



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.774.5

(02/2001)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Digital terminal equipments – Operations, administration
and maintenance features of transmission equipment

Synchronous digital hierarchy (SDH) management of connection supervision functionality (HCS/LCS) for the network element view

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**“SYNCHRONOUS DIGITAL HIERARCHY (SDH)
MANAGEMENT OF CONNECTION SUPERVISION FUNCTIONALITY
(HCS/LCS) FOR THE NETWORK ELEMENT VIEW”**

Summary

This Recommendation provides an information model for the Synchronous Digital Hierarchy (SDH) Network. This model describes the managed object classes and their properties for the management of Connection Supervision Functionality (HCS/LCS), as defined in Recommendation G.783 [2] and as related to SDH network Elements. These objects are useful to describe information exchanged across interfaces defined in M.3010 [5] Telecommunications Management Network (TMN) architecture.

1. Scope

SDH Connection Supervision Functions are used to configure the supervision of higher and lower order path overhead independent from termination functions.

Configuration is done by modifications of attributes of the relevant managed objects. These attributes are included by subclassing of existing G.774 managed object Classes.

The new objects defined in this Recommendation supersede those defined in Recommendation G.774.05 (1995). For each object class, attribute, action, notification, parameter defined in this Recommendation it shall be indicated what the impacts upon the existing Recommendation G.774.05 (1995) are.

Structure of this Recommendation

Subclause 5.1 provides an overview of the SDH Connection Supervision information model. Clauses 6 to 12 describe the information model using the mechanisms defined in X.722. Clause 15 contains the syntax definitions of the information carried in the protocol using Abstract Syntax Notation One (ASN.1) defined in X.680 – X.683. Naming and Inheritance are illustrated in informative Appendix I. Clauses 5 to 15 are normative; all other text is informative.

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.

- ITU-T Recommendation G.707 (2000), *Network-node interface for the synchronous digital hierarchy*.
- ITU-T Recommendation G.773 (1993), *Q-Interface protocols*.
- ITU-T Recommendation G.774 (2000), *SDH management information model for the network element view*.
- ITU-T Recommendation G.783 (1998), *Characteristics of Synchronous Digital Hierarchy (SDH) equipment functional blocks*.

- ITU-T Recommendation G.784 (1999), *Synchronous Digital Hierarchy (SDH) management*.
- ITU-T Recommendation G.803 (1997), *Architectures of transport networks based on the synchronous digital hierarchy (SDH)*.
- ITU-T Recommendation G.831 (1996), *Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)*.
- ITU-T Recommendation G.958 (1994), *Digital line systems based on SDH for use on optical fibre cables*.
- ITU-T Recommendation M.60 (1993), *Maintenance terminology and definitions*.
- ITU-T Recommendation M.2120 (1997), *Digital path, section and transmission system fault detection and localisation procedures*.
- ITU-T Recommendation M.3010 (2000), *Principles for a telecommunication management network*.
- ITU-T Recommendation M.3013 (2000), *Considerations for a Telecommunications Management Network*.
- ITU-T Recommendation M.3100 (1995), *Generic network information model*.
- ITU-T Recommendation Q.811 (1990), *Q3-Lower layers protocols*.
- ITU-T Recommendation Q.812 (1990), *Q3-Higher layers protocols*.
- ITU-T Recommendation Q.822 (1993), *Stage 1, Stage 2 and Stage 3 description for the Q3-interface: performance management*.
- ITU-T Recommendation X.680 - X.683 (1997), *Specification of Abstract Syntax Notation One (ASN.1)*.
- ITU-T Recommendation X.701(1997), *Systems management overview*.
- ITU-T Recommendation X.710 (1997), *Common management information service*.
- ITU-T Recommendation X.711(1997), *Common management information protocol*.
- ITU-T Recommendation X.720 (1992) and Amd.1 (95) and Corr.1 (94), *Information technology – OSI – Structure of Management Information: Management information model*.
- ITU-T Recommendation X.721 (1993) and Corr. 1, 2, 3, and 4, *Definition of management information*.
- ITU-T Recommendation X.722 (1992) and Amd.1 (95), Amd.2 (97), Amd.2 (97) and Corr.1 (96), *Information technology – OSI – Structure of management information: Guidelines for the definition of managed objects*.
- ITU-T Recommendation X.730 (1992) and Amd.1 (95) and Corr1Amd1 (96), *Object management function*.
- ITU-T Recommendation X.731 (1992) and Amd.1 (95), Corr.1 (95) and Corr1Amd1 (96), *State management function*.
- ITU-T Recommendation X.733 (1992) and Corr.1 (94), Amd1 (95), Corr1Amd1 (96) and Corr.2 (99), *Alarm reporting function*.
- ITU-T Recommendation X.734 (1992) and Corr.1 (94), Amd1 (95), Corr1Amd1 (96) and Corr.2 (99), *Event report management function*.
- ITU-T Recommendation X.735 (1992) and Amd.1 (95) and Corr1Amd1 (96), *Log control function*.

