INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

M.3100
Amendment 6
(03/2003)

SERIES M: TMN AND NETWORK MAINTENANCE:
INTERNATIONAL TRANSMISSION SYSTEMS,
TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE
AND LEASED CIRCUITS

Telecommunications management network

Generic network information model
Amendment 6

ITU-T Recommendation M.3100 (1995) – Amendment 6

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TMN AND NETWORK MAINTENANCE: INTERNATIONAL TRANSMISSION SYSTEMS, TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE AND LEASED CIRCUITS

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ITU-T Recommendation M.3100

Generic network information model

Amendment 6

Summary

This amendment provides several enhancements to the generic network and network element level information model. First, it details a mechanism that supports reporting attribute value ranges across the EMS-NMS interface. Second, it defines a new Generic Transport TTP object class which is intended to represent a physical port or endpoints of transport connections. Third, it defines a new object class, ManagedElementR2, a subclass of ManagedElement with three additional attributes added. These attributes include one to hold the "model code" of a piece of equipment. Another new attribute is used to represent network element aliases, or names used by the EMS to refer to Network Elements. Also defined is an attribute to hold the generic "type" of network element.

Another enhancement included in this amendment relates to expanding the CharacteristicInfo constants module so that it can adequately represent as much of the currently available signal rates as possible.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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

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

NOTE

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

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

CONTENTS

ITU-T Recommendation M.3100

Generic network information model

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1   Scope

This amendment provides equipment model enhancements to the GDMO generic network and network element level information model. First, it details a mechanism that supports reporting attribute value ranges across the interface. Second, it defines a new Generic Transport TTP object class which is intended to represent a physical port or endpoints of transport connections. Third, it defines a new object class, ManagedElementR2, a subclass of ManagedElement with three additional attributes added. These attributes include one to hold the "model code" of a piece of equipment. Another new attribute is used to represent network element aliases, or names used by the EMS to refer to Network Elements. Also defined is an attribute to hold the generic "type" of a network element.

Another enhancement included in this amendment relates to expanding the CharacteristicInfo constants so that they can adequately represent as much of the currently available signal rates as possible.

2   References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[1]   ITU-T Recommendation X.721 (1992), *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information*.

[2]   ITU-T Recommendation X.722 (1992), *Information technology – Open Systems Interconnection – Structure of management information: Guidelines for the definition of managed objects*.

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

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

3   Definitions

This amendment has no new definitions in addition to those found in the base Recommendation.

4   Abbreviations

This amendment has no new abbreviations in addition to those found in the base Recommendation.

5 Conventions

This amendment has no new conventions in addition to those found in the base Recommendation.

6 Overview of the attribute value ranges information model

This clause of the amendment provides a mechanism that would allow managed systems using the M.3100 paradigm to automatically report acceptable value ranges for attributes associated with a network element in the model. Such mechanism would be a valuable asset for equipment discovery and configuration, since a managing system would automatically be aware of the acceptable value ranges for each configurable parameter in the network before attempting to set these values.

For this mechanism to be implemented, we define a new AttributeRanges object class. The AttributeRanges class allows the managed system to report the minimum and maximum values a certain attribute accepts, as well as the granularity, or step increments, of the range. Each AttributeRanges instance contains ranges for attributes belonging to one object class. The "*kind*" attribute in AttributeRanges denotes the object class for which ranges are being defined. "*attributeName*" specifies the name of the attribute for which a range is being defined. The range is then defined using the "*minimum*", "*maximum*", and "*granularity*" attributes.

For each ManagedElement instance representing a network element, one or more AttributeRanges instances may be created. AttributeRanges instances are bound to the ManagedElement instance via a containment relationship.

Ranges are defined per ManagedElement instance. This allows for an attribute to have different ranges when it belongs to different network elements. In other words, the scope of each AttributeRanges instance is the relevant objects associated with the ManagedElement which contains the AttributeRanges instance. The managed system instantiates one AttributeRanges instance per class per Managed Element instance.

Clause 10.1.1 of this Recommendation provides the managed object definitions for the attribute value ranges information model. Figures 1 and 2 show the inheritance and containment relationship of the managed objects defined in this Recommendation.

