ETSI
ETSI
ETSI TECHNICAL REPORT

ETR 048

September 1992

Source: ETSI TC-NA

Reference: DTR NA43306

ICS: 33.080

Key words: TMN, management, network, service

Network Aspects (NA);
Telecommunications Management Network (TMN)
Management services prose descriptions

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

New presentation - see History box

Contents

Blank page

Foreword

ETSI Technical Reports (ETRs) are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim-European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

This ETR has been produced by the Network Aspects Technical Committee of the European Telecommunications Standards Institute (ETSI), as a result of studies into Telecommunications Management Network (TMN), management services issues. This ETR provides a list and short prose descriptions of management services that can be supported by TMN, in order to assist in detailed specification work.

Only part of the management services has been completed so far, the remaining parts are for further study.

The descriptions for this document have mainly been collected from ETR 047 [1] which contains detailed definitions of these management services.

Blank page

1   Scope

This ETR provides a list and short prose descriptions of the Telecommunications Management Network (TMN) management services which have been adopted by ETSI Sub-Technical Committee (STC) NA4.

These descriptions are intended to assist the development of detailed specification work in the TMN field.

2   References

The following references are used within this document:

[1]   ETR 047: "Network Aspects (NA); Telecommunication Management Network (TMN) Management services".

[2]   CCITT Recommendation E.142: "Time-to-answer by operators".

[3]   CCITT Recommendation Q.500: "Digital local, combines, transit and international exchnges".

[4]   CCITT Recommendation Q.511: "Exchange interfaces towards other exchanges".

[5]   CCITT Recommendation Q.512: "Exchange interfaces for subscriber access".

[6]   CCITT Recommendation Q.513: "Exchange interfaces for operations, administration and maintenance".

[7]   CCITT Recommendation Q.521: "Exchange functions".

[8]   CCITT Recommendation Q.542: "Digital exchange design objectives - Operations and maintenance".

[9]   CCITT Recommendation Q.791 (1988): "Specifications of Signalling System No. 7 - Monitoring and measurements for Signalling System No. 7 networks".

3   Abbreviations

The following abbreviations are used within this document:

ATM   Asynchronous Transfer Mode

CCF   Connection (Call) Control Function

CS1   Capacity Set 1

HMI   Human-Machine Interface

IN   Intelligent Network

ME   Management Entity

NE   Network Element

OMC   Operation and Maintenance Centre

OS   Operation System

OSF   Operation System Functions

POTS   Plain Old Telephone Service

PDH	Plesiochronous Digital Hierarchy
PSDN	Packet Switched Data Network
RLU	Reloadable Unit
RPU	Replaceable Unit
SCF	Service Control Function
SDF	Specialised Database Function
SIB	Service Independent building Block
SDH	Synchronous Digital Hierarchy
STP	Signalling Transfer Point
TMN	Telecommunications Management Network

4 TMN management services

4.1 Customer administration

Customer administration is a management activity that the network operator performs in order to exchange with customers all the customer related management data and functions required to offer a telecom service, and to exchange with the network all the customer related management data and functions necessary for the network to produce that telecom service.

In a wide sense this could include interactions for the purpose of service provision management, configuration administration, fault administration, charging (including detailed billing) administration, complaints administration, quality of service administration, traffic measurement administration etc. Here, however, only customer administration, in the more traditional sense of service provision, service configuration and complaints management, has been included.

4.2 Routing and digit analysis administration

The purpose of routing management information in an exchange is to allow either a traffic or a routing manager to change the static routing information dynamically. For traffic management purposes the requirements as specified in CCITT Recommendation E.142 [2] should be met.

In specifying the management object classes for routing, certain requirements must be met:

1) it must be possible to verify routing information in an exchange, with a minimal distortion in the normal operation of an exchange;

2) it must be possible to switch between routing tables according to a predefined timing schedule, e.g. by introducing scheduling for routing tables;

3) define functionality in such a way that routing tables may be changed easily;

4) avoid redundant information by making use of objects which exist during run time;

5) it must be possible to expand the model with future requirements, therefore the specification of object classes for routing purposes must be expandable.

4.3 Traffic measurement and analysis administration

For further study.

