**3GPP TSG-WG SA2 Meeting #165 *S2-241xxxx***

**Hyderabad, IN, 14th Oct – 18th Oct, 2024 (revision of S2-24010410)**

**Source: Huawei, HiSilicon**

**Title: Conclusion on key Issue 1 for Topology 1 Architecture**

**Document for: Approval**

**Agenda Item: 19.14.1**

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

*Abstract: conclusion principles are proposed on key issue 1 for topology 1 architecture.*

# 1. Introduction/Discussion

This is a revision of S2-24010410 which takes all the inputs related to KI1 (copied into Annex A for reference), sorts them into various categories and from then then presents the conclusion for Topology 1 aspects of KI1. Topology 2 and common aspects will be handled by revisions of other documents and together they form the conclusion for KI1.

The highlighting in the text in Annex A shows Topology 1 aspects and Topology 2 aspects. The remainder are considered common aspects.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-13, v1.0.0.

Foe guidance, the expected clause structure for clause 8.1 is:

8.1.1 General

8.1.2 Architecture to Support Topology 1

8.1.3 Architecture to Support Topology 2

\* \* \* \* First change (All new?) \* \* \* \*

8.1.1 General

Key issue #1 includes the following aspects:

- System architecture identified along with the solutions for KI#2 and KI#3.

Key issue#2 aspect on "Ambient IoT Device subscription management" and key issue#3 aspect on "Ambient IoT service exposure" is considered in this section.

At least the following principles are agreed for the architecture to support topology 1:

- A new core network function is introduced to support Ambient IoT.

Editor's note: Whether the new core network function also applies to topology 2 is FFS.

\* \* \* \* Second change (All new) \* \* \* \*

8.1.2 Architecture to Support Topology 1

The principles and aspects in this clause are agreed to support Topology 1:

- The new core network function (AIoTF) introduced to support Ambient IoT supports the functionality described in clause 8.1.1, with the following additions:

- The BS Reader and the new core network function always communicate for AIoT signaling (e.g., inventory request).

- Manage the BS Reader information, e.g. based on BS reader reporting or via OA&M configuration

- Ambient IoT services can be deployed isolated from existing deployments.

NOTE x: It is assumed that the Reader for Topology 1 can be deployed without having to deploy other gNB functionality for NR-Uu, i.e., BS Reader functionality and (other) gNB functionality that may be co-located with the BS Reader are assumed to be independent.

- BS Reader selection is performed by the AIoT NF selecting one or multiple BS Reader(s) and forwards the AIoT service request to the BS Reader(s).

- The Authorization and configuration of a BS Reader is assumed to be handle by OAM as part of the BS Reader authorization and configuration.

**A BS Reader and the AIoTF communicate directly:**

- The AIoTF communicates with a BS Reader via a direct interface Nx.

- Figure 8.1.2-x below shows the aspects related to Topology 1 (direct path) reference architecture with other NFs removed.



Figure 8.1.2-x: Non-Roaming 5G System Architecture (Direct Path)

- Figure 8.1.2-x below shows the aspects related to Topology 1 (direct path) in reference point representation with other NFs removed.



Figure 8.1.2-x: Non-Roaming 5G System Architecture in reference point representation (Direct Path)

- The protocol used over N2 will support procedures and information to be exchanged as specified by RAN2, RAN3 and SA2.

NOTE X: The protocol stack used between the AIoTF and the BS Reader will be concluded by RAN3.

- Figure 8.1.2-x below shows the aspects related to Topology 1 (direct path) protocol stack between the BS Reader and AIoTF.

Figure 8.1.2-Y: Example Protocol Stack between AIoTF and AIoT Device for Topology 1 (Direct Path)

Editor’s Note: The details of the protocol stack are FFS.

**A BS Reader and the AIoTF communicate via an AMF:**

- The AIoTF connects with a BS Reader via AMF. The interface between the BS Reader and AMF supports Ambient IoT services including delivery of inventory/command messages.

NOTE X: The enhancements used between the AMF and the RAN Reader will be concluded by RAN3.