In order to set ranges for attributes defined inside data structures, the dot notation is used. For instance, consider the following data structure:

```
SampleStructureType::= SEQUENCE {
                  xyz       REAL,
                  abc       REAL,
                  def       REAL
                  }
```

In order to set an attribute range on attribute xyz, we may refer to attribute xyz by setting the attributeName attribute in the Ranges data structure to "*SampleStructureType.xyz*".
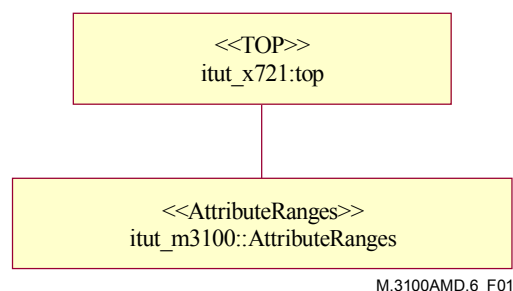
Figure 1/M.3100/Amd.6 – AttributeRanges inheritance relationship
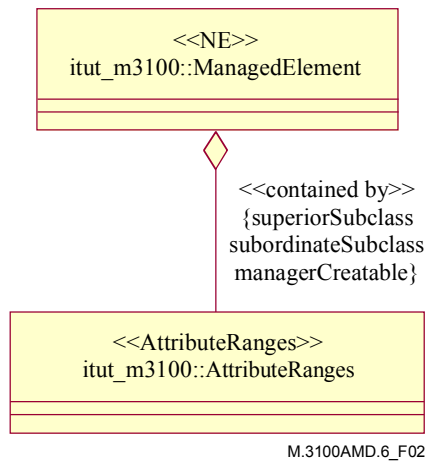
M.3100AMD.6_F02

Figure 2/M.3100/Amd.6 – AttributeRanges containment relationship

7 Overview of the Generic Transport TTP information model

This amendment provides a new Generic Transport TTP object class. This new object is used to represent a physical port or endpoints of transport connections. It may be used by technology-specific models as an abstraction of an underlying transport layer.

A new GenericTransportTTP interface is defined. This object is a subclass of NetworkTP. It is related to ManagedElement using a containment relationship. It is associated with CircuitPack using the PortAssociationList attribute, and with LinkEnd using the ClientLinkEndPointerList attribute.

