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Naming and Structuring Guidelines for X.500 Directory Pilots

Status of this Memo

This memo provides information for the Internet community. This memo does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

Abstract

Deployment of a Directory will benefit from following certain guidelines. This document defines a number of naming and structuring guidelines focused on White Pages usage. Alignment to these guidelines is recommended for directory pilots. The final version of this document will replace RFC 1384.

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1. Introduction

The intended audience for this document are mainly data managers using X.500 Directory Services. With the help of these guidelines it should be easier for them to define the structure for the part of the Directory Information Tree they want to model, e.g., the representation of their organisation in the Directory. In addition, decisions like which data elements to store for each kind of entry shall be supported.

These guidelines concentrate mainly on the White Pages use of the Directory, the X.500 application with most operational experience today, nonetheless many recommendations are also valid for other applications of the Directory.

As a pre-requisite to this document, it is assumed that the COSINE and Internet X.500 Schema is followed [1].

2. DIT Structure

The majority of this document is concerned with DIT structure, naming and the usage of attributes for organisations, organisational units and personal entries.

This section briefly notes five other key issues.

2.1 Structure Rules

A DIT structure is suggested in Annex B of X.521 [2], and it is recommended that Directory Pilots for White Pages services should follow these guidelines. Some simple restrictions should be applied, as described below. For further usage of the Directory like e-mail routing with the Directory or storage of network information in the Directory it will be necessary to follow the guidelines specified in the respective documents.

One of the few exceptions to the basic DIT structure is, that international organisations will be stored immediately under the root of the tree. Multi-national organisations will be stored within the framework outlined, but with some use of aliases and attributes such as seeAlso to help bind together the constituent parts of these organisations. This is discussed in more detail in section 2.5.

A general rule for the depth of a subtree is as follows: When a subtree is mainly accessed via searching, it should be as flat as possible to improve the performance, when the access will be mainly through read operations, the depth of the subtree is not a significant parameter for performance.

2.2 The Top Level of the DIT

The following information will be present at the top level of the DIT:

Participating Countries

According to the standard the RDN is the ISO 3166 country code. In addition, the entries should contain suitable values of the friendlyCountryName attribute specified in RFC 1274. Use of this attribute is described in more detail in section 4.4.4.

International Organisations

An international organisation is an organisation, such as the United Nations, which inherently has a brief and scope covering many nations. Such organisations might be considered to be supra-national and this, indeed, is the raison-d'etre of such organisations. Such organisations will almost all be governmental or quasi-governmental. A multi-national organisation is an organisation which operates in more than one country, but is not supra-national. This classification includes the large commercial organisations whose production and sales are spread throughout a large number of countries.

International organisations may be registered at the top level. This will not be done for multi-national organisations. Currently three organisations are registered so far: Inmarsat, Internet and North Atlantic Treaty Organization.

Localities

A few localities will be registered under the root. The chief purpose of these locality entries is to provide a "natural" parent node for organisations which are supra-national, and yet which do not have global authority in their particular field. Such organisations will usually be governmental or quasi-governmental. Example localities might include: Europe, Africa, West Indies. Example organisations within Europe might include: European Court of Justice, European Space Agency, European Commission.

DSA Information

Some information on DSAs may be needed at the top level. This should be kept to a minimum.

The only directory information for which there is a recognised top level registration authority is countries. Registration of other information at the top level may potentially cause problems. At this stage, it is argued that the benefit of limiting additional top level registrations outweighs these problems. However, this potential problem should be noted by anyone making use of such a registration.

2.3 Countries

The national standardisation bodies will define national guidelines for the structure of the national part of the DIT. In the interim, the following simple structure should suffice. The country entry will appear immediately beneath the root of the tree. Organisations which have national significance should have entries immediately beneath their respective country entries. Smaller organisations which are only known in a particular locality should be placed underneath locality entries representing states or similar geographical divisions. Entry for private persons will be listed under the locality entries. An example plan evolving for the US is the work of the North American Directory Forum [3]. Another example is the organisation of the X.500 namespace as standardized in Australia [4].

