MANAGEMENT ANALYSIS FOR INTERCONNECTION OF MULTI-MEDIA SERVICE NETWORKS

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There are a number of emerging services that build, in addition to the traditional voice component, on new media elements as e.g. text, photos, videos etc. In order to improve exploitation of these new revenue opportunities it needs to be ensured that these services can also be used in inter-network scenarios, i.e. network domain boundaries.

This work introduces deeper analysis of the needs regarding Management (operations, administrations, maintenance and provisioning – OAM&P) correspondingly to the specified requirements. The view of which resources and capabilities are applicable to an interconnect relationship are taken in consideration. That is, what kind of flows, paths, and/or circuits, are applicable and what QoS (Quality of Services) and CoS (Class of Services) features as well as QoS monitoring and SLA (Service Level Agreement) assurance capabilities are assumed. When the assumptions are identified the corresponding management requirements can be captured.

The next step is to agree on and specify a protocol neutral information model, which captures all managed entities and management capabilities that should be available on the management interface. Then, on a bilateral basis, the exact management protocol profile may be chosen from a set of standard protocol profiles.

Because of the still several open issues crucial for deciding on the management functionality needed, a full set of management requirements has not been captured. Rather, potential requirements are identified and some issues are addressed. Different choices regarding these issues will have significant influence on the management capabilities needed.

In this work the management interfaces are discussed. These interfaces depend on the management capabilities applicable, the administrative domains involved, and which roles the administrative domains play with respect to each other.

Keywords: Management, Multimedia services, Interface, Quality of Services, Class of Services, Service Level Agreement

1. INTRODUCTION

1.1 Background

The interconnection of IP (Internet Protocol) based networks providing Multimedia services, has not been given adequate consideration from the perspective of the telecommunication operators. The interconnection of IP – networks based on the work done to date is likely to suffer from: non-guarantied QoS (Quality of services); security risks; inefficient use of network resources; interworking achieved only by bilateral agreements on a case-by-case basis.

This will prevent or at least impede interoperability of many services, thus making it impossible to offer them as a service spanning more then one operator network. Due to the declining revenues from traditional voice services, new type of services built upon new media elements – images, videos etc., will increasingly contribute to the revenues of operators. In order to improve exploration of these new reve-

nue opportunities it needs to be ensured that these services can also be used in inter-network scenarios.

One of the areas that is taken in consideration concerning the interconnection of MM service networks is the management. In order to analyse needs regarding Management and correspondingly to specify requirements, two main aspects are taken in consideration: management functionality and interfaces needed. This has led to a development of a management model which will be presented in a future work. Here only the main topics of the aspects will be shown.

Functionality: SLA conformance reporting, Traffic reporting, Routing management, Accounting, Consistent QoS/CoS (Class of Services) marking, Management of inter-office interconnect tunnels;

Interfaces: There are many types of interfaces defined – between Service Providers, between Network operators, between Transport Network Operators and between all of them.

1.2 Assumption and methodology

Capabilities and choices regarding the following issues will have great influence on the specific requirements for interconnect management operations and information flows. Capabilities with respect to the following need to be defined in order to specify the corresponding Interconnect Management requirements and capabilities needed.

- End-user services and CoS classes, their permanents, and objectives (SLA's),
- Network performance objectives,
- QoS and SLA measurement methodologies,
- QoS and SLA assurance methodologies,
- Transport plane capabilities and types of connectivity resources including CoS, QoS, and resource reservation features, as perceived from an interconnection point of view,
- Constraints and assumptions regarding mapping of end user MMoIP (Multimedia over IP) flows (bearers) onto aggregate flows (tunnels),
- End-user naming scheme and "addressing" plan,
- Addressing scheme and addressing plan for MMoIP bearers (flows),
- Addressing scheme and address plan for tunnel end-points as well as for end-points of interconnect links,
- Routing information dissemination approach,
- Resource usage monitoring, charging and accounting schemes.

Several documents regarding management and OSS (Operation Support System) are applicable as sources for this work. Typically, the sources provide generic descriptions and requirements that need further investigation when analysing and specifying what are applicable requirements and functionality in a given setting, such as for instance given interconnect architecture. Examples of such sources are: ITU-T M.3010 [1], ITU-T M.3200 [2], ITU-T M.3400 [3]etc.

