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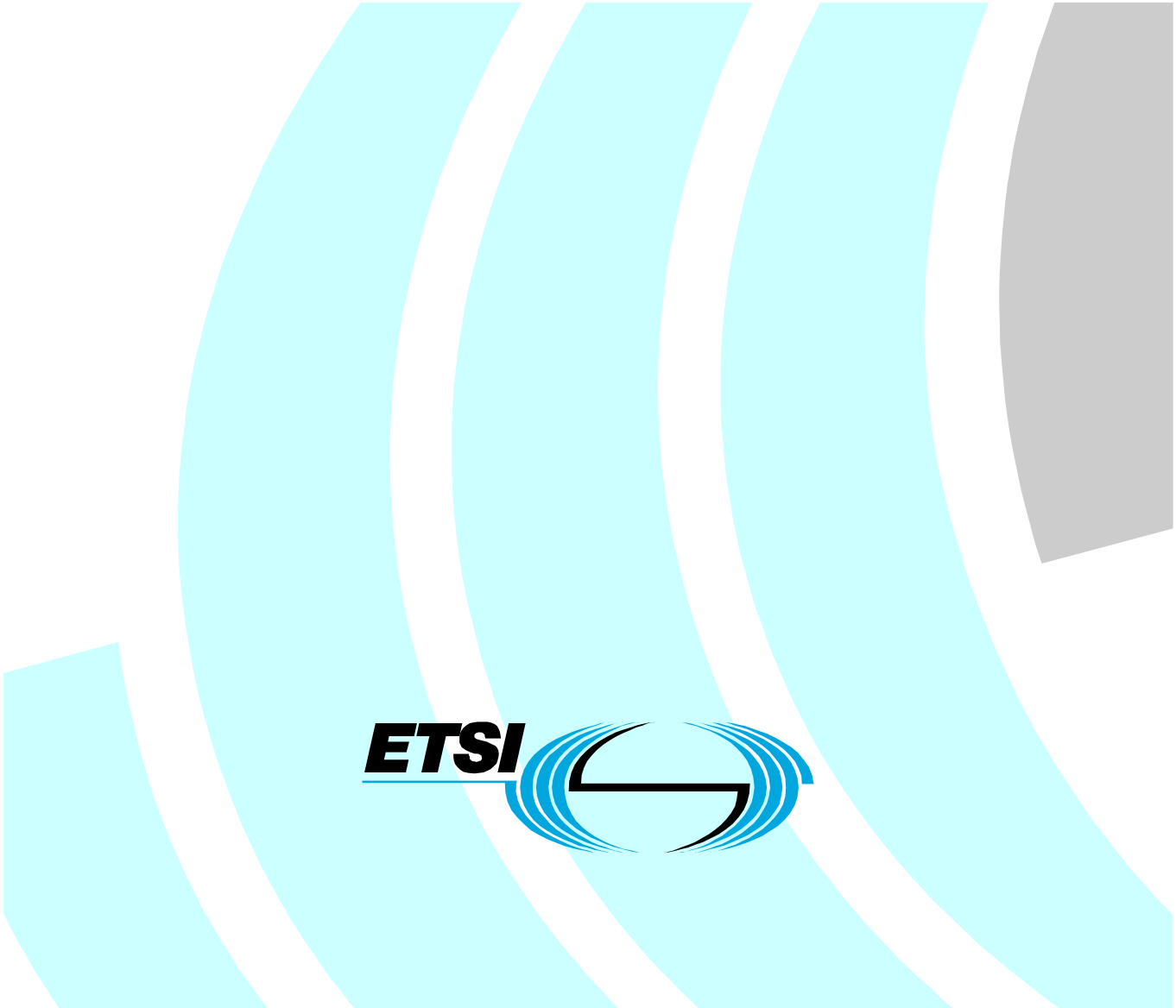
Technical Specification

Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); NGN management; Operations Support Systems Architecture



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

The focus of the present document is on NGN OSS architecture, and in particular on the management of IP-based services in the NGN network environment. As the lifecycle of services are expected to become shorter and shorter, automated OSS processes for service creation and lifecycle management process are needed, as well as tools that automatically advertise data about new services to customers.

For the business, secure e-services is one cornerstone to success in connection with networking (security in connection with monitory transactions is a must). In addition, network accessibility and "always-on" are also of tremendous importance as a network outage can result in substantial economical losses. Concepts and/or specifications within the tariff and billing area may be restructured and changed to meet the requirements of NGN. The ability to offer arbitrary service packaging in connection with right pricing will be one area of competitive advantage.

The task of standardization is to standardize methods and tools that support service development in a consistent way. However standardization should not touch areas of competition, which is a very sensitive area for SPs and ISPs. The focus regarding service management and support is on Why-leading to requirement statement specifications, on What-leading to functional/information modelling (and concrete syntax agnostic) specifications and on How-leading to concrete syntax specifications. The present document does not deal with system internal implementation.

1 Scope

The purpose of the present document is to specify a high level architecture and design principles for the NGN Management OSS Architecture Release 1.

The NGN management Architecture specified in the present document is structured in three views:

- The Business Requirements view: this presents the business concepts, strategies and requirements, for Management on the NGN.
- The Functional/Information view: this presents the architecture including functions and their relationships and the information models and logical interfaces defined for supporting the business requirements. The Functional/Information view is the focus of the present document.
- The Implementation view: this presents the technical components, the technical interfaces and the data models defined for supporting the Functional/Information view.

The security of management aspects are transverse; they cover the three management views: Business Requirements view, Functional/Information view and Implementation view.

The Business Requirements for NGN management are described in the NGN OSS Requirements document (TS 188 003 (see bibliography)) and the OSS Services Release 1 document (TS 188 002 (see bibliography)).

The present document specifies the Functional/Information view of the NGN OSS Architecture for the management of the NGN network and services and its specific Security aspects. The NGN OSS Functional/ Information view is based on the concepts of TeleManagement Forum's New Generation Operations System and Software (NGOSS) [2] including the TMF eTOM, TNA and SID. It should be noted that the Functional and Information views are sometimes described separately, however as they are so closely linked, they are considered as a single view for the purposes of NGN Management.

The present document also gives some design principles and guidelines for the Implementation View. A technology specific implementation architecture is not specified. However, technology neutral requirements on such an architecture are specified. This is to allow the maximum flexibility for NGN equipment vendors, OSS Vendors and Operators in packaging functionality as they see fit.

In the body of the present document the term NGN refers to TISPAN NGN.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] ITU-T Recommendation M.3050 series: "Enhanced Telecommunications Operations Map (eTOM)".

[2] TeleManagement Forum TMF 053: "NGOSS Technology Neutral Architecture".

[3] ETSI TS 132 101: "Universal Mobile Telecommunications System (UMTS); Telecommunication management; Principles and high level requirements (3GPP TS 32.101)".

[4] ETSI TS 132 150: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Integration Reference Point (IRP) Concept and definitions (3GPP TS 32.150)".

[5] ETSI TS 132 151: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Integration Reference Point (IRP) Information Service (IS) template (3GPP TS 32.151)".

[6] ETSI TS 132 152: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Integration Reference Point (IRP) Information Service (IS) Unified Modelling Language (UML) repertoire (3GPP TS 32.152)".

[7] ETSI TS 132 311: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Generic Integration Reference Point (IRP) management; Requirements (3GPP TS 32.311)".

[8] ETSI TS 132 312: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Generic Integration Reference Point (IRP) management; Information Service (IS) (3GPP TS 32.312)".

[9] ETSI TS 132 313: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Generic Integration Reference Point (IRP) management; Common Object Request Broker Architecture (CORBA) Solution Set (SS) (3GPP TS 32.313)".

[10] ETSI TS 132 300: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Configuration Management (CM); Name convention for Managed Objects (3GPP TS 32.300)".

[11] ETSI TS 132 621: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP); Requirements (3GPP TS 32.621)".

[12] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture Release 1".

[13] TeleManagement Forum TMF 608: "Multi Technology Network Management Information Agreement".

[14] TeleManagement Forum TMF GB921: "Enhanced Telecom Operations Map® (eTOM) Browsable and Interactive Version".

[15] ETSI TS 132 111-2: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information Service (IS) (3GPP TS 32.111-2)".

[16] TeleManagement Forum TMF GB922: "Shared Information/Data (SID) Model-Phase III: Concepts, Principles, and Business Entities".

[17] TeleManagement Forum TMF 513: "Multi-Technology Network Management Business Agreement".

[18] TeleManagement Forum TMF 814: "Multi Technology Network Management NML to EML Interface Solution Set".

[19] OASIS wd-soa-rm-10 (2005): "Service Oriented Architecture Reference Model".

[20] ETSI TR 188 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Management; OSS vision".

[21] ETSI TS 132 622: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Network Resource Model (NRM) (3GPP TS 32.622)".

[22] ETSI TS 132 632: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Telecommunication management; Configuration Management (CM); Core Network Resources Integration Reference Point (IRP): Network Resource Model (NRM) (3GPP TS 32.632)".

[23] ITU-T Recommendation H 248: "Gateway control protocol".

[24] ITU-T Recommendation H.323: "Packet-based multimedia communications systems".

3 Definitions and abbreviations

3.1 Definitions

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

interaction pattern: a well defined sequence of messages exchanged between a provider and a user

NOTE: For example the ebXML business transaction activity Request/Confirm.

IRP (Integration Reference Point): architectural concept that is described by a set of specifications for definition of a certain aspect of the Itf-N, comprising a Requirements specification, an IRP Information Service specification, and one or more IRP Solution Set specifications (TS 132 101 [3])

IRP Information Service (IS): 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)

NOTE: Information Services are defined for all IRPs (TS 132 101 [3]).

IRP Solution Set (IRP SS): contains a mapping of the IRP Information Service (IS) to one of several technologies. An IS can be mapped to several different Solution Sets

NOTE: Different technology selections may be made for different IRP Information Services. The functionality and information specified in a Solution Set is constrained by the functionality and information specified in the associated Information Service (TS 132 101 [3]).

Network Resource Model (NRM): Information Service describing Information Object Classes representing the manageable aspects of network resources, e.g. an RNC or NodeB (TS 132 101 [3])

NGN OSS Service Interface Group (NGN OSS SIG) (depicted as a dotted line oval): grouping of NGN OSS Service Interfaces that belong together according to a chosen context

NOTE: NGN OSS Service Interface Groups may be comprised of other NGN OSS Service Interface Groups.

NGN OSS Operation (NGN OSS Op): behaviour which is published as a member of an NGN OSS Service Interface or an NGN OSS Service Interface Consumer

NOTE 1: Each NGN OSS Operation is defined in terms of one specific Interaction Pattern.

NOTE 2: A behaviour is defined in terms of pre-conditions, post-conditions and exceptions.

NOTE 3: An NGN OSS Operation can be seen as a capability of the NGN OSS.

NGN OSS Service (depicted as an ellipse): behaviour or set of behaviours, made available through a profilable aggregation of NGN Service Interfaces, offered by one entity for use by others through their NGN OSS Service Interface Consumers; this usage is governed by a service description

NGN OSS Service Interface (NGN OSS SI) (depicted as a lollipop): well defined grouping of related NGN OSS Operations and constant data which are necessary to deliver coherent business or system functionality

NOTE: The NGN OSS Service Interface is the fundamental unit of standardization.

NGN OSS Service Interface Consumer (NGN OSS SIC) (depicted as a crescent): a well defined grouping of related NGN OSS Operations and constant data which represent the user/consumer of an NGN OSS Service Interface.

Operations Support System (OSS): generic term for a suite of management functions that enable an enterprise to monitor, analyse and manage systems, resources and services

Process: process describes a systematic, sequenced set of functional activities that deliver a specified result

NOTE 1: In other words, a Process is a sequence of related activities or tasks required to deliver results or outputs.

NOTE 2: See ITU-T Recommendation M.3050 series: "Enhanced Telecommunications Operations Map (eTOM)" [1].

Process Element : is the highest level of the constructs within the eTOM framework, which can be used directly by the enterprise

NOTE 1: Process elements are modular for potential reuse and independent update and/or replacement.

NOTE 2: ITU-T Recommendation M.3050 series: "Enhanced Telecommunications Operations Map (eTOM)" [1].

provisioned services: services that are configured through network management applications by the operator

NOTE: Examples are (IP) VPNs, VLLs, VPLS and other leased line data services and transport services ("pipes"), These services can be delivered to end-users and whole-sale customers or be part of the operator's network infrastructure services to connect to own or ASPs' access networks.

Service Oriented Architecture (SOA): software architecture of services, policies, practices and frameworks in which components can be reused and repurposed rapidly in order to achieve shared and new functionality

NOTE 1: This enables rapid and economical implementation in response to new requirements thus ensuring that services respond to perceived user needs. SOA uses the object-oriented principle of encapsulation in which entities are accessible only through interfaces and where those entities are connected by well-defined interface agreements or contracts.

NOTE 2: See OASIS wd-soa-rm-10 (2005): "Service Oriented Architecture Reference Model" [19].

signalled services: services that are initiated by end-users (using SIP or other signalling protocols) from CPE equipment/terminals

NOTE: Examples are voice, video-on-demand, internet access, multi-media calls, etc.

Solution Set (SS): mapping of an information model pertaining to an interface to a specific technology.

NOTE: Examples of Solution Sets are:

- 3GPP IRP Solution Sets: see TS 132 101 [3].
- TMF MTNM Solution Set: see TMF 814 [18].

third-party Application Services: services that are built using general IT programming environments, make use of the available network capabilities and interface with the network capabilities through open interfaces, such as Parlay

NOTE: These services are the source of the rich service offering that is expected to be possible in the NGN environment. These services are also mostly signalled services.

3.2 Abbreviations

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

3GPP	3rd Generation Partnership Project
ABE	Aggregate Business Entity
API	Application Programme Interface
CCV	Common Communication Vehicle
CM	Configuration Management
CMIP	Common Management Information Protocol
CN	Core Network
CORBA	Common Object Request Broker Architecture
CRM	Customer Relations Management
DHCP	Dynamic Host Control Protocol

EM	Element Management
eTOM	enhanced Telecommunications Operations Map
ETSI	European Telecommunications Standards Institute
FCAPS	Fault, Configuration, Accounting, Performance and Security
IETF	Internet Engineering Task Force
IRP	Integration Reference Point
IS	IRP Information Service
Itf-N	Interface N
ITU-T	International Telecommunication Union - Telecommunications sector
MP&C	Market Product and Customer
MPCM	Market Product and Customer Management
MTNM	Multi Technology Network Management
MTOSI	Multi-Technology Operations Systems Interface
NE	Network Elements
NGN	Next Generation Network
NGOSS™	New Generation Operations Systems and Software
NM	Network Management
NRM	Network Resource Model
OMG	Object Management Group
OOAD	Object Oriented Analysis and Design
OSS	Operations Support System
RIM	Remote Invocation Method
RM	Resource Management
SI	Service Interface
SIC	Service Interface Consumer
SID	Shared Information/Data model
SIG	Service Interface Group
SLA	Service Level Agreement
SM	Service Management
SOA	Service Oriented Architecture
SOAD	Service Oriented Architecture and Design
SRM	Service Resource Management
SS	Solution Set
TMF	TeleManagement Forum
TMN	ITU-T Telecommunications Management Network
TNA	Technology Neutral Architecture
TRM	Transport Resource Management
UDDI	Universal Description, Discovery and Integration
UML	Unified Modelling Language
VoIP	Voice over IP
WSDL	Web Service Description Language
XML	eXtended Mark up Language

4 Introduction to NGN OSS management views

The NGN Network Architecture [12] builds on 3GPP IP Multimedia Subsystem (IMS) specifications for part of its network architecture and extends them to cover the fixed network requirements.

The specification of the NGN OSS Architecture should cover the management of this extended network and its services. The NGN OSS Architecture shall be defined according to (in line with) the concepts of Service Oriented Architecture (SOA) design.

The NGN management specifications build wherever possible on existing management standards from 3GPP (e.g. IRPs), ITU-T and TMF (e.g. MTOSI, MTNM, IPNM).

This clause introduces the different views on NGN OSS management in terms of business requirements, functional/information architecture, implementation views and security aspects.

TISPAN NGN introduces the following views of NGN management (figure 1):

- the Business Requirements view: this presents the business concepts, strategies and requirements, for Management in the NGN;

- the Functional/Information view: this presents the Service Oriented Architecture [19] including functions and their relationships and the information models and logical interfaces defined for supporting the business requirements;

- the Implementation view: this presents the technical components, the technical interfaces and the data models defined for supporting the Functional/Information view.

In this approach, the security of management aspects are transverse (i.e. the security aspects of NGN_OSS Management, rather than the Management of Security of the NGN itself, which is an integral part of the 3 views above), they cover the three architecture views: Business Requirements, Functional/Information and Implementation.

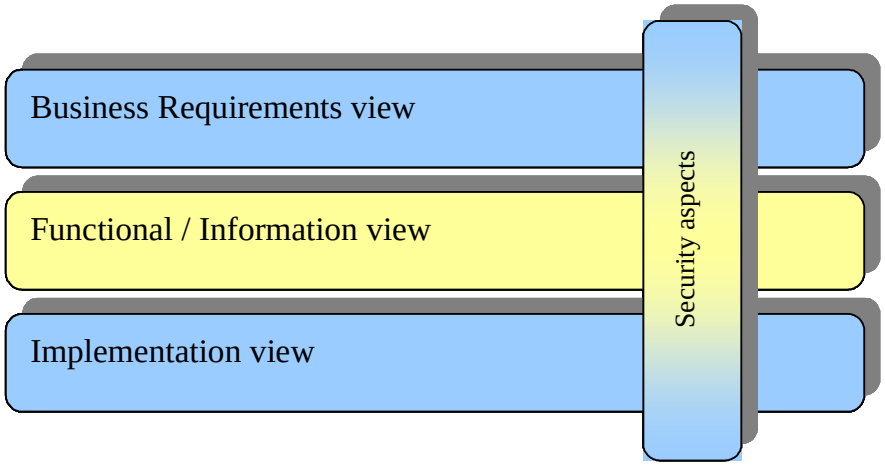

Figure 1: NGN OSS management views

The main purpose of the NGN management views is to allow ETSI NGN to document the steps required to progress from a set of business needs to the creation of a functional/ information view to logically specify those needs. Then, from this Functional/Information View of the Architecture, an Implementation View of the Architecture can be derived that takes into account specific realization requirements such as cost, performance, integration or adaptation of legacy applications, and technology and other organizational preferences.

