| --- |
| ***SCG field descriptions*** |
| ***eutra-SCG***  *RRCConnectionReconfiguration* message as specified in TS 36.331 [10] used to configure an EUTRA SCG, when a SCG with this *scg-Id* is not already configured or is released, or to reconfigure the E-UTRA SCG with this *scg-Id*. |
| ***nr-SCG***  *RRCReconfiguration* message to configure an NR SCG (i.e. including *CellGroupConfig* with cellGroupConfig 1 and possibly an associated *MeasConfig*), when an NR with this *scg-Id* is not already configured or is released, or to reconfigure the NR SCG with this *scg-Id*. |

#### – *SCG-Id*

The IE *SCG-Id* is used to identify an SCG (NR or E-UTRA). In this release, the *SCG-Id* is always 1.

*SCG-Id information element*

-- ASN1START

-- TAG-EUTRA-SCG-ID-START

SCG-ID ::= INTEGER (1..maxNrOfSCG)

-- TAG-EUTRA-SCG-ID-RESOURCE-STOP

-- ASN1STOP

**Question 2: Which option is preferred by companies?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1/2** | **Comments** |
| **Huawei, HiSilicon** | See comments | In the *RRCReconfiguration* message, it is possible to include *CellGroupConfig* in *masterCellGroup* and in *secondaryCellGroup*, MCG is identified by *cellGroupId* 0 (for SA)and SCG by *cellGroupId* 1 (for SCG).  For NR-DC, release is important but maybe we should first confirm the full picture on setup and reconfiguration e.g.  - that *CellGroupConfig* is always configured for a SCG while *MeasConfig* may or may not be configured  - whether *secondaryCellGroupConfig* in the *RRCReconfiguration* message transmitted on SRB1 (i.e. not in *nr-SCG*) can be used to establish or reconfigure the SCG  - whether *masterCellGroupConfig* or *secondaryCellGroupConfig* in the *RRCReconfiguration* message in *nr-SCG* is used to (re)configure the SCG  - on SRB3, whether *masterCellGroupConfig* or *secondaryCellGroupConfig* is used to reconfigure the SCG, in the *RRCReconfiguration* message transmitted on SRB3 or in the *nr-SCG*  On the options for release: options 1 and 2 are probably feasible, but there could also be alternatives, e.g. 2a which is like 2 but with separate fields for NR-DC and NE-DC, or 2b which results in exactly the same ASN.1 encoding like 2 but is modelled as ToAddModList/ToReleaseList (list has a single element and SCG-Id is not encoded since it has a single value).  On the "MCG" condition in options 1/2: we suggest a description as in options 2a or 2b. |
| **MediaTek** | 2 | On the SCG release part, it seems no functional different between option 1 and option 2. We slightly prefer option 2 as it is simpler in ASN.1 define. The option 2a and 2b provided by Huawei seems imply that there will be multiple SCG and complicate the ASN.1. We think original option 2 is fine for R15. Even if RAN2 want to have multiple SCG in the future, we can still have extension later.  On the SCG setup part, we agree with Huawei that further discussion is required. |
| **DOCOMO** | 1/2 | We have no strong preference on option 1 or option2. Option2 seems slightly simpler in terms of the bit size of the message. |
| **LG** | 2 | We prefer option2. SetupRelease, used to *either* setup or release, seems not in line with the case where both release and setup are done in a single message. |
| **CATT** | 2b | We appreciate Huawei’s proposal of Option 2b. This option is more future proof while it costs only a few more bits. It prevents listing many “CellGroupConfig” or similar IEs again and again in the *RRCReconfiguration* message if we decide to support multiple SN connectivity one day.  In addition, we propose a few simplification for Option 2b: In the current version of TS 38.331, there is already an IE namely “CellGroupId”:  CellGroupId ::=                             INTEGER (0.. maxSecondaryCellGroups)  It seems feasible to reuse this IE directly as the identity of one “SCG”. And thus it is not necessary to define the new IE “EUTRA-SCG-ID” and the relevant value “maxNR-SCG”. The IE structures would look like the following:  RRCReconfiguration-v15xy-IEs ::=            SEQUENCE {      scg-ToAddModList                        SEQUENCE (SIZE (1.. maxSecondaryCellGroups) OF SCG                     OPTIONAL, -- Cond MCG      scg-ToReleaseList                       SEQUENCE (SIZE (1.. maxSecondaryCellGroups) OF CellGroupId             OPTIONAL, -- Cond MCG      nonCriticalExtension                    SEQUENCE {}                                                            OPTIONAL  }  SCG ::=                                     SEQUENCE {      cellGroupId                             CellGroupId,      scg-Configuration                       CHOICE {          eutra-SCG                           OCTET STRING          nr-SCG                              OCTET STRING      }  } |
| **ERICSSON** | 2 | Agree with MediaTek that there is no functional difference between Option 1 and Option 2, also with preference for option 2, since there would be no need to introduce multiple fields for the same release behavior.  We disagree with Option 2a, to introduce a separate field to release NE-DC, there is no need since the UE will not be configured with NR-DC and NE-DC at the same time so the same field can be used. The proposed change by Huawei to the condition of *nr-SCG* is ok.  Regarding Option 2b, we agree with MediaTek that this seems to suggest more than one SCG, which should not be treated for Rel-15. |
| **vivo** | 2 | We also do not see major difference between these two options. But as including independent fields in *RRCReconfiguration* message can achieve both SCG release and SCG configuration, we prefer option 2. |
| **Apple** | 2 | We are fine with either option1 or option 2, and agree option2 is simpler. |

