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G.774.9
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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

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

Synchronous Digital Hierarchy (SDH) configuration of linear multiplex section protection for the network element view

ITU-T Recommendation G.774.9

(Previously CCITT Recommendation)

ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION G.774.9

SYNCHRONOUS DIGITAL HIERARCHY (SDH) CONFIGURATION OF LINEAR MULTIPLEX SECTION PROTECTION 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 configuration of the protection switching function, as defined in Recommendations G.805 [7] and G.774.3 [4] and as related to SDH transmission resources. These objects are useful to describe information exchanged across interfaces defined in M.3010 [8] Telecommunications Management Network (TMN) architecture for the configuration of the protection function. The protection switching scheme of an SDH network element is usually set up autonomously by the network element according to its make-up and mode of operation. When this is not possible, the information model defined by this Recommendation will be used. Post-configuration management of the protection function is described in Recommendation G.774.3 [4].

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the 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.

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, the 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.

CONTENTS

SYNCHRONOUS DIGITAL HIERARCHY (SDH) CONFIGURATION OF LINEAR MULTIPLEX SECTION PROTECTION FOR THE NETWORK ELEMENT VIEW

(Geneva, 1998)

The ITU-T,

considering

a)   that Recommendation G.707 is a specification for the Synchronous Digital Hierarchy (SDH) and the Network Node Interface (NNI);

b)   that Recommendations G.783 and G.784 form a coherent set of specifications for SDH multiplex equipment functions and management;

c)   that Recommendation M.3010 defines the principles for a Telecommunications Management Network (TMN);

d)   that Recommendation G.773 defines the protocol suites for Q-interfaces;

e)   that Recommendation M.3100 defines a Generic Network Information Model for the exchange of management information;

f)   that Recommendation G.774 defines an SDH Management Information Model for the Network Element View;

g)   that Recommendation G.774.3 defines an SDH Information Model for Management of the Multiplex-Section Protection for the Network Element View,

recommends

that the configuration of multiplex section protection groups of SDH equipment be carried out by using the information model defined in accordance with the details contained within this Recommendation.

1   Scope

1.1   Scope of this Recommendation

Recommendation G.774.3 [4] defines an information model for management of fixed linear Multiplex Section Protection (MSP) groups. This Recommendation defines the object model that allows to configure flexible linear MSP groups in accordance with the requirements described in Recommendation G.784 [6]. This model can be used to establish, modify and remove MSP groups for Network Elements that require external provisioning to configure their protection switching schemes. The protection switching scheme of an SDH network element is usually set up autonomously by the network element according to its make-up and mode of operation. When this is not possible, the information model defined by this Recommendation will be used. Post-configuration control of the protection function is carried out by means of the object model defined in Recommendation G.774.3 [4].

1.2   Structure of this Recommendation

Subclause 5.1 provides an overview of the SDH protection configuration information model. Clauses 6-15 describe the information model using the notation mechanisms defined in Recommendation X.722 Guidelines for the Definition of Managed Objects [19]. Clause 15 contains the syntax definitions of the information carried in the protocol using Abstract Syntax Notation One (ASN.1) defined in Recommendation X.208 [13]. Naming and Inheritance are illustrated in Appendix I. Clauses 5-15 are normative; all other text is informative.

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; 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 G.707 (1996), *Network node interface for the Synchronous Digital Hierarchy (SDH)*.

[2]   ITU-T Recommendation G.773 (1993), *Protocol suites for Q-interfaces for management of transmission systems*.

[3]   CCITT Recommendation G.774 (1992), *Synchronous Digital Hierarchy (SDH) management information model for the network element view*.

[4]   ITU-T Recommendation G.774.3 (1994), *Synchronous Digital Hierarchy (SDH) management of multiplex-section protection for the network element view*.

[5]   ITU-T Recommendation G.783 (1997), *Characteristics of Synchronous Digital Hierarchy (SDH) equipment functional blocks*.

[6]   ITU-T Recommendation G.784 (1994), *Synchronous Digital Hierarchy (SDH) management*.

