3GPP TSG-RAN WG2 Meeting #126 R2-240xxxx

Fukuoka, Japan, May 20th -24th, 2024

Agenda Item: 8.1.4

Source: Mediatek Inc.

Title: Report of [AT126][020][AI/ML PHY] UE side data collections

Document for: Discussion, Decision

# Introduction

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

* [AT126][020][AI/ML PHY] UE side data collections (Mediatek)

 Intended outcome: Agreeable table for UE side data collection and clarification of visibility, levels of visibility, and standardized vs. non-standardized

 Deadline: 05-23-24

# Discussion

## 2.1 Phase 1: Offline F2F Discussion

During the online discussion, the different levels of visibility on the data content were discussed, i.e., full visibility, partial visibility, and no visibility.

To achieve different levels of visibility, we need to assess whether the data content is standardized, non-standardized, or partially standardized. An instance of partially standardized data content could be an Information Element (IE) with an undefined value where the fields are visible, but the exact values remain undisclosed. Based on the variations in data content visibility and standardization levels, the following possibilities have been identified:

1. Full visibility for standardized data content.
2. Full visibility for non-standardized data content as per the SLA.
3. Partial visibility for partially standardized data content.
4. Partial visibility for non-standardized data content as per the SLA.
5. No visibility for non-standardized data content.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Full Visibility | Partial Visibility | No Visibility |
| Standardized data content | 1. Yes | NA | NA |
| Partial-standardized data content | NA | 3. Yes | NA |
| Non-standardized data content | 2. Can be visible based on SLA or business contract providing data description | 4. Can be visible based on SLA or business contract providing data description | 5. Yes |

Those possibilities are applicable to solution 1b, 2 and 3.

Proposal 1: For solution 1b/2/3, the following options are identified to realize the different levels of data content visibility:

1. Full visibility for standardized data content.
2. Full visibility for non-standardized data content as per the SLA.
3. Partial visibility for partially standardized data content.
4. Partial visibility for non-standardized data content as per the SLA.
5. No visibility for non-standardized data content.

Proposal 2: The MNO has full visibility of the data content either through standardized data format or via SLA/business contract for partial-standardized/non-standardized data for solution 1b, 2 and 3.

For solution 1b, as outlined by Ericsson and Qualcomm, varying degrees of data content visibility can be established through SLA. The visibility, whether full, partial, or none, is not affected by whether the data content is standardized or not since it is stipulated by the SLA and transmitted via a UP tunnel. Thus, both standardized and non-standardized data can be configured to have full, partial, or no visibility, in accordance with the terms set forth in the SLA.

Proposal 3: RAN2 assumes that different levels of visibility on the data content can be achieved via SLA defined by SA2 in solution 1b.

Proposal 4: RAN2 assumes that different levels of visibility on the data content can be achieved via SLA or business contract in solution 2/3 for partial-standardized/non-standardized data content.

Proposal 5: As a starting point, RAN2 assumes that 'visibility' of data content signifies the capability of the MNO to, at least, be aware of, access, and comprehend the data during transfer. The scope does not exclude additional requisites, such as the ability to modify the collected data. FFS on the meaning of modify. NOTE: It is an assumption for RAN2 study purpose. The definition of “visibility” and the category of visibility should be discussed and defined in SA1.

Proposal 6: RAN2 endorse Table 1 to capture the characteristics of different options for UE-side training data collection as the starting point for future discussion.

Proposal 7: Capture the privacy concerns from different stakeholders as informative annexes in the TR.

