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Recommendation Z.337

NETWORK MANAGEMENT ADMINISTRATION

1 General

This Recommendation has been developed in accordance with the methodology defined in Recommendations Z.332 and Z.333.

The main part of this Recommendation deals with the model of the Network Management Administration. A glossary of the terms used is also included.

The list of operator jobs and the list of system functions to be controlled are contained in Annex A.

For each system function to be controlled by means of MML, one or more MML functions can be derived and each of them can be described using the metalanguage defined in Recommendation Z.333, in order to detail the relevant information structure.

Annex B contains guidelines for the definition of the list of MML functions and the information structure diagrams associated to each of them to be used as guidelines.

2 Introduction

Network management is the function of supervising the network and taking action to control the flow of traffic so as to ensure the maximum utilization of the network in all situations. The objective is to enable as many calls as possible to be successfully completed. In its current scope, Network Management doesn’t address the aspects of managing traffic on portions of the network that are leased or under the control of network customers.

According to CCITT Recommendations E.410 through E.414, E.502, Q.542 and Q.544, Network Management requires the performance of a certain number of activities to detect abnormal network conditions and to initiate the execution of corrective actions and/or controls. The general scenario of Network Management activities can be described through the involved information flow as depicted in Figure 1/Z.337. Network Raw Data related to traffic parameters and the status (i.e. level of overload, out of service conditions, etc.) of the Network Elements can be processed to provide Network Management Parameters, using the Network Reference Data which are necessary to calculate Network Management Parameters. The Network Raw Data are produced from Network Management Elements.

Network Management Parameters, describing the current network status and performance, can be related to some threshold values (representing the boundary between normal and abnormal behaviour) in order to detect abnormal conditions.

Abnormal Condition Reports, Network Management Parameters and other information (from telephone operators, work centres, news media, etc.) are used to identify the origin of the problem and, as a consequence, to decide the proper actions to be taken or the most suitable controls to be activated.

Network problem identification and consequent corrective actions can be handled manually or automatically by an ‘‘expert’’ system which is capable of performing the functions of abnormal condition detection, problem analysis and problem solving. All the activities carried out for Network Management can be handled by the operator supervision.

Furthermore, for cooperation, coordination and planning purposes, Network Management Reports could be distributed to other operating centres, to higher authorities, etc.

Depending on each Administration and network organization, Network Management activities can be partially or totally performed at exchange level or concentrated in one or more Network Management Centres.

Figure 2/Z.337 contains an example of how the general scenario can be applied to a particular operating organization. In this example, the functions shown for the Network Element and Network Management Operations System are performed by the system under operator control.

Considering the Network Management scenario and the operator activities (listed in Annex A to this Recommendation) three different sub-areas can be recognized:

— Network Management Data administration;

— Network Management Controls administration;

— Network Management Data Distribution administration.

Only the sub-areas for Network Management Data administration is covered by the present Recommendation. The remaining two sub-areas, namely Network Management Controls administration and Network Management Data Distribution administration are left for further study.

Figure 1/Z.337, p.1

Figure 2/Z.337, p.2

3 Network Management Models

3.1 *Introduction*

According to the division of Network Management activities in three sub-areas as stated in § 2, three different models, as indicated in the following, have to be developed:

- Network Management Data administration model;
- Network Management Controls administration model;
- Network Management Data Distribution administration model.

3.2 *Network Management Data administration model*

Network Management Data administration sub-area concerns the operator activities for managing the set of information necessary to monitor the network status and performance. This information can be routed toward proper display and/or storage devices in the Network Management Centre or passed to remote Administrations under operator control.

Data administration is applied to the following data:

- Network Raw Data;
- Network Management Parameters;
- Network Management Indicators;
- Network Reference Data.

3.2.1 *Network Raw Data*

Network Raw Data describe, for each network management element, the current operating conditions (e.g. exchange load, number of in-service circuits, etc.) and traffic behaviour (e.g. number of seizures for circuits sub-group).

Network Raw Data are administered by the MML functions for Traffic Measurements Administration, therefore they are not considered in the Network Management functional area.

3.2.2 *Network Management Parameters*

Network Management Parameters describe the network status and performance in terms of entities (as indicated in Recommendation E.411) and Network Management Objects.

Network Management Objects are the set of Network Elements subject to measurement for Network Management purposes.

One or more Network Management Objects can be grouped as origin and/or destination objects to define traffic flow; the Network Management Objects are hierarchically presented below:

- network group;
- network;
- exchange group;

— exchange;

— circuit group;

— circuit sub-group.

Network management monitoring and control of circuit groups and circuit sub-groups can only be performed via an exchange.

In Figure 3/Z.337 is represented, as an example, a Network Management Parameter in terms of the entity ‘‘answer/seizure ratio’’ for traffic handled by a circuit sub-group and forwarded to a set of exchanges characterized by the same destination code.

Figure 3/Z.337, p.

3.2.3 *Network Management Indicators*

Network Management Indicators represent the logical results (e.g. yes or no) obtained from the comparison of Network Management Parameters against a predefined set of numerical values (thresholds).

