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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document contains the concept, use cases, requirements, and potential solutions for collecting the measurement data to support AI/ML enabled RAN with the AI/ML functions residing in OAM.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TR 37.817: "Study on enhancement for data collection for NR and ENDC".

[3] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[4] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[5] 3GPP TS 28.550: "Management and orchestration; Performance assurance".

[6] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[7] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[8] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

# 3 Definitions of terms, symbols, and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply:

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**example:** text used to clarify abstract rules by applying them literally

## 3.2 Symbols

Void.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] apply.

NOTE: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

# 4 Concepts and overview

## 4.1 Overview

The present document is intended to study the mechanisms needed to collect the measurement data that will be used as the input to AI/ML functions residing in OAM [2]. Figure 4.1-1 depicts that the measurement data includes the UE measurements (i.e. MDT and RRM measurements), and actor feedback from the NG-RAN serving node, and the input information from the NG-RAN neighbouring nodes [2].



Figure 4.1-1: Measurement data collection

## 4.2 Concept

Figure 4.2-1 shows the management framework for measurement data connection needed to support RAN intelligence. Consumers may invoke management services to request 3GPP management system to collect measurement data from the NFs of NG-RAN serving node and neighbouring nodes. The NG-RAN serving node contains actors associated with AI enabled intelligent RAN use cases (e.g. network energy saving, mobility optimization, and load balancing) that may generate actions directed to the NG-RAN nodes and feedbacks to monitor the performance of the AI/ML Model (see clause 4.2 in TR 37.817 [2]). The NG-RAN serving node may collect the measurement reports from the UEs to which it is connected.



Figure 4.2-1: Management framework for measurement data collection

# 5 Use cases, requirements, and potential solutions

## 5.1 Use cases

### 5.1.1 Mobility optimization

Mobility management is the scheme to guarantee the service-continuity during the UE mobility by minimizing the call drops, RLFs, unnecessary handovers, and ping-pong. The objective of mobility optimization is to dynamically improve the UE handover performance with aims to improve end-user experience and increase network capacity. The mobility optimization use case in TR 37.817 [2] utilizes the AI/ML techniques with model training residing in OAM and model inference residing in the gNB to enhance the SON function in the following aspects:

- Reduction of the probability of unintended events.

- UE Location/Mobility/Performance prediction.

- Traffic Steering.

Clause 5.3.2.2 in TR 37.817 [2] describes a solution of AI/ML Model Training in OAM and AI/ML Model Inference in NG-RAN node, where OAM will collect input data from the serving RAN node and neighbouring RAN nodes to train the mobility optimization model, and then deploy the model to the serving RAN node to perform the inference function that will recommend actions to enable gNB to perform the mobility optimization / handover procedure to hand over UE(s) from serving NG-RAN node to the target NG-RAN node.

Therefore, to support the model training residing in OAM, 3GPP management service producer should be able to collect the following input data (see clause 5.3.2.4 in TR 37.817 [2]):

- From the UE:

- UE location information (e.g. coordinates, serving cell ID, moving velocity) interpreted by gNB implementation when available.

- Radio measurements related to serving cell and neighbouring cells associated with UE location information, e.g. RSRP, RSRQ, SINR.

- UE Mobility History Information.

- From the neighbouring RAN nodes:

- UE's history information from neighbour.

- Position, QoS parameters and the performance information of historical HO-ed UE (e.g. loss rate, delay, etc.).

- Current/predicted resource status.

- UE handovers in the past that were successful and unsuccessful, including too-early, too-late, or handover to wrong (sub-optimal) cell, based on existing SON/RLF report mechanism.

- Feedbacks from the target node:

- Resource status information updates from target NG-RAN.

- Performance information from target NG-RAN. The details of performance information are to be discussed during normative work phase.

- From the serving node:

- UE trajectory prediction.

- Current/predicted resource status.

- Current/predicted UE traffic.

- Feedback: QoS parameters such as throughput, packet delay of the handed-over UE, etc.

### 5.1.2 Network energy saving

It has been a global concern that the energy consumption of ICT (Information and Communication Technology) equipment is impacting the environment and contributing to the global warming. Energy efficiency for mobile networks is very important, since 5G networks will consume more energy due to the vast number of mmWave small cells. The network energy saving use case in TR 37.817 [2] utilizes the AI/ML techniques with model training residing in OAM and model inference residing in the gNB, where OAM will need to collect input data from RAN nodes to enable the network energy saving model training, and then deploy the model to the gNB to perform the inference function that will determine the energy saving actions based on the input data received from the serving node.

