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Telecommunications management network

TMN management service: maintenance aspects of B-ISDN management

ITU-T Recommendation M.3207.1

(Previously «CCITT Recommendation»)

FOREWORD

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ITU-T Recommendation M.3207.1 was prepared by ITU-T Study Group 4 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 12th of May 1996.

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NOTE

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

CONTENTS

SUMMARY

This Recommendation describes the TMN management service for the maintenance aspect of B-ISDN management with using GDMS (Guideline for the Definition of TMN Management Services).

KEYWORDS

B-ISDN, Telecommunications Management Network (TMN), TMN management service.

Recommendation M.3207.1

TMN MANAGEMENT SERVICE: MAINTENANCE ASPECTS
OF B-ISDN MANAGEMENT

(Geneva, 1996)

1 Scope

This Recommendation describes the TMN management service for the maintenance aspect of B-ISDN management.

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 the currently valid ITU-T Recommendations is regularly published.

[1]   ITU-T Recommendation M.3610 (1996), *Principles for applying the TMN concept to the management of B-ISDN*.

[2]   ITU-T Recommendation I.311 (1993), *B-ISDN general network aspects*.

[3]   ITU-T Recommendation G.803 (1993), *Architectures of transport networks based on the Synchronous Digital Hierarchy (SDH)*.

[4]   CCITT Recommendation M.3400 (1992), *TMN management functions*.

[5]   CCITT Recommendation M.1400 (1992), *Designations for international networks*.

[6]   ITU-T Recommendation I.610 (1995), *B-ISDN operation and maintenance principles and functions*.

[7]   ITU-T Recommendation M.3020 (1995), *TMN interface specification methodology*.

[8]   CCITT Recommendation M.3200 (1992), *TMN management services: Overview*.

[9]   ITU-T Recommendation I.326 (1995), *Functional architecture of transport networks based on ATM*.

3 Abbreviations

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

ATM   Asynchronous Transfer Mode

GDMS   Guidelines for the Definition of TMN Management Services

MSP   Management Service Provider

NEF   Network Element Function

OAM   Operation, Administration and Maintenance

OSF   Operations System Function

TIB   Task Information Base

TMN   Telecommunications Management Network

UNI/NNI   User Network Interface/Network Node Interface

VP/VC   Virtual Path/Virtual Channel

4   TMN management service description based on GDMS

This clause presents the TMN management service based on GDMS, which is specified in Recommendation M.3020 [7].

The GDMS makes use of references to the functions in Recommendation M.3400 [4]. The references in this Recommendation are referring to the published 1992 version of Recommendation M.3400. Best efforts have been made to accommodate current developments in Recommendation M.3400.

In general in this Recommendation, OSF and NEF take manager and agent roles respectively.

4.1   Management service description

This TMN management service deals with the maintenance aspect of the management of B-ISDN by the TMN in the functional areas of:

–   fault management including alarm surveillance and testing;

–   performance management in terms of performance monitoring functions associated with the ATM layer;

–   configuration management needed to handle virtual connections; and

–   security management.

4.2   Management goals

Using the B-ISDN Telecommunications Managed Area (see [8]), TMN users, including network operators and B-ISDN customers, can provide and maintain physical/logical resources constructing B-ISDN efficiently. The objective of this managed area is to supply B-ISDN customers with a high quality service through such provisioning and maintenance activities. The architecture, to which the B-ISDN Telecommunications Managed Area is applied, is shown in Figures 1/M.3610 to 4/M.3610 [1].

The architecture of Recommendation M.3610 supports TMN users of the B-ISDN Telecommunications Managed Area and allows:

1)   a network operator to manage his/her own B-ISDN network;

2)   MSP-OSF (see Recommendation M.3610 [1]) to request OAM-OSF for managing services; and

3)   TMNs of multiple interconnected B-ISDNs to exchange management information for the purpose of management of customer end-to-end connections.

This TMN Management Service addresses the maintenance aspects of B.ISDN management.

