3GPP TSG-RAN WG2 Meeting #128 R2-240xxxx

Orlando, USA, 18 – 22 November 2024

**Agenda item: 8.1.3**

**Source: Nokia (Rapporteur)**

**Title: [POST128][019][AI PHY] NW side data collection (Nokia)**

**WID/SID: WI\_CODE - Release XX**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following email discussion:

* [POST128][019][AI PHY] NW side data collection (Nokia)

 Intended outcome: Discuss the motivation and specification complexity for the three radio conditions.

 Deadline: Long

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| --- | --- | --- |
| Company | Name | Email Address |
| Nokia (Rapporteur) | Jerediah Fevold | jerediah.fevold@nokia.com |
| ZTE | Fei Dong | dong.fei@zte.com.cn |
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# 3 Discussion

An email discussion was triggered to discuss the following event-based logging mechanisms.

🡺 Focus on the following three radio condition event-based logging

1. L3 serving cell measurement based (e.g. X1/X2 similar to A1/A2)

2. Beam based events (e.g. beam becomes top-1 beam and number of measurements is less than configured value)

3. L1 beam level measurement

Additionally, companies discussed how long to log after an event has been triggered, e.g., log a configured number of samples after an event triggers, log a configured number of samples per beam, or log periodically after an event has been triggered.

The purpose of AI/ML data collection is to develop one or more datasets which capture a representation of scenarios, e.g., radio conditions, changes in the best beam, and different locations in the cell, which a UE might encounter as it traverses through the network. To capture a complete dataset, especially considering rarer scenarios, event-triggered logging could aid in identifying useful measurement logging occasions and reduce overhead of transmission of redundant samples. Therefore, for each event-triggered logging initiation event and event-triggered logging termination event, the mechanism should be evaluated against that goal.

The questions that follow are general in nature to promote discussion about the benefit of each event to the resulting dataset. The evaluations could be, for example, in terms of the following: redundant sample reduction and data collection coverage, e.g., covering unique measurement scenarios. For each event type discussed, it is asked whether the event helps accomplish the goal of data collection and what deficiencies it has. In the end, a combination of events would be considered holistically to perform together to build complete datasets.

## 3.1 Motivation for Event Triggers

We find it useful first to discuss the motivations and goals of event-based measurement logging. Coming to a common understanding will help us determine the set of events that will help collect a complete and representative dataset for training AI/ML beam management models. The events discussed in this email discussion could be evaluated against our common understanding of the criteria to help identify any gaps.

**Question 0**: Beyond collecting a complete and representative dataset for training AI/ML beam management models, is there any other motivation and goals for event-based measurement logging?

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| Answers to Question 0 |
| Company | Technical Arguments |
| ZTE | From NW perspective, the basic motivation of event triggered measurement is to save the air interface resources of sending collected data by avoiding collecting the useless data. |
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**Summary 0**: TBD.

**Proposal 0**: TBD.

## 3.2 Measurement Event Triggers

### L3 serving cell measurement-based events

R2-2409945 (Apple) proposed the following:

Proposal 8: Support the following two radio condition based event triggered logging:

• Event X1: when L3 serving cell measurement becomes better than absolute threshold (similar to A1).

• Event X2: when L3 serving cell measurement becomes worse than absolute threshold (similar to A2).

**Question 1**: Do L3 serving cell level measurement events help accomplish the goal of data collection for training network-side beam management AI/ML models? If not, state any deficiencies or ways to augment the event to mitigate them.

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| Answers to Question 1 |
| Company | Yes/No | Technical Arguments |
| ZTE | Yes with comments(The event can be further considered) | According to our understanding about the motivation of event triggered measurement ,we think event by using the L3 serving cell measurement result is valid.Normally, when the L3 measurement for a serving cell is worse than a threshold which means the UE have reached at the edge of the cell and handover is expected to be happened, assuming UE at the edge but the handover is not happened in time, the RLF will be triggered even worse, the sample collected under this scenario is no longer valid or helpful for the NW side model training. In this sense, it is reasonable that UE performs collecting the data when L3 serving cell measurement is better than an absolute threshold.Then the event X can be modified as below:The data logging is performed only when L3 serving cell measurement ~~become~~ is better than an absolute threshold,  |
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**Summary 1**: TBD.

**Proposal 1**: TBD.

**Question 2**: What is the specification impact of implementing logging based on L3 serving cell measurement events?

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| Answers to Question 2 |
| Company | Technical Arguments |
| ZTE | Design the L3 serving cell measurement events for logging the data. No other specification impact can be foreseen. |
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**Summary 2**: TBD.

**Proposal 2**: TBD.

### L1 Beam-based Events

R2-2409908 (Qualcomm) proposed the following:

Proposal 4: RAN2 is requested to consider at least the following events for training data collection for network-side model training,

• Event 1. Based on the number of samples to be collected and reported across different beams, UE triggers the measurement collection and logging if a beam becomes the top-1 beam and the logged number of measurements is less than the configured value.

• Event 2. Based on the change of the top-1 beam: UE is configured to log the measurement when the top-1 beam changes. UE can additionally be configured with the number of samples to be logged and its periodicity

These events are triggered when the top-1 beam changes, i.e., “if a beam becomes the top-1 beam” or “based on the change of the top-1” beam. The key difference between these events is the termination condition. These termination conditions will be discussed in another question.

