

The COSINE and Internet X.500 Schema

Status of this Memo

This RFC specifies an IAB standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "IAB Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This document suggests an X.500 Directory Schema, or Naming Architecture, for use in the COSINE and Internet X.500 pilots. The schema is independent of any specific implementation. As well as indicating support for the standard object classes and attributes, a large number of generally useful object classes and attributes are also defined. An appendix to this document includes a machine processable version of the schema.

This document also proposes a mechanism for allowing the schema to evolve in line with emerging requirements. Proformas to support this process are included.

Corrections and additions to the schema should be sent to na-update@cs.ucl.ac.uk list, as described within.

1. Introduction

Directory Services are a fundamental requirement of both human and computer communications' systems. Human users need to be able to look up various details about other people: for example, telephone numbers, facsimile numbers and paper mail addresses. Computing systems also need Directory Services for several purposes: for example, to support address look-ups for a variety of services, and to support user-friendly naming and distribution lists in electronic mail systems.

Directory Services have recently been standardised and published as the 1988 CCITT X.500 / ISO IS9594 recommendations [1]. The standard provides a good basis for the provision of real services, and a considerable amount of Directory Service piloting activity is

currently underway. In the U.S., the PSI White Pages Pilot [4] has stimulated use of X.500 on the Internet. In Britain, the U.K. Academic Community Directory Pilot [5] is similarly promoting use of X.500.

2. Motivation and aims of this document

In a number of areas the X.500 standard only provides a basis for services. One such area is the Directory's Schema or Naming Architecture. The standard defines a number of useful object classes, in X.521, and attribute types, in X.520. These are intended to be generally useful across a range of directory applications. However, while these standard definitions are a useful starting point, they are insufficient as a basis for a large scale pilot directory.

While it is possible for directory administrators to define their own sets of additional attribute types and object classes, this is undesirable for some common attributes and objects. The same objects and attribute types would be privately defined many times over. This would result in the directory's generality being diminished as remote systems would be unable to determine the semantics of these privately defined data types.

A number of useful additions to the standard definitions were made in this note's forerunner, "The THORN and RARE Naming Architecture" [2]. These have been heavily used in early X.500 piloting activities. Furthermore, both the THORN and Quipu X.500 implementations have made use of these definitions.

Since the afore-mentioned note was issued, a number of further requirements have come to light as the volume and variety of piloting activity has increased. Yet further requirements seem likely as the scale of X.500 pilot services increases. Thus, it is argued that it is not sufficient to merely reissue an updated version of the original note. The schema is a "living document" that needs procedures for:

- Allowing submission of requests for new attributes and object classes to be added into the schema;
- Allowing groups of object classes and attribute types defined elsewhere to be integrated into the schema.
- Checking for the redundancy of any previously defined attribute types and object classes.

This document attempts to establish procedures to allow for the

continual updating of the schema. Two proformas are set out for this purpose. In addition, descriptive detail is provided for the additional object classes and attribute types defined in the schema. These descriptions follow the style used in X.520 and X.521. Finally, also following the style adopted in the standards documents, appendices will include the entire schema. Plain text versions of the document's appendices are intended to be machine processable to allow derivation of a system's schema tables. Appendix C lists all the schema's object classes and attribute types in their respective ASN.1 macro formats.

The scope and intended remit of this coordination activity should be clearly understood.

- Esoteric and local, highly experimental requirements should continue to be met by private definitions.
- Requirements which have support from more than one site will usually be integrated into the schema. Put in other words, the tendency will be for the inclusion, as opposed to the exclusion, of useful additions to the schema.
- An attempt will be made to avoid duplication of object classes and attribute types for essentially similar real world objects.

3. What conformance to this schema means

It is not reasonable to require that a DSA which supports this schema has specific code to handle each of the defined syntaxes. However, the following requirements are made of a system which claims conformance to this specification:

1. A DSA shall be able to store all of the attributes and object class values specified. (Note that this implies support for all the object classes and attribute types required by strong authentication as defined in X.509.)
2. A DUA shall be able to identify each attribute type and object class to the user, with an appropriate representation (e.g., a string).
3. These statement are qualified for large attributes values (>1kbyte). A conforming DSA does not have to store such attribute values, and a DUA does not have to display such values, although it must indicate their presence.

The following are desirable, but not required:

1. For a DSA to match correctly on the basis of all attribute syntaxes defined
 2. For a DSA to enforce the Object Class schema implied by these definitions
 3. For a DUA to correctly display the attribute values (syntaxes) defined
 4. For DUAs and DSAs to maintain compatibility with a previous version of the schema.
4. Requesting new object classes and attribute types

This section defines procedures for requesting new object classes and attribute types to be added to the schema. Proformas for object classes and attribute types are specified, and examples given of how to use them. A mechanism for making requests for large groups of new object classes and attribute types is described in the next section.

As stated earlier, it is anticipated that the schema will evolve considerably over time. As X.500 is used to support a widening range of applications, there will be requirements for extensions to the schema. This document proposes formalising this procedure by requiring requests for additions to the schema to be submitted as completed proformas. This stipulation will greatly simplify subsequent revisions of the schema.

There is one qualification to the above with respect to requests for modifications to an existing object class. If a modification to an object class merely involves additional, optional attributes, the object class will be enhanced as requested. Systems are expected to be resilient to such changes to the schema. However, requests to modify an object class, such that the mandatory attribute types require altering, will not be met. Instead, a new object class will be created, and the original object class expired following the scheme described in the next main section.

It is anticipated that most requests for modifications to the schema will be met without any need for editorial intervention. Sometimes, however, some discussion between the submitter of a request and the schema's editor may be required. For example, the editor may have to judge the relative merits of two very similar requests and, as a result, one of the parties may not get quite what they want. In cases such as this where the submitter of a request feels aggrieved about an editorial decision, the requestor may appeal to a broader community by explaining their views to the mailing list `osi-ds@cs.ucl.ac.uk`. Heed will be paid to any consensus that emerges

from discussions on the schema on this list. If it proves that this list is used almost solely for discussions on schema issues, a separate discussion list will be created.

To facilitate the production of the afore-mentioned proformas, tools are included in Appendix B which will verify that a proforma has been correctly formatted.

Completed proformas should be mailed to na-update@cs.ucl.ac.uk

4.1. Object Class proforma

This section gives an example, completed proforma for a new object class, alcoholic drink. A proforma for object class specified in BNF is included in Appendix A.

Object Class: Alcoholic Drink

Description: The Alcoholic Drink object class is used to define entries representing intoxicating beverages.

```
ASN1OCMacro: alcoholicDrink OBJECT-CLASS
  SUBCLASS OF drink
  MUST CONTAIN {
    percentAlcohol}
  MAY CONTAIN {
    normalServing,
    hue}
```

An object class description consists of three fields, separated by blank lines. The keywords Object Class, Description and ASN1OCMacro, and their suffixed colons, must be included exactly as above.

The Object Class field should be used for a textual description of the object class. This will be at most three or four words.

The Description field should contain some explanatory text about the intended use of the object class. This can run to a number of lines.

The ASN1OCMacro field should follow the definition of the object class macro as specified in X.501. The above example shows the main features. There are many more examples which can be studied in the section defining the Pilot Object Classes.

4.2. Attribute type proforma

This section gives an example completed proforma for a new attribute type, hue (one of the attribute types in the alcoholic drink object

class).

Attribute Type: Hue

Description: The Hue attribute type specifies the hue of an object. (Note that a description may run to several lines.)

OCMust:

OCMay: alcoholicDrink

```
ASN1ATMacro:hue ATTRIBUTE
  WITH ATTRIBUTE SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-hue))
```

ub-hue INTEGER ::= 256

An attribute type description consists of five fields, separated by blank lines. The keywords Attribute Type, Description, OCMust, OCMay and ASN1ATMacro, and their suffixed colons, must be included exactly as above.

The Attribute Type field should be used for a textual description of the attribute type. This will be at most three or four words.

The Description field should contain some explanatory text about the intended use of the attribute type. This can run to a number of lines.

The OCMust field should contain a comma-separated list of object classes for which this attribute is mandatory.

The OCMay field should contain a comma-separated list of object classes for which this attribute is optional.

The ASN1ATMacro field should follow the definition of the attribute macro as specified in X.501. The above example shows some of the features. In particular, please note the format for specifying size constraints.

