Technical Specification Group Services and System Aspects
Meeting #7, Madrid, Spain, 15-17 March 2000

TSGS#7(00)0015

Source: **WG SA5 (Telecom Management)**

Title: **2 CRs to 32.102 v.3.0.0 (3G Telecom Management architecture)**

Document for: **Approval**

Agenda Item: **5.5.3**

Ty	Number	Title	WG	editor	version
TS	32.102	3G Telecom Management architecture	S5	Tommy Berggren	3.0.0

TSG Meet-ing	TSG WG doc number	Spec	CR	Ph	Vers Old	Vers New	Subject	TSG WG meeting	WG status	Workitem
SP-07	S5-000107	32.102	001	R99	3.0.0	3.1.0	resolving remaining R99 inconsistency between 32.101 & 32.102	S5-10	Agreed	Telecom Management Architecture (AR)
SP-07	S5-000152	32.102	002	R99	3.0.0	3.1.0	Correction of IRP-related terminology	S5-10	Agreed	AR

Meeting S5 #10
Luleå, Sweden, 28th February – 3rd March 2000

***Document* S5-000107**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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32.102 CR Xxx Current Version: 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submision to: SA#7	for approval	X	strategic	X	*(for SMG*
list approval meeting # here ↑	for information		non-strategic		*use only)*

Form: CR cover sheet, version 1.1 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CRF-11.rtf*

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN [X] Core Network [X]
(at least one should be marked with an X)

Source: SA5 **Date:** 22.02.00

Subject: In Compliance Conditions Table refer to Valid Network Layer Protocols as defined in 32.101 Annex B, remove explicit reference to IP.

Work item: Architecture

Category:				**Release:**		
	F	Correction	X		Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X

(releases phase2, 96, 97 and 98 apply only to GSM specifications)

Reason for change: This CR proposes that a correction be made to the compliance conditions tables of 32.102 to refer to the Valid Network Layer Protocols as defined in 32.101 Annex B. This change also will align clauses 8.2 – 8.6 with Clause 8.1 which already states that a Valid Network Layer Protocol should be used.

Clauses affected: Annex A

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments:

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8.2 Network elements management architecture

The following figure demonstrates two possible options for management interface from the OS upper layers to NE. Option 1, provides access to the NE via element manager, and Option 2, provides a direct access. It is sufficient to provide one or the other.