2.4 Organisations

Large organisations will probably need to be sub-divided by organisational units to help in the disambiguation of entries for people with common names. Entries for people and roles will be stored beneath organisations or organisational units.

The organisation entry itself shall contain the information necessary to contact the organisation: for example, postal address, telephone and fax numbers.

Although the structure of organisations often changes considerably over time, the aim should be to minimise the number of changes to the DIT. Note that renaming a superior, department entry has the effect of changing the DN of all subordinate entries. This has an undesirable impact on the service for several reasons. Alias entries and certain attributes or ordinary entries such as seeAlso, secretary and roleOccupant use DNs to maintain links with other entries. These references are one-way only and the Directory standard offers no support to automatically update all references to an entry once its DN changes.

2.4.1 Directory Manager, Postmaster & Secretary

Similar to messaging, where every domain has its postmaster address it is highly recommended that each organisation in the X.500 Directory has two entries: Postmaster and Directory Manager. In addition, Secretary entries for an organisation and its units should be listed. If this guidance is followed, users will benefit because it will be straightforward to find the right contacts for questions or problems with the service.

These entries should use the object class organizationalRole with the roleOccupant attributes containing the distinguished names of the persons in charge of this role. The values

CN=Directory Manager

CN=Postmaster

CN=Secretary

should be added as additional values whenever another language than English is used for the name of the entries.

2.4.2 Depth of tree

The broad recommendation for White Pages is that the DIT should be as flat as possible. A flat tree means that Directory names will be relatively short, and probably somewhat similar in length and component structure to paper mail addresses. A deep DIT would imply long Directory names, with somewhat arbitrary component parts, with a result which it is argued seems less natural. Any artificiality in the choice of names militates against successful querying.

A presumption behind this style of naming is that most querying will be supported by the user specifying convenient strings of characters which will be mapped onto powerful search operations. The alternative approach of the user browsing their way down the tree and selecting names from large numbers of possibilities may be more appropriate in some cases, and a deeper tree facilitates this. However, these guidelines recommend a shallow tree, and implicitly a search oriented approach.

It may be considered that there are two determinants of DIT depth: first, how far down the DIT an organisation is placed; second, the structure of the DIT within organisations.

The structure of the upper levels of the tree will be determined in due course by various registration authorities, and the pilot will have to work within the given structure. However, it is important that the various pilots are cognisant of what the structures are likely to be, and move early to adopt these structures.

The other principal determinant of DIT depth is whether an organisation splits its entries over a number of organisational units, and if so, the number of levels. The recommendation here is that this sub-division of organisations is kept to a minimum. A maximum of two levels of organisational unit should suffice even for large organisations. Organisations with only a few tens or hundreds of employees should strongly consider not using organisational units at all. It is noted that there may be some problems with choice of unique RDNs when using a flat DIT structure. Multi-component RDNs can alleviate this problem: see section 3.1. The standard X.521 recommends that an organizationalUnitName attribute can also be used as a naming attribute to disambiguate entries [2]. Further disambiguation may be achieved by the use of a personalTitle or userId attribute in the RDN.

2.4.3 Real World Organisational Structure

Another aspect on designing the DIT structure for an organisation is the administrative structure within a company. Using the same structure in the DIT might help in distributing maintenance authority to the different units. Please note comments on the stability of the DIT structure in section 2.4.

2.5 Multi-National Organisations

The standard says that only international organisations may be placed under the root of the DIT. This implies that multi-national organisations must be represented as a number of separate entries underneath country or locality entries. This structure makes it more awkward to use X.500 within a multi-national to provide an internal organisational directory, as the data is now spread widely throughout the DIT, rather than all being grouped within a single sub-tree.