Rapporteur summary: 6 companies prefer option 2 (among the 6 companies most of them could also agree on option 1, but stated a slightly preference for option 2); 1 company further proposed options 2a and 2b; 1 company supported option 2b.

1. For NR-DC and NE-DC, include in *RRCReconfiguration* message independent fields for SCG release and SCG configuration.

### 2.2.2 When does UE release the SCG configuration at suspend/resume?

In RAN2#103bis, the following was agreed:

Agreements

1: For NE-DC, NGEN-DC, and NR-DC, the UE stores the PDCP/SDAP configuration when moving to INACTIVE. When resuming, the UE applies the stored PDCP/SDAP configuration as in NR SA/LTE.

2 A UE releases its lower-layer SCG configuration in RRC\_INACTIVE

However, it is not clear when the SCG release is performed concerning transitions to/from RRC\_INACTIVE, e.g. upon receiving *RRCRelease* message including *suspendConfig* field or upon receiving *RRCResume* message.

For NG-EN-DC, in TS 36.331, the UE releases the SCG configuration upon initiating the procedure for resuming the RRC connection. But a more forward compatible mechanism, to enable the possibility to introduce the resume of a suspended SCG configuration in future releases, would be to perform release operations upon receiving an *RRCResume* message.

**Question 3: Do companies agree that the UE should perform SCG release upon receiving *RRCResume* message?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1/2** | **Comments** |
| **Huawei, HiSilicon** |  | No strong preference. Even if a Rel-15 UE would release the SCG upon receiving RRCRelease, it would be possible to specify that a Rel-16 UE doesn't and introduce resume of a suspended SCG configuration. |
| **MediaTek** | No | We prefer to follow the same model as in 36.331 to have consistent behavior for MR-DC. As for the forward compatibility, we think there should be a UE capability if we want to support “resume of a suspended SCG configuration” in the future. There could be new if-else condition based on the capability bit. So, we think it is fine to releases the SCG configuration upon initiating the procedure for resuming the RRC connection. |
| **DOCOMO** |  | We also prefer to have consistency with behavior in 36.331, i.e. UE releases the SCG configuration upon initiating the procedure for resuming the RRC connection. |
| **LG** | No | We prefer to have a consistent behavior, .i.e. to release lower layer SCG configuration upon initiating resume procedure. |
| **CATT** |  | No strong view. Even if a Rel-15 UE and a Rel-16 UE have different actions on SCG configuration, the modification does not lead to a forward compatible problem. Hence we are ok with 36.331 approach. |
| **ERICSSON** |  | We think it could be cleaner to perform SCG release upon receiving RRCResume message, considering the possibility to introduce the resume of a suspended SCG configuration in Rel-16. But we are also fine to align the procedures with 36.331 for Rel-15, i.e. the UE releases the SCG configurations upon initiating the Resume procedure. |
| **vivo** | No | We prefer to follow the same behavior of just releasing the low layer configuration as for Rel-15. The release of the whole SCG should be upon RRCRelease message. |
| **Apple** | No | We prefer to follow same model as 36.331. |

Rapporteur summary: 6 companies could agree that the UE should perform SCG release upon initiating resume request, as captured in 36.331 (among the 6 companies, 1 had a preference for SCG release upon receiving *RRCResume* message, but stated that it could also agree on having it upon initiating resume request); 2 companies have no strong preference whether to perform SCG release upon initiating resume request or upon receiving *RRCResume* message.

