INTERNATIONAL TELECOMMUNICATION UNION

ITU-T X.460

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(04/95)

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

MESSAGE HANDLING SYSTEMS

INFORMATION TECHNOLOGY – MESSAGE HANDLING SYSTEMS (MHS) MANAGEMENT: MODEL AND ARCHITECTURE

ITU-T Recommendation X.460

(Previously “CCITT Recommendation”)

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. Some 179 member countries, 84 telecom operating entities, 145 scientific and industrial organizations and 38 international organizations participate in ITU-T which is the body which sets world telecommunications standards (Recommendations).

The approval of Recommendations by the Members of ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, 1993). In addition, the World Telecommunication Standardization Conference (WTSC), which meets every four years, approves Recommendations submitted to it and establishes the study programme for the following period.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC. The text of ITU-T Recommendation X.460 was approved on 10th of April 1995. The identical text is also published as ISO/IEC International Standard 11588-1.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

ITU-T X-SERIES RECOMMENDATIONS

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS
(February 1994)

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Summary

This Recommendation | International Standard establishes an architecture for managing Message Handling Systems and provides an overview to the family of Message Handling Systems Management standards. The scope of this family of Recommendations | International Standards is to provide guide-lines and define tools to be used for the management of Message Handling Systems.

Introduction

This Specification provides, through its four sections plus annex, an overview of the MHS Management functions.

The first section briefly introduces the reader to the terminology, abbreviations, conventions and definitions used throughout the Recommendation | International Standard. Although primarily used as a reference section, both new and experienced Recommendation | International Standard readers should note the additional definitions and conventions.

Section two introduces MHS Management as a member of the family of OSI Systems management standards. It guides readers towards the other Recommendation | International Standards in the MHS Management series which may be of interest.

Section three, the MHS Management Model, addresses the needs of systems management designers to know how to fit their solutions together with the standards. For this purpose the model featured in figures will be a useful aid to visualise the relationships existing amongst the different functional layers and between the functional areas so far identified.

Section four, the MHS Management Architecture, helps the reader to understand how MHS Management fits into and relates to the overall OSI Systems management architecture. This should be of specific interest to implementors who need to know the protocol and service requirements.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – MESSAGE HANDLING SYSTEMS (MHS) MANAGEMENT: MODEL AND ARCHITECTURE

SECTION 1 – INTRODUCTION

1 Scope

This Recommendation | International Standard establishes a model for MHS Management which is consistent with the management layers defined in Telecommunications Management Network. This Recommendation | International Standard establishes an architecture for managing MHS Systems which is consistent with OSI Systems management.

This Recommendation | International Standard provides an overview to the family of MHS Management standards.

The scope of this family of Recommendations | International Standards is to provide guide-lines and define tools to be used for the management of MHS Systems. This includes the management within and between ADMDs and/or PRMDs. Examples of objects to be managed are: MTA, UA, AU, and MS.

This Recommendation | International Standard provides an overview of the MHS Management functions.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The basic model*.
- ITU-T Recommendation X.462 (1995) | ISO/IEC 11588-3:1995, *Information technology – Message Handling Systems (MHS) management: Logging information*.
- ITU-T Recommendation X.467 (1995) | ISO/IEC 11588-8:1995, *Information technology – Message Handling Systems (MHS) management: Message transfer agent entity*.
- CCITT Recommendation X.701 (1992) | ISO/IEC 10040:1992, *Information technology – Open Systems Interconnection – Systems management overview*.
- CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management information model*.
- CCITT Recommendation X.730 (1992) | ISO/IEC 10164-1:1993, *Information technology – Open Systems Interconnection – Systems management: Object management function*.

2.2 Paired Recommendations | International Standards

- ITU-T Recommendation X.402 (1995), *Message Handling Systems: Overall architecture*.

  ISO/IEC 10021-2:1990, *Information technology – Text Communication – Message-Oriented Text Interchange Systems (MOTIS) – Part 2 – Overall Architecture*.

– CCITT Recommendation X.700 (1992), *Management framework for Open Systems Interconnection (OSI) for CCITT applications*.

  ISO/IEC 7498-4:1989, *Information processing systems – Open Systems Interconnection – Basic Reference Model – Part 4: Management framework*.

– CCITT Recommendation X.710 (1991), *Common management information service definition for CCITT applications*.

  ISO/IEC 9595:1991, *Information technology – Open Systems Interconnection – Common management information service definition*.

2.3 Additional references

– CCITT Recommendation M.3010 (1992), *Principles for a telecommunications management network*.

– ITU-T Manual X.461 (1995) | ISO/IEC TR 11588-2:1995, *Information technology – Message Handling Systems (MHS) management: Information*.

3 Definitions

For the purposes of this Recommendation | International Standard, the following definitions apply.