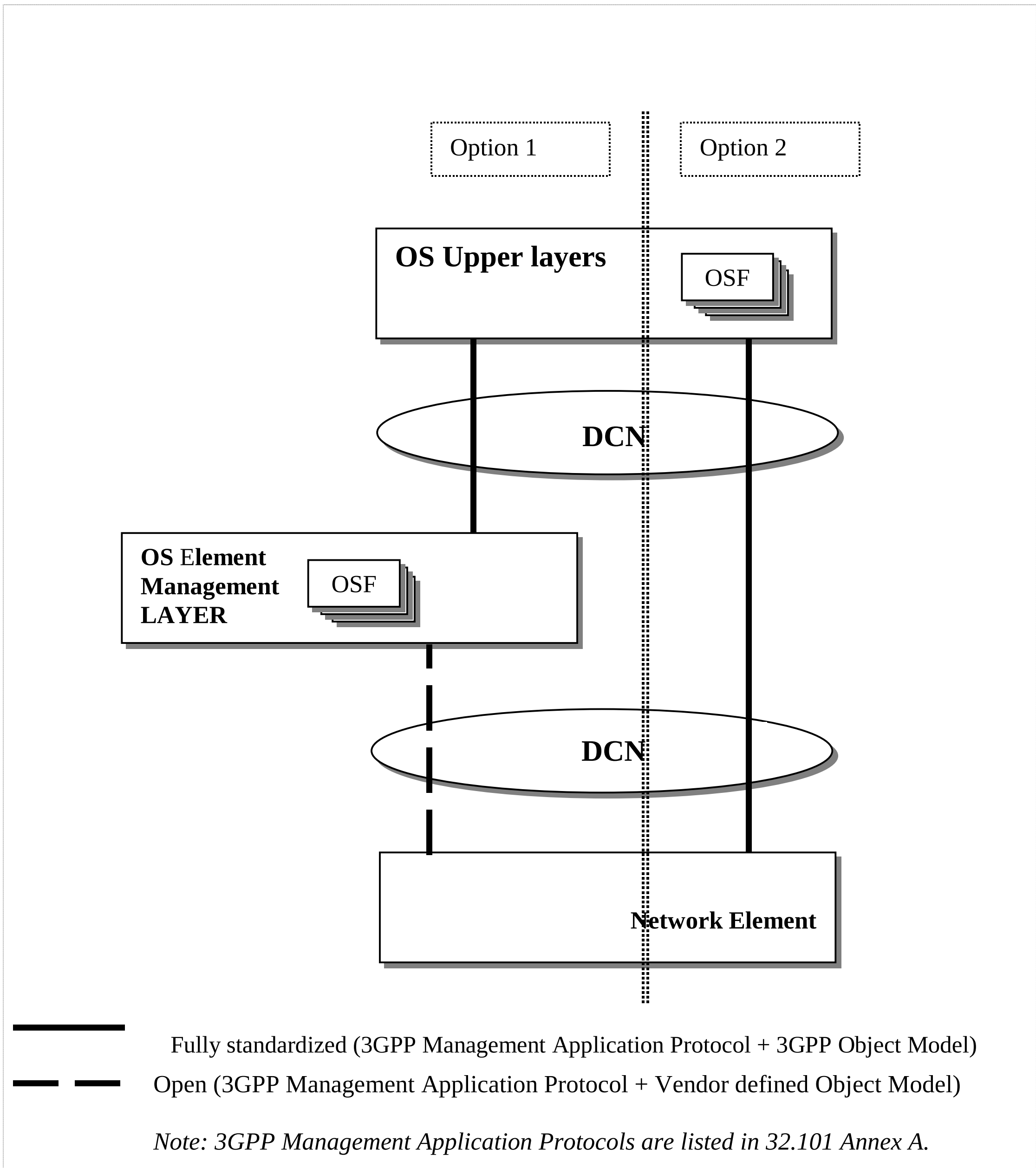

Figure 4: Network Element Management Architecture

For a UMTS entity (network element or management system) to be compliant to a given UMTS Management Interface the following conditions shall all be satisfied.

Item	Compliance conditions
1	Implements relevant 3GPP UMTS Management Information Model and flows
2	Application protocol (e.g. CMIP,SNMP,CORBA IIOP) defined in [2] , Annex A Implements relevant IRP Solution Sets, if available for that application protocol. (Defined in [2], Annex C)
3	~~Internet Protocol (IP)~~ Valid Network Layer Protocol (See Annex B 32.101)
4	Lower protocol levels required by Item 1,2 and 3

Any other entity taking part in a UMTS, as an implementation choice, shall satisfy the following condition:

Item	Compliance conditions
1	Not standardised but open

8.3 Network & Subnetwork Element Management Architecture

(Example UMTS RNC / NodeB)

An important special case of the network element management architecture is where one type of network element as the RNC will need management information for coordination of a subnetwork of other types of network elements as NodeB.

This management information shared between the RNC and NodeB will not reach the operators and is not considered to be a part of the UMTS TMN. All other management information related to NodeB will transparently be transferred by the RNC towards the UMTS TMN.

