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**Digital cellular telecommunications system (Phase 2+) (GSM);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
Telecommunication management;  
Integration Reference Point (IRP) overview and usage guide  
(3GPP TS 32.103 version 11.6.0 Release 11)**



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# Foreword

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# Introduction

This document provides the IRP Overview for 3GPP specifications, addressing Interface IRPs, NRM IRPs, Measurement / Trace /SON specifications, as well as their relationships with each other.

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# 1 Scope

The present document gives an overview about 3GPP's management interface capabilities and related functionality. It provides high-level information about IRP Framework, available IRPs as well as their relationship with each other. This document is intended to be a guide into the world of 3GPP management specifications, enabling also non-subject matter experts to gain an understanding about 3GPP's management solutions.

In addition Annex A provides IRP packaging suggestions, intended to guide service providers as well as equipment and solutions providers to identify and choose suitable standardized management interface capabilities.

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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.
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- [147] 3GPP TS 28.621: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [148] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [149] 3GPP TS 28.623: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [150] 3GPP TS 28.627: "Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [151] 3GPP TS 28.628: "Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [152] 3GPP TS 28.629: "Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [153] 3GPP TS 28.631: "Telecommunication management; Inventory Management (IM) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [154] 3GPP TS 28.632: "Telecommunication management; Inventory Management (IM) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [155] 3GPP TS 28.633: "Telecommunication management; Inventory Management (IM) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [156] 3GPP TS 28.651: "Telecommunication management; Universal Terrestrial Radio Access Network (UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [157] 3GPP TS 28.652: "Telecommunication management; Universal Terrestrial Radio Access Network (UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [158] 3GPP TS 28.653: "Telecommunication management; Universal Terrestrial Radio Access Network (UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [159] 3GPP TS 28.654: "Telecommunication management; GSM/EDGE Radio Access Network (GERAN) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [160] 3GPP TS 28.655: "Telecommunication management; GSM/EDGE Radio Access Network (GERAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [161] 3GPP TS 28.656: "Telecommunication management; GSM/EDGE Radio Access Network (GERAN) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [162] 3GPP TS 28.657: "Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [163] 3GPP TS 28.658: "Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

- [164] 3GPP TS 28.659: "Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [165] 3GPP TS 28.661: "Telecommunication management; Generic Radio Access Network (RAN) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [166] 3GPP TS 28.662: "Telecommunication management; Generic Radio Access Network (RAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [167] 3GPP TS 28.663: "Telecommunication management; Generic Radio Access Network (RAN) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [168] 3GPP TS 28.671: "Telecommunication management; Home Node B (HNB) Subsystem (HNS) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [169] 3GPP TS 28.672: "Telecommunication management; Home Node B (HNB) Subsystem (HNS) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [170] 3GPP TS 28.673: "Telecommunication management; Home Node B (HNB) Subsystem (HNS) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [171] 3GPP TS 28.674: "Telecommunication management; Home enhanced Node B (HeNB) Subsystem (HeNS) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [172] 3GPP TS 28.675: "Telecommunication management; Home enhanced Node B (HeNB) Subsystem (HeNS) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [173] 3GPP TS 28.676: "Telecommunication management; Home enhanced Node B (HeNB) Subsystem (HeNS) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [174] 3GPP TS 28.701: "Telecommunication management; Core Network (CN) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [175] 3GPP TS 28.702: "Telecommunication management; Core Network (CN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [176] 3GPP TS 28.703: "Telecommunication management; Core Network (CN) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [177] 3GPP TS 28.704: "Telecommunication management; IP Multimedia Subsystem (IMS) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [178] 3GPP TS 28.705: "Telecommunication management; IP Multimedia Subsystem (IMS) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [179] 3GPP TS 28.706: "Telecommunication management; IP Multimedia Subsystem (IMS) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [180] 3GPP TS 28.707: "Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [181] 3GPP TS 28.708: "Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [182] 3GPP TS 28.709: "Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [183] 3GPP TS 28.731: "Telecommunication management; Transport Network (TN) interface Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [184] 3GPP TS 28.732: "Telecommunication management; Transport Network (TN) interface Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

- [185] 3GPP TS 28.733: "Telecommunication management; Transport Network (TN) interface Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [186] 3GPP TS 28.734: "Telecommunication management; Signalling Transport Network (STN) interface Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [187] 3GPP TS 28.735: "Telecommunication management; Signalling Transport Network (STN) interface Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [188] 3GPP TS 28.736: "Telecommunication management; Signalling Transport Network (STN) interface Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [189] 3GPP TS 28.751: "Telecommunication management; Subscription Management (SuM) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements".
- [190] 3GPP TS 28.752: "Telecommunication management; Subscription Management (SuM) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [191] 3GPP TS 28.753: "Telecommunication management; Subscription Management (SuM) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], TS 32.150 [2].

### 3.2 Abbreviations

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

FMC	Fixed Mobile Convergence
FNIM	Federated Network Information Model
IF	Interface
IRP	Integration Reference Point
IS	Information Service
SS	Solution Set
UIM	Umbrella Information Model



## 4 IRP Framework

### 4.1 Introduction

For the purpose of management interface development 3GPP has developed an interface concept known as Integration Reference Point (IRP) to promote the wider adoption of standardized management interfaces in telecommunication networks. The IRP concept and associated methodology employs model-driven development, protocol and technology neutral modelling methods as well as protocol specific solution sets to achieve its goals.

IRP Framework and Methodology related 3GPP specifications:

- 32.150 [2]: Integration Reference Point (IRP) Concept and definitions
- 32.151 [13]: IRP Information Service (IS) template (*applicable to 32-series IRPs*)
- 32.152 [14]: IRP IS Unified Modeling Language (UML) repertoire
- 32.153 [15]: IRP technology specific templates, rules and guidelines
- 32.154 [16]: Backward and Forward Compatibility Concept and definitions
- 32.155 [17]: Requirements template
- 32.156 [144]: Fixed Mobile Convergence (FMC) Model repertoire
- 32.157 [145]: IRP Information Service (IS) template (*applicable for FMC*)

### 4.2 IRP Framework Highlights

#### 4.2.1 IRP Concept

IRP specifications are specified using a 3-level approach: Requirements, IS-level and SS-level.

