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Information technology — Open systems interconnection —

Part 6: The Directory: Selected attribute types

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted (see www.iso.org/directives).

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This document was prepared by ITU-T as ITU-T X.520 (10/2019) and drafted in accordance with its editorial rules, in collaboration with Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

This ninth edition cancels and replaces the eighth edition (ISO/IEC 9594-6:2017), which has been technically revised.

A list of all parts in the ISO/IEC 9594 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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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 that 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 objects defined in Rec. ITU-T X.521 | ISO/IEC 9594-7.

This Recommendation | International Standard provides the foundation frameworks upon which industry profiles can be defined by other standards groups and industry forums. Many of the features defined as optional in these frameworks may be mandated for use in certain environments through profiles. This ninth edition technically revises and enhances the eighth edition of this Recommendation | International Standard.

This ninth edition specifies versions 1 and 2 of the Directory protocols.

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

Annex D, which is not an integral part of this Recommendation | International Standard, provides an example of upper bounds value constraints. These constraints are not reflected in these Directory Specifications, but are provided as a reference for those implementations applying these constraints.

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

Annex F, which is not an integral part of this Recommendation | International Standard, gives examples relevant to the definition of zonal matching.

Annex G, which is not an integral part of this Recommendation | International Standard, describes how a directory distinguished name may be based on object identifiers and on Uniform Resource Names (URNs).

Annex H, which is not an integral part of this Recommendation | International Standard, describes an alternative way of generating directory distinguished based on object identifiers. It contains information retrieved from Rec. ITU-T X.660 | ISO/IEC 9834-1.

Annex I, 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.

INTERNATIONAL STANDARD
RECOMMENDATION ITU-T

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

NOTE 2 – The attribute and context types definitions by this Recommendation | International Standard have some associated semantics. Such specifications should not be used in situations where these semantics do not apply.

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 through 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. 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 edition 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

– Recommendation ITU-T X.500 (2019) | ISO/IEC 9594-1:2020, *Information technology – Open Systems Interconnection – The Directory: Overview of concepts, models and services*.

– Recommendation ITU-T X.501 (2019) | ISO/IEC 9594-2:2020, *Information technology – Open Systems Interconnection – The Directory: Models*.

– Recommendation ITU-T X.509 (2019) | ISO/IEC 9594-8:2020, *Information technology – Open Systems Interconnection – The Directory: Public-key and attribute certificate frameworks*.

– Recommendation ITU-T X.511 (2019) | ISO/IEC 9594-3:2020, *Information technology – Open Systems Interconnection – The Directory: Abstract service definition*.

– Recommendation ITU-T X.518 (2019) | ISO/IEC 9594-4:2020, *Information technology – Open Systems Interconnection – The Directory: Procedures for distributed operation*.

– Recommendation ITU-T X.519 (2019) | ISO/IEC 9594-5:2020, *Information technology – Open Systems Interconnection – The Directory: Protocol specifications*.

– Recommendation ITU-T X.521 (2019) | ISO/IEC 9594-7:2020, *Information technology – Open Systems Interconnection – The Directory: Selected object classes*.

– Recommendation ITU-T X.525 (2019) | ISO/IEC 9594-9:2020, *Information technology – Open Systems Interconnection – The Directory: Replication*.

- Recommendation ITU-T X.660 (2011) | ISO/IEC 9834-1:2012, *Information technology –Procedures for the operation of object identifier registration authorities: General procedures and top arcs of the international object identifier tree*.
- Recommendation ITU-T X.667 (2012) | ISO/IEC 9834-8:2014, *Information technology –Procedures for the operation of object identifier registration authorities: Generation of universally unique identifiers and their use in object identifiers*.
- Recommendation ITU-T X.668 (2008) | ISO/IEC 9834-9:2008, *Information technology – Open Systems Interconnection – Procedures for the operation of OSI Registration Authorities: Registration of object identifier arcs for applications and services using tag-based identification*.
- Recommendation ITU-T X.680 (2015) | ISO/IEC 8824-1:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.
- Recommendation ITU-T X.681 (2015) | ISO/IEC 8824-2:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification*.
- Recommendation ITU-T X.682 (2015) | ISO/IEC 8824-3:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification*.
- Recommendation ITU-T X.683 (2015) | ISO/IEC 8824-4:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications*.
- Recommendation ITU-T X.690 (2015) | ISO/IEC 8825-1:2015, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*.