5. Integrating groups of object classes and attribute types.

This section describes two mechanisms that may be employed to allow the integration of a substantial number of new object classes and attribute types into the schema.

The first mechanism allows for the transition of groups of related, privately defined object classes and attribute types into the schema. An example of when such a transition might be appropriate is when some experimental use of the Directory is widely adopted within the pilot. Such a transition will be made if the following conditions hold:

- The definitions are well structured: i.e., they are not scattered over a multiplicity of object identifier subtrees.
- The definitions are in use at a number of sites, and having to adopt new object identifiers would be unnecessarily disruptive.

A second mechanism allows for the allocation of an object subtree for a group of new definitions. A pilotGroups object identifier has been defined for this purpose. This method will be suitable for an experiment requiring a considerable number of new object identifiers to be defined. This approach allows for flexibility during experimentation and should simplify both the management and the coherence of the pilot's object identifiers.

In both cases, the object classes, attribute types and syntaxes should be defined and described in an RFC. It is suggested that such documents should follow the style used in this document for object class and attribute type definitions. A reference will be given in this schema to the document containing the definitions.

6. Removing "old" object classes and attribute types.

It is also important that object classes and attribute types which are no longer used or useful are removed from the schema. Some object classes and attribute types initially defined as pilot extensions may be included as standard definitions in future versions of the standard. In such a case, it is important that there should be a fairly rapid transition to the standard definitions. Another possibility is that newer, more specific definitions obviate the original definitions.

Two things are essential. First, it is crucial that "old" definitions are retired as gracefully as possible. The intention to retire a definition will be sent to the `osi-ds@cs.ucl.ac.uk` mail list. In the absence of objections, the definition will be marked for expiry with a given expiry date. The definition will remain in the schema until the expiry date. Users of the schema should ensure that they make the transition to new, alternative definitions in the interim.

Second, users of the schema must have the right to argue for the retention of definitions which they regard as necessary, there being no other definitions which closely meet their requirements. It is clearly impossible to lay down hard and fast rules on this point, as no two instances will ever be quite the same. It is intended that the refereeing on these matters will be sympathetic! As for requests for additions, an aggrieved user can "go to arbitration" by initiating a discussion on the `osi-ds@cs.ucl.ac.uk` mail list.

7. Object Identifiers

Some additional object identifiers are defined for this schema. These are also reproduced in Appendix C.

```
data OBJECT IDENTIFIER ::= {ccitt 9}
pss OBJECT IDENTIFIER ::= {data 2342}
ucl OBJECT IDENTIFIER ::= {pss 19200300}
pilot OBJECT IDENTIFIER ::= {ucl 100}

pilotAttributeType OBJECT IDENTIFIER ::= {pilot 1}
pilotAttributeSyntax OBJECT IDENTIFIER ::= {pilot 3}
pilotObjectClass OBJECT IDENTIFIER ::= {pilot 4}
pilotGroups OBJECT IDENTIFIER ::= {pilot 10}

ia5StringSyntax OBJECT IDENTIFIER ::= {pilotAttributeSyntax 4}
caseIgnoreIA5StringSyntax OBJECT IDENTIFIER ::=
    {pilotAttributeSyntax 5}
```

8. Object Classes

8.1. X.500 standard object classes

A number of generally useful object classes are defined in X.521, and these are supported. Refer to that document for descriptions of the suggested usage of these object classes. The ASN.1 for these object classes is reproduced for completeness in Appendix C.

8.2. X.400 standard object classes

A number of object classes defined in X.400 are supported. Refer to X.402 for descriptions of the usage of these object classes. The ASN.1 for these object classes is reproduced for completeness in Appendix C.

8.3. COSINE/Internet object classes

This section attempts to fuse together the object classes designed for use in the COSINE and Internet pilot activities. Descriptions

are given of the suggested usage of these object classes. The ASN.1 for these object classes is also reproduced in Appendix C.

8.3.1. Pilot Object

The PilotObject object class is used as a sub-class to allow some common, useful attributes to be assigned to entries of all other object classes.

```
pilotObject OBJECT-CLASS
  SUBCLASS OF top
  MAY CONTAIN {
    info,
    photo,
    manager,
    uniqueIdentifier,
    lastModifiedTime,
    lastModifiedBy,
    dITRedirect,
    audio}
  ::= {pilotObjectClass 3}
```

8.3.2. Pilot Person

The PilotPerson object class is used as a sub-class of person, to allow the use of a number of additional attributes to be assigned to entries of object class person.

```
pilotPerson OBJECT-CLASS
  SUBCLASS OF person
  MAY CONTAIN {
    userid,
    textEncodedORAddress,
    rfc822Mailbox,
    favouriteDrink,
    roomNumber,
    userClass,
    homeTelephoneNumber,
    homePostalAddress,
    secretary,
    personalTitle,
    preferredDeliveryMethod,
    businessCategory,
    janetMailbox,
    otherMailbox,
    mobileTelephoneNumber,
    pagerTelephoneNumber,
    organizationalStatus,
```

```

        mailPreferenceOption,
        personalSignature}
 ::= {pilotObjectClass 4}

```

8.3.3. Account

The Account object class is used to define entries representing computer accounts. The userid attribute should be used for naming entries of this object class.

```

account OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    userid}
  MAY CONTAIN {
    description,
    seeAlso,
    localityName,
    organizationName,
    organizationalUnitName,
    host}
 ::= {pilotObjectClass 5}

```

8.3.4. Document

The Document object class is used to define entries which represent documents.

```

document OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    documentIdentifier}
  MAY CONTAIN {
    commonName,
    description,
    seeAlso,
    localityName,
    organizationName,
    organizationalUnitName,
    documentTitle,
    documentVersion,
    documentAuthor,
    documentLocation,
    documentPublisher}
 ::= {pilotObjectClass 6}

```

8.3.5. Room

The Room object class is used to define entries representing rooms. The commonName attribute should be used for naming entries of this object class.

```
room OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName}
  MAY CONTAIN {
    roomNumber,
    description,
    seeAlso,
    telephoneNumber}
  ::= {pilotObjectClass 7}
```

8.3.6. Document Series

The Document Series object class is used to define an entry which represents a series of documents (e.g., The Request For Comments papers).

```
documentSeries OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName}
  MAY CONTAIN {
    description,
    seeAlso,
    telephoneNumber,
    localityName,
    organizationName,
    organizationalUnitName}
  ::= {pilotObjectClass 9}
```

8.3.7. Domain

The Domain object class is used to define entries which represent DNS or NRS domains. The domainComponent attribute should be used for naming entries of this object class. The usage of this object class is described in more detail in [3].

```
domain OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    domainComponent}
  MAY CONTAIN {
```

```

        associatedName,
        organizationName,
        organizationalAttributeSet}
 ::= {pilotObjectClass 13}

```

8.3.8. RFC822 Local Part

The RFC822 Local Part object class is used to define entries which represent the local part of RFC822 mail addresses. This treats this part of an RFC822 address as a domain. The usage of this object class is described in more detail in [3].

```

rFC822localPart OBJECT-CLASS
  SUBCLASS OF domain
  MAY CONTAIN {
    commonName,
    surname,
    description,
    seeAlso,
    telephoneNumber,
    postalAttributeSet,
    telecommunicationAttributeSet}
 ::= {pilotObjectClass 14}

```

8.3.9. DNS Domain

The DNS Domain (Domain NameServer) object class is used to define entries for DNS domains. The usage of this object class is described in more detail in [3].

```

dNSDomain OBJECT-CLASS
  SUBCLASS OF domain
  MAY CONTAIN {
    ARecord,
    MRecord,
    MXRecord,
    NSRecord,
    SOARecord,
    CNAMERecord}
 ::= {pilotObjectClass 15}

```

8.3.10. Domain Related Object

The Domain Related Object object class is used to define entries which represent DNS/NRS domains which are "equivalent" to an X.500 domain: e.g., an organisation or organisational unit. The usage of this object class is described in more detail in [3].

```

domainRelatedObject OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    associatedDomain}
  ::= {pilotObjectClass 17}

```

8.3.11. Friendly Country

The Friendly Country object class is used to define country entries in the DIT. The object class is used to allow friendlier naming of countries than that allowed by the object class country. The naming attribute of object class country, countryName, has to be a 2 letter string defined in ISO 3166.

```

friendlyCountry OBJECT-CLASS
  SUBCLASS OF country
  MUST CONTAIN {
    friendlyCountryName}
  ::= {pilotObjectClass 18}

