**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 that 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. |
| Interdigital | Yes (With comments) | We sympathize with the views from companies above that the role of the NG-RAN is use case dependent. However, our understanding is that we are aiming for one solution that can be used for all use cases (also taking future proofness into consideration). Also, we think SA2 is asking this question to determine if the NG-RAN can be considered just a pipeline for the data transfer or has any other role to play in the data collection process. Considering these, we think it can be agreeable to respond that NG-RAN involvement is anticipated (i.e., **SA2 should not consider the NG-RAN just as the pipeline** for transferring the collected data and whatever configuration is required for the data collection).  |
| Huawei, HiSilicon | Yes with comments | Based on the rapporteur's inputs, the following aspects should be discussed:(a) initiating (e.g. triggering) of UE-sided data collection(b) terminating collection of UE-sided data collection(c) configure the UE with measurement configuration associated to data collection for training(d) control data transferHere are our views for different options:For all options, (a)(b) may or may not need NG-RAN involvement. If OTT server/CN/OAM can initiate/terminate data collection, there is no NG-RAN involvement, otherwise it may involve NG-RAN.For all options, (c) may need NG-RAN involvement, and it will be further discussed in RAN2 (related to the RAN2-127bis agreement mentioned by the rapporteur).For d), i.e. data transfer control:**Option 1a:** NG-RAN involvement is not needed.**Option 1b:** NG-RAN involvement is not needed.**Option 2-CP:** NG-RAN involvement may not be needed as NAS signalling should be transparent to NG-RAN. However, whether NG-RAN involvement is needed or not has not been discussed in RAN2.**Option 2-UP:** NG-RAN involvement may not be needed (similar analysis as for Option 2-CP).**Option 3-CP:** NG-RAN may be involved.**Option 3-UP:** whether NG-RAN involvement is needed depends on feasibility analysis by SA5.It is noted that the discussion of NG-RAN involvement should also consider use cases, and for now UE-sided BM is a use case.In general, we think more discussions in RAN2 are needed on the NG-RAN involvement in data collection process |
| Xiaomi | See comments | We also agree that the answer might depend on use cases. Our understanding is that at least for beam management use case, NG-RAN is involved in the configuration. So we could reply to SA2 that: **NG-RAN is involved in the data collection procedure, at least in configuring the required measurements in some use cases (e.g. beam management).** |
| Charter | Yes |  |
| Lenovo | Yes, but only for configuring the required measurement | Yes, gNB will be involved (if required) in providing the configuration related to UE measurement (e.g., the time-frequency location of reference signal to measure and the measurement quantity) for both beam management use case (CSI related config) and positioning use case (e.g., PRS related config). It is unclear for RAN2 at the moment if and why gNB should be the node that initiates the whole data collection procedure for UE sided model training. We think the initiation does not necessarily require the involvement of the NG-RAN (gNB), as it should be up to the UE/UE-server to trigger and start the data collection process. One thing we noticed from the discussions during the last SA2 meeting is that the terminology of “measurement configuration” in SA2 discussions has different meaning than the “measurement configuration” in RAN2 discussion.In SA2, “measurement configuration” means NW (e.g., DCAF) configures the UE to **collect and report** a certain type of data (e.g., delay, throughput). It does not include any configuration on how the measurement should be exactly done.In RAN2, “measurement configuration” means NW (e.g., gNB) configures the UE **how to perform measurement exactly**, e.g., time-frequency location of the reference signal to measure and the measurement quantity.We better clarify this point in the LS reply to SA2 to avoid any further confusion. |
| Google | Yes for configuring and terminating (if included);No for initiating; | We agree that the NG-RAN is involved in the data collection procedure, at least in configuring the required measurements for BM case. Whether and how NG-RAN involvement is coordinated with other entity (e.g. OAM, CN, application server) based on options 1b/2/3 in the data collection process is FFS and wait for SA2 or RAN3 progress.For initiating of the data collection at UE side, it’s better for UE to initiate it. Based on RAN2 agreement, *the Data collection initiation 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)* For terminating of the data collection at UE side mentioned above, we tend to agree that NG-RAN is also involved. The data collection is performed based on the data collection configuration from the NW. Technically speaking, both UE and the NW can trigger the termination of the data collection.  |
| Samsung | No | The original RAN LS (and related agreements / TP to TR) only referred to controllability in the context of data transfer. We note that even the present section of this document is entitled ‘2.1.1 Controllability of MNO on data transfer’We acknowledge that the SA2 – in their LS – refer to both data transfer and data collection, expanding the discussion coverage compared to the original RAN LS.At the very minimum, any reply LS would need to separate out the two (data transfer and data collection). And then, on the topic of UE-data collection controllability and whether it requires NG-RAN involvement (as per Q1 from SA2 LS), the most we can reply at this point is that there is no consensus in RAN2 – this is in our view very clear from responses received so far. |
| CMCC | Yes with comments | We agree with MTK that NG-RAN is involved in all considered use cases for configuration. For initiation of data collection, we think NG-RAN can initiate data collection for CSI and beam management use case, but for positioning use case, data collection is initiated by LMF. |

**Summary:**

**Yes (NG-RAN is involved)**: ZTE, T-Mobile, Nokia, OPPO, CATT, Ericsson, MediaTek, vivo (option 3 only), Interdigital, Xiaomi, Charter, Lenovo, Google

**No (NG-RAN is/(may not be) involved at all or more discussion in RAN2 needed, i.e., no consensus in RAN2):** Qualcomm, Apple, Huawei, Samsung

Of the 17 companies who responded, 14 answered that NG-RAN involvement is needed but there was no consensus among these 14 companies regarding how exactly the NG-RAN is involved. For example, some companies think the NG-RAN is involved only for (AS) configuration (e.g., ZTE/OPPO/Xiaomi/Lenovo), while others indicated that NG-RAN is not necessarily involved in the configuration (e.g., Ericsson). Some companies also mentioned the involvement is solution or use case dependent (e.g., vivo: only for option 3, Xiaomi: beam management use case).