2.2 Other references

- Recommendation ITU-T E.123 (2001), *Notation for national and international telephone numbers, e-mail addresses and web addresses*.
- Recommendation ITU-T E.164 (2010), *The international public telecommunication numbering plan*.
- Recommendation ITU-T F.1 (1998), *Operational provisions for the international public telegram service*.
- Recommendation ITU-T F.31 (1988), *Telegram retransmission system*.
- Recommendation ITU-T F.401 (1992), *Message handling services: Naming and addressing for public message handling services*.
- Recommendation ITU-T T.30 (2005), *Procedures for document facsimile transmission in the general switched telephone network*.
- Recommendation ITU-T T.51 (1992), *Latin based coded character sets for telematic services*.
- Recommendation ITU-T T.62 (1993), *Control procedures for teletex and Group 4 facsimile services*.
- Recommendation ITU-T X.121 (2000), *International numbering plan for public data networks*.
- ISO 3166-1:2013, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*.
- ISO 3166-3:2013, *Codes for the representation of names of countries and their subdivisions – Part 3: Code for formerly used names of countries*.
- ISO 639-2:1998, *Codes for the representation of names of languages – Part 2: Alpha-3 code*.
- ISO/IEC/IEEE 9945:2009, *Information technology – Portable Operating System Interface (POSIX) – Base Specifications, Issue 7*.
- ISO/IEC 15897:2011, *Information technology – User interfaces – Procedures for the registration of cultural elements.*
- IETF RFC 3406 (2002), *Uniform Resource Names (URN) Namespace Definition Mechanisms*.
- IETF RFC 3454 (2002), *Preparation of Internationalized Strings ("stringprep")*.
- IETF RFC 3492 (2003), *Punycode: A Bootstring encoding of Unicode for Internationalized Domain Names in Applications (IDNA)*.
- IETF RFC 3641 (2003), *Generic String Encoding Rules (GSER) for ASN.1 Types*.
- IETF RFC 3642 (2003), *Common Elements of Generic String Encoding Rules (GSER) Encodings*.
- IETF RFC 3672 (2003), *Subentries in the Lightweight Directory Access Protocol (LDAP)*.
- IETF RFC 3986 (2005), *Uniform Resource Identifier (URI): Generic Syntax*.

- IETF RFC 4512 (2006), *Lightweight Directory Access Protocol (LDAP): Directory Information Models*.
- IETF RFC 4514 (2006); *Lightweight Directory Access Protocol (LDAP): String Representation of Distinguished Names*.
- IETF RFC 4517 (2006), *Lightweight Directory Access Protocol (LDAP): Syntaxes and Matching Rules*.
- IETF RFC 4520 (2006), *Internet Assigned Numbers Authority (IANA) Considerations for the Lightweight Directory Access Protocol (LDAP)*.
- IETF RFC 4792 (2007), *Encoding Instructions for the Generic String Encoding Rules (GSER).*
- IETF RFC 5890 (2010), *Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework*.
- IETF RFC 5892 (2010), *The Unicode Code Points and Internationalized Domain Names for Applications (IDNA)*.
- National Imagery and Mapping Agency (NIMA): TR 8350.2 (1984), *Department of Defense World Geodetic System*, third edition.
- The Unicode Consortium. *The Unicode Standard, Version 4.0.0*, defined by: *The Unicode Standard, Version 4.0* (Reading, MA: Addison-Wesley, 2003. ISBN 0-321-18578-1).
- *Unicode Standard Annex #15: Unicode Normalization Forms*, by Mark Davis and Martin Dürst. An integral part of *The Unicode Standard, Version 4.0*.

2.3 ISO/IEC Standards

- ISO/IEC 10646:2017, *Information technology – Universal Coded Character Set (UCS)*.

3 Definitions

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

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

a) *attribute type*;

b) *context*;

c) *matching rule*;

d) *object class*.

4 Abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

AFI	Application Family Identifier
EPC	Electronic Product Code
FQDN	Fully-Qualified Domain Name
GSER	Generic String Encoding Rules
IDN	Internationalized Domain Name
LDAP	Lightweight Directory Access Protocol
LDH	Letters, Digits, Hyphen
RFID	Radio Frequency Identification
RDN	Relative Distinguished Name
UII	Unique Item Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
UTM	Universal Transverse Mercator
UUID	Universally Unique Identifier

5 Conventions

The term "Directory Specification" (as in "this Directory Specification") shall be taken to mean Rec. ITU-T X.520 | ISO/IEC 9594-6. The term "Directory Specifications" shall be taken to mean the Rec. ITU-T X.500 | ISO/IEC 9594-1, Rec. ITU-T X.501 | ISO/IEC 9594-2, Rec. ITU-T X.511 | ISO/IEC 9594-3, Rec. ITU-T X.518 | ISO/IEC 9594-4, Rec. ITU-T X.519 | ISO/IEC 9594-5, Rec. ITU-T X.520 | ISO/IEC 9594-6, Rec ITU-T X.521 | ISO/IEC 9594-7 and Rec. ITU-T X.525 | ISO/IEC 9594-9.

