

# Performance Management

## DESCRIPTION

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# 1 Introduction

This document provides an overview of the management model and concepts associated with the Performance Management (PM) managed area.

A managed area is represented by a group of Managed Object Classes (MOCs) within the Managed Object Model (MOM).





## 2 Functions and Concepts

PM provides a management interface for performance measurement data handling in the Managed Element (ME) including the following:

- Collection and aggregation of performance measurement data
- Creation of performance measurement reports
- Reporting of performance threshold alarms

An overview of PM is shown in Figure 1.

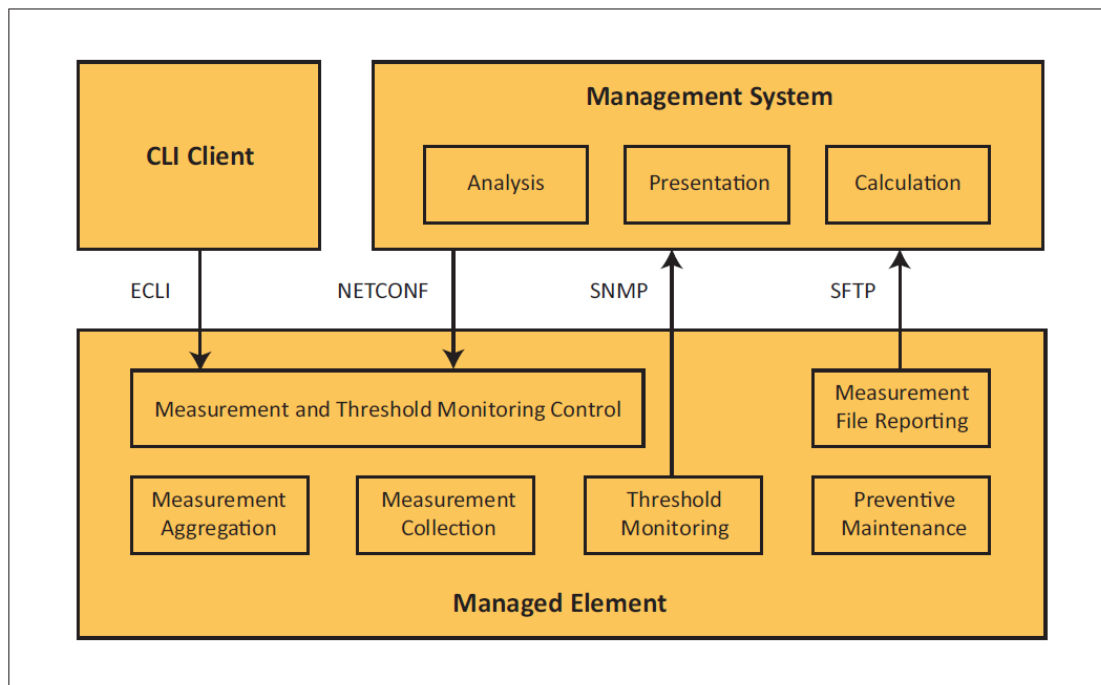


Figure 1 Performance Management Overview

Performance measurement data is collected and recorded by the ME regularly. This activity is performed to verify the physical and logical configuration of the IPWorks network and its functions, to understand how they are used, and to locate potential problems as early as possible. The performance measurement reports can be used by management systems to understand performance trends, to balance traffic load, and to identify problem areas.

Performance threshold alarms can be used by management systems to identify problem areas needing immediate attention.

### Measurement Types

The measurement types define what measurement data the ME can collect as well as what collection method and aggregation method are used. A measurement



type supports one collection method and one aggregation method. Details are provided in Table 1 and Table 2, respectively.