Table 1 Characteristics of different options for training data collection for UE-side models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Aspects | 1a) OTT (3GPP Transparent) | 1b) The server for training data collection for UE-side models (3GPP non-transparent) | 2. Transfer via Core Network | 3. Transfer via OAM |
|  |  |  |  |  |
|  |  |  |  |  |
| UP/CP tunnel | UP tunnel (Note: data collection may be charged as normal traffic.) | UP tunnel (Note: data collection may be charged as normal traffic.) | CP tunnel (provided the data volume remains within the NAS signalling capacity)FFS: UP tunnel | CP tunnel (provided the data volume remains within the RRC signalling capacity)FFS: UP tunnel |
| Data Transfer Path | NA | UE->gNB->CN (FFS on NF)/AF->Server for data collection for UE-side model training/OTT server | UE->gNB->CN (FFS on the NF)-> Server for data collection for UE-side model training/OTT server | UE->gNB->OAM-> Server for data collection for UE-side model training/OTT server |
| Protocol layer for data transfer | Application layer | Application layer | NAS layer for CP tunnelFFS: the protocol layer for UP tunnel | RRC layer for CP tunnelFFS: the protocol layer for UP tunnel UP tunnel |
| Controllability of MNO on data transfer | No specific controllability | Has controllabilityFFS: level of controllability | Full controllability (Note 1) | Full controllability (Note 1) |
| Control granularity by NW | NA, the OTT server can directly request data from the UE. | Example: per PDU sessions based on SLA | NAS procedure | RRC procedure |
| Visibility of data content in MNO | No visibility | Full visibility (Note 2, Note 3, Note 4) | Full visibility (Note 2, Note 3, Note 4) | Full visibility (Note 2, Note3, Note 4) |
| Data format  | Out of 3GPP scope | Standardized and non-Standardized | StandardizedFFS: non-standardized | StandardizedFFS: non-standardized |
| Involved WGs | No, out of 3GPP scope | SA2, RAN2 | SA2, RAN2 | SA5, SA2, RAN2 |
| * Note 1: Full controllability: The MNO has the capability to manage data transfer to the server for UE-side data collection. This includes initiating, terminating, and fully managing the volume of data. (Subject to refinement and modification)
* Note 2: Visibility of data content signifies the capability of the MNO to, at least, be aware of, access, and comprehend the data during transfer. (Subject to refinement and modification, the scope does not exclude additional requisites, such as the ability to modify the collected data.)
* Note 3: The MNO has full visibility of the data content either through standardized data format or via SLA for non-standardized data in solution 1b, 2 and 3.
* Note 4: Different levels of visibility on the data content can be achieved via SLA defined by SA2 in solution 1b or SLA/business contract in solution 2/3..
* The following options are identified to realize the different levels of data content visibility if different levels of data content visibility to MNO are considered:
1. Full visibility for standardized data content.
2. Full visibility for non-standardized data content as per the SLA.
3. Partial visibility for partially standardized data content.
4. Partial visibility for non-standardized data content as per the SLA.
5. No visibility for non-standardized data content.
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Meeting notes:

Proposal 1: For solution 1b/2/3, the following options are identified to realize the different levels of data content visibility:

1. Full visibility for standardized data content.
2. Full visibility for non-standardized data content as per the SLA.
3. Partial visibility for partially standardized data content.
4. Partial visibility for non-standardized data content as per the SLA.
5. No visibility for non-standardized data content.
* TMO: SLA should be defined in 3GPP and within 3GPP scope. Object the SLA. Accept 1, 3, 5 as options.
* HW: SLA is the agreement between users and operators. Unclear how SLA can be achieved. RAN2 should focus on option 1.
* OPPO: for solution 1b, it is non-visibility. Full visibility can be achieved but outside of 3GPP. Partial and no visibility is not preferred to MNO.
* QC: Refer to TS 26.532, 1b can have standardized data and SLA is defined by SA2, taking EVEX as example. SA2 defines something for SLA, e.g., what data is collected, the sampling rate, etc.
* Apple: share same view as HW. Not clear which part can be visible to MNO via SLA.
* Vivo: should be based on standardized data and remove 2 and 4.
* Interdigital: as MNO has controllability, the visibility is possible via SLA.
* ZTE: treat 1,3, 5 as baseline. Verizon shares the same view.
* Xiaomi: solution 2/4 can minimize the standardization effort and should be considered.
* Samsung: 1a is not in the proposal.
* Nokia: Proprietary solution can exist. Suggests grouping the options in three categories: Full visibility for standardized data content; Partial visibility for partially standardized data content; visibility for partial/non-standardized data via SLA.
* Intel: Categorize the options into two ways: Standardized way vs. SLA-based way.
* Verizon: all the visibility is out of 3gpp and should be separate option.
* Interdigital: Support Nokia’s suggestion.
* Ericsson: SLA-based solution will not be worked in RAN2. Ok to keep them.
* CATT: option 4 is one sub-case of option 2.
* Apple: RAN2 can’t guarantee how SLA-based solution works. And 1, 3, 5 is the baseline.
* HW: support 1, 3, 5 and remove SLA-based solution.
* QC: We can have 1, 3,5 {visibility can be achieved with SLA} as baseline.
* Apple: RAN2 has no consensus on SLA.
* HW: SLA should not have 3GPP impact.

