**3GPP TSG- Meeting #125bis *Draft R2-2403793***

**Changsha, China, April 15th – 19th, 2024**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **0501** | **rev** | **2** | **Current version:** |  |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | LPP support for sub 1s location information reporting periodicity [Sub\_1s\_periodicity] | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, AT&T, T-Mobile, Vivo, Deutsche Telekom, Huawei, HiSilicon, Vodafone | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI18 | | | | |  | ***Date:*** | | | 2024-04-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | |  |
|  | *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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Missing support for sub 1s loction information reporting periodicity, which means that the reporting cannot be adapted to positioning reference signal periodicity and report periodicity of related information over other interfaces such as NRPPa cannot be aligned in time.  This has been discussed during Rel 17 since March 2023, and companies wanted to await an LS from CT4, which arrived to RAN2#124, got postponed and discussed at RAN2#125, but then it was seen as too late to be considered for Rel 17, and TEI18 was seen as a reasonable alternative.The CR is Cat B, but the discussion is not new.  For more details about the history, see  [1] R2-2304050 Missing LPP support for sub 1s location information reporting periodicity, Ericsson  [2] R2-2304300, Report from [AT121bis-e][427][POS] Rel-17 LPP CRs, Qualcomm  [3] RAN2#123 Chairman’s notes  [4] RAN2#123-bis Chairman’s notes  [5] R2-2312938 Open issues for RAT-dependent integrity, Ericsson  [6] TS 38.455 V.16.1.0 NR Positioning Protocol A (NRPPa)  [5][7] R2-2311703 , Sub One Second Report Period for Deferred Location over SBI (C4-234472), CT4 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The following has been added/changed   * a new capability to indicate support for sub 1s periodicity, defined per positioning method and positioning mode for applicable positioning methods * a new optional request for sub 1s periodicity | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Sub 1s periodicity is not supported | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4.1, 6.4.2, 6.5.1.7, 6.5.2.9, 6.5.3.4, 6.5.4.4, 6.5.5.4, 6.5.6.4, 6.5.7.4, 6.5.9.4, 6.5.10.6, 6.5.11.6, 6.5.12.6, | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### 6.4.1 Common Lower-Level IEs

*[…]*

#### *– PeriodicAssistanceDataControlParameters*

The IE *PeriodicAssistanceDataControlParameters* is used in a periodic assistance data delivery procedure as described in clauses 5.2.1a and 5.2.2a.

-- ASN1START

PeriodicAssistanceDataControlParameters-r15 ::= SEQUENCE {

periodicSessionID-r15 PeriodicSessionID-r15,

...,

[[

updateCapabilities-r15 UpdateCapabilities-r15 OPTIONAL -- Need ON

]]

}

PeriodicSessionID-r15 ::= SEQUENCE {

periodicSessionInitiator-r15 ENUMERATED { locationServer, targetDevice, ... },

periodicSessionNumber-r15 INTEGER (0..255),

...

}

UpdateCapabilities-r15 ::= BIT STRING {primaryCellID-r15 (0)} (SIZE(1..8))

-- ASN1STOP

| *PeriodicAssistanceDataControlParameters* field descriptions |
| --- |
| ***periodicSessionID***  This field identifies a particular periodic assistance data delivery session and the initiator of the session. |
| ***updateCapabilities***  This field identifies the capabilities of the sending entity to support an update of periodic assistance data. A bit value set to one indicates a capability is supported and a bit value set to zero indicates a capability is not supported. |

#### *– PeriodicReportingIntervalMsSupport*

The IE *PeriodicReportingIntervalMsSupport* is used by the target device to indicate if millisecond reporting intervals are supported by providing the minimum millisecond reporting interval for periodic location information reporting.

-- ASN1START

PeriodicReportingIntervalMsSupport-r18 ::= SEQUENCE {

minPeriodicReportingIntervalMs-r18 ENUMERATED {ms1, ms10, ms100,...},

...

}

-- ASN1STOP

| *PeriodicReportingIntervalMsSupport* field descriptions |
| --- |
| ***minPeriodicReportingIntervalMs***  This field indicates the minimum sub-second periodic reporting interval supported by the target device, where ms1, ms10, ms100 corresponds to 1, 10, and 100 milliseconds respectively. |

#### *– PeriodicReportingIntervalMsSupportPerMode*

The IE *PeriodicReportingIntervalMsSupport* is used by the target device to indicate if millisecond reporting intervals are supported by providing the minimum millisecond reporting interval for periodic location information reporting for each positioning mode indicated by *PositioningModes*.

-- ASN1START

PeriodicReportingIntervalMsSupportPerMode-r18 ::= SEQUENCE {

minPeriodicReportingIntervalMs1-Supported-r18 PositioningModes OPTIONAL,

minPeriodicReportingIntervalMs10-Supported-r18 PositioningModes OPTIONAL,

minPeriodicReportingIntervalMs100-Supported-r18 PositioningModes OPTIONAL,

...

}

-- ASN1STOP

| *PeriodicReportingIntervalMsSupportPerMode* field descriptions |
| --- |
| ***minPeriodicReportingIntervalMs1-Supported***  This field indicates the positioning modes of the target device supporting a minimum of 1 millisecond periodic reporting interval. |
| ***minPeriodicReportingIntervalMs10-Supported***  This field indicates the positioning modes of the target device supporting a minimum of 10 millisecond periodic reporting interval. |
| ***minPeriodicReportingIntervalMs100-Supported***  This field indicates the positioning modes of the target device supporting a minimum of 100 millisecond periodic reporting interval. |

*[…]*

### 6.4.2 Common Positioning

*[…]*

#### – *CommonIEsRequestLocationInformation*

The *CommonIEsRequestLocationInformation* carries common IEs for a Request Location Information LPP message Type.

-- ASN1START

CommonIEsRequestLocationInformation ::= SEQUENCE {

locationInformationType LocationInformationType,

triggeredReporting TriggeredReportingCriteria OPTIONAL, -- Cond ECID

periodicalReporting PeriodicalReportingCriteria OPTIONAL, -- Need ON

additionalInformation AdditionalInformation OPTIONAL, -- Need ON

qos QoS OPTIONAL, -- Need ON

environment Environment OPTIONAL, -- Need ON

locationCoordinateTypes LocationCoordinateTypes OPTIONAL, -- Need ON

velocityTypes VelocityTypes OPTIONAL, -- Need ON

...,

[[

messageSizeLimitNB-r14 MessageSizeLimitNB-r14 OPTIONAL -- Need ON

]],

[[

segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL -- Need ON

]],

[[

scheduledLocationTime-r17

ScheduledLocationTime-r17 OPTIONAL, -- Need ON

targetIntegrityRisk-r17

TargetIntegrityRisk-r17 OPTIONAL -- Need ON

]],

[[

periodicalReportingExt-r18 PeriodicalReportingCriteriaExt-r18 OPTIONAL -- Need ON

]]

}

LocationInformationType ::= ENUMERATED {

locationEstimateRequired,

locationMeasurementsRequired,

locationEstimatePreferred,

locationMeasurementsPreferred,

...,

locationEstimateAndMeasurementsRequired-r18

}

PeriodicalReportingCriteria ::= SEQUENCE {

reportingAmount ENUMERATED {

ra1, ra2, ra4, ra8, ra16, ra32,

ra64, ra-Infinity

} DEFAULT ra-Infinity,

reportingInterval ENUMERATED {

noPeriodicalReporting, ri0-25,

ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64

}

}

PeriodicalReportingCriteriaExt-r18 ::= SEQUENCE {

reportingAmount-r18 ENUMERATED {

ra2, ra4, ra8, ra16, ra32,

ra64, ra-Infinity

} DEFAULT ra-Infinity,

reportingIntervalMs-r18 INTEGER (1..999),

...

}

TriggeredReportingCriteria ::= SEQUENCE {

cellChange BOOLEAN,

reportingDuration ReportingDuration,

...

}

ReportingDuration ::= INTEGER (0..255)

AdditionalInformation ::= ENUMERATED {

onlyReturnInformationRequested,

mayReturnAdditionalInformation,

...

