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Foreword

This final draft Interim European Telecommunication Standard (I-ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

An ETSI standard may be given I-ETS status either because it is regarded as a provisional solution ahead of a more advanced standard, or because it is immature and requires a "trial period". The life of an I-ETS is limited to three years after which it can be converted into an ETS, have it's life extended for a further two years, be replaced by a new version, or be withdrawn.

This I-ETS provides a generic management information model. It identifies those Telecommunications Management Network (TMN) managed object classes that are generic (i.e. potentially apply to more than one specific information model) and that are used to describe information exchanged across TMN interfaces defined in CCITT Recommendation M.3010.

Proposed announcement date	
Date of latest announcement of this I-ETS (doa):	3 months after ETSI publication

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1 Scope

This final draft Interim European Telecommunication Standard (I-ETS) provides a generic management information model. It identifies those TMN managed object classes that are generic (i.e. potentially apply to more than one specific information model) and that are used to describe information exchanged across TMN interfaces defined in CCITT Recommendation M.3010 [1].

CCITT Recommendation M.3100 [2], which is extended by this I-ETS, addresses generically the abstractions of those aspects of telecommunication resources (e.g. equipment, networks and telecommunication services) required to manage the network. It also includes the abstractions related to the management services.

The generic model is not yet complete and future issues of this I-ETS will be enhanced as a result of object modelling work in ETSI.

This I-ETS does not address abstractions relevant to technology specific areas or implementation specific details.

2 Normative references

This I-ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this I-ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] CCITT Recommendation M.3010 (1992): "Principles for a telecommunications management network".

[2] CCITT Recommendation M.3100 (1992): "Generic network information model".

[3] CCITT Recommendation X.722 (1992): "Information technology - Open Systems Interconnection - Structure of Management Information: Guidelines for the definition of managed objects".

[4] CCITT Recommendation X.208 (1990): "Specification of Abstract Syntax Notation One (ASN.1)".

[5] ETR 047 (1992): "Network Aspects (NA): "Telecommunications Management Network (TMN) Management services".

[6] CCITT Recommendation G.803 (1992): "Architectures of transport networks based on the synchronous digital hierarchy (SDH)".

[7] CCITT Recommendation X.721 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[8] CCITT Recommendation Q.821 (1992): "Stage 2 and 3 descriptions for the Q3 interface - Alarm surveillance".

3 Abbreviations

For the purposes of this I-ETS, the following abbreviations apply:

ASN.1	Abstract Syntax Notation One
CA	Customer Administration
NE	Network Element
OS	Operation Systems
OSI	Open System Interconnection
TMN	Telecommunications Management Network
UMTS	Universal Mobile Telecommunications Systems

4 General

4.1 Purpose

As CCITT Recommendation M.3100 [2].

4.2 Field of application

As CCITT Recommendation M.3100 [2].

4.3 Structure of this I-ETS

CCITT Recommendation M.3100 [2] provides an overview of the generic network model used in this I-ETS. The definition of management information given in clauses 5 to 12, describing information model is documented using the notional mechanisms defined in CCITT Recommendation X.722 [3]. The notation used is Abstract Syntax Notation One (ASN.1) defined in CCITT Recommendation X.208 [4]. Some object classes are imported from CCITT Recommendations X.721 [7] and Q.821 [8].

Annexes A and B contain candidate generic management information which have been identified as part of the call routing information management and customer administration modelling tasks. They have been included in these annexes for registration purposes prior to consideration for inclusion in the main body of this I-ETS.

Annexes C and D contain candidate management information for the network level viewpoint and service level viewpoint respectively. They are included for information, prior to consideration for inclusion in the main body of this I-ETS.

Annex E contains explanatory text designed to illustrate potential uses of the managed objects, identified in the body of this I-ETS.

4.4 Overview of the network model

As CCITT Recommendation M.3100 [2].

5 Object classes

This clause contains the textual definitions of the object classes that form the basis for the generic network information model. This model takes as its basis the managed objects defined in the body of CCITT Recommendation M.3100 [2]. These object classes are grouped into 6 fragments. These fragments show all related object classes from different perspectives.

The object classes, packages, attributes, notifications, actions and name bindings, which are registered through ETSI, are additional to those defined in clauses 3 to 10 of CCITT Recommendation M.3100 [2]. Objects identified in Annexes of CCITT Recommendation M.3100 [2] are not considered to be part of this I-ETS.

5.1 Network fragment

Objects imported from CCITT Recommendation M.3100 [2] are as follows:

```
BEGIN
IMPORTS
        Recommendation M.3100:1992 Network,
from M.3100ObjectClass{ccitt(0) recommendation(0) m(13) 3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

All packages, attributes, ASN.1 and name bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object class.

5.2 Managed element fragment

Objects imported from CCITT Recommendation M.3100 [2] are as follows:

```
BEGIN
IMPORTS
        Recommendation M.3100:1992 Equipment,
        Recommendation M.3100:1992 Managed Element,
        Recommendation M.3100:1992 Software,
from M.3100ObjectClass{ccitt(0) recommendation(0) m(13) 3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

All packages, attributes, ASN.1 and name bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object class.

5.3 Termination point fragment

Objects imported from CCITT Recommendation M.3100 [2] are as follows:

```
BEGIN
IMPORTS
        Recommendation M.3100:1992 Connection Termination Point Bidirectional,
        Recommendation M.3100:1992 Connection Termination Point Sink,
        Recommendation M.3100:1992 Connection Termination Point Source,
        Recommendation M.3100:1992 Termination point,
        Recommendation M.3100:1992 Trail Termination point Bidirectional,
        Recommendation M.3100:1992 Trail Termination point Sink,
        Recommendation M.3100:1992 Trail Termination point Source,
from M.3100ObjectClass{ccitt(0) recommendation(0) m(13) 3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

All packages, attributes, ASN.1 and name bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object class.

5.4 Cross connect fragment

Objects imported from CCITT Recommendation M.3100 [2] are as follows:

```
BEGIN
IMPORTS
        Recommendation M.3100:1992 Cross Connection,
        Recommendation M.3100:1992 Fabric,
        Recommendation M.3100:1992 Group Termination Point,
        Recommendation M.3100:1992 Multipoint Cross-Connection Network,
        Recommendation M.3100:1992 Named Cross-Connection,
        Recommendation M.3100:1992 Named Multipoint Cross Connection,
        Recommendation M.3100:1992 TP Pool,
from M.3100ObjectClass{ccitt(0) recommendation(0) m(13) 3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

All packages, attributes, ASN.1 and name bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object class.

5.5 Functional area fragment

Objects imported from CCITT Recommendation M.3100 [2] are as follows:

```
BEGIN
IMPORTS
        Recommendation X.721:1992 Alarm Record,
        Recommendation X.721:1992 Alarm Severity Assignment Profile,
        Recommendation X.721:1992 Attribute Value Change Record,
        Recommendation Q.821:1992 Current Alarm Summary Control,
        Recommendation X.721:1992 Discriminator,
        Recommendation X.721:1992 Event Forwarding Discriminator,
        Recommendation X.721:1992 Event Log Record,
        Recommendation X.721:1992 Log,
        Recommendation X.721:1992 Log Record,
        Recommendation Q.821:1992 Management Operations Scheduler,
        Recommendation X.721:1992 Object Creation Record,
        Recommendation X.721:1992 Object Deletion Record,
        Recommendation X.721:1992 State Change Record,
from M.3100ObjectClass{ccitt(0) recommendation(0) m(13) 3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

All packages, attributes, ASN.1 and name bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object class.

5.6 Service fragment

No managed objects have been defined for this fragment. However candidate object classes are listed in annex D.

6 Packages

As CCITT Recommendation M.3100 [2].

7 Attributes

As CCITT Recommendation M.3100 [2]:

8 Name bindings

As CCITT Recommendation M.3100 [2], plus the following:

8.1 Equipment

```
equipment-network NAME BINDING
        SUBORDINATE OBJECT CLASS                equipment AND SUBCLASSES;
        NAMED BY
        SUPERIOR OBJECT CLASS           network AND SUBCLASSES;
        WITH ATTRIBUTE                  equipmentId
        BEHAVIOUR
                equipment-networkNameBindingBehaviour BEHAVIOUR
        DEFINED AS
        "This naming is for use when viewing equipment from the network
        perspective."

REGISTERED AS {etsiNameBinding 1}
```

8.2 Network

```
network-root NAME BINDING
        SUBORDINATE OBJECT CLASS        network;
        NAMED BY
        SUPERIOR OBJECT CLASS           root;
        WITH ATTRIBUTE                  networkId;
        CREATE;
        DELETE
        ONLY-IF-NO-CONTAINED-OBJECTS;

REGISTERED AS {etsiNameBinding 2};
```

9 Actions

As CCITT Recommendation M.3100 [2].

10 Notifications

As CCITT Recommendation M.3100 [2].

11 ASN.1 defined type module

As CCITT Recommendation M.3100 [2].

12 Entity-relationship diagrams

As CCITT Recommendation M.3100 [2].

Additions to the CCITT Entity-Relationship diagrams to accommodate ETSI object classes, name bindings, etc. are not included in this issue of the I-ETS.

Annex A (normative): Object classes for call routing information management

The following candidate management information has been identified as part of the call routing Information management modelling.

It has been included in this annex for registration purposes, prior to consideration for inclusion in the main body of this I-ETS.

A.1 Object classes

A.1.1 ExchangeTerminationPoint (XTP)

xtp MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100 : 1992":connectionTerminationPointBidirectional;

CHARACTERIZED BY

"Recommendation M.3100 : 1992":ctpInstancePackage,

xtpPackage PACKAGE

BEHAVIOUR

xtpBehaviour BEHAVIOUR

DEFINED AS

"The attributes upStreamConnectivityPointer and downStreamConnectivityPointer have NULL value. The value of cTPId could be e.g. the serial number of the 64 kbit/s connection within a 2 Mbit/s trail."

;;

ATTRIBUTES

cic GET-REPLACE,

associatedOwningXtpsg GET;

;;

REGISTERED AS {managedObjectClass 1};

A.1.2 ExchangeTerminationPoint Sub Group (XTPSG)

```
xtpsg MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100 : 1992":tpPool;

        CHARACTERIZED BY

xtpsgPackage PACKAGE

BEHAVIOUR

        xtpsgBehaviour BEHAVIOUR

        DEFINED AS

        "If no XTP is associated with an XTPSG, its operational state is disabled. The attribute tpsInTpPoolList is used as relationship attribute to the associated XTP's (XTPSG is owner)."

;;

ATTRIBUTES

signCapab                                       GET,

bearerCapab                                 GET-REPLACE,

satelLink                                       GET-REPLACE,

echoControl                                     GET-REPLACE,

continCheck                                     GET-REPLACE,

adjacentXId                                     GET-REPLACE,

typeOfAdjacentX                                 GET-REPLACE,

label                                           GET-REPLACE,

attenuator                                      GET-REPLACE,

dcme                                            GET-REPLACE,

"Recommendation M.3100 : 1992":alarmStatus      GET,

"Recommendation X.721 | ISO/IEC 10165-2 : 1992":administrativeState   GET-REPLACE,

"Recommendation X.721 | ISO/IEC 10165-2 : 1992":operationalState      GET;

ACTIONS

addXtpToXtpsg,

removeXtpFromXtpsg;

NOTIFICATIONS

"Recommendation X.721 | ISO/IEC 10165-2 : 1992":objectCreation,

"Recommendation X.721 | ISO/IEC 10165-2 : 1992":objectDeletion,

"Recommendation X.721 | ISO/IEC 10165-2 : 1992":attributeValueChange;
```

;;

REGISTERED AS {managedObjectClass 2};

A.1.3 ExchangeTerminationPoint Sub Group In (XTPSGIN)

xtpsgIn MANAGED OBJECT CLASS

DERIVED FROM xtpsg;

CHARACTERIZED BY

xtpsgInPackage PACKAGE

BEHAVIOUR

xtpsgInBehaviour BEHAVIOUR

DEFINED AS

"XTP's listed in this XTPSG are used only for incoming traffic."

;;;;

REGISTERED AS {managedObjectClass 3};

A.1.4 ExchangeTerminationPoint Sub Group Out (XTPSGOUT)

xtpsgOut MANAGED OBJECT CLASS

DERIVED FROM xtpsg;

CHARACTERIZED BY

xtpsgOutPackage PACKAGE

BEHAVIOUR

xtpsgOutBehaviour BEHAVIOUR

DEFINED AS

"XTP's listed in this XTPSG are used only for outgoing traffic."

;;

ATTRIBUTES

searchMethod PERMITTED VALUES

ASN1TypeModule.SearchMethodPValues

GET-REPLACE;;

;

REGISTERED AS {managedObjectClass 4};

A.1.5 ExchangeTerminationPoint Sub Group Bidirectional (XTPSGBID)

xtpsgBid MANAGED OBJECT CLASS

DERIVED FROM xtpsg;

CHARACTERIZED BY

xtpsgBidPackage PACKAGE

BEHAVIOUR

xtpsgBidBehaviour BEHAVIOUR

DEFINED AS

"XTP's listed in this XTPSG are used only for both outgoing and incoming traffic."

;;

ATTRIBUTES

searchMethod GET-REPLACE,

prefTrafficDirect GET-REPLACE;

;;

REGISTERED AS {managedObjectClass 5};

A.1.6 ExchangeTrailTerminationPoint (XTTP)

xttp MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100 : 1992":trailTerminationPointBidirectional;

CHARACTERIZED BY

"Recommendation M.3100 : 1992":ttpInstancePackage,

xttpPackage PACKAGE

BEHAVIOUR

xttpBehaviour BEHAVIOUR

DEFINED AS

"This object class represents the logical aspects of the outlet of a switch. The attributes upStreamConnectivityPointer and downStreamConnectivityPointer have NULL value."

;;;;

REGISTERED AS {managedObjectClass 6};

A.2 Attributes

```
adjacentXId ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 1};


associatedOwningXtpsg ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.OwningXTPSG;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 2};


attenuator ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.YesNo;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 3};


bearerCapab ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.BearerCapab;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 4};


cic ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 5};


continCheck ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.ContinCheck;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 6};
```

```
dcme ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1TypeModule.YesNo;
MATCHES FOR EQUALITY;
REGISTERED AS {attribute 7};

echoControl ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1TypeModule.YesNo;
MATCHES FOR EQUALITY;
REGISTERED AS {attribute 8};

label ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;
MATCHES FOR EQUALITY;
REGISTERED AS {attribute 9};

prefTrafficDirect ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1TypeModule.TrafficDirect;
MATCHES FOR EQUALITY;
REGISTERED AS {attribute 10};

satelLink ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1TypeModule.SatelLink;
MATCHES FOR EQUALITY;
REGISTERED AS {attribute 11};

searchMethod ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1TypeModule.SearchMethod;
MATCHES FOR EQUALITY;
REGISTERED AS {attribute 12};
```

signCapab ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.SignCapab;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 13};

typeOfAdjacentX ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;

MATCHES FOR EQUALITY;

REGISTERED AS {attribute 14};

A.3 Name Bindings

xtpsg-"Recommendation M.3100 : 1992":equipment NAME BINDING

SUBORDINATE OBJECT CLASS xtpsg;

NAMED BY

SUPERIOR OBJECT CLASS "Recommendation M.3100 : 1992":equipment;

WITH ATTRIBUTE "Recommendation M.3100 : 1992":tpPoolId;

CREATE

    WITH-REFERENCE-OBJECT,

    WITH-AUTOMATIC-INSTANCE-NAMING;

DELETE

    ONLY-IF-NO-CONTAINED-OBJECTS;

REGISTERED AS {nameBinding 3};

xtpsg-"Recommendation M.3100 : 1992":managedElement NAME BINDING

SUBORDINATE OBJECT CLASS xtpsg;

NAMED BY

SUPERIOR OBJECT CLASS "Recommendation M.3100 : 1992":managedElement;

WITH ATTRIBUTE "Recommendation M.3100 : 1992":tpPoolId;

CREATE

    WITH-REFERENCE-OBJECT,

    WITH-AUTOMATIC-INSTANCE-NAMING;

```
DELETE
        ONLY-IF-NO-CONTAINED-OBJECTS;

REGISTERED AS {nameBinding 4};

xtp-xttp NAME BINDING
SUBORDINATE OBJECT CLASS xtp;
NAMED BY
SUPERIOR OBJECT CLASS xttp;
WITH ATTRIBUTE "Recommendation M.3100 : 1992": cTPId;
CREATE
        WITH-REFERENCE-OBJECT,
        WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE
        ONLY-IF-NO-CONTAINED-OBJECTS;

