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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

ITU-T Recommendation G.774.5

(Formerly CCITT Recommendation)

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ITU-T Recommendation G.774.5

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 ITU-T G.783 and as related to SDH network Elements. These objects are useful to describe information exchanged across interfaces defined in ITU-T M.3010 Telecommunications Management Network (TMN) architecture.

Document History	
Issue	**Notes**
2001	First revision incorporated the changes documented in the G.774.5 Corrigendum 1.
7/1995	Initial version of the Recommendation.

Source

ITU-T Recommendation G.774.5 was revised by ITU-T Study Group 15 (2001-2004) and approved under the WTSA Resolution 1 procedure on 9 February 2001.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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

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 ITU-T G.774.5 (1995). For each object class, attribute, action, notification, parameter defined in this Recommendation it shall be indicated what the impacts upon the existing ITU-T G.774.5 (1995) are.

Structure of this Recommendation

Clause 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 ITU-T X.680-X.683. Naming and Inheritance are illustrated in informative Appendix I.

2 References

The following ITU-T 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; 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 G.707/Y.1322 (2000), *Network node interface for the synchronous digital hierarchy (SDH)*.
- ITU-T G.773 (1993), *Protocol suites for Q-interfaces for management of transmission systems*.
- ITU-T G.774 (2001), *Synchronous digital hierarchy (SDH) – Management information model for the network element view*.
- ITU-T G.783 (2000), *Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks*.
- ITU-T G.784 (1999), *Synchronous digital hierarchy (SDH) management*.
- ITU-T G.803 (2000), *Architecture of transport networks based on the synchronous digital hierarchy (SDH*).
- ITU-T G.831 (2000), *Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)*.
- ITU-T G.958 (1994), *Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables*.

– ITU-T M.60 (1993), *Maintenance terminology and definitions*.

– ITU-T M.2120 (2000), *PDH path, section and transmission system and SDH path and multiplex section fault detection and localization procedures*.

– ITU-T M.3010 (2000), *Principles for a telecommunications management network*.

– ITU-T M.3013 (2000), *Considerations for a telecommunications management network*.

– ITU-T M.3100 (1995), *Generic network information model*.

– ITU-T Q.811 (1997), *Lower layer protocol profiles for the Q3 and X interfaces*.

– ITU-T Q.812 (1997), *Upper layer protocol profiles for the Q3 and X interfaces*.

– ITU-T Q.822 (1994), *Stage 1, Stage 2 and Stage 3 description for the Q3-interface – Performance management*.

– ITU-T X.680 to X.683 (1997), *Information technology – Abstract Syntax Notation One (ASN.1)*.

– ITU-T X.701 (1997), *Information technology – Open Systems Interconnection – Systems management overview*.

– ITU-T X.710 (1997), *Information technology – Open Systems Interconnection – Common management information service*.

– ITU-T X.711 (1997), *Information technology – Open Systems Interconnection – Common management information protocol: Specification*.

– ITU-T X.720 (1992), *Information technology – Open Systems Interconnection – Structure of Management Information: Management information model, plus* Amd.1 (1995) and Cor.1 (1994).

– ITU-T X.721 (1992), *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information, plus* Cor.1 (1994), Cor.2 (1996), Cor.3 (1998) and Cor.4 (2000).

– ITU-T X.722 (1992), *Information technology – Open Systems Interconnection – Structure of management information: Guidelines for the definition of managed objects, plus* Amd.1 (1995), Amd.2 (1997) and Cor.1 (1996).

– ITU-T X.730 (1992), *Information technology – Open Systems Interconnection – Systems Management: Object management function, plus* Amd.1 (1995) and Amd.1/Cor.1 (1996).

– ITU-T X.731 (1992), *Information technology – Open Systems Interconnection – Systems Management: State management function, plus* Amd.1 (1995), Cor.1 (1995) and Amd.1/Cor.1 (1996).

– ITU-T X.733 (1992), *Information technology – Open Systems Interconnection – Systems Management: Alarm reporting function, plus* Cor.1 (1994), Amd.1 (1995), Amd.1/Cor.1 (1996) and Cor.2 (1999).

– ITU-T X.734 (1992), *Information technology – Open Systems Interconnection – Systems Management: Event report management function, plus* Cor.1 (1994), Amd.1 (1995), Amd. 1/Cor.1 (1996) and Cor.2 (1999).

– ITU-T X.735 (1992), *Information technology – Open Systems Interconnection – Systems Management: Log control function, plus* Amd.1 (1995) and Amd.1/Cor.1 (1996).

