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INTERNATIONAL TELECOMMUNICATION UNION

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(11/93)

**DATA NETWORKS AND OPEN SYSTEM
COMMUNICATIONS
DIRECTORY**

**INFORMATION TECHNOLOGY –
OPEN SYSTEMS INTERCONNECTION –
THE DIRECTORY: SELECTED
ATTRIBUTE TYPES**

ITU-T Recommendation X.520

Superseded by a more recent version

(Previously "CCITT Recommendation")

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Foreword

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. Some 179 member countries, 84 telecom operating entities, 145 scientific and industrial organizations and 38 international organizations participate in ITU-T which is the body which sets world telecommunications standards (Recommendations).

The approval of Recommendations by the Members of ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, 1993). In addition, the World Telecommunication Standardization Conference (WTSC), which meets every four years, approves Recommendations submitted to it and establishes the study programme for the following period.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC. The text of ITU-T Recommendation X.520 was approved on 16th of November 1993. The identical text is also published as ISO/IEC International Standard.

NOTE

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

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ITU-T X-SERIES RECOMMENDATIONS

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

(February 1994)

ORGANIZATION OF X-SERIES RECOMMENDATIONS

Subject area	Recommendation series
PUBLIC DATA NETWORKS	
Services and facilities	X.1-X.19
Interfaces	X.20-X.49
Transmission, signalling and switching	X.50-X.89
Network aspects	X.90-X.149
Maintenance	X.150-X.179
Administrative arrangements	X.180-X.199
OPEN SYSTEMS INTERCONNECTION	
Model and notation	X.200-X.209
Service definitions	X.210-X.219
Connection-mode protocol specifications	X.220-X.229
Connectionless-mode protocol specifications	X.230-X.239
PICS proformas	X.240-X.259
Protocol identification	X.260-X.269
Security protocols	X.270-X.279
Layer managed objects	X.280-X.289
Conformance testing	X.290-X.299
INTERWORKING BETWEEN NETWORKS	
General	X.300-X.349
Mobile data transmission systems	X.350-X.369
Management	X.370-X.399
MESSAGE HANDLING SYSTEMS	X.400-X.499
DIRECTORY	X.500-X.599
OSI NETWORKING AND SYSTEM ASPECTS	
Networking	X.600-X.649
Naming, addressing and registration	X.650-X.679
Abstract Syntax Notation One (ASN.1)	X.680-X.699
OSI MANAGEMENT	X.700-X.799
SECURITY	X.800-X.849
OSI APPLICATIONS	
Commitment, concurrency and recovery	X.850-X.859
Transaction processing	X.860-X.879
Remote operations	X.880-X.899
OPEN DISTRIBUTED PROCESSING	X.900-X.999

Superseded by a more recent version

CONTENTS

	<i>Page</i>
1 Scope	1
2 Normative references.....	1
2.1 Identical Recommendations International Standards.....	1
2.2 Paired Recommendations International Standards equivalent in technical content.....	2
2.3 Other references	2
3 Definitions	2
4 Conventions	2
5 Definition of selected attribute types	3
5.1 System attribute types.....	3
5.2 Labeling attribute types	3
5.3 Geographical Attribute Types	5
5.4 Organizational attribute types.....	6
5.5 Explanatory attribute types.....	7
5.6 Postal Addressing attribute types	9
5.7 Telecommunications Addressing attribute types.....	10
5.8 Preferences attribute types.....	13
5.9 OSI Application attribute types	13
5.10 Relational attribute types.....	14
6 Definition of matching rules	15
6.1 String matching rules.....	15
6.2 Syntax-based matching rules	18
6.3 Time matching rules	20
6.4 First component matching rules	21
6.5 Word matching rules	21
Annex A – Selected attribute types in ASN.1	22
Annex B – Summary of attribute types.....	32
Annex C – Upper bounds	33
Annex D – Alphabetical index of attributes and matching rules	34
Annex E – Amendments and corrigenda	35

Superseded by a more recent version

Summary

This Recommendation | International Standard defines a number of attribute types and matching rules which may be found useful across a range of applications of the Directory. One particular use for many of the attributes defined is in the formation of names, particularly for the classes of object defined in Recommendation X.521.

Introduction

This Recommendation | International Standard, together with other Recommendations | International Standards, has been produced to facilitate the interconnection of information processing systems to provide directory services. A set of such systems, together with the directory information which they hold, can be viewed as an integrated whole, called the *Directory*. The information held by the Directory, collectively known as the Directory Information Base (DIB), is typically used to facilitate communication between, with or about objects such as application entities, people, terminals, and distribution lists.

The Directory plays a significant role in Open Systems Interconnection, whose aim is to allow, with a minimum of technical agreement outside of the interconnection standards themselves, the interconnection of information processing systems:

- from different manufacturers;
- under different managements;
- of different levels of complexity; and
- of different ages.

This Recommendation | International Standard defines a number of attribute types which may be found useful across a range of applications of the Directory, as well as a number of standard attribute syntaxes and matching rules. One particular use for many of the attributes defined herein is in the formation of names, particularly for the classes of object defined in ITU-T Rec. X.521 | ISO/IEC 9594-7.

This second edition technically revises and enhances, but does not replace, the first edition of this Recommendation | International Standard. Implementations may still claim conformance to the first edition.

This second edition (1993) specifies version 1 of the Directory service and protocols. The first edition (1988) also specifies version 1. Differences between the services and between the protocols defined in the two editions are accommodated using the rules of extensibility defined in the second edition (1993) of X.519 | ISO/IEC 9594-5.

Annex A, which is an integral part of this Recommendation | International Standard, provides the ASN.1 notation for the complete module which defines the attributes, attribute syntaxes, and matching rules.

Annex B, which is not an integral part of this Recommendation | International Standard, provides a table of attribute types, for easy reference.

Annex C, which is not an integral part of this Recommendation | International Standard, provides suggested upper bounds value constraints used in these Directory Specifications.

Annex D, which is not an integral part of this Recommendation | International Standard, lists alphabetically the attributes and matching rules defined in this Directory Specification.

Annex E, which is not an integral part of this Recommendation | International Standard, lists the amendments and defect reports that have been incorporated to form this edition of this Recommendation | International Standard.

: 1995 (E)

INTERNATIONAL STANDARD

CCITT RECOMMENDATION

**INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION –
THE DIRECTORY: SELECTED ATTRIBUTE TYPES**

SECTION 1 – GENERAL

1 Scope

This Recommendation | International Standard defines a number of attribute types and matching rules which may be found useful across a range of applications of the Directory.

Attribute types and matching rules fall into three categories, as described below.

Some attribute types and matching rules are used by a wide variety of applications or are understood and/or used by the Directory itself.

NOTE – It is recommended that an attribute type or matching rule defined in this document be used, in preference to the generation of a new one, whenever it is appropriate for the application.

Some attribute types and matching rules are internationally standardized, but are application-specific. These are defined in the standards associated with the application concerned.

Any administrative authority can define its own attribute types and matching rules for any purpose. These are not internationally standardized, and are available to others beyond the administrative authority which created them only by bilateral agreement.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard part. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent editions of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- ITU-T Recommendation X.500 (1993) | ISO/IEC 9594-1:1993, *Information technology – Open Systems Interconnection – The Directory: Overview of concepts, models and services.*
- ITU-T Recommendation X.501 (1993) | ISO/IEC 9594-2:1993, *Information technology – Open Systems Interconnection – The Directory: Models.*
- ITU-T Recommendation X.511 (1993) | ISO/IEC 9594-3:1993, *Information technology – Open Systems Interconnection – The Directory: Abstract service definition.*
- ITU-T Recommendation X.518 (1993) | ISO/IEC 9594-4:1993, *Information technology – Open Systems Interconnection – The Directory: Procedures for distributed operation.*
- ITU-T Recommendation X.519 (1993) | ISO/IEC 9594-5:1993, *Information technology – Open Systems Interconnection – The Directory: Protocol specifications.*
- ITU-T Recommendation X.521 (1993) | ISO/IEC 9594-7:1993, *Information technology – Open Systems Interconnection – The Directory: Selected object classes.*

- ITU-T Recommendation X.509 (1993) | ISO/IEC 9594-8:1993, *Information technology – Open Systems Interconnection – The Directory: Authentication framework.*
- ITU-T Recommendation X.525 (1993) | ISO/IEC 9594-9:1993, *Information technology – The Directory: Replication.*
- ITU-T Recommendation X.680 (1994) | ISO/IEC 8824-1:1994, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*
- ITU-T Recommendation X.681 (1994) | ISO/IEC 8824-2:1994, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*
- ITU-T Recommendation X.682 (1994) | ISO/IEC 8824-3:1994, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification.*
- ITU-T Recommendation X.683 (1994) | ISO/IEC 8824-4:1994, *Information technology – Abstract Syntax Notation One (ASN.1): Parametrization of ASN.1 specifications.*

2.2 Paired Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.200 (1988), *Reference Model of Open Systems Interconnection for CCITT Applications.*
ISO 7498:1984/Corr. 1: 1988, *Information Processing Systems – Open Systems Interconnection – Basic Reference Model.*

2.3 Other references

- CCITT Recommendation E.123 (1988), *Notation for National and International Telephone numbers.*
- CCITT Recommendation E.164 (1991), *Numbering plan for the ISDN era.*
- CCITT Recommendation F.1 (1992), *Operational provisions for the international public telegram service.*
- CCITT Recommendation F.200 (1992), *Teletex service.*
- CCITT Recommendation F.401 (1992), *Message handling services: Naming and addressing for public message handling services.*
- CCITT Recommendation T.30 (1993), *Procedures for document facsimile transmission in the general switched telephone network.*
- CCITT Recommendation T.61 (1993), *Character repertoire and coded character sets for the international teletex service.*
- CCITT Recommendation T.62 (1993), *Control procedures for teletex and Group 4 facsimile services.*
- CCITT Recommendation X.121 (1992), *International numbering plan for public data networks.*
- ISO 3166:1988, *Codes for the representation of names of countries.*

3 Definitions

For the purposes of this CCITT Recommendation | International Standard, the following definitions apply.

The following terms are defined in CCITT Rec. X.501 | ISO/IEC 9594-2:

- attribute type;*
- object class;*
- matching rule.*

4 Conventions

With minor exceptions this Directory Specification has been prepared according to the “Presentation of ITU-T/ISO/IEC common text” guidelines in the Guide for ITU-T and ISO/IEC JTC 1 Cooperation, March 1993.

The term “Directory Specification” (as in “this Directory Specification”) shall be taken to mean ITU-T Rec. X.520 | ISO/IEC 9594-6. The term “Directory Specifications” shall be taken to mean the X.500-Series Recommendations and all parts of ISO/IEC 9594.

: 1995 (E)

This Directory Specification uses the term “1988 edition systems” to refer to systems conforming to the previous (1988) edition of the Directory Specifications, i.e. the 1988 edition of the CCITT X.500-Series Recommendations and the ISO/IEC 9594:1990 edition. Systems conforming to the current Directory Specifications are referred to as “1993 edition systems”.

Attribute types and matching rules are defined in this Recommendation | International Standard by use of the **ATTRIBUTE** and **MATCHING-RULE** information object classes defined in ITU-T Rec. X.501 | ISO/IEC 9594-2.

Examples of the use of the attribute types are described using an informal notation, where attribute type and value pairs are represented by an acronym for the attribute type, followed by an equals sign (“=”), followed by the example value for the attribute.

SECTION 2 – SELECTED ATTRIBUTE TYPES

5 Definition of selected attribute types

This Directory Specification defines a number of attribute types which may be found useful across a range of applications of the Directory.

