**3GPP T****SG-RAN WG2 Meeting #128 R2-230xxxx**

**Orlando, USA, November 18-22, 2024**

**Agenda item: xxx**

**Source: Interdigital, Nokia**

**Title: [POST127bis][020][AI PHY] Reply LS to SA2/SA5 (InterDigital/Nokia)**

**Document for: Discussion and Decision**

# 1 Introduction

This contribution is aimed at reporting the discussion and results of the following post email discussion:

**[POST127bis][020][AI PHY] Reply LS to SA2/SA5 (InterDigital/Nokia)**

 Intended outcome: Address/discuss SA2 questions from SA2/SA5 LS (if it is sent to RAN2) and possible answers. The discussion is based on RAN2 understanding and previously made agreements. No Tdocs should be submitted to the meeting

 Deadline: Nov. 8th, 10 UTC

Companies providing input to this email discussion are requested to leave contact information below.

|  |  |  |
| --- | --- | --- |
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# 2 Discussion

In [1],RAN sent an LS to SA groups that included the requirements for data collection for a UE-sided AIML model and question regarding which of the data collection solutions identified by RAN2 can fulfil these requirements.

Specifically, the requirements for the data collection indicated in the LS were:

*RAN has agreed to the following* ***requirements for data collection for UE sided model training for standardized solution (if standardized) (i.e. Option 1b, 2, 3). Option 1a is not precluded.***

* + 1. *The data collected is secured and data integrity and confidentiality for that data is ensured.*
		2. *User data privacy, anonymity and user consent is respected.*
		3. *The MNO has full control of the standardized data collection transfer process and can manage data transfer to the server for UE-side data collection, without the need of SLA for this purpose. This includes initiating, terminating, and fully managing data transfer.*
		4. *MNO has full visibility for standardized data.*
		5. *The design is futureproof and extendable.*

*FFS/study if and how to handle non-standardized data (i.e. partial visibility).*

*FFS controllability on data collection*

*Standardized Solutions should follow the principle of aiming to minimize air interface overhead and impact to NW operation*

## 2.1 SA2 LS

In [2],SA2 sent an intermediate response the included some clarification questions. In the following sections, we will address these questions.

### 2.1.1 Controllability of MNO on data transfer

*Q1: Are there any aspects of the UE-data collection controllability, that required NG-RAN involvement? If so, what is the involvement of NG-RAN in UE-data collection controllability, e.g., what aspects of MNO controllability would require NG-RAN involvement and what would such involvement be?*

*As an example of the kind of feedback that is requested, some companies in SA2 understand that initiating (e.g., triggering), terminating collection of UE-side data and controlling data transfer may require NG-RAN involvement, and it is currently not clear what this involvement may be.*

**Rapporteur’s input**

In RAN2-127bis [3], the following agreement was made regarding data collection for model training:

* *Data collection initiation and configuration for data collection is under network control. FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly or UE server)*

The rapporteur’s understanding is that the NG-RAN is involved in the data collection process, at least for configuring the UE with the required measurements and initiating the data collection.

**A: Do companies agree that the NG-RAN is involved in the data collection procedure, at least in configuring the required measurements and initiating the data collection procedure?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes for configuration;No for initiating data collection procedure | We tend to agree that the NG-RAN involvement includes the RRC configuration related to UE side data collection, which is common understanding in RAN2.For initiating or terminating the data collection procedure , we understand there is no any agreements in RAN2 can deduce such conclusion. In our understanding, the UE side data collection procedure also can be initiated by the CN (e.g. option 2, option 1b) or OAM(e.g. option 3)  |
| Qualcomm | No (with comments) | The question itself is too broad compared to RAN2 agreement. The above RAN2 agreement is only about gNB providing RS configuration and associated ID to the UE, upon UE or UE server request. This procedure for providing RS configuration and associated ID is needed for data collection and applies to all UE side data collection solutions including solution 1a. However, there is no technical reason that it should be part of the data collection configuration and initiation of UE side data collection.As agreed in the RAN2 agreement quoted above, the initiation of UE side data collection is up to the UE or the UE side server.Furthermore, note that UE side can perform training data collection even without training RS configuration and associated IDs. Comment to Nokia: There exist two scenarios:1. The UE does not need RS configuration from the gNB:
* The gNB does not provide RS configuration and other parameters, then the UE determines conditions/triggers for training data collection. No gNB involvement.
1. The UE need RS configuration from the gNB:
* The gNB provides the RS configuration and other parameters, upon the UE / UE server request. Note that in UAI framework, the **gNB may or may not honor the request** **(similar as in other UAI functionalities).**
* Further restrictions on when the UE can send the UAI can be further discussed in RAN2. Note that currently, we have prohibition timer-based restrictions for the UE request. If required other restrictions, they can be introduced.
 |
| T-Mobile USA | Yes |  |
| Nokia | Yes | Clarification: We think that there is a terminology issue here. The above agreement means that that the UE or the server can request the initiation of Data Collection, but this is request is not the initiation. The initiation of DC happens when the NW configures the measurements. As in Rel-19 cases the gNB configures them, involvement of the NG-RAN (gNB) cannot be avoided. |
| Apple | No | In RAN2-127bis, we only agreed “*Data collection initiation and configuration for data collection* ***is under network control****.”* However, **it is not clear whether “network control” is NG-RAN or CN (e.g. NWDAF, LMF, etc.),** which should be further discussed in RAN2 case by case (e.g. for AI/ML based positioning, AI/ML based beam management, AI/ML based CSI prediction). **As example, in legacy NR positioning, it is LMF (rather than NG-RAN) to initialize PRS and provide PRS configuration in LPP Assistance Data message**. As SA2’s question is on “NG-RAN”, we don’t think RAN2 can confirm it directly before RAN2 discussion is finalized.   |
| OPPO | Yes for AS configuration part | - No matter RAN considering positioning use cases or BM use cases, AS configuration is anyway needed, e.g. RS configuration and/or associated ID info, in this sense, RAN involvement at least includes providing RS configuration and/or associated ID info for training data collection. - As for initiating data collection task, we understand UE or UE server request is the trigger to initiate data collection task because our focus is data collection for UE sided model training, it’s unlikely for NG-RAN or CN to initiate data collection task without UE server guidance/requirements. |
| CATT | Yes |  |
| Ericsson | Yes for the “NG-RAN is involved in the data collection”No for the “at least in configuring the required measurements and initiating the data collection procedure” | RAN2 agreed that “data collection initiation and configuration for data collection is under network control”, however we have not agreed that the network is in charge of configuring the required measurements and initiating data collection procedures. Hence, the NG-RAN is not necessarily involved in configuring the required measurements and initiating data collection procedures.As the FFS says, the network determines that the data collection should be initiated via direct UE request or via the UE server, which means that the RAN will be involved and in control in allowing/not allowing the data collection (and the related data transfer), as well as configuring/not configuring the necessary radio resources for the data collection. However, which measurements to collect, and when to trigger the request for data collection is outside the NG-RAN scope. |
| Mediatek | Yes with comment | 1. Option 1a is not within the scope of our discussion. We should focus on options 1b, 2, and 3.
2. For the use cases of BM, CSI feedback, and even Mobility, it’s obverse that the NG-RAN is involved in the data collection process. For the use case of positioning, NG-RAN is involved even if LMF sends configurations to UE for positioning measurement, as LMF needs to request PRS configuration first from NG-RAN. Hence, NG-RAN is involved in all considered use cases for configuration and initiation of data collection.
3. According to the agreement reached at the RAN2#127bis meeting, although it is unclear how the network decides to initiate data collection, we agreed that it is the network that initiates the data collection procedure.