3 Terms and definitions

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

4 Abbreviations

This Recommendation uses the following abbreviations:

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

MSA Multiplex Section Adaptation

NE Network Element

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 ITU-T 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 ITU-T 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 ITU-T G.774.2) and the equipment is able to provide HCS/LCS functionality (see R3), instead of (ITU-T 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 ITU-T 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 ITU-T G.774.1). 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 ITU-T 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 ITU-T G.774.5 (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.774.5 (1995) managed object class "au4SupervisedCTPBidirectional", the revised label will become "au4SupervisedCTPBidirectionalR1".

Below is a table of classes deprecated from ITU-T G.774.5 (1995) and the G.774.5 classes which replace them:

Deprecated G.774.5 (1995) Classes	*Replacement G.774.5 Classes*
au4SupervisedCTPBidirectional	au4SupervisedCTPBidirectionalR1
au4SupervisedCTPSink	au4SupervisedCTPSinkR1
au3SupervisedCTPBidirectional	au3SupervisedCTPBidirectionalR1
au3SupervisedCTPSink	au3SupervisedCTPSinkR1
tu3SupervisedCTPBidirectional	tu3SupervisedCTPBidirectionalR1
tu3SupervisedCTPSink	tu3SupervisedCTPSinkR1
tu2SupervisedCTPBidirectional	tu2SupervisedCTPBidirectionalR1
tu2SupervisedCTPSink	tu2SupervisedCTPSinkR1
tu12SupervisedCTPBidirectional	tu12SupervisedCTPBidirectionalR1
tu12SupervisedCTPSink	tu12SupervisedCTPSinkR1
tu11SupervisedCTPBidirectional	tu11SupervisedCTPBidirectionalR1
tu11SupervisedCTPSink	tu11SupervisedCTPSinkR1

6.1 Administrative unit 4 CTP bidirectional with HCS

```
au4SupervisedCTPBidirectionalR1  MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":au4CTPBidirectionalR1,
          au4SupervisedCTPSinkR1,
          au4SupervisedCTPSource;
     CHARACTERIZED BY
          vc3-4SupervisionBidirectionalPackage;
REGISTERED AS {g774-05MObjectClass 19 };
```

6.2 Administrative unit 4 CTP sink with HPOM

```
au4SupervisedCTPSinkR1 MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":au4CTPSinkR1;
     CHARACTERIZED BY
          vc3-4SupervisionSinkPackageR1;
REGISTERED AS {g774-05MObjectClass 20 };
```

6.3 Administrative unit 4 CTP source with HUG

```
au4SupervisedCTPSource           MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774": au4CTPSource;
     CHARACTERIZED BY
          vc3-4SupervisionSourcePackage;
REGISTERED AS {g774-05MObjectClass 3};
```

6.4 Administrative unit 3 CTP bidirectional with HCS

```
au3SupervisedCTPBidirectionalR1  MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":au3CTPBidirectionalR1,
               au3SupervisedCTPSinkR1,
               au3SupervisedCTPSource;
     CHARACTERIZED BY
          vc3-4SupervisionBidirectionalPackage;
REGISTERED AS {g774-05MObjectClass 21 };
```

6.5 Administrative unit 3 CTP sink with HPOM

```
au3SupervisedCTPSinkR1 MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":au3CTPSinkR1;
     CHARACTERIZED BY
          vc3-4SupervisionSinkPackageR1;
REGISTERED AS {g774-05MObjectClass 22 };
```

6.6 Administrative unit 3 CTP source with HUG

```
au3SupervisedCTPSource           MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774": au3CTPSource;
     CHARACTERIZED BY
          vc3-4SupervisionSourcePackage;
REGISTERED AS {g774-05MObjectClass 6};
```

6.7 Tributary unit 3 CTP bidirectional with LCS

```
tu3SupervisedCTPBidirectionalR1  MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":tu3CTPBidirectionalR1,
               tu3SupervisedCTPSinkR1,
               tu3SupervisedCTPSource;
     CHARACTERIZED BY
          vc3-4SupervisionBidirectionalPackage;
REGISTERED AS {g774-05MObjectClass 23 };
```

6.8 Tributary unit 3 CTP sink with LPOM

```
tu3SupervisedCTPSinkR1 MANAGED OBJECT CLASS
     DERIVED FROM       "Recommendation G.774":tu3CTPSinkR1;
     CHARACTERIZED BY
          vc3-4SupervisionSinkPackageR1;
REGISTERED AS {g774-05MObjectClass 24 };
```

6.9 Tributary unit 3 CTP source with LUG

```
tu3SupervisedCTPSource           MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774": tu3CTPSource;
     CHARACTERIZED BY
          vc3-4SupervisionSourcePackage;
REGISTERED AS {g774-05MObjectClass 9};
```

6.10 Tributary unit 2 CTP bidirectional with LCS

```
tu2SupervisedCTPBidirectionalR1 MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":tu2CTPBidirectionalR1,
               tu2SupervisedCTPSinkR1,
               tu2SupervisedCTPSource;
     CHARACTERIZED BY
          vc11-2SupervisionBidirectionalPackage;
REGISTERED AS {g774-05MObjectClass 25 };
```