One of the architectural principles behind the architecture for management of Next Generation Networks is that of being a Service-Oriented Architecture (SOA). A Service Oriented Architecture (SOA) is a software architecture of services, policies, practices and frameworks in which components can be reused and repurposed rapidly in order to achieve shared and new functionality. This enables rapid and economical implementation in response to new requirements thus ensuring that services respond to perceived user needs [19].

SOA uses the object-oriented principle of encapsulation in which entities are accessible only through interfaces and where those entities are connected by well-defined interface agreements or contracts.

The present document concentrates on the Functional/Information Architecture of the OSS required for NGN Management. The rest of this clause describes the content of the other NGN management views (Business Requirements and Implementation) and the link between the three views.

5 Business requirements view

The business requirements for the NGN network encompass the following paradigms:

- the Next Generation Network (NGN), as defined by TISPAN (ES 282 001 [12], which distinguishes service layer and transport layer. This new network must interact with legacy networks (PSTN, GSM, etc.);

- new business and operational requirements described in TR 188 004 [20] and specified in TS 188 003 (see bibliography), supporting the eTOM Business Process framework (TMF GB921 [14]/ITU-T Recommendation M.3050 [1])].

The following clause provides an overview of the context of the ETSI TISPAN NGN OSS Architecture.

5.1 Overview of the ETSI TISPAN NGN Architecture

Figure 2 provides an overview of the NGN Architecture (ES 282 001 [12]). The network subsystems are divided into 2 layers (Service layer and Transport Layer). The NGN OSS Architecture (clause 6) reflects this division of NGN resources into two layers.

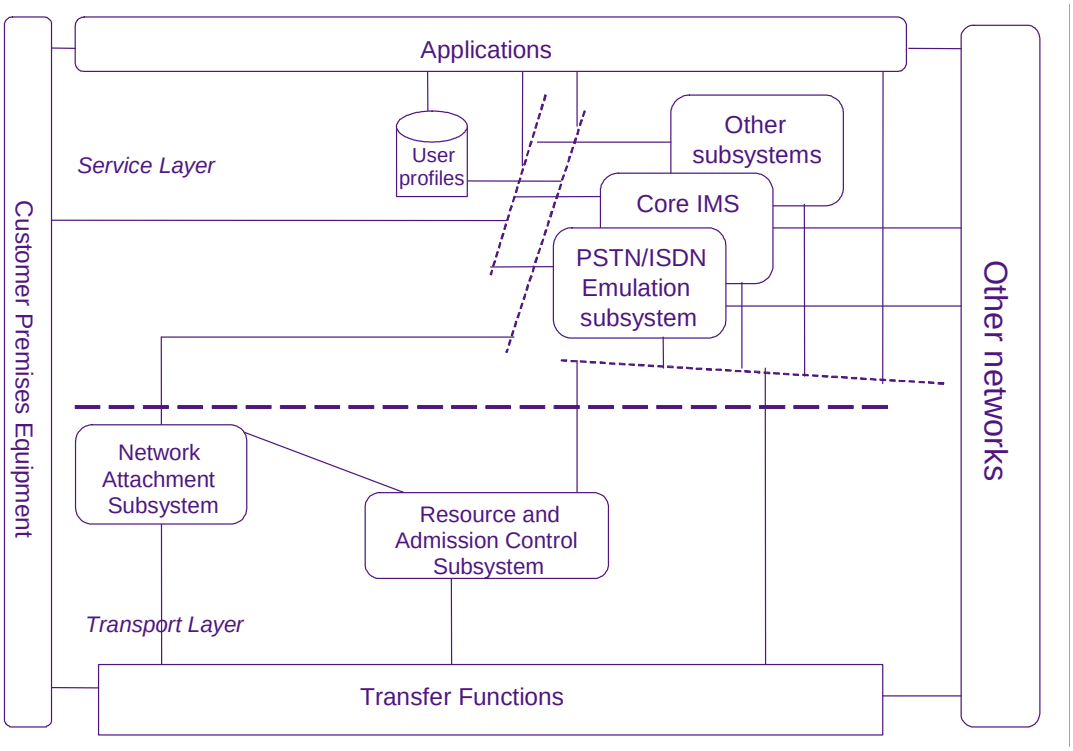

Figure 2: NGN Architecture components

The functional entities making up a subsystem may be distributed over network/service provider domains and may thus fall into separate management domains. For example, as shown in figure 3 the network attachment subsystem may be distributed between a visited and a home network. Service-layer subsystems that support nomadism may also be distributed between a visited and a home network.

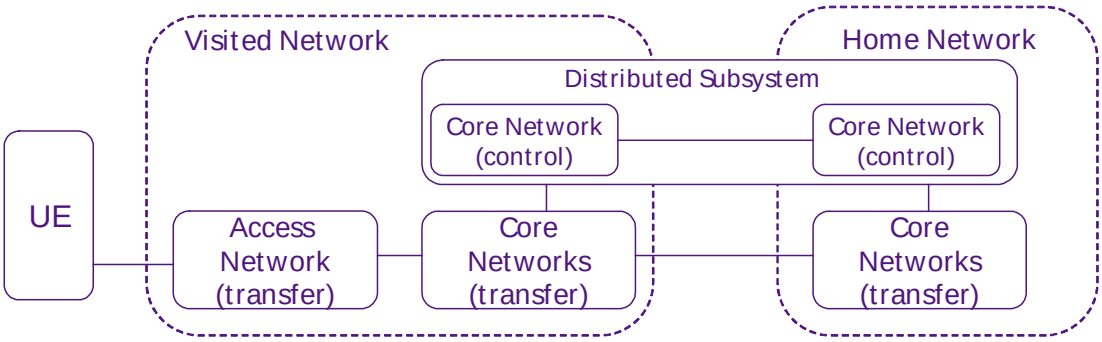

Figure 3: NGN Network Distributed Subsystems (ES 282 001) [12]

The implication of the distribution of the TISPAN NGN Architecture is that the NGN OSS Architecture needs to be distributed following the same principles.

5.2 NGN business and operational requirements

Business and operational requirements for NGN management are specified within different sources, amongst which:

- OSS Vision, TR 188 004 [20];
- eTOM Business Process Framework (TMF GB921 series [14]; ITU-T Recommendation M.3050 series [1]);
- OSS Requirements and Priorities, TS 188 003 (see bibliography);
- OSS Services Release 1, TS 188 002 (see bibliography).

5.2.1 NGN OSS vision

The "OSS Vision" document presents business, regulatory and operational requirements, utilizing the eTOM as reference business process framework, and referring to the TeleManagement Forum NGOSS (New Generation Operation Systems and Software) program as reference industry approach for development of OSSs.

5.2.2 eTOM business process framework

eTOM is a business process model or framework that has the objective of describing and classifying the business processes required for a Service Provider; it analyzes the processes to different levels of detail according to their significance and priority for the business.

eTOM uses hierarchical decomposition to structure the business processes according to which all of the processes of the enterprise are successively decomposed. Process elements are formalized by means of a name, a description, inputs/outputs, etc.

The eTOM supports two different perspectives on the grouping of the detailed process elements:

- horizontal process groupings, in which process elements are grouped according to reference accomplished functionalities (e.g. Market and Product and Customer management, Service management, etc.);
- vertical process groupings, in which process elements are grouped within End-To-End processes (e.g. Fulfilment, Assurance, etc.) accomplished by the Service Provider enterprise.

The eTOM Business Process Framework is defined as generically as possible, so that it is independent of organization, technology and service. However it is not a Service Provider business model.

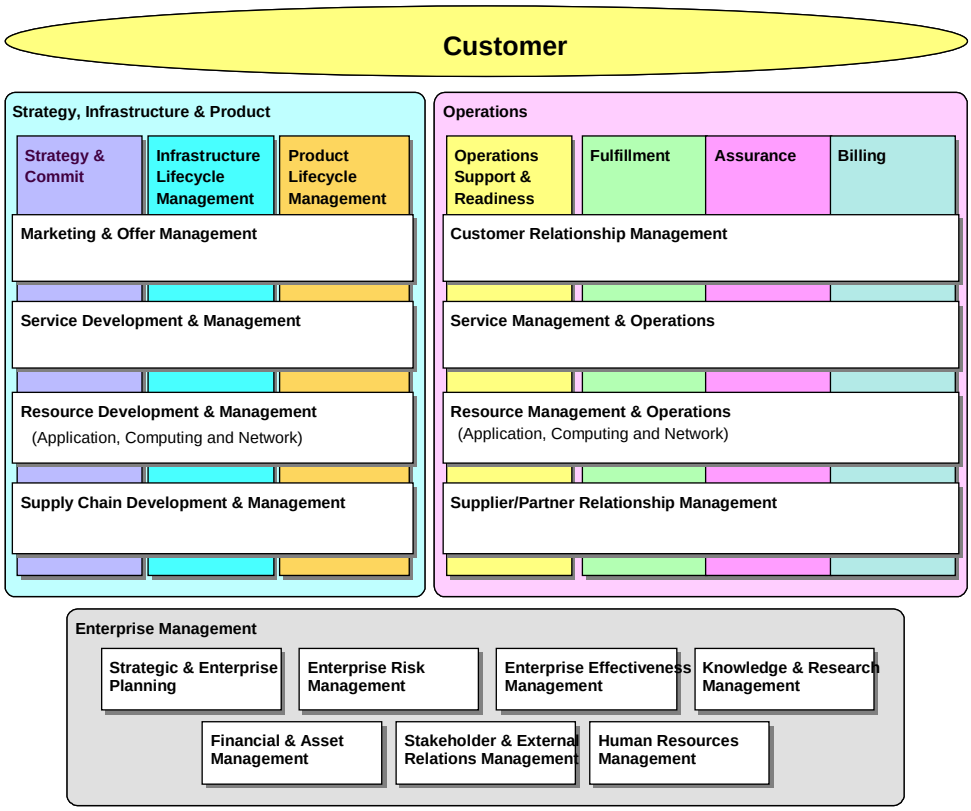

Figure 4: eTOM Business process framework (TMF GB921 [14], ITU-T Recommendation M.3050.1 [1])

Since the eTOM framework provides a description of Service Provider processes, this framework provides implicit business requirements for the specification of the NGN OSS Architecture.

The NGN OSS Architecture specified within the present document complies with the above requirements.

6 Functional/information view

The functional/information Architecture view describes the components, functions and information needed to fulfil the Business Requirements in order to provide the NGN OSS Services as defined in TS 188 002 (see bibliography).

6.1 Principles underlying the view

The NGN OSS functional/information view builds on the following principles:

- The OASIS Service Oriented Architecture (SOA) [19].

NOTE: This does *not* rule out the import of non-SOA-based or "legacy" standards from 3GPP, TMF or other organizations.

- The 3GPP Integration Reference Point (IRP) concept [3], [4], [5], [6], [7], [8], [9], [10][11].
- The TMF NGOSS Technology Neutral Architecture TMF 053 [2].
- Applicable concepts of ITU-T.
- Applicable concepts of TMF MTNM/MTOSI/IPNM.

The fundamental SOA concepts that are adopted within the NGN OSS Architecture are:

- operations: they represent single logical units of behaviour. They have a specific, structured interface, and return structured responses using a particular interaction pattern;

- service interfaces: logical groupings of operations.

Using the above ideas and principles, the rest of this clause introduces the basic concepts and entities used in the description of the SOA-based NGN OSS Functional/Information View. The proposed formal relationship amongst these entities is established in an Architecture Meta-model presented in the informative annex C.

The NGN OSS Architecture concepts and entities are defined in a way that enables the re-use of / mapping to existing management interface standards from e.g. 3GPP, ITU-T and TMF.

Details on the correspondence of these concepts to similar concepts used in 3GPP are given in annex C. The formalization of the mapping of these concepts to 3GPP concepts and the correspondence or mapping to similar concepts of ITU-T and TMF are for further study in Version 2. This may lead to further adaptations of the Metamodel as required.

6.2 Methodology for the identification of NGN OSS functional/information view entities

Service orientation is an approach to defining distributed, interface-oriented systems that deliver functionality as services. These services are accessed through the interfaces they expose.

The objective of the definition of the NGN OSS functional/information view is the identification of the logical service interfaces to be provided by components of an NGN OSS system. Then such parts can be assembled into an NGN OSS system by using their interfaces in a way that supports a particular service providers' business processes.

The logical service interfaces of the NGN OSS service-oriented architecture are the primary focus of standardization.

In order to identify the NGN OSS Service Interfaces of the NGN OSS Architecture that need to be standardized, the management functions expressed in the business requirements view (clause 5.2) need to be mapped to the NGN OSS Functional/Information View.

For a given set of known service interfaces, a service interface group can be used to associate such service interfaces into different groups on the basis of a criterion chosen to fulfil a certain need, e.g. common functionality, a selling package, a directory organization, alphabetical order, etc. Thus the NGN OSS service interface group can be the means through which NGN OSS Service Interfaces will be identified and grouped.

Initially, for the NGN OSS functional/information view under definition, the NGN OSS Service Interfaces are not yet formalized and first need to be identified. However, as the target of the NGN OSS Functional/Information View is to support Service Providers' business processes on a flexible way, the eTOM Business process framework [14] has been chosen as the guiding criterion to group NGN OSS Service Interfaces.

- At the top level, the NGN OSS Service Interface Groups are defined to support the eTOM Level 1 functional process groupings.
- Then, each of these top level NGN OSS Service Interface Groups can be further refined into smaller NGN OSS Service Interface Groups in order to support Level 2, Level 3, Level 4 etc. eTOM processes.
- This refinement of NGN OSS Service Interface Groups can thus be utilized as a practical method for the identification of individual NGN OSS Service Interfaces.

Examples of the use of the concept of NGN OSS Service Interface Group are contained in annex B.

6.3 Entities composing the NGN OSS view

This clause introduces the definitions of the different entities used to describe the NGN OSS Functional/Information View and provides their formal definition with additional explanations.

6.3.1 Overview

The NGN OSS Service and the NGN OSS Service Interface are the main basic entities used in the description of the NGN OSS View. An NGN OSS Service Interface provides access to functionality for managing the NGN in a way that supports the eTOM operational processes.

NGN OSS Service Interfaces are the target of standardization and shall be specified as well-defined sets of related behaviours that together deliver necessary functionality to be provided by an NGN OSS.

Each behaviour is specified as an operation with a well-defined name, data, and pre- and post-conditions.

NGN OSS Service Interfaces and Service Interface Consumers are grouped into NGN OSS Services.

For a given NGN OSS Service, NGN OSS Service Interfaces and Service Interface Consumers may be defined as mandatory or as optional. The NGN OSS Service can be profiled: a profile of an NGN OSS Service indicates which of its Service Interfaces and Service Interface Consumers are present in a given specification used in the description of a possible realization of an NGN OSS system. All NGN OSS Operations within an NGN OSS Service Interface/Service Interface Consumer must be provided if the NGN OSS Service Interface/Service Interface Consumer is present in the specification. i.e. individual operations cannot be profiled.

The basic NGN OSS Architecture principles require that NGN OSS Service Interfaces are made publicly available for use by NGN OSS Service Interface Consumers.

Following the above introduction, the NGN OSS Functional/Information View is described in terms of the entities explained below.

The proposed correspondence of these entities with 3GPP concepts can be found in annex C.

6.3.2 NGN OSS Service Interface

NGN OSS Service Interface (NGN OSS SI) (graphically depicted as a lollipop): a well defined grouping of related NGN OSS Operations and constant data which are necessary to deliver coherent business or system functionality.

The NGN OSS Service Interface is:

- The fundamental unit of standardization.
- An aggregation of functionality required for managing some coherent aspect of the NGN network or services. This functionality is provided through a set of related behaviour/functionality and is made publicly available for use by consumers of this service interface. An example is an Alarm Reporting service interface that offers the functionality supporting the NGN OSS Operations "getAlarmList" and "acknowledgeAlarms".
- Comprised of a set of NGN OSS Operations which must be all present.
- Equivalent to the SOA service interface concept.

6.3.3 NGN OSS Service Interface Consumer

NGN OSS Service Interface Consumer (NGN OSS SIC) (graphically depicted as a crescent): a well defined grouping of related NGN OSS Operations and constant data which represent the user/consumer of an NGN OSS Service Interface.

NGN OSS Service Interface Consumer is:

- The means through which an NGN OSS Service indicates how/if it uses an NGN OSS Services Interface published by another NGN OSS Service.
- A consumer of those NGN OSS Service Interfaces that offer the functionality that its associated NGN OSS Service needs to realize its own NGN OSS Service Interfaces.

SOA principles require that relationships between NGN OSS Service Interfaces and NGN OSS Service Interface Consumers can be established dynamically at run time to perform activities in support of business requirements. However, for early deployment reasons, this relationship may initially also be established manually by Systems Administration people (in the NGOSS Operations Viewpoint) rather than by the services themselves at run time. This may also be needed for dimensioning, planning and performance reasons.

6.3.4 NGN OSS Service

NGN OSS Service (depicted as an ellipse): A behaviour or set of behaviours, made available through a profitable aggregation of NGN Service Interfaces, offered by one entity for use by others through their NGN OSS Service Interface Consumers; this usage is governed by a service description.

The NGN OSS Services are:

- Composed recursively (for details, refer to annex C).
- Used together in orchestrated or choreographed assemblies to deliver specified service/network provider business results according to those business processes that are necessary to manage the NGN.
- Packaged for implementation purposes.

All behaviours that a NGN OSS Service makes available to other NGN OSS Services must be explicitly exposed by one or more NGN OSS Service Interfaces.

NOTE: The association of NGN OSS Service Interfaces with NGN OSS Services is currently out of the scope of TISPAN NGN management standardization.

6.3.4.1 Service description

The service description of a NGN OSS Service makes available information necessary for other NGN OSS Services in order to decide whether or not to bind to that specific NGN OSS Service. Information contained in a service description is typically related to:

- The identity of the NGN OSS Service and information on its availability.
- Policies, parameters, terms of use, invocation constraints of the NGN OSS Service (and possibly other information), all expressed by the NGN OSS Service Interfaces exposed by the NGN OSS Service.