[7]   ITU-T Recommendation G.805 (1995), *Generic functional architecture of transport networks*.

[8]   ITU-T Recommendation M.3010 (1996), *Principles for a Telecommunications Management Network*.

[9]   ITU-T Recommendation M.3100 (1995), *Generic network information model*.

[10]   ITU-T Recommendation M.60 (1993), *Maintenance terminology and definitions*.

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

[12]   ITU-T Recommendation Q.812 (1997), *Upper layers protocol profiles for the Q3 and X interfaces*.

[13]   CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1)*.

[14]   ITU-T Recommendation X.701 (1997) | ISO/IEC 10040:1998, *Information technology – Open Systems Interconnection – Systems management overview*.

[15]   ITU-T Recommendation X.710 (1997) | ISO/IEC 9595:1998, *Information technology – Open Systems Interconnection – Common Management Information Service*.

[16]   ITU-T Recommendation X.711 (1997) | ISO/IEC 9596-1:1998, *Information technology – Open Systems Interconnection – Common Management Information Protocol: Specification*.

[17]   CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management information model*.

[18]   CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information*.

[19]   CCITT Recommendation X.722 (1992) | ISO/IEC 10165-4:1992, *Information technology – Open Systems Interconnection – Structure of management information: Guidelines for the Definition of Managed Objects*.

[20]   CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2:1992, *Information technology – Open Systems Interconnection – Systems management: State management function*.

[21]   CCITT Recommendation X.730 (1992) | ISO/IEC 10164-1:1993, *Information technology – Open Systems Interconnection – Systems Management: Object management function*.

[22]   CCITT Recommendation X.733 (1992), | ISO/IEC 10164-4:1992, *Information technology – Open Systems Interconnection Systems management: Alarm Reporting Function*.

[23]   CCITT Recommendation X.734 (1992) | ISO/IEC 10164-5:(1993), *Information technology – Open Systems Interconnection – Systems management: Event report management function*.

[24]   CCITT Recommendation X.735 (1992) | ISO/IEC 10164-6:1993, *Information technology – Open Systems Interconnection – Systems management: Log control function*.

3   Definitions

None.

4   Abbreviations

This Recommendation uses the following abbreviations.

APDU   Application Protocol Data Unit

APS   Automatic Protection Switching

CMIP   Common Management Information Protocol

CMIS   Common Management Information Service

CTP   Connection Termination Point

ISO   International Organization for Standardization

ITU   International Telecommunication Union

LOS   Loss of Signal

MS   Multiplex Section

MSP   Multiplex Section Protection

NE   Network Element

OS   Operations System

OSI   Open Systems Interconnection

Pkg   Package

RDN   Relative Distinguished Name

SDH   Synchronous Digital Hierarchy

SF   Signal Fail

STM-N   Synchronous Transport Module N

TMN   Telecommunications Management Network

TP   Termination Point

TTP   Trail Termination Point

WTR   Wait-to-Restore

5   Multiplex-Section Protection configuration management model

5.1   Overview

Recommendation G.774.3 defines a generic model for protection schemes and the specific model for SDH MS protection. The model defined in G.774.3 allows full operation and control of the MS protection function for Network Elements that set up autonomously their protection switching schemes, according to their make-up and mode of operation.

Some Network Elements, due to equipment flexibility, require external provisioning to determine the configuration of their MS protection schemes, particularly as to the definition of the lines participating in the protection.

This clause provides Managed Objects to support configuration of MS protection groups in SDH Network Elements.

This model is a compatible extension that supports external creation and deletion of SDH MS protection groups and units to the model defined in Recommendation G.774.3.

5.2 Requirements

The information model defined in this Recommendation is based on the same approach as used in Recommendation G.774.3 that identifies generic objects to support general protection functional requirements plus specific subclasses for the particular purposes of Multiplex Section Protection.

The functional requirements for configuration management of Multiplex Section Protection groups may be found in Recommendation G.784.

