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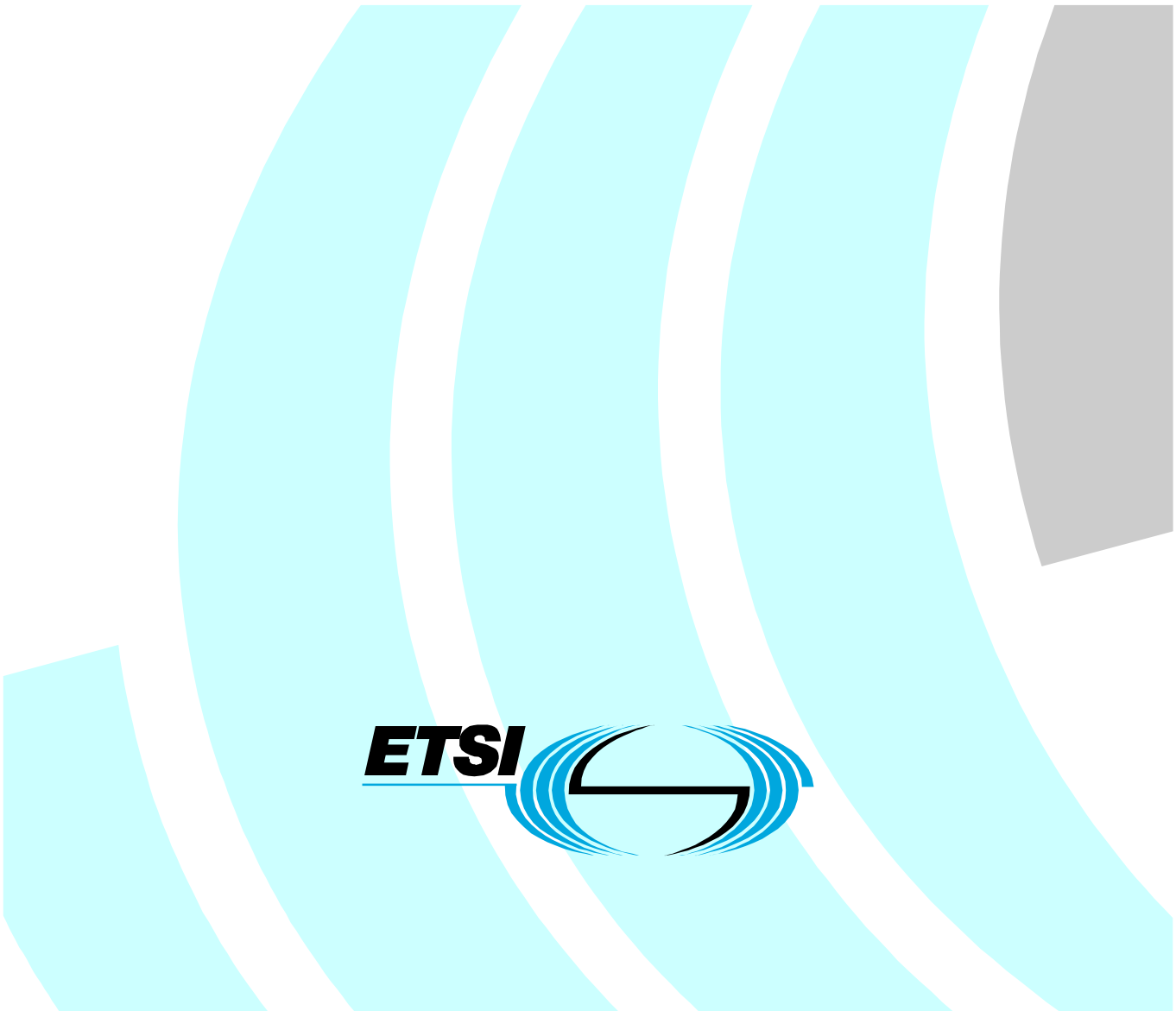
Technical Report

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Management; OSS vision



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Contents

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Foreword

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

Introduction

The present document is intended to provide the context and direction for TISPAN NGN Management Releases.

It provides:

- A vision of the end goal for the Management of Next Generation Networks being defined by TISPAN.
- The conceptual scope of the business, operational, and technical requirements that must be addressed progressively by the NGN management releases.

1 Scope

The present document provides a high level view of the scope and context of requirements for NGN Management covering: business, regulatory, legal, operational and technical requirements for:

- Service aggregation and Resource/Network aggregation.
- Customer centric service requirements.
- Service management and personalization.
- Resource/Network Management.
- Value chains amongst Service Providers.