4.3   Management context description

4.3.1   Roles

The roles described here include maintenance (including testing, performance monitoring and alarm surveillance) and some aspects of service provisioning. Network provider uses the service described below to support B-ISDN maintenance and some aspects of B-ISDN provisioning.
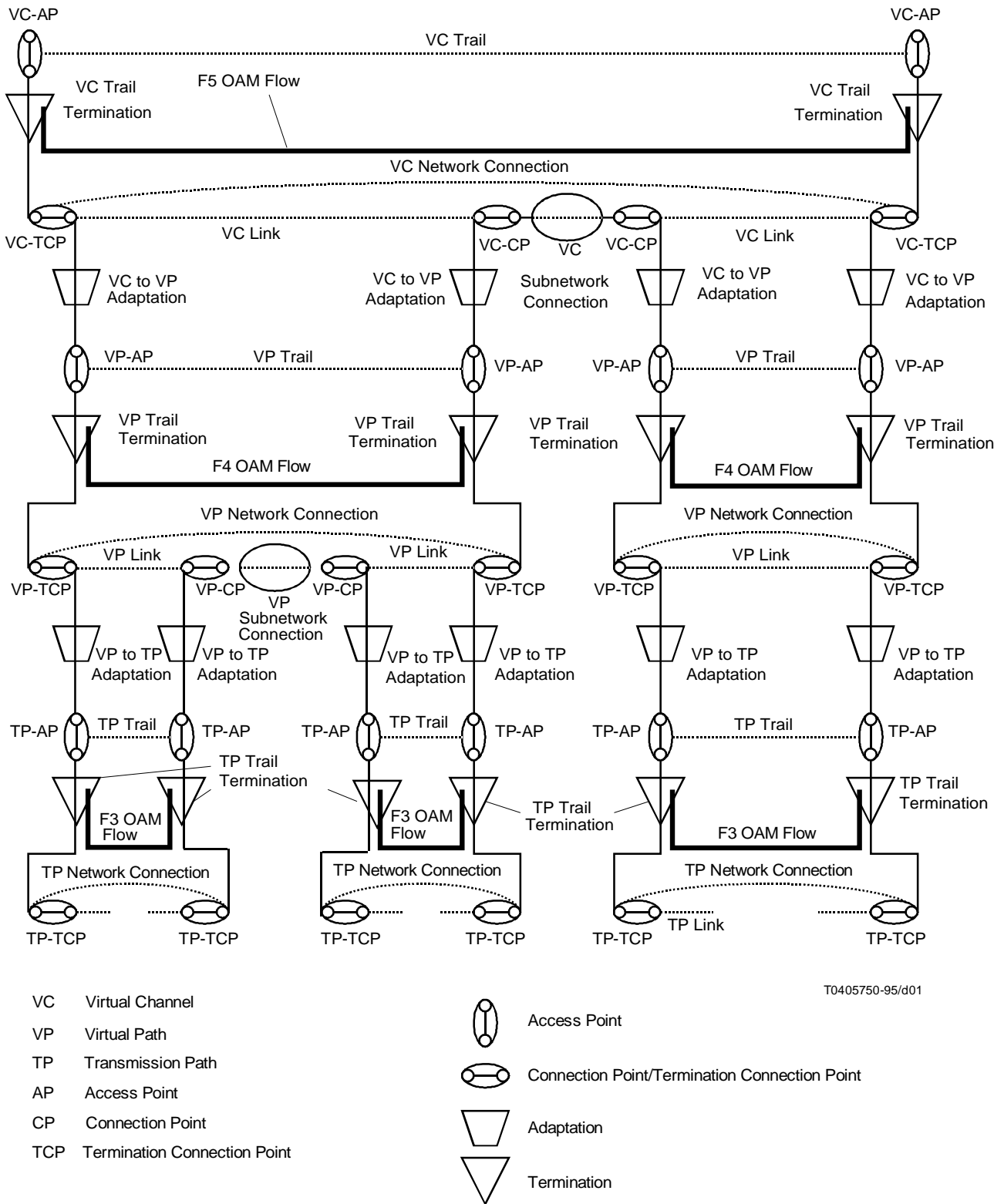
4.3.2 Resources

The resources to be managed are logical and physical resources constructing B-ISDN. These resources are identified in Recommendation I.311 "B-ISDN general network aspects" [2]. They include virtual paths/channels as well as VP/VC cross-connects/switches, etc.