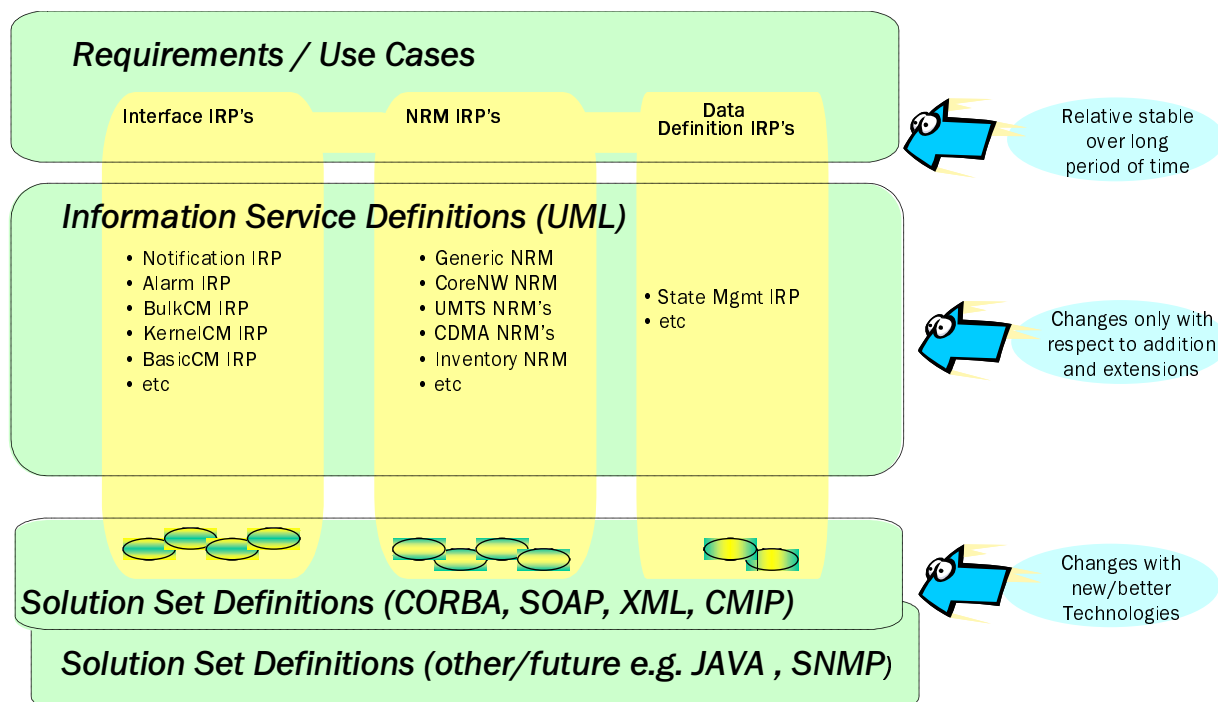


Figure 4.2-1: The IRP 3-Level Specifications Approach combined with the three IRP categories [2].

**Requirements-level:**

The "Requirements-level" intends to provide conceptual and use cases definitions for a specific management interface aspect as well as defining subsequent requirements for this IRP.

**IS-level:**

- The "IS-level" provides the technology independent specification of an IRP.

**SS-level:**

The "SS-level" finally provides the mapping of IS definitions into one or more technology-specific Solution Sets. This concept provides support for multiple interface technologies as applicable on a vendor and/or network type basis and also enables accommodation of future interface technologies - without the need to redefine requirements and IS-level definitions.

## 4.2.2 Relationships between IRPs

There are three categories of IRP specifications:

- Interface IRPs
- NRM IRPs
- Data Definition IRPs

Each category is partitioned into Requirements, IS-level and SS-level specifications.

Relationships between various kinds of IRPs:

- Some Interface IRPs and NRM IRPs are used together. Such Interface IRPs operate on entities modelled by NRM IRPs. For example, operations defined in Basic CM IRP are used together with E- UTRAN NRM IRP to support E- UTRAN configuration management function.
- Interface IRPs are network/radio technology independent and can operate on entities modelled by NRM IRPs of different network technologies. For example, operations defined in Basic CM IRP are used together with E- UTRAN NRM IRP or UTRAN NRM IRP to support E- UTRAN or UTRAN configuration management functions.
- Interface IRPs are Converged Management ready (e.g. support management of fixed and/or mobile) and can operate on modelled mobile and/or fixed network entities.
- A Data Definition IRP provides common data definitions, referenced by specifications of Interface IRPs and NRM IRPs.

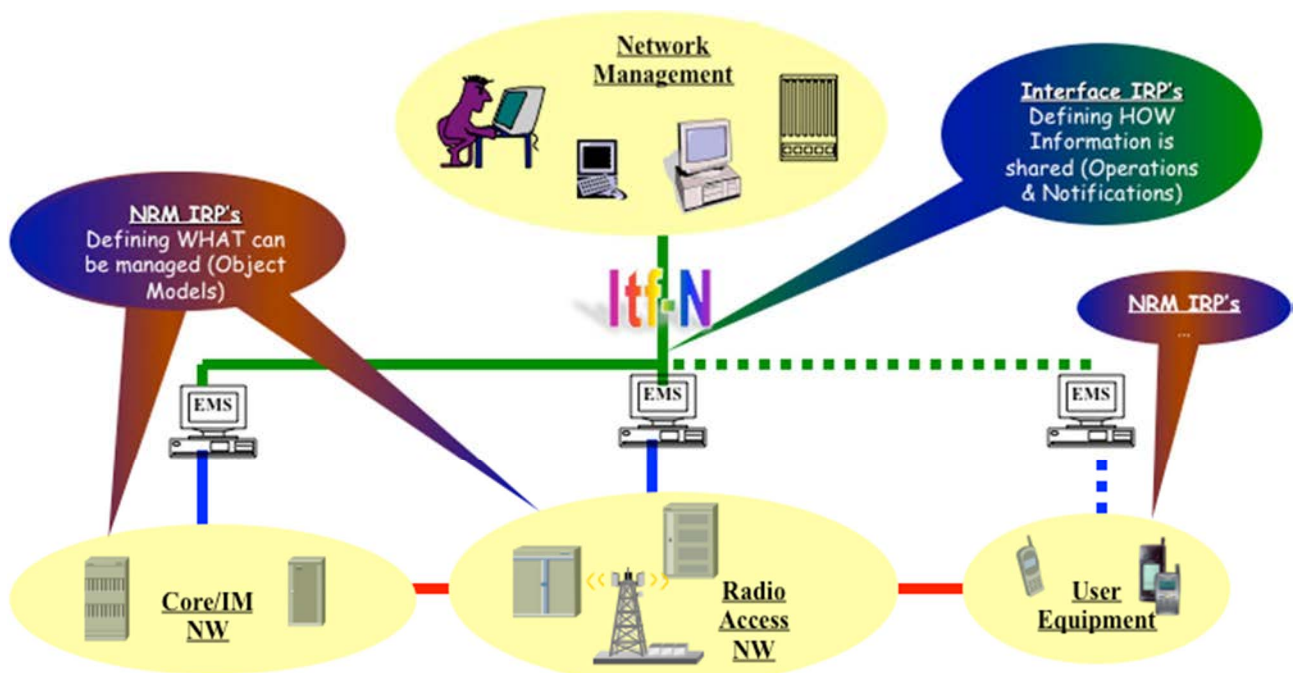


Figure 4.2-2: Relationship Interface IRP vs NRM IRP

### 4.2.3 IRP Development Principles

**NRM IRP Extendibility** - Enabling Technology, Organizational & Vendor-specific NRM extensions via

- Rule-based NRM Extensions (e.g. Sub-classing)
- vsDataContainer

**Interface IRP Flexibility** - Enabling: wide applicability, phased introduction capabilities & broad industry adoption (not just for wireless) via

