3GPP TSG-SA WG2#170 S2-2506504r1

Goteborg, SE, August 25 – 29, 2025 (Revision of S2-250xxxx)

**Source: Sony +???**

**Title: [WT#8] Scope on 6G IoT**

**Document for: Approval**

**Agenda Item: 20.6.8**

**Work Item / Release: FS\_6G\_ARC / Rel-20**

*Abstract of the contribution: This contribution proposes a scope description for WT#8 on 6G IoT.*

# 1. Discussion

The following documents proposes scope updates and KI descriptions

|  |  |  |
| --- | --- | --- |
| Tdoc | Title | Source |
| S2-2506499 | [WT#8, Cellular IoT] Update to WT#8 | Qualcomm |
| S2-2506504 | [WT#8] Scope on 6G IoT | Sony |
| S2-2506634 | [WT#8] 6G IoT | Nokia |
| S2-2506643 | [WT#8, 6G IoT] Unified Architecture for 6G IoT and eMBB | Vivo |
| S2-2506941 | [WT#8] Support for Massive IoT | Ericsson |
| S2-2507364 | [WT#8, cellular IoT] WTs and KIs for cellular IoT enablers in 6G | Xiaomi |

Below follows the proposals per document divided into the WT objective description part and the Key Issue description part.

## WT#8 Objective parts

**S2-2506499 (Qualcomm)**

## A.X Work Task 8

Editor's note: Description of Work Task X. Sub-clauses can be used if needed.

**WT#8:** Study whether and how to support cellular IoT enablers in 6G, based on RAN decision for 6G IoT. Analyze which existing cellular IoT features documented in TS 23.501 clause 5.31 should be applied to 6G cellular IoT and/or which should be enhanced.

NOTE 9: The detailed scope for WT#8 will be coordinated and aligned with RAN. Ambient IoT is not in the scope of the study.

**S2-2506504 (Sony)**

### A.8.1 Scope

Editor’s Note: It is FFS which of the legacy 4GS and 5GS CIoT/RedCap features and functionalities applicability for 6GS and identify possible inefficiency, inconsistency or even duplication of the legacy features. Agree on a specific list of features to consider before SA#110.

* Study how to natively support IoT services via TN and NTN. For NTN coordination with WT#2 is needed.
* Study whether and how the enhancements to the user plane architecture and network exposure framework studied in WT#1.2 can be used to provide e2e IoT architecture in 6GS.
* Study whether and how to support lightweight procedure to deliver large data in downlink direction (e.g., firmware upgrade)
* The study considers all types of IoT devices, except for Ambient IoT, even if RAN does not support all types of IoT device types from Release 20/21.
* Study whether and how to support legacy CIoT devices in 6GS.

Editor’s Note: It is FFS which legacy IoT devices to include in the study e.g. 4G-NB-IoT, 4G-MTC and 5G-Redcap.

**S2-2506634 (Nokia)**

## Annex A.X. WT#8

Editor's Note: Describe the technical scope of the proposed Work Task. If applicable, suggest logical subdivision of this WT into smaller sub-WT. This clause is part of the TR Annex.

It is proposed to study the following aspects to support IoT devices in 6G:

* Study advanced UE power saving mechanisms for 6G, enabling longer battery life and improved energy efficiency across various IoT device categories.
* Study scalable access control applicable to massive IoT fleets.
* Study lightweight procedures for small-size, infrequent data transfer, reducing signalling overhead and enabling efficient energy use.

NOTE 1: The enhancements from this WT should be designed to be reusable across different device types (e.g., both 6G regular UEs and 6G IoT UEs).

NOTE 2: Coordination with SA3 is required for any security and privacy related topics.

NOTE 3: Coordination with RAN WG is required for any features related to RAN procedures.

**S2-2506643 (Vivo)**

Annex A.X. WT#X Scope

Editor's Note: Describe the technical scope of the proposed Work Task. If applicable, suggest logical subdivision of this WT into smaller sub-WT. This clause is part of the TR Annex.