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| Agreement:1. Option 1, 3, 5 are considered as baseline. FFS on 2, 4. |

Proposal 7: Capture the privacy concerns from different stakeholders as informative annexes in the TR.

* Nokia, vivo support to capture it. The context can be revised when capturing in the TR.

## 2.2 Phase 2: Offline Discussion to construct the table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Aspects | 1a) OTT (3GPP Transparent) | 1b) The server for training data collection for UE-side models (3GPP non-transparent) | 2. Transfer via Core Network | 3. Transfer via OAM |
|  |  |  |  |  |
| First termination entity | OTT server | The server for data collection for UE-side model training | Inside the CN(e.g., LMF) | Inside OAM domain |
| AI/ML-specific Data Transfer Path | UE to OTT server via either 3GPP or non-3GPP network | UE-> CN ->Server for data collection for UE-side model training/OTT server(Note 4) | UE-> CN -> Server for data collection for UE-side model training/OTT server(Note 4) | UE->gNB->OAM-> Server for data collection for UE-side model training/OTT server |
| UP/CP tunnel | UP tunnel | UP tunnel  | CP tunnel (provided the data volume remains within the NAS signalling capacity)FFS: UP tunnel | CP tunnel (provided the data volume remains within the RRC signalling capacity)FFS: UP tunnel |
| Protocol layer for data transfer | Application layer | Application layer | NAS layer for CP tunnelFFS: the protocol layer for UP tunnel | RRC layer for CP tunnelFFS: the protocol layer for UP tunnel |
| Controllability of MNO on data transfer | No specific controllability | Has controllabilityFFS: level of controllability | Full controllability (Note 1) | Full controllability (Note 1) |
| Control granularity by NW | NA, the OTT server can directly request data from the UE. | Example: per PDU sessions  | NAS procedure | RRC procedure |
| Visibility of data content in MNO and Data format (Note 2, Note 3)  | No visibility, data content is out of 3GPP scope |  | Full visibility for standardized data content.FFS: other levels of visibility and how to achieve | Full visibility for standardized data content.FFS: other levels of visibility and how to achieve |
| FFS on the levels of visibility and how to achieve |
| Involved WGs | NA | SA2, RAN2 | SA2, RAN2 | SA5, FFS SA2, RAN2, RAN3 |
| * Note 1: Full controllability: The MNO has the capability to manage data transfer to the server for UE-side data collection. This includes initiating, terminating, and fully managing the volume of data. (Subject to refinement and modification)
* Note 2: Visibility of data content signifies the capability of the MNO to, at least, be aware of, access, and comprehend the data during transfer. (Subject to refinement and modification, the scope does not exclude additional requisites, such as the ability to modify the collected data.)
* Note 3: For Solution 1b, 2/3, the following options are identified to realize the different levels of data content visibility if different levels of data content visibility to MNO are considered. FFS on the data content visibility via SLA.
	+ Full visibility for standardized data content.
	+ Partial visibility for partially standardized data content.
	+ No visibility for non-standardized data content.
* Note 4: The potential involvement of NF or other higher layers entities/functionalities should be discussed in other WGs.
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The above table is revised based on the table provided in the email discussion R2-2405931. Companies are invited to provide comments on the content of the table.

