



**MSF Technical Report  
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**Management for Next Generation  
Multi Service System Networks**

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## ABSTRACT

This white paper is part of series of white papers that will be published by the MSF in 2003. The series of white papers explore the issues motivating the MSF 2003 work plan. The white papers also discuss the solution space within which the MSF will work and identify a proposed work programme for 2003. The end goal of the 2003 work programme will be a second Global MSF Interoperability (GMI2004) event.

This white paper discusses the issues involved in management of MSF MSS systems and proposes a solution space that the MSF will explore during 2003. The paper also discusses areas where the MSF can cooperate with other industry bodies involved with management systems.

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## 1 Problem for MSS management

The MSF architecture adds new management requirements that are not met by current management technologies. This compounds the already difficult situation which occurs when trying to integrate OSS environments. It also impedes the introduction of MSF functionality, as the ability to provision, control, monitor and report on new functionality is critical for its acceptance. It is the responsibility of the MSF to insure that the architectures and profiles it defines are manageable.

This responsibility introduces a set of requirements. Some of the specific requirements include:

- a. Provide a consolidated operational infrastructure to support all management aspects of the MSF architecture.
- b. Provide an OSS application interface definition to allow for Graphical User Interfaces, Electronic Transactional Interfaces and CLI Interfaces to support efficient network element configuration, service provisioning, ongoing growth and retrofit.
- c. Provide the ability to link the physical elements and the services enabled by the MSF architecture with operational and billing systems. This is needed for revenue assurance activities and carrier audits.
- d. Provide interface definitions that enable metrics generation, collection and summarization sufficient enough to support platform traffic engineering network element capacity planning activities
- e. Provide Alarming interfaces for all network elements contained within the network architecture with enough information to perform root-cause analysis
- f. Provide interface definitions for Fault Management systems and automated recovery.
- g. Provide interface definitions and data models for Trouble Tracking, Recording and Reporting.
- h. Provide interface definitions to enable the backup and restoration of configurations.
- i. Provide interface definitions and data models to enable Transactional Logging of all configuration events to support trouble shooting activities and audits
- j. Provide event definitions to enable Accounting and Billing for all service invocations and network utilization. These must include appropriate information to support inter-carrier, wholesale and end customer billing.
- k. Provide a definition of a Highly Available Highly Scalable and Disaster Recoverable MSF Architecture Management Plane.
- l. Provide interface definitions for activating a service and associating multiple levels of customers and subscribers to these services

## 2 Decomposition of the problem

In reviewing the problem, it is necessary to distinguish both the technical, business and cultural components of the problem as they will need to be addressed in a coherent manner if there is any hope of obtaining a workable solution. While this is true in most areas of the telecommunications effort, it is especially necessary in any discussion of solutions to the management problem. The history of telecommunications management is ripe with examples where good technology did not meet the needs of business and of examples where the

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business drivers were such that necessary technology could not be successfully deployed. Historically while business needed management that could provide service definition, technology focused on element management leaving a gap between what was wanted and what was possible. If operational expenses are to be lowered in the future, this gap must be closed.

## **2.1 Technical issues**

### **2.1.1 Platform Installation, Setup and Configuration**

Given the MSF architecture, and especially the decomposition of elements, there needs to be a definition of how installation set up and configuration should be supported in a multi-element environment.

### **2.1.2 Circuit / Path Design**

The MSF architecture presupposes that the network implementation enables edge to edge circuit and path design. Yet the architecture does not provide any help in this area. Several approaches to this problem are possible:

- First Approach – Have the Higher Level OSS complete the Circuit design support by a network engineer and then pass specific provisioning events to the MSF Management Plane
- Second Approach – Have the Higher Level OSS Pass the design criteria (e.g., A/Z LOCs, Bandwidth Requirements) and the MSF Management fulfils the point to point design requirements and then through inventory management interfaces feeds back specific design details to the higher level OSS
- Third Approach - Middleware solutions that facilitate detailed circuit design in the middle ground between the Higher Level OSS and the Network Elements of the MSF Architecture.

### **2.1.3 Flow Through Provisioning Support**

Each layer of the MSF architecture required Management Plane Interfaces to support flow-through provisioning of the capabilities offered by that layer. The technology utilised for these interfaces should be extensible as the services mix and capabilities supported by the MSF Architecture increases over time. Therefore, it would be appropriate to leverage technologies like Web Services, SML, and J2EE with bridges into the legacy environment

- Physical Edge
  - Port Activation / De-activation, Port Suspension / restoration without losing configurations, Port Configuration and Change
- Control and Routing Plane
  - Signalling Interface Activation / De-Activation
  - Route Interface Establishment
  - Constraint and Service Level Enforcement
- Services Plane
  - AAA servers
  - Application servers

### **2.1.4 Metric Production Support**

Metrics are required by integrated multi-network architectures to insure that the solution is functioning per requirements. The following functionality needs to be defined consistently for the full solution:

- Capture and generation by the Data Control and Application Planes
- Summarization and distribution to appropriate Traffic Engineering and Network Planning Systems to support Carrier Network Infrastructure Requirements
- Summarization and distribution as required to support Wholesale Views or End Customer Views
- Network Element Consumption Reports (Over Various Time Periods) to support activities between