}

QoS ::= SEQUENCE {

horizontalAccuracy HorizontalAccuracy OPTIONAL, -- Need ON

verticalCoordinateRequest BOOLEAN,

verticalAccuracy VerticalAccuracy OPTIONAL, -- Need ON

responseTime ResponseTime OPTIONAL, -- Need ON

velocityRequest BOOLEAN,

...,

[[ responseTimeNB-r14 ResponseTimeNB-r14 OPTIONAL -- Need ON

]],

[[ horizontalAccuracyExt-r15 HorizontalAccuracyExt-r15 OPTIONAL, -- Need ON

verticalAccuracyExt-r15 VerticalAccuracyExt-r15 OPTIONAL -- Need ON

]]

}

HorizontalAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100),

...

}

VerticalAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100),

...

}

HorizontalAccuracyExt-r15 ::= SEQUENCE {

accuracyExt-r15 INTEGER(0..255),

confidence-r15 INTEGER(0..100),

...

}

VerticalAccuracyExt-r15 ::= SEQUENCE {

accuracyExt-r15 INTEGER(0..255),

confidence-r15 INTEGER(0..100),

...

}

ResponseTime ::= SEQUENCE {

time INTEGER (1..128),

...,

[[ responseTimeEarlyFix-r12 INTEGER (1..128) OPTIONAL -- Need ON

]],

[[ unit-r15 ENUMERATED { ten-seconds, ... , ten-milli-seconds-v1700 }

OPTIONAL -- Need ON

]]

}

ResponseTimeNB-r14 ::= SEQUENCE {

timeNB-r14 INTEGER (1..512),

responseTimeEarlyFixNB-r14 INTEGER (1..512) OPTIONAL, -- Need ON

...,

[[ unitNB-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

]]

}

Environment ::= ENUMERATED {

badArea,

notBadArea,

mixedArea,

...

}

MessageSizeLimitNB-r14 ::= SEQUENCE {

measurementLimit-r14 INTEGER (1..512) OPTIONAL, -- Need ON

...

}

ScheduledLocationTime-r17 ::= SEQUENCE {

utcTime-r17 UTCTime OPTIONAL, -- Need ON

gnssTime-r17 SEQUENCE {

gnss-TOD-msec-r17 INTEGER (0..3599999),

gnss-TimeID-r17 GNSS-ID

} OPTIONAL, -- Need ON

networkTime-r17 CHOICE {

e-utraTime-r17 SEQUENCE {

lte-PhysCellId-r17 INTEGER (0..503),

lte-ArfcnEUTRA-r17 ARFCN-ValueEUTRA,

lte-CellGlobalId-r17 CellGlobalIdEUTRA-AndUTRA

OPTIONAL, -- Need ON

lte-SystemFrameNumber-r17 INTEGER (0..1023)

},

nrTime-r17 SEQUENCE {

nr-PhysCellID-r17 NR-PhysCellID-r16,

nr-ARFCN-r17 ARFCN-ValueNR-r15,

nr-CellGlobalID-r17 NCGI-r15 OPTIONAL, -- Need ON

nr-SFN-r17 INTEGER (0..1023),

nr-Slot-r17 CHOICE {

scs15-r17 INTEGER (0..9),

scs30-r17 INTEGER (0..19),

scs60-r17 INTEGER (0..39),

scs120-r17 INTEGER (0..79)

} OPTIONAL -- Need ON

},

...

} OPTIONAL, -- Need ON

relativeTime-r17 INTEGER (1..1024) OPTIONAL -- Need ON

}

TargetIntegrityRisk-r17 ::= INTEGER (10..90)

-- ASN1STOP

Editor Notes: FFS exact IE structure of the request for location+measurements in the agreement of RAN2#123bis.

| Conditional presence | Explanation |
| --- | --- |
| *ECID* | The field is optionally present, need ON, if E-CID or NR E-CID is requested. Otherwise it is not present. |