NOTE: This clause needs further analysis and refinement in NGN OSS Architecture Release 2 due to the fact that the NGN OSS Service and NGN OSS Service Interface definitions are structured in a different way compared to the OASIS SOA Reference Model [19].

6.3.5 NGN OSS Operation

NGN OSS Operation (NGN OSS Op): a behaviour which is published as a member of an NGN OSS Service Interface or an NGN OSS Service Interface Consumer.

NGN OSS Operation(s):

- Is bound to a specific NGN OSS Service Interface or NGN OSS Service Interface Consumer.
- Represents a published behaviour of the NGN OSS service exposing this NGN OSS service interface.
- May be defined using NGN OSS Operations that are published as part of NGN OSS Service Interfaces of other NGN OSS Services.
- Is a single logical unit of behaviour. This behaviour is defined in terms of pre-conditions, post-conditions, and exceptions, and further policy artefacts, in which case the NGN OSS Operation is called contract-defined. An example of an NGN OSS Operation is the "getAlarmList" operation as specified in the 3GPP Alarm IRP Information Service document (TS 132 111-2) [15].
- Are defined using "Message Exchange Patterns" (such as synchronous or asynchronous Request/ Response/ Notification) as defined, for example, by TMF NGOSS Contracts, the design pattern TMF MTOSI communication styles and patterns, and W3C WSDL. Each NGN OSS Operation is defined in terms of one specific Interaction Pattern (e.g. SRR, SIT, SFB, ARR, ABR, AFB in case of TMF MTOSI), which is a well defined sequence of messages exchanged between a provider and a user, such as the ebXML business transaction activity RequestConfirm.

NOTE: Correspondence with 3GPP IRP can be found in clause C7 and annex D.

6.3.6 NGN OSS Service Interface Group

NGN OSS Service Interface Group (NGN OSS SIG): a grouping of NGN OSS Service Interfaces that belong together according to a given logic or context.

NGN OSS Service Interface Group(s):

- Are basically collections of NGN OSS Services Interfaces that have similar characteristics or business objectives. Possible examples of such collections may be Utility Services (defined by NGOSS as OSS Framework Services), or groups of OSS Business Services needed to support business objectives such as Customer Relationship Management (CRM).
- May be a member of several NGN OSS Service Interface Groups. For example, the operations of the "Customer Profile Management" NGN OSS Service Interface could belong to both a Provisioning and a Billing Management Service Interface Group.
- Can be comprised recursively of NGN OSS Services and/or other NGN OSS Service Interface Groups.
- Can be seen as a subset of the capabilities or a management functions of the NGN OSS.

6.4 The NGN OSS Function/Information View Reference Model

Using the entities introduced in the previous clause, the NGN OSS Functional/Information View Reference Model (figure 5) can be presented as a collection of NGN OSS Services which provide groups of NGN OSS Operations that are exposed as NGN OSS Service Interfaces and that use the NGN OSS Service Interfaces of other NFN OSS Services through NGN OSS Service Interface Consumers.

The binding between NGN OSS Service Interfaces and NGN OSS Service Interface Consumers is not described in the Functional/Information View.

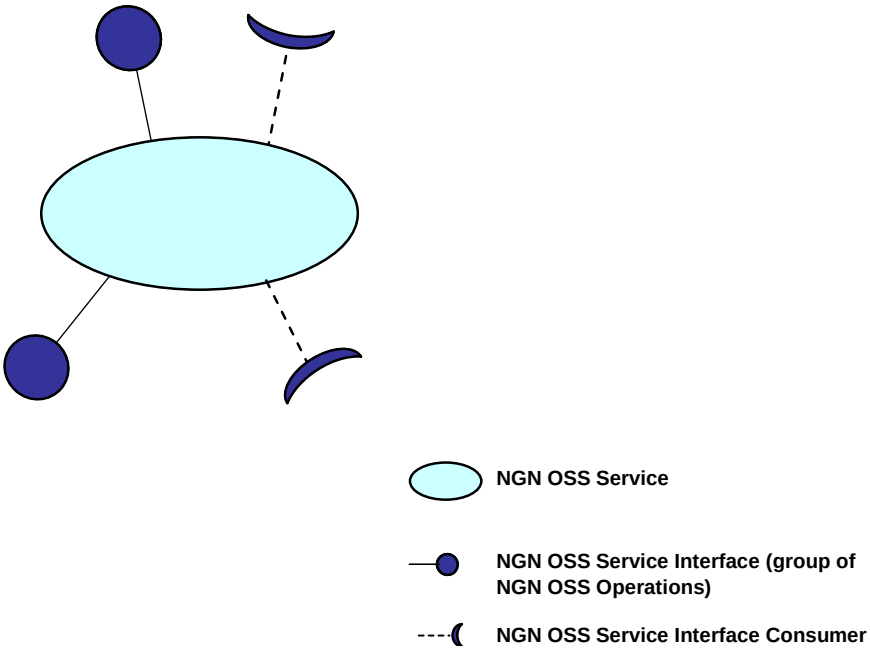

Figure 5: NGN OSS Functional/Information View Reference Model

NGN OSS Service Interface Groups can be used to create different views on the NGN OSS Service Interfaces according to different criteria. For example, a criterion can be "alphabetical order" for use by marketing tools or Product offer management tools, or a domain oriented grouping for use by different operators.

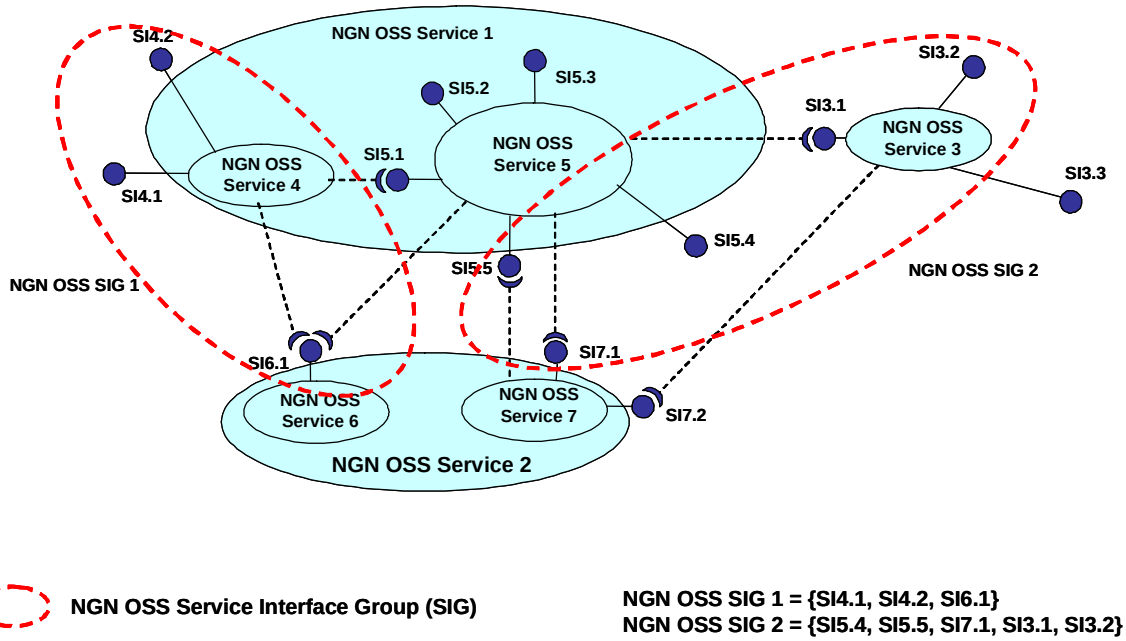

Figure 6: NGN OSS Service Interface Groups: example

Clause 10 identifies the NGN OSS Service Interface Groups and related NGN OSS Service Interfaces required for defining the NGN OSS Functional/Information View.

7 Implementation view

Essentially the NGN OSS implementation view is the transformation of the functional and information view into a implementation view as shown in figure 1. Note that constraints, and requirements, are placed on the implementation view covering cost, legacy, performance and preferences. The most important preferences are the choice of software or protocol platforms for realization. The binding between NGN OSS Service Interfaces and NGN OSS Service Interface Consumers is realized in the implementation view.

The target implementation view:

- uses practical and available SOA technology implementations, such as, but not limited to, OSS/J Remote Method Invocation (RMI) and Java Messaging Services (JMS), Web Services using XML/SOAP/WDSL, MTOSI JMS v1 and MTOSI v2 HTTP/S (which is SOA WSDL based);
- re-uses 3GPP IRP Solution Sets as needed;
- re-uses TMF Solution Sets and ITU-T interface specification as needed;
- adds NGN specific management specification Solutions Sets as needed.

7.1 Introduction to SOA implementation

A Service Oriented Architecture (SOA) is a software architecture involving loosely coupled, location independent services generally using the so-called "find-bind-execute" paradigm for the communication between SOA service providers, SOA service users and a SOA service registry. Any given service may assume a client or a server role with respect to another service, depending on situation. An essential characteristic of an SOA is that it provides published contract-based, platform and technology neutral Service Interfaces. This means that the interface of a service is independent of its implementation. In practice, interfaces are defined using ubiquitous IT standards such as XML, HTTP, SOAP, and WDSL.

Major goals of an SOA in comparison with other software architectures used in the past are to enable:

- faster adaptation of software to changing business needs;
- cost reduction in the integration of new services, as well as in the maintenance of existing services.

Today, an SOA is a key to the development and deployment of heterogeneous, network addressable software components. Web Services currently represent the most well known implementation of an SOA although Java and proprietary Enterprise Bus systems or other implementations based on the "publish - subscribe" paradigm follow similar principles.

7.2 Implications of SOA implementation

TMF NGOSS specifications (one of the fundamental sources for developing the TISPAN NGN OSS Architecture) are based upon the use of the eTOM Business Process framework, the SID Information Model, and the NGOSS Technology Neutral Architecture.

In particular, the TMF NGOSS Technology Neutral Architecture (TNA) (TMF 053), which includes the specification of the NGOSS contract, is recognized as the one of the most suitable references to guide the implementation of SOAs in the telecom industry, and is the only known source of metamodels to specify SOAs [2].

NOTE: In the present document the definition of SOA is taken from OASIS [19].

The critical features of a SOA are in fact captured within the NGOSS principles:

- Common Communications Vehicle (CCV) - Reliable distributed communications infrastructure e.g. Software bus integrating NGOSS components and workflow.
- Externalization of process control - Separation of end to end business process workflow from NGOSS Component functionality.
- Shared Information Data Model (SID) - NGOSS component uses /implements a defined part of the SID model.
- Business Aware NGOSS components - where component services/functionality are defined by NGOSS Contracts.
- Contract trading and registration using NGOSS framework components (covering things like directories, transactions, HMI, security, etc.).

7.3 Implementation View Reference Model

The NGN OSS architecture implementation view requires the use of a reference model. As illustrated in figure 7, at the highest level of abstraction, this reference model is composed of:

- NGN OSS Basic Framework Services, providing the infrastructure necessary to support the distributed nature of the NGN OSS Architecture.
- NGN OSS Business Services, whose utilization in choreographed assemblies fulfils specific Service Providers" business needs.
- Common Communications Vehicle (CCV), allowing interaction amongst the above-mentioned NGN OSS Services.

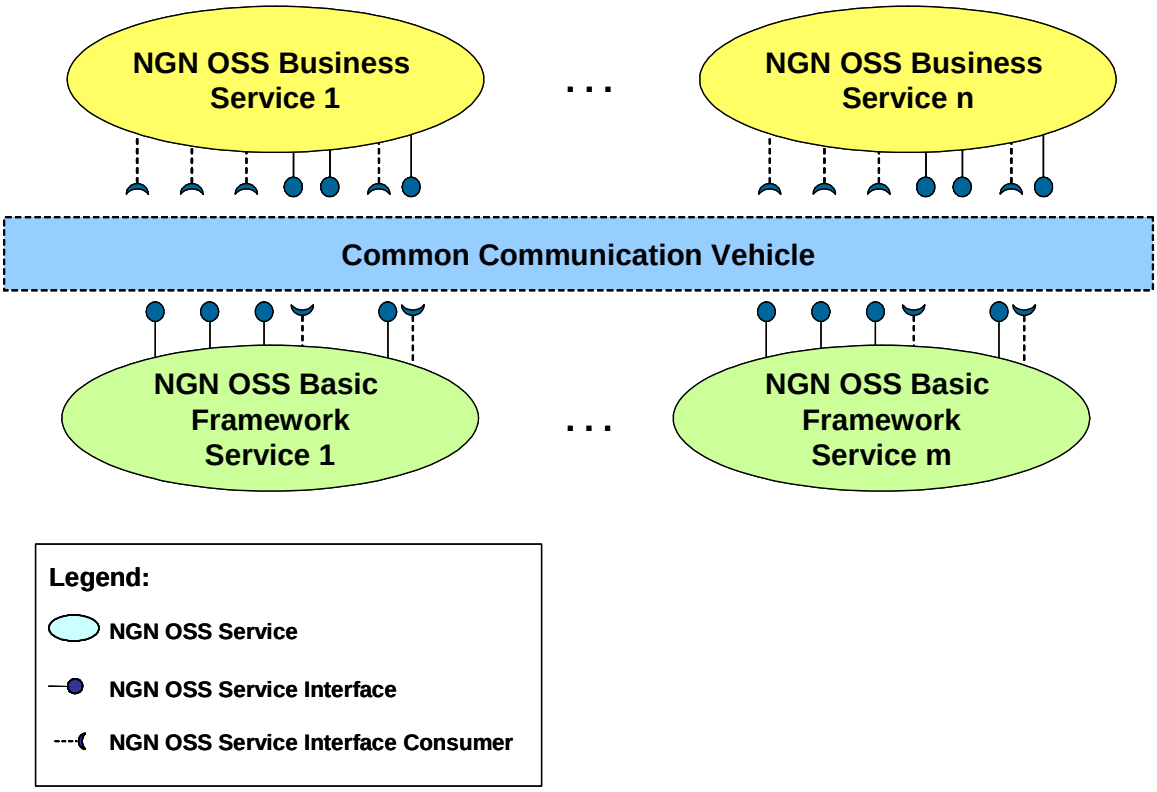

Figure 7: TISPAN NGN OSS Implementation View reference model

NGN OSS Basic Framework Services relate to aspects such as distribution, transparency, registration, etc.

For an exhaustive list of candidate NGN OSS Basic Framework Services refer to TMF 053 [2], pp. 34 - 36 (within the present document they are referred as NGOSS Framework Services and Other Mandatory NGOSS Services).

NGN OSS Business Services provide services that support business requirements stated in clause 5.2 (e.g. market, product and customer management, service management, resource management, etc.).

The use of a CCV (e.g. a messaging bus or some other form of common communication) enables the standardization of system-wide operations, messages, or events that can be distributed.

More detailed requirements on the implementation view of the NGN OSS Architecture are for further study.

7.4 Role of Registry/Directories in SOA Implementation

This latter principle has very considerable impact on the architecture as it means that components must register themselves and that clients of these components use a "find-bind-execute model". This means that the interactions between components are established dynamically at run time unlike the traditional concept of TMN architectures where interactions are defined statically at design time in the form of reference points.

7.5 SOA Registry/Directory Organization

An important aspect of a SOA is that a Directory is needed to support the trading and registration services to support the "find" operation. These directories, an example being the UDDI directories used for Web Services, need to have a taxonomy or classification schema for organizing the registered web services.

In this functional/informational architecture the primary classification scheme is based on the TMF eTOM decomposition hierarchy. Secondary Classification schemes could include the TMF SID Aggregate Business Entity (ABE) hierarchy, or the forthcoming TMF Application Map.

8 Security of Management

The security of management aspects are transverse, they cover the three architecture views: Business Requirements, Functional/Information Architecture and Implementation.

Detailed Security architecture implementation is for further study.

9 Linking Business, Functional/Information and Implementation Views

The NGN OSS Business, Functional/Information and Implementation views are partly described in different and often multiple standards documents today:

- Business requirement are mostly specified in the TMF eTOM.
- Functional/information views and related requirements are specified by the TMF NGOSS (Technology Neutral Architecture and SID model) and TMF MTOSI/MTNM/IPNM, 3GPP and ITU-T documents.
- Implementation views are also given by the TMF NGOSS program and MTNM/MTOSI specifications, 3GPP and ITU-T. Moreover, several implementation related fora, such as OMG, OSS/J, OASIS and W3C also specify "semi-standard" implementation views.

9.1 Assumptions for linkage

For ETSI TISPAN, the following assumptions hold:

- eTOM business requirements are expected to be valid for the NGN OSS, even if today's eTOM may need further elaboration of some business processes to cover NGN.
- 3GPP management requirements, functional/information architecture and implementation views are a prime resource for the ETSI NGN. 3GPP management specifications cover today the mobile network management and could be extended to cover NGN management. They also cover the basics of the next generation service resource management support around subscriber, and subscription management.
- TMF MTNM specifications may be used to cover today the network resource management of fixed edge/core, transport and access networks. Network resource management for VoIP as the next generation service is covered by TMF IPNM specifications. Both are of prime importance in the definition of the ETSI TISPAN_OSS for NGN management.
- ITU-T management specifications cover the still valid basic management FCAPS concepts. It is assumed that reference point definitions will evolve to support the more flexible integration requirements of the NGN OSS.
- fixed/mobile convergence, or rather the "any access to any service, any time, any where" requirements, imply that the NGN OSS implementations are based on common Services and Transport resources models for both fixed and mobile technologies.

The ETSI TISPAN approach needs to take into account all the above mentioned points, and also has to recognize the fact that the next generation software architecture will be a Service Oriented Architecture (SOA), e.g. WebServices based.

9.2 Route to convergence

There is a need to converge TMF NGOSS, ITU-T, 3GPP, and TMF MTNM and IPNM specifications.

The proposed approach is that ETSI NGN OSS focuses on the definition of service-oriented, technology independent management interfaces for the OSS which is sufficiently decoupled from individual 3GPP, MTNM/IPNM and ITU-T network resource management specifications to allow for an abstract view towards the managed networks.

