Performance Management (PM)

last modified by Sergio Benco

on 2022/06/09 12:04

Table of Contents

Introduction

This page aims to describe some of the available Perfomance Management (PM) parameters. Furthermore it resumes the most common tags of a PM (XML format).

For further information refer to:

- **3GPP TS 32.401**, Performance Management (PM) Concept and requirements
- **3GPP TS 32.432**, PM: File format definition
- **3GPP TS 32.435**, PM eXtensible Markup Language (XML) file format definition

For a complete overview of **5G** specific performance measurement see:

- **3GPP TS 28.552**, Management and orchestration 5G performance measurements

Relevant Performance Measurements (valid for all gNB deployment scenarios)

In **3GPP TS 28.552** (Management and orchestration 5G performance measurements), there is a subset of performance metrics that can be considered as common to all scenarios (i.e. regarding gNB) and, thus, should be always available from SMO O1 RAN interface, such as:

Packet delay

- Average delay DL air-interface (**DRB.AirIfDelayDl**): provides the average (arithmetic mean) time it takes for packet transmission over the air-interface in the downlink direction. The measurement is calculated per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.
- Average delay UL on over-the-air interface (**DRB.AirIfDelayUl**): provides the average (arithmetic mean) over-the-air packet delay on the uplink. The measurement is calculated per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

NOTE: The measurement name has the form DRB.AirIfDelayDl_Filter, where filter is a combination of PLMN ID and QoS level and S-NSSAI. Where PLMN ID represents the PLMN ID, QoS representes the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

Radio resource utilization (RRU)

- DL total available PRB (**RRU.PrbAvailDl**): total number of physical resource blocks (PRBs) available downlink (integer)
- UL total available PRB (**RRU.PrbAvailUl**): total number of physical resource blocks (PRBs) available uplink (integer)
- Mean DL PRB used for data traffic (**RRU.PrbUsedDl**): this measurement is for monitoring the DL PRB load of the radio physical layer **per S-NSSAI**
- Mean UL PRB used for data traffic (**RRU.PrbUsedUl**): this measurement is for monitoring the UL PRB load of the radio physical layer **per S-NSSAI**

NOTE: RRU.PrbUsedDl, or optionally RRU.PrbUsedDl.*QoS,* where the *QoS* identifies the target quality of service class and RRU.PrbUsedDl.*SNSSAI*, where SNSSAI identifies the S-NSSAI, and RRU.PrbUsedDl.PLMN, where PLMN identifies the PLMN ID.

UE throughput

- Average DL UE throughput in gNB (**DRB.UEThpDl**)
- Average UL UE throughput in gNB (**DRB.UEThpUl**)

NOTE: DRB.UEThpDl, or optionally DRB.UEThpDl.*QOS,* where *QOS* identifies the target quality of service class, and DRB.UEThpDl.*SNSSAI,* where *SNSSAI* identifies the S-NSSAI, and DRB.UEThpDl.*PLMN,* where *PLMN* identifies the PLMN ID.

QoS flow related measurements

Furthermore, certain "failure" metrics, can be exploited to assess i.e., RAN Use Case 8 QoS flows, such as:

- Number of QoS flow failed to setup (**QF.EstabFailNbr.*Cause***)
- Number of QoS flows failed to modify (**QF.ModNbrFail.C*ause***)

PM XML file example

An example of Performance Measurement (PM) XML data structure is show below.