| *CommonIEsRequestLocationInformation* field descriptions |
| --- |
| ***locationInformationType***  This IE indicates whether the server requires a location estimate or measurements. For '*locationEstimateRequired*', the target device shall return a location estimate if possible, or indicate a location error if not possible. For '*locationMeasurementsRequired*', the target device shall return measurements if possible, or indicate a location error if not possible. For '*locationEstimatePreferred*', the target device shall return a location estimate if possible, but may also or instead return measurements for any requested position methods for which a location estimate is not possible. For '*locationMeasurementsPreferred*', the target device shall return location measurements if possible, but may also or instead return a location estimate for any requested position methods for which return of location measurements is not possible. For '*locationEstimateAndMeasurementsRequired*', the PRU shall return both location estimate and measurements if possible, or indicate a location error if not possible.  NOTE: If the PRU is requested to return both location estimate and measurements, the location information is determined independently of the reported measurements. |
| ***triggeredReporting***  This IE indicates that triggered reporting is requested and comprises the following subfields:  - ***cellChange***: If this field is set to TRUE, the target device provides requested location information each time the primary cell has changed.  - ***reportingDuration***: Maximum duration of triggered reporting in seconds. A value of zero is interpreted to mean an unlimited (i.e. "infinite") duration. The target device should continue triggered reporting for the *reportingDuration* or until an LPP *Abort* or *LPP Error* message is received.  The *triggeredReporting* field should not be included by the location server and shall be ignored by the target device if the *periodicalReporting* IE or *responseTime* IE or *responseTimeNB* IE is included in *CommonIEsRequestLocationInformation.* |
| ***periodicalReporting***  This IE indicates that periodic reporting is requested and comprises the following subfields:  - ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 1, 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite'*, the target device shou-ld continue periodic reporting until an LPP *Abort* message is received. The value '*ra1*' shall not be used by a sender.  - ***reportingInterval*** indicates the interval between location information reports and the response time requirement for the first location information report. Enumerated values ri0-25, ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64 correspond to reporting intervals of 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds, respectively. Measurement reports containing no measurements or no location estimate are required when a *reportingInterval* expires before a target device is able to obtain new measurements or obtain a new location estimate. The value '*noPeriodicalReporting*' shall not be used by a sender. |
| ***additionalInformation***  This IE indicates whether a target device is allowed to return additional information to that requested. If this IE indicates '*onlyReturnInformationRequested'* then the target device shall not return any additional information to that requested by the server. If this IE indicates '*mayReturnAdditionalInformation'* then the target device may return additional information to that requested by the server. If a location estimate is returned, any additional information is restricted to that associated with a location estimate (e.g. might include velocity if velocity was not requested but cannot include measurements). If measurements are returned, any additional information is restricted to additional measurements (e.g. might include E-CID measurements if A-GNSS measurements were requested but not E-CID measurements). |
| ***qos***  This IE indicates the quality of service and comprises a number of sub-fields. In the case of measurements, some of the sub-fields apply to the location estimate that could be obtained by the server from the measurements provided by the target device assuming that the measurements are the only sources of error. Fields are as follows:  - ***horizontalAccuracy*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracy*' corresponds to the encoded uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].  - ***verticalCoordinateRequest*** indicates whether a vertical coordinate is required (TRUE) or not (FALSE)  - ***verticalAccuracy*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracy*' corresponds to the encoded uncertainty altitude as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].  - ***responseTime***  - ***time*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present with enumerated value '*ten-seconds*', the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. If the *unit* field is present with enumerated value '*ten-milli-seconds*', the maximum response time is given in units of 10-milli-seconds, between 0.01 and 1.28 seconds. If the *periodicalReporting* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).  - ***responseTimeEarlyFix*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present with enumerated value '*ten-seconds*', the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. If the *unit* field is present with enumerated value '*ten-milli-seconds*', the maximum response time is given in units of 10-milli-seconds, between 0.01 and 1.28 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFix* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *time* IE. A target shallomit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFix* IE. A server should set the *responseTimeEarlyFix* IE to a value less than that for the *time* IE. A target shall ignore the *responseTimeEarlyFix* IE if its value is not less than that for the *time* IE.  - ***unit*** indicates the unit of the *time* and *responseTimeEarlyFix* fields. Enumerated value '*ten-seconds*' corresponds to a resolution of 10 seconds. Enumerated value '*ten-milli-seconds*' corresponds to a resolution of 0.01 seconds. If this field is absent, the unit/resolution is 1 second. Enumerated value '*ten-milli-seconds*' is only applicable for NR E-CID Positioning, NR DL-TDOA Positioning, NR DL-AoD Positioning, and NR Multi-RTT Positioning. If the enumerated value '*ten-milli-seconds*' is included for methods others than NR E-CID Positioning, NR DL-TDOA Positioning, NR DL-AoD Positioning, and NR Multi-RTT Positioning the target device shall ignore the *unit* field.  - ***velocityRequest*** indicates whether velocity (or measurements related to velocity) is requested (TRUE) or not (FALSE).  - ***responseTimeNB*** If the *periodicalReporting* IE or *responseTime* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).  - ***timeNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unitNB* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unitNB* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds.  - ***responseTimeEarlyFixNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unitNB* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unitNB* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFixNB* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *timeNB* IE. A target shall omit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFixNB* IE. A server should set the *responseTimeEarlyFixNB* IE to a value less than that for the *timeNB* IE. A target shall ignore the *responseTimeEarlyFixNB* IE if its value is not less than that for the *timeNB* IE.  - ***unitNB*** indicates the unit of the *timeNB* and *responseTimeEarlyFixNB* fields. Enumerated value '*ten-second*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.  - ***horizontalAccuracyExt*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and 'confidence' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *horizontalAccuracy* field is included in QoS.  - ***verticalAccuracyExt*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *verticalAccuracy* field is included in QoS.  All QoS requirements shall be obtained by the target device to the degree possible but it is permitted to return a response that does not fulfill all QoS requirements if some were not attainable. The single exception is *time* and *timeNB* which shall always be fulfilled – even if that means not fulfilling other QoS requirements.  A target device supporting NB-IoT access shall support the *responseTimeNB* IE*.*  A target device supporting HA GNSS shall support the *HorizontalAccuracyExt*, *VerticalAccuracyEx*, and *unit* fields with enumerated value '*ten-seconds*'.  A target device supporting NB-IoT access and HA GNSS shall support the *unitNB* field. |
| ***environment***  This field provides the target device with information about expected multipath and non line of sight (NLOS) in the current area. The following values are defined:  - badArea: possibly heavy multipath and NLOS conditions (e.g. bad urban or urban).  - notBadArea: no or light multipath and usually LOS conditions (e.g. suburban or rural).  - mixedArea: environment that is mixed or not defined.  If this field is absent, a default value of 'mixedArea' applies. |
| ***locationCoordinateTypes***  This field provides a list of the types of location estimate that the target device may return when a location estimate is obtained by the target. |
| ***velocityTypes***  This fields provides a list of the types of velocity estimate that the target device may return when a velocity estimate is obtained by the target. |
| ***messageSizeLimitNB***  This field provides an octet limit on the amount of location information a target device can return.  - ***measurementLimit*** indicates the maximum amount of location information the target device should return in response to the *RequestLocationInformation* message received from the location server. The limit applies to the overall size of the LPP message at LPP level (LPP Provide Location Information), and is specified in steps of 100 octets. The message size limit is then given by the value provided in *measurementLimit* times 100 octets. |
| ***segmentationInfo***  This field indicates whether this *RequestLocationInformation* message is one of many segments, as specified in clause 4.3.5 |
| ***scheduledLocationTime***  This field indicates that the target device is requested to obtain location measurements or location estimate valid at the *scheduledLocationTime* *T* and comprises the following subfields:  - ***utcTime*** provides *T* in UTC in the form of YYMMDDhhmmssZ.  - ***gnssTime*** provides *T* in GNSS system time of the GNSS indicated by *gnss-TimeID*.  - ***gnss-TOD-msec*** specifies the GNSS TOD in 1-milli-second resolution rounded down to the nearest millisecond unit.  - ***networkTime*** provides *T* in E-UTRA or NR network time.  - ***lte-PhysCellId, lte-ArfcnEUTRA, lte-CellGlobalId*** identifies the reference cell (E-UTRA) that is used for the network time.  - ***lte-systemFrameNumber*** specifies the system frame number in E-UTRA.  - ***nr-PhysCellID***, ***nr-ARFCN*** , ***nr-CellGlobalID*** identifies the reference cell (NR) that is used for the network time.  - ***nr-SFN*** specifies the system frame number in NR.  - ***nr-Slot*** specifies the slot number in NR for the indicated subcarrier spacing (SCS). The total NR network time is given by *nr-SFN* + *nr-Slot*.  - ***relativeTime*** provides *T* in seconds from current time, where current time is defined as the time the *CommonIEsRequestLocationInformation* was received.  NOTE 1: A location estimate returned to an LCS Client, AF or UE for a scheduled location time can be treated by the LCS Client, AF or UE as an estimate of the location of the UE at the scheduled location time (see TS 23.273 [42]).  NOTE 2: If this field is present, at least one of *utcTime*, *gnssTime*, *networkTime,* or *relativeTime* shall be present. |
| ***targetIntegrityRisk***  This field indicates the TIR for which the PL is requested. The TIR is calculated by *P*=10-0.1*n* [hour-1] where *n* is the value of *targetIntegrityRisk* and the range is 10-1 to 10-9 per hour. |
| ***periodicalReportingExt***  This IE indicates that extended periodic reporting is requested and comprises the below subfields. If this field is present, the field *periodicalReporting* is absent. Measurement reports containing no measurements or no location estimate are required when a *reportingIntervalMs* expires before a target device is able to obtain new measurements or obtain a new location estimate.  - ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite*', the target device should continue periodic reporting until an LPP *Abort* message is received.  - ***reportingIntervalMs*** indicates the interval between location information reports and the response time requirement for the first location information report in milliseconds. |

*[…]*

#### 6.5.1.7 OTDOA Capability Information

#### – *OTDOA-ProvideCapabilities*

The IE *OTDOA-ProvideCapabilities* is used by the target device to indicate its capability to support OTDOA and to provide its OTDOA positioning capabilities to the location server.

-- ASN1START

OTDOA-ProvideCapabilities ::= SEQUENCE {

otdoa-Mode BIT STRING { ue-assisted (0),

ue-assisted-NB-r14 (1),

ue-assisted-NB-TDD-r15 (2) } (SIZE (1..8)),

...,

supportedBandListEUTRA SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA OPTIONAL,

supportedBandListEUTRA-v9a0 SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA-v9a0

OPTIONAL,

interFreqRSTDmeasurement-r10 ENUMERATED { supported } OPTIONAL,

additionalNeighbourCellInfoList-r10 ENUMERATED { supported } OPTIONAL,

prs-id-r14 ENUMERATED { supported } OPTIONAL,

tp-separation-via-muting-r14 ENUMERATED { supported } OPTIONAL,

additional-prs-config-r14 ENUMERATED { supported } OPTIONAL,

prs-based-tbs-r14 ENUMERATED { supported } OPTIONAL,

additionalPathsReport-r14 ENUMERATED { supported } OPTIONAL,

densePrsConfig-r14 ENUMERATED { supported } OPTIONAL,

maxSupportedPrsBandwidth-r14 ENUMERATED { n6, n15, n25, n50, n75, n100, ...} OPTIONAL,

prsOccGroup-r14 ENUMERATED { supported } OPTIONAL,

prsFrequencyHopping-r14 ENUMERATED { supported } OPTIONAL,

maxSupportedPrsConfigs-r14 ENUMERATED { c2, c3 } OPTIONAL,

periodicalReporting-r14 ENUMERATED { supported } OPTIONAL,

multiPrbNprs-r14 ENUMERATED { supported } OPTIONAL,

idleStateForMeasurements-r14 ENUMERATED { required } OPTIONAL,

numberOfRXantennas-r14 ENUMERATED { rx1, ... } OPTIONAL,

motionMeasurements-r15 ENUMERATED { supported } OPTIONAL,

interRAT-RSTDmeasurement-r15 ENUMERATED { supported } OPTIONAL,

scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupport-r17 OPTIONAL,

periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupport-r18 OPTIONAL

}

maxBands INTEGER ::= 64

SupportedBandEUTRA ::= SEQUENCE {

bandEUTRA INTEGER (1..maxFBI)