Many of the attributes defined in this Specification are based on a common ASN.1 syntax:

```
DirectoryString { INTEGER : maxSize } ::= CHOICE {
    teletexString          TeletexString (SIZE (1..maxSize)),
    printableString       PrintableString (SIZE (1..maxSize)),
    universalString       UniversalString (SIZE (1..maxSize)) }
```

Some implementations of the Directory do not support the last of these choices, and will not be able to generate, match, or display attributes having such a syntax.

5.1 System attribute types

5.1.1 Knowledge Information

The Knowledge Information attribute type specifies a human readable accumulated description of knowledge mastered by a specific DSA.

NOTE – This attribute is now obsolete.

```
knowledgeInformation ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-knowledge-information}
    EQUALITY MATCHING RULE caseIgnoreMatch
    ID                   id-at-knowledgeInformation }
```

5.2 Labeling attribute types

These attributes type are concerned with information about objects which has been explicitly associated with the objects by a labeling process.

5.2.1 Name

The *Name* attribute type is the attribute supertype from which string attribute types typically used for naming may be formed.

```
name ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-name}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-name }
```

5.2.2 Common Name

The *Common Name* attribute type specifies an identifier of an object. A Common Name is not a directory name; it is a (possibly ambiguous) name by which the object is commonly known in some limited scope (such as an organization) and conforms to the naming conventions of the country or culture with which it is associated.

An attribute value for common name is a string chosen either by the person or organization it describes or the organization responsible for the object it describes for devices and application entities. For example, a typical name of a person in an English-speaking country comprises a personal title (e.g. Mr., Ms, Rd, Professor, Sir, Lord), a first name, middle name(s), last name, generation qualifier (if any, e.g. Jr.) and decorations and awards (if any, e.g. QC).

Examples:

CN = "Mr. Robin Lachlan McLeod BSc(Hons) CEng MIEE";

CN = "Divisional Coordination Committee";

CN = "High Speed Modem".

Any variants should be associated with the named object as separate and alternative attribute values.

Other common variants should also be admitted, e.g. use of a middle name as a preferred first name; use of "Bill" in place of "William", etc.

```
commonName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-common-name}
  ID                   id-at-commonName }
```

5.2.3 Surname

The *Surname* attribute type specifies the linguistic construct which normally is inherited by an individual from the individual's parent or assumed by marriage, and by which the individual is commonly known.

An attribute value for Surname is a string, e.g. "McLeod".

```
surname ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                   id-at-surname }
```

5.2.4 Given Name

The *Given Name* attribute type specifies the linguistic construct which is normally given to an individual by the individual's parent, or is chosen by the individual, or by which the individual is commonly known.

An attribute value for Given Name is a string, e.g. "David", or "Jean Paul".

```
givenName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                   id-at-givenName }
```

5.2.5 Initials

The *Initials* attribute type contains the initials of some or all of an individual's names, but not the surname(s).

An attribute value for Initials is a string, e.g. "D" or "D." or "J.P.".

```
initials ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                   id-at-initials }
```

5.2.6 Generation Qualifier

The *Generation Qualifier* attribute type contains a string which is used to provide generation information to qualify an individual's name.

An attribute value for Generation Qualifier is a string, e.g. "Jr." or "II".

```
generationQualifier ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                   id-at-generationQualifier }
```

: 1995 (E)

5.2.7 Unique Identifier

The *Unique Identifier* attribute type specifies an identifier which may be used to distinguish between object references when a distinguished name has been reused. It may be, for example, an encoded object identifier, certificate, date, timestamp, or some other form of certification on the validity of the distinguished name.

An attribute value for Unique Identifier is a bit string.

```

uniqueIdentifier ATTRIBUTE ::= {
  WITH SYNTAX UniqueIdentifier
  EQUALITY MATCHING RULE bitStringMatch
  ID id-at-uniqueIdentifier }
UniqueIdentifier ::= BIT STRING

```

5.2.8 DN Qualifier

The *DN Qualifier* attribute type specifies disambiguating information to add to the relative distinguished name of an entry. It is intended to be used for entries held in multiple DSAs which would otherwise have the same name, and that its value be the same in a given DSA for all entries to which this information has been added.

```

dnQualifier ATTRIBUTE ::= {
  WITH SYNTAX PrintableString
  EQUALITY MATCHING RULE caseIgnoreMatch
  ORDERING MATCHING RULE caseIgnoreOrderingMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID id-at-dnQualifier }

```

5.2.9 Serial Number

The *Serial Number* attribute type specifies an identifier, the serial number of a device.

An attribute value for Serial Number is a printable string.

```

serialNumber ATTRIBUTE ::= {
  WITH SYNTAX PrintableString (SIZE (1..ub-serialNumber))
  EQUALITY MATCHING RULE caseIgnoreMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID id-at-serial-number }

```

5.3 Geographical Attribute Types

These attribute types are concerned with geographical positions or regions with which objects are associated.

5.3.1 Country Name

The *Country Name* attribute type specifies a country. When used as a component of a directory name, it identifies the country in which the named object is physically located or with which it is associated in some other important way.

An attribute value for country name is a string chosen from ISO 3166.

```

countryName ATTRIBUTE ::= {
  SUBTYPE OF name
  WITH SYNTAX PrintableString (SIZE (2)) -- IS 3166 codes only
  SINGLE VALUE TRUE
  ID id-at-countryName }

```

5.3.2 Locality Name

The *Locality Name* attribute type specifies a locality. When used as a component of a directory name, it identifies a geographical area or locality in which the named object is physically located or with which it is associated in some other important way.

An attribute value for Locality Name is a string, e.g. L = "Edinburgh".

```

localityName ATTRIBUTE ::= {
  SUBTYPE OF name
  WITH SYNTAX DirectoryString {ub-locality-name}
  ID id-at-localityName }

```

The *Collective Locality Name* attribute type specifies a locality name for a collection of entries.

```
collectiveLocalityName ATTRIBUTE ::= {
  SUBTYPE OF          localityName
  COLLECTIVE          TRUE
  ID                  id-at-collectiveLocalityName }
```

5.3.3 State or Province Name

The *State or Province Name* attribute type specifies a state or province. When used as a component of a directory name, it identifies a geographical subdivision in which the named object is physically located or with which it is associated in some other important way.

An attribute value for State or Province Name is a string, e.g. S = "Ohio".

```
stateOrProvinceName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-state-name}
  ID                  id-at-stateOrProvinceName }
```

The *Collective State or Province Name* attribute type specifies a state or province name for a collection of entries.

```
collectiveStateOrProvinceName ATTRIBUTE ::= {
  SUBTYPE OF          stateOrProvinceName
  COLLECTIVE          TRUE
  ID                  id-at-collectiveStateOrProvinceName }
```

5.3.4 Street Address

The *Street Address* attribute type specifies a site for the local distribution and physical delivery in a postal address, i.e. the street name, place, avenue, and the house number. When used as a component of a directory name, it identifies the street address at which the named object is located or with which it is associated in some other important way.

An attribute value for Street Address is a string, e.g. "Arnulfstraße 60".

```
streetAddress ATTRIBUTE ::= {
  WITH SYNTAX         DirectoryString {ub-street-address}
  EQUALITY MATCHING RULE caseIgnoreMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID                  id-at-streetAddress }
```

The *Collective Street Address* attribute type specifies a street address for a collection of entries.

```
collectiveStreetAddress ATTRIBUTE ::= {
  SUBTYPE OF          streetAddress
  COLLECTIVE          TRUE
  ID                  id-at-collectiveStreetAddress }
```

5.3.5 House Identifier

The *House Identifier* attribute type specifies a linguistic construct used to identify a particular building, for example a house number or house name relative to a street, avenue, town or city, etc.

An attribute value for House Identifier is a string, e.g. "14".

```
houseIdentifier ATTRIBUTE ::= {
  WITH SYNTAX         DirectoryString {ub-name}
  EQUALITY MATCHING RULE caseIgnoreMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID                  id-at-houseIdentifier }
```

5.4 Organizational attribute types

These attribute types are concerned with organizations and can be used to describe objects in terms of organizations with which they are associated.

: 1995 (E)

5.4.1 OrganizationName

The *OrganizationName* attribute type specifies an organization. When used as a component of a directory name it identifies an organization with which the named object is affiliated.

An attribute value for OrganizationName is a string chosen by the organization (e.g. O = “Scottish Telecommunications plc”). Any variants should be associated with the named Organization as separate and alternative attribute values.

```

organizationName ATTRIBUTE ::= {
  SUBTYPE OF                name
  WITH SYNTAX              DirectoryString {ub-organization-name}
  ID                       id-at-organizationName }

```

The *Collective Organization Name* attribute type specifies an organization name for a collection of entries.

```

collectiveOrganizationName ATTRIBUTE ::= {
  SUBTYPE OF                organizationName
  COLLECTIVE              TRUE
  ID                       id-at-collectiveOrganizationName }

```

5.4.2 Organizational Unit Name

The *Organizational Unit Name* attribute type specifies an organizational unit. When used as a component of a directory name it identifies an organizational unit with which the named object is affiliated.

The designated organizational unit is understood to be part of an organization designated by an OrganizationName attribute. It follows that if an Organizational Unit Name attribute is used in a directory name, it must be associated with an OrganizationName attribute.

An attribute value for Organizational Unit Name is a string chosen by the organization of which it is part (e.g. OU = “Technology Division”). Note that the commonly used abbreviation “TD” would be a separate and alternative attribute value.

Example:

O = “Scottel”, OU = “TD”

```

organizationalUnitName ATTRIBUTE ::= {
  SUBTYPE OF                name
  WITH SYNTAX              DirectoryString {ub-organizational-unit-name}
  ID                       id-at-organizationalUnitName }

```

The *Collective Organizational Unit Name* attribute type specifies an organizational unit name for a collection of entries.

```

collectiveOrganizationalUnitName ATTRIBUTE ::= {
  SUBTYPE OF                organizationalUnitName
  COLLECTIVE              TRUE
  ID                       id-at-collectiveOrganizationalUnitName }

```

5.4.3 Title

The *Title* attribute type specifies the designated position or function of the object within an organization.

An attribute value for Title is a string.

Example:

T = “Manager, Distributed Applications”

```

title ATTRIBUTE ::= {
  SUBTYPE OF                name
  WITH SYNTAX              DirectoryString {ub-title}
  ID                       id-at-title }

```

5.5 Explanatory attribute types

These attribute types are concerned with explanations (e.g. in a natural language) of something about an object.

5.5.1 Description

The *Description* attribute type specifies text which describes the associated object.

For example, the object “Standards Interest” might have the associated description “distribution list for exchange of information about intra-company standards development”.

An attribute value for Description is a string.

```

description ATTRIBUTE ::= {
  WITH SYNTAX
  EQUALITY MATCHING RULE
  SUBSTRINGS MATCHING RULE
  ID
  DirectoryString {ub-description}
  caseIgnoreMatch
  caseIgnoreSubstringsMatch
  id-at-description }

```

5.5.2 Search Guide

The *Search Guide* attribute type specifies information of suggested search criteria which may be included in some entries expected to be a convenient base-object for the search operation, e.g. country or organization.

Search criteria consist of an optional identifier for the type of object sought and combinations of attribute types and logical operators to be used in the construction of a filter. It is possible to specify for each search criteria item the matching level, e.g. approximate match.

