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*Technical Specification*

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
Telecommunication management;  
Performance Management (PM)  
Integration Reference Point (IRP):  
Common Object Request Broker Architecture (CORBA)  
Solution Set (SS)  
(3GPP TS 32.413 version 6.3.0 Release 6)**

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## Foreword

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## Introduction

The present document is part the 32.41x-series covering the 3<sup>rd</sup> Generation Partnership Project: Technical Specification Group Services and System Aspects; Telecommunication management; Performance Management (PM) Integration Reference Point (IRP), as identified below:

TS 32.411: "Requirements";

TS 32.412: "Information Service (IS)";

**TS 32.413: "Common Object Request Broker Architecture (CORBA) Solution Set (SS)";**

TS 32.414: "Common Management Information Protocol (CMIP) Solution Set (SS)".

The present document is part of a set of TSs which describe the requirements and information model necessary for the Telecommunication Management (TM) of 3G systems. The TM principles and TM architecture are specified in 3GPP TS 32.101 [1] and 3GPP TS 32.102 [2].

A 3G system is composed of a multitude of Network Elements (NE) of various types and, typically, different vendors, which inter-operate in a co-ordinated manner in order to satisfy the network users' communication requirements. Any evaluation of PLMN-system behaviour will require performance data collected and recorded by its NEs according to a schedule established by the EM.

This aspect of the management environment is termed Performance Management. The purpose of any Performance Management activity is to collect performance related data, which can be used to locate potential problems in the network.

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# 1 Scope

The present document specifies the Common Object Request Broker Architecture (CORBA) Solution Set (SS) for the IRP whose semantics is specified in PM (Performance Management) IRP: Information Service 3GPP TS 32.412 [7].

This Solution Set specification is related to 3GPP TS 32.412 V6.2.X.

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# 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 TS 32.101: "Telecommunication management; Principles and high level requirements".
- [2] 3GPP TS 32.102: "Telecommunication management; Architecture".
- [3] 3GPP TS 32.411: "Telecommunication management; Performance Management (PM) Integration Reference Point (IRP): Requirements".
- [4] 3GPP TS 32.311: "Telecommunication management; Generic Integration Reference Point (IRP): Requirements".
- [5] 3GPP TS 32.303: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)".
- [6] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".
- [7] 3GPP TS 32.412: "Telecommunication management; Performance Management (PM) Integration Reference Point (IRP): Information Service (IS)".
- [8] 3GPP TS 32.312: "Telecommunication management; Generic Integration Reference Point (IRP) management: Information Service (IS)".
- [9] OMG TC Document telecom/98-11-01: "OMG Notification Service".  
<http://www.omg.org/technology/documents/>
- [10] 3GPP TS 32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.401 [10], 3GPP TS 32.411 [3] and the following apply:

**IRP document version number string (or "IRPVersion"):** See 3GPP TS 32.311 [4].

### 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CM	Configuration Management
CORBA	Common Object Request Broker Architecture
DN	Distinguished Name
EM	Element Manager
IDL	Interface Definition Language
IS	Information Service
MOC	Managed Object Class
NE	Network Element
OMG	Object Management Group
PM	Performance Management
SS	Solution Set

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## 4 Architectural features

The overall architectural feature of PMIRP is specified in 3GPP TS 32.411 [3].

This clause specifies features that are specific to the CORBA SS.

### 4.1 Notifications

Notifications are sent according to the Notification IRP: CORBA SS (see 3GPP TS 32.303 [5]).

The contents of the PMIRP notifications are defined in the present document.

### 4.2 Syntax for distinguished names and versions

The format of a Distinguished Name is defined in 3GPP TS 32.300 [6].

The version of this IRP is represented as a string (see also clause 3 for versions).

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## 5 Mapping

### 5.1 Operation and Notification mapping

PMIRP: IS 3GPP TS 32.412 [7] defines semantics of operation and notification visible across the PMIRP. Table 1 indicates mapping of these operations and notifications to their equivalents defined in this SS.