Therefore, to support the model training residing in OAM, 3GPP management service producer should be able to collect the following input data (see clause 5.1.2.4 in TR 37.817 [2]):

- From serving node:

- UE mobility/trajectory prediction.

- Current/Predicted Energy efficiency.

- Current/Predicted resource status.

- From the UE:

- UE location information (e.g. coordinates, serving cell ID, moving velocity) interpreted by gNB implementation when available.

- UE measurement report (e.g. UE RSRP, RSRQ, SINR measurement, etc.), including cell level and beam level UE measurements.

- From neighbouring NG-RAN nodes:

- Current/Predicted energy efficiency.

- Current/Predicted resource status.

- Current energy state (e.g. active, high, low, inactive).

To optimize the performance of AI/ML-based network energy saving model, following feedback can be considered to be collected from NG-RAN nodes:

- Resource status of neighbouring NG-RAN nodes.

- Energy efficiency.

- UE performance affected by the energy saving action (e.g. handed-over UEs), including bitrate, packet loss, latency.

- System KPIs (e.g. throughput, delay, RLF of current and neighbouring NG-RAN node).

Note: The data of resource status and energy efficiency are to be defined in the stage 2 and stage 3 solutions for Network energy saving use case.

### 5.1.3 Load balancing

With the rapid traffic growth, multiple frequency bands were utilized in the commercial network. It is quite challenging to steer the traffic in a balanced distribution so that the network performance could be assured. Load balancing had been proposed to address the issue. The objective of load balancing is to distribute load evenly among cells and among areas of cells, or to transfer part of the traffic from congested cells or from congested areas of cells, or to offload users from one cell, cell area, carrier or RAT to improve network performance. This can be done by means of optimization of handover parameters and handover actions. AI/ML capabilities, e.g. traffic load prediction, prediction of selected UE and/or target cell for handover, could be introduced to improve the load balance performance, in terms of the quality user experience and system capacity. It also enables the network automation which would help to reduce human intervention in the network management and optimization tasks. To support the AI/ML based load balancing in RAN, the related AI/ML Model can be trained, validated and tested in OAM while AI/ML Model inference could be done in the gNB. In case of CU-DU split architecture, AI/ML Model Training can be located in the OAM and AI/ML Model Inference can be located in the gNB-CU.

To facilitate the AI/ML Model Training, validation and testing in OAM, 3GPP management service producer should be able to collect the input data, output data as well as the feedback of AI/ML based load balancing. (see clause 5.2.2. in TR 37.817 [2]). Note that the output data can be used as the label for the supervised learning. The feedback of AI/ML based load balancing data could be used to re-tune the AI/ML model and optimize the AI/ML model for load balancing.

To support the model training residing in OAM, 3GPP management service producer should be able to collect the following input data:

- From serving node:

- Current and predicted resource status.

- UE trajectory prediction.

- Current and predicted UE traffic.

- Predicted resource status information of neighboring NG-RAN node(s).

- Inter-gNB conditional handovers.

- Intra-gNB conditional handovers.

- From neighbouring NG-RAN nodes:

- Current and predicted resource status.

- UE performance measurement at traffic offloaded neighbouring cell.

- From the UE:

- UE location information (e.g. coordinates, serving cell ID, moving velocity) interpreted by gNB implementation when available.

- UE Mobility History Information.

- UE measurement report (e.g. UE RSRP, RSRQ, SINR measurement, etc.), including cell level and beam level UE measurements.

To support the model training residing in OAM, 3GPP management service producer should be able to collect the following output data. The output data could serve as the supervised learning label data:

- From serving node:

- Selection of target cell for load balancing.

- The predicted UE(s) selected to be handed over to target NG-RAN node (will be used by RAN node internally).

To optimize the performance of AI/ML-based load balancing, following feedback can be considered to be collected from NG-RAN nodes:

- UE performance information from target NG-RAN.

- Resource status information updates from target NG-RAN.

- System KPIs, e.g. throughput, delay, RLF of current and neighbor cells.

## 5.2 Requirements

**REQ-DATA-COLLECT-FUN-1:** 3GPP management service producer should have the capability allowing authorized consumers to collect the serving node input data required for model training.