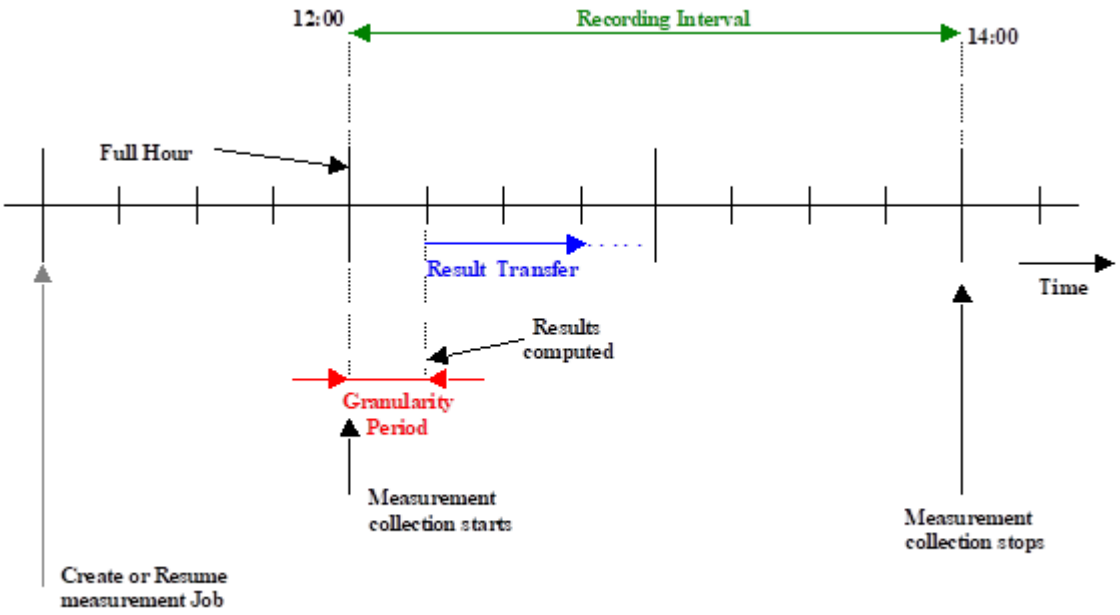
```
<?xml version="1.0" encoding="UTF-8"?>
<measCollecFile xmlns="http://www.3gpp.org/ftp/specs/archive/32_series/32.435#measCollec">
    <fileHeader dnPrefix="Prefix" fileFormatVersion="32.435 V10.0" vendorName="Acme Ltd">
        <fileSender localDn="440"/>
        <measCollec beginTime="2021-12-07T10:51:20.137"/>
    </fileHeader>
    <measData>
        <managedElement localDn="440" swVersion="r0.1"/>
        <measInfo measInfoId="measInfoIsVal">
            <job jobId="1344"/>
            <granPeriod duration="PT900S" endTime="2021-12-07T10:51:20.137"/>
            <repPeriod duration="PT900S"/>
            <measType p="1">SM.PrbUsedDl.001-010000</measType>
            <measType p="2">SM.PrbUsedUl.001-010000</measType>
            <measValue measObjLdn="10896">
                <r p="1">2</r>
                <r p="2">11</r>
                <suspect>false</suspect>
            </measValue>
            <measValue measObjLdn="11561">
                <r p="1">78</r>
                <r p="2">10</r>
                <suspect>false</suspect>
            </measValue>
...
        </measInfo>
    </measData>
    <fileFooter>
        <measCollec endTime="2021-12-07T10:51:20.137"/>
    </fileFooter>
</measCollecFile>
```

Definitions

(Measurement) Job ID (JobId) - This field is used to identify the measure tasks (Jobs) performed by one specific (Network) Element Manager (EM).

Granularity period (granPeriod) - The granularity period is the time between the initiation of two successive gatherings of measurement data. Valid values for the granularity period are 5 minutes, 15 minutes, 30 minutes, 1 hour.

Measurement collection (measCollec) - The recording interval in which one or more measures are executed and reported organized in slots of granPeriod(s). See the figure below to understand how the measure timing is organized.



Complete mapping between XML tags, Items and Descriptions

XML	File Content Item	Description
measCollecFile	measDataCollection	This is the top-level tag, which identifies the file as a collection of measurement data. The file content is made up of a header ("**measFileHeader**"), the collection of measurement result items ("**measData**"), and a measurement file footer ("**measFileFooter**").
fileHeader	measFileHeader	This is the measurement result file header to be inserted in each file. It includes a version indicator, the name, type and vendor name of the sending network node, and a time stamp ("collectionBeginTime").
measData	measData	The "measData" construct represents the sequence of zero or more measurement result items contained in the file. It can be empty in case no measurement data can be provided. The individual "measData" elements can appear in any order. Each "measData" element contains the name of the NE ("nEId") and the list of measurement results pertaining to that NE ("measInfo").
fileFooter	measFileFooter	The measurement result file footer to be inserted in each file. It includes a time stamp, which refers to the end of the overall measurement collection interval that is covered by the collected measurement results being stored in this file.
fileHeader fileFormatVersion	fileFormatVersion	This parameter identifies the file format version applied by the sender. The format version defined in the present document

		shall be the abridged number and version of this 3GPP document (see below). The abridged number and version of a 3GPP document is constructed from its version specific full reference "3GPP [...] (yyyy-mm)" by: - removing the leading "3GPP TS" - removing everything including and after the version third digit, representing editorial only changes, together with its preceding dot character - from the resulting string, removing leading and trailing white space, replacing every multi character white space by a single space character and changing the case of all characters to uppercase.
fileHeader dnPrefix and fileSender localDn	senderName	The senderName uniquely identifies the NE or EM that assembled this measurement file by its Distinguished Name (DN), according to the definitions in 3GPP TS 32.300 [6]. In the case of the NE-based approach, it is identical to the sender's "nEDistinguishedName".
fileSender elementType	senderType	This is a user configurable identifier of the type of network node that generated the file, e.g. NodeB, EM, SGSN. The string may be empty (i.e. string size =0) in case the "senderType" is not configured in the sender.
fileHeader vendorName	vendorName	The "vendorName" identifies the vendor of the equipment that provided the measurement file. The string may be empty (i.e. string size =0) if the "vendorName" is not configured in the sender.
measCollec beginTime	collectionBeginTime	The "collectionBeginTime" is a time stamp that refers to the start of the first measurement collection interval (granularity period) that is covered by the collected measurement results that are stored in this file.
managedElement	neId	The unique identification of the NE in the system. It includes the user name ("nEUserName"), the distinguished name ("nEDistinguishedName") and the software version ("nESoftwareVersion") of the NE.
managedElement userLabel	neUserName	This is the user definable name ("userLabel") defined for the NE in 3GPP TS 28.622 [23]. The string may be empty (i.e. string size =0) if the "nEUserName" is not configured in the CM applications.
fileHeader dnPrefix and managedElement localDn	neDistinguishedName	This is the Distinguished Name (DN) defined for the NE in 3GPP TS 32.300 [6]. It is unique across an operator's network. The string may be empty (i.e. string size =0) if the