```

8.3.12. Simple Security Object

The Simple Security Object object class is used to allow an entry to have a userPassword attribute when an entry's principal object classes do not allow userPassword as an attribute type.

```

simpleSecurityObject OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    userPassword }
  ::= {pilotObjectClass 19}

```

8.3.13. Pilot Organization

The PilotOrganization object class is used as a sub-class of organization and organizationalUnit to allow a number of additional attributes to be assigned to entries of object classes organization and organizationalUnit.

```

pilotOrganization OBJECT-CLASS
  SUBCLASS OF organization, organizationalUnit
  MAY CONTAIN {
    buildingName}
  ::= {pilotObjectClass 20}

```

8.3.14. Pilot DSA

The PilotDSA object class is used as a sub-class of the dsa object class to allow additional attributes to be assigned to entries for DSAs.

```
pilotDSA OBJECT-CLASS
  SUBCLASS OF dsa
  MUST CONTAIN {
    dSAQuality}
  ::= {pilotObjectClass 21}
```

8.3.15. Quality Labelled Data

The Quality Labelled Data object class is used to allow the assignment of the data quality attributes to subtrees in the DIT.

See [8] for more details.

```
qualityLabelledData OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    dSAQuality}
  MAY CONTAIN {
    subtreeMinimumQuality,
    subtreeMaximumQuality}
  ::= {pilotObjectClass 22}
```

9. Attribute Types

9.1. X.500 standard attribute types

A number of generally useful attribute types are defined in X.520, and these are supported. Refer to that document for descriptions of the suggested usage of these attribute types. The ASN.1 for these attribute types is reproduced for completeness in Appendix C.

9.2. X.400 standard attribute types

The standard X.400 attribute types are supported. See X.402 for full details. The ASN.1 for these attribute types is reproduced in Appendix C.

9.3. COSINE/Internet attribute types

This section describes all the attribute types defined for use in the COSINE and Internet pilots. Descriptions are given as to the suggested usage of these attribute types. The ASN.1 for these

attribute types is reproduced in Appendix C.

9.3.1. Userid

The Userid attribute type specifies a computer system login name.

```
userid ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
      (SIZE (1 .. ub-user-identifier))
  ::= {pilotAttributeType 1}
```

9.3.2. Text Encoded O/R Address

The Text Encoded O/R Address attribute type specifies a text encoding of an X.400 O/R address, as specified in RFC 987. The use of this attribute is deprecated as the attribute is intended for interim use only. This attribute will be the first candidate for the attribute expiry mechanisms!

```
textEncodedORAddress ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
      (SIZE (1 .. ub-text-encoded-or-address))
  ::= {pilotAttributeType 2}
```

9.3.3. RFC 822 Mailbox

The RFC822 Mailbox attribute type specifies an electronic mailbox attribute following the syntax specified in RFC 822. Note that this attribute should not be used for greybook or other non-Internet order mailboxes.

```
rfc822Mailbox ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
      (SIZE (1 .. ub-rfc822-mailbox))
  ::= {pilotAttributeType 3}
```

9.3.4. Information

The Information attribute type specifies any general information pertinent to an object. It is recommended that specific usage of this attribute type is avoided, and that specific requirements are met by other (possibly additional) attribute types.

```
info ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
```

```

        caseIgnoreStringSyntax
        (SIZE (1 .. ub-information))
 ::= {pilotAttributeType 4}

```

9.3.5. Favourite Drink

The Favourite Drink attribute type specifies the favourite drink of an object (or person).

```

favouriteDrink ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
  caseIgnoreStringSyntax
  (SIZE (1 .. ub-favourite-drink))
 ::= {pilotAttributeType 5}

```

9.3.6. Room Number

The Room Number attribute type specifies the room number of an object. Note that the commonName attribute should be used for naming room objects.

```

roomNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
  caseIgnoreStringSyntax
  (SIZE (1 .. ub-room-number))
 ::= {pilotAttributeType 6}

```

9.3.7. Photo

The Photo attribute type specifies a "photograph" for an object. This should be encoded in G3 fax as explained in recommendation T.4, with an ASN.1 wrapper to make it compatible with an X.400 BodyPart as defined in X.420.

```

IMPORT G3FacsimileBodyPart FROM { mhs-motis ipms modules
information-objects }

photo ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
  CHOICE {
    g3-facsimile [3] G3FacsimileBodyPart
  }
  (SIZE (1 .. ub-photo))
 ::= {pilotAttributeType 7}

```


9.3.8. User Class

The User Class attribute type specifies a category of computer user. The semantics placed on this attribute are for local interpretation. Examples of current usage of this attribute in academia are undergraduate student, researcher, lecturer, etc. Note that the organizationalStatus attribute may now often be preferred as it makes no distinction between computer users and others.

```
userClass ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-user-class))
  ::= {pilotAttributeType 8}
```

9.3.9. Host

The Host attribute type specifies a host computer.

```
host ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-host))
  ::= {pilotAttributeType 9}
```

9.3.10. Manager

The Manager attribute type specifies the manager of an object represented by an entry.

```
manager ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
  ::= {pilotAttributeType 10}
```

9.3.11. Document Identifier

The Document Identifier attribute type specifies a unique identifier for a document.

```
documentIdentifier ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-identifier))
  ::= {pilotAttributeType 11}
```

9.3.12. Document Title

The Document Title attribute type specifies the title of a document.

```
documentTitle ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-title))
  ::= {pilotAttributeType 12}
```

9.3.13. Document Version

The Document Version attribute type specifies the version number of a document.

```
documentVersion ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-version))
  ::= {pilotAttributeType 13}
```

9.3.14. Document Author

The Document Author attribute type specifies the distinguished name of the author of a document.

```
documentAuthor ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
  ::= {pilotAttributeType 14}
```

9.3.15. Document Location

The Document Location attribute type specifies the location of the document original.

```
documentLocation ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-location))
  ::= {pilotAttributeType 15}
```

9.3.16. Home Telephone Number

The Home Telephone Number attribute type specifies a home telephone number associated with a person. Attribute values should follow the agreed format for international telephone numbers: i.e., "+44 71 123 4567".

```
homeTelephoneNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    telephoneNumberSyntax
  ::= {pilotAttributeType 20}
```

9.3.17. Secretary

The Secretary attribute type specifies the secretary of a person. The attribute value for Secretary is a distinguished name.

```
secretary ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
  ::= {pilotAttributeType 21}
```

9.3.18. Other Mailbox

The Other Mailbox attribute type specifies values for electronic mailbox types other than X.400 and rfc822.

```
otherMailbox ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    SEQUENCE {
      mailboxType PrintableString, -- e.g. Telemail
      mailbox IA5String -- e.g. X378:Joe
    }
  ::= {pilotAttributeType 22}
```

9.3.19. Last Modified Time

The Last Modified Time attribute type specifies the last time, in UTC time, that an entry was modified. Ideally, this attribute should be maintained by the DSA.

```
lastModifiedTime ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    uTCTimeSyntax
  ::= {pilotAttributeType 23}
```

9.3.20. Last Modified By

The Last Modified By attribute specifies the distinguished name of the last user to modify the associated entry. Ideally, this attribute should be maintained by the DSA.

```
lastModifiedBy ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
```

```
::= {pilotAttributeType 24}
```

9.3.21. Domain Component

The Domain Component attribute type specifies a DNS/NRS domain. For example, "uk" or "ac".

```
domainComponent ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
  SINGLE VALUE
 ::= {pilotAttributeType 25}
```

9.3.22. DNS ARecord

The A Record attribute type specifies a type A (Address) DNS resource record [6] [7].

```
aRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 26}
```

9.3.23. MX Record

The MX Record attribute type specifies a type MX (Mail Exchange) DNS resource record [6] [7].

```
mXRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 28}
```

9.3.24. NS Record

The NS Record attribute type specifies an NS (Name Server) DNS resource record [6] [7].

```
nSRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 29}
```

9.3.25. SOA Record

The SOA Record attribute type specifies a type SOA (Start of Authority) DNS resource record [6] [7].

```

sOARRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
  ::= {pilotAttributeType 30}