3.1. Basic Reference Model definitions

This Recommendation | International Standard is based on the concepts in the Basic Reference Model for Open Systems Interconnection (see ITU-T Rec. X.200 | ISO/IEC 7498-1) and makes use of the following term defined in that model:

– systems management

3.2 Telecommunications Management Network definitions

This Recommendation | International Standard makes use of the following terms defined in Principles for a Telecommunications Management Network (CCITT Recommendation M.3010):

a) business management layer;

b) management information model;

c) network element layer;

d) network element management layer;

e) network management layer;

f) service management layer.

3.3 OSI Systems Management definitions

This Recommendation | International Standard makes use of the following terms defined in the OSI Management Framework (CCITT Rec. X.700 | ISO/IEC 7498-4):

a) managed object;

b) management information base.

This Recommendation | International Standard makes use of the following terms defined in OSI Systems Management Overview (CCITT Rec. X.701 | ISO/IEC 10040):

a) agent;

b) agent role;

c) generic definitions;

d) managed object class;

e) managed (open) system;

f) management information;

g) manager;

h) manager role;

i) managing (open) system;

j) notification;

k) (systems management) operation;

m) systems management functional area.

This Recommendation | International Standard makes use of the following terms defined in the OSI Management Information Service Definition (CCITT Rec. X.710 | ISO/IEC 9595):

– Attribute

This Recommendation | International Standard makes use of the following terms defined in the OSI Management Information Model (CCITT Rec. X.720 | ISO/IEC 10165-1):

a) Allomorphism;

b) Behaviour;

c) Conditional Package;

d) Containment;

e) Encapsulation;

f) Inheritance;

g) Instantiation;

h) Mandatory Package;

i) Naming Tree;

j) Package;

k) Specialisation;

l) Subclass;

m) Superclass.

This Recommendation | International Standard makes use of the following terms defined in the OSI Management Object Management Functions (CCITT Rec. X.730 | ISO/IEC 10164-1):

a) pass-through

3.4 Message Handling System definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.402 | ISO/IEC 10021-2:

a) access unit (AU);

b) administration management domain (ADMD);

c) delivery;

d) delivery report;

e) distribution list (DL);

f) distribution list expansion;

g) conversion;

h) message;

i) message store (MS);

j) message transfer agent (MTA);

k) originator;

l) probe;

m) recipient;

n) transfer;

o) user agent (UA).

3.5. Additional definitions

3.5.1 MHS management domain: In the context of Message Handling, a set of messaging systems – at least one of which contains, or realises, an MTA – that is managed by a single organisation.

3.5.2 MHS system: The term MHS System refers to a system which provides MHS services. It may, but not necessarily, correspond to an MHS Management Domain.

3.5.3 MIS management domain: A set of managed objects, to which a common systems management policy applies.

3.5.4 MIS-user: The term MIS-user will be used to denote a user entity or process who wishes to use a MHS Management service. An MIS-user can use the service to both retrieve information from the service, and to control the service subject to the security policy in force. The term Manager is used in some cases to denote a type of MIS-user who defines or enforces management policy by using systems management functions.

3.5.5 network element control point: An entity within the network element management layer which provides resource management for an entity in the network element layer.

3.5.6 TMN-layer: Any one of the layers defined in Appendix II/CCITT Rec. M.3010 (Principles for a telecommunications management network).

4 Abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

ACSE	Association Control Service Element
ADMD	Administration Management Domain
ASN.1	Abstract Syntax Notation One
AU	Access Unit
BM	Business Management
CCITT	International Telegraph and Telephone Consultative Committee
DL	Distribution List
IEC	International Electrotechnical Commission
ISO	International Organization for Standardisation
ITU-T	International Telecommunication Union, Telecommunication Standardisation Sector
MD	MHS Management Domain
MHS	Message Handling System
MIB	Management Information Base
MIM	Management Information Model
MIS	Management Information System
MS	Message Store
MTA	Message Transfer Agent
NE	Network Element
NECP	Network Element Control Point
NEM	Network Element Management
NM	Network Management
OSI	Open Systems Interconnection
PRMD	Private Management Domain
PSAP	Presentation Services Access Point
ROSE	Remote Operations Service Element
RTSE	Reliable Transfer Service Element
SM	Service Management
TMN	Telecommunication Management network
UA	User Agent

5 Conventions

This Specification makes use of the following conventions.

5.1 Management Domain

The term Management Domain (MD) when used on its own signifies an MHS Management Domain.

SECTION 2 – MHS MANAGEMENT INTRODUCTION

6 MHS Management standards overview

MHS Management is based on the family of OSI Systems management standards and CCITT Rec. M.3010 (Principles for a telecommunications management network). The specification CCITT Recommendation M.3010 shows how to split management functions into layers in order to show the flow of management information between various communicating entities. The OSI Systems management standards define the object management techniques and protocols used to carry management information between open systems.

6.1 Message Handling Systems (MHS) Management: Information

Management information consists of managed object classes and the packages, attributes, attributes groups, notifications, actions and parameters that apply to each class.

The specification ITU-T Manual X.461 | ISO/IEC TR 11588-2 provides a roadmap for the management information that is defined in MHS Management specifications. This roadmap consists of the following aspects:

- the whole MHS Management naming tree;
- the index of MHS Management information defined in the MHS Management specifications.