- The BS Reader provides the supporting reader ID list or serving area list for AIoT services to the AMF and the AMF updates that information to the NRF via NF profile update procedure.

- The AMF shall be enhanced to support Ambient IoT Services.

Editor’s Note: The AMF enhancements are FFS.

- An SBI based service on the AMF (to be used by the AIoTF) is introduced in 5GC.

Editor’s Note: Details of the Service (e.g. whether it is a new service, whether the existing Namf service is enhanced is FFS).

- Figure 8.1.2-x below shows the aspects related to Topology 1 (direct path) reference architecture with other NFs removed.



Figure 8.1.2-x: Non-Roaming 5G System Architecture (AMF Path)

- Figure 8.1.2-x below shows the aspects related to Topology 1 (AMF Path) in reference point representation with other NFs removed.



Figure 8.1.2-x: Non-Roaming 5G System Architecture in reference point representation (AMF Path)

- Figure 8.1.2-x below shows the aspects related to Topology 1 (AMF path) protocol stack between the BS Reader and AIoTF.



Figure 8.1.2-2: Example Protocol Between AIoTF and AIoT Device for Topology 1 (AMF Path)

Editor’s Note: The details of the protocol stack are FFS.

It is proposed to capture the following changes vs. TR 23.700-13, v1.0.0.#

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

# Annex A: Input Summary

## A.1 Introduction

The following are copied from the contributions to SA2#165 and split into the groups as described by the sub-clause headers. They are then further considered and highlighted for the parts which are relevant to this part of the conclusion.

## A.2 Common Aspects to All Topologies

**S2-2410056 (Lenovo, NEC):**

1. A new core network function (e.g., AIoTF) is introduced to support Ambient IoT service for both the topology 1 and topology 2.
2. The AIoTF is responsible for both the BS reader and UE reader selection to interact with the AIoT devices for the AIoT service. Optionally, the BS reader and UE reader register at the AIoTF with their supported service information, location, and capability. Optionally, for topology 2, AIoTF may interact with the AMF/RAN for selecting the UE reader.
3. The AIoTF performs the AIoT device ID validation by interacting with the AUSF/UDM/AAA server, when necessary.
4. The AIoTF terminates the AIoT NAS protocol from the AIoT device.
5. AIoTF stores the AIoT device context information after successful device ID validation. Optionally, AIoTF can store and update the device context information into UDM, that includes the device status, last known (binding) reader information of the device, and the device validation result.
6. The AIoTF supports the inventory and command operations with the following details:

* AIoTF receives an AIoT service request (e.g., inventory, write, read, enable, disable) from the AF via NEF. The AIoTF may store an AIoT service context/parameters based on the request from the AF.
* AIoTF executes the AIoT service request within the network by creating an AIoT NAS message and sending it to the selected reader(s).
* AIoTF configures the reader with necessary parameters for required AIoT service.
* AIoTF collects the AIoT related service response received from reader, and optionally aggregates the responses, before exposing to the AF via NEF.

1. The AIoTF registers itself in the NRF with its NF profile, including the supported service information and its service area (e.g. the service area is the sum of the coverage areas of the readers registered with the AIoTF).

**S2-2410237 (Nokia):**

- A new core network function is introduced to support Ambient IoT.

- The AIoT reader and the new core network function always communicate for AIoT signaling (e.g., inventory request) through AMF.

- The AIoT device does not support a UICC.

- There is no UDM/UDR/AUSF involvement for AIoT device authentication and authorization.

- The AIoT device is assumed to be authenticated and authorized over the top mechanism.

- The AIoT device ID validation is supported during an AIoT service procedure.

**S2-2410270 (China Mobile, NEC):**

* the operator should be able to manage ambient IoT devices in both topology 1 and topology 2.
* The ambient IoT Device does not distinguish whether the topology of accessed network is Topology 1 or Topology 2, nor the transport used by the reader.

**S2-241034 (ZTE):**

The illustration of converged deployment of Topology 1 and Topology 2 is shown in Figure 8.2.X-1..



