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1 Scope

The present document specifies the stage 1, 2 and 3 of performance assurance related management services for 5G networks including network slicing.

The present document does not specify the performance data, i.e. performance measurements, Key Performance Indicators (KPIs).

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.
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- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".
- [3] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".
- [4] ITU-T Recommendation X.721 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".
- [5] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [6] ISO 8601:2000(E) Data elements and interchange formats – Information interchange – Representation of dates and times".
- [7] 3GPP TS 28.532: "Management and orchestration; Generic management services".
- [8] Void
- [9] Void
- [10] Void
- [11] Void
- [12] Void
- [13] 3GPP TS 28.628: "Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [14] 3GPP TS 32.158: "Management and orchestration; Design rules for Representational State Transfer (REST) Solution Sets (SS)".
- [15] ITU-T Recommendation X.680 (08/2015) "Information Technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation" (Same as the ISO/IEC International Standard 8824-1).
- [16] ITU-T Recommendation X.681 (08/2015) "Information Technology - Abstract Syntax Notation One (ASN.1): Information object specification" (Same as the ISO/IEC International Standard 8824-2).

- [17] ITU-T Recommendation X.691 (08/2015) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).
- [18] IETF RFC 6455: "The WebSocket Protocol".
- [19] IETF RFC 793: "TRANSMISSION CONTROL PROTOCOL".
- [20] Void.
- [21] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".
- [22] 3GPP TS 23.288: " Technical Specification Group Services and System Aspects; Architecture enhancements for 5G System (5GS) to support network data analytics services".
- [23] 3GPP TS 28.530: "Technical Specification Group Services and System Aspects; Management and orchestration; Concepts, use cases and requirements".
- [24] 3GPP TS 28.531: " Management and orchestration; Provisioning".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

4 Concepts and overview

4.1 Overview

The 5G networks and network slicing are designed to support eMBB, URLLC and mMTC services. Some services have ultra-low latency, high data capacity, and strict reliability requirements, as any faults or performance issues in the networks can cause service failure which may result in property damage and body injury. Therefore, it is necessary to collect real-time performance data that can be used by analytic applications (e.g., network optimization, SON, etc.) to detect the potential issues in advance, and take appropriate actions to prevent or mitigate the issues. Also, the performance data shall be able to be consumed by multiple analytic applications with specific purposes.

4.2 Management data analytics

The raw performance data of NFs of the mobile network can be analysed, together with other management data (e.g., alarm information, configuration data), and formed into one or more management analytical data for NFs, sub-networks, NSSIs or NSIs. The management analytical data can be used to diagnose ongoing issues impacting the performance of the mobile network and predict any potential issues (e.g., potential failure and/or performance degradation). For example, the analysis of NSI/NSSI resource usage can form a management analytical data indicating whether a certain resource is deteriorating. The analysis and correlation of the overall performance data of mobile network may indicate overload situation and potential failure(s).

SON Capacity and Coverage Optimization (CCO) is one typical case that may consume the management analytical data. CCO provides optimal coverage and capacity for the E-UTRAN, see clause 4.5 of TS 28.628 [13], which may also be applicable for 5G radio networks. The management analytical data related to coverage and capacity help the SON CCO to realise the situation of coverage and capacity or interference, and to trigger corresponding optimization if needed.

NOTE: Details of the management analytical data including e.g. format, categorisation and method/algorithm of calculations are to be defined.

4.3 PM services

The PM for 5G networks and network slicing is comprised of the management services listed in the table 4.3-1 below:

Table 4.3-1: PM services for 5G networks and network slicing

Management service	Description
Measurement job control service for NF	The management service for creating, terminating and querying the measurement job(s) for the NF(s).
Performance data file reporting service for NF	The management service for reporting the NF performance data file.
Performance data streaming service for NF	The management service for reporting the NF performance data stream.
Measurement job control service for NSSI	The management service for creating, terminating and querying the measurement job(s) for the NSSI(s).
Performance data file reporting service for NSSI	The management service for reporting the NSSI performance data file.
Performance data streaming service for NSSI	The management service for reporting the NSSI performance data stream.
Measurement job control service for NSI	The management service for creating, terminating and querying the measurement job(s) for the NSI(s).
Performance data file reporting service for NSI	The management service for reporting the NSI performance data file.
Performance data streaming service for NSI	The management service for reporting the NSI performance data stream.
Measurement job control service for network/sub-network	The management service for creating, terminating and querying the measurement job(s) for the network(s)/subnetwork(s). The measurement job for the network(s)/subnetwork(s) is to collect the network/subnetwork performance data that are not specific to network slicing.
Performance data file reporting service for network/sub-network	The management service for reporting the file of the network/subnetwork performance data that is not specific to network slicing.
Performance data streaming service for network/sub-network	The management service for reporting the stream of the network/subnetwork performance data that is not specific to network slicing.
MnS responsible for KPI job control	The management service for creating, terminating and querying the KPI job(s)