5.2.1 Generic protection configuration requirements

The general functional requirements for the configuration of protection schemes are:

– the ability for a managing system to establish a protection scheme, indicating the protection mode (revertive/non revertive), the entities participating in the protection, their role (protecting/protected), and possibly their priority;[1]

– the ability for a managing system to modify a protection scheme, adding or removing entities and/or modifying their protection characteristics (role and priority);

– the ability for a managing system to suppress a protection scheme.

5.2.2 Specific SDH MS linear protection configuration requirements

The specific functional requirements for the configuration of SDH MS protection schemes are:

– the ability for a managing system to specify the type of protection (unidirectional/bidirectional) and to enable or disable the K1, K2 protocol when establishing a protection scheme;[1]

– the ability for a managing system to specify the channel number and priority (high/low) associated to each protection line and optionally control extra-traffic on each protection line when establishing or modifying a protection scheme.[1]

5.3 Model overview

The information model specified in this Recommendation defines a generic object (protectionCoordinator) that includes the actions (namely establishProtection, modifyProtection, dismissProtection), necessary to configure a generic protection scheme.

A subclass of protectionCoordinator (sdhMSProtectionCoordinator) is then defined for the specific purposes of SDH MS Protection configuration. Such object class inherits all of the actions and behavior defined in the protectionCoordinator superclass and specifies the additional information needed to establish or modify a protection scheme in the particular case of SDH MSP.

6 Managed Object Class definitions

6.1 Protection Coordinator

protectionCoordinator MANAGED OBJECT CLASS
      DERIVED FROM "Recommendation X.721 | ISO/IEC 10165-2 : 1992":top;
      CHARACTERIZED BY
         protectionCoordinatorPkg PACKAGE
            BEHAVIOUR protectionCoordinatorBeh;

---

[1] These parameters can be configured when establishing the protection scheme. Subsequent modifications may be achieved by using Recommendation G.774.3.

```
                ATTRIBUTES
                    protectionCoordinatorId  GET;
                ACTIONS
                    establishProtection          protectionConfigurationError,
                    dismissProtection            removeProtectionError,
                    modifyProtection             protectionConfigurationError
                                                 removeProtectionError;;;
REGISTERED AS {g774-09MObjectClass 1};
```

protectionCoordinatorBeh BEHAVIOUR
      DEFINED AS
      This object class allows the management system to configure the protection schemes of a network element. Instances of this class or of its subclasses are created at system start-up and can never be deleted.;

6.2   SDH MS Protection Coordinator

```
sdhMSProtectionCoordinator MANAGED OBJECT CLASS
        DERIVED FROM          protectionCoordinator;
        CHARACTERIZED BY
            sdhMSProtectionCoordinatorPkg PACKAGE
                BEHAVIOUR sdhMSProtectionCoordinatorBeh;
                ACTIONS
                    establishProtection          mSPGroupConfigurationParameter
                                                 mSPUnitConfigurationParameter
                                                 mSPConfigurationError,
                    modifyProtection             mSPUnitConfigurationParameter
                                                 mSPConfigurationError;;;
REGISTERED AS {g774-09MObjectClass 2};
```

sdhMSProtectionCoordinatorBeh BEHAVIOUR
      DEFINED AS
      *This object class is used specifically to configure SDH MS protection schemes. Only one instance can be created in one NE.

When the establishProtection action is successfully performed one sdhMSProtectionGroup instance and as many sdhMSProtectionUnit instances are created as specified by the action information. The unreliableResourcePointer of each sdhMSProtectionUnit will point to the unprotectedCTP indicated by the unreliableObjects field of the action information. The reliableResourcePointer will point to the protectedTTP connected to the unprotectedCTP, unless the protectionUnit is protecting and extra-traffic is not required or not supported. In this case the reliableResourcePointer is NULL.

UnprotectedCTPs and protectedTTPs are anyhow instantiated for sections which can potentially be included in a protection group irrespective whether protection is actually present or not. When a section is not part of a protection group, the crossConnectionObjectPointer of the unprotectedCTP and protectedTTP point to the sdhMSProtectionCoordinator object instance. When protection is established the crossConnectionObjectPointer points to the associated sdhMSprotectionUnit. When it is possible, unprotectedCTPs and protectedTTPs may be created/deleted as a result of the establish/modify/dismiss actions.*;

7   Packages

None.