**Question 3**: Does triggering logging based on the change of the top-1 beam help accomplish the goal of data collection for training network-side beam management AI/ML models? If not, state any deficiencies or ways to augment the event to mitigate them.

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| Answers to Question 3 |
| Company | Yes/No | Technical Arguments |
| ZTE | Maybe No | My understanding both events is to prevent UE from continuously collecting the data when the mobility status of the UE is static in order for power saving. However, in the real deployment, the beam measurement result is still fluctuated even though UE mobility status is static, from NW perspective, those data is still useful for NW to train the model regardless of the top-1 beam have been changed or not. |
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**Summary 3**: TBD.

**Proposal 3**: TBD.

**Question 4**: What is the specification impact of implementing events based on a change in the top-1 beam?

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| Answers to Question 4 |
| Company | Technical Arguments |
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**Summary 4**: TBD.

**Proposal 4**: TBD.

### L1 beam level measurement

From the discussion, ZTE proposed to consider “that both L3 and L1 beam measurements can be useful.”

Given the broad nature of possible L1 beam level measurement triggers and since L3-based triggers are being discussed in questions 1 and 2, this section can be used to discuss which types of triggers could be useful aside from those proposed to trigger on the top-1 beam changing. Therefore, one open-ended question will be asked to promote that discussion.

**Question 5**: Which types of triggers based on L1 beam level measurements could help accomplish the goal of data collection for training network-side beam management AI/ML models? Add specification impacts for identified options, if any.

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| Answers to Question 5 |
| Company | Technical Arguments |
| ZTE | For L1 beam level measurement, the event for triggering data collection can be as below:* the RSRP value of top 1/K beams of set A are better than a threshold.

In the real deployment, if the top 1/K beam measurement result for the set A is worse than a threshold, then the abnormal case must be occurred, such as the beam failure, the deep fading, or obstacle..Those collected samples are not valid which is not helpful for the NW side model training. All those samples can be filtered out at UE side in order to save the air-interface resources for collected data reporting.In this sense, we tend to suggest the following event triggered data logging:*The data logging is performed only when the RSRP value of top 1/K beams of set A is better than a threshold.* |
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**Summary 5**: TBD.

**Proposal 5**: TBD.

## 3.3 Measurement Logging Behaviours

### Logging periodically after a data collection event trigger

R2-2409547 (OPPO) proposed the following:

Proposal 5: During the period that radio condition-based logging event fulfills, UE performs data logging periodically.

Proposal 6: For periodic logging or event-triggered periodic logging, data logging interval is configured by the network, the value range of data logging interval is pending on RAN1 inputs.

**Question 6**: Should periodical logging after a measurement event is triggered be supported?

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| Answers to Question 6 |
| Company | Yes/No | Technical Arguments |
| ZTE | Yes |  |
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**Summary 6**: TBD.

**Proposal 6**: TBD.

Performing periodical measurement logging for a time duration was proposed by OPPO in R2-2409547.

Proposal 5: During the period that radio condition-based logging event fulfills, UE performs data logging periodically.

Proposal 6: For periodic logging or event-triggered periodic logging, data logging interval is configured by the network, the value range of data logging interval is pending on RAN1 inputs.

And performing periodical measurement logging of number of samples was proposed by Qualcomm in R2-2409908.

Proposal 4: RAN2 is requested to consider at least the following events for training data collection for network-side model training,

Event 2. Based on the change of the top-1 beam: UE is configured to log the measurement when the top-1 beam changes. UE can additionally be configured with the number of samples to be logged and its periodicity

**Question 7**: If periodical logging after a data collection event is triggered is supported, which parameters should be configurable to control the amount of data logged (e.g., time-based, sample-based)?

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| Answers to Question 7 |
| Company | Time-based,Sample-based,Other | Technical Arguments |
| ZTE | Other | The basic logic is that, when the event is met, then the data collection is performed, otherwise, the data collection is suspended. |
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**Summary 7**: TBD.

**Proposal 7**: TBD.

### Event triggering based on number of samples previously collected

In R2-2409908 (Qualcomm) proposed the following:

Proposal 4: RAN2 is requested to consider at least the following events for training data collection for network-side model training,

• Event 1. Based on the number of samples to be collected and reported across different beams, UE triggers the measurement collection and logging if a beam becomes the top-1 beam and the logged number of measurements is less than the configured value.

That is, an event would only trigger a single measurement and could re-trigger up to a configured number of times or samples. For example, an event could trigger based on the top-1 beam changing to a hypothetical beam, A, which would capture a single measurement or a single set of beam measurements in the log. Later, the UE determines that beam C is the best beam, captures a measurement, and subsequently determines that beam A is once again the best beam. If the number of samples captured for a change to beam A is less than the configured value, single measurement or a single set of beam measurements could be captured, otherwise, the event would not be triggered.

**Question 8**: Should triggering an event, one or more times, based on having captured fewer than a configured number of samples based on the event criteria, e.g., the top-1 beam changed, be supported?

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| Answers to Question 8 |
| Company | Yes/No | Technical Arguments |
| ZTE | Other | The basic logic is that, when the event is met, then the data collection is performed, otherwise, the data collection is suspended. |
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**Summary 8**: TBD.

**Proposal 8**: TBD.

# 4 Conclusion

TBD.