2 References

For the purposes of this Technical Report (TR) the following references apply:

[1] ITU-T Recommendation Y.110: "Global Information Infrastructure principles and framework architecture".

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

[3] TeleManagementForum TR 128: "Value Chain issues facing the ICT Industry".

NOTE: See: www.tmforum.org.

[4] TeleManagementForum TMF053: "NGOSS™ New Generation Operations Support and Services".

NOTE: See: www.tmforum.org.

[5] MDA: "Model Driven Architecture".

NOTE: See: www.omg.org.

[6] TeleManagementForum GB927: "The NGOSS Lifecycle and Methodology".

NOTE: See: www.tmforum.org.

[7] ITU-T Recommendation M.3050: "Enhanced Telecom Operations Map (eTOM)".

[8] ITU-T Recommendation M.3400: "TMN Management Functions".

[9] ETSI TR 180 000: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN);NGN Terminology".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 180 000 [9] and the following apply:

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

3.2 Abbreviations

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

3GPP	3G Partnership Project
API	Application Programme Interface
COTS	Commercial Off The Shelf
DHCP	Dynamic Host Control Protocol
eTOM	TMF enhanced Telecom Operations Map
ETSI	European Telecommunications Standards Institute
IMS	IP Multimedia Subsystem
ISDN	Integrated Service Digital Network
ITU-T	International Telecommunication Union - Telecommunications sector
KPI	Key Performance Indicators
NASS	Network Attachment SubSystem
NGN	Next Generation Network
NGOSS™	New Generation Operations Systems and Software - TeleManagement Forum
OLO	On-Line Operation
OSS	Operations Support Systems
PES	PSTN/ISDN Emulation Subsystem
PSTN	Public Switch Telecommunication Network
RACS	Resource and Admission Control Subsystem
SLA	Service Level Agreement
SOA	Service Orientated Architecture
SP	Service Provider
TMF	TeleManagement Forum
TMN	ITU-T Telecommunications Management Network
UML	Unified Modelling Language

4 Introduction

Next Generation Networks are essentially about delivering new services that are available:

- any place;
- any time;
- through any chosen access mechanism.

Service Providers are looking for a Management Framework that:

- radically increases customer satisfaction;
- and at the same time underpins a significant reduction in operating costs, for example through:
  - new technologies;
  - new business models;
  - and new operational methods.

Services in this context are the traditional telecommunication use of the word which is really around applications such as: voice, messaging, etc., which in most industries are referred to as products.

Whilst the title is Next Generation Networks (NGN) much of the challenge arises from new business models and the effective operational delivery of those services, which in turn is high dependant on flexible and efficient Operations Support Systems (OSS) and processes.

The present document focuses on these later management concerns rather than the networking and application aspects.

5 Next Generation Networks (NGN)

The main sources of NGN frameworks and architectures are emerging from ETSI and the ITU-T.

ITU-T has produced an overview ITU-T Recommendation Y.110 [1] that provides a comprehensive view of the challenges that have to be addressed by NGN solutions. It focuses on:

- The conceptual overview of an NGN and the users.
- The enterprise (Business) Models that are needed to support the delivery of an NGN, with an emphasis on the multi-organizational models that will become more prevalent.
- A structural model of services, applications, and infrastructure components.
- Models and a set of examples.

ETSI has produced ES 282 001 [2] that provides a description of the overall functional architecture of NGN, The ETSI NGN functional architecture complies with the ITU-T general reference model for next generation networks and is structured according to a service layer and an IP-based transport layer.

The service layer comprises the following components:

- the core IP Multimedia Subsystem (IMS);
- the PSTN/ISDN Emulation Subsystem (PES);
- other multimedia subsystems (e.g. streaming subsystem, content broadcasting subsystem, etc.) and applications;
- common components (i.e. used by several subsystems) such as those required for accessing applications, charging functions, user profile management, security management, etc.

IP-connectivity is provided to NGN user equipment by the transport layer, under the control of the Network Attachment SubSystem (NASS) and the Resource and Admission Control Subsystem (RACS). These subsystems hide the transport technology used in access and core networks below the IP layer.

6 Customer centric vision

For Service Providers (SP) a critical business driver is improvement of the customer experience. Customer perception of an SP is driven by the amount of contact that they need to have, and the experience they have in achieving their objectives through these contacts.

Poor internal processes, communications and complex information flows all lead to unnecessary visits, slow resolution of customers' issues and high levels of customer dissatisfaction.

A number of key objectives are described in the following clause have to be realized for NGN to deliver and improve customer service.