6.11 Tributary unit 2 CTP sink with LPOM

```
tu2SupervisedCTPSinkR1 MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774":tu2CTPSinkR1;
     CHARACTERIZED BY
          vc11-2SupervisionSinkPackageR1;
REGISTERED AS {g774-05MObjectClass 26 };
```

6.12 Tributary unit 2 CTP source with LUG

```
tu2SupervisedCTPSource           MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774": tu2CTPSource;
     CHARACTERIZED BY
          vc11-2SupervisionSourcePackage;
REGISTERED AS {g774-05MObjectClass 12};
```

6.13 Tributary unit 12 CTP bidirectional with LCS

```
tu12SupervisedCTPBidirectionalR1 MANAGED OBJECT CLASS
     DERIVED FROM       "Recommendation G.774":tu12CTPBidirectionalR1,
               tu12SupervisedCTPSinkR1,
               tu12SupervisedCTPSource;
     CHARACTERIZED BY
          vc11-2SupervisionBidirectionalPackage;
REGISTERED AS {g774-05MObjectClass 27 };
```

6.14 Tributary unit 12 CTP sink with LPOM

```
tu12SupervisedCTPSinkR1 MANAGED OBJECT CLASS
     DERIVED FROM    "Recommendation G.774":tu12CTPSinkR1;
     CHARACTERIZED BY
          vc11-2SupervisionSinkPackageR1;
REGISTERED AS {g774-05MObjectClass 28 };
```

6.15 Tributary unit 12 CTP source with LUG

```
tu12SupervisedCTPSource     Managed Object Class
     DERIVED FROM       "Recommendation G.774": tu12CTPSource;
     CHARACTERIZED BY
          vc11-2SupervisionSourcePackage;
REGISTERED AS {g774-05MObjectClass 15};
```

6.16 Tributary unit 11 CTP bidirectional with LCS

```
tu11SupervisedCTPBidirectionalR1 MANAGED OBJECT CLASS
     DERIVED FROM       "Recommendation G.774":tu11CTPBidirectionalR1,
               tu11SupervisedCTPSinkR1,
               tu11SupervisedCTPSource;
     CHARACTERIZED BY
          vc11-2SupervisionBidirectionalPackage;
REGISTERED AS {g774-05MObjectClass 29 };
```

6.17 Tributary unit 11 CTP sink with LPOM

```
tu11SupervisedCTPSinkR1 MANAGED OBJECT CLASS
     DERIVED FROM    "Recommendation G.774":tu11CTPSinkR1;
     CHARACTERIZED BY
          vc11-2SupervisionSinkPackageR1;
REGISTERED AS {g774-05MObjectClass 30 };
```

6.18 Tributary unit 11 CTP source with LUG

```
tu11SupervisedCTPSource          MANAGED OBJECT CLASS
     DERIVED FROM  "Recommendation G.774": tu11CTPSource;
     CHARACTERIZED BY
          vc11-2SupervisionSourcePackage;
REGISTERED AS {g774-05MObjectClass 18};
```

7 Packages

This clause provides replacement package definitions for the existing ITU-T G.774.5 (1995). Any package replaced by one in this clause is considered to be deprecated. The reasons for the replacement of a package are as follows:

1) The replaced package is faulty and must be fixed.

2) The replaced package includes an attribute, package, notification or action which has been re-registered in this Recommendation.

In each case where a package is replaced, the new package will be registered within this Recommendation. The textual label for the package will be revised to include the text "R1". For example, in the revision of the G.774.5 (1995) package "vc11-2SupervisionSinkPackage", the revised label will become "vc11-2SupervisionSinkPackageR1".

Below is a table of packages deprecated from ITU-T G.774.5 (1995) and the G.774.5 packages which replace them:

Deprecated G.774.5 (1995) Packages	*Replacement G.774.5 Packages*
vc11-2SupervisionSinkPackage	vc11-2SupervisionSinkPackageR1
vc3-4SupervisionSinkPackage	vc3-4SupervisionSinkPackageR1

7.1 Virtual container 11-2 supervision bidirectional package

```
vc11-2SupervisionBidirectionalPackage PACKAGE
     BEHAVIOUR vc11-2SupervisionBidirectionalPackageBehaviour;
REGISTERED AS {g774-05Package 1};

vc11-2SupervisionBidirectionalPackageBehaviour BEHAVIOUR
     DEFINED AS
*    A communicationAlarm notification shall be issued if a far end receive
failure (V5 Byte) is detected. The probableCause parameter of the notification
shall indicate FERF (Far End Receive Failure).
If monitoring is suspended due to monitorActive an existing far end receive
failure is cleared and removed from the current problem list.
If the (inherited) attributes monitorActive and generatorEnabled have the value
TRUE and the upstreamConnectivityPointer has the value NULL (not connected), the
originated supervisory unequipped VC can indicate in the V5 byte a far end
receive failure according to the conditions given in the functional specification
(Recommendation G.783: signal label mismatch, path trace mismatch, AIS or loss of
pointer).
 *;
```

