

Superseded by a more recent version



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

X.161

(04/95)

**DATA NETWORKS AND OPEN SYSTEM
COMMUNICATIONS
PUBLIC DATA NETWORKS – MAINTENANCE**

**DEFINITION OF CUSTOMER NETWORK
MANAGEMENT SERVICES FOR PUBLIC
DATA NETWORKS**

ITU-T Recommendation X.161

Superseded by a more recent version

(Previously "CCITT Recommendation")

Superseded by a more recent version

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation X.161 was prepared by ITU-T Study Group 7 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 10th of April 1995.

NOTE

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

© ITU 1996

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

Superseded by a more recent version

ITU-T X-SERIES RECOMMENDATIONS

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

ORGANIZATION OF X-SERIES RECOMMENDATIONS

Subject area	Recommendation Series
PUBLIC DATA NETWORKS	
Services and Facilities	X.1-X.19
Interfaces	X.20-X.49
Transmission, Signalling and Switching	X.50-X.89
Network Aspects	X.90-X.149
Maintenance	X.150-X.179
Administrative Arrangements	X.180-X.199
OPEN SYSTEMS INTERCONNECTION	
Model and Notation	X.200-X.209
Service Definitions	X.210-X.219
Connection-mode Protocol Specifications	X.220-X.229
Connectionless-mode Protocol Specifications	X.230-X.239
PICS Proformas	X.240-X.259
Protocol Identification	X.260-X.269
Security Protocols	X.270-X.279
Layer Managed Objects	X.280-X.289
Conformance Testing	X.290-X.299
INTERWORKING BETWEEN NETWORKS	
General	X.300-X.349
Mobile Data Transmission Systems	X.350-X.369
Management	X.370-X.399
MESSAGE HANDLING SYSTEMS	X.400-X.499
DIRECTORY	X.500-X.599
OSI NETWORKING AND SYSTEM ASPECTS	
Networking	X.600-X.649
Naming, Addressing and Registration	X.650-X.679
Abstract Syntax Notation One (ASN.1)	X.680-X.699
OSI MANAGEMENT	X.700-X.799
SECURITY	X.800-X.849
OSI APPLICATIONS	
Commitment, Concurrency and Recovery	X.850-X.859
Transaction Processing	X.860-X.879
Remote Operations	X.880-X.899
OPEN DISTRIBUTED PROCESSING	X.900-X.999

Superseded by a more recent version

CONTENTS

	<i>Page</i>
1 Scope	1
2 References	1
2.1 Identical Recommendations International Standards	1
2.2 Paired Recommendations International Standards equivalent in technical content	1
2.3 Additional References	2
3 Definitions	2
4 Abbreviations	2
5 Conventions	3
6 Overview of Customer Network Management services	3
7 CNM services definitions	3
7.1 Fault Management.....	4
7.1.1 CNM Alarm Notification Service	4
7.1.1.1 CNM Alarm Notification Service definition	4
7.1.1.2 CNM Alarm Notification Service description.....	4
7.1.2 CNM Fault History Service.....	6
7.1.2.1 CNM Fault History Service definition	6
7.1.3 CNM Trouble Report service	6
7.1.3.1 CNM Trouble Report service definition.....	6
7.1.3.2 CNM Trouble Report Service description.....	7
7.1.4 CNM Loop set up Service	8
7.1.5 CNM Test host Service	8
7.1.6 CNM Protocol Monitoring Service	8
7.2 Configuration Management	8
7.2.1 CNM Configuration Inquiry Service.....	8
7.2.1.1 CNM Configuration Inquiry Service definition	8
7.2.1.2 CNM Configuration Inquiry Service description	9
7.2.2 CNM Reconfiguration Service	9
7.2.2.1 CNM Reconfiguration Service definition	9
7.2.2.2 CNM Reconfiguration Service description	9
7.2.3 CNM Ordering Service	10
7.2.3.1 CNM Ordering Service definition	10
7.2.3.2 CNM Ordering Service description.....	10
7.2.4 CNM Cancellation service	10
7.2.4.1 CNM Cancellation Service definition	10
7.2.5 CNM Systematic Call Re-direction Service	10
7.2.6 CNM Inventory inquiry service	10
7.3 Accounting Management	11
7.3.1 CNM Periodic billing Service	11
7.3.1.1 CNM Periodic billing Service definition.....	11
7.3.1.2 CNM Periodic billing Service description	11
7.3.2 CNM Detailed accounting service.....	11
7.3.3 CNM Quota Control Service	11
7.3.4 CNM Real-time Charging Information Service	11
7.4 Performance Management.....	11
7.4.1 CNM Traffic Information Service.....	11
7.4.1.1 CNM Traffic Information Service definition	11
7.4.1.2 CNM Traffic Information service description.....	13
7.4.2 CNM Quality of Service Information Service.....	13
7.4.3 CNM Network statistics service.....	13
7.4.3.1 CNM Network statistics service definition	13

Superseded by a more recent version

	<i>Page</i>
7.5 Security Management.....	13
7.5.1 CNM Password Change Service	13
7.5.2 CNM Access Rights Definition Service.....	13
7.6 CNM supporting services.....	13
7.6.1 CNM Service Request service.....	13
7.6.1.1 CNM Service Request service definition	13
7.6.1.2 CNM Service Request service description	14
8 Compliance with this Recommendation	14
Annex A – Summary of CNM services	14
Annex B – CNM Service sets	15
Annex C – Functional units for the CNM _c interface	17
C.1 Description	17
C.1.1 Fault Management.....	17
C.1.1.1 CNM Alarm Notification Service	17
C.1.1.2 CNM Fault History Service.....	18
C.1.1.3 CNM Trouble Report Service	18
C.1.2 Configuration Management.....	20
C.1.2.1 CNM Configuration Inquiry Service.....	20
C.1.2.2 CNM Reconfiguration Service	20
C.1.3 Accounting Management	21
C.1.3.1 CNM Periodic billing service.....	21
C.1.4 Performance Management.....	21
C.1.4.1 CNM Traffic Information Service.....	21
C.1.5 CNM supporting services	22
C.1.5.1 CNM Service Request Service	22
C.2 Referenced Functional units.....	26
C.3 Functional units defined in this Recommendation	26
Annex D – Element of procedure for provision of CNM services	27
D.1 CNM _c interface.....	27
D.1.1 Fault Management.....	27
D.1.1.1 CNM Alarm Reporting Service.....	27
D.1.1.2 CNM Trouble Report Service	27
D.1.2 Configuration Management.....	27
D.1.2.1 CNM Configuration Inquiry Service.....	27
D.1.2.2 CNM Reconfiguration Service	28
D.1.3 Performance Management.....	28
D.1.3.1 CNM Traffic information service.....	28
D.1.3.2 CNM Network Statistics service	28
D.2 CNM _e interface.....	28
D.2.1 Fault Management.....	28
D.2.1.1 CNM Fault History Service.....	28
D.2.2 Configuration Management.....	29
D.2.2.1 CNM Configuration Inquiry Service.....	29
D.2.2.2 CNM Reconfiguration Service	29
D.2.2.3 CNM Ordering Service	29
D.2.2.4 CNM Cancellation Service.....	29
D.2.3 Accounting Management	29
D.2.3.1 CNM Periodic Billing Service.....	29
D.2.4 Performance Management.....	29
D.2.4.1 CNM Traffic Information Service.....	29
D.2.4.2 CNM Network Statistics service	29
D.2.5 CNM supporting service	30
D.2.5.1 CNM Service Request Service	30

Superseded by a more recent version

	<i>Page</i>
Annex E – Typical sequences of CNM services.....	31
E.1 Introduction.....	31
E.2 Fault Management.....	31
E.2.1 Alarm Notification (or Fault Event Handling)	31
E.2.2 Fault History.....	32
E.2.3 Trouble Report	34
E.2.4 Loop set-up.....	34
E.2.5 Test host	34
E.2.6 Protocol monitoring.....	34
E.3 Configuration Management	34
E.3.1 Configuration inquiry	34
E.3.2 Service Reconfiguration	35
E.3.3 Ordering Service	35
E.3.3.1 X.25 Ordering.....	35
E.3.4 Inventory inquiry	35
E.3.5 Systematic call re-direction	35
E.4 Accounting Services	36
E.4.1 Periodic billing	36
E.4.2 Detailed accounting.....	36
E.4.3 Quota control.....	36
E.4.4 Real-time charging information	36
E.5 Performance Management Service.....	36
E.5.1 Traffic information	36
E.5.1.1 Real-time traffic information.....	36
E.5.1.2 Traffic Statistics Service.....	36
E.5.2 Quality of Service.....	36
E.6 Security Management.....	36
E.6.1 Password change	37
E.6.2 Access rights	37
E.7 Service Inquiry Service	37
E.7.1 Identification	37

Superseded by a more recent version

SUMMARY

This Recommendation defines the management services which may be provided to a customer and collectively described as Customer Network Management (CNM). CNM is a service which provides customers with the ability to access (and in some cases modify) management information relating to the services provided to them by the network.

Superseded by a more recent version

Recommendation X.161

DEFINITION OF CUSTOMER NETWORK MANAGEMENT SERVICES FOR PUBLIC DATA NETWORKS

(Geneva, 1995)

1 Scope

This Recommendation defines the management services and supporting functions for CNM. Where possible, reference is made to other Recommendations which define management services and functions. This Recommendation is intended to complement TMN specifications and provide a specification for the non-TMN environment. The relationship of this Recommendation to other Recommendations for CNM is presented in ITU-T Recommendation X.160. Definitions of management information for the currently defined CNM interfaces are in Recommendations X.162 and X.163.

This Recommendation is applicable to provision of the CNM Service in the Public Data Network (PDN) environment. In future, this may extend to other network technologies. The specification contained in this Recommendation is written such that it may be developed to be generic to all network technologies where the requirement for CNM is identified.

2 References

The following Recommendations, and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision: all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of currently valid ITU-T Recommendations is regularly published.