Clause 10.1.2 of this Recommendation defines a set of managed objects for the GenericTransportTTP class. Figures 3 and 4 show the inheritance, containment, and association relationships of the managed objects defined in this Recommendation.
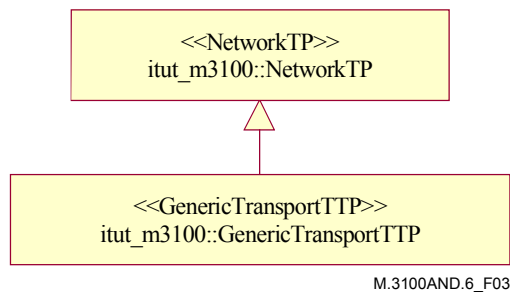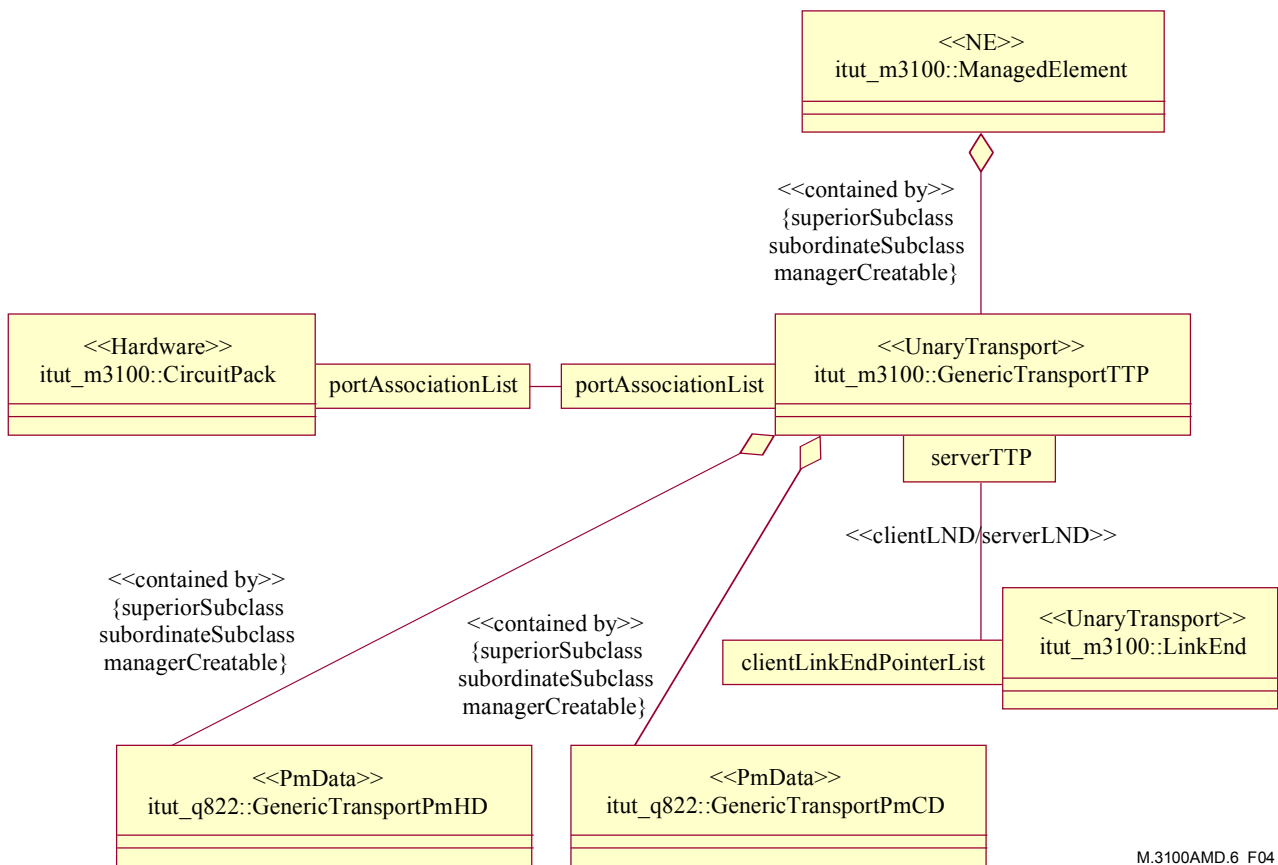

M.3100AND.6_F03

Figure 3/M.3100/Amd.6 – Generic Transport TTP inheritance relationship

Figure 4/M.3100/Amd.6 – Generic Transport TTP containment and association relationships

8　Enhancements to ManagedElement object class

This amendment describes new attributes to be added to the ManagedElement class. In order to preserve backward compatibility, these new attributes are placed in a subclass of ManagedElementR1, named ManagedElementR2. ManagedElementR2 inherits all the attributes of ManagedElementR1 and defines the following extra three:

8.1　Model code

This attribute stores the product model code of the Network Element. The product model code is the manufacturer's model identification information. It is vendor-provided information that the vendor uses to distinguish the network element among a family of products. This attribute is useful for OSSs performing equipment discovery and inventory processes.

The model code is a read-only attribute.

8.2　Network element aliases

This attribute is used to hold aliases given by the EMS to a certain Managed Element instance. Having such aliases available via the EMS/NMS interface is useful for relating Network Element names entered at the EMS, via the Graphical User Interface or otherwise, to those found on the NMS user interface. More importantly, these aliases may appear in alarms sent by certain EMS software outside the interface. Thus, it would be crucial for the NMS to recognize such aliases in order to perform alarm correlation or other fault and performance functions.

8.3 Network element type

Currently, the Managed Element class does not contain an attribute to specify the type of the network element it represents. This attribute holds a textual description of the type of the Network Element modelled by the ManagedElementR2 instance.

The network element type attribute is a read-only attribute.

9 Expansion of characteristic information

The Characteristic Information constants defined in ITU-T Rec. M.3100 leave out a large number of widely used signal rates. The following is an expansion to the signal rates list so it can adequately describe as many signal rates and port types as possible.