6.1 Personalized

Personalization requires a service and operational management design based on "Users", not on the services they use, and a design that enables the customer to fully take control of their communication needs. Achieving this goal requires a user profile to record user choices that can be dynamically attached to wherever they chose to access their services.

Networks and services will need to recognize "Users" not simply physical access points or terminal devices to configure their services.

Some users may perform multiple roles e.g. home and business roles, and the personalization solutions will need to support individuals working in multiple roles e.g. set up call diversions based on roles selected, time of day, etc.

The Customer is the role that contracts for the services offered by a service provider based on a contractual relationship.

The role of "customer" will need to be recognized as the customer may be the only one permitted to perform some tasks such as authorizing new services that require tariff or chargeable feature changes for users.

6.2 Flexibility

This has a number of implications for management:

- Customers will increasingly require services to be delivered in shorter time-frames and for shorter lifetimes.
- Customers require access to new services and need to be able control rapid service evolution themselves.
- Customers will be using multiple access devices that will not always be purchased from a single supplier.
- The services that the customer uses will need to be seamless, requiring open and published standards, to ensure service interoperability.
- The customer will require a variable bandwidth to deliver the services that they require at any given point in time.
- The customer requires access to their services any time, any place, through any chosen access mechanism.

The implication is that Service Provider processes need to consider flexibility as part of their design, not simply efficiency and cost factors.

6.3 Self service and straightforward services

Customers want 24 × 7 access to support services. Increasingly many of the routine changes to customer services and other inquiries can be supported by electronic access through self service portals.

To make these portals easy to use it is critical that the ways in which services are designed, and the options presented to the customer are tailored to the customer's perception of a service.

To allow customer to aggregate services, possibly from many suppliers, requires a conceptually simple and straight forward conceptual model of services to be created and presented to a customer; and for problems to be reported in the context of those straightforward models.

A particularly important need for customer satisfaction is that the billing models presented to customers for NGN Services need to be straightforward and easily related to events and configuration changes that the customer can understand, or has access to, and that form part of the simple service description.

6.4 Security

Customers will not entrust their personal information, including that held in User Profiles, without operator's providing measures to secure this information.

The customer requires the service to be secure and reliable both in their home environment and in remote environment operated by other providers.

NGN Services may be presented over many access methods including inherently insecure radio paths. Security will depend on Identity Management using cryptographic, and possibly biometric, authentication methods that can be supported over multiple operator domains.

National and Regional security regulations will also need to be taken into account.

Adequate security between Service Providers (SP) will also be required.

NGN Management will manage the underlying NGN, therefore, the security of the management network is essential to maintaining the security of the NGN. Furthermore, the NGN may incorporate security features that need to be managed by the management network. ITU-T Recommendation M.3400 [8] enumerates those security management functions.

6.5 Applications and transport

The customers or users may chose to select applications and transport service from amongst a number of providers. The NGN Management solutions have to support multiple service providers that have effective process and security amongst them to deliver a seamless service to the joint customers. ITU-T Recommendation Y.110 [1] provides example of the business models needed to support customers in this way.

7 Business vision

7.1 Value chains of multiple Service Providers (SP)

A characteristic of an NGN is that customers will construct their service needs from the offering of multiple providers who may provide combinations of NGN Applications and Transport Services. More over some providers will act as:

- retailers of services;
- resellers of content and aggregation;
- wholesalers of "white box" applications and infrastructure.

Solutions to support these type of industry structures are known, and depend on the use of B2B processes and interfaces amongst the trading Service Providers. Communicating applications and service have some stringent requirements on B2B and the main challenges (see ITU-T Recommendation Y.110 [1] and TR 128, [3] are:

- Operations of B2B processes in near real time (minutes & hours). Services being software based can in principle be delivered more quickly than physical goods such as books where acceptable responses are measure in hours and days.
- Broader range of B2B processes. NGN Services will require coverage of fulfilment, assurance (repair and performance), and billing processes.
- Motivation for SP co-operation will require the development of industry revenue share models supported by billing processes that are coherent and work in near real time.
- Security requires the establishment of trust amongst cooperating Service Providers, and needs both identity management, and fraud management processes to be in place and agreed.
- For the end to end processes amongst cooperating Service Providers (SP) to operate seamlessly it is necessary to have agreements about Service Level Agreements (SLA) for the processes performed by each SP. SLAs applied to processes are also referred to as Key Performance Indicators (KPIs), or process metrics.

Technology to support B2B processes is available, and is generally based on either, or both, ebXML and web services.

7.2 Services

7.2.1 Service mix

Service Provider business on current networks, both fixed and mobile, is dominated by voice service volumes and revenues.