ETSI TISPAN introduces concepts for use in the definition of the ETSI NGN OSS Functional/ Information Architecture which allow to englobe related concepts of these other management specifications, in particular the 3GPP Integration Reference Point (IRP) concept, so that maximal re-use of existing specifications is possible.

These concepts offer on the one hand a functional modularity required to support the operational processes on the functional NGN OSS architecture and NGN network. On the other hand, they provide the flexibility required by the Service Oriented Architecture and can be considered as a first step to e.g. WebServices support. The ETSI_TISPAN introduced concepts also enable stepwise evolution from existing implementations by their openness to new interface technologies while enabling re-use of existing requirements and information model specifications.

Using the introduced concepts, the resulting ETSI TISPAN specifications will be documented as follows:

- The link with the eTOM business aspects is documented in the "NGN OSS Requirements" document that provides the grouping of these requirements in terms of NGN OSS Service Interface Groups.
- The link between the Requirements view and NGN OSS Functional/ Information Architecture view will be given by means of a mapping of the requirements into NGN OSS Service Interface Groups which group NGN OSS Service Interfaces. After sufficient decomposition of NGN OSS Service Interface Groups, this will result in a set of NGN OSS Service Interfaces to be standardized.
- For each NGN OSS Service Interface, the link with a particular Implementation View will be given by mapping to a Solution Set (refer to clause 7). This step will be further described in Version 2 of the present document.

The following clause describe the NGN OSS Functions Sets and their mapping onto entities of the NGN OSS Functional/Information Architecture.

10 NGN OSS Functional/Information View and Service Interface Groups

The NGN OSS Functional/Information Architecture covers the management of both fixed and mobile networks and has to handle a set of new NGN related aspects such as network capabilities and an all-IP multi-media service environment.

TISPAN NGN inherits as much as possible from the 3GPP IMS architecture.

Working top down, this clause creates an NGN OSS Functional View by mapping the NGN OSS Requirements onto main NGN OSS Service Interface Groups. This is the first step required in the identification of the NGN OSS Service Interfaces which will then be used in the definition of the NGN OSS Functional/ Information Architecture definition.

Examples related to NGN OSS Service Interface Groups are found in annex B.

10.1 Mapping of NGN OSS Requirements to Service Interface Groups

Due to the complexity of both the business and the support systems there is a need for a framework that can be used when systems are developed within the scope of the architecture. For that purpose a NGN OSS reference model is defined in this clause.

The main purpose of this model is to help business and development projects to make clear distinctions between different management areas in order to utilize a stable and cost-effective management environment. NGN OSS architecture consists of Service Interface Groups, or groupings of Service Interface Groups.

At the highest level, the NGN OSS Functional/Information view supports three main NGN OSS Service Interface Groups grouping respectively the NGN OSS Service Interfaces required for managing:

- customer facing aspects of the OSS, e.g. the Market, Product and Customer Management Service Interface Group;
- services on the NGN networks, e.g. the Service Management Service Interface Group;
- resources of the NGN network, e.g. the Resource Management Service Interface Group.

Figure 8 depicts the NGN OSS Functional/Information view in terms of NGN OSS Service Interface Groups.

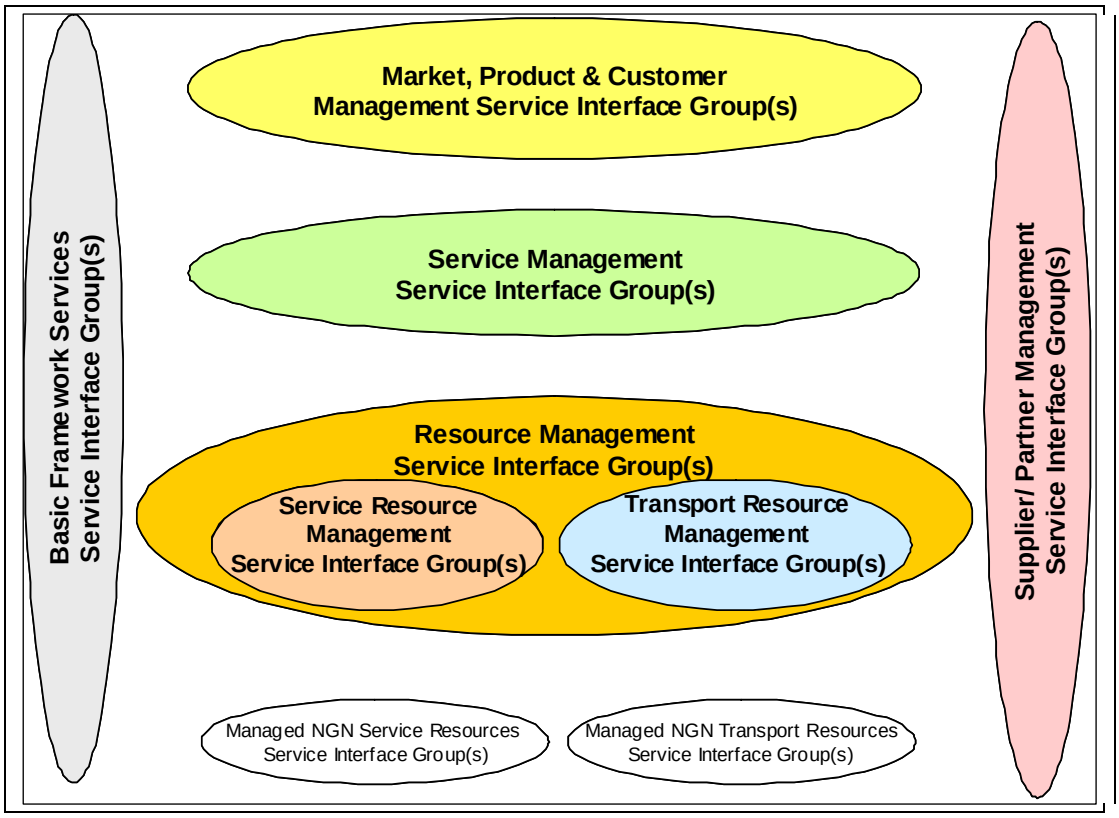

Figure 8: NGN OSS Functional View in terms of eTOM based Service Interface Groups

The motive for this NGN OSS Functional/Information View is that technology and business must be able to develop independently from each other. The technology independent Market Product and Customer Service Interface Groups and Service Management Service Interface Groups guarantee this.

Within the NGN OSS Functional/Information View, there is a Service Interface Group, named Basic Framework Services Service Interface Group, which provides common services (e.g. security, directory, etc.) supporting the other Service Interface Groups.

NOTE: The security services provided within the Basic Framework Services Service Interface Group are used for the management of security of the NGN services.

The NGN OSS Functional/Information View encompasses management functionality of NGN managed resources, that are part of the NGN Transport layer or the NGN Service layer. Such management functionality can be either directly exposed by the NGN (Service or Transport) Resources located within the actual NGN network or proxied (Managed Services Resource / Managed Transport Resource Service Interface Groups).

The Supplier/Partner Management Service Interface Group included in the NGN OSS Functional/Information View is for further study.

10.2 Market, Product and Customer Management (MPCM) Service Interface Group

The Market, Product and Customer Management Service Interface Group (MPCM) is the customer facing Service Interface Group in the NGN OSS Functional View. It is mainly responsible for supporting the development, management and improvement of the relationship with the Customer and for the development, management and retirement of Products.

The management functions which compose the MPCM Service Interface Group will be specified in further releases of the present document. It is suggested to refer to the eTOM framework (TMF GB921 series [14] - ITU-T Recommendation M.3050 series [1]) and to the SID (Shared Information/Data Model) model (TMF GB922 series [16]), as first reference sources for collection of reference information in order to specify the above mentioned management functions.

Some examples (not to be intended as an exhaustive list) of management functions of the MPCM Service Interface Group may be:

- management of instances of Products during their whole lifecycle;
- management of the interaction with customers through a well-defined business interface;
- administration and management of functionality that uses information from the Service Management Service Interface Group (such as trouble ticket handling, collection and processing of accounting data on a product- and/or customer level);
- definition of the product itself from a marketing and commercial perspective (i.e. the characteristics of the product, how to bill, to whom it is addressed, geographical covering of the offer, bundling of services, etc.).

In terms of comparison with the eTOM framework, the MPCM Service Interface Group can be mapped with the eTOM Marketing and Offer Management and Customer Relationship Management process groupings.

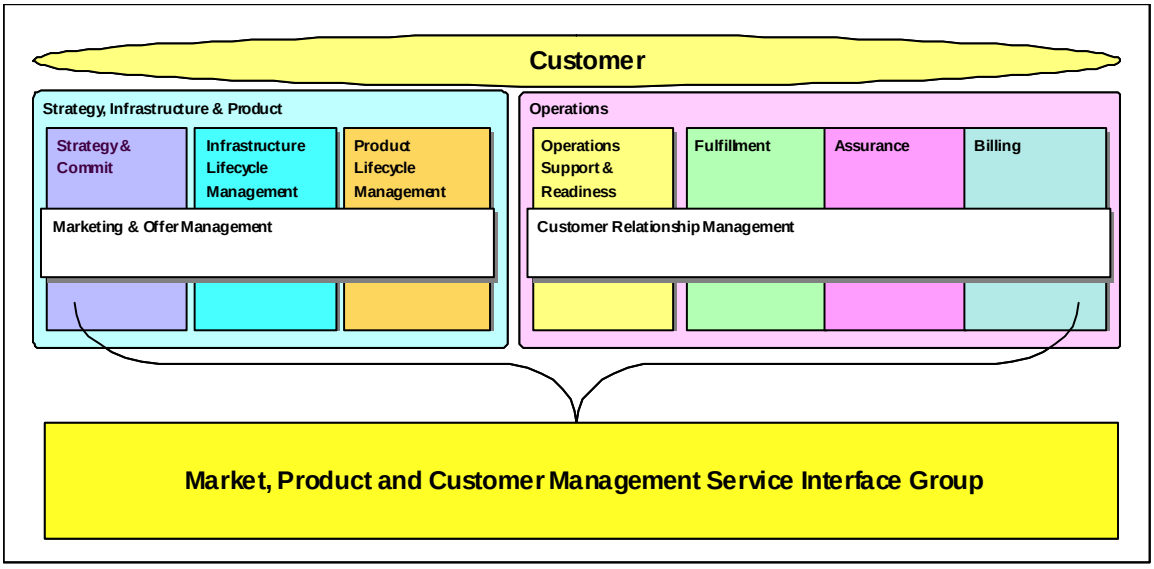

Figure 9: Market Product and Customer Management Service Interface Group compared with eTOM

10.3 Service Management (SM) Service Interface Group

The Service Management (SM) Service Interface Group includes those management functions dealing with Service development, management and operations. All management functions within the SM Service Interface Group will be "resource/technology independent" and will not have any knowledge of the underlying resources involved in the provisioning of services to the customers: no information about transport or service platforms are available in the SM Service Interface Group.

The exhaustive set of management functions which compose the SM Service Interface Group will be specified in further releases of the present document. It is suggested to refer to the eTOM framework (TMF GB921 series [14] - ITU-T Recommendation M.3050 series [1]) and to the SID (Shared Information/Data Model) model (TMF GB922 series [16]), as first reference sources for collection of reference information in order to specify the above-mentioned management functions.

Some examples (not to be intended as an exhaustive list) are given below of management functions of the SM Service Interface Group related to delivery of service capability, service configuration, service problem management, service quality analysis and management, service rating, etc. according to customer expectations.

Typical management tasks that would be performed within the SM function may be:

- the management of the service from an end-to-end perspective (service configuration, service re-routing, service activation, service quality assurance, etc.);
- the management of service profiles (each service profile expresses the network and service resources requirements needed to activate the service) and the management of the association of actual subscribers to the set of profiles corresponding to this subscribers service contract;
- the supervision and proactive management of services to guarantee contractual SLA(s);
- the management of usage records for provision of data to the MPCM Service Interface Group in cases of not respected SLA(s); etc.

In terms of comparison with the eTOM framework, the SM Service Interface Group can be mapped with the eTOM Service Development and Management and Service Management Operations process groupings.

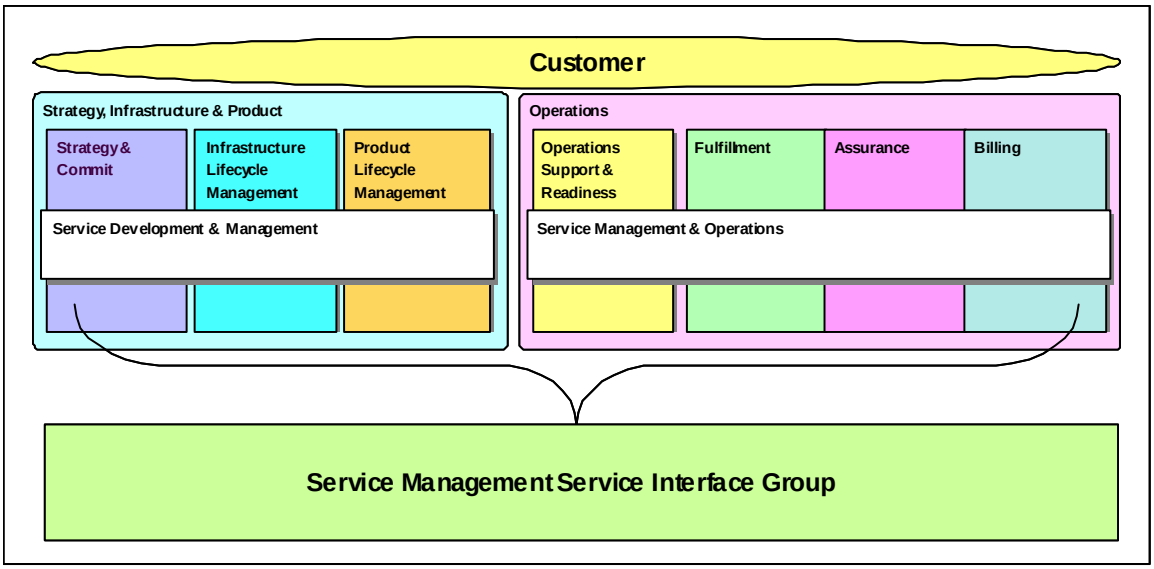

Figure 10: Service Management Service Interface Group compared with eTOM

The SM Service Interface Group relies on the Resource Management (RM) Service Interface Group to map its service oriented view and information to the required resources.

10.4 Resource Management (RM) Service Interface Group

While the Service Management (SM) Service Interface Group has the responsibility for managing the service lifecycle and the delivery and assurance of service instances independently from the type of underlying resources, the Resource Management (RM) Service Interface Group is responsible for the management of the logical and physical service and transport infrastructure.

With respect to the management of the resources of the non-NGN networks, changes due to the introduction of NGN include the need to:

- manage resources linked to services (application and content servers, etc.);
- manage resources linked to new network capabilities (localization, presence, nomadism, etc.);
- support self - and home network management;
- support the combined management of fixed and mobile transport network resources.

The Resource Management (RM) Service Interface Group enables the mapping of service-oriented information used by the Service Management (SM) Service Interface Group into resource/technology dependent information.

In terms of comparison with the eTOM framework, the RM Service Interface Group can be mapped with the eTOM Resource Development and Management and Resource Management and Operations process groupings.

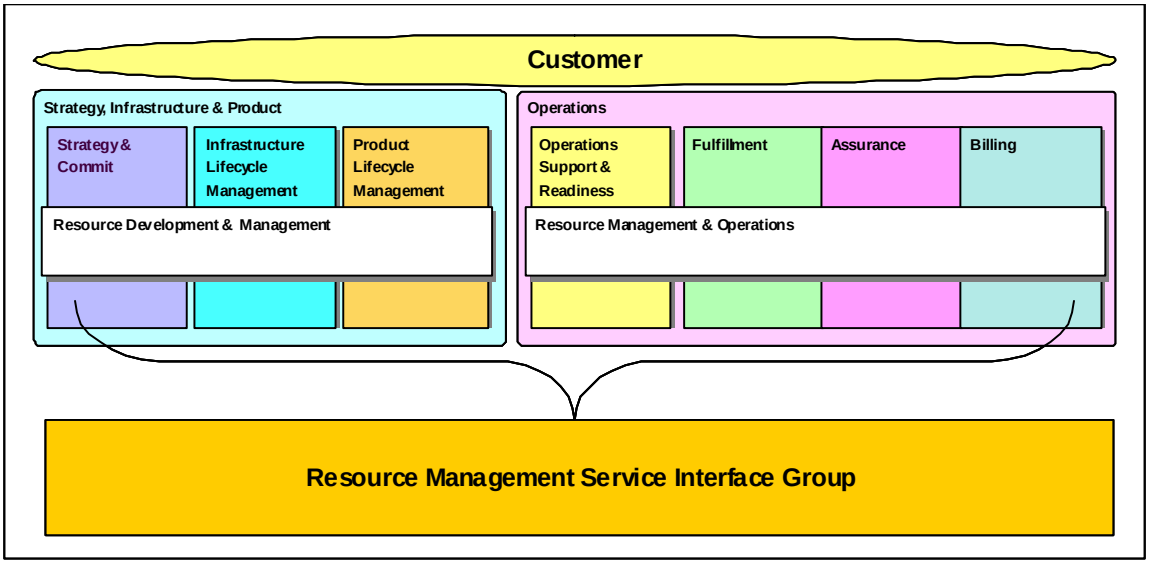

Figure 11: Resource Management Service Interface Group compared with eTOM

The RM Service Interface Group is composed of two Service Interface Groups:

- the Service Resource Management (SRM) Service Interface Group;
- the Transport Resource Management (TRM) Service Interface Group.

The SRM Service Interface Group corresponds to a new set of resource management features related to support the service layer of the NGN, such as the management of applications, application data, users, user data, terminal equipment, etc.

The TRM Service Interface Group corresponds to the traditional transport management functions, with enhancements to support the transport layer of the NGN, such as end-to-end IP connectivity and QoS management, etc.