Many people have expressed the view that this restriction is a severe limitation of X.500, and argue that the intentions of the standard should be ignored in this respect. This note argues, though, that the standard should be followed.

No attempt to precisely define multinational organisation is essayed here. Instead, the observation is made that the term is applied to a variety of organisational structures, where an organisation operates in more than one country. This suggests that a variety of DIT structures may be appropriate to accommodate these different organisational structures. This document suggests three approaches, and notes some of the characteristics associated with each of these approaches.

Before considering the approaches, it is worth bearing in mind again that a major aim in the choice of a DIT structure is to facilitate querying, and that approaches which militate against this should be avoided wherever possible.

2.5.1 The Multi-National as a Single Entity

In many cases, a multi-national organisation will operate with a highly centralised structure. While the organisation may have large operations in a number of countries, the organisation is strongly controlled from the centre and the disparate parts of the organisation exist only as limbs of the main organisation. In such a situation, the model shown in figure 1 may be the best choice.

```
                            ROOT

                           / | \
                          /  |  \

                      C=GB  C=FR  C=US

                     /       |       \
                    /        |        \

          O=MultiNat---->O=MultiNat<----O=MultiNat

                         /    |    \
                        /     |     \
                       /      |      \

                 l=abc      ou=def     l=fgi

                     ---> means "alias to"
```

Figure 1: The multi-national as a single entity

The organisation’s entries all exist under a single sub-tree. The organisational structure beneath the organisation entry should reflect the perceived structure of the organisation, and so no recommendations on this matter can be made here. To assist the person querying the directory, alias entries should be created under all countries where the organisation operates.

2.5.2 The Multi-National as a Loose Confederation

Another common model of organisational structure is that where a multi-national consists of a number of national entities, which are in large part independent of both sibling national entities, and of any central entity. In such cases, the model shown in Figure 2 may be a better choice. Organisational entries exist within each country, and only that country’s localities and organisational units appear directly beneath the appropriate organisational entry.

```
                              ROOT

                             / | \
                            /  |  \
                        C=GB C=FR C=US

                        /      |      \
                       /       |       \
              O=MultiNat   O=MultiNat   O=MultiNat

             /    |        /    |   \        |    \
            /     |       /     |    \       |     \

        L=FR    L=GB<---L=GB     |   L=US--->L=US   L=FR
          \                      |                 /
           ------------------->L=FR<----------------

                      ---> means "alias to"
```

Figure 2: The multi-national as a loose confederation

Some binding together of the various parts of the organisation can be achieved by the use of aliases for localities and organisational units, and this can be done in a highly flexible fashion. In some cases, the national view might not contain all branches of the company, as illustrated in Figure 2.

2.5.3 Loosely Linked DIT Sub-Trees

A third approach is to avoid aliasing altogether, and to use the looser binding provided by an attribute such as seeAlso. This approach treats all parts of an organisation as essentially separate.

A unified view of the organisation can only be achieved by user interfaces choosing to follow the seeAlso links. This is a key difference with aliasing, where decisions to follow links may be specified within the protocol. (Note that it may be better to specify another attribute for this purpose, as seeAlso is likely to be used for a wide variety of purposes.)

2.5.4 Summary of Advantages and Disadvantages of the Above Approaches

Providing an internal directory

All the above methods can be used to provide an internal directory. In the first two cases, the linkage to other parts of the organisation can be followed by the protocol and thus organisation-wide searches can be achieved by single X.500

operations. In the last case, interfaces would have to "know" to follow the soft links indicated by the seeAlso attribute.

Impact on naming

In the single-entity model, all DNs within the organisation will be under one country. It could be argued that this will often result in rather "unnatural" naming. In the loose- confederation model, DNs are more natural, although the need to disambiguate between organisational units and localities on an international, rather than just a national, basis may have some impact on the choice of names. For example, it may be necessary to add in an extra level of organisational unit or locality information. In the loosely-linked model, there is no impact on naming at all.

