**3GPP TSG-RAN WG2 Meeting #109e *R2-2000423***

**Online, 24 February-6 March 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **36.331** | **CR** | **4189**  | **rev** | **1** | **Current version:** | **15.8.0** |  |
|  |
| *For* [***HE******LP***](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:***  | Introduction of UECapabilityInformation segmentation in 36.331 |
|  |  |
| ***Source to WG:*** | MediaTek Inc., CATT, Ericsson, Spreadtrum Communications, ZTE Corporation, Sanechips, OPPO, Qualcomm Incorporated |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | RACS-RAN-Core |  | ***Date:*** | 2020-02-28 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | RAN2 agreed to introduce segmentation of the UECapabilityInformation message in LTE, following the same principles agreed for NR in RAN2#106:Agreements1: RRC level segmentation is applied in UE capability information segmentation.2: The RRC message shall be ASN.1 encoded first before the segmentation, and the segmentation shall be processed on the OCTET STRING of encoded RRC message. After segmentation, each segment of the encoded RRC message (OCTET STRING), shall be encapsulated in to a separate RRC message.3 Each message segment carries the following information: rrcMessageSegmentContainer, which is used to include the segmented ASN.1 encoded RRC message segmentEndIndication, which is used to indicate whether the last segment of the RRC message is included in the rrcMessageSegmentContainer.4 Confirm decision from last meeting that within this WI we will only specify the segment of the UE capability informationAgreements1 Each uplink message segment carries a segment number2 Max number segments is 163 RAN2 will specify a new UL message type which carries a segment of uplink messagesAdditions for RAN2#109:* Updated section 5.7.x.2 to refer to UL segmentation
* Clarified that segmentation applies to the whole RRC PDU
* Replaced the hardcoded size with a statement that the encoded RRC PDU should be smaller than the PDCP SDU size limit
* Added lateNonCriticalExtension container
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|  |  |
| ***Summary of change:*** | Segmentation is introduced into the RRC with the following changes:* New procedural section for UL message segment transfer
* ulDedicatedMessageSegment message type added to UL-DCCH-MessageType
* Indication of segmentation allowed added to UECapabilityEnquiry
* Definition of ULDedicatedMessageSegment message added to ASN.1
* Added the ULDedicatedMessageSegment message to annex A.6 on protection of RRC messages

The procedural text for including the *segmentEndIndication* field is clarified. |
|  |  |
| ***Consequences if not approved:*** | Segmentation is not supported in LTE. |
|  |  |
| ***Clauses affected:*** | 5.6.x (new), 6.2.1, 6.2.2, A.6 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS36.300 CR 1258 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

#### 5.6.3.3 Reception of the *UECapabilityEnquiry* by the UE

The UE shall:

1> for NB-IoT, set the contents of *UECapabilityInformation* message as follows:

2> include the UE Radio Access Capability Parameters within the *ue-Capability*;

2> include *ue-RadioPagingInfo*;

2> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends;

1> else, set the contents of *UECapabilityInformation* message as follows:

2> if the *ue-CapabilityRequest* includes *eutra*:

3> include the *UE-EUTRA-Capability* within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *eutra*;

3> if the UE supports FDD and TDD:

4> set all fields of *UECapabilityInformation*, except field *fdd-Add-UE-EUTRA-Capabilities* and *tdd-Add-UE-EUTRA-Capabilities* (including their sub-fields), to include the values applicable for both FDD and TDD (i.e. functionality supported by both modes);

4> if (some of) the UE capability fields have a different value for FDD and TDD:

5> if for FDD, the UE supports additional functionality compared to what is indicated by the previous fields of *UECapabilityInformation*:

6> include field *fdd-Add-UE-EUTRA-Capabilities* and set it to include fields reflecting the additional functionality applicable for FDD;

5> if for TDD, the UE supports additional functionality compared to what is indicated by the previous fields of *UECapabilityInformation*:

6> include field *tdd-Add-UE-EUTRA-Capabilities* and set it to include fields reflecting the additional functionality applicable for TDD;

NOTE 1: The UE includes fields of *XDD-Add-UE-EUTRA-Capabilities* in accordance with the following:

- The field is included only if one or more of its sub-fields (or bits in the feature group indicators string) has a value that is different compared to the value signalled elsewhere within *UE-EUTRA-Capability*;

(this value signalled elsewhere is also referred to as the *Common value*, that is supported for both XDD modes)

- For the fields that are included in *XDD-Add-UE-EUTRA-Capabilities*, the UE sets:

- the sub-fields (or bits in the feature group indicators string) that are not allowed to be different to the same value as the *Common value*;

- the sub-fields (or bits in the feature group indicators string) that are allowed to be different to a value indicating at least the same functionality as indicated by the *Common value*;

3> else (UE supports single xDD mode):

4> set all fields of *UECapabilityInformation*, except field *fdd-Add-UE-EUTRA-Capabilities* and *tdd-Add-UE-EUTRA-Capabilities* (including their sub-fields), to include the values applicable for the xDD mode supported by the UE;

3> compile a list of band combinations, candidate for inclusion in the *UECapabilityInformation* message, comprising of band combinations supported by the UE according to the following priority order (i.e. listed in order of decreasing priority):

4> include all non-CA bands, regardless of whether UE supports carrier aggregation, only:

- if the UE includes *ue-Category-v1020* (i.e. indicating category 6 to 8); or

- if for at least one of the non-CA bands, the UE supports more MIMO layers with TM9 and TM10 than implied by the UE category; or

- if the UE supports TM10 with one or more CSI processes; or

- if the UE supports 1024QAM in DL;

4> if the *UECapabilityEnquiry* message includes *requestedFrequencyBands* and UE supports *requestedFrequencyBands*:

5> include all 2DL+1UL CA band combinations, only consisting of bands included in *requestedFrequencyBands*;

5> include all other CA band combinations, only consisting of bands included in *requestedFrequencyBands*, and prioritized in the order of *requestedFrequencyBands*, (i.e. first include remaining band combinations containing the first-listed band, then include remaining band combinations containing the second-listed band, and so on);

4> else (no requested frequency bands):

5> include all 2DL+1UL CA band combinations;

5> include all other CA band combinations;

4> if UE supports *maximumCCsRetrieval* and if the *UECapabilityEnquiry* message includes the *requestedMaxCCsDL* and the *requestedMaxCCsUL* (i.e. both UL and DL maximums are given):

5> remove from the list of candidates the band combinations for which the number of CCs in DL exceeds the value indicated in the *requestedMaxCCsDL* or for which the number of CCs in UL exceeds the value indicated in the *requestedMaxCCsUL*;

5> indicate in *requestedCCsUL* the same value as received in *requestedMaxCCsUL*;

5> indicate in *requestedCCsDL* the same value as received in *requestedMaxCCsDL*;

4> else if UE supports *maximumCCsRetrieval* and if the *UECapabilityEnquiry* message includes the *requestedMaxCCsDL* (i.e. only DL maximum limit is given):

5> remove from the list of candidates the band combinations for which the number of CCs in DL exceeds the value indicated in the *requestedMaxCCsDL*;

5> indicate value in *requestedCCsDL* the same value as received in *requestedMaxCCsDL*;

4> else if UE supports *maximumCCsRetrieval* and if the *UECapabilityEnquiry* message includes the *requestedMaxCCsUL* (i.e. only UL maximum limit is given):

5> remove from the list of candidates the band combinations for which the number of CCs in UL exceeds the value indicated in the *requestedMaxCCsUL*;

5> indicate in *requestedCCsUL* the same value as received in *requestedMaxCCsUL;*

4> if the UE supports *reducedIntNonContComb* and the *UECapabilityEnquiry* message includes *requestReducedIntNonContComb*:

5> set *reducedIntNonContCombRequested* to true;

5> remove from the list of candidates the intra-band non-contiguous CA band combinations which support is implied by another intra-band non-contiguous CA band combination included in the list of candidates as specified in TS 36.306 [5], clause 4.3.5.21:

4> if the UE supports *requestReducedFormat* and UE supports *skipFallbackCombinations* and *UECapabilityEnquiry* message includes *requestSkipFallbackComb*:

5> set *skipFallbackCombRequested* to true;