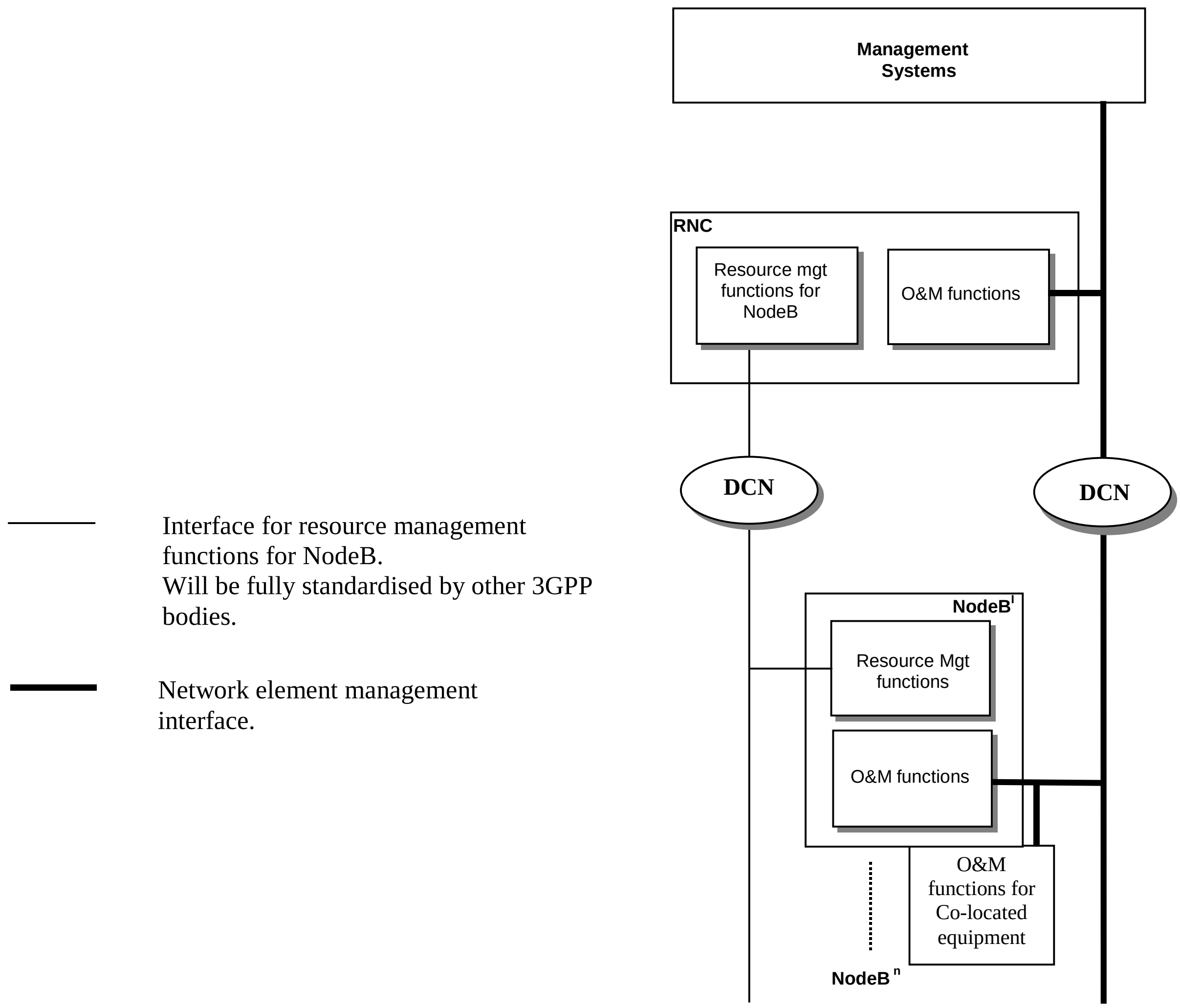

Figure 5: Network and Subnetwork Management Architecture

For a UMTS entity (network element, subnetwork element or management system) to be compliant to a given UMTS Management Interface the following conditions shall be satisfied.

Item	Compliance conditions
1	Implements relevant 3GPP UMTS Management Information Model and flows
2	Application protocol (e.g. CMIP,SNMP,CORBA IIOP) defined in [2] , Annex A Implements relevant IRP Solution Sets, if available for that application protocol. (Defined in [2], Annex C)
3	~~Internet Protocol (IP)~~ Valid Network Layer Protocol (See Annex B 32.101)
4	Lower protocol levels required by Item 1,2 and 3

8.4 Operations Systems interoperability architecture.

Interoperability between operations systems is an important issue in a UMTS. Different organisations may take different roles in a UMTS. The need to share information across corporate boundaries will be a consequence of this.

The heterogeneous, distributed and complex network of a UMTS will be a market for many different vendors. All operations systems has to interoperate and must be able to share information. This is a critical issue in the management of third generations systems.

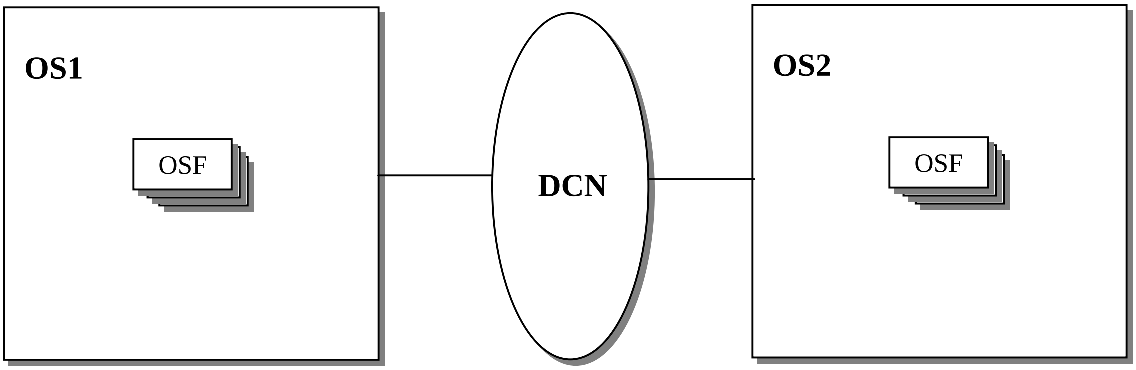

Figure 6: Operations Systems interoperability Architecture

For a Operations System to be UMTS TMN compliant the following conditions shall all be satisfied.

