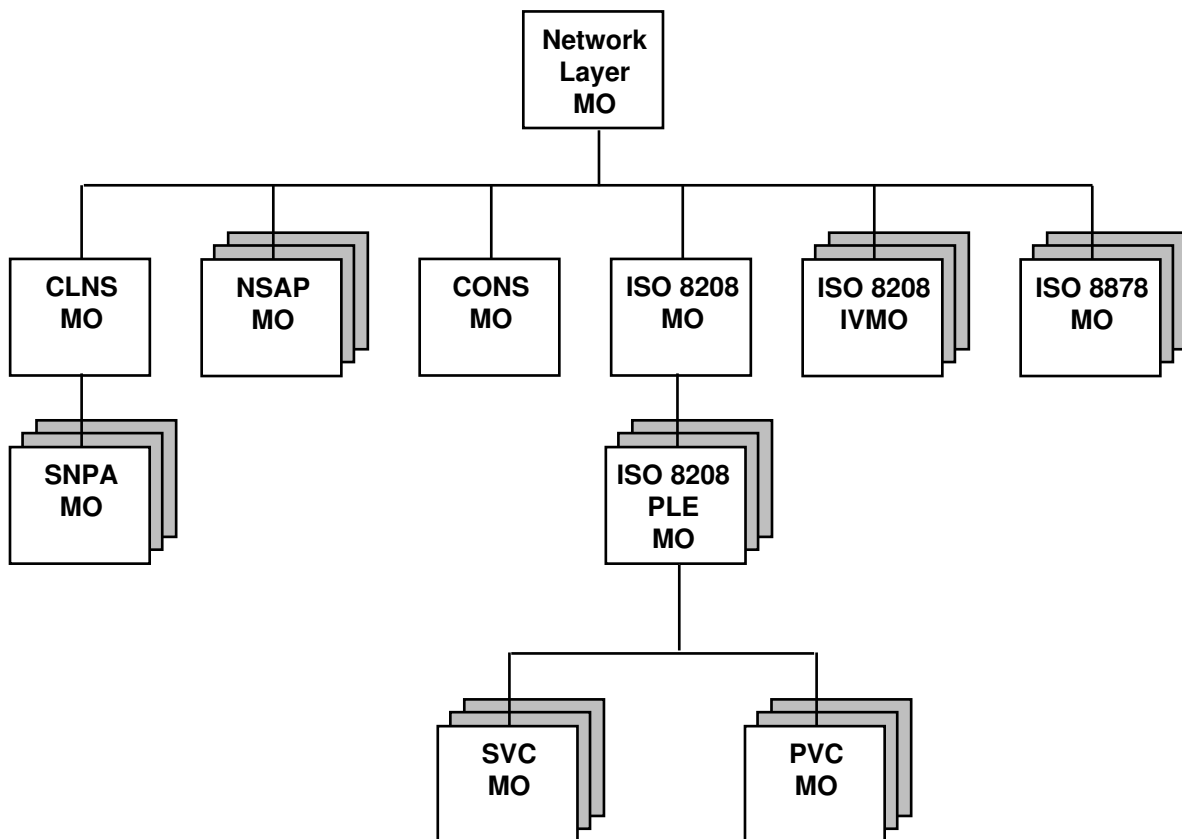


--  
-- Description of Network Layer Managed Objects using GDMO DIS text 21N 4852 (15th June 1990)  
-- It is based on SC6/WG2/N349 (Editors instructions output from Paris, P2.77), though I have taken the liberty  
-- to make some modifications where the text of 2N349 was obviously wrong or disagreed strongly with my  
-- recollections of the agreement reached in Paris. All (I hope) such changes have been documented in  
-- comments.  
--  
-- 29th June 1990 Mike Shand

--  
-- The following diagram shows the naming hierarchy of the Managed Objects defined for the Network Layer in  
-- this document.



```
--
-- General Comments
--
-- According to GDMO the first character of a label-string is supposed to be a lower case alpha character.
-- Things like cLNS, cONS and iSO8473, look so strange that I haven't followed this strictly.
--
-- In 2N349, the majority of attributes are preceded by ISOxxxx. This is unnecessary and may lead to
-- problems with CCITT alignment. These prefixes have therefore been removed.
--
-- Managed Object for Network Layer
--
-- There is exactly one of these MOs within a system. It exists to provide a container for the
-- layer entity MOs. Its definition permits it to be created and deleted by management, but in
-- many systems it will exist inherently in the system and neither creation nor deletion will
-- be possible.
--
-- NOTE: the following definition reflects 2N349, although I don't believe we ever reached an agreement
-- in Paris that there would be a single NET for the network layer and that this attribute could be used
-- as the naming attribute.
```

```
networkLayer MANAGED OBJECT CLASS
DERIVED FROM "ISO/IEC 10165-2":top;
CHARACTERIZED BY nlPackage PACKAGE
ATTRIBUTES
    networkEntityTypeTitle GET;
REGISTERED AS <object-identifier>;
```

```
nl-NB NAME BINDING
SUBORDINATE OBJECT CLASS networkLayer;
NAMED BY
    SUPERIOR OBJECT CLASS system;
WITH ATTRIBUTE networkEntityTypeTitle;
CREATE;
DELETE only-if-no-contained-objects;
REGISTERED AS <object-identifier>;
```

```
networkEntityTypeTitle ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.NSAPAddress;
MATCHES FOR Equality;
BEHAVIOUR networkEntityTypeTitleB BEHAVIOUR
    DEFINED AS The Network Entity Title (having the same abstract syntax as an
    NSAP address), which unambiguously identifies the Network Entity in
    an End or Intermediate System. For the purposes of OSI management
    there is assumed to be one Network Entity per open system;
    -- National Body comment is solicited as to how the NET value is acquired.
REGISTERED AS <object-identifier>;
```

```
-- Connectionless Mode Network Entity
--
-- There is exactly one of these MOs within a system. Its definition permits it to be created
-- and deleted by management, but in many systems it will exist inherently in the system and neither
-- creation nor deletion will be possible. Similarly, although the enable and disable actions are
-- defined here, a system may always exist in the 'On' operational state.
```

#### CLNS MANAGED OBJECT CLASS

**DERIVED FROM** "ISO/IEC 10165-2":top;

**CHARACTERIZED BY** CLNS PACKAGE

##### ATTRIBUTES

```
"ISO/IEC 10165-2":OperationalState GET,
cLNS-MO-Name DEFAULT VALUE SyntaxModule.CLNS-MO-Name-Value
REQUIRED VALUES SyntaxModule.CLNS-MO-Name-Value
PERMITTED VALUES SyntaxModule.CLNS-MO-Name-Value
GET,
lifetime REPLACE WITH DEFAULT
GET-REPLACE,
segmentationPermitted REPLACE WITH DEFAULT
GET-REPLACE, -- see note on attribute definition
segmentsReceived GET,
segmentsDiscarded GET,
expiredSegmentsDiscarded GET,
errorReportsReceived GET, -- see note on attribute definition
pDUFormatErrors GET,
unsupportedOptions GET,
otherErrors GET; -- see note before attribute definition
```

##### ATTRIBUTE GROUPS

```
counters
    segmentsReceived
    segmentsDiscarded
    expiredSegmentsDiscarded
    errorReportsReceived
    pDUFormat Errors
    unsupportedOptions
    otherErrors;
```

##### ACTIONS

```
enable,
disable;
-- Note: the terms suggested in SC21 for these actions are ACTIVATE and
-- DEACTIVATE.
```

##### NOTIFICATIONS

```
pDUFormatError,
unsupportedOption,
otherError; -- see note before notification definition
```

**CONDITIONAL PACKAGES** CLNSChecksumPackage

**PRESENT IF** The 8473 Generate Checksum option is implemented;

**REGISTERED AS** <object-identifier>;

#### CLNS-NB NAME BINDING

**SUBORDINATE OBJECT CLASS** CLNS;

**NAMED BY**

**SUPERIOR OBJECT CLASS** Network Layer;

**WITH ATTRIBUTE** CLNS-MO-Name;

**CREATE** with-reference-object, with-automatic-instance-naming;

```
-- Since the only possible instance name for this is 'CLNS' it seems reasonable to permit
-- creation without specifying an instance name.
```

**DELETE** only-if-no-contained-objects;

**REGISTERED AS** <object-identifier>;

CLNSChecksumPackage **PACKAGE**  
**BEHAVIOUR DEFINITIONS** CLNSChecksumPackageB **BEHAVIOUR**  
**DEFINED AS** When present checksum generation is controlled by the 8473EnableChecksum attribute;  
**ATTRIBUTES**  
enableChecksum **REPLACE WITH DEFAULT**  
**DEFAULT VALUE** SyntaxModule.False  
**REQUIRED VALUES** SyntaxModule.False  
-- If the ChecksumPackage is present it must be possible to turn off  
-- checksum generation  
**GET-REPLACE;**  
**REGISTERED AS** <object-identifier>;

CLNS-MO-Name **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.GraphicString;  
**MATCHES FOR** Equality, Substrings;  
**BEHAVIOUR** CLNS-MO-NameB **BEHAVIOUR**  
**DEFINED AS** The naming attribute for the CLNS MO;  
--Note: The value of this attribute is always 'CLNS'.  
**REGISTERED AS** <object-identifier>;

lifetime **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.lifetime;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** lifetimeB **BEHAVIOUR**  
**DEFINED AS** The value to be used for the ISO 8473 lifetime field in PDUs originated by this network entity. The value is expressed as the number of ½ seconds;  
**REGISTERED AS** <object-identifier>;

segmentationPermitted **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Boolean;  
**MATCHES FOR** Equality;  
**BEHAVIOUR** segmentationPermittedB **BEHAVIOUR**  
**DEFINED AS** Boolean indication of whether or not the segmentation permitted flag shall be set in PDUs originated by this network entity;  
-- Note: This attribute is considered "on probation" and National Body  
-- comment on its suitability is solicited.  
**REGISTERED AS** <object-identifier>;

segmentsReceived **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** segmentsReceivedB **BEHAVIOUR**  
**DEFINED AS** Counter of the number of data and error report NPDUs received prior to reassembly, including those which may subsequently be discarded;  
**REGISTERED AS** <object-identifier>;

segmentsDiscarded **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** segmentsDiscardedB **BEHAVIOUR**  
**DEFINED AS** Counter of the number of data and error report NPDUs discarded without delivery to a transport entity. This includes segments discarded for any reason except lifetime expiry during reassembly;  
**REGISTERED AS** <object-identifier>;

expiredSegmentsDiscarded **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** expiredSegmentsDiscardedB **BEHAVIOUR**  
**DEFINED AS** Counter of the number of data and error report NPDUs discarded due to PDU lifetime expiry during reassembly;  
**REGISTERED AS** <object-identifier>;

--Note: in P2.40 a ISO8473ErrorReportsGenerated attribute  
--was defined which is not present in 2N349. It is not clear if this deletion was intentional.