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. |
| Interdigital | Yes with comments | We are OK with the rephrasing suggested by Ericsson. |
| Huawei, HiSilicon | No | We think Apple's suggestion makes sense, so we support it.In addition, regarding NG-RAN involvement, we think at least the following aspects will impact RAN2 discussions:(1) use cases(2) data transfer options(3) aspects like:*(a) initiating (e.g. triggering) of UE-sided data collection**(b) terminating collection of UE-sided data collection**(c) configure the UE with measurement configuration associated to data collection for training**(d) control data transfer* |
| Xiaomi | See comments | As reply in A, we could reply to SA2 that: **NG-RAN is involved in the data collection procedure, at least in configuring the required measurements in some use cases (e.g. beam management).**We are also OK with the suggestion from Ericsson. |
| Charter | Yes |  |
| Lenovo | Yes with comments | In general, we believe NG-RAN can be involved in the data collection process, and this includes providing the UE with the data collection related measurement configurations, if required. The version suggested by Ericsson is also ok.  |
| Google | No, See comments | Based on our reply to A, we prefer the following response to SA2:*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 for BM case ~~and initiating the data collection~~. For initiating of data collection, it’s up to UE implementation.* Besides, the suggestions from ZTE or Ericsson are both fine. |
| Samsung | No | As mentioned in our previous response, the most we can say at this point is that controllability as discussed in RAN2 so far only refers to data transfer, and that for UE-data collection controllability and whether it requires NG-RAN involvement – there is no current consensus in RAN2. |
| CMCC | See comments | We are fine with ZTE’s revision. |

**Summary:**

Among the companies that answered Yes to QA, there were various amendments proposed regarding the proposed response to Q1 from SA2.

Among the companies that answered No to QA, as expected, the input was to respond by saying that there is no consensus in RAN2 regarding NG-RAN involvement.

*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?**

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| --- | --- | --- |
| **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. |
| Interdigital | Yes | We agree with the proposal above. However, since the aim of this email discussion is to provide current understanding and not make new agreements, if some companies have different understanding and think further discussions are required whether the gNB is involved in the data transfer for the BM/CSI cases and LMF is involved in the positioning use cases, then we are OK to communicate that view to SA2 (E.g., as proposed by Apple/Ericsson)  |
| Huawei, HiSilicon | No | Firstly, we think *“initiating, terminating and fully managing data transfer”* should be discussed per use case (e.g. UE-side BM).Secondly, we think **"under what conditions"** is a very important question, but RAN2 has not discussed it and RAN2 has not identified conditions.Thirdly, in previous RAN2 meetings, RAN2 discussed controllability and RAN2 did not confirm the necessity of controllability. If controllability is considered, we think any of MNO controlled entities may be involved, it may be NG-RAN, OAM, or MNO controlled AF. Based on the Table 7.2.1.3.2-1 in previous endorsed TP [R2-2407807](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_127%5CDocs%5CR2-2407807.zip), here is our analysis for entities and controllability:**Option 1a:** OTT server performs controllability**Option 1b/Option 2 (CP/UP):** an MNO controlled AF performs controllability. For data transfer part, it may bring impacts to Uu interface, and thus NG-RAN may be involved to minimize such impacts.**Option 3-CP:** OAM/RAN perform controllability.**Option 3-UP:** which entity should perform controllability depends on feasibility analysis by SA5. |
| Xiaomi | No | Agree with Qualcomm that for CSI prediction/compression use cases, the gNB support for providing RS Configuration and associated ID is still under RAN1 discussion. |
| Charter | Yes |  |
| Lenovo | See comments | We share similar understanding as OPPO and Ericsson. gNB is involved in generating the measurement configuration for data collection in beam prediction, CSI prediction and positioning (cooperating with LMF) use cases. LMF is involved in generating the measurement configuration for data collection in positioning use case. While it is unclear how they get involved in the data transfer procedure after data is collected. |
| Google | Yes with updates | Yes for beam management and positioning use cases.For the CSI use case, we can remove it and wait for RAN1 progress. |
| Samsung | No | As noted by multiple companies, this question (and discussion above) goes beyond existing agreements. Additionally, the question is specifically on data transfer. |
| CMCC | Yes |  |

**Summary:**

**Yes:** T-Mobile, Nokia, OPPO, CATT, MediaTek, vivo, Lenovo, Interdigital, Charter, Google,

**No:** ZTE, Qualcomm, Apple, Huawei, Xiaomi, Samsung, Ericsson?

Of the 17 companies who responded, 10 agreed that gNB is involved in the BM case and LMF is involved in the positioning case.

The 7 other companies that responded “*No”* stated that the discussion is either out of the scope of the current email discussion or we don’t have agreements in RAN1/2 to be able to answer the question. Some of the companies also mentioned that Q2 from SA2 is referring to only the data transfer aspect.