**REQ-DATA-COLLECT -FUN-2:** 3GPP management service producer should have the capability allowing authorized consumers to collect the UE input data required for model training.

**REQ-DATA-COLLECT -FUN-3:** 3GPP management service producer should have the capability allowing authorized consumers to collect the neighbouring node input data required for model training.

## 5.3 Potential solutions

### 5.3.0 General

This clause contains the potential solutions to support the requirements listed in clauses 5.1, 5.2 and 5.3.

NOTE: The solutions will only result in new measurements to support defined data in the normative work.

### 5.3.1 Measurement data collected from NG-RAN neighbouring nodes

#### 5.3.1.0 Measurement collection from NG-RAN neighbouring nodes

RAN intelligence use cases defined in TR 37.817 [2] require input data and feedbacks from the neighbouring nodes. Figure 5.3.1-1 shows that MnF of performance assurance (see clause 4.5 in TS 28.533 [8]) can be used by consumers to collect the measurement data from NG-RAN neighbouring nodes.



Figure 5.3.1.0-1: Measurement data collected from NG-RAN neighbouring nodes

#### 5.3.1.1 Measurement collection via performance job control

Figure 5.3.1.1-1 depicts a solution to describe how a consumer can utilize the MnS produced by MnF of performance assurance to collect the measurement data from neighbouring nodes via the performance job control.



Figure 5.3.1.1-1: Measurement data collection via performance job control

1. A consumer invokes the createMeasurementJob operation (see TS 28.550 [5]) provided by the MnF of performance assurance to create a measurement job for collecting measurement data. The operation includes the following, but not limited to, attributes:

- iOCInstanceList: the DN(s) of NRCellRelation MOI (see TS 28.541 [3]).

- measurementCategoryList: the measurement type(s) (see TS 28.550 [5]) that include new measurements for RAN3 defined data, such as Current/predicted resource status, historical successful and unsuccessful UE handovers from neighbouring nodes (see clause 5.3.2.4 in TR 38.817 [2]).

- reportingMethod: file or streaming based reporting.

2. MnF of Performance assurance returns the output parameter with jobId to indicate the measurement job been created.

3. If the measurement job is based on performance file reporting service, then

3.1. The consumer invokes the subscribe operation (see clause 12.6.1.1.1 in TS 28.532 [6]) to subscribe to receive notifications when the measurement data is ready for collection.

Otherwise, (performance data streaming service).

3.2. The consumer invokes the establishStreamingConnection operation to establish a streaming connection for sending the streaming data.

4. Neighbouring gNB-CU NF reports the measurement data to serving gNB-CU NF via the Xn interface.

5. Serving gNB-CU NF reports the measurement data to the MnF of performance assurance (see note).

6. MnF of performance assurance playing the producer role to collect the measurements, according to the performance job.

7. If the measurement job is based on performance file reporting service, then:

7.1. MnF of performance assurance sends a notifyFileReady notification (see clause 11.6.1.1 in TS 28.532 [6]) to the consumer to indicate the performance data file is ready.

7.2. The consumer fetches the measurement data from the MnF of performance assurance.

Otherwise, (performance data streaming service)

7.3. MnF of performance assurance invokes the reportStreamData operation to send the streaming measurement data to the consumer.

NOTE: The interface between performance assurance MnS for NF and serving gNB CU is not subject to standardization.

#### 5.3.1.2 Measurement collection via configurable measurement control

Figure 5.3.1.2-1 depicts a solution to describe how a consumer can utilize the MnS produced by MnF of performance assurance to collect the measurement data via the configuration measurement control.



Figure 5.3.1.2-1: Measurement data collection via configurable measurement control

1. A consumer invokes the createMOI operation (see TS 28.532 [6]) for PerfMetricJob IOC (see clause 4.3.31 in TS 28.622 [7]) to request the MnF of performance assurance to create a measurement job for collecting measurement data from the neighbouring node. The operation includes the following, but not limited to, attributes:

- objectInstances: the DN(s) of NRCellRelation MOI(s) indicating the NR cell CU of the neighbouring node.

- performanceMetrics: the list of performance metrics.

- reportingCtrl: file or streaming based reporting.

2. MnF of performance assurance returns the output parameter with the status of PerfMetricJob MOI creation.

3. If the measurement job is based on performance file reporting service, then:

3.1. The consumer invokes the subscribe operation to subscribe to receive notifications when the measurement data is ready for collection.