**errorReportsReceived ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** errorReportsReceivedB **BEHAVIOUR**

**DEFINED AS** Counter of the number of error report NPDUs received;

**REGISTERED AS** <object-identifier>;

**pDUFormatErrors ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** pDUFormatErrorsB **BEHAVIOUR**

**DEFINED AS** Counter of the number of data or error report PDUs discarded due to the presence of a format error. This counter is incremented irrespective of the setting of the Error Report bit in the received PDU;

-- Note: this counter is therefore a count of the number of

-- pDUFormatError notifications generated (as opposed to CMIP events,

-- may be suppressed) as required by GDMO clause 9.8.5 (SC21 N4852).

**REGISTERED AS** <object-identifier>;

**pDUFormatError NOTIFICATION**

**BEHAVIOUR** pDUFormatErrorB **BEHAVIOUR**

**DEFINED AS** Notification issued when a data or error report PDU is discarded due to the presence of a format error. The notification includes the header of the invalid PDU;

**MODE** NON-CONFIRMED;

**WITH INFORMATION SYNTAX** SyntaxModule.pDUFormatErrorSyntax;

**REGISTERED AS** <object-identifier>;

**unsupportedOptions ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** unsupportedOptionsB **BEHAVIOUR**

**DEFINED AS** Counter of the number of data or error report PDUs discarded due to the presence of an unsupported option. This counter is incremented irrespective of the setting of the Error Report bit in the received PDU;

**REGISTERED AS** <object-identifier>;

**unsupportedOption NOTIFICATION**

**BEHAVIOUR** unsupportedOptionB **BEHAVIOUR**

**DEFINED AS** Notification issued when a data or error report PDU is discarded due to the presence of an unsupported option. The notification includes the header of the invalid PDU;

**MODE** NON-CONFIRMED;

**WITH INFORMATION SYNTAX** SyntaxModule.unsupportedOptionSyntax;

**REGISTERED AS** <object-identifier>;

-- Note: Although not reflected in 2N349 there was agreement at the Paris meeting that a third type of error  
-- notification and counter should be defined to cover the cases not dealt with by the existing two. The following  
-- counter and event are place-holders for this. National Body comment is solicited on the suitability of these  
-- three classifications and the division of the protocol errors among them.

**otherErrors ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** otherErrorsB **BEHAVIOUR**

**DEFINED AS** Counter of the number of data or error report PDUs discarded due to the presence of an error other than a format error or unsupported option. This counter is incremented irrespective of the setting of the Error Report bit in the received PDU;

**REGISTERED AS** <object-identifier>;

otherError **NOTIFICATION**

**BEHAVIOUR** otherErrorB **BEHAVIOUR**

**DEFINED AS** Notification issued when a data or error report PDU is discarded due to the presence of an error other than a format error or unsupported option.  
The notification includes the header of the invalid PDU;

**MODE** NON-CONFIRMED;

**WITH INFORMATION SYNTAX** SyntaxModule.pDUOtherErrorSyntax;

**REGISTERED AS** <object-identifier>;

enable **ACTION**

**BEHAVIOUR** enableB **BEHAVIOUR**

**DEFINED AS** Sets OperationalState to 'On' and commences operation. Note that it is permissible for a system to be initially in an enabled state. Note also that an enable while in Operational State 'On' has no effect and does not return an error;

**MODE** CONFIRMED;

**PARAMETERS** <parameter-label>; -- yes we probably need some to carry the error reports --

**WITH INFORMATION SYNTAX** <syntax-label>; -- I don't think we need any of this

**WITH REPLY SYNTAX** <syntax-label>; -- we might need this for an OK? --

-- Note: it is not clear from GDMO how to use PARAMETERS in conjunction with

-- INFORMATION SYNTAX and REPLY SYNTAX.

**REGISTERED AS** <object-identifier>;

disable **ACTION**

**BEHAVIOUR** disableB **BEHAVIOUR**

**DEFINED AS** Sets OperationalState to 'Off' and shuts down operation. Note that it is permissible for this action to always fail in a given implementation (i.e. that implementation is not capable of shutting down). Note also that a disable while in Operational State 'Off' has no effect and does not return an error;

**MODE** CONFIRMED;

**PARAMETERS** <parameter-label>; -- yes we probably need some to carry the error reports --

**WITH INFORMATION SYNTAX** <syntax-label>; -- I don't think we need any of this

**WITH REPLY SYNTAX** <syntax-label>; -- we might need this for an OK? --

**REGISTERED AS** <object-identifier>;

counters **ATTRIBUTE GROUP**

-- No GROUP ELEMENTS so far. They are all added in the package definitions.

**DESCRIPTION** The group of all counter attributes;

**REGISTERED AS** <object-identifier>;

nonReplaceableCounter **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Counter;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** nonReplaceableCounterB **BEHAVIOUR**

**DEFINED AS** Non-replaceable, non-wrapping counter;

**REGISTERED AS** <object-identifier>;

```

--      NSAP Managed Object
--
--      There is one NSAP MO for each NSAP supported by the Network Layer Entity.
--
-- NOTE: The following definition reflects that agreed in 2N349. National Bodies may like to consider
-- the suitability of the Sap Objects and attributes defined in GMO for this purpose.

NSAP MANAGED OBJECT CLASS
DERIVED FROM "ISO/IEC 10165-2":top;
CHARACTERIZED BY NSAP PACKAGE
ATTRIBUTES
    NSAP-MO-Name GET,
        -- It might be more appropriate to just call this NSAP
        -- National Body comment is solicited as to how the value of this
        -- attribute is derived on creation of the MO, and how it may be
        -- changed during the operation of the entity.
    transportClientRelationship GET;
        -- We should probably look into using some already defined
        -- relationship attribute if an appropriate one exists
REGISTERED AS <object-identifier>;

NSAP-NB NAME BINDING
SUBORDINATE OBJECT CLASS NSAP;
NAMED BY
    SUPERIOR OBJECT CLASS NetworkLayer;
WITH ATTRIBUTE NSAP-MO-Name;
CREATE;
DELETE only-if-no-contained-objects;
REGISTERED AS <object-identifier>;

-- The following attribute could possible be replaced by the LocalSapAddress attribute from GMO

NSAP-MO-Name ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.NSAPAddress;
    -- Defined as an OCTETSTRING
MATCHES FOR Equality, Substrings;
BEHAVIOUR NSAP-MO-NameB BEHAVIOUR
    DEFINED AS The NSAP address in the Hexadecimal Reference Publication Format;
        --Note: National Bodies are encouraged to comment on the appropriateness of this
        -- attribute and its definition. Specifically, should multiple NSAP addresses be
        -- permitted and should it be permitted to add and/or delete members from the set?
REGISTERED AS <object-identifier>;

-- The following attribute could possible be replaced by the UserEntityName attribute from GMO
-- but that doesn't have the concept of a set of users.

transportClientRelationship ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.transportClientRelationship;
    -- Defined as Set of CMIP-1.ObjectInstance
    -- This includes localDistinguishedName as one of the choices, which is what is
    -- required here..
MATCHES FOR Equality;
BEHAVIOUR transportClientRelationshipB BEHAVIOUR
    DEFINED AS The set of Distinguished names of the Transport Layer client MOs within
        the local system supported by the NSAP. This attribute is included to represent
        protocol usage relationships;
REGISTERED AS <object-identifier>;

```

```
-- Subnetwork Point of Attachment Managed Object
--
-- One such MO exists for each SNPA of the local system over which the CLNS is supported.
--
--
-- The following text reflects the agreement in Paris to use conditional packages to represent the various
-- sub-types of SNPA support. National Body comment is solicited as to whether this is the most appropriate
-- way or whether (for example) multiple MO classes should be defined for ES and IS operation. The attributes
-- defined here for IS operation include only those aspects related to the operation of ISO 9542. Many more
-- attributes would be required in order to manage the operation of the DP 10589 protocols. The requirement
-- to add these extra attributes should be taken into account when defining the present structure. In addition
-- National Body comment is solicited on the possible requirement for additional package granularity to deal
-- with the optional implementation the various subsets of ISO 9542 (e.g. configuration information subset)
```

## SNPA MANAGED OBJECT CLASS

**DERIVED FROM** "ISO/IEC 10165-2":top;  
**CHARACTERIZED BY** SNPA PACKAGE  
**ATTRIBUTES**

SNPA-MO-Name **GET**,  
 "ISO/IEC 10165-2":operationalState **GET**,  
 "ISO/IEC 10165-2":administrativeState **GET-REPLACE**,  
 -- while the above attribute is included in 2N349 it is by no means  
 -- clear what function it is intended to perform. The associated text reads  
 -- 'Indication of the the last Enable/Disable operation to be performed.  
 -- This may only be appropriate for some subclasses of SNPAs and  
 -- National Body comments are welcomed'  
 SNPARequestedSDUSize **REPLACE WITH DEFAULT**  
 -- Note: default value is implementation specific  
 -- Note: 2N349 has this called SNPADesiredSDUSize. I believe the  
 -- agreement in Paris was to remove this anthropomorphism  
**GET-REPLACE**,  
 SN-SAP **GET**,  
 SN-ServiceProvider **GET-REPLACE**;

## **ACTIONS**

enable,  
 disable;  
 -- Note: Although 2N349 defines separate attributes for the enable  
 -- (and disable) actions of each MO, there is currently no reason why  
 -- the same attributes cannot be used for all Network Layer MOs.  
 -- If, subsequently, different PARAMETERS are required for different  
 -- actions, they can be added here in the PACKAGE definitions.  
 -- However, as GDMO currently stands, the same would not be true for  
 -- INFORMATION SYNTAX, and this would require the definition of  
 -- separate attributes.