Table 1 Measurement Type Collection Methods

Collection Method	Description
Cumulative counter	An ME uses a cumulative counter for counting events. Each time the event occurs a value is added to the counter. The counter is reset to a well-defined value (usually 0) at the beginning of each Granularity Period (GP). The GP is the time between the initiation of two successive collections of measurement data.
Gauge	A gauge is used for representing a dynamic value that can change in either direction. It can be used for continuous measurements over many GPs, for example, representing a temperature. It can also be used to get a maximum or minimum value during a GP. In this case, the gauge is reset at the beginning of each GP.
Discrete Event Registration (DER)	Using DER, data related to a particular event is captured (same as a gauge). Every nth event is registered, where n can be 1 or larger. The value of n depends on the frequency of occurrence of the event being measured. DER measurements are reset at the beginning of each GP and only have a valid result at the end of the GP. <sup>(1)</sup>
Status Inspection (SI)	An SI is supported in the same way as a gauge but cannot be used for continuous measurements over several GPs. Status inspection measurements are reset at the beginning of the GP and only have a valid result at the end of the GP. <sup>(1)</sup>

(1) For IPWorks, this collection method is not used.

Table 2 Measurement Type Aggregation Methods

Aggregation Method	Description
Sum	All measured values are added during a GP.
Average	An average value is calculated using all values collected during a GP. For a gauge, an average value can be calculated over several GPs.
Minimum	The minimum value during a GP is collected.
Maximum	The maximum value during a GP is collected.
Last update	The last value during a GP is collected.

Measurement types are categorized and logically grouped into PM groups.

### Measurement Jobs

The execution of measurement data collection, aggregation, and reporting is performed by measurement jobs. A measurement job applies to one or more measurement types or to an entire PM group. A measurement job executes the measurement types respective collection method and aggregation method at regular time intervals as defined by its GP.





The supported GP values are 1 minute, 5 minutes, 15 minutes, 30 minutes, 1 h, 12 h, and 24 h. The default value for GP is 15 minutes.

The Measurement reader defines the measurement being counted in a particular measurement job and ties it to the specific measurement types or a PM group.

A measurement job collects measurement data and generates reports as performance measurement XML files.

A PM job can have three different priorities; low, medium, or high. The measurement jobs with the highest priority have their reports output first or its threshold condition checked first.

### Reported Data / Performance Measurement XML Files

Performance measurement XML files are compliant with 3GPP® TS 32.435. The files are of type “A”, which means that the file contains results of measurements collected from a single ME during a single GP, according to the 3GPP TS 32.432 V10.0.0 standard. The performance measurement XML files also handle multi-value counters, which are an addition to the 3GPP standard. For more information, refer to [Performance Management Report File Format](#).

The performance XML file can optionally be compressed using GZIP to reduce the amount of disk space used.

A new performance measurement XML file is created after regular aggregation intervals at the end of each GP.

An example of generation of performance measurement files is shown in Table 3. The collection of performance measurement data is started when the time is 0:00. Four jobs are set up. Two (job 1 and 2) have a GP of 5 minutes and the other two (job 3 and 4) have a GP of 15 minutes.

Table 3 Example of Generation of Files

Time	Number of Generated Files	Content
Between 0:00 and 0:05 (a)	0	No file is generated, measurement time collection has started at 0:00, and the GP has not finished
Between 0:05 and 0:10 (b)	1	Measurement results for jobs 1 and 2 during period (a)
Between 0:10 and 0:15 (c)	1	Measurement results for jobs 1 and 2 during period (b)
Between 0:15 and 0:20 (d)	2	Measurement results for jobs 1 and 2 during period (c)
		Measurement results for jobs 3 and 4 during period (a) + (b) + (c)
Between 0:20 and 0:25 (e)	1	Measurement results for jobs 1 and 2 during period (d)

The creation of a performance measurement XML file after the end of a GP can take up to 5 minutes. After this time, the absence of an expected performance measurement XML file or the absence of measurement data for an active performance job is to be considered as a potential fault situation.

This default performance file generation can be modified using the concept of job groups. A job group is defined using a simple text string associated with each PM job. The PM jobs with a common string name are all to be written into a performance management XML file prefixed by that string name, creating a group of PM jobs.