8   Attributes

8.1   Protection Coordinator Id

```
protectionCoordinatorId          ATTRIBUTE
        WITH ATTRIBUTE SYNTAX     SDHProtCoordASN1.NameType;
        MATCHES FOR          EQUALITY;
        BEHAVIOUR            protectionCoordinatorIdBeh;
REGISTERED AS {g774-09Attribute 1};
```

protectionCoordinatorIdBeh BEHAVIOUR

>> **DEFINED AS**

>> *The protectionCoordinatorId attribute is an attribute type whose distinguished value can be used as an RDN when naming an instance of the protectionCoordinator object class.*;

9   Actions

9.1   Dismiss Protection

dismissProtection   **ACTION**

>> **BEHAVIOUR**   **dismissProtectionBeh;**

>> **MODE CONFIRMED;**

>> **WITH INFORMATION SYNTAX**   **SDHProtCoordASN1.DismissProtectionInfo;**

>> **REGISTERED AS {g774-09Action 1};**

>> **dismissProtectionBeh BEHAVIOUR DEFINED AS**

>> *This action is used to dismiss a protection scheme. The protectionGroup object instance indicated in the action argument and all the contained protectionUnits are deleted. After the execution of this action all the resources previously participating in the protection scheme will operate in an unprotected mode. Yet, protectedTTPs and unprotectedCTPs will remain to allow for future participation in other protection groups.

>> The action fails if manual or forced switch commands are active on any of the protection units.

>> Automatic switches present before the deletion are implicitly released as a side effect. No notification is sent to report the release of automatic switches.*;

9.2   Establish Protection

establishProtection   **ACTION**

>> **BEHAVIOUR**   **establishProtectionBeh;**

>> **MODE CONFIRMED;**

>> **WITH INFORMATION SYNTAX**   **SDHProtCoordASN1.EstablishProtectionInfo;**

>> **REGISTERED AS {g774-09Action 2};**

establishProtectionBeh BEHAVIOUR DEFINED AS

>> *This action is used to create a protection scheme within a network element. When applied, one protectionGroup object instance is created.

>> The protectionUnits field indicates the protection resources which will participate in the protection scheme and their role (protected/protecting). One protectionUnit instance is created for each element of the protectionUnits field. The unreliableResourcePointer, the protecting and the priority attributes of each protectionUnit are initialized with the value provided by the ProtectionResource sequence (priority optional). The priority must be assigned either to all protected (or protecting) units or to none. At least one protected and one protecting protection units must be provided by the managing system. The specificPUConfiguration field allows to define additional protection unit attributes for specific subclasses of the protectionUnit class. The specific parameter to be used is defined in protectionCoordinator subclasses.

>> The optional protectionGroupType field is used to discriminate whether the protection type is 1+1 (plus) or M:N (colon). The protectionGroupType attribute of the protectionGroup object instance will be set accordingly. This field can be present only when the managing system indicated one protected and one protecting resource; if, in this case, it is absent the NE will set the protectionGroupType attribute according to its own capabilities.

>> The optional revertiveInformation field allows the managing system to ask for a revertive/non-revertive protection scheme and, only if revertive is set to TRUE, to assign the wait-to-restore time. If the revertiveInformation is not present the NE will set the revertive and waitToRestoreTime attributes according to its own capabilities.

>> The specificPGConfiguration field allows to define additional protection group attributes for specific subclasses of the protectionGroup class. The specific parameter to be used is defined in protectionCoordinator subclasses.*;

9.3   Modify Protection

modifyProtection   ACTION

        BEHAVIOUR   modifyProtectionBeh;

        MODE CONFIRMED;

        WITH INFORMATION SYNTAX   SDHProtCoordASN1.ModifyProtectionInfo;

        REGISTERED AS {g774-09Action 3};

modifyProtectionBeh BEHAVIOUR DEFINED AS

        *This action is used to add and/or remove one or more resources from a protectionGroup. Action requests that would reduce to zero the number of protected or protecting units will be rejected.