Table 1: Mapping from IS Operations and Notification to SS equivalents

IS Operations/ notification 3GPP TS 32.412 [7]	SS Method	Qualifier
createMeasurementJob	create_measurement_job	M
stopMeasurementJob	stop_measurement_job	M
suspendMeasurementJob	suspend_measurement_job	O
resumeMeasurementJob	resume_measurement_job	O
listMeasurementJobs	list_measurement_jobs	M
createThresholdMonitor	create_threshold_monitor	O
deleteThresholdMonitor	delete_threshold_monitor	O
listThresholdMonitors	list_threshold_monitors	O
suspendThresholdMonitor	suspend_threshold_monitor	O
resumeThresholdMonitor	resume_threshold_monitor	O
getIRPVersion	get_PM_IRP_versions	M
getOperationProfile (see note)	get_PM_IRP_operations_profile	O
getNotificationProfile (see note)	get_PM_IRP_notification_profile	O
notifyMeasurementJobStatusChanged	push_structured_events(See subclause 6.1)	M
notifyThresholdMonitorStatusChanged	push_structured_events(See subclause 6.1)	O
NOTE: This operation is of ManagedGenericIRP IOC specified in 3GPP TS 32.312 [8]. The PMIRP IOC of [7] inherits from it.		

## 5.2 Operation parameter mapping

The PMIRP: IS 3GPP TS 32.412 [7] defines semantics of parameters carried in operations across the PMIRP. The following tables indicate the mapping of these parameters, as per operation, to their equivalents defined in this SS.

Table 2: Mapping from IS createMeasurementJob parameters to SS equivalents

IS Operation parameter	SS Method parameter	Qualifier
iocName	PMIRPConstDefs::MOClassNameType moClass	M
iocInstanceList	PMIRPConstDefs::MOInstanceListType moInstanceList	M
measurementCategoryList	PMIRPConstDefs::MeasurementCategoryListType measurementCategoryList	M
granularityPeriod	PMIRPConstDefs::GranularityPeriodType granularityPeriod	M
reportingPeriod	PMIRPConstDefs::ReportingPeriodType reportingPeriod	M
startTime	PMIRPConstDefs::IRPTimeTypeOpt startTime	O
stopTime	PMIRPConstDefs::IRPTimeTypeOpt stopTime	O
schedule	PMIRPConstDefs::ScheduleTypeOpt schedule	O
jobId	Return value of type PMIRPConstDefs::JobIdType	M
unsupportedList	PMIRPConstDefs::JobUnsupportedListType unsupportedList	M
priority	PMIRPConstDefs::JobPriorityTypeOpt priority	O
status	ManagedGenericIRPConstDefs::Signal Exception: CreateMeasurementJob, ManagedGenericIRPSystem::InvalidParameter, ManagedGenericIRPSystem::ParameterNotSupported, HighWorkLoad	M

Table 3: Mapping from IS stopMeasurementJob parameters to SS equivalents

IS Operation parameter	SS Method parameter	Qualifier
jobId	PMIRPConstDefs::JobIdType jobId	M
status	PMIRPConstDefs::ResultType Exception: StopMeasurementJob, UnknownJob, JobCannotBeStopped	M



**Table 4: Mapping from IS suspendMeasurementJob parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
jobId	PMIRPCConstDefs::JobIdType jobId	M
status	PMIRPCConstDefs::ResultType Exception: SuspendMeasurementJob, UnknownJob, JobAlreadySuspended, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 5: Mapping from IS resumeMeasurementJob parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
jobId	PMIRPCConstDefs::JobIdType jobId	M
status	PMIRPCConstDefs::ResultType Exception: ResumeMeasurementJob, UnknownJob, JobsNotSuspended, HighWorkLoad, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 6: Mapping from IS listMeasurementJobs parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
jobIdList	PMIRPCConstDefs::JobListIdType jobIdList	M
jobInfoList	Return value of type PMIRPCConstDefs::JobInfoListType	M
status	PMIRPCConstDefs::ResultType Exception: ListMeasurementJobs, ManagedGenericIRPSystem::InvalidParameter	M