In addition to providing the configuration and initiating the data collection procedure, the network also controls the data transfer, for example, in terms of data amount, latency, priority, etc.  |
| vivo | Yes for option 3 | For option 3, the data transfer path is UE-> gNB->OAM -> Server for data collection for UE-side model training/OTT server, which implies that the gNB is involved in data collection procedure. For other solutions, the gNB is not aware of the data collection as the data transfer is transparent to gNB. |

If the answer to A is positive, then the rapporteur proposes the following response to Q1 from LS:

*RAN2 confirms that the NG-RAN is involved in the data collection process, and this includes at least providing the UE with the required measurement configurations and initiating the data collection.*

**B: Do companies agree to the proposed response above to Q1 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | No | As above comments, we suggest to answer the question as below on top of rapporteur’s suggestion For example:*RAN2 confirms that the NG-RAN is involved in the data collection process, and this includes at least providing the UE with the data collection related configurations.* |
| Qualcomm  | No | RAN2 agreement was about gNB configuring UE with “associated ID” and “RS Configuration for training”. The triggers for data collection and reporting cannot be determined by the network as there are internal UE conditions that determine when the data needs to be collected and reported.Therefore, we suggest modifying the above sentence as:*RAN2 confirms that the NG-RAN should support a procedure for providing RS configuration for training and associated ID to facilitate training data collection (upon UE or UE server request based on RAN2 agreement). The triggers for data collection and reporting cannot be determined by the network as there are internal UE conditions that determine when data needs to be collected and reported.*   |
| T-Mobile USA | Yes |  |
| Nokia | Yes | Clarification as above: the actual initiation happens when NW configures the relevant measurements. What triggers the NW to initiate it is FFS according to agreement. |
| Apple | No | As we replied in Q1-A, according to RAN2#127b agreement, it is not clear whether “NG-RAN” has to be involved, maybe it is sufficient for CN to control the process similar to NR positioning, which should be further discussed in RAN2.Thus, we suggest below response:“**RAN2-127bis made the following high level agreement regarding data collection for model training:*** *Data collection initiation and configuration for data collection is under network control. FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly or UE server)*

**However, RAN2 has not concluded whether the “network control” needs NG-RAN involvement. RAN2 will continue to discuss it.”** |
| OPPO | No | Tends to agree with ZTE with minor change*RAN2 confirms that the NG-RAN is involved in the data collection process, and this includes at least providing the UE with the data collection related AS configurations. The design of AS configurations is the scope of RAN side.* |
| CATT | Yes | Our understanding is that measurement configuration is a kind of AS configuration for data collection, especially for the BM case. So Rapp suggested wording is fine. |
| Ericsson | No | We are ok with the rephasing suggested by Oppo/ZTE, or just mentioning that NG-RAN involvement is expected. We also propose adding the agreement reached in last meeting:*“RAN2 confirms that the NG-RAN is involved in the data collection process~~, and this includes at least providing the UE with the required measurement configurations and initiating the data collection~~. RAN2 further agreed that data collection initiation and configuration for data collection is under network control. It is FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly) or UE server)”* |
| Mediatek | Yes with comment | *RAN2 confirms that the NG-RAN is involved in the data collection process, and this includes at least providing the UE with the required measurement configurations, ~~and~~ initiating the data collection and controlling data transfer from the UE to the server for data collection for UE-side model training/OTT server.* |
| vivo | Yes as baseline | RAN2 confirms that the NG-RAN is involved in the data collection process for option 3, and this includes at least providing the UE with the required measurement configurations and initiating the data collection. For other Options, the data collection process is transparent to NG-RAN. |

*Q2: Furthermore, with regards to “initiating, terminating and fully managing data transfer” some companies in SA2 believe that further clarification is required, on a per use case basis, on where (which entities) and under what conditions, should controllability be performed, e.g., in NG-RAN, a NF, OAM, an MNO controlled AF, a 3rd party AF, a UE)?*

**Rapporteur’s input**

The rapporteur’s understanding is that the gNB is involved in the UE side data collection for the beam management and CSI prediction/compression use cases, while the LMF is involved for the positioning use cases. This does not mean other entities will not be involved at all in the controlling/enabling the data collection. However, the involvement of other entities outside the RAN is not within the scope of RAN2.