5> for each band combination included in the list of candidates (including 2DL+1UL CA band combinations), starting with the ones with the lowest number of DL and UL carriers, that concerns a fallback band combination of another band combination included in the list of candidates as specified in TS 36.306 [5]:

6> remove the band combination from the list of candidates;

6> include *differentFallbackSupported* in the band combination included in the list of candidates whose fallback concerns the removed band combination, if its capabilities differ from the removed band combination;

4> if the UE supports *requestReducedFormat* and *diffFallbackCombReport*, and *UECapabilityEnquiry* message includes *requestDiffFallbackCombList*:

5> if the UE does not support *skipFallbackCombinations* or *UECapabilityEnquiry* message does not include *requestSkipFallbackComb*:

6> remove all band combination from the list of candidates;

5> for each CA band combination indicated in *requestDiffFallbackCombList*:

6> include the CA band combination, if not already in the list of candidates;

6> include the fallback combinations for which the supported UE capabilities are different from the capability of the CA band combination;

5> include CA band combinations indicated in *requestDiffFallbackCombList* into *requestedDiffFallbackCombList*;

3> if the *UECapabilityEnquiry* message includes *requestReducedFormat* and UE supports *requestReducedFormat*:

4> include in *supportedBandCombinationReduced* as many as possible of the band combinations included in the list of candidates, including the non-CA combinations, determined according to the rules and priority order defined above;

3> else

4> if the *UECapabilityEnquiry* message includes *requestedFrequencyBands* and UE supports *requestedFrequencyBands*:

5> include in *supportedBandCombination* as many as possible of the band combinations included in the list of candidates, including the non-CA combinations and up to 5DL+5UL CA band combinations, determined according to the rules and priority order defined above;

5> include in *supportedBandCombinationAdd* as many as possible of the remaining band combinations included in the list of candidates, (i.e. the candidates not included in *supportedBandCombination)*, up to 5DL+5UL CA band combinations, determined according to the rules and priority order defined above;

4> else

5> include in *supportedBandCombination* as many as possible of the band combinations included in the list of candidates, including the non-CA combinations and up to 5DL+5UL CA band combinations, determined according to the rules defined above;

5> if it is not possible to include in *supportedBandCombination* all the band combinations to be included according to the above, selection of the subset of band combinations to be included is left up to UE implementation;

3> indicate in *requestedBands* the same bands and in the same order as included in *requestedFrequencyBands*, if received;

3> if the UE is a category 0, M1 or M2 UE, or supports any UE capability information in *ue-RadioPagingInfo,* according to TS 36.306 [5]:

4> include *ue-RadioPagingInfo* and set the fields according to TS 36.306 [5];

3> if the UE supports (NG)EN-DC or NE-DC and if *requestedFreqBandsNR-MRDC* is included in the request:

4> include into *featureSetsEUTRA* the feature sets that are applicable for the received *requestedFreqBandsNR-MRDC* and *requestedCapabilityCommon* as specified in TS 38.331 [82], clause 5.6.1.4.

NOTE 2: The network must include the *requestedFreqBandsNR-MRDC* in order to obtain feature sets for E-UTRA and MR-DC.

NOTE 3: Even if the network requests (only) capabilities for *eutra*, it may include NR band numbers in the *requestedFreqBandsNR-MRDC* in order to ensure that the UE includes all necessary feature sets (i.e. E-UTRA and NR) needed for subsequently requested *eutra-nr* capabilities.

3> if the *UECapabilityEnquiry* message includes *requestSTTI-SPT-Capability* and if the UE supports short TTI and/or SPT (i.e., *sTTI-SPT-Supported*):

4> for each band combination the UE included in a field of the *UECapabilityInformation* message in accordance with the previous:

5> if the UE supports short TTI, include the short TTI capabilities for each of the band combinations using the *stti-SPT-BandParameters*;

5> if the UE supports SPT, include the SPT capabilities for each of the band combinations using the *stti-SPT-BandParameters*;

NOTE 4: The UE may have to add/repeat the band combinations to the list of band combinations included earlier, to include short TTI capabilities and/or SPT capabilities.

