**3GPP TSG-WG SA2 Meeting #171 *S2-250xxxx***

**Wuhan, CN, 13th Oct – 17th Oct, 2025 (revision of S2-250xxxx)**

**Source: Huawei, HiSilicon**

**Title: [KI#2, New Solution] AIoT Device Registration and data transmission Procedure**

**Document for: Approval**

**Agenda Item: 20.5.1**

**Work Item / Release: FS\_AmbientIoT\_Ph2\_ARC / Rel-20**

*Abstract: Solution for Registration Procedure* *and data transmission procedure for the DO-A Capable AIoT device.*

# 1. Introduction/Discussion

The following is the solution for registration procedure and data transmission procedure for DO-A capable device relating to the following WT in Study on Architecture support of Ambient power-enabled Internet of Things - Phase 2:

|  |
| --- |
| **WT#2: Study the support of DO-A Capable AIoT Devices**, including:- Support of the AIoT Device informing the network of its presence autonomously (e.g., an AIoT Device initiated registration-like procedure).- Support for an autonomous AIoT Device originated procedure to send data to the AIOTF, and support for routing the received data by AIOTF.- Naiotf and Nnef interface enhancements to provide the data received from an AIoT Device to the AF.NOTE 4: topology 2 aspect of WT#2 has dependency on WT#1. |

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-30.

\* \* \* \* First change \* \* \* \*

## 6.0 Mapping of Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

|  |  |
| --- | --- |
|  | Key Issues |
| Solutions | Key Issue #1 | <Key Issue #2> |
| #1 |  | X |
| #2 |  | X |
| #3 |  | X |
| #4 |  | X |
| #X |  | X |

\* \* \* \* Second change (all new texts) \* \* \* \*

## 6.X Solution #X: AIoT Device Registration and data transmission Procedure

### 6.X.0 High-level solution Principles

DO-A capable AIoT Devices have the ability to send MO originating signalling and data. The AIoT Device actively registers to the network to inform the network of its presence autonomously and once the AIoT Device is registered it can actively send data to the network autonomously without triggers from the network. The transferred data is included in AIoT NAS messages. The network is configured with a route for uplink data from the AIOT Device and the route is used when traffic is sent.

### 6.X.1 Description

This solution addresses KI#2, and includes how to enable the AIoT Device to inform the network of its presence autonomously for Topology 1, how to enable the device to perform DO-A data transmission, and Inventory and Command Procedures.

It is assumed that the AIoT Device actively initiates the registration process with the network and the data transmission procedure without any trigger from the network. The registration type can be an Initial Registration or a Mobility Registration Update when it to moves outside of an AIoT Registration Area. When an AIoT Device initially registers a context is created in the network for the AIoT Device and the AIoT Device is provided with an AIoT Registration Area.

Editor’s Note: It is FFS whether other registration type need to be supported.

According to TS 23.369 [3] and TS 33.369 [y], the AIOTF is the supports termination point of the AIoT NAS protocol within the network, and supports the authentication of the AIoT Device. For a DO-A capable AIoT Devices the AIOTF remains the NAS termination point, including for device authentication, and additionally supports registration management and mobility management.

### 6.x.2 Procedures

#### 6.X.2.1 Registration Procedure



Figure 6.X.2.1-1: Registration Procedure

1. The AIoT Device sends a D2R message to NG-RAN, including D2R parameters and a NAS Registration Request (Registration Type, device information, security parameters).

 The D2R parameters contains, e.g., a Temporary ID, the selected PLMN ID and allows NG-RAN to route the request to the appropriate AIOTF.

NOTE 1: The details of the D2R parameters need to be coordinated with RAN WG.

 The Registration Type indicates if the AIoT Device is performing an Initial Registration or a Mobility Registration Update. The AIoT Device performs an Initial Registration if it is not registered with the network and performs a Mobility Registration if it has moved outside of its AIoT Registration Area.

2. NG-RAN selects an AIOTF based on the D2R parameters or local configuration and to send the NAS message received from the AIoT Device to. If Indirect Connectivity is used between NG-RAN and the AIOTF, NG-RAN sends the selected AIOTF ID to AMF which can then route the message to the selected AIOTF.

3. NG-RAN sends the Registration Request NAS Message, Temporary ID and selected PLMN ID from the D2R message, and Reader information to the selected AIOTF. If the Temporary ID indicates another AIOTF assigned it, the selected AIOTF fetches the AIoT Device context from that AIOTF.

4. [Conditional] The new AIOTF may determine an old AIOTF using the Temporary ID, and retrieves the AIoT Device context from the old AIOTF.

5. The AIOTF performs authentication and security procedures, and stores the security context.

NOTE 2: Details of authentication and security procedures will be determined by SA3 WG.

6. The AIOTF determines the ADM for the AIoT Device based on the AIoT Device’s permanent ID.

7. The AIOTF registers itself with ADM as serving AIOTF for the AIoT Device and may retrieve the subscription data for the AIoT Device.