The created performance measurement XML files are exposed in the logical file system under `MO FileGroup=PerformanceManagementReportFiles` and can be transferred to external systems as any files in the logical file system. For more information, refer to [File Management](#).

File Management preventive maintenance policies must not be applied to performance measurement XML files. PM provides instead its own internal preventive maintenance policy. Up to 1000 files can coexist in the ME. When this limit is reached, the ME always deletes the oldest file before creating a new one.

### Threshold Alarms

Threshold alarms can be used in conjunction with the gauge and cumulative counter collection methods. A threshold monitoring job monitors measurement data and raises an alarm when a threshold is crossed, but do not collection measurement data. A threshold monitoring job raises or clears an alarm based on a comparison of the counter value with the configured high and low threshold values.

At the end of the GP, if the counter value is higher than the high threshold value and no alarm is active, then an alarm is raised. However, if the counter value is lower than the low threshold value and if an alarm is active, then the alarm is cleared.

If two or more threshold monitoring jobs are associated with a measurement type, then a change alarm can be raised to indicate that the counter value has crossed a higher or a lower threshold than previously shown in any earlier alarm.

### Used Interfaces

PM uses the following:

- NETCONF or the Ericsson Command-Line Interface (ECLI) for configuration
- A file interface for performance measurements
- The Ericsson SNMP Alarm Management Information Base (MIB) interface for performance threshold alarms



## 2.1 Types of Operation

PM supports the following operations:

- List measurement types, PM groups, and PM jobs

The list of measurement types and PM groups informs the user about what measurement data it is possible to collect on the ME. The list of PM jobs informs the user about what PM jobs can be started or are already running on the ME. The procedures in [List Performance Management Groups and Measurement Types](#) and [List Performance Management Jobs](#) provide further details on how to perform these operations.

- Create, start, stop, and delete measurement collection jobs

A new performance measurement collection job can be created by the user to collect performance data according to supported measurement types that are currently not collected on the ME. As part of maintenance situations, the user can suspend a measurement collection job to lower the resource use in the ME and start it again. The procedures in [Create Measurement Collection Job](#), [Start Measurement Collection Job](#), [Stop Measurement Collection Job](#), and [Delete Measurement Collection Job](#) provide further details on how to perform these operations.

**Note:** The automated suspension of jobs in, for example, overload situations, is not supported.

A defined measurement collection job cannot be modified. Instead the user must stop the defined job, delete it, and then create a new job.

A performance measurement collection job that is no longer of interest due to, for example, a new network performance monitoring strategy can be deleted by the user.

- Create, start, stop, and delete threshold monitoring jobs

A new threshold monitoring job can be created by the user to raise threshold alarms on supported measurement types that are currently not monitored through alarms. As part of maintenance situations, the user can stop a threshold monitoring job and start it again. The procedures in [Create Threshold Monitoring Job](#), [Start Threshold Monitoring Job](#), [Stop Threshold Monitoring Job](#), and [Delete Threshold Monitoring Job](#) provide further details on how to perform these operations.

A defined threshold monitoring job cannot be modified. Instead the user must stop the defined job, delete it, and then create a new job.

A threshold monitoring job that is no longer of interest because of, for example, a new network performance monitoring strategy can be deleted by the user.





### 3 Managed Object Model

The PM managed area is represented in the Managed Object Model (MOM) as follows:

```
ManagedElement
+-SystemFunctions
+-Pm
+-PmGroup
+-MeasurementType
+-PmJob
+-MeasurementReader
+-PmThresholdMonitoring
+-PmMeasurementCapabilities
```

For IPWorks specific performance measurement groups and counters, refer to [IPWorks Measurement List](#) or relevant instances in MOM. For general information about the MOM, MOCs, MOs, cardinality, and related concepts, refer to [Managed Object Model User Guide](#).

The PM MOCs are described in Table 4.