```

9.3.26. CNAME Record

The CNAME Record attribute type specifies a type CNAME (Canonical Name) DNS resource record [6] [7].

```

cNAMERecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    ia5StringSyntax
  ::= {pilotAttributeType 31}

```

9.3.27. Associated Domain

The Associated Domain attribute type specifies a DNS or NRS domain which is associated with an object in the DIT. For example, the entry in the DIT with a distinguished name "C=GB, O=University College London" would have an associated domain of "UCL.AC.UK". Note that all domains should be represented in rfc822 order. See [3] for more details of usage of this attribute.

```

associatedDomain ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
  ::= {pilotAttributeType 37}

```

9.3.28. Associated Name

The Associated Name attribute type specifies an entry in the organisational DIT associated with a DNS/NRS domain. See [3] for more details of usage of this attribute.

```

associatedName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
  ::= {pilotAttributeType 38}

```

9.3.29. Home postal address

The Home postal address attribute type specifies a home postal address for an object. This should be limited to up to 6 lines of 30 characters each.

```

homePostalAddress ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX

```

```

        postalAddress
        MATCHES FOR EQUALITY
 ::= {pilotAttributeType 39}

```

9.3.30. Personal Title

The Personal Title attribute type specifies a personal title for a person. Examples of personal titles are "Ms", "Dr", "Prof" and "Rev".

```

personalTitle ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-personal-title))
 ::= {pilotAttributeType 40}

```

9.3.31. Mobile Telephone Number

The Mobile Telephone Number attribute type specifies a mobile telephone number associated with a person. Attribute values should follow the agreed format for international telephone numbers: i.e., "+44 71 123 4567".

```

mobileTelephoneNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    telephoneNumberSyntax
 ::= {pilotAttributeType 41}

```

9.3.32. Pager Telephone Number

The Pager Telephone Number attribute type specifies a pager telephone number for an object. Attribute values should follow the agreed format for international telephone numbers: i.e., "+44 71 123 4567".

```

pagerTelephoneNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    telephoneNumberSyntax
 ::= {pilotAttributeType 42}

```

9.3.33. Friendly Country Name

The Friendly Country Name attribute type specifies names of countries in human readable format. The standard attribute country name must be one of the two-letter codes defined in ISO 3166.

```

friendlyCountryName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
 ::= {pilotAttributeType 43}

```

9.3.34. Unique Identifier

The Unique Identifier attribute type specifies a "unique identifier" for an object represented in the Directory. The domain within which the identifier is unique, and the exact semantics of the identifier, are for local definition. For a person, this might be an institution-wide payroll number. For an organisational unit, it might be a department code.

```
uniqueIdentifier ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-unique-identifier))
  ::= {pilotAttributeType 44}
```

9.3.35. Organisational Status

The Organisational Status attribute type specifies a category by which a person is often referred to in an organisation. Examples of usage in academia might include undergraduate student, researcher, lecturer, etc.

A Directory administrator should probably consider carefully the distinctions between this and the title and userClass attributes.

```
organizationalStatus ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-organizational-status))
  ::= {pilotAttributeType 45}
```

9.3.36. Janet Mailbox

The Janet Mailbox attribute type specifies an electronic mailbox attribute following the syntax specified in the Grey Book of the Coloured Book series. This attribute is intended for the convenience of U.K users unfamiliar with rfc822 and little-endian mail addresses. Entries using this attribute MUST also include an rfc822Mailbox attribute.

```
janetMailbox ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
    (SIZE (1 .. ub-janet-mailbox))
  ::= {pilotAttributeType 46}
```

9.3.37. Mail Preference Option

An attribute to allow users to indicate a preference for inclusion of their names on mailing lists (electronic or physical). The absence of such an attribute should be interpreted as if the attribute was present with value "no-list-inclusion". This attribute should be interpreted by anyone using the directory to derive mailing lists, and its value respected.

```
mailPreferenceOption ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX ENUMERATED {
    no-list-inclusion(0),
    any-list-inclusion(1), -- may be added to any lists
    professional-list-inclusion(2)
                                -- may be added to lists
                                -- which the list provider
                                -- views as related to the
                                -- users professional inter-
                                -- ests, perhaps evaluated
                                -- from the business of the
                                -- organisation or keywords
                                -- in the entry.
  }
 ::= {pilotAttributeType 47}
```

9.3.38. Building Name

The Building Name attribute type specifies the name of the building where an organisation or organisational unit is based.

```
buildingName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-building-name))
 ::= {pilotAttributeType 48}
```

9.3.39. DSA Quality

The DSA Quality attribute type specifies the purported quality of a DSA. It allows a DSA manager to indicate the expected level of availability of the DSA. See [8] for details of the syntax.

```
dSAQuality ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX DSAQualitySyntax
  SINGLE VALUE
 ::= {pilotAttributeType 49}
```


9.3.40. Single Level Quality

The Single Level Quality attribute type specifies the purported data quality at the level immediately below in the DIT. See [8] for details of the syntax.

```
singleLevelQuality ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX DataQualitySyntax
  SINGLE VALUE
  ::= {pilotAttributeType 50}
```

9.3.41. Subtree Minimum Quality

The Subtree Minimum Quality attribute type specifies the purported minimum data quality for a DIT subtree. See [8] for more discussion and details of the syntax.

```
subtreeMinimumQuality ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX DataQualitySyntax
  SINGLE VALUE
  -- Defaults to singleLevelQuality
  ::= {pilotAttributeType 51}
```

9.3.42. Subtree Maximum Quality

The Subtree Maximum Quality attribute type specifies the purported maximum data quality for a DIT subtree. See [8] for more discussion and details of the syntax.

```
subtreeMaximumQuality ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX DataQualitySyntax
  SINGLE VALUE
  -- Defaults to singleLevelQuality
  ::= {pilotAttributeType 52}
```

9.3.43. Personal Signature

The Personal Signature attribute type allows for a representation of a person's signature. This should be encoded in G3 fax as explained in recommendation T.4, with an ASN.1 wrapper to make it compatible with an X.400 BodyPart as defined in X.420.

```
IMPORT G3FacsimileBodyPart FROM { mhs-motis ipms modules
  information-objects }
```

```
personalSignature ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
  CHOICE {
```

```

        g3-facsimile [3] G3FacsimileBodyPart
    }
    (SIZE (1 .. ub-personal-signature))
 ::= {pilotAttributeType 53}

```

9.3.44. DIT Redirect

The DIT Redirect attribute type is used to indicate that the object described by one entry now has a newer entry in the DIT. The entry containing the redirection attribute should be expired after a suitable grace period. This attribute may be used when an individual changes his/her place of work, and thus acquires a new organisational DN.

```

dITRedirect ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
 ::= {pilotAttributeType 54}

```

9.3.45. Audio

The Audio attribute type allows the storing of sounds in the Directory. The attribute uses a u-law encoded sound file as used by the "play" utility on a Sun 4. This is an interim format.

```

audio ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    Audio
    (SIZE (1 .. ub-audio))
 ::= {pilotAttributeType 55}

```

9.3.46. Publisher of Document

The Publisher of Document attribute is the person and/or organization that published a document.

```

documentPublisher ATTRIBUTE
  WITH ATTRIBUTE SYNTAX caseIgnoreStringSyntax
 ::= {pilotAttributeType 56}

```

9.4. Generally useful syntaxes

```

caseIgnoreIA5StringSyntax ATTRIBUTE-SYNTAX
  IA5String
  MATCHES FOR EQUALITY SUBSTRINGS

```

```
IA5StringSyntax ATTRIBUTE-SYNTAX
  IA5String
  MATCHES FOR EQUALITY SUBSTRINGS
```

-- Syntaxes to support the DNS attributes

```
DNSRecordSyntax ATTRIBUTE-SYNTAX
  IA5String
  MATCHES FOR EQUALITY
```

```
NRSInformationSyntax ATTRIBUTE-SYNTAX
  NRSInformation
  MATCHES FOR EQUALITY
```

```
NRSInformation ::= SET {
    [0] Context,
    [1] Address-space-id,
    routes [2] SEQUENCE OF SEQUENCE {
      Route-cost,
      Addressing-info }
  }
```