**C: Do companies agree that the gNB is involved in controlling the data collection for the beam management and CSI use cases, while the LMF is involved in controlling the data collection for the positioning use cases?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | No | In our understanding, what we discussed before and having RAN2 agreements is just about the controllability for each option not from use case perspective. We do not think this question can be answered for now from RAN2 perspective. |
| Qualcomm | No | For beam management, upon UE or UE server request, the gNB determines when and what RS configuration and associated IDs for training. Other aspects of UE side data collection are **not** configurable by the gNB. For positioning enhancements, upon the UE or UE server request, the LMF determines when and what PRS configuration and network side addition conditions to provide for training. Other aspects of UE side data collection are not configurable by the LMF. For CSI prediction/feedback, RAN2 should wait for RAN1 discussions.  |
| T-Mobile USA | yes |  |
| Nokia | Yes |  |
| Apple | No (It is out of scope of this email discussion) | See our comments to Q-A/Q-B, we believe this is one step further beyond current RAN2 agreement, which **is out of scope of this email discussion** highlighted below:**[POST127bis][020][AI PHY] Reply LS to SA2/SA5 (InterDigital/Nokia)** Intended outcome: Address/discuss SA2 questions from SA2/SA5 LS (if it is sent to RAN2) and possible answers. The discussion is based on RAN2 understanding and **previously made agreements.** No Tdocs should be submitted to the meetingThus, we still suggest the response in Q1-B:“**RAN2-127bis made the following high level agreement regarding data collection for model training:*** *Data collection initiation and configuration for data collection is under network control. FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly or UE server)*

**However, RAN2 has not concluded whether the “network control” needs NG-RAN involvement. RAN2 will continue to discuss it.**” |
| OPPO | Yes with clarification | * For BM and CSI use cases, we understand gNB is involved in providing AS configuration, but OAM or CN may also be involved in providing other data collection configuration like PLMN ID list.
* For positioning use cases, LMF is involved in suggesting AS configuration, e.g. PRS configuration, while gNB is also involved in providing UE with AS configuration.
 |
| CATT | Yes |  |
| Ericsson | See comments | This question seems to be specifically on the “data transfer”, so in our reply we need to focus on that, not just on the control of the data collection which is instead the focus of the previous question.As in our previous reply, the NG-RAN/gNB/LMF can be involved in the data collection, however it should be clarified to SA2 that RAN2 has not agreed that the NG-RAN/gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”. RAN2 understanding is that the impacts of “initiating, terminating and fully managing data transfer” should be evaluated by SA2, on the basis of the options defined by RAN2 for the data collection. |
| Mediatek | Yes | I believe this is within the scope of the email discussion. Based on the table analyzing different options, option 2 and option 3 allow full controllability, while option 1b allows some level of controllability. For all these options, the control of data collection on the UE should be over the air interface, especially for option 2/3. Specifically, the gNB is involved for the use case of beam management, while the LMF is involved for the use case of positioning.  |
| vivo | Yes with comments | For beam management and CSI use cases, both gNB and OAM (for option 3) are involved in controllability. For POS use case, at least LMF is involved. |

If the answer to C is positive, then the rapporteur proposes the following response to Q2 from the LS:

*For the beam management and CSI prediction/compression use cases, at least the gNB is involved in the control of the data collection. For the positioning use cases, at least the LMF is involved in the control of the data collection.*

**D: Do companies agree to the proposed response above to Q2 from SA2?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | No | No answer from RAN2 can be provided for now |
| Qualcomm  | No (suggest modification) | *For the beam management, the gNB should support a procedure for providing the RS configuration and the associated IDs for training, based on UE or UE server request. For the positioning use cases, the LMF should support a procedure for providing the PRS configuration and the network side additional conditions for training, based on UE or UE server request. For CSI prediction/compression use cases, the gNB support for providing RS Configuration and associated ID is still under RAN1 discussion. The triggers for data collection and reporting cannot be determined by the network as there are internal UE conditions that determine when data needs to be collected and reported.*  |
| T-Mobile USA | Partially | Suggest modifying the answer to state “Overall goal the work item is to develop a framework that works for many different use cases. It is envisioned for beam management and CSI prediction/compression use cases, at least the gNB is involved in the control of the data collection. For the positioning use cases, at least the LMF is involved in the control of the data collection.” |
| Nokia | Yes, but comments | 1) We are also OK with the revision proposed by T-Mobile USA.2) We are also OK to leave out CSI prediction/compression use-cases from the answer based on Qualcomm comment (RAN1 dependency)Comment on Qualcomm’s answer is the same as Q1 and Q2: what triggers the initiation from the NW is FFS, but the actual initiation happens when NW configures it. |
| Apple | No (It is out of scope of this email discussion) | See our comments to Q-A/Q-B, we believe this is one step further beyond current RAN2 agreement, which **is out of scope of this email discussion** highlighted below:**[POST127bis][020][AI PHY] Reply LS to SA2/SA5 (InterDigital/Nokia)** Intended outcome: Address/discuss SA2 questions from SA2/SA5 LS (if it is sent to RAN2) and possible answers. The discussion is based on RAN2 understanding and **previously made agreements.** No Tdocs should be submitted to the meetingThus, we still suggest the response in Q1-B:“**RAN2-127bis made the following high level agreement regarding data collection for model training:*** *Data collection initiation and configuration for data collection is under network control. FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly or UE server)*

