**3GPP TSG-RAN WG3 Meeting #126 R3-24xxxx**

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**Agenda Item: 16.1**

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**Title: (TP to TR 38.769) Removal of Editor's Note**

**Document for: Approval**

# 1 Introduction

In this paper, the corresponding TP is provided to reflect the removal of Editor’s Notes in offline A-IoT discussion.

# 2 Text Proposal

<<<<<<<<<<<<<<<<<<<< First Change >>>>>>>>>>>>>>>>>>>>

6.4 RAN architecture aspects

This clause attempts to identify and describe architectural elements necessary to define a RAN architecture for support of Ambient IoT embedded in the overall 5G system architecture in support of topology 1 and topology 2 (as defined in TR 38.848 [2]).

This chapter also attempts to identify a functional split between RAN and CN.

The logical system architecture for A-IoT consists of the following architectural elements:

**A-IoT device**: Equipment with characteristics outlined e.g., in TS 22.369 [10] and TR 38.848 [2].

**A-IoT RAN**: Hosts certain functions for A-IoT as part of the functional in RAN.

Editor’s Note 4: Further details regarding A-IoT functions hosted in the A-IoT RAN and the respective functional split to be decided by RAN2, RAN3 and SA2.

**A-IoT radio**: Radio interface between A-IoT device and A-IoT RAN node in topology 1 and between A-IoT device and A-IoT-enabled UE in topology 2.

**A-IoT CN**: Hosts certain functions for A-IoT as of the functional in CN.

NOTE: the details of A-IoT CN are subject to SA2.

Editor’s Note 6: Further details regarding A-IoT functions hosted in the A-IoT CN and the respective functional split to be decided by RAN2, RAN3 and SA2.

**XX interface**: Interface between the A-IoT RAN and the A-IoT CN on which certain A-IoT specific functions are performed.

Editor’s Note 7: The functions represented by the XX interfaces are FFS. It is also FFS whether this interface represents a new logical interface or is equal to NG. E.g., for topology 1 it may only represent a single interface instance, e.g., a new interface between A-IoT RAN and A-IoT CN, for topology 2 it might represent either 2 interface instances, one instance for NG and one instance “XX” for a new interface between A-IoT CN and A-IoT RAN, or one instance for NG alone.

**Common reader function**: A function that communicates with the A-IoT device by means of A-IoT radio.

**A-IoT RAN node function**: A function that contains e.g., the control of the A-IoT radio resources used towards the A-IoT device.

Editor’s Note 9: further details are FFS. Note that “control of A-IoT radio resources” does not necessarily imply dynamic configuration of resources but could also rely on static assignment of resources by means of OAM. Aspects concerning coordination of the Upper Layer functions (e.g., Inventory, Command) e.g., in case these functions have to be performed over a multitude of instances of the Common Reader Function are FFS.

6.4.1 Support of Topology 1

Figure 6.4.1-1 depicts a logical system architecture for topology 1, where the Common reader function and A-IoT RAN node function are deployed within an A-IoT RAN.

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**Figure 6.4.1-1 Logical system architecture for topology 1**

For Toplogy 1, architecture and protocol aspects of split RAN architecture are not studied.

In Topology 1, the XX interface could be based on NG or a new interface carried over NG or a new interface.

Figure 6.4.1-2 shows the Protocol stack for Topology 1, assuming a SCTP-based transport:

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**Figure 6.4.1-2. Protocol Stack for Topology 1**

NOTE: The protocol stack in Figure 6.4.1-2 does not illustrate how A-IoT upper layer information, if any, is transported over XXAP. Details are subject to SA2 agreements.

For topology 1, the XXAP is terminated at an A-IoT RAN node.

The signalling transport for XXAP at the A-IoT RAN node is SCTP/IP. Other options of signalling transport for XXAP at the A-IoT RAN node (e.g., HTTP/2/TLS/TCP) were discussed, but will not be pursued.

NOTE: The A-IoT CN may include AMF and A-IoTF which is up to SA2 decision.

In Topology 1, an A-IoT RAN node may serve one or more readers.

The A-IoT RAN node should enable the coordination of the usage of the A-IoT radio resources among readers.

Reader selection may need coordination between A-IoT RAN node and A-IoT CN.

6.4.2 Support of Topology 2

Figure 6.4.2-1 depicts a logical system architecture for topology 2, where the Common reader function is located at an A-IoT-enabled UE, and the A-IoT RAN node function is located at an A-IoT-enabled gNB.