9.5. Upper bounds on length of attribute values

```
ub-document-identifier INTEGER ::= 256
```

```
ub-document-location INTEGER ::= 256
```

```
ub-document-title INTEGER ::= 256
```

```
ub-document-version INTEGER ::= 256
```

```
ub-favourite-drink INTEGER ::= 256
```

```
ub-host INTEGER ::= 256
```

```
ub-information INTEGER ::= 2048
```

```
ub-unique-identifier INTEGER ::= 256
```

```
ub-personal-title INTEGER ::= 256
```

```
ub-photo INTEGER ::= 250000
```

ub-rfc822-mailbox INTEGER ::= 256
ub-room-number INTEGER ::= 256
ub-text-or-address INTEGER ::= 256
ub-user-class INTEGER ::= 256
ub-user-identifier INTEGER ::= 256
ub-organizational-status INTEGER ::= 256
ub-janet-mailbox INTEGER ::= 256
ub-building-name INTEGER ::= 256
ub-personal-signature ::= 50000
ub-audio INTEGER ::= 250000

References

- [1] CCITT/ISO, "X.500, The Directory - overview of concepts, models and services, CCITT /ISO IS 9594.
- [2] Kille, S., "The THORN and RARE X.500 Naming Architecture, in University College London, Department of Computer Science Research Note 89/48, May 1989.
- [3] Kille, S., "X.500 and Domains", RFC 1279, University College London, November 1991.
- [4] Rose, M., "PSI/NYSERNet White Pages Pilot Project: Status Report", Technical Report 90-09-10-1, published by NYSErNet Inc, 1990.
- [5] Craigie, J., "UK Academic Community Directory Service Pilot Project, pp. 305-310 in Computer Networks and ISDN Systems 17 (1989), published by North Holland.
- [6] Mockapetris, P., "Domain Names - Concepts and Facilities", RFC 1034, USC/Information Sciences Institute, November 1987.
- [7] Mockapetris, P., "Domain Names - Implementation and Specification, RFC 1035, USC/Information Sciences Institute, November 1987.
- [8] Kille, S., "Handling QOS (Quality of service) in the

Directory," publication in process, March 1991.

APPENDIX A - Object Class and Attribute Type proformas

These are specified in BNF. First some useful definitions, common to both proformas.

```
EOL ::= -- the end of line character(s)

BlankLine ::= -- a line consisting solely of an EOL character

String ::= <anychar> | <String> <anychar>

anychar ::= --any character occurring in general text, excluding
           -- the end of line character

lString ::= <lowercase> <otherstring>

lowercase ::= [a-z]

UString ::= <uppercase> <otherstring>

uppercase ::= [A-Z]

otherstring ::= <otherchar> | <otherstring> <otherchar>

otherchar ::= <lowercase> | <uppercase> | <digit>

Integer ::= <digit> | <Integer> <digit>

digit ::= [0-9]
```

1. Object Class

```
OCProforma ::= <ObjectClassName> <BlankLine> <Description> \
              <BlankLine> <OCMacro>

ObjectClassName ::= "ObjectClass:" <String> <EOL>

Description ::= "Description:" <DescriptiveText> <EOL>

DescriptiveText ::= <String> | <DescriptiveText> <EOL> <String>

OCMacro ::= "ASN1OCMacro:" <ObjectClassMacro>

-- The definition of ObjectClassMacro is adapted from
-- that given in X.501
```

```

ObjectClassMacro ::= <OCName> "OBJECT-CLASS" <SubclassOf> \
                    <MandatoryAttributes> <OptionalAttributes>

OCName ::= <lString>

SubclassOf ::= "SUBCLASS OF" Subclasses | <empty>

Subclasses ::= <Subclass> | <Subclass> "," <Subclasses>

Subclass ::= <OCName>

MandatoryAttributes ::= "MUST CONTAIN {" <Attributes> "}" \
                        | <empty>
OptionalAttributes ::= "MAY CONTAIN {" <Attributes> "}" | <empty>

Attributes ::= <AttributeTerm> | <AttributeTerm> "," <Attributes>

AttributeTerm ::= <Attribute> | <AttributeSet>

Attribute ::= <lString>

AttributeSet ::= <lString>

```

2. Attribute Type

```

ATProforma ::= <AttributeTypeName> <BlankLine> <Description> \
              <BlankLine> <OCMust> <Blankline> <OCMay> \
              <BlankLine> <ATMacro>

AttributeTypeName ::= "Attribute Type:" <String> <EOL>

Description ::= "Description:" <DescriptiveText> <EOL>

DescriptiveText ::= <String> | <DescriptiveText> <EOL> <String>

OCMust ::= "OCMust:" <OCList> <EOL>

OCList ::= <OCName> | <OCList> "," <OCName> | <empty>

OCMay ::= "OCMay:" <OCList> <EOL>

ATMacro ::= "ASN1ATMacro:" <AttributeTypeMacro>

-- The definition of AttributeTypeMacro is adapted from that
-- given in X.501

AttributeTypeMacro ::= <ATname> "ATTRIBUTE" <AttributeSyntax> \

```

```

        <Multivalued> | <empty>

ATName ::= <lString>

AttributeSyntax ::= "WITH ATTRIBUTE SYNTAX" SyntaxChoice

SyntaxChoice ::= <Syntax> <Constraint> | <ASN1Type> <MatchTypes>

Syntax ::= <lString>

Constraint ::= "(" ConstraintAlternative ")" | <empty>

ConstraintAlternative ::= StringConstraint | IntegerConstraint

StringConstraint ::= "SIZE" "(" SizeConstraint ")"

SizeConstraint ::= SingleValue | Range

SingleValue ::= <Integer>

Range ::= <Integer> ".." <Integer>

IntegerConstraint ::= Range

ASN1Type ::= <UString>
-- one of ASN.1's base types: e.g. PrintableString,
-- NumericString, etc.

MatchTypes ::= "MATCHES FOR" Matches | <empty>

Matches ::= Match | Matches Match

Match ::= "EQUALITY" | "SUBSTRINGS" | "ORDERING"

Multivalued ::= "SINGLE VALUE" | "MULTI VALUE" | <empty>

```

APPENDIX B - Format checking tools

This section includes the source for format checking tools for the two proformas. The tools are written as Bourne shell scripts for UNIX systems.

1. Object class format checker

```

sed 's/ *: */:/' |
awk '
BEGIN {

```

```

        state = "initial"
    }
/^$/ {
    next
}
/^Object Class:/ {
    n = index($0, ":")
    if (state != "initial")
    {
        print "Already got object class " oc
        print "Got another object class " substr($0, n+1)
        state = "notOK"
        exit 1
    }
    oc = substr($0, n+1)
    state = "gotOC"
    next
}
/^Description:/ {
    n = index($0, ":")
    if (state != "gotOC")
    {
        print "Got Description: " substr($0, n+1)
        for (i = 0; i < 2 && getline > 0; i++)
        {
            print $0
            print "..."
            if (state == "initial")
                print "Expecting Object Class:"
            else
                print "Expecting ASN1OCMacro:"
            state = "notOK"
            exit 1
        }
        while (getline > 0)
            if (length($0) > 0)
                continue
            else
                break
        state = "gotDesc"
        next
    }
}
/^ASN1OCMacro:/ {
    n = index($0, ":")
    if (state != "gotDesc")

```



```

    {
        print "Got ASN1Macro: " substr($0, n+1)
        for (i = 0; i < 2 && getline > 0; i++)
            print $0
        print "..."
        if (state == "initial")
            print "Expecting Object Class:"
        else
            print "Expecting Description:"
        state = "notOK"
        exit 1
    }
    state = "OK"
    exit 0
}

{
    print "Parsing has got confused on seeing line: " $0
    state = "notOK"
    exit 1
}

END {
    if (state == "OK")
        print "Input looks OK"
}

```

2. Attribute Type format checker

```

sed 's/ *: */:/' |
awk '
BEGIN {
    state = "initial"
}

/^$/ {
    next
}

/^Attribute Type:/ {
    n = index($0, ":")
    if (state != "initial")
    {
        got = "Attribute Type:"
        exit 1
    }
}