}

SupportedBandEUTRA-v9a0 ::= SEQUENCE {

bandEUTRA-v9a0 INTEGER (maxFBI-Plus1..maxFBI2) OPTIONAL

}

maxFBI INTEGER ::= 64 -- Maximum value of frequency band indicator

maxFBI-Plus1 INTEGER ::= 65 -- lowest value extended FBI range

maxFBI2 INTEGER ::= 256 -- highest value extended FBI range

-- ASN1STOP

| *OTDOA-ProvideCapabilities* field descriptions |
| --- |
| ***otdoa-Mode***  This field specifies the OTDOA mode(s) supported by the target device. This is represented by a bit string, with a one value at the bit position means the particular OTDOA mode is supported; a zero value means not supported. A zero-value in all bit positions in the bit string means OTDOA positioning method is not supported by the target device.  ue-assisted: Bit 0 indicates that the target device supports UE-assisted OTDOA and LTE PRS.  ue-assisted-NB: Bit 1 indicates that the target device supports UE-assisted OTDOA and NB-IoT NPRS.  ue-assisted-NB-TDD: Bit 2 indicates that the target device supports UE-assisted OTDOA and NB-IoT NPRS for TDD. |
| ***SupportedBandEUTRA***  This field specifies the frequency bands for which the target device supports RSTD measurements. One entry corresponding to each supported E-UTRA band as defined in TS 36.101 [21]. In the case the target device includes *bandEUTRA-v9a0*, the target device shall set the corresponding entry of *bandEUTRA* (i.e. without suffix) to *maxFBI*. |
| ***interFreqRSTDmeasurement***  This field, if present, indicates that the target device supports inter-frequency RSTD measurements within and between the frequency bands indicated in *SupportedBandEUTRA*. |
| ***additionalNeighbourCellInfoList***  This field, if present, indicates that the target device supports up to 3×24 *OTDOA-NeighbourCellInfoElement* in *OTDOA‑NeighbourCellInfoList* in *OTDOA-ProvideAssistanceData* without any restriction for the *earfcn* in each *OTDOA-NeighbourCellInfoElement* as specified in clause 6.5.1.2. |
| ***prs-id***  This field, if present, indicates that the target device supports PRS generation based on the PRS-ID as specified in TS 36.211 [16] and support for TP-ID in *OTDOA-ReferenceCellInfo* and *OTDOA-NeighbourCellInfoList*. |
| ***tp-separation-via-muting***  This field, if present, indicates that the target device supports RSTD measurements for cells which have associated transmission points (e.g., Remote Radio Heads) within the cell coverage and where these associated transmission points have the same physical cell identity as the associated cell, and where these transmission points are identified via a different muting pattern. The field also indicates support for TP-ID in *OTDOA-ReferenceCellInfo* and *OTDOA‑NeighbourCellInfoList*. |
| ***additional-prs-config***  This field, if present, indicates that the target device supports additional PRS configurations. The additional PRS configuration in *PRS-Info* IE comprise:  - support for *prs-ConfigurationIndex* > 2399; - support for NPRS values in addition to 1, 2, 4 and 6 (*add-numDL-Frames in PRS-Info);*  - support for muting bit string lengths > 16 bits. |
| ***prs-based-tbs***  This field, if present, indicates that the target device supports RSTD measurements for PRS-only TPs. |
| ***additionalPathsReport***  This field, if present, indicates that the target device supports reporting of timing information for additional detected paths for RSTD reference and each neighbour cell. |
| ***densePrsConfig***  This field, if present, indicates that the target device supports a subset of the additional PRS configurations associated with capability *additional-prs-config* which comprises:  - support for *prs-ConfigurationIndex* > 2404;  - support for NPRS values of 10, 20, 40, 80 and 160 (in addition to 1, 2, 4 and 6).  In the case *additional-prs-config* is present, this field is not present. |
| ***maxSupportedPrsBandwidth***  This field, if present, indicates the maximum PRS bandwidth supported by the target device. Enumerated value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If this field is not present, the target device is assumed to support the PRS bandwidth associated with the target device type, which for LTE devices including Cat-M1/M2 is 100 resource blocks and for NB-IoT devices is 1 resource block. |
| ***prsOccGroup***  This field, if present, indicates that the target device supports PRS occasion groups, which implies that each bit of a configured muting pattern applies per PRS occasion group. |
| ***prsFrequencyHopping***  This field, if present, indicates that the target device supports PRS occasion frequency hopping, as specified in TS 36.211 [16]. |
| ***maxSupportedPrsConfigs***  This field, if present, indicates that the target device supports multiple PRS configurations per cell. Enumerated value c2 indicates support for up to 2 configurations; c3 indicates support for up to 3 configurations. |
| ***periodicalReporting***  This field, if present, indicates that the target device supports *periodicalReporting* of RSTD measurements*.* If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***multiPrbNprs***  This field, if present, indicates that the target device supports NPRS configuration in more than one resource block (i.e., *maxCarrier* in *PRS-Info-NB* greater than 1). |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform RSTD measurements. |
| ***numberOfRXantennas***  This field is not applicable to NB-IoT devices.  This field, if present, indicates the number of UE downlink receive antennas for RSTD measurements (see TS 36.133 [18]). Enumerated value rx1 indicates a single antenna receiver. If this field is absent, the target device is assumed to support two RX antennas for RSTD measurements. |
| ***motionMeasurements***  This field, if present, indicates that the target device supports reporting of motion measurements (*delta-SFN* and *motionTimeSource*) in *OTDOA‑SignalMeasurementInformation*. The presence of this field implies presence of *sensor-MotionInformationSup* in IE *Sensor‑ProvideCapabilities*. |
| ***interRAT-RSTDmeasurement***  This field, if present, indicates that the target device supports inter-RAT RSTD measurements (TS 38.215 [36]); i.e., E-UTRA RSTD measurements when the target device is served by an NR cell. |
| ***scheduledLocationRequestSupported***  This field, if present, indicates that the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time. |
| ***periodicReportingIntervalMsSupport***  This field, if present, indicates that the target device supports millisecond periodic reporting intervals for location information – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.2.9 GNSS Capability Information

#### – *A-GNSS-ProvideCapabilities*

The IE *A-GNSS-Provide-Capabilities* is used by the target device to indicate its capability to support A-GNSS and to provide its A-GNSS location capabilities (e.g., GNSSs and assistance data supported) to the location server.

-- ASN1START

A-GNSS-ProvideCapabilities ::= SEQUENCE {

gnss-SupportList GNSS-SupportList OPTIONAL,

assistanceDataSupportList AssistanceDataSupportList OPTIONAL,

locationCoordinateTypes LocationCoordinateTypes OPTIONAL,

velocityTypes VelocityTypes OPTIONAL,

...,

[[ periodicalReportingNotSupported-r14

PositioningModes OPTIONAL,

idleStateForMeasurements-r14

ENUMERATED { required } OPTIONAL

]],

[[ periodicAssistanceData-r15

BIT STRING { solicited (0),

unsolicited (1) } (SIZE (1..8)) OPTIONAL

]],

[[ scheduledLocationRequestSupported-r17

ScheduledLocationTimeSupportPerMode-r17 OPTIONAL

]],

[[ periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]

}

GNSS-SupportList ::= SEQUENCE (SIZE(1..16)) OF GNSS-SupportElement

GNSS-SupportElement ::= SEQUENCE {

gnss-ID GNSS-ID,

sbas-IDs SBAS-IDs OPTIONAL, -- Cond GNSS-ID-SBAS

agnss-Modes PositioningModes,

gnss-Signals GNSS-SignalIDs,

fta-MeasSupport SEQUENCE {

cellTime AccessTypes,

mode PositioningModes,

...

