**3GPP TSG- Meeting #**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** |  | **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)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network | **x** |

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| ***Title:***  |  |
|  |  |
| ***Source to WG:*** | , China Telecom, Huawei |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***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 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)* |
|  |  |
| ***Reason for change:*** | Some requirements added to TS 22.104 were not supported in Release 18 stage 2 and stage 3 standardization. To align all 3GPP specifications, these unfulfilled requirements are removed from the Release 18 version of the specification. Other requirements have been satisfied in Release 18, mainly in TS 28.318. |
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| ***Summary of change:*** | Text in specific clauses is removed. |
|  |  |
| ***Consequences if not approved:*** | This specification will remain incompletely aligned with other 3GPP specifications for Release 18. |
|  |  |
| ***Clauses affected:*** | 2, 5.6.1, 5.6C |
|  |  |
|  | **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:*** |  |

FIRST CHANGE

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.261: "Service requirements for the 5G system".

[3] IEC 61784-3: "Industrial communication networks – profiles – part 3: functional fieldbuses – general rules and profile definitions".

[4] BZKI, "Aspects of dependability assessment in ZDKI", June 2017.

[5] BZKI, "Requirement Profiles in ZDKI", 2017.

[6] IEC 61158: "Industrial communication networks – fieldbus specification", 2014.

[7] IEC 61907, "Communication network dependability engineering".

[8] Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Pearson, Harlow, 13th Edition, 2017.

[9] Ernie Hayden, Michael Assante, and Tim Conway, "An Abbreviated History of Automation & Industrial Controls Systems and Cybersecurity", SANS Institute, <https://ics.sans.org/media/An-Abbreviated-History-of-Automation-and-ICS-Cybersecurity.pdf> {accessed: 2017-05-23}, 2014.

[10] IEC 61512 "Batch control - Part 1: Models and terminology".

[11] RESERVE project, Deliverable D1.3, ICT Requirements,
<http://www.re-serve.eu/files/reserve/Content/Deliverables/D1.3.pdf>, September 2017.

[12] RESERVE project, Deliverable D1.2, Energy System Requirements
<http://www.re-serve.eu/files/reserve/Content/Deliverables/D1.2.pdf>, September 2017.

[13] G. Garner, "Designing Last Mile Communications Infrastructures for Intelligent Utility Networks (Smart Grids)", IBM Australia Limited, 2010.

[14] B. Al-Omar, B., A. R. Al-Ali, R. Ahmed, and T. Landolsi, "Role of Information and Communication Technologies in the Smart Grid", Journal of Emerging Trends in Computing and Information Sciences, Vol. 3, pp. 707-716, 2015.

[15] H. Kagermann, W. Wahlster, and J. Helbig, "Recommendations for implementing the strategic initiative INDUSTRIE 4.0", Final report of the Industrie 4.0 working group, acatech – National Academy of Science and Engineering, Munich, April 2013.

[16] IEC 62443-3-2: "Security for industrial automation and control systems - Part 3-2: Security risk assessment and system design", in progress.

[17] IEC 62657-2: "Industrial communication networks - Wireless communication networks - Part 2: Coexistence management", 2017.

[18] IEC 62657-1: "Industrial communication networks – Wireless communication networks – Part 1: Wireless communication requirements and spectrum considerations".

[19] IEEE Std 802.1Q: "IEEE Standard for Local and Metropolitan Area Networks---Bridges and Bridged Networks".

 NOTE: IEEE Std 802.1Qbv-2015 "IEEE Standard for Local and Metropolitan Area Networks--Bridges and Bridges Networks - Amendment 25: Enhancements for Scheduled Traffic" has been included into IEEE Std 802.1Q-2018.

[20] IEEE, Use Cases IEC/IEEE 60802, 2018.

[21] (void)

[22] IEEE Std 802.1AS: "IEEE Standard for Local and Metropolitan Area Networks--Timing and Synchronization for Time-Sensitive Applications".

[23] 3GPP TS 22.289: "Mobile Communication System for Railways".