```

```
        state = "gotAT"
        next
    }
/^Description:/ {
    n = index($0, ":")
    if (state != "gotAT")
    {
        got = "Description:"
        exit 1
    }
    while (getline > 0)
        if (length($0) > 0)
            continue
        else
            break
    state = "gotDesc"
    next
}

/^OCMust:/ {
    n = index($0, ":")
    if (state != "gotDesc")
    {
        got = "OCMust:"
        exit 1
    }
    state = "gotOCMust"
    next
}

/^OCMay:/ {
    n = index($0, ":")
    if (state != "gotOCMust")
    {
        got = "OCMay:"
        exit 1
    }
    state = "gotOCMay"
    next
}

/^ASN1ATMacro:/ {
    n = index($0, ":")
    if (state != "gotOCMay")
    {
        got = "ASN1ATMacro:"
        exit 1
    }
}
```

```

    }
    state = "OK"
    exit 0
}
{
    print "Parsing has got confused on seeing line: " $0
    state = "notOK"
    exit 1
}
END {
    if (state == "initial")
        print "Expecting Attribute Type:"
    else if (state == "gotAT")
        print "Expecting Description:"
    else if (state == "gotDesc")
        print "Expecting OCMust:"
    else if (state == "gotOCMust")
        print "Expecting OCMay:"
    else if (state == "gotOCMay")
        print "Expecting ASN1ATMacro:"
    if (state != "OK")
        print "Got " got
    else
        print "Input looks OK"
}

```

APPENDIX C - Summary of all Object Classes and Attribute Types

-- Some Important Object Identifiers

```

data OBJECT IDENTIFIER ::= {ccitt 9}
pss OBJECT IDENTIFIER ::= {data 2342}
ucl OBJECT IDENTIFIER ::= {pss 19200300}
pilot OBJECT IDENTIFIER ::= {ucl 100}

pilotAttributeType OBJECT IDENTIFIER ::= {pilot 1}
pilotAttributeSyntax OBJECT IDENTIFIER ::= {pilot 3}
pilotObjectClass OBJECT IDENTIFIER ::= {pilot 4}
pilotGroups OBJECT IDENTIFIER ::= {pilot 10}

ia5StringSyntax OBJECT IDENTIFIER ::= {pilotAttributeSyntax 4}
caseIgnoreIA5StringSyntax OBJECT IDENTIFIER ::=
    {pilotAttributeSyntax 5}

```

```
-- Standard Object Classes
```

```
top OBJECT-CLASS
```

```
  MUST CONTAIN {  
    objectClass}
```

```
::= {objectClass 0}
```

```
alias OBJECT-CLASS
```

```
  SUBCLASS OF top  
  MUST CONTAIN {  
    aliasedObjectName}
```

```
::= {objectClass 1}
```

```
country OBJECT-CLASS
```

```
  SUBCLASS OF top  
  MUST CONTAIN {  
    countryName}
```

```
  MAY CONTAIN {  
    description,  
    searchGuide}
```

```
::= {objectClass 2}
```

```
locality OBJECT-CLASS
```

```
  SUBCLASS OF top  
  MAY CONTAIN {  
    description,  
    localityName,  
    stateOrProvinceName,  
    searchGuide,  
    seeAlso,  
    streetAddress}
```

```
::= {objectClass 3}
```

```
organization OBJECT-CLASS
```

```
  SUBCLASS OF top  
  MUST CONTAIN {  
    organizationName}
```

```
  MAY CONTAIN {  
    organizationalAttributeSet}
```

```
::= {objectClass 4}
```

```
organizationalUnit OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    organizationalUnitName}
  MAY CONTAIN {
    organizationalAttributeSet}
  ::= {objectClass 5}

person OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName,
    surname}
  MAY CONTAIN {
    description,
    seeAlso,
    telephoneNumber,
    userPassword}
  ::= {objectClass 6}

organizationalPerson OBJECT-CLASS
  SUBCLASS OF person
  MAY CONTAIN {
    localeAttributeSet,
    organizationalUnitName,
    postalAttributeSet,
    telecommunicationAttributeSet,
    title}
  ::= {objectClass 7}

organizationalRole OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName}
  MAY CONTAIN {
    description,
    localeAttributeSet,
    organizationalUnitName,
    postalAttributeSet,
    preferredDeliveryMethod,
    roleOccupant,
    seeAlso,
    telecommunicationAttributeSet}
  ::= {objectClass 8}
```

```
groupOfNames OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName,
    member}
  MAY CONTAIN {
    description,
    organizationName,
    organizationalUnitName,
    owner,
    seeAlso,
    businessCategory}
 ::= {objectClass 9}
```

```
residentialPerson OBJECT-CLASS
  SUBCLASS OF person
  MUST CONTAIN {
    localityName}
  MAY CONTAIN {
    localeAttributeSet,
    postalAttributeSet,
    preferredDeliveryMethod,
    telecommunicationAttributeSet,
    businessCategory}
 ::= {objectClass 10}
```

```
applicationProcess OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName}
  MAY CONTAIN {
    description,
    localityName,
    organizationalUnitName,
    seeAlso}
 ::= {objectClass 11}
```

```
applicationEntity OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    commonName,
    presentationAddress}
  MAY CONTAIN {
    description,
    localityName,
```

```
        organizationName,  
        organizationalUnitName,  
        seeAlso,  
        supportedApplicationContext}  
 ::= {objectClass 12}
```

```
dSA OBJECT-CLASS  
  SUBCLASS OF applicationEntity  
  MAY CONTAIN {  
    knowledgeInformation}  
 ::= {objectClass 13}
```

```
device OBJECT-CLASS  
  SUBCLASS OF top  
  MUST CONTAIN {  
    commonName}  
  MAY CONTAIN {  
    description,  
    localityName,  
    organizationName,  
    organizationalUnitName,  
    owner,  
    seeAlso,  
    serialNumber}  
 ::= {objectClass 14}
```

```
strongAuthenticationUser OBJECT-CLASS  
  SUBCLASS OF top  
  MUST CONTAIN {  
    userCertificate}  
 ::= {objectClass 15}
```

```
certificationAuthority OBJECT-CLASS  
  SUBCLASS OF top  
  MUST CONTAIN {  
    cACertificate,  
    certificateRevocationList,  
    authorityRevocationList}  
  MAY CONTAIN {  
    crossCertificatePair}  
 ::= {objectClass 16}
```

-- Standard MHS Object Classes

mhsDistributionList OBJECT-CLASS

```
SUBCLASS OF top
MUST CONTAIN {
    commonName,
    mhsDLSubmitPermissions,
    mhsORAddresses}
MAY CONTAIN {
    description,
    organizationName,
    organizationalUnitName,
    owner,
    seeAlso,
    mhsDeliverableContentTypes,
    mhsdeliverableEits,
    mhsDLMembers,
    mhsPreferredDeliveryMethods}
::= {mhsObjectClass 0}
```

mhsMessageStore OBJECT-CLASS

```
SUBCLASS OF applicationEntity
MAY CONTAIN {
    description,
    owner,
    mhsSupportedOptionalAttributes,
    mhsSupportedAutomaticActions,
    mhsSupportedContentTypes}
::= {mhsObjectClass 1}
```

mhsMessageTransferAgent OBJECT-CLASS

```
SUBCLASS OF applicationEntity
MAY CONTAIN {
    description,
    owner,
    mhsDeliverableContentLength}
::= {mhsObjectClass 2}
```

mhsOrganizationalUser OBJECT-CLASS

```
SUBCLASS OF organizationalPerson
MUST CONTAIN {
    mhsORAddresses}
MAY CONTAIN {
    mhsDeliverableContentLength,
    mhsDeliverableContentTypes,
```



```
        mhsDeliverableEits,  
        mhsMessageStoreName,  
        mhsPreferredDeliveryMethods }  
 ::= {mhsObjectClass 3}
```

```
mhsResidentialUser OBJECT-CLASS  
  SUBCLASS OF residentialPerson  
  MUST CONTAIN {  
    mhsORAddresses}  
  MAY CONTAIN {  
    mhsDeliverableContentLength,  
    mhsDeliverableContentTypes,  
    mhsDeliverableEits,  
    mhsMessageStoreName,  
    mhsPreferredDeliveryMethods }  
 ::= {mhsObjectClass 4}
```

```
mhsUserAgent OBJECT-CLASS  
  SUBCLASS OF applicationEntity  
  MAY CONTAIN {  
    mhsDeliverableContentLength,  
    mhsDeliverableContentTypes,  
    mhsDeliverableEits,  
    mhsORAddresses,  
    owner}  
 ::= {mhsObjectClass 5}
```