WT#8: Support to the unified design for both devices in first releases, including the following aspects:

- Allow Single 6GC and 6G RAN compatible to both 6G IoT devices and eMBB devices

- Maximum common design (e.g., common NAS, unified DRX, unified Service Request, etc.)

- Allow 6G IOT specific technologies enhancement.

- Allow eNBB to utilize the technologies of 6G IOT in specific scenarios.

**S2-2506941 (Ericsson)**

# Annex A.X. WT#8 Support for Massive IoT

Editor's Note: Describe the technical scope of the proposed Work Task. If applicable, suggest logical subdivision of this WT into smaller sub-WT. This clause is part of the TR Annex.

The study for the support of Massive IoT includes the following aspects:

- Study potential implications of the lowest complexity device supported in 6G system with regards to functionalities supported by 6G system that are in SA2 purview.

NOTE: This depends on RAN WGs output.

- Study whether, what and how to re-use 5G functionalities for support of Massive IoT in 6G system, e.g., re-use of RRC Inactive state functionality to minimize signaling overhead, re-use of Small Data Transfer (SDT) to enable efficient UP transfer.

- Study whether and how to simplify/harmonize the UE power saving schemes.

- Investigate improvements for scheduled DL data delivery to a group of devices.

- How to support interworking with 5G system, considering the influence of 6G system architecture work in Work Task #2.

**S2-2507364 (Xiaomi)**

# Annex A.X. WT#8 Scope: Cellular IoT enablers in 6G

Editor's Note: Describe the technical scope of the proposed Work Task. If applicable, suggest logical subdivision of this WT into smaller sub-WT. This clause is part of the TR Annex.

**WT#8** Study how to support cellular IoT enablers in 6G:

- Whether and how the 6G CIoT is supported over multiple Access (e.g. not or not only the E-UTRA).

- Whether and how to support the 6G CIoT considering the exist and new services capability (e.g., AI, sensing).

- How to enable 6G CIoT to ensure the 6G LPWA devices supporting basic network connectivity which can allow them to be connected to future generations (e.g. new monitoring or power saving mechanism).

- Whether and how to support the 6G CIoT considering the wide-area (i.e. rural area and deep indoor) coverage capabilities.

## Key Issue part

**S2-2506634 (Nokia)**

## 5.X. Key Issue #X: IoT support in 6G network

Editor's Note: This clause defines the potential scope of KI(s) and is part of the TR.

It is proposed to study the following aspects to support IoT devices in 6G:

* Study advanced UE power saving mechanisms for 6G, enabling longer battery life and improved energy efficiency across various IoT device categories.
* Study scalable access control applicable to massive IoT fleets.
* Study lightweight procedures for small-size, infrequent data transfer, reducing signalling overhead and enabling efficient energy use.

NOTE 1: The enhancements from this KI should be designed to be reusable across different device types (e.g., both 6G regular UEs and 6G IoT UEs).

NOTE 2: Coordination with SA3 is required for any security and privacy related topics.

NOTE 3: Coordination with RAN WG is required for any features related to RAN procedures.

**S2-2506643 (Vivo)**

# 5.X. Key Issue #X: Key Issue Title

Editor's Note: This clause defines the potential scope of KI(s) and is part of the TR.

The definition of 6G IoT device is assumed to be devices with the following characteristics:

**-** Bandwidth around 5MHz.

**-** Single Tx & Rx.

**-** Up to 10 Mbps, but still transmit small data frequently.

**-** Massive number.

Editor's Note: The final capability and definition of 6G IoT device will be cooperated with RAN WGs.

**The study for 6G IoT includes the following aspects:**

**- #1: Study how to support** a **unified design adaptive to both 6G IoT and eMBB devices, including the following aspects:**

- How to maximum common design for both eMBB and 6G IOT (e.g., common NAS, unified DRX, unified Service Request, etc.)

