**3GPP TSG-SA4 Meeting #131 *S4-250029r01***

**Geneva, , 17th Feb 2025 - 21st Feb 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **26.346** | **CR** | **0672** | **rev** | **-** | **Current version:** | **18.0.1** |  |
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| *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 |  | Core Network | **X** |

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| ***Title:***  | Improved Time Synchronization for MBMS |
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| ***Source to WG:*** | QUALCOMM Europe Inc. - Spain |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | TRAPI, TEI19 |  | ***Date:*** | 2025-02-06 |
|  |  |  |  |  |
| ***Category:*** | **C** |  | ***Release:*** | Rel-19 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | There is a discussion in 5G-MAG: https://github.com/5G-MAG/Standards/issues/159Clause 4.6 of the MBMS specification talks about time synchronization between the BM-SC and MBMS UEs. It says: *A number of MBMS metadata fragments and File Delivery Table (FDT) contain NTP encoded time values. NTP uses UTC as reference time and is independent from time zones. In order to process the time information from the BM-SC correctly, the MBMS UEs shall be time synchronized with the BM-SC with a tolerance of +/- 1 second. The BM-SC shall offer an SNTP [84] time server.*Time Synchronization can be done by two means: anycast or unicast. For 5G Broadcast, only unicast would make sense. In this case it says: "The MBMS UE sends a request to the server using **its pre-configured SNTP server address** . The network may distribute the SNTP request traffic load to a pool of SNTP servers in the network, as long as the UE pre-configured SNTP server address is unchanged. The way the network performs this load distribution is out of scope of this specification. SNTP servers shall only respond if they have a valid synchronization time and shall not leave the timestamp blank, such that the SNTP Leap Indicator (LI) field shall not use the value 3 (warning: unsynchronized)."Some potential problems:* However, in ROM services, unicast may not be available.
* Also SNTP servers may be attached <https://en.wikipedia.org/wiki/NTP_server_misuse_and_abuse>
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| ***Summary of change:*** | Restrict requirements for SNTP to non-ROM servicesPermit usage of SIB16 for non-ROM servicesRequire SIB16 for ROM services |
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| ***Consequences if not approved:*** | May result in services that are not time-synced. |
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| ***Clauses affected:*** |  |
|  |  |
|  | **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:*** |  |

## ===== CHANGE =====

# 2 References

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[36306] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities".

## ===== CHANGE =====

## 4.6 Time synchronization between the BM-SC and MBMS UEs

### 4.6.1 General

A number of MBMS metadata fragments and File Delivery Table (FDT) contain NTP-encoded time values. NTP uses UTC as reference time and is independent from time zones. In order to process the time information from the BM-SC correctly, the MBMS UEs shall be time synchronized with the BM-SC with a tolerance of +/- 1 second.

In case the BM-SC offers any service non-ROM service, the requirements and recommendations for a BM-SC in clause 4.6.2 apply. In addition, for an MBMS UE receiving any non-ROM service, the requirements and recommendations in clause 4.6.2 apply.

In case the BM-SC offers a ROM service, the requirements and recommendations for a BM-SC in clause 4.6.3 apply. In addition, for an MBMS UE receiving any ROM service, the requirements and recommendations in clause 4.6.3 apply.

### 4.6.2 Time synchronization for non-ROM services

This clause applies when the BM-SC offers non-ROM services, as well as for UEs receiving non-ROM services.

The BM-SC shall offer an SNTP [84] time server.

The MBMS UEs should use SNTP to synchronize the time with the BM-SC. It is expected that the MBMS UE periodically requests SNTP time synchronization in order to keep the +/- 1 second tolerance. However, the MBMS UE should use the SNTP time synchronization service only as necessary to keep +/- 1 second accuracy, and should at most use the SNTP time synchronization once every 24 hours to avoid scalability issues.

To further prevent scalability issues, the MBMS UE should randomize its periodic SNTP requests over 1 hour just preceding its determined SNTP request time.

SNTP time synchronization may be achieved either by using SNTP anycast [84], or SNTP unicast [84], depending on network support.

For network deployment where intermediate router nodes between the UE and BM-SC have anycast enabled, the BM-SC shall support the SNTP anycast mode. The MBMS UE sends a request to a designated IPv4 or IPv6 local broadcast address or multicast group address. One or more SNTP anycast servers reply and include a timestamp with their current time and its precision. BM-SC SNTP servers shall only respond if they have a valid synchronization time and shall not leave the timestamp blank, such that the SNTP Leap Indicator (LI) field shall not use the value 3 (warning: unsynchronised). The MBMS UE does not need to keep server address state data and changes in the SNTP server addressing will not affect each subsequent synchronization operation.

For IPv4, the Internet Assigned Numbers Authority (IANA) has assigned the Any Source Multicast group address 224.0.1.1 for NTP, which is used by both multicast servers and anycast clients. For IPv6, the IANA has assigned the multicast group address FF0X:0:0:0:0:0:0:101. These NTP assignments apply to SNTP usage as well. The SNTP server will join these IP multicast groups.

For network deployment where intermediate router nodes between the UE and the SNTP servers do not have anycast enabled, the SNTP server(s) shall support unicast mode. The MBMS UE sends a request to the server using its pre-configured SNTP server address. The network may distribute the SNTP request traffic load to a pool of SNTP servers in the network, as long as the UE pre-configured SNTP serveraddress is unchanged. The way the network performs this load distribution is out of scope of this specification. SNTP servers shall only respond if they have a valid synchronization time and shall not leave the timestamp blank, such that the SNTP Leap Indicator (LI) field shall not use the value 3 (warning: unsynchronized).

An MBMS UE shall select the SNTP mode to use as follows:

1) Attempt time synchronization using SNTP anycast;

2) If SNTP anycast procedure is successful then the UE should use SNTP anycast and continue using anycast for future periodic SNTP time synchronization over the same access network;

3) If the SNTP anycast procedure fails then it should use SNTP unicast and continue using unicast for future periodic SNTP time synchronization over the same access network.

4) In case of access network change detected by the UE, the UE should go to step 1 for its next periodic SNTP time synchronization.

E-UTRAN may distribute *SystemInformationBlockType16* proving information for time synchronization to a UTC wallclock time. In this case, the BM-SC shall be synchronized to the same wallclock as E-UTRAN SIB16, so that timestamps contained in MBMS metadata fragments and File Delivery Table (FDT) of any Non-ROM service are related to the same wallclock time, as used for *SystemInformationBlockType16*. The UE may use this information to stay synchronized with the BM-SC without using SNTP servers.

### 4.6.3 Time synchronization for ROM services

This clause applies when the BM-SC offers ROM services, as well as for UEs receiving ROM services.

In this case,:

1) E-UTRAN shall distribute *SystemInformationBlockType16* for providing time information to the UE, and

2) the BM-SC shall be synchronized to the same wallclock as E-UTRAN. Timestamps in MBMS metadata fragments and File Delivery Table (FDT) of any ROM service are derived from the same wallclock as E-UTRAn *SystemInformationBlockType16* information.

An ROM capable MBMS UE shall implement the feature of receiving E-UTRAN *SystemInformationBlockType16* as defined in clause 6.6.1 of TS 36.306 [36306]. The MBMS UE shall use the information in *SystemInformationBlockType16* to interpret timestamps contained in MBMS metadata fragments and File Delivery Tables (FDTs).