**Table 7: Mapping from IS createThresholdMonitor parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
iocName	PMIRPCConstDefs::MOClassNameType moClass	M
iocInstanceList	PMIRPCConstDefs::MOInstanceListType moInstanceList	M
thresholdInfoList	PMIRPCConstDefs::ThresholdInfoListType thresholdInfoList	M
monitorGranularityPeriod	PMIRPCConstDefs::MonitorGranularityPeriodType monitorGranularityPeriod	M
monitorId	Return value of type PMIRPCConstDefs::MonitorIdType	M
unsupportedList	PMIRPCConstDefs::MonitorUnsupportedListType unsupportedList	M
status	ManagedGenericIRPCConstDefs::Signal Exception: CreateThresholdMonitor, ManagedGenericIRPSystem::InvalidParameter, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 8: Mapping from IS deleteThresholdMonitor parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
monitorId	PMIRPCConstDefs::MonitorIdType monitorId	M
status	PMIRPCConstDefs::ResultType Exception: DeleteThresholdMonitor, UnknownThresholdMonitor, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 9: Mapping from IS listThresholdMonitors parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
monitorIdList	PMIRPConstDefs::MonitorIdListType monitorIdList	M
monitorInfoList	Return value of PMIRPConstDefs::MonitorInfoListType	M
status	PMIRPConstDefs::ResultType Exception: ListThresholdMonitors, ManagedGenericIRPSystem::InvalidParameter, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 10: Mapping from IS suspendThresholdMonitor parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
monitorId	PMIRPConstDefs::MonitorIdType monitorId	M
status	PMIRPConstDefs::ResultType Exception: SuspendThresholdMonitor, UnknownThresholdMonitor, ThresholdMonitorAlreadySuspended, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 11: Mapping from IS resumeThresholdMonitor parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
monitorId	PMIRPConstDefs::MonitorIdType monitorId	M
status	PMIRPConstDefs::ResultType Exception: ResumeThresholdMonitor, UnknownThresholdMonitor, ThresholdMonitorsNotSuspended, ManagedGenericIRPSystem::OperationNotSupported	M

**Table 12: Mapping from IS getIRPVersion parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
versionNumberSet	Return value of type ManagedGenericIRPConstDefs::VersionNumberSet	M
status	Exception: GetPMIRPVersions	M

**Table 13: Mapping from IS getOperationProfile parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
iRPVersion	ManagedGenericIRPConstDefs::VersionNumber pm_irp_version	M
operationNameProfile,operationParameterProfile	Return of type ManagedGenericIRPConstDefs::MethodList	M
status	Exception: GetPMIRPOperationsProfile, ManagedGenericIRPSystem::OperationNotSupported, ManagedGenericIRPSystem::InvalidParameter	M

**Table 14: Mapping from IS getNotificationProfile parameters to SS equivalents**

IS Operation parameter	SS Method parameter	Qualifier
iRPVersion	ManagedGenericIRPConstDefs::VersionNumber pm_irp_version	M
notificationNameProfile,notificationParameterProfile	Return value of type ManagedGenericIRPConstDefs::MethodList	M
status	Exception: GetPMIRPNotificationProfile, ManagedGenericIRPSystem::OperationNotSupported, ManagedGenericIRPSystem::InvalidParameter	M

## 5.3 Notification parameter mapping

The PMIRP: IS 3GPP TS 32.412 [7] defines semantics of parameters carried in notifications. The following table indicates the mapping of these parameters to their OMG CORBA Structured Event (defined in OMG Notification Service [9]) equivalents. The composition of OMG Structured Event, as defined in the OMG Notification Service [9], is:

```
Header
  Fixed Header
    domain_name
    type_name
    event_name
  Variable Header
Body
  filterable_body_fields
  remaining_body
```

The following tables list all OMG Structured Event attributes in the second column. The first column identifies the PMIRP: IS 3GPP TS 32.412 [7] defined notification parameters.

**Table 5.3.1: Mapping for notifyMeasurementJobStatusChanged**

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
There is no corresponding IS attribute.	domain_name	M	It carries the IRP document version number string. See subclause 3.1. It indicates the syntax and semantics of the Structured Event as defined by the present document.
notificationType	type_name	M	This is the "notifyMeasurementJobStatusChanged".
There is no corresponding IS attribute	event_name	M	It carries no information.
There is no corresponding IS attribute.	Variable Header		
objectClass, objectInstance	One NV pair of filterable_body_fields	M	NV stands for name-value pair. Order arrangement of NV pairs is not significant. The name of NV-pair is always encoded in string.  Name of this NV pair is the MANAGED_OBJECT_INSTANCE of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is a string. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
notificationId	One NV pair of remaining_body	M	Name of NV pair is the NOTIFICATION_ID of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is a long. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
eventTime	One NV pair of filterable_body_fields	M	Name of NV pair is the EVENT_TIME of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is IRPTime. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
systemDN	One NV pair of filterable_body_fields	M	Name of NV pair is the SYSTEM_DN of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is a string. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
jobId	One NV pair of filterable_body_fields	M	Name of NV pair is the JOB_ID of PMIRPNotifDefs::notifyMeasurementJobStatusChanged  Value of NV pair is JobIdType of module PMIRPConstDefs.
jobStatus	One NV pair of remaining_body	M	Name of NV pair is the JOB_STATUS of PMIRPNotifDefs::notifyMeasurementJobStatusChanged  Value of NV pair is JobStatusType of module PMIRPConstDefs.
reason	One NV pair of remaining_body	O	Name of NV pair is the REASON of PMIRPNotifDefs::notifyMeasurementJobStatusChanged  Value of NV pair is a string.