2. MANAGEMENT INTERFACES AND FUNCTIONALITY OVERVIEW – ISSUES AND POTENTIAL REQUIREMENTS

2.1 Interconnect management functionality

The following will provide further introduction to the field of interconnect management. It is considered appropriate to identify Interconnect Management (ICM) functional layers along the line of the ETSI architectures augmented with functional layers according to the three types of connectivity resources. Figure 1 illustrates the proposed ICM functional layers.

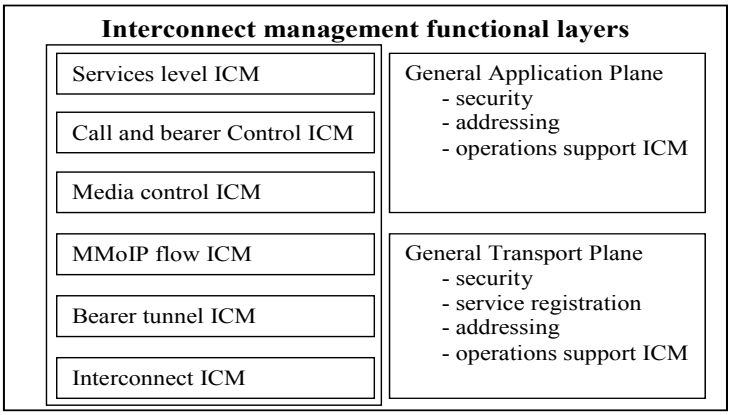

Fig. 1 Management functional layers

This structuring of the ICM is preliminary. For example: The Service Control is not a separate layer – that means that the other layers will deal with this topic. It is also possible that not all these functions may be needed corresponding the specific service components. However, the above structuring should be considered and assessed in the general context of interconnection of Multimedia services, with the goal of providing a future proof and useful structuring of ICM functionality. The structuring of ICM functionality should be applicable and extensible also when introducing for instance multi-technology handover and roaming of Multimedia services.

Application plane (AP) ICM functionality

1. *Services ICM*- It is expected that existing functionality from existing services at this layer can stay unchanged to a large degree and be reused. If there is relevant ICM functionality at this layer it should be also be possible to reuse existing solutions. However, this must be considered with respect to new NGN capabilities.
2. *Call and bearer (control) ICM*

- Functionality related to discovery, negotiation and management of call and bearer capabilities for one or more interconnection relationships,
- Management functionality related to call and bearer level SLA assurance and conformance reporting,
- Management of call and bearer routing polices,
- Call and bearer accounting management,

- Functionality related to monitoring and management of call and bearer control operations, e.g. call and bearer control performance and fault management.

3. Media (control) ICM

- Functionality related to discovery and negotiation of media gateway capability,
- Functionality related to monitoring and management of media gateway operations – media gateway performance and fault management,
- Media gateway services accounting management.

4. AP Security ICM

- Security management functionality related to AP interconnection DCN (Data Communication Network) and AP related exchange of management and control information,
- End-user authentication and access control support.

5. AP addressing and naming server ICM

- Announcement and discovery related to end-user naming plans,
- Management of inter-domain name server services.

6. AP operation support ICM

- Discovery, negotiation and management related to AP protocols plane and its capabilities,
- Management of DCN and its components and features,
- Monitoring and management AP performance and faults.

Transport plane (TP) ICM functionality

1. MMoIP flow ICM

- Announcement and discovery related to mapping of CoS and QoS capabilities regarding mapping from call CoS to MMoIP flow CoS,
- Management functionality related to MMoIP flow SLA assurance and conformance reporting,
- Announcement and discovery of routing and assignment polices for assigning MMoIP flows onto bearer tunnels,
- MMoIP flow accounting management.

2. Interconnect bearer tunnel ICM

- Management functionality related to bearer tunnel SLA assurance and conformance reporting,
- Announcement and discovery related to mapping of CoS and QoS capabilities regarding QoS mapping from bearer tunnel onto interconnection links,
- Bearer tunnel set up and release,
- Bearer tunnel resource reservation and modification,
- Bearer tunnel fault management,
- Bearer tunnel performance management,
- Bearer tunnel accounting management.

3. Interconnect link ICM

- Management functionality related to SLA assurance,
- Interconnect link set up and release,
- Interconnect link resource reservation and modification,

- Interconnect link fault management,
- Interconnect link performance management,
- Interconnect link accounting management.