The following changes in ITU-T Rec. M.3100 are necessary to expand the list of Characteristic Information type:

Clause 10.2:

Inside the ASN.1 module, add the following lines:

```
e5-565M                 CharacteristicInformation ::= {characteristicInfo 24}
sts3c-and-VC4-1c        CharacteristicInformation ::= {characteristicInfo 25}
sts12c-and-VC4-4c       CharacteristicInformation ::= {characteristicInfo 26}
sts48c-and-VC4-16c      CharacteristicInformation ::= {characteristicInfo 27}
sts192c-and-VC4-64c     CharacteristicInformation ::= {characteristicInfo 28}
section-OC1-STS1-and-RS-STM0
                        CharacteristicInformation ::= {characteristicInfo 29}
section-OC192-STS192-and-RS-STM64
                        CharacteristicInformation ::= {characteristicInfo 30}
line-OC1-STS1-and-MS-STM0
                        CharacteristicInformation ::= {characteristicInfo 31}
line-OC192-STS192-and-MS-STM64
                        CharacteristicInformation ::= {characteristicInfo 32}
fc-12-133M              CharacteristicInformation ::= {characteristicInfo 33}

-- Fiber Channel protocol
fc-25-266M              CharacteristicInformation ::= {characteristicInfo 34}
-- Fiber Channel protocol
fc-50-531M              CharacteristicInformation ::= {characteristicInfo 35}

-- Fiber Channel protocol
fc-100-1063M            CharacteristicInformation ::= {characteristicInfo 36}

-- Fiber Channel protocol
fddi                    CharacteristicInformation ::= {characteristicInfo 37}
fast-Ethernet           CharacteristicInformation ::= {characteristicInfo 38}
gigabit-Ethernet        CharacteristicInformation ::= {characteristicInfo 39}
isdn-BRI                CharacteristicInformation ::= {characteristicInfo 40}

-- ISDN Basic Rate Interface PTP layer rate
dsr-OC192-and-STM64
                        CharacteristicInformation ::= {characteristicInfo 41}
dsr-OC768-and-STM256
                        CharacteristicInformation ::= {characteristicInfo 42}
section-OC24-STS24-and-RS-STM8
                        CharacteristicInformation ::= {characteristicInfo 43}
line-OC24-STS24-and-MS-STM8
                        CharacteristicInformation ::= {characteristicInfo 44}
section-OC768-STS768-and-RS-STM256
                        CharacteristicInformation ::= {characteristicInfo 45}
```

```
line-OC768-STS768-and-MS-STM256
                          CharacteristicInformation ::= {characteristicInfo 46}

tenGigabit-Ethernet     CharacteristicInformation ::= {characteristicInfo 47}
```

10   Information model

10.1   Object classes

10.1.1   Attribute ranges

```
attributeRanges  MANAGED OBJECT CLASS
     DERIVED FROM       "Recommendation X.721: 1992":top;
     CHARACTERIZED BY   attributeRangesPackage  PACKAGE
         BEHAVIOUR attributeRangesBeh;
         ATTRIBUTES
           attributeRangesId GET,
           kind GET,
           ranges GET;;;
REGISTERED AS {m3100ObjectClass 75};


attributeRangesBeh BEHAVIOUR
DEFINED AS
     "The AttributeRanges class allows the managed system to report the minimum
and maximum values accepted by a certain attribute, as well as the granularity,
or step increments, of the range. Each AttributeRanges instance contains ranges
for attributes belonging to one object class. The 'kind' attribute denotes the
object class for which ranges are being defined. The 'attributeName' field of
the kind attribute specifies the name of the attribute for which a range is
being defined. The range is then defined using the 'minimum', 'maximum', and
'granularity' fields.

For each ManagedElement instance representing a network element, one or more
AttributeRanges instances may be created. AttributeRanges instances are bound to
the ManagedElement instance via a containment relationship.

Ranges are defined per ManagedElement instance. This allows for an attribute to
have different ranges when it belongs to different network elements. In other
words, the scope of each AttributeRanges instance is the relevant objects
associated with the ManagedElement which contains the AttributeRanges
instance.";
```