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?**

|  |  |  |
| --- | --- | --- |
| **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. |
| Interdigital | See response to previous question (C)  |  |
| Huawei, HiSilicon | No | The original question asked about "where (which entities)" and "under what conditions" for performing controllability, and here is our suggestion on replies:(1) For **"under what conditions"**, RAN2 has not discussed it and RAN2 has not identified conditions.(2) Regarding which entities should perform controllability, the Table 7.2.1.3.2-1 (in previous endorsed TP [R2-2407807](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_127%5CDocs%5CR2-2407807.zip)) can be used as the starting point, and more RAN2 discussions are needed. The aspects can include use cases, data transfer options and other aspects (e.g. whether/how to minimize Uu impacts). |
| Xiaomi | See comments | We’re OK with T-Mobile’s revision, and we can remove CSI prediction/compression use case since it is still under discussion in RAN1. |
| Charter | Yes with comment | We agreed with T-Mobile’s revision |
| Lenovo | See comment | We understand “*gNB is involved in the control of the data collection*” is relevant to the answer to the first question “*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*”. Maybe we better use the same wording when answering Q1 and Q2 to avoid ambiguity. E.g., gNB is involved in providing the required measurement configurations for beam prediction,CSI prediction and positioning (cooperation with LMF). However, RAN2 has not concluded on which node should initiate, terminate and fully manage data transfer.  |
| Google | Yes with comment | OK with T-Mobile’s revision, and we need remove CSI use case. |
| Samsung | No | As noted by multiple companies, this question (and related discussion) goes beyond existing agreements. Additionally, the question is specifically on data transfer. |
| CMCC | Yes with comment | We are OK with T-Mobile’s revision and leave out CSI compression from the answer.  |

**Summary:**

Among the companies that answered Yes to Question C, there were various amendments proposed regarding the proposed response to Q2 from SA2.

Among the companies that answered No to Question C, the input was to respond by saying that there is no consensus in RAN2 regarding entities involved in the data transfer.

*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** |
| 1 | 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. |
| 2 | 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.  |
| 3 | T-Mobile USA | Yes | AI/ML data collection functionality is on top of existing UE operations. |
| 4 | 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. |
| 5 | 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. |
| 6 | 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. |
| 7 | CATT | Yes |  |
| 8 | 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. |
| 9 | 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.  |
| 10 | 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. |
| 11 | Interdigital | See comments | We are OK to respond that “RAN2 has not analyzed/agreed regarding the impact on UE’s normal operation” |
| 12 | Huawei, HiSilicon | No | Firstly, we understand that "UE normal operation" means normal traffic at UE side, and they may correspond to different QoS levels. However, we are open to check the meaning with SA2.Secondly, we think question E is linked to the controlling entities. For example, if CN performs controllability, and data collection may be enabled when NG-RAN is congested, therefore UE normal operation is impacted.Thirdly, we observe the following impacts on UE normal operation:**UE battery.** Due to UE-sided data transfer, the UE battery may be consumed more quickly, and then it may impact UE normal operation.**Priority.** If UE-sided data transfer has a high priority, it may impact normal operation, as normal operation may be delayed. Even if data transfer is put on the lowest SRB/DRB, it still needs resources for data transmission.In summary, we think that full controllability does not mean no direct impact on UE's normal operation. |
| 13 | Xiaomi | See comments | We are OK to reply that “RAN2 has not analyzed/agreed regarding the impact on UE’s normal operation”. |
| 14 | Charter | Yes with comment | We do not see any impact at this point but RAN2 has not study the impact yet. Agreed with Xiaomi. |
| 15 | Lenovo | Comments | Our understanding based on the SA2 discussions is that “normal operation” here means the data collection process should not impact other on-going MBB services from QoS point of view. From RAN2 perspective, the impact to the QoS of on-going MBB services is not really evaluated. |
| 16 | Google | See comments | We are OK to reply: *“RAN2 has not evaluated/analyzed the impact on UE’s normal operation due to the full controllability of the data collection process.”* |
| 17 | Samsung | See comments | OK with Google’s suggestion. |
| 18 | CMCC | See comments | OK with Google’s suggestion. |

**Summary:**

**Yes:** T-Mobile, Nokia, CATT, MediaTek, Vivo, Interdigital,

**No (or the question from SA2 is not clear):** ZTE, Qualcomm, Apple, OPPO, Ericsson, Huawei, Xiaomi, Charter, Lenovo, Google, Samsung

Of the 17 companies who responded, 11 stated that the question from SA2 is not clear (i.e., what is meant by normal UE operation?) or/and that no discussion/agreement has been made in RAN2 regarding 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?**

|  |  |  |
| --- | --- | --- |
| **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. |
| Interdigital | See response to previous question (E) |  |
| Huawei, HiSilicon | No | See our comments for question E.Our reply is as below:RAN2 has not discussed impact on UE normal operation due to the full controllability. For this issue, it may need to take at least use cases and controlling entities into account. |
| Xiaomi | See comments | We are OK to reply that “RAN2 has not analyzed/agreed regarding the impact on UE’s normal operation”. |
| Charter | Yes |  |
| Lenovo | No | “not evaluated” would be more appropriate as suggested by Ericsson. |
| Google | See comments | We are OK to reply: *“RAN2 has not evaluated/analyzed the impact on UE’s normal operation due to the full controllability of the data collection process.”* |
| Samsung | No | We are ok with suggestion from Google. |
| CMCC | See comments | OK with Google’s suggestion. |