-- Pilot Object Classes

```
pilotObject OBJECT-CLASS  
  SUBCLASS OF top  
  MAY CONTAIN {  
    info,  
    photo,  
    manager,  
    uniqueIdentifier,  
    lastModifiedTime,  
    lastModifiedBy,  
    dITRedirect,  
    audio}  
 ::= {pilotObjectClass 3}
```

```
pilotPerson OBJECT-CLASS
  SUBCLASS OF person
  MAY CONTAIN {
    userid,
    textEncodedORAddress,
    rfc822Mailbox,
    favouriteDrink,
    roomNumber,
    userClass,
    homeTelephoneNumber,
    homePostalAddress,
    secretary,
    personalTitle,
    preferredDeliveryMethod,
    businessCategory,
    janetMailbox,
    otherMailbox,
    mobileTelephoneNumber,
    pagerTelephoneNumber,
    organizationalStatus,
    mailPreferenceOption,
    personalSignature}
 ::= {pilotObjectClass 4}
```

```
account OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    userid}
  MAY CONTAIN {
    description,
    seeAlso,
    localityName,
    organizationName,
    organizationalUnitName,
    host}
 ::= {pilotObjectClass 5}
```

```
document OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    documentIdentifier}
  MAY CONTAIN {
    commonName,
    description,
    seeAlso,
    localityName,
```

```
    organizationName,  
    organizationalUnitName,  
    documentTitle,  
    documentVersion,  
    documentAuthor,  
    documentLocation,  
    documentPublisher}  
 ::= {pilotObjectClass 6}
```

```
room OBJECT-CLASS  
  SUBCLASS OF top  
  MUST CONTAIN {  
    commonName}  
  MAY CONTAIN {  
    roomNumber,  
    description,  
    seeAlso,  
    telephoneNumber}  
 ::= {pilotObjectClass 7}
```

```
documentSeries OBJECT-CLASS  
  SUBCLASS OF top  
  MUST CONTAIN {  
    commonName}  
  MAY CONTAIN {  
    description,  
    seeAlso,  
    telephoneNumber,  
    localityName,  
    organizationName,  
    organizationalUnitName}  
 ::= {pilotObjectClass 9}
```

```
domain OBJECT-CLASS  
  SUBCLASS OF top  
  MUST CONTAIN {  
    domainComponent}  
  MAY CONTAIN {  
    associatedName,  
    organizationName,  
    organizationalAttributeSet}  
 ::= {pilotObjectClass 13}
```

```
rFC822localPart OBJECT-CLASS
  SUBCLASS OF domain
  MAY CONTAIN {
    commonName,
    surname,
    description,
    seeAlso,
    telephoneNumber,
    postalAttributeSet,
    telecommunicationAttributeSet}
  ::= {pilotObjectClass 14}

dNSDomain OBJECT-CLASS
  SUBCLASS OF domain
  MAY CONTAIN {
    ARecord,
    MRecord,
    MXRecord,
    NSRecord,
    SOARRecord,
    CNAMERRecord}
  ::= {pilotObjectClass 15}

domainRelatedObject OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    associatedDomain}
  ::= {pilotObjectClass 17}

friendlyCountry OBJECT-CLASS
  SUBCLASS OF country
  MUST CONTAIN {
    friendlyCountryName}
  ::= {pilotObjectClass 18}

simpleSecurityObject OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    userPassword }
  ::= {pilotObjectClass 19}

pilotOrganization OBJECT-CLASS
  SUBCLASS OF organization, organizationalUnit
```

```
    MAY CONTAIN {
        buildingName}
 ::= {pilotObjectClass 20}
```

```
pilotDSA OBJECT-CLASS
  SUBCLASS OF dsa
  MUST CONTAIN {
    dSAQuality}
 ::= {pilotObjectClass 21}
```

```
qualityLabelledData OBJECT-CLASS
  SUBCLASS OF top
  MUST CONTAIN {
    dSAQuality}
  MAY CONTAIN {
    subtreeMinimumQuality,
    subtreeMaximumQuality}
 ::= {pilotObjectClass 22}
```