The Search Guide attribute may recur to reflect the various types of requests, e.g. search for a Residential Person or an Organizational Person, which may be fulfilled from the given base-object where the Search Guide is read.

```

searchGuide ATTRIBUTE ::= {
  WITH SYNTAX
  ID
  Guide
  id-at-searchGuide }

Guide ::= SET {
  objectClass [0] OBJECT-CLASS.&id OPTIONAL,
  criteria [1] Criteria }

Criteria ::= CHOICE {
  type [0] CriteriaItem,
  and [1] SET OF Criteria,
  or [2] SET OF Criteria,
  not [3] Criteria }

CriteriaItem ::= CHOICE {
  equality [0] AttributeType,
  substrings [1] AttributeType,
  greaterOrEqual [2] AttributeType,
  lessOrEqual [3] AttributeType,
  approximateMatch [4] AttributeType }

```

Example:

The following is a potential value of the Search Guide attribute that could be stored in entries of object class Locality to indicate how entries of object class Residential Person might be found:

```

residential-person-guide Guide ::= {
  objectClass residentialPerson.&id,
  criteria and : {
    type : substrings : commonName.&id,
    type : substrings : streetAddress.&id }}

```

The construction of a filter from this value of Guide is straightforward.

Step (1) produces the intermediate Filter value

```

intermediate-filter Filter ::=
  and : {
    item : substrings {
      type commonName.&id,
      strings { any : teletexString : “Dubois” }},
    item : substrings {
      type streetAddress.&id,
      strings { any : teletexString “Hugo” }}}}

```

: 1995 (E)

Step (2) produces a filter for matching Residential Person entries in the subtree:

```

residential-person-filter Filter ::=
  and : {
    item : equality : {
      type objectClass.&id,
      assertion residentialPerson.&id },
    intermediateFilter }

```

5.5.3 Enhanced Search Guide

The *Enhanced Search Guide* attribute provides an enhancement of the **searchGuide** attribute, adding information about the recommended search depth for searches among subordinate objects of a given object class.

```

enhancedSearchGuide ATTRIBUTE ::= {
  WITH SYNTAX
  ID
  EnhancedGuide
  id-at-enhancedSearchGuide }

EnhancedGuide ::= SEQUENCE {
  objectClass [0] OBJECT-CLASS.&id,
  criteria [1] Criteria,
  subset [2] INTEGER
  { baseObject (0), oneLevel (1), wholeSubtree (2) } DEFAULT oneLevel }

```

5.5.4 Business Category

The *Business Category* attribute type specifies information concerning the occupation of some common objects, e.g. people. For example, this attribute provides the facility to interrogate the Directory about people sharing the same occupation.

```

businessCategory ATTRIBUTE ::= {
  WITH SYNTAX
  EQUALITY MATCHING RULE
  SUBSTRINGS MATCHING RULE
  ID
  DirectoryString {ub-business-category}
  caseIgnoreMatch
  caseIgnoreSubstringsMatch
  id-at-businessCategory }

```

5.6 Postal Addressing attribute types

These attribute types are concerned with information required for physical postal delivery to an object.

5.6.1 Postal Address

The *Postal Address* attribute type specifies the address information required for the physical delivery of postal messages by the postal authority to the named object.

An attribute value for Postal Address will be typically composed of selected attributes from the MHS Unformatted Postal O/R Address version 1 according to CCITT Recommendation F.401 and limited to 6 lines of 30 characters each, including a Postal Country Name. Normally the information contained in such an address could include an addressee's name, street address, city, state or province, postal code and possibly a Post Office Box number depending on the specific requirements of the named object.

```

postalAddress ATTRIBUTE ::= {
  WITH SYNTAX
  EQUALITY MATCHING RULE
  SUBSTRINGS MATCHING RULE
  ID
  PostalAddress
  caseIgnoreListMatch
  caseIgnoreListSubstringsMatch
  id-at-postalAddress }

PostalAddress ::= SEQUENCE SIZE(1..ub-postal-line) OF DirectoryString {ub-postal-string}

```

The *Collective Postal Address* attribute type specifies a postal address for a collection of entries.

```

collectivePostalAddress ATTRIBUTE ::= {
  SUBTYPE OF
  COLLECTIVE
  ID
  postalAddress
  TRUE
  id-at-collectivePostalAddress }

```

5.6.2 Postal Code

The *Postal Code* attribute type specifies the postal code of the named object. If this attribute value is present it will be part of the object's postal address.

An attribute value for Postal Code is a string.

```
postalCode ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-postal-code}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-postalCode }
```

The *Collective Postal Code* attribute type specifies a postal code for a collection of entries.

```
collectivePostalCode ATTRIBUTE ::= {
    SUBTYPE OF          postalCode
    COLLECTIVE          TRUE
    ID                   id-at-collectivePostalCode }
```

5.6.3 Post Office Box

The *Post Office Box* attribute type specifies the Post Office Box by which the object will receive physical postal delivery. If present, the attribute value is part of the object's postal address.

```
postOfficeBox ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-post-office-box}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-postOfficeBox }
```

The *Collective Post Office Box* attribute type specifies a post office box for a collection of entries.

```
collectivePostOfficeBox ATTRIBUTE ::= {
    SUBTYPE OF          postOfficeBox
    COLLECTIVE          TRUE
    ID                   id-at-collectivePostOfficeBox }
```

5.6.4 Physical Delivery Office Name

The Physical Delivery Office Name attribute type specifies the name of the city, village, etc. where a physical delivery office is situated.

An attribute value for Physical Delivery Office Name is a string.

```
physicalDeliveryOfficeName ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-physical-office-name}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-physicalDeliveryOfficeName }
```

The *Collective Physical Delivery Office Name* attribute type specifies a physical delivery office name for a collection of entries.

```
collectivePhysicalDeliveryOfficeName ATTRIBUTE ::= {
    SUBTYPE OF          physicalDeliveryOfficeName
    COLLECTIVE          TRUE
    ID                   id-at-collectivePhysicalDeliveryOfficeName }
```

5.7 Telecommunications Addressing attribute types

These attribute types are concerned with addressing information needed to communicate with the object using telecommunication means.

: 1995 (E)

5.7.1 Telephone Number

The *Telephone Number* attribute type specifies a telephone number associated with an object.

An attribute value for Telephone Number is a string that complies with the internationally agreed format for showing international telephone numbers, CCITT Recommendation E.123 (e.g. "+ 44 582 10101").

```

telephoneNumber ATTRIBUTE ::= {
    WITH SYNTAX PrintableString (SIZE (1..ub-telephone-number))
    EQUALITY MATCHING RULE telephoneNumberMatch
    SUBSTRINGS MATCHING RULE telephoneNumberSubstringsMatch
    ID id-at-telephoneNumber }

```

The *Collective Telephone Number* attribute type specifies a telephone number for a collection of entries.

```

collectiveTelephoneNumber ATTRIBUTE ::= {
    SUBTYPE OF telephoneNumber
    COLLECTIVE TRUE
    ID id-at-collectiveTelephoneNumber }

```

5.7.2 Telex Number

The *Telex Number* attribute type specifies the telex number, country code, and answerback code of a telex terminal associated with an object.

```

telexNumber ATTRIBUTE ::= {
    WITH SYNTAX TelexNumber
    ID id-at-telexNumber }

TelexNumber ::= SEQUENCE {
    telexNumber PrintableString (SIZE (1..ub-telex-number)),
    countryCode PrintableString (SIZE (1..ub-country-code)),
    answerback PrintableString (SIZE (1..ub-answerback)) }

```

The *Collective Telex Number* attribute type specifies a telex number for a collection of entries.

```

collectiveTelexNumber ATTRIBUTE ::= {
    SUBTYPE OF telexNumber
    COLLECTIVE TRUE
    ID id-at-collectiveTelexNumber }

```

5.7.3 Teletex Terminal Identifier

The *Teletex Terminal Identifier* attribute type specifies the Teletex terminal identifier (and, optionally, parameters) for a teletex terminal associated with an object.

An attribute value for Teletex Terminal Identifier is a string which complies with CCITT Recommendation F.200 and an optional set whose components are according to CCITT Recommendation T.62.

```

teletexTerminalIdentifier ATTRIBUTE ::= {
    WITH SYNTAX TeletexTerminalIdentifier
    ID id-at-teletexTerminalIdentifier }

TeletexTerminalIdentifier ::= SEQUENCE {
    teletexTerminal PrintableString (SIZE(1..ub-teletex-terminal-id)),
    parameters TeletexNonBasicParameters OPTIONAL }

```

The *Collective Teletex Terminal Identifier* attribute type specifies a teletex terminal identifier for a collection of entries.

```

collectiveTeletexTerminalIdentifier ATTRIBUTE ::= {
    SUBTYPE OF teletexTerminalIdentifier
    COLLECTIVE TRUE
    ID id-at-collectiveTeletexTerminalIdentifier }

```

5.7.4 Facsimile Telephone Number

The Facsimile Telephone Number attribute type specifies a telephone number for a facsimile terminal (and optionally its parameters) associated with an object.

An attribute value for the facsimile telephone number is a string that complies with the internationally agreed format for showing international telephone numbers, CCITT Recommendation E.123 (e.g. “+81 3 347 7418”) and an optional bit string (formatted according to CCITT Recommendation T.30).

```

facsimileTelephoneNumber ATTRIBUTE ::= {
  WITH SYNTAX FacsimileTelephoneNumber
  ID id-at-facsimileTelephoneNumber }

FacsimileTelephoneNumber ::= SEQUENCE {
  telephoneNumber PrintableString (SIZE (1..ub-telephone-number)),
  parameters G3FacsimileNonBasicParameters OPTIONAL }

```

The *Collective Facsimile Telephone Number* attribute type specifies a facsimile telephone number for a collection of entries.

```

collectiveFacsimileTelephoneNumber ATTRIBUTE ::= {
  SUBTYPE OF facsimileTelephoneNumber
  COLLECTIVE TRUE
  ID id-at-collectiveFacsimileTelephoneNumber }

```

5.7.5 X.121 Address

The *X.121 Address* attribute type specifies an address as defined by CCITT Recommendation X.121 associated with an object.

```

x121Address ATTRIBUTE ::= {
  WITH SYNTAX NumericString (SIZE (1..ub-x121-address))
  EQUALITY MATCHING RULE numericStringMatch
  SUBSTRINGS MATCHING RULE numericStringSubstringsMatch
  ID id-at-x121Address }

```

5.7.6 International ISDN Number

The *International ISDN Number* attribute type specifies an International ISDN Number associated with an object.

An attribute value for International ISDN Number is a string which complies with the internationally agreed format for ISDN addresses given in CCITT Recommendation E.164.

```

internationalISDNNumber ATTRIBUTE ::= {
  WITH SYNTAX NumericString (SIZE (1..ub-international-isdn-number))
  EQUALITY MATCHING RULE numericStringMatch
  SUBSTRINGS MATCHING RULE numericStringSubstringsMatch
  ID id-at-internationalISDNNumber }

```

The *Collective International ISDN Number* attribute type specifies an international ISDN number for a collection of entries.

```

collectiveInternationalISDNNumber ATTRIBUTE ::= {
  SUBTYPE OF internationalISDNNumber
  COLLECTIVE TRUE
  ID id-at-collectiveInternationalISDNNumber }

```

5.7.7 Registered Address

The Registered Address attribute type specifies a mnemonic for an address associated with an object at a particular city location. The mnemonic is registered in the country in which the city is located and is used in the provision of the Public Telegram Service (according to CCITT Recommendation F.1).

```

registeredAddress ATTRIBUTE ::= {
  SUBTYPE OF postalAddress
  WITH SYNTAX PostalAddress
  ID id-at-registeredAddress }

```

: 1995 (E)

5.7.8 Destination Indicator

The *Destination Indicator* attribute type specifies (according to CCITT Recommendation F.1 and CCITT Recommendation F.31) the country and city associated with the object (the addressee) needed to provide the Public Telegram Service.