7.2 Virtual container 11-2 supervision sink package

```
vc11-2SupervisionSinkPackageR1 PACKAGE
     BEHAVIOUR vc11-2SupervisionSinkPackageR1Behaviour;
     ATTRIBUTES
          monitorActive           GET-REPLACE,
          "Recommendation G.774": v5SignalLabelExpected     GET-REPLACE,
          "Recommendation G.774": v5SignalLabelReceive      GET,
          j2PathTraceExpected REPLACE-WITH-DEFAULT          DEFAULT VALUE SDH
CSASN1.defaultNull GET-REPLACE,
          j2PathTraceReceive      GET;
REGISTERED AS {g774-05Package 7 };

vc11-2SupervisionSinkPackageR1Behaviour BEHAVIOUR
     DEFINED AS
 *If a SDH-CTP has to be created and the underlying resource is able to provide
connection supervision, a supervised CTP should be created. The attribute
monitorActive of supervised CTPs does only influence the behaviour related to
connection supervision. A SET-operation of monitorActive to TRUE may be rejected
dependent from the dynamic situation of the specific network element. In case of
rejection the "invalidAttributeValue" error should be returned. If the attribute
monitorActive has the value TRUE, then the path overhead is monitored. A
communicationAlarm notification shall be issued if the signal label received (V5
Byte) does not match the signal label expected. The probableCause parameter of
the notification shall indicate signal label mismatch. A communicationAlarm
notification shall be issued if the path trace received (J2 Byte) does not match
the path trace expected. The probableCause parameter of the notification
shall indicate path trace mismatch.
If monitoring is suspended due to monitorActive, all outstanding alarms related
to the connection supervision (see above) are cleared and removed from the
current problem list. In this state the attributes v5SignalLabelReceive and
j2PathTraceReceive may contain values which do not reflect the received signal
and no alarms (see before) are emitted. If the attribute monitorActive 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 of a possibly
contained currentData object.
If the network element supports LCS with restricted capability, the local initial
value of the attribute monitorActive should be FALSE.
*;
```

7.3 Virtual container 11-2 supervision source package

```
vc11-2SupervisionSourcePackage PACKAGE
     BEHAVIOUR vc11-2SupervisionSourcePackageBehaviour;
     ATTRIBUTES
          generatorEnabled        GET-REPLACE,
          j2PathTraceSend         GET-REPLACE;
REGISTERED AS {g774-05Package 3};

vc11-2SupervisionSourcePackageBehaviour BEHAVIOUR
     DEFINED AS
*    If an SDH-CTP has to be created and the underlying resource is able to
provide connection supervision, a supervised CTP should be created. The attribute
generatorEnabled of supervised CTPs does only influence the behaviour related to
connection supervision. A SET-operation of generatorEnabled to TRUE may be
rejected dependent from the dynamic situation of the specific network element. In
case of rejection, the “invalidAttributeValue” error should be returned.
If the supervised CTP is not connected (the upstreamConnectivityPointer has the
value NULL) and the attribute generatorEnabled has the value TRUE, then a
supervisory unequipped signal with the current value of j2PathTraceSend is
originated.
If the supervised CTP is connected (the upstreamConnectivityPointer does not have
the value NULL), this package does not influence the transmitted VC (independent
from generatorEnabled).
If the network element supports LCS with restricted capability, the local initial
value of the attribute generatorEnabled should be FALSE.
*;
```

7.4 Virtual container 3-4 supervision bidirectional package

```
vc3-4SupervisionBidirectionalPackage PACKAGE
     BEHAVIOUR vc3-4SupervisionBidirectionalPackageBehaviour;
REGISTERED AS {g774-05Package 4};

vc3-4SupervisionBidirectionalPackageBehaviour BEHAVIOUR
     DEFINED AS
*    A communicationAlarm notification shall be issued if a far end receive
failure (G1 Byte) is detected. The probableCause parameter of the notification
shall indicate FERF (Far End Receive Failure). If monitoring is suspended due to
monitorActive, an existing far end receive failure is cleared and removed from
the current problem list.
If the (inherited) attributes monitorActive and generatorEnabled have the value
TRUE and the upstreamConnectivityPointer has the value NULL (not connected), the
originated supervisory unequipped VC can indicate in the G1 byte a far end
receive failure according to the conditions given in the functional specification
(Recommendation G.783: signal label mismatch, path trace mismatch, AIS or loss of
pointer).
 *;
```