**Summary:**

**Yes (no impact identified):** T-Mobile, Nokia, CATT, MediaTek, Vivo, interdigital, Charter

**There is/maybe impact on UE operation:** QC, Apple, OPPO

**No impact evaluated/discussed:** Ericsson, Huawei, Xiaomi, Lenovo, Google, Samsung

**Ask SA2 what is meant by UE normal behavior:** ZTE

The view from the majority of the companies (13/17) is in line with the response to Question D, i.e., that RAN2 has not identified/analyzed/concluded regarding the 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. |
| Interdigital | Yes | Our understanding is that standardized data means that the format is explicitly defined in 3GPP specifications, and we don’t see the need to couple it with measurement configurations. What matters is that the information sent by the UE is visible and network knows the content/value as well as the meaning of each individual information element of the collected data samples. |
| Huawei, HiSilicon | No.Agree with T-mobile suggestion. | For the rapporteur's suggestion, we do not see a need of mentioning timestamps, because the requirements of training data depend on RAN1 progress. |
| Xiaomi | No | We can simply confirm SA2 understanding. |
| Charter | No | Sympathizes with T-Mobile’s point. |
| Lenovo | Yes with comments | We share same understanding with Rapp. The suggested version from Mediatek looks fine.One thing we noticed based on the discussions during last SA2 meeting is that the terminology of “measurement configuration” in SA2 discussion has different meaning than the “measurement configuration” in RAN2 discussion.In SA2, “measurement configuration” means NW (e.g., DCAF) configures the UE to **collect and report** a certain type of data (e.g., delay, throughput). It does not include any configuration on how the measurement should be exactly done.In RAN2, “measurement configuration” means NW (e.g., gNB) configures the UE **how to perform measurement exactly**, e.g., time-frequency location of the reference signal to measure and the measurement quantity.We better clarify this point in the LS reply to SA2 to avoid any further confusion. |
| Google | No | First, we want to clarify whether the standardized data content means that the data format should be explicitly defined in 3GPP specification. We believe the explicit definition of data format is beneficial for interoperability across different networks.If this is the common understanding, we agree with T-Mobile’s suggestion.  |
| Samsung | See comment | OK with Apple’s revision of T-Mobile’s suggestion, assuming we can agree the following revision of Apple’s revision:“**RAN2 confirm SA2 understanding that standardized data content refers only to data reflecting results of measurements performed by the UE according to data collection procedure network measurement configuration”**(Please note that using ‘network measurement configuration’ immediately above would go a step beyond existing agreements.) |
| CMCC | Yes |  |

**Summary:**

**Yes (as proposed by the rapporteur or with some modification):** ZTE, Qualcomm, Nokia, OPPO, CATT, MediaTek, Vivo, Interdigital, Lenovo

**No (confirm SA2 understanding)**: T-Mobile, Apple, Ericsson, Huawei, Xiaomi, Charter, Google, Samsung

There was almost even split among the companies that wanted to just confirm the SA2’s understanding (i.e., the collected data is according to the measurement configuration by the network) and the companies that wanted to indicate that the collected data format/content is according to 3GPP specification, but it may contain something more than configured by measurements (e.g., timestamps).

### 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)\_ |
| Interdigital | See comments | We agree that roaming is outside the scope of RAN2 and we can respond like that. However, that may delay the response from SA2, if they are going to analyze each solution for roaming and non-roaming scenarios. Since this is a feasibility study, our preference is to do the analysis without considering roaming and may be consider that in future analysis.  |
| Huawei, HiSilicon | No | Firstly, we think that roaming is worth discussing in RAN2, but the requirements and issues should be discussed in SA2 first.Secondly, for the rapporteur input "it is up to the network to enable/disable ...", we think it may involve some aspects (like mentioned by Qualcomm). So this part would need some clarifications from SA2 and maybe other groups.In general, we suggest to reply like this:RAN2 may discuss roaming but the requirements, issues, involvement of other groups should be discussed in SA2 first. |
| Xiaomi | No | Suggest to combine ZTE and QC’s reply: “Roaming is out of RAN2 scope, therefor no conclusion about roaming is reached in RAN2”. |
| Charter | No | Agreed with Xiaomi |
| Lenovo | see comments | We also believe it’s enough to say it is out of RAN2 scope. |
| Google | No | First, in our understanding roaming support is deemed as fundamental requirement for data collection at UE side. With roaming scheme, data collection can be done locally in the serving network. The collected training data can then generate a better AI/ML model that fits UE locally for AI/ML inferencing.Moreover, the roaming discussion is not a standalone aspect. RAN2 would continue roaming discussion along with other aspects like controllability and visibility. The architecture impacts and roaming support should be led by SA2 and coordinated with RAN2.We suggest the following reply:*RAN2 supports data collection scheme when the UE is roaming and may continue discussions on other roaming aspects, e.g., controllability and visibility. If needed, coordination between RAN2 and SA2 can be considered* |
| Samsung | No | OK with response from ZTE or Qualcomm. |
| CMCC | No | We are fine with response from Xiaomi |

**Summary:**

The majority of the companies (13/17) want to simply respond by stating that either roaming is out of the scope of RAN2 and/or that no conclusion was made regarding roaming in RAN2. Two companies (vivo and Interdigital) wanted to limit the scenario to non-roaming case first to progress the SA2 discussion quickly. Huawei stated that roaming is worth discussing in RAN2, but discussion in SA2 is needed first for setting the requirements/issues. Only one company (Google) wanted to put roaming as an essential requirement.