10.1.2   Generic transport trail termination point

```
genericTransportTTP MANAGED OBJECT CLASS
     DERIVED FROM         networkTerminationPoint;
     CHARACTERIZED BY   genericTransportTTPPackage  PACKAGE
       BEHAVIOUR genericTransportTTPBeh BEHAVIOUR DEFINED AS
          "The GenericTransportTTP object is used to represent a physical port
          or endpoints of transport connections. It may be used by
          technology-specific models as an abstraction of an underlying
          transport layer.";;
     ATTRIBUTES
       clientLinkEndPointerList GET-REPLACE;;;
     CONDITIONAL PACKAGES
       ttpPortIDPackage PRESENT IF
          "the server TTP port is represented",
       potentialCapacityPackage PRESENT IF
          "the TTP represents a rate-adaptive technology";
REGISTERED AS {m3100ObjectClass 76};
```

```
ttpPortIDPackage PACKAGE
     ATTRIBUTES
         ttpPortID        GET;
REGISTERED AS {m3100Package 104};


potentialCapacityPackage     PACKAGE
     ATTRIBUTES
         potentialCapacity    GET;
REGISTERED AS {m3100Package 105};
```

10.1.3   Managed element R2

```
managedElementR2   MANAGED OBJECT CLASS
     DERIVED FROM         managedElementR1;
     CHARACTERIZED BY   managedElementR2Package   PACKAGE
         BEHAVIOUR managedElementR2Beh BEHAVIOUR DEFINED AS
             "This object class is a subclass of ManagedElementR1, and it
             introduces three additional attributes not present in
             ManagedElementR1: modelCode, managedElementType, and neAlias.";;
     ATTRIBUTES
         managedElementType GET,
         modelCode GET;;;
     CONDITIONAL PACKAGES
       neAliasPackage PRESENT IF
"an instance supports it.";
REGISTERED AS {m3100ObjectClass 77};


naAliasPackage PACKAGE
     ATTRIBUTES
         neAliases GET;
REGISTERED AS {m3100Package 106};
```

10.2   Attributes

```
attributeRangesId  ATTRIBUTE
     WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.NameType;
     MATCHES FOR EQUALITY, ORDERING, SUBSTRINGS;
     BEHAVIOUR
       "Recommendation X.721 : 1992" : rDNIdBehaviour,
       -- The above behaviour is defined as part of discriminatorId in
       -- Recommendation X.721
       attributeRangesIdBehaviour      BEHAVIOUR
       DEFINED AS
         "The Attribute Ranges Id is an attribute type whose distinguished
         value can be used as a RDN when naming an instance of the Attribute
         Ranges object class.";;
REGISTERED AS {m3100Attribute 164};


kind ATTRIBUTE
     WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.Kind;
     MATCHES FOR EQUALITY;
     BEHAVIOUR
       kindBehaviour    BEHAVIOUR
       DEFINED AS
         "This attribute holds a string representing the name of an object
         class for which the AttributeRanges instance is defining attribute
         ranges.";;
REGISTERED AS {m3100Attribute 157};
```

```
managedElementType      ATTRIBUTE
    WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.ManagedElementType;
    MATCHES FOR EQUALITY;
    BEHAVIOUR
      managedElementTypeBehaviour    BEHAVIOUR
      DEFINED AS
        "This attribute holds a set of either textual strings or values from a
        predefined set (Object Identifiers), that describe the generic type of
        the Network Element modelled by the ManagedElementR2 instance.
        Multiple managed element type values may be used to describe hybrid
        equipment.";;
REGISTERED AS {m3100Attribute 158};


modelCode    ATTRIBUTE
    WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.ModelCode;
    MATCHES FOR EQUALITY;
    BEHAVIOUR
      equipmentHolderTypeBehaviour    BEHAVIOUR
      DEFINED AS
        "This attribute stores the product model code of the Network Element.
        The product model code is the manufacturer's model identification
        information. It is vendor-provided information that the vendor uses to
        distinguish the network element among a family of products. This
        attribute is useful for OSSs performing equipment discovery and
        inventory processes.";;
REGISTERED AS {m3100Attribute 159};


neAliases    ATTRIBUTE
    WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.NeAliases;
    MATCHES FOR EQUALITY;
    BEHAVIOUR
        neAliasBeh BEHAVIOUR
      DEFINED AS
        "This attribute is used to hold aliases given by the EMS to a certain
        Managed Element instance. Having such aliases available via the
        EMS/NMS interface is useful for relating Network Element names entered
        at the EMS, via the Graphical User Interface or otherwise, to those
        found on the NMS user interface. More importantly, these aliases may
        appear in alarms sent by certain EMS software outside the interface.
        Thus, it would be crucial for the NMS to recognize such aliases in
        order to perform alarm correlation or other fault and performance
        functions.";;
REGISTERED AS {m3100Attribute 160};


potentialCapacity ATTRIBUTE
    WITH ATTRIBUTE SYNTAX M3100ASN1TypeModule2.Capacity;
    MATCHES FOR EQUALITY, ORDERING;
      BEHAVIOUR
        potentialLinkCapacityBehaviour BEHAVIOUR
          DEFINED AS
            "This attribute indicates the number of link connections or the
            amount of bandwidth that has not yet been assigned to a Link, but
            that could be assigned to the Link from the server trail.";;
REGISTERED AS {m3100Attribute 161};


ranges    ATTRIBUTE
    WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.Ranges;
    MATCHES FOR EQUALITY;
    BEHAVIOUR
      rangesBehaviour  BEHAVIOUR
      DEFINED AS
        "This attribute stores the ranges for attributes. Ranges may be
        defined for attributes of type INTEGER or type REAL. The
        'attributeName' field specifies the name of the attribute for which a
```

```
            range is being defined. The range is then defined using the 'minimum',
            'maximum', and 'granularity' fields.";;
REGISTERED AS {m3100Attribute 162};


ttpPortID    ATTRIBUTE
    WITH ATTRIBUTE SYNTAX  ASN1DefinedTypesModule7.PortIDType;
    MATCHES FOR EQUALITY;
REGISTERED AS {m3100Attribute 163};
```