- Flexible use of qualifiers "mandatory", "optional", "conditional" for operation, notifications and/or parameters
- NRM/Technology-neutrality & avoiding competing procedures

### 4.2.4 IRP Specification Structure

32-series IRPs follow a uniform specification structure:

- xx1: xyz IRP Requirements
- xx2: xyz IRP IS
- xx3: xyz IRP CORBA SS (merged into xx6 after R9)
- xx4: xyz IRP CMIP SS (retired after R6)
- xx5: xyz IRP XML Definitions (applicable for NRM's & notification emitting IRPs - merged into xx6 after R9)
- xx6: xyz IRP SS (since R10, containing all technology specific Solution Set definitions)
- xx7: xyz IRP SOAP SS (merged into xx6 after R9)

28-series IRPs (supporting FMC) consisting of 3-specification sets, structured as follows:

- 28.3xx: Interface IRP specifications.
- 28.620-28.649: Common/Generic NRM IRPs.
- 28.650-28.699: Access Network related NRM IRPs.
- 28.700-28.729: CN-related NRM IRPs.
- 28.730-28.749: Transport-related NRM IRPs.
- 28.750-28.769: Service-related NRM IRPs.
- 28.770-28.799: *reserved for future topic NRM IRPs.*

## 4.2.5 Essential IRP Definitions [2]

**Data Definition IRP:** 3GPP publishes IRP specifications relating to commonly used data definitions that can be imported for use by Interface IRP and/or NRM IRP. This term represents all such specifications. An example of a Data Definition IRP is the State Management IRP (32.671 [109], 32.672 [110], 32.673 [111], etc).

**Integration Reference Point (IRP):** An architectural concept that is described by a set of specifications for definition of a certain aspect of a management interface, comprising a **Requirements** specification, an **Information Service** specification, and one or more **Solution Set** specifications.

**Interface IRP:** 3GPP publishes a number of IRP specifications each of which is related to a set of operations and notifications for a specific telecom management domain such as alarm management, configuration management, etc. Interface IRPs also contain definitions of Support IOCs. This term represents all such specifications. An example of an Interface IRP is the Basic CM IRP (the set of TSs 32.601 [88], 32.602 [89], 32.606 [90], etc.).

**IRPAgent:** Encapsulates a well-defined subset of network (element) functions. It interacts with IRPManagers using one or more IRPs. From the IRPManager's perspective, the IRPAgent behaviour is only visible via the IRP(s).

**Information Service (IS):** an IRP Information Service describes the information related to the entities (either network resources or support objects) to be managed and the way that the information may be managed for a certain functional area (e.g. the Alarm IRP Information Service in the fault management area). Information Services are defined for all IRPs.

**IRPManager:** Models a user of IRPAgent(s) and it interacts directly with the IRPAgent(s) using IRP(s). Since the IRPManager represents an IRPAgent user, it gives a clear picture of what the IRPAgent is supposed to do. From the IRPAgent perspective, the IRPManager behaviour is only visible via the IRP.

**Network Resource Model (NRM):** An Information Service describing Information Object Classes representing the manageable aspects of network resources, e.g. an RNC or NodeB.

**NRM IRP:** 3GPP publishes a number of IRP specifications each of which is related to a particular NRM (Network Resource Model) as defined in 3GPP TS 32.101 [3]. NRM IRPs do not define any operations or notifications. This term represents all such specifications. Note: In some NRM IRP titles, for historic reasons, they are named "...network resources IRP"). An example of an NRM IRP is the Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97], etc.).

**Solution Set (SS):** contains a mapping of the IRP Information Service (IS) defined entities (that are technology-agnostic) to technology specific termed entities. It does not contain specification of the entities' semantics. The semantics can be found in the corresponding IS. It is noted that one IS can be mapped to one or several SSs.

## 4.3 IRP related High-level Requirements & Architecture Specifications

The IRP Framework has been developed in response to management requirements documented in the following specifications:

- 32.101[3]: Principles and high level requirements

- 32.102 [4]: Architecture
- 32.107: Fixed Mobile Convergence (FMC) Federated Network Information Model (FNIM)
- 32.111-1 [5]: 3G fault management requirements
- 32.140 [11],32.141 [12]: SuM requirements / SuM architecture
- 32.300 [21]: Name convention for Managed Objects
- 32.401 [49]: PM Concept and requirements
- 32.500 [75]: SON Concepts and requirements
- 32.511 [79]: ANR management Concepts and requirements
- 32.521 [80]: Self-optimization Concepts and requirements
- 32.541 [86]: Self-healing Concepts and requirements
- 32.551 [87]: Energy Saving Management (ESM) Concepts and requirements
- 32.600 [88]: CM Concept and high-level requirements
- 32.854: Fixed Mobile Convergence (FMC) 3GPP / TM Forum Concrete Model Relationships and Use Cases

## 4.4 Converged Management and IRPs

As outlined in previous sections, 3GPP Interface IRPs are network-technology-independent, and therefore can be utilized for the management of various network technologies.

To further ease converged management (the common management of multiple network technologies) and to address the need for OPEX reduction, 3GPP together with other industry organizations (i.e. NGMN and TM Forum) developed jointly the following specifications:

- Fixed Mobile Convergence (FMC) Federated Network Information Model (FNIM) (published in 3GPP as TS 32.107)
  - Defining conceptually the federated network information model and the relationships between participating models (see also section 5.5 of TS 32.101 [3]).
- FMC FNIM Umbrella Information Model (UIM) (published in 3GPP as TS 28.620 [146])
  - Providing abstract definitions of information objects applicable across Domain/Technology-specific Concrete Models.
- Fixed Mobile Convergence (FMC) Model repertoire (published in 3GPP as TS 32.156 [144])
  - Defining meta definitions for models supporting converged management.
- Fixed Mobile Convergence (FMC) 3GPP / TM Forum Concrete Model Relationships and Use Cases (published in 3GPP as TR 32.854)
  - Proposing the specific structure of model and realisation of that structure across 3GPP and TM Forum by taking advantage of current TM Forum transport-oriented model work (SID, MTNM/MTOSI) as well as current 3GPP SA5 mobile-oriented model work (NRM IRPs etc.).

Based on above, 3GPP has applied definitions provided by these specifications by creating the 28-series variants of the 3GPP NRM IRPs to support converged management.