2.1 Identical Recommendations | International Standards

- CCITT Recommendation X.701 (1992) | ISO/IEC 10040:1992, *Information technology – Open systems interconnection – System management overview.*
- CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information.*
- CCITT Recommendation X.730 (1992) | ISO/IEC 10164-1:1993, *Information technology – Open Systems Interconnection – Systems management: Object management function.*
- CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2:1992, *Information technology – Open Systems Interconnection – Systems management: State management function.*
- CCITT Recommendation X.733 (1992) | ISO/IEC 10164-4:1992, *Information technology – Open Systems Interconnection – Systems management: Alarm reporting function.*
- CCITT Recommendation X.734 (1992) | ISO/IEC 10164-5:1993, *Information technology – Open Systems Interconnection – Systems management: Event report management function.*
- CCITT Recommendation X.735 (1992) | ISO/IEC 10164-6:1993, *Information technology – Open Systems Interconnection – Systems management: Log control function.*

2.2 Paired Recommendations | International Standards equivalent in technical content

- 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.*

Superseded by a more recent version

- CCITT Recommendation X.711 (1991), *Common management information protocol specification for CCITT applications*.
- ISO/IEC 9596-1:1991, *Information technology – Open Systems Interconnection – Common management information protocol – Part 1: Specification*.

2.3 Additional References

- CCITT Recommendation F.400/X.400 (1992), *Message handling services: Message handling system and service overview*.
- CCITT Recommendation M.3010 (1992), *Principles for a telecommunications management network*.
- CCITT Recommendation M.3020 (1992), *TMN interface specification methodology*.
- ITU-T Recommendation Q.821 (1993), *Stage 2 and stage 3 description of the Q3 interface – Alarm surveillance*.
- ITU-T Recommendation Q.822 (1994), *Stage 1, stage 2 and stage 3 description for the Q3 interface – Performance management*.
- ITU-T Recommendation X.160 (1994), *Architecture for customer network management service for public data networks*.
- ITU-T Recommendation X.162 (1995), *Definition of management information for customer network management service for public data networks to be used with the CNMc interface*.
- ITU-T Recommendation X.163 (1995), *Definition of management information for customer network management service for public data networks: to be used with the CNMe interface*.
- CCITT Recommendation X.411 (1992), *Message handling systems – Message transfer system: Abstract service definition and procedures*.
- ITU-T Recommendation X.790¹⁾, *Trouble management function for ITU-T applications*.

3 Definitions

This Recommendation makes use of the following terms defined in ITU-T Recommendation X.160:

- CNMc;
- CNMe;
- Customer's Management System;
- Service Provider's CNM System.

4 Abbreviations

For the purposes of this Recommendation, the following abbreviations apply:

CMIS	Common Management Information Service
CNM	Customer Network Management
CNMc	Customer Network Management using CMIP
CNMe	Customer Network Management using EDI/MHS
EDI	Electronic Data Interchange
EFD	Event Forwarding Discriminator
FU	Functional Unit
ISP	International Standardised Profile

¹⁾ Presently at the stage of draft.

Superseded by a more recent version

MAPDU	Management Application Protocol Data Unit
MHS	Message Handling System
MIB	Management Information Base
OSI	Open Systems Interconnection
PDN	Public Data Network
TMN	Telecommunications Management Network

5 Conventions

The following conventions apply to the tables contained in this Recommendation:

M	Mandatory
O	Optional
–	Not defined
N/A	Not Applicable
FS	Further Study

6 Overview of Customer Network Management services

A CNM service is a capability that is provided to a customer across a CNM interface. A CNM service is provided for example, by using CMIS, OSI Systems Management Functions and appropriate management information. Alternatively, a CNM service can be provided by exchanging EDI forms over MHS.

The services currently defined in this Recommendation (and summarised in Annex A) are those services which are considered to be of most importance to customers, and are therefore priorities for provision. Further services are identified but are considered to be of lower priority. Other CNM services may be added in future when further OSI System Management Functions have been completed and additional business requirements have been identified.

The CNM services defined in this Recommendation are, for convenience, classified into six groups:

- Fault Management;
- Accounting Management;
- Configuration Management;
- Performance Management;
- Security Management;
- CNM supporting services.

This Recommendation should be read in conjunction with Recommendation X.160 which defines the CNM Architecture, and Recommendations X.162 and X.163 which define management information for respectively CNMc and CNMe interfaces.

7 CNM services definitions

The following clauses describe the CNM services that may be provided across the CNM interfaces.

When the service is provided across the CNM interface, the description is made in accordance to the TMN interface specification methodology M.3020. In the case of the CNMc interface, the term CNM service is fully equivalent to the term TMN function set and the associated management information is defined in Recommendation X.162. When the service is provided across the CNMe interface, the description is made using EDI forms. These forms are defined in ITU-T Recommendation X.163.

Element of procedure to be used for provision of CNM Services are described in Annex D.

Superseded by a more recent version

7.1 Fault Management

7.1.1 CNM Alarm Notification Service

7.1.1.1 CNM Alarm Notification Service definition

The CNM Alarm Notification Service provides a customer with the capability to be notified when a failure or event occurs which affects the normal operation of the customer's dedicated resources. It may also apply to shared resources that are used by the customer.

The following functions are associated with the alarm notification service, some of them are optional:

a) *Report alarm*

The Service Provider's CNM System informs the Customer's Management System of a spontaneous occurrence of an alarm.

b) *Report state change*

The Service Provider's CNM System informs the Customer's Management System of a state change.

c) *Inhibit/Allow alarm and state change reporting*

The Customer's Management System instructs the Service Provider's CNM System to suspend/resume alarm and state change reporting.

d) *Condition alarm and state change reporting*

The Customer's Management System instructs the Service Provider's CNM System to assign filtering criteria with the values it provides.

e) *Request alarm and state change reporting conditions*

The Customer's Management System requests the Service Provider's CNM System to send the current assignment of the filtering criteria it specifies.

7.1.1.2 CNM Alarm Notification Service description

The CNM Alarm Notification Service is described in Table 1/X.161.

TABLE 1/X.161

Alarm services

Functions	Support	Services
Report Alarm	M	Alarm Reporting
Report State Change	O	State change reporting
Inhibit/Allow alarm and state change reporting	O	Suspend/Resume alarm and state change reporting
Condition alarm and state change reporting	O	Initiate/Terminate Alarm and State change reporting Set the EFD attributes
Request alarm and state change reporting conditions	O	Get the EFD attributes

Alarm reporting

There are several types of alarm notifications as defined in CCITT Recommendation X.733 | ISO/IEC 10164-4:

- Communications alarm;
- Quality of service alarm;

Superseded by a more recent version

- Processing error alarm;
- Equipment alarm;
- Environmental alarm.

The alarms provide a number of mandatory and optional parameters. For information, representative parameters including the following:

- Event type;
- Event time;
- Probable cause;
- Specific problems;
- Perceived severity.

Complete lists of these parameters are contained Table 1 of CCITT Rec. X.733 | ISO/IEC 10164-4.

State change reporting

The state change reports also provide a number of mandatory and optional parameters. For information, representative parameters including the following as defined in Recommendation X.731:

- Event type;
- Event time;
- Attribute identifier;
- New attribute value.

Complete lists of these parameters are contained Table 2 of CCITT Rec. X.731 | ISO/IEC 10164-2.

Suspend/Resume alarm and state change reporting

This service allows the Customer's Management System to only modify the administrative state of the EFD object which may be pre-defined.

The suspend alarm and state change reporting service allows the Customer's Management System to inhibit the reporting of alarms and state change by setting the administrative state attribute to locked. This service supports the Inhibit alarm and state change reporting function.

The resume alarm and state change reporting service allows the managing system to allow the reporting of alarms and state change by setting the administrative state attribute to unlocked. This service supports the Allow alarm and state change reporting function.

Initiate/Terminate alarm and state change reporting

The Initiate Alarm and State change reporting service allows the Customer's Management System to create an instance of the EFD object class in the Service Provider's CNM System. This service supports the condition alarm reporting function identified in this Recommendation.

The Terminate Alarm and State change reporting service allows a Customer's Management System to delete an instance of the EFD object class in the Service Provider's CNM System. This service supports the condition alarm reporting function identified in this Recommendation.

When an *a priori* agreement exists, between the customer and the service provider for pre-defined EFDs, the initiate and terminate alarm and state change reporting services may be omitted. In this case, the Alarm and state change report service starts automatically at system initialisation.

Set the EFD attributes service

The Set EFD attributes service is a service that allows a Customer's Management System to set the attribute values of a specified instance of an EFD object class in the Service Provider's CNM System, thus allowing it to alter the criteria used to determine those alarm and state changes that are reported. This service supports the condition alarm reporting function identified in this Recommendation.

The attributes that can be handled to change the criteria of the event discrimination by a customer's management operation are listed in CCITT Rec. X.734 | ISO/IEC 10164-5.

Superseded by a more recent version

Get the EFD attributes service

The Get EFD attributes service is a service that allows a Customer's Management System to get the attributes values of a specified instance of an EFD managed object class in the Service Provider's CNM System. This service supports the Request alarm and state change reporting conditions function defined in this Recommendation.

7.1.2 CNM Fault History Service

7.1.2.1 CNM Fault History Service definition

The CNM fault history service provides a customer with the capability to retrieve its own fault history log records stored at the service provider side. The report contains information related to failure or event occurrence which affect the normal operation of the customer's dedicated resources.

This service is for further study.

7.1.3 CNM Trouble Report service

7.1.3.1 CNM Trouble Report service definition

The Trouble Report service is, so called, the automated trouble ticketing function. This service provides a customer with the capability to report trouble on services or resources that affect the customer's communication, track the progress of trouble to resolution, and identify the clearing and closure of trouble.

Capabilities include:

- giving notice to the customer/the service provider that a service provided by the network is in need of repair;
- allowing the customer to ask for status information on a previously entered trouble report;
- providing a template for a trouble report for a particular service or class of services (to show what attributes of a trouble report are considered mandatory or optional);
- notifying the customer that the trouble report has been closed out, or keeps the close out information in an internal log;
- allowing the customer to ask for information about past troubles that have been reported;
- adding information to a trouble report that it has entered;
- notifying the customer that the status of that trouble report has changed;
- notifying the customer that the commitment time for that trouble report has changed;
- notifying the customer that other attributes of interest for that trouble report have changed;
- notifying the customer that a trouble report has been created, either as the result of a request or as a result of an internal action of the service provider;
- notifying the customer that a trouble report has been deleted, either as the result of a request or as a result of an internal action of the service provider;
- notifying the customer on a periodic basis about the status of any trouble that have occurred during a defined period (this would be by prior agreement between the service provider and the customer);
- allowing the customer to verify that the repair has been completed to its satisfaction before the trouble report is closed out in the service provider (network);
- notifying the customer that a Trouble Report Format Definition has been created;
- notifying the customer that a Trouble Report Format Definition has been deleted;
- notifying the customer that a Trouble Report Format Definition attribute of interest has changed;
- notifying the customer about progress on resolving the trouble;

Superseded by a more recent version

- allowing the customer to notice a previously reported trouble is no longer of interest;
- providing information that may be used for trouble report correlation;
- notifying a customer of a plan or schedule for maintenance action which affects the customer's communication such as file update, a kind of test.