The resources are abstracted as architectural components, which are defined in clause 3/G.803 [3]. The B-ISDN architectural components are described as follows:

– The set of the access points for virtual channels constructs virtual channel layer network.

– The set of the access points for virtual paths constructs virtual path layer network.

– The set of the access points for transmission paths constructs transmission paths layer network.

– Trails are provided between the access points that are connected by a virtual channel, virtual path, or transmission path in the associated layer network.

– A trail supported by a virtual channel (virtual channel trail) is formed by trail termination functions, a virtual channel network connection and its TCPs (Termination Connection Points) in the virtual channel layer network. The virtual channel trail termination function is placed between the access point of the trail and the TCP of the network connection. The trail termination source function inserts and the trail termination sink function drops the end-to-end F5 OAM flow (see Recommendation I.610 [6]) to obtain information related to the integrity of virtual channel information transfer.

– A trail supported by a virtual path (virtual path trail) is formed by trail termination functions, a virtual path network connection and its TCPs in the virtual path layer network. The virtual path trail termination function is placed between the access point of the trail and the TCP of the network connection. The trail termination source function inserts and the trail termination sink function drops the end-to-end F4 OAM flow (see Recommendation I.610 [6]) to obtain information related to the integrity of virtual path information transfer.

– A trail supported by a transmission path (transmission path trail) is formed by trail termination functions, a transmission path network connection and its TCPs in the transmission path layer network. The transmission path trail termination function is placed between the access point of the trail and the TCP of the network connection. The trail termination source function inserts and the trail termination sink drops the F3 OAM (see Recommendation I.610 [6]) flow to obtain information related to the integrity of transmission path information transfer.

– A virtual channel network connection consists of the concatenation of virtual channel subnetwork connections and virtual channel links. Typically, a virtual channel subnetwork connection is a cross-connection.

– A virtual path network connection consists of the concatenation of virtual path subnetwork connections and virtual path links. Typically, a virtual path subnetwork connection is a cross-connection.

– A transmission path consists of the concatenation of virtual path subnetwork connections and transmission path links.

– The virtual channel layer network and the virtual path layer network form the client/server association: the virtual channel layer network is the client while the virtual path layer network is the server. Thus, a virtual channel link is provided by adaptation functions and a virtual path trail.

– The adaptation functions between the virtual channel layer network and the virtual path network include multiplexing, demultiplexing, Usage Parameter Control (UPC) and capacity management.

– The virtual path layer network and the transmission path layer network form the client/server association: the virtual path layer network is the client while the transmission path layer network is the server. Thus, a virtual path link is provided by adaptation functions and a transmission path trail.

– The adaptation functions between the virtual path layer network and the transmission path network include multiplexing, demultiplexing, cell delineation, Usage Parameter Control (UPC), and capacity management.

Figure 1 illustrates these resources.

FIGURE 1/M.3207.1

B-ISDN resources to be managed

4.3.3 TMN management functions

4.3.3.1 TMN management function sets found in Recommendation M.3400 [4]

4.3.3.1.1 Alarm surveillance

All management function sets in 3.1/M.3400 "Alarm surveillance" [4] may be applied to this failure information:

1) VPC – AIS/RDI including alarm location from the location identification fields in OAM cells and continuity check failure is reported from NEF to OSF. See Recommendation M.1400 [5] on how the location identification field is determined. The report has to include the identification of the virtual path/channel trail termination function that detects AIS/RDI including alarm location identification fields in OAM cell and continuity check failure. When this optional location information is not available the report will so indicate.

2) VCC – AIS/RDI including optional alarm location may be reported from NEF to OSF.