6.2 Message Handling Systems (MHS) Management: Management functions

OSI Systems management is split into five functional areas. Each area is covered within the family of MHS Management standards in an individual document. The five documents are entitled:

- Message Handling Systems (MHS) Management: Logging Information.
- Message Handling Systems (MHS) Management: Security Management Functions.
- Message Handling Systems (MHS) Management: Configuration Management Functions.
- Message Handling Systems (MHS) Management Fault Management Functions.
- Message Handling Systems (MHS) Management: Performance Management Functions.

The management model is refined in each of these standards for the given functional area.

6.3 Message Handling Systems (MHS) Management: Managed entities

The entities of interest to MHS Management are the functional objects:

- User Agent;
- Message Store;
- Access Unit;
- Message Transfer Agent.

Each managed entity is covered in an individual document in this series of Recommendations | International Standards. The management model is refined in each of these standards for the given managed entity.

6.4 MHS Management – Table of documents

This is one of a family of standards related to the management of MHS Systems. Table 1 lists the documents in the family.

Table 1 – MHS Management documents

Name of Recommendation | International Standard	ITU-T	ISO/IEC
General		
Message Handling Systems (MHS) management: Model and architecture	X.460	11588-1
Message Handling Systems (MHS) management: Information	X.461	11588-2
Management functions		
Message Handling Systems (MHS) management: Logging information	X.462	11588-3
Message Handling Systems (MHS) management: Security management functions	X.463	11588-4
Message Handling Systems (MHS) management: Configuration management functions	X.464	11588-5
Message Handling Systems (MHS) management : Fault management functions	X.465	11588-6
Message Handling Systems (MHS) management: Performance management functions	X.466	11588-7
Managed entities		
Message Handling Systems (MHS) management: Message transfer agent entity	X.467	11588-8
Message Handling Systems (MHS) management: User agent entity	X.468	11588-9
Message Handling Systems (MHS) management: Message store entity	X.469	11588-10
Message Handling Systems (MHS) management: Access unit entity	X.470	11588-11

SECTION 3 – MHS MANAGEMENT MODEL

7 MHS Management model

This section describes the techniques used for modelling MHS Management, then shows the various entities involved in MHS Management split across the layers of the model.

7.1 Use of Telecommunications Management Network

The MHS Management model is based on the management layers defined in Appendix II/CCITT Rec. M.3010. The hierarchical approach taken in this model provides an understanding of the relationship between different management functions of MHS and the underlying network services by splitting the various functions over the layers of the model.

7.1.1 Why TMN is used

When managing an MD many different management aspects are encountered. Some of these aspects are:

- the need for integrated management of a whole MD instead of managing several separated network elements;
- multi-vendor policies, which cause network elements from different vendors with different management functionalities to reside within one MD;
- the need to allow easy extension of management functionality (implementation of every function in a given TMN-layer is not necessary, but this can be done when the need arises).

Using the TMN model, it is possible to develop a modular model for integrated management of an MD that can cope with the problems mentioned above.

TMN is a framework for total management of networks, systems and services in a telecommunications environment. This framework can be used as a guide to model the management of an MD as an integrated whole.

Vendors can build systems (as in the TMN physical model) that provide the standardised functionality of one or more management functions. When the different systems in a management system conform to the standards, it is possible to construct a management system from systems supplied by different vendors.

Conformance of the different systems to standards still allows future extensions of the management system as the management needs change. It is possible to remove one system and replace it with a new system (possibly from a different vendor) that has more capabilities, better performance, etc.

7.1.2 How TMN is used

The basic idea is to identify the different MHS Management functions and map them onto the layers of the TMN functional model.

The identification of MHS Management functions can be done in two ways, namely top-down and bottom-up. In the top-down approach an inventory of management needs is made. These needs are then translated into different management functions at different hierarchical levels. On the other hand there is the bottom-up approach. The management information of each network element can be extracted and the management actions that can be performed are identified. Using this information, management functions for the network elements can be defined. A combination of both approaches is used in MHS Management.

After the management functions and their place in the TMN functional model are identified, the information flow between the different functions must be specified. For each pair of functions exchanging information, a Management Information Model (MIM) must be defined.

7.2 Layers of the MHS Management model

The TMN functional model is a reference model that can be used to define the exchange of information between management functions. The different functions can be placed in five hierarchical layers, known in this Recommendation | International Standard as TMN-layers. These TMN-layers are:

- Business Management Layer;
- Service Management Layer;
- Network Management Layer;
- Network Element Management Layer;
- Network Element Layer.

The allocation of entities to different TMN-layers does not imply that there is an actual service boundary between entities, or that there has to be a defined protocol for the transfer of information between the entities. The TMN-layers are used in this Recommendation | International Standard as a modelling tool that helps human understanding of the complexities of MHS Management.