7.5 Virtual container 3-4 supervision sink package

```
vc3-4SupervisionSinkPackageR1 PACKAGE
     BEHAVIOUR   vc3-4SupervisionSinkPackageR1Behaviour;
     ATTRIBUTES
          monitorActive           GET-REPLACE,
          "Recommendation G.774": c2SignalLabelExpected     GET-REPLACE,
          "Recommendation G.774": c2SignalLabelReceive      GET,
          "Recommendation G.774": j1PathTraceExpected
                    REPLACE-WITH-DEFAULT
                    DEFAULT VALUE SDHCSASN1.defaultNull
                    GET-REPLACE,
          j1PathTraceReceive      GET;
REGISTERED AS {g774-05Package 8 };
```

```
vc3-4SupervisionSinkPackageR1Behaviour BEHAVIOUR
     DEFINED AS
*    If a SDH-CTP has to be created and the underlying resource is able to
provide connection supervision, a supervised CTP should be created.
The attribute monitorActive of supervised CTPs does only influence the behaviour
related to connection supervision. A SET-operation of monitorActive to TRUE may
be rejected dependent from the dynamic situation of the specific network element.
In case of rejection the "invalidAttributeValue" error should be returned.
If the attribute monitorActive has the value TRUE, then the path overhead is
monitored. A communicationAlarm notification shall be issued if the signal label
received (C2 Byte) does not match the signal label expected. The probableCause
parameter of the notification shall indicate signal label mismatch. A
communicationAlarm notification shall be issued if the path trace received (J1
Byte) does not match the path trace expected. The probableCause parameter of the
notification shall indicate path trace mismatch. If monitoring is suspended due
to the attribute monitorActive, all outstanding alarms related to the connection
supervision (see above) are cleared and removed from the current problem list. In
this state the attributes c2SignalLabelReceive and j1PathTraceReceive may contain
values which do not reflect the received signal and no alarms (see before) are
emitted. If the attribute monitorActive 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 of a possibly contained currentData object. If the
network element supports HCS with restricted capability, the local initial value
of the attribute monitorActive should be FALSE.
*;
```

7.6 Virtual container 3-4 supervision source package

```
vc3-4SupervisionSourcePackage PACKAGE
     BEHAVIOUR     vc3-4SupervisionSourcePackageBehaviour;
     ATTRIBUTES
          generatorEnabled        GET-REPLACE,
          j1PathTraceSend         GET-REPLACE;
REGISTERED AS {g774-05Package 6};

vc3-4SupervisionSourcePackageBehaviour BEHAVIOUR
     DEFINED AS
*    If an SDH-CTP has to be created and the underlying resource is able to
provide connection supervision, a supervised CTP should be created.
The attribute generatorEnabled of supervised CTPs does only influence the
behaviour related to connection supervision. A SET-operation of generatorEnabled
to TRUE may be rejected dependent from the dynamic situation of the specific
network element. In case of rejection, the “invalidAttributeValue” error should
be returned.
If the supervised CTP is not connected (the upstreamConnectivityPointer has the
value NULL) and the attribute generatorEnabled has the value TRUE, then a
supervisory unequipped signal with the current value of j1PathTraceSend is
originated.
If the supervised CTP is connected (the upstreamConnectivityPointer does not have
the value NULL), this package does not influence the transmitted VC (independent
from generatorEnabled).
If the network element supports HCS with restricted capability, the local initial
value of the attribute generatorEnabled should be FALSE.
*;
```

8 Attributes

8.1 Generator enabled

```
generatorEnabled  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.Boolean;
     MATCHES FOR   EQUALITY;
REGISTERED AS {g774-05Attribute 1};
```

8.2 Monitor active

```
monitorActive  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.Boolean;
     MATCHES FOR   EQUALITY;
REGISTERED AS {g774-05Attribute 2};
```

8.3 J1 Path trace receive

```
j1PathTraceReceive   ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.PathTraceRS;
     MATCHES FOR   EQUALITY;
     BEHAVIOUR
          j1PathTraceReceiveBehaviour BEHAVIOUR
               DEFINED AS
*    This attribute is used to indicate the value of the incoming J1 VC Path
Trace byte message.*
     ;;
REGISTERED AS {g774-05Attribute 3};
```

8.4 J1 Path trace send

```
j1PathTraceSend  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.PathTraceRS;
     MATCHES FOR   EQUALITY;
     BEHAVIOUR
          j1PathTraceSendBehaviour BEHAVIOUR
               DEFINED AS
*    This attribute is used to indicate the value of the outgoing J1 VC Path
Trace byte message.*
     ;;
REGISTERED AS {g774-05Attribute 4};
```