8. [Conditional] The ADM informs the old AIOTF using Nadm\_SDM\_unsubscribe that it is no longer the serving AIOTF for the AIoT Device.

9. The AIOTF sends the Registration Accept to the AIoT Device, which may include a new Temporary ID and AIoT Registration Area.

NOTE 3: Power consumption parameters can supplied to the AIoT Device in this procedure and details are expected to described other solutions.

6.x.2.2 Configuration of MO data routing

The procedure to configure the routing of uplink traffic from an AIoT Device is show in figure 6.x.2.2-1.



Figure 6.X.2.2-1: DO-A Target AF information configuration Procedure

1. The AF sends an Nnef\_DOAconfiguration\_Create Request message (AIoT Device information, AF Identifier, validity time) to the NEF. The validity time is used to indicate the how long network maintains the DO-A configuration information.

2. The NEF selects an ADM based on the AIoT Device information received in step 1.

3. The NEF sends a Nadm\_DOAConfiguration\_Create Request message (AIoT Device information, AF Identifier, validity time) to the ADM.

4. The ADM validates the request from the NEF and stores the AF information for devices’ DO-A data transmission, i.e., AF Identifier and validity time.

5. The ADM sends the Nadm\_DOAConfiguration\_Create Response message to NEF to confirm the route has been stored.

6. The NEF sends Nnef\_DOAconfiguration\_Create Response to the AF to acknowledge acceptance of the Nnef\_DOAconfiguration\_Create Request.

#### 6.x.2.3 DO-A traffic routing

The procedure uses the routing information stored in the ADM to route DO-A traffic from an AIoT Device and is shown in figure 6.x.2.3-1.



Figure 6.X.2.2-1: DO-A Data Transmission Procedure

1. The AIoT Device sends D2R message to NG-RAN, including Temporary ID and AIoT UL NAS message (Temporary ID, DO-A Data).

2. Based on the Temporary ID, NG-RAN selects an AIOTF, and forwards the AIoT UL NAS message and the RAN AIoT Device NGAP ID to the selected AIOTF. If Indirect Connectivity is used between NG-RAN and the AIOTF, NG-RAN sends the selected AIOTF ID to AMF so it can route the messages to the AIOTF.

3. The AIOTF obtains the target AF information for the AIoT Device through subscribing to the ADM.

4. The AIOTF forwards the AIoT Device ID, DO-A Data and the target AF information an NEF. The NEF does not have to be the same NEF that that AF used to provide the routing information to the network.

5. The NEF forwards the AIoT Device ID, DO-A Data to the AF based on the target AF information.

#### 6.X.2.4 Inventory Procedures

The Inventory Procedure as specified in TS 23.369 [3], clause 6.2.2 is performed with following differences:

* In step 2, if the information about the target AIoT Device(s) has been provided, the NEF determines the corresponding serving AIOTFs by querying the ADM for the serving AIOTF based on the AIoT Device ID, and uses that AIOTF to perform the Inventory Procedure.
* In step 11, the AIOTF may find the serving AIOTF based on the Temporary ID, and retrieve the AIoT Device ID from the serving AIOTF. The AIoT Device context is not transferred, therefore a new Temporary ID does not need to be provided to the AIoT Device.

NOTE: Power consumption parameters might need to be provided to NG-RAN when performing the Inventory Procedure, and details are expected to described other solutions.

#### 6.X.2.5 Command Procedures

The Command Procedure as specified in TS 23.369 [3], clause 6.2.3 is performed with following differences:

- In step 2, if the information about the target AIoT Device(s) has been provided, the NEF determines the corresponding serving AIOTFs by querying the ADM for the serving AIOTF based on the AIoT Device ID, and uses that AIOTF to perform inventory procedure.

- In step 7, the AIOTF may find the serving AIOTF based on routing information, e.g., from within the temporary ID, and fetch AIoT Device contexts from the serving AIOTFs. It also registers/updates itself in the ADM as new Serving AIOTF.

 If the serving AIOTF has changed, a new Temporary ID, needs be generated and provided to the AIoT Device so when it performs DO-A procedure the new AIOTF can be selected by NG-RAN.

- In step 8, the new Temporary ID, is provided to the AIoT Device along with the NAS Command Request message.

NOTE: Power consumption parameters might need to be provided to NG-RAN when performing the Command Procedure, and details are expected to described other solutions.

### 6.X.3 Impacts on Services, Entities and Interfaces

**AIOTF:**

- Support Registration and Mobility Management.

- Support DO-A data routing.

**NG-RAN:**

- Supports AIOTF selection and transferring NAS messages to and from the AIoT Device.

**AIoT Device:**

- Support performing registration procedure.

**ADM:**

- Support new interface with AIOTF.

\* \* \* \* End of changes \* \* \* \*