1. The release of SCG lower layer configuration is performed upon initiating a resume request.

## 2.3 Measurements

In the following table we list the discussed TDocs and agreements made in last RAN2#104 meeting with the remaining open issues to be addressed in this email discussion.

|  |  |
| --- | --- |
| **TDoc** | **Agreement from RAN2#104** |
| R2-1818399 | 1. The L2 handling options for bearer type change with key change should apply also for NE-DC, NGEN-DC and NR-DC. 2. UE is able to determine upon reception of measurement configuration whether the configuration is for MCG or SCG. FFS: How to capture this in 38.331. 3. ULInformationTransferMR-DC is introduced in 38.331 to carry SCG measurement reports. 4. The FFS in 5.7.3.3 can be removed: Editor's Note: FFS / TODO: Either use this section also for NR-DC or change section title (add "for EN-DC"). |
| R2-1817589 | 1. MN and SN can each provide independent measurement configurations (separate measurement ID, meas object IDs, report config ID space for MN and SN) 2. UE sends measurement report to SRB3 if the measurement configuration was received on SRB3 or within he SN container from, otherwise it sends on SRB1. |
| R2-1818300 | For NE-DC,   1. The UE can report LTE serving cell measurements for reports triggered by Bx events configured by the MN and related to LTE measurements. 2. The LTE serving cell measurements included for reported triggered by Bx events configured by the MN include both PSCell and SCell. 3. UE sends available LTE serving cell measurements in measurement reports triggered by NR A3, 4 and 5 events configured by the MN only . Available measurements are always provided (not configurable) 4. UE sends available LTE best neighbour cell measurements for serving frequencies (in addition to NR best neighbour cell measurements) in measurement reports triggered by NR A3, 4 and 5 events only. (configurable and controlled by the NR configuration for best neighbour reporting). 5. The UE includes ARFCN and PCI of the LTE serving cells to identify the LTE serving cell measurements. SCellIndex is not used for this purpose.   For NR-DC,   1. UE sends available SCG serving cell measurements in MCG measurement reports triggered with A3, 4 and 5 events. Available measurements are always provided (not configurable) 2. UE sends available SCG best neighbour cell measurements in the serving frequencies in MCG measurement reports triggered with NR A3, 4 and 5 events. (configurable and controlled by MCG configuration for best neighbour reporting). 3. The UE includes ARFCN and PCI of the SCG serving cells to identify the SCG serving cell measurements. SCellIndex is not used for this purpose. |
| R2-1816569 | For SFTD measurement for option 4 (NE-DC):   1. PCell can configure SFTD to perform on PSCell 2. At most one measID can be configured for one-shot SFTD reporting. 3. MN can forward SFTD reporting to SN via SCG-ConfigInfo |
| R2-1816570 | 1. SFTD/SSTD measurement of NR-DC is postponed to Rel16 because only synchronous NR-DC is considered in Rel15 late drop |

The agreements listed above should be straightforward to capture in the late drop running CR that will be provided. However, companies are also encouraged to list other issues, if any, in section 2.7, including measurements.

Concerning also the table above, the only listed remaining issue regarding measurement is how to capture in the specification the fact that, in NR-DC, the UE is able to determine, upon the reception of the measurement configuration, whether this configuration is referring to the MCG or SCG. In the last RAN2#104 meeting, this issue was addressed in [6] and [7]. Basically, two main solutions where proposed.

**Solution 1: Limit the measID values that the MN and SN can pick when configuring measurements in order to avoid any overlap. This solution required changes in the ASN.1 and the procedural text [6].**

**Solution 2: Clarify in the procedural text that when receiving the measurement configuration by the MN and SN (i.e., that can configure the measurements independently), the UE maintains two independent VarMeasConfig and VarMeasReportList variables, one associated with each measConfig received [7].**

At the end, it was agreed that UE is able to determine upon reception of measurement configuration whether the configuration is for MCG or SCG. In order to address the remaining FFS on how to capture this agreement in 38.331, we believe two main aspects need to be addressed. The first one is related to the measurement’s configuration, and the other one is related to the measurement reporting. Our proposal would be to clarify these aspects in the procedural text without impacting the ASN.1. For this reason, we believe that Solution 2 listed above may be enough to clarify that, in NR-DC, the UE upon receiving the measConfig from the MN and SN maintains independent UE variable for each of the measurement configuration received - an example of the possible implementation is given in Annex C. Therefore, we kindly ask companies to answer the following question:

**Question 4: Do companies agree that, in NR-DC, when receiving the measurement configuration by the MN and SN (i.e., that both can configure independent measurements), the UE maintains two independent *VarMeasConfig* and *VarMeasReportList* variables, one associated with each *measConfig* received?**

If the answer is no, please provide a motivation or an alternative solution about how to clarify such aspect.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, HiSilicon** | Yes | We think this is implied by agreement 1 for R2-1817589.  Besides, we need to specify that the UE has a *MeasConfig* associated with CG#0, which is (re)configured via *measConfig* in the RRCReconfiguration message transmitted on SRB1 and a *MeasConfig* associated with CG#1, which is (re)configured via *measConfig* in the *RRCReconfiguration* message in *nr-SCG* and in the *RRCReconfiguration* message on SRB3. |
| **MediaTek** | Yes | We also agree that additional clarification is required as pointed by Huawei. |
| **DOCOMO** | Yes | Agree with Huawei’s view. |
| **LG** | Yes | Clarification to associate each *MeasConfig* to corresponding is beneficial. |
| **CATT** | Yes | Agree with Huawei and MediaTek |
| **ERICSSON** | Yes | We agree with Huawei’s additional clarification |
| **vivo** | Yes | Agree with MediaTek |
| **Apple** | Yes | Agree with Huawei. |

Rapporteur summary: All companies agree that in NR-DC, the UE maintains two independent *VarMeasConfig* and *VarMeasReportList* variables, one associated with each *measConfig* received.

1. In NR-DC, when receiving the measurement configuration by the MN and SN (i.e., that both can configure independent measurements), the UE maintains two independent VarMeasConfig and VarMeasReportList variables, one associated with each measConfig received.

## 2.4 SCG Failure

The handling of SCG failure for MR-DC was not addressed so far due to limited time availability. In the last RAN2#104 meeting, contributions have been submitted by companies with proposal about how to handle this issue [8], [9], [10], [11], [12].

According to what has been submitted and considering the limited amount of time left to conclude the standardization of the late drop options, we believe that a straightforward solution would be to handle the failure over the SCG according to the same framework we are currently using in EN-DC. This is also reflected on submitted CRs for this issue, which have all a similar principle. Therefore, we kindly ask companies to answer the following question:

**Question 5: Do companies agree that the SCG failure handling for NGEN-DC, NE-DC, and NR-DC follow the same framework of EN-DC?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, HiSilicon** | Yes |  |
| **MediaTek** | Yes |  |
| **DOCOMO** | Yes |  |
| **LG** | Yes |  |
| **CATT** | Yes |  |
| **Ericsson** | Yes |  |
| **vivo** | Yes |  |
| **Apple** | Yes |  |

Rapporteur summary: All companies agree that a similar SCG failure handling as in EN-DC can be adopted for NGEN-DC, NE-DC and NR-DC.

1. SCG failure handling for NGEN-DC, NE-DC, and NR-DC follow the same framework of EN-DC.

## 2.5 Overheating

From the TDoc [13] submitted to RAN2#104 meeting, the following FFS can be identified:

**FFS: Whether overheating mechanism is also applicable for NE-DC, NR-DC.**

When configured to provide overheating report, if the UE is configured in MR-DC as well, it generates ambiguity when sending this report. For instance, it is unclear whether an indicated reduced number of CCs applies to carriers from both MCG and SCG or MCG only.

**Question 6: Should overheating mechanism be applicable also for NE-DC and NR-DC?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No?** | **Comments** |
| **Huawei, HiSilicon** | Yes |  |
| **MediaTek** | Yes | RAN2 agrees to support overheating mechanism in NR SA. Compare to NR SA, the possibility of overheating is higher in NE-DC and NR-DC due to the increasing of data rate and number of CC. So, It is reasonable to support overheating in NE-DC and NR-DC. |
| **DOCOMO** | Yes | Similar view with MediaTek that it is reasonable to support overheating mechanism for NE-DC and NR-DC |
| **LG** | Yes |  |
| **CATT** | No | Considering the limited time on late drop, we prefer to discuss overheating mechanism of NE-DC and NR-DC in R16. |
| **Ericsson** | Yes | No strong view, but the overheating extension to cover NE-DC and NR-DC could be easily captured, as in the provided example in Annex D. |
| **vivo** | Yes | Agree with MediaTek to have support of overheating mechanism in NE-DC and NR-DC |
| **Apple** | Yes | Agree with MediaTek that overheating problem is more serious in NE-DC and NR-DC. We should extend the current overheating mechanism to cover NE-DC and NR-DC. |

Rapporteur summary: 7 companies agree that overheating mechanism can be applicable also for NE-DC and NR-DC; 1 company would prefer to discuss this topic for Rel-16.