        If the protectionGroupType was 1+1 (plus) and one or more protection units are added, it automatically switches to M:N (colon).

        The action fails if manual or forced switch commands are active on any of the protection units under removal.

        Automatic switches present before the deletion of a protectionUnit are implicitly released as a side effect.*;

10   Notifications

None.

11   Parameters

11.1   MSP Configuration Error

mSPConfigurationError   PARAMETER

        CONTEXT SPECIFIC-ERROR;

        WITH SYNTAX   SDHProtCoordASN1.MSPConfigurationError;

        BEHAVIOUR   mSPConfigurationErrorBeh;

        REGISTERED AS {g774-09Parameter 1};

mSPConfigurationErrorBeh   BEHAVIOUR DEFINED AS

        This parameter is included in the error parameter of the CMIP APDU when the establishProtection or modifyProtection action received by the sdhMSPProtectionCoordinator fails for specific MSP configuration inconsistencies.;

11.2   MSP Group Configuration Parameter

mSPGroupConfigurationParameter   PARAMETER

        CONTEXT ACTION-INFO;

        WITH SYNTAX   SDHProtCoordASN1.MSPGroupConfigurationParameter;

        BEHAVIOUR   mSPGroupConfigurationParameterBeh;

        REGISTERED AS {g774-09Parameter 2};

mSPGroupConfigurationParameterBeh BEHAVIOUR DEFINED AS

        *This parameter is used in the specificPGConfiguration field of the establishProtection action received by the sdhMSPProtectionCoordinator, when the establishment of a sdhMSProtectionGroup is requested by the management system.

        The protectionSwitchMode field indicates whether protection switching is done on a unidirectional or bidirectional basis.

        The aPSProtocolPresent boolean field indicates whether the K1/K2 protocol is used. The protectionMismatchStatusPkg conditional package of the sdhMSProtectionGroup object is instantiated if aPSProtocolPresent value is TRUE.*;

11.3   MSP Unit Configuration Parameter

mSPUnitConfigurationParameter   PARAMETER
          CONTEXT ACTION-INFO;
          WITH SYNTAX   SDHProtCoordASN1.MSPUnitConfigurationParameter;
          BEHAVIOUR   mSPUnitConfigurationParameterBeh;
          REGISTERED AS {g774-09Parameter 3};

mSPUnitConfigurationParameterBeh   BEHAVIOUR DEFINED AS
          *This parameter is used in the specificPUConfiguration field of the establishProtection or modifyProtection action
          received by the sdhMSPProtectionCoordinator, when the establishment or modification of a
          sdhMSProtectionGroup is requested by the management system.

          The channelNumber field indicates the channel number associated with the protection unit.

          The sdhPriority field indicated the priority (High/Low) of the protected protection unit. For protecting protection
          units this field is not present.

          If the extraTrafficControl field is present the extraTrafficControlPkg is instantiated in the protectionUnit object
          instance. The administrativeState is initialized with the value provided by this field. This field can only be present if
          the aPSProtocolPresent value is set to true and if the protection unit is protecting.*;

11.4   Protection Configuration Error

protectionConfigurationError   PARAMETER
          CONTEXT SPECIFIC-ERROR;
          WITH SYNTAX   SDHProtCoordASN1.ProtectionConfigurationError;
          BEHAVIOUR   protectionConfigurationErrorBeh;
          REGISTERED AS {g774-09Parameter 4};

protectionConfigurationErrorBeh   BEHAVIOUR DEFINED AS
          *This parameter is included in the error parameter of the CMIP APDU when the establishProtection or
          modifyProtection action received by a subclass of the protectionCoordinator fails for generic configuration
          inconsistencies.*;

11.5   Remove Protection Error

removeProtectionError   PARAMETER
          CONTEXT SPECIFIC-ERROR;
          WITH SYNTAX   SDHProtCoordASN1.RemoveProtectionError;
          BEHAVIOUR   removeProtectionErrorBeh;
          REGISTERED AS {g774-09Parameter 5};

removeProtectionErrorBeh   BEHAVIOUR DEFINED AS
          *This parameter is included in the error parameter of the CMIP APDU when the dismissProtection or
          modifyProtection action received by a subclass of the protectionCoordinator fails.