The following specific capabilities are associated with the basic trouble report activity. These are defined in Recommendation X.790:

- Enter Trouble Report;
- Request Trouble Report Status;
- Request Trouble Report Format;
- Trouble History Event;
- Review Trouble History;
- Add Trouble Information;
- Trouble Report Status Update;
- Trouble Report Commitment Time Update;
- Trouble Report Attribute Value Change;
- Enrol Trouble Report;
- Deenroll Trouble Report;
- Verify Repair Completion;
- Modify other Trouble Report Attributes;
- Enrol Trouble Report Format Definition;
- Deenroll Trouble Report Format Definition;
- Attribute Value Change Trouble Report Format Definition;
- Trouble Report Progress update;
- Cancel Trouble Report.

The provider-to-provider interface specified in Recommendation X.790 is outside the scope of Recommendation X.161.

7.1.3.2 CNM Trouble Report Service description

The following functions are associated with the Trouble Report service. Some of them are optional:

a) *Basic Trouble Report function*

When a customer finds the occurrence of trouble in his communication, he informs perceived trouble by issuing a Telecommunication Trouble Report containing information about the trouble. The customer can retrieve the format provided by the service provider by electrical access. Several formats, as defined in Recommendation X.790, may be defined using standard attributes. Repair activities can be retrieved from historical records of activities performed to resolve the trouble, such as activity information and activity person.

When the network (the service provider) finds the occurrence of trouble in a customer's communication, the provider creates a Telecommunication Trouble Report and notifies the customer of the trouble.

Also, this function allows the service provider to report the trouble report progress information to the customer, or log the information at the service provider side.

b) *Planned maintenance reporting function*

The Service provider may inform customers that planned maintenance or preventive maintenance action is scheduled, to prevent future trouble. The Provider Trouble Report is used for this purpose.

c) *Trouble History function*

This function allows the Service provider to report the trouble report close out information to the customer, or log the information in the Service provider.

Superseded by a more recent version

TABLE 2/X.161

Trouble Report services

Functions	Support	Services
Basic Trouble Report Control	M	Basic Trouble Report Handling
Planned maintenance reporting	O	Planned maintenance information notification
Trouble HistoryManagement	O	Trouble History Retrieval

7.1.4 CNM Loop set up Service

This CNM service is for further study.

7.1.5 CNM Test host Service

This CNM service is for further study.

7.1.6 CNM Protocol Monitoring Service

This CNM service is for further study.

7.2 Configuration Management

7.2.1 CNM Configuration Inquiry Service

7.2.1.1 CNM Configuration Inquiry Service definition

The CNM Configuration Inquiry service provides a customer with the capability to acquire and maintain information about the telecommunications services and equipment supplied by the service provider. Capabilities include:

- tracking network services and equipment supplied by the service provider, allowing the customer to identify the location, and responsible person(s);
- attachment of customer organisational information to services and equipment:
- contract number;
- telephone number;
- facsimile number;
- contact details;
- contact procedure;
- auditing and queries of service provider's data to rectify perceived errors.

This CNM service may be provided across the CNMc and CNMe interfaces.

The following functions are associated with the configuration inquiry service, some of them are optional:

a) *Full configuration inquiry*

The Customer's Management System acquires all the information needed for having a complete view of the network services that are managed.

b) *Partial configuration inquiry*

The Customer's Management System selectively acquires (a) part(s) of the configuration information.

c) *Configuration update*

The Service Provider's CNM System automatically informs the Customer's Management System of a spontaneous change in the configuration. For example when a new interface has been installed.

Superseded by a more recent version

7.2.1.2 CNM Configuration Inquiry Service description

The complete configuration acquisition service allows the Customer's Management System to acquire the complete MIB contained in the Service Provider's CNM System.

The partial configuration acquisition service allows a Customer's Management System to selectively acquire configuration information contained in the Service Provider's CNM System.

The automatic configuration update service allows the Provider Management System to notify the Customer's Management System of changes that have occurred in the customer's configuration.

TABLE 3/X.161

Configuration inquiry services

Functions	Support	Services
Full configuration inquiry	M	Complete configuration acquisition
Partial configuration inquiry	O	Partial configuration acquisition
Configuration update	O	Automatic configuration update

7.2.2 CNM Reconfiguration Service

7.2.2.1 CNM Reconfiguration Service definition

The CNM reconfiguration service provides a customer with the capability to modify parameters associated with configurable aspects of their network services. Reconfiguration may take effect immediately as a result of direct action by the customer or on a delayed basis as a result of actions by the service provider. In both cases security mechanisms may be implemented by the service provider.

7.2.2.2 CNM Reconfiguration Service description

The immediate reconfiguration function is associated with reconfiguration service and it is mandatory. It allows the customer to directly and immediately modify the configuration of the customer resources. The customer resources that can actually be modified will be defined by the service provider.

The delayed reconfiguration service makes use of the CNM Service Request service defined in this Recommendation.

The configuration setting service allows a customer to get and modify the customer resources.

The configuration setting reporting service is used by the Service Provider's CNM System to confirm that the customer resources to be modified have been set with the values it provides.

TABLE 4/X.161

Service reconfiguration services

Function	Support	Services
Immediate reconfiguration	M	Configuration setting – Configuration setting reporting

Superseded by a more recent version

7.2.3 CNM Ordering Service

7.2.3.1 CNM Ordering Service definition

CNM Ordering provides a customer with the capability to request and manage orders with the service provider. Capabilities include:

- creating service orders with scheduling requirements;
- receiving provisioning status;
- amending service orders (where appropriate);
- attaching customer reference information; and
- creating, modifying and deleting PVCs.

Ordering may take effect immediately as a result of direct action by the customer or on a delayed basis as a result of actions by the service provider. In both cases security may be implemented by the service provider.

7.2.3.2 CNM Ordering Service description

In the case of ordering service on a delayed basis, negotiation and validation mechanisms may be implemented by the service provider. These mechanisms may be provided using the CNM Service Request service defined in this Recommendation.

7.2.4 CNM Cancellation service

This service allows a customer to cancel a network service he has previously ordered.

The customer may cancel his subscription, for example:

- X25 terminationPoint;
- PVC;
- Closed User group;
- Hunt Group.

Cancellation may take effect immediately as a result of direct action by the customer or on a delayed basis as a result of actions by the service provider. In both cases security may be implemented by the service provider.

7.2.4.1 CNM Cancellation Service definition

In the case of cancellation service on a delayed basis, negotiation and validation mechanisms may be implemented by the service provider. These mechanisms may be provided across the interface using the CNM Service Request service defined in this Recommendation.

7.2.5 CNM Systematic Call Re-direction Service

This CNM service is for further study.

7.2.6 CNM Inventory inquiry service

CNM Inventory inquiry service provides a customer with the capability to acquire and maintain information about the telecommunications equipment supplied by the service provider. This includes all equipment assigned to the customer whether or not it is operational. For example, this service can provide information about the equipment type, manufacturer, model number, serial number, location, etc.

The details of this CNM service and the management information model are for further study.

Superseded by a more recent version

7.3 Accounting Management

7.3.1 CNM Periodic billing Service

7.3.1.1 CNM Periodic billing Service definition

Billing provides a customer with invoicing information, and the functionality to perform analysis, processing and reporting on a range of financial topics. Capabilities may include:

- a) periodic billing to allow customers to receive an electronic copy of their invoice;
- b) hierarchy management to enable users to create and manage their own organisational structures (unit, project, geographical or financial);
- c) customer invoice validation:
 - 1) invoice query management to identify queried invoice items and report on them;
 - 2) allocation and apportionment of costs to allow a customer to allocate charges to responsible cost centres, including allocation of discounts;
 - 3) cost management reports on customer telecommunications expenditure to assist in identifying excessive usage;

The following capabilities are also for Further Study:

- contract management with automatic notification of approaching critical dates;
- credit management to allow a customer to access information relating to their invoicing points (account balance and payment status), and a log of transactions recorded for their accounts; and
- customer management to allow a customer to inform the service provider of changes to customer information.

7.3.1.2 CNM Periodic billing Service description

Detailed Specifications are for further study.

7.3.2 CNM Detailed accounting service

This CNM service is for further study.

7.3.3 CNM Quota Control Service

This CNM service is for further study.

7.3.4 CNM Real-time Charging Information Service

This CNM service is for further study.

7.4 Performance Management

7.4.1 CNM Traffic Information Service

7.4.1.1 CNM Traffic Information Service definition

This service provides a customer with capability to retrieve traffic information (statistical data). He may control how to collect traffic data, as well as specify what traffic item is required. The customer may access only the resources related to his communications. This service shall be provided if and only if the customer registers the use of the service to the Service provider.

The following functions are associated with the traffic information service. Some of them are optional.

Superseded by a more recent version

Traffic data collection refers to the ability for the service provider to collect the various traffic data relating to a single monitored entity in the network. The following specific functions are associated with the collection activity:

a) *Assign traffic data collection interval*

A customer may instruct the service provider about the duration of the traffic data collection interval for a given entity. By creating an object for collecting data (current data object), this interval is assigned.

b) *Suspend/Resume traffic data collection*

A customer may instruct the service provider to suspend/resume the traffic data collection activity for a given monitored entity.

c) *Schedule traffic data collection*

A customer may instruct the service provider to schedule the traffic data collection activity for a given entity or set of entities. For the time being, only the daily scheduling and the duration (start and stop times), both of which are defined in CCITT Rec. X.721 | ISO/IEC 10165-2, may be registered.