Numerical values associated with thresholds can be time-dependent (e.g. morning/afternoon hours, holidays, etc.).

3.2.4 *Network Reference Data*

Network Reference Data can be administered by the MML functions which are appropriate for each type of reference data, therefore they are not considered in the network management functional area.

3.3 *Network management control administration model*

To be developed.

3.4 *Network management data distribution administration model*

To be developed.

4 Glossary of terms

abnormal Condition Report

Information produced in the Network Management Centre after detection of abnormal network status or performance.

circuit group

The set of all switched circuits which directly interconnect one exchange with another.

circuit sub-group

A group of circuits within a circuit group which are uniquely identifiable for operational or technical reasons. A circuit group may consist of one or more circuit sub-groups.

exchange group

A set of exchanges which handles traffic forwarded to or coming from a specific geographical area (e.g. area code, switching centre, etc.).

network

All the exchanges which are relevant to the service standpoint operated by a company in a country.

network Element

Telecommunication equipment which may perform signalling, switching and transmission functions.

network group

A group of telecommunication networks relevant to the service standpoint (e.g. different operating companies offering the same service in the same country).

network management action

The activity performed, not necessarily in the network elements, to regulate traffic flow.

network Management Centre

A centre where network management functions are performed (e.g. O and M centre, switching centre).

network Management Control

The capabilities in network elements to regulate traffic flow and network operation in order to insure the maximum utilization of the network capacity in all situations of traffic overload and network element failure.

network Management Data

The set of information necessary to monitor, detect and identify a network problem.

network Management Indicator

A logical result of comparison of Network Management Parameters and thresholds comparison.

network Management Information

The set of information produced in the Network Management Centre describing the network status and performance, the abnormal conditions detected, the problems identity and the active network management controls.

network Management Object

A set of network elements under control of network management functions and/or subject to measurement for network management purposes.

network Management Parameters

Information produced in the Network Management Centre to be used for the production of abnormal condition report and for display on alerting devices.

network Management System

A system which performs Network Management functions.

network Problem Identity

Information produced in the Network Management Centre to indicate the type of problem detected and the portion of the network and/or services affected.

network Raw Data

Network information provided by network elements and used for the production of Network Management Parameters and for display on alerting devices.

network Reference Data

Information on the network elements and structure (e.g. circuit groups, number of circuits in a circuit group, routing information, type and quantity of switching system components).

ANNEX A

(To Recommendation Z.337)

List of system functions to be controlled by means of MML

and list of jobs

A.1 *List of system functions to be controlled by means of MML*

Network Management functions include:

— performing measurements of network status and performance;

— performing Network Management Actions;

— performing Network Management information distribution.

A.2 *List of jobs*

The jobs are supposed to be performed at Network Management Centre level (i.e. any centre which performs network management functions).

A.2.1 *To determine the appropriate Network Raw Data to be collected*

— the purpose of this job is to select the appropriate sets of Network Raw Data for the evaluation of the network elements and traffic monitoring;

— the Network Raw Data are defined for each specific network element. The operator is supposed to select the consistent subset of information necessary for monitoring purposes;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.2 *To collect appropriate Network Raw Data*

— the purpose of this job is to schedule the collection of Network Raw Data from network elements:

— the operator is supposed to schedule selected sets of Network Raw Data for collection;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.3 *To define the appropriate parameters to be used for the network and traffic monitoring*

— the purpose of this job is the definition of the Network Management Parameters for the evaluation of the network status and traffic performance. The Network Management Parameters are derived from the available set of Network Raw Data;

— the operator is supposed to define the set of information necessary for Network Management Parameters production;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.4 *To choose the Network Management Parameters with which to monitor network status and performance*

— the purpose of this job is to choose, from defined Network Management Parameters, a subset for the evaluation of network status and performance;

— the operator is supposed to choose the Network Management Parameters necessary for network monitoring;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.5 *To activate and deactivate the production of Network Management Parameters*

— the purpose of this job is to control the production of any Specific Network Management Parameter;

— the system is supposed to store the Network Management Parameters produced;

— the complexity of the job is low;

— the frequency of the job is low.

A.2.6 *To assemble appropriate reference data to characterize traffic behaviour of network elements*

— the purpose of this job is to obtain appropriate reference data describing network behaviour to be used in the analysis of the network problems;

— the operator is supposed to determine what reference data is to be collected and stored;

— data items characterizing the network elements and their interrelationships are supposed to be collected and stored in the Network Management Centre;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.7 *To define or change the thresholds for the network status and performance monitoring*

— the purpose of this job is to define a specific set of thresholds to which Network Management Parameters will be compared;

— the operator is supposed to define, for the selected Network Management Parameters, the numerical values to be used as thresholds;

— the complexity of the job may be medium depending on the number of thresholds to be defined;

— the frequency of the job is low.