REGISTERED AS {nameBinding 5};
```

A.4 Actions

addXtpToXtpsg ACTION

BEHAVIOUR

addXTPToXTPSGBehaviour BEHAVIOUR

DEFINED AS

"This action is used to arrange XTPs into XTPSG. The XTP is added to those already in the XTPSG. The relationship attributes tpsInTpPoolList (inherited from tpPool) in the affected object instance XTPSG and associatedOwningXTPSG in the affected object instance XTP are updated. If used, the attribute channelNumber in the affected object instance XTP is to be updated as well. If it is used as the serial number of the XTPs within the XTPSG, the value to be assigned here is the value of XTPSG's attribute totalTpCount (inherited from tpPool) plus one. Independently from the use of the attribute channelNumber, the value of the attribute totalTpCount is to be incremented by one as well as, depending on the operational state of the XTP, XTPSG's attribute connectedTpCount or idleTpCount (inherited from tpPool, too). If the first XTP is added to an XTPSG, the operational state of the XTPSG changes to enabled.";;

MODE CONFIRMED;

WITH INFORMATION SYNTAX ASN1TypeModule.XTPRelatedToXTPSGInformation;

WITH REPLY SYNTAX ASN1TypeModule.XTPRelatedToXTPSGResult;

REGISTERED AS {action 1};

removeXtpFromXtpsg ACTION

BEHAVIOUR

removeXTPFromXTPSGBehaviour BEHAVIOUR

DEFINED AS

"This action is used to remove XTPs from XTPSG. If the attribute channelNumber is used as the serial number of the XTPs within the XTPSG, this action can only be performed on the XTP object instance whose attribute channnelNumber has the same value as the XTPSG's attribute totalTpCount (i.e., only the association between an XTPSG and its XTP with the highest channelNumber can be deleted). In any case, from the attribute tpsInTpPoolList of the affected object instance XTPSG the cTPId of the affected object instance XTP is removed. The attributes associatedOwningXTPSG and, if used, channelNumber in the affected object instance XTP are set to default value. The value of XTPSG's attribute totalTpCount (inherited from tpPool) is to be decremented by one as well as, depending on the operational state of the XTP, XTPSG's attribute connectedTpCount or idleTpCount (inherited from tpPool, too). If the last XTP is removed from an XTPSG, the operational state of the XTPSG changes to disabled.";;

MODE CONFIRMED;

WITH INFORMATION SYNTAX ASN1TypeModule.XTPRelatedToXTPSGInformation;

WITH REPLY SYNTAX ASN1TypeModule.XTPRelatedToXTPSGResult;

REGISTERED AS {action 2};

A.5 ASN.1 type definitions

ASN1TypeModule {ccitt (0) identfied-organistion (4) etsi (0)genericManagedObjects (43307) informationModel (0) asn1Module(2) asn1TypeModule (0)}

DEFINITIONS IMPLICIT TAGS ::= BEGIN

IMPORTS

NameType, ProbableCause FROM ASN1TypesModule {ccitt recommendation m (13) 3100 (3100) 0 2 0};

standardSpecificExtension OBJECT IDENTIFIER ::= {informationModel standardSpecificExtension (0)}

managedObjectClass OBJECT IDENTIFIER ::= { informationModel managedObjectClass (3)}

package OBJECT IDENTIFIER ::= { informationModel package (4)}

parameter OBJECT IDENTIFIER ::= { informationModel parameter(5)}

nameBinding OBJECT IDENTIFIER ::= { informationModel nameBinding (6)}

attribute OBJECT IDENTIFIER ::= { informationModel attribute(7)}

attributeGroup OBJECT IDENTIFIER ::= { informationModel attributeGroup (8)}

action OBJECT IDENTIFIER ::= { informationModel action (9)}

notification OBJECT IDENTIFIER ::= { informationModel notification (10)}

informationModel OBJECT IDENTIFIER ::= { ccitt (0) identified-

organisation (4) etsi (0) genericManagedObjects (43307) informationModel (0)}

BearerCapab ::= ENUMERATED {

speech (0),

64kbitsUnrestricted (1),

56kbitsDigitalRestricted (2),

3.1kHzAudio (3),

7kHzAudio (4)}

ContinCheck ::= INTEGER

list with values of checks (ffs.)

```
YesNo ::= BOOLEAN

Failed ::= CHOICE {
        logicalProblem          [0] LogicalProblem,
        resourceProblem         [1] ResourceProblem}

LogicalProblem ::= SEQUENCE {
    problemCause                [0] ProbableCause,
    incorrectInstances          [1] SET OF ObjectInstance OPTIONAL}

NameTypeN ::= SET OF NameType

OwningXTPSG ::= ObjectInstance -- of class xtpsg

ResourceProblem ::= ProbableCause

SatelLink ::= BOOLEAN

SearchMethod ::= ENUMERATED {
        sequential              (0),
        cyclic                  (1),
        reversed                (2),
        lifoFifoEven            (3),
        lifoFifoOdd             (4),
        lifoFifoFirst           (5),
        lifoFifoLast            (6)}

SearchMethodPValues ::= INTEGER (1..3)

SignCapab ::= ENUMERATED{
        isup                    (0),
        isupV2          (1),
```

```
                ccittNO5        (2),
                R2              (3)}

TrafficDirect ::= INTEGER{
                noPref          (0),
                incoming        (1),
                outgoing        (2)}

XTPRelatedToXTPSGInformation ::= SET OF ObjectInstance
-- of class xtp


XTPRelatedToXTPSGResult ::= CHOICE {
failed          [0] Failed,
success         [1] XTPRelatedToXTPSGInformation }

END -- end of ASN1 DefinedTypesModule
```

Annex B (informative): Object classes for customer administration on the Operation Systems/Network Element (OS/NE) interface

The following candidate management information has been identified as part of the Customer Administration (CA) on the OS/NE interface information model.

It has been included in this annex, prior to consideration for inclusion in the main body of this I-ETS.

B.1 Object classes

B.1.1 "ETSI 300 291:1995": Access channel

B.1.2 "ETSI 300 291:1995": Access port

B.1.3 "ETSI 300 291:1995": Analogue access

B.1.4 "ETSI 300 291:1995": Basic access

B.1.5 "ETSI 300 291:1995": Digital access

B.1.6 "ETSI 300 291:1995": Directory number

B.1.7 "ETSI 300 291:1995”: CCITT Recommendation E.164 directory number

B.1.8 "ETSI 300 291:1995": Primary rate access

Annex C (informative): Candidate object classes for the network level viewpoint

C.1 Network

This class is as defined in CCITT Recommendation M.3100 [2].

C.2 Layer sub-network

layerSubNetwork MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100:1992":network;

CHARACTERISED BY

"Recommendation M.3100:1992": createDeleteNotificationsPackage,

"Recommendation M.3100:1992": stateChangeNotificationPackage,

layerSubNetworkPackage PACKAGE;

BEHAVIOUR

layerSubNetworkBehaviour BEHAVIOUR;

CONDITIONAL PACKAGES

"Recommendation M.3100:1992": characteristicInformationPackage PRESENT IF "thelayerSubnetwork is not contained in a layer network ",

administrativestatePackage PRESENT IF "an instance supports it"

layerSubNetworkBehaviour BEHAVIOUR

DEFINED AS
"The layerSub-network object class is a class of managed objects that manages the setup and cleardown of layerSub-network connections. It also manages the assignment of network termination points to Network GTPs.

If the administrative state is present:

Administrative state:

Unlocked:
The layerSub-network is allowed to perform its normal functions. ACTIONS will be accepted to setup or remove layerSub-network connections, to add/remove network termination points to/from Network GTPs.

Locked:
The LayerSub-Network is not allowed to perform its normal functions. No ACTIONS will be accepted. No new layerSub-network connection can be setup or removed, or rearranged, and no termination points can be added/removed to/from network GTPs.

Operational state:
Enabled: When the LayerSub-Network is in the enabled operational state, it may be fully operational or partially operational.

Disabled:
The LayerSub-Network is incapable of performing its normal function. For instance, the managing system will not be able to (1) setup or remove any layerSub-network connection, (2) add/remove network termination points to/from network GTPs.

Availability status:

The supported values for this attribute are:

Degraded:
The LayerSub-network is degraded in some respect. For instance, the LayerSub-network cannot perform the function of establishing new layerSub-network connections The LayerSub-network remains available for service (its operational state is enabled) while it is degraded.

Empty Set." ;;

ATTRIBUTES

"Recommendation X.721: 1992":availabilityStatus GET,

"Recommendation X.721 : 1992":operationalState GET,

ACTIONS

addTpsToGTP,

removeTpsFromGTP,

setupLayerSubNetworkConnection,

cleardownLayerSubNetworkConnection;

;;;

REGISTERED AS { etsiclass xx };

C.2.1 Connectivity

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.2 Trail

This class is as defined in CCITT Recommendation M.3100 [2].

C.2.3 Connection

This class is as defined in CCITT Recommendation M.3100 [2].

C.2.4 Multiparty trail

multipartyTrail MANAGED OBJECT CLASS

DERIVED FROM multipartyConnectivity;

CHARACTERISED. BY

multipartyTrailPackage PACKAGE

BEHAVIOUR

multipartyTrailBehavior BEHAVIOUR

DEFINED AS
"Multiparty Trail is a class of managed objects in layer networks which is responsible for the integrity of transfer of characteristic information from one or more other layer networks. A trail is composed of two or more Trail Termination Points and one or more connection and associated connection termination points."

;;

ATTRIBUTES

"Recommendation M.3100:1992":trailId GET;;;

CONDITIONAL PACKAGES

layerConnectionListPackage PRESENT IF "an instance supports it",

clientConnectionListPackage PRESENT IF "an instance supports it";

REGISTERED AS {etsiObjectClass x};

C.2.5 Multiparty call

multipartyCall MANAGED OBJECT CLASS

DERIVED FROM "Recommendation X.721:1992":top;

CHARACTERISED. BY

multipartyCallPackage PACKAGE

BEHAVIOUR

multipartyCallBehavior BEHAVIOUR

DEFINED AS
"Multiparty Call managed object class correlates unidirectional trails which have different near end Termination Points and which have a far-end Termination Point list. When the near end Termination Point and the far end Termination Point list are considered together, this set is the same for each trail and represents the different parties of the multiparty call."

;;

ATTRIBUTES

multipartyCallId GET;;;

trailList GET-REPLACE-ADD-REMOVE;

ACTIONS

joinMultipartyCall,

splitMultipartyCall,

REGISTERED AS {etsiObjectClass x};

C.2.6 Multiparty connection

multipartyConnection MANAGED OBJECT CLASS

DERIVED FROM multipartyConnectivity;

CHARACTERISED BY

multipartyConnectionPackage PACKAGE

BEHAVIOUR

multipartyConnectionBehaviour BEHAVIOUR

DEFINED AS
"The Multiparty Connection object class is a class of managed objects responsible for the transparent transfer of information between Connection termination points. A Multiparty Connection is a component of a Multiparty Trail. A sequence of one or more connections and/or sub-trees of connections are linked together to form a Multiparty Trail. A Multiparty Connection may be either uni- or bi-directional."

;;

ATTRIBUTES

"Recommendation M.3100:1992":connectionId GET;;;

CONDITIONAL PACKAGES

serverTrailListPackage PRESENT IF "an instance supports it",

layerTrailPackage PRESENT IF "an instance supports it";

REGISTERED AS {etsiObjectClass x};

C.2.7 Multiparty connectivity

multipartyConnectivity MANAGED OBJECT CLASS

DERIVED FROM "Recommendation X.721":top;

CHARACTERISED. BY

connectivityPackage PACKAGE

BEHAVIOUR

connectivityBehavior BEHAVIOUR

DEFINED AS
The Multiparty Connectivity object class is a class of managed objects which ensures the transfer of information between two or more termination points. The Multiparty Connectivity object class is not instantiable because the transfer is effected via the client-server relationship of Multiparty Trail and Multiparty Connection. Connectivity direction is determined by the directionality of the near-end termination point."

The operational state indicates the capability to carry a signal.

If an instance of this class is bidirectional, there shall be only a single far-end termination point. The near end termination point and the far end termination point shall both be bidirectional. If an instance of this class is unidirectional, the near end point shall be the source TP and the far-end-termination point shall be the sink TP"

;;

ATTRIBUTES

directionality GET,

"Recommendation X.721":administrativeState GET-REPLACE,

"Recommendation X.721":operationalState GET,

nearEndTPList GET,

farEndTPList GET

;;;

CONDITIONAL PACKAGES

createDeleteNotificationsPackage PRESENT IF

"the objectCreation and objectDeletion notifications defined in Recommendation X.721 are supported by an instance of this managed object class",

"the attributeValueChange notification defined in Recommendation X.721 is supported by an instance of attributeValueChangeNotificationPackage PRESENT IF this managed object class",

stateChangeNotificationPackage PRESENT IF

"the stateChange notification defined in Recommendation X.721 is supported by an instance of this managed object class",

characteristicInformationPackage PRESENT IF "an instance supports it.",

protectedPackage PRESENT IF "an instance supports it.",

tmnCommunicationsAlarmInformationPkg PRESENT IF

"the communicationsAlarm notification (as defined in Recommendation X.721) is supported by

this managed object",

alarmSeverityAssignmentPointerPackage PRESENT IF

"the communicationsAlarmInformationPkg package is present AND the managed object supports

configuration of alarm severities";

REGISTERED AS {etsiObjectClass x};

C.2.8 Layer sub-network connection

layerSubNetworkConnection MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100:1992":connectivity;

CHARACTERISED BY

"Recommendation M.3100:1992":createDeleteNotificationsPackage,

"Recommendation M.3100:1992":stateChangeNotificationPackage,

"Recommendation M.3100:1992":characteristicInformationPackage,

layerSubNetworkConnectionPackage PACKAGE;

BEHAVIOUR

layerSubNetworkConnectionBehaviour BEHAVIOUR;

CONDITIONAL PACKAGES

layerSubNetworkQualityPointerPointerPackage PRESENT IF "an instance supports it.",

compositePointerPackage PRESENT IF "an instance supports it.",

componentPointerPackage PRESENT IF "an instance supports it.",

layerSubNetworkConnectionBehaviour BEHAVIOUR

DEFINED AS
"The layer sub-network connection object class is a class of managed objects that associates the Network CTP or network GTP object listed in the A Termination or near-end attribute and the Network CTP or network GTP objects listed in the Z Termination or far-end attribute of this managed object.

The Z or far-end Termination attribute will always be non-NULL. The A termination attribute will only be NULL in the case of point-to-multipoint configurations. If the A Termination or near-end attribute has a value of NULL, the assignment relationship is between the termination point object or the GTP object listed in the A Termination or near-end attribute of the containing Multipoint layerSub networkconnection managed object and the termination point managed object or GTP managed object listed in the Z Termination or far-endattribute of this managed object.

A point to point layerSub-network connection can be established between: one of Network CTP Sink, Network CTP Bidirectional, Network TTP Source, Network TTP Bidirectional, or Network GTP and one of Network CTP Source, Network CTP Sink CTP Network CTP Bidirectional, Network TTP Sink, Network TTP Bidirectional or Network GTP.

In a unidirectional layerSub-network connection, the termination or GTP managed object pointed to by the A Termination and the termination point or GTP managed object pointed to by the Z Termination attribute (in this managed object or the containing mpLayerSub-networkConnection) are related in such a way that traffic can flow between the termination points represented by these managed objects. In a bidirectional layerSub-network-connection, information flows in both directions.

If the managed objects listed in the A Termination and Z Termination attributes are GTPs, the nth element of the A Termination GTP is related to the nth element of the Z Termination GTP (for every n).

If the A Termination attribute has a value of NULL, the directionality attribute must have the value 'unidirectional'.

The total rate of the A Terminations must be equal to the total rate of Z Terminations. The characteristic information package describes the signal that is connected. The termination points or GTPs that are layerSub-network-connected must have signal types that are compatible.

If an instance of this managed object class is contained in a multipoint layerSub-network connection and the operational state of the containing multipoint layerSub-network connection is 'disabled', the operational state of this managed object will also be 'disabled'.

The following are the definitions of the administrative state and the operational state attributes:

Administrative State:

Unlocked:
The Layer Sub-network connection managed object is administratively unlocked. Traffic is allowed to pass through the connection.

Locked:
No traffic is allowed to pass through the LayerSub-network connection. The connectivity pointers in the connected termination points are NULL This arises in the case where the layer sub-network connection has been assigned but not configured (i.e. no changes have been made to the NE model).

Operational State:

Enabled:
The LayerSub-network connection is performing its normal function.

Disabled:
The LayerSub-network connection is incapable of performing its normal layerSub-network connection function.

The LayerSub Network Quality pointer allows the layerSub-network connection to be associated with quality parameters. These parameters are described by a quality managed object.

The compositePointerPackage is supported where the layerSub-network connection is a component of another layerSub-network connection , which spans a number of connections and layerSub-network connections within the same layer.

The componentPointerPackage is supported where the layerSub-network connection is made up of a number of component layerSub-network connections, and connections, within the same layer"

;;

ATTRIBUTES

layerSubNetworkConnectionId GET,

;;;

REGISTERED AS (etsiObjectClass x);

C.2.9 Termination point

This class is as defined in CCITT Recommendation M.3100 [2]. This class is not instantiable.

C.2.10 Connection termination point source

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.11 Connection termination point sink

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.12 Connection termination point bidirectional

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.13 Network CTP source

networkCTPSource MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100:1992":connectionTerminationPointSource;

CHARACTERISED BY

"Recommendation M.3100:1992":createDeleteNotificationsPackage,

"Recommendation M.3100:1992":stateChangeNotificationPackage,

"Recommendation M.3100:1992":characteristicInformationPackage,

"Recommendation M.3100:1992":administrativeStatePackage,

"Recommendation M.3100:1992":ctpInstancePackage,

networkTPPackage;

networkCTPSource PACKAGE;

BEHAVIOUR

networkCTPSourceBehaviour BEHAVIOUR;

CONDITIONAL PACKAGES

farEndPointerPackage PRESENT IF "an instance supports it",

networkCTPPackage PRESENT IF "an instance supports it",

sNCPointerPackage PRESENT IF "an instance supports it",

networkCTPSourceBehaviour BEHAVIOUR

DEFINED AS
"The Network CTP Source object class is a class of managed objects that originates connections or layerSub-network connections.

The network CTP package identifies instances of the network CTP managed object class at higher and lower levels of layerSub-network partitioning within a given layer.

The referenced managed object instances (one per pointer) shall be a member of one of the following classes (or their allomorphic classes or sub-classes): Connection Termination Point Sink or Connection Termination Point Bidirectional"
;;;
;;;

REGISTERED AS (etsiObjectClass x);

C.2.14 Network CTP sink

networkCTPSink MANAGED OBJECT CLASS

DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSink;

CHARACTERISED BY

"Recommendation M.3100:1992":createDeleteNotificationsPackage,

"Recommendation M.3100:1992":stateChangeNotificationPackage,

"Recommendation M.3100:1992":characteristicInformationPackage,

"Recommendation M.3100:1992":administrativeStatePackage,

"Recommendation M.3100:1992":ctpInstancePackage,

networkTPPackage;

sNCPointerPackage,

networkCTPSink PACKAGE;

BEHAVIOUR

networkCTPSinkBehaviour BEHAVIOUR;

CONDITIONAL PACKAGES

farEndPointerPackage PRESENT IF "an instance supports it",

networkCTPPackage PRESENT IF "an instance supports it",

sNCPointerPackage PRESENT IF "an instance supports it",

networkCTPSinkBehaviour BEHAVIOUR

DEFINED AS
"The Network CTP Sink object class is a class of managed objects that terminates connections or layerSub-network connections.

The network CTP package identifies instances of the network CTP managed object class at higher and lower levels of sub-network partitioning within a given layer.

The referenced managed object instances (one per pointer) shall be a member of one of the following classes (or their allomorphic classes or sub-classes): Connection Termination Point Sink or Connection Termination Point Bidirectional"

;;;

REGISTERED AS (etsiObjectClass x);

C.2.15 Network CTP bidirectional

networkCTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM CTPBidirectional,
networkCTPSink,
networkCTPSource;

REGISTERED AS (etsiObjectClass x);

C.2.16 Trail termination point source

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.17 Trail termination point sink

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.18 Trail termination point bidirectional

This class is as defined in CCITT Recommendation M.3100 [2]. It is not instantiated in the Network Viewpoint.

C.2.19 Network TTP source

networkTTPSource MANAGED OBJECT CLASS

DERIVED FROM " Recommendation M.3100:1992":TrailTerminationPointSource;

CHARACTERISED BY

"Recommendation M.3100:1992":createDeleteNotificationsPackage,

"Recommendation M.3100:1992":attributeValueChangeNotificationPackage,

"Recommendation M.3100:1992":stateChangeNotificationPackage,

"Recommendation M.3100:1992":characteristicInformationPackage,

"Recommendation M.3100:1992":administrativeStatePackage,

"Recommendation M.3100:1992":ttpInstancePackage,

networkTTPPackage,

networkTTPSource PACKAGE

BEHAVIOUR

networkTTPSourceBehaviour BEHAVIOUR

DEFINED AS
"The Network TTP Source object class is a class of managed objects that originates trails in the Network viewpoint. ";;

CONDITIONAL PACKAGES

farEndPointerPackage PRESENT IF "an instance supports it",
sNCPointerPackage PRESENT IF "an instance supports it",

REGISTERED AS (etsiObjectClass x);

C.2.20 Network TTP sink

networkTTPSink MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100:1992":networkTTPSink;

CHARACTERISED BY

"Recommendation M.3100:1992":createDeleteNotificationsPackage,

"Recommendation M.3100:1992":attributeValueChangeNotificationPackage,

"Recommendation M.3100:1992":stateChangeNotificationPackage,

"Recommendation M.3100:1992":characteristicInformationPackage,

"Recommendation M.3100:1992":administrativeStatePackage,

"Recommendation M.3100:1992":ttpInstancePackage,

networkTPPackage,

networkTTPSinkPackage PACKAGE

BEHAVIOUR

networkTTPSinkBehaviour BEHAVIOUR;

DEFINED AS
"The Network TTP Sink object class is a class of managed objects that terminates trails in the Network viewpoint.";;

CONDITIONAL PACKAGES

farEndPointerPackage PRESENT IF "an instance supports it",

sNCPointerPackage PRESENT IF "an instance supports it",

REGISTERED AS (etsiObjectClass x);

C.2.21 Network TTP bidirectional

networkTTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100:1992":TTPBidirectional,

networkTTPSink,
networkTTPSource;

REGISTERED AS (etsiObjectClass x);

C.3 Package definitions

C.3.1 Administrative state package