In the following, an example of the interactions between the SM Service Interface Group and the RM Service Interface Group is given. The provisioning of a given service to an end-user will result in the following actions:

- the creation in the SM Service Interface Group of a new service instance that will associate the results of the allocation of the required service resources and transport resources (connectivity) to this service instance by the RM Service Interface Group;
- an interaction with the TRM Service Interface Group:

  1) for checking availability of required network resources;

  2) for the end-to-end/cross-application configuration of required network resources;

  3) for configuring this end-users' access line according to the technical requirements corresponding to the service contract.

- an interaction with the SRM Service Interface Group:

  4) for creating all user related data the relevant network databases in case of a new user;

  5) for creating all service related data for this user in the relevant network databases;

  6) for triggering/checking the configuration of the CPE equipment.

10.4.1 Service Resource Management (SRM) Service Interface Group

While the Service Management (SM) Service Interface Group has the responsibility for managing the service lifecycle and the delivery and assurance of service instances, the Service Resource Management (SRM) Service Interface Group is responsible for the management of the implementation and logical infrastructure resources required to enable the services.

This service infrastructure includes the data/information required to enable the NGN services with:

- associated mechanisms used by the services to access the data;
- the management of the contained data.

The Service Resource Management (SRM) Service Interface Group includes, but is not limited to, the following functions:

- the mapping of the SM Service Interface Group requirements into service profiles and data interpretable by the underlying EMS/NMS and network nodes;
- the management of the application software and application data in the network, including introduction, upgrade, inventory, distribution, application technologies, open application interfaces and associated security mechanisms;
- the management of the end-user actions on his/her service profile: access by the end-user to his/her profile, the management of the impact on OSS systems following profile changes made by the end-user;
- the management of the aspects related to Service Capabilities, such as Presence, Location, Nomadism, and their impact on active services from the user perspective;
- the management of the aspects related to Network Capabilities, such as Billing, Routing, etc.;
- the management and mechanisms to support subscription to services and the management of the subscription by the end-user (self management);
- the management of the subscriber data and user profile database and its content;
- the collection of service delivery SLA data (data to calculate the time to deliver a service to a user after subscription) in order to guarantee that services are delivered with the requested characteristics;
- the collection of service performance data and its analysis to enable input to service resource planning functions;
- the management of the service required software and configuration on CPE;
- the management of the system allowing for CPE management;
- the management of the pre - testing of the service;
- the management of the application redundancy policy;
- the management of the re-dimensioning of the infrastructure in case the service needs to be extended;
- the management of the collection of application performance data.

An example that illustrates the SRM Service Interface Group as well as the possible information models and solution set is given in annex A.

10.4.2 Transport Resource Management (TRM) Service Interface Group

The Transport Resource Management (TRM) Service Interface Group is responsible for the realization of the required connectivity and for the configuration of other provisioned service related aspects in the NGN. This includes functions such as selection of network technologies, routing, network resource management, inventories, etc.

Transport Resource Management Functions handle the management of the transport layer, e.g. IP/MPLS tunnels, multi-point VPNs, VLLs and transport services, etc.

The Transport Resource Management Service Interface Group relies on existing management functions, and defines additional NGN management functions for handling the end-to-end aspects of implementing services on the network, such as:

- the management of the connectivity aspects related to the provisioning of resources related to access lines;
- the management of QoS mechanisms and mappings at inter-network borders, security and NAT/firewall configuration, signalling network configuration.

The Transport Resource Management (TRM) Service Interface Group includes, but is not limited to, the following functions:

- network to service alarm correlation;
- network access point configuration based on Service Profiles;
- enabling end-to-end IP-based connectivity configuration;
- enabling end-to-end IP-based connectivity assurance;
- VoIP Infrastructure Management (trunking, routing, etc.);
- Network Quality Management;
- collecting service related network performance data on the network to enable service planning.

An example that illustrates the TRM Service Interface Group as well as the possible information models and solution set is given in annex A.

10.5 Managed NGN Resources Service Interface Group

Managed Resource Service Interface Groups group the functions provided by Managed Elements present in the network and used by the Resource Management Service Interface Group. Their identification is for further study.

11 NGN OSS Service Interfaces

11.1 Introduction to TISPAN NGN OSS Service Interfaces

The previous clause has identified several NGN OSS Service Interface Groups, each grouping a number of NGN OSS Service Interfaces. The next step, for each NGN OSS Service Interface Group, identifies and further decomposes these NGN OSS Service Interface Groups in order to determine those NGN OSS Service Interfaces that need to be standardized.

NGN OSS Service Interfaces will be defined whenever possible through re-use or enriching of existing management standards, and may concern only new specifications specifically for NGN OSS requirements in the case that no existing management standard is available yet.

The present clause focuses on identifying the NGN OSS Service Interfaces that:

- Map onto existing management specifications: in this case the present document shall only contain references to them and explain in an annex how this mapping is achieved. This will concern fixed network management standards (e.g. TMF MTNM, ITU-T, IETF, etc.) and mobile network management standards (e.g. 3GPP Release 6 and Release 7). See annex D for a proposed correspondence to 3GPP IRP specifications.
- Are not yet available from other specifications and that should be further elaborated possibly as part of NGN OSS specification documents or by other fora as required.

11.2 NGN OSS Service Interfaces of the MPCM Service Interface Group

The MPCM covers the area of service ordering (order intake) and self-management, for instance applicable to user profile management.

The identification of the NGN OSS Service Interfaces related to the Market Product and Customer Management (MPCM) Service Interface Group is for further study.

11.3 NGN OSS Service Interfaces of the SM Service Interface Group

The identification of the NGN OSS Service Interfaces related to the Service Management (SM) Service Interface Group is for further study.

The Service Management (SM) supports the management of services from the point of view of the end-user, e.g. supporting SLA management, Service provisioning, Service Assurance and the link between the two, and Service composition, VPN / Connectivity, Service Profile management, etc.

The SM focuses on the provisioning of the service elements of the NGN network infrastructure, on the assurance of NGN services end-to-end and on the billing of these services.

11.4 NGN OSS Service Interfaces of the SRM Service Interface Group

The identification of the NGN OSS Service Interfaces related to the Service Resource Management (SRM) Service Interface Group is in the scope of Release 1.

The NGN OSS Service Interfaces for Service Resource Management shall focus on managing, with first priority, on real time conversational services (voice) and content delivery services (Video-on-Demand) across several sub-networks. This covers the management of the RACS, of the NASS, of the PES, of the Application Servers, of associated network capabilities (e.g. localization, presence, reachability) and of the service access / end points (CPE equipment).

As a summary, standardization effort on the NGN OSS Service Interfaces shall apply in the following functional areas:

- Service Application Management.
- Network Capability Management (Presence, Reachability, Localization).
- CPE provisioning.
- Self management (Profile Management).
- Billing /rating configuration management.

Further, generic management specifications defined for Resource Fault Management, Resource Test Management, Resource Performance Management, etc. according to the eTOM processes (see below) may need to be adapted.

11.5 NGN OSS Service Interfaces of the TRM Service Interface Group

The identification of the NGN OSS Service Interfaces related to the Transport Resource Management (TRM) Service Interface Group is in the scope of Release 1.

The Transport Resource Management shall focus on managing provisioned/ connectivity services (e.g. IP, VPN, VPLS, and other leased line data services and "pipes") including access points across several sub-networks.

For specific sub-networks, it may be possible to reuse existing management specifications. In particular, for transport network resource configuration purposes:

- Management specification for managing mobile transport networks may be mapped onto 3GPP Network Resource Model (NRM) specifications. The corresponding NGN OSS Service Interfaces may have correspondence with 3GPP specifications.
- Management specification for managing fixed transport networks may be mapped onto TMF MTNM specifications. The corresponding NGN OSS Service Interfaces may be mapped onto TMF MTNM Interface Model specifications.
- Management specification for managing IP transport services may be mapped onto TMF IPNM specifications. The corresponding NGN OSS Service Interfaces may be mapped onto TMF IPNM Interface Model specifications.

Areas of standardization in Transport Resource Management concern NGN network management, cross-domain Ethernet service management, IP address management, etc. Work should be done in cooperation with TMF MTNM/IPNM for fixed transport network management functions.

Standardization effort on the NGN OSS Service Interfaces shall apply in the following functional areas:

- VoIP Management.
- VoIP Traffic Management.
- NGN Trunk and NGN Routing Management.
- NGN Protocol Management e.g. SIP, H248 [23], etc.

Further, generic management specifications shall be defined for Resource Fault Management, Resource Test Management, Resource Performance Management, etc. according to the eTOM processes. These shall be mapped whenever possible onto existing 3GPP, TMF or ITU-T management specifications and Interface Models.

11.6 NGN OSS Service Interfaces of the SPM Service Interface Group

The identification of the NGN OSS Service Interfaces related to the Supplier/Partner Management (SPM) Service Interface Group is for further study.

11.7 NGN OSS Service Interfaces of the BFS Service Interface Group

The identification of the NGN OSS Service Interfaces related to the Basic Framework Services (BFS) Service Interface Group is in the scope of Release 1.

These NGN OSS Basic Framework Service Interfaces need to be further elaborated or mapped onto existing specifications if available in the framework of the NGN OSS Architecture:

- Communication Service Interfaces for each used Interaction Pattern.
- Publication / Registration Service Interfaces.
- Customization Service Interfaces.
- Security Service Interfaces, etc.

Annex A (informative): Examples of Resource Management functions

Figure A.1 may be used to illustrate the SRM Service Interface Groups s as well as possible information models and solutions sets. The boxes in the diagram are to be considered as examples of functions required for NGN management (in addition to the traditional FCAPS) and identify areas where new SIs shall be proposed as explained in clause 6.

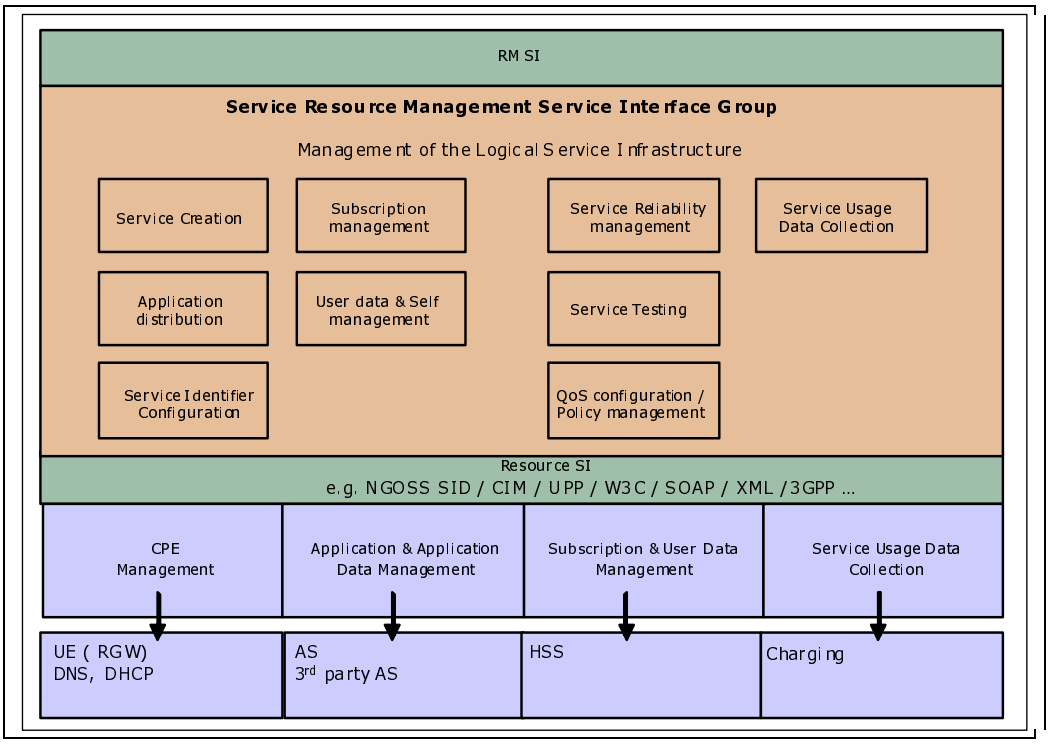

Figure A.1: SRM Service Interface Group example

Figure A.2 may be used to illustrate the TRM Functions as well as possible information models and solutions sets.

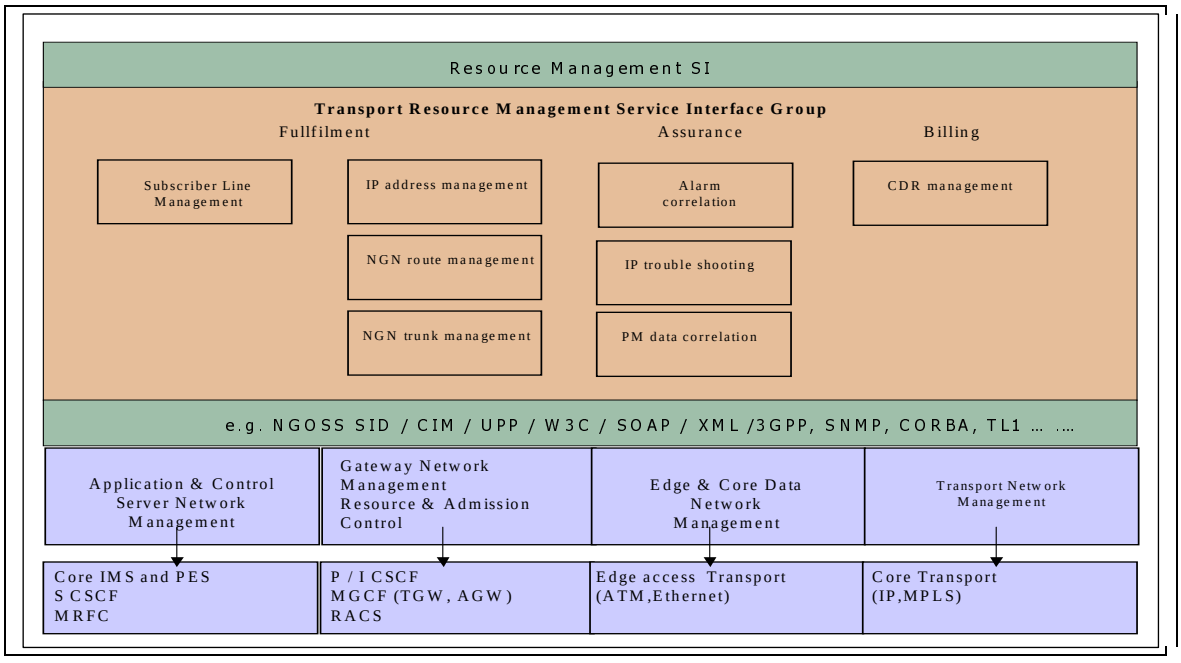

Figure A.2: TRM Service Interface Group example

Annex B (informative): Summary of the rules of SM, SRM, TRM Service Interface Groups

Table B.1 summarizes the role of each Service Interface Groups. This is to help understand what those Service Interface Groups are designed for.

Table B.1: Summary of the rules of SM, SRM, TRM Service Interface Groups

Service Interface Group	Main characteristics	Managed information
Service Management (SM): Responsible for the management of:		
• Service profiles: each service profile expresses the network and service resources non-technical requirements needed to activate the service. • Connectivity profile: to enable the activation of signalled services according to the end-user contract, including the required connectivity and its associated characteristics: bandwidth, QoS, level of SLA). • CPE profile: expresses the required non-technical requirements on the CPE to support the service. • Subscriber SLA: supervision of active services to guarantee meeting the contractual SLA and the impact of non-respect on the billing functions (delivery of information to the operator, rebate indications to billing system in case of too low QoS, etc.). • The association of an actual subscriber identifier to the set of profile instantiations according to the contracted services by this subscriber.	Focus on subscriber satisfaction and demands (mapped into a set of profiles). Focus on activation of the service (signalled services) and on assurance of the service (signalled and provisioned). Focus on QoS from a subscriber perspective. Independent on technology. No technical information about the real network. End-to-end subscriber oriented.	Service profile, Connectivity profile CPE profile Subscriber SLA

Service Interface Group	Main characteristics	Managed information
Service Management (SM): Responsible for the management of:		
• The application software and application data in the network, including introduction, upgrade, inventory, distribution, application technologies, open application interfaces and associated security mechanisms. • The end-user actions on his/her service profile: access by the end-user to his/her profile, the management of the impact on OSS systems following profile changes made by the end-user. • The aspects related to Network(?) Service Capabilities, such as Presence, Location, Nomadism, and their impact on active services from the user perspective. • The management of the system allowing for CPE management (tbc). • Other functions in the SRM domain. • Pre - testing of the service. • Application redundancy policy. • Re-dimensioning of the infrastructure in case the service needs to be extended. • The configuration of the billing infrastructure and related data.	Dependent on technology Takes care of the logical infrastructure that operator needs to deploy in order to provide a given service. Focus on Subscriber in general, Subscriber data base, subscriber profile. Focus on added value application server and applications. Focus on CPE server and associated server (DNS, DHCP) Focus on attachment and authentication data (NASS, AAA, etc.) Focus on billing data collection?	Subscriber data and user profile data base, application data Service delivery SLA data (data to calculate the time to deliver a service to a user after subscription) Service performance data and its analysis to enable input to service resource planning functions DNS/DHCP data CDRs, service resource identification CPE related data

Service Interface Group	Main characteristics	Managed information
Service Management (SM): Responsible for the management of:		
• Selection of network technologies, routing, network resource management, inventories etc. • Connectivity aspects related to inter-operator connectivity or connectivity over multiple networks taking into account the multi-vendors contexts in which NGN networks will operate. • Cross network management function, such as Subscriber line configuration and subscriber ID management in various NEs. • FCAPS provisioning of interfaces on the different underlying networks, mono or cross-domain. • Provision of mediation/abstraction functions between the different networks in order to adapt any proprietary protocols and/or data models. • Other functions: - Network to service alarm correlation. - Enabling end-to-end IP network configuration. - Enabling end-to-end IP-based service assurance.	Dependent from technology Takes care of the physical infrastructure that operator needs to deploy (FCAPS support). Focus on Topology Focus on cross-domain management of the following network components: • Transmission network. • Backbone networks (IP based). • Access networks (ATM/Ethernet based). • RACS for resource control. • Gateways (TGW, AGW, RGW). • PSTN/ISDN emulation subsystem. • IMS subsystem (e.g. S-CSCF).	Network addresses such as IP address and ranges of these Geographical information (where network resources and entities are located). Naming. Topology of how the equipments are connected to each other. Network resources in the network, such as admission control configuration, QoS mechanisms and mappings at inter-network borders, NAT and firewall configuration, signalling network configuration. Network performance data and its analysis to enable input to network resource planning functions.