NOTE – Traffic data that may be handled by this service are based on the agreement between the service provider and its customers. They are chosen from the counters defined in Recommendations X.283 and X.282 for the time being. Examples are:

- callAttempt;
- callConnected;
- callTimeouts;
- clearTimeouts;
- dataPacketsReceived;
- dataPacketsSent;
- octetsReceivedCounter;
- octetsSentCounter;
- protocolErrorsAccusedOf;
- protocolErrorsDetectedLocally;
- service provider InitiatedDisconnects;
- service provider InitiatedResets;
- resetTimeouts;
- remotelyInitiatedResets ;
- remotelyInitiatedRestarts;
- segmentsReceived;
- segmentsSent.

Traffic data storage refers to the ability for the Service provider to store historical traffic data on each monitored entity for a prescribed time duration. The following specific functions are associated with the storage activity:

a) *Assign traffic data history duration*

A customer may instruct the Service provider to establish the duration during which to maintain a specific record of traffic historical data. The stored data are kept for a certain time period agreed by both the service provider and its customers.

b) *Suppress all zero data*

A customer may instruct the Service provider to originate historical data by suppressing 'all zero' data.

Traffic data retrieval refers to the ability for the customer to retrieve traffic data. A report may contain data from a given monitored entity. The following specific function is associated with the retrieval activity:

– *Retrieve traffic data*

A customer may issue a spontaneous request to the service provider for current or historical traffic data information on a given set of monitored entities.

Superseded by a more recent version

7.4.1.2 CNM Traffic Information service description

See Table 5.

TABLE 5/X.161

CNM Traffic Information services

Functions	Support	Services
Assign collection interval and retrieve traffic data	M	Traffic data collection interval assignment Traffic data retrieval
Suspend/Resume traffic data collection	O	Traffic data collection suspension/ Retention
Schedule traffic data collection	O	Traffic data collection scheduling
Assign history duration and retrieve traffic history data	O	Traffic history data duration assignment
	O	Traffic history data retrieval
Suppress all zero data	O	Zero Suppressing

7.4.2 CNM Quality of Service Information Service

This CNM service is for further study.

7.4.3 CNM Network statistics service

7.4.3.1 CNM Network statistics service definition

This service allows the Customer's Management System to receive aggregated information about the traffic inside the customer's network and about the usage of the components of the network.

This information may be used by the Customer's Management System to optimise and manage the usage of a given X25TerminationPoint.

7.5 Security Management

7.5.1 CNM Password Change Service

This CNM service is for further study.

7.5.2 CNM Access Rights Definition Service

This CNM service is for further study.

7.6 CNM supporting services

7.6.1 CNM Service Request service

7.6.1.1 CNM Service Request service definition

In the framework of the CNM, customers can directly manipulate resources represented by management information, through interaction between their management systems and the Service Provider's CNM System. In practice, there are numerous cases where the service provider will not let the service customer directly manage some resources. Allowing a customer to manipulate resources can affect security. The operations required for service provision or usage may need human intervention (for example, placing a device for performance measurement, or ordering a new X.25 interface).

Superseded by a more recent version

Therefore, functionality is needed to allow the customer to request a service provision or usage from the service provider. Functionality to control and monitor this request and to negotiate eventually some of its details is also required by the customer.

The service request function is associated with the service request service. It allows a Customer's Management System to request a service from the Service Provider's CNM System and provides the ability to:

- create and delete a service request;
- modify elements of the service request;
- be informed of modifications made, by the provider, on the service request;
- obtain all information about the service request processing results;
- propose the date at which the service is to be furnished;
- be informed about the fixed date for the service to be furnished;
- negotiate details of the service request (such as the dates);
- consult *a posteriori* all the information associated with a deleted service request.

7.6.1.2 CNM Service Request service description

See Table 6.

TABLE 6/X.161

Services request services

Function	Support	Services
Service request	M	Initiation of a service request Deletion of a service request Negotiation of a service request Retrieval of a service request

8 Compliance with this Recommendation

Recommendations that reference this Recommendation and define CNM interfaces (e.g. Recommendations X.162 and X.163) shall comply with this Recommendation and shall include a conformance clause period. This shall state that if a service defined in this Recommendation or a service set defined in Annex B is implemented, then at least the mandatory parts of that services shall be implemented.

Annex A

Summary of CNM services

(This annex forms an integral part of this Recommendation)

Table A.1 summarises for each of the CNM services currently defined in this Recommendation the CNM interface type on which they may be implemented (indicated by the letter X).

Superseded by a more recent version

TABLE A.1/X.161

Summary of CNM services

Group	Service Name	CNMc interface	CNMe interface
Fault management	CNM Alarm notification	X	FS
	CNM Fault History	FS	FS
	CNM Trouble Report	X	FS
	CNM Loop set-up	FS	FS
	CNM Test host	FS	FS
	CNM Protocol monitoring	FS	FS
Configuration management	CNM Configuration Inquiry	X	FS
	CNM Reconfiguration (includes Activate/Deactivate)	X	X
	CNM Ordering (includes PVC)	X	X
	CNM Cancellation	X	X
	CNM Systematic call re-direction	FS	FS
	CNM Inventory inquiry service	FS	FS
Accounting	CNM Periodic billing	FS	FS
	CNM Detailed accounting	FS	FS
	CNM Quota Control	FS	FS
	CNM Real-time Charging Information	FS	FS
Performance management	CNM Traffic information	X	FS
	CNM Quality of service	FS	FS
	CNM Network statistics	FS	FS
Security management	CNM Password Change Service	FS	FS
	CNM Access Rights definition	FS	FS
Supporting services	CNM Service Request	X	X

Annex B

CNM Service sets

(This annex forms an integral part of this Recommendation)

To encourage consistency of provision of CNM services to customers, this annex designates sets of CNM services. While services providers may offer CNM services in any combination, they are encouraged to provide CNM services according to one or more of these sets.

Superseded by a more recent version

The services included in each set are shown in Table B.1. Compatibility between the services sets offered by the services providers and those that can be used by the customer are shown in Table B.2. Additional CNM services may be offered with any of these above sets including CNM services defined in this Recommendation and network dependent CNM services.

NOTE – The CNM service sets will conform to specific elements of the common part of the functional ISPs. The definition of these conformance aspects is for further study.

TABLE B.1/X.161

Definition of the service sets

Services	Sets									
	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7	Set 8	Set 9	Set 10
Alarm Notification	X		X		X		X	X	X	
Configuration inquiry	X	X	X	X	X	X	X	X	X	X
Trouble Report		X		X		X	X	X	X	
Reconfiguration			X	X	X	X		X	X	X
Ordering and cancellation					X	X			X	X

NOTES

- 1 Service sets 1 to 10 may be provided over the CNMc interface. Service sets 2, 4, 6 and 10 may be provided over CNMe interface.
- 2 For configuration inquiry over the CNMe interface, the service set 2, 4, 6, and 10 will include this service when it is defined in the Recommendation X.163.
- 3 For Trouble Report over the CNMe interface, the service set 2, 4 and 6 will include this service when it is defined in the Recommendation X.163.

TABLE B.2/X.161

Service sets compatibility

Service sets provided by the service provider										Service sets usable by the customer
Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7	Set 8	Set 9	Set 10	
X		X		X		X	X	X		Set 1
	X		X		X	X	X	X		Set 2
		X		X			X	X		Set 3
			X		X		X	X		Set 4
				X				X		Set 5
					X			X		Set 6
						X	X	X		Set 7
							X	X		Set 8
								X		Set 9
				X				X	X	Set 10

NOTE – These apply to service sets over the same interface.

Superseded by a more recent version

Annex C

Functional units for the CNMc interface

(This annex forms an integral part of this Recommendation)

NOTE – This is a temporary annex. It is intended that this Recommendation will contain the description of CNM services independent of the specific CNM interface used.

C.1 Description

CMIS based CNM service uses various Functional Units, some of which are OSI System Management Functional Units. The implementation of each Functional Unit may be *Mandatory* or *Optional*.

Implementation of a *Mandatory* Functional Unit is essential for the provision of a CNM service. The *Optional* Functional Units provide additional capabilities that the service provider may wish to offer. The CMIS based CNM service is provided across the CNMc interface. Recommendation X.162 provides the appropriate management information which must be defined in order to fully specify a CNM service for use with CMIS.

C.1.1 Fault Management

C.1.1.1 CNM Alarm Notification Service

See Table C.1.

TABLE C.1/X.161

Alarm Notification functions, services, managed object classes and FUs

Functions	Support	Services	Managed object classes	FUs
Report Alarm	M	Alarm Reporting	All monitored classes (to be defined)	Alarm Reporting
Report State Change	O	State change reporting	All monitored classes (to be defined)	State change reporting
Inhibit/Allow alarm and state change reporting	O	Suspend/Resume alarm and state change reporting	Event Forwarding Discriminator	Basic report control (to be defined in this Rec.)
Condition alarm and state change reporting	O	Initiate/Terminate Alarm and State change reporting Set the EFD attributes	EFD	Enhanced report control (to be defined in this Rec.)
Request alarm and state change reporting conditions	O	Get the EFD attributes	EFD	Monitor event report

Relationships with other Recommendations

The CNM Alarm Notification service uses the Object Management Function defined in CCITT Rec. X.730 | ISO/IEC 10164-1 and the Alarm Reporting Function defined in CCITT Rec. X.733 | ISO/IEC 10164-4. It may also use the State Management Function defined in CCITT Rec. X.731 | ISO/IEC 10164-2 to indicate the operational state, and the Monitor Even Report Functional Unit or the Event Report Management Functional Unit of the Event Report Management Function defined in CCITT Rec. X.734 | ISO/IEC 10164-5.

Superseded by a more recent version

C.1.1.2 CNM Fault History Service

Detailed specifications, in particular FUs to be used, are for further study. This service may use the Monitor Log Functional Unit or the Control Log Functional Unit defined in CCITT Rec. X.735 | ISO/IEC 10164-6 to retrieve information contained in the records and change the criteria for logging. It may also use the Multiple Object Selection, Filter and Multiple Reply Functional Units defined in CCITT Rec. X.710 | ISO/IEC 9595 to select multiple log records.

C.1.1.3 CNM Trouble Report Service

The following function use the following Functional Units defined in Recommendation X.790:

- 1) *Basic Trouble Report Function*
 - kernel;
 - request Trouble Report Format;
 - add Trouble Information;
 - Trouble Report Status/Commitment Time Update Notification;
 - verify Trouble Repair Completion;
 - modify Trouble Administration information;
 - Trouble Administration Configuration Event Notification;
 - Trouble Report Progress Notification;
 - cancel Trouble Report;
 - extended modify Trouble Administration Information;
 - delete Telecommunications Trouble Report;
 - refer Telecommunications Trouble Report;
 - update State and Status;
 - repair activity Object.