Table 5.3.2: Mapping for notifyThresholdMonitorStatusChanged

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
There is no corresponding IS attribute.	domain_name	M	It carries the IRP document version number string. See subclause 3.1. It indicates the syntax and semantics of the Structured Event as defined by the present document.
notificationType	type_name	M	This is the "notifyThresholdMonitorStatusChanged".
There is no corresponding IS attribute	event_name	M	It carries no information.
There is no corresponding IS attribute.	Variable Header		
objectClass, objectInstance	One NV pair of filterable_body_fields	M	NV stands for name-value pair. Order arrangement of NV pairs is not significant. The name of NV-pair is always encoded in string.  Name of this NV pair is the MANAGED_OBJECT_INSTANCE of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is a string. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
notificationId	One NV pair of remaining_body	M	Name of NV pair is the NOTIFICATION_ID of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is a long. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
eventTime	One NV pair of filterable_body_fields	M	Name of NV pair is the EVENT_TIME of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is IRPTime. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
systemDN	One NV pair of filterable_body_fields	M	Name of NV pair is the SYSTEM_DN of interface AttributeNameValue of module NotificationIRPConstDefs.  Value of NV pair is a string. See corresponding table in Notification IRP: CORBA SS (3GPP TS 32.303 [5]).
monitorId	One NV pair of filterable_body_fields	M	Name of NV pair is the MONITOR_ID of PMIRPNotifDefs::notifyThresholdMonitorStatusChanged  Value of NV pair is MonitorIdType of module PMIRPConstDefs.
monitorStatus	One NV pair of remaining_body	M	Name of NV pair is the MONITOR_STATUS of PMIRPNotifDefs::notifyThresholdMonitorStatusChanged  Value of NV pair is MonitorStatusType of module PMIRPConstDefs.
reason	One NV pair of remaining_body	O	Name of NV pair is the REASON of PMIRPNotifDefs::notifyThresholdMonitorStatusChanged  Value of NV pair is a string.

---

## 6 PMIRPNotification Interface

OMG CORBA Notification push operation is used to realise the notification of PMIRP Notifications. All the notifications in this interface are implemented using this `push_structured_event` method.

### 6.1 Method `push` (M)

```
module CosNotifyComm {  
  ...  
  Interface SequencePushConsumer : NotifyPublish {  
    void push_structured_events(  
      in CosNotification::EventBatch notifications)  
        raises( CosEventComm::Disconnected);  
  };  
  // SequencePushConsumer  
  ...  
}; // CosNotifyComm
```

NOTE 1: The `push_structured_events` method takes an input parameter of type `EventBatch` as defined in the `OMG CosNotification` module (OMG Notification Service [9]). This data type is the same as a sequence of Structured Events. Upon invocation, this parameter will contain a sequence of Structured Events being delivered to `IRPManager` by `IRPAgent` to which it is connected.

NOTE 2: The maximum number of events that will be transmitted within a single invocation of this operation is controlled by `IRPAgent` wide configuration parameter.

NOTE 3: The amount of time the supplier (`IRPAgent`) of a sequence of Structured Events will accumulate individual events into the sequence before invoking this operation is controlled by `IRPAgent` wide configuration parameter as well.

NOTE 4: `IRPAgent` may push `EventBatch` with only one Structured Event.