2> if the *ue-CapabilityRequest* includes *geran-cs* and if the UE supports GERAN CS domain:

3> include the UE radio access capabilities for GERAN CS within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *geran-cs*;

2> if the *ue-CapabilityRequest* includes *geran-ps* and if the UE supports GERAN PS domain:

3> include the UE radio access capabilities for GERAN PS within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *geran-ps*;

2> if the *ue-CapabilityRequest* includes *utra* and if the UE supports UTRA:

3> include the UE radio access capabilities for UTRA within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *utra*;

2> if the *ue-CapabilityRequest* includes *cdma2000-1XRTT* and if the UE supports CDMA2000 1xRTT:

3> include the UE radio access capabilities for CDMA2000 within a *ue-Capability**RAT-Container* and with the *rat-Type* set to *cdma2000-1XRTT*;

2> if the *ue-CapabilityRequest* includes *nr* and if the UE supports NR:

3> include the UE radio access capabilities for NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *nr*;

3> include band combinations and feature sets as specified in TS 38.331 [82], clause 5.6.1.4, considering the included *requestedFreqBandsNR-MRDC*, *requestedCapabilityNR*, the *eutra-nr-only* flag and *requestedCapabilityCommon* (if present);

2> if the *ue-CapabilityRequest* includes *eutra-nr* and if the UE supports (NG)EN-DC or NE-DC:

3> include the UE radio access capabilities for EUTRA-NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *eutra-nr*;

3> include band combinations as specified in TS 38.331 [82], clause 5.6.1.4, considering the included *requestedFreqBandsNR-MRDC*, *requestedCapabilityNR* (if present) and *requestedCapabilityCommon* (if included)*;*

1> if the RRC message segmentation is allowed based on the field *rrc-SegAllowed* received, and the encoded RRC message is larger than the maximum supported size of a PDCP SDU specified in TS 36.323 [8]:

2> initiate the UL message segment transfer procedure as specified in clause 5.6.x;

1> else:

2> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends;

#### […]

### 5.6.x UL message segment transfer

#### 5.6.x.1 General



Figure 5.6.x.1-1: UL message segment transfer

The purpose of this procedure is to transfer segments of UL DCCH messages from UE to E-UTRAN in RRC\_CONNECTED.

NOTE: The segmentation of UL DCCH message is only applicable to *UECapabilityInformation* in this release.

#### 5.6.x.2 Initiation

A UE capable of UL RRC message segmentation in RRC\_CONNECTED will initiate the procedure when the following conditions are met:

1> if the RRC message segmentation is enabled based on the field *rrc-SegAllowed* received, and

1> if the encoded RRC message is larger than the maximum supported size of a PDCP SDU specified in TS 36.323 [8];

Upon initiating the procedure, the UE shall:

1> initiate transmission of the *ULDedicatedMessageSegment* message as specified in 5.6.x.3;

#### 5.6.x.3 Actions related to transmission of *ULDedicatedMessageSegment* message

The UE shall segment the encoded RRC PDU based on the maximum supported size of a PDCP SDU specified in TS 36.323 [8]. UE shall minimize the number of segments and set the contents of the *ULDedicatedMessageSegment* messages as follows:

1. For each new UL DCCH message, set the *segmentNumber* to 0 for the first message segment and increment the *segmentNumber* for each subsequent RRC message segment;

1> set *rrc-MessageSegmentContainer* to include the segment of the UL DCCH message corresponding to the *segmentNumber*;

1> if the segment included in the *rrc-MessageSegmentContainer* is the last segment of the UL DCCH message:

2> include the *segmentEndIndication* and set the value to true;

1> submit all the *ULDedicatedMessageSegment* messages generated for the segmented RRC message to lower layers for transmission in ascending order based on the *segmentNumber*, upon which the procedure ends.

## […]

## 6.2 RRC messages

NOTE: The messages included in this clause reflect the current status of the discussions. Additional messages may be included at a later stage.

### 6.2.1 General message structure

#### […]

#### – *UL-DCCH-Message*

The *UL-DCCH-Message* class is the set of RRC messages that may be sent from the UE to the E‑UTRAN or from the RN to the E-UTRAN on the uplink DCCH logical channel.