1. Overheating mechanism is applicable for NE-DC and NR-DC.

If the answer to Question 6 is yes, the next step would be to define which parameters from overheating report are also applicable to NE-DC and NR-DC. For EN-DC, overheating was extended by adding the following highlighted text (in yellow) to *reducedCCsDL* and *reducedCCsUL* field description in TS 36.331:

|  |
| --- |
| ***reducedCCsDL***  Indicates the UE’s preference on reduced configuration corresponding to the maximum number of downlink SCells indicated by the field, to address overheating. This maximum number includes both Scells of E-UTRA and PSCell/Scells of NR in EN-DC. |
| ***reducedCCsUL***  Indicates the UE’s preference on reduced configuration corresponding to the maximum number of uplink Scells indicated by the field, to address overheating. This maximum number includes both Scells of E-UTRA and PSCell/Scells of NR in EN-DC. |

For NR SA, following parameters may be used in overheating report:

* *reducedBW-FR1-DL*
* *reducedBW-FR1-UL*
* *reducedBW-FR2-DL*
* *reducedBW-FR2-UL*
* *reducedCCsDL*
* *reducedCCsUL*
* *reducedMIMO-LayersFR1-DL*
* *reducedMIMO-LayersFR1-UL*
* *reducedMIMO-LayersFR2-DL*
* *reducedMIMO-LayersFR2-UL*

A possible way forward of how the field descriptions of those parameters above could be extended to include NE-DC and NR-DC is provided in Annex E.

**Question 7: Can the field description of overheating parameters be updated, as in Annex D, to include overheating behavior for NE-DC and NR-DC?** **Please add possible comments/update proposals to the Annex D in the comment field below.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, HiSilicon** | Yes | The text in Annex D looks fine. |
| **MediaTek** | Yes | The proposed change in Annex D follows the same principle as in EN-DC. We think this is simple and reasonable. |
| **DOCOMO** | Yes | Annex D looks fine |
| **LG** | Yes | Annex D looks fine |
| **Ericsson** | Yes |  |
| **vivo** | Yes | Annex D looks ok. |
| **Apple** | Yes | We are fine with the text in Annex D. |

Rapporteur summary: All companies (that responded Yes to question 6) agree to capture overheating mechanism for NE-DC and NR-DC as in Annex D; this question 7 was not applicable to companies that responded No to question 6; however, if proposal 6 can be agreed, a further proposal to be made would be to adopt the behavior provided in Annex D, which is basically similar to (NG)EN-DC overheating handling.

1. The same principle of overheating extension for (NG)EN-DC is adopted for overheating extension for NE-DC and NR-DC.

## 2.6 Other

Companies are welcome to add further FFS:

|  |  |  |
| --- | --- | --- |
| Issue | Company | Comment |
|  |  |  |
|  |  |  |

# 3 Conclusion

# 4 References

1. R2-1818399, Email discussion summary [103bis#10][NR/Late drop] 38.331 CR (Ericsson), Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
2. R2-1818400, Draft 38.331 CR - Introduction of late drop NGEN-DC, NE-DC and NR-DC, Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
3. R2-1816807, Configuration of SCG during RRC Resume in NE-DC and NR-DC (38.331), Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
4. R2-1817996, Draft CR on release and addition for NE-DC, Huawei, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
5. R2-1816801, Release of secondary cell group in NR-DC and NE-DC (38.331), Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
6. R2-1817800, CR on 38.331 on measurement Aspects for NR-DC, Huawei, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
7. R2-1817589, Measurement identities and reporting in NR-DC, Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
8. R2-1818340, Introduction of SCG Failure information for MR-DC, Samsung, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
9. R2-1817795, CR on 38.331 on SCG failure in NE-DC, Huawei, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
10. R2-1818395, SCG failure handling in case of NE-DC, Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
11. R2-1818396, SCG failure handling in case of NR-DC, Ericsson, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
12. R2-1817368, CR on 38.331 for SCG failure in NR-DC, Huawei, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.
13. R2-1818035, UE overheating support for late drop, Huawei, 3GPP TSG-RAN WG2#104, Spokane, USA, 12th – 17th November 2018.