When the Basic Trouble Report Function is provided, the Kernel functional unit shall be supported. The other ones are optional. The service provider may select the functional units to be supported.

- 2) *Planned maintenance reporting function*
 - Provider Trouble Report Control.
- 3) *Trouble History management function*
 - Review Trouble History Record;
 - Trouble History Event Notification.

The support of these two functional units is optional.

Relationships with Other Recommendations

Recommendation X.790 defines all the functional units that may be used for trouble management. Each functional unit specifies the services provided by the Application Service Element for the trouble management, and the managed objects involved for each functional unit.

This CNM service complies with the applicable parts of Recommendation X.790.

Superseded by a more recent version

TABLE C.2/X.161

Trouble Report functions, services, managed object classes and FUs

Functions	Support	Services	Managed object classes	FUs
Basic Trouble Report Control	M	Basic Trouble Report Handling	Telecommunications Trouble Report Trouble Report Format Definition Repair activity Contact EFD	Kernel Request Trouble Report Format Add Trouble Information Trouble Report Status/ Commitment Time Update Notification Verify Trouble Repair Completion Modify Trouble Administration information Trouble Administration Configuration Event Notification Trouble Report Progress Notification Cancel Trouble Report Extended Modify Trouble Administration Information Delete Telecommunications Trouble Report Refer Telecommunications Trouble Report Update State and Status Repair Activity Object
Planned maintenance reporting	O	Planned maintenance information notification	Provider Trouble Report	Provider Trouble Report Control
Trouble HistoryManagement	O	Trouble History Retrieval	Trouble History RecordLog	Trouble History Event Notification, Review Trouble History Record

Superseded by a more recent version

C.1.2 Configuration Management

C.1.2.1 CNM Configuration Inquiry Service

The provision of the CNM Configuration Inquiry Service via the CNMc interface is described in Table C.3.

The objects and attributes that may be modified by this service are contained in Recommendation X.162.

TABLE C.3/X.161

Configuration inquiry functions, services, managed object classes and FUs

Functions	Support	Services	Managed object classes	FUs
Full configuration inquiry	M	Complete configuration acquisition	All monitored objects: location, contact, customer, cnmsuser	MOS MR Monitor
Partial configuration inquiry	O	Partial configuration acquisition	All monitored objects: location, contact, customer, cnmsuser	MOS MR Filter Monitor
Configuration update	O	Automatic configuration update	All monitored objects: location, contact, customer, cnmsuser	Object event State change reporting

NOTE – The term monitored object classes is used to designate any managed object class representing the managed resources. For example X.25 profile as defined in Recommendation X.162. Management support object classes as defined in CCITT Rec. X.721 | ISO/IEC 10165-2 (such as Log, EFD) are not monitored object classes.

Relationships with other Recommendations

This CNM service uses the monitor and the objectEvents functional units of the Object Management Function defined in CCITT Rec. X.730 | ISO/IEC 10164-1 and the state change reporting functional unit of the state management function defined in CCITT Rec. X.731 | ISO/IEC 10164-2. It also uses the Multiple Object Selection (MOS), Filter and Multiple Reply (MR) Functional Units of CMIS defined in CCITT Rec. X.710 | ISO/IEC 9595.

C.1.2.2 CNM Reconfiguration Service

The minor reconfiguration FU contains the attributes setting and attributes setting reporting services.

The immediate reconfiguration function is associated with reconfiguration service and it is mandatory. It allows the customer to directly and immediately modify the attribute values of existing managed objects. The objects and attributes that may be modified by this service are contained in Recommendation X.162. The objects and attributes that can actually be modified will be defined by the service provider.

Superseded by a more recent version

TABLE C.4/X.161

Service reconfiguration function, services, managed object classes and FU

Function	Support	Services	Managed object classes	FUs
Immediate reconfiguration	M	Attributes setting Attributes setting reporting	All monitored classes with GET-REPLACE attributes	Minor reconfiguration

Relationships with other Recommendations

This CNM service uses the PT-GET, PT-SET and Attribute value change reporting services defined in CCITT Rec. X.730 | ISO/IEC 10164-1.

C.1.3 Accounting Management

C.1.3.1 CNM Periodic billing service

Detailed Specifications, in particular FUs are for further study. This service may use the Control, Monitor and ObjectEvents Functional Units of the Object Management Function defined in CCITT Rec. X.730 | ISO/IEC 10164-1. It may also use the Multiple Object Selection and Filter Functional Units defined in CCITT Rec. X.710 | ISO/IEC 9595.

The objects and attributes that may be modified by this service will be contained in Recommendation X.162.

C.1.4 Performance Management

C.1.4.1 CNM Traffic Information Service

The following functional units are defined in this Recommendation for the managed object classes of this CNM service:

- a) *Interval assignment and traffic retrieval* – This functional Unit requires support of:
 - 1) the PT-GET, PT-SET, PT-CREATE and PT-DELETE services for instances of currentTrafficData, managed object class and any of their subclasses;
 - 2) object creation reporting, object deletion reporting for currentTrafficData.
- b) *Basic traffic data collection control functional unit* – This functional unit requires support of:
 - 1) the PT-GET and PT-SET services on the administrativeState of instances of currentTrafficData managed object class and any of their sub-classes;
 - 2) attribute value change reporting and state change reporting services for currentTrafficData.
- c) *Extended traffic data collection control functional unit* – This functional unit requires support of:
 - the PT-GET and PT-SET services on scheduling attributes for instances of currentTrafficData managed object class and any of their sub-classes.
- d) *History duration assignment*
 - the PT-GET, PT-SET services on duration attributes on instances of currentTrafficData managed object class, and any of their sub-classes.

Superseded by a more recent version

- e) *Traffic history retrieval*
 - the PT-GET, PT-SET services on duration attributes on instances of historyTrafficData managed object class, and any of their sub-classes.
- f) *Suppress all zero*
 - the PT-GET, PT-SET services on attributes on instances of historyTrafficData managed object class, and any of their sub-classes.

In addition to the basic trafficDataCollectionControl unit, scheduling and zero suppressing may be requested.

Relationships with other Recommendations

The CNM traffic information service makes use of CCITT Rec. X.730 | ISO/IEC 10164-1, CCITT Rec. X.731 | ISO/IEC 10164-2 and Recommendation Q.822.

TABLE C.5/X.161

CNM Traffic Information functions, services, managed object classes and FUs

Functions	Support	Services	Managed object Class	FUs
Assign collection interval and retrieve traffic data	M	Traffic data collection interval assignment Traffic data retrieval	Monitored objects currentPacketTrafficData, currentMLPTrafficData currentSLPTrafficData	Interval assignment and traffic retrieval
Suspend/Resume traffic data collection	O	Traffic data collection suspension/ Retention	currentPacketTrafficData, currentMLPTrafficData currentSLPTrafficData	Basic Traffic data collection control
Schedule traffic data collection	O	Traffic data collection scheduling	currentPacketTrafficData, currentMLPTrafficData currentSLPTrafficData	Extended Traffic data collection control
Assign history duration and retrieve traffic history data	O	Traffic history data duration assignment	currentPacketTrafficData, currentMLPTrafficData currentSLPTrafficData	History duration assignment
	O	Traffic history data retrieval	historyPacketTrafficData historyMLPTrafficData historySLPTrafficData	Traffic history retrieval
Suppress all zero data	O	Zero Suppressing	historyPacketTrafficData historyMLPTrafficData historySLPTrafficData	Suppress all zero

C.1.5 CNM supporting services

C.1.5.1 CNM Service Request Service

Recommendation X.162 defines the Service Request managed object class which is used as the generic class to be used for all service requests.

The solution is based on the instantiation of managed object classes which models the service requested and provides information on the different phase of the service processing.

The provision of the CNM Service Request service via the CNMc interface is described in Table C.6.

Superseded by a more recent version

TABLE C.6/X.161

Service request function, services, managed object classes and FUs

Function	Support	Services	Managed object classes	FUs
Service request	M	Initiation of a service request Deletion of a service request Negotiation of a service request Retrieval of a service request	Service request managed object class and its sub-classes	Service request control

This function must be used in conjunction with an instance of the Service Request managed object class.

The service request control functional unit contains the initiation of a service request, deletion of a service request, modification of a service request and service provider initiated modifications reporting services.

Detailed description:

- The serviceRequest object allows the performance of many services in one request, such as the creation of many objects of the same type. The mandatory operationList attribute allows the Customer’s Management System to specify the different operation he would like to perform. This attribute is in fact an ordered list of OperationArgument (CMIP syntax OperationArgument). A default value (empty list) is specified .
- The Service Provider’s CNM System can specify if the realisation of the different services be down in order or not. When the order is important, the Customer’s Management System is able to decide what to do in case of operation failure (to stop or to continue the request). Either the treatment of the operation sequence is “atomic”, meaning that each operation is performed separately (if one of them leads to an error, then no operation is realised), or the objective is to do “the best possible” (bestEffort), which means that each operation is attempted and succeeds or not. The order in which the operations are attempted is important. Each operation modifies the MIB and so affects the conditions of success of it.

If the Customer’s Management System doesn’t specify any “treatment, the default treatment is bestEffort.

- The Customer’s Management System has the possibility to specify when it wants that the requested services should be performed, with a priority order or a precise date. The mandatory dateRequest attribute allows the Customer’s Management System to do that. The Service Provider’s CNM System can modify this attribute value during the negotiation phase. The attribute syntax can indicate that the date is:
 - doesn’t matter;
 - immediately;
 - a precise date.
- The Service Provider’s CNM System can negotiate with the Customer’s Management System the features of the request with the dialogue attribute of the conditional dialogPackage Package. They can exchange text information. This allows the Customer’s Management System to give to the Service Provider more information about the implementation of the service, to help the negotiation.
- The Customer’s Management System can delete a service request if it is still in negotiation phase with the Service Provider’s CNM System. After the service processing has begun, the serviceRequest deletion by the Customer’s Management System is impossible. A try of deletion or modification should fail and cause a processingFailure type CMIP error with a specific parameter error: sRChangeDenied.