Evidence is emerging from the mobile and fixed network industry that the future revenue growth will be achieved by an increasing the numbers and types of services offered to customers. Most of these will be based on data services providing access to applications and content.

The increase in the number and types of the services means:

- Mass Customization: Services will need to be created on a mass customization model where they can be introduce systematically using repeatable processes, with parallel and concurrent development of many services.

- Market Segments: Services will need to be tailored, and targeted, at specific market segments.
- Better market segmentation: Service providers will need to research the needs of their customers using more detailed, and more numerous market segmentation, as is done in many consumer retail businesses.
- Tariffs will need to be structured according to the combination of services and market segments which will result in a significant increase in the number of tariffs, and a consequent increase in rating activity; and more rigorous audit and revenue management/assurance processes.

7.2.2 Context and location aware

The emergence of merged fixed mobile services focus will result in many services having a context and location aware element. E.g. queries for local restaurant, petrol stations, etc.

This has significant implication on the linking of network derived information to Applications, especially those provided by/to third parties, and the need to maintain privacy and confidentiality.

User profile information is a combination of information provided by the user together with network and application derived information. Persons to whom this information may be released to, is conditioned by data protection, privacy and national security laws, and the commercial agreement between the User and the Service Providers. This restricts the ways in which information may be exchanged between Service Providers particularly those in different jurisdictions.

Emergency service has a requirement for making available user location information to applications.

7.2.3 Service Management

The main business area that directly impacts the perception of customer experience is the Service Management. However the effectiveness of these Service Management processes is completely dependant on improvements in Customer Relationship and Network Management processes.

Services are sold as combinations of:

- Services based on resources. These can be:
  - Applications such a voice, unified messaging;
  - Transport : e.g. GPRS access.
- Management Services such as - service repair, Service Level Agreement (SLA) monitoring, Billing reports - that augment the services based on resources.

Service management is both the presentation of management capabilities based on the underlying resources e.g. voice mail options, and access speed options, AND management service such as SLAs.

7.3 Agility leanness and shortened lifecycles

Management of current networks has achieved high levels of process automation. Current OSS solutions are difficult to modify to support introduction of new services, operational processes, technologies and communication infrastructure. Changes require high levels of skilled people to change monolithic OSS "Stove-piped" solutions.

NGN solutions have to support higher levels of agility as measured by the effort levels to makes these changes, and the ease and speed with which new services and can be introduced. The lifecycles of services and technologies are reducing and as a result of both market and technology obsolescent drivers.

The OSS industry recognizes that the most likely path to solving these problems is through the use of two closely coupled approaches:

- Component based Systems Architecture. This approach is typified by the TeleManagement Forum New Generation Operations Systems and Software NGOSS™ [4] which defines a plug and play component architecture. Component based Architecture -which is a specific form of Service orientated Architecture (SOA) - has the potential to allow Services to be constructed out of components. If these components are defined as services that will work with multiple clients. It allows for new combination of old and new components to be combined dynamically. Thus it reduces development time, developments costs, integration and testing costs.

- Model Driven Architecture [5] This is a software approach that allows the specification of a solution at a software technology neutral level and supported by tools for the automated generation of software code. The important aspect of this approach is that it supports fully roundtrip engineering for the fully lifecycle of the solution. These methods are incorporated in the TMF NGOSS Lifecycle approach.

7.4 Operations

The main requirements from an operational viewpoint arise from the need for reduced operational costs and improved effectiveness. These requirements include:

- Streamlined process with high level of automation and low level of manual process fallout and reduced level of physical network activity, e.g. few truck rolls, multiple network repair activities per visit.

- Product agnostic management services, processes and their presentation to Service Providers' operators.

- Automated management of Resources: Networks, Servers, platforms and applications.

- Proactive management particularly for fault resolution and SLA Management and monitoring.

- Provision of customer access to some testing facilities e.g. testing broadband access loop to allow improved customer experience.

- Improved resource resilience through self healing networks and protection switching.

- Single view of Product/Service information which is aligned for the customer self service view and the Service Providers' operator view.

- Reduce capital expenditure by improved planning through links to inventory measurement of resources utilization.

- Single security system for end-users customers and Service Providers' operators allowing for operator single sign-on.

- Automated configuration of new equipment.

- Centralized management of all resources.

7.5 Applications, network and technology

The vision is that the realization is based on a new model of service component combined amongst service providers on a converged network infrastructure using packet technology amongst a number of providers.