[24] IEEE P802.1CS: "IEEE Standard for Local and Metropolitan Area Networks--Link-local Registration Protocol".

[25] IEEE P802.1Qdd: "IEEE Draft Standard for Local and Metropolitan Area Networks--Bridges and Bridged Networks -- Amendment: Resource Allocation Protocol (RAP) ".

[26] IEC/IEEE 60802: "Time-Sensitive Networking Profile for Industrial Automation".

[27] 3GPP TS 22.263: "Service requirements for Video, Imaging and Audio for Professional Applications (VIAPA)".

[28] IEC TR 61850-90-1:2010, Communication Networks and Systems for Power Utility automation – Part 90-1: Use of IEC61850 for the communication between substations.

[29] 5G DNA White Paper: "5GDN@Smart Grid White Paper: Requirements, Technologies, and Practices" <https://www.5gdna.org/>

[30] IEC 61850-9-3-2016 – IEC/IEEE International Standard - Communication Networks and Systems for Power Utility automation – Part 9-3: Precision time protocol profile for power utility automation.

[31] IEEE Std C37.238-2017 , IEEE Standard Profile for Use of IEEE Std 1588™ Precision Time Protocol in Power System Applications.

[32] Void.

[33] Void.

[34] IEEE Std 1588-2019: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control".

NEXT CHANGE

### 5.6.1 Clock synchronisation service level requirements

The 5G system shall support a mechanism to process and transmit IEEE 1588v2 / Precision Time Protocol messages to support 3rd-party applications which use this protocol.

The 5G system shall support a mechanism to synchronise the user-specific time clock of UEs with a global clock.

The 5G system shall support a mechanism to synchronize the user-specific time clock of UEs with a working clock.

The 5G system shall support two types of synchronization clocks, the global time domain and the working clock domains.

The 5G system shall support networks with up to 128 working clock domains (with different synchronization domain identifiers / domain numbers), including for UEs connected through the 5G network.

NOTE 1: The domain number (synchronization domain identifier) is defined with one octet in IEEE 802.1AS [22].

The 5G system shall be able to support up to four simultaneous synchronization domains on a UE.

NOTE 1A: The four synchronization domains are used, for example, as two synchronization domains for global time and two working clock domains. One pair of global time and working clock is used as redundant synchronization domains for zero failover time.

The synchronicity budget for the 5G system within the global time domain shall not exceed 900 ns.

NOTE 2: The global time domain requires in general a precision of 1 µs between the sync master and any device of the clock domain. Some use cases require only a precision of ≤ 100 µs for the global time domain if a working clock domain with precision of ≤ 1 µs is available.

NOTE 3: (void)

The synchronicity budget for the 5G system within a working clock domain shall not exceed 900 ns.

NOTE 4: The working clock domains require a precision of ≤ 1 µs between the sync master and any device of the clock domain.

NOTE 5: Different working clock domains are independent and can have different precision.

NOTE 6: The synchronicity budget for the 5G system is also applicable when the flow of clock synchronization messages traverses the air interface twice.

The 5G system shall provide a media-dependent interface for one or multiple IEEE 802.1AS sync domains [22].

The 5G system shall provide an interface to the 5G sync domain which can be used by applications to derive their working clock domain or global time domain (Reference Clock Model).

The 5G system shall provide an interface at the UE to determine and to configure the precision and time scale of the working clock domain.

The 5G system shall be able to support arbitrary placement of sync master functionality and sync device functionality in integrated 5G / non-3GPP TSN networks.

The 5G system shall be able to support clock synchronization through the 5G network if the sync master and the sync devices are served by different UEs. (Flow of clock synchronization messages is in either direction, UL and DL.)

The 5G system shall provide a suitable means to support the management of the merging and separation of working clock domains, that is interoperable with the corresponding mechanisms of TSN and IEEE 802.1AS.

The 5G system shall provide a suitable means to support precise time distribution, clock synchronization functionalities specific to smart grid applications.

NEXT CHANGE

## 5.6C Void

### 5.6C.1 Void

### 5.6C.2 Void

END OF CHANGES