## **CONDITIONAL PACKAGES**

-- NOTE the syntax of the 'present if' clause defined in GDMO is such that the  
 -- English language <condition-definition> is terminated by the presence of a comma.  
 -- Avoiding the use of embedded commas makes for stilted English. Attempts to parse  
 -- the following productions using the strict syntax of GDMO may therefore fail.

SNPA-ISO9542ESPackage

**PRESENT IF** support for ISO 9542 operating as an ES,

SNPA-ISO9542ISPackage

**PRESENT IF** support for ISO 9542 operating as an IS,

SNPA-ISO8208Package

**PRESENT IF** support for ISO 8208 as a subnetwork over which the system  
 is running ISO 8473. That is, these definitions represent management of  
 the ISO8208 SND CF for ISO 8473,

SNPA-ISO8802Package

**PRESENT IF** support for an ISO 8802 subnetwork;

**REGISTERED AS** <object-identifier>;



SNPA-NB **NAME BINDING**  
    **SUBORDINATE OBJECT CLASS** SNPA;  
    **NAMED BY**  
        **SUPERIOR OBJECT CLASS** CLNS;  
        **WITH ATTRIBUTE** SNPA-MO-Name;  
    **CREATE** with-reference-object;  
    **DELETE** only-if-no-contained-objects;  
    **REGISTERED AS** <object-identifier>;

**SNPA-MO-Name ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.GraphicString;

**MATCHES FOR** Equality, Substrings;

**BEHAVIOUR** SNPA-MO-NameB **BEHAVIOUR**

**DEFINED AS** The naming attribute of the SNPA MO instance;

-- Note: although 2N349 states this is an RDN, I believe it is only the attribute

-- assertion of this attribute which is required to be an RDN

**REGISTERED AS** <object-identifier>;

**requestedSDUSize ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.SDUSize;

-- A cardinal seems right.

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** requestedSDUSizeB **BEHAVIOUR**

**DEFINED AS** The data link SDU size to be used for this SNPA. Where negotiation is permitted, this represents the proposed value;

**REGISTERED AS** <object-identifier>;

**SN-SAP ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.LocalDistinguishedName;

**MATCHES FOR** Equality;

**BEHAVIOUR** SN-SAPB **BEHAVIOUR**

**DEFINED AS** Distinguished name of the subnetwork SAP MO. This is obtained via an internal interface when the SNPA is enabled;

-- Note: 2N349 states that 'This attribute is conditional upon SN type and requires

-- redefinition for each. However, since it is not yet clear what form this would take,

-- it has been included here in the non-conditional package.

**REGISTERED AS** <object-identifier>;

**SN-ServiceProvider ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.LocalDistinguishedName;

**MATCHES FOR** Equality;

**BEHAVIOUR** SN-ServiceProviderB **BEHAVIOUR**

**DEFINED AS** Distinguished name of the SN service provider MO. Identifies the subnetwork entity to be used to support the SNPA, when enabled;

**REGISTERED AS** <object-identifier>;

SNPA-ISO9542ESPackage **PACKAGE**

**BEHAVIOUR DEFINITIONS** SNPA-ISO9542ESPackageB **BEHAVIOUR**

**DEFINED AS** Controls the operation of ISO 9542 on an EndSystem;

**ATTRIBUTES**

holdingTimerMultiplier

**DEFAULT VALUE** SyntaxModule.HoldingTimerMultiplierDefault

-- 3

**REQUIRED VALUES** SyntaxModule.HoldingTimerMultiplierRequired

-- 2

**PERMITTED VALUES** SyntaxModule.HoldingTimerMultiplierPermitted

-- 2-63

**GET-REPLACE,**

-- Note: The actual values quoted here for the default, required and permitted values

-- are subject to NB agreement. They are presented here as a place-holder for the

-- finally agreed values.

defaultESConfigTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

activeESConfigTimer **GET,**

iSReachabilityChanges **GET;**

**ATTRIBUTE GROUPS**

counters

iSReachabilityChanges;

**NOTIFICATIONS**

iSReachabilityChange;

**REGISTERED AS** <object-identifier>;

holdingTimerMultiplier **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** holdingTimerMultiplierB **BEHAVIOUR**

**DEFINED AS** Parameter which, when multiplied by a configuration timer yields the value of the holding timer parameter issued with configuration information. The semantics of this parameter are such that it is permissible to also add a delta value to the result to compensate for imprecision in delay estimates. That is, local overestimation is permitted. The result of the calculation is truncated, upon overflow, to the maximum value for the parameter permitted by the protocol (65535);

**REGISTERED AS** <object-identifier>;

defaultESConfigTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** defaultESConfigTimerB **BEHAVIOUR**

**DEFINED AS** Default value for the ISO 9542 configuration timer, used when the ES has not received, or has not chosen to accept, a suggested configuration timer value from an Intermediate System;

**REGISTERED AS** <object-identifier>;

activeESConfigTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** activeESConfigTimerB **BEHAVIOUR**

**DEFINED AS** Currently active value for the ISO 9542 configuration timer;

-- National Body comment is solicited as to the need for this attribute;

**REGISTERED AS** <object-identifier>;

iSReachabilityChanges **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** iSReachabilityChangesB **BEHAVIOUR**

**DEFINED AS** Counter associated with the iSReachabilityChange notification;

**REGISTERED AS** <object-identifier>;

iSReachabilityChange **NOTIFICATION**

**BEHAVIOUR** iSReachabilityChangeB **BEHAVIOUR**

**DEFINED AS** Notification generated when an ES detects a change in the reachability of a neighboring IS;  
-- Note: This is not strictly reachability information. It is more akin to an adjacency  
-- in DP 10589.

**MODE** NON-CONFIRMED;

**WITH INFORMATION SYNTAX** SyntaxModule.iSReachabilityChangeSyntax;

**REGISTERED AS** <object-identifier>;

SNPA-ISO9542ISPackage **PACKAGE**

**BEHAVIOUR DEFINITIONS** SNPA-ISO9542ISPackageB **BEHAVIOUR**

**DEFINED AS** Controls the operation of ISO 9542 on an Intermediate System;

**ATTRIBUTES**

holdingTimerMultiplier

**DEFAULT VALUE** SyntaxModule.HoldingTimerMultiplierDefault

-- 3

**REQUIRED VALUES** SyntaxModule.HoldingTimerMultiplierRequired

-- 2

**PERMITTED VALUES** SyntaxModule.HoldingTimerMultiplierPermitted

-- 2-63

**GET-REPLACE,**

-- Note: The actual values quoted here for the default, required and permitted values

-- are subject to NB agreement. They are presented here as a place-holder for the

-- finally agreed values.

iSConfigurationTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

suggestedESConfigurationTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

eSReachabilityChanges **GET;**

**ATTRIBUTE GROUPS**

counters

eSReachabilityChanges;

**NOTIFICATIONS**

eSReachabilityChange;

**REGISTERED AS** <object-identifier>;

iSConfigurationTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** iSConfigurationTimerB **BEHAVIOUR**

**DEFINED AS** Value for the ISO 9542 configuration timer, used to determine how often an IS reports configuration information to ESs;

**REGISTERED AS** <object-identifier>;

suggestedESConfigurationTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** suggestedESConfigurationTimerB **BEHAVIOUR**

**DEFINED AS** Value to be used for the ISO 9542 suggested ES configuration timer value, advertised in IS hellos generated by this network entity;

-- Note: It is far from clear that this attribute would be able to be set to a specific

-- value in all implementations. For example, the DP 10589 ES poll protocol relies

-- on the IS being able to set this to different values in different circumstances.

-- it *may* be useful to be able to GET the current value.

**REGISTERED AS** <object-identifier>;

eSReachabilityChanges **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** eSReachabilityChangesB **BEHAVIOUR**

**DEFINED AS** Counter associated with the eSReachabilityChange notification;

**REGISTERED AS** <object-identifier>;

eSReachabilityChange **NOTIFICATION**

**BEHAVIOUR** eSReachabilityChangeB **BEHAVIOUR**

**DEFINED AS** Notification generated when an IS detects a change in the reachability of a  
neighboring ES;

**MODE** NON-CONFIRMED;

**WITH INFORMATION SYNTAX** SyntaxModule.eSReachabilityChangeSyntax;

**REGISTERED AS** <object-identifier>;

SNPA-ISO8208Package **PACKAGE**

**BEHAVIOUR DEFINITIONS** SNPA-ISO8208PackageB **BEHAVIOUR**

**DEFINED AS** Controls the operation of ISO 8208 as an SND CF for ISO 8473;

**ATTRIBUTES**

recallTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

idleTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

maxRecallAttempts **REPLACE WITH DEFAULT**

**GET-REPLACE,**

initialMinimumTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

reserveTimer **REPLACE WITH DEFAULT**

**GET-REPLACE,**

dTEAddress **GET-REPLACE,**

-- Note: this attribute may be better handled using an IVMO

callsPlaced **GET,**

callsFailed **GET;**

**ATTRIBUTE GROUPS**

counters

callsPlaced,

callsFailed;

**NOTIFICATIONS**

<none-yet-defined>;

**REGISTERED AS** <object-identifier>;

recallTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** recallTimerB **BEHAVIOUR**

**DEFINED AS** The timer which determines the interval (in seconds) after which the SND CF will attempt to place subsequent calls following an unsuccessful first call attempt;

**REGISTERED AS** <object-identifier>;

idleTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** idleTimerB **BEHAVIOUR**

**DEFINED AS** The timer which determines the interval (in seconds) for which a call is permitted to remain idle (i.e. no data traffic in either direction) before being released by the SND CF;

**REGISTERED AS** <object-identifier>;

maxRecallAttempts **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** maxRecallAttemptsB **BEHAVIOUR**

**DEFINED AS** The maximum number of times the SND CF will attempt to place a call before (doing what????);

**REGISTERED AS** <object-identifier>;

reserveTimer **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** reserveTimerB **BEHAVIOUR**

**DEFINED AS** The timer which determines the interval (in seconds) for which resources are retained for re-establishment of an idled VC;