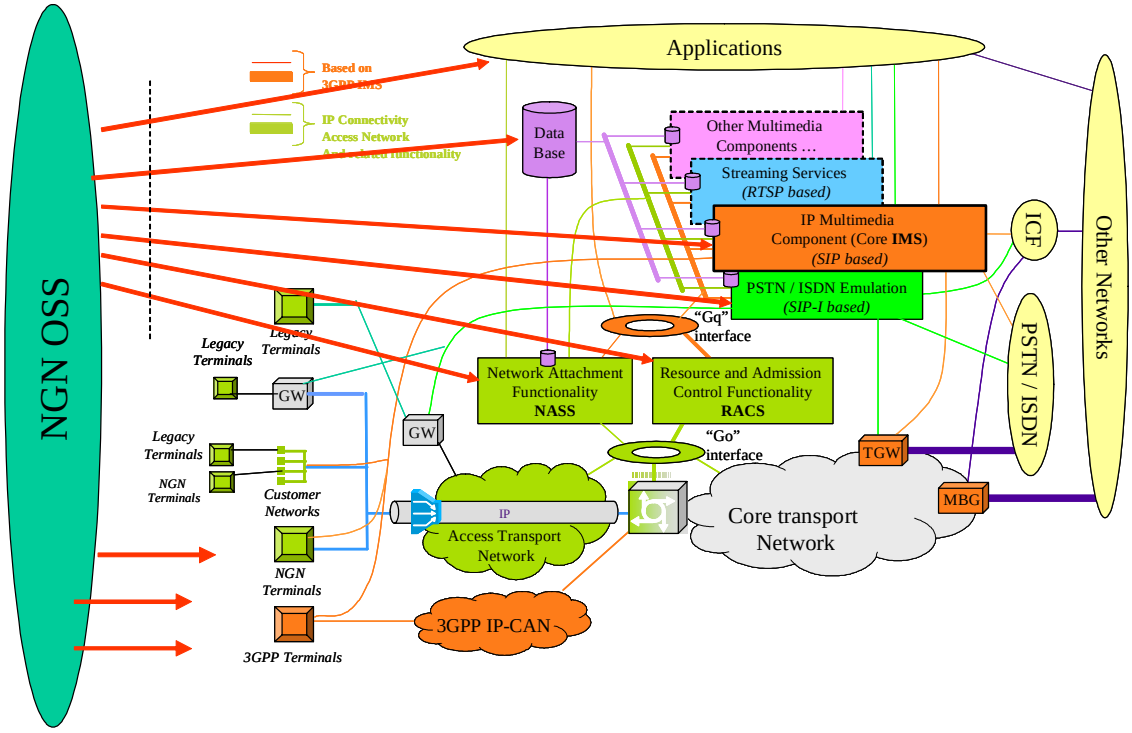

Figure 1: Example of TISPAN NGN Architecture

Figure 1 combines both the physical and functional overview of the scope of NGN. It provides a simplistic decomposition of an NGN into defined portions to enable standardization activities to progress in parallel.

The components are related to each other and may contain common or shared functionality. No assumptions should be made concerning their representation as separate components in the figure 1.

The PSTN/ISDN emulation component provides all of the network functionality associated with supporting existing services to legacy customer interfaces and equipment.

Physical transport networks provide the connectivity for all components and physically separated functions within the NGN. Transport is divided into Access Networks and Core Network, with a Border Gateway linking the two transport network categories.

IP-connectivity is provided to the NGN customer equipment by the transport layer, under the control of the network attachment subsystem and the resource and admission control functionality.

Figure 2 represents the compilation of user and other control data into a single "User Profile" function. This function may be specified and realized as a set of co-operating databases with functionality residing in any part of the NGN.

Customer interfaces are supported by both physical and functional (control) interfaces, and both are shown in figure 2. No assumptions are made about the diverse customer interfaces and customer networks that may be connected to the NGN access network. All categories of customer equipment are supported in the NGN, from single-line legacy telephones to complex corporate networks. Customer equipment may be both mobile and fixed.

The NGN interface(s) to other networks includes many existing networks, such as the PSTN/ISDN, other NGN, 3GPP networks, the Public Internet, etc.

The NGN interfaces other networks both at the control level and at the transport level, using border gateways. Border gateways may involve media transcoding and bearer adaptation. Interactions between the control and transport level may take place, directly or through the RACS functionality.

All of the interfaces and service categories are further overviewed elsewhere in the present document. The functionality and interactions for all the items in the figure 1 are defined within the complete specifications of the NGN, see clause 7 for a roadmap of documents.