## Annex A (normative): IDL specifications

```
// File: PMIRPConstDefs.idl

#ifndef _PMIRPCONSTDEFS_IDL_
#define _PMIRPCONSTDEFS_IDL_

#include "TimeBase.idl"

// This statement must appear after all include statements
#pragma prefix "3gppsa5.org"

/* ## Module: PMIRPConstDefs
This module contains commonly used definitions for PM IRP
=====
*/
module PMIRPConstDefs
{
    enum ResultType {OK, Failure};

    typedef string MOCClassNameType;
    typedef string MOInstanceType;
    typedef sequence<MOInstanceType> MOInstanceListType;
    typedef string MeasurementCategoryType;
    typedef sequence<MeasurementCategoryType> MeasurementCategoryListType;
    typedef unsigned long GranularityPeriodType; //The unit is minute.
    typedef unsigned long ReportingPeriodType; //The unit is minute.
    typedef TimeBase::UtcT UTCTimeType;

    union IRPTimeTypeOpt switch(boolean)
    {
        case TRUE: UTCTimeType value;
    };

    struct Time24
    {
        unsigned short hour; // 0-23
        unsigned short minute; // 0-59
    };

    struct IntervalOfDayType
    {
        Time24 intervalStartTime;
        Time24 intervalStopTime;
    };
    typedef sequence<IntervalOfDayType> DailySchedulingType;

    const short Sunday = 1;
    const short Monday = 2;
    const short Tuesday = 4;
    const short Wednesday = 8;
    const short Thursday = 16;
    const short Friday = 32;
    const short Saturday = 64;

    typedef short DaysOfWeekType;
    // Bit mask of week days,
    // e.g. 'Sunday(1) and Wednesday(8)' is encoded as 9.

    struct WeeklySchedulingElement
    {
        DaysOfWeekType days;
        DailySchedulingType intervalsOfDay;
    };
    typedef sequence<WeeklySchedulingElement> WeeklySchedulingType;
    enum scheduleTypeChoice { Daily, Weekly };
    union ScheduleType switch (scheduleTypeChoice)
    {
        case Daily: DailySchedulingType dailyScheduling;
        case Weekly: WeeklySchedulingType weeklyScheduling;
    };
    union ScheduleTypeOpt switch(boolean)

```

```

{
  case TRUE: ScheduleType value;
};

typedef unsigned long JobIdType;
typedef sequence<JobIdType> JobIdListType;
struct JUnsupportedType
{
  MOInstanceType moInstance;
  MeasurementCategoryType measurementCategory;
  string reason;
};
typedef sequence<JUnsupportedType> JUnsupportedListType;

/**
 * Defines the name of an attribute of a Managed Object
 */
typedef string MOAttributeName;

enum JobStatusType {Scheduled, Active, Suspended, Stopped};
enum JobPriorityType {Low, Medium, High};
union JobPriorityTypeOpt switch (boolean)
{
  case TRUE: JobPriorityType value;
};

struct JobInfoType
{
  JobIdType jobId;
  MOClassNameType moClass;
  MOInstanceListType moInstanceList;
  MeasurementCategoryListType measurementCategoryList;
  GranularityPeriodType granularityPeriod;
  ReportingPeriodType reportingPeriod;
  IRPTimeTypeOpt startTime;
  IRPTimeTypeOpt stopTime;
  ScheduleTypeOpt schedule;
  JobStatusType jobStatus;
  JobPriorityTypeOpt jobPriority;
};
typedef sequence<JobInfoType> JobInfoListType;

typedef string MeasurementTypeNameType;
typedef string SubCounterNameType;
typedef short ProbableCauseType; //THRESHOLD_CROSSED = 351;

typedef string SpecificProblemType;
typedef any ThresholdValueType;
enum SeverityType {Warning, Minor, Major, Critical};
union HysteresisType switch(boolean)
{
  case TRUE: long longValue;
  case FALSE: float floatValue;
};
enum DirectionType { Increasing, Decreasing};
struct ThresholdPackElementType
{
  ThresholdValueType thresholdValue;
  SeverityType severity;
  HysteresisType hysteresis;
};
typedef sequence<ThresholdPackElementType> ThresholdPackType;
struct ThresholdInfoType
{
  MeasurementTypeNameType measurementTypeName;
  SubCounterNameType subCounterName;
  ProbableCauseType probableCause;
  SpecificProblemType specificProblem;
  DirectionType direction;
  ThresholdPackType thresholdPack;
};
typedef sequence<ThresholdInfoType> ThresholdInfoListType;
typedef GranularityPeriodType MonitorGranularityPeriodType;// time period is based on 5 minutes.
typedef unsigned long MonitorIdType;
struct MUnsupportedType
{

```



```

    MOInstanceType moInstance;
    MeasurementTypeNameType measurementTypeName;
    SubCounterNameType subCounterName;
    string reason;
};
typedef sequence<MUnsupportedType> MUnsupportedListType;
enum MonitorStatusType {MSuspended, MActive};

typedef sequence<MonitorIdType> MonitorIdListType;
typedef string EventTypeType; // The value is "Quality of Service Alarm"
struct MonitorInfoType
{
    MonitorIdType monitorId;
    MOClassNameType moClass;
    MOInstanceListType moInstanceList;
    MonitorGranularityPeriodType monitorGranularityPeriod;
    ThresholdInfoListType thresholdInfoList;
    MonitorStatusType thresholdMonitorStatus;
    EventTypeType eventType;
};
typedef sequence<MonitorInfoType> MonitorInfoListType;

/**
 * This block identifies attributes which are included as part of the
 * PMIRP. These attribute values should not
 * clash with those defined for the attributes of notification
 * header (see IDL of Notification IRP).
 */
interface AttributeNameValue
{
    const string JOB_ID = "JOB_ID";
    const string JOB_STATUS = "JOB_STATUS";
    const string REASON = "REASON";
    const string MONITOR_ID = "MONITOR_ID";
    const string MONITOR_STATUS = "MONITOR_STATUS";

    const string MONITOR_GRANULARITYPERIOD = "MONITOR_GRANULARITYPERIOD";
    const string THRESHOLD_INFO_LIST = "THRESHOLD_INFO_LIST";
};
};

#endif _PMIRPCONSTDEFS_IDL_