### 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 |  |
| Interdigital | Yes (with comments) | We think there is a confusion regarding what “matching” between collected data and transferred data means. A first interpretation could be that the matching just refers to the transferred data contains only information elements that has been agreed/standardized to be collected. A second interpretation could be that the matching also includes checking if the UE is sending what it has actually collected (i.e., content/value validation/verification). We are Ok with the first interpretation, but not with the second. And our understanding is that that first interpretation is straightforward from the visibility definition. That is, visibility requirement ensures that MNO can clearly see the content of the data being transferred. And controllability requirement ensures that if the MNO notices that that UE is sending extra information that it was configured to collect, it can terminate the data transfer.  |
| Huawei, HiSilicon | Yes with comments | For the highlighted part, we have some concerns.*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.*This is to consider quality/accuracy of the collected data, and we think analysis of this direction makes sense. However, we suggest to also consider the other possibility:**Although standardized data format/content is defined, the UE may use it for other purposes, e.g. the UE may use one IE to fill in other information. Therefore, verifying is required.**So we suggest the following:*If the concerns are about the following two possibilities:**(1) For the quality/accuracy of the collected data, RAN4 may be involved to ensure that UEs performing data collection must comply with any requirements**(2) The UE may use standardized data format/content for other purposes, e.g. the UE may use one IE to fill in other information**For concern (2), RAN2 thinks verifying the match between data transferred and data collected may be required.* |
| Xiaomi | See comments | We are OK with the revision from T-Mobile. |
| Charter | No, see comments | Agreed with T-Mobile |
| Lenovo | Partially | Besides repeating the conclusion in the TR, we should also clarify that the main motivation for considering the full visibility is to prevent any privacy leakage. |
| Google | Partially | Agreed with Qualcomm.We also believe that there is no requirement for the MNO to verify the match between data transferred and data collected. |
| Samsung | No (rewording needed) | We support the proposal from T-Mobile USA, with some rewording: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 including whether such visibility is supported in this Release |
| CMCC | See comment | Agree with T-Mobile and Mediatek. |

**Summary:**

The majority of the companies (13/17) agree that it is sufficient to respond with the definition of MNO visibility according to RAN2 agreements and indicate that further considerations (like MNO needing to verify the match between collected data and data being transferred) are FFS. Four companies (ZTE, Apple, CATT and Huawei) indicated that verifying the match between data transferred and data collected is/maybe required.

## 2.2 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. |
| Interdigital  | Yes (see comments) | We are OK with the amendments proposed by Qualcomm/Apple |
| Huawei, HiSilicon | See comments | RAN2 triggered the discussion of "Server/OTT server", and RAN2 should be responsible for discussing the ownership of it.We are fine with Apple's suggestion on the wording, and we think it has reflected the current RAN2 status. |
| Xiaomi | See comments | Agree with ZTE and Apple, and we’re OK with the version from Apple. |
| Charter | No | Controllability and visibility of the data are more important from our point of view – agreed with T-Mobile. |
| Lenovo | Yes | Revisions suggested by Qualcomm and Apple are also fine to us. |
| Google | Yes (see comments) | We are fine with revisions from Nokia, Qualcomm and Apple. |
| Samsung | No (needs revisions) | OK with the following response:**Whether the “Server for data collection for UE-side model training” is controlled by operators or not, is outside RAN2 discussion/scope.** (Referring to “controlling of the data collection/transfer process” as suggested by the rapporteur, would cause confusion since it collates the two processes (collection, and transfer). We feel the one-sentence reply immediately above is sufficient.) |
| CMCC | See comment | We are fine with Apple’s suggestion on wording. |

**Summary:**

**What matters is the controllability/visibility of data collection, not of the server (or out of RAN2 scope):** Qualcomm, T-Mobile, Nokia, OPPO, Ericsson?, MediaTek, Interdigital, Charter, Lenovo, Google, Samsung

**RAN2 has discussed it and there was no conclusion:** ZTE, Apple, Huawei, Xiaomi,

**Should be controlled by the operator:** CATT,Vivo

The majority of the companies (11/17) agree that the control of the server is either not important (as long as the controllability and visibility requirements are ensured) or it is outside of RAN2 scope. Four companies stated that RAN2 has discussed the issue, and no agreement/conclusion has been made. Two companies indicated that the server for UE side data collection must be under the control of the MNO.

*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.* |
| Interdigital | See comments | Our understanding is that this is to give some idea to SA2 regarding the data to be collected and final response. Thus, we are Ok with the response proposed by T-mobile.  |
| Huawei, HiSilicon | Yes with comments | We support vivo's revision.SA5 is not asking about data size, so it seems no strong need to include this part. RAN1 is responsible for identifying the requirements of training data, so it is helpful to add "by RAN1". |
| Xiaomi | See comments | Agree with T-Mobile that RAN WGs need further discussion on this aspect. We can provide RAN1 LS as an example to give SA5 some clues on what are expected collected data. Therefore we’re OK with the version from T-Mobile. |
| Charter | No | Agreed with T-Mobile and Xiaomi. |
| Lenovo | Yes |  |
| Google | No (See comments) | Agree with T-Mobile. The information in R1-2310681 can be taken as initial examples. |
| Samsung | Yes with comments | Prefer Nokia’s version, with some rewording: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 or whether standardized data for AIML collection is supported in this Release. ~~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 |
| CMCC | See comments | We support T-mobile’s revision. |

**Summary:**

**Yes (with some modifications):** ZTE, Qualcomm, Nokia, OPPO, CATT, (Vivo), Interdigital, Huawei, Lenovo, Samsung

**No (no discussion/conclusion so far):** T-Mobile, Apple, Ericsson, MediaTek, Xiaomi, Charter, Google

There seems to be a consensus (even among the companies that responded *yes*) that the input provided in R1-2310681 is a baseline/example, and further updates are likely to happen as the work/study item progresses.