## 5 Interface IRPs

### 5.1 Interface IRP Overview

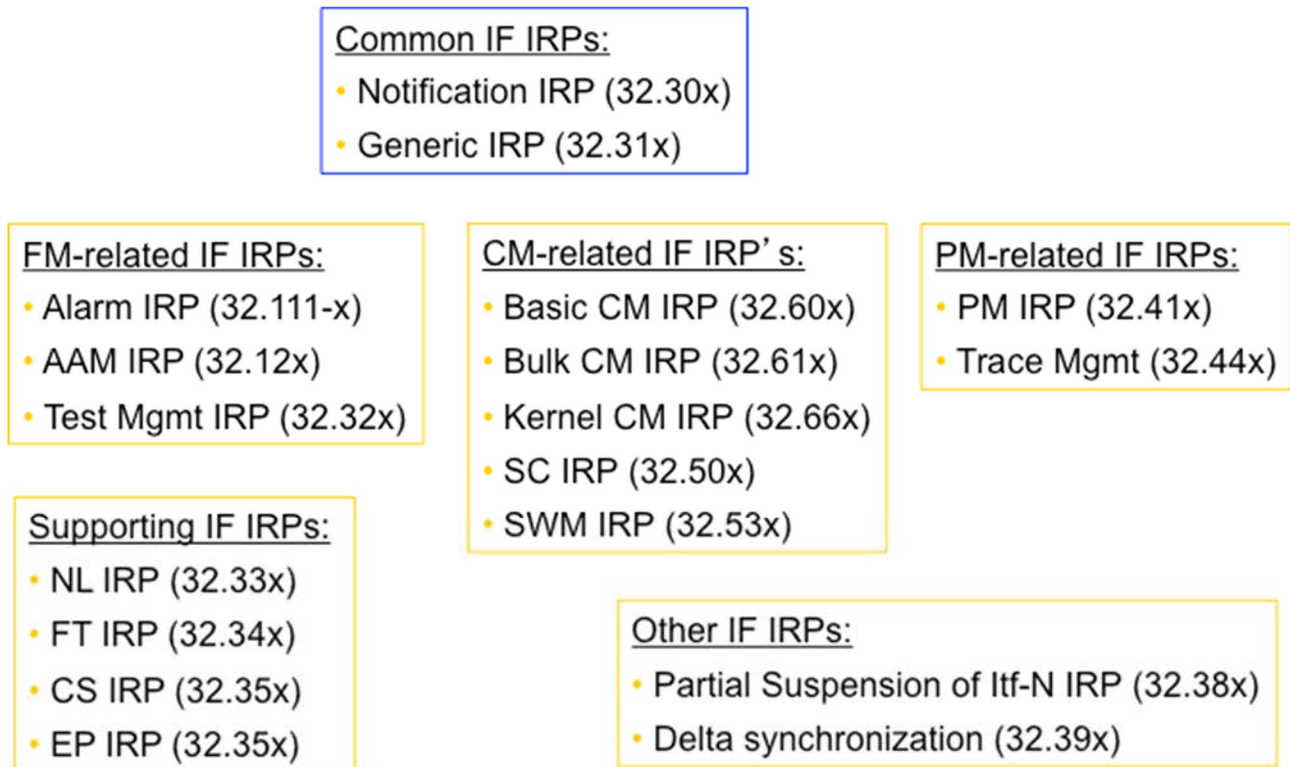


Figure 5.1-1: 3GPP Interface IRPs

### 5.2 Generic/Common Interface IRPs

#### Notification IRP – 32.300 [21], 32.301 [22], 32.302 [23], 32.306[24]

The purpose of the Notification IRP is to define an interface through which an IRPManager can subscribe to an IRPAgent for receiving notifications, manage these subscriptions, and optionally set filters.

#### Generic IRP – 32.311 [25], 32.312 [26], 32.316 [27]

This IRP defines common services supported by all IRPs such as AlarmIRP. With this common service supported by all IRPs, an IRPManager can retrieve the profile of operations and notifications supported by a given IRP name-contained by an IRPAgent. An IRPManager can also retrieve the IRPVersions supported by a given IRP.

## 5.3 FM related Interface IRPs

### Alarm IRP – 32.111-1 [5], 32.111-2 [6], 32.111-3 [6]

The Alarm (IRP) addresses the alarm surveillance aspects of Fault Management (FM), applied to Itf-N. It defines alarm semantics & syntax as well as alarm management related operations and notifications.

### Advanced Alarm Management IRP – 32.121 [8], 32.122 [9], 32.126 [10]

The purpose of Advanced Alarm Management (AAM) IRP is to define an interface through which an IRPManager can categorize alarm notifications. It defines, for the purpose of categorizing alarm notifications, the information observable and controlled by management system's client and it also specifies the semantics of the interactions used to carry this information.

### Test management IRP – 32.321 [28], 32.322 [29], 32.326 [30]

The purpose of the Test management IRP is to define an interface through which an IRPManager can manage and monitor tests in NE's, as well as methods to receive test results.

## 5.4 CM related Interface IRPs

### Self-Configuration IRP – 32.500 [75], 32.501 [76], 32.502 [77], 32.506 [78]

The Self-Configuration provides methods to allow automatic configuration of eNBs, which are brought newly into a network.

### Software Management IRP – 32.531 [83], 32.532 [84], 32.536 [85]

The Software Management IRP provides an IRPManager with capabilities to automate software management via Itf-N.

### Basic CM IRP – 32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]

Using this IRP, an IRPAgent can communicate basic Configuration Management related information to one or several IRPManagers. The function of this Basic CM IRP Information Service is to define an interface for the retrieval and modification of Configuration Management Information.

### Bulk CM IRP – 32.611 [92], 32.612 [93], 32.616 [94]

Using the Bulk CM IRP an IRPAgent can communicate CM related information to one or several IRPManagers using bulk data transfer methods.

- BulkCM SimpleUpload, enabling upload of resource information by the IRPManager without explicit session control
- BulkCM Controlled Upload, enabling a session controlled upload of resource information by the IRPManager
- BulkCM Controlled Upload & Provisioning, enabling a session controlled upload and provisioning of resource information by the IRPManager

### Kernel CM IRP – 32.661 [107], 32.662 [108]

The function of this Kernel CM IRP Information Service is to define an interface that provides essential CM notification services. While it is not expected that the Kernel CM IRP alone will provide adequate CM capabilities, the Kernel CM IRP is expected to provide the common supporting CM notifications required for other CM IRPs such as the Basic CM IRP or the Bulk CM IRP, each of which require the Kernel CM IRP.

## 5.5 PM & Trace related Interface IRPs

### **Performance Management IRP – 32.410 [55], 32.411 [56], 32.412 [57], 32.416 [58]**

The Performance Management IRP is defines an interface through which an IRPManager can manage measurement jobs as well threshold values.

### **Trace Management IRP – 32.441 [67], 32.442 [68], 32.446 [69]**

The Trace Management IRP is defines an interface through which an IRPManager can activate and manage equipment and subscriber trace jobs.

## 5.6 Special-purpose related Interface IRPs

### **Notification Log IRP – 32.331 [31], 32.332 [32], 32.336 [33]**

The purpose of the Notification Log IRP is to define an interface through which an IRPManager can manage a Notification Log, as well as methods for retrieval of logged notifications.

### **File Transfer IRP – 32.341 [34], 32.342 [35], 32.346 [36]**

The purpose of the File Transfer IRP is to define a generic tools set supporting the management of file transfers between IRPManager and IRPAgent. Curently the following management data types are supported by this IRP:

- performance data files
- configuration & inventory files
- test result files
- call trace files
- notification log files
- charging files

### **Communication Surveillance IRP – 32.351 [37], 32.352 [38], 32.356 [39]**

The purpose of the Communication Surveillance IRP is to provide an IRPManager with the capability to monitor the health of the communications link towards an IRPAgent.