Figure 8.2.X-1: Illustration of converged deployment of Topology 1 and Topology 2

For the scenario of converged deployment of two topologies, a new AIoTMF function is responsible for handling AIoT services for both RAN Reader and UE Reader.

AIoTMF function receives the AIoT service request for Devices from AF (through NEF) and distribute it to RAN Readers and UE Readers.

AIoTMF function aggregates the service operation results from RAN Readers and UE Readers and sends back to AF.

AF may not be aware of which kind of Readers (RAN or UE) serving the devices.

The binding information of Device and Reader can be used to locate the serving Reader.

**S2-2410454 (NTT DOCOMO, T-Mobile USA, China Telecom, NEC, InterDigital Inc., KPN N.V.):**

At least the following principles are agreed for the architecture to support topology 1 and topology 2:

- A new core network function is introduced to support Ambient IoT.

- Reader connects to AMF via existing N1/N2. N1/N2 is expanded to support Ambient IoT services. Expansion includes delivery of inventory/command messages and reader capability indication/authorization/revocation.

- Ambient IoT services can be deployed isolated from existing deployments.

**S2-2410523 (Qualcomm Incorporated, MediaTek Inc.):**

- A new core network function (referred to as AIoT NF) is introduced to support Ambient IoT. The new AIoT NF is part of 5GC.

- The Permanent AIoT subscriber ID and keys are stored in the AIoT device and the UDM or a Credential Holder’s AAA server.

Editor's note: Whether storage of AIoT device credentials in a Credential Holder's AAA server will also be supported for PLMNs is FFS.

- The Reader connects directly to AIoT NF using the AIoT Application Protocol (AIoT-AP) on top of SCTP. This protocol will support procedures and information to be exchanged as specified by RAN2, RAN3 and SA2.

NOTE 1: The AIoT Application Protocol (AIoT-AP) is common for Topology 1 and Topology 2.

- An AIoT NAS layer will be defined between AIoT Device and AIoT NF. The functionality of the AIoT NAS layer includes:

- Delivery of Inventory response, Command and Response messages between AIoT Device and AIoT NF;

- Integrity protection and ciphering for Inventory response, Command and Response messages exchanged between AIoT Device and AIoT NF.

NOTE 2: The details of integrity protection and ciphering are assumed to be specified by SA3.

NOTE 3: The details of the AIoT NAS layer are assumed to be specified by CT1.

**S2-2410557 (InterDigital, Inc.):**

At least the following principles are agreed for the architecture to support both topology 1 and topology 2:

- A new core network function is introduced to support Ambient IoT. The new network function for Ambient IoT may be collocated with AMF.

- The AIoT service procedures and information exchange is supported with existing NAS, NGAP protocols with enhancements.

**S2-2410102 (Ericsson) (KI3, snippet):**

- For reader selection, it is performed by both CN and RAN (A-IoT RAN and NG-RAN) together.

**S2-2410415 (Huawei) (KI3, snippet):**

8. A dedicated lightweight Ambient IoT NAS is used to support the information transfer between Ambient IoT Devices and an AIoTF, and supports the following types of information exchanged:

- Device ID Report from AIoT Device to 5GC.

- Read/Write/Disable Command Request from 5GC to AIoT Device.

- Read/Write/Disable Command Response from AIoT Device to 5GC.

9. The dedicated lightweigh Ambient IoT NAS is identical for both topologies and the AIoT Device is agnostic to whether it is transferred by a RAN Reader in Topology 1 or a UE Reader in Topology 2.

## A.3 Topology 1 Common Aspects

**S2-2409708 (vivo):**

The BS reader connects the CN by setup a NG interface connection.

The BS reader is an AIoT access system which supports one or more reader(s). The BS reader provide the supporting reader ID list or serving area list for AIoT service to the AMF and the AMF updates that information to the NRF via NF profile update procedure.

Both reader ID list or serving area list can be used to select the BS reader.

**S2-2409720 (CATT):**

- AIoTF may interact with RAN Reader directly via a new defined Nxx interface or AIoTF may interact with RAN Reader via AMF.