Table 4 Performance Management Managed Object Class Descriptions

Managed Object Class	Description
Pm	The root of the PM model, manages the PM jobs and PM measurements.
PmGroup	Logical grouping of measurement types.
MeasurementType	Describes the measurement types supported by the ME.
PmJob	Contains the configured measurement jobs in the ME and their current state.
MeasurementReader	Defines the measurement being counted in a particular PM job and ties it to specific measurement types or a PM group.
PmThresholdMonitoring	Contains the configured thresholds for the threshold jobs.
PmMeasurementCapabilities	Is used to display the PM capabilities supported by this ME. For example, the maximum number of supported performance measurement XML files





## 4 Performance Management Framework

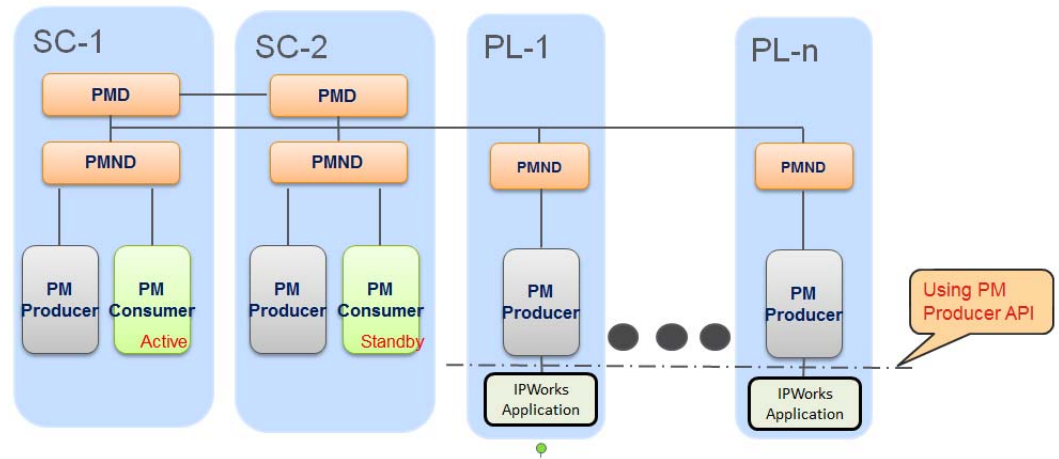


Figure 2 Overview of IPWorks PM Framework

With:

- **PM Producer:** It runs on SC nodes, the active PMD triggers start of harvesting and aggregating when a GP ends. It also handles harvesting and aggregation values for threshold job.
- **PM Node Director (PMND):** The PMND handles collection and aggregation of values (measurement job) on the node it is running on.
- **PM Consumer:** It subscribes to PM events and fetches Measurement Job data.
- **PM Producer:** IPWorks application uses the PM Producer API to provide measurement data into Measurement instances.

- **PM Measurement**

Report PM data from the IPWorks application to PM periodically using PM Producer API. The report cycle is 10 seconds. For details, refer to [IPWorks Measurement List](#).

- **Measurement Related Alarms**

PM generates alarm notifications when Threshold Monitoring is activated, which are related to IPWorks applicatin TPS alarms. For details, refer to [IPWorks Alarm List](#).

- **PM Reporting File Generation**

Report files are generated at the end of the reporting periods, one file for each granularity period. The measurement report files are generated



in the directory, as specified in the `fileLocation` attribute of the `PmMeasurementCapabilities`.





## 5 Configuration Management

PM is accessed using NETCONF or the ECLI to manipulate the Management Information Base (MIB).

The following operations can be performed by the user and are described in Operating Instructions using the ECLI:

### **List PM Information**

- List Performance Management Groups and Measurement Types
- List Performance Management Jobs

### **Manage Measurement Collection Jobs**

- Create Measurement Collection Job
- Start Measurement Collection Job
- Stop Measurement Collection Job
- Delete Measurement Collection Job

### **Manage Threshold Monitoring Jobs**

- Create Threshold Monitoring Job
- Start Threshold Monitoring Job
- Stop Threshold Monitoring Job
- Delete Threshold Monitoring Job