# 3 Phase 2 discussion

### 3.1 Response to SA2

#### 3.1.1 Q1: NG-RAN involvement

*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.*

Regarding Q1 from SA2, the rapporteurs’ view is like the view expressed by the majority of the companies in section 2.1.1, i.e., NG-RAN involvement is needed. However, few companies expressed that there is no conclusion in RAN2 regarding NG-RAN involvement for ensuring network controllability. Thus, we propose two options for response to Q1:

Option 1:

*SA2 can assume that NG-RAN involvement is required to ensure data collection controllability.*

Option 2:

*The majority’s view in RAN2 is that NG-RAN involvement is required to ensure data collection controllability.*

*RAN2 has not reached a consensus regarding that.*

**Phase2-A: Which proposed response option do companies prefer regarding Q1 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option1/Option 2** | **Comments** |
| Qualcomm | Do not agree with option 1 and option 2 (suggest modification) | Based on the rapporteur summery, companies believe there may be NG-RAN for measurement configuration, but there is no consensus among companies on NG-RAN involvement for data transfer. Therefore, we prefer to modify the response as below. Suggest modification: For the beam management use case, the NG-RAN is involved in providing required measurementconfiguration, if needed. RAN2 has not reached a consensus on whether NG-RAN is involved in datatransfer from UE to the server for data collection for UE-side model training/OTT server, as it depends on different UE-side data collection solution. |
| vivo | Option 2 with some rewordings  | Agree with QC, but further suggest the following:For the beam management use case, the NG-RAN is involved in providing required measurementconfiguration, for option 3. RAN2 has not reached a consensus on whether NG-RAN is involved in datatransfer from UE to the server for data collection for UE-side model training/OTT server, as it depends on different UE-side data collection solution |
| Lenovo | Modification on QC’s version | We are fine with QC’s suggestion, and to avoid any misunderstanding by SA2 about the term “measurement configuration”, we suggest highlighting this is only about how to measure the reference signals. In SA2 discussion “measurement configuration” usually consist of both measurement and report.For the beam management use case, the NG-RAN is involved in providing required measurement configuration (i.e., how to measure the reference signals), if needed. RAN2 has not reached a consensus on whether NG-RAN is involved in datatransfer from UE to the server for data collection for UE-side model training/OTT server, as it depends on different UE-side data collection solution. |
| CMCC | Option 2 with comments | We are fine with Lenovo’s suggestion. |
| Ericsson | Option 1; orOption 2 (with some possible changes to address the concerns) | We are ok in general with the Option 1 proposed by the rapporteur. If companies want to distinguish the two phases of data collection, i.e. 1) the measurement configuration/initiation for training and 2) the data transfer, we are not sure why for the data transfer the companies are skeptical about the NG-RAN involvement, unless solution 1a is considered. However, we already agreed that solution 1a is out-of-scope and hence we should not even consider it when discussing the controllability/visibility.For all the other options 1b, 2, 3 (as discussed at length during the SI) some NG-RAN involvement can be expected either at UP level (e.g. in the setting of PDU sessions and related transport channels) or at CP level. So if companies are not ok with the wording proposed by the rapporteur, we propose the following changes in green to the Option 2 by the Rapporteur, just to clarify that NG-RAN involvement is not considered for 1a.*The majority’s view in RAN2 is that NG-RAN involvement is required to ensure data collection controllability if the transfer of collected data is done via the options 1b, 2, 3 (which are captured in the endorsed CR to TR 38.843 (R2-2407807)).* *~~RAN2 has not reached a consensus regarding that.~~*  |
| Samsung | Neither is accurate | We propose the following:UE-data collection controllability referred to by RAN was in the context of data transfer, and RAN2 has not reached a consensus on whether NG-RAN is involved in data transfer from UE to the server for data collection for UE-side model training/OTT server, as it depends on different UE-side data collection transfer solution. RAN2 has not discussed whether/how initiating and configuring data collection process in NG-RAN is related to data collection transfer process.  |
| Xiaomi | See comments | We are fine with Lenovo’s suggestion. |
| Huawei, HiSilicon | Neither of options | The scope of the discussion was to reply with the current agreements, so we do not think "*The majority’s view in RAN2*" should be used in the LS.We have provided our technical analysis for Question A, in which we think that for some aspects/options NG-RAN involvement may not be required. In other words, more RAN2 discussions are needed.In general, we should not jump to conclusions, so we are **NOT** ok with both options listed in **Phase2-A**.We suggest to use Apple's response as below (for Question 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.”** |
| Apple | Neither is accurate | First, we disagree Option 1. *data collection controllability*” is too general to mislead SA2 it includes both providing data collection config and data collection transfer. In Q-A of phase 1, we see a lot of companies which said “Yes” actually only agreed NW to provide data collection config but disagree transfer part (as Rapporteur suggested in Q-B). So, we don’t think SA2 can make such assumption without RAN2 consensus. On Option 2, we share the same view as Huawei and their suggested response. Meanwhile, due to confusion between “data collection” and “data collection transfer” in RAN2 discussion, we further suggest to clarify the RAN2#127b agreement is only touching “data collection” rather than “data collection transfer”, to avoid SA2 misunderstanding RAN2 agreement. “**RAN2-127bis made the following high level agreement regarding data collection for model training (not related to data transfer):*** *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.”** |
| Mediatek | Option 1 | I don’t quite understand why companies are saying that there is no consensus on NG-RAN involvement for data transfer or disagreeing with the data transfer part.For option 1, *SA2 can assume that NG-RAN involvement is required to ensure data collection controllability.*Which part has not been agreed, the ‘**NG-RAN**’ part or ' **the data collection**' part?If it is the ‘NG-RAN’ part that is not agreed upon, we can change ‘NG-RAN’ to ‘network’. However, at least in the case of BM, NG-RAN should be involved in both data collection configuration and data transfer.If it is the ‘data collection’ part, we have tried to clarify the terminologies of ‘data collection’ and ‘data transfer’ at the very beginning of the email discussion. It seems that the responding companies have a common understanding that data collection involves gathering data by network nodes, management entities, or UEs for the purposes of AI/ML model training, data analytics, and inference, while data transfer is a component of 'data collection'.**In RAN2#127bis meeting, we agreed that** *Data collection initiation and configuration for data collection* ***is under network control.***Based on the analysis table, we agreed that for options 1b, 2, and 3, there is controllability and even full controllability for MNO on data transfer.I think the network involvement in ‘data collection’ part (at least for configuration and data transfer) is very clear according to what we agreed for option 1b, 2 and 3. If option 1 *SA2 can assume that NG-RAN involvement is required to ensure data collection controllability.* still can’t be accepted by companies, we can revisit it as:*SA2 can assume that ~~NG-RAN~~ network involvement is required to ensure data collection controllability. For example, for AI BM, NG-RAN involvement is required for data collection configuration and initiation.* Once again, we should clarify that **option 1a is not in the scope** of discussion.  |
| Google |  | We are fine with Lenovo’s suggestion.We are OK to further discuss whether NG-RAN is involved in providing required measurement configuration. This may depend on the data collection solution. |