Views of the organisation

The first method provides a unique view of the organisation. The loose confederacy allows for a variety of views of the organisation. The view from the centre of the organisation may well be that all constituent organisations should be seen as part of the main organisation, whereas other parts of the organisation may only be interested in the organisation’s centre and a few of its sibling organisations. The third model gives an equally flexible view of organisational structures.

Lookup performance

All methods should perform reasonably well, providing information is either held within a single DSA or it is replicated to the other DSAs.

3. Naming Style

The first goal of naming is to provide unique identifiers for entries. Once this is achieved, the next major goal in naming entries should be to facilitate querying of the Directory. In particular, support for a naming structure which facilitates use of user friendly naming [5] is desirable. Other considerations, such as accurately reflecting the organisational structure of an organisation, should be disregarded if this has an adverse effect on normal querying. Early experience in the pilot has shown that a consistent approach to structure and naming is an aid to querying using a wide range of user interfaces, as interfaces are often optimised for DIT structures which appear prevalent. In addition, the X.501 standard notes that "RDNs are intended to be long-lived so that the users of the Directory can store the distinguished names of objects..." and "It is preferable that distinguished names of objects which humans have to deal with be user-friendly." [2]

Naming is dependent on a number of factors and these are now considered in turn.

3.1 Multi-Component Relative Distinguished Names

According to the standard, relative distinguished names may have more than one component selected from the set of the attributes of the entry to be named. This is useful when there are, for example, two "John Smiths" in one department. The use of multi-component relative distinguished names allows one to avoid artificial naming values such as "John Smith 1" or "John Smith-2". Attributes which could be used as the additional naming attribute include: personalTitle, roomNumber, telephoneNumber, and userId.

3.2 National Guidelines for Naming

Where naming is being done in a country which has established guidelines for naming, these guidelines should in general be followed. These guidelines might be based on an established registration authority, or may make use of an existing registration mechanism (e.g., company name registration).

Where an organisation has a name which is nationally registered in an existing registry, this name is likely to be appropriate for use in the Directory, even in cases where there are no national guidelines.

3.3 Naming Organisation and Organisational Unit Names

The naming of organisations in the Directory will ultimately come under the jurisdiction of official naming authorities. In the interim, it is recommended that pilots and organisations follow these guidelines. An organisation's RDN should usually be the full name of the organisation, rather than just a set of initials. This means that University College London should be preferred over UCL. An example of the problems which a short name might cause is given by the proposed registration of AA for the Automobile Association. This seems reasonable at first glance, as the Automobile Association is well known by this acronym. However, it seems less reasonable in a broader perspective when you consider that organisations such as Alcoholics Anonymous and American Airlines use the same acronym.

Just as initials should usually be avoided for organisational RDNs, so should formal names which, for example, exist only on official charters and are not generally well known. There are two reasons for this approach:

1. The names should be meaningful.

2. The names should uniquely identify the organisation, and be a name which is unlikely to be challenged in an open registration process. For example, UCL might well be challenged by United Carriers Ltd.

The same arguments on naming style can be applied with even greater force to the choice of RDNs for organisational units. While abbreviated names will be in common parlance within an organisation, they will almost always be meaningless outside of that organisation. While many people in academic computing habitually refer to CS when thinking of Computer Science, CS may be given several different interpretations. It could equally be interpreted as Computing Services, Cognitive Science, Clinical Science or even Counselling Services.

For both organisations and organisational units, extra naming information should be stored in the directory as alternative values of the naming attribute. Thus, for University College London, UCL should be stored as an alternative organizationName attribute value. Similarly CS could be stored as an alternative organizationalUnitName value for Computer Science and any of the other departments cited earlier. In general, entries will be located by searching, and so it is not essential to have RDNs which are either the most memorable or guessable, although names should be recognisable. The need for users not to type long names may be achieved by use of carefully selected alternative values.