An attribute value for Destination Indicator is a string.

```

destinationIndicator ATTRIBUTE ::=      {
    WITH SYNTAX                        PrintableString (SIZE (1..ub-destination-indicator))
    EQUALITY MATCHING RULE             -- alphabetical characters only
    SUBSTRINGS MATCHING RULE           caseIgnoreMatch
    ID                                  caseIgnoreSubstringsMatch
                                          id-at-destinationIndicator }

```

5.8 Preferences attribute types

These attribute types are concerned with the preferences of an object.

5.8.1 Preferred Delivery Method

The *Preferred Delivery Method* attribute type specifies the object's priority order regarding the method to be used for communicating with it.

```

preferredDeliveryMethod ATTRIBUTE ::= {
    WITH SYNTAX                        SEQUENCE OF INTEGER {
      ny-delivery-method                (0),
      mhs-delivery                      (1),
      physical-delivery                 (2),
      telex-delivery                    (3),
      teletex-delivery                  (4),
      g3-facsimile-delivery             (5),
      g4-facsimile-delivery             (6),
      ia5-terminal-delivery             (7),
      videotex-delivery                 (8),
      telephone-delivery                (9) }
    SINGLE VALUE                       TRUE
    ID                                  id-at-preferredDeliveryMethod }

```

5.9 OSI Application attribute types

These attribute types are concerned with information regarding objects in the OSI Application Layer.

5.9.1 Presentation Address

The *Presentation Address* attribute type specifies a presentation address associated with an object representing an OSI application entity.

An attribute value for Presentation Address is a presentation address as defined in ISO 7498.

```

presentationAddress ATTRIBUTE ::=      {
    WITH SYNTAX                        PresentationAddress
    EQUALITY MATCHING RULE             presentationAddressMatch
    SINGLE VALUE                       TRUE
    ID                                  id-at-presentationAddress }

PresentationAddress ::= SEQUENCE {
    pSelector                            [0] OCTET STRING OPTIONAL,
    sSelector                            [1] OCTET STRING OPTIONAL,
    tSelector                            [2] OCTET STRING OPTIONAL,
    nAddresses                           [3] SET SIZE (1..MAX) OF OCTET STRING }

```

5.9.2 Supported Application Context

The *Supported Application Context* attribute type specifies the object identifier(s) of application context(s) that the object (an OSI application entity) supports.

```
supportedApplicationContext ATTRIBUTE ::= {
    WITH SYNTAX                OBJECT IDENTIFIER
    EQUALITY MATCHING RULE     objectIdentifierMatch
    ID                          id-at-supportedApplicationContext }
```

5.9.3 Protocol Information

The *Protocol Information* attribute type associates protocol information with each network address in the Presentation Address attribute.

For each nAddress, the protocol component identifies the protocol or profile for the network and transport layers.

```
protocolInformation ATTRIBUTE ::= {
    WITH SYNTAX                ProtocolInformation
    EQUALITY MATCHING RULE     protocolInformationMatch
    ID                          id-at-protocolInformation }

ProtocolInformation ::= SEQUENCE {
    nAddress                    OCTET STRING,
    profiles                    SET OF OBJECT IDENTIFIER }
```

5.10 Relational attribute types

These attribute types are concerned with information regarding the objects which are related to a particular object in certain ways.

5.10.1 Distinguished Name

The *Distinguished Name* attribute type is an attribute for specifying the name of an object.

```
distinguishedName ATTRIBUTE ::= {
    WITH SYNTAX                DistinguishedName
    EQUALITY MATCHING RULE     distinguishedNameMatch
    ID                          id-at-distinguishedName }
```

5.10.2 Member

The *Member* attribute type specifies a group of names associated with the object.

An attribute value for Member is a distinguished name.

```
member ATTRIBUTE ::= {
    SUBTYPE OF                 distinguishedName
    ID                          id-at-member }
```

5.10.3 Unique Member

The *Unique Member* attribute type specifies a group of unique names associated with an object. A unique name is a name that is optionally disambiguated by the inclusion of its unique identifier.

An attribute value for Unique Member is a distinguished name accompanied by an optional unique identifier.

```
uniqueMember ATTRIBUTE ::= {
    WITH SYNTAX                NameAndOptionalUID
    EQUALITY MATCHING RULE     uniqueMemberMatch
    ID                          id-at-uniqueMember }

NameAndOptionalUID ::= SEQUENCE {
    dn                          DistinguishedName,
    uid                          UniqueIdentifier OPTIONAL }
```

: 1995 (E)

5.10.4 Owner

The *Owner* attribute type specifies the name of some object which has some responsibility for the associated object.

An attribute value for Owner is a distinguished name (which could represent a group of names) and can recur.

```
owner ATTRIBUTE ::= {
  SUBTYPE OF distinguishedName
  ID id-at-owner }
```

5.10.5 Role Occupant

The *Role Occupant* attribute type specifies the name of an object which fulfills an organizational role.

An attribute value for Role Occupant is a distinguished name.

```
roleOccupant ATTRIBUTE ::= {
  SUBTYPE OF distinguishedName
  ID id-at-roleOccupant }
```

5.10.6 See Also

The *See Also* attribute type specifies names of other Directory objects which may be other aspects (in some sense) of the same real world object.

An attribute value for See Also is a distinguished name.

```
seeAlso ATTRIBUTE ::= {
  SUBTYPE OF distinguishedName
  ID id-at-seeAlso }
```

SECTION 3 – MATCHING RULES**6 Definition of matching rules**

NOTE – For definitions of **objectIdentifierMatch** and **distinguishedNameMatch**, see ITU-T Recommendation X.501 | ISO/IEC 9594-2.

6.1 String matching rules

In the matching rules specified in 7.1.1 through 7.1.11, the following spaces are regarded as not significant:

- leading spaces (i.e. those preceding the first printing character);
- trailing spaces (i.e. those following the last printing character);
- multiple consecutive internal spaces (these are taken as equivalent to a single space character).

In the matching rules to which these apply, the strings to be matched shall be matched as if the insignificant spaces were not present in either string.

6.1.1 Case Ignore Match

The *Case Ignore Match* rule compares for equality a presented string with an attribute value of type **DirectoryString**, without regard to the case (upper or lower) of the strings (e.g. “Dundee” and “DUNDEE” match).

```
caseIgnoreMatch MATCHING-RULE ::= {
  SYNTAX DirectoryString {ub-match}
  ID id-mr-caseIgnoreMatch }
```

The rule returns TRUE if the strings are the same length and corresponding characters are identical except possibly with regard to case.

Where the strings being matched are of different ASN.1 syntax, the comparison proceeds as normal so long as the corresponding characters are in both character sets. Otherwise matching fails.

6.1.2 Case Ignore Ordering Match

The *Case Ignore Ordering Match* rule compares the collation order of a presented string an attribute value of type **DirectoryString**, without regard to the case (upper or lower) of the strings.

```
caseIgnoreOrderingMatch MATCHING-RULE ::= {
  SYNTAX          DirectoryString {ub-match}
  ID              id-mr-caseIgnoreOrderingMatch }
```

The rule returns TRUE if the attribute value is “less” or appears earlier than the presented value, when the strings are compared using the normal collation order for their syntax after lower-case letters in both strings have been replaced by their upper-case equivalents.

Where the strings being matched are of different ASN.1 syntax, the comparison proceeds as normal so long as the corresponding characters are in both character sets. Otherwise matching fails.

6.1.3 Case Ignore Substrings Match

The *Case Ignore Substrings Match* rule determines whether a presented value is a substring of an attribute value of type **DirectoryString**, without regard to the case (upper or lower) of the strings.

```
caseIgnoreSubstringsMatch MATCHING-RULE ::= {
  SYNTAX          SubstringAssertion
  ID              id-mr-caseIgnoreSubstringsMatch }
```

```
SubstringAssertion ::= SEQUENCE OF CHOICE {
  initial          [0]    DirectoryString {ub-match},
  any              [1]    DirectoryString {ub-match},
  final           [2]    DirectoryString {ub-match} }
-- at most one initial and one final component
```

The rule returns TRUE if there is a partitioning of the attribute value (into portions) such that:

- the specified substrings (**initial**, **any**, **final**) match different portions of the value in the order of the **strings** sequence;
- **initial**, if present, matches the first portion of the value;
- **final**, if present, matches the last portion of the value;
- **any**, if present, matches some arbitrary portion of the value.

There shall be at most one **initial**, and at most one **final** in **strings**. If **initial** is present, it shall be the first element of **strings**. If **final** is present, it shall be the last element of **strings**. There shall be zero or more **any** in **strings**.

For a component of substrings to match a portion of the attribute value, corresponding characters must be identical, except in regard to case. Where the strings being matched are of different ASN.1 syntax, the comparison proceeds as normal so long as the corresponding characters are in both character sets. Otherwise matching fails.

6.1.4 Case Exact Match

The *Case Exact Match* rule compares for equality a presented string with an attribute value of type **DirectoryString**.

```
caseExactMatch MATCHING-RULE ::= {
  SYNTAX          DirectoryString {ub-match}
  ID              id-mr-caseExactMatch }
```

The rule is identical to the **caseIgnoreMatch** rule except that case is not ignored.

6.1.5 Case Exact Ordering Match

The *Case Exact Ordering Match* rule compares the collation order of a presented string with an attribute value of type **DirectoryString**.

```
caseExactOrderingMatch MATCHING-RULE ::= {
  SYNTAX          DirectoryString {ub-match}
  ID              id-mr-caseExactOrderingMatch }
```

The rule is identical to the **caseIgnoreOrderingMatch** rule except that lower-case letters are not replaced by upper-case letters.

: 1995 (E)

6.1.6 Case Exact Substrings Match

The *Case Exact Substrings Match* rule determines whether a presented value is a substring of an attribute value of type **DirectoryString**.

```

caseExactSubstringsMatch MATCHING-RULE ::= {
  SYNTAX                               SubstringAssertion -- only the PrintableString choice
  ID                                     id-mr-caseExactSubstringsMatch }

```

The rule is identical to the **caseIgnoreSubstringsMatch** rule except that case is not ignored.

6.1.7 Numeric String Match

The *Numeric String Match* rule compares for equality a presented numeric string with an attribute value of type **NumericString**.

```

numericStringMatch MATCHING-RULE ::= {
  SYNTAX                               NumericString
  ID                                     id-mr-numericStringMatch }

```

The rule is identical to the **caseIgnoreMatch** rule except that all space characters are skipped during comparison (case is irrelevant as characters are numeric).

6.1.8 Numeric String Ordering Match

The *Numeric String Ordering Match* rule compares the collation order of a presented string with an attribute value of type **NumericString**.

```

numericStringOrderingMatch MATCHING-RULE ::= {
  SYNTAX                               NumericString
  ID                                     id-mr-numericStringOrderingMatch }

```

The rule is identical to the **caseIgnoreOrderingMatch** rule except that all space characters are skipped during comparison (case is irrelevant as characters are numeric).

6.1.9 Numeric String Substrings Match

The *Numeric String Substrings Match* rule determines whether a presented value is a substring of an attribute value of type **NumericString**.

```

numericStringSubstringsMatch MATCHING-RULE ::= {
  SYNTAX                               SubstringAssertion
  ID                                     id-mr-numericStringSubstringsMatch }

```

The rule is identical to the **caseIgnoreSubstringsMatch** rule except that all space characters are skipped during comparison (case is irrelevant as characters are numeric).

6.1.10 Case Ignore List Match

The *Case Ignore List Match* rule compares for equality a presented sequence of strings with an attribute value which is a sequence of **DirectoryStrings**, without regard to the case (upper or lower) of the strings.

```

caseIgnoreListMatch MATCHING-RULE ::= {
  SYNTAX                               SEQUENCE OF DirectoryString {ub-match}
  ID                                     id-mr-caseIgnoreListMatch }

```

The rule returns TRUE if and only if the number of strings in each is the same, and corresponding strings match. The latter matching is as for the **caseIgnoreMatch** matching rule.