- AIoTF interacts with AIoT Device via AIoT NAS message.

**S2-2410103 (Ericsson):**

- A new core network function, Ambient IoT Function (AIOTF), is introduced to support Ambient IoT, which provides AIoT services (e.g., inventory, command) to the AF.

- The AIOTF interacts with A-IoT RAN via XX.

Editor’s note: Cooperation with RAN3 is required to decide the XX interface between A-IoT RAN and AIOTF, while the name and the nature of XX is to be determined by RAN3.

- The NEF exposes AIoT services to the AF outside trusted domain.

- The NRF stores the NF profile for AIOTF and provides service discovery for AIOTF.

- The CHF provides charging function for Ambient IoT services.

- The UDM/UDR stores device subscription information, if required.

**S2-2410225 (OPPO):**

- AIoT Device NAS layer is existing between the AIoT Device and AIoT NF assuming that the security is to be defined in the AIoT Device NAS layer by SA3.

NOTE 1: Details of security are to be defined in SA3.

- AIoT layer is existing between the RAN Reader and AIoT NF.

NOTE 2: Details of AIoT layer is to be defined by RAN3 .



Figure 8.x.2.3-1 Architecture to support Topology 1

The protocol stack is shown in figure 8.x.2.3-2



Figure 8.x.2.3-2 Protocol stack to support Topology 1

**S2-2410237 (Nokia):**

- The BS reader communicates with the new core network function via AMF over N2 interface with NGAP.

**S2-2410272 (China Mobile, NEC):**

- The new core network function shall connect with a BS Reader via AMF.

- The SBI based standard interface between AMF and the new core network function shall be introduced in 5GC.

- the NGAP protocol between gNB and AMF shall be enhanced to support ambient IoT service.

- The AMF shall be enhanced to support ambient IoT services.

**S2-2410314 (Sony):**

The Authorization and configuration of a RAN Reader is assumed to be handle by OAM as part of the gNB authorization and configuration.

**S2-2410372 (Samsung):**

- The Architecture to support Ambient IoT Devices is similar to 5GC, which includes the following:

- Online-subscription from 3rd party (AF): Service-Related Data is provisioned to MNO.

- Deployment of Ambient IoT Devices may be done, before Online-subscription.

- Bulk Provisioning (Group Registration) of Devices including authentication of devices is done.

- Shared PDU Session establishment is done.

- Data Transfer between AF and Devices through MNO is done.

**S2-2410410 (Huawei):**

* Manage the BS Reader information, e.g. based on BS reader reporting or via OA&M configuration
* Receive and handle the AF request (via NEF) for Ambient IoT Services i.e. Inventory and Command (Read, Write or Disable)
* Generate Task ID for the AF requested Ambient IoT Service, and maintain the association (AF ID, Task ID, Mask etc) within the 5GC
* Based on AF request, the stored BS Reader information and the last known BS Reader information (if available), to select the BS Reader
* Interact with the BS Reader for DL and UL Ambient IoT signaling transfer
* Interact with Ambient IoT Device for UL and DL AIoT information transfer, via a light-weight AIoT-NAS protocol.
* Validate the Ambient IoT Device ID
* Aggregate the reported information from the multiple Ambient IoT Devices
* Respond to the AF request with the received information reported by Ambient IoT Devices

- The AIoTF communicates with a BS Reader via a direct interface.

NOTE X1: The protocol stack used between the AIoTF and the RAN Reader will be concluded by RAN3.

NOTE X2: The Ambient IoT feature may be deployed as a standalone AIoT network or being integrated into an existing network.

- The CN (e.g. UDM, etc) is responsible for management of Ambient IoT Device subscription-like information.

- NEF is responsible for Ambient IoT service exposure to third-party AF, including data transfer.

**S2-2410523 (Qualcomm Incorporated, MediaTek Inc.):**

- The architecture for Topology 1 is depicted in Figure 8.1.2-X. The related protocol stack is shown in Figure 8.1.2-Y.