Otherwise, (performance data streaming service).

3.2. The consumer invokes the establishStreamingConnection operation to establish a streaming connection for sending the streaming data.

4. Neighbouring gNB-CU NF reports the measurement data to serving gNB-CU NF via the Xn interface.

5. Serving gNB-CU NF reports the measurement data to the MnF of performance assurance (see note).

6. MnF of performance assurance generates the measurement for the object instance of NRCellRelation MOI(s) referring to the neighbouring gNB CU NF.

7. If the measurement job is based on performance file reporting service, then:

7.1. MnF of performance assurance sends a notifyFileReady notification to the consumer to indicate the performance data file is ready.

7.2. The consumer fetches the measurement data from the MnF of performance assurance.

Otherwise, (performance data streaming service).

7.3. The consumer collects the measurement data and invokes the reportStreamData operation to send the 5GC NF streaming data to the consumer.

NOTE: The interface between performance assurance MnS for NF and serving gNB CU is not subject to standardization.

### 5.3.2 Measurement data collected from NG-RAN serving node

#### 5.3.2.0 General

The existing performance assurance MnS can be reused to collect the measurement data, including feedbacks from actors, from the NG-RAN serving node. The actors are distributed SON functions that are modelled as DMROFunction, DLBOFunction, and DESManagementFunction IOCs (see TS 28.541 [3]).

#### 5.3.2.1 Measurement collection via performance job control

Figure 5.3.2.1-1 depicts a solution to describe how a consumer can utilize the MnS produced by MnF of performance assurance to collect the measurement data (e.g. feedbacks from the actors) via the performance job control.



Figure 5.3.2.1-1: Measurement data collection via performance job control

1. A consumer invokes the createMeasurementJob operation provided by the MnF of performance assurance to create a measurement job for the collection of measurement data to create a measurement job for collecting the feedback data from the actors. The operation includes the following, but not limited to, attributes:

- iOCInstanceList: the DN(s) of DMROFunction, DLBOFunction, and DESManagementFunction MOI.

- measurementCategoryList: the measurement type(s) that include new measurements for RAN3 defined data, such as UE trajectory prediction, current/predicted UE traffic from serving nodes (see clause 5.3.2.4 in TR 38.817 [2]).

- reportingMethod: file or streaming based reporting.

2. MnF of performance assurance returns the output parameter with jobId to indicate the measurement job been created.

3. If the measurement job is based on performance file reporting service, then:

3.1. The consumer invokes the subscribe operation to subscribe to receive notifications when the measurement data is ready for collection.

Otherwise, (performance data streaming service).

3.2. The consumer invokes the establishStreamingConnection operation to establish a streaming connection for sending the streaming data.

4. The actor of network energy saving reports the measurement data to the performance assurance MnS-P for NF (see note).

5. The actor of mobility optimization reports the measurement data to the performance assurance MnS-P for NF (see note).

6. The actor of load balancing reports the measurement data to the performance assurance MnS-P for NF (see note).

7. MnF of performance assurance generates the measurement for the object instance of NRCellRelation MOI(s) referring to the neighbouring gNB CU NF.

8. If the measurement job is based on performance file reporting service, then:

8.1. MnF of performance assurance sends a notifyFileReady notification to the consumer to indicate the performance data file is ready.

8.2. The consumer fetches the measurement data from the MnF of performance assurance.

Otherwise, (performance data streaming service).

8.3. The consumer collects the measurement data and invokes the reportStreamData operation to send the 5GC NF streaming data to the consumer.

NOTE: The interface between performance assurance MnS for NF and serving gNB CU is not subject to standardization.

#### 5.3.2.2 Measurement collection via configurable measurement control

Figure 5.3.2.2-1 depicts a solution to describe how a consumer can utilize the MnS produced by MnF of performance assurance to collect the measurement data (e.g. feedbacks from the actors) via the configuration measurement control.



Figure 5.3.2.2-1: Measurement data collection via configurable measurement control

1. A consumer invokes the createMOI operation for PerfMetricJob IOC to request the MnF of performance assurance to create a measurement job for collecting measurement data from the actors. It includes the following, but not limited to, attributes:

- objectInstances: the DN(s) of DMROFunction, DLBOFunction, and DESManagementFunction MOI(s).

- performanceMetrics: the list of performance metrics.