Item	Compliance conditions
1	Implements relevant 3GPP UMTS Management Information Model and flows
2	Application protocol (e.g. CMIP,SNMP,CORBA IIOP) defined in [2] , Annex A Implements relevant IRP Solution Sets, if available for that application protocol. (Defined in [2], Annex C)
3	~~Internet Protocol (IP)~~ Valid Network Layer Protocol (See Annex B 32.101)
4	Lower protocol levels required by Item 1,2 and 3

8.5 Operations Systems intraoperability architecture

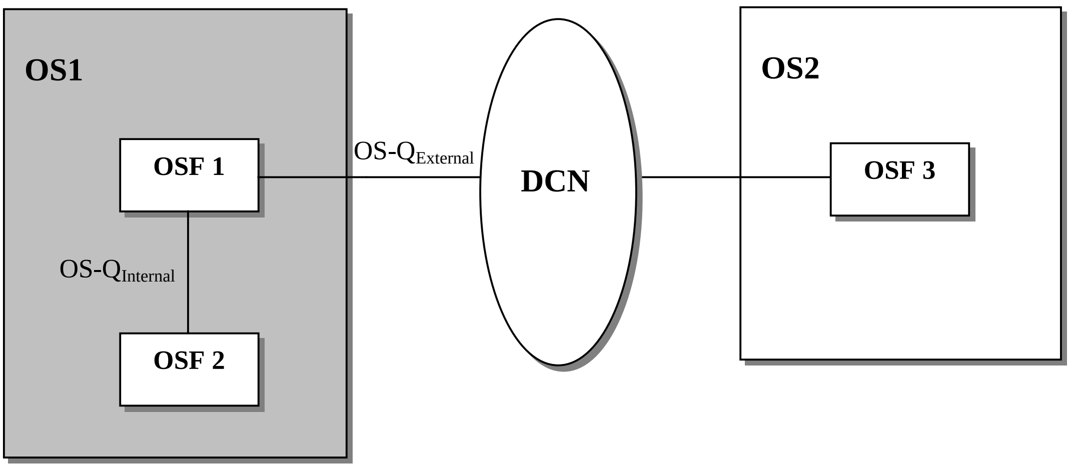

Figure 7: Operations Systems intraoperability Architecture

OS-$Q_{Internal}$ indicates an internal flow and should to be compliant with a given UMTS Management Interface satisfy the following conditions:

Item	Compliance conditions
1	Implements relevant 3GPP UMTS Management Information Model and flows
2	Application protocol (e.g. CMIP,SNMP,CORBA IIOP) defined in [2] , Annex A Implements relevant IRP Solution Sets, if available for that application protocol. (Defined in [2], Annex C)

OS-$Q_{External}$ indicates an external flow and shall to be compliant to a given UMTS Management Interface satisfy the following conditions:

Item	Compliance conditions
1	Implements relevant 3GPP UMTS Management Information Model and flows
2	Application protocol (e.g. CMIP,SNMP,CORBA IIOP) defined in [2] , Annex A Implements relevant IRP Solution Sets, if available for that application protocol. (Defined in [2], Annex C)
3	~~Internet Protocol (IP)~~ Valid Network Layer Protocol (See Annex B 32.101)
4	Lower protocol levels required by Item 1,2 and 3

8.6 Business System interconnection architecture

The business management layer has in the second generation systems a very low degree of standardisation. Operators have legacy systems or more IT influenced systems often adopted to every organisations different needs. Business systems is not a part of a UMTS TMN.

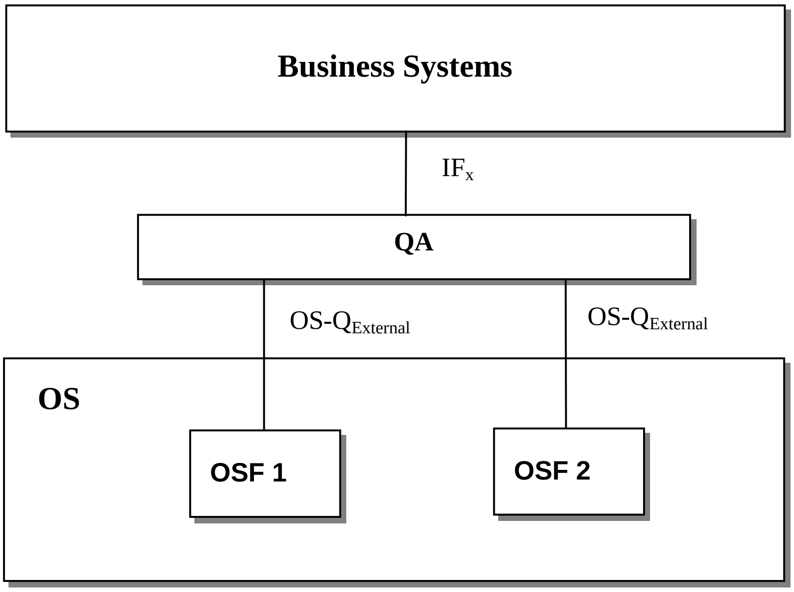

Figure 8: Business Systems interconnection architecture

OS-$Q_{Exteral}$ Indicates an external flow and shall to be compliant to a given UMTS Management Interface satisfy the following conditions:

Item	Compliance conditions
1	Implements relevant 3GPP UMTS Management Information Model and flows
2	Application protocol (e.g. CMIP,SNMP,CORBA IIOP) defined in [2] , Annex A Implements relevant IRP Solution Sets, if available for that application protocol. (Defined in [2], Annex C)
3	~~Internet Protocol (IP)~~ Valid Network Layer Protocol (See Annex B 32.101)
4	Lower protocol levels required by Item 1,2 and 3

IF_X indicates an external flow and shall to be compliant to a given UMTS Management Interface satisfy the following condition:

Item	Compliance conditions
1	Not standardised but open

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Luleå, Sweden, 28 Feb. – 3 March 2000

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32.102 CR xxx Current Version: 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA#7	for approval	X	strategic	
list expected approval meeting # here ↑		for information		non-strategic	

(for SMG use only)

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [X]
(at least one should be marked with an X)

Source: SA5 **Date:** 2000-03-01

Subject: Correction of IRP-related terminology

Work item: Architecture

Category:				**Release:**	
	F	Correction	X	Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change:

The purpose of the proposed changes is to improve one of the IRP-related terms in this TS: It is proposed to change the name “Resource Model” to “Network Resource Model” (in this and all TSs using IRP terminology). The reason for this is that the former name is very generic and can be interpreted as “any kind of model”, while the proposed new name more clearly indicates that it is a model for the managed network resources. Consequently, it also changes the use of MIM to NRM.
The term ‘alarm record’ is also changed to ‘alarm information’, according to a proposal from the FM/CM groups.

Please note that both figures 11 and 12 are also updated, but no revision marks are seen for these updates.

Finally, it also corrects the definition of the acronym WBEM and changes the ‘Network Element Manager’ to ‘Element Manager’ in 10.2.

Clauses affected: 3.1, 3.2, 10.1, 10.2

Other specs affected:				
	Other 3G core specifications		→ List of CRs:	
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications	X	→ List of CRs:	32.101 CR xxx

Other comments:

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3.1 Definitions

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

Architecture: The organisational structure of a system or component, their relationships, and the principles and guidelines governing their design and evolution over time.

Closed interfaces: Privately controlled system/subsystem boundary descriptions that are not disclosed to the public or are unique to a single supplier.

De facto standard: A standard that is widely accepted and used but that lacks formal approval by a recognised standards organisation.

Interface standard: A standard that specifies the physical or functional interface characteristics of systems, subsystems, equipment, assemblies, components, items or parts to permit interchangeability, interconnection, interoperability, compatibility, or communications.

Interoperability: The ability of two or more systems or components to exchange data and use information.

Intraoperability: The ability to interchange and use information, functions and services among components within a system.

IRP Information Model: An IRP Information Model consists of an IRP Information Service and a Network Resource Model (see below for definitions of IRP Information Service and Network Resource Model).

IRP Information Service: An IRP Information Service describes the information flow and support objects for a certain functional area, e.g. the alarm information service in the fault management area. As an example of support objects, for the Alarm IRP there is the ‘alarm information’ and ‘alarm list’.

IRP Solution Set: An IRP Solution Set is a mapping of the IRP Information Service to one of several technologies (CORBA/IDL, SNMP/SMI, CMIP/GDMO etc.). An IRP Information Service can be mapped to several different IRP Solution Sets. Different technology selections may be done for different IRPs.

Management Infrastructure: The collection of systems (computers and telecommunications) a UMTS Organisation has in order to manage UMTS.

Market Acceptance: Market acceptance means that an item has been accepted in the market as evidenced by annual sales, length of time available for sale, and after-sale support capability.

Modular: Pertaining to the design concept in which interchangeable units are employed to create a functional end product.

Module: An interchangeable item that contains components. In computer programming, a program unit that is discrete and identifiable with respect to compiling, combining with other modules, and loading is called a module.

Open Specifications: Public specifications that are maintained by an open, public consensus process to accommodate new technologies over time and that are consistent with international standards.