} OPTIONAL, -- Cond fta

adr-Support BOOLEAN,

velocityMeasurementSupport BOOLEAN,

...,

[[

adrEnhancementsSupport-r15 ENUMERATED { true } OPTIONAL,

ha-gnss-Modes-r15 PositioningModes OPTIONAL

]],

[[

ha-gnss-MetricsSupport-r17 ENUMERATED { true } OPTIONAL

]]

}

AssistanceDataSupportList ::= SEQUENCE {

gnss-CommonAssistanceDataSupport GNSS-CommonAssistanceDataSupport,

gnss-GenericAssistanceDataSupport GNSS-GenericAssistanceDataSupport,

...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *GNSS‑ID‑SBAS* | The field is mandatory present if the *GNSS‑ID* = *sbas*; otherwise it is not present. |
| *fta* | The field is mandatory present if the target device supports the reporting of fine time assistance measurements; otherwise it is not present. |

| *A-GNSS-ProvideCapabilities* field descriptions |
| --- |
| ***gnss-SupportList***  This field specifies the list of GNSS supported by the target device and the target device capabilities associated with each of the supported GNSS. This field shall be present if the *gnss-SupportListReq* in the A-GNSS *-RequestCapabilities* IE is set to TRUE and if the target device supports the A-GNSS positioning method. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports the assisted GNSS positioning method. |
| ***gnss-ID***  This field specifies the GNSS supported by the target device for which the capabilities in *GNSS-SupportElement* are provided. |
| ***sbas-IDs***  This field specifies the SBAS(s) supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular SBAS is supported; a zero‑value means not supported. |
| ***agnss-Modes***  This field specifies the GNSS mode(s) supported by the target device for the GNSS indicated by *gnss-ID*. This is represented by a bit string, with a one‑value at the bit position means the particular GNSS mode is supported; a zero‑value means not supported. |
| ***gnss-Signals***  This field specifies the GNSS signal(s) supported by the target device for the GNSS indicated by *gnss-ID*. This is represented by a bit string, with a one‑value at the bit position means the particular GNSS signal type is supported; a zero‑value means not supported. |
| ***fta-MeasSupport***  This field specifies that the target device is capable of performing fine time assistance measurements (i.e., GNSS‑cellular time association reporting). The *cellTime* field specifies for which cellular network(s) this capability is supported. This is represented by a bit string, with a one‑value at the bit position means FTA measurements for the specific cellular network time is supported; a zero‑value means not supported. The *mode* field specifies for which GNSS mode(s) FTA measurements are supported by the target device. This is represented by a bit string, with a one‑value at the bit position means FTA measurements for the GNSS mode is supported; a zero‑value means not supported. |
| ***adr-Support***  This field specifies whether the target device supports ADR measurement reporting. TRUE means supported. |
| ***velocityMeasurementSupport***  This field specifies whether the target device supports measurement reporting related to velocity. TRUE means supported. |
| ***assistanceDataSupportList***  This list defines the assistance data and assistance data choices supported by the target device. This field shall be present if the *assistanceDataSupportListReq* in the A-GNSS*-RequestCapabilities* IE is set to TRUE and if the target device supports GNSS assistance data. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports any GNSS assistance data. |
| ***locationCoordinateTypes***  This parameter identifies the geographical location coordinate types that a target device supports for GNSS. TRUE indicates that a location coordinate type is supported and FALSE that it is not. This field shall be present if the *locationVelocityTypesReq* in the A-GNSS*-RequestCapabilities* IE is set to TRUE and if the target device supports UE-based or standalone GNSS positioning method. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports UE-based or standalone GNSS positioning method. |
| ***velocityTypes***  This parameter identifies the velocity types that a target device supports for GNSS. TRUE indicates that a velocity type is supported and FALSE that it is not. FALSE for all velocity types indicates that velocity reporting is not supported. This field shall be present if the *locationVelocityTypesReq* in the A-GNSS*-RequestCapabilities* IE is set to TRUE and if the target device supports UE-based or standalone GNSS positioning method. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports UE-based or standalone GNSS positioning method. |
| ***periodicalReportingNotSupported***  This field, if present, specifies the positioning modes for which the target device does not support *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is not supported; a zero‑value means supported. If this field is absent, the location server may assume that the target device supports *periodicalReporting* in *CommonIEsRequestLocationInformation* for each supported positioning mode. |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform GNSS measurements. |
| ***periodicAssistanceData***  This field identifies the periodic assistance data delivery procedures supported by the target device. This is represented by a bit string, with a one value at the bit position means the periodic assistance data delivery procedure is supported; a zero value means not supported. Bit 0 (solicited) represents the procedure according to clause 5.2.1a; bit (1) (unsolicited) represents the procedure according to clause 5.2.2a. |
| ***adrEnhancementsSupport***  This field, if present, indicates that the target device supports the fields *adrMSB*, *adrSign*, *adrRMSerror*, and *delta‑codePhase* in IE *GNSS-MeasurementList*.  This field may only be present if *adr-Support* is set to TRUE, and shall be absent if *adr-Support* is set to FALSE. |
| ***ha-gnss-Modes***  This field specifies the High-Accuracy GNSS mode(s) supported by the target device for the GNSS indicated by *gnss‑ID*. This is represented by a bit string, with a one‑value at the bit position means the particular GNSS mode is supported; a zero‑value means not supported. |
| ***ha-gnss-MetricsSupport***  This field specifies that high accuracy GNSS positioning metrics are supported by the target device. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.3.4 E‑CID Capability Information

#### – *ECID-ProvideCapabilities*

The IE *ECID-ProvideCapabilities* is used by the target device to indicate its capability to support E‑CID and to provide its E‑CID location capabilities to the location server.

-- ASN1START

ECID-ProvideCapabilities ::= SEQUENCE {

ecid-MeasSupported BIT STRING { rsrpSup (0),

rsrqSup (1),

ueRxTxSup (2),

nrsrpSup-r14 (3),

nrsrqSup-r14 (4)} (SIZE(1..8)),

...,

[[ ueRxTxSupTDD-r13 ENUMERATED { true } OPTIONAL

]],

[[ periodicalReporting-r14 ENUMERATED { supported } OPTIONAL,

triggeredReporting-r14 ENUMERATED { supported } OPTIONAL,

idleStateForMeasurements-r14 ENUMERATED { required } OPTIONAL

]],

[[ scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupport-r17 OPTIONAL

]],

[[ periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupport-r18 OPTIONAL

]]

}

-- ASN1STOP

| *ECID-Provide-Capabilities* field descriptions |
| --- |
| ***ecid-MeasSupported***  This field specifies the E‑CID measurements supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular measurement is supported; a zero‑value means not supported. A zero-value in all bit positions in the bit string means only the basic Cell ID positioning method is supported by the target device.  If the UE Rx-Tx time difference measurement is supported by the target device (i.e., *ueRxTxSup* field is set to one), it means that the UE supports the UE Rx-Tx time difference measurement reporting via both LPP signaling and RRC signalling.  If a target device doesn't support LPP, the E-SMLC may assume the target device can not report the UE Rx-Tx time difference measurement results via RRC signalling. |
| ***ueRxTxSupTDD***  This field, if present, indicates that any UE Rx-Tx time difference measurement reporting for TDD from the target device includes the *NTAoffset*according to TS 36.211 [16], TS 36.214 [17] and uses the UE Rx-Tx time difference measurement report mapping for TDD as specified in TS 36.133 [18]. This field may only be included if the *ueRxTxSup* field in *ecid‑MeasSupported* is set to value one. |
| ***periodicalReporting***  This field, if present, indicates that the target device supports *periodicalReporting* of E-CID measurements*.* If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***triggeredReporting***  This field, if present, indicates that the target device supports *triggeredReporting* for the *cellChange* event. If this field is absent, the location server may assume that the target device does not support *triggeredReporting* in *CommonIEsRequestLocationInformation*. |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform E-CID measurements. |
| ***scheduledLocationRequestSupported***  This field, if present, indicates that the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time. |
| ***periodicReportingIntervalMsSupport***  This field, if present, indicates that the target device supports millisecond periodic reporting intervals for location information – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.4.4 TBS Capability Information

#### – *TBS-ProvideCapabilities*

The IE *TBS-ProvideCapabilities* is used by the target device to indicate its capability to support TBS and to provide its TBS location capabilities to the location server.