3. Terms and Definitions

This Recommendation uses the terms and definitions defined in Recommendations G.784, G.774 and M.3100.

4. Abbreviations

For the purpose of this Recommendation, the following abbreviations are used:

AIS	Alarm Indication Signal
CTP	Connection Termination Point
EBER	Excessive Bit Error Ratio
FERF	Far End Receive Failure
HCS	Higher Order Connection Supervision
HPA	Higher Order Path Adaptation
LCS	Lower Order Connection Supervision
NE	Network Element
MSA	Multiplex Section Adaptation
OS	Operations System
SDH	Synchronous Digital Hierarchy
TMN	Telecommunications Management Network
TTP	Trail Termination Point
VC	Virtual Container

5. Connection supervision information model

5.1 Overview

5.1.1 HCS and LCS may be provided in the case of an open HPC respective LPC (unused connection). This case is modelled by connected AU3/4CTP respective TUxCTP. Therefore:

- the HCS is modelled by “supervisedAU3/4CTP”. These classes are subclasses of AU3/4CTP of G.774 which currently model only the MSA function;
- the LCS is modelled by “supervisedTU3/2/12/11CTP”. These classes are subclasses of TU3/2/12/11CTP of G.774 which currently model only the HPA function.

5.1.2 If an instance of an AU3/4CTP or TUxCTP has to be created (only possible as a consequence of the creation of a superior TTP or as a side effect of payload configuration – see Recommendation G.774.02) and the equipment is able to provide HCS/LCS functionality (see R3.), instead of (Recommendation G.774) CTPs, the supervised CTPs should be created automatically.

5.1.3 The (de-)activation of HCS/LCS is modelled using the attribute generatorEnabled for the unequipped generator subfunction and the attribute monitorActive for the path overhead monitor subfunction. These attributes allow the independent management of both subfunctions (requirement R4.).

5.1.4 The (de-)activation of HCS/LCS in the supervised CTP objects does not influence the behaviour derived from Recommendation G.774 (MSA, HPA). A SET-operation of generatorEnabled or of monitorActive to TRUE may be rejected depending upon the dynamic

situation of the specific network element if it supports the connection supervision function with less than 100%. This results from requirement R5.

5.1.5 Performance measurement of the connection supervision functionality of supervised CTPs (Sink or Bidirectional) can be done using a subclass of currentData which is applicable for path termination (see Recommendation G.774.01). This subclass provides the parameters background block errors, errored seconds, severely errored seconds and unavailable seconds (some are optional and are also provided for the far end). If the attribute monitorActive of a CTP has the value FALSE during a part of a PM period the performance data is not reliable. This should be indicated by the attribute suspectIntervalFlag in the currentData object.

5.2 Requirements

The features of HCS/LCS (defined in Recommendation G.783) which influence the modelling approach are summarized below:

- R1 The connection supervision function includes the monitoring of parts of HO/LO-POH to get alarms and performance information about the path segment [sub function H/L-POM (Path Overhead Monitor)].
- R2 The connection supervision function includes the generation of supervisory unequipped HO/LO-POH with a Path Trace [sub function H/L-UG (Unequipped Generator)].
- R3 The connection supervision function may be optional.
- R4 The connection supervision function shall be able to be set into the INACTIVE state and the ACTIVE state (independent for HPOM and HUG respective LPOM and LUG).
- R5 The connection supervision function may be supported for a specific equipment at the same time in the range of 0% to 100%.

6. Object classes

This clause provides replacement managed object class definitions for the existing Recommendation G.774.05 (1995). Any managed object class replaced by one in this clause is considered to be deprecated. The reasons for the replacement of a managed object class are as follows:

- 1) The replaced managed object class is faulty and must be fixed.
- 2) The replaced managed object class includes an attribute, package, notification or action which has been re-registered in this or another Recommendation.
- 3) The replaced managed object class inherits from a managed object class which has been re-registered in this or another Recommendation.

In each case where a class is replaced the new class will be registered within this Recommendation. The textual label for the class will be revised to include the text "R1". For example in the revision of the G.774.05 (1995) managed object class "au4SupervisedCTPBidirectional", the revised label will become "au4SupervisedCTPBidirectionalR1".

Below is a table of classes deprecated from Recommendation G.774.05 (1995) and the G.774.05 classes which replace them:

Deprecated G.774.05 (1995) Classes	Replacement G.774.05 Classes
au4SupervisedCTPBidirectional	au4SupervisedCTPBidirectionalR1
au4SupervisedCTPSink	au4SupervisedCTPSinkR1
au3SupervisedCTPBidirectional	au3SupervisedCTPBidirectionalR1
au3SupervisedCTPSink	au3SupervisedCTPSinkR1
tu3SupervisedCTPBidirectional	tu3SupervisedCTPBidirectionalR1
tu3SupervisedCTPSink	tu3SupervisedCTPSinkR1
tu2SupervisedCTPBidirectional	tu2SupervisedCTPBidirectionalR1