**REGISTERED AS** <object-identifier>;

dTEAddress **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.DTEAddress;

**MATCHES FOR** Equality;

**BEHAVIOUR** dTEAddressB **BEHAVIOUR**

**DEFINED AS** The DTEAddress to which calls associated with the SNDCF are to established;

**REGISTERED AS** <object-identifier>;

callsPlaced **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** callsPlacedB **BEHAVIOUR**

**DEFINED AS** The number of X.25 VCs successfully established by the SNDCF;

**REGISTERED AS** <object-identifier>;

callsFailed **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** callsFailedB **BEHAVIOUR**

**DEFINED AS** The number of X.25 call failures while attempting establishment by the SNDCF;

**REGISTERED AS** <object-identifier>;

SNPA-ISO8802Package **PACKAGE**  
**BEHAVIOUR DEFINITIONS** SNPA-ISO8802PackageB **BEHAVIOUR**  
**DEFINED AS** Controls the operation of ISO 8802 as a subnetwork;  
**ATTRIBUTES**  
Address **GET**,  
**ADD-REMOVE** ;  
**NOTIFICATIONS**  
<none-yet-defined>;  
**REGISTERED AS** <object-identifier>;

manualISAddress **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.manualISAddress;  
-- Set of MACAddresses  
**MATCHES FOR** Set Comparison, Set Intersection;  
**BEHAVIOUR** manualISAddressB **BEHAVIOUR**  
**DEFINED AS** The set of MAC addresses of ISs on the subnetwork which do not implement  
the configuration subset of ISO 9542;  
**REGISTERED AS** <object-identifier>;



-- Connection Mode Network Entity

--

-- There is exactly one of these MOs within a system. Its definition permits it to be created

-- and deleted by management, but in many systems it will exist inherently in the system and neither

-- creation nor deletion will be possible.

--

-- 2N349 does not define any enable and disable actions for this MO, nor any operational state.

-- The assumption is that being a reliable service, unlike CLNS, it is always active?!?!

# **CONS MANAGED OBJECT CLASS**

**DERIVED FROM** "ISO/IEC 10165-2":top;  
**CHARACTERIZED BY** CONS **PACKAGE**  
**ATTRIBUTES**

CONS-MO-Name **DEFAULT VALUE** SyntaxModule.CONNS-MO-Name-Value  
**REQUIRED VALUES** SyntaxModule.CONNS-MO-Name-Value  
**PERMITTED VALUES** SyntaxModule.CONNS-MO-Name-Value  
**GET**,  
-- Note: Unlike the CLNS MO, 2N349 does not constrain this to have a  
-- single value such as 'CONS' or 'ISO8878'. It would seem reasonable  
-- that there should be consistency in this matter between the two MOs, and  
-- it is my belief that it was agreed in Paris.  
minimumAcceptableEndToEndDelay **REPLACE WITH DEFAULT**  
**GET-REPLACE**,  
targetEndToEndDelay **REPLACE WITH DEFAULT**  
**GET-REPLACE**,  
minimumAcceptableThroughputRequested **REPLACE WITH DEFAULT**  
**GET**,  
targetThroughputRequested **REPLACE WITH DEFAULT**  
**GET**;

**REGISTERED AS**<object-identifier>;

## **CONS-NB NAME BINDING**

**SUBORDINATE OBJECT CLASS** CONS;  
**NAMED BY**  
**SUPERIOR OBJECT CLASS** Network Layer;  
**WITH ATTRIBUTE** CONS-MO-Name;  
**CREATE** with-reference-object, with-automatic-instance-naming;  
**DELETE** only-if-no-contained-objects;

**REGISTERED AS** <object-identifier>;

## **CONS-MO-Name ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.GraphicString;  
**MATCHES FOR** Equality, Substrings;  
**BEHAVIOUR** CONS-MO-NameB **BEHAVIOUR**  
**DEFINED AS** The name of the CONS MO;

**REGISTERED AS** <object-identifier>;

## minimumAcceptableEndToEndDelay **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.EndToEndDelay;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** minimumAcceptableEndToEndDelayB **BEHAVIOUR**  
**DEFINED AS** The minimum acceptable End To End Delay to be requested when establishing  
a network connection;

**REGISTERED AS** <object-identifier>;

## targetEndToEndDelay **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.EndToEndDelay;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** targetEndToEndDelayB **BEHAVIOUR**  
**DEFINED AS** The target End To End Delay for a network connection;

**REGISTERED AS** <object-identifier>;

-- Although 2N349 specifies that the identifiers of the following two attributes end with 'requested', that has been  
-- omitted here for consistency with the previous two attributes.

minimumAcceptableThroughput **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Throughput;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** minimumAcceptableThroughputB **BEHAVIOUR**

**DEFINED AS** The minimum acceptable Throughput to be requested when establishing  
a network connection;

**REGISTERED AS** <object-identifier>;

targetThroughput **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Throughput;

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** targetThroughputB **BEHAVIOUR**

**DEFINED AS** The target Throughput for a network connection;

**REGISTERED AS** <object-identifier>;

```

--      ISO 8208 Managed Object
--
--      There is exactly one of these MOs within a system. Its definition permits it to be created
--      and deleted by management, but in many systems it will exist inherently in the system and neither
--      creation nor deletion will be possible.
ISO8208 MANAGED OBJECT CLASS
DERIVED FROM "ISO/IEC 10165-2":top;
--      Consideration should be given as to the suitability of the entity Managed Object defined in
--      GMO.
CHARACTERIZED BY ISO8208 PACKAGE
ATTRIBUTES
    ISO8208-MO-Name DEFAULT VALUE SyntaxModule.ISO8208-MO-Name-Value
    REQUIRED VALUES SyntaxModule.ISO8208-MO-Name-Value
    PERMITTED VALUES SyntaxModule.ISO8208-MO-Name-Value
    GET,
    -- Note: Unlike the CLNS MO, 2N349 does not constrain this to have a
    -- single value such as 'ISO8208'. It would seem reasonable
    -- that there should be consistency in this matter between the two MOs, and
    -- it is my belief that it was agreed in Paris.
    networkUserIdentity REPLACE WITH DEFAULT
    GET-REPLACE,
    rPOASequence REPLACE WITH DEFAULT
    GET-REPLACE;
REGISTERED AS <object-identifier>;

ISO8208-NB NAME BINDING
SUBORDINATE OBJECT CLASS ISO8208;
NAMED BY
    SUPERIOR OBJECT CLASS Network Layer;
    WITH ATTRIBUTE ISO8208-MO-Name;
CREATE with-reference-object, with-automatic-instance-naming;
DELETE only-if-no-contained-objects;
REGISTERED AS <object-identifier>;

ISO8208-MO-Name ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.GraphicString;
MATCHES FOR Equality, Substrings;
BEHAVIOUR ISO8208-MO-NameB BEHAVIOUR
    DEFINED AS The name of the ISO8208 MO;
    -- Note: 2N349 says 'The RDN of this particular ISO8208 MO', which implies that
    -- there may be multiple such MOs and that they may have different names. However
    -- the diagram in 2N349 only indicates the possibility of a single ISO8208MO
    -- instance per system, and notes taken in Paris indicate that there was agreement that
    -- the value of this attribute should be fixed as for CLNS.
REGISTERED AS <object-identifier>;

networkUserIdentity ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.NUI;
    -- Needs a value for 'not specified'
MATCHES FOR Equality;
BEHAVIOUR networkUserIdentityB BEHAVIOUR
    DEFINED AS The Network User Identity to be included in call (for billing or other purposes).
    The syntax is defined by the PSDN administration;
REGISTERED AS <object-identifier>;

```

rPOASequence **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.RPOASequence;

-- Sequence of 4 digit decimal numbers.

-- Needs a value for 'Not specified'

**MATCHES FOR** Equality;

**BEHAVIOUR** rPOASequenceB **BEHAVIOUR**

**DEFINED AS** Requests the Private Operating Agency sequence of transmit networks in setting up the call. Each network is identified by a 4 digit number. An empty sequence indicates 'Not Specified';

**REGISTERED AS** <object-identifier>;

```
--      X25 PLE Managed Object
--
--      There may be multiple instances of these MOs within a system, corresponding to Multiple X.25 PLEs.

-- Note: The default values for many of these attributes have not been defined even though a
-- REPLACE WITH DEFAULT clause exists. NB comment is solicited as to what values would be appropriate.
-- Where ISO 8208 specifies specific default values, these have been used.
```