### **Entry Point IRP – 32.361 [40], 32.362 [41], 32.366 [42]**

The purpose of the Entry Point IRP is to provide an IRPManager with discovery and entry point capabilities towards an IRPAgent and its supported IRPs.

### **Partial Suspension of Itf-N IRP – 32.381 [43], 32.382 [44], 32.386 [45]**

The purpose of Partial Suspension of Itf-N IRP is to define an interface through which an IRPManager can suspend the forwarding of notifications via Itf-N which were generated in parts of the managed systems.

### **Delta synchronization IRP – 32.391 [46], 32.392 [47], 32.396 [48]**

The purpose of Delta Synchronization IRP is to define an interface through which an IRPManager can request only those data that have changed (i.e. changed, were created or deleted) from a synchronization point onwards.



## 6 NRM IRPs

### 6.1 NRM IRP Overview

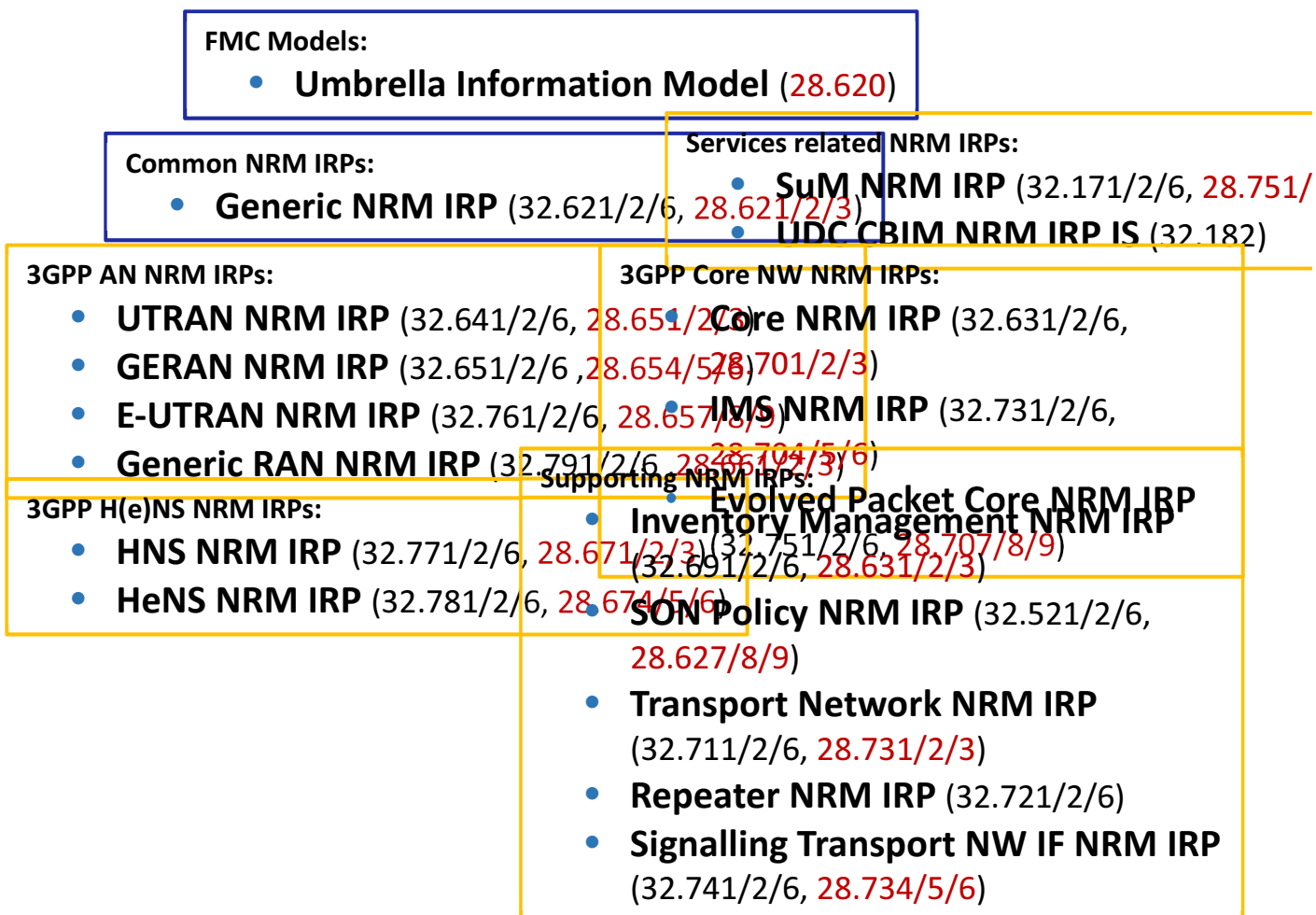


Figure 6.1-1: 3GPP NRM IRPs

## 6.2 FMC Models and Common NRM IRPs

### FMC FNIM Umbrella Information Model (UIM) 28.620 [146]

The Umbrella Information Model (UIM) provides abstract definitions of information objects applicable across Domain/Technology-specific Concrete Models to enable end-to-end consistency of such definitions. These definitions are used by the Generic NRM IRP (28.621[147], 28.622 [148], 28.623 [149]) to enable 3GPP NRM IRPs to be part of the industry-wide Federated Network Information Model (FNIM).

### Generic NRM IRP – 32.621 [95], 32.622 [96], 32.626 [97], 28.621 [147], 28.622 [148], 28.623 [149]

The Generic NRM IRP provides the generic network resources information that can be communicated between an IRP Agent and one or several IRP Managers for network management purposes. To enable converged management, the Generic NRM IRP as defined in 28.621[147], 28.622 [148], 28.623 [149] uses the common definitions specified in the FMC FNIM Umbrella Information Model (UIM).

## 6.3 Access Network (AN) related NRM IRPs

### **UTRAN NRM IRP – 32.641 [101], 32.642 [102], 32.646 [103] / 28.651 [156], 28.652 [157], 28.653 [158]**

The UTRAN NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning UTRAN specific network resource, by reusing relevant parts of the Generic NRM IRP.

### **GERAN NRM IRP – 32.651[104], 32.652 [105], 32.656 [106] 28.654 [159], 28.655 [160], 28.656 [161]**

The GERAN NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning GERAN specific network resource, by reusing relevant parts of the Generic NRM IRP.

### **E-UTRAN NRM IRP – 32.761 [131], 32.762 [132], 32.767 [133] / 28.657 [162], 28.658 [163], 28.659 [164]**

The E-UTRAN NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning E-UTRAN specific network resource, by reusing relevant parts of the Generic NRM IRP.

### **Generic RAN NRM IRP – 32.791/2/6 / 28.661 [165], 28.662 [166], 28.663 [167]**

The Generic RAN NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning common RAN network resource (applicable to GERAN, UTRAN and E\_UTRAN), by reusing relevant parts of the Generic NRM IRP.