# Annex A – Required changes for SCG setup upon resume

START OF FIRST CHANGE

#### 5.3.13.4 Reception of the *RRCResume* by the UE

The UE shall:

1> stop timer T319;

1> if the *RRCResume* includes the *fullConfig*:

2> perform the full configuration procedure as specified in 5.3.5.11;

1> else:

2> restore the PDCP state and reset COUNT value for SRB2 and all DRBs;

2> restore the *cellGroupConfig* from the stored UE AS context;

2> indicate to lower layers that stored UE AS context is used;

1> discard the *fullI-RNTI*, *shortI-RNTI* and the stored UE AS context, except *ran-NotificationAreaInfo*;

1> if the *RRCResume* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

1> if the *RRCReconfiguration* includes the *mrdc-SecondaryCellGroup:*

2> if the received *mrdc-SecondaryCellGroup* contains *nr-SCG*:

3> perform the RRC reconfiguration for the embedded SCG *RRCReconfiguration* message according to 5.3.5.3;

2> if the received *mrdc-SecondaryCellGroup* contains *eutra-SCG*:

3> perform the RRC reconfiguration for the embedded SCG *RRCConnectionReconfiguration* message according to TS 36.331 [10], clause 5.3.5.3;

1> if the *RRCResume* includes the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

Editor's Note: FFS Whether there needs to be a second *radioBearerConfig*.

1> resume SRB2 and all DRBs;

1> if stored, discard the cell reselection priority information provided by the *cellReselectionPriorities* or inherited from another RAT;

1> stop timer T320, if running;

1> if the *RRCResume* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> resume measurements if suspended;

Editor's Note: FFS Whether there is a need to define UE actions related to access control timers (equivalent to T302, T303, T305, T306, T308 in LTE). For example, informing upper layers if a given timer is not running.

1> enter RRC\_CONNECTED;

1> indicate to upper layers that the suspended RRC connection has been resumed;

1> stop the cell re-selection procedure;

1> consider the current cell to be the PCell;

1> set the content of the of *RRCResumeComplete* message as follows:

2> if the upper layer provides NAS PDU, set the *dedicatedNAS-Message* to include the information received from upper layers;

2> if the upper layer provides a PLMN, set the *selectedPLMN-Identity* to PLMN selected by upper layers (TS 24.501 [23]) from the PLMN(s) included in the *plmn-IdentityList* in *SIB1;*

2> if the *masterCellGroup* contains the *reportUplinkTxDirectCurrent*:

3> include the uplinkTxDirectCurrentList;

1> submit the *RRCResumeComplete* message to lower layers for transmission;

1> the procedure ends.

END OF FIRST CHANGE

START OF SECOND CHANGE

### 6.2.2 Message definitions

#### – *RRCResume*

The *RRCResume* message is used to resume the suspended RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*RRCResume* message

-- ASN1START

-- TAG-RRCRESUME-START

RRCResume ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcResume RRCResume-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCResume-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

measConfig MeasConfig OPTIONAL, -- Need M

fullConfig ENUMERATED {true} OPTIONAL, -- Need N

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCResume-v15xx-IEs OPTIONAL

}

RRCResume-v15xx-IEs ::= SEQUENCE {

mrdc-SecondaryCellGroup CHOICE {

nr-SCG OCTET STRING,

eutra-SCG OCTET STRING

} OPTIONAL, -- Need M

nonCriticalExtension SEQUENCE{} OPTIONAL

}

-- TAG-RRCRESUME-STOP

-- ASN1STOP

|  |
| --- |
| *RRCResume-IEs field descriptions* |
| ***masterCellGroup***  Configuration of the master cell group (NR Standalone): |
| ***mrdc-SecondaryCellGroup***  Includes an RRC message for SCG configuration in NR-DC or NE-DC.  For NR-DC (nr-SCG), *mrdc-SecondaryCellGroup* contains the *RRCReconfiguration* message as generated (entirely) by SN gNB. In this version of the specification, the RRC message only includes fields *secondaryCellGroup* and *measConfig*.  For NE-DC (eutra-SCG), *mrdc-SecondaryCellGroup* includes the E-UTRA *RRCConnectionReconfiguration* message as specified in TS 36.331 [10]. In this version of the specification, the E-UTRA RRC message only includes fields *radioResourceConfigDedicated* (with no PDCP configuration present) and/or *mobilityControlInfo* and/ or *measConfig*. |

Editor's Note: FFS Whether secondary group can be resumed.