		"nEDistinguishedName" is not configured in the CM applications.
managedElement swVersion	neSoftwareVersion	This is the software version ("swVersion") defined for the NE in 3GPP TS 28.622 [23]. This is an optional parameter which allows post-processing systems to take care of vendor specific measurements modified between software versions.
measInfo	measInfo	The sequence of measurements, values and related information. It includes a list of measurement types ("measTypes") and the corresponding results ("measValues"), together with the time stamp ("measTimeStamp") and granularity period ("granularityPeriod") pertaining to these measurements.
measInfoId	measInfoId	This attribute associates a tag name with the set of measurements defined by a *measInfo* property. This is an optional parameter that may be used to assign unique names to categories of measurements grouped together by measInfo elements. It allows parsing tools to easily isolate measurement sets by name.
granPeriod endTime	measTimeStamp	Time stamp referring to the end of the granularity period.
job jobId	jobId	The "jobId" represents the job with which measurement result contained in the file is associated. The "jobId" is mandatory when PMIRP is supported.
granPeriod duration	granularityPeriod	Granularity period of the measurement(s) in seconds.
repPeriod duration	reportingPeriod	Reporting period of the measurement(s) in seconds. The "reportingPeriod" is mandatory when PMIRP is supported.
measTypes or measType	measTypes	This is the list of measurement types for which the following, analogous list of measurement values ("measValues") pertains. The measurement types for UMTS and combined GSM/UMTS networks are specified in TS 32.405 [12], TS 32.406 [13], TS 32.407 [14], TS 32.408 [15] and for IMS in TS 32.409 [16]. Measurement types for E-UTRAN are specified in TS 32.425 [17] and for EPC in TS 32.426 [18]. Measurement types for Home Node B (HNB) Subsystem (HNS) are defined in TS 32.452 [19] and for Home enhanced Node B (HeNB) Subsystem (HeNS) in TS.32.453 [20].The GSM only measurement types are defined in TS 52.402 [7].

		The measurement types for NR and 5GC are specified in TS 28.552 [21] and TS 32.404 [22]
measValue	measValues	This parameter contains the list of measurement results for the resource being measured, e.g. trunk, cell. It includes an identifier of the resource ("measObjInstId"), the list of measurement result values ("measResults") and a flag that indicates whether the data is reliable ("suspectFlag").
measValue measObjLdn	measObjInstId	The "measObjInstId" field contains the local distinguished name (LDN) of the measured object within the scope defined by the "nEDistinguishedName" (see 3GPP TS 32.300 [6]). The concatenation of the "nEDistinguishedName" and the "measObjInstId" yields the DN of the measured object. The "measObjInstId" is therefore empty if the "nEDistinguishedName" already specifies completely the DN of the measured object, which is the case for all measurements specified on NE level. For example, if the measured object is a "ManagedElement" representing RNC "RNC-Gbg-1", then the "nEDistinguishedName" will be for instance "DC=a1.companyNN.com,SubNetwork=1,IRPAgent=1,SubNet Gbg-1,ManagedElement=RNC-Gbg-1", and the "measObjInstId" will be empty. On the other hand, if the measured object is a "UtranCell" representing cell "Gbg-997" managed by that RNC, then the "nEDistinguishedName" will be for instance the same as above, i.e. "DC=a1.companyNN.com,SubNetwork=1,IRPAgent=1,SubNet Gbg-1,ManagedElement=RNC-Gbg-1", and the "measObjInstId" will be for instance "RncFunction=RF-1,UtranCell=Gbg-997". The class of the "measObjInstId" is defined in item F of each measurement definition template.
measResults or " r "	measResults	This parameter contains the sequence of result values for the observed measurement types. The "measResults" sequence shall have the same number of elements, which follow the same order as the measTypes sequence. Normal values are INTEGERs and REALs. The NULL value is reserved to indicate that the measurement item is not applicable or could not be retrieved for the object instance.
suspect	suspectFlag	Used as an indication of quality of the scanned data. FALSE in the case of reliable data, TRUE if not reliable. The default value is "FALSE", in case the suspect flag has its default value it may be omitted.

measCollec endTime	timestamp	This tag carries the time stamp that refers to the end of the measurement collection interval (granularity period) that is covered by the collected measurement results that are stored in this file. The minimum required information within timestamp is year, month, day, hour, minute, and second.
measType p		An optional positioning XML attribute specification of XML element "measType" (XML schema based), used to identify a measurement type for the purpose of correlation to a result. The value of this XML attribute specification is expected to be a non-zero, non-negative integer value that is unique for each instance of XML element "measType" that is contained within the measurement data collection file.
r p		An optional positioning XML attribute specification of XML element "r", used to correlate a result to a measurement type. The value of this XML attribute specification should match the value of XML attribute specification "p" of the corresponding XML element "measType" (XML schema based).