## 6.4 Core/IMS related NRM IRPs

### **Core NRM IRP – 32.631[98], 32.632 [99], 32.636 [100], 28.701 [174], 28.702 [175], 28.703 [176]**

The Core NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning core network specific resource, by reusing relevant parts of the Generic NRM IRP in.

### **IMS NRM IRP – 32.731 [122], 32.732 [123], 32.736 [124], 28.704 [177], 28.705 [178], 28.706 [179]**

The IMS NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning IP MultiMedia Subsystem specific network resource, by reusing relevant parts of the Generic NRM IRP.

### **Evolved Packet Core (EPC) NRM IRP – 32.751[128], 32.752 [129], 32.756 [130], 28.707 [180], 28.708 [181], 28.709 [182]**

The EPC NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Evolved Packet Core specific network resource, by reusing relevant parts of the Generic NRM IRP.

## 6.5 H(e)NB related NRM IRPs

### **HNS NRM IRP – 32.771 [134], 32.772 [135], 32.776 [136], 28.671 [168], 28.672 [169], 28.673 [170]**

The HNS NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Home NodeB Subsystem specific network resource, by reusing relevant parts of the Generic NRM IRP.

### **HeNS NRM IRP – 32.781 [137], 32.782 [138], 32.786 [139], 28.674 [171], 28.675 [172], 28.676 [173]**

The HeNS NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Home enhanced NodeB Subsystem specific network resource, by reusing relevant parts of the Generic NRM IRP.

## 6.6 Service Management related NRM IRPs and UDC specifications

**SuM NRM IRP** – 32.171 [18], 32.172 [19], 32.176 [20], **28.751** [189], 28.752 [190], **28.753** [191]

Subscription Management is a feature that permits Service Providers, Value Added Service Providers and Mobile Operators to provision services for a specific subscriber. The SuM NRM IRP defines the Subscription Management specific network resource information between an IRP Agent and one or several IRP Managers.

**UDC** – 32.181 [141], 32.182 [142]

User Data Convergence (UDC) presents a layered architecture where user data is accessible at a logically unique repository called User Data Repository (UDR). The UDC CBIM defines a Common Baseline Information Model for UDC, which denotes an abstract, formal representation of entity types that are common to many applications using the UDR.

## 6.7 Special-purpose related NRM IRPs

### **Inventory Management NRM IRP – 32.691 [113], 32.692 [114], 32.696 [115], 28.631 [153], 28.632 [154], 28.633 [155]**

Inventory Management (IM) provides the operator with the ability to assure correct and effective operation of the telecom network as it evolves. IM actions have the objective to monitor the actual configuration on the Network Elements (NEs) and Network Resources (NRs). The Inventory Management NRM IRP defines the inventory specific network resource information between an IRPAgent and one or several IRPManagers.

### **SON Policy NRM IRP – 32.521 [80], 32.522 [81], 32.526 [82] / 28.627 [150], 28.628 [151], 28.629 [152]**

The SON Policy NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Self-Organizing Networks Policies. Currently the following SON use cases are supported by this NRM IRP:

- SON Self-Optimization Management (requirements determined by TS 32.521 [80]/28.627 [150])
- SON Self-Healing Management (requirements determined by TS 32.541 [86])
- Energy Saving Management (requirements determined by TS 32.551[87])

### **Transport Network NRM IRP – 32.711 [116], 32.712 [117], 32.716 [118], 28.731 [183], 28.732 [184], 28.733 [185]**

The Transport Network NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Transport resources, by reusing relevant parts of the Generic NRM IRP.

### **Repeater NRM IRP – 32.721 [119], 32.722 [120], 32.726 [121]**

The Repeater NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Repeater resources, by reusing relevant parts of the Generic NRM IRP.

### **Signalling Transport NW IF NRM IRP – 32.741 [125], 32.742 [126], 32.746 [127], 28.734 [186], 28.735 [187], 28.736 [188]**

The Signalling Transport NW IF NRM IRP defines an IRP through which an IRPAgent can communicate Configuration Management information to one or several IRPManagers concerning Signalling Transport resources, by reusing relevant parts of the Generic NRM IRP.

## 7 Measurement & Trace Definitions

### 7.1 Performance Measurements

#### 7.1.1 Overview and relationships to IRP Framework

##### Requirements and templates:

- Concept and requirements (32.401)
- Definitions and template (32.404)

##### Core measurement specifications

- CS core (32.407)
- PS core (32.406)
- IMS (32.409)
- EPC (32.426)
- Services (32.408)

##### PM File Format (32.43x)

##### Radio measurement specifications

- GSM (52.402)
- UTRAN (32.405)
- E-UTRAN (32.425)
- HNB (32.452)
- HeNB (32.453)

##### KPI specifications

- UMTS and GSM (32.410)
- E-UTRAN – (32.450/451)
- IMS (32.454)
- EPC (32.455)

Figure 7.1.1-1: PM-related Specifications 3GPP R10

## 7.1.2 Performance Measurement Specifications

### PS core Performance Measurements – 32.406 [51]

The purpose of this specification is to define performance measurements specific to Core Network Packet Switched Domain in a UMTS network or combined UMTS/GSM network. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### CS core Performance Measurements – 32.407 [52]

The purpose of this specification is to define performance measurements specific to Core Network Circuit Switched Domain in a UMTS network or combined UMTS/GSM network. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### Services Performance Measurements – 32.408 [53]

The purpose of this specification is to define performance measurements specific to teleservices(categorized by Multimedia Messaging Service, Short Message Service, Multimedia Calls, Voice Call and Intelligent Services) in a UMTS network or combined UMTS/GSM network, . The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### IMS Performance Measurements – 32.409 [54]

The purpose of this specification is to define performance measurements specific to an IMS (IP Multimedia Subsystem) network. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### EPC Performance Measurements – 32.426 [63]

The purpose of this specification is to define performance measurements specific to an EPC network or combined EPC/UMTS/GSM network. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### GSM Performance Measurements – 52.402 [140]

The purpose of this specification is to define performance measurements specific to a GSM system. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.**UTRAN Performance Measurements – 32.405 [50]**

The purpose of this specification is to define performance measurements specific to a UTRAN in UMTS network or combined UMTS/GSM network. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### E-UTRAN Performance Measurements – 32.425 [62]

The purpose of this specification is to define performance measurements specific to an E-UTRAN network. The standardized measurements result in comparability of measurement data produced in a multi-vendor network.**HNB Performance Measurements – 32.452 [71]**

The purpose of this specification is to define performance measurements specific to Home NodeB Subsystem(consists of HNB and HNB-GW). The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### HeNB Performance Measurements – 32.453 [72]

The purpose of this specification is to define performance measurements specific to Home enhanced NodeB Subsystem(consists of HeNB and optionally HeNB-GW). The standardized measurements result in comparability of measurement data produced in a multi-vendor network.