**x25PLE MANAGED OBJECT CLASS**

```
DERIVED FROM "ISO/IEC 10165-2":top;
CHARACTERIZED BY x25PLE PACKAGE
ATTRIBUTES
```

```
    x25PLE-MO-Name GET,
    "ISO/IEC 10165-2":operationalState GET,
    "ISO/IEC 10165-2":administrativeState GET-REPLACE,
        -- Note: This attribute exists in 2N349, but it is not clear how it is used
        -- Note: The following two attributes have been moved here from the VC MO in
        -- accordance with the ammendments to 2N349
    reverseCharging REPLACE WITH DEFAULT
        GET-REPLACE,
    fastSelect REPLACE WITH DEFAULT
        GET-REPLACE,
    protocolVersionsSupported GET,
    localDTEAddress GET-REPLACE,
        -- Note: above attribute renamed to localDTEAddress to avoid conflict
        -- with SNPA DTEAddress.
    interfaceMode GET-REPLACE,
    maxActiveCircuits REPLACE WITH DEFAULT
        GET-REPLACE,
    restartTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.restartTimeDefault
        GET-REPLACE,
    callTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.callTimeDefault
        GET-REPLACE,
    resetTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.resetTimeDefault
        GET-REPLACE,
    clearTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.clearTimeDefault
        GET-REPLACE,
    windowTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.windowTimeDefault
        GET-REPLACE,
    dataRetransmissionTime REPLACE WITH DEFAULT
        DEFAULT VALUE
            SyntaxModule.dataRetransmissionTimeDefault
        GET-REPLACE,
    interruptTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.interruptTimeDefault
        GET-REPLACE,
    rejectTime REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.rejectTimeDefault
        GET-REPLACE,
    registrationRequestTime REPLACE WITH DEFAULT
        DEFAULT VALUE
            SyntaxModule.registrationRequestTimeDefault
        GET-REPLACE,
    restartCount REPLACE WITH DEFAULT
        DEFAULT VALUE SyntaxModule.restartCountDefault
        GET-REPLACE,
```

```

resetCount REPLACE WITH DEFAULT
DEFAULT VALUE SyntaxModule.resetCountDefault
GET-REPLACE,
clearCount REPLACE WITH DEFAULT
DEFAULT VALUE SyntaxModule.clearCountDefault
GET-REPLACE,
dataTransmissionCount REPLACE WITH DEFAULT
DEFAULT VALUE SyntaxModule.dataTransmissionCountDefault
GET-REPLACE,
rejectCount REPLACE WITH DEFAULT
DEFAULT VALUE SyntaxModule.rejectCountDefault
GET-REPLACE,
registrationRequestCount REPLACE WITH DEFAULT
DEFAULT VALUE
    SyntaxModule.registrationRequestCountDefault
GET-REPLACE,
dataLinkID REPLACE WITH DEFAULT
GET-REPLACE,
logicalChannelAssignments REPLACE WITH DEFAULT
GET-REPLACE,
extendedPacketSequencing REPLACE WITH DEFAULT
GET-REPLACE,
"ISO/IEC 10165-2":OctetsSentCounter GET,
    -- This corresponds to the ISO8208OctetsSent attribute. Note that the DMI
    -- definition is in terms of user data octets.
"ISO/IEC 10165-2":OctetsReceivedCounter GET,
    -- This corresponds to the ISO8208OctetsReceived attribute. Note that the
    -- DMI definition is in terms of user data octets.
dataPacketsSent GET,
    -- Note the "ISO/IEC 10165-2":PDUsSentCounter cannot be used here
    -- since it is defined as total number of PDUs sent, not just data PDUs.
dataPacketsReceived GET,
callAttempts GET,
callsConnected GET,
providerInitiatedDisconnects GET,
callTimeouts GET,
clearTimeouts GET,
remotelyInitiatedResets GET,
dataRetransmissionTimerExpires GET,
providerInitiatedResets GET,
resetTimeouts GET,
restarts GET,
restartTimeouts GET,
protocolErrorsDetectedLocally GET,
protocolErrorsAccusedOf GET,
retryCountsExceeded GET,
clearCountsExceeded GET,
interruptPacketsSent GET,
interruptPacketsReceived GET,
interruptTimerExpiries GET,
pLEClientMOnName GET;

```

## ATTRIBUTE GROUPS

```

counters
    "ISO/IEC 10165-2":OctetsSentCounter
    "ISO/IEC 10165-2":OctetsReceivedCounter
    dataPacketsSent
    dataPacketsReceived
    callAttempts
    callsConnected
    providerInitiatedDisconnects
    callTimeouts

```

clearTimeouts  
 remotelyInitiatedResets  
 dataRetransmissionTimerExpires  
 providerInitiatedResets  
 resetTimeouts  
 restarts  
 restartTimeouts  
 protocolErrorsDetectedLocally  
 protocolErrorsAccusedOf  
 retryCountsExceeded  
 clearCountsExceeded  
 interruptPacketsSent  
 interruptPacketsReceived  
 interruptTimerExpiries;

#### **ACTIONS**

Enable,  
 Disable;

#### **NOTIFICATIONS**

providerInitiatedDisconnect,  
 remotelyInitiatedReset,  
 providerInitiatedReset,  
 restartTimeout,  
 protocolErrorDetectedLocally,  
 accusedOfProtocolError,  
 retryCountExceeded;  
 clearCountExceeded;

**REGISTERED AS** <object-identifier>;

#### **x25PLE-NB NAME BINDING**

**SUBORDINATE OBJECT CLASS** x25PLE;  
**NAMED BY**

**SUPERIOR OBJECT CLASS** ISO8208;  
**WITH ATTRIBUTE** x25PLE-MO-Name;

**CREATE** with-reference-object;

**DELETE** only-if-no-contained-objects;

**REGISTERED AS** <object-identifier>;

#### **x25PLE-MO-Name ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.GraphicString;

**MATCHES FOR** Equality, Substrings;

**BEHAVIOUR** x25PLE-MO-NameB **BEHAVIOUR**

**DEFINED AS** The name of this instance of x25PLE MO;

**REGISTERED AS** <object-identifier>;

#### **reverseCharging ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Boolean;

**MATCHES FOR** Equality;

**BEHAVIOUR** reverseChargingB **BEHAVIOUR**

**DEFINED AS** When this has the value 'True' the call is to be charged to the accepting DTE;

**REGISTERED AS** <object-identifier>;

#### **protocolVersionsSupported ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.ProtocolVersions;

**MATCHES FOR** Equality;

**BEHAVIOUR** protocolVersionsSupportedB **BEHAVIOUR**

**DEFINED AS** The supported set of versions of ISO8208 available on the PLE interface;

**REGISTERED AS** <object-identifier>;

localDTEAddress **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.DTEAddress;  
**MATCHES FOR** Equality;  
**BEHAVIOUR** localDTEAddressB **BEHAVIOUR**  
**DEFINED AS** The full DTE address of this PLE expressed as an X.121, X.31, etc. address;  
**REGISTERED AS** <object-identifier>;

interfaceMode **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.InterfaceMode;  
**MATCHES FOR** Equality;  
**BEHAVIOUR** interfaceModeB **BEHAVIOUR**  
**DEFINED AS** To be supplied;  
-- 2N349 is silent on this matter. As I recall, this is the DCE/DTE mode in which  
-- the interface is currently operating. The attribute has been defined accordingly.  
**REGISTERED AS** <object-identifier>;

fastSelect **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.FastSelect;  
-- Enumerated( Not Specified, Fast Select, Fast Select With Response, No Fast Select)  
**MATCHES FOR** Equality;  
**BEHAVIOUR** fastSelectB **BEHAVIOUR**  
**DEFINED AS** Request for *fast select*, *fast select with response*, or *no fast select* facility for  
the call. Includes a value 'not specified' which indicates that no preference is  
expressed;  
**REGISTERED AS** <object-identifier>;

restartTime **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** restartTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T20 (Restart Request Response Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

callTime **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** callTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T21 (Call Request Response Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

resetTime **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** resetTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T22 (Reset Request Response Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

clearTime **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** clearTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T23 (Clear Request Response Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

windowTime **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** windowTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T24 (Window Status Transmission Timer) in seconds;  
**REGISTERED AS** <object-identifier>;



**dataRetransmissionTime ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** dataRetransmissionTimeB **BEHAVIOUR**  
**DEFINED AS** Default for Timer T25 (Window Rotation Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

**interruptTime ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** interruptTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T26 (Interrupt Response Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

**rejectTime ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** rejectTimeB **BEHAVIOUR**  
**DEFINED AS** Default Limit for Timer T27 (Reject Response Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

**registrationRequestTime ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** registrationRequestTimeB **BEHAVIOUR**  
**DEFINED AS** Default for Timer T28 (Registration Request Timer) in seconds;  
**REGISTERED AS** <object-identifier>;

**restartCount ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** restartCountB **BEHAVIOUR**  
**DEFINED AS** Default for count R20 (Restart Request Retransmission Count);  
**REGISTERED AS** <object-identifier>;

**resetCount ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** resetCountB **BEHAVIOUR**  
**DEFINED AS** Default for count R22 (Reset Request Retransmission Count);  
**REGISTERED AS** <object-identifier>;

**clearCount ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** clearCountB **BEHAVIOUR**  
**DEFINED AS** Default for count R23 (Clear Request Retransmission Count);  
**REGISTERED AS** <object-identifier>;

**dataRetransmissionCount ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** dataRetransmissionCountB **BEHAVIOUR**  
**DEFINED AS** Default for count R25 (Data Packet Retransmission Count);  
**REGISTERED AS** <object-identifier>;

rejectCount **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** rejectCountB **BEHAVIOUR**  
**DEFINED AS** Default for count R27 (Reject Retransmission Count);  
**REGISTERED AS** <object-identifier>;

registrationRequestCount **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Integer;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** registrationRequestCountB **BEHAVIOUR**  
**DEFINED AS** Default for count R28 (Registration Request Retransmission Count);  
**REGISTERED AS** <object-identifier>;

dataLinkID **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.LocalDistinguishedName;  
**MATCHES FOR** Equality;  
**BEHAVIOUR** dataLinkIDB **BEHAVIOUR**  
**DEFINED AS** Distinguished name of the Data Link Layer MO representing the Logical Link used by the PLE;  
-- Note: It is not clear whether this is the value to control which Data Link Layer MO the PLE is to use, or whether it represents the one which the PLE is in fact using.  
-- If the latter, shouldn't it be the Distinguished name of a DLSAP MO?  
-- Note also: The present definition may need amendment to deal with the case of multi-link operation. NB comment is solicited.  
**REGISTERED AS** <object-identifier>;

logicalChannelAssignments **ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.logicalChannelAssignments;  
**MATCHES FOR** Equality;  
**BEHAVIOUR** logicalChannelAssignmentsB **BEHAVIOUR**  
**DEFINED AS** Represents the logical channel assignments of this PLE, expressed as a six-tuple where the values represent  
the highest permanent channel,  
the highest incoming channel,  
the lowest two-way channel,  
the highest two-way channel,  
the lowest outgoing channel  
and the highest outgoing channel, respectively.  
This attribute is subject to the rules for logical assignments described in clause 0.1. It is understood that the Highest Permanent Channel (HPC) is defined by the Lowest Incoming Channel (LPC) value minus one.;  
-- Note: Clause 9.5.2 of GDMO argues that these should be separate attributes  
-- if it is required to manipulate individual fields.  
**REGISTERED AS** <object-identifier>;

## 0.1 Management Behaviour of Logical Channel Assignments<sup>1</sup>

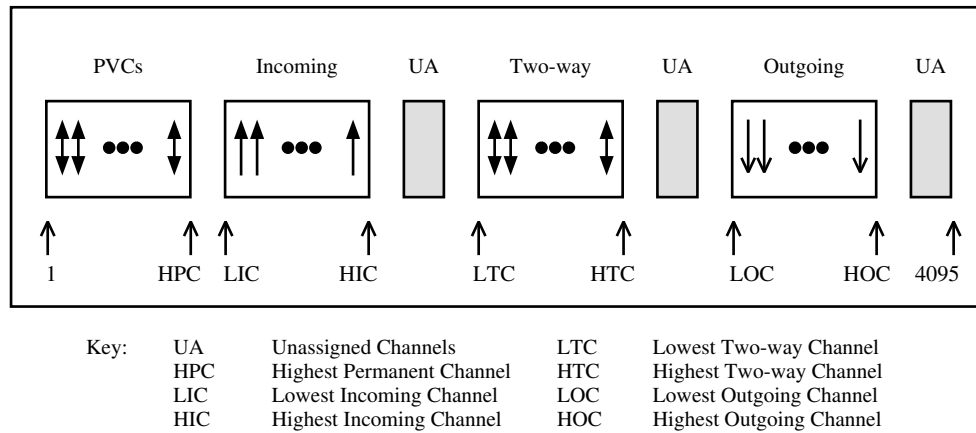
An X.25 PLE Managed Object is management's view of an X.25 PLE and, as such, represents a grouping of logical channels. Any management operations applied to a DTE Managed Object may potentially affect any or all of the contained logical channels. Logical Channels are grouped into four basic types:

- 1) permanent virtual circuits,
- 2) incoming,
- 3) outgoing, and

<sup>1</sup>Note: the text of this clause is included here in order to permit reference to it from the above attribute definition. It is a copy of the relevant clause from P2.23 (the Paris input document).