```

---

## A.2 IDL specification (file name "PMIRPSystem.idl")

```

//File: PMIRPSystem.idl

#ifndef _PMIRPSYSTEM_IDL_
#define _PMIRPSYSTEM_IDL_

#include "ManagedGenericIRPSystem.idl"
#include "ManagedGenericIRPConstDefs.idl"
#include "PMIRPConstDefs.idl"

// This statement must appear after all include statements
#pragma prefix "3gppsa5.org"

/* ## Module: PMIRPSystem
This module contains the specification of all operations of PM IRP Agent.
=====
*/
module PMIRPSystem
{
    /**
    * The reason specifies whether EM or NE has high workload. The value shall be one
    * of following: emCpuBusy; emHDSshortage, emLowMemory, {neCpuBusy, neObjectInstList},
    * {neHDSshortage neObjectInstList}, {neLowMemory, neObjectInstList}, maxJobReached,
    * otherReason.
    * In the case the reason is a tuple, the first element is the string such as
    * "NE_CPU_BUSY" followed by a comma, then followed by a sequence of DN where
    * each DN is separated by its adjacent DN, if any, by a colon. The DN is formatted
    * as described in 32.300.
    */

```

```

*/
exception HighWorkLoad { string reason; };
interface HighWorkLoadExceptionReason
{
    const string EmCpuBusy = "EM_CPU_BUSY";
    const string EmHDSshortage = "EM_HD_SHORTAGE";
    const string EmLowMemory = "EM_LOW_MEMORY";
    const string NeCpuBusy = "NE_CPU_BUSY";
    const string NeHDSshortage = "NE_HD_SHORTAGE";
    const string NeLowMemory = "NE_LOW_MEMORY";
    const string MaxJobReached = "MAX_JOB_REACHED";
    const string OtherReason = "OTHER_REASON";
};

exception UnknownJob { string reason; };
exception JobCannotBeStopped { string reason; };
exception JobAlreadySuspended { string reason; };
exception JobIsNotSuspended { string reason; };
exception UnknownThresholdMonitor { string reason; };
exception ThresholdMonitorAlreadySuspended { string reason; };
exception ThresholdMonitorIsNotSuspended { string reason; };

/**
 * System fails to complete the operation. System can provide reason
 * to qualify the exception. The semantics carried in reason
 * is outside the scope of this IRP.
 */
exception GetPMIRPVersions { string reason; };
exception GetPMIRPOperationsProfile { string reason; };
exception GetPMIRPNotificationProfile { string reason; };
exception CreateMeasurementJob { string reason; };
exception StopMeasurementJob { string reason; };
exception SuspendMeasurementJob { string reason; };
exception ResumeMeasurementJob { string reason; };
exception ListMeasurementJobs { string reason; };

exception CreateThresholdMonitor { string reason; };
exception DeleteThresholdMonitor { string reason; };
exception ListThresholdMonitors { string reason; };
exception SuspendThresholdMonitor { string reason; };
exception ResumeThresholdMonitor { string reason; };

interface PMIRP
{
    readonly attribute string iRPID;

    /**
     * Return the list of all supported PM IRP versions.
     */
    ManagedGenericIRPConstDefs::VersionNumberSet get_PM_IRP_versions (
    )
    raises (GetPMIRPVersions);

    /**
     * Return the list of all supported operations and their supported
     * parameters for a specific PM IRP version.
     */
    ManagedGenericIRPConstDefs::MethodList get_PM_IRP_operations_profile (
        in ManagedGenericIRPConstDefs::VersionNumber pm_irp_version
    )
    raises (GetPMIRPOperationsProfile,
            ManagedGenericIRPSystem::OperationNotSupported,
            ManagedGenericIRPSystem::InvalidParameter);

    /**
     * Return the list of all supported notifications and their supported
     * parameters for a specific PM IRP version.
     */
    ManagedGenericIRPConstDefs::MethodList get_PM_IRP_notification_profile
    (
        in ManagedGenericIRPConstDefs::VersionNumber pm_irp_version
    )
    raises (GetPMIRPNotificationProfile,
            ManagedGenericIRPSystem::OperationNotSupported,
            ManagedGenericIRPSystem::InvalidParameter);
}