### **2.1.5 Billing Support**

Billing for multi-vendor services in a consistent fashion on an integrated bill has been one of the most difficult issues in the post-Telecom Act environment. Billing models with standardized formats and transfer mechanisms must support the following types of customers:

- End Customer
- Wholesale Customer
- Carrier Customer

### **2.1.6 Alarming and Network Operation Center (NOC) Support**

While alarm interfaces are the most consistent of all the operations interfaces today, accurate identification of the problem and correlation between alarms remains an area where improvement is needed. The following areas need to be considered as part of the overall solution:

- SNMP Support
- Text Alarming Support
- Root Cause Support
- Geographic and physical location mapping

### **2.1.7 Policy Definition and Enforcement Support**

In order to further the MSF model's goal of convergence between telephony and the Internet, there is a need for IP network resource management and QoS provisioning models. In order to define and enforce the resource management policy along the lines that have made the internet successful, there is a need to create a management function that can take in policy data and then can coordinate the resource management of elements that are operating across the network.

In addition to enforcing resource provisioning, it may also be necessary for the MSF management architecture to include a description of how a security policy can be defined and enforced.

## **2.2 Business issues**

- Even in good times, replacing or upgrading an OSS architecture is problematic. This implies that any solution proposed must leverage the existing OSS systems as much as possible.
- Operational expenses need to be decreased by using more automation. This means that management needs to be made less manual (CLI based).
- It has been argued that it is possible to reduce operation expenses by judicious application of capital expenses in the management and control area. This has, however, not been proven. If the MSF has a solution that makes this possible, an economic analysis of how this is possible must be developed.

## **2.3 Cultural Issues**

One of the problems encountered in developing management solutions for a MSS that incorporates both telecommunications-derived systems and IP-derived systems is a mismatch between the architectural world views those systems are based upon. Despite the fact that the participants of the MSF have gotten beyond the Bell vs. Net Head conflicts we cannot assume that the architectural underpinnings of the architectural views are the same. Whether it is the difference between an approach based on centralized management vs. distributed management or the differences in the meaning of the word service, e.g. business service, application service, peer to peer service, transport service etc., or the lack of isomorphism between the layers in the respective architectures, there are real differences that must be acknowledged and understood in order to be resolved.

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### 3 Standards and Other Fora

As the MSF does not define standards unless absolutely necessary, part of the MSF effort requires an ongoing analysis of available solutions. This involves paying close attention to the work going on in industry fora and standards organisations that address the problem space. In terms of management, the following all have components that contribute part of the solution:

- CORBA: OMG's Common Object Request Broker Architecture in many cases constitutes the legacy framework for non IP telecommunication management systems. Many systems make use of the IIOP protocol or the IDL interface definition.
- DMTF: The Distributed Data Management forum is engaged in the effort to derive schemas that will cover management information in a network / enterprise environment. Their definitions are based on the Common Information Model (CIM). The IETF has based much of its work on DMTF's CIM.
- IETF protocols: The solution in the IETF consist largely of Simple Network Management protocol (SNMP) and the Management Information Bases (MIBS), which while aimed at both configuration and management, are largely used by systems primarily for monitoring status. Other work includes the Common Open Policy Service - Provisioning (COPS-PR) and the Policy information Bases (PIBS), which are intended for policy based configuration. There is also an effort in the SMIng WG to establish a new data definition language that can be mapped onto both the SMI used in MIBS and the SPPI used in PIBS to allow for a common representation for monitoring, configuration and provisioning. Part of the intention of the SMIng WG is to also increase the expressive power of the data modelling language to allow, for example, the expression of creation and deletion of capabilities. This may allow for the use of the SMIng at higher levels of abstraction.
- IRTF: Ongoing research is being done in the IRTF on transport service management. The focus of this work is specifically the requirements and technologies involved in creating QoS capable networks. This work has resulted in RFC3387. It is unclear where this effort is headed or what the end results will be.
- Jain/OSS: This Sun led initiative is fostering the use of Java to produce Java interface definitions to support service providers. There are many efforts in place to produce Jain/OSS definitions for IETF efforts such as SIP and for trouble tickets, service creation and QoS.. The MSF has held inconclusive talks with Jain about establishing a liaison.
- TMF toolkit: The Tele Management Forum offers a very rich toolkit of components for managing systems at the network level. While the members of the forum are very skilled at management components, they do not have an architectural representation of the systems they need to manage. Cooperative efforts between the MSF and the TMF are being explored where the MSF provides the architecture framework and specific requirements for TMF catalyst programs. One catalyst program, accounting systems management for H.248 MGC systems, has been proposed.
- XML: This is an attempt to create a single markup language that can be used to express varied data models. The IETF is considering the use of XML for expressing data models. It offers interesting possibilities to the MSF as a way to express our interface model and schemas free of proprietary metadata. It would, however, require significant effort. XML is a useful tool for defining accounting data, log entry data and other management data that may be passed across interfaces to provide information to multiple systems.
- Active networks, Jini: Jini has been mostly implemented in non-telephony applications and is a way for hardware elements to submit event messages between each other. Applications in the telecom arena need to be validated.