10.3   Name binding

```
attributeRanges-managedElement NAME BINDING
    SUBORDINATE OBJECT CLASS     attributeRanges AND SUBCLASSES;
    NAMED BY
      SUPERIOR OBJECT CLASS     managedElement AND SUBCLASSES;
    WITH ATTRIBUTE attributeRangesId;
REGISTERED AS {m3100NameBinding 93};


genericTransportTTP-managedElement NAME BINDING
    SUBORDINATE OBJECT CLASS     genericTransportTTP AND SUBCLASSES;
    NAMED BY
      SUPERIOR OBJECT CLASS     managedElement AND SUBCLASSES;
    WITH ATTRIBUTE tTPId;
REGISTERED AS {m3100NameBinding 94};
```

11   ASN.1 definitions

```
M3100ASN1TypeModule7 {itu-t recommendation m gnm(3100) informationModel(0)
asn1Modules(2) asn1Module7(6)} DEFINITIONS IMPLICIT TAGS ::=
BEGIN
-- EXPORTS everything
-- IMPORTS nothing


AttributeChoiceInteger::= SEQUENCE {
                attributeName      GraphicString,
                minimumValue       INTEGER,
                maximumValue       INTEGER,
                granularity        INTEGER
            }

AttributeChoiceReal::= SEQUENCE {
                attributeName      GraphicString,
                minimumValue       REAL,
                maximumValue       REAL
            }

Kind::= GraphicString

ManagedElementType::= SET OF CHOICE {
    meTypeString GraphicString,
    meTypeOID OBJECT IDENTIFIER
}

ModelCode::= GraphicString


NeAliases::= SET OF GraphicString
```

```
PortIDType::= SEQUENCE {
                managedElement  GraphicString,
                bay             GraphicString OPTIONAL,
                shelf           GraphicString OPTIONAL,
                drawer          GraphicString OPTIONAL,
                slot            GraphicString OPTIONAL,
                port            GraphicString
             }

Ranges::= SET OF CHOICE {
     integerRange   AttributeChoiceInteger,
     realRange      AttributeChoiceReal
}

END
```

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