8.5 J2 Path trace expected

```
j2PathTraceExpected  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.PathTrace;
     MATCHES FOR   EQUALITY;
     BEHAVIOUR
          j2PathTraceExpectedBehaviour BEHAVIOUR
               DEFINED AS
*    This attribute is used to specify the value of the expected J2  VC Path
Trace byte message. If the value of this attribute is set to NULL then any
Received Path Trace shall be considered to match.*
     ;;
REGISTERED AS {g774-05Attribute 5};
```

8.6 J2 Path trace receive

```
j2PathTraceReceive  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.PathTraceRS;
     MATCHES FOR   EQUALITY;
     BEHAVIOUR
          j2PathTraceReceiveBehaviour BEHAVIOUR
               DEFINED AS
*    This attribute is used to indicate the value of the incoming J2  VC Path
Trace byte message.*
     ;;
REGISTERED AS {g774-05Attribute 6};
```

8.7 J2 Path trace send

```
j2PathTraceSend  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX   SDHCSASN1.PathTraceRS;
     MATCHES FOR    EQUALITY;
     BEHAVIOUR
          j2PathTraceSendBehaviour BEHAVIOUR
               DEFINED AS
*    This attribute is used to indicate the value of the outgoing J2  VC Path
Trace byte message.*
     ;;
REGISTERED AS {g774-05Attribute 7};
```

9 Actions

None.

10 Notifications

None.

11 Parameters

None.

12 Name bindings

This clause provides replacement namebinding definitions for the existing ITU-T G.774.5 (1995). Any namebinding replaced by one in this clause is considered to be deprecated. The reasons for the replacement of a namebinding are as follows:

1) The replaced namebinding is faulty and must be fixed.

2) The replaced namebinding refers to a superior managed object class which has been re-registered in this Recommendation.

3) The replaced namebinding refers to a subordinate managed object class which has been re-registered in this Recommendation.

4) The replaced namebinding refers to a naming attribute which has been re-registered in this Recommendation.

In each case where a namebinding is replaced, the new namebinding will be registered within this Recommendation. The textual label for the namebinding will be revised to include the text "R1". For example, in the revision of the G.774.5 (1995) namebinding "pathTerminationCurrentData-au4SupervisedCTPSink", the revised label will become "pathTerminationCurrentData-

au4SupervisedCTPSinkR1". Note the "R1" is placed immediately following the revised class which impacts the namebinding.

Below is a table of namebindings deprecated from ITU-T G.774.5 (1995) and the G.774.5 namebindings which replace them:

Deprecated G.774.5 (1995) Namebindings

```
pathTerminationCurrentData-au4SupervisedCTPSink
pathTerminationCurrentData-au3SupervisedCTPSink
pathTerminationCurrentData-tu3SupervisedCTPSink
pathTerminationCurrentData-tu2SupervisedCTPSink
pathTerminationCurrentData-tu12SupervisedCTPSink
pathTerminationCurrentData-tu11SupervisedCTPSink
```

Replacement G.774.5 Namebindings

```
pathTerminationCurrentData-au4SupervisedCTPSinkR1
pathTerminationCurrentData-au3SupervisedCTPSinkR1
pathTerminationCurrentData-tu3SupervisedCTPSinkR1
pathTerminationCurrentData-tu2SupervisedCTPSinkR1
pathTerminationCurrentData-tu12SupervisedCTPSinkR1
pathTerminationCurrentData-tu11SupervisedCTPSinkR1
```