Superseded by a more recent version

- The contactAgent and contactManager attribute of the serviceRequest object can identify the contact people, if any, by the Service Provider's CNM System and by the Customer's Management System. The syntax allows to point to a pre-existing contact instance, or to indicate a name in a graphic string or to keep unknown (NULL). A default value is specified (unknown).
- The services are only performed in the direction Service Provider's CNM System for Customer's Management System. The complete answer of the request operation is not returned to the Customer's Management System. Nevertheless, he receives a short report for each operation. The resultList attribute gives the ordered operation result list in the same order as the operation list. Initially, the attribute is an empty list. The list is then filled progressively with the result of the completed operations. In the same time, attributeValueChange Notification is transmitted to the Customer's Management System.

For each operation, the possible result values are:

- fully succeeded;
- failed;
- not attempted.

The different operations can be performed in a different order than the order of the operation list, but the result list is filled in the same order.

Initiation of a service request

The initiation of a service request service is used to allow the Customer's Management System to request the Service Provider's CNM System to create an instance of the Service Request managed object class. It defines the service request parameters.

When a Service Request managed object is created, it generates an Object Creation notification containing a notification identifier, the status (progress state), the contact name (service request initiator).

Deletion of a service request

The deletion of an instance of the Service Request managed object class is used to allow the Customer's Management System to request the Service Provider's CNM System to delete a Service Request managed object. At any time after the creation and before the normal end of the negotiation, the customer is able to close the request deleting the Service Request instance. Otherwise, the Service Request instance is normally deleted after all the service request results are provided.

When a Service Request managed object is deleted, it generates an Object Deletion notification containing the deletion date and time.

Negotiation of a service request

This service is used to allow the Customer's Management System and the Service Provider's CNM System to negotiate the conditions of the service provision. It allows the Service Provider's CNM System to notify the Customer's Management System of the condition it proposes. It allows the Customer's Management System to modify a serviceRequest managed object.

The mandatory status attribute gives the current state of the request. Four states are identified by the integer 0, 1, 2, 3. When a request is created by a Customer's Management System, the initial state is 0 (customer agreement). That means that the Customer's Management System has initialised the parameters of his request and is waiting for the Service Provider's CNM System answer. The state has always this 0 value (customer agreement) when the Customer's Management System agrees with the current term of the request. In this way, the Service Provider's CNM System knows that the Customer's Management System is waiting for an answer.

If the Service Provider's CNM System accepts all the terms of the request, the state takes the value 2 (serviceBeingProcessed). That means that the performance of the request has began (the request can not be cancelled any more).

The state 3 (endOfProcessing) indicates that the service request has been realised. The resultList attribute can be consulted by the Customer's Management System.

Superseded by a more recent version

If the Service Provider's CNM System cannot accept the proposal of the Customer's Management System, it modifies the parameters which it cannot accept and make a new proposal to the Customer's Management System. In this case, the state attribute changes to 1 (providerAgreement). The new value of the state attribute warns the Customer's Management System that the Service Provider's CNM System is waiting for an answer from him. Then, the Customer's Management System can accept the request (it changes the state attribute to 0) or modify some parameters it doesn't agree with and make a new proposal (the state attribute changes to 0). This continues until both Service Provider's CNM System and Customer's Management System agree on a proposal.

The service Provider's CNM System and the Customer's Management System can use a conditional package in the negotiation, the negotiationPackage package which contains the limitValidityDate attribute. This attribute can be used in turn by the Service Provider's CNM System and Customer's Management System during the negotiation phase. Every time one of them makes a new proposal to the other one, the requestor can use this attribute to indicate the limit validity date of its proposal. If there is no response from the interlocutor before this date, the request is not valid anymore and the serviceRequest instance is deleted.

NOTE 1 – When an attribute or a set of attributes is modified, the serviceRequest managed object generates an Attribute Value Change notification containing a list of the modified attributes, their old value(s), their new value(s), and the time of modification.

Retrieval of a service request

This service is used to allow the Customer's Management System to request the Service Provider's CNM System to retrieve attribute values of a Service Request managed object.

The Customer's Management System is informed that the requested service is available by an objectCreation notification emitted by the instance modelling the service provided.

The state diagram of the service request process is given in Figure C.1.

NOTE 2 – The CMIP argument optional parameter accessControl has no utility in the service request service.

NOTE 3 – The serviceRequest object allows the request of operation on instance. The concerned CMIP operations are ACTION, CREATE, DELETE, GET, SET, (and not CANCEL-GET). A particular implementation can limit the number of CMIP operations.

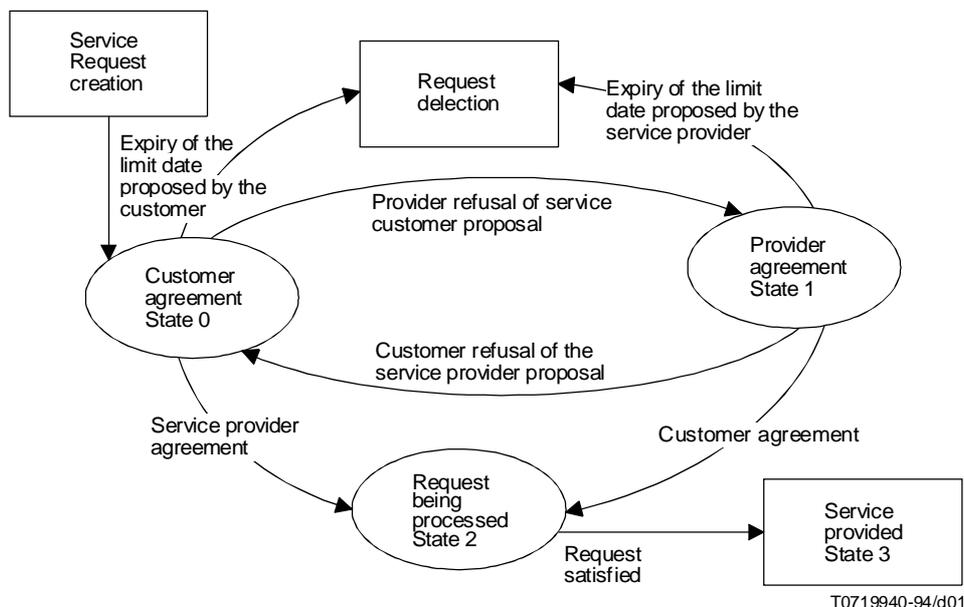


FIGURE C.1/X.161

State diagram of the service request process

Superseded by a more recent version

Relationships with other Recommendations

This CNM service uses the PT-GET, PT-SET, PT-CREATE, PT-DELETE, objectCreation and objectDeletion and Attribute value change reporting services defined in CCITT Rec. X.730 | ISO/IEC 10164-1.

C.2 Referenced Functional units

The following FUs are defined in Recommendations referenced by this Recommendation:

- Alarm Reporting FU defined in CCITT Rec. X.733 | ISO/IEC 10164-4.
- State change reporting FU defined in CCITT Rec. X.731 | ISO/IEC 10164-2.
- Monitor event report FU defined in CCITT Rec. X.734 | ISO/IEC 10164-5.
- Multiple Object Selection (MOS) FU defined in CCITT Rec. X.710 | ISO/IEC 9595.
- Multiple Reply (MR) FU defined in CCITT Rec. X.710 | ISO/IEC 9595.
- Filter FU defined in CCITT Rec. X.710 | ISO/IEC 9595.
- Monitor FU defined in CCITT Rec. X.730 | ISO/IEC 10164-1.
- Object event FU defined in CCITT Rec. X.730 | ISO/IEC 10164-1.
- Kernel FU defined in Recommendation X.790.
- Request Trouble Report Format defined in Recommendation X.790.
- Add Trouble Information defined in Recommendation X.790.
- Trouble Report Status/Commitment Time Update Notification defined in Recommendation X.790.
- Verify Trouble Repair Completion defined in Recommendation X.790.
- Modify Trouble Administration information defined in Recommendation X.790.
- Trouble Administration Configuration Event Notification defined in Recommendation X.790.
- Trouble Report Progress Notification defined in Recommendation X.790.
- Cancel Trouble Report defined in Recommendation X.790.
- Extended Modify Trouble Administration Information defined in Recommendation X.790.
- Delete Telecommunications Trouble Report defined in Recommendation X.790.
- Refer Telecommunications Trouble Report defined in Recommendation X.790.
- Update State and Status defined in Recommendation X.790.
- Repair activity Object defined in Recommendation X.790.
- Provider Trouble Report Control defined in Recommendation X.790.
- Review Trouble History Record defined in Recommendation X.790.
- Trouble History Event Notification defined in Recommendation X.790.

C.3 Functional units defined in this Recommendation

The following FU's may be used as defined in Recommendation X.162:

- 0 Basic report control;
- 1 Enhanced report control;
- 2 Minor Reconfiguration;
- 3 Interval assignment and traffic retrieval;
- 4 Basic traffic data collection control;

Superseded by a more recent version

- 5 Extended traffic data collection control;
- 6 History duration assignment;
- 7 Traffic history retrieval;
- 8 Suppress all zero;
- 9 Service request,

where the number identifies the bit positions in the BIT STRING assigned to the functional units, and the names referencing the functional units are as defined in this Recommendation.

Annex D

Element of procedure for provision of CNM services

(This Annex forms an integral part of this Recommendation)

NOTE – This is a temporary annex. It is intended that this Recommendation will contain the description of CNM services independent of the specific CNM interface used.

D.1 CNMc interface

This part describes the element of procedure to be used for provision of CNM services through the CNMc interface.

D.1.1 Fault Management

D.1.1.1 CNM Alarm Reporting Service

The Alarm Reporting service is invoked by the Service Provider's CNM management system by issuing an MAPDU corresponding to an Alarm Report notification as defined in CCITT Rec. X.733 | ISO/IEC 10164-4. If the Alarm Report is sent in a confirmed mode, upon its receipt the Customer's Management System will acknowledge it. This service is invoked only if the discrimination criteria of the EFD permits to report the notification to the Customer's Management system.

The State change reporting service is invoked by the Service Provider's CNM management system by issuing an MAPDU corresponding to a State Change reporting notification. If this MAPDU is sent in a confirmed mode, upon its receipt the Customer's Management System will acknowledge it. This service is invoked only if the discrimination criteria of the EFD permits to report the notification to the Customer's Management System.

The Suspend/Resume alarm and state change reporting service is invoked by the Customer's Management System by issuing a PT-GET on the administrative state of the EFD.