-- ASN1START

TBS-ProvideCapabilities-r13 ::= SEQUENCE {

tbs-Modes-r13 BIT STRING { standalone (0),

ue-assisted (1),

ue-based (2)} (SIZE (1..8)),

...,

[[ mbs-AssistanceDataSupportList-r14 MBS-AssistanceDataSupportList-r14 OPTIONAL,

periodicalReportingSupported-r14 PositioningModes OPTIONAL,

mbs-ConfigSupport-r14 BIT STRING { tb1 (0),

tb2 (1),

tb3 (2),

tb4 (3)} (SIZE (1..8)) OPTIONAL,

mbs-IdleStateForMeasurements-r14 ENUMERATED { required } OPTIONAL

]],

[[ scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL

]],

[[ periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]

}

-- ASN1STOP

| *TBS-ProvideCapabilities* field descriptions |
| --- |
| ***tbs-Modes***  This field specifies the TBS mode(s) supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular TBS mode is supported; a zero‑value means not supported. |
| ***mbs-AssistanceDataSupportList***  This list defines the MBS assistance data supported by the target device. This field shall be present if the target device supports MBS assistance data. |
| ***periodicalReportingSupported***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***mbs-ConfigSupport***  This field specifies the MBS configurations supported by the target device. This field shall be present if the target device supports MBS [24]. |
| ***mbs-IdleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform MBS measurements. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

#### *- MBS-AssistanceDataSupportList*

The IE *MBS-AssistanceDataSupportList* is used by the target device to indicate its capability to support MBS Assistance Data and to provide its capabilities to the location server.

-- ASN1START

MBS-AssistanceDataSupportList-r14 ::= SEQUENCE {

mbs-AcquisitionAssistanceDataSupport-r14 BOOLEAN,

mbs-AlmanacAssistanceDataSupport-r14 BOOLEAN,

...

}

-- ASN1STOP

| *MBS-AssistanceDataSupportList* field descriptions |
| --- |
| ***mbs-AcquisitionAssistanceDataSupport***  This field specifies whether the target device supports MBS Acquisition Assistance Data. TRUE means supported. |
| ***mbs-AlmanacAssistanceDataSupport***  This field specifies whether the target device supports MBS Almanac Assistance Data. TRUE means supported. |

*[…]*

#### 6.5.5.4 Sensor Capability Information

#### *– Sensor-ProvideCapabilities*

The IE *Sensor-ProvideCapabilities* is used by the target device to provide capabilities for sensor-based methods from to the location server.

-- ASN1START

Sensor-ProvideCapabilities-r13 ::= SEQUENCE {

sensor-Modes-r13 BIT STRING { standalone (0),

ue-assisted (1),

ue-based (2)} (SIZE (1..8)),

...,

[[ sensor-AssistanceDataSupportList-r14 Sensor-AssistanceDataSupportList-r14 OPTIONAL,

periodicalReportingSupported-r14 PositioningModes OPTIONAL,

idleStateForMeasurements-r14 ENUMERATED { required } OPTIONAL

]],

[[ sensor-MotionInformationSup-r15 ENUMERATED { true } OPTIONAL

]],

[[ adjustmentSupported-r16 ENUMERATED { true } OPTIONAL

]],

[[ scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL

]],

[[ periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]

}

Sensor-AssistanceDataSupportList-r14 ::= SEQUENCE {

...,

[[ validityPeriodSupported-v1520 ENUMERATED { true } OPTIONAL,

validityAreaSupported-v1520 ENUMERATED { true } OPTIONAL

]]

}

-- ASN1STOP

| *Sensor-ProvideCapabilities* field descriptions |
| --- |
| ***sensor-Modes***  This field specifies the sensor mode(s) supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular sensor mode is supported; a zero‑value means not supported. |
| ***sensor-AssistanceDataSupportList***  This field specifies a list of sensor assistance data supported by the target device. This field shall be present if the target device supports assistance data for Barometric pressure sensor. |
| ***validityPeriodSupported***  This field, if present, indicates that the target device supports *period* i.e. pressure validity period and pressure rate as part of the *Sensor-AssistanceDataList*. |
| ***valitidyAreaSupported***  This field, if present, indicates that the target device supports *area* i.e. pressure validity area and North/East pressure gradient as part of the *Sensor-AssistanceDataList*. |
| ***periodicalReportingSupported***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform sensor measurements. |
| ***sensor-MotionInformationSup***  This field, if present, indicates that the target device supports displacement reporting in IE *Sensor-MotionInformation*. |
| ***adjustmentSupported***  This field, if present, indicates that the target device supports the *adjustment* IE in *Sensor-MeasurementInformation*. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.6.4 WLAN Capability Information

#### *–* *WLAN-ProvideCapabilities*

The IE *WLAN-ProvideCapabilites* is used by the target device to provide its capabilities for WLAN positioning to the location server.

-- ASN1START

WLAN-ProvideCapabilities-r13 ::= SEQUENCE {

wlan-Modes-r13 BIT STRING { standalone (0),

ue-assisted (1),

ue-based (2)} (SIZE (1..8)),

wlan-MeasSupported-r13 BIT STRING {

rssi-r13 (0),

rtt-r13 (1)} (SIZE(1..8)),

... ,

[[ wlan-AP-AD-Supported-r14

BIT STRING { ap-identifier (0),

ap-location (1)} (SIZE (1..8))

OPTIONAL,

periodicalReportingSupported-r14 PositioningModes OPTIONAL,

idleStateForMeasurements-r14

ENUMERATED { required } OPTIONAL

]],

[[ scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL

]],

[[ periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]

}

-- ASN1STOP

| *WLAN-ProvideCapabilities* field descriptions |
| --- |
| ***wlan-Modes***  This field specifies the WLAN mode(s) supported by the target device. This is represented by a bit string, with a one value at the bit position means the WLAN mode is supported; a zero value means not supported. |
| ***wlan-MeasSupported***  This field specifies the measurements supported by the target device when accessing a WLAN. This is represented by a bit string, with a one‑value at the bit position means the particular measurement is supported; a zero‑value means not supported. A zero-value in all bit positions in the bit string means only the basic WLAN positioning method is supported by the target device which is reporting of the WLAN identity. The following bits are assigned for the indicated measurements.  rssi: AP signal strength at the target  rtt: Round Trip Time between target and AP |
| ***wlan-AP-AD-Supported*** This field specifies the WLAN AP assistance data supported by the target device. This is represented by a bit string, with a one-value at the bit position means the particular assistance data is supported; a zero-value means not supported. A zero-value in all bit positions or absence of this field means no assistance data is supported. The following bits are assigned for the indicated assistance data.  ap-identifier: WLAN AP identity information  ap-location: WLAN AP location information |
| ***periodicalReportingSupported***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform WLAN measurements. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.7.4 Bluetooth Capability Information

#### *–* *BT-ProvideCapabilities*

The IE *BT-ProvideCapabilites* is used by the target device to provide its capabilities for Bluetooth positioning to the location server.

-- ASN1START

BT-ProvideCapabilities-r13 ::= SEQUENCE {

bt-Modes-r13 BIT STRING { standalone (0),

ue-assisted (1),

ue-based-v1810 (2)} (SIZE (1..8)),

bt-MeasSupported-r13 BIT STRING { rssi-r13 (0),

aod-v1800 (1)} (SIZE (1..8)),

...,

[[

idleStateForMeasurements-r14

ENUMERATED { required } OPTIONAL,

periodicalReportingSupported-r14

PositioningModes OPTIONAL

]],

[[ scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL

]],

[[ bt-AoA-r18 ENUMERATED { request-only, suggestion } OPTIONAL,

periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]}

-- ASN1STOP

| *BT-ProvideCapabilities* field descriptions |
| --- |
| ***bt-Modes***  This field specifies the Bluetooth mode(s) supported by the target device. This is represented by a bit string, with a one value at the bit position means the Bluetooth mode is supported; a zero value means not supported. |
| ***bt-MeasSupported***  This field specifies the Bluetooth measurements supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular measurement is supported; a zero‑value means not supported. A zero-value in all bit positions in the bit string means only the basic Bluetooth positioning method is supported by the target device which is reporting of the Bluetooth beacon identity. The following bits are assigned for the indicated measurements.  - rssi: Bluetooth beacon signal strength at the target device.  - aod: Bluetooth beacon AoD at the target device. |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform BT measurements. |
| ***periodicalReportingSupported***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***bt-AoA***  This field, if present, indicates that the target device supports Bluetooth AoA, where:  - request-only: Target device supports to provide its Bluetooth AoA transmission configuration to LMF upon request.  - suggestion: Target device supports obtaining a suggestion from LMF about device Bluetooth AoA transmission configuration and device supports to provide its Bluetooth AoA transmission configuration based on the suggestion back to LMF. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.9.4 NR E-CID Capability Information

#### – *NR-ECID-ProvideCapabilities*

The IE *NR-ECID-ProvideCapabilities* is used by the target device to indicate its capability to support NR E-CID and to provide its NR E-CID positioning capabilities to the location server.