NOTE 1: It is assumed that the Reader for Topology 1 can be deployed without having to deploy other gNB functionality for NR-Uu, i.e., Reader functionality and (other) gNB functionality that may be co-located with the Reader are assumed to be independent.



Figure 8.1.2-X: Architecture for Topology 1

Figure 8.1.2-Y: Protocol Stack for Topology 1

**S2-2410497 (InterDigital, Inc.) (KI3, snippet):**

1. The AIoT NF selects one or multiple BS Reader(s) and forwards the AIoT service request to the BS Reader(s) over the N2 interface.

## A.4 Topology 2 Common Aspects

**S2-2409706 (vivo):**

- A new core network function AIOT Function is introduced to support Ambient IoT for Topology 2, which is responsible for the AIoT operation granularity management.

- The AMF is responsible for the per UE reader management, including: authorizing a registered UE to act as UE Reader and reader configuration.

- The UDM stores the UE subscription data for UE reader.

The AIoT data forwarding between UE reader and AIoT Function could be CP-based or UP-based and the UE may support CP based and/or UP based method.

There is an AIoT NAS layer between UE reader and AIoT Function as shown in **Figure 8.x.z.2-1 and Figure 8.x.z.3-1.**

**S2-2409707 (vivo):**

**- Registration and authorization aspects:**

- The UE supporting to be reader performs an initial registration to AMF, indicating its Capability of acting as an reader and optionally the supported communication path (e.g. CP and/or UP).

- The AMF is responsible for the UE reader authorization during the UE registration as the following:

- The the AMF authorizes UE whether to be reader based on the UE capability and UE subscription data for UE reader in UDM during registration.

**-** When the UE is authorized as a reader, the AMF indicates to the UE that the UE is authorized as a reader and provides the UE reader configurations, may including: reader ID.

- The UE subscription data for UE reader in UDM includes allow the UE to act as a reader, permit area to be a reader (Optional), permit time to be a reader (Optional), client list for which the UE is allowed to be a reader.

**- UE reader selection aspects:**

- The AIoT function is responsible for the UE reader selection.

- The AIoT function takes the Target UE reader

**S2-2409720 (CATT):**

- A new core network function is introduced to support Ambient IoT.

- AIoTF may interact with UE Reader via user plane signaling or NAS signaling.

- AIoTF interacts with AIoT Device via AIoT NAS message.

**S2-2410103 (Ericsson):**

- The AIOTF applies to topology 2.

- NG-RAN is responsible for radio resource management towards UE for radio resources between UE reader and AIoT devices.

Editor’s note: Cooperation with RAN2/RAN3 is required to determine whether to adopt RRC based solution, NAS based solution, and/or UP based solution.

**S2-2410226 (Oppo):**

- The AIoT Device does not distinguish whether the Inventory or Command is performed based on the user plane or control plane based architecture if both are deemed be supported for Topology 2.

- The UP based architecture is supported by default if the UE supports the Reader functionality.

- The CP based architecture (UE NAS based solution) may be supported in addition to the UP based architecture if the UE supports the Reader functionality.

- A new core network function (AIoT NF) is introduced to support Topology 2 in both UP based or CP based architecture.

- AIoT Device NAS layer is existing between the AIoT Device and AIoT NF assuming that the security is to be defined in the AIoT Device NAS layer by SA3.

NOTE : Details of security are to be defined in SA3.

UE reader authorization and control

- The AMF is responsible for authorizing a registered UE to act as UE Reader. The authorization information may include:

- UE has been authorized to perform the AIoT operation.

- Validity information may also be included for the AIoT operation. Validity information can be time validity information (defined by start and end times) to indicate when the UE is allowed to perform the AIoT operation or location validity information (defined by TAI or cell ID) to indicate where the UE is allowed to performed the AIoT operation.

- Radio resources required by the UE Reader for Ambient IoT operations are allocated and controlled by RAN

NOTE: How Radio resources required by the UE Reader for Ambient IoT operations are allocated and controlled by RAN is be defined by RAN WG.

- a serving network including AMF and/or RAN, owning the licensed spectrum, can authorize and revoke rights for a UE to act as a reader.