```
administrativestatePackage PACKAGE

        ATTRIBUTES

                "Recommendation X.721:1992":administrativeState  GET-REPLACE,

REGISTERED AS {etsiPackage x};
```

C.3.2 Network TP package

```
networkTPPackage PACKAGE

                BEHAVIOUR

                        networkTPBehaviour BEHAVIOUR;

        DEFINED AS
        "The connectivity pointer is a pointer to a connectivity managed object which defines the association
        between the network termination point and the far-end network termination point"

        ATTRIBUTES

                connectivityPointer GET;

REGISTERED AS (etsiPackage x);
```

C.3.3 Far-end pointerpackage

```
farendPointerPackage PACKAGE

                BEHAVIOUR

                        farendPointerBehaviour          BEHAVIOUR;

        DEFINED AS
        "The far-end pointer is a pointer to an adjacent network termination point "

        ATTRIBUTES

                farendPointer GET;

REGISTERED AS (etsiPackage x);
```

C.3.4 Network CTP package

networkCTPackage PACKAGE

BEHAVIOUR

networkCTPBehaviour BEHAVIOUR;

DEFINED AS
"The Up Partition pointer is a pointer to a network CTP which is in a higher level partition. This pointer will only be present for the network CTPs in the lower partition which have a direct correspondence to the network CTPs at the higher level. The higher level network CTPs have an inverse pointer, the down partition pointer to the lower level."

ATTRIBUTES

superPartitionPointer GET;

subPartitionPointer GET;

REGISTERED AS (etsiPackage x);

C.3.5 Layer sub network quality pointer package

This package contains a 'general purpose' pointer to an managed object which defines quality parameters for the layerSub-network connection. The issue of what these parameters should be, and how they are used is still active, and is beyond the scope of this I-ETS.

layerSubNetworkQualityPointerPackage PACKAGE

BEHAVIOUR

layerSubNetworkQualityPointerBehaviour BEHAVIOUR;

DEFINED AS
This package identifies a pointer to a managed object instance which is used to define quality information associated with the setting up of a layerSub-network connection."

ATTRIBUTES

layerSubNetworkQualityPointer GET;

;;

REGISTERED AS (etsiPackage x);

C.3.6 Composite pointer package

compositePointerPackage PACKAGE

BEHAVIOUR

compositePointerBehaviour BEHAVIOUR;

DEFINED AS
This package identifies an of instance of the layerSub-network connection managed object class which a given component is part of , within a given layer."

ATTRIBUTES

compositePointer GET;

;;

REGISTERED AS (etsiPackage x);

C.3.7 Component pointer package

componentPointerPackage PACKAGE

BEHAVIOUR

componentPointerBehaviour BEHAVIOUR;

DEFINED AS
This package identifies a sequence of instances of connectivity managed objects which are components of a layerSub-network connection, within a given layer."
ATTRIBUTES

componentPointers GET;

;;

REGISTERED AS (etsiPackage x);

C.3.8 SNC pointer package

sNCPointerPackage PACKAGE

BEHAVIOUR

sNCPointerPackageBehaviour BEHAVIOUR;

DEFINED AS
This package defines a pointer to an instance of the layerSub-network connection managed object class, within a given layer."

ATTRIBUTES

layerSubNetworkConnectionPointer GET;

;;

REGISTERED AS (etsiPackage x);

C.3.9 Client connection list

```
clientConnectionListPackage      PACKAGE
        ATTRIBUTES
                clientConnectionList          GET;
REGISTERED AS (etsiPackage x);
```

C.3.10 Server trail list

```
serverTrailListPackage   PACKAGE
        ATTRIBUTES
                serverMultipartyTrailList      GET;
REGISTERED AS (etsiPackage x);
```

C.3.11 Layer trail

```
layerTrailPackage         PACKAGE
        ATTRIBUTES
                layerTrail    GET;
REGISTERED AS (etsiPackage x);
```

C.3.12 Layer connection list

```
layerConnectionListPackage      Package
        ATTRIBUTES
                layerConnectionListGET;
REGISTERED AS (etsiPackage x);
```

C.4 Attribute definitions

C.4.1 Client connection list

clientConnectionList ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes Module.ObjectList;

MATCHES FOR EQUALITY;

BEHAVIOUR

clientConnectionListBehaviour BEHAVIOUR;

DEFINED AS
This attribute defines the list of Connections or Multiparty Connections which are clients of a Trail, a Multiparty Trail or bundle (i.e. a number of trails in parallel) of trails in another layer. Usually a single Trail or Multiparty Trail in a higher order layer will support a number of Connections or Multiparty Connections in a lower order layer. Alternatively, a bundle (i.e. a number of trails in parallel) of Trails or MultipartyTrails in a lower order layer may support a Connection or Multiparty Connection in a higher order layer."
;;

REGISTERED AS (etsiAttribute x);

C.4.2 Multiparty call ID

multipartyCallId ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes.NameType;

MATCHES FOR EQUALITY;

BEHAVIOUR

multipartyCallIdBehaviour BEHAVIOUR;

DEFINED AS
"The MultipartyCall Id is an attribute type whose distinguished value can be used as a RDN when naming an instance of the Multiparty Call object class.";;

REGISTERED AS (etsiAttribute x);

C.4.3 Server trail list

serverTrailList ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes Module.ObjectList;
MATCHES FOR EQUALITY;

BEHAVIOUR

serverTrailListBehaviour BEHAVIOUR;

DEFINED AS
This attribute defines the list of Trails or Multiparty Trails which may serve a Multiparty Connection in another layer. Usually a single Trail or Multiparty Trail in a higher order layer will support a Connection or Multiparty Connection in a lower order layer. Alternatively, a bundle (i.e. a number of trails in parallel) of Trails or Multiparty Trails in a lower order layer may support a Connection or Multiparty Connection in a higher order layer."

;;

REGISTERED AS (etsiAttribute x);

C.4.4 Layer connection list

layerConnectionList ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes Module.LayerConnectionList;

MATCHES FOR EQUALITY;

BEHAVIOUR

layerConnectionListBehaviour BEHAVIOUR;

DEFINED AS
This attribute defines the list of connections or layer sub-network connections in a given layer which may compose a Trail or Multiparty Trail in the same layer. This composition of connections/layer sub network connections may be a simple sequence or, in the case of a multiparty trail, a tree structure."
;;

REGISTERED AS (etsiAttribute x);

C.4.5 Layer trail

```
layerTrail          ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes Module.ObjectInstance;

        MATCHES FOR EQUALITY;

                BEHAVIOUR

                        layerTrailBehaviour    BEHAVIOUR;

        DEFINED AS
        This attribute defines the trail or Multiparty Trails which a connection or multiparty connection forms
        a part of within a given layer."

;;

REGISTERED AS (etsiAttribute x);
```

C.4.6 Near end TP list

```
nearEndTPList   ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes Module.ObjectList;

        MATCHES FOR EQUALITY;

                BEHAVIOUR

                        nearEndTPListBehaviour       BEHAVIOUR;

        DEFINED AS
        The value of this attribute identifies one or more termination points of an instance of a sub-class of
        the connectivity object class."

;;

REGISTERED AS (etsiAttribute x);
```

C.4.7 Far end TP list

```
farEndTPList      ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypes Module.ObjectList;

        MATCHES FOR EQUALITY;

                BEHAVIOUR

                        farEndTPListBehaviour         BEHAVIOUR;

        DEFINED AS
        The value of this attribute identifies one or more termination points of an instance of a sub-class of
        the connectivity object class."

;;

REGISTERED AS (etsiAttribute x);
```

C.5 Name bindings

For further study

C.6 Actions

For further study

C.6.1 Setup layersubnetwork connection

setupLayerSubNetworkConnection ACTION

BEHAVIOUR

setupLayerSubNetworkConnectionBehaviour BEHAVIOUR

DEFINED AS
"This action is used to ...";;

MODE CONFIRMED;
WITH INFORMATION SYNTAX
ASN1DefinedTypesModule.SetupLayerSubNetworkConnectionInformation;

WITH REPLY SYNTAX ASN1DefinedTypesModule.SetupLayerSubNetworkConnectionResult;

REGISTERED AS { etsiAction x};

C.6.2 Remove layersubnetwork connection

removeLayerSubNetworkConnection ACTION

BEHAVIOUR

removeLayerSubNetworkConnectionBehaviour BEHAVIOUR

DEFINED AS
"This action is used to ...";;

MODE CONFIRMED;

WITH INFORMATION SYNTAX
ASN1DefinedTypesModule.RemoveLayerSubNetworkConnectionInformation;

WITH REPLY SYNTAX
ASN1DefinedTypesModule.RemoveLayerSubNetworkConnectionResult;

REGISTERED AS { etsiAction x};

C.6.3 Add TPs to GTP

```
addTpsToGTP ACTION

        BEHAVIOUR

            addTpsToGTPBehaviour BEHAVIOUR

    DEFINED AS
    "This action is used to ...";;

    MODE            CONFIRMED;

    WITH INFORMATION SYNTAX    ASN1DefinedTypesModule.AddTpsToGTPInformation;

    WITH REPLY SYNTAX    ASN1DefinedTypesModule.addTpsToGTPResult;

REGISTERED AS { etsiAction x};
```

C.6.4 Remove TPs from GTP

```
removeTpsFromGTP ACTION

        BEHAVIOUR

            removeTpsFromGTPBehaviour BEHAVIOUR

    DEFINED AS
    "This action is used to ...";;

    MODE                CONFIRMED;

    WITH INFORMATION SYNTAX    ASN1DefinedTypesModule.RemoveTpsFromGTPInformation;

    WITH REPLY SYNTAX    ASN1DefinedTypesModule.removeTpsFromGTPResult;

REGISTERED AS { etsiAction x};
```

C.6.5 Join multiparty call

```
joinMultipartyCall ACTION

        BEHAVIOUR

            joinMultipartyCallBehaviour BEHAVIOUR

    DEFINED AS
    "This action is used to ...";;

    MODE                CONFIRMED;

    WITH INFORMATION SYNTAX
    ASN1DefinedTypesModule.JoinMultipartyCallInformation;

    WITH REPLY SYNTAX    ASN1DefinedTypesModule.JoinMultipartyCallResult;

REGISTERED AS { etsiAction x};
```

C.6.6 Split multiparty call

splitMultipartyCall ACTION

BEHAVIOUR

splitMultipartyCallBehaviour BEHAVIOUR

DEFINED AS
"This action is used to ";;

MODE CONFIRMED;

WITH INFORMATION SYNTAX ASN1DefinedTypesModule.SplitMultipartyCallInformation;

WITH REPLY SYNTAX ASN1DefinedTypesModule.SplitMultipartyCallResult;

REGISTERED AS { etsiAction x};

C.7 ASN.1 syntax

layerConnectionList ::= Tree

Tree ::= SEQUENCE OF Subtree

Subtree ::= CHOICE { singleConnectivityInstance[0] ObjectInstance,

multicast [1] SET OF Tree}

JoinMultipartyCallInformation ::=

JoinMultipartyCallResult ::=

SplitMultipartyCallInformation ::=

SplitMultipartyCallResult ::=

AddTpsToGTPInformation ::=

AddTpsToGTPResult ::=

RemoveTpsFromGTPInformation ::=

RemoveTpsFromGTPResult ::=

SetupSubNetworkConnectionInformation ::=

SetupSubNetworkConnectionResult ::=

RemoveSubNetworkConnectionInformation ::=

RemoveSubNetworkConnectionResult ::=

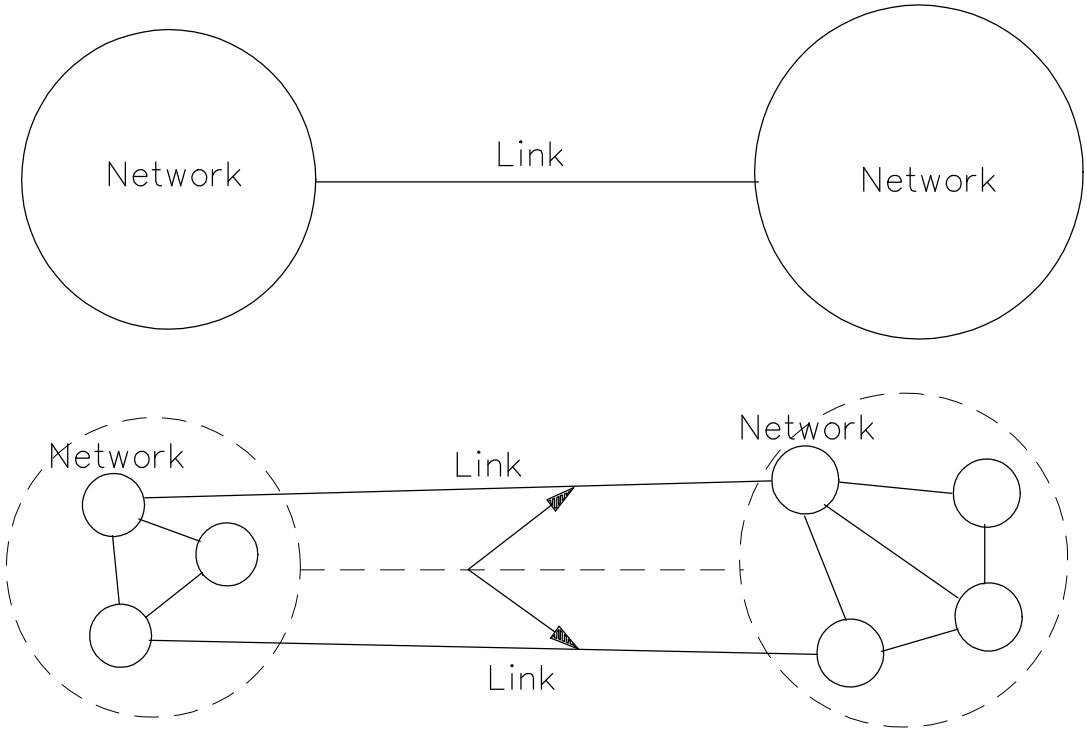

Figure C.1: Topology defined using links