-- ASN1START

NR-ECID-ProvideCapabilities-r16 ::= SEQUENCE {

nr-ECID-MeasSupported-r16 BIT STRING { ssrsrpSup (0),

ssrsrqSup (1),

csirsrpSup (2),

csirsrqSup (3)} (SIZE(1..8)),

periodicalReporting-r16 ENUMERATED { supported } OPTIONAL,

triggeredReporting-r16 ENUMERATED { supported } OPTIONAL,

...,

[[

ten-ms-unit-ResponseTime-r17 ENUMERATED { supported } OPTIONAL,

scheduledLocationRequestSupported-r17

ScheduledLocationTimeSupport-r17 OPTIONAL

]],

[[ periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupport-r18 OPTIONAL

]]

}

-- ASN1STOP

| *NR-ECID-ProvideCapabilities* field descriptions |
| --- |
| ***nr-ECID-MeasSupported:***  Indicates the supported NR ECID measurements:  - *ssrsrpSup* indicates the UE supports SSB based cell/beam specific RSRP measurement;  - *ssrsrqSup* indicates the UE supports SSB based cell/beam specific RSRQ measurement;  - *csirsrpSup* indicates the UE supports CSI-RS based cell/beam specific RSRP measurement;  - *csirsrqSup* indicates the UE supports CSI-RS based cell/beam specific RSRQ measurement. |
| ***ten-ms-unit-ResponseTime***  This field, if present, indicates that the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. |
| ***scheduledLocationRequestSupported***  This field, if present, indicates that the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time. |
| ***periodicReportingIntervalMsSupport***  This field, if present, indicates that the target device supports millisecond periodic reporting intervals for location information – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.10.6 NR DL-TDOA Capability Information

#### – *NR-DL-TDOA-ProvideCapabilities*

The IE *NR-DL-TDOA-ProvideCapabilities* is used by the target device to indicate its capability to support NR DL-TDOA and to provide its NR DL-TDOA positioning capabilities to the location server.

-- ASN1START

NR-DL-TDOA-ProvideCapabilities-r16 ::= SEQUENCE {

nr-DL-TDOA-Mode-r16 PositioningModes,

nr-DL-TDOA-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

nr-DL-TDOA-MeasurementCapability-r16 NR-DL-TDOA-MeasurementCapability-r16,

nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

periodicalReporting-r16 PositioningModes OPTIONAL,

...,

[[

ten-ms-unit-ResponseTime-r17 PositioningModes OPTIONAL,

nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0),

beamInfoSup (1),

rtdInfoSup (2),

trpTEG-InfoSup (3),

integritySup-r18 (4),

pruInfoSup-r18 (5)

} (SIZE (1..8)) OPTIONAL,

nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

type-r17 LOS-NLOS-IndicatorType2-r17,

granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

...

} OPTIONAL,

nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

eAoA (1)

} (SIZE (1..8)) OPTIONAL,

nr-DL-TDOA-On-Demand-DL-PRS-Support-r17 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

type-r17 LOS-NLOS-IndicatorType2-r17,

granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

...

} OPTIONAL,

additionalPathsExtSupport-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,

scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL,

nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL, ...

} OPTIONAL,

multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

]],

[[

posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

]],

[[

multiLocationEstimateInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL

]],

[[

locationCoordinateTypes-r18 LocationCoordinateTypes OPTIONAL,

symbolTimeStampSupport-r18 ENUMERATED { supported } OPTIONAL,

periodicAssistanceData-r18 BIT STRING { solicited (0),

unsolicited (1)} (SIZE (1..8)) OPTIONAL,

nr-IntegrityAssistanceSupport-r18 BIT STRING {

serviceParametersSup-r18 (0),

serviceAlertSup-r18 (1),

riskParametersSup-r18 (2),

integrityParaTRP-LocSup-r18 (3),

integrityParaBeamInfoSup-r18 (4),

integrityParaRTD-InfoSup-r18 (5)

} (SIZE (1..8)) OPTIONAL, nr-DL-TDOA-OnDemandPRS-ForBWA-Support-r18 ENUMERATED { supported } OPTIONAL,

periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-ProvideCapabilities* field descriptions |
| ***nr-DL-TDOA-Mode***  This field specifies the NR DL-TDOA mode(s) supported by the target device. |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***  This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***  This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-TDOA. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.  - bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 3 indicates whether the field *nr-DL-PRS-TRP-TEG-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field.  - bit 4 together with bit 0 indicates whether the fields *nr-IntegrityTRP-LocationBounds*, *nr-IntegrityDL-PRS-ResourceSetARP-LocationBounds*, *nr-IntegrityDL-PRS-ResourceARP-LocationBounds* in IE *NR-TRP-LocationInfo* are supported or not; bit 4 together with bit 1 indicates whether the field *nr-IntegrityBeamInfoBounds* in IE *NR-DL-PRS-BeamInfo* is supported or not; bit 4 together with the bit 2 indicates whether the field *nr-IntegrityRTD-InfoBounds* in IE *NR-RTD-Info* is supported or not.  - bit 5 indicates whether the field *nr-PRU-DL-Info* in IE *NR-PositionCalculationAssistance* is supported or not. |
| ***nr-los-nlos-AssistanceDataSupport***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.  - *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* '*per-trp*', '*per-resource*', or both.  The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2*, *dl-RSTD-MeasurementPerPairOfTRP-FR1*, *dl-RSTD-MeasurementPerPairOfTRP-FR*2, *maxNrOfRx-TX-MeasFR1*, *maxNrOfRx-TX-MeasFR2*, *supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2*. Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***nr-DL-TDOA-On-Demand-DL-PRS-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-los-nlos-IndicatorSupport***  This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-TDOA-SignalMeasurementInformation*.  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*  - *granularity* indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both.  NOTE: A single value is reported when both Multi-RTT and DL-TDOA are supported. |
| ***additionalPathsExtSupport***  This field, if present, indicates that the target device supports the *nr-AdditionalPathListExt* reporting in IE *NR-DL-TDOA-SignalMeasurementInformation*. The enumerated value indicates the number of additional paths supported by the target device.  NOTE: The *supportOfDL-PRS-FirstPathRSRP* in IE *NR-DL-TDOA-MeasurementCapability* also applies to the additional paths. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***  This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:  - ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports*.* |
| ***multiMeasInSameMeasReport***  This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***  This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***  This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***multiLocationEstimateInSameMeasReport***  This field, if present, indicates that the target device supports multiple location estimate instances in a single measurement report. |
| ***locationCoordinateTypes***  This field indicates the geographical location coordinate types that a target device supports for UE-based DL-TDOA. TRUE indicates that a location coordinate type is supported and FALSE that it is not. |
| ***symbolTimeStampSupport***  This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |
| ***periodicAssistanceData***  This field identifies the periodic NR assistance data delivery procedures supported by the target device. This is represented by a bit string, with a one value at the bit position means the periodic NR assistance data delivery procedure is supported; a zero value means not supported. Bit 0 (solicited) represents the procedure according to clause 5.2.1a; bit (1) (unsolicited) represents the procedure according to clause 5.2.2a. |
| ***nr-IntegrityAssistanceSupport***  This field indicates the Integrity Assistance Data supported. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.  - bit 0 indicates whether the field *nr-IntegrityServiceParameters* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 1 indicates whether the field *nr-IntegrityServiceAlert* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 2 indicates whether the field *nr-IntegrityRiskParameters* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 3 indicates whether the field *nr-IntegrityParametersTRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 4 indicates whether the field *nr-IntegrityParametersDL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not.  - bit 5 indicates whether the field *nr-IntegrityParametersRTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not. |
| ***nr-DL-TDOA-OnDemandPRS-ForBWA-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS request for bandwidth aggregation. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.11.6 NR DL-AoD Capability Information

#### – *NR-DL-AoD-ProvideCapabilities*

The IE *NR-DL-AoD-ProvideCapabilities* is used by the target device to indicate its capability to support NR DL-AoD and to provide its NR DL-AoD positioning capabilities to the location server.