7.2.1 Network Element Layer

A network to be managed consists of many physical components such as Message Transfer Agents, communications interfaces and transmission systems; each item of equipment is referred to as a Network Element. The Network Element Layer of the model represents data of network elements and the operations that can be performed on those elements.

7.2.2 Network Element Management Layer

The Network Element Management Layer consists of functions for management of a collection of network elements. This can, for example, be a group of network elements from the same manufacturer, or a group of network elements located in the same region.

7.2.3 Network Management Layer

The Network Management Layer offers functions for management of a network as a whole. In this TMN-layer the separate network elements and also the relationships between the different network elements are visible. This TMN-layer offers a network-view to the network manager.

7.2.4 Service Management Layer

The Service Management Layer (SM-layer) offers functions for management of services offered by a network. Physical details of the underlying network are not visible to the service managers. The functions in the SM-layer can be divided into two categories:

- management functions for support of operational processes (e.g. service order);
- management functions for support of service managers (e.g. generating statistic information on service use).

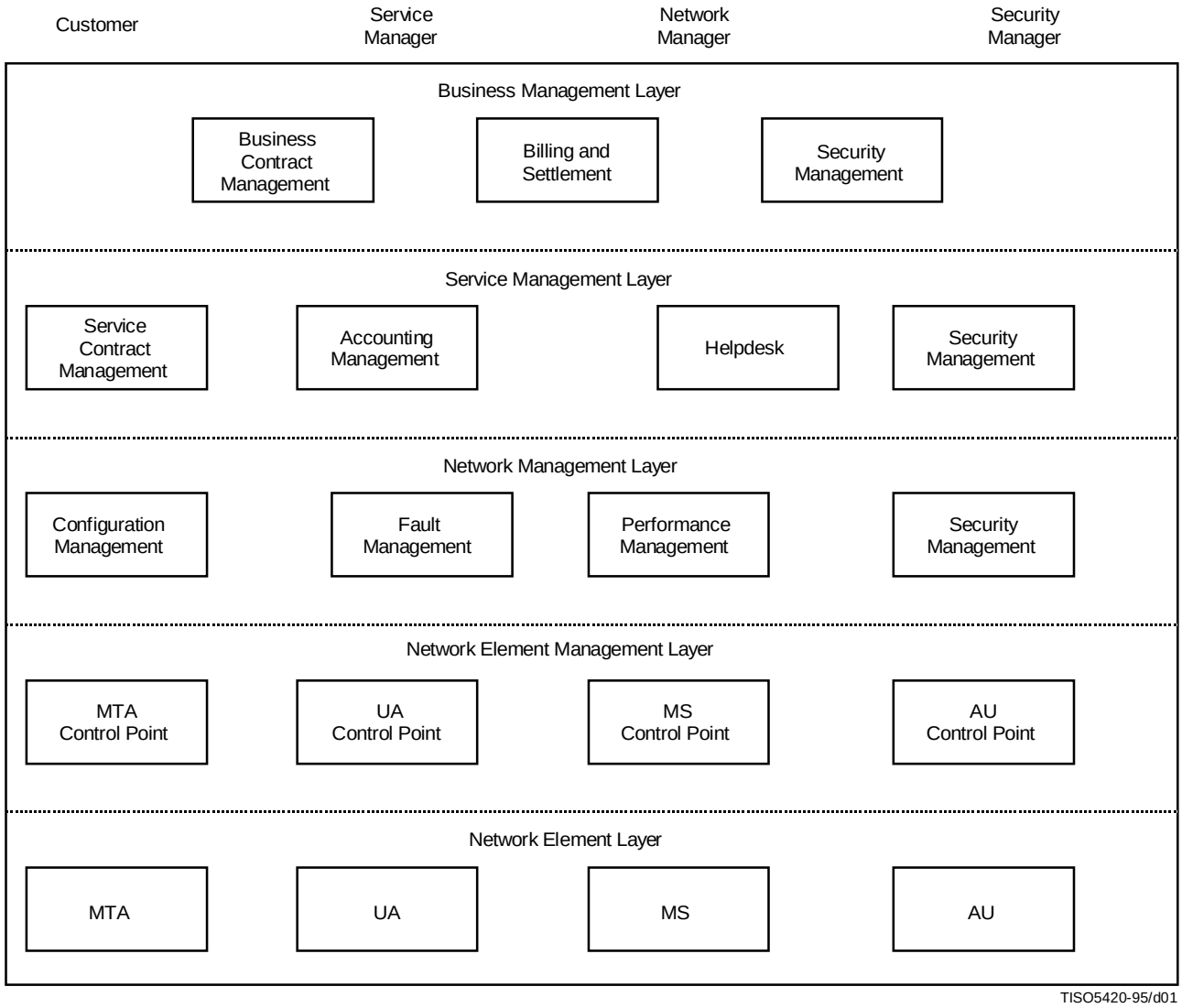
7.2.5 Business Management Layer

Interactions between the functions of service management and service Customers occur in the business management layer.