4.4 PM services for multiple tenant support

The MnS consumer, acting on behalf of a tenant, may get the performance measurements of a network slice.. Performance measurements specified in TS 28.552 [1] can be split into sub-counters per S-NSSAI. 3GPP management system can use these sub-counters to distinguish performance measurements for different tenants, which might be required when performance measurements are exposed as part of Network Slice as a Service (NSaaS) specified in TS 28.530 [23].

5 Specification level requirements

5.1 Use cases

5.1.0 Introduction

The steps of the use cases are logical illustration on how the management service request can be fulfilled. Depending on the deployment scenario, other steps can be used to fulfil the management service request.

5.1.1 NF PM services

5.1.1.1 NF measurement job control service

5.1.1.1.1 Creation of measurement job for NF(s)

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to create a measurement job for collecting the performance data of NF(s).	
Actors and Roles	An authorized consumer of NF measurement job control service.	
Telecom resources	NF(s); Producer of the NF measurement job control service.	
Assumptions	N/A	
Pre-conditions	- The NF(s) have been deployed. - The NF measurement job control service producer is in operation.	
Begins when	The authorized consumer needs to create measurement job for collecting the performance data of NF(s).	
Step 1 (M)	The authorized consumer requests the NF measurement job control service producer to create measurement job to collect the performance data of NF(s). The request needs to indicate that the performance data needs to be reported by performance data file or by performance data streaming.	
Step 2 (M)	The NF measurement job control service producer requests the NF(s) to collect the performance data, per the received measurement job creation request.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The measurement job for NF(s) has been created, and the NF measurement job control service producer generates the performance data for the NF measurement job.	
Traceability	REQ-MJCS_NF-FUN-1, REQ-MJCS_NF-FUN-2, REQ-MJCS_NF-FUN-3, REQ-MJCS_NF-FUN-4 and REQ-MJCS_NF-FUN-7	

5.1.1.1.2 Termination of measurement job for NF(s)

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to request the NF measurement job control service producer to terminate a NF measurement job.	
Actors and Roles	An authorized consumer of NF measurement job control service.	
Telecom resources	NF(s) NF measurement job control service producer.	
Assumptions	N/A	
Pre-conditions	The NF measurement job has been created.	
Begins when	The authorized consumer does not need the NF measurement job that is collecting the performance data of NF(s).	
Step 1 (M)	The authorized consumer requests the NF measurement job control service producer to terminate a measurement job that is collecting the performance data of NF(s).	
Step 2 (M)	The NF measurement job control service producer terminates the measurement job and may request the NF(s) to stop collecting the measurements requested by the measurement job.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The NF measurement job is terminated, or still retained but not does not serve the subject consumer anymore.	
Traceability	REQ-MJCS_NF-FUN-5	

5.1.1.1.3 Query of measurement jobs for NF(s)

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to query the ongoing NF measurement jobs (i.e. the NF measurement jobs that have been created by the subject consumer and not terminated).	
Actors and Roles	An authorized consumer of NF measurement job control service.	
Telecom resources	NF(s) NF measurement job control service producer.	
Assumptions	N/A	
Pre-conditions	The NF measurement job control service producer is in operation.	
Begins when	The authorized consumer needs to query the ongoing NF measurement jobs.	
Step 1 (M)	The authorized consumer queries the information about the ongoing NF measurement jobs from the NF measurement job control service producer.	
Step 2 (M)	The NF measurement job control service producer provides the information about the ongoing NF measurement jobs to the consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The information about the ongoing NF measurements jobs are available to the consumer.	
Traceability	REQ-MJCS_NF-FUN-6	