The Initiate alarm and state change reporting service is invoked by the Customer's Management System by issuing a PT-CREATE with the managed object class parameter set to the EFD OBJECT IDENTIFIER.

The Terminate Alarm and State change reporting service is invoked by the Customer's Management System by issuing a PT-DELETE to the EFD.

The set EFD attributes is invoked by the Customer's Management System by issuing a PT-GET to some or all of the GET-REPLACE EFD attributes except the Administrative State attribute.

D.1.1.2 CNM Trouble Report Service

The elements of procedure for this CNM service are as specified in Recommendation X.790.

D.1.2 Configuration Management

D.1.2.1 CNM Configuration Inquiry Service

The complete configuration acquisition service is invoked by the Customer's Management System by issuing a scoped PT-GET service on the whole subtree. Upon receipt of the PT-GET, the Service Provider's CNM System will respond with the adequate number of linked replies.

Superseded by a more recent version

The partial configuration acquisition service is invoked by the Customer's Management System by issuing a scoped and/or filtered PT-GET. Upon receipt of the PT-GET the Service Provider's CNM System will respond with the adequate number of linked replies.

The automatic configuration update service is invoked by the Service Provider's CNM System by spontaneously emitting an objectCreation, objectDeletion, attributeValueChange or stateChangeReporting notifications to the Customer's Management System. Depending on the service provider policy, these notifications may or may not need to be confirmed by the Customer's Management System.

D.1.2.2 CNM Reconfiguration Service

The attribute setting service is invoked by the Customer's Management System by issuing a PT-GET which may be scoped to the GET-REPLACE attributes of the objects to be modified.

The attribute setting reporting service is invoked by the Service Provider's CNM System by issuing one (or several) MAPDU corresponding to attribute value change reporting notification(s) of the modified object(s).

D.1.3 Performance Management

D.1.3.1 CNM Traffic information service

The traffic data collection interval assignment service is invoked by the Customer's Management System by issuing a PT-SET service with the granularity period attributes set to one of the values allowed by the service provider.

The traffic data retrieval service is invoked by the Customer's Management System by issuing a PT-GET service on the currentPacketTrafficData, currentMLPTrafficData or currentSLPTrafficData managed objects.

The traffic data collection suspension/retention service is invoked by the Customer's Management System by issuing a PT-GET service with the administrativeState attribute set to the value Locked/unLocked.

The traffic data collection scheduling service is invoked by the Customer's Management System by issuing a PT-SET service with the values of the startTime and stopTime attributes or with the value of the intervalOfDay attribute.

The traffic history data duration assignment service is invoked by the Customer's Management System by issuing a PT-SET service with a permissible integer value for the historyRetention attribute.

The traffic history data retrieval service is invoked by the Customer's Management System by issuing a PT-SET service on historyPacketTrafficData, historyMLPTrafficData or historySLPTrafficData managed objects. Scoping and/or filtering criteria may be applied.

The zero suppressing service is used if currentPacketTrafficData, currentMLPTrafficData or currentSLPTrafficData managed objects have the zeroSuppression package and if an interval terminates with 'all-zeros' performance measurements.

D.1.3.2 CNM Network Statistics service

This service is for further study.

D.2 CNMe interface

This part describes the element of procedure to be used for provision of CNM services through the CNMe interface.

D.2.1 Fault Management

D.2.1.1 CNM Fault History Service

This service may be provided across the CNMe interface, if the necessary time for message transit across an EDI/MHS system is not considered as a barrier for the service provision.

Superseded by a more recent version

This service may be provided in a synchronous or an asynchronous mode:

- *Asynchronous mode* – by using the information request service described further in this Recommendation: the customer transmits via EDI/MHS a message containing the parameters of the request. The service provider's system answers by transmitting an EDIFACT message, via EDI/MHS, to the customer.
- *Synchronous mode* – the service provider's system periodically transmits to the customer a set of EDIFACT messages containing the required information.

The customer may select the objects (X25 access or PVC) and the type of information he wants to get by specifying selection criteria, either in the request message, or by agreement with the service provider.

This service is for further Study.

D.2.2 Configuration Management

D.2.2.1 CNM Configuration Inquiry Service

Full inquiry and partial inquiry services may be provided using the **information request service** which is for further study.

For automatic configuration update, the service provider's system transmits to the customer the updated configuration of one or more objects that have been modified either by customer action or by the service provider, itself.

D.2.2.2 CNM Reconfiguration Service

The CNM reconfiguration service uses the CNM request service across the CNMe interface defined in this Recommendation.

D.2.2.3 CNM Ordering Service

The EDI forms to be used for this service are specified in Recommendation X163. A customer may also attach customer reference information to all subscribed services.

The CNM ordering service uses the CNM Service Request service provided across the CNMe interface as defined in this Recommendation.

D.2.2.4 CNM Cancellation Service

The CNM Cancellation service uses the CNM Service Request service provided across the CNMe interface as defined in this Recommendation.

D.2.3 Accounting Management

D.2.3.1 CNM Periodic Billing Service

The provision of this CNM service across the CNMe interface is for further Study.

D.2.4 Performance Management

D.2.4.1 CNM Traffic Information Service

This CNM Service is for further study.

D.2.4.2 CNM Network Statistics service

The provider's management system sends periodically one or more EDIFACT messages containing the aggregated information. The period between two sending may be defined by contract.

Superseded by a more recent version

The information may contain:

- exchanges (volume, duration, number of calls) per caller/called couple, inside the network;
- volume and duration sent and received by each access;
- engagement in number of logical channel set-up per connection;
- engagement in number of virtual circuit set-up per caller/called couple;
- etc.

This CNM service is for further Study.

D.2.5 CNM supporting service

D.2.5.1 CNM Service Request Service

Recommendation X.163 defines EDI forms to be used for provision of this service across the CNMe interface.

In the CNMe framework, CNM Service Request service may be used in every case where a contractual information exchange is needed. The financial aspect of this contractual exchange is outside the scope of Recommendation X.163.

The CNM Service Request service, in the CNMe framework, is functionally similar to the service request service in the CNMc framework.

Elements of procedure are specified hereafter:

a) *Initiation of a service request*

The Customer's Management System creates an ORDERS EDIFACT message and sends it to the provider's management system via MHS.

In response, provider's management system creates an acknowledgement EDIFACT message which indicates whether the ORDERS EDIFACT message is correct or not:

- A negative acknowledgement indicates that the ORDERS message is syntactically incorrect. The service order procedure is abandoned.
- A positive acknowledgement indicates that the ORDERS message is syntactically correct and is being processed. This indicates that the service request was taken into account in the provider's management system.

b) *Negotiation of a service request:*

After the initiation stage, the provider's management system creates and then transmits, via MHS, an ORDRSP EDIFACT message, which is the response to the ORDERS message. It may indicate:

- An **acceptance** of all the order's parameters.
- A **modification proposal** of the former order's parameters.
- A **refusal of the order**: The reasons may be linked to contractual problems or to technical problems.

In both cases, the Customer's Management System has to transmit an acknowledgement message which indicates whether the ORDRSP EDIFACT message is correct or not:

- a negative acknowledgement (CONTRL) indicates that the ORDRSP message is syntactically incorrect;
- a positive acknowledgement (ORDRSP) indicates that the orders message is syntactically correct and is that the ORDRSP message is taken in account.

If the ORDRSP includes a modification proposal of the order's parameters, the customer management system may execute one of the following action:

- **Accept** the modification proposal by sending an ORDRSP EDIFACT message which contains the ORDRSP parameters and the acceptance and mentions the related former ORDERS.
- **Refuse** the modification proposal – in this case the service order will not be completed.
Propose some modifications to the parameters contained in the ORDRSP message.

The process may be iterated

Superseded by a more recent version

c) *Processing indication*

The specification of this element of service is for further Study.

d) *Service order deletion*

The Customer's Management System send an ORDERS message which indicates that the related former order is cancelled.

Annex E

Typical sequences of CNM services

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

E.1 Introduction

The CNM Service is divided into six main service Groups as follows:

- Fault Management;
- Configuration Management;
- Accounting Information;
- Performance Management;
- Security Management;
- Service Inquiry.

Each of these service groups is divided into specific functions that are themselves provided by elementary services. This annex gives typical sequences of these elementary services for each function.

E.2 Fault Management

The Fault Management service group is divided into the following functions:

- Alarm Notification;
- Fault History;
- Trouble Report;
- Loop set up;
- Test host;
- Protocol monitoring.

This service group can also be divided into functions that concern loss of service (e.g. line down), and functions that concern performance trouble (e.g. connect time exceeds agreed level).

E.2.1 Alarm Notification (or Fault Event Handling)

A fault event can be characterised by the following attributes:

- type of event;
- entity where generated;
- perceived gravity;
- responsibility.

The typical information flows of elementary services are shown in Figure E.5.

A fault event is one that prevents the provision of the expected service. The event, therefore, may be in the customers or the providers network. The usual work flow is notification --> identification --> analysis --> resolution.

Superseded by a more recent version

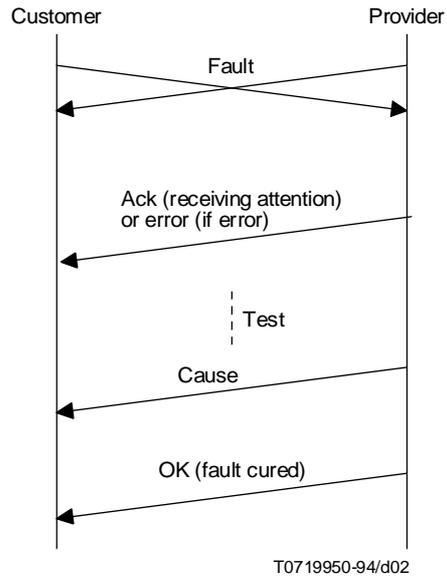


FIGURE E.1/X.161
Fault event information flow

E.2.2 Fault History

Fault histories could be provided periodically or on request as shown pictorially in Figures E.2 and E.3.