Annex C (informative): NGN OSS Architecture metamodel

It is generally considered "best practice" to underpin management architectures with a formal metamodel based up the use of a notation such as the Unified Modelling Language (UML). UML is designed in such a way that other more specialized languages may be developed from it.

The benefits of architecture metamodels is that they lead to a precise specification of the architectural terms, entities and the relationships amongst them. This is particularly important for Service Oriented Architectures where these relationships are formed at run time rather than at design time and are not subject to validation by human architects.

The TMF NGOSS Technology Neutral Architecture has a metamodel TMF 053, which is a specialization of the Object Management Group (OMG) UML 1.5, for NGOSS based architectures. These metamodels take a number of design iterations to get them correct, and usually require that functional, information, and deployment aspects have been considered.

At this stage of development of the TISPAN NGN Management Architecture there is no experience with the deployment aspects so it is difficult to be absolutely confident that a metamodel of the NGN Management Architecture is complete, or accurate at this point in time.

The metamodel is a formal UML definition of the architectural concepts outlined in clause 6. Its main value is that it specifies the relationships between the architectural entities and their cardinality. It is expected that practical use in TISPAN of the metamodel to define extensions to the 3GPP IRPs, and liaison activities with both the TMF and 3GPP, will allow us to make this a normative annex in a later version.

This architecture metamodel shall be based on:

- service oriented architecture principles, such as those from Web Services;
- use of TMF NGOSS TMF NGOSS metamodel TMF 053 and contract TMF 053 as a pragmatic definition of an SOA for OSS architectures;
- re-use of 3GPP specifications;
- alignment with TMF MTNM/MTOSI (TMF 513 [17], TMF 608 [13], TMF 814 [18]) specifications.

The alignment with NGOSS as the SOA and the alignment with IRPs are considered of equal importance. This is due to the fact that the NGOSS SOA is considered to have a rigorous metamodel; and without a metamodel there is greater difficulty in achieving an implementable system.

The remainder of this annex reviews the main characteristics of these inputs before proposing the NGN OSS Architecture metamodel.

C.1 Service Oriented Architecture (SOA)

There is not single industry definition of Service Oriented Architecture (SOA) but several sources have similar definitions:

- http://www.service-architecture.com/;
- http://www-306.ibm.com/software/solutions/webservices/.

SOAs are characterized by (logical) components that expose service interfaces to other components. These service interfaces specify the operations that may be exposed to other components.

All invocation relationships between components are established dynamically at run time using a locate-bind-execute model. This means:

- there is no static reference point architecture;
- a run time mechanism: a registry repository is needed to support the locate-bind-execute model;

- the registry/repository needs to be structured so that components can search for, and find, the services that they wish to use.

One of the characteristics of a SOA is that a component may be used by any other component subject only to the other component having the necessary security access rights, and the ability to comply with the signature of the component service interface.

A specific issue with SOA Architecture and Design (SOAD) is the level of granularity of the definition of these services. Typically these are more granular than the operations that one would find in a Object Oriented Analysis and Design (OOAD). However both SOAD and OOAD use UML as the basis of their specifications.

As an example, a Service Interface might be "Customer Profiling" whereas a typical Operation might be "List customers by name and postal code" (http://www-128.ibm.com/developerworks/webservices/library/ws-soad1/).

C.2 Anatomy of Web Services

Web services using Web Service Description Language (WSDL) have a concept of separating the logical from the physical aspects of an API by providing an Abstract (specification) API that is realized by a Concrete (implementation) API. Many of the terms are derived from software practice rather than Telecom. Specifically the term "interface" is used differently from TMN or common telecoms usage. Interfaces are logical and specify what needs to be implemented and may be realized by one or more software implementations.

- abstract (specification) API in Web Services based on WSDL comprise:
  - interfaces which represent service interfaces and can comprise one or more Operations;
  - operations representing Web service functions and can contain multiple Messages;
  - messages represent collections of input and output parameters which may be grouped into parts;
  - parts which represent Operation parameter data.
- concrete APIs comprise of the following additional elements:
  - service elements that represent collections of Endpoints;
  - endpoints that contain Endpoint data including: physical addresses and protocol information;
  - binding elements associate themselves to Operations elements;
  - each Endpoint references a Binding element, and thus relates the Endpoint information to an underlying Operation.

C.3 NGOSS Architecture Metamodel

NGOSS is essentially an SOA model. Figure C.1 consists of the following NGOSS entities (shown in Yellow).

NGOSS Extensible Element. This provides the core modelling entity for NGOSS and is derived from the UML 1.5 concept of a ModelElement and a GeneralizableElement. It provides the key attributes and relationships which should be supported by all derived NGOSS extensible elements.

NGOSS Component is a software entity that can be independently deployed (unit of deployment) and built conforming to a component software model, and uses NGOSS Contracts to expose its functionality.

NGOSS Shared information Entities is a super-class for defining all information that can be shared and reused amongst different NGOSS Components.

NGOSS Contract. This is the core NGOSS concept and this captures the atomic level of functionality. It captures the relationship with the Shared information Entities that it "uses"; and it provides the element of functionality "exposed by" the NGOSS component that it supports.

NGOSS Components are logical grouping of contracts and are logical "Units of Deployment" for Services.

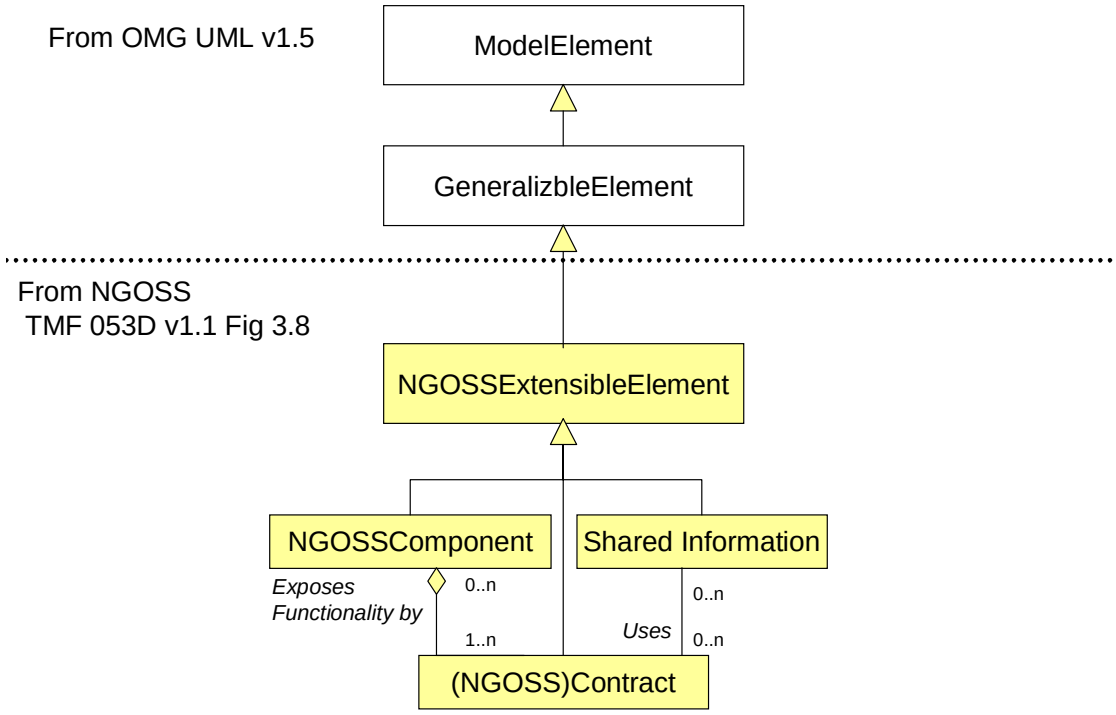

Figure C.1: Core NGOSS architecture metamodel and relationship to UML v1.5 metamodel

C.4 Anatomy of TMF MTOSI

MTOSI is a extension of the TMF MTNM management interface for telecommunication networking technology. MTNM is currently based on CORBA Platform and covers ATM, SDH, DSL, Ethernet and Control Plane technologies.

The main MTOSI extension is to provide XML messages and message exchange patterns that can be operated over either a Java Messaging Service (SOAP over JMS) or HTTP Web Service platform. The contents of these messages reference the MTNM Information Model (TMF 608 [13]). The operations are based on MTNM, but have been extended to be document oriented, and support both efficient inventory and fault management requirements.

MTOSI has adopted the concept of a separate Abstract and Concrete API and has two additional standardization concepts:

- Communication Patterns (also known in Web Services as Message Exchange Patterns) based on software industry practice.
- Communication Styles to accommodate both Remote Procedure and Messaging styles of Software platform implementation. These allow relatively simple binding to be produced to current technologies: JMS and HTTP Web Services; and provide the mechanism to move to new technologies e.g. WSDL 2.0.

C.5 3GPP Architecture and metamodels

This clause analyses the current 3GPP documents that have a relationship with the proposed TISPAN NGN Management metamodel.

The key sources of models in 3GPP are:

- TS 132 150 [4] Integration Reference Point (IRP) Concept and definitions;
- TS 132 151 [5] Integration Reference Point (IRP) IS template;

- TS 132 312 [8] Generic Integration Reference Point Information Service;
- TS 132 152 [6] Integration Reference Point (IRP) Information Service Unified Modelling Language repertoire;
- TS 132 622 [21] Generic NRM IRP IS;
- TS 132 632 [22] CN NRM IRP IS (including IMS model).

The primary focus in 3GPP SA5 is the definition of Itf-N between Network Managers (NM) and either Element Managers (EM) or Network Elements (NE).

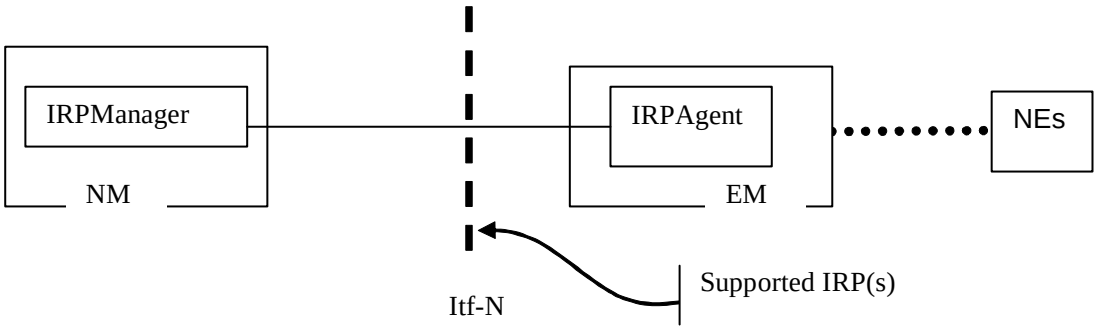

Figure C.2: Example of 3GPP System Context

Note that the physical interface supports the relationship between and IRP Manager and IRPAgent. The IRPAgent supports a set of IRPs i.e. Interface IRPs (e.g. Alarm IRP [15]), Network Resource Model IRPs (e.g. CN NRM IRP), Data Definition IRPs (e.g. State Management IRP).

3GPP does not have currently a formal metamodel. It does however have some of these concepts captured in the UML stereotypes that it defines e.g. <<InformationObjectClass>>, <<Interface>>. In TS 132 150 annex C [4] Integration Reference Point (IRP) Concept and definitions, an informative example is given.

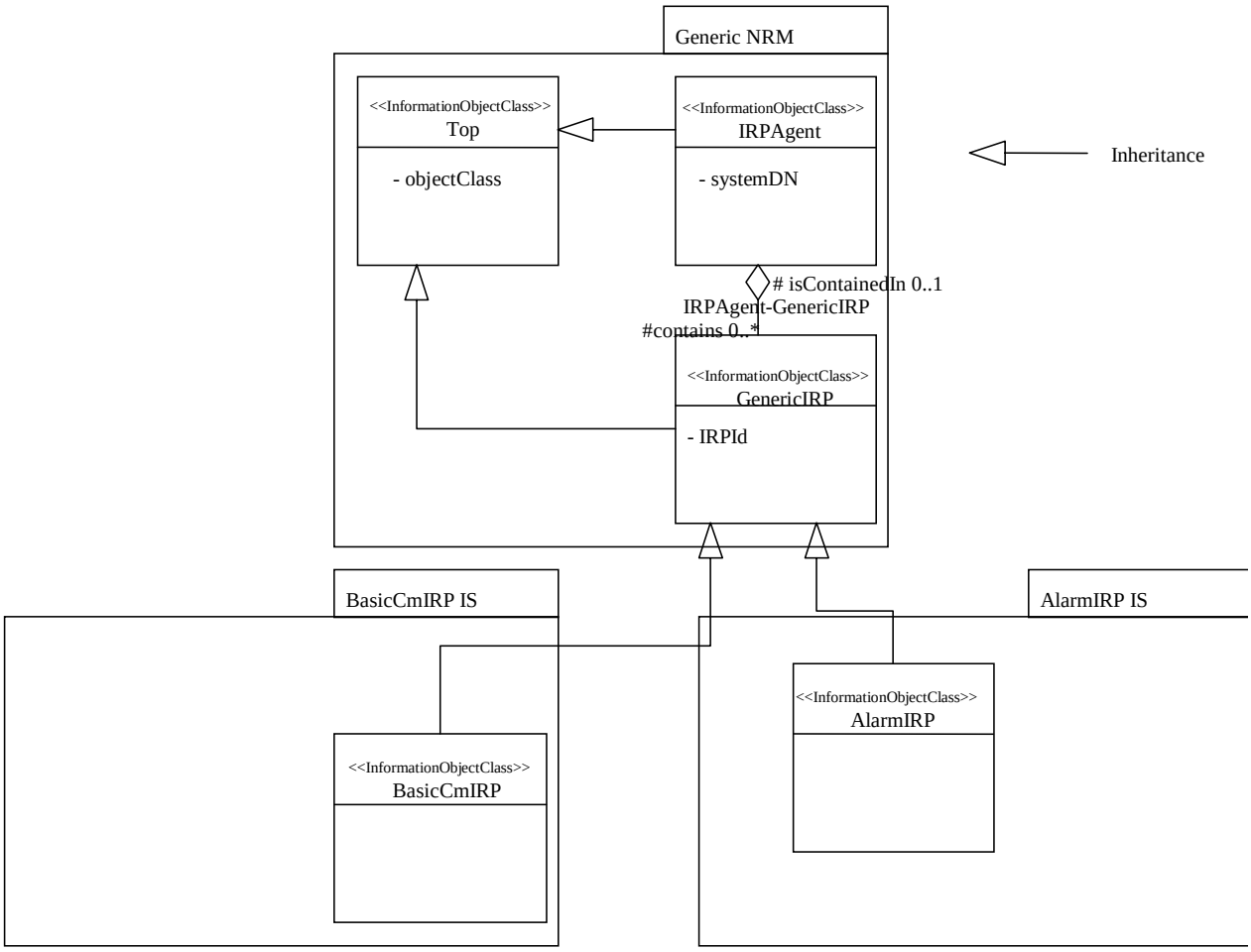

Figure C.3: Example of possible packages together with Information Object Classes (IOCs) and their inter-relationships

NOTE 1: This diagram is taken from an informative annex of TS 132 150 [4].

There are a few very important modelling points in figure C.3:

- IRP IS are collections of UML specifications and accompanying definitions.
- ManagedGenericIRP InformationObjectClass, which inherits from GenericIRP, is the super-class for all Interface IRPs.
- IRPAgents are a container for the IRPs exposed over Itf-N.
- Top is the superclass for all 3GPP IRP InformationObjectClasses.

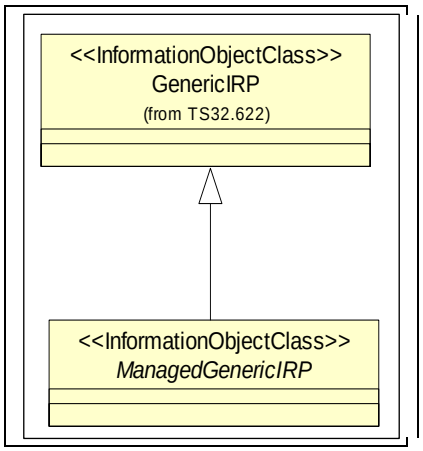

Figure C.4: Managed generic IRP derived from Generic IRP

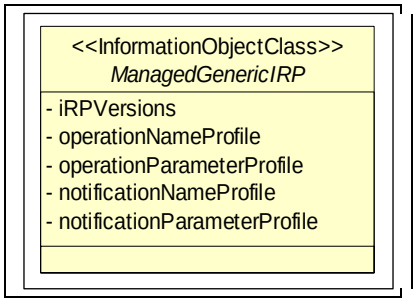

Figure C.5: Operations and notifications for Managed Generic IRP

Example of IRPs are the Alarm IRP which performs much the same function as the NGOSS Component in that it is a unit of deployment, albeit contained within a IRP Agent. Its operations, i.e. getAlarmList in Alarm IRP, seem to line up with the NGOSS Contract concept.

In 3GPP different kinds of solutions sets can be derived from the IRPs. Specifically mappings to CORBA, CMIP and XML.

NOTE 2: XML specifications are not SSs but parts of SSs have been created. These are conceptually equivalent to the concrete API binding described for Web Services and MTOSI above. Theses realizations are called IRP Solution Sets (SS).

C.6 TISPAN NGN Management metamodel

The approach adopted by TISPAN is to create a metamodel, using UML, of the concepts introduced in the main body of the document.

The NGN OSS Architecture reuses and generalizes concepts from UML/Java/C# (class, interface, component), 3GPP IRP methodology (Information Service), and TMF NGOSS DIOA (interface, contract, server component, client component) to define a novel, component-based and service-oriented approach to telecom management. The architecture is defined by a UML metamodel that is depicted and explained below.