If an International Standard or ITU-T Recommendation is referenced within normal text without an indication of the edition, the edition shall be taken to be the latest one as specified in the normative references clause.

Prior to year 2020, the parts making up the Directory Specifications progressed together and can therefore collectively be identified as the Directory Specifications of a specific edition using the format: Rec. ITU-T X.5** (yyyy) | ISO/IEC 9594-*:yyyy (e.g.; Rec ITU-T X.5** (1993) | ISO/IEC 9594-*:1995).

This Directory Specification makes extensive use of Abstract Syntax Notation One (ASN.1) for the formal specification of data types and values, as it is specified in Rec. ITU-T X.680 | ISO/IEC 8824-1, ITU-T X.681 | ISO/IEC 8824-2, ITU-T X.682 | ISO/IEC 8824-3, ITU-T X.683 | ISO/IEC 8824-4 and Rec. ITU-T X.690 | ISO/IEC 8825-1.

This Directory Specification presents ASN.1 notation in the bold Courier New typeface. When ASN.1 types and values are referenced in normal text, they are differentiated from normal text by presenting them in the bold Courier New typeface. The names of procedures, typically referenced when specifying the semantics of processing, are differentiated from normal text by displaying them in bold Times New Roman. Access control permissions are presented in italicized Times New Roman.

If the items in a list are numbered (as opposed to using "–" or letters), then the items shall be considered steps in a procedure.

Attribute types, matching rules and context types are defined in this Recommendation | International Standard by use of the **`ATTRIBUTE`**, **`MATCHING-RULE`** and **`CONTEXT`** information object classes defined in Rec. ITU-T 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

6 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 attribute types defined in this Directory Specification are based on a common ASN.1 syntax:

```
UnboundedDirectoryString ::= CHOICE {
  teletexString    TeletexString(SIZE (1..MAX)),
  printableString  PrintableString(SIZE (1..MAX)),
  bmpString        BMPString(SIZE (1..MAX)),
  universalString  UniversalString(SIZE (1..MAX)),
  uTF8String       UTF8String(SIZE (1..MAX)) }
```

A few attribute types are based on the following data type:

```
DirectoryString{INTEGER:maxSize} ::= CHOICE {
  teletexString    TeletexString(SIZE (1..maxSize,...)),
  printableString  PrintableString(SIZE (1..maxSize,...)),
  bmpString        BMPString(SIZE (1..maxSize,...)),
  universalString  UniversalString(SIZE (1..maxSize,...)),
  uTF8String       UTF8String(SIZE (1..maxSize,...)) }
```

NOTE 1 – The above syntaxes are also used in other parts of these Directory Specifications.

NOTE 2 – The use of **TeletexString** is deprecated.

6.1 System attribute types

6.1.1 Knowledge information

A value of the **knowledgeInformation** attribute type holds a human readable accumulated description of knowledge mastered by a specific DSA.

NOTE – This attribute is now obsolete.

```
knowledgeInformation ATTRIBUTE ::= {
  WITH SYNTAX                UnboundedDirectoryString
  EQUALITY MATCHING RULE     caseIgnoreMatch
  OBSOLETE                   TRUE
  ID                         id-at-knowledgeInformation }
```

6.2 Labelling attribute types

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

6.2.1 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                UnboundedDirectoryString
  EQUALITY MATCHING RULE     caseIgnoreMatch
  SUBSTRINGS MATCHING RULE   caseIgnoreSubstringsMatch
  LDAP-SYNTAX                directoryString.&id
  LDAP-NAME                  {"name"}
  ID                         id-at-name }
```

6.2.2 Common name

A value of the **commonName** attribute type holds an identification of an object. A common name is not a directory name in itself; 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 by either 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               UnboundedDirectoryString
  LDAP-SYNTAX               directoryString.&id
  LDAP-NAME                 {"cn","commonName"}
  ID                        id-at-commonName }
```

6.2.3 Surname

An attribute of the type **surname** 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               UnboundedDirectoryString
  LDAP-SYNTAX               directoryString.&id
  LDAP-NAME                 {"sn"}
  ID                        id-at-surname }
```


6.2.4 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               UnboundedDirectoryString
  LDAP-SYNTAX               directoryString.&id
  LDAP-NAME                 {"givenName"}
  ID                        id-at-givenName }
```

6.2.5 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               UnboundedDirectoryString
  LDAP-SYNTAX               directoryString.&id
  LDAP-NAME                 {"initials"}
  ID                        id-at-initials }
```

6.2.6 Generation Qualifier

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