6.1.11 Case Ignore List Substrings Match

The *Case Ignore List Substring* rule compares a presented substring with an attribute value which is a sequence of **DirectoryStrings**, but where the case (upper or lower) is not significant for comparison purposes.

```

caseIgnoreListSubstringsMatch MATCHING-RULE ::= {
  SYNTAX                               SubstringAssertion
  ID                                     id-mr-caseIgnoreListSubstringsMatch }

```

A presented value matches a stored value if and only if the presented value matches the string formed by concatenating the strings of the stored value. This matching is done according to the **caseIgnoreSubstringsMatch** rule; however, none of the **initial**, **any**, or **final** values of the presented value are considered to match a substring of the concatenated string which spans more than one of the strings of the stored value.

6.2 Syntax-based matching rules

6.2.1 Boolean Match

The *Boolean Match* rule compares for equality a presented Boolean value with an attribute value of type **BOOLEAN**.

```
booleanMatch MATCHING-RULE ::= {
  SYNTAX                       BOOLEAN
  ID                            id-mr-booleanMatch }
```

The rule returns TRUE if the values are the same, i.e. both are TRUE or both are FALSE.

6.2.2 Integer Match

The *Integer Match* rule compares for equality a presented integer value with an attribute value of type **INTEGER**.

```
integerMatch MATCHING-RULE ::= {
  SYNTAX                       INTEGER
  ID                            id-mr-integerMatch }
```

The rule returns TRUE if the integers are equal.

6.2.3 Integer Ordering Match

The *Integer Ordering Match* rule compares a presented integer value with an attribute value of type **INTEGER**.

```
integerOrderingMatch MATCHING-RULE ::= {
  SYNTAX                       INTEGER
  ID                            id-mr-integerOrderingMatch }
```

The rule returns TRUE if the attribute value is less than the presented value.

6.2.4 Bit String Match

The *Bit String Match* rule compares a presented bit string with an attribute value of type **BIT STRING**.

```
bitStringMatch MATCHING-RULE ::= {
  SYNTAX                       BIT STRING
  ID                            id-mr-bitStringMatch }
```

The rule returns TRUE if the attribute value has the same number of bits as the presented value and the bits match on a bitwise basis.

6.2.5 Octet String Match

The *Octet String Match* rule compares for equality a presented octet string with an attribute value of type **OCTET STRING**.

```
octetStringMatch MATCHING-RULE ::= {
  SYNTAX                       OCTET STRING
  ID                            id-mr-octetStringMatch }
```

The rule returns TRUE if and only if the strings are the same length and corresponding octets are identical.

6.2.6 Octet String Ordering Match

The *Octet String Ordering* rule compares the collation order of a presented octet string with an attribute value of type **OCTET STRING**.

```
octetStringOrderingMatch MATCHING-RULE ::= {
  SYNTAX                       OCTET STRING
  ID                            id-mr-octetStringOrderingMatch }
```

: 1995 (E)

The rule compares octet strings from first octet to last octet, and from the most significant bit to the least significant bit within the octet. The first occurrence of a different bit determines the ordering of the strings. A zero bit precedes a one bit. If the strings are identical but contain different numbers of octets, the shorter string precedes the longer string.

6.2.7 Octet String Substrings Match

The *Octet String Substrings Match* rule determines whether a presented octet string is a substring of an attribute value of type **OCTET STRING**.

```

octetStringSubstringsMatch MATCHING-RULE ::= {
  SYNTAX                               OctetSubstringAssertion
  ID                                    id-mr-octetStringSubstringsMatch }

OctetSubstringAssertion ::= SEQUENCE OF CHOICE {
  initial                               [0]    OCTET STRING,
  any                                   [1]    OCTET STRING,
  final                                 [2]    OCTET STRING }
  -- at most one initial and one final component

```

The rule returns TRUE if the attribute value contains the sequence of octets in the presented string, as described for **caseIgnoreSubstringsMatch**.

6.2.8 Telephone Number Match

The *Telephone Number Match* rule compares for equality a presented value with an attribute value of type **PrintableString** which is a telephone number.

```

telephoneNumberMatch MATCHING-RULE ::= {
  SYNTAX                               PrintableString
  ID                                    id-mr-telephoneNumberMatch }

```

The rules for matching are identical to those for **caseIgnoreMatch**, except that all space and “-” characters are skipped during the comparison.

6.2.9 Telephone Number Substrings Match

The *Telephone Number Substrings Match* rule determines if a presented substring is a substring of an attribute value of type **PrintableString** which is a telephone number.

```

telephoneNumberSubstringsMatch MATCHING-RULE ::= {
  SYNTAX                               SubstringAssertion
  ID                                    id-mr-telephoneNumberSubstringsMatch }

```

The rules for matching are identical to those for **caseExactSubstringsMatch**, except that all space and “-” characters are skipped during the comparison.

6.2.10 Presentation Address Match

The *Presentation Address Match* rule compares for equality a presented Presentation Address with an attribute value of type **PresentationAddress**.

```

presentationAddressMatch MATCHING-RULE ::= {
  SYNTAX                               PresentationAddress
  ID                                    id-mr-presentationAddressMatch }

```

The rule returns TRUE if and only if the selectors of the presented and stored presentation address are equal and the presented **nAddresses** are a subset of the stored ones.

6.2.11 Unique Member Match

The *Unique Member Match* rule compares for equality a presented Unique Member value with an attribute value of type **NameAndOptionalUID**.

```

uniqueMemberMatch MATCHING-RULE ::= {
  SYNTAX                               NameAndOptionalUID
  ID                                    id-mr-uniqueMemberMatch }

```

The rule returns TRUE if and only if the **dn** components of the attribute value and the presented value match according to the **distinguishedNameMatch** rule, and the **uid** component is absent from the attribute value or matches the corresponding component from the presented value according to the **bitStringMatch** rule.

6.2.12 Protocol Information Match

The *Protocol Information Match* rule compares for equality presented values of **ProtocolInformation** with values of the same type.

```
protocolInformationMatch MATCHING-RULE ::= {
    SYNTAX                               OCTET STRING
    ID                                    id-mr-protocolInformationMatch }
```

A value of the assertion syntax is derived from a value of the attribute syntax by using the **nAddress** component.

The value returns True if the presented value and the **nAddress** component of the stored value match according to the **octetStringMatch** rule.

6.3 Time matching rules

6.3.1 UTC Time Match

The *UTC Time Match* rule compares for equality a presented value with an attribute value of type **UTCTime**.

```
uTCTimeMatch MATCHING-RULE ::= {
    SYNTAX                               UTCTime
    ID                                    id-mr-uTCTimeMatch }
```

The rule returns TRUE if the attribute value represents the same time as the presented value. If a UTC time is specified with the seconds absent, the number of seconds is assumed to be zero.

6.3.2 UTC Time Ordering Match

The *UTC Time Ordering* rule compares the time ordering of a presented value with an attribute value of type **UTCTime**.

```
uTCTimeOrderingMatch MATCHING-RULE ::= {
    SYNTAX                               UTCTime
    ID                                    id-mr-uTCTimeOrderingMatch }
```

The rule returns TRUE if the attribute value represents a time which is earlier than the presented time. If a UTC time is specified with the seconds absent, the number of seconds is assumed to be zero.

6.3.3 Generalized Time Match

The *Generalized Time Match* rule compares for equality a presented value with an attribute value of type **GeneralizedTime** [as per 34.3 b) or c) of CCITT Recommendation X.208 | ISO/IEC 8824].

```
generalizedTimeMatch MATCHING-RULE ::= {
    SYNTAX                               GeneralizedTime
                                         -- as per 34.3 b) or c) of CCITT Rec. X.208 | ISO/IEC 8824
    ID                                    id-mr-generalizedTimeMatch }
```

The rule returns TRUE if the attribute value represents the same time as the presented value. If a time is specified with the minutes or seconds absent, the number of minutes or seconds is assumed to be zero.

6.3.4 Generalized Time Ordering Match

The *Generalized Time Ordering* rule compares the time ordering of a presented value with an attribute value of type **GeneralizedTime** [as per 34.3 b) and c) of CCITT Recommendation X.208 | ISO/IEC 8824].

```
generalizedTimeOrderingMatch MATCHING-RULE ::= {
    SYNTAX                               GeneralizedTime
                                         -- as per 34.3 b) or c) of CCITT Rec. X.208 | ISO/IEC 8824
    ID                                    id-mr-generalizedTimeOrderingMatch }
```

The rule returns TRUE if the attribute value represents a time which is earlier than the presented time. If a time is specified with the minutes or seconds absent, the number of minutes or seconds is assumed to be zero.

: 1995 (E)

6.4 First component matching rules

6.4.1 Integer First Component Match

The *Integer First Component Match* rule compares for equality a presented integer value with an attribute value of type **SEQUENCE** whose first component is mandatory and of type **INTEGER**.

```
integerFirstComponentMatch MATCHING-RULE ::= {
  SYNTAX                               INTEGER
  ID                                   id-mr-integerFirstComponentMatch }
```

The rule returns TRUE if the attribute value has a first component whose value equals the presented integer.

A value of the assertion syntax is derived from a value of the attribute syntax by using the value of the first component of the **SEQUENCE**.

6.4.2 Object Identifier First Component Match

The *Object Identifier First Component Match* rule compares for equality a presented object identifier value with attribute values of type **SEQUENCE** whose first component is mandatory and of type **OBJECT IDENTIFIER**.

```
objectIdentifierFirstComponentMatch MATCHING-RULE ::= {
  SYNTAX                               OBJECT IDENTIFIER
  ID                                   id-mr-objectIdentifierFirstComponentMatch }
```

The rule returns TRUE if the attribute value has a first component whose value matches the presented object identifier using the rules of **objectIdentifierMatch**.

A value of the assertion syntax is derived from a value of the attribute syntax by using the value of the first component of the **SEQUENCE**.

6.4.3 Directory String First Component Match

The *Directory String First Component Match* rule compares for equality a presented **DirectoryString** value with an attribute value of type **SEQUENCE** whose first component is mandatory and of type **DirectoryString**.

```
directoryStringFirstComponentMatch MATCHING-RULE ::= {
  SYNTAX                               DirectoryString {ub-directory-string-first-component-match}
  ID                                   id-mr-directoryStringFirstComponentMatch }
```

The rule returns TRUE if the attribute value has a first component whose value matches the presented **DirectoryString** using the rules of **caseIgnoreMatch**.

A value of the assertion syntax is derived from a value of the attribute syntax by using the value of the first component of the **SEQUENCE**.

6.5 Word matching rules

6.5.1 Word Match

The *Word Match* rule compares a presented string with words in an attribute value of type **DirectoryString**.

```
wordMatch MATCHING-RULE ::= {
  SYNTAX                               DirectoryString {ub-match}
  ID                                   id-mr-wordMatch }
```

The rule returns TRUE if a presented word matches any word in the attribute value. Individual word matching is as for the **caseIgnoreMatch** matching rule. The precise definition of a “word” is a local matter.

6.5.2 Keyword Match

The *Keyword Match* rule compares a presented string with keywords in an attribute value of type **DirectoryString**.

```
keywordMatch MATCHING-RULE ::= {
  SYNTAX                               DirectoryString {ub-match}
  ID                                   id-mr-keywordMatch }
```

The rule returns TRUE if a presented value matches any *keyword* in the attribute value. The identification of keywords in an attribute value and of the exactness of match are both local matters.