END OF SECOND CHANGE

# Annex B – EN-DC release signaling and procedures

In EN-DC, the NR configurations are provided to the UE in the *nr-Config* IE in the *RRCConnectionReconfiguration* message:

RRCConnectionReconfiguration-v1510-IEs ::= SEQUENCE {

nr-Config-r15 CHOICE {

release NULL,

setup SEQUENCE {

endc-ReleaseAndAdd-r15 BOOLEAN,

nr-SecondaryCellGroupConfig-r15 OCTET STRING OPTIONAL, -- Need ON

p-MaxEUTRA-r15 P-Max OPTIONAL -- Need ON

}

} OPTIONAL, -- Need ON

sk-Counter-r15 INTEGER (0.. 65535) OPTIONAL, -- Need ON

nr-RadioBearerConfig1-r15 OCTET STRING OPTIONAL, -- Need ON

nr-RadioBearerConfig2-r15 OCTET STRING OPTIONAL, -- Need ON

tdm-PatternConfig-r15 CHOICE {

release NULL,

setup SEQUENCE {

subframeAssignment-r15 SubframeAssignment-r15,

harq-Offset-r15 INTEGER (0.. 9)

}

} OPTIONAL, -- Cond FDD-PCell

nonCriticalExtension RRCConnectionReconfiguration-v1530-IEs OPTIONAL

}

If the full NR configurations of the SCG shall be released, the *nr-Config* is set to *release*, whereas if a new NR configurations shall be included in the same message, the *nr-Config* is set to *setup*, and the *endc-ReleaseAndAdd* flag is set to *true*. Either way, the procedures will trigger the same UE behaviour, namely perform the EN-DC release specified in TS 38.331.

1> if the received *RRCConnectionReconfiguration* includes the *nr-Config* and it is set to *release*; or

1> if the received *RRCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform EN-DC release as specified in TS 38.331 [82], clause 5.3.5.10;

The procedures for EN-DC release as specified in TS 38.331 are:

5.3.5.10 EN-DC release

The UE shall:

1> as a result of EN-DC release triggered by E-UTRA:

2> release SRB3 (configured according to *radioBearerConfig*), if present;

2> release *measConfig*;

2> release the SCG configuration as specified in section 5.3.5.4.

# Annex C – Measurements aspects in NR-DC

*START CHANGE*

5.5 Measurements

5.5.1 Introduction

The network may configure an RRC\_CONNECTED UE to perform measurements and report them in accordance with the measurement configuration. The measurement configuration is provided by means of dedicated signalling i.e. using the *RRCReconfiguration.*

The network may configure the UE to perform the following types of measurements:

- NR measurements;

- Inter-RAT measurements of E-UTRA frequencies.

The network may configure the UE to report the following measurement information based on SS/PBCH block(s):

- Measurement results per SS/PBCH block;

- Measurement results per cell based on SS/PBCH block(s);

- SS/PBCH block(s) indexes.

The network may configure the UE to report the following measurement information based on CSI-RS resources:

- Measurement results per CSI-RS resource;

- Measurement results per cell based on CSI-RS resource(s);

- CSI-RS resource measurement identifiers.

The measurement configuration includes the following parameters:

**1. Measurement objects:** A list of objects on which the UE shall perform the measurements.

- For intra-frequency and inter-frequency measurements a measurement object indicates the frequency/time location and subcarrier spacing of reference signals to be measured. Associated with this measurement object, the network may configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not applicable in event evaluation or measurement reporting. Whitelisted cells are the only ones applicable in event evaluation or measurement reporting.

- The *measObjectId*of the MO which corresponds to each serving cell is indicated by *servingCellMO* within the serving cell configuration.

- For inter-RAT E-UTRA measurements a measurement object is a single EUTRA carrier frequency. Associated with this E-UTRA carrier frequency, the network can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not applicable in event evaluation or measurement reporting. Whitelisted cells are the only ones applicable in event evaluation or measurement reporting.

**2. Reporting configurations:** A list of reporting configurations where there can be one or multiple reporting configurations per measurement object. Each reporting configuration consists of the following:

- Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.

- RS type: The RS that the UE uses for beam and cell measurement results (SS/PBCH block or CSI-RS).

- Reporting format: The quantities per cell and per beam that the UE includes in the measurement report (e.g. RSRP) and other associated information such as the maximum number of cells and the maximum number beams per cell to report.

**3. Measurement identities:** A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities, it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is also included in the measurement report that triggered the reporting, serving as a reference to the network.

**4. Quantity configurations:** The quantity configuration defines the measurement filtering configuration used for all event evaluation and related reporting, and for periodical reporting of that measurement. For NR measurements, the network may configure up to 2 quantity configurations with a reference in the NR measurement object to the configuration that is to be used. In each configuration, different filter coefficients can be configured for different measurement quantities, for different RS types, and for measurements per cell and per beam.