-- ASN1START

UL-DCCH-Message ::= SEQUENCE {

 message UL-DCCH-MessageType

}

UL-DCCH-MessageType ::= CHOICE {

 c1 CHOICE {

 csfbParametersRequestCDMA2000 CSFBParametersRequestCDMA2000,

 measurementReport MeasurementReport,

 rrcConnectionReconfigurationComplete RRCConnectionReconfigurationComplete,

 rrcConnectionReestablishmentComplete RRCConnectionReestablishmentComplete,

 rrcConnectionSetupComplete RRCConnectionSetupComplete,

 securityModeComplete SecurityModeComplete,

 securityModeFailure SecurityModeFailure,

 ueCapabilityInformation UECapabilityInformation,

 ulHandoverPreparationTransfer ULHandoverPreparationTransfer,

 ulInformationTransfer ULInformationTransfer,

 counterCheckResponse CounterCheckResponse,

 ueInformationResponse-r9 UEInformationResponse-r9,

 proximityIndication-r9 ProximityIndication-r9,

 rnReconfigurationComplete-r10 RNReconfigurationComplete-r10,

 mbmsCountingResponse-r10 MBMSCountingResponse-r10,

 interFreqRSTDMeasurementIndication-r10 InterFreqRSTDMeasurementIndication-r10

 },

 messageClassExtension CHOICE {

 c2 CHOICE {

 ueAssistanceInformation-r11 UEAssistanceInformation-r11,

 inDeviceCoexIndication-r11 InDeviceCoexIndication-r11,

 mbmsInterestIndication-r11 MBMSInterestIndication-r11,

 scgFailureInformation-r12 SCGFailureInformation-r12,

 sidelinkUEInformation-r12 SidelinkUEInformation-r12,

 wlanConnectionStatusReport-r13 WLANConnectionStatusReport-r13,

 rrcConnectionResumeComplete-r13 RRCConnectionResumeComplete-r13,

 ulInformationTransferMRDC-r15 ULInformationTransferMRDC-r15,

 scgFailureInformationNR-r15 SCGFailureInformationNR-r15,

 measReportAppLayer-r15 MeasReportAppLayer-r15,

 failureInformation-r15 FailureInformation-r15,

 ulDedicatedMessageSegment-r16 ULDedicatedMessageSegment-r16,spare4 NULL, spare3 NULL, spare2 NULL, spare1 NULL

 },

 messageClassExtensionFuture-r11 SEQUENCE {}

 }

}

-- ASN1STOP

#### […]

### 6.2.2 Message definitions

#### […]

#### – *UECapabilityEnquiry*

The *UECapabilityEnquiry* message is used to request the transfer of UE radio access capabilities for E‑UTRA as well as for other RATs.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*UECapabilityEnquiry message*

-- ASN1START

UECapabilityEnquiry ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 c1 CHOICE {

 ueCapabilityEnquiry-r8 UECapabilityEnquiry-r8-IEs,

 spare3 NULL, spare2 NULL, spare1 NULL

 },

 criticalExtensionsFuture SEQUENCE {}

 }

}

UECapabilityEnquiry-r8-IEs ::= SEQUENCE {

 ue-CapabilityRequest UE-CapabilityRequest,

 nonCriticalExtension UECapabilityEnquiry-v8a0-IEs OPTIONAL

}

UECapabilityEnquiry-v8a0-IEs ::= SEQUENCE {

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension UECapabilityEnquiry-v1180-IEs OPTIONAL

}

UECapabilityEnquiry-v1180-IEs ::= SEQUENCE {

 requestedFrequencyBands-r11 SEQUENCE (SIZE (1..16)) OF FreqBandIndicator-r11 OPTIONAL,

