**3GPP TSG-WG SA2 Meeting #166 *S2-2412512***

**Orlando, US, 18th Nov – 22nd Nov, 2024 (revision of S2-2412129)**

**Source: Huawei, HiSilicon**

**Title: KI#3 Conclusion on Support of Ambient IoT Services**

**Document for: Approval**

**Agenda Item: 19.14.1**

**Work Item / Release: FS\_AmbientIoT / Rel-19**

*Abstract: Conclusion update for AIoT KI3.*

# 1. Introduction

## 1.1 Overview

The conclusion for KI3 contains Editor’s notes related to the support of temporary disable and AIoT services exposed by the NEF, these ENs are resolve, and additionally the principle for the procedure is also provided.

## 1.2 AIoT Services

The AIoT Services supported by 5GC towards an AIoT Device, which match those exposed by the NEF to the AF are: Inventory, Read, Write and Disable.

**Memory target for Read and Write Operations**

For Read and Write there was a discussion in the last meeting about whether the target of the read and write service is non-volatile memory or some other type of memory. The type of memory that is targeted by the services depends on the AIoT Device implementation. It can be seen that some devices may have non-volatile memory, therefore allowing the AIoT Device to store and return the information. It can also be foreseen that some AIoT Devices may place the written data into volatile memory, for example, if it then needs to additionally process it, and similarly data read may come from volatile memory which is the result of some processing by the device. It can even be foreseen that an AIoT Device may even support both types of memory at different addresses indicated in the read/write operations.

The actual type of memory does not impact the operations, they perform the same from the service and standard point of view – transport data to the AIoT Device, transport data from the AIoT Device and what type of memory is targeted by the operations is an implementation detail for the device manufacture and application requesting the operation.

Therefore, can conclude that memory is targeted, but not be specific for the type of memory.

**Temporary Enable & Disable**

There is an Editor’s note that says whether and how to support temporary disable is FFS.

At present there is no solutions in the TR which cover these operations, so it is not clear how they can or will work, especially considering enabling a disabled device. While it there are potential solutions about how much of the AIoT Devices radio is disabled (fully, only TX etc), to enable the device it can be expected that some transmission will be required, there is nothing documented about them.

This requirement should be postponed and can be re-examined in a future release.

**NEF Exposure**

The NEF expose, its services, operations and parameters need to follow the operations supported by 5GC for Ambient IoT. Common to all the service operations are parameters which identify the target AIoT Devices and which Readers to use for the operation, along with operation specific parameters, for example, addresses to read/write data to/from, its length and data to write, etc.

## 1.3 Principles for procedures

The overall procedure for AIoT Services is shown in the figure below.



The procedure starts with the AF making a request to the NEF and it being passed to an AIOTF. The AIOTF determines relevant information to the handle the request, including which readers are used, and then performs an inventory / paging request. When AIoT Device(s) respond the AIoTF may interact with UDM/other NFs for subscription-like information. If a command is requested by the AF, then a AIoT specific NAS message it send to the AIoT Device for the requested operation, and results obtained. The results are then provided to the AF, via the NEF.

These steps are provided in clause 8.3.4 in the text proposal.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-13.

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

### 8.3.4 Principles on the procedures to support AIoT services

To support the services provided by 5GC and the NEF exposure of those AIoT services, the following procedures are supported:

- Inventory Procedure.

- Command Procedure, to transfer the Read, Write and Disable requests and responses to AIoT Device as AIoT specific NAS messages.

There are request that are used from the AIOTF towards the Reader and responses from the Reader to the AIOTF. The routing of the request and response messages and their encoding depends on the topology and transport to the Reader (see KI#1),

All the procedures follow have the following steps:

1. The AF makes a service request to the NEF, including parameters to identify the target AIoT Device(s), target Readers and service operation specific parameters.

2. The NEF determines an AIOTF for the requested operation, and invokes a new service operation on the AIOTF.

3. For the requested operation the AIOTF:

1). Performs initial reader selection by either:

- Using information from the AF, which represents the location/area, identify the Readers which can be used for the operation in the location/area. The information can identify multiple or an individual Reader to use for the request.

NOTE aa: Management of which readers are identified by the information from the AF is up to the network deployment, configuration or implementation. How the information is synchronised with an AF is dependent on the network deployment and operator policy.

- If a single UE Reader ID is provided by the AF via the NEF for the operation, then that is used as the selected Reader.

- If reader selection information or UE Reader ID is not provided, then how the AIOTF determines which readers to use is based on implementation. The AIOTF may be e.g., preconfigured with which readers to use, or take the requested target AIoT Devices last known location into account, etc.

NOTE bb: There may be additional steps during initial reader selection depending upon the topology and routing, see the conclusion to KI#1.

 If no reader can be selected then the request is rejected.

2). Determines A-IoT Device Identification information (i.e. a MASK) based on the information from the AF, to be included in the paging message on the AIoT air interface to find the AIoT Devices. AIoT Devices compare the A-IoT Device Identification information (e.g. a bit string/MASK) with (part of) their own AIoT Device Identifier (including Home Network Identifier) to determine whether respond to the paging message.

Editor's note: Whether and how the A-IoT Device Identification information will be security protected will be concluded by SA WG3.

3). Determines Reader Assistance information required for the operation used to the Reader, taking into account assistance information from the AF.

4). Constructs a request for an Inventory operation using the determined information to page the AIoT Devices, and a TASK ID used as a correlation identifier for the AIOTF to relate responses to request. The Inventory request is routed to the Readers determined by the initial reader selection.

NOTE gg: In the “command-only” case, if a command and paging can be performed in a single operation, then an AIoT specific NAS message may be included in the request.

 See clause 8.1 for how to provide the request to a Reader.

NOTE dd: In Topology 1 and Topology 2 RRC based options , and if RAN determines that Reader down-selection is supported, then RAN may only request some of the readers initially selected by the AIOTF to perform the requested operation.

5). The Reader executes the inventory request, reporting AIoT specific NAS message responses from the AIoT Device to the AIOTF, including its Reader ID. The Reader may aggregate results from multiple AIoT Devices in the responding messages. The AIOTF can determine which request the results are for using the TASK ID to correlate the request and response.

6). The AIOTF may, depending on the information within the AIoT Device identifier, obtain subscription-like information from either:

- the service network performing the operation (either as identified by a AIoT Device Identifier or operator policy to check it been provided with information for a specific AIoT Device), or

- another network as identified by a AIoT Device Identifier, or

- A third party as identified by a AIoT Device Identifier.

7). Verifies the AIOT Device identity.

NOTE ee: Whether and how AIOT Device Identifiers are verified depends on SA3.

8). If the operation if a command operation, the AIOT generates a request, including an AIoT specific NAS message for the command, along with any additional information required by the Reader to execute the command, a TASK ID etc. The request is then routed to the Reader. The Reader executes the command, passing the AIoT specific NAS message to the AIoT Device and collecting any AIoT specific NAS responses. The AIoT specific NAS responses are then routed back to the AIOTF.

NOTE ff: Whether and how security protection is applied to the AIoT specific NAS message send to the AIoT Device and the response AIoT specific NAS message from the AIoT Device depends on SA3.

9). Updates the AIoT Device subscription-like data to include the Reader identifier used for the AIoT Device, any service specific results (e.g., the device is disabled).

10). Provide the results of the operation to the NEF. Results from multiple AIoT Devices may be included in the service response(s).

4. Provide the results of the operation from the NEF to the AF.

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