3) NEF reports failure of restoration taken for a particular virtual path/channel connection.

4.3.3.1.2 Testing

The following are performed using the testing function sets in 3.4/M.3400 "Testing" [4]:

1) OSF requests NE to execute ATM non-intrusive loopback test.

   The test request has to include:

   – loopback location (see Recommendation M.1400) or indication for end-to-end measurement; and

   – the identification of the trail termination function or the connection point that inserts and analyses the loopback OAM cell.

2) NEF reports the results of non-intrusive loopback tests. The report has to include the results as well as the identification of the trail termination functions or the connection points of the subnetwork connection that perform the test.

3) OSF requests NEF to insert or drop test cells for ATM performance testing in the in-service, out-of-service, or drop-insert measurement mode. The request has to include the identification of the insertion or drop point for test signal. Such a point corresponds to a trail termination function or a connection point of the subnetwork connection of the virtual path/channel to be tested.

4) OSF requests NEF to execute ATM performance testing, and NEF reports the results of ATM performance testing.

4.3.3.1.3 Fault correction

The following are performed using the fault correction function sets in 3.3/M.3400 "Fault correction" [4]:

1) NEF reports the result of change over function on a particular virtual path/channel connection;

2) OSF requests NEF to send back information or records associated with change over function.

4.3.3.1.4 Performance management control

The following are performed using the performance management control function sets in 2.1/M.3400 "Performance Monitoring (PM)" [4]:

1) NEF reports the status of performance monitoring on a particular virtual path/channel connection or a particular segment of a virtual path/channel connection. The report has to include the performance parameter values as well as the identification of the trail termination functions or the connection points of the subnetwork connection that perform monitoring. The monitored performance parameters are identified in Recommendation I.610 [6].

2) OSF sets/clears control parameters of performance monitoring including a monitoring block size, threshold for the reporting of performance degradation, etc. The request has to include the performance monitoring control parameter values as well as the identification of the trail termination functions or the connection points of the subnetwork connection that perform monitoring.

3) NEF reports degradations in performance parameters, including errored blocks and misinserted/dropped cells.

4.3.3.1.5   NE configuration

The following are performed using the NE configuration function set in clause 4/M.3400 "Configuration management" [4]:

1) OSF sets/clears segment endpoints for virtual path/channel level in NE.

2) OSF requests NEFs to constitute cross-connections to establish a particular virtual path/channel connection. The request must include the identifications of the virtual path/channel connection points.

3) NEF reports the results of cross-connection establishment.

4.3.3.1.6   Security management

The following are performed using the security management function sets in clause 6/M.3400 "Security management" [4]:

1) OSF requests NEF to report security audit on a particular VPC/VCC manipulation;

2) OSF sets/clears a security level of operations to a particular virtual path/channel connection;

3) NEF reports security violation alarm on a particular virtual path/channel connection on which security level of operations is set.

4.3.3.2   Newly defined TMN management function sets and function set groups [TIB B]

4.3.3.2.1   Virtual channel connection alarm generation control function set

4.3.3.2.1.1   Management requirements

In Recommendation I.610 [6], a limited number of virtual channel connections can be alarmed. Therefore, the TMN must be able to manage which virtual channel should be alarmed. This TMN management service provides such management of alarms on virtual channel connections.

4.3.3.2.1.2   Functional model

This TMN management function set enables the TMN user to allow or inhibit the generation of the alarms for specified virtual channel connections. Control of alarm generation should not be confused with control of alarm reporting, which is found in M.3400 alarm reporting function set [4]. Thus, the TMN user can obtain alarm information from only a limited number of the virtual channels, which he/she specified.

4.3.3.2.1.3   TMN management functions

1) OSF requests NEFs to enable the alarm generation on a particular virtual channel connection;

2) OSF requests NEF to disable the alarm generation on a particular virtual channel connection;

3) OSF requests NEF to report the status of alarm generation on a particular virtual channel;

4) OSF requests NEF to report the remaining capacity for the alarm generation on a particular virtual path.