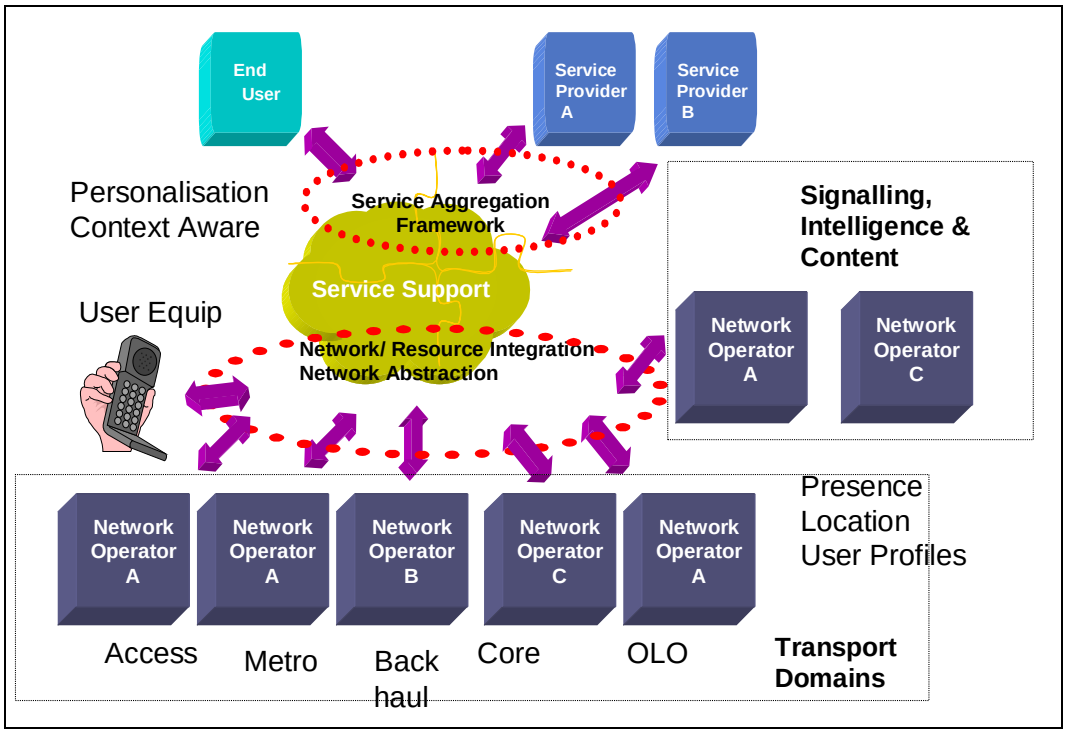

Figure 2: Main Management challenges for NGN Services and Networks

Figure 2 summarizes a number of the key points that have been described earlier:

Service Aggregation

- Customers have personalized services that they, or their service providers construct from a number of resources drawn from amongst a number of Service Providers.
- Service providers may also act as aggregators of services from many Service Providers.
- Services are supported by abstraction of the resources.

Resources Aggregation

- The resources to support the services comprise: Networks, Signalling intelligence and content.
- Signalling intelligence and content may be provided by multiple Service Providers possibly operational linked together by use of Parlay gateways.
- Intelligence services will depend on User profiles, location and presence information.

8 Regulatory and legal implications

Operation of telecommunications networks and services is subject to national and regional regulation and laws.

Next generation networks will need to support a number of management requirements arising from these regulations and laws.

8.1 Regulatory impacts

Current regulatory impact include requirement for:

- Open Access e.g. unbundled local loops, open access to the broadband access networks;
- Provision of third party "home/residential gateways" and other terminals;

- Numbering plans and addressing for IP (including number range management);
- Management Inter-operator voice gateways;
- Management of Number portability, and Carrier Pre-selection;
- Supporting resellers and virtual operators by provision of:
  - wholesale access;
  - wholesale call services;
- Management of Lawful intercept services supporting government and law enforcement agencies.

Note that the European Commission has enforced a New Regulatory Framework that is applicable to NGN networks.

8.2 Legal impacts

Legal impacts on of NGN Management include:

- Accounting standards for call records and settlements including Sabanes Oxley for revenue assurance.
- Crisis/emergency management for operations of networks under civil emergency conditions.
- Protection of data about individuals.

9 Implications of industry direction requirements on OSS solutions

9.1 Processes

The TMF enhanced Telecoms Operations Map initiative has analysed the processes that all Service Providers need to operate (see ITU-T Recommendation M.3050 [7]).