- How to enable the eMBB devices to utilize the 6G IOT features in some perspective scenario and how to keep the service/IP continuity when eNBB devices to utilize the technologies of 6G IOT feature in specific scenarios

- How to support small data transmission.

- How to support Power saving mechanism.

- How to reflect the coverage enhancement defined by RAN WGs.

**S2-2506941 (Ericsson)**

# 5.X. Key Issue #X: Support for Massive IoT

Editor's Note: This clause defines the potential scope of KI(s) and is part of the TR.

This KI investigates the support of Massive IoT includes the following aspects:

- Study potential implications of the lowest complexity device supported in 6G system with regards to functionalities supported by 6G system that are in SA2 purview.

NOTE: This depends on RAN WGs output.

- Study whether, what and how to re-use 5G functionalities for support of Massive IoT in 6G system, e.g., re-use of RRC Inactive state functionality to minimize signaling overhead, re-use of Small Data Transfer (SDT) to enable efficient UP transfer.

- Study whether and how to simplify/harmonize the UE power saving schemes.

- Investigate improvements for scheduled DL data delivery to a group of devices.

- How to support interworking with 5G system, considering the influence of 6G system architecture work in Work Task #2.

**S2-2507364 (Xiaomi)**

# 5.X. Key Issue #8: Study how to support cellular IoT enablers in 6G

The 5GS supports the Control Plane CIoT 5GS Optimisations and User Plane CIoT 5GS Optimisations over E-UTRA as described in TS 23.501 [2]. The Cellular IoT is in earlier 3GPP releases also referred to as Machine Type Communication (MTC) (see clause 4.3.17 of TS 23.401 [x]).

Though motivated by scenarios and use cases defined in TS 22.261 [y], the functions added to support CIoT have general applicability and are in no way constrained to any specific scenario, use case or UE types, except where explicitly stated. In the context of CIoT the term AF denotes an SCS/AS as defined TS 23.682 [z].

While 5G has made significant strides for CIoT, challenges remain including the CIoT 5GS optimisations is only supported over E-UTRA, CIoT 5GS optimisations are not supported over Non-3GPP RAT type accesses, and the new services (e.g., AI, sensing) supporting for the CIoT is FFS.

TR 22.870 [w] has several requirements for the 6G CIoT. This key issue will study how to support cellular IoT enablers in 6G.

In particular, this key issue will study:

- Whether and how the 6G CIoT is supported over multiple Access (e.g. not or not only the E-UTRA).

- Whether and how to support the 6G CIoT considering the exist and new services capability (e.g., AI, sensing).

- How to enable 6G CIoT to ensure the 6G LPWA devices supporting basic network connectivity which can allow them to be connected to future generations (e.g. new monitoring or power saving mechanism).

- Whether and how to support the 6G CIoT considering the wide-area (i.e. rural area and deep indoor) coverage capabilities.

# 2. Text proposal

In the merger of all the above documents, the “User Name” (company + tdoc number) shows from which document each of the specific text in the WT objective description comes from.

For the Key Issue description, it is here suggested to use the same text as in the objective description (first change).

It is proposed to agree the following changes to TR 23.801-01:

>>>>FIRST CHANGE<<<<

## A.8 WT#8: Study whether and how to support massive IoT enablers in 6GS

The following legacy CIoT/Redcap (EPS and 5GS) features to be studied:

* How to simplify/harmonize the UE power saving schemes, enabling longer battery life and improved energy efficiency across various IoT device categories.
* Minimize signaling overhead for device state transitions and small-size, infrequent data transfer e.g. Small Data Transfer (SDT) to enable efficient UP transfer.
* Whether and how to support the 6G CIoT considering the wide-area (i.e. rural area and deep indoor) coverage capabilities.

