3GPP TSG-RAN WG3 Meeting #125 R3-244716

**Maastricht, NL, 19 - 23 Aug, 2024**

Title: (TP for TR 38.769) RAN architecture aspects

Agenda Item: 16.2

Source: Huawei

Document for: other

# 1 Introduction

In [1], about the RAN architecture, the Logical System Architecture for AIoT was captured, this contribution tried to have further text proposals to topology 1 and topology, on the architecture and protocol stack.

# 2 Reference

1. R3-244030 (BL pCR to TR 38.769) Study on solutions for Ambient IoT in NR, Huawei, CMCC

# 3 Text Proposal to TR 38.769

***------------Start of the Change-------------***

# 3 Definitions of terms, symbols and abbreviations

This clause and its three (sub) clauses are mandatory. The contents shall be shown as "void" if the TS/TR does not define any terms, symbols, or abbreviations.

## 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**example:** text used to clarify abstract rules by applying them literally.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AIoT Ambient IoT

AIoT RAN AIoT Radio Access Network

DO-A Device-originated autonomous

DO-DTT Device-originated by device-terminated trigger

DT Device-terminated

FR Frequency Range

IoT Internet of Things

LPWA Low-power, wide-area

LTE-MTC Long Term Evolution – Machine Type Communication

NB-IoT Narrowband IoT

RFID Radio frequency identification

SFO Sampling frequency offset

***------------Start of the Next Change-------------***

## 6.2 Protocol stack and signalling procedures

Editor’s note: Corresponds to the RAN2 objective in the SID.

## 6.3 RAN architecture aspects

Editor’s note 1: Corresponds to the second RAN3 objective in the SID, to identify RAN architecture aspects, including whether support for split architecture is necessary.

This chapter 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]).

Editor’s Note 2: What functionalities are hosted by the 5GS for AIoT is TBD.

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

Figure 6.3-1 depicts the logical system architecture for AIoT.

It consists of the following architectural elements:

**AIoT device**: equipment with characteristics outlined e.g. in TS 22.369 [x] and TR 38.848 [2].

Editor’s Note 3: Further details FFS, if any.

**AIoT RAN**: hosts certain functions for AIoT as part of the functional split between RAN and CN.

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

**AIoT radio**: radio interface between AIoT device and AIoT RAN node in toplogy 1 and between AIoT device and AIoT enabled UE in topology 2.

Editor’s Note 5: Further details on AIoT radio to be discussed by RAN1 and RAN2.

**AIoT CN**: hosts certain functions for AIoT as of the functional split between RAN and CN

NOTE: the details of AIoT CN are subject to SA2.

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

**XX interface**: interface between the AIoT RAN and the AIoT CN on which certain AIoT 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 AIoT RAS and AIoT CN, for topology 2 it might represent either 2 interface instances, one instance for NG and one instance “XX” for a new interface between AIoT CN and AIoT RAS, or one instance for NG alone.**Common reader function**: a function that communicates with the AIoT device by means of AIoT radio.

Editor’s Note 8: Further details on Common reader function is to be discussed by RAN1 and RAN2.

**AIoT RAN node function**: a function that contains e.g. the control of the AIoT radio resources used towards the AIoT device.

Editor’s Note 9: further details are FFS. Note that “control of AIoT 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.

### 6.3.1 Support of Topology 1

 Figure 6.3.1-1 depicts a logical system architecture for topology 1, where the the Common reader function and AIoT RAN node function are deployed within an AIoT RAN.



**Figure 6.3.1-1 Logical system architecture for topology 1**

In Topology 1, the XX interface represents a single interface instance, and it could be either a new logical interface or a NG interface.

Figure 6.3.1-2 shows the Protocol stack for Topology 1, assuming a SCTP-based transport:



1. **Figure 6.3.1-2. Protocol Stack for Topology 1**
2. Editor’s Note 1: Figure 6.3.1-2 serves as a starting point for further discussions.

The XXAP is terminated at the AIoT RAN node.

Editor’s Note 2: the signalling transport for XXAP is FFS.

Editor’s Note 3: The protocol stack in option 3 does not detail how Upper layer information is transported over XXAP, details are pending on SA2 agreements.

Editor’s Note 4: aspects of interaction between upper layer information exchange and XXAP in order to trigger the AIoT RAN node functions are FFS.

### 6.3.2 Support of Topology 2

Figure 6.3.2-1 depicts a logical system architecture for topology 2, the Common reader function located at AIoT-enabled UE, and the AIoT RAN node function located at the AIoT-enabled gNB.

The following applications apply as below:

**AIoT-enabled gNB**: a gNB supporting AIoT RAN node function, which is able to communicate with the AIoT enabled UE via NR Uu interface.

**AIoT-enabled UE**: a UE supporting Common reader function, which is able to communicate with the AIoT device via the AIoT radio interface.



**Figure 6.3.2-1 Logical system architecture for topology 2**

Editor’s Note 1: Figure 6.3.2-1 doesn’t illustrate the protocol between AIoT enabled UE and AIoT CN, 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.

Editor’s Note 3: The AIoT CN could include AMF and AIoT related functions.

In Topology 2, the the AIoT CN could include AMF and AIoT related network functions.

Editor’s Note 4: The AIoT-enabled gNB performs radio resource management for AIoT related radio resources, details are pending on RAN1 and RAN2 mechanisms.

#### 6.3.2.1 Solutions for Topology 2

To support Topology 2, the following solutions are to be studied for conveying AIoT upper layer information:

* **RRC based solution.** With this solution, AIoT CN applies AIoT upper layer information explicitly per AIoT transaction over XXAP signaling. AIoT upper layer information is then relayed explicitly to/from the AIoT-enabled UE via NR Uu RRC.
* **NAS based solution.** With this solution, there is no explicit termination of AIoT upper layer information at AIoTenabled gNB. AIoT upper layer information is transmitted over AIoTenabled UE's NAS.
* **UP based solution.** With this solution, there is no explicit terminatio of AIoT upper layer information at AIoT-enabled gNB. AIoT upper layer information is transmitted as AIoT-enabled UE's user plane data.

Editor’s note 1: how to enable radio resource control, i.e. trigger AIoT RAN node functions for above solutions is FFS.

Editor’s note 2: depiction and further details of the options above are FFS.

***------------End of the Change-------------***