#### 4) two-way virtual calls.

The ordering of different types of logical channels is important from the point of view of Systems Management. For example, the first group always consists of permanent virtual circuits, the second of incoming virtual calls, the third of two way, and the fourth of outgoing. In addition, ISO 8208 provides for spare capacity in that those logical channels that are not allocated circuits are considered unassigned. This contingency is only provided for incoming, outgoing and two-way groups. The organization of logical channels in an X.25 PLE is illustrated in



**Figure 1 - X.25 Packet Level Environment**

Figure 1.

While it is correct to state that the range of all logical channels is 1..4095, there are additional criteria which influence the range which virtual call types may occupy. Increasing the number of logical channels available for a specific type of call, may require a decrease in an adjacent group if enough unassigned channels are not available. This problem may occur when adjusting the high, low, or both ends of a range of channels. In addition, the effect upon existing calls must be considered when reassigning channel allocations, as calls may be supported by logical channels which are affected by a reassignment.

#### moduloNumbering **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.Boolean;

**MATCHES FOR** Equality;

**BEHAVIOUR** moduloNumberingB **BEHAVIOUR**

**DEFINED AS** The modulo of the packet sequence number space. Expressed as a boolean where a value of 'True' indicates 128 and a value of false indicates 8;

-- Note: this is what the modification to 2N349 says! It would seem more logical to

-- express this as an enumerated type with the two values 8 and 128

**REGISTERED AS** <object-identifier>;

#### dataPacketsSent **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** dataPacketsSentB **BEHAVIOUR**

**DEFINED AS** The total number of data packets sent;

**REGISTERED AS** <object-identifier>;

#### dataPacketsReceived **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** dataPacketsReceivedB **BEHAVIOUR**

**DEFINED AS** The total number of data packets received;

**REGISTERED AS** <object-identifier>;

callAttempts **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** callAttemptsB **BEHAVIOUR**  
**DEFINED AS** The total number of calls attempted;  
-- It is not clear whether or not the  
-- "ISO/IEC 10165-2":OutgoingConnectionRequestsCounter  
-- could be used for this attribute, since that counts CR PDUs while this counts the  
-- rather vague 'attempts'.  
**REGISTERED AS** <object-identifier>;

callsConnected **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** callsConnectedB **BEHAVIOUR**  
**DEFINED AS** The total number of calls which have reached the open state;  
**REGISTERED AS** <object-identifier>;

providerInitiatedDisconnect **NOTIFICATION**  
**BEHAVIOUR** providerInitiatedDisconnectB **BEHAVIOUR**  
**DEFINED AS** Notification issued upon receipt of a clear packet with a cause code other than  
'DTE initiated';  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.providerInitiatedDisconnectSyntax;  
**REGISTERED AS** <object-identifier>;

providerInitiatedDisconnects **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** providerInitiatedDisconnectsB **BEHAVIOUR**  
**DEFINED AS** Counter for the providerInitiatedDisconnect notifications;  
**REGISTERED AS** <object-identifier>;

callTimeouts **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** callTimeoutsB **BEHAVIOUR**  
**DEFINED AS** The number of times timer T21 expiry is experienced by the PLE;  
**REGISTERED AS** <object-identifier>;

clearTimeouts **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** clearTimeoutsB **BEHAVIOUR**  
**DEFINED AS** The number of times timer T23 expiry is experienced by the PLE;  
**REGISTERED AS** <object-identifier>;

remotelyInitiatedReset **NOTIFICATION**  
**BEHAVIOUR** remotelyInitiatedResetB **BEHAVIOUR**  
**DEFINED AS** Notification issued upon occurrence of a remotely initiated reset. This  
notification is issued in lieu of an 'providerInitiatedReset' notification  
when operating in a DTE-DXE environment;  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.remotelyInitiatedResetSyntax;  
**REGISTERED AS** <object-identifier>;

remotelyInitiatedResets **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** remotelyInitiatedResetsB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the remotelyInitiatedReset notification;  
**REGISTERED AS** <object-identifier>;

dataRetransmissionTimerExpiries **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** dataRetransmissionTimerExpiriesB **BEHAVIOUR**  
**DEFINED AS** Count of the number of expiries of timer T25. Returns zero if the option is not implemented;  
**REGISTERED AS** <object-identifier>;

providerInitiatedReset **NOTIFICATION**  
**BEHAVIOUR** providerInitiatedResetB **BEHAVIOUR**  
**DEFINED AS** Notification issued upon occurrence of a provider initiated reset.  
This notification is issued when operating in a DTE-DCE environment;  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.providerInitiatedResetSyntax;  
**REGISTERED AS** <object-identifier>;

providerInitiatedResets **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** providerInitiatedResetsB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the providerInitiatedReset notification;  
**REGISTERED AS** <object-identifier>;

resetTimeouts **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** resetTimeoutsB **BEHAVIOUR**  
**DEFINED AS** The number of timer T22 expiries experienced by the PLE;  
**REGISTERED AS** <object-identifier>;

restarts **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** restartsB **BEHAVIOUR**  
**DEFINED AS** The total number of restart experienced by the PLE, excluding the restart associated with bringing up the PLE interface;  
**REGISTERED AS** <object-identifier>;

restartTimeout **NOTIFICATION**  
**BEHAVIOUR** restartTimeoutB **BEHAVIOUR**  
**DEFINED AS** Notification issued upon expiry of timer T20;  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.restartTimeoutSyntax;  
**REGISTERED AS** <object-identifier>;

restartTimeouts **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** restartTimeoutsB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the restartTimeout notification;  
**REGISTERED AS** <object-identifier>;

protocolErrorDetectedLocally **NOTIFICATION**  
**BEHAVIOUR** protocolErrorDetectedLocallyB **BEHAVIOUR**  
**DEFINED AS** Notification issued upon receipt of a packet in which a protocol error was detected;  
-- Note: includes header of packet in notification format  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.protocolErrorDetectedLocallySyntax;  
**REGISTERED AS** <object-identifier>;

protocolErrorsDetectedLocally **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** protocolErrorsDetectedLocallyB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the protocolErrorDetectedLocally  
notification;  
-- Note: should this use the "ISO/IEC 10165-2":IncomingProtocolErrorCounter?  
**REGISTERED AS** <object-identifier>;

accusedOfProtocolError **NOTIFICATION**  
**BEHAVIOUR** accusedOfProtocolErrorB **BEHAVIOUR**  
**DEFINED AS** Notification issued upon receipt of a diagnostic packet or a  
clear, reset or restart packet with a cause code equal to 'protocol error';  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.accusedOfProtocolErrorSyntax;  
**REGISTERED AS** <object-identifier>;

protocolErrorsAccusedOf **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** protocolErrorsAccusedOfB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the accusedOfProtocolError  
notification;  
**REGISTERED AS** <object-identifier>;

retryCountExceeded **NOTIFICATION**  
**BEHAVIOUR** retryCountExceededB **BEHAVIOUR**  
**DEFINED AS** Notification issued on retry failure due to retry limit exceeded;  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.retryCountExceededSyntax;  
**REGISTERED AS** <object-identifier>;

retryCountsExceeded **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** retryCountsExceededB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the retryCountExceeded notification;  
**REGISTERED AS** <object-identifier>;

-- According to the modifications to 2N349 the following Notification and associated counter should be added  
-- for 'R23 expires'  
--

clearCountExceeded **NOTIFICATION**  
**BEHAVIOUR** clearCountExceededB **BEHAVIOUR**  
**DEFINED AS** Notification issued on retry failure due to clear limit (R23) exceeded;  
**MODE** NON-CONFIRMED;  
**WITH INFORMATION SYNTAX** SyntaxModule.clearCountExceededSyntax;  
**REGISTERED AS** <object-identifier>;

clearCountsExceeded **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** clearCountsExceededB **BEHAVIOUR**  
**DEFINED AS** Counter associated with the clearCountExceeded notification;  
**REGISTERED AS** <object-identifier>;

interruptPacketsSent **ATTRIBUTE**  
**DERIVED FROM** NonReplaceableCounter;  
**BEHAVIOUR** interruptPacketsSentB **BEHAVIOUR**  
**DEFINED AS** The total number of interrupt packets sent by the PLE or over the PVC/VC;  
**REGISTERED AS** <object-identifier>;

interruptPacketsReceived **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** interruptPacketsReceivedB **BEHAVIOUR**

**DEFINED AS** The total number of interrupt packets received by the PLE or over the PVC/VC;

**REGISTERED AS** <object-identifier>;

interruptTimerExpiries **ATTRIBUTE**

**DERIVED FROM** NonReplaceableCounter;

**BEHAVIOUR** interruptTimerExpiriesB **BEHAVIOUR**

**DEFINED AS** The total number of expiries of of timer T26 experienced by the PLE or  
over the PVC/VC;

**REGISTERED AS** <object-identifier>;

pLEClientMOname **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.LocalDistinguishedName;

-- Not a set?