**However, RAN2 has not concluded whether the “network control” needs NG-RAN involvement. RAN2 will continue to discuss it.**” |
| OPPO | Yes with modification | * For BM and CSI use cases, gNB is involved in providing AS configuration, but OAM or CN may also be involved in providing other data collection configuration like PLMN ID list which is out of RAN2 scope.
* For positioning use cases, LMF is involved in suggesting AS configuration, e.g. RS configuration, while gNB is also involved in providing UE with AS configuration.
 |
| CATT | Yes | For the positioning case, we could say at least LMF is involved in case 1. |
| Ericsson | Yes, but it should be clarified that RAN2 has not agreed that the NG-RAN/gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”.  | The question from SA2 is about “initiating, terminating and fully managing data transfer”. Hence, we believe that we should further clarify to SA2 that RAN2 has not agreed that the NG-RAN/gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”. As in our previous replies, the gNB can configure the radio resources (CSI-RS) for BM data collection, and the LMF can configure the radio resources (PRS) for positioning-related data collection. However, this does not mean that the gNB/LMF initiates/terminates/manages the data transfer. In the endorsed CR to TR 38.843 (R2-2407807), it was captured that the “The MNO can manage data transfer to the server for UE-side data collection, without the need of SLA. This includes initiating, terminating, and fully managing data transfer”. It is expected that the nodes/functions involved in the initiation/termination/management of data transfer should be evaluated by SA2 on the basis of the various options defined in RAN2.We suggest the following answer, with the additions in red below:For the beam management and CSI prediction/compression use cases, at least the gNB is involved in the control of the data collection. For the positioning use cases, at least the LMF is involved in the control of the data collection. However, RAN2 has not agreed that the NG-RAN/gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”. RAN2 understanding is that how to initiate/terminate/manage the data transfer should be evaluated by SA2, based on the options descriptions provided by RAN2 in R2-2407807, where it is defined e.g. initiating and terminating nodes for the data collection process. |
| Mediatek | Yes with comment | We are OK with T-Mobile’s revision and leave out CSI compression use case from the answer.  |
| vivo | Yes as baseline | *SA2 also mentioned ‘under what conditions, should controllability be performed’.* Both positioning and MDT take the user consent as criteria for initiating the process. Therefore, the NW should check the validity of user consent before the controllability of data collection. In addition, for NW side data collection, we agreed that the UE status may impact the data collection process:1. When UE reaches its buffer limitation the UE stops measurement for data collection purposes and logging.
2. Measurements for data collection purposes and logging based can be controlled based on power state of the UE. It is up to UE implementation how the UE determines power state. FFS whether the UE stops autonomously or if it reports to the network .

From our understanding, the agreements are also valid for UE side data collection and UE status should be considered for NW controllability.Based on the above analysis, we propose to refine the response as:For the beam management and CSI prediction/compression use cases, at least the gNB and OAM(for option 3 ) are involved in the control of the data collection. For the positioning use cases, at least the LMF is involved in the control of the data collection. The controllability is performed when user consent is valid. Besides, the UE status should also be considered, e.g., buffer status, power status. |

*Q3: Furthermore, some companies in SA2 wondered whether full controllability would have any impact on UE normal operation. If so, what impact is expected from RAN2 perspective to enable UE-side Data Collection?*

**Rapporteur’s input**

For collecting data for the training of a network side model, RAN2 is already discussing the impact on UE’s performance and how to minimize that. For example, the usage of lower priority SRB for sending the collected data has already been agreed to ensure that data reporting will not delay other important control plane message.

Our understanding is that there will be some impact to the UE’s operation/performance due to the data collection/reporting for UE side model training. The level of impact on UE’s normal operation, as well as other factors such as the impact on the NW, air interface load, specification impact, etc., may also be considered to down select among the identified solutions that enable MNO controllability. Also, considerations must be made in the design of the final data collection solution to ensure the impact on the UE’s performance/operation are minimized.

However, the question from SA2 seems to be on the impact of the full controllability aspect on UE’s operation, rather than the general aspect of UEs performing the data collection and reporting. During the RAN2 discussions so far, no impact on UE’s normal operation due to the full controllability of the data collection process has been identified.

**E: Do companies agree that no direct impact on UE’s normal operation due to the full controllability of the data collection process has been identified by RAN2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | See comments | What is the UE’s normal operation？What kind of UE behavior can be called as normal operation, We are confused about such definition from SA. |
| Qualcomm | No | This was not discussed in RAN2. As the data collection procedure may place a huge burden on the UE, only the UE side may determine when/what is the appropriate time/conditions for the collection/reporting of the training data. The UE side may consider the UE hardware version, software version, load, power, memory, and other factors in account when initiating the collection/ reporting of the training data.We also agree that in solution 1b/2/3, the network side can also consider when/what is the appropriate time/conditions for the reporting of the training data. In option 1a, it is up to UE implementation. Coming to the response to the SA2 question, if the full controllability means that network decides when does the UE collect and report the training data (in solution 1b/2/3), that may impact the UE normal operations. The RAN doesn’t have enough information to mitigate the impact.As discussed, previously, the network may determine when it want to provide RS configuration for training and associated IDs for training, but it is up to UE whether UE can and wants to collect training data and triggers for UE side data collection. Comment to Nokia: As discussed above, impact to normal behavior may come from full controllability. As we explained above only the UE can determine what is appropriate condition/triggers for data collection/reporting. Therefore, if the full controllability means that network decides when does the UE collect and report the training data (in solution 1b/2/3), that may impact the UE normal operations. Note that “not discussed is not the same as not identified”. RAN2 never discussed this issue.  |
| T-Mobile USA | Yes | AI/ML data collection functionality is on top of existing UE operations. |
| Nokia | Yes | Comment to Qualcomm: the UE issues with data collection are there, but these issues are not coming from the controllability requirement. The comment is a new proposal that has not been proposed/discussed in RAN2 earlier. Based on the previous discussions RAN2 has not identified any issues. |
| Apple | No  | First, we agree with ZTE: it is not clear what “UE’s normal operation” means from SA2 perspective. RAN2 should first have consensus for it before responding, to avoid any misunderstanding between RAN2 and SA2. Thus, we request RAN2 ask SA2 what is “UE’s normal operation” in the reply LS.Secondly, we believe it has impacts on UE operation. As highlighted in below RAN2#127b agreement, UE request for data collection is FFS and will be discussed in RAN2:* *Data collection initiation and configuration for data collection is under network control. FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly or UE server)*

We think the UE request will have direct impact on UE operation (if supported): * If the UE directly request, RAN2 needs to specify the request signaling, and may need to specify the timing / condition to send the request, e.g. to avoid interference with on-going measurement efforts.
* If the UE server request, OTT Server may have requirements on special measurement times /locations. So, we believe MNO will also have to cater to those requirements as well, which will finally impact UE operation.