#### 3.1.2 Q2: Which entities and under what conditions controllability is performed

*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)?*

Regarding Q2 from SA2, the rapporteurs’ view is like the view expressed by the majority of the companies in section 2.1.1, i.e., gNB is involved in the BM/CSI cases and LMF is involved in the positioning use case. Thus, we propose the following response (inspired by Ericsson’s proposal):

SA2 can assume that the gNB is involved in the data collection process for the beam management use case and the LMF is involved for the positioning use cases. However, RAN2 has not agreed that the gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”.

**Phase2-B: Do companies agree to the proposed response above to Q2 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No(suggest modification) | SA2 can assume that the gNB is involved in providing required radio measurement configuration (if needed) for beam management use case and LMF is involved in providing required radio measurement configuration (if needed). However, RAN2 has not agreed that the gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”. |
| vivo |  | Agee with QC suggestion. |
| Lenovo |  | Agree with QC suggestion. |
| CMCC |  | We are fine with QC’s suggestion. |
| Ericsson |  | OK with QC´s suggestion |
| Samsung | No – this question is about data transfer – rapporteur’s proposed response is off-topic | To clarify, SA2’s Q2 is about “*…with regards to “initiating, terminating and fully managing data transfer”.* We propose the following response:RAN2 has not reached a consensus on where (which entities), and under what conditions, should controllability be performed. |
| Xiaomi | See comments | We are fine with QC’s suggestion. |
| Huawei, HiSilicon | No | We are **NOT** ok with the current reply. Q2 is asking about data transfer, why should we mention data collection process here?For data transfer, it has been clearly mentioned in section 7.2.1.3.2 in TR 38.843, and we should focus on data transfer for Q2.I copied our previous suggestion here:(1) For **"under what conditions"**, RAN2 has not discussed it and RAN2 has not identified conditions.(2) Regarding which entities should perform controllability, the Table 7.2.1.3.2-1 (in previous endorsed TP [R2-2407807](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_127%5CDocs%5CR2-2407807.zip)) can be used as the starting point, and more RAN2 discussions are needed. The aspects can include use cases, data transfer options and other aspects (e.g. whether/how to minimize Uu impacts). |
| Apple | No  | We agree with Samsung and Huawei that the SA2’s Q2 is only on “***data transfer****” rather than “****data collection****”.**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)?* Thus, the first part is not what SA2 asked which should be removed to avoid misunderstanding SA2. And 2nd part is sufficient to answer SA2’s question:~~SA2 can assume that the gNB is involved in the data collection process for the beam management use case and the LMF is involved for the positioning use cases. However,~~ RAN2 has not agreed that the gNB/LMF is in charge of “initiating, terminating and fully managing data transfer”.  |
| Mediatek |  | We are fine with QC’s suggestion. |
| Google |  | OK with QC suggestion |

#### 3.1.3 Q3: Impact on normal UE operation

*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?*

Regarding Q3 from SA2, the majority of the companies responded in section 2.1.1. that we can not give a definite answer to SA2 about the impact on UE’s normal operation as that aspect is not discussed/analyzed in RAN2 (it was also not completely clear what SA2 is referring to by “UE’s normal operation”). Thus, we propose the following response (as proposed by Google):

*RAN2 has not evaluated/analyzed the impact on UE’s normal operation due to the full controllability of the data collection process.*

**Phase2-C: Do companies agree to the proposed response above to Q3 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Lenovo | Yes |  |
| CMCC | Yes |  |
| Ericsson  | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
| Mediatek | Yes |  |
| Google  | Yes |  |

#### 3.1.4 Q4: Whether standardized data content refers only to data collected according to measurement configuration

*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.*

Regarding Q4 from SA2 whether the collected data may contain information other than the one according to measurement configuration, there was no consensus in the responses captured in section 2.1.1. Thus, we propose to just respond by clarifying the agreement from RAN2 that standardized data means the format is explicitly defined in 3GPP specifications, i.e.,

*Standardized data refers to data whose format is explicitly defined in 3GPP specifications, allowing the network to understand its content and meaning.*

**Phase2-D: Do companies agree to the proposed response above to Q4 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Lenovo | Yes |  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes | Suggest to change " *whose format* " to " *whose format/content*", because in previous RAN2 meetings, some companies pointed out that data format can be standardized, while the content can be non-standardized, and we think this option is still not aligned with "standardized data". |
| Apple | Yes |  |
| Mediatek | Yes |  |
| Google | Yes |  |

#### 3.1.5 Q5: Roaming considerations

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

Regarding Q5 from SA2 about roaming, the majority of the companies responded in section 2.1.2 that this is an aspect that is out of the scope of RAN2 and RAN2 has not discussed about it yet. Thus, we propose the following response (as proposed by Qualcomm):