3.4 Naming Human Users

A reasonably consistent approach to naming people is particularly critical as a large percentage of directory usage will be looking up information about people. User interfaces will be better able to assist users if entries have names conforming to a common format, or small group of formats. It is suggested that the RDN should follow such a format. Alternative values of the common name attribute should be used to store extra naming information. It seems sensible to try to ensure that the RDN commonName value is genuinely the most common name for a person as it is likely that user interfaces may choose to place greater weight on matches on the RDN than on matches on one of the alternative names.

The choice of RDN for humans will be influenced by cultural considerations. In many countries the best choice will be of the form familiar-first-name surname. Thus, Steve Kille is preferred as the RDN choice for one of this document’s co-authors, while Stephen E. Kille is stored as an alternative commonName value. Pragmatic choices will have to be made for other cultures. The common name attribute should not be used to hold other attribute information such as telephone numbers, room numbers, or local codes. Such information should be stored within the appropriate attributes as defined in the COSINE and Internet X.500 Schema. Section 3.1 on multi-component RDNs shows how clashing names can be made unique.

The choice of a naming strategy should not be made on the basis of the possibilities of the currently available user interface implementations. For example, it is inappropriate to use common names of the form 'surname firstname' merely because a user interface presents results in a more satisfactory order by so doing. Use the best structure for human names, and fix the user interface!

More details on the use of commonName in section 4.4.1.

3.5 Application Entities

The guidelines of X.521 should be followed, in that the application entity should always be named relative to an Organisation or Organisational Unit. The application process will often correspond to a system or host. In this case, the application entities should be named by Common Names which identify the service (e.g., "FTAM Service"). In cases where there is no useful distinction between application process and application entity, the application process may be omitted (This is often done for DSAs in the current pilot).

4. Attribute Values

In general the attribute values should be used as documented in the standards. Sometimes the standard is not very precise about which attribute to use and how to represent a value.

The following sections give recommendations how to use them in X.500 pilot projects.

4.1 Basic Attribute Syntaxes

Every attribute type has a definition of the attribute syntaxes its values may be use. Most attribute types make use the basic attribute syntaxes only.

4.1.1 Printable String

This most simple syntax uses a subset of characters from ISO 646 IRV.

A-Z	a-z	0-9	'	(	)	+
,	-	.	/	:	?	space

Tab 1: Characters in PrintableString

4.1.2 IA5 String - T.50

The International Alphabet No. 5 (IA5) is known from the X.400 message handling service. It covers a wider range of characters than the printable string. The international reference version of IA5 offers the same set of characters as ISO 646 IRV.

4.1.3 Teletex String - T.61

The Teletex character set is a very unusual one in the computing environment because it uses mixed one and two octet character codes which are more difficult to handle than single octet codes. Most of the characters can be mapped to the more often supported 8-bit character set standard ISO 8859-1 (ISO Latin-1).

4.1.4 Case Ignore String

Many attributes use this case insensitive syntax. It allows attribute values to be represented using a mixture of upper and lower case letters, as appropriate. Matching of attribute values, however, is performed such that no significance is given to case.

4.1.5 Distinguished Name

A Distinguished Name should currently never contain a value in T.61 string syntax because most users would not be able to view or type it correctly by lack of appropriate hardware/software configuration. Therefore, only the characters defined in printable string syntax should be used as part of a RDN. The correct representation of the name should be added as additional attribute value to match for search operations.

4.2 Languages & Transliteration

The standard as available has no support at all for the use of different languages in the Directory. It is e.g., not possible to add a language qualifier to a description attribute nor is it possible to use characters beyond the Teletex character set.

4.2.1 Languages other than English

Many countries have more than one national language and a world-wide Directory must be able to support non-English-speaking users.

Until the standard provides a solution for this problem it is possible to make use of multi-valued attributes to specify a value not only in the local languages but also in English.