Thus, we disagree RAN2 to respond “**no direct impact on UE’s normal operation”** at this stage. |
| OPPO | Comments | We don’t fully understand why SA2 would like to know the impact on UE normal operation for training data collection, usually if 3GPP introduce a new feature, the extra impact on UE behavior anyway cannot be avoided, this is not an AI specific issue why the answer is really important for SA analysis? More addition, the UE impact is too broad, this may involve UE starts/stops data collection or UE reports collected data which is usually the scope of RAN, without touching stage 3, RAN can not give the full picture. |
| CATT | Yes |  |
| Ericsson | Comments | The question is not clear. We have agreed that the data collection is under NW control, and it is FFS how the NW determines that the UE needs to perform data collection. So there might be impact on legacy RAN2 procedures impacting the UE. Suggest simply saying that the RAN2 has not evaluated the impact of full controllability in the UE. |
| Mediatek | Yes | Although the intention of the question from SA2 and the specifics of 'UE’s normal operation' are not entirely clear, it is generally understood that the UE’s normal operation is also controlled by the network. With full controllability, the network should manage the UE’s normal operation appropriately, even if data collection is initiated or ongoing. Based on UE-assisted information reporting, the network can decide whether to stop the data collection process depending on information related to the UE’s power state, memory, computation, etc. Alternatively, the UE can autonomously stop the data collection if it may impair its normal operation. Therefore, we agree that there is no direct impact on the UE’s normal operation.  |
| vivo | Yes with comments | Similar to Question D, UE status (e.g., buffer status, power status) should also be considered to avoid impact on UE’s normal operation. |

If the answer to E is positive, then the rapporteur proposes the following response to Q3 from the LS:

*RAN2 has not identified any impact on UE normal operation due to the full controllability.*

**F: Do companies agree to the proposed response above to Q3 from SA2?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | No | We need to ask SA what is UE normal behaviour, and what kind of UE behaviour can be called as normal operation... |
| Qualcomm | No (suggest modification) | *There may be impact on UE normal operation due to the full controllability. Only the UE can determine appropriate time/conditions for UE-side training data collection/reporting. In solution 1b/2/3, the UE report the collected data based on network-provided configurations and UE-determined time/conditions for UE-side training data reporting.*  |
| T-Mobile USA | Yes |  |
| Nokia | Yes | Comment to Qualcomm: See comment above. This reply does not exclude that something will be identified later. |
| Apple | No | We do not agree with Nokia comment. We believe, according to RAN2#127b agreement, RAN2 has identified potential impact to UE operation and agreed to further study it. So, we suggest below response:“**First, RAN2 is not sure what “normal UE operation” means and request SA2 to clarify.** **Then, RAN2#127b agreed that UE request for data collection initiation and configuration is FFS, which will be discussed in RAN2:*** *Data collection initiation and configuration for data collection is under network control. FFS how the NW determines whether data collection should be initiated (e.g. via UE requests (UE directly or UE server)*

**Depending on different UE request solution, full controllability may have any impact on UE operation. For example, if the UE directly request, RAN2 needs to specify the request signaling, and may need to specify the timing / condition to send the request, e.g. to avoid interference with on-going measurement efforts.”**  |
| OPPO | No | The UE impact may involve UE starts/stops data collection or UE reports collected data which is usually the scope of RAN, without touching stage 3, RAN cannot give the full picture. |
| CATT | Yes |  |
| Ericsson | No, suggest modification | RAN2 has not evaluated the impact on the UE of full controllability. Suggest modifying the proposed reply as follows:*RAN2 has not evaluated ~~identified any~~ impact on UE normal operation due to the full controllability* |
| Mediatek | Yes with revision | *RAN2 has not identified any direct impact on UE normal operation due to the full controllability.* |
| vivo | Yes as baseline | RAN2 has not identified any impact on UE normal operation due to the full controllability. However, the NW controllability should consider UE status (e.g., buffer status, power status) to avoid impact on UE’s normal operation. |

*Q4: Some companies in SA2 understands that standardized data content refers only to data reflecting results of measurements performed by the UE according to network measurement configuration. SA2 would kindly asks RAN2 to confirm this understanding.*

**Rapporteur’s input**

Most of the standardized data to be collected is expected to be according to measurement configuration provided by the network. However, there may be elements in the report that are not based on measurement configuration provided by the network. For example, timestamp information is indicated to be one of the information elements to be collected/reported for the beam management case.

What is meant by standardized data is that the format and the meaning of the data will be known by the network (e.g., the type of information that is contains, the size/type of the data, etc.,).

Thus, the rapporteur proposes the following response to Q4 from the LS:

*Most of the collected/reported standardized data will be according to the measurement configuration provided by the network. However, there could be information elements (e.g., timestamps) in the collected/reported data that may not be acquired based on the measurement configuration. Thus, standardized data can be defined without necessarily tying it to measurement configuration and it refers to data whose format will be explicitly defined in 3GPP specifications, and the network will be able to understand the content/meaning of the data based on that.*