```

```

/**
 * Request to create a MeasurementJob through Itf-N.
 */
ManagedGenericIRPConstDefs::Signal create_measurement_job (
    in PMIRPConstDefs::MOClassNameType moClass,
    in PMIRPConstDefs::MOInstanceListType moInstanceList,
    in PMIRPConstDefs::MeasurementCategoryListType measurementCategoryList,
    in PMIRPConstDefs::GranularityPeriodType granularityPeriod,
    in PMIRPConstDefs::ReportingPeriodType reportingPeriod,
    in PMIRPConstDefs::IRPTimeTypeOpt startTime,
    in PMIRPConstDefs::IRPTimeTypeOpt stopTime,
    in PMIRPConstDefs::ScheduleTypeOpt schedule,
    in PMIRPConstDefs::JobPriorityTypeOpt priority,
    out PMIRPConstDefs::JobIdType jobId,
    out PMIRPConstDefs::JUnsupportedListType unsupportedList
)
raises (CreateMeasurementJob,
        ManagedGenericIRPSystem::InvalidParameter,
        ManagedGenericIRPSystem::ParameterNotSupported,
        HighWorkLoad);

/**
 * Request to stop a MeasurementJob through Itf-N, after which,
 * the MeasurementJob will still be visible via Itf-N. Whether
 * the MeasurementJob is thoroughly removed immediately from
 * the managed system is vendor specific.
 */
PMIRPConstDefs::ResultType stop_measurement_job (
    in PMIRPConstDefs::JobIdType jobId)
raises (StopMeasurementJob,
        UnknownJob,
        JobCannotBeStopped);

/**
 * Request to suspend a MeasurementJob
 */
PMIRPConstDefs::ResultType suspend_measurement_job (
    in PMIRPConstDefs::JobIdType jobId)
raises (SuspendMeasurementJob,
        UnknownJob,
        JobAlreadySuspended,
        ManagedGenericIRPSystem::OperationNotSupported);

/**
 * Request to resume a MeasurementJob
 */
PMIRPConstDefs::ResultType resume_measurement_job (
    in PMIRPConstDefs::JobIdType jobId)
raises (ResumeMeasurementJob,
        UnknownJob,
        JobIsNotSuspended,
        HighWorkLoad,
        ManagedGenericIRPSystem::OperationNotSupported);

/**
 * Request to list the information of all or of specified
 * MeasurementJobs
 */
PMIRPConstDefs::ResultType list_measurement_jobs (
    in PMIRPConstDefs::JobIdListType jobListId,
    out PMIRPConstDefs::JobInfoListType jobInfoList)
raises (ListMeasurementJobs,
        ManagedGenericIRPSystem::InvalidParameter);

/**
 * Request to create a ThresholdMonitor to define the threshold
 * for some specific measurementTypes or subCounters
 */
ManagedGenericIRPConstDefs::Signal create_threshold_monitor (
    in PMIRPConstDefs::MOClassNameType moClass,
    in PMIRPConstDefs::MOInstanceListType moInstanceList,
    in PMIRPConstDefs::ThresholdInfoListType thresholdInfoList,
    in PMIRPConstDefs::MonitorGranularityPeriodType monitorGranularityPeriod,
    out PMIRPConstDefs::MonitorIdType monitorId,
    out PMIRPConstDefs::MUnsupportedListType unsupportedList)
raises (CreateThresholdMonitor,
        ManagedGenericIRPSystem::InvalidParameter,