```
link MANAGED OBJECT CLASS
        DERIVED FROM connectivity;
        CHARACTERISED BY
        linkPackage PACKAGE
                BEHAVIOUR
                        linkBehavior;
        ATTRIBUTES
                totalBandwidth GET,
                availableBandwidth GET,
                availableContiguousBandwidth GET,
                connectivityList GET,
                aEndTermination GET,
                zEndTermination GET;;;
        CONDITIONAL PACKAGES
```

REGISTERED AS (etsiObjectClass x);

linkBehavior BEHAVIOUR

DEFINED AS
"The link object class is a class of managed objects which gives a topological description of the capacity between two networks, including bandwidth available for connection. Capacity is assigned using the connection managed object class."

aEndTermination ATTRIBUTE
WITH ATTRIBUTE SYNTAX ASN1DefinedTypesModule.RelatedObjectInstance;

MATCHES FOR EQUALITY;

BEHAVIOUR

aEndTermination BEHAVIOUR

DEFINED AS
"The a end termination attribute is the terminating network or Network Connection Termination Point for an instance of the managed object class link"

zEndTermination ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1DefinedTypesModule.RelatedObjectInstance;

MATCHES FOR EQUALITY;

BEHAVIOUR

zEndTerminationBEHAVIOUR

DEFINED AS
"The z end termination attribute is the terminating network or Network Connection Termination Point for an instance of the managed object class link"

C.8 Topological points

An alternative approach is to define a topological point which acts as a termination point for a link, as illustrated in Figure C.2. This is analogous to the NWCTP which terminates a connection. In this case a link does not contain other links; links at a lower level in the hierarchy are referenced via the topological point. The topological point has a list of topological points at the next lower layer- these points have pointers to their associated links. At the lowest level of the hierarchy, the topological point will point to a NWCTP, which in turn, points to a connection. Class definitions for this approach are:

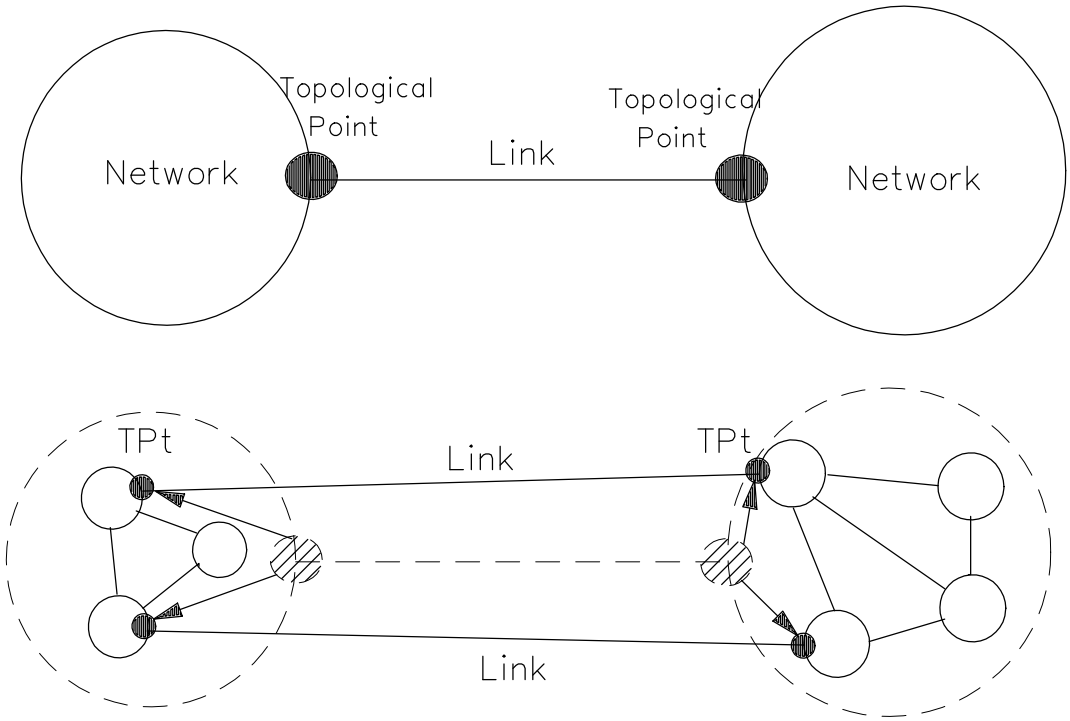

Figure C.2: Topological description using points