**G: Do companies agree to the proposed response above to Q4 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | This could be RAN2 common understanding. |
| Qualcomm | No (suggest modification) | *A part of the collected/reported standardized data will be according to the measurement configuration provided by the network. However, there could be additional information elements (e.g., timestamps) in the collected/reported data that may not be standardized. The standardized data will be explicitly defined in RAN1/RAN2 standard specifications.* Comment to Nokia: We did not discuss the below in RAN2 and prefer not to include in LS reply: “The measurement configuration is not limited to measurements on reference signals, and could, e.g., require the UE to include standardized timestamps.”  |
| T-Mobile USA | No | Simply state “ RAN2 confirms this understanding” |
| Nokia | Yes with revision proposal | We propose the following revision:~~Most of t~~The collected/reported standardized data will be according to the measurement configuration provided by the network~~. However, there could be information elements (e.g., timestamps) in the collected/reported data that may not be acquired based on the measurement configuration. Thus, standardized data can be defined without necessarily tying it to measurement configuration~~ and it refers to data whose format will be explicitly defined in 3GPP specifications, and the network will be able to understand the content/meaning of the data based on that. The measurement configuration is not limited to measurements on reference signals, and could, e.g., require the UE to include standardized timestamps.We are also OK with the simple answer proposed by T-Mobile USA. |
| Apple | Yes (but prefer T-Mobile suggestion)  | RAN2 only agreed standardized data, but non-standardized data is still FFS. Meanwhile, in this question, SA2 only ask RAN2 about standardized data. So, we do not agree to reply SA2 anything related to non-standardized data. In our understanding, standardized data content refers only to measurements performed by the UE according to network measurement configuration Thus, we agree with T-Mobile to simple confirm the SA2 understanding: “**RAN2 confirm SA2 understanding that standardized data content refers only to data reflecting results of measurements performed by the UE according to network measurement configuration”** |
| OPPO | Yes |  |
| CATT | Yes | To shorten the response, the last sentence (i.e. “standardized data can be defined without…”) is sufficient. |
| Ericsson | No.Agree with T-mobile suggestion |  |
| Mediatek | Yes with revision | I think we can simply saying: Standardized data refers to data whose format is explicitly defined in 3GPP specifications, allowing the network to understand its content and meaning. It includes information that follows the measurement configuration and may also contain information not necessarily tied to the measurement configuration. |
| vivo | Yes with comments. | Agree with Rapp that the standardized data is decoupled with the configuration and refers to standardized data format defined in 3GPP specifications or specifications from other organizations. |

### 2.1.2 Roaming support

*Q5: Does RAN2 expect data to be collected from UEs that are roaming?*

**Rapporteur’s input**

Roaming considerations are in general outside the scope of RAN2.

The UE is not operating autonomously (i.e., the network is the one that configures the measurements, controls the data collection/transfer). Thus, it is up to the network to enable/disable the data collection operation when the UE is roaming.

Any further aspects of roaming considerations are in general outside the scope of RAN2.

The rapporteur proposes the following response to Q5 from the LS:

*The UE is not operating autonomously (i.e., the network configures the required measurements and controls the data collection/transfer). Thus, it is up to the network to enable/disable the data collection operation when the UE is roaming. Any further aspects of roaming considerations are in general outside the scope of RAN2.*

**H: Do companies agree to the proposed response above to Q5 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | No | RAN2 does not touch this discussion, and no RAN2 any agreement can reflect above response. We would like to answer this question simply:*No conclusion about roaming is reached in RAN2.* |
| Qualcomm | No | Whether roaming can be supported or not is under SA2/SA3 scope. For example, RAN is not aware about HPLMN and VPLMN, and it should be decided by SA2/SA3 whether training data collection can be supported across VPLMN and HPLMN based on bilateral agreements and local regulatory. Therefore, suggest removing the first two paragraph and rewording, as below*Roaming considerations are outside the scope of RAN2.* |
| T-Mobile USA | No | We agree with ZTE’s suggested response “No conclusion about roaming is reached in RAN2” |
| Nokia | Yes, with simplification | We propose the following simplification:The UE is not operating autonomously (i.e., the network configures the required measurements and controls the data collection/transfer). ~~Thus, it is up to the network to enable/disable the data collection operation when the UE is roaming.~~ Any further aspects of roaming considerations are in general outside the scope of RAN2.We are OK with the proposal from ZTE or Qualcomm  |
| Apple | See comments  | We believe roaming was not discussed in RAN2 and it is out of scope of RAN2.And the below statement is not technical correct:*“The UE is not operating autonomously (i.e., the network configures the required measurements and controls the data collection/transfer). Thus, it is up to the network to enable/disable the data collection operation when the UE is roaming.”*1. When UE in RRC\_CONNECTED state, it is true for intra-PLMN case. However, if is **inter-PLMN case**, it may not be correct. For example, MNO A and MNO B have different AI/ML vendors. Then data collection configured by MNO A should not be controlled by MNO B. And it may lead to risk of NW vendor proprietary implementation exposure.
2. It is possible that UE may enter RRC\_IDLE/RRC\_INACTIVE state autonomously (e.g. after detection of RLF) when collecting data. Then, from RAN2 point of view, we are not sure how network can enable/disable data collection operation in such case.

 Thus, we suggest to take ZTE’s simple response:**“No conclusion about roaming is reached in RAN2.”**  |
| OPPO | Yes with comments | Only the last sentence is sufficient. |
| CATT | Yes | We suggest to modify the following sentence:*Thus, it is up to the network to enable/disable the data collection operation when the UE is roaming, e.g., taking into account user consent or UE location.* |
| Ericsson | No. Just reply that roaming is outside RAN2 scope | RAN2 can just reply by saying that:“Roaming is not in the scope of RAN2 discussion”. |
| Mediatek | No | Agree with ZTE. One point to note for roaming is that data collection is done on the serving network. In the case of roaming, the controllability discussed in RAN2/RAN pertains to the VPLMN. |
| vivo | See comments | Agree with Rapp that the roaming is in general outside RAN2 scope. To simplify discussion and afterward deployment complexity of data collection, in this release we can just focus on non-roaming scenario. Roaming is an essential scenario, which should be investigated in future release (led by SA2)\_ |

### 2.1.3 Visibility

*Q6: SA2 would like confirmation from RAN2, whether it is sufficient that the data content be standardized and MNO knowing which data type is collected, and the MNO knowing the actual data content to be considered as the MNO having full visibility of such data or should further conditions be required in order to declare that the MNO has full visibility of such data, e.g. whether MNO need to verify the match between the data transferred and the data collected ?*

**Rapporteur’s input**

As stated in the LS sent from RAN and also discussed above in relation to Q4, visibility of data content only signifies that the MNO will be able to be aware of, access, and comprehend the content of the collected/reported data without the need of SLA.

Also, it is not clear on how the MNO will be able to verify the match between the data transferred and the collected data. The data is collected at the UE mainly because it is information (e.g., such as DL signal levels) that only the UE can measure. If the concern is about the quality/accuracy of the collected data, RAN4 discussions are being (will be) made concerning that and UEs performing data collection must comply with any requirements that will be set based on that discussion (e.g., like current requirements for RRM measurement reporting).