- A UE needs to be authorized as an AIoT Reader before interacting with AIoT devices.

UE reader selection

- The AF includes the UE reader ID to the AIoT NF and the AIoT NF will use this UE reader to perform the Inventory or the Command;

- If the AF includes the Target Inventory or the Command area instead of the UE reader ID to the AIoT NF, then the AIoT NF will perform the UE reader selection based on the Inventory or the Command area;

**S2-2410237 (Nokia):**

The following principles are agreed for the architecture to specifically support topology 2:

- The UE reader communicates with the new core network function via gNB and AMF.

- RRC based protocol stack is supported at least for the DL.

- AMF is responsible for authorizing the UE as an AIoT reader based on UE subscription information.

**S2-2410314 (Sony):**

* A UE with UE Reader capability performs legacy registration procedure.
* The UE includes the UE Reader capability in the Registration Request.
* The AMF checks the UE subscription whether the UE is allowed to act as a UE Reader. The AMF stores the result in the UE context.
* The AMF discovers a PCF supporting UE Reader provisioning and establishes a UE policy association with the PCF. The PCF provides the UE with UE Reader Policy/Parameters including e.g. Authorization information.
* The AMF also provides the UE Reader authorized indication in an NGAP message and RAN stores the UE Reader authorized indication in the UE context.
* How RAN configures the UE Reader is up do RAN WGs to specify.

**S2-2410344 (ZTE):**

It proposed to endorse CP based solution for topology 2 architecture and proceed normative work based on it.

NOTE 1: CP based solution includes RRC involved and NAS involved; it needs further discussion on which one will be the way forward.

A new AIoTMF function is used to handle service operations for AIoT devices.

A UE needs to be authorized as an AIoT Reader before interacting with AIoT devices.

The protocol stack and interaction between AIoT device and UE Reader will be defined by RAN WGs.

NOTE 2: The security aspects for Ambient IoT requires coordination with SA WG3.

**S2-2410414 (Huawei):**

UE Subscription data is enhanced to include an indication that whether the UE is enabled/disabled to serve as AIoT intermediate node, this indication in the UE subscription is used by the AMF to authorize the UE as a AIOT reader during UE registration procedure.

**S2-2410416 (Huawei):**

- A new core network function (AIoTF) is introduced to support Ambient IoT.

- The AMF and UE subscription data in the UDM is enhanced to support authorizing/revoking the UE to act as a reader during UE registration procedure.

**S2-2410523 (Qualcomm Incorporated, MediaTek Inc.):**

- As depicted in Figure 8.1.3-X, the Reader function in the UE connects to the AIoT NF based on the same AIoT Application Protocol (AIoT-AP) as is used for Topology 1 but using an IP PDU Session between the UE and the UPF as transport. The related protocol stack is shown in Figure 8.1.3-Y.

NOTE 1: Also in case of Topology 2 the AIoT NF is part of the core network, i.e., the operator can manage the subscriptions of AIoT devices and can verify the operator-assigned AIoT Device ID.



Figure 8.1.3-X: Architecture for Topology 2



Figure 8.1.3-Y: Protocol Stack for Topology 2

NOTE 3: Security for AIoT-AP over SCTP is assumed to be defined by SA3.

**S2-2410552 (Lenovo):**

- The new core network function (AIoTF) as introduced for topology 1 is also used for topology 2.

- The UE reader indicates its AIoT capabilities to the AMF (during the Registration procedure). The AMF authorizes the UE to act as UE reader (e.g. based on subscription or policy information).

- The AMF (in case of CP-based solution) or the SMF (in case of UP-based sollution) selects an AIoTF and registers the UE reader with the AIoTF.

- The radio resources required by the UE reader for the communicaiton with the AIoT devices are allocated and controlled by NG-RAN.

- Regarding the transport of the AIoT messages between the UE reader and AIoTF:

- Both CP-based and UP-based solutions are supported.

- The AIoTF determines whether to use CP-based and UP-based solutions for the transport or the AIoTF messages based on the expected traffic amount (e.g. if many interactions towards the UE reader are expected for many AIoT devices or multilpe AIoT operations, the AIoTF selects to use the UP-based solution).