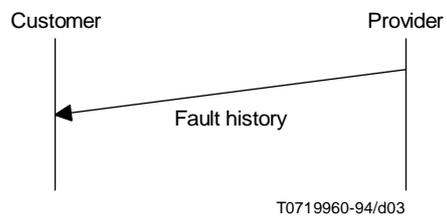


FIGURE E.2/X.161
Periodic fault history information flow

Superseded by a more recent version

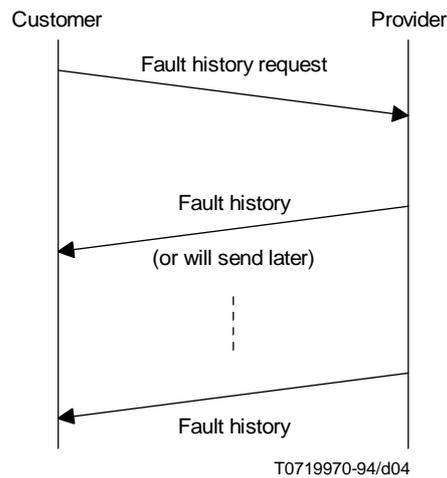


FIGURA E.3/X.161

Requested fault history information flow

The fault history request message could include information such as:

- period;
- level of reporting;
- particular fault numbers.

The fault history report message could include information such as:

- period covered;
- faults or no faults in period.

If there are faults, then for each:

- identification of object;
- severity;
- service below agreed level or not;
- duration of fault;
- outstanding or resolved;
- perceived course;
- responsibility;
- date and time of occurrence;
- date and time of resolution – or expected date of resolution;
- status (open, closed, in process).

To this would be added standard information such as Customer identification. Actions taken to resolve the problem could include a visit to the customer site that the customer will be charged for, or is covered in the service agreement.

Summary information could be included which would provided information such as number of faults if each gravity level, total down-time, and so on.

Superseded by a more recent version

E.2.3 Trouble Report

This function is for further study.

E.2.4 Loop set-up

This function is for further study.

E.2.5 Test host

This function is for further study.

E.2.6 Protocol monitoring

This function is for further study.

E.3 Configuration Management

The Configuration Management service group is divided into the following functions:

- Configuration inquiry.
Two subsets are planned: full inquiry (all information) and partial. The latter is more difficult as it requires filtering criteria.
- Service Reconfiguration (within the terms of the contract).
- Service Ordering (change to the terms of the contract).
- Service Inventory inquiry.
- Systematic call redirection.

These services could cover all sorts of matters such as X.25 line, speech line, window size, packet size, closed user groups and so on.

E.3.1 Configuration inquiry

A configuration inquiry may be for a complete set of information related to a particular customer or for a partial set (according to some selection criteria). It would also be possible to have an automatic configuration update service.

The information flows for these services are likely to be simple request/response pairs as depicted in Figure E.4:

Refer also to the Service Inquiry service clause.

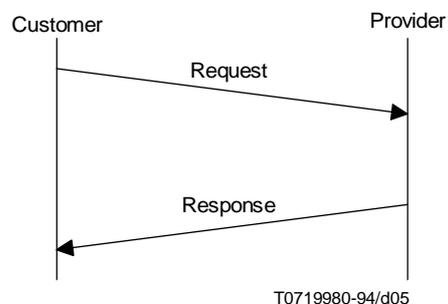


FIGURE E.4/X.161
Service inquiry information flow

Superseded by a more recent version

E.3.2 Service Reconfiguration

This function is for further study.

E.3.3 Ordering Service

This may be divided into the following functions:

- service subscription;
- service reconfiguration (implying change to the contract);
- service cancellation.

E.3.3.1 X.25 Ordering

This is a specific example. Entity-relationship techniques can be used to model the basic data that could then be mapped to EDIFACT data items, or ASN.1 Managed Objects for use with CMIP. Business process rules can be used to define the flow of information. A pictorial example for an order for an X.25 line is given in Figure E.5.

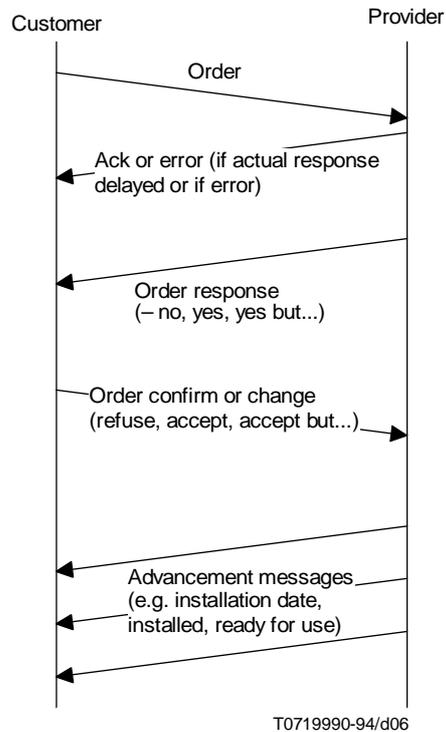


FIGURE E.5/X.161
Information flow for an X.25 line

E.3.4 Inventory inquiry

This function is for further study. Refer also to the Service Inquiry service clause.

E.3.5 Systematic call re-direction

This function is for further study.

Superseded by a more recent version

E.4 Accounting Services

The Account Management service group is divided into the following functions:

- periodic billing;
- detailed accounting, such as tariff communications (e.g. price lists);
- Quota control;
- Real-time charging information.

E.4.1 Periodic billing

This function is for further study.

E.4.2 Detailed accounting

This function is for further study.

E.4.3 Quota control

This function is for further study.

E.4.4 Real-time charging information

This function is for further study.

E.5 Performance Management Service

The Performance Management service group is divided into the following functions:

- traffic information;
- Quality of Service information.

E.5.1 Traffic information

The Traffic information function may be further divided into the following functions:

- Real-time traffic information;
- traffic statistics.

E.5.1.1 Real-time traffic information

This function is for further study.

E.5.1.2 Traffic Statistics Service

The Traffic Statistics function is divided into the following elementary functions:

- statistics of access (at a port);
- statistics of performance;
- network statistic (overall pattern of calls – get from billing system).

Information for the first two items would come from the network itself and concern statistics such as volume transmitted, duration, number of calls on a line, number of rejected calls, and so on.

E.5.2 Quality of Service

This function is for further study.

E.6 Security Management

This whole service group is for further study. At present it is intended to provide the following functions.

Superseded by a more recent version

E.6.1 Password change

This function is for further study.

E.6.2 Access rights

This function is for further study.

E.7 Service Inquiry Service

The Service Inquiry service group is divided into the following functions:

- configuration inquiry;
- inventory inquiry.

Each of these could be complete inquiries or partial inquiries (according to some selection criteria). It would also be possible to have an automatic configuration update service.

The information flows for these services are likely to be simple request/response pairs as depicted in Figure E.6:

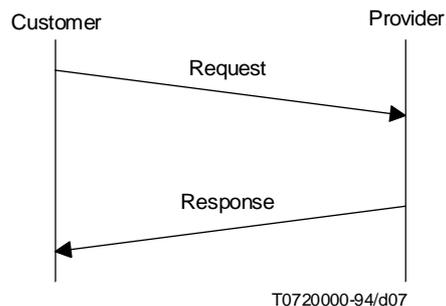


FIGURE E.6/X.161
Service inquiry information flow

The situation is complicated by the fact that the customer could be using more than one network as shown in Figure E.7. Thus, there will be a need for an identification scheme for networks, network elements, services, physical items, data rates, and so on.

Partial inquiries require the specification of criteria for the selective retrieval of information. In general, this requires means of specifying and communicating “and”, “or”, nesting relationships, and so on. One way of supporting these requirements could be to reveal some of the Service Provider’s database structure. A “catalogue” elementary service could be used so long as this supports nesting and logical relationships.

The logical division of service inquiries according to the user’s view is depicted in Figure E.8.

E.7.1 Identification

Directory Relative Distinguished Names (RDN) can be used as an hierarchical naming mechanism. It is for further study as to whether this is inadequate to meet all the demands for names required in the CNM Series of Recommendations. There is a need to consider the applicability of Directory Relative Distinguished Names (RDN) to the CNMe realisation and the place of other naming schemes.

Superseded by a more recent version

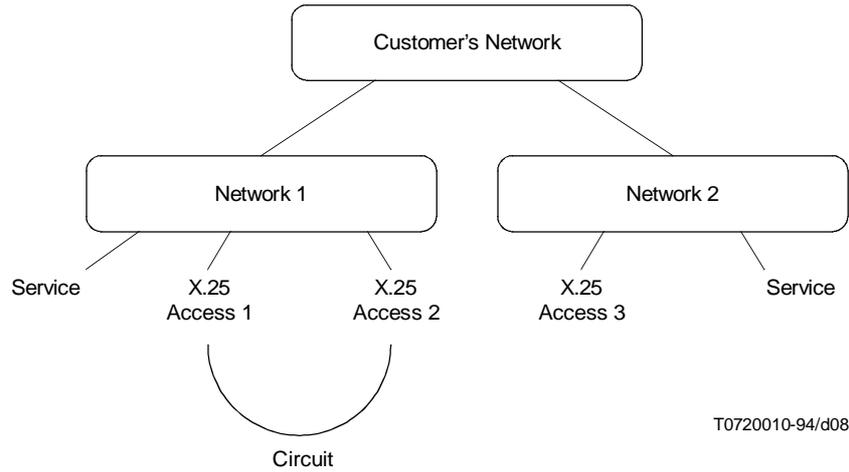


FIGURE E.7/X.161
Customer's network view

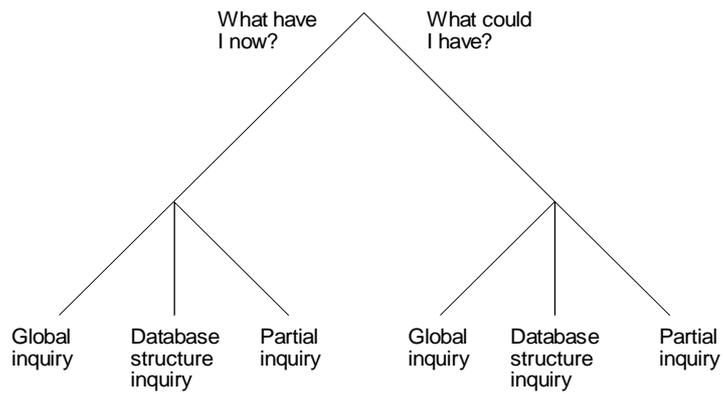


FIGURE E.8/X.161
Inquiry relationships