-- ASN1START

NR-DL-AoD-ProvideCapabilities-r16 ::= SEQUENCE {

nr-DL-AoD-Mode-r16 PositioningModes,

nr-DL-AoD-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

nr-DL-AoD-MeasurementCapability-r16 NR-DL-AoD-MeasurementCapability-r16,

nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

periodicalReporting-r16 PositioningModes OPTIONAL,

...,

[[

ten-ms-unit-ResponseTime-r17 PositioningModes OPTIONAL,

nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0),

beamInfoSup (1),

rtdInfoSup (2),

beamAntInfoSup (3),

integritySup-r18 (4)

} (SIZE (1..8)) OPTIONAL,

nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

type-r17 LOS-NLOS-IndicatorType2-r17,

granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

...

} OPTIONAL,

nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

eAoA (1)

} (SIZE (1..8)) OPTIONAL,

dl-PRS-ResourcePrioritySubset-Sup-r17 ENUMERATED { sameSet, differentSet, sameOrDifferentSet }

OPTIONAL,

nr-DL-PRS-BeamInfoSup-r17 ENUMERATED { supported } OPTIONAL,

nr-DL-AoD-On-Demand-DL-PRS-Support-r17 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

type-r17 LOS-NLOS-IndicatorType2-r17,

granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

...

} OPTIONAL,

scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17

OPTIONAL,

nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL,

...

} OPTIONAL,

multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

]],

[[

posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

]],

[[

multiLocationEstimateInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL

]],

[[

locationCoordinateTypes-r18 LocationCoordinateTypes OPTIONAL,

nr-DL-AoD-PosIntegritySupport-r18 ENUMERATED { supported } OPTIONAL,

nr-DL-AoD-OnDemandPRS-ForBWA-Support-r18 ENUMERATED { supported } OPTIONAL,

periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupportPerMode-r18 OPTIONAL

]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-ProvideCapabilities* field descriptions |
| ***nr-DL-AoD-Mode***  This field specifies the NR DL-AoD mode(s) supported by the target device. |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***  This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***  This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-AoD. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.  - bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field;  - bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is supported or not.  - bit 4 indicates whether the target service supports the range of integrity risk (IR) for which the integrity assistance data are valid. |
| ***nr-los-nlos-AssistanceDataSupport***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.  - *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistanc*e 'per-trp', '*per-resource*', or both.  The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2,dl-RSTD-MeasurementPerPairOfTRP-FR1, dl-RSTD-MeasurementPerPairOfTRP-FR2, maxNrOfRx-TX-MeasFR1, maxNrOfRx-TX-MeasFR2, supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2* . Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***dl-PRS-ResourcePrioritySubset-Sup***  This field, if present, indicates that the target device supports the *DL-PRS-ResourcePrioritySubset* in IE *NR-DL-PRS-Info.* Enumerated value indicates the supported resource set relationship for the target DL-PRS Resource and the associated subset. | |
| ***nr-DL-PRS-BeamInfoSup***  This field, if present, indicates that the target device supports the *NR-DL-PRS-BeamInfo* in IE *NR-DL-AoD-ProvideAssistanceData.* |
| ***nr-DL-AoD-On-Demand-DL-PRS-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-los-nlos-IndicatorSupport***  This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-AoD-SignalMeasurementInformation*.  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*  - *granularit*y indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***  This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:  - ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports. |
| ***multiMeasInSameMeasReport***  This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***  This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***  This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***multiLocationEstimateInSameMeasReport***  This field, if present, indicates that the target device supports multiple location estimate instances in a single measurement report. |
| ***locationCoordinateTypes***  This field indicates the geographical location coordinate types that a target device supports for UE-based DL-AoD. TRUE indicates that a location coordinate type is supported and FALSE that it is not. |
| ***nr-DL-AoD-PosIntegritySupport***  This field, if present, indicates that the target device supports the RAT-dependent positioning integrity for DL-AoD. |
| ***nr-DL-AoD-OnDemandPRS-ForBWA-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS request for bandwidth aggregation. |
| ***periodicReportingIntervalMsSupport***  This field, if present, specified the supported minimum millisecond periodic reporting interval for location information per positioning mode – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*

#### 6.5.12.6 NR Multi-RTT Capability Information

#### – *NR-Multi-RTT-ProvideCapabilities*

The IE *NR-Multi-RTT-ProvideCapabilities* is used by the target device to indicate its capability to support NR Multi-RTT and to provide its NR Multi-RTT positioning capabilities to the location server.

-- ASN1START

NR-Multi-RTT-ProvideCapabilities-r16 ::= SEQUENCE {

nr-Multi-RTT-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

nr-Multi-RTT-MeasurementCapability-r16 NR-Multi-RTT-MeasurementCapability-r16,

nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

nr-UL-SRS-Capability-r16 NR-UL-SRS-Capability-r16,

additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

periodicalReporting-r16 ENUMERATED { supported } OPTIONAL,

...,

[[

ten-ms-unit-ResponseTime-r17 ENUMERATED { supported } OPTIONAL,

nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

eAoA (1)

} (SIZE (1..8)) OPTIONAL, nr-Multi-RTT-On-Demand-DL-PRS-Support-r17

NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

nr-UE-RxTx-TEG-ID-ReportingSupport-r17 BIT STRING { case1 (0),

case2 (1),

case3 (2)

} (SIZE (1..8)) OPTIONAL,

nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

type-r17 LOS-NLOS-IndicatorType2-r17,

granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

...

} OPTIONAL,

additionalPathsExtSupport-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,

scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupport-r17 OPTIONAL,

nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL,

...

} OPTIONAL,

multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

]],

[[

posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

]],

[[

symbolTimeStampSupport-r18 ENUMERATED { supported } OPTIONAL,

nr-MultiRTT-OnDemandPRS-ForBWA-Support-r18 ENUMERATED { supported } OPTIONAL,

periodicReportingIntervalMsSupport-r18 PeriodicReportingIntervalMsSupport-r18 OPTIONAL

]]

}

-- ASN1STOP

| *NR-Multi-RTT-ProvideCapabilities* field descriptions |
| --- |
| ***ten-ms-unit-ResponseTime***  This field, if present, indicates that the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***nr-Multi-RTT-On-Demand-DL-PRS-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-UE-RxTx-TEG-ID-ReportingSupport***  This field, if present, indicates that the target device supports *nr-UE-RxTx-TEG-Info* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation.* This is represented by a bit string, with a one‑value at the bit position means the particular case is supported; a zero‑value means not supported:  - bit 0indicates that the target device supports the '*case1*' choice in *NR-UE-RxTx-TEG-Info*.  - bit 1 indicates that the target device supports the '*case2*' choice in *NR-UE-RxTx-TEG-Info*.  - bit 2 indicates that the target device supports the '*case3*' choice in *NR-UE-RxTx-TEG-Info*. |
| ***nr-los-nlos-IndicatorSupport***  This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation*.  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*  - *granularity* indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both.  NOTE: A single value is reported when both Multi-RTT and DL-TDOA are supported. |
| ***additionalPathsExtSupport***  This field, if present, indicates that the target device supports the *nr-AdditionalPathListExt* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation*. The enumerated value indicates the number of additional paths supported by the target device.  NOTE: The *supportOfDL-PRS-FirstPathRSRP* in IE *NR-Multi-RTT-MeasurementCapability* also applies to the additional paths. |
| ***scheduledLocationRequestSupported***  This field, if present, indicates that the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time. |
| ***nr-dl-prs-AssistanceDataValidity***  This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:  - ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports*.* |
| ***multiMeasInSameMeasReport***  This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***  This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***  This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***symbolTimeStampSupport***  This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |
| ***nr-multiRTT-OnDemandPRS-ForBWA-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS request for bandwidth aggregation. |
| ***periodicReportingIntervalMsSupport***  This field, if present, indicates that the target device supports millisecond periodic reporting intervals for location information – i.e., supports the subfield *reportingIntervalMs* of the IE *PeriodicalReportingCriteriaExt* in IE *CommonIEsRequestLocationInformation* – and the minimum millisecond report interval supported for the periodic reporting. |

*[…]*