**5. Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

A UE in RRC\_CONNECTED maintains a measurement object list, a reporting configuration list, and a measurement identities list according to signalling and procedures in this specification. The measurement object list possibly includes NR measurement object(s) and inter-RAT objects. Similarly, the reporting configuration list includes NR and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

The measurement procedures distinguish the following types of cells:

1. The NR serving cell(s) - these are the SpCell and one or more SCells.

2. Listed cells - these are cells listed within the measurement object(s).

3. Detected cells - these are cells that are not listed within the measurement object(s) but are detected by the UE on the SSB frequency(ies) and subcarrier spacing(s) indicated by the measurement object(s).

For NR measurement object(s), the UE measures and reports on the serving cell(s), listed cells and/or detected cells. For inter-RAT measurements object(s) of E-UTRA, the UE measures and reports on listed cells and detected cells.

Whenever the procedural specification, other than contained in sub-clause 5.5.2, refers to a field it concerns a field included in the *VarMeasConfig* unless explicitly stated otherwise i.e. only the measurement configuration procedure covers the direct UE action related to the received *measConfig*.

In NR-DC, the UE may receive two independent *measConfig*:

- a *measConfig* included in the *RRCReconfiguration* message received via SRB1; and

- a *measConfig* included in the *RRCReconfiguration* message received via SRB3, if SRB3 is established and not suspended, or included within a *RRCReconfiguration* message embedded in a *RRCReconfiguration* message received via SRB1.

In this case, the UE maintains two independent *VarMeasConfig* and *VarMeasReportList*, one associated with each *measConfig*, and independently performs all the procedures in clause 5.5 for each *measConfig* and the associated *VarMeasConfig* and *VarMeasReportList*, unless explicitly stated otherwise.

*END CHANGE*

# Annex D – Field description of overheating parameters for NE-DC and NR-DC

| *UEAssistanceInformation* field descriptions |
| --- |
| ***delayBudgetReport***  Indicates the UE-preferred adjustment to connected mode DRX. |
| ***reducedBW-FR1-DL***  Indicates the UE's preference on reduced configuration corresponding to the maximum aggregated bandwidth across all downlink carriers of FR1 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR1. This maximum aggregated bandwidth includes downlink carriers of FR1 of both the MCG and the SCG. |
| ***reducedBW-FR1-UL***  Indicates the UE's preference on reduced configuration corresponding to the maximum aggregated bandwidth across all uplink carriers of FR1 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR1. This maximum aggregated bandwidth includes uplink carriers of FR1 of both the MCG and the SCG. |
| ***reducedBW-FR2-DL***  Indicates the UE's preference on reduced configuration corresponding to the maximum aggregated bandwidth across all downlink carriers of FR2 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR2. mhz0 is only applicable for FR2. This maximum aggregated bandwidth includes downlink carriers of FR2 of both the MCG and the NR SCG. |
| ***reducedBW-FR2-UL***  Indicates the UE's preference on reduced configuration corresponding to the maximum aggregated bandwidth across all uplink carriers of FR2 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR2. mhz0 is only applicable for FR2. This maximum aggregated bandwidth includes uplink carriers of FR2 of both the MCG and the NR SCG. |
| ***reducedCCsDL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of downlink SCells indicated by the field, to address overheating. This maximum number includes both SCells of the MCG and PSCell/SCells of the SCG. |
| ***reducedCCsUL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of uplink SCells indicated by the field, to address overheating. This maximum number includes both SCells of the MCG and PSCell/SCells of the SCG. |
| ***reducedMIMO-LayersFR1-DL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of downlink MIMO layers of each serving cell operating on FR1 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR1. |
| ***reducedMIMO-LayersFR1-UL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of uplink MIMO layers of each serving cell operating on FR1 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR1. |
| ***reducedMIMO-LayersFR2-DL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of downlink MIMO layers of each serving cell operating on FR2 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR2. |
| ***reducedMIMO-LayersFR2-UL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of uplink MIMO layers of each serving cell operating on FR2 indicated by the field, to address overheating. This field is allowed to be reported only when UE is configured with serving cells operating on FR2. |
| ***type1***  Indicates the preferred amount of increment/decrement to the long DRX cycle length with respect to the current configuration. Value in number of milliseconds. Value ms40 corresponds to 40 milliseconds, msMinus40 corresponds to -40 milliseconds and so on. |