 nonCriticalExtension UECapabilityEnquiry-v1310-IEs OPTIONAL

}

UECapabilityEnquiry-v1310-IEs ::= SEQUENCE {

 requestReducedFormat-r13 ENUMERATED {true} OPTIONAL, -- Need ON

 requestSkipFallbackComb-r13 ENUMERATED {true} OPTIONAL, -- Need ON

 requestedMaxCCsDL-r13 INTEGER (2..32) OPTIONAL, -- Need ON

 requestedMaxCCsUL-r13 INTEGER (2..32) OPTIONAL, -- Need ON

 requestReducedIntNonContComb-r13 ENUMERATED {true} OPTIONAL, -- Need ON

 nonCriticalExtension UECapabilityEnquiry-v1430-IEs OPTIONAL

}

UECapabilityEnquiry-v1430-IEs ::= SEQUENCE {

 requestDiffFallbackCombList-r14 BandCombinationList-r14 OPTIONAL, -- Need ON

 nonCriticalExtension UECapabilityEnquiry-v1510-IEs OPTIONAL

}

UECapabilityEnquiry-v1510-IEs ::= SEQUENCE {

 requestedFreqBandsNR-MRDC-r15 OCTET STRING OPTIONAL,

 nonCriticalExtension UECapabilityEnquiry-v1530-IEs OPTIONAL

}

UECapabilityEnquiry-v1530-IEs ::= SEQUENCE {

 requestSTTI-SPT-Capability-r15 ENUMERATED {true} OPTIONAL,

 eutra-nr-only-r15 ENUMERATED {true} OPTIONAL,

 nonCriticalExtension UECapabilityEnquiry-v1550-IEs OPTIONAL

}

UECapabilityEnquiry-v1550-IEs ::= SEQUENCE {

 requestedCapabilityNR-r15 OCTET STRING OPTIONAL,

 nonCriticalExtension UECapabilityEnquiry-v1560-IEs OPTIONAL

}

UECapabilityEnquiry-v1560-IEs ::= SEQUENCE {

 requestedCapabilityCommon-r15 OCTET STRING OPTIONAL,

 nonCriticalExtension UECapabilityEnquiry-v16xy-IEs OPTIONAL

}

UECapabilityEnquiry-v16xy-IEs ::= SEQUENCE {

 rrc-SegAllowed-r16 ENUMERATED {enabled} OPTIONAL, -- Need ON

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

UE-CapabilityRequest ::= SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT-Type

-- ASN1STOP

| *UECapabilityEnquiry* field descriptions |
| --- |
| ***eutra-nr-only***Indicates that the UE is requested to provide UE capabilities related to (NG)EN-DC only as specified in TS38.331 [82]. |
| ***requestDiffFallbackCombList***List of CA band combinations for which the UE is requested to provide different capabilities for their fallback band combinations in conjunction with the capabilities supported for the CA band combinations in this list. The UE shall exclude fallback band combinations for which their supported UE capabilities are the same as the CA band combination indicated in this list. |
| ***requestReducedFormat***Indicates that the UE is requested to provide supported CA band combinations in the *supportedBandCombinationReduced-r13* instead of the *supportedBandCombination-r10*. The E-UTRAN includes this field if *requestSkipFallbackComb* or *requestDiffFallbackCombList* is included in the message. |
| ***requestSkipFallbackComb***Indicates that the UE shall explicitly exclude fallback CA band combinations in capability signalling.  |
| ***ue-CapabilityRequest***List of the RATs for which the UE is requested to transfer the UE radio access capabilities i.e. E-UTRA, UTRA, GERAN-CS, GERAN-PS, CDMA2000. A separate *RAT-Type* value applies for some EUTRA-NR capabilities that are transferred by a separate UE capability container, used in case of MRDC. |
| ***requestedFrequencyBands***List of frequency bands for which the UE is requested to provide supported CA band combinations and non CA bands. |
| ***requestedFreqBandsNR-MRDC***Interpreted as *FreqBandList* IE as specified in TS 38.331 [82]. It concerns a list of NR and/ or E-UTRA frequency bands for which the UE is requested to provide its supported NR CA and/or MR-DC band combinations (i.e. within the UE capability containers for NR and MR-DC, as requested by E-UTRAN) and feature sets corresponding to the MR-DC band combinations (i.e. within the UE capability containers for LTE and NR, as requested by E-UTRAN). |
| ***requestedCapabilityCommon***Contains the filter common for all requested MR-DC related capability containers as defined by *UE-CapabilityRequestFilterCommon* IE in TS 38.331 [82]. |
| ***requestedCapabilityNR***Interpreted as *UE-CapabilityRequestFilterNR* IE as specified in TS 38.331 [82], in which the field *frequencyBandList* is omitted. |
| ***requestedMaxCCsDL, requestedMaxCCsUL***Indicates the maximum number of CCs for which the UE is requested to provide supported CA band combinations and non-CA bands. |
| ***requestReducedIntNonContComb***Indicates that the UE shall explicitly exclude supported intra-band non-contiguous CA band combinations other than included in capability signalling as specified in TS 36.306 [5], clause 4.3.5.21.  |
| ***requestSTTI-SPT-Capability***Indicates that the UE shall include all the short TTI and SPT capabilities in capability signalling.  |
| ***rrc-SegAllowed***Indicates that the UE is enabled to segment the response message into a series of *ULDedicatedMessageSegment* messages. |