```

```

        ManagedGenericIRPSystem::OperationNotSupported);

/**
 * Request to delete a specified ThresholdMonitor
 */
PMIRPConstDefs::ResultType delete_threshold_monitor (
    in PMIRPConstDefs::MonitorIdType monitorId)
raises (DeleteThresholdMonitor,
        UnknownThresholdMonitor,
        ManagedGenericIRPSystem::OperationNotSupported);

/**
 * Request to list detailed information about all or
 * specified ThresholdMonitors
 */
PMIRPConstDefs::ResultType list_threshold_monitors (
    in PMIRPConstDefs::MonitorIdListType monitorIdList,
    out PMIRPConstDefs::MonitorInfoListType monitorInfoList)
raises (ListThresholdMonitors,
        ManagedGenericIRPSystem::InvalidParameter,
        ManagedGenericIRPSystem::OperationNotSupported);

/**
 * Request to suspend a ThresholdMonitor
 */
PMIRPConstDefs::ResultType suspend_threshold_monitor (
    in PMIRPConstDefs::MonitorIdType monitorId)
raises (SuspendThresholdMonitor,
        UnknownThresholdMonitor,
        ThresholdMonitorAlreadySuspended,
        ManagedGenericIRPSystem::OperationNotSupported);

/**
 * Request to resume a ThresholdMonitor
 */
PMIRPConstDefs::ResultType resume_threshold_monitor (
    in PMIRPConstDefs::MonitorIdType monitorId)
raises (ResumeThresholdMonitor,
        UnknownThresholdMonitor,
        ThresholdMonitorIsNotSuspended,
        ManagedGenericIRPSystem::OperationNotSupported);

};

};

#endif _PMIRPSYSTEM_IDL_

```

---

## A.3 IDL specification (file name "PMIRPNotifications.idl")

```

// File: PMIRPNotifications.idl

#ifndef _PMIRPNOTIFICATIONS_IDL_
#define _PMIRPNOTIFICATIONS_IDL_

#include "PMIRPConstDefs.idl"
#include "NotificationIRPConstDefs.idl"
#include "NotificationIRPNotifications.idl"

// This statement must appear after all include statements
#pragma prefix "3gppsa5.org"

/* ## Module: PMIRPNotifDefs
This module contains the specification of all notifications of PM IRP Agent.
=====
*/
module PMIRPNotifications
{
    /**
    * Constant definitions for the notifyMeasurementJobStatusChanged notification
    */
    interface notifyMeasurementJobStatusChanged: NotificationIRPNotifications::Notify
    {
        const string EVENT_TYPE = "notifyMeasurementJobStatusChanged";
    }
}

```

```
/**
 * This constant defines the name of the jobId property.
 * The data type for the value of this property
 * is PMIRPConstDefs::JobIdType.
 */
const string JOB_ID = PMIRPConstDefs::AttributeNameValue::JOB_ID;

/**
 * This constant defines the name of the jobStatus property.
 * The data type for the value of this property
 * is PMIRPConstDefs::JobStatusType.
 */
const string JOB_STATUS = PMIRPConstDefs::AttributeNameValue::JOB_STATUS;

/**
 * This constant defines the name of the reason property.
 * The data type for the value of this property is string.
 */
const string REASON = PMIRPConstDefs::AttributeNameValue::REASON;
};

/**
 * Constant definitions for the notifyThresholdMonitorStatusChanged notification
 */
interface notifyThresholdMonitorStatusChanged: NotificationIRPNotifications::Notify
{
    const string EVENT_TYPE = "notifyThresholdMonitorStatusChanged";

    /**
     * This constant defines the name of the monitorId property.
     * The data type for the value of this property
     * is PMIRPConstDefs::MonitorIdType.
     */
    const string MONITOR_ID = PMIRPConstDefs::AttributeNameValue::MONITOR_ID;

    /**
     * This constant defines the name of the monitorStatus property.
     * The data type for the value of this property
     * is PMIRPConstDefs::MonitorStatusType.
     */
    const string MONITOR_STATUS = PMIRPConstDefs::AttributeNameValue::MONITOR_STATUS;

    /**
     * This constant defines the name of the reason property.
     * The data type for the value of this property is string.
     */
    const string REASON = PMIRPConstDefs::AttributeNameValue::REASON;
};

};

#endif _PMIRPNOTIFICATIONS_IDL_
```

## Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Mar 2004	S_23	SP-040136	--	--	Submitted to TSG SA#23 for Approval	2.0.0	6.0.0
Jun 2004	S_24	SP-040273	001	--	Correction and enhancement of data type definitions in IDL files	6.0.0	6.1.0
Sep 2004	S_25	SP-040557	002	--	Align to latest PM IRP Information Service (IS) 32.412 version number	6.1.0	6.2.0
Sep 2004	S_25	SP-040558	003	--	Add Measurement Job Overload Management function – Align with 32.412	6.1.0	6.2.0
Dec 2004	SA_26	SP-040784	004	--	Add missing exception & filter to PM IRP CORBA SS, Align with IDL Style Guide in 32.150	6.2.0	6.3.0

---

## History

<b>Document history</b>		
V6.3.0	December 2004	Publication