Editor’s Note: It is FFS which of the legacy EPS and 5GS CIoT/RedCap features and functionalities applicability to 6G cellular IoT and/or which should be enhanced. Agree on a specific list of features to consider before SA#110.

Further enhancements/enablers to be studied:

* Study scalable access control applicable to massive IoT fleets.
* Investigate improvements for scheduled DL data delivery to a group of devices.
* Study whether and how to support lightweight procedure to deliver large data in downlink direction (e.g., firmware upgrade)
* Whether and how the 6G CIoT is supported over multiple Access (e.g. not or not only the E-UTRA).
* Study whether and how the enhancements to the user plane architecture and network exposure framework studied in WT#1.2 can be used to provide e2e IoT architecture in 6GS.
* Maximum common design (related to WT#1 e.g., common NAS, unified DRX, unified Service Request, etc.) accross 6GS.
* Study how to natively support IoT services via TN and NTN. For NTN coordination with WT#2 is needed.

The study should consider the longevity of 6G IoT devices and also study whether and how to support legacy CIoT devices in 6GS.

Editor’s Note: It is FFS which legacy IoT devices to include in the study e.g. 4G-NB-IoT, 4G-MTC and 5G-Redcap.

NOTE 1: The study considers all types of IoT devices, except for Ambient IoT, even if RAN does not support all types of IoT device types from Release 20/21

NOTE 2: The enhancements from this WT should be designed to be reusable across different device types (e.g., both 6G regular UEs and 6G IoT UEs).

NOTE 3: Coordination with SA3 is required for any security and privacy related topics.

NOTE 4: Coordination with RAN WG is required for any features related to RAN procedures.

>>>>SECOND CHANGE<<<<

# 5.X. Key Issue #8: Study how to support massive IoT in 6G

The following legacy CIoT/Redcap (EPS and 5GS) features to be studied:

* How to simplify/harmonize the UE power saving schemes, enabling longer battery life and improved energy efficiency across various IoT device categories.
* Minimize signaling overhead for device state transitions and small-size, infrequent data transfer e.g. Small Data Transfer (SDT) to enable efficient UP transfer.
* Whether and how to support the 6G CIoT considering the wide-area (i.e. rural area and deep indoor) coverage capabilities.

Editor’s Note: It is FFS which of the legacy EPS and 5GS CIoT/RedCap features and functionalities applicability to 6G cellular IoT and/or which should be enhanced. Agree on a specific list of features to consider before SA#110.

Further enhancements/enablers to be studied:

* Study scalable access control applicable to massive IoT fleets.
* Investigate improvements for scheduled DL data delivery to a group of devices.
* Study whether and how to support lightweight procedure to deliver large data in downlink direction (e.g., firmware upgrade)
* Whether and how the 6G CIoT is supported over multiple Access (e.g. not or not only the E-UTRA).
* Study whether and how the enhancements to the user plane architecture and network exposure framework studied in WT#1.2 can be used to provide e2e IoT architecture in 6GS.
* Maximum common design (related to WT#1 e.g., common NAS, unified DRX, unified Service Request, etc.) accross 6GS.
* Study how to natively support IoT services via TN and NTN. For NTN coordination with WT#2 is needed.

The study should consider the longevity of 6G IoT devices and also study whether and how to support legacy CIoT devices in 6GS.

Editor’s Note: It is FFS which legacy IoT devices to include in the study e.g. 4G-NB-IoT, 4G-MTC and 5G-Redcap.

NOTE 1: The study considers all types of IoT devices, except for Ambient IoT, even if RAN does not support all types of IoT device types from Release 20/21

NOTE 2: The enhancements from this WT should be designed to be reusable across different device types (e.g., both 6G regular UEs and 6G IoT UEs).

NOTE 3: Coordination with SA3 is required for any security and privacy related topics.

NOTE 4: Coordination with RAN WG is required for any features related to RAN procedures.

>>>>END OF CHANGES<<<<