7.3 Entities of the MHS Management model

Conceptual entities are positioned on each TMN-layer of the MHS. These entities are used in the function descriptions to show the various information flows necessary to carry out system management. This subclause describes the entities used for MHS Management.

Figure 1 shows in outline how each of these entities fit within the layers of the TMN model.



NOTE – There is no significance to the vertical alignment of boxes within the TMN layers.

Figure 1 – Telecommunications Management Network layer model for MHS

7.3.1 Network Element Layer

Physical entities within the network are shown on the Network Element Layer. For MHS, the physical entities are:

MTA: This entity represents the MIB of the network element MTA and the management operations that can be performed on those elements.

UA: This entity represents the MIB of the network element UA and the management operations that can be performed on those elements.

AU: This entity represents the MIB of the network element AU and the management operations that can be performed on those elements.

MS: This entity represents the MIB of the network element MS and the management operations that can be performed on those elements.

7.3.2 Network Element Management Layer

Information relating to a resource is accessed through a resource manager which for the purposes of MHS Management is called a network element control point. For MHS, these are:

MTA control point: This entity manages MTAs according to a standardised (i.e. non-vendor-specific) view.

UA control point: This element manages UAs according to a standardised (i.e. non-vendor-specific) view.

MS control point: This element manages MSs according to a standardised (i.e. non-vendor-specific) view.

AU control point: This element manages AUs according to a standardised (i.e. non-vendor-specific) view.

7.3.3 Network Management Layer

Configuration management, Fault management and Performance management are functional areas that exist primarily within the Network Management Layer. Security management exists at every TMN-layer within the TMN model.

7.3.4 Service Management Layer

The Accounting Management functional area exists primarily within the Service Management Layer. Additional entities in the Service Management Layer are Helpdesk, and service contract management.

Helpdesk: The human point of contact for assistance with using the service including the reporting of faults.

Service Contract Management: This element is the interface to the Customer. It handles the order and send the right information to the other elements (e.g. if the Customer has not got a network service subscription, for example for an X.25 connection, the external order entry is invoked to get a network service subscription).

7.3.5 Business Management Layer

The MHS entities defined for management of the business relationship between MHS and Customers are:

Business Contract Management: Responsible for the maintenance of information relating to the business relationship between MHS entities.

Billing and Settlement: This element turns accounting information into financial statements regarding bills and settlement details.

The entities within the business management layer are not subject to standardisation although the information flows between service and business management are.

7.3.6 Additional entities

Additional entities required to group the functions of MHS Management are:

Customer: A user who wishes to use the facilities provided by the MHS service. Some aspects of information interchange between the user and the MHS service fall outside the scope of the currently defined protocol.

Network Manager: A user who is responsible for the day to day operations and management control of a portion of the MHS.

Service Manager: A user who is responsible for the management policy to be applied within a portion of the MHS.

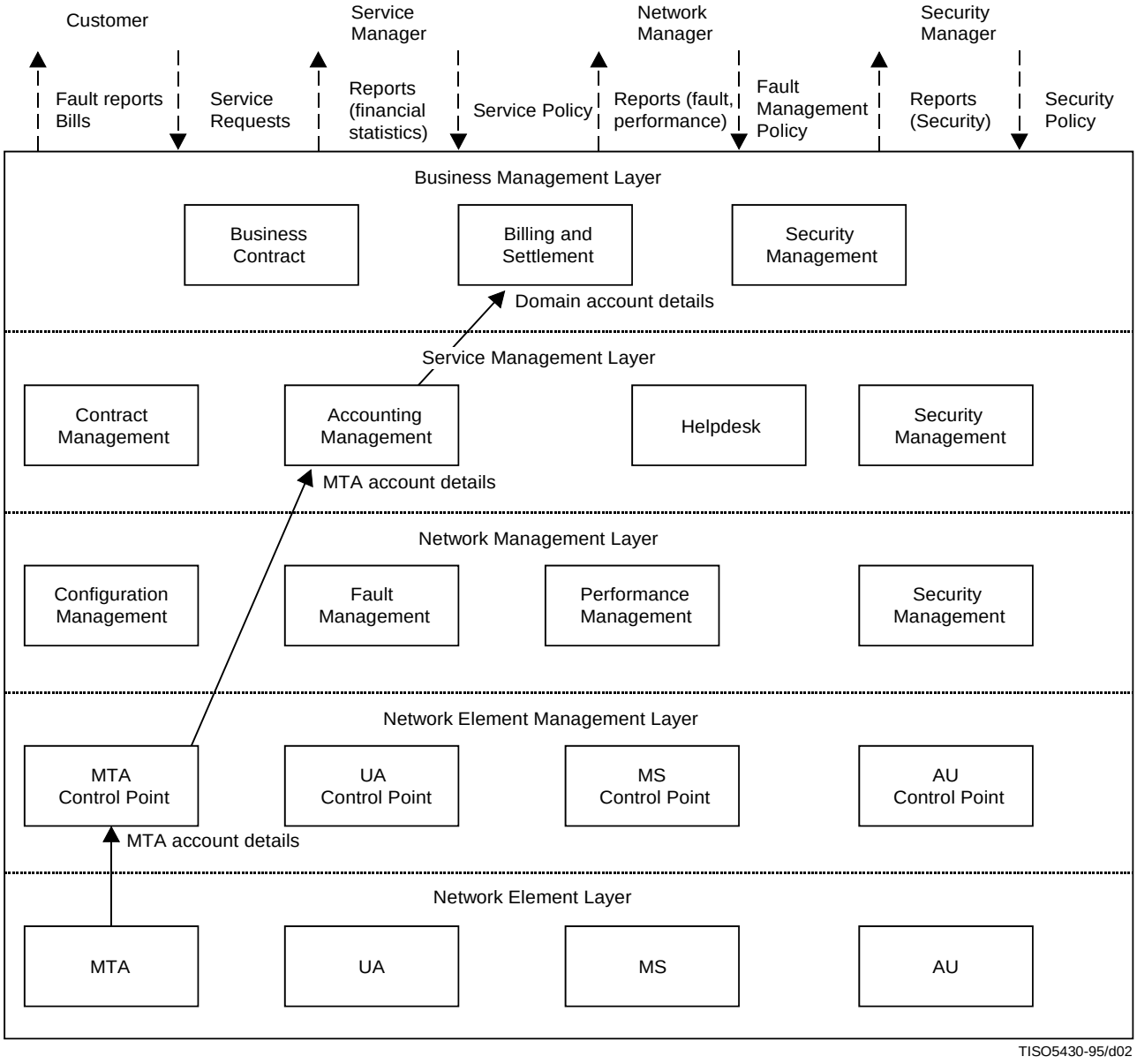
Security Manager: A user who is responsible for the security policy to be applied within a portion of the MHS.