Open Standards: Widely accepted and supported standards set by recognised standards organisation or the commercial market place. These standards support interoperability, portability, and scalability and are equally available to the general public at no cost or with a moderate license fee.

Open Systems Architecture (OSA): An architecture produced by an open systems approach and employing open systems specifications and standards to an appropriate level.

Open Systems Strategy: An open systems strategy focuses on fielding superior telecom capability more quickly and more affordably by using multiple suppliers and commercially supported practices, products, specifications, and standards, which are selected based on performance, cost, industry acceptance, long term availability and supportability, and upgrade potential.

Physical Architecture: A minimal set of rules governing the arrangement, interaction, and interdependence of the parts or elements whose purpose is to ensure that a conformant system satisfies a specified set of requirements. The physical architecture identifies the services, interfaces, standards, and their relationships. It provides the technical guidelines for implementation of systems upon which engineering specifications are based and common building blocks are built.

Plug&play: Term for easy integration of HW/SW.

Portability: The ease with which a system, component, data, or user can be transferred from one hardware or software environment to another.

Proprietary Specifications: Specifications which are exclusively owned by a private individual or corporation under a trademark or patent, the use of which would require a license.

Reference Model: A generally accepted abstract representation that allows users to focus on establishing definitions, building common understandings and identifying issues for resolution. For TMN Systems acquisitions, a reference model is necessary to establish a context for understanding how the disparate technologies and standards required to implement TMN relate to each other. A reference model provides a mechanism for identifying the key issues associated with applications portability, modularity, scalability and interoperability. Most importantly, Reference Models will aid in the evaluation and analysis of domain-specific architectures.

Network Resource Model (NRM): A protocol independent model describing managed objects representing network resources, e.g. an RNC or NodeB.

Scalability : The capability to adapt hardware or software to accommodate changing work loads.

Specification: A document that prescribes, in a complete, precise, verifiable manner, the requirements, design, behaviour, or characteristics of a system or system component.

Standard: A document that establishes uniform engineering and technical requirements for processes, procedures, practices, and methods. Standards may also establish requirements for selection, application, and design criteria of material.

Standards Based Architecture: An architecture based on an acceptable set of open standards governing the arrangement, interaction, and interdependence of the parts or elements that together may be used to form a TMN System, and whose purpose is to insure that a conformant system satisfies a specified set of requirements.

System : Any organised assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions.

System Architecture: A description, including graphics, of systems and interconnections providing for or supporting management functions. The SA defines the physical connection, location, and identification of the key nodes, circuits, networks, platforms, etc., and specifies system and component performance parameters. It is constructed to satisfy Operational Architecture requirements per standards defined in the Physical Architecture. The SA shows how multiple systems within a subject area link and interoperate, and may describe the internal construction or operations of particular systems within the architecture.

UMTS Organisation: A legal entity that is involved in the provisioning of UMTS.

3.2 Abbreviations

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

BG	Border Gateway
BSC	Base Station Controller
BSS	Base Station Subsystem
BTS	Base Transceiver Station
CIM	Common Information Model Specification (from DMTF)
CMIP	Common Management Information Protocol
CMISE	Common Management Information Service
CORBA	Common Object Request Broker Architecture
FM	Fault Management
FTAM	File Transfer, Access and Management
F/W	Firewall

GGSN	Gateway GPRS Support Node
HLR	Home Location Register
HTTP	HyperText Transfer Protocol
IDL	Interface Definition Language
IIOP	Internet Inter-ORB Protocol
IRP	Integration Reference Point
IWU	Inter Working Unit
MD	Mediation Device
MIB	Management Information Base
MMI	Man-Machine Interface
MML	Man-Machine Language
MSC	Mobile Service Switching Centre
NE	Network Element
NRM	Network Resource Model
NSS	Network Switching Subsystem
NW	Network
OS	Operations System
OSF	Operations System Functions
PSTN	Public Switched Telephone Network
QA	Q-Adapter
OMG	Object Management Group
QoS	Quality of Service
SGSN	Serving GPRS Support Node
SLA	Service Level Agreement
SMI	Structure of Management Information (RFC 1155)
SNMP	Simple Network Management Protocol
TL1	Transaction Language 1
TM	Telecom Management
TMN	Telecommunications Management Network as defined in ITU-T Recommendation M.3010 [1].
UML	Unified Modelling Language
VLR	Visitor Location Register
WBEM	Web Based Enterprise Management
WS	Workstation

10.1 Integration levels

Virtually all types of telecom/datacom networks comprise many different technologies purchased from several different vendors. This implies that the corresponding management solution need to be built by integrating product-specific applications from different vendors with a number of generic applications that each provide some aspect of multi-vendor and/or multi-technology support. A complete management solution is thus composed of several independent applications.