4.3.3.2.2 Continuity check control

4.3.3.2.2.1 Management requirements

This TMN management function set provides the ability to control the virtual path/channel connection continuity check specified in Recommendation I.610 [6]. By invoking continuity check on a virtual path/channel connection, the TMN user can obtain information about the correctness of the connectivity in the case that the connection is not loaded with traffic. The management function set allows the TMN user to activate and deactivate continuity check for a particular connection/segment as well as to ask whether continuity check is activated or not on a particular connection/segment.

This function is used to manage an optional ATM capability. If this capability is not available, then managed resources are required to indicate the absence of this function.

4.3.3.2.2.2 Functional model

When continuity check is executed on the end-to-end basis, this TMN management function set controls the virtual path/channel trail termination function, which inserts or drops the end-to-end F4/F5 OAM cells. The trail termination function source transmits the continuity check fault management OAM cell when no user cell has been sent for a period of t, where Ts < t < 2Ts, and no failure is indicated. If the trail termination function sink receives no cells within a time interval Tr (Tr > 2Ts), it concludes the disconnection of the virtual path/channel trail. At activation and deactivation of continuity check, the trail termination functions exchange the activation/deactivation OAM cells.

When continuity check is executed on the segment basis, this TMN management function set controls specified connection points of the virtual path/channel subnetwork connection. The connection points delimit the virtual path/channel connection segment to be checked. The connection points work in a similar way as the termination functions do in end-to-end continuity check except for exchanging the segment OAM cells instead of the end-to-end OAM cells. The functionalities of the termination functions/connection points include:

–   exchange of the activation/deactivation OAM cells;

–   start/stop of OAM cell insertion/drop;

–   detection and reporting of disconnection.

The resource that is subject to continuity check is a virtual path/channel connection or a virtual path/channel connection segment, which is delimited by the specified connection points and composed of the concatenation of virtual path/channel links and subnetwork connections.

4.3.3.2.2.3 TMN management functions

The following are the TMN management functions that allow the TMN user to control continuity check:

1)   OSF requests NEF to activate/deactivate continuity check on a particular virtual path/channel connection with indicating the identification of the associated trail termination function. The request must include the information showing that continuity check is performed on the end-to-end basis. NEF reports whether the activation/deactivation was confirmed or denied.

2)   OSF requests NEF to activate/deactivate continuity check on a particular virtual path/channel connection segment with indicating the identification of the associated connection point. The request must include the information showing that continuity check is performed on the segment basis. NEF reports whether the activation/deactivation was confirmed or denied.

3)   OSF requests NEF to set the parameter values Tr, Ts (see Recommendation I.610 [6]). The request has to include the parameter values as well as the identification of the associated trail termination function or connection point. Whether Ts/Tr is set per connection or per NE is for further study.

4)   OSF asks NEF whether continuity check is activated or not on a particular virtual path/channel connection or connection segment. The request has to include the identification of the associated trail termination function or connection point.

4.3.3.2.3 ATM performance monitoring control

4.3.3.2.3.1 Management requirements

This TMN management function set provides the ability to activate and deactivate the virtual path/channel connection performance monitoring specified in Recommendation I.610 [6]. The performance monitoring is carried out on a certain number of selected virtual path/channel connections per UNI/NNI (see Recommendation I.610). The management service allows the TMN user to select the virtual path/channel connection that is subject to monitoring and start/stop the monitoring. By activating the monitoring, the TMN user can obtain information as to the virtual path/channel performance, which is described through parameters such as errored blocks, loss/misinsertion of cells, etc. The TMN user can also know whether performance monitoring is activated or not on a particular connection/segment.

This function is used to manage an optional ATM capability. If this capability is not available, then managed resources are required to indicate the absence of this function.