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| --- | --- |
| Company | Comments on the table |
| Apple | On involved WGs of option 3, we think SA2 needs to be involved only if UP solution is needed. Otherwise (i.e. CP tunnel via OAM), only SA5 only need to be involved. Since UP solution of option 3 is FFS, we should make SA2 as FFS. |
| Xiaomi | For “AI/ML-specific Data Transfer Path” of solution 1b, our understanding is that solution 1b is UP based solution and should go through UPF. So suggest to change “CN (FFS on NF) / AF” to “CN (UPF)”.For “AI/ML-specific Data Transfer Path” of solution 2, our understanding is that solution 2 is CP based solution, and should go through AMF. So suggest to change “CN (FFS on the NF)” to “CN (AMF 🡪 FFS on the NF)”.For “Involved WGs of solution 2, it is suggested to add CT1 since NAS signalling is specified by CT1. |
| OPPO | For visibility row:For 1b, we don’t think Full visibility, Partial visibility should be removed from FFS part to agreeable part for option 1b when we have the following FFS part in note 3 based on F2F agreement, i.e. FFS on 2 and 4:FFS on the data content visibility via SLA.Some companies refer to TS 26.532, we understand it’s only defined for APP layer data collection, i.e. EVEX, and we don’t know whether/what type of data is standardized for EVEX. So basically, from 3GPP spec perspective, the baseline is that MNO has no visibility for data collected via 1b if UP tunnel is used for 1b, only SLA is confirmed and then we can say Full visibility, Partial visibility is possible for 1b but this SLA is out of 3GPP spec scope, i.e. cross vendor implementation.For 2/3, we think the baseline is that MNO has Full visibility of the collected data from 3GPP spec perspective. I don’t quite understand why MNO would like to have Partial or no visibility for option 2/3, so Partial or no visibility should be put into FFS for option 2/3.For Data format rawFor 1b, the baseline is that all data is non-standardized, FFS for standardized or partial standardized. The same reason as for visibility row above.For involved group row, Option 3 also involves RAN3. |
| Huawei, HiSilicon | For Option 2 and 3, we suggest to remove “FFS: UP tunnel”. There are the following reasons:* For option 2, the UP tunnel is between UE and UPF, and it is up to implementation. As we commented before, the visibility of such data is quite unclear for now.
* For option 3, we are not sure how OAM can connect to UE directly via UP tunnel, maybe some companies can clarify how it works first. As comparison, the CP tunnel between UE and OAM can take MDT as an example.

For “Partial visibility for partially standardized data content.” In Note 3, we are unclear about “partial/partially”. For bullet 1, we say full visibility for standardized data, and for bullet 3 we say no visibility for non-standardized data, which should be clear about the visibility. On top of bullet 1 and bullet 3, we do not think there is “partial visibility” for standardized data. In other words, “partially standardized data” and “partial visibility” should be clarified. We understand that the whole offline discussion has much workload, so **we suggest to add “FFS meaning of partial/partially” for bullet 2 in Note 3.**For involved WGs, **we suggest to add “SA3” for option 2 and option 3**, because SA3 may need to check whether the data collection process and the collected data have privacy issues or not (also including the privacy discussions/concerns in the report R2-2405931), and if yes, there may be more disucussions between SA3 and other WGs.[Huawei2] We have concerns on the wording “XXX can be achieved via SLA”, and we also have concerns on the corresponding analysis based on such assumptions. To our understanding, SLA is outside 3GPP and it may not work in some cases. From RAN2 point of view, we can not assume that this SLA is feasible, and instead we should focus what we can discuss and what we can solve. In summary:For solution 1b, We are **NOT OK** to put full visiblity, partial visibility for "visibility" metric. We suggest: only put no visibility for now, and we are **NOT OK** to put standardized, partial-standardized for "data format" metric. We suggest: only put non-standardized for now. |
| Futurewei | We would like to remind our colleagues that in the TR, Option 1b) is described as below.1. UE collects and directly transfers training data to the Over-The-Top (OTT) server;
	1. OTT (Transparent)
	2. OTT (non-Transparent)