- reportingCtrl: file or streaming based reporting.

2. MnF of performance assurance returns the output parameter with the status of PerfMetricJob MOI creation.

3. If the measurement job is based on performance file reporting service, then:

3.1. The consumer invokes the subscribe operation to subscribe to receive notifications when the measurement data is ready for collection.

Otherwise, (performance data streaming service).

3.2. The consumer invokes the establishStreamingConnection operation to establish a streaming connection for sending the streaming data.

4. The actor of network energy saving reports the measurement data to the performance assurance MnS-P for NF (see note).

5. The actor of mobility optimization reports the measurement data to the performance assurance MnS-P for NF (see note).

6. The actor of load balancing reports the measurement data to the performance assurance MnS-P for NF (see note).

7. MnF of performance assurance generates the measurement.

8. If the measurement job is based on performance file reporting service, then:

8.1. MnF of performance assurance sends a notifyFileReady notification to the consumer to indicate the performance data file is ready.

8.2. The consumer fetches the measurement data from the MnF of performance assurance.

Otherwise, (performance data streaming service).

8.3. MnF of performance assurance invokes the reportStreamData operation to send the streaming measurement data to the consumer.

NOTE: The interface between performance assurance MnS for NF and serving gNB CU is not subject to standardization.

### 5.3.3 Measurement data collected from UEs

#### 5.3.3.0 Measurement report configuration

Figure 5.3.3-1 depicts that the gNB may configure the RRC\_CONNECTED UE to report NR measurements, inter-RAT measurements of E-UTRA frequencies, inter-RAT measurements of UTRA-FDD frequencies, and NR sidelink measurements of L2 U2N Relay UEs (see clause 5.5.1 in TS 38.331 [4]) that are neded to support handover, carrier aggregation, or dual connectivity. The gNB sends the RRCReconfiguration message with measConfig IE to determine the type of measurements to be collected by UE. UE returns the measurement in the MeasurementReport message.



Figure 5.3.3.0-1: UE measurement report configuration

Therefore, gNB already receives UE measurement report (e.g. RSRP, RSRQ, SINR, etc.) that can be used as input data for the model training without any additional trigger.

Figure 5.3.3-2 shows that MnF of performance assurance management can be used to collect the UE measurements. A measurement can be created when one or more UE measurement reports are received. The measurement should refer to NRCellCU IOC with sub-counter for each UE measurements. The sub-counter index should be based on C-RNTI that is associated with the RRC Connection.



Figure 5.3.3-2: UE measurement data collection

#### 5.3.3.1 Measurement collection via performance job control

Figure 5.3.3.1-1 depicts a solution to describe how a consumer can utilize the MnS produced by MnF of performance assurance to collect the UE measurement data via the performance job control.



Figure 5.3.3.1-1: Measurement data collection via performance job control

1. gNB CU sends a RRC message RRCReconfiguration message with measConfig IE to request UE #1 to report UE measurements.

2. gNB CU sends a RRC message RRCReconfiguration message with measConfig IE to request UE #2 to report UE measurements.

3. A consumer invokes the createMeasurementJob operation provided by the MnF of performance assurance to create a measurement job for collecting UE measurements. It includes the following, but not limited to, attributes:

- iOCInstanceList: the DN(s) of NRCellCU MOI.

- measurementCategoryList: the measurement type(s) that include new measurements for RAN3 defined data, such as UE location information, UE Mobility History Information from UEs (see clause 5.3.2.4 in TR 38.817 [2]).

- reportingMethod: file or streaming based reporting.

4. MnF of performance assurance returns the output parameter with jobId to indicate the measurement job been created.

5. If the measurement job is based on performance file reporting service, then:

5.1. The consumer invokes the subscribe operation to subscribe to receive notifications when the measurement data is ready for collection.

Otherwise, (performance data streaming service).

5.2. The consumer invokes the establishStreamingConnection operation to establish a streaming connection for sending the streaming data.

6. UE #1 returns a RRC message MeasurementReport to report the UE measurements.

7. UE #2 returns a RRC message MeasurementReport to report the UE measurements.

8. gNB-CU NF reports the UE measurements to the MnF of performance assurance (see note).

9. MnF of performance assurance generates the measurement with sub-counter identified by C-RNTI for each UE measurements.