-- Standard Attribute Types

```
objectClass ObjectClass
 ::= {attributeType 0}
```

```
aliasedObjectName AliasedObjectName
 ::= {attributeType 1}
```

```
knowledgeInformation ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX caseIgnoreString
 ::= {attributeType 2}
```

```
commonName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax
  (SIZE (1..ub-common-name))
 ::= {attributeType 3}
```

```
surname ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax
  (SIZE (1..ub-surname))
```

```
::= {attributeType 4}
```

```
serialNumber ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX printableStringSyntax  
  (SIZE (1..ub-serial-number))  
  ::= {attributeType 5}
```

```
countryName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX PrintableString  
  (SIZE (1..ub-country-code))  
  SINGLE VALUE  
  ::= {attributeType 6}
```

```
localityName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-locality-name))  
  ::= {attributeType 7}
```

```
stateOrProvinceName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-state-name))  
  ::= {attributeType 8}
```

```
streetAddress ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-street-address))  
  ::= {attributeType 9}
```

```
organizationName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-organization-name))  
  ::= {attributeType 10}
```

```
organizationalUnitName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-organizational-unit-name))  
  ::= {attributeType 11}
```

```
title ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax
```

```
(SIZE (1..ub-title))  
 ::= {attributeType 12}
```

```
description ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-description))  
  ::= {attributeType 13}
```

```
searchGuide ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX Guide  
  ::= {attributeType 14}
```

```
businessCategory ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-business-category))  
  ::= {attributeType 15}
```

```
postalAddress ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX PostalAddress  
  MATCHES FOR EQUALITY  
  ::= {attributeType 16}
```

```
postalCode ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-postal-code))  
  ::= {attributeType 17}
```

```
postOfficeBox ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-post-office-box))  
  ::= {attributeType 18}
```

```
physicalDeliveryOfficeName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX caseIgnoreStringSyntax  
  (SIZE (1..ub-physical-office-name))  
  ::= {attributeType 19}
```

```
telephoneNumber ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX telephoneNumberSyntax  
  (SIZE (1..ub-telephone-number))
```

```
::= {attributeType 20}
```

```
telexNumber ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX TelexNumber  
  (SIZE (1..ub-telex))  
  ::= {attributeType 21}
```

```
teletexTerminalIdentifier ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX TeletexTerminalIdentifier  
  (SIZE (1..ub-teletex-terminal-id))  
  ::= {attributeType 22}
```

```
facsimileTelephoneNumber ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX FacsimileTelephoneNumber  
  ::= {attributeType 23}
```

```
x121Address ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX NumericString  
  (SIZE (1..ub-x121-address))  
  ::= {attributeType 24}
```

```
internationaliSDNNumber ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX NumericString  
  (SIZE (1..ub-isdn-address))  
  ::= {attributeType 25}
```

```
registeredAddress ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX PostalAddress  
  ::= {attributeType 26}
```

```
destinationIndicator ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX PrintableString  
  (SIZE (1..ub-destination-indicator))  
  MATCHES FOR EQUALITY SUBSTRINGS  
  ::= {attributeType 27}
```

```
preferredDeliveryMethod ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX deliveryMethod  
  ::= {attributeType 28}
```



```
presentationAddress ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX PresentationAddress
  MATCHES FOR EQUALITY
  ::= {attributeType 29}

supportedApplicationContext ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX objectIdentifierSyntax
  ::= {attributeType 30}

member ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX distinguishedNameSyntax
  ::= {attributeType 31}

owner ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX distinguishedNameSyntax
  ::= {attributeType 32}

roleOccupant ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX distinguishedNameSyntax
  ::= {attributeType 33}

seeAlso ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX distinguishedNameSyntax
  ::= {attributeType 34}

userPassword ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX Userpassword
  ::= {attributeType 35}

userCertificate ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX UserCertificate
  ::= {attributeType 36}

cACertificate ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX cACertificate
  ::= {attributeType 37}

authorityRevocationList ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX AuthorityRevocationList
```

```
::= {attributeType 38}
```

```
certificateRevocationList ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX CertificateRevocationList  
  ::= {attributeType 39}
```

```
crossCertificatePair ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX CrossCertificatePair  
  ::= {attributeType 40}
```

```
-- Standard MHS Attribute Types
```

```
mhsDeliverableContentLength ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX integer  
  ::= {mhsAttributeType 0}
```

```
mhsDeliverableContentTypes ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX oID  
  ::= {mhsAttributeType 1}
```

```
mhsDeliverableEits ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX oID  
  ::= {mhsAttributeType 2}
```

```
mhsDLMembers ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX oRName  
  ::= {mhsAttributeType 3}
```

```
mhsDLSubmitPermissions ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX dLSubmitPermission  
  ::= {mhsAttributeType 4}
```

```
mhsMessageStoreName ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX dN  
  ::= {mhsAttributeType 5}
```

```
mhsORAddresses ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX oAddress
  ::= {mhsAttributeType 6}

mhsPreferredDeliveryMethods ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX deliveryMethod
  ::= {mhsAttributeType 7}

mhsSupportedAutomaticActions ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX oID
  ::= {mhsAttributeType 8}

mhsSupportedContentTypes ATTRIBUTE

  WITH ATTRIBUTE-SYNTAX oID
  ::= {mhsAttributeType 9}

mhsSupportedOptionalAttributes ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX oID
  ::= {mhsAttributeType 10}

-- Pilot Attribute Types

userid ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-user-identifier))
  ::= {pilotAttributeType 1}

textEncodedORAddress ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-text-encoded-or-address))
  ::= {pilotAttributeType 2}

rfc822Mailbox ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
    (SIZE (1 .. ub-rfc822-mailbox))
```

```
::= {pilotAttributeType 3}
```

```
info ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX  
    caseIgnoreStringSyntax  
    (SIZE (1 .. ub-information))  
 ::= {pilotAttributeType 4}
```

```
favouriteDrink ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX  
    caseIgnoreStringSyntax  
    (SIZE (1 .. ub-favourite-drink))  
 ::= {pilotAttributeType 5}
```

```
roomNumber ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX  
    caseIgnoreStringSyntax  
    (SIZE (1 .. ub-room-number))  
 ::= {pilotAttributeType 6}
```

```
photo ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX  
    CHOICE {  
      g3-facsimile [3] G3FacsimileBodyPart  
    }  
    (SIZE (1 .. ub-photo))  
 ::= {pilotAttributeType 7}
```

```
userClass ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX  
    caseIgnoreStringSyntax  
    (SIZE (1 .. ub-user-class))  
 ::= {pilotAttributeType 8}
```

```
host ATTRIBUTE  
  WITH ATTRIBUTE-SYNTAX  
    caseIgnoreStringSyntax  
    (SIZE (1 .. ub-host))  
 ::= {pilotAttributeType 9}
```

```
manager ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
  ::= {pilotAttributeType 10}

documentIdentifier ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-identifier))
  ::= {pilotAttributeType 11}

documentTitle ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-title))
  ::= {pilotAttributeType 12}

documentVersion ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-version))
  ::= {pilotAttributeType 13}

documentAuthor ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
  ::= {pilotAttributeType 14}

documentLocation ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-document-location))
  ::= {pilotAttributeType 15}

homeTelephoneNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    telephoneNumberSyntax
  ::= {pilotAttributeType 20}

secretary ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
```

```
        distinguishedNameSyntax
 ::= {pilotAttributeType 21}

otherMailbox ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    SEQUENCE {
        mailboxType PrintableString, -- e.g. Telemail
        mailbox IA5String -- e.g. X378:Joe
    }
 ::= {pilotAttributeType 22}

lastModifiedTime ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    uTCTimeSyntax
 ::= {pilotAttributeType 23}

lastModifiedBy ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
 ::= {pilotAttributeType 24}

domainComponent ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
    SINGLE VALUE
 ::= {pilotAttributeType 25}

aRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 26}

mXRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 28}

nSRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 29}
```

```
sOARRecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    DNSRecordSyntax
 ::= {pilotAttributeType 30}

cNAMERecord ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    ia5StringSyntax
 ::= {pilotAttributeType 31}

associatedDomain ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
 ::= {pilotAttributeType 37}

associatedName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
 ::= {pilotAttributeType 38}

homePostalAddress ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    postalAddress
    MATCHES FOR EQUALITY
 ::= {pilotAttributeType 39}

personalTitle ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-personal-title))
 ::= {pilotAttributeType 40}

mobileTelephoneNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    telephoneNumberSyntax
 ::= {pilotAttributeType 41}

pagerTelephoneNumber ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    telephoneNumberSyntax
 ::= {pilotAttributeType 42}
```

```

friendlyCountryName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
 ::= {pilotAttributeType 43}

uniqueIdentifier ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-unique-identifier))
 ::= {pilotAttributeType 44}

organizationalStatus ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-organizational-status))
 ::= {pilotAttributeType 45}

janetMailbox ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreIA5StringSyntax
    (SIZE (1 .. ub-janet-mailbox))
 ::= {pilotAttributeType 46}

mailPreferenceOption ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX ENUMERATED {
    no-list-inclusion(0),
    any-list-inclusion(1), -- may be added to any lists
    professional-list-inclusion(2)
                                -- may be added to lists
                                -- which the list provider
                                -- views as related to the
                                -- users professional inter-
                                -- ests, perhaps evaluated
                                -- from the business of the
                                -- organisation or keywords
                                -- in the entry.
  }
 ::= {pilotAttributeType 47}

buildingName ATTRIBUTE
  WITH ATTRIBUTE-SYNTAX
    caseIgnoreStringSyntax
    (SIZE (1 .. ub-building-name))

```



```
::= {pilotAttributeType 48}

dSAQuality ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX DSAQualitySyntax
    SINGLE VALUE
 ::= {pilotAttributeType 49}

singleLevelQuality ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX DataQualitySyntax
    SINGLE VALUE

subtreeMinimumQuality ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX DataQualitySyntax
    SINGLE VALUE
    -- Defaults to singleLevelQuality
 ::= {pilotAttributeType 51}

subtreeMaximumQuality ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX DataQualitySyntax
    SINGLE VALUE
    -- Defaults to singleLevelQuality
 ::= {pilotAttributeType 52}

personalSignature ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX
    CHOICE {
        g3-facsimile [3] G3FacsimileBodyPart
    }
    (SIZE (1 .. ub-personal-signature))
 ::= {pilotAttributeType 53}

dITRedirect ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX
    distinguishedNameSyntax
 ::= {pilotAttributeType 54}

audio ATTRIBUTE
    WITH ATTRIBUTE-SYNTAX
    Audio
    (SIZE (1 .. ub-audio))
 ::= {pilotAttributeType 55}
```

```
documentPublisher ATTRIBUTE
    WITH ATTRIBUTE SYNTAX caseIgnoreStringSyntax
 ::= {pilotAttributeType 56}
```

```
-- Generally useful syntaxes
```

```
caseIgnoreIA5StringSyntax ATTRIBUTE-SYNTAX
    IA5String
    MATCHES FOR EQUALITY SUBSTRINGS
```

```
iA5StringSyntax ATTRIBUTE-SYNTAX
    IA5String
    MATCHES FOR EQUALITY SUBSTRINGS
```

```
-- Syntaxes to support the DNS attributes
```

```
DNSRecordSyntax ATTRIBUTE-SYNTAX
    IA5String
    MATCHES FOR EQUALITY
```

```
NRSInformationSyntax ATTRIBUTE-SYNTAX
    NRSInformation
    MATCHES FOR EQUALITY
```

```
NRSInformation ::= SET {
    [0] Context,
    [1] Address-space-id,
    routes [2] SEQUENCE OF SEQUENCE {
    Route-cost,
    Addressing-info }
}
```

-- Upper bounds on length of attribute values

ub-document-identifier INTEGER ::= 256
ub-document-location INTEGER ::= 256
ub-document-title INTEGER ::= 256
ub-document-version INTEGER ::= 256
ub-favourite-drink INTEGER ::= 256
ub-host INTEGER ::= 256
ub-information INTEGER ::= 2048
ub-unique-identifier INTEGER ::= 256
ub-personal-title INTEGER ::= 256
ub-photo INTEGER ::= 250000
ub-rfc822-mailbox INTEGER ::= 256
ub-room-number INTEGER ::= 256
ub-text-or-address INTEGER ::= 256
ub-user-class INTEGER ::= 256
ub-user-identifier INTEGER ::= 256
ub-organizational-status INTEGER ::= 256
ub-janet-mailbox INTEGER ::= 256
ub-building-name INTEGER ::= 256
ub-personal-signature ::= 50000
ub-audio INTEGER ::= 250000

Security Considerations

Security issues are not discussed in this memo.

10. Authors' Addresses

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