**3GPP TSG-CT WG1 Meeting #131-eC1-214774**

**E-meeting, 19-27 August 2021**

**3GPP TSG-CT WG3 Meeting #117-eC3-214379**

**E-meeting, 18-27 August 2021**

**3GPP TSG-CT WG4 Meeting #105-eC4-214219**

**E-meeting, 17-27 August 2021**

(revision of CP-211327)

**Source: Nokia, Nokia Shanghai Bell**

**Title: Revised WID on CT aspects of support of enhanced Industrial IoT**

**Document for: Approval**

**Agenda Item: 17.1.1 (CT1, CT3) / 5 (CT4)**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>   
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

# Title: CT aspects of support of enhanced Industrial IoT

## Acronym: IIoT

## Unique identifier: 910014

Potential target Release: Rel-17

## 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  | X |  | X |  |
| **No** | X |  | X |  | X |
| **Don't know** |  |  |  |  |  |

## 2 Classification of the Work Item and linked work items

### 2.1 Primary classification

This work item is a building block.

|  |  |
| --- | --- |
|  | Feature |
| X | Building Block |
|  | *Work Task* |
|  | Study Item |

### 2.2 Parent Work Item

|  |  |  |  |
| --- | --- | --- | --- |
| Parent Work / Study Items | | | |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| IIoT | SA2 | 900008 | Support of enhanced industrial IoT |

### 2.3 Other related Work Items and dependencies

|  |  |  |
| --- | --- | --- |
| Other related Work Items (if any) | | |
| Unique ID | Title | Nature of relationship |
| 720005 | New services and market technology enablers (SMARTER) | SA1 work item |
| 800006 | LAN support in 5G (5GLAN) | SA1 work item |
| 800007 | Service requirements for cyber-physical control applications in vertical domains (cyberCAV) | SA1 work item |
| 820017 | 5GS Enhanced support of Vertical and LAN Services (Vertical\_LAN) | SA2 work item |
| 840027 | Security for 5GS Enhanced support of Vertical and LAN Services | SA3 work item |
| 830010 | CT aspects of 5GS enhanced support of vertical and LAN services (Vertical\_LAN) | CT work item (antecedent) |
| 840041 | Enhancements for cyber-physical control applications in vertical domains | SA1 work item |
| 840031 | Audio-visual service production (AVPROD) | SA1 work item |
| 850012 | Study on enhanced support for industrial IoT (IIoT) | SA2 study item |

## 3 Justification

SA2 have studied system enhancements to the 5G system to enable enhanced support of time-sensitive communication (TSC) and deterministic applications under FS\_IIoT. The conclusions of the study are captured in 3GPP TR 23.700-20 and provide a good overview of what is to be continued into normative phase and impacts to other working groups. As a result, TSG-SA approved a new WID (UID: 900008) in TSG-SA Meeting #90E.

Considering these, impacts on protocols and interfaces under CT WGs’ responsibilities are foreseen and the related work in CT WGs should be carried out within Rel-17.

## 4 Objective

The objective of the work item is to develop the specifications under remit of CT WGs for the stage 2 requirements agreed under the stage 2 work item IIoT. Stage 3 work will start when stage 2 requirements are available.

The following areas of work are expected to be covered (non-exhaustive):

**CT1**

1) Uplink time synchronization

- Enhancement in the gPTP message delivery mechanism

- Extension of UMIC to support reporting BMCA result from NW-TT to TSN-AF

2) Exposure of time synchronization

- Support for PTP message delivery

- Enhancement in the UMIC and PMIC to configure the (g)PTP functionality in DS-TT and NW-TT and termination of the UMIC and PMIC for time synchronization in the TSCTSF

- Support for DS-TT and NW-TT acting as a (g)PTP GM

**CT3**

1) Exposure of time synchronization

- Impacts on the network capability exposure framework which involves TSN AF, NEF, TSCTSF, PCF and SMF up to the introduction of an additional Nnef service to expose 5G time synchronization capabilities to the TSN AF

- PCC rule calculation with additional parameters

2) Use of survival time for deterministic applications in 5GS

- Impacts on N5 and N7 to support delivery of survival time for deterministic applications

3) Exposure of deterministic QoS

- Introduction of an additional Nnef service to support deterministic capability exposure.

- Impact on exposure framework to support PMIC/UMIC transmission by NEF.

- Potential impacts on PCF to handle additional parameters for TSC QoS.

4) Potential impact on UDR related APIs to store time synchronisation service parameters

5) Introduction of the TSCTSF, which associates the time synchronization service request from the NF consumer to the AF sessions with the PCF, manages the DS-TT and NW-TT, detects bridge information and supports QoS and TSC Assistance Container related functionalities.