Annex A

Selected attribute types in ASN.1

(This annex forms an integral part of this Recommendation | International Standard)

This annex includes all of the ASN.1 type and value definitions contained in this Directory Specification in the form of the ASN.1 module **SelectedAttributeTypes**.

```
SelectedAttributeTypes {joint-iso-ccitt ds(5) module(1) selectedAttributeTypes(5) 2}
```

```
DEFINITIONS ::=
```

```
BEGIN
```

```
-- EXPORTS All --
```

```
-- The types and values defined in this module are exported for use in the other ASN.1 modules contained
-- within the Directory Specifications, and for the use of other applications which will use them to access
-- Directory services. Other applications may use them for their own purposes, but this will not constrain
-- extensions and modifications needed to maintain or improve the Directory service.
```

```
IMPORTS
```

```
informationFramework, upperBounds, id-at, id-mr
```

```
FROM UsefulDefinitions {joint-iso-ccitt ds(5) module(1) usefulDefinitions(0) 2 }
```

```
ATTRIBUTE, MATCHING-RULE, AttributeType, OBJECT-CLASS, DistinguishedName,
objectIdentifierMatch, distinguishedNameMatch
```

```
FROM InformationFramework informationFramework
```

```
G3FacsimileNonBasicParameters, TeletexNonBasicParameters
```

```
FROM MTSAbstractService {joint-iso-ccitt mhs-motis(6) mts(3) modules(0)
mts-abstract-service(1)}
```

```
ub-answerback, ub-name, ub-common-name, ub-surname, ub-serial-number, ub-locality-name,
ub-state-name, ub-street-address, ub-organization-name, ub-organizational-unit-name, ub-title,
ub-description, ub-business-category, ub-postal-line, ub-postal-string, ub-postal-code,
ub-post-office-box, ub-physical-office-name, ub-telex-number, ub-country-code,
ub-teletex-terminal-id, ub-telephone-number, ub-x121-address, ub-international-isdn-number,
ub-destination-indicator, ub-user-password, ub-match, ub-knowledge-information, ub-name,
ub-directory-string-first-component-match
```

```
FROM UpperBounds upperBounds ;
```

```
-- Directory string type --
```

```
DirectoryString { INTEGER : maxSize } ::= CHOICE {
teletexString      TeletexString (SIZE (1..maxSize)),
printableString    PrintableString (SIZE (1..maxSize)),
universalString    UniversalString (SIZE (1..maxSize)) }
```

```
-- Attribute types --
```

```
knowledgeInformation ATTRIBUTE ::= {
WITH SYNTAX      DirectoryString { ub-knowledge-information }
EQUALITY MATCHING RULE caseIgnoreMatch
ID               id-at-knowledgeInformation }
```

```
name ATTRIBUTE ::= {
WITH SYNTAX      DirectoryString { ub-name }
EQUALITY MATCHING RULE caseIgnoreMatch
SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
ID               id-at-name }
```

```
commonName ATTRIBUTE ::= {
SUBTYPE OF      name
WITH SYNTAX      DirectoryString { ub-common-name }
ID               id-at-commonName }
```

: 1995 (E)

```

surname ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                  id-at-surname }

givenName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                  id-at-givenName }

initials ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                  id-at-initials }

generationQualifier ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-name}
  ID                  id-at-generationQualifier }

uniqueIdentifier ATTRIBUTE ::= {
  WITH SYNTAX         UniqueIdentifier
  EQUALITY MATCHING RULE bitStringMatch
  ID                  id-at-uniqueIdentifier }

UniqueIdentifier ::= BIT STRING

dnQualifier ATTRIBUTE ::= {
  WITH SYNTAX         PrintableString
  EQUALITY MATCHING RULE caseIgnoreMatch
  ORDERING MATCHING RULE caseIgnoreOrderingMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID                  id-at-dnQualifier }

serialNumber ATTRIBUTE ::= {
  WITH SYNTAX         PrintableString (SIZE (1..ub-serial-number))
  EQUALITY MATCHING RULE caseIgnoreMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID                  id-at-serialNumber }

countryName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         PrintableString (SIZE (2)) -- IS 3166 codes only
  SINGLE VALUE        TRUE
  ID                  id-at-countryName }

localityName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-locality-name}
  ID                  id-at-localityName }

collectiveLocalityName ATTRIBUTE ::= {
  SUBTYPE OF          localityName
  COLLECTIVE          TRUE
  ID                  id-at-collectiveLocalityName }

stateOrProvinceName ATTRIBUTE ::= {
  SUBTYPE OF          name
  WITH SYNTAX         DirectoryString {ub-state-name}
  ID                  id-at-stateOrProvinceName }

collectiveStateOrProvinceName ATTRIBUTE ::= {
  SUBTYPE OF          stateOrProvinceName
  COLLECTIVE          TRUE
  ID                  id-at-collectiveStateOrProvinceName }

streetAddress ATTRIBUTE ::= {
  WITH SYNTAX         DirectoryString {ub-street-address}
  EQUALITY MATCHING RULE caseIgnoreMatch
  SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
  ID                  id-at-streetAddress }

```

```

collectiveStreetAddress ATTRIBUTE ::= {
    SUBTYPE OF      streetAddress
    COLLECTIVE      TRUE
    ID              id-at-collectiveStreetAddress }

houseIdentifier ATTRIBUTE ::= {
    WITH SYNTAX      DirectoryString {ub-name}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID              id-at-houseIdentifier }

organizationName ATTRIBUTE ::= {
    SUBTYPE OF      name
    WITH SYNTAX      DirectoryString {ub-organization-name}
    ID              id-at-organizationName }

collectiveOrganizationName ATTRIBUTE ::= {
    SUBTYPE OF      organizationName
    COLLECTIVE      TRUE
    ID              id-at-collectiveOrganizationName }

organizationalUnitName ATTRIBUTE ::= {
    SUBTYPE OF      name
    WITH SYNTAX      DirectoryString {ub-organizational-unit-name}
    ID              id-at-organizationalUnitName }

collectiveOrganizationalUnitName ATTRIBUTE ::= {
    SUBTYPE OF      organizationalUnitName
    COLLECTIVE      TRUE
    ID              id-at-collectiveOrganizationalUnitName }

title ATTRIBUTE ::= {
    SUBTYPE OF      name
    WITH SYNTAX      DirectoryString {ub-title}
    ID              id-at-title }

description ATTRIBUTE ::= {
    WITH SYNTAX      DirectoryString {ub-description}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID              id-at-description }

searchGuide ATTRIBUTE ::= {
    WITH SYNTAX      Guide
    ID              id-at-searchGuide }

Guide ::= SET {
    objectClass      [0] OBJECT-CLASS.&id OPTIONAL,
    criteria         [1] Criteria }

Criteria ::= CHOICE {
    type            [0] CriteriaItem,
    and             [1] SET OF Criteria,
    or              [2] SET OF Criteria,
    not            [3] Criteria}

CriteriaItem ::= CHOICE {
    equality        [0] AttributeType,
    substrings     [1] AttributeType,
    greaterOrEqual [2] AttributeType,
    lessOrEqual    [3] AttributeType,
    approximateMatch [4] AttributeType}

enhancedSearchGuide ATTRIBUTE ::= {
    WITH SYNTAX      EnhancedGuide
    ID              id-at-enhancedSearchGuide }

EnhancedGuide ::= SEQUENCE {
    objectClass      [0] OBJECT-CLASS.&id,
    criteria         [1] Criteria,
    subset          [2] INTEGER
    { baseObject (0), oneLevel (1), wholeSubtree (2) } DEFAULT oneLevel }

```

: 1995 (E)

```

businessCategory ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-business-category}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-businessCategory }

postalAddress ATTRIBUTE ::= {
    WITH SYNTAX          PostalAddress
    EQUALITY MATCHING RULE caseIgnoreListMatch
    SUBSTRINGS MATCHING RULE caseIgnoreListSubstringsMatch
    ID                   id-at-postalAddress }

PostalAddress ::= SEQUENCE SIZE(1..ub-postal-line) OF DirectoryString {ub-postal-string}

collectivePostalAddress ATTRIBUTE ::= {
    SUBTYPE OF          postalAddress
    COLLECTIVE          TRUE
    ID                   id-at-collectivePostalAddress }

postalCode ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-postal-code}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-postalCode }

collectivePostalCode ATTRIBUTE ::= {
    SUBTYPE OF          postalCode
    COLLECTIVE          TRUE
    ID                   id-at-collectivePostalCode }

postOfficeBox ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-post-office-box}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-postOfficeBox }

collectivePostOfficeBox ATTRIBUTE ::= {
    SUBTYPE OF          postOfficeBox
    COLLECTIVE          TRUE
    ID                   id-at-collectivePostOfficeBox }

physicalDeliveryOfficeName ATTRIBUTE ::= {
    WITH SYNTAX          DirectoryString {ub-physical-office-name}
    EQUALITY MATCHING RULE caseIgnoreMatch
    SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
    ID                   id-at-physicalDeliveryOfficeName }

collectivePhysicalDeliveryOfficeName ATTRIBUTE ::= {
    SUBTYPE OF          physicalDeliveryOfficeName
    COLLECTIVE          TRUE
    ID                   id-at-collectivePhysicalDeliveryOfficeName }

telephoneNumber ATTRIBUTE ::= {
    WITH SYNTAX          PrintableString (SIZE (1..ub-telephone-number))
    EQUALITY MATCHING RULE telephoneNumberMatch
    SUBSTRINGS MATCHING RULE telephoneNumberSubstringsMatch
    ID                   id-at-telephoneNumber }

collectiveTelephoneNumber ATTRIBUTE ::= {
    SUBTYPE OF          telephoneNumber
    COLLECTIVE          TRUE
    ID                   id-at-collectiveTelephoneNumber }

telexNumber ATTRIBUTE ::= {
    WITH SYNTAX          TelexNumber
    ID                   id-at-telexNumber }

TelexNumber ::= SEQUENCE {
    telexNumber          PrintableString (SIZE(1..ub-telex-number)),
    countryCode          PrintableString (SIZE(1..ub-country-code)),
    answerback           PrintableString (SIZE(1..ub-answerback))}

```

collectiveTelexNumber ATTRIBUTE ::= {
SUBTYPE OF telexNumber
COLLECTIVE TRUE
ID id-at-collectiveTelexNumber }

teletexTerminalIdentifier ATTRIBUTE ::= {
WITH SYNTAX TeletexTerminalIdentifier
ID id-at-teletexTerminalIdentifier }

TeletexTerminalIdentifier ::= SEQUENCE {
teletexTerminal parameters PrintableString (SIZE(1..ub-teletex-terminal-id)),
TeletexNonBasicParameters OPTIONAL }

collectiveTeletexTerminalIdentifier ATTRIBUTE ::= {
SUBTYPE OF teletexTerminalIdentifier
COLLECTIVE TRUE
ID id-at-collectiveTeletexTerminalIdentifier }

facsimileTelephoneNumber ATTRIBUTE ::= {
WITH SYNTAX FacsimileTelephoneNumber
ID id-at-facsimileTelephoneNumber }