-- Do we really intend to associate a client with the PLE rather than a particular VC?

**MATCHES FOR** Equality;

**BEHAVIOUR** pLEClientMOnameB **BEHAVIOUR**

**DEFINED AS** The Distinguished name of the client MO;

-- Note this will either be a Transport Layer MO or a CLNS MO

**REGISTERED AS** <object-identifier>;

```

--
-- Virtual Call Initial Values Managed Object
--
-- This managed object exists in order to permit the values of various parameters of a virtual call to
-- be specified in advance by management. When a virtual call is to be established, the values of all the
-- parameters to be used can be identified by specifying an instance of this MO.
--

-- Note: in 2N349 there is only a single IVMO class for virtual calls. However, the agreements reached
-- in Paris were that there were to be two separate classes; one for ISO 8208 parameters, and one for
-- ISO8878 parameters. This agreement is reflected in the definitions presented here.

ISO8208VirtualCallIVMO MANAGED OBJECT CLASS
DERIVED FROM "ISO/IEC 10165-2":top;
CHARACTERIZED BY ISO8208IVMOPackage PACKAGE
ATTRIBUTES
    ISO8208VirtualCall-IVMO-Name GET,
    proposedPacketSize REPLACE WITH DEFAULT
    GET-REPLACE,
    -- Note: In 2N349 the above attribute was named
    -- 'ISO8208ProposedPacketSize', but the following attribute name did not
    -- include the prefix 'proposed'! This has been added for consistency.
    proposedWindowSize REPLACE WITH DEFAULT
    GET-REPLACE;
REGISTERED AS <object-identifier>;

ISO8208IVMO-NB NAME BINDING
SUBORDINATE OBJECT CLASS ISO8208VirtualCallIVMO;
NAMED BY
    SUPERIOR OBJECT CLASS NetworkLayer;
    -- While 2N349 places this MO as subordinate to the PLE-MO, I believe the
    -- agreement in Paris was that it be subordinate to the Network Layer.

    WITH ATTRIBUTE ISO8208VirtualCall-IVMO-Name;
CREATE;
DELETE only-if-no-contained-objects;
REGISTERED AS <object-identifier>;

ISO8208VirtualCall-IVMO-Name ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.GraphicString;
MATCHES FOR Equality, Substrings;
BEHAVIOUR ISO8208VirtualCall-IVMO-NameB BEHAVIOUR
    DEFINED AS The name of this instance of ISO8208VirtualCallIVMO;
REGISTERED AS <object-identifier>;

proposedPacketSize ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.ChoiceInteger;
    -- Includes a choice of a 'don't care' value.
MATCHES FOR Equality, Ordering;
BEHAVIOUR proposedPacketSizeB BEHAVIOUR
    DEFINED AS The proposed value of the packet size parameter to be used when establishing
    the virtual call, expressed in octets;
REGISTERED AS <object-identifier>;

proposedWindowSize ATTRIBUTE
WITH ATTRIBUTE SYNTAX SyntaxModule.ChoiceInteger;
MATCHES FOR Equality, Ordering;
BEHAVIOUR proposedWindowSizeB BEHAVIOUR
    DEFINED AS The proposed value of the window size parameter to be used when establishing
    the virtual call;
REGISTERED AS <object-identifier>;

```



```

--
-- ISO8878 Virtual Call Initial Values Managed Object
--
-- It is not yet clear which attributes are intended to be present in this MO.
--

ISO8878VirtualCallIVMO MANAGED OBJECT CLASS
    DERIVED FROM "ISO/IEC 10165-2";top;
    CHARACTERIZED BY ISO8878IVMOPackage PACKAGE
        ATTRIBUTES
            ISO8878VirtualCall-IVMO-Name GET;
            -- This needs some attributes!
REGISTERED AS <object-identifier>;

ISO8878IVMO-NB NAME BINDING
    SUBORDINATE OBJECT CLASS ISO8878VirtualCallIVMO;
    NAMED BY
        SUPERIOR OBJECT CLASS NetworkLayer;
        -- While 2N349 places this MO as subordinate to the PLE-MO, I believe the
        -- agreement in Paris was that it be subordinate to the Network Layer.

        WITH ATTRIBUTE ISO8878VirtualCall-IVMO-Name;
    CREATE;
    DELETE only-if-no-contained-objects;
REGISTERED AS <object-identifier>;

ISO8878VirtualCall-IVMO-Name ATTRIBUTE
    WITH ATTRIBUTE SYNTAX SyntaxModule.GraphicString;
    MATCHES FOR Equality, Substrings;
    BEHAVIOUR ISO8878VirtualCall-IVMO-NameB BEHAVIOUR
        DEFINED AS The name of this instance of ISO8878VirtualCallIVMO;
REGISTERED AS <object-identifier>;

```

```
-- Virtual Call Managed Object
--
-- This MO Class is never instantiated. It serves as a generic Virtual Call MO from which both the
-- Switched Virtual Call and the Permanent Virtual Circuit MOs are derived.
--
```

# virtualCall **MANAGED OBJECT CLASS**

**DERIVED FROM** "ISO/IEC 10165-2":top;

**CHARACTERIZED BY** vCMOPackage **PACKAGE**

## **ATTRIBUTES**

```
virtualCall-MO-Name GET,
channel GET,
packetSize GET,
windowSize GET,
-- The following two attribute, although not mentioned in P2.7, may be required
-- remoteDTEAddress
-- vCState
"ISO/IEC 10165-2":OctetsSentCounter GET,
-- This corresponds to the ISO8208OctetsSent attribute. Note that the DMI
-- definition is in terms of user data octets.
"ISO/IEC 10165-2":OctetsReceivedCounter GET,
-- This corresponds to the ISO8208OctetsReceived attribute. Note that the
-- DMI definition is in terms of user data octets.
dataPacketsSent GET,
-- Note the "ISO/IEC 10165-2":PDUsSentCounter cannot be used here
-- since it is defined as total number of PDUs sent, not just data PDUs.
dataPacketsReceived GET,
remotelyInitiatedResets GET,
dataRetransmissionTimerExpires GET,
providerInitiatedResets GET,
resetTimeouts GET,
interruptPacketsSent GET,
interruptPacketsReceived GET,
interruptTimerExpiries GET;
```

## **ATTRIBUTE GROUPS**

```
counters
"ISO/IEC 10165-2":OctetsSentCounter
"ISO/IEC 10165-2":OctetsReceivedCounter
dataPacketsSent
dataPacketsReceived
remotelyInitiatedResets
dataRetransmissionTimerExpires
providerInitiatedResets
resetTimeouts
interruptPacketsSent
interruptPacketsReceived
interruptTimerExpiries;
```

**REGISTERED AS** <object-identifier>;

```
--
-- Switched Virtual Call Managed Object
--
-- An instance of this MO exists for each Virtual Call. It is not created by management, but by the operation of
-- the protocol state machine. An existing instance may, however, be deleted by management action, which will
-- cause the associated VC to be cleared.
--
-- Note: it is not clear exactly when this MO is created. Is it when a call is first attempted, or is it when it is
-- successfully established? If the former, it needs some state attributes to show what is going on.
--
```

switchedVirtualCall **MANAGED OBJECT CLASS**

**DERIVED FROM** virtualCall;  
**CHARACTERIZED BY** sVCMOPackage **PACKAGE**  
**ATTRIBUTES**

direction **GET**,  
calledDTEAddress **GET**,  
callingDTEAddress **GET**,  
callData **GET**,  
throughputClass **GET**,  
-- Note 2N349 (amendments) indicate that the ReverseCharging and FastSelect  
-- attributes should be moved to the X.25 PLE MO. This has been done here,  
-- though there may be a case for an attribute on the VC to indicate if either  
-- of these facilities had been used for this particular call.  
redirectReason **GET**,  
originalCalledAddress **GET**,  
callingAddressExtension **GET**,  
targetAddressExtension **GET**;

**REGISTERED AS** <object-identifier>;

sVCMO-NB **NAME BINDING**

**SUBORDINATE OBJECT CLASS** switchedVirtualCall;  
**NAMED BY**

**SUPERIOR OBJECT CLASS** x25PLE;  
**WITH ATTRIBUTE** virtualCall-MO-Name;

**BEHAVIOUR** sVCMO-NBB **BEHAVIOUR**

**DEFINED AS** Created only by the operation of the protocol or local interface. The instance  
name is derived automatically (as for CREATE with-automatic-instance-naming);

**DELETE** only-if-no-contained-objects;

**REGISTERED AS** <object-identifier>;

virtualCall-MO-Name **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.GraphicString;

**MATCHES FOR** Equality, Substrings;

**BEHAVIOUR** virtualCall-MO-NameB **BEHAVIOUR**

**DEFINED AS** The name of this instance of virtualCall MO;

**REGISTERED AS** <object-identifier>;

channel **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.ChannelID;

-- 12 bit channel ID

**MATCHES FOR** Equality, Ordering;

**BEHAVIOUR** channelB **BEHAVIOUR**

**DEFINED AS** The actual Channel ID used for the call;

**REGISTERED AS** <object-identifier>;

**direction ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Direction;  
-- Enumerated( Incoming, Outgoing)  
**MATCHES FOR** Equality;  
**BEHAVIOUR** directionB **BEHAVIOUR**  
**DEFINED AS** The direction (incoming or outgoing) of the call;  
**REGISTERED AS** <object-identifier>;

**calledDTEAddress ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.DTEAddress;  
**MATCHES FOR** Equality, Substrings;  
**BEHAVIOUR** calledDTEAddressB **BEHAVIOUR**  
**DEFINED AS** The destination DTE address used when the call was placed;  
**REGISTERED AS** <object-identifier>;

**callingDTEAddress ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.DTEAddress;  
**MATCHES FOR** Equality, Substrings;  
**BEHAVIOUR** callingDTEAddressB **BEHAVIOUR**  
**DEFINED AS** The DTE address of this PLE;  
-- That is what 2N349 says, but surely if this is an incoming call the calling  
-- DTE address would be that of the caller!  
**REGISTERED AS** <object-identifier>;