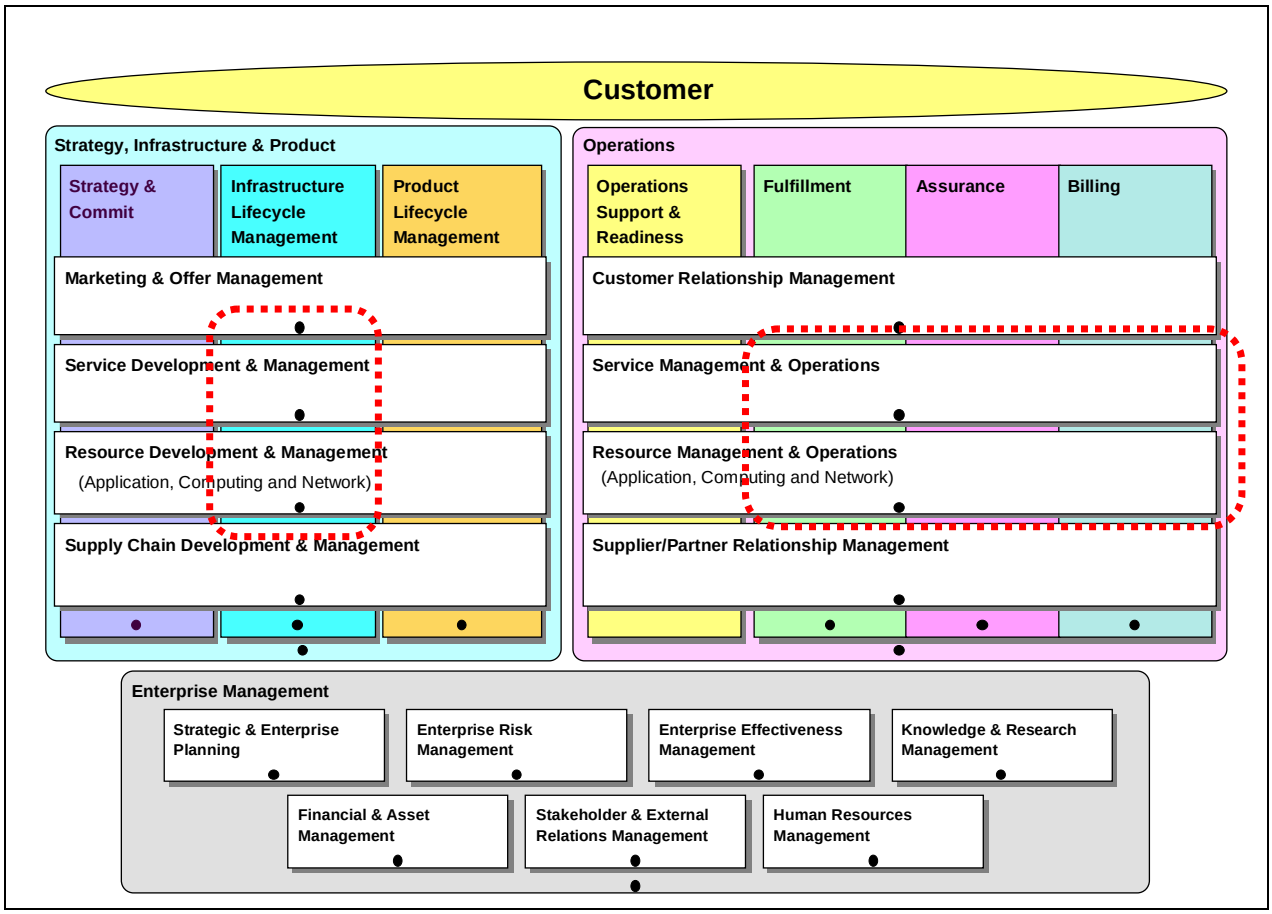

Figure 3: TMF eTOM - ITU-T Recommendation M.3050 [7]

Traditionally OSS investment has focussed on the automation of day to day repetitive tasks contained in the Operation Process Area. The need for shorter product/service and technology lifecycles means that greater emphasis has to be placed on automated OSS support for parts of the Strategy Infrastructure and Planning Process Area. Particularly important is the importance of linking the SIP and Operation processes for the Service and the Resource layer, and the way that these two process grouping interact. See process grouping marked with red dashed lines in figure 3.

For example planning processes for networks need access to operational inventory information to gauge current capacity utilization and exhaustion rates as input the planning processes. After network extensions are planned the planning processes need to be able to synchronize the "as-planned" inventory with the inventory as it is installed. After the extension is completed the new installation inventory need to be released to the operational processes.

9.2 Information management and quality

Increasing the scope of automated processes from Operations to include SIP Processes means that cross systems information models have to be consistent and the mechanism for synchronizing and replication of instances of data across systems need to be explicitly modelled, controlled, and monitored.