4.4 Tariff and charging administration

The tariff and charging administration covers the part of the management activities related to the tariffs in the Network Elements (NEs) and to the charging data of service usage. The activities may include creation, interrogation, modification and deletion of data and the management of the data collecting process. The activities include all types of methods used to verify that the charging data is correct.

The TMN may enhance this management service by providing faster, more extensive and more reliable data collecting possibilities from NE and data administration possibility remotely through Operation System (OS) to NE.

4.5 Management of the security of the TMN

For further study.

4.6 Traffic management

This TMN management service is concerned with the management of traffic associated with circuit switched networks such as the PSTN, ISDN and transmission networks, e.g. the Synchronous Digital Hierarchy (SDH).

The object of traffic management is to enable as many calls as possible to be successfully completed. This objective is met by maximising the use of all available equipment and facilities in any situation. It is also seen as the function of supervising the performance of a network, and to be able, when necessary, to take the action to control the flow of traffic, to optimise the maximum utilisation of the network capacity.

As a first attempt and to ensure an ease of specification this service will "initially" concern itself with the Network Element (NE) , digital exchange.

The TMN will collect traffic information from the NE and send commands to that NE to modify its operation or to re-configure the network. The NE may send traffic management information periodically, or upon threshold triggering. The TMN may alter the thresholds at which the NE sends the traffic data and/or the periodic time reports. The data sent from the NE may be processed within the TMN, via mediation processes or OSs.

In order for the NE, digital exchange, to accomplish the above, it will need to perform the following:

- collect traffic management information by the use of an internal measurement sub-system;

- process traffic management information; this will be done by processing the information from the measurement sub-system and converting it to a recognised set of traffic management indicators;

- transfer the recognised set of traffic management indicators over the Q3 interface to the OS;

- receive control information from the OS, via the Q3 interface, and execute the appropriate controls to impact the traffic flow.

The OS should be able to collect all the TM indicators to obtain an overall view of the status of the network.

During the description and specification of traffic management it is usual to take into account aspects of common channel signalling system management and traffic measurement. TMN at present consists of many TMN management services, two of which are the previously mentioned services. During the specification of this management service an attempt has been made to separate aspects of Common Channel Signalling System (CCSS) management and traffic measurement from traffic management. This attempt has been made so as to make the task of specifying management services easier. However if, during further passes of the TMN methodology, it becomes clear that these management services cannot be separated, then attempts will be made in future drafts to include them.

4.7 Management of customer access

Management of customer access belongs or relates to that part of the local network that extends from the network terminating equipment up to, and including, the exchange termination. This must take into account any equipment associated with the customer access including multiplex equipment, network terminating units, etc. regardless of whether they are narrowband, broadband, analogue or digital.

The term management also describes configuration, failure monitoring and fault analysis, security and network performance of any part, or piece, of equipment associated with the access. It should also take into account separate requirements resulting from circuit switched, or packet switched, environments.

Because of its complexity, customer access can no longer be regarded as consisting of just copper wires and network terminating equipment. It may however now consist of copper wires, or optical fibre, along with complex electronic equipment whose functions may need to be updated, or changed, by the network provider, therefore the access needs management control facilities so that these functions may be operated upon.

4.8 Management of transport network, circuits between exchanges and associated equipment

Management of the transport network covers all those functions necessary to bring into service, and to keep in service trails, including monitoring the performance of the trail. The trail is characterised by the responsibility, in a server layer, of the integrity of transfer of characteristic information from one or more client network layers between server layer access points. It is formed by combining a near-end trail termination function.

A trail termination has the responsibility to generate characteristic information of a network layer and to ensure its integrity. For example:

- in Synchronous Digital Hierarchy (SDH) a trail could be defined as a lower-order path, higher-order path. Connection functions could be done by a digital multiplex or a digital cross-connect;

- in Plesiochronous Digital Hierarchy (PDH) a trail could be defined as a path. Connection functions could be done by multiplex or line system;

- in Asynchronous Transfer Mode (ATM) a trail could be defined as a virtual channel or virtual path. Connection functions could be done by switching.

All these concepts are described in CCITT draft Recommendation G.tna "Generic functional architecture of transport networks".