          The operatorCommandPresent result is returned when a manual or forced switch is present in the protection
          group. It shall indicate the involved protection units.*;

12   Name binding definitions

12.1   Protection Coordinator

protectionCoordinator-sdhNE   NAME BINDING
          SUBORDINATE OBJECT CLASS   protectionCoordinator AND SUBCLASSES;
          NAMED BY
          SUPERIOR OBJECT CLASS   sdhNE AND SUBCLASSES;
          WITH ATTRIBUTE   protectionCoordinatorId;
          BEHAVIOUR   protectionCoordinator-sdhNEBeh;
          REGISTERED AS {g774-09NameBinding 1};

protectionCoordinator-sdhNEBeh   BEHAVIOUR DEFINED AS

  The subordinate managed object is automatically instantiated when the superior managed object is instantiated, according to the make-up and mode of operation of the equipment.;

13   Subordination Rules

None.

14   Pointer constraints

None.

15   Supporting ASN.1 productions

SDHProtCoordASN1 {itu-t(0) recommendation(0) g(7) g774(774) hyphen(127) protCoord(9) informationModel(0) asn1Module(2) sdhmspcoord(0)}

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

-- EXPORTS everything

IMPORTS

AdditionalInformation, AdministrativeState FROM Attribute-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2(2) asn1Module(2) 1}

ObjectInstance FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)}

NameType FROM ASN1DefinedTypesModule {ccitt(0) recommendation(0) m(13) gnm(3100) informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)}

ProtectionGroupType, ProtectionSwitchMode, ResourcePointer, SDHMSPriority FROM SDHProtASN1 {itu-t(0) recommendation(0) g(7) g774(774) hyphen(127) prot(03) informationModel(0) asn1Module(2) sdhmsp(0)};

sdhProtCoord OBJECT IDENTIFIER ::= {itu-t(0) recommendation(0) g(7) g774(774) hyphen(127) protCoord(9) informationModel(0)}

g774-09MObjectClass OBJECT IDENTIFIER ::= {sdhProtCoord managedObjectClass(3)}

g774-09NameBinding OBJECT IDENTIFIER ::= {sdhProtCoord nameBinding(6)}

g774-09Attribute OBJECT IDENTIFIER ::= {sdhProtCoord attribute(7)}

g774-09Action OBJECT IDENTIFIER ::= {sdhProtCoord action(9)}

g774-09Parameter OBJECT IDENTIFIER ::= {sdhProtCoord parameter(5)}

AddedProtectionUnits ::= ProtectionUnits

DismissedProtectionGroup ::= ObjectInstance

DismissProtectionInfo ::= DismissedProtectionGroup

EstablishProtectionInfo ::= SEQUENCE {
                          protectionUnits   ProtectionUnits,
                          protectionGroupType   ProtectionGroupType OPTIONAL,
                          revertiveInformation   RevertiveInformation OPTIONAL,
                          specificPGConfiguration   AdditionalInformation OPTIONAL
                          }

IncompatibleWithNEConfig ::= CHOICE {
                          alreadyProtected   [0] ObjectInstance,
                          otherIncompatibility   [1] NULL
                          }

InconsistentData ::= ENUMERATED {
                          exceedingProtectingUnits   (0),
                          exceedingUnitsFor1+1   (1),
                          duplicateUnreliable   (2),

```
                          nonRevertiveIncompatibleWith1:N        (3),
                          incompletePriorityAssignment           (4),
                          otherError                             (5)
                              }
```