The following definitions apply:

**A-IoT-enabled gNB**: A gNB supporting A-IoT RAN node function in topology 2, which is able to communicate with the A-IoT-enabled UE via NR Uu interface.

**A-IoT-enabled UE**: A UE supporting Common reader function, which is able to communicate with the A-IoTdevice via the A-IoT radio interface.

**Figure 6.4.2-1 Logical system architecture for topology 2**

Editor’s Note 1: Figure 6.4.2-1 doesn’t illustrate the protocol between A-IoT enabled UE and A-IoT CN, if needed, the figure needs to be revised in case such is defined by SA2.

Editor’s Note 2: In Topology 2, the XX interface could be based on NG or a new interface carried over NG or a new interface. XX signaling could be transported via XX-C or XX-U, which is FFS.

NOTE 1: The A-IoT CN could include AMF, UPF and A-IoTF, which is up to SA2 decision.

The A-IoT enabled gNB performs radio resource management for A-IoT related radio resources.

Editor’s Note 5: In Topology 2, it is FFS on reader selection, may need coordination between A-IoT RAN node and A-IoT CN.

In Topology 2, the RAN architecture should enable the coordination of the usage of the A-IoT radio resources among readers.

An A-IoT-enabled gNB could support both topology 1 and topology 2, this is an implementation matter.

6.4.2.1 Solutions for Topology 2

6.4.2.1.0 General To support Topology 2, the following solutions are to be studied for conveying A-IoT upper layer information:

**- RRC based solution.** With this solution, A-IoT CN applies A-IoT upper layer information explicitly over XXAP signaling. A-IoT upper layer information is then relayed explicitly to/from the A-IoT-enabled UE via NR Uu RRC.

- **NAS based solution**. With this solution, there is no explicit termination of A-IoT upper layer information at A-IoT-enabled gNB. A-IoT upper layer information is transmitted over A-IoT enabled UE's NAS.

- **UP based solution**. With this solution, there is no explicit termination of A-IoT upper layer information at A-IoT-enabled gNB. A-IoT upper layer information is transmitted as A-IoT-enabled UE's user plane data.

NOTE: The protocol stack for each solution option does not illustrate A-IoT CN internal architecture and how A-IoT upper layer information is transported, if any. Details are subject to SA2 agreements.

6.4.2.1.1 Solution1: RRC based solution

Upon receiving XXAP: A-IoT related message from A-IoT CN, the A-IoT-enabled gNB transmits the related information towards the A-IoT-enabled UE via NR Uu RRC, and vice versa.



**Figure 6.4.2.1.1-1: RRC based solution of Topology 2**

6.5 Impacts on CN-RAN interface

6.5.1 Information exchanged between A-IoT CN and A-IoT RAN

6.5.1.1 Inventory

Inventory can be sent by the A-IoT CN for a single device, or a group of devices, or all devices.

The Inventory Request from the A-IoT CN to the A-IoT RAN, may include the following:

(1) A-IoT Device Identification (to find a single device, a group of devices, or all devices)

Note 1: The definition of this identification is out of RAN3 scope.

For topology 1, A-IoT RAN needs to store the A-IoT Device Identification received from the inventory request.

Note 2: Whether to interpret and process needs further discussion.

(2) Scope of inventory request (e.g., a certain area in which the inventory is to be triggered)

Multiple individual A-IoT Device IDs (one ID per device) can be provided to the A-IoT CN via a single Inventory Report.

Note 3: For topology 1, whether device ID received from the device is sent transparent or not depends on RAN2 and SA2.

6.5.1.2 Command

Command can be sent by the A-IoT CN for a single device. For topology 1, A-IoT RAN node should be able to differentiate between command and inventory.

Note 4: Whether to command on a group of devices depends on RAN2, SA2 and SA3.

Note 5: Whether the A-IoT-enabled-gNB should be able to differentiate between command and inventory needs further discussion, which depends on SA2 and RAN2.

6.5.1.3 A-IoT radio resource allocation in case of NAS/UP based solutions

In NAS/UP based solutions, A-IoT radio resources can be requested in advance to the NAS/UP based communication with the A-IoT device or can be requested along with the NAS/UP based communication. There are different ways to trigger A-IoT radio resource allocation, e.g., upon CN request or or upon UE request, etc. Some aspects of A-IoT radio allocation may be preconfigured by OAM.