The following levels of integration are defined:

- **Screen Integration:** Each application provides its own specific graphical user interface (GUI) that need to be accessible from a single, unified screen (a common desktop). A seamless integration between the various GUIs is then required. Screen Integration will not be standardised in this Technical Specification.

- **Application Integration:** Applications need to interwork, on a machine-machine basis, in order to automate various end-to-end processes of a communication provider.

10.1.1 Application integration

Interfaces related to application integration can be divided in the following three categories:

- **High-level generic interfaces** between generic applications on the network and service management layers. The same approach and concepts apply for these as the next category:

- **High-level (technology-independent to the extent possible) interfaces** between product-specific and generic applications are needed in order to automate and streamline frequently occurring tasks applicable to several types of network elements. A top-down approach shall be taken when defining these interfaces, where the main input is (1) business processes of a communication provider, and (2) the types of generic applications that are used to implement the process support. The interfaces need to be stable, open and (preferably) standardised. These IRPs are discussed below under the heading Network Infrastructure IRPs.

- **Detailed (product-specific) interfaces** between product-specific applications and the corresponding network elements are of course also needed. These interfaces are defined using the traditional bottom-up approach, where the actual network infrastructure is modelled. This is the traditional TMN approach to element management. The management information in these interfaces is not further discussed in this document, as it is internal to a specific development organisation and does not need to be open. In fact, by publishing the management information in these interfaces, too much of the internal design may be revealed and it may become impossible to later enhance the systems that are using the interfaces. The management services (operations and notifications) and protocol shall however be open and standardised as long as they are independent of the NRM describing the managed NEs/NRs.

10.2 Network infrastructure IRPs

When providing integrated management solutions for multi-vendor networks, there is a strong requirement that the NEs and the management solutions that go together with them are systems integrateable. It is here proposed that the telecom vendors provide a set of Network Infrastructure IRPs.

It should be noted that these IRPs could be provided by either the NE, or the Element Manager (EM) or Sub-Network Manager (SNM) that goes together with the type of NE. There is actually not a clear distinction any more between NE and element management applications, mainly due to the increased processing capacity of the equipment platforms. Embedded Element Managers providing a web user interface is a common example of that.

These IRPs are introduced to ensure interoperability between product-specific applications (PSA) and the types of generic applications shown in the figure below. These IRPs are considered to cover the most basic needs of task automation.

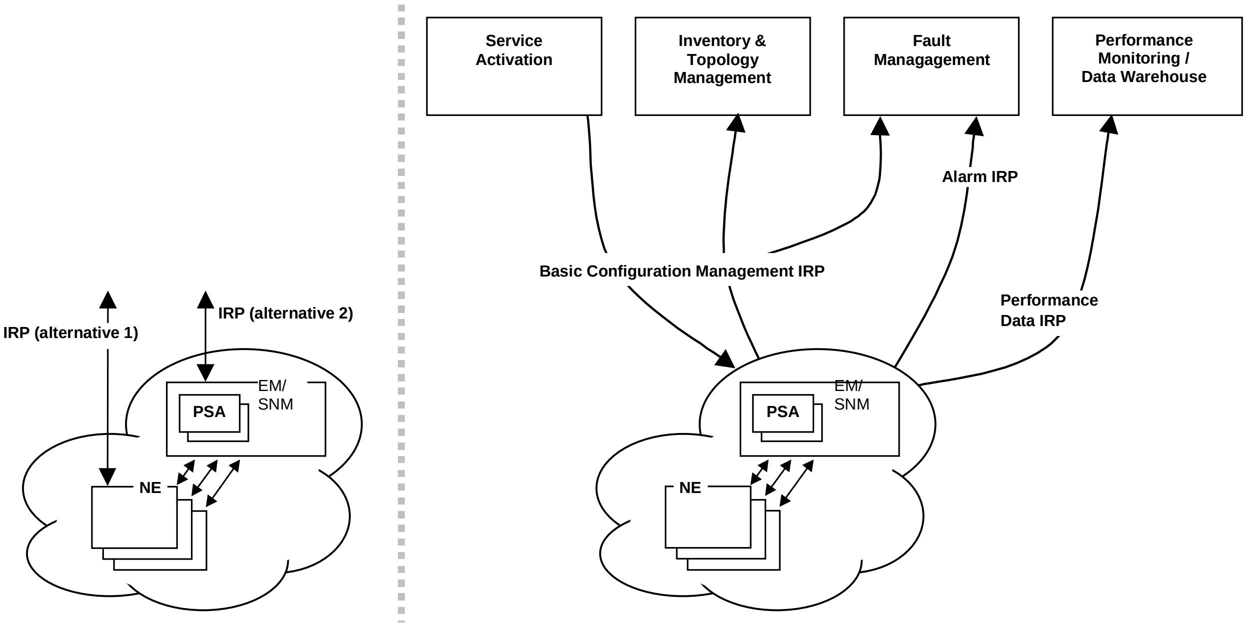

Figure 11: IRPs for application integration

The following gives examples of some basic IRPs:

The most basic need of a fault management (FM) application is to support alarm surveillance. Product-specific applications need to supply an *Alarm IRP* to forward alarms from all kinds of NEs and equipment to the FM application.

A *Basic Configuration Management IRP* is needed for management of topology and logical resources in the network *(*retrieval of the configuration and status of the network elements). It can also be used by inventory management applications, to track individual pieces of equipment and related data, as well as for all types of Configuration Management e.g. Service Activation applications, as a provisioning interface for frequent configuration activities that require automation. This IRP defines an IRP Information Model, covering both an IRP Information Service and a Network Resource Model.

Performance monitoring (PM) information is made available through the *Performance Data IRP*.

It is realised that the Alarm IRP, Performance Data IRP and Basic Configuration Management IRP all have similar needs to use notifications. The corresponding service is formalised as a *Notification IRP*. It specifies: Firstly, an interface through which subscriptions to different types of notifications can be set up (or cancelled), and secondly, common attributes for all notifications.

Further, applying a common *Name Convention for Managed Objects* is useful for co-operating applications that require identical interpretation of names assigned to network resources under management.

10.4 Defining the IRPs

It is important to avoid dependency on one specific technology, as the technologies will change over time. Applications need to be future-proof; One fundamental principle for achieving this is to clearly separate information models from protocols for the external interfaces, where the information models are more important than the selection of protocols.

Thus, the detailed IRP specifications are divided into two main parts, following the directives from TMF's SMART TMN:

- *Information models* specified with an implementation neutral modelling language. The Unified Modelling language (UML) has been selected, as it is standardised (by OMG), supported by most object oriented tools and used in several ongoing standardisation efforts (CIM etc.)

- *Solution sets*, i.e. mappings of the information models to one or several protocols (CORBA/IDL, SNMP/SMI, CMIP/GDMO, COM/IDL etc.). Different protocol selections may be done for different IRPs.

The following figure shows an example of how an IRP can be structured (the Alarm IRP).

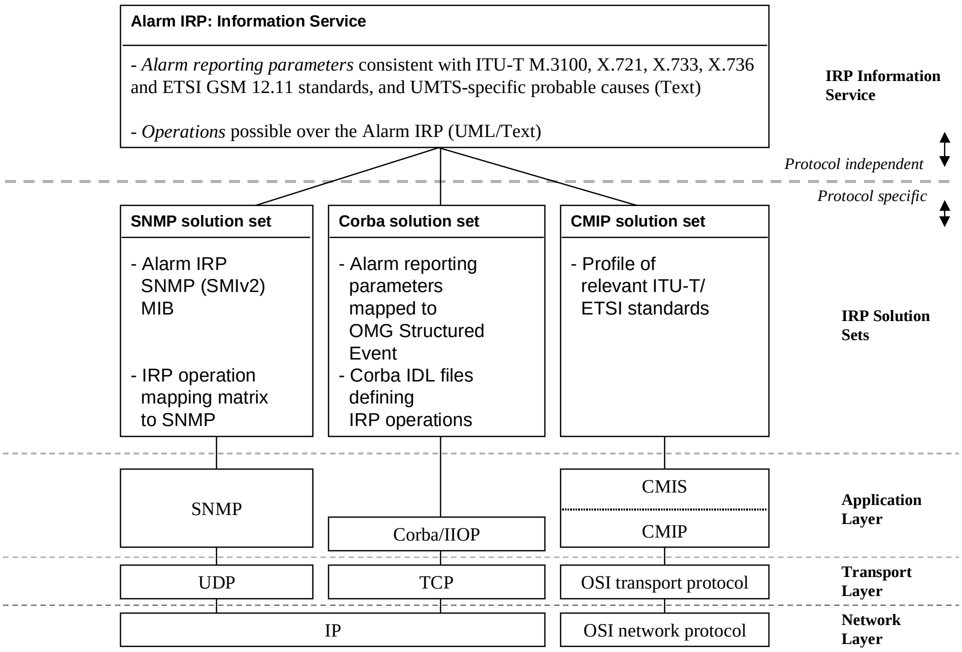

Figure 12: IRP example