ModifiedProtectionGroup ::= ObjectInstance

```
ModifyProtectionInfo ::= SEQUENCE {
                    modifiedProtectionGroup      ModifiedProtectionGroup,
                    addedProtectionUnits         AddedProtectionUnits OPTIONAL,
                    removedProtectionUnits       RemovedProtectionUnits OPTIONAL
                        }
```

```
MSPConfigurationError ::= ENUMERATED {
                                 protectionSwitchModeNotSupported     (0)
                                 aPSProtocolNotSupported              (1),
                                 invalidChannelNumber                 (2),
                                 notSupportedSDHPriority              (3),
                                 extraTrafficControlNotSupported      (4),
                                 otherError                           (5)
                                 }
```

```
MSPGroupConfigurationParameter ::= SEQUENCE {
                                 protectionSwitchMode         ProtectionSwitchMode,
                                 aPSProtocolPresent           BOOLEAN
                                     }
```

```
MSPUnitConfigurationParameter ::= SEQUENCE {
                                 channelNumber            INTEGER,
                                 sdhPriority              SDHMSPriority OPTIONAL,
                                 extraTrafficControl      AdministrativeState OPTIONAL
                                     }
```

OperatorCommandPresent ::= SET OF ResourcePointer

```
ProtectionConfigurationError ::= CHOICE {
                    inconsistentData                 [0] InconsistentData,
                    unsupportedProtConfiguration     [1] UnsupportedProtConfiguration,
                    incompatibleWithNEConfig         [2] IncompatibleWithNEConfig
                        }
```

```
ProtectionResource ::= SEQUENCE {
                    unreliableObjects       ResourcePointer,
                    protecting              BOOLEAN,
                    priority                INTEGER OPTIONAL,
                    specificPUConfiguration AdditionalInformation OPTIONAL
                        }
```

ProtectionUnits ::= SET OF ProtectionResource

RemoveProtectionError ::= OperatorCommandPresent

RemovedProtectionUnits ::= SET OF ObjectInstance

```
RevertiveInformation ::= SEQUENCE {
                    revertive           BOOLEAN,
                    waitToRestoreTime   INTEGER OPTIONAL
                        }
```

```
UnsupportedProtConfiguration ::= ENUMERATED {
                    notSupportedProtConfig        (0),
                    notSupportedPGType            (1),
                    notSupportedRevertiveMode     (2),
                    invalidWTRTime                (3),
                    invalidPriority               (4),
                    otherError                    (5)
                        }
```

END -- *end of SDHProtCoordASN1*

Appendix I

Naming and inheritance diagrams

The naming and inheritance trees are covering only the managed object classes of this Recommendation. See Figures I.1 and I.2.
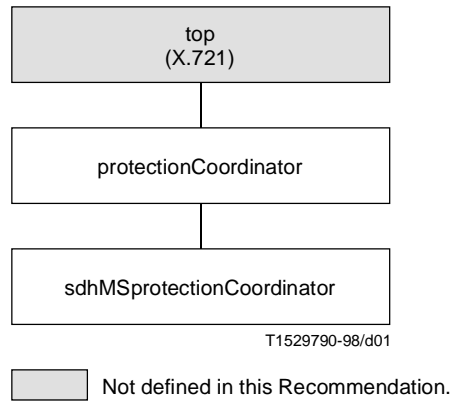

T1529790-98/d01

> [ ] Not defined in this Recommendation.

Figure I.1/G.774.9 – SDH MS configuration inheritance diagram
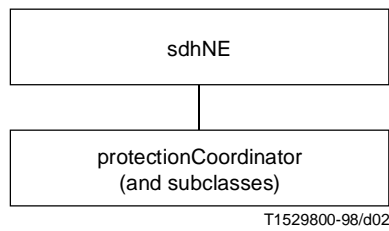

T1529800-98/d02

Figure I.2/G.774.9 – SDH MS configuration naming diagram

ITU-T RECOMMENDATIONS SERIES

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Series K   Protection against interference

Series L   Construction, installation and protection of cables and other elements of outside plant

Series M   TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits

Series N   Maintenance: international sound programme and television transmission circuits

Series O   Specifications of measuring equipment

Series P   Telephone transmission quality, telephone installations, local line networks

Series Q   Switching and signalling

Series R   Telegraph transmission

Series S   Telegraph services terminal equipment

Series T   Terminals for telematic services

Series U   Telegraph switching

Series V   Data communication over the telephone network

Series X   Data networks and open system communication

Series Y   Global information infrastructure

Series Z   Programming languages