Thus, there are no further requirement for the MNO to verify the match between data transferred and data collected.

The rapporteur proposes the following response to Q6 from the LS:

*As stated in the LS sent from RAN, visibility of data content only signifies that the MNO will be able to be aware of, access, and comprehend the content of the collected/reported data without the need of SLA. If the concern is about the quality/accuracy of the collected data, UEs performing data collection must comply with any requirements that will be set in RAN4 (e.g., like current requirements for RRM measurement reporting). Thus, there are no further requirement for the MNO to verify the match between data transferred and data collected.*

**I: Do companies agree to the proposed response above to Q6 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | No | In our understanding, the intention of full visibility is for MNO to check whether the data transferred to the UE server is matched to the data collected based on collection configuration to avoid the potential privacy leakage.In this sense, we think there is further requirement for the MNO to verify the match between the data transferred and the data collected. |
| Qualcomm | No (suggest rewording) | This is about UE-side data collection. Therefore, the network does not need to be check the quality. Suggest rewording as: *As stated in the LS sent from RAN, visibility of data content only signifies that the MNO will be able to be aware of, access, and comprehend the content of the collected/reported data without the need of SLA. There are no further requirement for the MNO to verify the match between data transferred and data collected.* Comment to T-Mobile: Other details cannot be concluded in RAN2. Therefore, other details are not FFS under RAN2. We suggest rewriting as following:~~Other details are FFS”~~To Other details (e.g., requirement for MNO to verify the match between the data transferred and the data collected) is outside RAN2 scope.  |
| T-Mobile USA | Partially | Shorten response to “As stated in the LS sent from RAN, visibility of data content only signifies that the MNO will be able to be aware of, access, and comprehend the content of the collected/reported data without the need of SLA. Other details are FFS” |
| Nokia | Partially | We support the proposal from T-Mobile USA |
| Apple | Partially (Yes for 1st part, No for 2nd part) | 1) We agree below part, and request to **notify SA2 that all standardized data need to be specified with clear RAN4 requirements:** *“UEs performing data collection must comply with any requirements that will be set in RAN4 (e.g., like current requirements for RRM measurement reporting).”*We believe if without clear RAN4 requirements, the UE collected data may be useless or even misleading to the Network (and finally Network/MNO will blame Chipset/OEM vendors). Thus, we believe “standardized data” must have clear RAN4 requirement.2) We disagree below part:*Thus, there are no further requirement for the MNO to verify the match between data transferred and data collected.* We agree with ZTE that the intention of full visibility is for MNO to check whether the data transferred to the UE server is matched to the data collected based on collection configuration to avoid the potential privacy leakage.Thus, we suggest below response:“**As stated in the LS sent from RAN, visibility of data content only signifies that the MNO will be able to be aware of, access, and comprehend the content of the collected/reported data without the need of SLA. If the concern is about the quality/accuracy of the collected data, UEs performing data collection must comply with any requirements that will be set in RAN4 (e.g., like current requirements for RRM measurement reporting), and all standardized data need to be specified with clear RAN4 requirements. ~~Thus, there are no further requirement for the MNO to verify the match between data transferred and data collected~~ However, MNO is required to verify whether the data transferred to the UE server is matched to the data collected based on collection configuration to avoid the potential privacy leakage.”** |
| OPPO | Partially | We’re fine with T-Mobile USA’s suggestion |
| CATT | No | MNO is required to verify whether the data transferred to the UE server is matched to the data collected based on collection configuration |
| Ericsson | Partially | We can just repeat what captured in the CR to TR 38.843, i.e. “Visibility of data content signifies that the MNO can, at least, be aware of, access, and comprehend the data without the need of SLA”. Other details were not discussed in RAN2. |
| Mediatek | Partially | Agree with T-mobile. Shorten response to “As stated in the LS sent from RAN, visibility of data content only signifies that the MNO will be able to be aware of, access, and comprehend the content of the collected/reported data without the need of SLA. Other details are FFS and may be out of RAN2 scope. “ |
| vivo | See comments | Agree with Rapp that the roaming is in general outside RAN2 scope. To simplify discussion and afterward deployment complexity of data collection, in this release we can just focus on non-roaming scenario. Roaming is an essential scenario, which should be investigated in future release (led by SA2). |
| vivo | Yes |  |

## 2.4 SA5 LS

In [4]**,** SA5 sent a reply LS to the RAN LS on AIML data collection (RP-242389) including two questions.

*Q8: Is the “Server for data collection for UE-side model training” controlled by operators?*

**Rapporteur’s input**

The requirement is for the data collection to be fully controlled by the MNO without the need for the SLA, and it is not about controlling the server. As long as the MNO can do that, a solution can be considered feasible by SA5 even if the server for data collection is located outside the MNO’s domain.

Thus, the rapporteur proposes the following response to Q8:

*The controllability requirement is referring to the controlling of the data collection/transfer process, and it is not concerned about the control of the server for data collection.*