**callData ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.CallData;  
-- OctetString?  
**MATCHES FOR** Equality, Substrings;  
**BEHAVIOUR** callDataB **BEHAVIOUR**  
**DEFINED AS** The first 16 octets of call user data associated with the call;  
**REGISTERED AS** <object-identifier>;

**throughputClass ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.Throughput;  
**MATCHES FOR** Equality, Ordering;  
**BEHAVIOUR** throughputClassB **BEHAVIOUR**  
**DEFINED AS** The actual throughput class in use for the call. For SVCs this is the result of  
negotiation;  
**REGISTERED AS** <object-identifier>;

**redirectReason ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.RedirectReason;  
-- Must include a 'nil' value  
**MATCHES FOR** Equality;  
**BEHAVIOUR** redirectReasonB **BEHAVIOUR**  
**DEFINED AS** The reason for call redirect. The zero value indicates that the call was not  
redirected;  
-- Is this information available for an outgoing call?  
-- 2N349 said there was a 'nil' value, but the zero value seems acceptable  
**REGISTERED AS** <object-identifier>;

**originallyCalledAddress ATTRIBUTE**  
**WITH ATTRIBUTE SYNTAX** SyntaxModule.DTEAddress;  
**MATCHES FOR** Equality, Substrings;  
**BEHAVIOUR** originallyCalledAddressB **BEHAVIOUR**  
**DEFINED AS** The originally called address;  
-- 2N349 states that this is an NSAP address, surely it is a DTE address  
**REGISTERED AS** <object-identifier>;

callingAddressExtension **ATTRIBUTE**

**WITH ATTRIBUTE SYNTAX** SyntaxModule.NSAPAddress;

-- In the OSI context this will always be an NSAP address (as 2N349) but in other uses

-- it may not. In any case it may be null, for example when used by ISO 8473.

**MATCHES FOR** Equality, Substrings;

**BEHAVIOUR** callingAddressExtensionB **BEHAVIOUR**

**DEFINED AS** The calling NSAP Address;

-- Shouldn't it just be the contents of the calling address extension field?

**REGISTERED AS** <object-identifier>;

targetAddressExtension **ATTRIBUTE**

-- Why 'Target' not 'called' as in ISO 8208?

**WITH ATTRIBUTE SYNTAX** SyntaxModule.NSAPAddress;

-- In the OSI context this will always be an NSAP address (as 2N349) but in other uses

-- it may not. In any case it may be null, for example when used by ISO 8473.

**MATCHES FOR** Equality, Substrings;

**BEHAVIOUR** targetAddressExtensionB **BEHAVIOUR**

**DEFINED AS** The Target NSAP Address which was carried in the call packet;

-- Shouldn't it just be the contents of the called address extension field?

**REGISTERED AS** <object-identifier>;

```

--
-- Permanent Virtual Circuit Managed Object
--
-- An instance of this MO exists for each Permanent Virtual Circuit. It may be both created and deleted by
-- management.
--

permanentVirtualCircuit MANAGED OBJECT CLASS
    DERIVED FROM virtualCall;
    CHARACTERIZED BY pVCMOPackage PACKAGE
        ATTRIBUTES
            -- 2N349 also specifies here
            -- ISO8208ThroughputClass; but it is not clear what purpose this attribute serves.
REGISTERED AS <object-identifier>;

pVCMO-NB NAME BINDING
    SUBORDINATE OBJECT CLASS permanentVirtualCircuit;
    NAMED BY
        SUPERIOR OBJECT CLASS x25PLE;
        WITH ATTRIBUTE virtualCall-MO-Name;
    BEHAVIOUR pVCMO-NBB BEHAVIOUR
        DEFINED AS The following attributes may (shall?) have their initial values set by
            parameters of the create operation.
                channel, -- mandatory
                packetSize, -- optional
                windowSize; -- optional
    CREATE with-automatic-instance-naming;
    DELETE only-if-no-contained-objects;
REGISTERED AS <object-identifier>;

```



## 0.2 ASN.1 modules

SyntaxModule { <object-identifier> }

**DEFINITIONS ::= BEGIN**

Boolean ::= BOOLEAN

CLNS-MO-Name-Value ::= "CLNS"

CONS-MO-Name-Value ::= "CONS"

CallData ::= OctetString(SIZE (0..16))  
-- limited to 16 octets

ChannelID ::= INTEGER (0..4095)

ChoiceInteger ::= CHOICE {  
    [0] IMPLICIT NULL,     -- The 'I don't care' value  
    [1] IMPLICIT INTEGER }

-- Another way of achieving this would be to use a specific object ID to mean 'I don't care'

DTEAddress ::= NumericString(FROM("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"))(SIZE(0..15))  
-- Up to 15 Digits 0..9

Direction ::= ENUMERATED {  
    Incoming(0),  
    Outgoing(1)}

EndToEndDelay ::= INTEGER(0..65535)  
-- Note that according to ISO8208 a value of 65535 indicates that the delay is unknown  
-- or exceeds 65534 milliseconds.

False ::= FALSE

FastSelect ::= ENUMERATED{  
    NotSpecified(0),  
    FastSelect(1),  
    FastSelectWithResponse(2),  
    NoFastSelect(3)}

GraphicString ::= GraphicString

HoldingTimerMultiplierDefault ::= 3

HoldingTimerMultiplierPermitted ::= INTEGER(2..63)

HoldingTimerMultiplierRequired ::= INTEGER(2)

InterfaceMode ::= ENUMERATED{  
    DTE(0),  
    DCE(1)}

Integer ::= INTEGER

ISO8208-MO-Name-Value ::= "ISO8208"



```

notificationSyntax ::= SEQUENCE {
    Channel          [1]      ChannelID,
    SequenceNumber [2]      INTEGER(0..127) OPTIONAL,
    Dbit             [3]      BOOLEAN,
    Mbit             [4]      BOOLEAN,
    Qbit             [5]      BOOLEAN,
    CallData         [6]      CallData}

```

```

accusedOfProtocolErrorSyntax ::= notificationSyntax

```

```

clearCountExceededSyntax ::= notificationSyntax

```

```

logicalChannelAssignments ::= SEQUENCE {
    HPC   [1]      INTEGER(0..4095),
    HIC   [2]      INTEGER(0..4095),
    LTC   [3]      INTEGER(0..4095),
    HTC   [4]      INTEGER(0..4095),
    LOC   [5]      INTEGER(0..4095),
    HOC   [6]      INTEGER(0..4095)}

```

```

protocolErrorDetectedLocallySyntax ::= notificationSyntax

```

```

providerInitiatedDisconnectSyntax ::= notificationSyntax

```

```

providerInitiatedResetSyntax ::= notificationSyntax

```

```

remotelyInitiatedResetSyntax ::= notificationSyntax

```

```

restartTimeoutSyntax ::= notificationSyntax

```

```

retryCountExceededSyntax ::= notificationSyntax

```

```

-- The following ISO8208 default values are taken from ISO 8208

```

```

restartTimeDefault ::= 180

```

```

callTimeDefault ::= 200

```

```

resetTimeDefault ::= 180

```

```

clearTimeDefault ::= 180

```

```

windowTimeDefault ::= 60

```

```

dataRetransmissionTimeDefault ::= 200

```

```

interruptTimeDefault ::= 180

```

```

rejectTimeDefault ::= 60

```

```

registrationRequestTimeDefault ::= 300

```

```

restartCountDefault ::= 1

```

```

resetCountDefault ::= 1

```

```

clearCountDefault ::= 1

```

```

dataTransmissionCountDefault ::= 0

```

```

rejectCountDefault ::= 0

```

```

registrationRequestCountDefault ::= 1

```

```

lifetime ::= INTEGER(0..255)
    -- Should this be (1..255)?

pDUFormatErrorSyntax ::= PDUHeader

PDUHeader ::= OctetString(SIZE(1..255))

pDUOtherErrorSyntax ::= SEQUENCE{
    errorCode      [1]    INTEGER(0..255),
    header         [2]    PDUHeader}

unsupportedOptionSyntax ::= PDUHeader

-- The following 2 definitions are suggestions only. Careful thought is required.
-- In particular, exactly when do the notifications get generated when an ES has multiple NSAPs
-- or if a single IS has multiple NETs?

eSReachabilityChangeSyntax ::= SEQUENCE{
    newState      [1]    ENUMERATED { Down(0), Up(1)},
    NSAPs         [2]    SET OF NSAPAddress,
    reason        [3]    ENUMERATED { HoldingTimerExpired(0),
                                   SNPADisabled(1)} OPTIONAL} -- Down only

iSReachabilityChangeSyntax ::= SEQUENCE{
    newState      [1]    ENUMERATED { Down(0), Up(1)},
    NET           [2]    NSAPAddress,
    reason        [3]    ENUMERATED { HoldingTimerExpired(0),
                                   SNPADisabled(1)} OPTIONAL} -- Down only

LocalDistinguishedName ::= CMIP-1.ObjectInstance
    -- This includes localDistinguishedName as one of its choices. There doesn't seem to be
    -- a free-standing definition of localDistinguishedName

MACAddress ::= OctetString(SIZE(6))
    -- exactly 6 octets in length

manualISAddress ::= SET OF MACAddress

nonReplaceableCounter ::= INTEGER(0..264-1)
    -- How should that be written in ASN.1? Is a fixed size counter necessary, especially for counts that are
    -- anticipated to increase slowly. Should a separate size be defined for each individual counter.?

NSAPAddress ::= OctetString(SIZE(0..20))
    --up to 20 octets

NUI ::= OctetString(SIZE(0..255))
    -- Can they really be this long?

ProtocolVersion ::= ???
    -- NB comment is solicited as to what a suitable type would be

ProtocolVersions ::= SET OF ProtocolVersion

RPOASequence ::= SEQUENCE OF NumericString(SIZE(0..4))
    -- each numeric string limited to 4 decimal digits
    -- an empty sequence is permitted

RedirectReason ::= INTEGER(0..127)
    -- Note an alternative more explicit encoding could be an enumerated type of all the possible
    -- redirect reasons currently defined, but this would have the disadvantage of not being extensible.
    -- Will zero do for the 'NIL' value to indicate no redirection?

```

SDUSize ::= INTEGER

Throughput ::= INTEGER (0..15)

transportClientRelationship ::= SET OF CMIP-1.ObjectInstance



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