10. If the measurement job is based on performance file reporting service, then:

10.1. MnF of performance assurance sends a notifyFileReady notification (see clause 11.6.1.1 in TS 28.532 [6]) to the consumer to indicate the performance data file is ready.

10.2. The consumer fetches the measurement data from the MnF of performance assurance.

Otherwise, (performance data streaming service).

10.3. The consumer collects the measurement data and invokes the reportStreamData operation to send the 5GC NF streaming data to the consumer.

NOTE: The interface between performance assurance MnS for NF and serving gNB CU is not subject to standardization.

#### 5.3.3.2 Measurement collection via configurable measurement control

Figure 5.3.3.2-1 depicts a solution describing how a consumer can utilize the MnS produced by MnF of performance assurance to collect the UE measurements via the configuration measurement control.



Figure 5.3.3.2-1: Measurement data collection via configurable measurement control

1. gNB CU sends a RRC message RRCReconfiguration message with measConfig IE to request UE #1 to report UE measurements.

2. gNB CU sends a RRC message RRCReconfiguration message with measConfig IE to request UE #2 to report UE measurements.

3. A consumer invokes the createMOI operation for PerfMetricJob IOC to request the MnF of performance assurance to create a measurement job for collecting UE measurements. It includes the following, but not limited to, attributes:

- objectInstances: the DN(s) of NRCellCU MOI(s).

- performanceMetrics: the list of performance metrics.

- reportingMethod: file or streaming based measurements.

4. MnF of performance assurance returns the output parameter with the status of PerfMetricJob MOI creation.

5. If the measurement job is based on performance file reporting service, then:

5.1. The consumer invokes the subscribe operation to subscribe to receive notifications when the measurement data is ready for collection.

Otherwise, (performance data streaming service).

5.2. The consumer invokes the establishStreamingConnection operation to establish a streaming connection for sending the streaming data.

6. UE #1 returns a RRC message MeasurementReport to report the UE measurements.

7. UE #2 returns a RRC message MeasurementReport to report the UE measurements.

8. gNB-CU NF reports the UE measurements to the MnF of performance assurance (see note).

9. MnF of performance assurance generates the measurement with sub-counter identified by C-RNTI for each UE measurements.

10. If the measurement job is based on performance file reporting service, then

10.1 MnF of performance assurance sends a notifyFileReady notification (see clause 11.6.1.1 in TS 28.532 [6]) to the consumer to indicate the performance data file is ready.

10.2. The consumer fetches the measurement data from the MnF of performance assurance.

Otherwise, (performance data streaming service).

10.3. MnF of performance assurance invokes the reportStreamData operation to send the streaming measurement data to the consumer.

NOTE: The interface between performance assurance MnS for NF and serving gNB CU is not subject to standardization.

# 6 Conclusions and recommendations

## 6.1 Conclusions

The present document describes the use cases with derived requirements and potential solutions for collecting measurement data required for supporting RAN3 defined AI/ML functions in OAM. It concludes that the existing performance assurance MnS can be reused with enhancements to collect measurements sourced from neighboring cells and UEs.

## 6.2 Recommendations

It is recommended to start the normative work to define the measurements required to implement RAN3 defined AI/ML training functions supporting intelligent RAN use cases in OAM.

Annex A:  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2022-06 | SA5#144e | n/a | - | - | - | Initial skeleton | 0.0.0 |
| 2022-07 | SA5#144e | S5-224039  S5-224040  S5-224379 | - | - | - | Update according to the meeting agreement in SA5#144e:  S5-224039 pCR 28.838 skeleton  S5-224040 pCR 28.838 add scope  S5-224379 pCR 28.838 add overview | 0.1.0 |
| 2022-11 | SA5#146 | S5-226957  S5-226958  S5-226959  S5-226960  S5-226961  S5-226962 | - | - | - | Update according to the meeting agreement in SA5#146:  S5-226957 pCR 28.838 add use case of mobility optimization  S5-226958 pCR 28.838 add use case of network energy saving  S5-226959 pCR 28.838 add use case of load balancing  S5-226960 pCR 28.838 add concept  S5-226961 pCR 28.838 add solution  S5-226962 pCR 28.838 add conclusions and recommendations | 0.2.0 |
| 2022-12 | SA#98e | SP-221165 |  |  |  | EditHelp review, presented for information and approval | 1.0.0 |
| 2022-01 | SA#98e |  |  |  |  | Upgrade to change control version | 18.0.0 |