**J: Do companies agree to the proposed response to Q8 above (Q4.1, part 1 from SA5)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | See comments | I guess SA5 is actually to ask the ownership of the server for data collection for UE side model training that we have discussed in RAN2 before but there is no any conclusion is made. We can answer the question directly:RAN2 does not reach the consensus about the controlling of server for data collection.  |
| Qualcomm | Yes (with comment) | From the RAN2 perspective, *the controllability requirement is referring to the controlling of the data collection/transfer process. Whether the the “Server for data collection for UE-side model training” controlled by operators is outside RAN2 discussion.* *Suggest modification:*From the RAN2 perspective, *the controllability requirement is referring to the controlling of the data collection/transfer process. Whether the “Server for data collection for UE-side model training” is controlled by operators or not, is outside RAN2 discussion/scope.*  |
| T-Mobile USA | No | Aspects of a server isn’t important. What is important is controllability and visibility of the data collected as defined in the LS from RAN |
| Nokia | Yes with revisions | We think that the ownership/control of the server is out of the scope of RAN2. We agree with TMO that controllability and the visibility requirements are the important points. We are OK with the proposal from Qualcomm, and we propose an additional clarification based on the comment from T-Mobile USA:From the RAN2 perspective controllability and visibility of the data collected as defined in the LS from RAN are the requirements, thus *the controllability requirement is referring to the controlling of the data collection~~/transfer~~ process. Whether the the “Server for data collection for UE-side model training” controlled by operators is outside RAN2 discussion.* |
| Apple | See comments | We have similar understanding as ZTE that RAN2 actually discussed whether the server is controlled by operators or UE vendors or 3rd party (see email discussion summary [R2-2405931](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_126%5CDocs%5CR2-2405931.zip)), but no consensus can be achieved. To better answer SA5’s question, we suggest to revise like below:“***The controllability requirement is referring to the controlling of the data collection/transfer process, and it is not concerned about the control of the server for data collection. RAN2 discussed whether the server is controlled by operators or UE vendors or 3rd party (in email discussion summary*** [***R2-2405931***](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_126%5CDocs%5CR2-2405931.zip)***), but no consensus can be achieved***” |
| OPPO | Comments  | We’re fine with the suggestion from above companies. |
| CATT | No | We think the discussion point from SA5 is whether current MDT mechanism can be reused for UE data collection. So our view is that“Server for data collection for UE-side model training” is controlled by operators, and the existing MDT mechanism can be reused/enhanced. |
| Ericsson | Yes | As other companies propose, we can further clarify that:*“whether the server for data collection for UE-side model training is controlled by operators or not, depends on the deployment and it was not discussed in RAN2”* |
| Mediatek | See comments | We are fine with QC’s proposal.  |
| vivo | No | From RAN2 agreement, the server for data collection for UE-side model training is inside the MNO while the OTT server is outside the MNO. Thus the “Server for data collection for UE-side model training” is owned and controlled by operators. Otherwise, the server should be OTT server. |

*Q9: What standardized data is to be collected?*

**Rapporteur’s input**

As indicated in the LS from RAN, RAN1 has provided initial information about the data to be collected for the different use cases (R1-2310681). However, this is initial information, and it is likely that further updates/additions will be made as the work/study item progresses. For example, RAN1 has made further agreements regarding the data to be collected for the positioning use case in RAN1#116b [5]. However, it is reasonable to assume that the amount of data to be collected (per sample) will be similar as the provided in R1-2310681.

Thus, the rapporteur proposes the following response to Q9:

*SA5 can refer to R1-2310681 for the content of standardized data to be collected for the different AIML use cases. Further updates/addition to this are likely to be made as the work/study item progresses. However, SA5 can assume the size of the data to be collected (per sample) will be similar as the one provided in R1-2310681.*

**K: Do companies agree to the proposed response to Q9 above (Q4.1, part 2 from SA5)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes |  |
| Qualcomm | Yes (with comments) | Agree with Rapporteur. Suggested modification:*SA5 can refer to R1-2310681 for the content of standardized data to be collected for the different AIML use cases. There can be additional contents that can be collected at the UE for UE side model training, as mentioned in R1-2310681. Further updates/addition to this are likely to be made as the work/study item progresses. However, SA5 can assume the size of the data to be collected (per sample) will be similar as the one provided in R1-2310681.*  |
| T-Mobile USA | No | This topic hasn’t been discussed in detail in RAN2 therefor I suggest “RAN WG’s need to further discuss what data needs be standardized. Some examples can be found in R1-2310681.” |
| Nokia | Yes with revisions | Revision is proposed:SA5 can refer to R1-2310681 for examples of the potential content of standardized data to be collected for the different AIML use cases. RAN2 is still discussing and has made no conclusions on the content of standardized data to be collected. ~~Further updates/addition to this are likely to be made as the work/study item progresses.~~ However, SA5 can assume the size of the data to be collected (per sample) will be similar as the one provided in R1-2310681 |
| Apple | No | We have similar view as T-Mobile. We think it is premature for RAN2 to say “*SA5 can refer to R1-2310681 for the content of standardized data to be collected for the different AIML use cases.*”:1. As email discussion Rapporteur mentioned, R1-2310681 is initial information. This is RAN1 LS in Rel-18 study item phase. And R1-2310681 has a lot of FFS. Thus, we believe it will mislead SA5.
2. As far as we know, RAN1 has not discussed specific contents of data collection in Rel-19. Email discussion Rapporteur mentioned agreements on AI/ML based positioning in RAN1#116b. However, it is only a high level agreement without any detailed contents (copied below). Thus, we don’t think SA5 can refer to R1-2310681:

AgreementFor training data collection of AI/ML based positioning, the collected data sample can include the following components:Part A:* channel measurement
* quality indicator of channel measurement
* time stamp of channel measurement

Part B:* ground truth label (or its approximation)
* quality indicator of label
* time stamp of label

Thus, on top of T-Mobile suggestion, we suggest below response:“**RAN2 has not discussed the details of standardized data yet. RAN WG’s need to further discuss what data needs be standardized.**” |
| OPPO | Yes |  |
| CATT | Yes |  |
| Ericsson | Agree with T-mobile proposal | As proposed by T-mobile, we can just refer to the RAN1 document, and indicate that RAN2 has not discussed the content of standardized data. |
| Mediatek | No | Agree with Apple that it’s premature to make assumption for SA5 that the size of the data to be collected (per sample) will be similar as the one provided in R1-2310681. More discussion is required in RAN WGs.  |
| vivo | Yes with comments | No need to mention the data size. Suggest refining as:*SA5 can refer to R1-2310681 for the content of standardized data to be collected for the different AIML use cases. Further updates/addition to this are likely to be made by RAN1 as the work/study item progresses.* |

# 3 Conclusion

To be added...

# 4 Reference

1. RP-242389 /S2-2409600, LS on AIML data collection, RAN #105, September 2024
2. S2-2411191, Reply LS on AIML data collection, SA2 #165, October 2024
3. RAN2 #127-bis, Chairman Notes, October 2024
4. S5-246299, Reply LS on AIML data collection, SA5 #157, October 2024
5. RAN1 #116-bis, Chairman Notes, April 2024