#### […]

#### – *ULDedicatedMessageSegment*

The *ULDedicatedMessageSegment* message is used to transfer segments of the *UECapabilityInformation* message.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*ULDedicatedMessageSegment message*

-- ASN1START

ULDedicatedMessageSegment-r16 ::= SEQUENCE {

 criticalExtensions CHOICE {

 ulDedicatedMessageSegment-r16 ULDedicatedMessageSegment-r16-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

ULDedicatedMessageSegment-r16-IEs ::= SEQUENCE {

 segmentNumber-r16 INTEGER (0..15),

rrc-MessageSegmentContainer-r16 OCTET STRING,

segmentEndIndication-r16 ENUMERATED {true} OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *ULDedicatedMessageSegment* field descriptions |
| --- |
| ***segmentNumber***Identifies the sequence number of a segment within the encoded UL DCCH message. |
| ***rrc-MessageSegmentContainer***Includes a segment of the encoded UL DCCH message. The size of the included segment in this container should be small enough that the resulting encoded RRC message PDU is less than or equal to the PDCP SDU size limit. |
| ***segmentEndIndication***Indicates whether the included UL DCCH message segment is the last segment or not. |

#### – *ULHandoverPreparationTransfer (CDMA2000)*

The *ULHandoverPreparationTransfer* message is used for the uplink transfer of handover related CDMA2000 information when requested by the higher layers.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*ULHandoverPreparationTransfer message*

-- ASN1START

ULHandoverPreparationTransfer ::= SEQUENCE {

 criticalExtensions CHOICE {

 c1 CHOICE {

 ulHandoverPreparationTransfer-r8 ULHandoverPreparationTransfer-r8-IEs,

 spare3 NULL, spare2 NULL, spare1 NULL

 },

 criticalExtensionsFuture SEQUENCE {}

 }

}

ULHandoverPreparationTransfer-r8-IEs ::= SEQUENCE {

 cdma2000-Type CDMA2000-Type,

 meid BIT STRING (SIZE (56)) OPTIONAL,

 dedicatedInfo DedicatedInfoCDMA2000,

 nonCriticalExtension ULHandoverPreparationTransfer-v8a0-IEs OPTIONAL

}

ULHandoverPreparationTransfer-v8a0-IEs ::= SEQUENCE {

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *ULHandoverPreparationTransfer* field descriptions |
| --- |
| ***meid***The 56 bit mobile identification number provided by the CDMA2000 Upper layers. |

#### […]

## A.6 Protection of RRC messages (informative)

The following list provides information which messages can be sent (unprotected) prior to security activation and which messages can be sent unprotected after security activation. Those messages indicated "-" in "P" column should never be sent unprotected by eNB or UE. Further requirements are defined in the procedural text.

P…Messages that can be sent (unprotected) prior to security activation

A - I…Messages that can be sent without integrity protection after security activation