*Roaming considerations are outside the scope of RAN2.*

**Phase2-E: Do companies agree to the proposed response above to Q5 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Lenovo | Yes |  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes | We still think that roaming is worth discussing in RAN2, but the requirements and issues should be discussed in SA2 first. In general, we are ok with the above reply, and we could wait for more progress in SA2. |
| Apple | Yes | On Huawei’s comments, we assume this response doesn’t prevent RAN2 to discuss inter-PLMN data collection issue (e.g. data collection configured by MNO A, whether it still needs to continue when handover to another cell with MNO B).  |
| Mediatek | Yes |  |
| Google | Yes | We agree with Apple that this answer allows RAN2 to continue the data collection discussion for roaming case. |

#### 3.1.6 Q6: What is sufficient to consider visibility (e.g., if MNO need to verify the match between collected and transferred data)

*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 ?*

Regarding Q6 from SA2, only few companies (4/17) responded that there is a need for the MNO to verify the match between collected and transferred data, while the rest indicated that the fact that the UE is collecting and sending the data according to a 3GPP standardized format is sufficient to consider that there is full visibility. That is, if the MNO can comprehend the data content, it can verify if the data being sent is according to the specified content/format. Rapporteurs’ understanding is that this is simply an implementation aspect. Thus, we propose the following response:

*As stated in the LS sent from RAN, visibility of data content 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.* *Thus, full visibility will allow the MNO verify/match that the UE is sending only information that it is configured to collect.*

**Phase2-F: Do companies agree to the proposed response above to Q6 from SA2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes (suggest modification) | *As stated in the LS sent from RAN, visibility of data content 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. Thus, full visibility allows the MNO verify/match measurements configured and measurement reported.*  |
| vivo | Yes |  |
| Lenovo | Yes |  |
| CMCC | Yes |  |
| Ericsson | Some rewording | We can just pinpoint more specifically the question asked by SA2, and leave to SA2 any discussion on how/whether to configure the data that the UE should collect:We suggest following rewording:*As stated in the LS sent from RAN, visibility of data content 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. Thus, full visibility will allow the MNO verify/match that the UE is sending only information ~~that it is configured to collect~~ according to a 3GPP specified content/format.* |
| Samsung | Some rewording | Regarding this statement from the rapporteur: “Thus, full visibility will allow the MNO verify/match that the UE is sending only information that it is configured to collect.” – verify/match function was not discussed in great detail in RAN2; key point of visibility is to allow the MNO to comprehend the content; what actions it then may perform are not important in the context of this LS.We therefore think the first part is enough, with some modification: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 including whether such visibility is supported in this Release |
| Xiaomi | See comments | We think the first part of the reply is fine but we are not sure whether the last part (“*Thus, full visibility will allow the MNO verify/match that the UE is* *sending only information that it is configured to collect*.”) is needed. SA2 asks “*whether MNO need to verify the match between the data transferred and the data collected*”, but we are not sure RAN2 is responsible to reply such question on requirements. |
| Huawei, HiSilicon | Yes | some suggestions on the wording:Thus, full visibility ~~will~~should allow the MNO to verify/match that .... |
| Apple | Prefer QC wording | We prefer QC provided wording.  |
| Mediatek |  | We agree with xiaomi that we are not sure RAN2 is responsible to reply such question on requirements ‘*whether MNO need to verify the match between the data transferred and the data collected’*. |
| Google |  | Agree with xiaomi and Mediatek. We can remove the last part. |

### 3.2 Response to SA5

#### 3.2.1 Q1: Is the server for data collection controlled by operators?

*Q1: Is the “Server for data collection for UE-side model training” controlled by operators?*

Considering the view of the majority of the companies (as captured in the responses in section 2.2) is that the controllability of the data collection/transfer does not necessarily mean that the server is also under the MNO control, we propose the following response to Q1 from SA5 (inspired by the proposal from Qualcomm/Samsung):

*The controllability requirement is referring to the controlling of the data collection/transfer process, and not necessarily the controlling of the server for data collection for UE-side model training. Whether the server for UE side model training is controlled by the MNO or not is outside the scope of RAN2.*

**Phase2-G: Do companies agree to the proposed response above to Q1 from SA5?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Lenovo | Yes |  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes to second part | Again – controllability requirement as outlined by the original RAN LS was referring to the controlling of the data transfer process. Here, it is enough to say:Whether the “Server for data collection for UE-side model training” is controlled by operators or not, is outside RAN2 discussion/scope.  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes | We are confused by "*, and not necessarily the controlling of the server for data collection for UE-side model training*". Firstly, the 2nd sentence says "the discussion of ownship of server is out of RAN2 scope", and it means the server may or may not be controlled by MNO, and we could leave it out of RAN2. Secondly, the 1st part of the 1st sentence is clear enough, and other WGs can check whether MNO needs to control the server or not. Thus, we do not see the need of this part, and RAN2 has not made agreements on it.Therefore, we suggest to remove "*, and not necessarily the controlling of the server for data collection for UE-side model training*". |
| Apple | Yes | We are also fine if 1st part is removed as Samsung suggested.  |
| Mediatek | Yes |  |
| Google | Yes |  |

#### 3.2.2 Q2: What standardized data is to be collected?

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

There seems to be a consensus that there is no final agreed upon list/format of the standardized data to be collected. Thus, we propose the following response to Q2 from SA5 (inspired by the response from T-Mobile)

*No final agreement is made in RAN WGs regarding the standardized data to be collected. Some examples can be found in R1-2310681.*

**Phase2-H: Do companies agree to the proposed response above to Q2 from SA5?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Lenovo | Yes |  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes with some changes | We propose: No final agreement is made in RAN WGs regarding the standardized data to be collected, or whether standardized data for AIML collection is supported in this Release. Some examples can be found in R1-2310681. |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes  |  |
| Mediatek | Yes |  |
| Google | Yes |  |

# 4 Conclusion

To be added...

# 5 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