### UMTS & GSM KPI's – 32.410 [55]

The purpose of this specification is to define Key Performance Indicators (KPIs) for GSM and UMTS. KPI definitions include high level KPIs that are a) common across GSM and UMTS networks; and b) **specific** to network techniques such as GSM and UMTS networks.

### E-UTRAN KPI's – 32.451 [70]

This specification defines requirements (business level requirements, specification level requirements and use case descriptions) related to KPIs for E-UTRAN.

**IMS KPI's – 32.454 [73]**

This specification defines KPIs for the IP Multimedia Subsystem (IMS).

**EPC KPI's – 32.455 [74]**

This specification defines KPIs for the Evolved Packet Core(EPC).network.

**PM File Format – 32.432 [64], 32.435 [65], 32.436 [66]**

This set of specifications describe the general semantics of performance measurement result and collection. It defines the report file format, report file conventions, and the file transfer procedure.

## 7.2 Trace Specifications

### 7.2.1 Overview and relationships to IRP Framework

Trace specifications:

- Concept and requirements (32.421)
- Trace control and configuration management (32.422)
- Trace data definition (32.423)

**Figure 7.2.1-2: Trace-related Specifications 3GPP R10**

### 7.2.2 Trace Specifications

#### **Trace Control & Configuration – 32.422 [60]**

This specification describes the mechanisms used for the control and configuration of the Trace functionality at the EMs, NEs and UEs. It covers the triggering events for starting/stopping of subscriber/UE activity traced over 3GPP standardized signalling interfaces, the types of trace mechanisms, configuration of a trace, level of detail available in the trace data, the generation of Trace results in the Network Elements (NEs) and User Equipment (UE) and the transfer of these results to one or more EM(s) and/or Network Manager(s) (NM(s)).

#### **Trace Data Definitions – 32.423 [61]**

This specification describes Trace data definition and management. It covers the trace records content, their format and transfer.



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## 8 Relationships between IRPs

Relationships between Interface IRPs:

- All Interface IRPs utilizing the functionality of the Generic IRP
- All Notification emitting Interface IRPs utilizing the functionality of the Notification IRP

Relationships between NRM IRPs:

- For FMC-enabled NRM IRP, the Generic NRM IRP is utilizing functionality of the FMC FNIM Umbrella Information Model (UIM)
- All NRM IRPs utilizing the functionality of the Generic NRM IRP
- All function-specific NRM IRPs (e.g. Core NRM IRP) utilizing the functionality of the Inventory NRM IRP

## 9 SON functions

In order to reduce the operating expenses (OPEX) associated with the management of increasing number of nodes from more than one vendor the concept of the Self-Organizing Network (SON) was introduced. Automation of some network planning, configuration and optimisation processes via the use of SON functions can help the network operator to reduce OPEX by reducing manual involvement in such tasks.

SON functions are Radio Access Technology (RAT) dependent. Generally, SON functions are applicable to E-UTRAN network, and can be applied to UTRAN network on a case by case basis. Currently the following specifications have identified the use cases and requirements in context of SON for standardization:

- Self-establishment of an eNodeB: Related requirements are defined in TS 32.501 [76];
- Automatic Neighbour Relation Management: Related requirements are defined in TS 32.511[79];
- Self-Optimisation Management: Related requirements are defined in TS 32.521[80] or TS 28.627[150];
- Self-Healing Management: Related requirements are defined in TS 32.541[86];
- Energy Saving Management: Related requirements are defined in TS 32.551[87];
- Minimization of Drive Tests: Related requirements are defined in TS 32.421[59] and TS 32.441 [67].

Each SON use case can involve multiple IRPs when corresponding management scenarios are applied. As to IRP solution fulfilment, Self-Optimization Management, Self-Healing Management and Energy Saving Management share the common information model of SON policy NRM (TS 32.522[81]), while each one also has RAT-dependent information model in E-UTRAN NRM (TS 32.761[131], 32.762 [132], 32.767 [133] /28.657 [162], 28.658 [163], 28.659 [164]) or UTRAN NRM (TS 32.641 [101], 32.642 [102], 32.646 [103] /28.651 [156], 28.652 [157], 28.653 [158]). The IRP relationships of SON functions and measurement definitions are addressed case by case as follows,

### Self-establishment of an eNodeB

Interface IRPs:

- SC IRP (32.500 [75], 32.501 [76], 32.502 [77], 32.503 [78])
- Software Management IRP (32.531 [83], 32.532 [84], 32.536 [85])
- Generic IRP (32.311 [25], 32.312 [26], 32.316 [27])
- Alarm IRP (32.111-1 [5], 32.111-2 [6], 32.111-6 [7])
- Test Management IRP (32.321 [28], 32.322 [29], 32.326 [30])
- Basic CM IRP (32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]) or Bulk CM IRP (32.611 [92], 32.612 [93], 32.616 [94])
- Kernel CM IRP (32.661 [107], 32.662 [108])
- Notification IRP (32.300 [21], 32.301 [22], 32.302 [23], 32.306 [24])
- File Transfer IRP (for ARCF data download) (32.341 [34], 32.342 [35], 32.346 [36])

NRM IRPs:

- Umbrella Information Model (28.620 [146])
- Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97] or 28.621[147], 28.622 [148], 28.623 [149])
- E-UTRAN NRM IRP (32.761 [131], 32.762 [132], 32.767 [133] or 28.657 [162], 28.658 [163], 28.659 [164])

### Automatic Neighbour Relation Management

Interface IRP:

- Basic CM IRP (32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]) or Bulk CM IRP (32.611 [92], 32.612 [93], 32.616 [94])
- Alarm IRP (32.111-1 [5], 32.111-2 [6], 32.111-6 [7])
- Kernel CM IRP (32.661 [107], 32.662 [108])
- Notification IRP (32.300 [21], 32.301 [22], 32.302 [23], 32.306 [24])

**NRM IRP:**

- Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97] or 28.620 [146], 28.621 [147], 28.622 [148], 28.623 [149])
- E-UTRAN NRM IRP (32.761 [131], 32.762 [132], 32.767 [133] or 28.657 [162], 28.656 [161], 28.659 [164])
- UTRAN NRM IRP (32.641 [101], 32.642 [102], 32.646 [103])

**Self-Optimisation Management****Interface IRP:**

- Basic CM IRP (32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]) or Bulk CM IRP (32.611 [92], 32.612 [93], 32.616 [94])
- Alarm IRP (32.111-1 [5], 32.111-2 [6], 32.111-6 [7])
- PM IRP (32.410 [55], 32.411 [56], 32.412 [57], 32.416 [58])
- File Transfer IRP (for PM data upload) (32.341 [34], 32.342 [35], 32.346 [36])
- Kernel CM IRP (32.661 [107], 32.662 [108])
- Notification IRP (32.300 [21], 32.301 [22], 32.302 [23], 32.306 [24])

**NRM IRP:**

- SON Policy NRM IRP (32.521 [80], 32.522 [81], 32.526 [82] or 28.627 [150], 28.628 [151], 28.629 [152])
- Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97] or 28.620 [146], 28.621 [147], 28.622 [148], 28.623 [149])
- E-UTRAN NRM IRP (32.761 [131], 32.762 [132], 32.767 [133] or 28.657 [162], 28.656 [161], 28.659 [164])