Management of circuits between exchanges and associated equipment covers all those functions necessary to bring into service, and keep in service, analogue or digital circuits between exchanges. This may also include recorded information services and other circuit related equipments such as echo cancellors.

Circuits are defined as physical links such as junctions, private wires, data and digital circuits. These analogue and digital circuits originate and terminate at their respective switching points and may be a mixture of circuits originating as analogue and terminating as digital.

An analogue circuit is defined as a circuit between two analogue telephone exchanges and which is provided with analogue transmission throughout. The circuit is terminated by its two circuit access points.

A digital circuit is defined as a circuit between two digital exchanges, and is provided with digital transmission throughout. Access to the circuit in the circuit access point can only be obtained via the digital switches.

A mixed analogue/digital circuit is defined as a circuit between two analogue or digital exchanges and provided with a mixed analogue/digital transmission system. A mixed analogue/digital circuit is a circuit which includes one or more analogue/digital converters.

Management of transmission paths covers all those functions necessary to bring into service and to keep in service transmission paths, including monitoring the performance of the paths. A transmission path is defined as the whole means of transmitting and receiving a transmission signal of specified rate between two distribution frames (or equivalent) at which terminal equipment or switches will be connected. Terminal equipments are those at which signals at the specified bit rate originate or terminate and may include multiplexing or de-multiplexing. The transmission path may contain one or more transmission sections. It also includes all equipment associated with the paths e.g. regenerators, line terminations and cross-connects.

4.9 Switching management

4.9.1 Introduction

The Network Element (NE) exchange includes functions as specified in CCITT Recommendation Q.500 [3]. One function is switching. This text describes the management needed for switching. Management of other functions included in the NE exchange will be described in separate texts.

This text is based on CCITT Recommendation Q.500 [3], which concerns 64 kbit/s. However, the same general principles will be used for higher level switches. The NE exchange may consist of one or more Management Entities (MEs). The MEs can be placed at different locations. One ME provides a Q3 interface, which is common for all MEs in one exchange. The NE is built up of hardware and software. The hardware is divided into a number of Replaceable Units (RPUs) and the software into a number of Reloadable Units (RLUs), see figure 1.

4.9.2 Definition

The management service "switching management" covers the functions for switching included in the NE exchange. The design objectives and interfaces for exchanges are specified in CCITT Recommendation Q.500 [3]. CCITT Recommendation Q.500 [3] will be used as a base for the work with management services which concern exchanges.

4.9.3 Scope of switching management

The scope of the management service "Switching management" is to provide management functions needed to meet the requirements on service quality states in CCITT Recommendation Q.500 [3].

The NE exchange may consist of one or more MEs. Every ME will be provided with functions for management. However, the reports from the NE to OS via the Q3 interface will only include identification of faulty RPUs or RLUs, independent of where the concerned RPUs and RLUs are placed in the NE. The geographic address for the ME is stored in the OS. The number of MEs in the NE depends on the system design and the population distribution in the area.

The management service will include functions for:

- performance management;