4.3.3.2.3.2 Functional model

When performance monitoring is executed on the end-to-end basis, this TMN management function set controls the virtual path/channel trail termination function, which inserts or drops the end-to-end F4/F5 OAM cells. The trail termination source function transmits the performance management OAM cell while performance monitoring is activated. Meanwhile, the trail termination sink function drops and analyses the received cells. At activation and deactivation of performance monitoring, the trail termination functions exchange the activation/deactivation OAM cells. By exchanging the activation OAM cell, the block size used in monitoring is determined.

When performance monitoring is executed on the segment basis, this TMN management function set controls specified connection points of the virtual path/channel subnetwork connection. The connection points delimit the virtual path/channel connection segment to be monitored. The connection points work in a similar way as the termination points do in end-to-end performance monitoring except for exchanging the segment OAM cells instead of the end-to-end OAM cells.

The functionalities of the termination functions/connection points include:

– exchange of the activation/deactivation OAM cells;

– start/stop of OAM cell insertion/drop;

– analysis of performance.

The resource that is subject to performance monitoring is a virtual path/channel connection or a virtual path/channel connection segment, which is delimited by the specified connection points and composed of the concatenation of virtual path/channel links and subnetwork connections.

4.3.3.2.3.3 TMN management functions

The following are the TMN management functions that allow the TMN user to control performance monitoring:

1) OSF requests NEF to activate/deactivate performance monitoring on a particular virtual path/channel connection with indicating the identification of the associated trail termination function as well as the value of the performance monitoring block size. The request must include the information showing that performance monitoring is performed on the end-to-end basis. NEF reports whether the activation/deactivation was confirmed or denied.

2) OSF requests NEF to activate/deactivate performance monitoring on a particular virtual path/channel connection segment with indicating the identification of the associated connection points as well as the value of the performance monitoring block size. The request must include the information showing that performance monitoring is performed on the segment basis. NEF reports whether the activation/ deactivation was confirmed or denied.

3) OSF asks NEF whether performance monitoring is activated or not on a particular virtual path/channel connection or connection segment. The request has to include the identification of the associated termination function.

4.3.3.2.4 ATM test control

4.3.3.2.4.1 Management requirements

This TMN management function set provides the ability to control the non-intrusive loopback test and the ATM layer performance test in addition to testing function sets (see 4.3.3.1.2), which supports the test request and report. By employing the management function, the TMN user can flexibly control the tests depending on the circumstance. Examples of the control include setting of the threshold, suspension/resumption, termination, etc. The management service is concerned with the performance test based on the test equipment and the non-intrusive loopback test specified in Recommendation I.610 [6].

4.3.3.2.4.2 Functional model

This TMN management function set affects the test cell insertion/drop point: the virtual path/channel trail termination function or the connection point of virtual path/channel subnetwork connection. The management function utilises the following functionalities of such a resource:

–   start/stop of OAM cell insertion/drop;

–   the analysis/storage of intermediate test results;

–   setting of the threshold for the measured performance parameters;

–   reporting the test result.

The resource that is subject to testing is a virtual path/channel connection or a virtual path/channel connection segment, which is delimited by the specified connection points and composed of the concatenation of virtual path/channel links and subnetwork connections.

4.3.3.2.4.3 TMN management functions

The following are the TMN management functions that allow the TMN user to control testing in addition to testing function set group:

1)   OSF request NEF to set conditions for the non-intrusive loopback test including duration, reporting frequency, etc. The request has to include the parameter values and the identification of the associated termination function or connection point.

2)   OSF requests NEF to suspend/resume the ATM layer performance test on a particular virtual path/channel connection. The request has to include the test invocation identifier and the identification of the associated termination function or connection point.

3)   OSF requests NEF to set the threshold for the ATM layer performance test on a particular virtual path/channel connection. The request has to include the threshold values, the test invocation identifier and the identification of the associated termination function or connection point.

4)   OSF requests NEF to terminate the ATM layer performance test on a particular virtual path/channel connection. The request has to include the test invocation identifier and the identification of the associated termination function or connection point.

5)   OSF asks NEF if the test is going on and requests NEF to report the status of the current test.

4.4   Architecture

The architecture, to which this TMN management service is applied, is found in Recommendation M.3610 [1].