**Measurement Definitions:**

- E-UTRAN Performance Measurements (32.425 [62])

**Self-Healing Management****Interface IRP:**

- Basic CM IRP (32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]) or Bulk CM IRP (32.611 [92], 32.612 [93], 32.616 [94])
- Alarm IRP (32.111-1 [5], 32.111-2 [6], 32.111-6 [7])
- Kernel CM IRP (32.661 [107], 32.662 [108])
- Notification IRP (32.300 [21], 32.301 [22], 32.302 [23], 32.306 [24])

**NRM IRP:**

- SON Policy NRM IRP (32.521 [80], 32.522 [81], 32.526 [82] or 28.627 [150], 28.628 [151], 28.629 [152])
- Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97] or 28.620 [146], 28.621 [147], 28.622 [148], 28.623 [149])
- E-UTRAN NRM IRP (32.761 [131], 32.762 [132], 32.767 [133] or 28.657 [162], 28.656 [161], 28.659 [164])

### Energy Saving Management

#### Interface IRP:

- Basic CM IRP (32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]) or Bulk CM IRP (32.611 [92], 32.612 [93], 32.616 [94])
- PM IRP (32.410 [55], 32.411 [56], 32.412 [57], 32.416 [58])
- File Transfer IRP (for PM data upload) (32.341 [34], 32.342 [35], 32.346 [36])
- Kernel CM IRP (32.661 [107], 32.662 [108])
- Notification IRP (32.300 [21], 32.301 [22], 32.302 [23], 32.306 [24])

#### NRM IRP:

- SON Policy NRM IRP (32.521 [80], 32.522 [81], 32.526 [82] or 28.627 [150], 28.628 [151], 28.629 [152])
- Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97] or 28.620 [146], 28.621 [147], 28.622 [148], 28.623 [149])
- E-UTRAN NRM IRP (32.761 [131], 32.762 [132], 32.767 [133] or 28.657 [162], 28.656 [161], 28.659 [164])
- UTRAN NRM IRP (32.641 [101], 32.642 [102], 32.646 [103])

#### Measurement Definitions:

- E-UTRAN Performance Measurements (32.425 [62])
- UTRAN Performance Measurements (32.405 [50])

### Minimization of Drive Tests

#### Interface IRP:

- Trace Management IRP (32.441 [67], 32.442 [68], 32.446 [69])
- Trace Control and Configuration Management IRP (32.421 [59], 32.422 [60], 32.423 [61])
- Basic CM IRP (32.600 [88], 32.601 [89], 32.602 [90], 32.606 [91]) or Bulk CM IRP (32.611 [92], 32.612 [93], 32.616 [94])
- Kernel CM IRP (32.661 [107], 32.662 [108])

#### NRM IRP:

- Generic NRM IRP (32.621 [95], 32.622 [96], 32.626 [97] or 28.620 [146], 28.621 [147], 28.622 [148], 28.623 [149])
- UTRAN NRM IRP (32.641 [101], 32.642 [102], 32.646 [103] or 28.651 [156], 28.652 [157], 28.653 [158]/2/3)
- E-UTRAN NRM IRP (32.761 [131], 32.762 [132], 32.767 [133] or 28.657 [162], 28.656 [161], 28.659 [164])

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# Annex A (Informative): IRP Packaging Suggestions

## A.1 Overview & Purpose

This Annex provides IRP packaging suggestions, intended to guide service providers as well as equipment and solutions providers to identify and choose suitable standardized management interface capabilities.

NOTE: No IRP Packaging Suggestions are identified.

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## Annex B (normative): Features supported

### B.1 Converged management support table

Table B.1.1 below illustrates the "Converged Management" feature support by the individual TS. The intersection of table rows (TS numbers) and columns (features) contains the 3GPP Release number starting from where this feature is supported.

**Table B.1.1: Converged management feature support**

<b>TS number</b>	<b>Converged management support</b>
32.101	Rel-11
32.103	Rel-11
32.150	Rel-11
32.107	Rel-11
32.156	Rel-11
32.157	Rel-11
32.300	Rel-11
32.853	Rel-11
32.854	Rel-11
28.620	Rel-11
28.621	Rel-11
28.622	Rel-11
28.623	Rel-11
28.624	Rel-11
28.625	Rel-11
28.626	Rel-11
28.627	Rel-11
28.628	Rel-11
28.629	Rel-11
28.631	Rel-11
28.632	Rel-11
28.633	Rel-11
28.651	Rel-11
28.652	Rel-11
28.653	Rel-11
28.654	Rel-11
28.655	Rel-11
28.656	Rel-11
28.657	Rel-11
28.658	Rel-11
28.659	Rel-11
28.661	Rel-11
28.662	Rel-11
28.663	Rel-11
28.671	Rel-11
28.672	Rel-11
28.673	Rel-11
28.674	Rel-11
28.675	Rel-11
28.676	Rel-11
28.701	Rel-11
28.702	Rel-11
28.703	Rel-11
28.704	Rel-11
28.705	Rel-11
28.706	Rel-11
28.707	Rel-11
28.708	Rel-11
28.709	Rel-11
28.731	Rel-11
28.732	Rel-11
28.733	Rel-11
28.734	Rel-11
28.735	Rel-11
28.736	Rel-11
28.751	Rel-11
28.752	Rel-11
28.753	Rel-11

## Annex C (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2010-12	SP-50	SP-100764	--	--	Submitted to SA#50 for Information	0.1.0	1.0.0
2011-05	SP-52	SP-110272	--	--	Submitted to SA#52 for Approval	1.2.0	2.0.0
2011-06	SP-52	--	--	--	Publication	2.0.0	10.0.0
2012-06	SP-56	SP-120370	001	2	Add relation description between IRPs	10.0.0	11.0.0
2012-12	SP-58	SP-120783	003	2	CR R11 32.103 Add usage description for SON functions	11.0.0	11.1.0
2013-03	SP-59	SP-130060	004	2	Enhancements for Converged Management	11.1.0	11.2.0
2013-09	SP-61	SP-130433	005	1	correction of references	11.2.0	11.3.0
2014-06	SP-64	SP-140332	006	2	Add missing feature support matrix	11.3.0	11.4.0
		SP-140359	007	-	remove the feature support statements		
2014-12	SP-66	SP-140797	008	1	Correction on the mapping information between 32 series and 28 series	11.4.0	11.5.0
			011	-	Update feature support statement for TS 32.300		

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2020-09	SA#89E	SP-200728	0020	-	A	Correction of reference list and adding references throughout the document	11.6.0



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## History

<b>Document history</b>		
V11.0.0	November 2012	Publication
V11.1.0	January 2013	Publication
V11.2.0	April 2013	Publication
V11.3.0	October 2013	Publication
V11.4.0	July 2014	Publication
V11.5.0	January 2015	Publication
V11.6.0	November 2020	Publication