```
link MANAGED OBJECT CLASS
    DERIVED FROM connectivity;
    CHARACTERISED BY
    linkPackage PACKAGE
        BEHAVIOUR
            linkBehavior;
    ATTRIBUTES
        totalBandwidth GET,
        availableBandwidth GET,
        availableContiguousBandwidth GET,
        aTerminationPointInstance GET,
        zTerminationPointInstance GET;;;
    CONDITIONAL PACKAGES
```

REGISTERED AS (etsiObjectClass x);

linkBehavior BEHAVIOUR

DEFINED AS
"The link object class is a class of managed objects which gives a topological description of the capacity between two networks, including bandwidth available for connection. Capacity is assigned using the connection managed object class."

topologicalPoint MANAGED OBJECT CLASS

DERIVED FROM terminationPoint;

CHARACTERISED BY

networkLevelPackage

characteristicInformationPackage

createDeleteNotificationsPackage

topologicalPointPackage PACKAGE

BEHAVIOUR

topologicalPointBehavior;

ATTRIBUTES

availableBandwidth GET,

availableContiguousBandwidth GET,

aTerminationPointInstance GET,

zTerminationPointInstance GET;;;

terminationPointList GET,

CONDITIONAL PACKAGES

REGISTERED AS (etsiObjectClass x);

topologicalPointBehavior BEHAVIOUR

DEFINED AS
"The topologicalPoint object class is a class of managed objects which terminates the link object class, and is a reference point for the next layer in the topological hierarchy. The Termination Point List points to a number of topological points or NWCTPs dependent on the position in the hierarchy"

C.9 Conclusion

Two alternative methods have been described to represent the topology component of the Network Viewpoint.

Annex D (informative): Candidate object classes for the service level viewpoint

D.1 Introduction

A service may be implemented across several networks, each network performing many services. It is at this level that customer related objects are found as well as objects required to define, establish and maintain the service itself.

This annex identifies a number of candidate service level objects. Figure D.1 gives a proposed service level class hierarchy.

NOTE: The "Security Facilities" and "Plan" objects remain to be defined and the words under the "**Behaviour**" items refer to the functional areas described in clause 4 of ETR 047 [5].

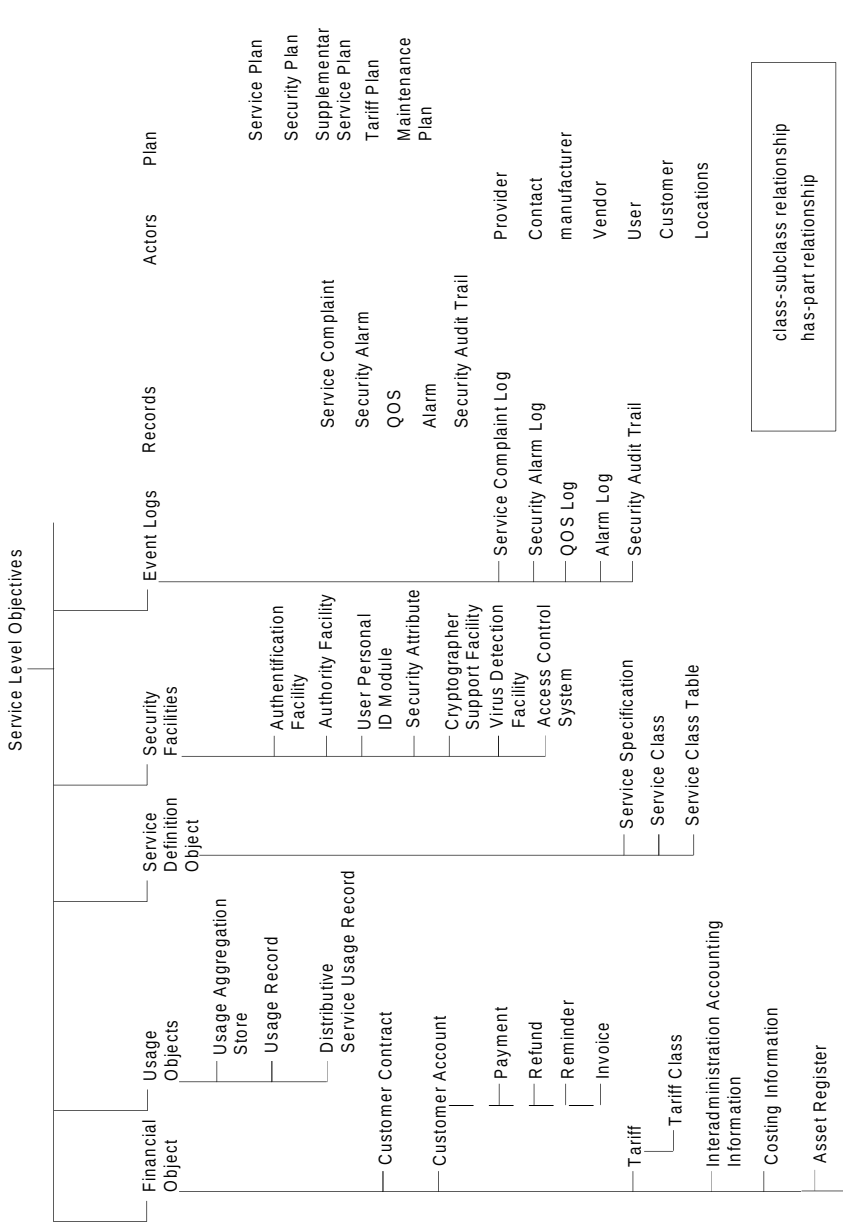

Figure D.1: Service level object hierarchy

D.2 Service level financial objects

D.2.1 Financial information

Class: Financial information.

Class Description: this high level object represents the recording and utilisation of data associated with the financial side of service provision.

Superclass: S/L top.

Subclass: Customer Contract, Customer Account, Tariff, Invoice, Interadministration Accounting Information, Costing Information.

Associations: Security Facilities, Event Logs, Tariff Plan, Records, Contact, Location, Actors.

Behaviour: Provisioning, Accounting Management, Installation, Planning, Customer Query, Security, Maintenance.

Attributes:

- Provider Name.

Comments: (none).

D.2.1.1 Customer Contract

Class: Customer Contract.

Class Description: this object is a legally binding document that specifies the service being subscribed to. It indicates tariffs and billing information for the service and any agreed accounting limits. Also included are maintenance arrangements, rental charges, security, QOS requirements.

Superclass: Financial information.

Subclass: (none).

Associations: tariff, customer account, customer, provider.

Behaviour: Billing & Charging, contract phase, Installation Planning, Access Control.

Attributes:

- Customer Name;
- Contract ID;
- Accounting Limits of Customer;
- Customer Signature;
- Provider Signature;
- Allowed security supplemental services;
- Rental charges;
- Maintenance arrangements;
- Quality Requirements;
- Security Requirements.

Comments: (none).

D.2.1.2 Customer Account

Class: Customer Account.

Class Description: the customer account supplies details of who is to be charged for a given use of services. It may be a residential customer or a business customer who would be billed for the aggregated use of a number of lines. Reverse charging, call forwarding and mobile telephony all require careful consideration of whose account should be billed and how. Detailed billing and barring are associated with both accounts and end users. The account contains a record of invoices issued and payments received, refunds issued, reminders set, etc.

Superclass: Financial information.

Subclass: (none).

Associations: Customer contract, Provider, Customer, Invoice, Usage Information.

Behaviour: Billing & Charging, Contract Phase, Installation Planning.

Attributes:

- Frequency of Invoicing;
- Account Limits;
- Account Balance;
- Payment Verification Options;
- Credit Limit Total;
- Per-session credit limit;
- Allowed payment options;
- Equipment rental fee;
- Customer Name;
- Currency;
- Allowed Payment Options;
- Allowed User Names;
- Service Names;
- Network Names.

Comments: (none).

D.2.1.3 Invoice

Class: Invoice.

Class Description: this information is sent to the customer to inform him of the amount due to the administration. This information includes the details of service usage and request for payment to the customer, VASP or other administrations. As well subscription details, information on the balance of account, credit rating and limits, etc.

Superclass: Financial information.

Subclass: Invoice Table.

Contains: Payment, Refund, Reminder.

Associations: Customer Account, Provider, Usage Information.

Behaviour: Billing & Charging & IA Accounting, Installation Planning, Advanced IN & VPN Access Control, Security.

Attributes:

- Media of Invoice;
- Customer Name;
- Invoice ID;
- Account Balance Due;
- Subscription charge for each service;
- List of Service Subscription Charges;
- Date Due;
- Details of Sessions;
- Type of Bill;
- Registration and Monitoring;
- Notarisation of Receipt;
- Allowed payment options;
- Credit Rating;
- Credit Limits (per call);
- Applicable discounts;
- Maintenance Charges;
- Connection charge (if appropriate);
- Reverse charging information shared with other customers;
- Other administration charges.

Comments: (none).

D.2.1.3.1 Reminder

Class: Reminder.

Class Description: this information reminds the customer how much money is due and when it should be paid and to whom.

Superclass: (none).

Subclass: (none).

IS-PART OF: Invoice.

Associations: Customer, Provider.

Behaviour: Billing & Charging.

Attributes:

- Reminder ID;
- Time-Out for payment (date due);
- Media of Reminder;
- Notarisation;
- Suggested payment media;
- Allowed/applicable discounts;
- Time-out (disconnection) to block customer.

Comments: (none).

D.2.1.3.2 Payment

Class: Payment.

Class Description: This is the money paid by the customer after receipt of an invoice.

Superclass: (none).

Subclass: (none).

IS-PART OF: Invoice.

Associations: Provider, Customer.

Behaviour: Billing & Charging, Access Control.

Attributes:

- Customer Signature;
- Type of Payment, e.g. charge account, EFT, credit card, cash, bank standing charge, etc.;
- Frequency, e.g. per session, monthly instalments, etc.;
- Payment ID (e.g. EFT PIN #);
- Amount of Payment;
- Payment Registration and Monitoring;
- Verification or Acknowledgement Details;
- Payment media.

Comments: (none).

D.2.1.3.3 Refund

Class: Refund.

Class Description in special cases, e.g. incorrect billing or poor quality of service, a refund is given by the administration to the customer.

Superclass: Top.

Subclass: (none).

Is-part of: Invoice.

Associations: Customer, Provider.

Behaviour: Billing & Charging, Access Control.

Attributes:

- Amount of Refund;
- Type of Payment (e.g. EFT, account credit, cash, etc.);
- Refund ID;
- Sessions details (ID, etc.);
- Reason for Refund (below QOS threshold, etc.);
- Registration and Monitoring Details;
- Verification or Acknowledgement Details;
- Refund media;
- Allowed refund options;
- Administration Signature.

Comments: (none).

D.2.1.3.4 Invoice Table

Class: Invoice Table.

Class Description: nearly static information of use to the invoicing function in the preparation and presentation of the invoice to the customers.

Superclass: Invoice.

Subclass: (none).

Associations: Usage Record, Usage Aggregation Store.

Behaviour: (Charging & Billing).

Attributes:

- Invoice ID;
- Invoice Tag;
- Invoice Presentation media;
- Invoice format;
- Invoice periodicity;
- Invoice Generation date.

Comments:

D.2.1.4 Tariff

Class: Tariff.

Class Description: a complex specification object containing various service specific attributes representing a provider view. These may include costs per chargeable unit and profits allowable to various classes and instances of service providers who add value. In addition, actual charging details, such as time of day, distance and subsidy from a government, may be included.

Superclass: Financial Information.

Subclass: Tariff Table.

Has-parts: Rental Charges.

Associations: Customer Contract, Customer Account, Interadministration Accounting Information, Service Class, Tariff Plan.

Behaviour: Charging and Billing, Contract and Cessation Phase, TMN Design.

Attributes:

- Date and Time Factor;
- Government subsidy;
- Distance Factor;
- Allowable Profits;
- Costs per chargeable (service, tariff, etc.) unit;
- Currency;
- Service Class unit (Currency value);
- Traffic (bandwidth, etc.) unit (Currency value).

Comments: (none).

D.2.1.4.1 Tariff table

Class: Tariff Table.

Class Description: an entity used to calculate a tariff.

Superclass: Tariff.

Subclass: (none).

Associations: Service Component Types, Service Component Group Types.

Behaviour: (none).

Attributes:

- Tariff Calculation Algorithm for each Service;
- Quality Classes;
- Security Mechanisms;
- Symmetry of Call.

Comments: (none).

D.2.1.4.2 Rental Charges

Class: Rental Charges.

Class Description: a description of provider's equipment leasing and installation charges.

Superclass: (none).

Subclass: (none).

Is-part of: Tariff.

Associations: Customer Contract, Work Order, Asset Register, Material List.

Behaviour: Charging and Billing, Contract Phase, Installation Planning, VPN Management.

Attributes:

- Charges for rental equipment;
- Equipment ID;
- Installation Fee;
- (Annual) Rental Fee;
- Session Charge;
- Duration;
- Volume Charge (bandwidth, etc.);
- Vendor Name;
- Provider Name;
- Manufacturer Name.

Comments: (none).

D.2.1.5 Interadministration Accounting Information

Class: Interadministration Accounting (IA) Information.

Class Description: these objects include the details of use and payments, invoices, etc. made of other networks or services and details of the tariffs that apply. The accounting rate is the rate per traffic unit(s) agreed between administrations in a given relation that is used for the establishment of interadministration accounts.

Superclass: Financial information.

Subclass: (none).

Contains: IA Payments, IA Invoices, IA account balance statement, IA account data analysis, IA Credit Risk Analysis.

Behaviour: IA Accounting, Service Design.

Attributes:

- Rate per traffic unit(s);
- Co-Operative Providers Name.

Comments: (none).

D.2.1.6 Costing information

Class: Costing Information.

Class Description: two types of costing information are envisaged; (i) detailed costing information is necessary for the financial running of the business; (ii) cost models can be used for planning purposes and contain less detailed information.

Superclass: Financial Information.

Subclass: Asset Register, Job records.

Associations: Tariff plan, Maintenance Plan, other plans ?

Behaviour: Cost Accounting, Service Forecasting, Maintenance, Installation Planning, TMN Design, Contract & Cessation Phase, VPN Management.

Attributes:

- Manufacturer Name;
- Vendor Name.

Comments: (none).

D.2.1.6.1 Asset Register

Class: Asset Register.

Class Description: a register of all the assets the organisation owns.

Superclass: Costing Information.

Subclass: (none).

Contains: Store Directory, Material list.

Associations: Goods Entry, Outgoing Stocks, Stock Scrapping, Rental Charges.

Behaviour: Cost Accounting, Scheduling of Maintenance, Installation Planning, Service Forecasting, Access Control, Contract Phase.

Attributes:

- equipment purchase cost;
- equipment Name;
- equipment location;
- current stocks of equipment;
- equipment status;
- equipment replacement cost.

Comments:

- 1.1.6.1.1 Store Directory.

Class: Store Directory.

Class Description: a directory to the physical repository for spare parts and equipment to be installed by an operator.

Superclass: (none).

Subclass: (none).

Is-part of: Asset Register.

Associations: Work Order, Material List, Network Element, Equipment, Maintainable Entity.

Behaviour: Cost Accounting, Installation Planning, Scheduling Maintenance.

Attributes:

- Store ID;
- Store Location Name;
- Store Ownership;
- Storeroom Size;
- Special Conditions of Store (Humidity control, height, etc.).

Comments: (none).

D.2.1.6.1.1 Material List

Class: Material List.

Class Description: information on physical equipment required for the asset register and general record keeping purposes.

Superclass: (none).

Subclass: (none).

Is-part of: Asset Register.

Associations: Stock Scrapping, Store Directory, Work Order, Network Element, Equipment, Network, Rental Charges, Maintainable Entity.

Behaviour: Cost Accounting, Scheduling of Maintenance, Installation Planning, VPN Management.

Attributes:

- Material ID;
- Material Compatibility Check (Release ID, dedicated spare list, etc.);
- Material Name;
- Vendor Name;
- Manufacturer Name;
- Material Type;
- Availability Status;
- Quantity;
- Condition Status;
- Guarantee Expiry Date.

Comments: (none).

D.2.1.6.2 Job Record

Class: Job Record.

Class Description: a record of cost of materials and labour used in installation, operations and maintenance jobs, along with details of the purpose of the job. Cost of scrapping materials must be recorded as well.

Superclass: Costing Information.

Subclass: (none).

Contains: Stock Scrapping, Labour Costs, Work Order, Goods Entry, Outgoing Stocks.

Associations: Maintenance plan, Equipment, Network Element, Maintainable Entity, Manufacturer Name, Vendor Name, Asset Register.

Behaviour: Cost Accounting, Maintenance, Installation Planning, Access Control.

Attributes:

- staff record data (cost, ID, etc.);
- installation materials;
- spare parts (work order) ID;
- repair order ID;
- installation order ID;
- time frame (start and closing time/date);
- cost of material;
- cost of labour.

Comments: (none).

D.2.1.6.2.1 Work Order

Class: Work Order.

Class Description: incoming orders for labour or reservations of equipment from a store for the purpose of repair, replacement or installation of physical equipment. The asset register is checked for status, location, cost, etc.

Superclass: (none).

Subclass: (none).

Is-part of: Job Record.

Associations: Goods Entry, Outgoing Stocks, Store Directory, Work Schedule, Staff Records, Material List, Stock Scrapping, Labour Costs, Rental Charges.

Behaviour: Cost Accounting, Scheduling of Maintenance, Installation Planning.

Attributes:

- Work Order ID;
- Account ID;
- Store Directory Name;