FacsimileTelephoneNumber ::= SEQUENCE {
telephoneNumber parameters PrintableString (SIZE(1.. ub-telephone-number)),
G3FacsimileNonBasicParameters OPTIONAL }

collectiveFacsimileTelephoneNumber ATTRIBUTE ::= {
SUBTYPE OF facsimileTelephoneNumber
COLLECTIVE TRUE
ID id-at-collectiveFacsimileTelephoneNumber }

x121Address ATTRIBUTE ::= {
WITH SYNTAX NumericString (SIZE (1..ub-x121-address))
EQUALITY MATCHING RULE numericStringMatch
SUBSTRINGS MATCHING RULE numericStringSubstringsMatch
ID id-at-x121Address }

internationalISDNNumber ATTRIBUTE ::= {
WITH SYNTAX NumericString (SIZE (1..ub-international-isdn-number))
EQUALITY MATCHING RULE numericStringMatch
SUBSTRINGS MATCHING RULE numericStringSubstringsMatch
ID id-at-internationalISDNNumber }

collectiveInternationalISDNNumber ATTRIBUTE ::= {
SUBTYPE OF internationalISDNNumber
COLLECTIVE TRUE
ID id-at-collectiveInternationalISDNNumber }

registeredAddress ATTRIBUTE ::= {
SUBTYPE OF postalAddress
WITH SYNTAX PostalAddress
ID id-at-registeredAddress }

destinationIndicator ATTRIBUTE ::= {
WITH SYNTAX PrintableString (SIZE (1..ub-destination-indicator))
-- *alphabetical characters only*
EQUALITY MATCHING RULE caseIgnoreMatch
SUBSTRINGS MATCHING RULE caseIgnoreSubstringsMatch
ID id-at-destinationIndicator }

preferredDeliveryMethod ATTRIBUTE ::= {
WITH SYNTAX SEQUENCE OF INTEGER {
any-delivery-method (0),
mhs-delivery (1),
physical-delivery (2),
telex-delivery (3),
teletex-delivery (4),
g3-facsimile-delivery (5),
g4-facsimile-delivery (6),
ia5-terminal-delivery (7),
videotex-delivery (8),
telephone-delivery (9) }


```

SubstringAssertion ::= SEQUENCE OF CHOICE {
    initial      [0]    DirectoryString {ub-match},
    any          [1]    DirectoryString {ub-match},
    final       [2]    DirectoryString {ub-match} }
-- at most one initial and one final component

caseExactMatch MATCHING-RULE ::= {
    SYNTAX      DirectoryString {ub-match}
    ID         id-mr-caseExactMatch }

caseExactOrderingMatch MATCHING-RULE ::= {
    SYNTAX      DirectoryString {ub-match}
    ID         id-mr-caseExactOrderingMatch }

caseExactSubstringsMatch MATCHING-RULE ::= {
    SYNTAX      SubstringAssertion -- only the PrintableString choice
    ID         id-mr-caseExactSubstringsMatch }

numericStringMatch MATCHING-RULE ::= {
    SYNTAX      NumericString
    ID         id-mr-numericStringMatch }

numericStringOrderingMatch MATCHING-RULE ::= {
    SYNTAX      NumericString
    ID         id-mr-numericStringOrderingMatch }

numericStringSubstringsMatch MATCHING-RULE ::= {
    SYNTAX      SubstringAssertion
    ID         id-mr-numericStringSubstringsMatch }

caseIgnoreListMatch MATCHING-RULE ::= {
    SYNTAX      SEQUENCE OF DirectoryString {ub-match}
    ID         id-mr-caseIgnoreListMatch }

caseIgnoreListSubstringsMatch MATCHING-RULE ::= {
    SYNTAX      SubstringAssertion
    ID         id-mr-caseIgnoreListSubstringsMatch }

booleanMatch MATCHING-RULE ::= {
    SYNTAX      BOOLEAN
    ID         id-mr-booleanMatch }

integerMatch MATCHING-RULE ::= {
    SYNTAX      INTEGER
    ID         id-mr-integerMatch }

integerOrderingMatch MATCHING-RULE ::= {
    SYNTAX      INTEGER
    ID         id-mr-integerOrderingMatch }

bitStringMatch MATCHING-RULE ::= {
    SYNTAX      BIT STRING
    ID         id-mr-bitStringMatch }

octetStringMatch MATCHING-RULE ::= {
    SYNTAX      OCTET STRING
    ID         id-mr-octetStringMatch }

octetStringOrderingMatch MATCHING-RULE ::= {
    SYNTAX      OCTET STRING
    ID         id-mr-octetStringOrderingMatch }

octetStringSubstringsMatch MATCHING-RULE ::= {
    SYNTAX      OctetSubstringAssertion
    ID         id-mr-octetStringSubstringsMatch }

OctetSubstringAssertion ::= SEQUENCE OF CHOICE {
    initial      [0]    OCTET STRING,
    any          [1]    OCTET STRING,
    final       [2]    OCTET STRING }
-- at most one initial and one final component

telephoneNumberMatch MATCHING-RULE ::= {
    SYNTAX      PrintableString
    ID         id-mr-telephoneNumberMatch }

```

: 1995 (E)

```

telephoneNumberSubstringsMatch MATCHING-RULE ::= {
    SYNTAX          SubstringAssertion
    ID              id-mr-telephoneNumberSubstringsMatch }

presentationAddressMatch MATCHING-RULE ::= {
    SYNTAX          PresentationAddress
    ID              id-mr-presentationAddressMatch }

uniqueMemberMatch MATCHING-RULE ::= {
    SYNTAX          NameAndOptionalUID
    ID              id-mr-uniqueMemberMatch }

protocolInformationMatch MATCHING-RULE ::= {
    SYNTAX          OCTET STRING
    ID              id-mr-protocolInformationMatch }

uTCTimeMatch MATCHING-RULE ::= {
    SYNTAX          UTCTime
    ID              id-mr-uTCTimeMatch }

uTCTimeOrderingMatch MATCHING-RULE ::= {
    SYNTAX          UTCTime
    ID              id-mr-uTCTimeOrderingMatch }

generalizedTimeMatch MATCHING-RULE ::= {
    SYNTAX          GeneralizedTime
    ID              id-mr-generalizedTimeMatch }
    -- as per clauses 34.3 b) or c) of CCITT Rec. X.208 / ISO/IEC 8824

generalizedTimeOrderingMatch MATCHING-RULE ::= {
    SYNTAX          GeneralizedTime
    ID              id-mr-generalizedTimeOrderingMatch }
    -- as per clauses 34.3 b) or c) of CCITT Rec. X.208 / ISO/IEC 8824

integerFirstComponentMatch MATCHING-RULE ::= {
    SYNTAX          INTEGER
    ID              id-mr-integerFirstComponentMatch }

objectIdentifierFirstComponentMatch MATCHING-RULE ::= {
    SYNTAX          OBJECT IDENTIFIER
    ID              id-mr-objectIdentifierFirstComponentMatch }

directoryStringFirstComponentMatch MATCHING-RULE ::= {
    SYNTAX          DirectoryString { ub-directory-string-first-component-match }
    ID              id-mr-directoryStringFirstComponentMatch }

wordMatch MATCHING-RULE ::= {
    SYNTAX          DirectoryString {ub-match}
    ID              id-mr-wordMatch }

keywordMatch MATCHING-RULE ::= {
    SYNTAX          DirectoryString {ub-match}
    ID              id-mr-keywordMatch }

-- Object identifier assignments --
-- object identifiers assigned in other modules are shown in comments
-- Attributes --

-- id-at-objectClass          OBJECT IDENTIFIER ::= {id-at 0}
-- id-at-aliasedEntryName    OBJECT IDENTIFIER ::= {id-at 1}
id-at-knowledgeInformation   OBJECT IDENTIFIER ::= {id-at 2}
id-at-commonName            OBJECT IDENTIFIER ::= {id-at 3}
id-at-surname               OBJECT IDENTIFIER ::= {id-at 4}
id-at-serialNumber          OBJECT IDENTIFIER ::= {id-at 5}
id-at-countryName           OBJECT IDENTIFIER ::= {id-at 6}
id-at-localityName          OBJECT IDENTIFIER ::= {id-at 7}
id-at-collectiveLocalityName OBJECT IDENTIFIER ::= {id-at 7 1}
id-at-stateOrProvinceName   OBJECT IDENTIFIER ::= {id-at 8}
id-at-collectiveStateOrProvinceName OBJECT IDENTIFIER ::= {id-at 8 1}
id-at-streetAddress         OBJECT IDENTIFIER ::= {id-at 9}
id-at-collectiveStreetAddress OBJECT IDENTIFIER ::= {id-at 9 1}
id-at-organizationName      OBJECT IDENTIFIER ::= {id-at 10}

```

```

id-at-collectiveOrganizationName OBJECT IDENTIFIER ::= {id-at 10 1}
id-at-organizationalUnitName OBJECT IDENTIFIER ::= {id-at 11}
id-at-collectiveOrganizationalUnitName OBJECT IDENTIFIER ::= {id-at 11 1}
id-at-title OBJECT IDENTIFIER ::= {id-at 12}
id-at-description OBJECT IDENTIFIER ::= {id-at 13}
id-at-searchGuide OBJECT IDENTIFIER ::= {id-at 14}
id-at-businessCategory OBJECT IDENTIFIER ::= {id-at 15}
id-at-postalAddress OBJECT IDENTIFIER ::= {id-at 16}
id-at-collectivePostalAddress OBJECT IDENTIFIER ::= {id-at 16 1}
id-at-postalCode OBJECT IDENTIFIER ::= {id-at 17}
id-at-collectivePostalCode OBJECT IDENTIFIER ::= {id-at 17 1}
id-at-postOfficeBox OBJECT IDENTIFIER ::= {id-at 18}
id-at-collectivePostOfficeBox OBJECT IDENTIFIER ::= {id-at 18 1}
id-at-physicalDeliveryOfficeName OBJECT IDENTIFIER ::= {id-at 19}
id-at-collectivePhysicalDeliveryOfficeName OBJECT IDENTIFIER ::= {id-at 19 1}
id-at-telephoneNumber OBJECT IDENTIFIER ::= {id-at 20}
id-at-collectiveTelephoneNumber OBJECT IDENTIFIER ::= {id-at 20 1}
id-at-telexNumber OBJECT IDENTIFIER ::= {id-at 21}
id-at-collectiveTelexNumber OBJECT IDENTIFIER ::= {id-at 21 1}
id-at-teletexTerminalIdentifier OBJECT IDENTIFIER ::= {id-at 22}
id-at-collectiveTeletexTerminalIdentifier OBJECT IDENTIFIER ::= {id-at 22 1}
id-at-facsimileTelephoneNumber OBJECT IDENTIFIER ::= {id-at 23}
id-at-collectiveFacsimileTelephoneNumber OBJECT IDENTIFIER ::= {id-at 23 1}
id-at-x121Address OBJECT IDENTIFIER ::= {id-at 24}
id-at-internationalISDNNumber OBJECT IDENTIFIER ::= {id-at 25}
id-at-collectiveInternationalISDNNumber OBJECT IDENTIFIER ::= {id-at 25 1}
id-at-registeredAddress OBJECT IDENTIFIER ::= {id-at 26}
id-at-destinationIndicator OBJECT IDENTIFIER ::= {id-at 27}
id-at-preferredDeliveryMethod OBJECT IDENTIFIER ::= {id-at 28}
id-at-presentationAddress OBJECT IDENTIFIER ::= {id-at 29}
id-at-supportedApplicationContext OBJECT IDENTIFIER ::= {id-at 30}
id-at-member OBJECT IDENTIFIER ::= {id-at 31}
id-at-owner OBJECT IDENTIFIER ::= {id-at 32}
id-at-roleOccupant OBJECT IDENTIFIER ::= {id-at 33}
id-at-seeAlso OBJECT IDENTIFIER ::= {id-at 34}
-- id-at-userPassword OBJECT IDENTIFIER ::= {id-at 35}
-- id-at-userCertificate OBJECT IDENTIFIER ::= {id-at 36}
-- id-at-cACertificate OBJECT IDENTIFIER ::= {id-at 37}
-- id-at-authorityRevocationList OBJECT IDENTIFIER ::= {id-at 38}
-- id-at-certificateRevocationList OBJECT IDENTIFIER ::= {id-at 39}
-- id-at-crossCertificatePair OBJECT IDENTIFIER ::= {id-at-40}
id-at-name OBJECT IDENTIFIER ::= {id-at 41}
id-at-givenName OBJECT IDENTIFIER ::= {id-at 42}
id-at-initials OBJECT IDENTIFIER ::= {id-at 43}
id-at-generationQualifier OBJECT IDENTIFIER ::= {id-at 44}
id-at-uniqueIdentifier OBJECT IDENTIFIER ::= {id-at 45}
id-at-dnQualifier OBJECT IDENTIFIER ::= {id-at 46}
id-at-enhancedSearchGuide OBJECT IDENTIFIER ::= {id-at 47}
id-at-protocolInformation OBJECT IDENTIFIER ::= {id-at 48}
id-at-distinguishedName OBJECT IDENTIFIER ::= {id-at 49}
id-at-uniqueMember OBJECT IDENTIFIER ::= {id-at 50}
id-at-houseIdentifier OBJECT IDENTIFIER ::= {id-at 51}

-- Matching rules --

-- id-mr-objectIdentifierMatch OBJECT IDENTIFIER ::= {id-mr 0}
-- id-mr-distinguishedNameMatch OBJECT IDENTIFIER ::= {id-mr 1}
id-mr-caseIgnoreMatch OBJECT IDENTIFIER ::= {id-mr 2}
id-mr-caseIgnoreOrderingMatch OBJECT IDENTIFIER ::= {id-mr 3}
id-mr-caseIgnoreSubstringsMatch OBJECT IDENTIFIER ::= {id-mr 4}
id-mr-caseExactMatch OBJECT IDENTIFIER ::= {id-mr 5}
id-mr-caseExactOrderingMatch OBJECT IDENTIFIER ::= {id-mr 6}
id-mr-caseExactSubstringsMatch OBJECT IDENTIFIER ::= {id-mr 7}
id-mr-numericStringMatch OBJECT IDENTIFIER ::= {id-mr 8}
id-mr-numericStringOrderingMatch OBJECT IDENTIFIER ::= {id-mr 9}
id-mr-numericStringSubstringsMatch OBJECT IDENTIFIER ::= {id-mr 10}