For performance monitoring, name bindings which have supervised CTPs (Sink or Bidirectional) are defined as superior class and the subclass of currentData for path termination as subordinate class (defined in ITU-T G.774.1).

```
pathTerminationCurrentData-au4SupervisedCTPSinkR1           NAME  BINDING
     SUBORDINATE OBJECT CLASS
          "Recommendation G.774.01":pathTerminationCurrentData     AND SUBCLASSES;
     NAMED BY SUPERIOR OBJECT CLASS au4SupervisedCTPSinkR1        AND SUBCLASSES;
     WITH ATTRIBUTE     "Recommendation X.739": scannerId;
     CREATE
          WITH-REFERENCE-OBJECT,
          WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
          DELETES-CONTAINED-OBJECTS;
REGISTERED AS {g774-05NameBinding 7};

pathTerminationCurrentData-au3SupervisedCTPSinkR1 NAME  BINDING
     SUBORDINATE OBJECT CLASS
          "Recommendation G.774.01":pathTerminationCurrentData     AND SUBCLASSES;
     NAMED BY SUPERIOR OBJECT CLASS   au3SupervisedCTPSinkR1      AND SUBCLASSES;
     WITH ATTRIBUTE     "Recommendation X.739": scannerId;
     CREATE
          WITH-REFERENCE-OBJECT,
          WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
          DELETES-CONTAINED-OBJECTS;
REGISTERED AS {g774-05NameBinding 8};

pathTerminationCurrentData-tu3SupervisedCTPSinkR1           NAME  BINDING
     SUBORDINATE OBJECT CLASS
          "Recommendation G.774.01":pathTerminationCurrentData     AND SUBCLASSES;
     NAMED BY SUPERIOR OBJECT CLASS   tu3SupervisedCTPSinkR1      AND SUBCLASSES;
     WITH ATTRIBUTE     "Recommendation X.739": scannerId;
     CREATE
          WITH-REFERENCE-OBJECT,
          WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
          DELETES-CONTAINED-OBJECTS;
REGISTERED AS {g774-05NameBinding 9};
```

```
pathTerminationCurrentData-tu2SupervisedCTPSinkR1     NAME  BINDING
     SUBORDINATE OBJECT CLASS
          "Recommendation G.774.01":pathTerminationCurrentData     AND SUBCLASSES;
     NAMED BY SUPERIOR OBJECT CLASS  tu2SupervisedCTPSinkR1       AND SUBCLASSES;
     WITH ATTRIBUTE     "Recommendation X.739": scannerId;
     CREATE
          WITH-REFERENCE-OBJECT,
          WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
          DELETES-CONTAINED-OBJECTS;
REGISTERED AS {g774-05NameBinding 10};

pathTerminationCurrentData-tu12SupervisedCTPSinkR1    NAME BINDING
     SUBORDINATE OBJECT CLASS
          "Recommendation G.774.01":pathTerminationCurrentData     AND SUBCLASSES;
     NAMED BY SUPERIOR OBJECT CLASS  tu12SupervisedCTPSinkR1      AND SUBCLASSES;
     WITH ATTRIBUTE     "Recommendation X.739": scannerId;
     CREATE
          WITH-REFERENCE-OBJECT,
          WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
          DELETES-CONTAINED-OBJECTS;
REGISTERED AS {g774-05NameBinding 11};

pathTerminationCurrentData-tu11SupervisedCTPSinkR1    NAME  BINDING
     SUBORDINATE OBJECT CLASS
          "Recommendation G.774.01":pathTerminationCurrentData     AND SUBCLASSES;
     NAMED BY SUPERIOR OBJECT CLASS   tu11SupervisedCTPSinkR1     AND SUBCLASSES;
     WITH ATTRIBUTE     "Recommendation X.739": scannerId;
     CREATE
          WITH-REFERENCE-OBJECT,
          WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
          DELETES-CONTAINED-OBJECTS;
REGISTERED AS {g774-05NameBinding 12};
```

13 Constraint rules

None.

14 Subordination rules

None.

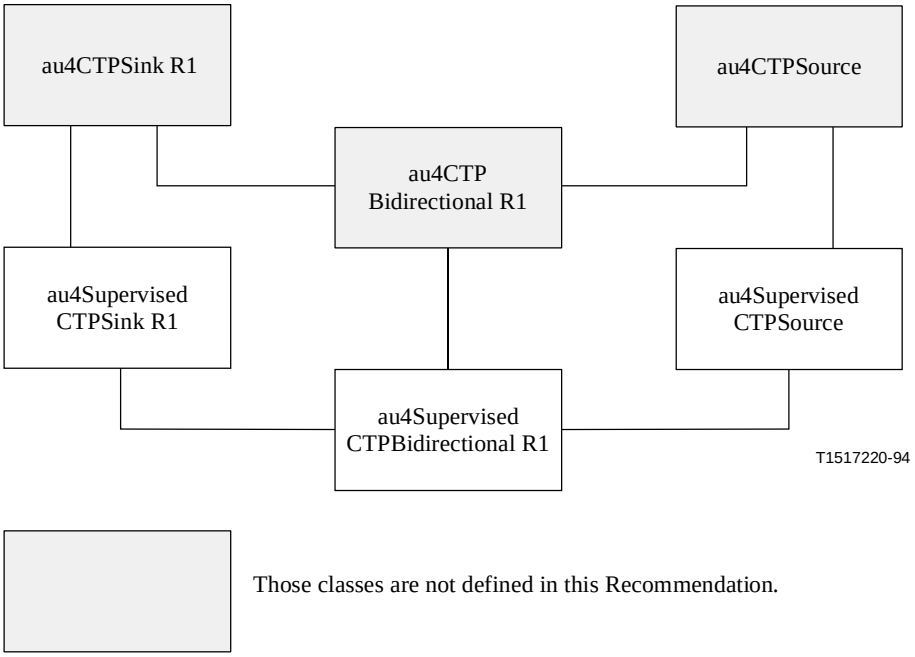
15 Supporting ASN.1 productions

```
SDHCSASN1 {itu-t(0) recommendation(0) g(7) g774(774) hyphen(127)  cs(05)
informationModel(0) asn1Module(2) sdhcs(0)}

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

-- EXPORTS Everything

IMPORTS

PathTrace FROM SDH {itu-t(0) recommendation(0) g(7) sdhm(774) informationModel(0)
asn1Module(2) sdh(0)};
```

```
sdhCS OBJECT IDENTIFIER ::= {itu-t(0) recommendation(0) g(7) g774(774)
hyphen(127) cs(05) informationModel(0)}

g774-05MObjectClass OBJECT IDENTIFIER ::= {sdhCS  managedObjectClass(3)}

g774-05Package OBJECT IDENTIFIER ::={sdhCS  package(4)}

g774-05NameBinding OBJECT IDENTIFIER ::= {sdhCS nameBinding(6)}

g774-05Attribute OBJECT IDENTIFIER    ::={sdhCS attribute(7)}

Boolean ::= BOOLEAN

defaultNull Null ::= NULL
Null ::= NULL

PathTraceRS   ::= GraphicString

END
```