- Work Details (What to do);
- Issue of Order;
- Location (Where to work);
- Order List;
- Assigned Staff;
- Delivery Date;
- Priority;
- Delivery Location Name;
- Time Limits;
- Conditions of Payment;
- Order Status.

Comments: (none).

D.2.1.6.2.2 Goods Entry

Class: Goods Entry.

Class Description: initial entry of storekeeping records for physical materials management purposes.

Superclass: (none).

Subclass: (none).

Is-part of: Job Record.

Associations: Work Order, Material List, Store Directory, Labour Costs.

Behaviour: Cost Accounting, Scheduling of Maintenance, Installation Planning.

Attributes:

- Cost of receiving and storing goods;
- Shipping Document ID;
- Order ID;
- Entry Date;
- Entry List;
- Shelf Addressing (Storage Place);
- Condition to Received.

Comments: (none).

D.2.1.6.2.3 Outgoing Stocks

Class: Outgoing Stocks.

Class Description: exit of inventory management of spare parts and equipment to be installed includes storekeeping (supervision of scrapped or outgoing stocks, dispatching of stocks and associated documentation handling).

Superclass: (none).

Subclass: (none).

Is-part of: Job Record.

Associations: Work Order, Stock Scrapping, Labour Costs, Material List.

Behaviour Cost Accounting, Installation Planning, Scheduling of Maintenance.

Attributes:

- Cost of shipping goods;
- Shipping Document ID;
- Shelf Addressing;
- Order ID;
- Delivery Date;
- Delivery List;
- Disposal Date.

Comments: (none).

D.2.1.6.2.4 Stock Scrapping

Class: Stock Scrapping.

Class Description: certain materials will never be utilised for repairs, installation etc. due to faulty, damaged or obsolete conditions. This wastage must be written off as a "cost" to overhead or some other account.

Superclass: (none).

Subclass: (none).

Is-part of: Job Record.

Associations: Material List, Store Directory, Outgoing Stocks, Labour Costs.

Behaviour Cost Accounting, Installation, Scheduling of Maintenance.

Attributes:

- Scrapped Stock ID;
- Scrapped Stock Location;
- Disposal Cost;
- Labour Cost;
- Manufacturer Name;
- Vendor Name;
- Guarantee Expiry ID;
- Manufacturer ID.

Comments: (none).

D.2.1.6.2.5 Labour Costs

Class: Labour Costs.

Class Description: a record of staff costs associated with particular work orders.

Superclass: (none).

Subclass: (none).

Is-part of: Job Record.

Associations: Work Orders, Staff Work Scheduling, Staff Record.

Behaviour Cost Accounting, Installation Planning, Scheduling of Maintenance.

Attributes:

- Staff ID;
- Staff Name;
- Labour Rate;
- Staff Organisational Unit ID;
- Start/Stop Time and Date;
- Overhead Costs for Staff;
- Total Labour Cost.

Comments: (none).

Is-part of: Job Record.

Association: Work Orders, Staff Work Scheduling, Staff Record.

Table D.1: Financial information (part 1)

C = CREATE **R = READ** **W = WRITE**	STORE DIRECTORY	MATERIAL LIST	JOB RECORD	RENTAL CHARGES	CUSTOMER CONTRACT	INVOICE	WORK ORDER	INTERADMIN ACCOUNTING
	TMN DESIGN							SERVICE DESIGN (C)
	PLANNING							
	INSTALLATION	INSTALLATION PLANNING (C)	INSTALLATION PLANNING (C)	INSTALLATION PLANNING (R)	INSTALLATION PLANNING (R)	INSTALLATION PLANNING (R)	INSTALLATION PLANNING (C)	
	PROVISIONING			CONTRACT PHASE (C)	CONTRACT PHASE (C)			
	MAINTENANCE	SCHEDULING (W)	SCHEDULING (W)				SCHEDULING (W)	
	PERFORMANCE MANAGEMENT							
	SECURITY					ACCESS CONTROL		
	ACCOUNTING MANAGEMENT	COST ACCOUNTING (R)	COST ACCOUNTING (R)	CHARGING & BILLING (W)	CHARGING & BILLING (R)	BILLING & CHARGING + (W) IA ACCT (R)	COST ACCOUNTING (W)	IA ACCOUNTING (R)
CUSTOMER QUERY				VPN MGT (W)	ADVANCED IN (W) & VPN MGT (W)	ADVANCED IN & VPN MGT (R)		IA ADMIN (R)

Table D.2: Financial information (part 2)

C = CREATE R = READ W = WRITE	TARIFF	COSTING INFORMATION	CUSTOMER ACCOUNT	PAYMENT	REMINDER	REFUND	ASSET REGISTER	JOB RECORDS
TMN DESIGN	SERVICE DESIGN (C)	DESIGN (C)						
PLANNING		SERVICE FORECASTING (C)					SERVICE FORECASTING (C)	SERVICE FORECASTING (C)
INSTALLATION		INSTALLATION PLANNING (R)	INSTALLATION PLANNING (R)				INSTALLATION PLANNING (R)	INSTALLATION PLANNING (R)
PROVISIONING	CONTRACT & CESSATION PHASE (C)	CONTRACT & CESSATION PHASE (C)	CONTRACT PHASE (C)				CONTRACT PHASE (C)	CONTRACT PHASE (C)
MAINTENANCE							SCHEDULING (W)	SCHEDULING (W)
PERFORMANCE MANAGEMENT								
SECURITY			ACCESS CONTROL	ACCESS CONTROL			ACCESS CONTROL	ACCESS CONTROL
ACCOUNTING MANAGEMENT	CHARGING & BILLING IA ACCT. (R)	COST ACCOUNTING (R)	CHARGING & BILLING (W)	CHARGING & BILLING (W)	CHARGING & BILLING (R)	CHARGING & BILLING (W)	CHARGING & BILLING (W)	
CUSTOMER QUERY	ADVANCED IN VPN MGT	VPN MGT (R)	ADVANCED IN (R) VPN MGT (R)	+ IA ACCOUNT (R) ADVANCED IN (C)		ADVANCED IN & VPN MGT		

Table D.3: Financial information (part 3)

C = CREATE R = READ W = WRITE	GOODS ENTRY	OUTGOING STOCKS	STOCK SCRAPPING	LABOUR COSTS				
TMN DESIGN								
PLANNING								
INSTALLATION	INSTALLATION PLANNING (W)	INSTALLATION PLANNING (W)	INSTALLATION PLANNING (W)	INSTALLATION PLANNING (W)				
PROVISIONING	SCHEDULING (W)	SCHEDULING (W)	SCHEDULING (W)	SCHEDULING (W)				
MAINTENANCE								
PERFORMANCE MANAGEMENT								
SECURITY								
ACCOUNTING MANAGEMENT	COST ACCOUNTING (R)	COST ACCOUNTING (R)	COST ACCOUNTING (R)	COST ACCOUNTING (R)				
CUSTOMER QUERY								

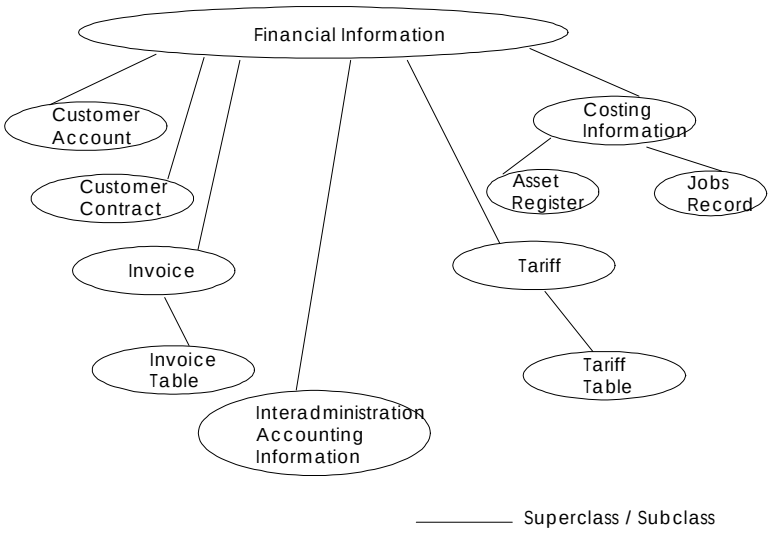

Figure D.2: Service specification inheritance tree

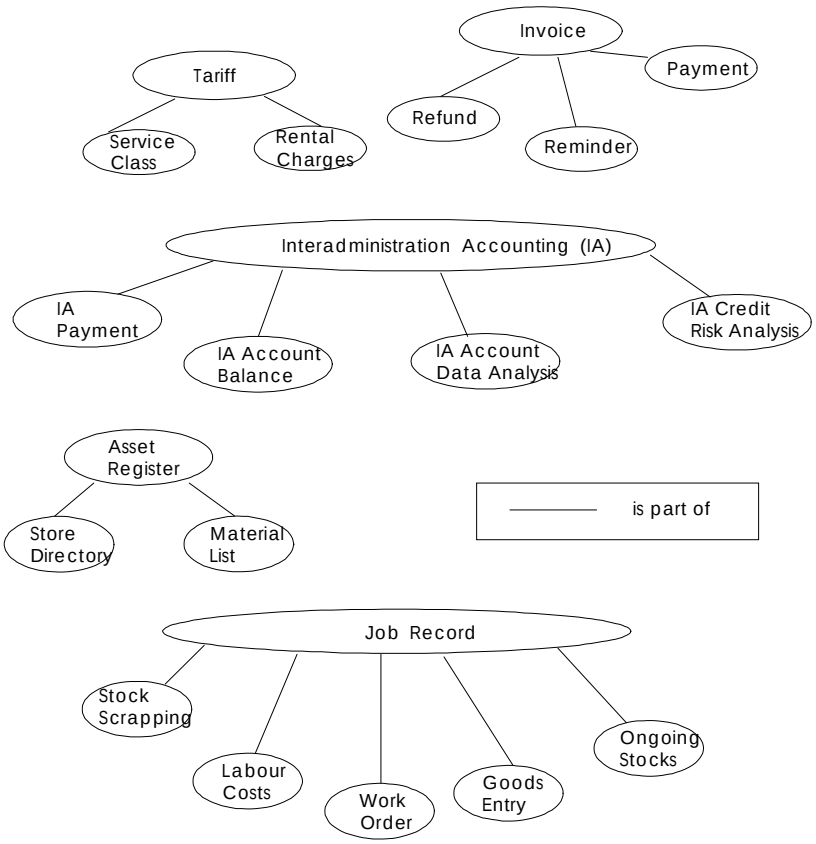

Figure D.3: Service specification add containment

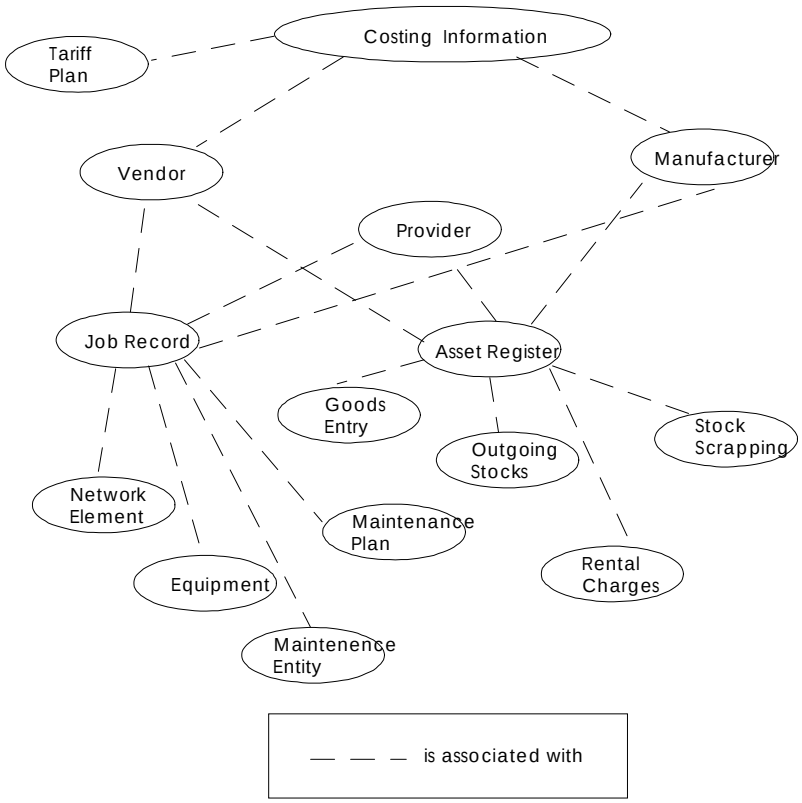

Figure D.4: Financial information service specification (add association) costing information

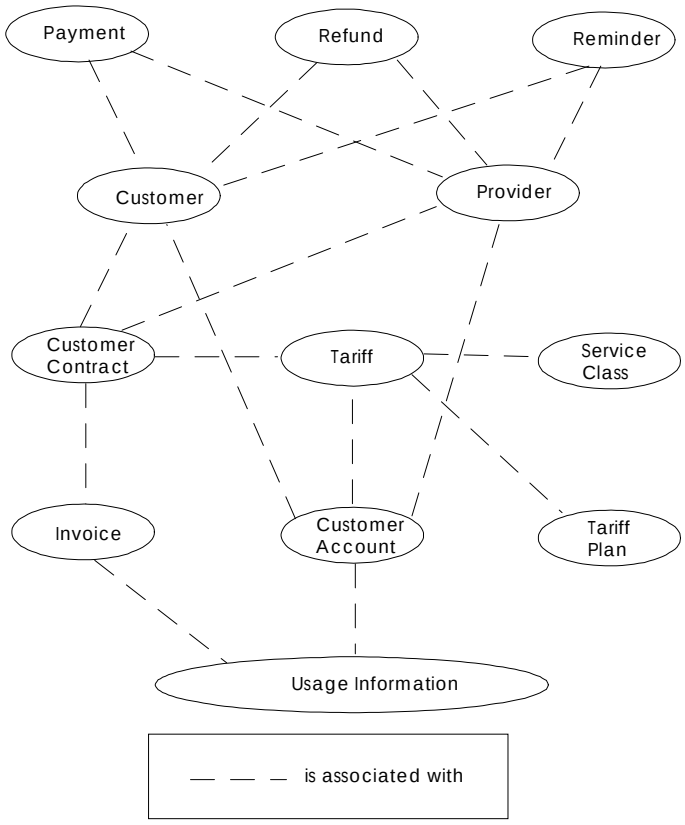

Figure D.5: Financial information service specification (add association) charging & billing information

D.3 Service level usage information objects

In the context of a TMN, usage refers to the utilisation of network resources and the primary purposes of measuring usage are cost recovery and the promotion of efficient system usage.

Therefore, some form of usage records are desirable. These records should be generic enough to serve as the input for services such as administration reports (e.g. monthly service usage statistics), performance feedback, planning resources and cost/charging functions. Therefore, it can be seen that usage records should be independent of the service using them, but provide enough information for that service.

It is worth noting that items such as charge splitting that will be a part of Universal Mobile Telecommunications Systems (UMTS) are regarded as being management services and will not be catered for explicitly in these objects.

Based on the above factors, the following objects are proposed (see figure 1 for the class definitions):

- Usage Information:
    - Usage Record;
    - Distributive Service Usage Record;
    - Usage Aggregation Store.

It may be decided to charge for the cost of resources used in signalling, as opposed to simply the time spent during signalling. This would be because of the increased complexity of future networks and the associated increase in resource usage by signalling e.g. the use of many sub-networks during a call will result in more complex signalling. Therefore, a specific signalling usage record to monitor the resources used during signalling will be required. This is a topic for further study.

D.3.1 Usage information

Class: Usage information.

Class Description: this high-level object represents the recording and aggregation of usage data.

Superclass: S/L Top.

Subclass: Usage Record, Usage Aggregation Store.

Associations: Service Class.

Attributes:

- Aggregation Frequency.

Comments:

The effort required to measure usage and the type of usage measurement that is appropriate is dependent on the architecture of the network in question:

- a circuit switch network reserves resources for each user call. Therefore, it is generally appropriate to initiate a usage record on call setup and fill in the relevant fields on call teardown;

- a connection-orientated packet switch network usually uses a fixed route for all its packets and is analogous to the circuit switched case if the connection protocol reserves resources on call setup. In this case, the network must maintain a record of the state of the connection. If, however, the connection protocol does not do this, then accounting information and a packet count must also be kept in the network;

- a pure datagram (connectionless) network has no resource reservation nor a connection state as packets from the same end-to-end may take different routes.

Furthermore, for an IBC network, allowance needs to be made to keep usage records appropriate to the distributive services that will be offered.

D.3.1.1 Usage record

Class: Usage Record.

Class Description: this service level object is built from network or network element usage aggregation stores (essentially a session usage record).

Superclass: Usage information.

Subclass: Distributive Service Usage Record.

Associations: Interadministration details, Tariff, Invoice, Telecommunication Service, Network Level Usage Records or Call Records, QOS Record.

Attributes:

- Record ID;
- Time of Creation;
- Date of Creation;
- Service Class Name;
- Call Identification;
- Inter SS details;
- Day of Week;
- Time of Day;
- Class of usage (e.g. priority or access class);
- Type of Service (e.g. interactive, distributive or supplementary);
- QOS of usage;
- Usage Units (e.g. bytes, packets , seconds, minutes);
- Volume of usage units (e.g. number of bytes or call duration);
- Number of discarded usage units.

Comments:

This usage record class should be generic and should have subclasses with attributes particular to a given network architecture/service.

The Call Identification field could be used to identify the call being made, e.g. it may contain the VCI and VPI in the case of ATM. In other systems it could consist of the actual source location (e.g. address or user name ID and destination location (e.g. address or name)).

It should also allow for specification of the type of service (i.e. voice, video, or data) as well as the related QOS desired (e.g. delay sensitivity) and achieved (for validation against that specified in the customer contract). It should also permit different network charging schemes, e.g. a fixed, per packet, fee, a fee based on time period or network load, a fee based on the packet priority.

Therefore, the record shall include indicators of the usage unit and the number of them, the time the usage occurred at, the sending and receiving addresses, details of any internetwork transfers and possibly the routing used.

It may also be more appropriate to further decompose the usage record into distributed, connectionless and connection oriented usage records, although the usage units attribute allows for the duration of a connection or the packet size of a connectionless system.

The possible association between this class and the Service Level Record class should be considered.

D.3.1.2 Distributive Service Usage Record

Class: Distributive Service Usage Record.

Class Description: this object inherits all the usage items in the Usage Record, so as to allow its network usage to be maintained, but adds on the details of the distributive service using the network. It also uses the information inherited for the purposes of the distributive service applications, e.g. time of day for rates.

Superclass: Usage Record.

Subclass: None.

Associations: Provider, Customer, Telecommunication Service.

Attributes:

- Distributive Service User Name;
- Distributive Service Cost Indicator.

Comments: (none).

D.3.1.3 Usage Aggregation Store

Class: Usage Aggregation Store.

Class Description: this object will group usage records on a specified basis for easier use by applications.

Superclass: Usage information.

Subclass: (none).

Associations: Service class, Customer, Tariff, Invoice.

Attributes:

- Store ID;
- Number of usage records;
- Max number of usage records allowed in this store;
- Aggregation basis (e.g. service or user);
- Aggregation basis details (e.g. service or user ID).

Comments:

There is a need to aggregate the usage records in terms more meaningful to a network user/and or management system user, as the units of usage measurement may be in packets, whereas the user is interested in calls. This aggregation is important so as to reduce the system overhead incurred if the records have too fine a grain. Related issues are the frequency of aggregation and what part of aggregation is done automatically by the system and what part is done by particular management applications. As a result of aggregation, it should be possible to detect and possibly warn of any thresholds that are being approached at points in the network.

This aggregation would be done on an address basis for a network user and perhaps on a service basis for a provider. Another possibility is to store the aggregation basis as part of the usage information class, rather than the aggregation class.

An alternative to simply using the usage aggregation store as a grouping of usage records would be to add an aggregation unit attribute and a volume of aggregation unit attributes and combine the contents of all the usage record attributes into particular aggregation store attributes.

Usage records and aggregation records will also be required at the network and/or network element level and will be related to those at the service level, although at the network element level aggregation will probably occur in real time.

There is also a possible association between this class and the Service Level Log class.

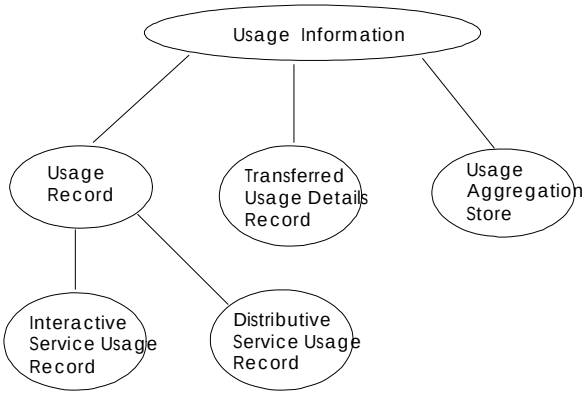

Figure D.6: Service specification inheritance tree

D.4 Service level objects for telecommunication services

D.4.1 Service Family Specification

Class: Service Family Specification.

Class Description: this object represents the informal or formal description of the features of a family of service classes from the viewpoint of the service provider(s). The specification refers to a specific functionality, which may be tariffed, to one or more customers. These service specifications are composed of two main types, service control element and service components.

Service specifications are refined to service classes that describes the service in terms of behaviour as seen by various users of the service, i.e. end user, service provider, network operator etc.

A service may be contained within another service, thereby creating a superior/subordinate relationship between them.

Superclass: S/L Top.

Subclass: Service Class.

Has-parts: Service Component Specification;

Service Control Element Specification;

Service Component Grouping Criteria.

Associations: Provider.

Behaviour: Design, Planning.

Attributes:

- Service Identity;
- Service Name;
- Service Type;
- Service Provider Name;
- Service Component Specification Names;
- Service Control Element Specification Name.

Notifications: (none).

Comments: (none).

D.4.1.1 Service Class

Class: Service Class.

Class Description: this object represents the informal or formal description of the features of a service class from the viewpoint of the service provider(s). The specification refers to a specific functionality, which may be tariffed, to one or more customers. These service class specifications are composed of two main parts, service control element and service components. Service Classes are the definition of services offered to customers. They can be customised to a particular user as defined in the User Service Profile object.