- fault (maintenance) management;
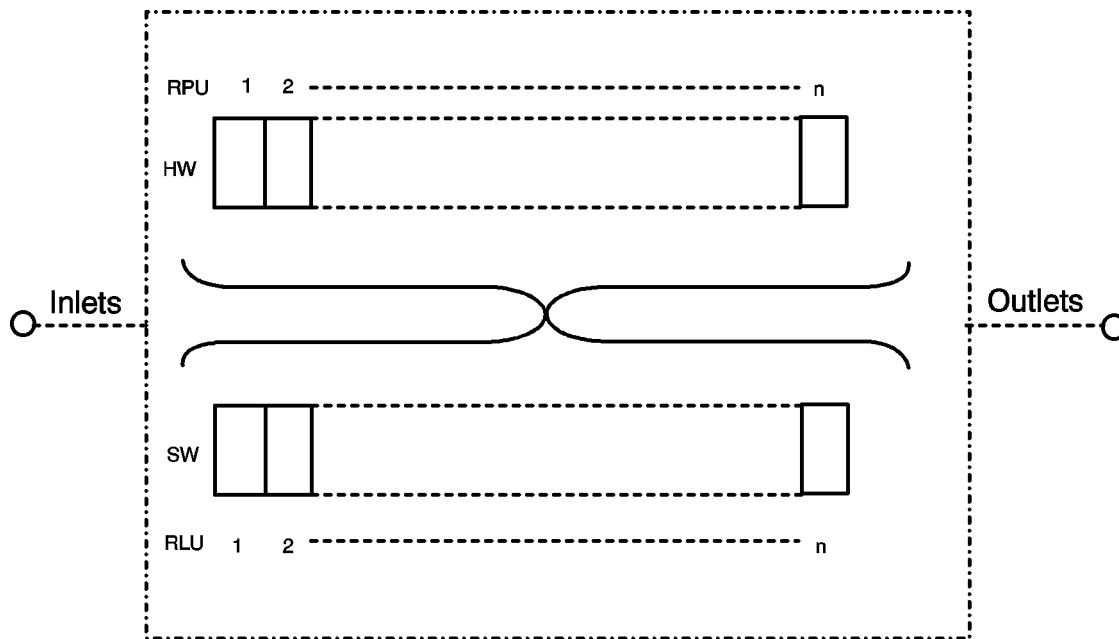
- configuration management.

Figure 1: Switch

The management functions in the NE include supervision which works continuously and generates an alarm if a fault occurs which leads to degradation of the performance. The performance provided by the NE depends on the switching functions, the transmission quality through the switch and the availability. The following reports concerning objects will be sent from the NE to OS:

a) degeneration of the performance. These reports will be based on attributes for abstract objects, in this case related to inlets and outlets in the switching network;

b) faulty objects; objects can be NE, ME, RPU or RLU;

When the reports concern RPUs or RLUs, the identification code will be included for the RPUs or RLUs which have been identified as faulty by the functions in NE. The identification code will consist of two parts:

- standard;
- system unique;

Test of the objects shall be possible from OS.

4.9.4 CCITT Recommendations

The NEs which will be connected to OS via Q3 are specified in CCITT Recommendations. CCITT Recommendations Q.511 [4], Q.512 [5], Q.513 [6], Q.521 [7] and Q.542 [8] will be used as a base for the work with modelling of the management service "Switching management".

4.10 Management of equipment in customer premises

For further study.

4.11 System installation administration

For further study.

4.12 Support element management

For further study.

4.13 QOS and network performance administration

For further study.

4.14 Management of the customer controlled service

For further study.

4.15 Common channel signalling system management

This TMN management service covers all those aspects concerned with the management of Common Channel Signalling Systems (CCSSs). In describing the process of managing a CCSS, it is necessary to take into account events and information outside of the sphere of this management service. An example of this may be the failure of a transmission system over which the signalling traffic is carried. This information will need to be taken into account to ensure efficient utilisation of the network.

To this end, it will be necessary to have a network wide view of the availability of the signalling network and the signalling traffic loading. In some network situations only information relating to a particular node, and the nodes connected to it, are known. Problems beyond this node, such as congestion, may add complications if the node is used as a Signalling Transfer Point (STP). Therefore the network wide view should contain the following relevant information:

- configuration of the network;

- the availability, or non-availability, of each signalling link set and its capacity;

- the current loading of each link set;

- indication of the initiation of internal flow control procedures.

This network "picture" will enable the right decisions to be made at the right time. The information gathered will be in the form of statistical measurements. These measurements will be gathered from within and from outside of the signalling network concerned.

The type of measurements needed have been taken from the existing CCITT Recommendation Q.791 [9]. Where appropriate additional information has been added.

CCSS management will also take into account planning and should make use of computer based tools. These tools could contain information such as:

- a map of the network containing all signalling and STP's signalling routes and their capacities;

- detection of signalling link sets requiring additional capacity;

- interconnection with transmission planning information to ensure the required diversity of transmission paths, etc.

The management system should provide links with the Human-Machine Interface (HMI). This would give the ability to manipulate signalling resources. Some of the types of information that could be accessed/altered could be as follows:

- control signalling link states;

- introduce new routes;

- reporting of fault conditions;

- collection of statistics;

- change routes.