```

: 1995 (E)

id-mr-caseIgnoreListMatch	OBJECT IDENTIFIER ::=	{id-mr 11}
id-mr-caseIgnoreListSubstringsMatch	OBJECT IDENTIFIER ::=	{id-mr 12}
id-mr-booleanMatch	OBJECT IDENTIFIER ::=	{id-mr 13}
id-mr-integerMatch	OBJECT IDENTIFIER ::=	{id-mr 14}
id-mr-integerOrderingMatch	OBJECT IDENTIFIER ::=	{id-mr 15}
id-mr-bitStringMatch	OBJECT IDENTIFIER ::=	{id-mr 16}
id-mr-octetStringMatch	OBJECT IDENTIFIER ::=	{id-mr 17}
id-mr-octetStringOrderingMatch	OBJECT IDENTIFIER ::=	{id-mr 18}
id-mr-octetStringSubstringsMatch	OBJECT IDENTIFIER ::=	{id-mr 19}
id-mr-telephoneNumberMatch	OBJECT IDENTIFIER ::=	{id-mr 20}
id-mr-telephoneNumberSubstringsMatch	OBJECT IDENTIFIER ::=	{id-mr 21}
id-mr-presentationAddressMatch	OBJECT IDENTIFIER ::=	{id-mr 22}
id-mr-uniqueMemberMatch	OBJECT IDENTIFIER ::=	{id-mr 23}
id-mr-protocolInformationMatch	OBJECT IDENTIFIER ::=	{id-mr 24}
id-mr-uTCTimeMatch	OBJECT IDENTIFIER ::=	{id-mr 25}
id-mr-uTCTimeOrderingMatch	OBJECT IDENTIFIER ::=	{id-mr 26}
id-mr-generalizedTimeMatch	OBJECT IDENTIFIER ::=	{id-mr 27}
id-mr-generalizedTimeOrderingMatch	OBJECT IDENTIFIER ::=	{id-mr 28}
id-mr-integerFirstComponentMatch	OBJECT IDENTIFIER ::=	{id-mr 29}
id-mr-objectIdentifierFirstComponentMatch	OBJECT IDENTIFIER ::=	{id-mr 30}
id-mr-directoryStringFirstComponentMatch	OBJECT IDENTIFIER ::=	{id-mr 31}
id-mr-wordMatch	OBJECT IDENTIFIER ::=	{id-mr 32}
id-mr-keywordMatch	OBJECT IDENTIFIER ::=	{id-mr 33}

END

Annex B**Summary of attribute types**

(This annex does not form an integral part of this Recommendation | International Standard)

This annex summarizes the selected attribute types referenced or defined in this Part and shows their hierarchical relationship. Attributes which share a common ASN.1 syntax are shown indented under that syntax, and attributes which are subtypes of other attributes are shown indented under their supertype. Collective attributes which are subtypes of a related non-collective attribute are not shown, but the related attribute is marked with an asterisk (*). The *syntax* is not shown for attributes whose name is the same as the syntax name.

DirectoryString

- Name
 - CommonName
 - Surname
 - GivenName
 - Initials
 - GenerationQualifier
 - CountryName
 - LocalityName *
 - StateOrProvinceName *
 - OrganizationName *
 - OrganizationalUnitName *
 - Title
- StreetAddress *
- HouseIdentifier
- Description
- BusinessCategory
- PostalCode *
- PostOfficeBox *
- PhysicalDeliveryOfficeName *
- KnowledgeInformation

PrintableString

- SerialNumber
- DNQualifier
- DestinationIndicator
- TelephoneNumber *

NumericString

- X121Address *
- InternationalISDNNumber *

ObjectIdentifier

- SupportedApplicationContext

Bit String

- UniqueIdentifier

NameAndOptionalUID

- UniqueMember

DistinguishedName

- Member
- Owner
- RoleOccupant
- SeeAlso

SearchGuide

- EnhancedSearchGuide

PostalAddress *

- RegisteredAddress

TelexNumber *

- TeletexTerminalIdentifier *

- FacsimileTelephoneNumber *

PreferredDeliveryMethod

- PresentationAddress

- ProtocolInformation

: 1995 (E)

Annex C

Upper bounds

(This annex does not form an integral part of this Recommendation | International Standard)

This annex includes all of the suggested upper bound value constraints used in these Directory Specifications, in the form of the ASN.1 module **UpperBounds**.

```
UpperBounds {joint-iso-ccitt ds(5) module(1) upperBounds(10) 2}
```

```
DEFINITIONS ::=
```

```
BEGIN
```

```
-- EXPORTS All --
```

```
-- The types and values defined in this module are exported for use in the other ASN.1 modules contained
-- within the Directory Specifications, and for the use of other applications which will use them to access
-- Directory services. Other applications may use them for their own purposes, but this will not constrain
-- extensions and modifications needed to maintain or improve the Directory service.
```

ub-answerback	INTEGER	::=	8
ub-business-category	INTEGER	::=	128
ub-common-name	INTEGER	::=	64
ub-country-code	INTEGER	::=	4
ub-description	INTEGER	::=	1024
ub-destination-indicator	INTEGER	::=	128
ub-directory-string-first-component-match	INTEGER	::=	32768
ub-international-isdn-number	INTEGER	::=	16
ub-knowledge-information	INTEGER	::=	32768
ub-locality-name	INTEGER	::=	128
ub-match	INTEGER	::=	128
ub-name	INTEGER	::=	32768
ub-organization-name	INTEGER	::=	64
ub-organizational-unit-name	INTEGER	::=	64
ub-physical-office-name	INTEGER	::=	128
ub-post-office-box	INTEGER	::=	40
ub-postal-code	INTEGER	::=	40
ub-postal-line	INTEGER	::=	6
ub-postal-string	INTEGER	::=	30
ub-schema	INTEGER	::=	1024
ub-serial-number	INTEGER	::=	64
ub-state-name	INTEGER	::=	128
ub-street-address	INTEGER	::=	128
ub-surname	INTEGER	::=	64
ub-tag	INTEGER	::=	64
ub-telephone-number	INTEGER	::=	32
ub-teletex-terminal-id	INTEGER	::=	1024
ub-telex-number	INTEGER	::=	14
ub-title	INTEGER	::=	64
ub-user-password	INTEGER	::=	128
ub-x121-address	INTEGER	::=	15

```
END
```

Annex D

Alphabetical index of attributes and matching rules

(This annex does not form an integral part of this Recommendation | International Standard)

This annex alphabetically lists all of the attributes and matching rules defined in this Directory Specification together with a cross reference to the subclause in which they are defined.

Bit String Match	6.2.4	Octet String Match	6.2.5
Boolean Match	6.2.1	Octet String Ordering Match	6.2.6
Business Category	5.5.4	Octet String Substrings Match	6.2.7
Case Exact Match	6.1.4	Organizational Unit Name	5.4.2
Case Exact Ordering Match	6.1.5	OrganizationName	5.4.1
Case Exact Substrings Match	6.1.6	Owner	5.10.4
Case Ignore List Match	6.1.10	Physical Delivery Office Name	5.6.4
Case Ignore List Substrings Match	6.1.11	Post Office Box	5.6.3
Case Ignore Match	6.1.1	Postal Address	5.6.1
Case Ignore Ordering Match	6.1.2	Postal Code	5.6.2
Case Ignore Substrings Match	6.1.3	Preferred Delivery Method	5.8.1
Common Name	5.2.2	Presentation Address	5.9.1
Country Name	5.3.1	Presentation Address Match	6.2.10
Description	5.5.1	Protocol Information	5.9.3
Destination Indicator	5.7.8	Protocol Information Match	6.2.12
Directory String First Component Match	6.4.3	Registered Address	5.7.7
Distinguished Name	5.10.1	Role Occupant	5.10.5
DN Qualifier	5.2.8	Search Guide	5.5.2
Enhanced Search Guide	5.5.3	See Also	5.10.6
Facsimile Telephone Number	5.7.4	Serial Number	5.2.9
Generation Qualifier	5.2.6	State or Province Name	5.3.3
Given Name	5.2.4	Street Address	5.3.4
House Identifier	5.3.5	Supported Application Context	5.9.2
Initials	5.2.5	Surname	5.2.3
Integer First Component Match	6.4.1	Telephone Number	5.7.1
Integer Match	6.2.2	Telephone Number Match	6.2.8
Integer Ordering Match	6.2.3	Telephone Number Substrings Match	6.2.9
International ISDN Number	5.7.6	Teletex Terminal Identifier	5.7.3
Keyword Match	6.5.2	Telex Number	5.7.2
Knowledge Information	5.1.1	Title	5.4.3
Locality Name	5.3.2	Unique Identifier	5.2.7
Member	5.10.2	Unique Member	5.10.3
Name	5.2.1	Unique Member Match	6.2.11
Numeric String Match	6.1.7	UTC Time Match	6.3.1
Numeric String Ordering Match	6.1.8	UTC Time Ordering Match	6.3.2
Numeric String Substrings Match	6.1.9	Word Match	6.5.1
Object Identifier First Component Match	6.4.2	X.121 Address	5.7.5

Annex E

Amendments and corrigenda

(This annex does not form an integral part of this Recommendation | International Standard)

This edition of this Directory Specification includes the following amendments:

- Amendment 1 for Schema.

This edition of this Directory Specification includes the following technical corrigenda correcting the defects in the following defect reports (some parts of some of the following Technical Corrigenda may have been subsumed by the amendments that formed this edition of this Directory Specification):

- There were no defect reports against the previous edition of this Directory Specification.