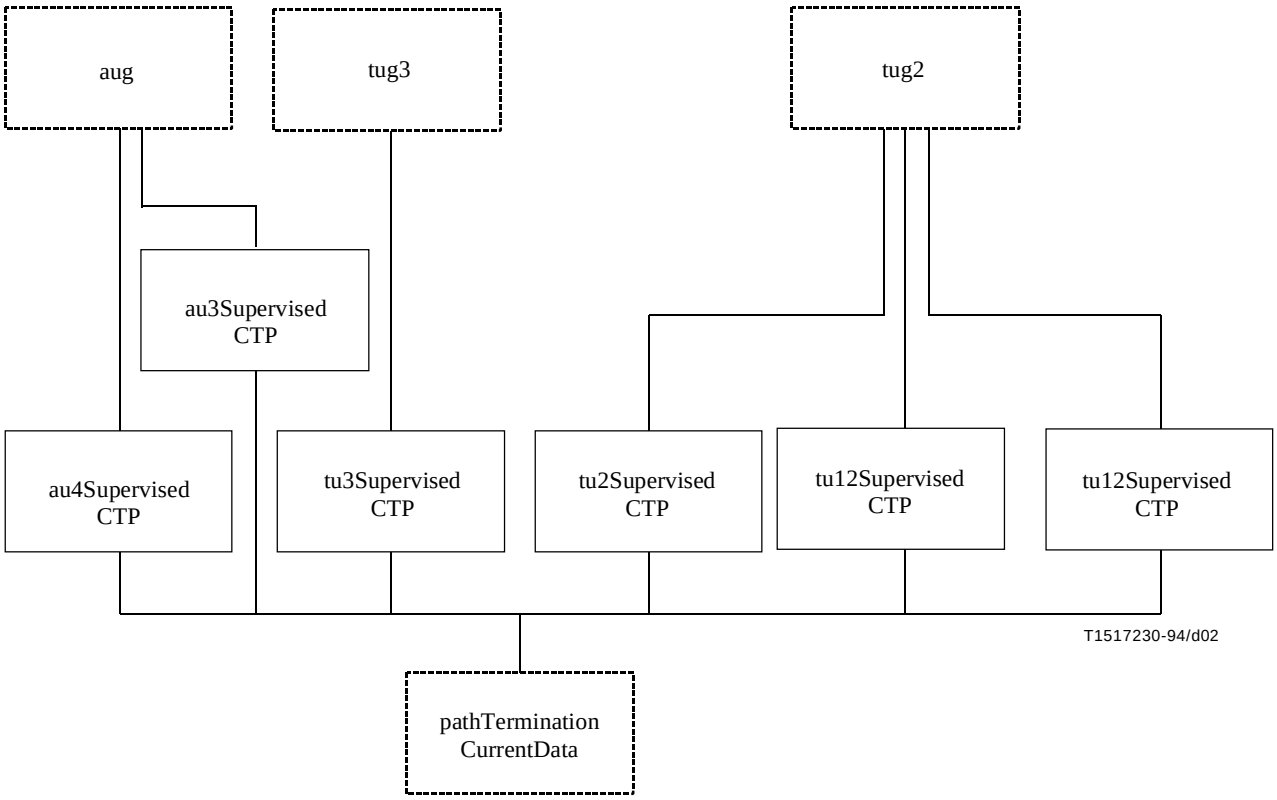
APPENDIX I

Inheritance and naming diagrams



NOTE – The inheritance scheme for supervised au3CTPs and tu3/2/12/11 CTP is analogous to this figure.

Figure I.1/G.774.5 – Inheritance relationship for supervised au4CTPs



Those classes are not defined in this Recommendation.

NOTE – Sink/Source and Bidirectional classes are not distinguished in this figure. Instances of Source classes cannot contain pathTermination-CurrentData.

Figure I.2/G.774.5 – Containment relationship for supervised CTPs

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