Superclass: Service Family Specification.

Subclass: User Service Profile.

Has-parts: Service Component Specification;

Service Control Element Specification;

Service Component Grouping Criteria.

Associations: Network, Provider.

Behaviour: Design, Planning, Installation, Provisioning, Accounting Management.

Attributes:

- Service Class Identity;
- Service Class Name;
- Service Class Type;
- Network Names;
- Tariff Name;
- Administrative State;
- Operational State;
- Service Class Feature Description;
- Service Class Control Specification;
- Service Class Component Specification Names.

Notifications: (none).

Comments:

The Service Class Type attribute contains information corresponding to Teleservice, Bearer Service, Supplementary Service etc.

D.4.1.1.1 User Service Profile

Class: User Service Profile.

Class Description: this object relates to the provider view of a service and implements a menu of Service features chosen by the user.

The user unique service information will interact with the components and the control elements in the service class to personalise the service class.

Superclass: Service Class Specification.

Subclass: User Connection Profile.

Associations: Directory Number, User.

Attributes:

- User Service Profile Identity;
- User Name;
- User Service Profile;
- User unique service information;
- Directory Number.

Notifications: (none).

Comments: (none).

D.4.1.2 User Connection Profile

Class: User Connection Profile.

Class Description: this object relates to the provider view of a service and implements a menu of Service features chosen by and available to the user at the time for connection to the networks Access Point. The service constrains and quality constrains are results of the negotiations done at the connection time and related to limitations in the network(s) involved and user service profiles of parties involved. The Access Point(s) in the network(s) may be different from time to time (e.g.. mobility) and notification, control and connection may be different access points.

Superclass: Service Class Specification.

Associations: Access Point.

Attributes:

- User Connection Profile Identity;
- Notification Access Point Name;
- Control Access Point Name;
- Connection Access Point Name;
- Service constrains;
- Quality constrains.

Comments: (none).

D.4.2 Service Component Specification

Class: Service Component Specification.

Class Description: an object type which can be constructed from other service components or may exist as a primitive or leaf service component. A large number of telecommunications services can be constructed from a limited set of service component specifications. These components are specified to share a common logical infrastructure as expressed in a reference configuration. These components which interact and are formed from the same reference model are termed a service group.

Service component specifications include specifications for video, audio, speech, graphics, still-pictures, text and data. These are defined below:

DATA: Digital information typically consisting of a sequence of bits. It is a way to bypass, in the context of communication, any other information type, leaving to the user the decision to select the user-oriented information type.

TEXT: A sequence of characters which can be reproduced on paper.

STILL GRAPHICS: A set of graphic primitives (e.g. point, line, circle) which can be statically reproduced on paper.

MOVING GRAPHICS: A sequence of still graphics which can be dynamically represented on a two-dimensional display.

PICTURES: Still three-dimensional images, consisting of a set of pixels which can be visually represented on a two dimensional display.

AUDIO: A sequence of tones.

PEECH: Human talking information type consisting of a sequence of tones and pauses.

MOVING VIDEO: Visual representation of three dimensional objects on a two dimensional screen.

The Service Component Quality attribute describes all identified service component qualities (QOS, NP) as seen by the user. It holds unique information about the quality of a particular component. For example,

a video component quality has attributes such as aspect ratio, and number of lines, whereas a graphics component will have information about resolution. It contains information on Information-delay, Information Transfer Rate, Bandwidth, Synch-processing, Flow-processing etc.

Superclass: S/L Top.

Subclass: (none).

Associations: Service Component Grouping Criteria.

Behaviour: Design, Planning, Provisioning, Performance Management, Security Aspects, Accounting Management.

Attributes:

- Service Component Identity;
- Service Component Name;
- Service Component Type;
- Service Component Vendor;
- Service Component Description;
- Charging Mode;
- Service Component Security;
- Service Component Quality;
- Administrative State;
- Operational State.

Notifications: (none).

Comments: (none).

D.4.3 Service Control Element (SCE) Specification

Class: Service Control Element (SCE) Specification.

Class Description: this object provide a specification of the messages between objects for the purpose of service access control, service call control and transmission/connection control. The SCE specification states the messages needed to control service components at specific points in the execution of a service. A SCE, therefore, defines the overall behaviour of a service.

Superclass: S/L Top.

Subclass: (none).

Has-parts: (none).

Associations: Service Component Grouping Criteria.

Behaviour: all functional areas.

Attributes:

- Service Control Element Identity;
- Service Control Element Name;
- Service Control Element Type;
- Service Control Element Vendor;
- Service Control Element Description;
- Administrative State;
- Operational State.

Notifications: (none).

Comments: (none).

D.4.4 Service Component Grouping Criteria

Class: Service Component Grouping Criteria.

Class Description: this object gives guidelines for combining Service Components within the Service Family in order create public or customised service classes.

Superclass: S/L Top.

Subclass: (none).

Has-parts: (none).

Associations: Service Component.

Behaviour: Design, Planning, Provisioning.

Attributes:

- Service Component Grouping Criteria Identity;
- Service Component Grouping Criteria Name;
- Service Component Names;
- Service Component Criteria Description;
- Administrative State.

Notifications: (none).

Comments: (none).

NOTE: The Access Point object should be described within the set of NETWORK ELEMENT objects.

D.4.5 Access Point

Class: Access Point.

Class Description: the Access Point entity relates to the provider view of information about the totality of infrastructure resources (HW and SW) which participate in the delivery of a service at a Access Point, including the type of Access Points which interfaces to the CPN. Access Points may be of type Notifications, Control or Connection or any combination of these.

Superclass: Trail Termination Point.

Subclass: (none).

Associations: Directory Number, Named by Network Element.

Attributes:

- Access Point Identity;
- Associated Directory Number;
- Access Point Type;
- Administrative State;
- Operational State;
- Access Point Capability;
- Assignment to Customer.

Notifications:

- Administrative State.

Comments: (none).

NOTE: The Directory Number object should be described within the set of NETWORK objects.

D.4.6 Directory Number

Class: Directory Number.

Class Description: the Directory Number Object Class is part of the network to user interface and id directly associated with one of more numbering plans and may be assigned to individual users. Users are always related to a specific customer via the user object.

Superclass: Top.

Subclass: (none).

Attributes:

- Directory Number Identity;
- Administrative State;
- Operational State;
- User Name;
- User Service Profile.

Comments: (none).

Associations: User Service Profile, User. The Directory number is named by Network.

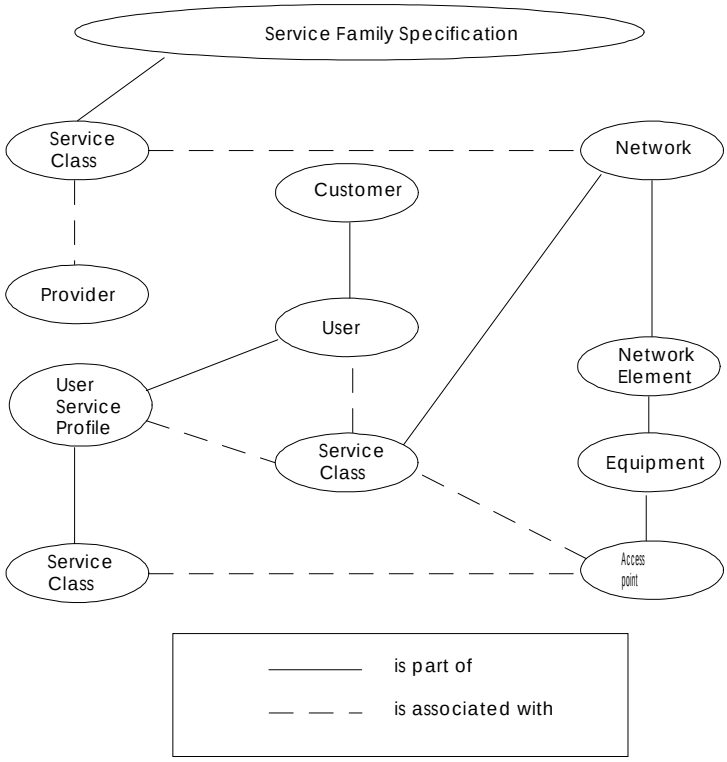

Figure D.7: Service specification associations and containment

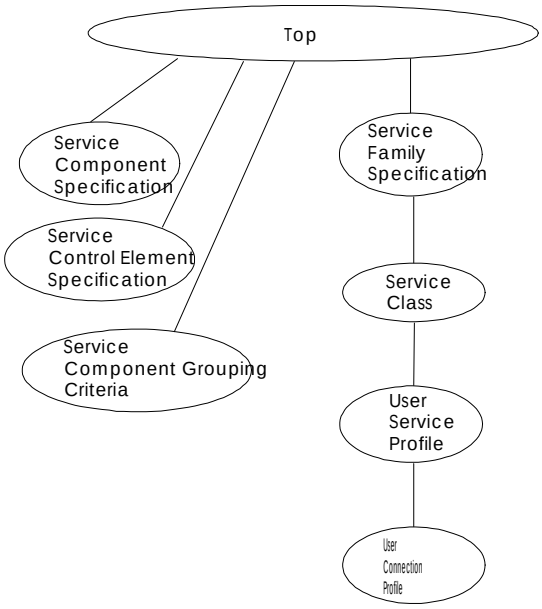

Figure D.8: Service specification inheritance tree

D.5 Other service level objects

D.5.1 Introduction

Table D.4 specifies the following classes of objects.

Table D.4

Subclause D.5.1.1: Service Logs	Subclause D.5.1.2: Service Records
Service Complaint Log Security Alarm log Quality of Service Log Alarm Log Security Audit Trail Log	Service Complaint Record Security Alarm Record Quality of Service Record Alarm Record Security Audit Trail Records
Subclause D.5.1.3: Actors	Subclause D.5.1.4: Plans.
Provider Contact Manufacturer Vendor User Customer Location	Service Plan Security Plan supplementary Service Plan Tariff Plan Maintenance Plan

D.5.1.1 Service Log

Class: Service Log.

Class Description: the log is a repository for records.

Superclass: SL/Top.

Subclass: Service Complaint Log, Security Alarm Log, Quality of Service Log, Alarm Log, Security Audit Trail Log.

Associations: (none).

Attributes:

- Log ID : <unique log identity >;
- Discriminator Construct :<parameters >;
- Administrative State :<locked or unlocked>;
- Operational State : <enabled or disabled>;
- Availability Status :<log-full .>;
- Usage State :<active, idle, busy or unknown>;
- Max Log size;
- Current Log Size;
- Number of Records;
- Capacity Alarm Threshold : <percent of max log size>;
- Log full action :<wrap or halt>;
- Packages : <conditional for log instance>;
- (Rec. X 735 | ISO/IEC DIS 10164-6).

D.5.1.1.1 Service Complaint Log

Class: Service Complaint Log.

Class Description: the Service Complaint Log will contain a synthesis of information obtained from Customer Complaints which relate to a particular service.

Superclass: Service Log.

Subclass: (none).

Associations: (none).

Attributes:

- has-parts : <Service Complaint Record>.

D.5.1.1.2 Security Alarm Log

Class: Security Alarm Log.

Class Description: (none).

Superclass: Service Log.

Subclass: (none).

Associations: (none).

Attributes:

- has-parts : <Security Alarm Record>.

D.5.1.1.3 Quality of Service Log

Class: Quality of Service Log.

Class Description: (none).

Superclass: Service Log.

Subclass: (none).

Associations: (none).

Attributes:

- has-parts : <QOS Records>.

D.5.1.1.4 Alarm log

Class: Alarm Log.

Class Description: (none).

Superclass: Service Log.

Subclass: (none).

Associations: (none).

Attributes:

- has-parts : <Alarm Records>.

D.5.1.1.5 Security Audit Trial Log

Class: Security Audit Trail Log.

Class Description: (none).

Superclass: Service Log.

Subclass: (none).

Associations: (none).

Attributes:

- has-parts : <Security Audit Trail Records>.

D.5.1.2 Service Record

Class: Service Record.

Class Description: a Service Record is created as a result of the receipt of an event report or side effect of a management operation. Records may only be retrieved and deleted; attributes of a record cannot be modified.

Superclass: SL/Top.

Subclass: Service Complaint Record, Security Alarm Record, Quality of Service Record, Alarm Record, Security Audit Trail Record.

Associations: (none).

Attributes:

- Record id : <unique record identity>;
- Logging Time : <time at which record entered into Service Log>;
- (Rec. X 735 | ISO/IEC DIS 10164-6).

D.5.1.2.1 Service Complaint Record

Class: Service Complaint Record.

Class Description: the Service Complaint Record will contain information on a particular Service Complaint.

Superclass: Service Record.

Subclass: (none).

Associations: (none).

Attributes: (none).

- part-of : <Service Complaint Log>;
- Service Complaint.

D.5.1.2.2 Security Alarm Record

Class: Security Alarm Record.

Class Description: (none).

Superclass: Service Record.

Subclass: (none).

Associations: (none).

Attributes:

- is-part-of : <Security Alarm Log>;
- Alarm-Type;
- Integrity-Violation;
- Operational-Violation;
- Physical-Violation;
- Security Service / Mechanism Violation;
- Time Domain Violation>;
- Security Alarm Severity;
- Security Alarm Cause;
- Security Alarm Text;
- Security Alarm Data;
- Service Provider;
- Service User.

D.5.1.2.3 Quality of Service Record

Class: Quality of Service Record.

Class Description: (none).

Superclass: Service Record.

Subclass: (none).

Associations: (none).

Attributes:

- is-part-of : <QOS Log>.

D.5.1.2.4 Alarm Record

Class: Alarm Record.

Class Description: (none).

Superclass: Service Record.

Subclass: (none).

Associations: (none).

Attributes:

- is-part-of : <Alarm Log>;
- Alarm-Type : <Communications, QOS, Processing, Equipment;
- Environment>;
- Probable-Cause;
- Specific-Problems;
- Perceived Severity;
- Backed-up-Status;
- Back-up Object Instance;
- Trend Indication;
- Threshold Information;
- Notification Identifier;
- Correlated-Notifications;
- Generic State Change;
- Monitored Attributes;
- Proposed Repair Actions;
- Problem Text;
- Problem Data.

D.5.1.2.5 Security Audit Trail Record

Class: Security Audit Trail Record.

Class Description: (none).

Superclass: Service Record.

Subclass: (none).

Associations: (none).

Attributes:

- is-part-of : <Security Audit Trail Log>.

D.5.1.3 Actors

Class: Actors.

Class Description: the Actors Class represents the people and/or organisations who are involved in some aspect of the Telecommunications Service life-cycle or part thereof.

Superclass: SL/Top.

Subclass: Provider, Contact, Manufacturer, Vendor, User, Customer.

Associations: (none).

Attributes:

- Contact Name.

D.5.1.3.1 Service Provider

Class: Service Provider.

Class Description: the Service Provider object contains information on either a public telecommunications company, or any other company which sells, produces or maintains telecommunications services.

Superclass: Actors.

Subclass: (none).

- Provider ID;
- Provider Type;
- Network Names;
- Service Names.

Associations: (none).

Attributes:

- has-part:<Contact>.

D.5.1.3.2 Contact

Class: Contact.

Class Description: the Contact object contains information relevant to the individuals who are the representatives of a Manufacturer, Provider or Vendor participating in Service activities.

Superclass: Actors.

Subclass: (none).

Associations: (none).

Attributes:

- Contact ID;
- Telephone Number;
- E-Mail Address;
- is-part-of <Manufacturer:Provider:Vendor>.
- Contact Type;
- Facsimile Number;
- Location Name;

D.5.1.3.3 Manufacturer

Class: Manufacturer.

Class Description: the Manufacturer object contains information relevant for the design, production, supply and maintenance of system resources to support service providers in their activities.

Superclass: Actors.

Subclass: (none).

Associations: (none).

Attributes:

- Manufacturer ID;
- Manufacturer Type;
- has-part:<Contact>.

D.5.1.3.4 Vendor

Class: Vendor.

Class Description: the Vendor object contains information relevant for the organisations who sell services.

Superclass: Actors.

Subclass: (none).

Associations: (none).

Attributes:

- Vendor ID;
- Vendor Type;
- has-part: <Contact>.