7.4 Function modelling using TMN

Modelling the management of MHS according to TMN means that the different functions of the service offered by the MHS are identified and placed in the different management layers of the TMN model. This allows a clear distinction to be made between apparently similar functions which are performed for different purposes, for example, messages are logged for a variety of purposes; accounting may require some aspects of the logging behaviour, while performance may require others.

As a consequence of the above, each function in each TMN-layer will have its own representation of a manageable part of the MHS in its own level of abstraction. For example, in the Network Element Layer a Managed Object MTA can exist with a very detailed view of the MTA while in the Network Element Management Layer another Managed Object exists with a less detailed view of the MTA.

Figure 2 shows some sample information flows between some of the MHS entities.



NOTE – The arrows illustrate an example of data flow through the TMN layers. There may be many other data flows.

Figure 2 – MHS Management Entities and selected functions

8 Functions

This clause defines some functions required to manage MHS Systems. It does not provide a complete list of the functions; the list of functions in each functional area is contained in the appropriate functional area standard.

It is essential that the overhead of management not overwhelm the actual messaging traffic on a network. The percentage of management information comparative to other network traffic should be considered when designing the management services.

8.1 Accounting Management

Accounting Management is the collection and analysis of information relating to the use made of system resources when acting upon messages, probes and reports. This type of information, possibly logged by multiple MDs, can be used for financial purposes to produce information for billing, settlement of balance of accounts, cost allocation, or account audits. The accounting information can also be used for security and statistical purposes.

Collection of the raw data for accounting is captured within the network elements, and logged by the network element control point. The accounting management functions themselves such as cost allocation and presenting statistics on service use are contained within the service management layer. Functions relating to the exchange of accounting information with Customers, such as the generation of bills, are within the business management layer.

8.2 Configuration Management

Configuration Management is the collection and exchange of information with regards to the network elements of the MHS, and the relationships between the network elements.

It takes place both prior to the establishment of a connection between MHS Systems, as well as at certain intervals after the installation of that connection, in order to deal with updates.

The amount of data that needs to be exchanged between the two entities can be quite limited for a simple interconnection. However, a more extensive exchange of information can improve the quality of service that is provided; for example MHS systems could provide: information about possible destinations that can be reached; about the possibility of setting up back-up connections in case of emergencies; as well as the information describing the physical connection to be established.

Changes to MHS configuration arise either as a result of Customer requests, or as a result of fault and performance management functions.

The contract management elements within the business and service management layers is where human service order entry requests are validated according to management policy; validated requests are translated into configuration changes by the configuration management functions within the service and network management layers. The configuration management functions control the updates necessary to the managed objects within the network element management layer which in turn controls the changes to the managed objects in the network elements themselves.

Abnormal situations can be detected by either fault or performance management functions. Corrective action which is initiated in response to out of line situations could include requests for configuration changes.

8.3 Performance Management

Performance Management is the collection and analysis of data regarding how the MHS element are performing compared with targets that have been set.

Information to be used for performance management is generated at the network element layer, consolidated at the network element control points, then passed to the performance management function in the network management layer. The services provided by the performance management function include the comparison of the actual performance achieved against targets set by the human management. Any out of line situation detected could for instance result in a request for Configuration Management service.