NOTE 1: This annex refers to concepts from OMG UML 2.0, 3GPP IRP, and TM Forum NGOSS. These concepts are defined and explained in the following references:

- "UML Distilled - Third Edition" by Martin Fowler, ISBN 0-321-19368-7.
- "The UML User Guide - Second Edition" by Grady Booch, James Rumbaugh, Ivar Jacobson, ISBN 0-321-26797-4.
- 3GPP SA5 TS 32-series on IRPs.
- "The NGOSS Technology-Neutral Architecture (TNA)", TMF053.

- "NGOSS TNA Contract Description: Business and System Views", TMF053B.
- "NGOSS TNA Metamodel", TMF053D.

NOTE 2: It is expected that the planned harmonization activities will lead to some adjustment of this metamodel and the mapping in the next release, version 2.

NOTE 3: The fundamental starting point of the NGN OSS Architecture is interface orientation but it goes far beyond by defining component-based and service-oriented approaches as well. The interface concept is taken from UML/Java/C#. Interfaces group operations and constant data and may be exposed by different types of entities such as class instances, components, or services.

NOTE 4: SOA introduces **two views on components and services**: the **inward view** of a service consumer/ requester, who **requires** interfaces (depicted as sockets/crescents), and the **outward view** of a service provider, who **provides** interfaces (depicted as balls/lollipops).

Figure C.6 shows the TISPAN metamodel in UML Notation.

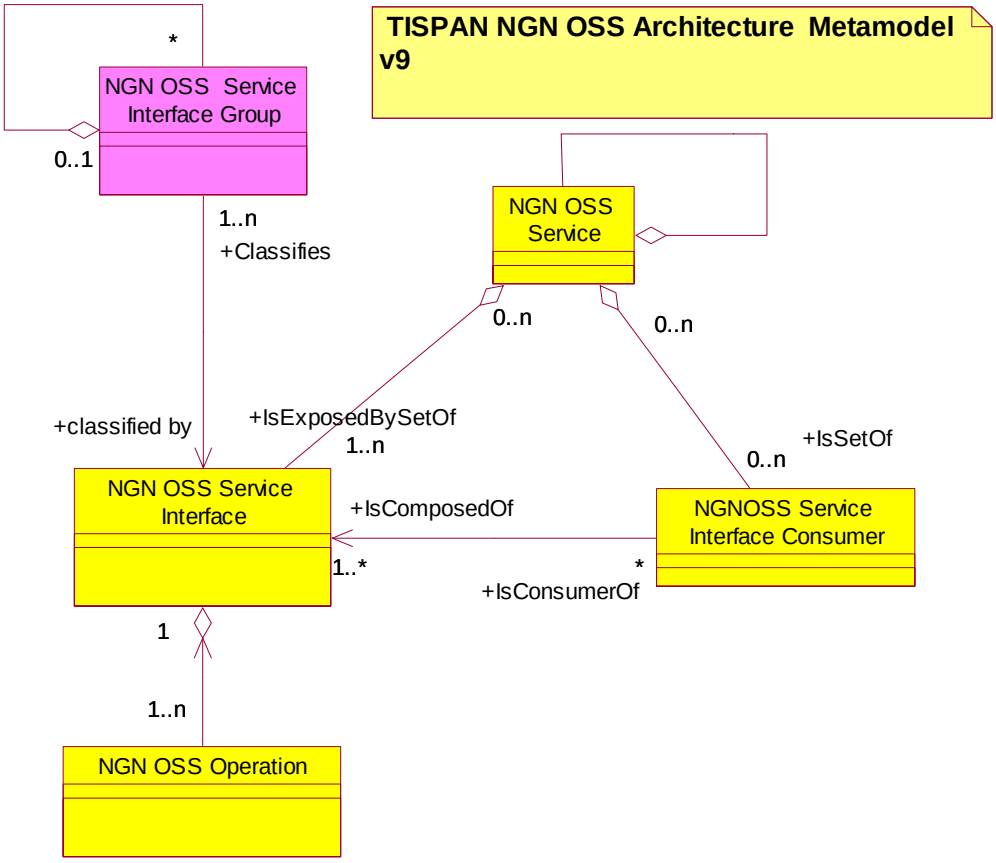

Figure C.6: TISPAN NGN OSS Architecture metamodel

This diagram is the formal metamodel in UML for the definitions in clause 3 and the reference model in clause 6. The key value that this metamodel adds is the relationships amongst architectural entities and their cardinality.

The definitions of these terms are exactly as described in the definitions clause 3.

C.7 Mapping of TISPAN Management Architecture to 3GPP, NGOSS

TISPAN specifications that realize this architecture have to be aligned with 3GPP and TMF NGOSS amongst others, and to assist this alignment a mapping of the TISPAN terms and concepts to the current terms in used by these other groups has been produced.

Table C.1 provides the current understanding of the mapping of TISPAN terms to these other architectures.

Table C.1

	ETSI TISPAN NGN OSS (TS 188 001)	3GPP SA5 IRP (TS 32-series)	TM Forum NGOSS TNA (TMF 053-series)	OMG UML 2.0
unit of deployment	for further study	-	NGOSS Component	Component
ellipse	atomic and composite NGN OSS Service	Operations Systems Function (OSF) (as implemented by one or more i/f IRP IOCs which expose only lollipops)	-	Classifier
lollipop	NGN OSS Service Interface (NGN OSS SI)	one or more i/f IRP IS <<Interface>>s	NGOSS Contract	provided Interface (see note 1)
operation	NGN OSS Operation	Operation	NGOSS Contract Operation	Operation
notification	NOTE - Mapping of notifications to TISPAN NGN OSS Operations is for further study.	Notification		
ellipse with only crescents (consumer role)	NGN OSS Service with only NGN OSS SICs	IRPManager	client entity	Classifier with only required Interfaces
crescent	NGN OSS Service Interface Consumer (NGN OSS SIC)	-	client entity Contract (see note 2)	required Interface (see note 3)
ellipse with only lollipops (provider role)	NGN OSS Service with only NGN OSS SIs	IRPAgent	server entity	Classifier with only provided Interfaces
dotted line oval	NGN OSS Service Interface Groups primarily based on M.3050	-	-	-
NOTE 1: Qualification by "provided" is for further study. NOTE 2: Possibly to be added to the NGOSS meta-model. NOTE 3: Qualification by "required" is for further study.				

NOTE 1: Mapping of 3GPP Notifications to TISPAN NGN OSS Operations is for further study.

A few important points to note are:

- All groups have the same concept of an Operation.
- NGOSS introduces the concept of a Logical Component which seems to be equivalent to the more general term Service as adopted by the SOA community.
- NGOSS introduces concepts around the use of policy.

NOTE 2: The concepts of lifecycle and methodology and their impact on architecture artefacts are for further study.

Annex D (informative): Re-use of 3GPP IRPs for NGN OSS Release 1

The focus of NGN OSS Release 1 is on the Resource Management Service Interfaces covering both Service Resources Management and Transport Resources Management.

ETSI NGN OSS should as a priority re-use 3GPP IRPs.

D.1 3GPP Documents

The following clause identifies candidate 3GPP documents:

1) Feature:

- Charging Management (CH)

  TS 32.295 Charging Data Record (CDR) transfer

  TS 32.296 Online Charging System (OCS): Applications and interfaces

  TS 32.297 Charging Data Record (CDR) file format and transfer

  TS 32.298 Charging Data Record (CDR) parameter description

  TR 32.815 Online Charging System (OCS) architecture study

- BB: Bearer Charging (CH-BC)

  TS 32.240 Charging architecture and principles

  TS 32.250 Circuit Switched (CS) domain charging

  TS 32.251 Packet Switched (PS) domain charging

  TS 32.252 Wireless Local Area Network (WLAN) charging

- BB: IMS Charging (CH-IC, IMS2-CH)

  TS 32.260 IP Multimedia Subsystem (IMS) charging

  TS 32.299 Diameter charging applications

- BB: Service Charging (CH-SC, MMS6-CH, LCS-CH, PoC-CH, MBMS-CH)

  TS 32.270 Multimedia Messaging Service (MMS) charging

  TS 32.271 Location Services (LCS) charging

  TS 32.272 Push-to-talk over Cellular (PoC) charging

  TS 32.273 Multimedia Broadcast and Multicast Service (MBMS) charging

2) Feature: Subscription Management (SuM)

TS 32.140 Subscription Management (SuM) requirements

TS 32.141 Subscription Management (SuM) architecture

TS 32.171 Subscription Management (SuM) NRM IRP: Requirements

TS 32.172 Subscription Management (SuM) NRM IRP: Information Service

TS 32.175 Subscription Management (SuM) NRM IRP: XML definition

TR 32.803 Process guide; Use cases in Unified Modelling Language (UML)

3) Feature: OAM&P (Operations, Administration, Maintenance & Provisioning) - (OAM)

3.1) BB: Principles, high level Requirements & Architecture (OAM-AR)

TS 32.101 Telecommunication management; Principles and high level requirements

TS 32.102 Telecommunication management; Architecture

3.2) BB: Performance Management (OAM-PM)

TS 32.401 Performance Management (PM); Concept and requirements

TS 52.402 Performance Management (PM); Performance measurements - GSM

TS 32.403 Performance Management (PM); Performance measurements - UMTS and combined UMTS/GSM

TS 32.411 Performance Management (PM) IRP: Requirements

TS 32.412 Performance Management (PM) IRP: Information Service

TS 32.413 Performance Management (PM) IRP: CORBA SS

TS 32.414 Performance Management (PM) IRP: CMIP SS

TS 32.431 Performance measurement collection IRP; Requirements

TS 32.432 Performance measurement: File format definition

TS 32.435 Performance measurement: XML file format definition

TS 32.436 Performance measurement: ASN.1 file format definition

3.3) BB: Subscriber and Equipment Trace Management (OAM-Trace)

TS 52.008 GSM subscriber and equipment trace

TS 32.421 Subscriber and equipment trace; Trace concepts and requirements

TS 32.422 Subscriber and equipment trace; Trace control and configuration management

TS 32.423 Subscriber and equipment trace; Trace data definition and management

3.4) BB: Network Infrastructure Management (OAM-NIM)

TS 32.150 IRP Concept and definitions

TS 32.151 IRP Information Service template

TS 32.152 IRP Information Service Unified Modelling Language (UML) repertoire

TR 32.805 Process guide; Backward compatibility recommendations

TS 32.300 Configuration Management (CM); Name convention for Managed Objects

TS 32.600 Configuration Management (CM); Concept and high-level requirements

3.5) Fault Management including Alarm IRP

TS 32.111-1 Fault Management; Part 1: 3G fault management requirements

TS 32.111-2 Fault Management; Part 2: Alarm IRP: Information Service

TS 32.111-3 Fault Management; Part 3: Alarm IRP: CORBA SS

TS 32.111-4 Fault Management; Part 4: Alarm IRP: CMIP SS

TS 32.111-5 Fault Management; Part 5: Alarm IRP: XML definitions

3.6) Notification IRP

TS 32.301 Configuration Management (CM); Notification IRP: Requirements

TS 32.302 Configuration Management (CM); Notification IRP: Information Service

TS 32.303 Configuration Management (CM); Notification IRP: CORBA SS

TS 32.304 Configuration Management (CM); Notification IRP: CMIP SS

TS 32.305 Configuration Management (CM); Notification IRP: CMIP SS

3.7) Generic IRP management

TS 32.311 Generic IRP management; Requirements

TS 32.312 Generic IRP management; Information Service

TS 32.313 Generic IRP management; CORBA SS

TS 32.314 Generic IRP management; CMIP SS

3.8) Test management IRP

TS 32.321 Test management IRP: Requirements

TS 32.322 Test management IRP: Information Service

TS 32.323 Test management IRP: CORBA SS

TS 32.324 Test management IRP: CMIP SS

3.9) Notification Log IRP

TS 32.331 Notification Log (NL) IRP: Requirements

TS 32.332 Notification Log (NL) (NL) IRP: Information Service

TS 32.333 Notification Log (NL) IRP: CORBA SS

TS 32.334 Notification Log (NL) IRP: CMIP SS

TS 32.335 Notification Log (NL) IRP: XML solution definitions

3.10) File Transfer IRP

TS 32.341 File Transfer (FT) IRP: Requirements

TS 32.342 File Transfer (FT) IRP: Information Service

TS 32.343 File Transfer (FT) IRP: CORBA SS

TS 32.344 File Transfer (FT) IRP: CMIP SS

3.11) Communication Surveillance IRP

TS 32.351 Communication Surveillance (CS) IRP: Requirements

TS 32.352 Communication Surveillance (CS) IRP: Information Service

TS 32.353 Communication Surveillance (CS) IRP: CORBA SS

TS 32.354 Communication Surveillance (CS) IRP: CMIP SS

3.12) Entry Point IRP

TS 32.361 Entry Point (EP) IRP: Requirements

TS 32.362 Entry Point (EP) IRP: Information Service

TS 32.363 Entry Point (EP) IRP: CORBA SS

3.13) Security Management IRP

TS 32.371 Security Management concept and requirements

3.14) Basic CM IRP

TS 32.601 Configuration Management (CM); Basic CM IRP; Requirements

TS 32.602 Configuration Management (CM); Basic CM IRP: Information Service

TS 32.603 Configuration Management (CM); Basic CM IRP: CORBA SS

TS 32.604 Configuration Management (CM); Basic CM IRP CMIP SS

3.15) Bulk CM IRP

TS 32.611 Configuration Management (CM); Bulk CM IRP: Requirements

TS 32.612 Configuration Management (CM); Bulk CM IRP: Information Service

TS 32.613 Configuration Management (CM); Bulk CM IRP: CORBA SS

TS 32.614 Configuration Management (CM); Bulk CM IRP: CMIP SS

TS 32.615 Configuration Management (CM); Bulk CM IRP: XML file format definition

3.16) Generic NRM IRP

TS 32.621 Configuration Management (CM); Generic network resources IRP; Requirements

TS 32.622 Configuration Management (CM); Generic network resources IRP: NRM

TS 32.623 Configuration Management (CM); Generic network resources IRP: CORBA SS

TS 32.624 Configuration Management (CM); Generic network resources: IRP: CMIP SS

TS 32.625 Configuration Management (CM); Generic network resources IRP: Bulk CM XML file format definition

3.17) CN NRM IRP

TS 32.631 Configuration Management (CM); Core network resources IRP: Requirements

TS 32.632 Configuration Management (CM); Core Network Resources IRP: NRM

TS 32.633 Configuration Management (CM); Core network resources IRP: CORBA SS

TS 32.634 Configuration Management (CM); Core network resources IRP: CMIP SS

TS 32.635 Configuration Management (CM); Core network resources IRP: Bulk CM XML file format definition

3.18) UTRAN NRM IRP

TS 32.641 Configuration Management (CM); UTRAN network resources IRP; Requirements

TS 32.642 Configuration Management (CM); UTRAN network resources IRP: NRM

TS 32.643 Configuration Management (CM); UTRAN network resources IRP: CORBA SS

TS 32.644 Configuration Management (CM); UTRAN network resources IRP: CMIP SS

TS 32.645 Configuration Management (CM); UTRAN network resources IRP: Bulk CM XML file format definition

3.19) GERAN NRM IRP

TS 32.651 Configuration Management (CM); GERAN network resources IRP: Requirements

TS 32.652 Configuration Management (CM); GERAN network resources IRP: NRM

TS 32.653 Configuration Management (CM); GERAN network resources IRP: CORBA SS

TS 32.654 Configuration Management (CM); GERAN network resources IRP: CMIP SS

TS 32.655 Configuration Management (CM); GERAN network resources IRP: Bulk CM XML file format definition

3.20) Kernel CM IRP

TS 32.661 Configuration Management (CM); Kernel CM; Requirements

TS 32.662 Configuration Management (CM); Kernel CM; Information service

TS 32.663 Configuration Management (CM); Kernel CM IRP: CORBA SS

TS 32.664 Configuration Management (CM); Kernel CM IRP: CMIP SS

3.21) State Management IRP

TS 32.671 Configuration Management (CM); State Management IRP: Requirements

TS 32.672 Configuration Management (CM); State Management IRP: Information Service

TS 32.673 Configuration Management (CM); State Management IRP: CORBA SS

TS 32.674 Configuration Management (CM); State Management IRP: CMIP SS

TS 32.675 Configuration Management (CM); State Management IRP: Bulk CM XML file format definition

3.22) Inventory Management IRP

TS 32.690 Inventory Management (IM): Requirements

TS 32.691 Inventory Management (IM) network resources IRP: Requirements

TS 32.692 Inventory Management (IM) network resources IRP: NRM

TS 32.695 Inventory Management (IM) network resources IRP: Bulk Configuration Management (CM) XML file format definition

3.23) Transport Network NRM IRP

TS 32.711 Configuration Management (CM); Transport Network (TN) NRM IRP: Requirements

TS 32.712 Configuration Management (CM); Transport Network (TN) NRM IRP: Information Service

TS 32.713 Configuration Management (CM); Transport Network (TN) NRM IRP: CORBA SS

TS 32.714 Configuration Management (CM); Transport Network (TN) NRM IRP: CMIP SS

TS 32.715 Configuration Management (CM) Transport Network (TN) NRM IRP: Bulk CM XML file format definition

3.24) Signalling Transport Network interface NRM IRP

TS 32.741 Configuration Management (CM); Signalling Transport Network (STN) interface NRM IRP: Requirements

TS 32.742 Configuration Management (CM); Signalling Transport Network (STN) interface NRM IRP: Information Service

TS 32.743 Configuration Management (CM); Signalling Transport Network (STN) interface NRM IRP: CORBA SS

TS 32.744 Configuration Management (CM); Signalling Transport Network (STN) interface NRM IRP: CMIP SS

TS 32.745 Configuration Management (CM); Signalling Transport Network (STN) interface NRM IRP: Bulk CM XML file format definition

D.2 NGN OSS Service Interfaces

D.2.1 NGN OSS Service Interfaces to standardize

The standardization work on Service Interfaces could be classified as follows.