A - C…Messages that can be sent unciphered after security activation

NA… Message can never be sent after security activation

| Message | P | A-I | A-C | Comment |
| --- | --- | --- | --- | --- |
| CSFBParametersRequestCDMA2000 | **+** | **-** | **-** |  |
| CSFBParametersResponseCDMA2000 | + | - | - |  |
| CounterCheck | - | -  | -  |  |
| CounterCheckResponse | - | -  | -  |  |
| DelayBudgetReport | - | - | - |  |
| DLInformationTransfer | + | - | - |  |
| FailureInformation | - | - | - |  |
| HandoverFromEUTRAPreparationRequest (CDMA2000) | - | -  | -  |  |
| InDeviceCoexIndication | - | -  | -  |  |
| InterFreqRSTDMeasurementIndication | - | - | - |  |
| LoggedMeasurementsConfiguration | - | - | - |  |
| MasterInformationBlock | + | + | + |  |
| MasterInformationBlock-MBMS | + | + | + |  |
| MBMSCountingRequest | + | + | + |  |
| MBMSCountingResponse | - | - | - |  |
| MBMSInterestIndication | + | - | - |  |
| MBSFNAreaConfiguration | + | + | + |  |
| MeasReportAppLayer | - | - | - |  |
| MeasurementReport | - | - | - | Measurement configuration may be sent prior to security activation. But: In order to protect privacy of UEs, MEASUREMENT REPORT is only sent from the UE after successful security activation. |
| MobilityFromEUTRACommand | - | -  | - |  |
| Paging | + | + | + |  |
| ProximityIndication | - | - | - |  |
| RNReconfiguration | - | - | - |  |
| RNReconfigurationComplete | - | - | - |  |
| RRCConnectionReconfiguration | + | - | - | The message shall not be sent unprotected before security activation if it is used to perform handover or to establish SRB2, SRB4 and DRBs |
| RRCConnectionReconfigurationComplete | + | - | - | Unprotected, if sent as response to RRCConnectionReconfiguration which was sent before security activation |
| RRCConnectionReestablishment | - | + | + | This message is not protected by PDCP operation. |
| RRCConnectionReestablishmentComplete | - | - | - |  |
| RRCConnectionReestablishmentReject | - | + | + | One reason to send this may be that the security context has been lost, therefore sent as unprotected.  |
| RRCConnectionReestablishmentRequest | - | - | + | This message is not protected by PDCP operation. However, a short MAC-I is included. |
| RRCConnectionReject | + | + | + | Except for UP-EDT, A-I and A-C are NA. |
| RRCConnectionRelease | + | - | - | Justification for P: If the RRC connection only for signalling not requiring DRBs or ciphered messages, or the signalling connection has to be released prematurely, this message is sent as unprotected.For UP-EDT, the message is only sent after successful security activation.*RRCConnectionRelease* message sent before security activation cannot include *rrc-InactiveConfig, redirectedCarrierInfo, idleModeMobilityControlInfo* information fields when UE is connected to 5GC. |
| RRCConnectionRequest | + | NA | NA |  |
| RRCConnectionResume | - | - | + | When this message is transmitted, security is activated but suspended. Integrity verification is done after the message received by RRC.For UP-EDT, the message is only sent after successful security activation.For RRC\_INACTIVE state, the message is protected with both integrity and ciphering. |
| RRCConnectionResumeRequest | - | - | + | This message is not protected by PDCP operation. However, a short MAC-I is included. |
| RRCConnectionResumeComplete | - | - | - |  |
| RRCConnectionSetup | + | NA | NA |  |
| RRCConnectionSetupComplete | + | NA | NA |  |
| RRCEarlyDataRequest | + | NA | NA |  |
| RRCEarlyDataComplete | + | NA | NA |  |
| SCGFailureInformation | - | - | - |  |
| SCGFailureInformationNR | - | - | - |  |
| SCPTMConfiguration | + | + | + |  |
| SecurityModeCommand | + | NA | NA | Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC) |
| SecurityModeComplete | - | NA | NA | Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure. |
| SecurityModeFailure | + | NA | NA | Neither integrity protection nor ciphering applied. |
| SidelinkUEInformation | + | - | - |  |
| SystemInformation | + | + | + |  |
| SystemInformationBlockType1 | + | + | + |  |
| SystemInformationBlockType1-MBMS | + | + | + |  |
| UEAssistanceInformation | - | - | - |  |
| UECapabilityEnquiry | + | - | - |  |
| UECapabilityInformation | + | - | - |  |
| UEInformationRequest | - | - | - |  |
| UEInformationResponse | - | - | - | In order to protect privacy of UEs, UEInformationResponse is only sent from the UE after successful security activation |
| ULDedicatedMessageSegment | + | - | - |  |
| ULHandoverPreparationTransfer (CDMA2000) | - | - | - | This message should follow HandoverFromEUTRAPreparationRequest |
| ULInformationTransfer | + | - | - |  |
| ULInformationTransferMRDC | - | - | - |  |
| WLANConnectionStatusReport | - | - | - |  |