- The CP-based solution includes enhanecments to speify a new NAS container type to be carried between the UE reader and the AioTF via the AMF.

- The UP-based solution includes the enhancements to configure the UE with the AIoTF address (e.g. IP address or FQDN). The UE reader initates the UP communication to register with the AIoTF.

NOTE 1: Stage 3 will specify the NAS container format for the CP-based solution and application protocol for the UP-based solution.

**S2-2410557 (InterDigital, Inc.):**

* both CP-based and UP-based solutions are supported for communication between a UE Reader and CN.

**S2-2409722 (CATT) (KI3, snippets):**

1. A RAN Reader or a UE Reader needs to be authorized before it performs Inventory/Command Service. For a RAN Reader, RAN Reader reports AIoT support capability to AMF and is authorized by AMF during NG setup procedure. For a UE Reader, UE Readers reports AIoT support capability to AMF and is authorized by AMF during Registration procedure.

6. The AIoTF discovers and selects RAN Reader/UE Reader based on the Area info received from the NEF.

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**S2-2410239 (Nokia) (KI3, snippet):**

- The UE reader(s) may be selected by the new core network function based on, e.g. the location information provided by the AF, UE authorization information, UE capability, UE related analytics, UE expected behaviours, Device capability.

NOTE : Whether the gNB selects the UE reader(s) indicated by the CN as they are, or selects some or none of them based on the radio conditions, and whether the gNB can select additional UE reader(s) will be further decided by RAN WG3.

**S2-2410415 (Huawei) (KI3 snippet):**

The following aspects and principles are agreed for conclusion on the support of Topology 2 and UE Readers:

10. To control the UE Reader functionality the UE NAS is enhanced to carry the AIoT service control (e.g., request an inventory) to/from the UE Reader and transport the dedicated lightweight Ambient IoT NAS between an AIoT Device and an AIoTF via the UEs and serving AMF.

## A.5 Topology 2 UE Reader Interaction via CP Aspects

**S2-2409706 (vivo):**

- The CP based architecture is as shown in **Figure 8.x.y-1** for topology 2:



**Figure 8.x.y-1: CP Based architecture for Topology 2**

For the AIoT control-plane based data forwarding method, followings are supported:

* + The AIoT Function interacts with AMF directly via service-based interface.
  + The AIoT data forwarding between UE reader and AMF should be over N1 NAS message.

The Protocol Stack for control plane AIoT data forwarding is as shown in the following figure:



**Figure 8.x.z.2-1: Control plane for AIoT CP-based data forwarding for topology 2**

**S2-2410226 (Oppo):**

Figure 8.x.2.3-1 shows the CP based architecture to support topology 2.



Figure 8.x.2.3-1 Architecture to support Topology 2-CP based solution

The corresponding protocol stack is shown in figure  8.x.2.3-2.



Figure 8.x.2.3-2 Protocol stack to support Topology 2-CP based solution

## A.6 Topology 2 UE Reader Interaction via UP Aspects

**S2-2409706 (vivo):**

- The UP based architecture is as shown in **Figure 8.x.y-1** for topology 2:



**Figure 8.x.y-1: UP Based architecture for Topology 2**

For the AIoT user plane data forwarding method, followings are supported:

* The UE reader is configured with the DNN/S-NSSAI for PDU session for AIoT data forwarding in the registration accept message or by pre-configuration.

The Protocol Stack for control plane AIoT data forwarding is as shown in the following figure:



**Figure 8.x.z.3-1: User plane for AIoT UP-based data forwarding for topology 2**

**S2-2410226 (Oppo):**

Figure 8.x.2.2-1 shows the UP based architecture to support Topology 2.



Figure 8.x.2.2-1 Architecture to support Topology 2-UP based solution

Figure 8.x.2.2-2 shows the protocol stack of UP based architecture to support Topology 2.



Figure 8.x.2.2-2 Protocol stack to support Topology 2-UP based solution

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