- Network Resource Model (NRM) Information Services for the NGN network nodes of the ETSI NGN architecture not yet covered by:

  a) 3GPP IRPs should be proposed to be included the 3GPP Release 7 specification set;

  b) TMF (e.g. MTNM, IPNM, MTOSI, etc.) a proposal of related Information Services should be made by ETSI TISPAN to be included as part of MTOSI, in such a way that Information Services provide a homogeneous views on the fixed/mobile converged network;

  c) other possible NRM IRP Information Services should be specified by ETSI TISPAN.

- Resource Management (RM) Information Services supporting the management of the Service and Transport Resources in the network:

  d) possible areas of work in Service Resource Management concern adaptation of the 3GPP subscription management IRP to ETSI TISPAN requirements, applications management SI, CPE management SI, etc.;

  e) possible areas of work in Transport Resource Management concern NGN network management Information Services, cross-domain Ethernet service management Information Services, VoIP management SI, IP address management SI, etc. Work should be done in cooperation with TMF MTNM/IPNM for fixed transport network management functions.

- Service Management (SM) SIs, supporting the management of services from the point of view of the end-user, e.g. supporting SLA management. Areas of work concern, Service provisioning SI, Service Assurance SI and the link between the two, and Service composition SI, VPN/Connectivity SI, Service Profile management SI, etc.;

- Market Product and Customer (MP&C) SIs cover the area of service ordering and self management. Possible areas of work are Order intake SI, User profile management SI, etc.;

- another area of work concerns security management SIs starting from the different available security architectures (TMF, 3GPP, ITU-T, etc.).

D.2.2 NGN Network Resource Model (NRM)

ETSI TISPAN should rely on the Network Resource Model (NRM) IRPs from 3GPP for the mobile network technology management aspects and on the MTNM model for the fixed network technology management aspects. For the latter, it is assumed that only SIs at Transport Resource Management level need to be identified and that these should be part of MTOSI.

ETSI TISPAN should work on the alignment of the following 3GPP Resource IRPs with MTNM and IPNM to obtain common SIs for the ETSI NGN OSS TRM Service Interface Group:

- TS 132 711 Transport Network (TN) Network Resource Model (NRM) (see bibliography).

- TS 132 631 Configuration Management (CM) Core network resources (see bibliography).

- TS 132 731 Service Specific Core Network (CN) IMS Network Resource Model (NRM).

- **NEW**: Wireless and Wireline BB Access (BBA) Network Resource Model (NRM).
- **NEW**: Mobile 3G Network Resource Model SI (planned as part of MTOSI Phase 2) i.e. giving an abstract view on Mobile NRM.

ETSI TISPAN should elaborate the following Resource SIs in cooperation with 3GPP and MTNM/IPNM:

- **NEW:** NGN (NGN) Network Resource Model (NRM) for softswitches, gateways, application servers, etc.
- **NEW:** Service Infrastructure Network Resource Model (NRM) for application servers, content servers, etc.
- **NEW:** CPE Network Resource Model (NRM) for CPE management.

D.2.3 NGN Transport and Service Resource Service Interfaces

Service provisioning should be done partly via OSSs to configure the supporting network resources (provisioned services) and partly will be user initiated signalled services which requires the pre-configuration of service transport infrastructure. Information about active services should be collected by the managers for assurance purposes.

Additionally, subscriber and profile management are main OSS features, as multiple services will be requested by a single subscriber in the same contract (i.e. triple play - voice, video and internet).

In complement to existing work on network oriented SIs, the above requirements lead to the need for the SIs that will be necessary for managing new NGN services and NGN architecture.

D.2.3.1 The Transport Resource Management Service Interfaces

The NGN OSS Transport Resource Management SIs specifications should focus on managing provisioned/connectivity services including access points across several sub-networks. Such specifications should re-use/extend/ contribute to3GPP IRPs and TMF specifications in the following functional areas:

- Cross-domain Transport Fault/Alarm management;
- Cross-domain Transport Service Inventory Management;
- Cross-domain Transport Service Resource provisioning;
- Transport and Subscriber Line provisioning;
- Cross-domain Transport Service Performance and Traffic management;
- Security.

It is foreseen that SIs will be defined in the following functional areas:

- VoIP Management;
- VoIP Traffic Management;
- NGN Trunk Management;
- NGN Routing Management;
- NGN Protocol Management (H.248 [23]/SIP/H.323 [24]).

D.2.3.2 The Service Resource Management Service Interfaces

The NGN OSS Service Resource Management SIs should focus on managing signalled services across several sub-networks. This includes also the management of the service applications, associated network capabilities (e.g. localization, presence, reachability) and the service access/end points (CPE equipment).

The NGN OSS Service Resource Management SIs should extend 3GPP IRPs in the following functional areas:

- Service Fault/Alarm Management;

- Service Test Management;
- Service Inventory Management;
- Service Resource provisioning;
- Service and Subscriber Data provisioning;
- Service Performance management;
- Security.

It is foreseen that SIs will be defined in the following functional areas:

- Service Application Management;
- Network Capability Management (Presence, Reachability, Localization);
- CPE provisioning;
- Self management (Profile Management);
- Billing /rating configuration management.

D.2.4 NGN Release 1 Service Interface Priorities

For NGN Release 1, it has been decided to focus the standardization effort on the Service and Resource Management Service Interface Groups and related SIs in order to support the requirements identified in TISPAN requirement and priorities for the management of:

1) the IMS core and the PES (PSTN/ISDN Emulation), including the related NASS and RACS aspects;
2) the following services:
   - real time conversational services (voice) for both IMS like and PES like subscribers;
   - Content delivery services (Video-on Demand).
3) the following network capabilities (seen as components of above-mentioned services):
   - nomadism;
   - number, naming and addressing that enable NGN to uniquely identify each user;
   - authentication of user at the access network.
4) supporting the following operational processes:
   - inventory;
   - service configuration and activation process of the SM&O;
   - Resource provisioning of the RM&O.

NGN performance, testing, assurance, QoS, etc. are to be covered in later releases.

Annex E (informative): TISPAN NGN OSS Architecture examples

This annex explain the usage of the NGN OSS Architecture by use of a number of examples.

- Management of the evolution of interfaces over time to cover both new and replacement functionality (operation and Notifications).
- Modelling of work flow engines.

E.1 Basic Architectural Model

The basic architectural model is that an NGN OSS service can expose one or more Service Interfaces and that it may have one or more Service Interface Consumer interfaces(SIC).

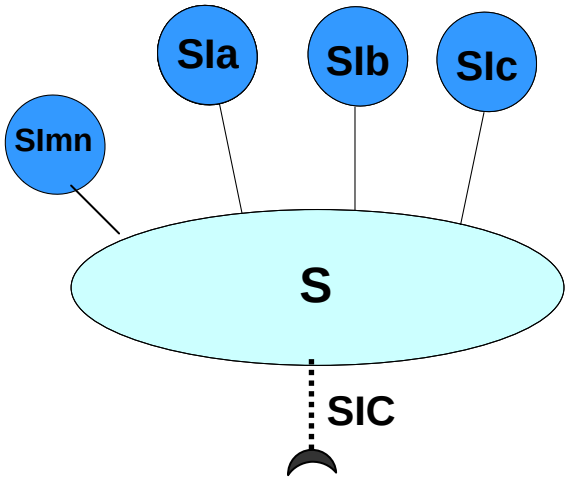

Figure E.1: Basic architectural model

E.2 Evolution of interfaces to address increased standardized functionality

The example described in the main document is that where the "S" NGN OSS Service is a "Manage Telephone Number" Service.

Initially the Service "S" supports a single SIa which has the following operations that can be performed on individual numbers:

- SIa:
  - "allocateNumber": This operation will allow a number to be allocated to an order.
  - "cancelAllocation": This operation will allow a previously allocated number to be removed from an order.
  - "queryNumber": This operation will return information related to a particular number.

After the service "S" has been deployed for some time it becomes apparent that reservations need to be made for both individual numbers and for blocks of numbers; and that improved search and query operations are needed. To support this evolved requirement a new Service interface SIb is defined with redefined and additional operations:

- SIb:
  - "allocateNumber": This operation will allow a number or a block of numbers to be allocated to an order.
  - "cancelAllocation": This operation will allow a previously allocated number or block of numbers to be removed from an order.
  - "cancelReservation": This operation will allow a previously reserved number or block of numbers to be un-reserved.
  - "modifyNumber": This operation will allow a sub-set of a number's attributes to be modified.
  - "reserveNumber": This operation will allow a number or a block of numbers to be reserved for a customer.
  - "searchNumbers": This operation will enable the number database to be searched for matches to the given parameters.

Note that the query Number is still needed and is retained as part of S1a. The new NGN OSS Service "S" now has both S1a and Sib supported but the operations defined in SIa are mapped internally to the equivalent operations in SIb. This is not visible to the user of interface SIa who simply dynamically binds to the new Service "S" rather than the old service "S".

E.3 Evolution of interfaces to address vendor extensions

A vendor decides to offer a NGN OSS Service Component that incorporates the standard ServiceIinterfaces for Mange Telephone Number together with additional features including email and Instant message addresses associated with the that customer number.

A third Service interfaces Sic is defined with the following additional operations:

- SIc:
  - "AssignEmailAddress": This operation adds an email address to a specified telephone numbers.
  - "modifyEmailAddress": This operation will allow number's email Address to be modified.
  - "CancelEmailAddress": This operation removes an email address from a specified telephone numbers.
  - "AssignIMAdresss": Adds an Instant messaging address to a specified telephone number.
  - "modifyIMAddress": This operation will allow number's IM Address to be modified.
  - "CancelIMAddress": This operation removes an email address from a specified telephone numbers.
  - "searchNumbers": This operation will enable the number database to be searched for matches to the email and or IM address parameters.

E.4 Adding manageability and common operations

A service provider decides that all NGN OSS Services operated by them shall support a standard set of management functions.

The Service Provider defines with its systems management software vendors a standard NGN Service Interface SImngt. This Service Interfaces support the following operations:

- **SImngt**
  - "CreateAuditLog": This operation creates a log that records all users of the Service Interfaces associated with the NGN OSS service.
  - "ClearAuditLog": This operation clears all entries form the log that are old than a specified parameter.
  - "MonitorUsers": This operation causes all user accesses to be recorded and time stamped to the Audit Log.
  - "SuspendLogging": This operation suspends all logging operations.
  - "Notify user access": This operation issues a notification (c.f. NGOSS Announcement) that a specific user has accessed or has attempted to access the NGN Service Component.
  - "CreateAccessControlList": This operation creates a list which may be populated with Users that may access the services Interfaces associated with the NGNN OSS Service "S".
  - "AddUserACL": This operation adds a user to the Access Control List (ACL)with a status attribute(levels from barred to Administrator).
  - "RemoveUserACL": This operation removes a user from the Access Control List (ACL) i.e. they get no service rights.
  - "Activate activity Monitoring": This operation activates the monitoring of transaction over all service Interfaces and time stamps them together with defined parameters to the Transaction Log.
  - "CollectTransactionLog": This operation reads and sends the transaction log to the client.
  - "ClearTransactionLog": This operation clears all entries form the log that are old than a specified parameter.
  - "NotifyJeopardyTransaction": This operation notifies the client when a Transaction is detected that has not completed within the jeopardy threshold.
  - "SetJeopardyThreshsold": This operation sets the Jeopardy threshold(s) for transactions received by the NGN Service over and Service Interface.

E.5 Modelling Workflow and process managers in the NGN OSS Architecture

One common practice endorsed by the TMF NGOSS Architecture is to separate the process workflow from the Business Aware functionality. For example an end to end repair process might invoke diagnostic services and trouble ticket recording services and B2B services as illustrated in figure E.2.

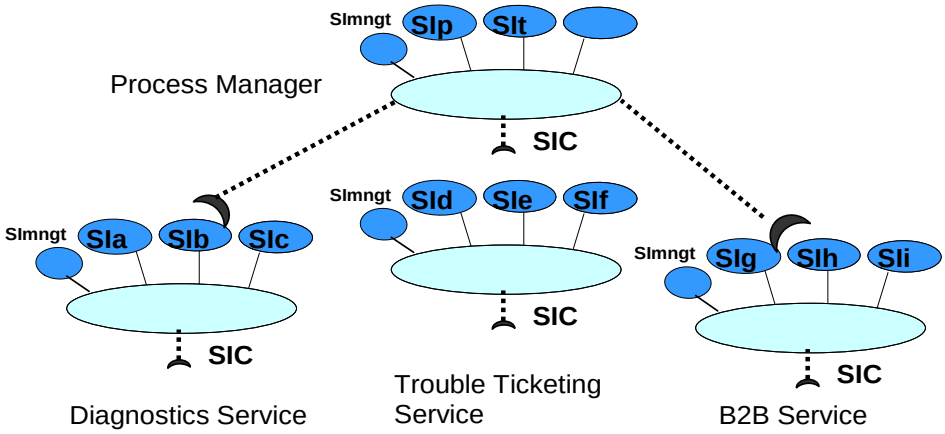

Figure E.2

The process manager which is modelled as a NGN OSS service is mostly concerned with invoking the services of the supporting business functions provided by:

- Diagnostics Service.
- Trouble Ticketing Service.
- B2B Services.

The process manager in this example supports two Service Interfaces:

- **SIp** which is used to store in the process manger specific work flow sequences and logis possibly using one of the industry process notation sE.g Business Process Modelling language(BPML), BPML4WS.

  Specific operations might include:

  - "CreateProcessSpecification": This operation creates a new process specification together with the input trigger conditions and the identity of the externally invoked Business Functions.
  - "ModifyProcessSpecification": This operation modifies an existing Process specification and increments its version number.
  - "RemoveProcessSpecification": This operation removes an existing Process specification after all running instances have terminated.

- **SIt** which is used as a point to invoke an instance of a store process specification with the process manager. The Process specifications that is invoked is decided by the trigger event and the rules stored with the stored Process specifications.

All NGN OSS Service support the Management Service Interface SLmngt.

Annex F (informative): NGN OSS Service behaviour exposure

The following clause provides clarification on behaviour exposure of NGN OSS Services by means of NGN OSS Service Interfaces.

An NGN OSS Service may capture aggregate behaviour across several NGN OSS Service Interfaces. For example, an NGN OSS Service - "Manage Telephone Numbers and Telephone Number Ranges" - may need to model the state and policies associated with individual telephone numbers and telephone number ranges.

A Manage Telephone Number NGN OSS Service may have a number of service interfaces: e.g. "Assign Telephone Number ", Check Telephone Number Status", and "Release Telephone Number".

Initially the use case definition for "Assign Telephone Number" might define either the response that the telephone number is free and assigned to the requesting party, or respond that it is not available. When telephone numbers are released they may enter a quarantined state and requests for re-assignment may be refused until the quarantine interval has expired. The existence of a quarantined state may not be visible to this "Assign Telephone Number service interface, only the free and not available states.

Different operators may set different quarantine periods to one another, and different periods for different types of numbers.

If subsequently there is a need to introduce the concept of number portability it is necessary to introduce a new number portability NGN OSS Service Interface to manage additional sub-states of telephone numbers whilst they are being ported e.g. Marked for porting, Porting, Ported. These states do not need to be made available to the previously defined interfaces.

In both these cases aggregate behaviour i.e. the state and policies of telephone numbers, are best captured in the definition of the NGN OSS Service, not the NGN OSS Service Interfaces.

It should be noted that binding state and policies to the NGN OSS Service leads to clear and more complete specification than simply specify the Interfaces" states, and also allows for the natural evolution of related interfaces and services.

A case may exist in which a NGN OSS Service S exposes its behaviours through 3 NGN OSS Service Interfaces:

- SIa;
- SIb; and
- SIc.

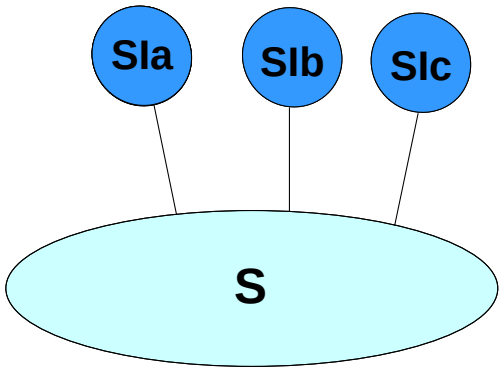

Figure F.1

If the functionality of NGN OSSS Service S needs to be extended, two solutions may exist:

- to add an additional Service Interface to NGN OSS Service S: SId. In this case, SIa, SIb and SIc are unaffected and may still be utilized by other NGN OSS Services (through their NGN OSS SICs) which do not need the additional functionality provided by NGN OSS Service S;

- to amend the behaviour exposed by an existing NGN OSS Service Interface: SIb → SIb". This case can be used if all consuming NGN OSS Services need the additional functionality and all NGN OSS SICb are upgraded simultaneously with NGN OSS SIb.

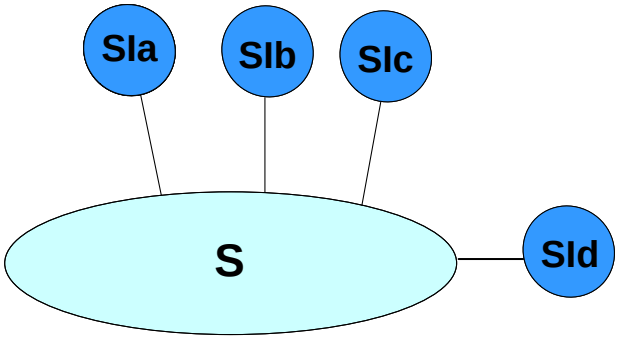

Figure F.2

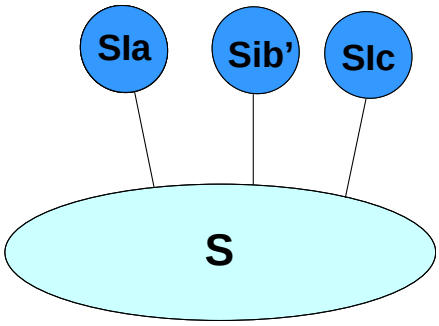

Figure F.3

Annex G (informative): Bibliography

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History

Document history		
V1.1.1	September 2005	Publication
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