4. *TP Security ICM*- Security management related to TP interconnection DCN and TP related exchange of management and control information.
5. *TP addressing ICM* – Announcement and discovery related to TP address plan e.g. announcement of bearer tunnel end-point identifications. Must be considered in relation to any (use of) routing protocol used, if applicable.
6. *TP operations support ICM*

- Functionality related to discovery, negotiation and management related to TP protocols plane and its capability,
- Management of TP DCN and its components and features,
- Monitoring and management TCP DCN performance and faults.

2.2 Management interfaces

The functional layers defined above can be associated with potential actors in several ways, depending on the business model. In this work a generalisation of these roles is made – there is a distinction between *service provider* (SP) and *network operator* (NO). One issue may be how many different kinds of management interfaces are needed. This will depend on the management capabilities applicable, the administrative domains involved, and which roles the administrative domains play with respect to each other. In Figure 2 several management interfaces are introduced along with the roles that apply.

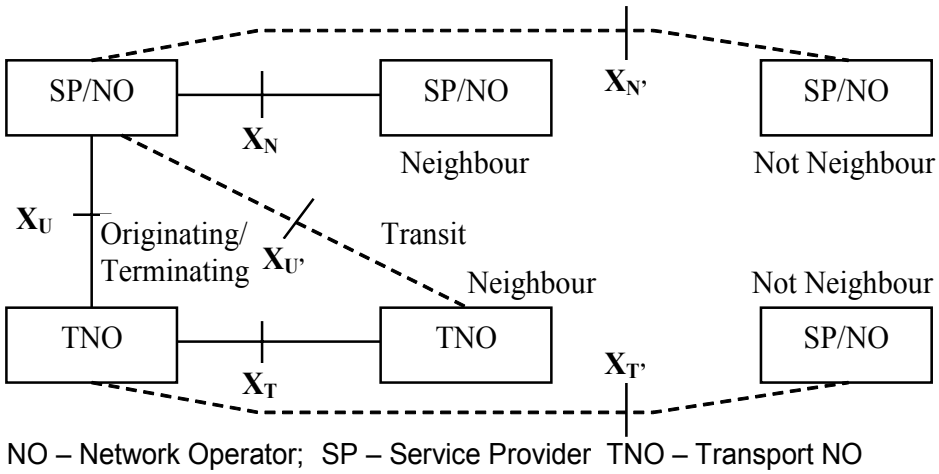

Fig. 2 Management interfaces layers

X_N is used to identify the management interface between two interconnecting NO at the MMoIP level. The same interface is also used to identify a MMoIP SP interconnecting to and using services from a NO providing interconnect services. $X_{N'}$ is used between two NO that does not have direct interconnect relationship in the

MMoIP transport and signalling planes, hence, there are one or more transit NO in between.

The picture also identifies management interfaces applicable when inter-office tunnels or links are used, where the tunnel or link possibly also passes through one or more transit transport domains. X_U is used to label the interface between the transport service user and the transport service provider. Services can for instance be offered via a User-Network Interface (UNI). $X_{U'}$ is used toward a transit TNO. X_T is used to identify the management interface between two (interconnecting) transport NO's that are neighbours, while $X_{T'}$ is used toward a non-neighbour transport NO.

All interfaces mentioned above may be used without significant changes for interconnection of MMoIP networks.

3. CONCLUSIONS

For each type of management interface one must analyse and identify which managed entities should be perceived and managed across the interface. Managed entities, their elements and relationships can represent different things at different abstraction level or detail, from network connectivity resources, QoS and SLA configuration and monitoring capabilities, to call and service level features.

By analysing potential FCAPS (Fault, Configuration, Accounting, Performance and Security) functionality as identified in M.3400 for each ICM function layer, ICM functional requirements should be identified and appropriately structured.

The next step is then to consider various alternative management entities [5] [6] and relationships between such entities, to reach a functional specification of the different interfaces. Protocol neutral information modelling may be used as a specification approach. Then, on a bilateral basis, the exact management protocol profile may be chosen from a set of standard protocol profiles.

Depending on the volume and complexity of management transactions, it is possible that some management tasks can be done manually. At a later stage, when the volume increases, automation by an OSS-OSS interface can be introduced.

4. REFERENCES

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