### 3.1 What are the gaps in the available solutions

Operations continue to be the major deterrent to quick deployment of new services. Some of the major problem areas include:

- No common look and feel to support full point to point service fulfilment
- Billing is difficult, and in many cases is impossible, to support
- Inadequate support for trouble tracking and reporting
- Inadequate support for monitoring and enforcing service level agreements.
- Too many partial and incompatible management solutions
- Non cooperation between many control mechanisms and management mechanisms
- New services need to be managed
- Too difficult to enhance systems with non-flexible architectures
- Issues involving hybrid IP-Telecomm technologies, e.g. VoIP and MPLS, have not been adequately defined.

## 4 A solution framework

A significant part of the MSF effort must be to architect an operations framework for addressing the functions required to support a multi-vendor network element and application services environment. Billing, provisioning, alarms and metrics management, QoS management, and resource management must become standard operational platforms. The operational framework should be simplified and well-defined, rather than a complex maze of functional names. It should set the stage for full interoperability of applications with operations components in a reduced timeframe.

### 4.1 Further Develop MSF Management Architecture

The management plane in the Release 1 architecture is only a rudimentary design, essentially a place holder. In order to advance, it is necessary that this framework be fleshed out:

- Define the necessary management plane functional structure. This includes support for the Bandwidth management function as described in MSF Technical Report , [Quality of Service for Next Generation Voice over IP Networks \(MSF-TR-QoS-001\)](#).
- Define management plane interfaces to Application and Control Planes
- Define an Operation/OSS plane and its functionality
- Define management plane interfaces to Operations/OSS Plane

### 4.2 Determining areas to be managed

The following areas should be considered as part of the solution framework:

- IP Resource Management, aka Bandwidth, Brokers
- QoS Management
- Provisioning
- Billing
- Alarms (more standardization has occurred in this area than others)
- Metrics
- Configuration
- Trouble tracking, recording and reporting.
- Security Management
- Service Level monitoring and management

Furthermore, integration to a work flow management capability and to a service creation environment should be defined. An application should be developed with already-equipped operational capabilities which can "plug in" and interoperate with a set of OSS's in a similar fashion to network elements speaking the same network protocol. A work flow management

system should be able to identify, prioritize and log the functional events associated with these operational services.

### **4.3 Revolution or Evolution**

If the MSF adopts a 'revolutionary' strategy in producing new management models there will be a problem interfacing with current operational. On the other hand, if one adopts an evolutionary strategy, there is an impossible burden involved in supporting the legacy model of management. It will not be enough to define an architecture and its interfaces. In order to effect useful change, it is necessary to solve the conundrum. The MSF program must then show how to use the architecture to introduce future management and control models

## **5 Overview of required MSF actions and work items**

This paper identifies an area which needs attention by the MSF in 2003. As this area has a significant number of challenges to address, it will be necessary to define a scope in 2003 that is achievable. This section defines the major 2003 work items, under the assumption that work in this area will continue into 2004.

### **5.1 Functional architecture framework**

The MSF needs to define the set of functions and components which integrate with the MSF architecture. Evaluation of existing functional definitions from other groups, e.g., TMF, should be part of this evaluation to determine how much of existing standards can be reused and where there is duplication. Common data elements and repositories should be defined.

As part of this functional architecture effort, the priorities of each of the functional components should be identified. This priority will provide input into the focus of the 2003 effort in regards to scenario examples. For instance, it might be determined that the greatest areas of concern are resource management and billing. In this case, the scenarios and examples approached in 2003 would focus on standardization in those functional areas, with the remaining functions addressed beyond 2003.

This functional architecture would develop into the Physical Architecture. The architecture should define its integration with the other MSF planes.

### **5.2 Requirements**

The priority areas identified as part of the Functional Architecture effort would result in more detailed requirements related to the following:

- Major components, functions and data elements

Data objects associated with the high priority areas would be defined.

- Types of functional messages

Standard messages to support service management would be identified for the high priority functional areas.

- Web services operational integration

This allows users to access the information provided by the service management plane through the web.

### **5.3 Develop Scenarios**

The following scenarios are candidates for developing examples of standardized integration:

- VoIP - SIP
- All IP Core - QoS Service Manager
- MPLS – Bandwidth Reservation Broker
- VPN

- 3G UMTS

Highest priority for 2003 should be to integrate with the GMI2004 plans for IP telephony and other services. With SIP gaining popularity so significantly over the last few years, standardized operations message sets for SIP applications could support a more rapid deployment of these new services capabilities. The ultimate challenge will be to define an overall OSS architecture that is standardized for all the scenarios identified in this section.

#### **5.4 Liaison activities**

The functional architecture and associated scenario develop should be based on existing standards definitions wherever possible. To support this endeavour, the following activities should take place:

- Continue to track work in IETF. Review relevant MIBS and PIBS and suggest changes where they are required to support necessary MSF functionality.
- Develop the formal liaison with the TMF that has been established.
- Resume work on a catalyst program with TMF.