4.16 Management of the Intelligent Networks (INs)

4.16.1 Introduction

The Intelligent Network (IN) functional model shows the association and interaction of several functional entities which, when considering the physical realisation, may reside in entirely separate NEs. The separation of these functional entities into NEs can be as a result of equipment from different manufacturers, or become of geographic separation.

The management arrangements required for an effective operation of such a network, which itself will normally be intimately meshed with other telecommunications networks (POTS, PSDN, leased lines etc.) will probably rely on the functional layer model of TMN Operation System Functions (OSFs). This is because the IN cannot be treated as a simple collection of "objects" but as a selection of some objects from classes of objects supporting other networks. The layering of OSFs will allow localised grouping of "objects" to administer certain of their attributes for management in common (i.e. failure detection in service switching function and telephone exchanges), whilst management of other attributes (i.e. data/configuration changes in Service Control Function (SCF), Specialised Database Function (SDF) and Connection (Call) Control Function (CCF) can be delegated to be managed in another grouping.

4.16.2 Extent of management from TMN on IN

Below are lists of services, service features, Service Independent building Blocks (SIBs) and functional blocks which need management. These lists are only a part of an initial standardisation phase worked on by ETSI Sub-technical Committee NA6 as Capacity Set 1 (CS1) and will need expansion as IN standardisation progresses.

4.16.2.1 Services

Freephone
Virtual Private Networks
Universal Personal Telecommunications
User-defined Routing
Abbreviated Dialling
Originating Call Screening
Terminating Call Screening
Call Forwarding
Call Distribution
Destination Call Routing
Selective Call Forwarding on Busy/Don't Answer
Security Screening
Automatic Alternative Billing
Universal Access Number
Premium Rate
Split Charging
Account Card Calling
Credit Card Calling
Televoting
Mass Calling
Call Volume Distribution
Call Re-routing Distribution
Completion of Call to Busy Subscriber
Conference Calling

4.16.2.2 Service features

Reverse Charging
Call Volume Distribution
Call Gapping
Call Limiter
Call Queueing
Originating Call Screening
Terminating Call Screening
Closed User Group

Customer Profile Management
Follow Me Diversion
Origin Dependent Routing
Customised Recorded Announcement Time Dependent Routing
User Prompter
Abbreviated Dialling
Authentication
Authentication Code
Off Network Access
Off Network Calling
Attendant
Mass Calling
Split Charging
Premium Charging
Private Numbering Plan
One Number
Customised Ringing
Call Logging
Call Forwarding On Busy and Don't Answer
Automatic Call Back
Meet-Me Conference
Call Transfer
Call Hold with Announcement

4.16.2.3 SIBs

Translation
Announcement
Collect User Info
Screening
Authorisation
Timer
Billing/charging
Call Gap
Call Logging
Service Data Management
Verification
Queueing
Resume Call Control
Event/Status Notification
Start
Stop

4.16.2.4 Functional blocks

CCF Connection (Call) Control Function
SSF Service Switching Function
SCF Service Control Function
SRF Specialised Resource Function
SDF Specialised Database Function
SMF Service Management Function
SCEF Service Creation Environment Function
SMAF Service Management Access Function

4.17 Restoration and recovery

For further study.

4.18 Materials management

Materials management of stores, OMCs, exchanges etc. enables a network operator to perform the required maintenance and installation work. Although this management service has no direct influence on NEs, it should be considered that a sophisticated materials management supports network operators to keep investment cost for spare parts and installation materials as low as possible.

4.19 Staff work scheduling

The quality of telecommunication services offered to the customer depends very much on the network operator's staff. Although this management service has no direct influence on NEs, it should be considered that an effective staff work scheduling helps to keep the staff effort on an economic level.

Accordingly staff work scheduling is a management activity of the network operator in order to dispatch the appropriate staff member for the work to be performed. This is valid not only for operation and maintenance of NEs, but also for maintenance and installation work to be carried out on the customer's premises. Furthermore, staff have to be scheduled for installation or repair work in the field e.g. for cables or microwaves etc.

4.20 Management of the TMN

For further study.

History

Document history	
September 1992	First Edition
December 1995	Converted into Adobe Acrobat Portable Document Format (PDF)