- Introduction of the TSCTSF as a NF service consumer of the PCF for TSC functionality and as a 5GC NF for the NEF for the exposed time synchronization and TSC QoS services.

- Introduction of the TSCTSF – NEF reference point and the related APIs

- Support for time synchronization service, which allows the NF consumer (AF/NEF) to subscribe for the UE and 5GC capabilities for (g)PTP.

- Provisioning of QoS parameters and information.

**CT4**

1) UE-UE TSC

- Update the description of TSC procedures to support UE-UE TSC, i.e. UPF performing local switching for UEs with PDU sessions associated with the same DNN and S-NSSAI

2) Exposure of time synchronization

- Impacts to N4 to enable management for time synchronization for IP type PDU sessions

- Update the description of the N4 procedures to transfer UMIC and PMIC to also apply for information exchanged between TSCTSF and NW-TT (i.e. without TSN integration)

- Impacts to the NRF NFManagement and NFDiscovery APIs to support TSCTSF registration and discovery

## 5 Expected Output and Time scale

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| --- | --- | --- | --- | --- | --- |
| **New specifications** *{One line per specification. Create/delete lines as needed}* | | | | | |
| Type | TS/TR number | Title | For info  at TSG# | For approval at TSG# | Rapporteur |
| TS | 24.539 | 5G System (5GS); Network to TSN translator (TT) protocol aspects; Stage 3 | N/A | N/A | Won, Sung Hwan [sung.won@nokia.com](mailto:sung.won@nokia.com)  CT1 responsibility |
| TS | 29.abc | 5G System (5GS); Time Sensitive Communication and Time Synchronization Function Services; Stage 3 | TSG#94 (Dec. 2021) | TSG#95 (Mar. 2022) | Xiaoyun Zhou [zhouxiaoyun8@huawei.com](mailto:zhouxiaoyun8@huawei.com)  CT3 responsibility |

|  |  |  |  |
| --- | --- | --- | --- |
| **Impacted existing TS/TR** *{One line per specification. Create/delete lines as needed}* | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
| 24.501 | Overall descriptions on uplink gPTP message delivery and time synchronization without integration to IEEE TSN network | TSG#95 (Mar. 2022) | CT1 |
| 24.519 | Removal of contents (transferred to TS 24.539)  No further updates after TSG#92e (June 2021) | TSG#95 (Mar. 2022) | CT1 |
| 24.535 | Enhancement in gPTP delivery mechanism Introduction of PTP delivery | TSG#95 (Mar. 2022) | CT1 |
| 29.512 | Impacts to N7 to support exposure of TSC services, time domain and survival time delivery | TSG#95 (Mar. 2022) | CT3 |
| 29.513 | Update of the policy and charging control signalling flows. | TSG#95 (Mar. 2022) | CT3 |
| 29.514 | Impacts to N5 to support exposure of TSC services, time domain and survival time delivery Introduction of TSCTSF as a new NF consumer | TSG#95 (Mar. 2022) | CT3 |
| 29.519 | Potential impact on UDR related APIs to store time synchronisation service parameters | TSG#95 (Mar. 2022) | CT3 |
| 29.522 | Impacts to N33 to support the exposure of TSC services | TSG#95 (Mar. 2022) | CT3 |
| 29.591 | Potential impacts the Nnef event exposure service to support the exposure of TSC services | TSG#95 (Mar. 2022) | CT3 |
| 29.244 | Impacts to N4 to enable management for time synchronization for IP type PDU sessions.  Update the description of TSC procedures to support UE to UE communication.  Update the description of the N4 procedures to transfer UMIC and PMIC to also apply for information exchanged between TSCTSF and NW-TT (i.e. without TSN integration). | TSG#95 (Mar. 2022) | CT4 |
| 29.510 | Impacts to support TSCTSF registration and discovery | TSG#95 (Mar. 2022) | CT4 |

## 6 Work item Rapporteur(s)

Won, Sung Hwan, Nokia, [sung.won@nokia.com](mailto:sung.won@nokia.com)

## 7 Work item leadership

CT1

## 8 Aspects that involve other WGs

SA3 for security aspects and SA5 for charging aspects.

## 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| Nokia |
| Nokia Shanghai Bell |
| Cisco Systems |
| Huawei |
| HiSilicon |
| NTT DOCOMO |
| ZTE |
| Ericsson |
| Intel |
| MediaTek Inc. |
| Verizon |
| Qualcomm Incorporated |