8.4 Fault Management

Fault Management is the collection and analysis of data regarding out of line situations within the MHS, and the correction of these out of line situations.

MHS is one component of an open systems environment and MHS fault management is solely concerned with the management of the MHS component. The relationship between an MHS component and the open system in which it resides is a local matter, however for correct operation of the global MHS, some general principles should be observed.

- Reporting of faults detected by other services within the application service element including ACSE, ROSE and RTSE are not covered by MHS fault management.
- Reporting of faults of the open system itself such as hardware, software or environment malfunctions are also not covered by MHS fault management.
- Repairing network faults between MHS network elements is not an MHS Management responsibility.
- Avoiding the effects of a network failure within the MHS is an MHS Management responsibility, so MHS fault management must be made aware of faults that affect the ability of the MHS to deliver the expected service.
- Any configuration changes necessary to temporarily avoid the effects of a network failure should be clearly identified as temporary in nature.

Fault Management information will normally be created at the network element and/or network element management layers and collected in the fault management function of the network management layer. Interaction with the Customer is possible either when the Customer submits a problem report to the helpdesk, or when a notification of a problem is sent to a Customer. The Network and Service Managers are responsible for determining the automatic actions to be taken by Fault Management to correct out of line situations.

8.5 Security Management

There are two security aspects of MHS Management, the management of security features of MHS and the security of the MHS Management information.

The Management of security features of MHS are required to provide a secure Message Handling service. It provides the means of changing and controlling the security mechanisms employed within a secure MHS, such as: encryption key, encryption parameters, hashing algorithms, etc.

Security of the MHS Management information is required to protect the MHS Management information itself. Where appropriate, this protection may be provided by the communications protocol used to distribute the MHS security management information, in other cases protection has to be built into the MHS Management information itself.

Each MD is responsible for its own security policy, which shall include the determination of control and access to MHS security management information. Access control is applicable both within the local MD, and between MDs.

SECTION 4 – MHS MANAGEMENT ARCHITECTURE

9 MHS Management

9.1 Introduction

This clause identifies the architectural concepts of systems management that are relevant to the management of MHS.

9.2 Where MHS Management fits within an open system

MHS Management is based on OSI Systems management as defined in the OSI Systems management overview (see CCITT Rec. X.701 | ISO/IEC 10040). MHS System network elements are one set of resources in an open system that can be managed; OSI Systems management also applies to other applications in the open system, and to the OSI lower layers required for communication with other open systems.

In order to describe MHS Management, a model of the MHS System is used which is shown in isolation from the other resources in the open system to be managed. Real systems may implement MHS Management in isolation, or may use OSI Systems management techniques such as specialisation, inheritance, and allomorphism to implement an integrated set of Systems management functions. Regardless of which way a real system is implemented, the mechanisms established by OSI Systems management ensure that the managed objects defined for MHS Management exhibit consistent behaviour from an external viewpoint.

9.3 Use of OSI Systems management in MHS

In some cases, an MHS managed object only exists in order to manage an aspect of MHS application behaviour; an example of this would be the message conversion facilities provided by an MTA. In other cases, the real world object modelled by the MHS managed object is known by other applications in the open system; an example of this would be the definition in the local MTA of a neighbouring MTA.

Where a real object is modelled within a number of applications in the open system, each managed object definition will contain a set of attributes, operations, notifications and behaviour. Implementations may hold each managed object instance separately, or may combine the managed objects in order to reduce the storage of duplicate attributes defined in a number of the managed object definitions.

As an example of the relationship, configuration management requirements for the definition of a neighbour MTA may require:

- an MHS managed object containing details required within the MTA such as MTA name and password;
- an RTSE managed object containing details required within RTSE such as PSAP;
- OSI layer managed objects containing details required to initiate and manage communications with the neighbour.

If the neighbour is only available at restricted times of the day, this information may be required at the MTA level since it impacts routing strategies. The information may also be required at the RTSE level to control when associations are requested, and in other OSI applications which communicate with the neighbour.

The following subclauses describe the various aspects of the MHS Management architecture. This follows closely the descriptions contained in OSI Systems management overview (see CCITT Rec. X.701 | ISO/IEC 10040).

9.3.1 Information aspects

The specification which defined each object class also defined its position within the registration, naming, and inheritance hierarchy. ITU-T Manual X.461 | ISO/IEC TR 11588-2 illustrates entire naming hierarchy for reference purposes.

9.3.2 Functional aspects

The five primary functional areas of MHS management are described in clause 8. Each individual system management function may satisfy one or more requirements in one or more functional areas. A system management function's services may be grouped into one or more functional units which can be negotiated between MIS-users. Each Functional Unit is defined in one of the five Standards on MHS Management functional areas; it may be imported into others of the Standards as required.

9.3.3 OSI Communication aspects

MHS management does not mandate use of a particular underlying communication service. Each management operation or notification defined for a particular function in the five Standards on MHS Management functional areas are mapped onto the pass-through service defined in OSI System management: Object Management Function (see CCITT Rec X.730 | ISO/IEC 10164-1).