RAN2 later changed the “OTT” term for 1b) to “Server for data collection for UE-side model training”. We would like to point out the following issues of 1b).1. Note that Option 1 emphasizes on “*UE collects and* ***directly*** *transfers training data to…*” the final termination entity of model training (i.e., there is no first termination entity like in Option 2 and 3). In other words, the tunnel is between the UE and the final termination entity. In this case, we wonder how the MNO can have visibility of the data collected. If the collected data needs to be temporally stored in CN or OAM, we think Option 2 and 3 can handle the situations.
2. We agree with OPPO that TS 26.531/26.532 may be defined for APP layer data collection only, i.e. EVEX, and not suitable for the PHY layer use cases.

Therefore, for 1b), we suggest at least making it an FFS if not removing it immediately. |

Question: Are you agree to capture the privacy concerns from different stakeholders as informative annexes in the TR? Details are up to TR rapporteur.

|  |  |
| --- | --- |
| Company | Yes/NO |
| Mediatek | Yes |
| Lenovo | Yes |
| Huawei, HiSilicon | Yes. And SA3 may need to be involved then. |
| Xiaomi | Yes |
| NEC | Yes |
| Ericsson | Yes. We should also add that all the options (1a, 1b, 2, 3) should respect those privacy concerns. |
| OPPO | Yes |

# Conclusion

2.1 Phase 1: Offline F2F Discussion

**Proposal 1: For the options identified to realize the different levels of data content visibility for solution 1b, 2 and 3, Option 1, 3, 5 are considered as baseline. FFS on 2, 4.**

1. **Full visibility for standardized data content.**
2. **Full visibility for non-standardized data content as per the SLA.**
3. **Partial visibility for partially standardized data content.**
4. **Partial visibility for non-standardized data content as per the SLA.**
5. **No visibility for non-standardized data content.**

2.2 Phase 2: Offline Discussion to construct the table

**Proposal 2: RAN2 endorse the table to capture the characteristics of different options for UE-side training data collection as the starting point for future discussion.**

**Proposal 3: Capture the privacy concerns from different stakeholders as informative annexes in the TR. All the options (1a, 1b, 2, 3) should respect those privacy concerns. Details are up to TR rapporteur.**

|  |  |  |  |  |
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| Control granularity by NW | NA, the OTT server can directly request data from the UE. | Example: per PDU sessions  | NAS procedure, FFS impact to other layers | RRC procedure |
| Visibility of data content in MNO and Data format (Note 2, Note 3)  | No visibility, data content is out of 3GPP scope | FFS on the levels of visibility and how to achieve | Full visibility for standardized data content.FFS: other levels of visibility and how to achieve | Full visibility for standardized data content.FFS: other levels of visibility and how to achieve |
| Involved WGs | NA | SA2, SA3, RAN2 | SA2, SA3, RAN2 | RAN2, RAN3, SA3, SA5, FFS SA2 |
| * Note 1: Full controllability: The MNO has the capability to manage data transfer to the server for UE-side data collection. This includes initiating, terminating, and fully managing the volume of data. (Subject to refinement and modification)
* Note 2: Visibility of data content signifies the capability of the MNO to, at least, be aware of, access, and comprehend the data during transfer. (Subject to refinement and modification, the scope does not exclude additional requisites, such as the ability to modify the collected data.)
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