D.5.1.3.5 User

Class: User.

Class Description: the User object contains information on legitimate users of a telecom service. The User is not necessarily the buyer of a service, but is the recipient of that service. It is with the User of a service that Customer Facing functions will interact with when Service Complaints are received.

Superclass: Actors.

Subclass: (none).

Associations: Associated-customer: <Customer>.

Attributes:

- User ID;
- Customer ID;
- Access Rights Security;
- Directory Number.

D.5.1.3.6 Customer

Class: Customer.

Class Description: the Service Customer object contains information on any individual or company which enters into a Contract with a Provider for the supply of Telecommunication Service(s). A distinction is drawn between the Customer (i.e.. who is legally bound to pay for a service via a contract) and the User (i.e.. the recipient of the service). Customers can be classified into either Domestic or Business which distinguishes between the type of services available.

Superclass: Actors.

Subclass: Business, Domestic.

Associations: Associated-User : <User>.

Attributes:

- Customer ID;
- Customer Type;
- Network Names;
- Service Names.

D.5.1.3.7 Location

Class: Location.

Class Description: the location class refers to a place occupied by one or more managed objects or persons associated with telecommunications management.

Subclass: (none).

Associations: Contact.

Attributes:

- Geographic Co-ordinates;
- Location Identifier;
- Location Type;
- Postal Address;
- Contact Names.

D.5.2 Telecommunications Services

Class: Telecommunication Services.

Class Description: (none).

Superclass: SL/Top.

Subclass: Value Added Service, Supplementary Service, Bearer Service, Teleservice.

Associations: (none).

Attributes:

- Name;
- Quality of Service.

D.5.2.1 Value Added Service

Class: Value Added Service.

Class Description: value Added Services are services provided additionally to existing telecommunications services, and provide services that go beyond the range of standard telecommunications type services.

Superclass: Telecommunications Services.

Subclass: (none).

Associations: (none).

Attributes: (none).

D.5.2.2 Supplementary Service

Class: Supplementary Service.

Class Description: supplementary Services extend the functionality of existing Teleservices, enhancing their value. These services cannot exist independently of a parent teleservice.

Superclass: Telecommunications Services.

Subclass: (none).

Associations: (none).

Attributes:

- Parent-Service : <Teleservice>.

D.5.2.3 Bearer Service

Class: Bearer Service.

Class Description: a Bearer Service provides the capability for communication between User-Network interfaces so as to support the provisioning of IBC services.

Superclass: Telecommunication Service.

Subclass: (none).

Associations: (none).

Attributes: (none).

D.5.2.4 Teleservice

Class: Teleservice.

Class Description: a Teleservice provides IBC service usage and communication between user-to-terminal interfaces.

Superclass: Telecommunication Service.

Subclass: (none).

Annex E (informative): Examples of use of generic object classes

This annex gives examples of the use of the object classes defined in this I-ETS. It is not intended to provide a complete description, but only to illustrate the potential use of objects to model logical and physical resources.

E.1 Transport network architecture

E.1.1 Introduction

This annex explains different aspects of the transport network architecture, as defined in CCITT Recommendation G.803 [6]. This architecture is a basis for defining the management aspects of networks in general. In subclause E.1.2 the transport architecture is explained. Subclause E.1.3 describes how this is applied to the generic model.

E.1.2 Transport network architecture

The transport network architecture is a layered model in which one transport network layer makes use of the service provided by another network layer (client / server association between adjacent layers). Figure E.1 illustrates this concept for, an ATM VP cross-connect overlay network as a client of the SDH, PDH or cell based physical transport network layer.

Within the example of figure E.1, it can be seen that the server network provides a synchronous high capacity network service, where the VP (client) network provides an asynchronous service to its own client.

Separation between server and client networks is required, because the server network is normally available for more than one client network. In this case, the SDH (server) network can offer its service to the VP network, but it may also be possible to provide this service directly to customers.

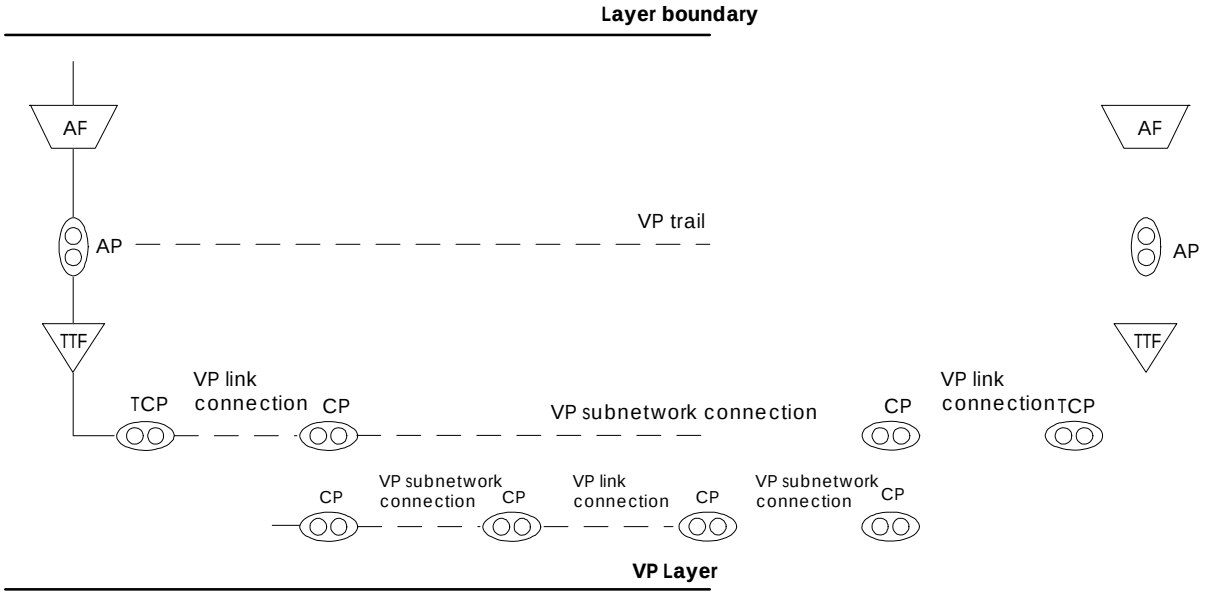

Figure E.1

The transport functions and entities used in this figure are as follows:

- **trail:**

  this transport entity used to connect two access points. A trail is responsible for the integrity of the information transferred between access points. This is the essential part of a trail. Between the endpoints of a trail there is some mechanism to ensure integrity (e.g. retransmission) or to give information about the integrity (performance information);

- **trail termination function (TTF):**

  this function is in charge of generating, extracting and analysing the information to insure the integrity of the information transferred between access points;

- **adaptation function (AF):**

  this function represents the association between a connection point in the client layer and an access point in the server layer. The information in the client layer is adapted by this function to a form suitable for transport in the server layer;

- **access point (AP):**

  information transfer point where a TTF is bound to an AF;

- **termination connection point (TCP):**

  information transfer point where a TTF is bound to a connection;

- **connection:**

  a connection transfers information but does not insure the integrity of the information transferred between access points. An example is a 64 kbit/s slot in a PCM link (the bits are transferred without any integrity check);

  There are two types of connections:

  - link connection:

    this is a connection with fixed connectivity (e.g.. a slot in a PCM Link between two exchanges);

  - sub-network connection:

    this is a connection with flexible connectivity (this means there is always a switch between the endpoints of the connection). A sub-network connection can be partitioned in link and sub-network connections as will be indicated in figure E.2;

- **connection point (CP):**

  information transfer point where a connection is bound to another connection.

  A trail is a relation between the trail endpoints. Normally several routes exist to reach those endpoints. That is why the separation between trails and connections is applied. The integrity is realised by its termination function (e.g. OSI transport layer functionality), where the information is transported by the connection without check (e.g. OSI network layer).

Each network layer can be separately partitioned between borders into subnetworks. Examples of subnetworks are access rings, backbone networks, regional and national networks. A connection is partitioned into link connections and subnetwork connections. A subnetwork connection is a connection within a subnetwork with flexibility. Therefore, within a subnetwork there is always a switch present. Link connections are fixed, they represent, typically, the connection between two switches. Figure E.2 illustrates the concept of partitioning applied to the VP cross-connect overlay network.

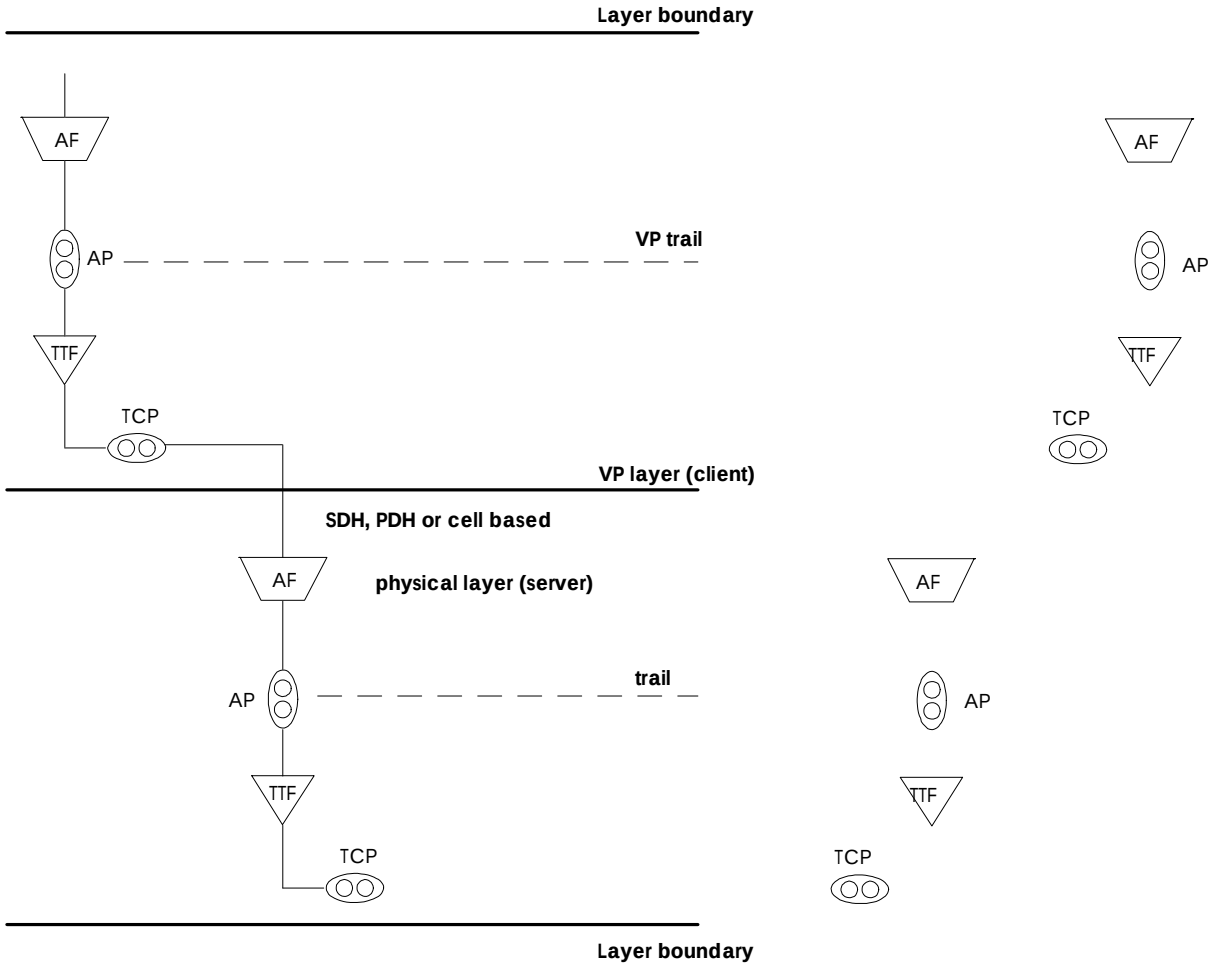

Figure E.2

E.1.3 Generic network model

The transport architecture is used for the management view of a network. Therefore, the generic network model consists of the following object classes:

- trail termination point:

  the trail termination point object class represents the management information associated with the trail termination function and part of the adaptation function. Management information of the TTF is typically about the performance of the trail. That part of the adaptation function that is related to the trail is represented by the TTP;

- connection termination point (CTP):

  the CTP object class represents management information of the connection point (CP) in the transport architecture and also part of the AF. The most important aspects of the CPs are the identification of the CTP, in order to be able to connect them with other points. The part of the management information of the AF that is related to the connection is represented by a CTP. A typical example within SDH is pointer processing (an AF). For each connection a pointer exists. Therefore, the alarm LossOfPointer is represented by the CTP.

This figure shows that within a NE:

- the downstream connection pointer points from the CTP sink to the CTP source;

- the upstream connection pointer points from the CTP source to the CTP sink.

The rational is:

- the sink and source aspects are related to the network view, where the pointers are related to the NE view;

- this is similar to batteries, where the current flows from + to -, outside the battery, and from - to + within the battery.

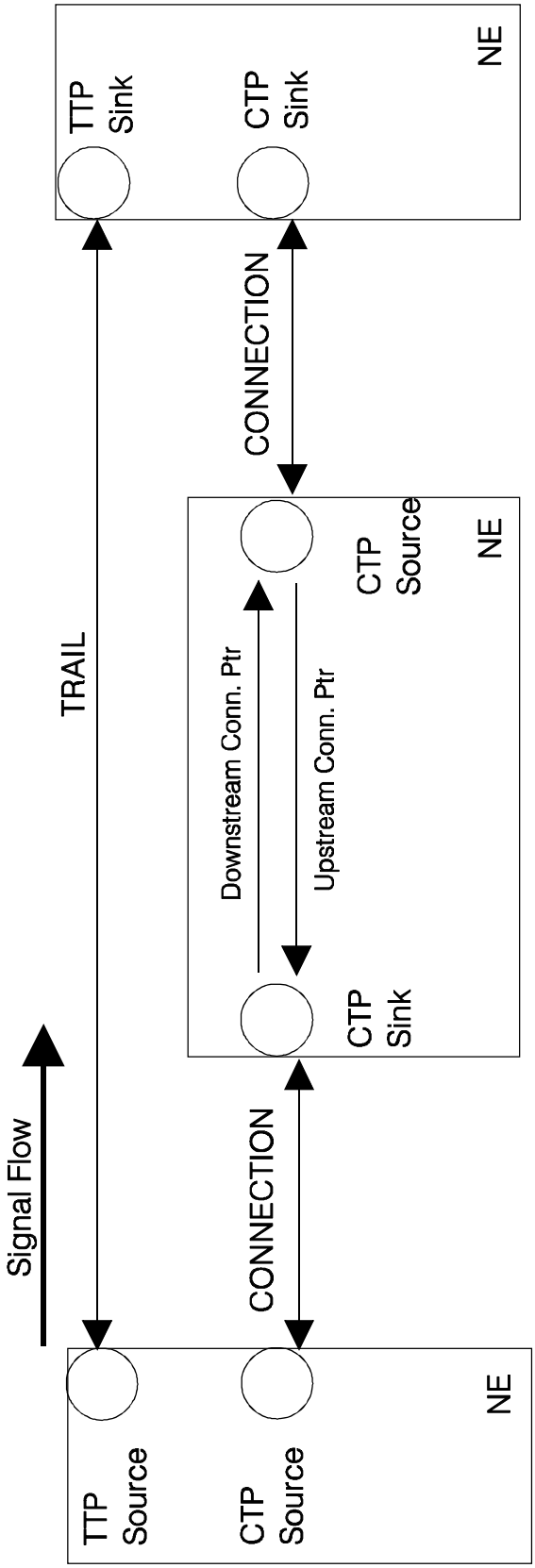

Figure E.3

E.2 Applications of the proposed model

E.2.1 Queries of cross-connections

With the proposed model, it is very easy to retrieve information on cross-connections. Queries based on the state of a cross-connection, its name, one of its endpoints or another attribute of the cross-connection, can be performed by simple filtering on the cross-connection objects.

Also, to find out if a termination point is involved in a cross-connection, one simply has to look at the CrossConnectionObject pointer. If the CrossConnectionObject pointer points to the Fabric, the termination point is neither cross-connected nor reserved for cross-connection (assigned to a group). If the CrossConnectionObject pointer does not point to the Fabric, the termination point is assigned to a cross-connection or reserved. In this case, the source of the signal is indicated by the connectivity pointer.

E.2.2 Unidirectional cross-connection using Group Termination Points (GTPs)

The cross-connection of groups of unidirectional termination points leads to a complicated arrangement in the current model (see figure E.11). The proposed model presents the situation in a much more intuitive manner and allows to know the connectivity between the termination points by issuing a single M-GET to retrieve the connectivity pointer in the termination point object. Figure E.4 repeats the example shown in figure E.11, using the proposed model.

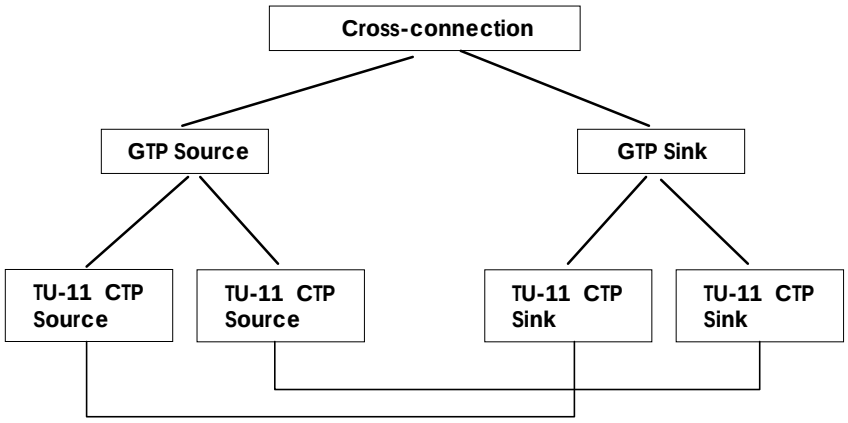

Figure E.4: Unidirectional 2xTU-11 point-to-point cross-connection with proposed model

E.2.3 Cross-connection of concatenated payloads

Cross-connection of concatenated payloads is a special case. A termination point whose traffic is carried by **n** concatenated payloads can be cross-connected to exactly **n** termination points of the lower rate. In all other cases, a point-to-point cross-connection will be established between termination points of the same characteristic information type and each sink or bidirectional termination point will be the sink of exactly one termination point.

Since a sink or bidirectional termination point whose traffic is carried by **n** concatenated payloads may be the sink of zero or **n** source or bidirectional termination points, its connectivity pointer must be special. The connectivity pointer in such a termination point will point to either zero or **n** source or bidirectional termination points. All the other sink or bidirectional termination points will have a connectivity pointer that can point only to zero or one termination point.

Figure E.5 is an example of this situation using the VC-4 according to the North American practice. In North-America, the VC-4 is carried by three AU-3s and, as such, can be crossconnected to three AU-3s. In Europe, the VC-4 would only be connected to an AU-4 (see figure E.6).

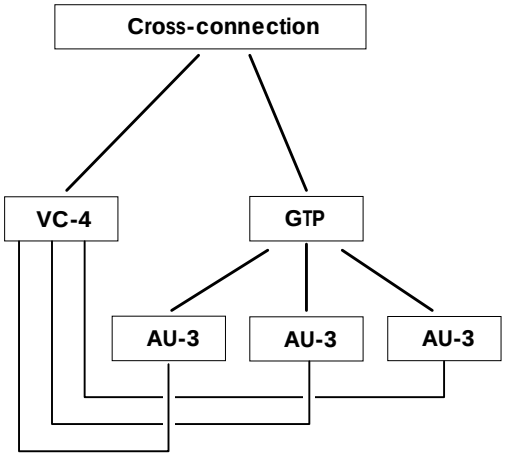

Figure E.5: VC-4 connected to three AU-3s (North-America)

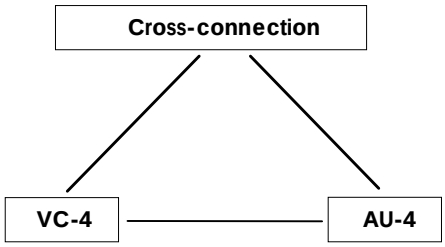

Figure E.6: VC-4 connected to one AU-4 (Europe)

The same situation will exist in Europe when concatenated payloads are introduced. For example, a VC-4-2c will have to be cross-connected to two AU-4s (see figure E.7). In North-America, a VC-4-2c would be cross-connected to six AU-3s (see figure E.8).

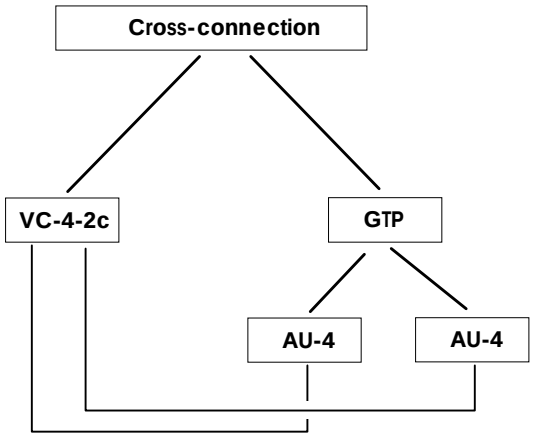

Figure E.7: VC-4-2c connected to two AU-4s (Europe)

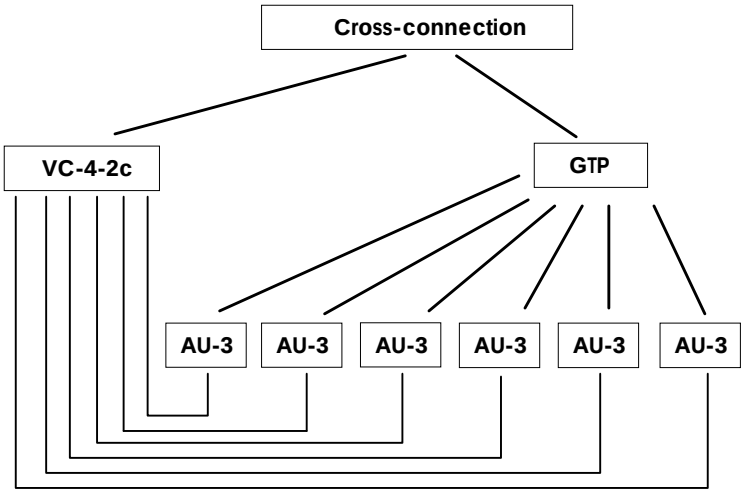

Figure E.8: VC-4-2c connected to six AU-3s (North-America)

E.2.4 Cross-connection of indirect adaptors

The proposed model allows for cross-connection of the termination points contained in indirect adaptors. The manager does not have to be aware of the actual content of the group but can still manage the cross-connection of the group as a whole. An example of this situation is the crossconnection of TUG-2s where the content of the TUG-2 may change while the cross-connection remains undisturbed. The connect action requests the connection of two TUG-2s. Two GTPs are automatically created to reflect the content of the TUG-2s. A cross-connection is established between these GTPs. If the content of the TUG-2s changes (for example from three TU-12s to one TU-2), the content of the GTPs will also change to reflect this, but the management view of the cross-connection will not change (see figures E.9 and E.10).

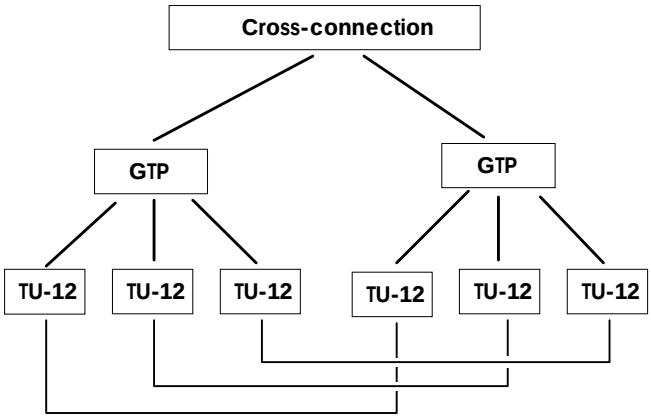

Figure E.9: Cross connection of two TUG-2s containing three TU-12s

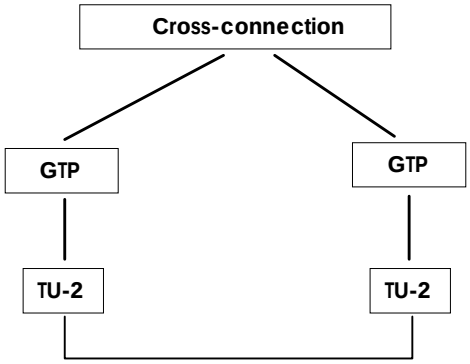

Figure E.10: The two TUG-2s now contain one TU-2

E.2.5 Cross-connection of arbitrary groups

The proposed model allows for the cross-connection of arbitrary GTPs. The only restriction is that the GTPs must be composed of compatible termination points (see figure E.11).

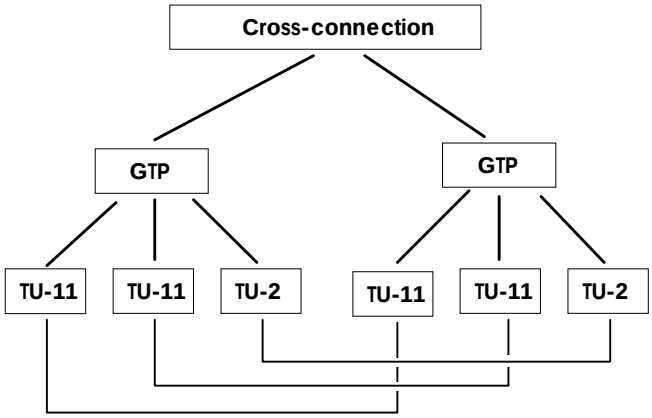

Figure E.11: Cross-connection of GTPs composed of two TU-11s and one TU-2

E.2.6 Suspending a cross-connection

The proposed model allows one to set-up a cross-connection and then prevent traffic from flowing through it. For example, a cross-connection may be set-up and tested, but the telephone company want to prevent traffic from flowing through it before the service is billed to the customer. This can be done either by putting the cross-connection in an intrusive test configuration and allowing a test signal to flow through, or by suspending the cross-connection, in which case the termination points will generate a 'not equipped' signal. The proposed model supports the control status 'suspended' in the cross-connection objects to allow this situation. In this case, the crossConnectionObject pointers will remain the same, but the connectivity pointers in the termination points will be set to NULL (see figure E.12).

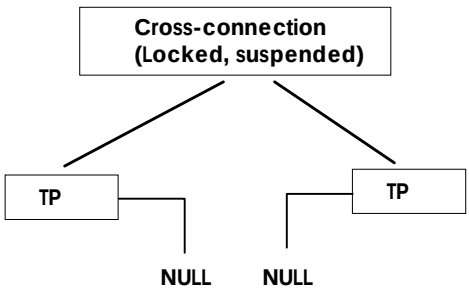

Figure E.12: Suspended Cross-Connection

History

Document history			
May 1993	Public Enquiry	PE 42:	1993-05-24 to 1993-10-15
May 1996	Vote	V 102:	1996-05-06 to 1996-08-09