Improvements in Service Management are highly dependant on improving the linkage of information and data in the TMF assurance and fulfilment vertical process grouping in the Operations process area. Customer perception of Service Management quality is also highly dependant on high quality Network Management of Resources.

9.2.1 Improved service assurance

Improved service assurance needs high quality information models and data quality to be able to relate network failures to specific service instances and specific customers. This is critically dependant on network inventory information (logical and physical) that is synchronized with the network.

Validating service across NGN requires testing capabilities at the edge of the network.

Services and networks need to be proactively managed and supported by highly resilient networks.

9.2.2 Improved service fulfilment

Access to up to the minute information on available and planned network capacity is essential to improving the customer service management experience. Especially where customers chose to use self service automated access methods, there is a strong expectation that the information provided is up to date.

9.3 Reusable component based solutions

The implication of a move to a component based solution is quite far reaching.

The scope and nature of components is not limited to management but spans user, control and management plane functionality.

The following clause explores some of these implications.

9.3.1 Application, control and management plane components.

In NGN is it intended that all functionality is componentised irrespective of the plane in which they exist.

Two complexities arise with management:

- The Application and Control Plane components have to be manageable which means that physical realization of Application and Control Plane components have to have logical component in the Management Plane to manage them. Both of these types of components are Resource Management as defined by the TMF eTOM [7]. Currently this type of management capability is contained in existing OSS systems, and may not be modularized.

- Management Services e.g. SLA Management, exist that are not based upon resources in the network or Services/intelligence. In some cases these Management Services are common across many products and services.

9.3.2 Management components not systems

Management components imply that the process of managing the delivery of management functionality needs to be around functions that are defined logically and not in terms of physical systems. i.e. exactly the same management functionality is available, even if it is implemented on different systems and platforms.

The industry approach to this is documented in the TMF NGOSS™ programme and is based upon a number of principles. These principles challenge the traditional way that OSS systems are defined, realized, and deployed.

- Components are defined so that they may be re-used. All the components are defined using a NGOSS Contract which is a form of enhanced API. The full service behaviour of the components is specified by means of use cases, and is not dependant on the calling component, aside from access control considerations.

- Common platform framework that provides the feature for security, distribution, and component registration discovery and trading.

- Common Information Models to describe the entities referenced in the Contracts. The TMF approach is captured in a UML model called the Shared Information and Data model.

- Separation of the end to end process into a workflow tool. Note to realize the function of a component there may be an embedded local workflow engine but this will not be controlled at the Contract interface.

- Separation of technology neutral and technology specific architectures that allow one architecture to evolve, and use multiple platform technologies. E.g. CORBA, J2EE, Web Services.

9.4 Component Management

Components specifications or Contracts are used at different stages of their development by different people performing different roles.

The TMF NGOSS™ Lifecycle Model [6] proposed four related views of components:

- Business view is about "identification of the business need". The purpose of the view is to document the business requirements and all associated business activities that help to define the business requirements, such as process definition, policies, stakeholders, resource, etc.
- Systems View is about "modelling the system solution". In this View there is formal information modelling of business needs and the desired system solution, done using a "grey box" perspective that places a focus on the points of interoperability.
- Implementation View is about "validating the proposed solution". The Implementation View maps the System View solution models onto target technologies, potentially including a COTS component base.
- Deployment View is about "realizing the solution". Here there is the observable behaviour of the solution operating in the "real world". There are items relating to Contract Instances, Components, and the full-scale run-time solution.

What is critical to re-use, is that changes to requirements in any view can be analysed for their impact on the other views. To achieve this component specification contracts have to be recorded along with their dependences on requirements expressed in all views. Note that all views can impose constraints or requirements that have to be mapped back to the impacts on the other views. For example the lack of availability of DHCP on a specific router card type may affect the systems model, and impact the business view of the services that can be offered to customer.

It is not practical to maintain this information, and manage their dependencies, without the use of repositories to maintain and track the relationships between the documentation of the views.

Any real world re-use environment is critically dependant on a suitable on line repository.

As an example the business view might give a high level overview of generic "objects" with some of the main attributes e.g. Managed transmission entity. The systems view may provide more detailed objects derived from the Business view e.g. Router , router port DHCP control, and more detailed operations. In the implementation view the pure Objects may be transformed into Implementation objects that are fewer in number for realization purposes i.e. they map many objects into a single container object and represent them as attributes. E.g. a Router Port DHCP control object might be represented as a set of attributes of a Router configuration. A change to detailed port features e.g. DHCP is no longer available on a specific port type, might also require a change to the product specification in the systems view, and the Business view.

History

Document history		
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