9.3.4 Organisational aspects

MHS splits the global messaging service up into a major functional grouping which in this Standard is referred to as an MHS Management Domain (MD). The MD may be a purely organisational partitioning, or it may reflect the partitioning of the OSI management environment such that within the MD there is a consistent set of management policies.

MIS Management Domains, when used for systems management purposes, may be a subset of the managed objects contained within an MD, or may consist of the set of managed objects contained within several MDs.

NOTE – There is a terminology clash between MHS and Systems Management in the use of the term Management Domain. Systems Management defines this as a set of managed objects to which a common systems management policy applies. In the MHS definition, a Management Domain is a set of MHS systems that is managed by a single organisation. The terms MHS Management Domain (MD) and MIS Management Domain are used in the series of MHS Management Standards where a distinction needs to be made.

Annex A

Example scenarios and management functions

(This annex does not form an integral part of this Recommendation | International Standard)

A.1 Management scenarios

This annex gives some examples of the information flows between various function blocks that are positioned on different management layers according to the TMN model. The following sample functions will be mentioned in the scenarios:

Service Management:

- service order management function;
- external order management;
- contract management function.

Network Management:

- standardised MTA management;
- standardised UA management;
- routing management.

Network Element Management:

- Vendor specific MTA management.
- Vendor specific UA management.

A.2 Service management scenarios

One of the Service management needs is to be able to add and to cancel subscriptions to the MHS service. These two activities are described in the following scenarios.

New service subscription

When a new subscriber must be added to the MHS the necessary information (as specified in the corresponding MIM) is passed to the service order management function. This can be a computer program operated by someone at an MHS sales point. When all subscriber information is entered the following events will occur:

Optional subscription to the network service:

In order to receive messages from the MHS there must be a connection between the UA and the MTA or the UA and the MS. These connections are established using a network service; the X.25 network service is used in the following example. If the subscriber already has a network subscription this step is not made.

Invocation of the standardised MTA management function:

The necessary subscriber information (including X.25 information) is passed to this function as parameter of the invocation. Using the subscriber information and MHS configuration/performance/etc. information this function selects the MTA to which the subscriber will be added.

Standardised MTA management function:

a) orders the network element management function responsible for the management of the selected MTA to install the new subscriber on that MTA;

b) informs the routing management function of the addition of a new subscriber to the selected MTA (necessary if routing is done using the full O/R address);

c) passes necessary information of the selected MTA to the standardised UA management function.

Invocation of the standardised UA management function:

The necessary subscriber information is passed to this function as parameter of the invocation. This information and the information of the selected MTA (which will be received from the standardised MTA management function) is used to:

a) order the network element management function responsible for the management of the UA of the subscriber to install the new UA;

b) inform the contract management function of the details of the new service order.

Cancel service subscription

When a subscriber wants to cancel the subscription to the MHS service, the service order management function will:

Optionally cancel the subscription to the network service:

- If the subscriber only used this service in combination with the MHS service, this contract can be deleted.

Invocation of the standardised MTA management function:

The necessary subscriber information (O/R address is probably sufficient) is passed to this function. Then the standardised MTA management function determines on which MTA the subscriber was installed.

Orders the network element management function responsible for the management of that MTA to remove the subscriber from that MTA.

Informs the routing management function of the removal of the subscriber from the MTA (necessary if routing is done using the full O/R address).

Invocation of the standardised UA management function:

The necessary subscriber information is passed to this function as parameter of the invocation. If the UA contains information (such as MTA addresses) that must be deleted when the service contract has ended, then the network element management function responsible for the management of the UA of the subscriber is ordered to remove the specified data. Finally the UA is removed from the management scope of the standardised UA management function.

Inform the contract management function of the deletion of the service order.

A.3 Network Management scenarios

One of the Network Management needs is to be able to add and delete MTAs within the managed MHS Management Domain. The addition and the removal of an MTA is described in the next two scenarios.

Add an MTA

When a new MTA is added to the existing network of MTAs, the network manager passes the necessary information about the MTA to the standardised MTA management function. If all information is entered, the following events will occur:

Invocation of the vendor specific MTA management function:

The necessary information is passed to the function responsible for management of that specific MTA type. Using this information the function installs and initialises the new MTA.

Invocation of the routing management function:

The routing management function determines the new routing tables for the MTAs within the MHS Management Domain. When this is done, routing management function orders the different vendor specific MTA management functions to update the routing tables of the MTAs managed by that function.

Remove an MTA

When a new MTA is removed from the existing network of MTAs the network manager passes the necessary information about the MTA to the standardised MTA management function. If all information is entered, the following events will occur:

Invocation of the vendor specific MTA management function:

The necessary information is passed to the function responsible for management of that specific MTA type. Using this information the function removes the indicated MTA.

Invocation of the routing management function:

The routing management function determines the new routing tables for the MTAs within the MHS Management Domain. When this is done, the routing management function orders the different vendor specific MTA management functions to update the routing tables of the MTAs managed by that function.