3GPP RAN WG2 Meeting #122 draft R2-2306668

Incheon KR, May 22nd – 26th, 2023

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **36.331** | **CR** | **4934** | **rev** | **-** | **Current version:** | **17.4.0** |  |
|  |
| *For* [*HE**LP*](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Clarify the reference point for UTC in SIB16 |
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| ***Source to WG:*** | MediaTek |
| ***Source to TSG:*** | RAN2 |
|  |  |
| ***Work item code:*** | LTE\_NBIOT\_eMTC\_NTN |  | ***Date:*** | 2023-05-30 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | In eMTC and NB-IoT, the UTC time info and reference time info were carried in the SIB16(-NB). When the UE acquired the network broadcasted SIB16(-NB), the absolute timing info carried in SIB16(-NB) is no longer correct due to the long propagation delay for IoT NTN. The propagation delay has to be compensated to get accurate timing. The network cannot compensate for broadcasted signalling as the UEs are in different places. It must be the UE that do the compensation. The UE needs to know a certain starting point of the propagation delay (e.g., RP, eNB or satellite) to figure out how much of the propagation is to be compensated. The reference point for epoch time in SIB31 was specified as the uplink time synchronization reference point, it can also be applied to the reference point for the timing info in SIB16(-NB). |
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| ***Summary of change:*** | The reference point for UTC and reference time info in SIB16 is specified as uplink time synchronization reference point.**Impact analysis:**Impacted functionality: IoT NTNInter-operability: No inter-operability issue. |
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| ***Consequences if not approved:*** | UE doesn’t know how long the transmission delay should be compensated for the received timing info in SIB16.  |
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| ***Clauses affected:*** | 6.3.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

Start of changes

#### – SystemInformationBlockType16

The IE *SystemInformationBlockType16* contains information related to GPS time and Coordinated Universal Time (UTC). The UE may use the parameters provided in this system information block to obtain the UTC, the GPS and the local time.

NOTE: The UE may use the time information for numerous purposes, possibly involving upper layers e.g. to assist GPS initialisation, to synchronise the UE clock (a.o. to determine MBMS session start/ stop).

*SystemInformationBlockType16* information element

-- ASN1START

SystemInformationBlockType16-r11 ::= SEQUENCE {

 timeInfo-r11 SEQUENCE {

 timeInfoUTC-r11 INTEGER (0..549755813887),

 dayLightSavingTime-r11 BIT STRING (SIZE (2)) OPTIONAL, -- Need OR

 leapSeconds-r11 INTEGER (-127..128) OPTIONAL, -- Need OR

 localTimeOffset-r11 INTEGER (-63..64) OPTIONAL -- Need OR

 } OPTIONAL, -- Need OR

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 ...,

 [[ timeReferenceInfo-r15 TimeReferenceInfo-r15 OPTIONAL -- Need OR

 ]]

}

-- ASN1STOP

| *SystemInformationBlockType16* field descriptions |
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| ***dayLightSavingTime***It indicates if and how daylight saving time (DST) is applied to obtain the local time. The semantics is the same as the semantics of the *Daylight Saving Time* IE in TS 24.301 [35] and TS 24.008 [49]. The first/leftmost bit of the bit string contains the b2 of octet 3, i.e. the value part of the *Daylight Saving Time* IE, and the second bit of the bit string contains b1 of octet 3. |
| ***leapSeconds***Number of leap seconds offset between GPS Time and UTC. UTC and GPS time are related i.e. GPS time -*leapSeconds* = UTC time. |
| ***localTimeOffset***Offset between UTC and local time in units of 15 minutes. Actual value = field value \* 15 minutes. Local time of the day is calculated as UTC time + *localTimeOffset*. |
| ***timeInfoUTC***Coordinated Universal Time corresponding to the SFN boundary at or immediately after the ending boundary of the SI-window in which *SystemInformationBlockType16* is transmitted. In a NTN cell, the reference point for UTC time is the uplink time synchronization reference point. The field counts the number of UTC seconds in 10 ms units since 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Sunday, December 31, 1899 and Monday, January 1, 1900). NOTE 1.This field is excluded when estimating changes in system information, i.e. changes of *timeInfoUTC* should neither result in system information change notifications nor in a modification of *systemInfoValueTag* in SIB1. |

NOTE 1: The UE may use this field together with the leapSeconds field to obtain GPS time as follows: GPS Time (in seconds) = timeInfoUTC (in seconds) - 2,524,953,600 (seconds) + leapSeconds, where 2,524,953,600 is the number of seconds between 00:00:00 on Gregorian calendar date 1 January, 1900 and 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time).

Next changes

– *TimeReferenceInfo*

***TimeReferenceInfo* information elements**

-- ASN1START

TimeReferenceInfo-r15 ::= SEQUENCE {

 time-r15 ReferenceTime-r15,

 uncertainty-r15 INTEGER (0..12) OPTIONAL, -- Need OR

 timeInfoType-r15 ENUMERATED {localClock} OPTIONAL, -- Need OR

 referenceSFN-r15 INTEGER (0..1023) OPTIONAL -- Cond TimeRef

}

ReferenceTime-r15 ::= SEQUENCE {

 refDays-r15 INTEGER (0..72999),

 refSeconds-r15 INTEGER (0..86399),

 refMilliSeconds-r15 INTEGER (0..999),

 refQuarterMicroSeconds-r15 INTEGER (0..3999)

}

-- ASN1STOP

| ***TimeReferenceInfo* field descriptions** |
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| ***referenceSFN***This field indicates the reference SFN for time reference information. The *time* field indicates the time at the ending boundary of the SFN indicated by *referenceSFN*. The UE considers the frame indicated by the *referenceSFN* nearest to the frame where the field is received.If the *time* field is included in *SystemInformationBlockType16* and the *referenceSFN* field is not included, the *time* field indicates the time at the SFN boundary at or immediately after the ending boundary of the SI-window in which *SystemInformationBlockType16* is transmitted. |
| ***time, timeInfoType***This field indicates time reference with 0.25 us granularity. The indicated time is referenced at the network, i.e., without compensating for RF propagation delay. In a NTN cell, the reference point for indicated time is the uplink time synchronization reference point. The indicated time in 0.25 us unit from the origin is *refDays*\*86400\*1000\*4000 + *refSeconds*\*1000\*4000 + *refMilliSeconds*\*4000 + *refQuarterMicroSeconds*. The *refDays* field specifies the sequential number of days (with day count starting at 0) from the origin of the *time* field. If *timeInfoType* is not included, the origin of the *time* field is 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time). If *timeInfoType* is set to *localClock*, the interpretation of the origin of the *time* is unspecified and left up to upper layers.If *time* field is included in *SystemInformationBlockType16*, this field is excluded when estimating changes in system information, i.e. changes of *time* should neither result in system information change notifications nor in a modification of *systemInfoValueTag* in SIB1. |
| ***uncertainty***This field indicates the number of LSBs which may be inaccurate in the *refQuarterMicroSeconds* field. If *uncertainty* is absent, the uncertainty of *refQuarterMicroSeconds* is not specified. |

| **Conditional presence** | **Explanation** |
| --- | --- |
| *TimeRef* | The field is mandatory present if *TimeReferenceInfo* is included in *DLInformationTransfer* message; otherwise the field is not present. |

End of changes