A.2.8 *To associate Network Management Parameters with selected thresholds*

— the purpose of this job is to associate selected thresholds with Network Management Parameters;

— the operator is supposed to select the Network Management Parameters which are to be compared against selected thresholds;

— Network Management Parameters are supposed to be compared by the system;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.9 *To display appropriate exception conditions*

— the purpose of this job is to control the display of the results derived from the comparison of Network Management Parameters against established thresholds so as to alert the operator;

— exception conditions may be displayed on a number of different devices so as to best serve the network management operator. The operator is supposed to select the devices on which exceptions are to be displayed;

— the complexity of the job is medium;

— the frequency of the job is medium.

A.2.10 *To request appropriate additional data displays to characterize network problems*

— the purpose of this job is to request the display of reference data and Network Management Parameters not otherwise automatically displayed. These data elements provide the operator with additional information on which to base his determination of network problems;

— the operator is supposed to determine what additional information is to be displayed;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.11 *To request appropriate data displays to characterize possible network management actions*

— the purpose of this job is to request the display of reference data and Network Management Parameters not otherwise automatically displayed. These data elements provide the operator with additional information on which to base his determination of possible Network Management Actions;

— the operator is supposed to determine what additional information is to be displayed;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.12 *To request additional data analysis for determining actions to be taken*

— the purpose of this job is to request additional data analysis to assist the operator in determining the correct Network Management Actions to be taken (e.g. equipment operating conditions, active Network Management Controls, etc.);

— the operator is supposed to request additional data analysis as to determine alternatives for the implementation of network management controls;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.13 *To choose appropriate Network Management Controls*

— the purpose of this job is to choose the appropriate Network Management Controls to be applied as solutions to network problems;

— the operator is supposed to choose the appropriate controls to correct problems in the network;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.14 *To administer automatic Network Management Controls*

— the purpose of this job is to administer the thresholds/tables used by network elements to implement automatic control in the network;

— the operator is supposed to create, change and delete data from tables used by network elements to implement automatic network management controls;

— the complexity of the job is high;

— the frequency of the job is low.

A.2.15 *To choose appropriate Network Management Control parameters*

— the purpose of this job is to choose the appropriate parameters to be used in the application of network management controls;

— the operator is supposed to select the appropriate control parameters to correct network problems;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.16 *To activate/deactivate Network Management Controls*

— the purpose of this job is to implement Network Management Controls. Implementation may include all types of controls;

— the operator is supposed to implement Network Management Controls;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.17 *To monitor known problems and adjust Network Management Controls*

— the purpose of this job is to provide for iterative adjustment to the network management process. It requires as a minimum that the operator repeat the necessary jobs to insure that actions taken to relieve a particular problem had the optimum effect;

— the operator is supposed to repeat necessary jobs;

— the complexity of the job is high;

— the frequency of the job is high.

A.2.18 *To administer Network Management Information distribution characteristics*

— the purpose of this job is to set up the required parameters for data distribution in and/or outside the Network Management Centre;

— the operator is supposed to define the parameters necessary for display, record and delivery of the Network Management Information;

— the complexity of the job is medium;

— the frequency of the job is low.

A.2.19 *To activate and deactivate Network Management Information Distribution*

— the purpose of this job is to control the distribution of Network Management Information in and/or outside the Network Management Centre;

— the operator is supposed to activate/deactivate automatic and manual Network Management Information Distribution;

— the complexity of the job is medium;

— the frequency of the job is high.

ANNEX B

(To Recommendation Z.337)

Guidelines for the list of MML functions and

associated information structure diagrams

B.1 *Introduction*

This annex contains guidelines for the list of MML functions and associated information structure diagrams related to the Network Management administration model defined in Recommendation Z.337 — Section 3.

B.2 *List of MML functions*

The list contains possible MML functions for Network Management administration.

This list is not mandatory nor complete, it may vary according to administration needs, telecommunication network levels, regulatory needs, etc.

These MML functions do not represent the actual command structure of any real implementation of the man-machine interface. Each of the MML functions identified can be implemented by providing one or more separate distinctive commands or several MML functions could be implemented by using a single command.

B.2.1 *List of MML functions for Network Management Data administration*

1) *Creation*

— create a Network Management Object;

— create a Network Management Parameter;

— create a Network Management Indicator.

2) *Activation*

— activate a Network Management Parameter;

— activate a Network Management Indicator.

3) *Deactivation*

— deactivate a Network Management Parameter;

— deactivate a Network Management Indicator.

4) *Interrogation*

— interrogate a Network Management Object;

— interrogate a Network Management Parameter;

— interrogate a Network Management Indicator.

5) *Deletion*

— delete a Network Management Object;

— delete a Network Management Parameter;

— delete a Network Management Indicator.

6) *Changing*

— change a Network Management Object;

— change a Network Management Parameter;

— change a Network Management Indicator.

B.2.2 *List of MML functions for Network Management Controls administration*

To be developed.

B.2.3 *List of MML functions for Network Management Data Distribution administration*

To be developed.

B.3 *Information structure diagrams*

Only the information entities needed for the MML functions previously defined have been identified and are reported in the present section by means of diagrams representing the information structure of each MML function.

Figure B-1/Z.337, p.4

Figure B-2/Z.337, p.5

Figure B-3/Z.337, p.6

Figure B-4/Z.337, p.7

Figure B-5/Z.337, p.8

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Figure B-8/Z.337, p.11

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