In particular the friendlyCountryName, stateOrProvinceName and localityName attributes should use the most often used translations of its original value to increase the chance for successful searches also for users with a foreign language. Other attributes like description, organizationName and organizationalUnitName attributes should provide multi-lingual values where appropriate.

The drawback of this solution is, that the user interfaces present much redundant information because they are not able to know the language of the values and make an automatic selection.

Note: The sequence of multi-valued attribute values in an entry cannot be defined. It is always up to the DSA to decide on which order to store them and return them as results, and to the DUA to decide on which order to display them.

4.2.2 Transliteration

What measures can be taken to make sure all users are able to read an attribute, when a value uses one of the special characters from the T.61 character set? An interim solution is transliteration as used in earlier days with the typewriters, where e.g., the German ’a’ with umlaut is written as ’ae’. Transliteration is not necessarily unique since it is dependent on the language, English speakers transliterate the ’a’ with umlaut just to an ’a’. However, it is an improvement over just using the T.61 value since it may not be possible to display such a value at all. Whenever an attribute needs a character not in PrintableString and the attribute syntax allows the use of the T.61 character set, it is recommended that the attribute should be supplied as multi-valued attribute both in T.61 string and in a transliterated PrintableString notation.

4.3 Access control

An entry’s object class attribute, and any attribute(s) used for naming an entry are of special significance and may be considered to be "structural". Any inability to access these attributes will often militate against successful querying of the Directory. For example, user interfaces typically limit the scope of their searches by searching for entries of a particular type, where the type of entry is indicated by its object class. Thus, unless the intention is to bar public access to an entry or set of entries, the object class and naming attributes should be publicly readable.

4.4 Selected Attributes

The section lists attributes together with a short description what they should be used for and some examples. [6] The source of the attributes is given in brackets.

Note that due to national legal restrictions on privacy issues it might be forbidden to use certain attributes or that the search on them is restricted. [7]

4.4.1 Personal Attributes

commonName [X.520]

It is proposed that pilots should ignore the standard's recommendations on storing personal titles, and letters indicating academic and professional qualifications within the commonName attribute, as this overloads the commonName attribute. A personalTitle attribute has already been specified in the COSINE and Internet Schema, and another attribute could be specified for information about qualifications.

The choice of a name depends on the culture as discussed in section 3.4. When a commonName is selected as (part of) a RDN the most often used form of the name should be selected. A firstname should never be supplied only as an initial (unless, of course, the source data does not include forenames). It is very important to have its full value in order to be able to distinguish between two similar entries. Sets of initials should not be concatenated into a single "word", but be separated by spaces and/or "." characters.

Format: Firstname [Initials] Lastname

Example: Steve Kille

Stephen E. Kille

S.E. Kille

The use of ’Lastname Firstname’ is deprecated as explained in section 3.4.

favouriteDrink [RFC 1274]

The intention of this attribute is that it provides at least one benign attribute which any user can create or modify, given a suitable user interface, without having the unfortunate impact on the directory service that follows from modifying an attribute such as an e-mail address or telephone number.

Example: Pure Crystal Water

organizationalStatus [RFC 1274]

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

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

Example: undergraduate student

personalTitle [RFC 1274]

The usually used titles, especially academic ones. Excessive use should be avoided.

Example: Prof. Dr.

roomNumber [RFC 1274]

The room where the person works, it will mostly be locally defined how to write the room number, e.g., Building Floor Room.

Example: HLW B12

secretary [RFC 1274]

The secretary of the person. This is the Distinguished Name (DN) of the secretary.

Example: CN=Beverly Pyke, O=ISODE Consortium, C=GB surname [X.520]

Like with commonName it is a matter of culture what to use for surname in case of a noble name, e.g., de Stefani, von Gunten.

Example: Kille

title [X.520]

Title describing the position, job title or function of an organisational person.

Example: Manager - International Sales

userId [RFC 1274]

When an organisation has centrally managed user ids, it might make sense to include it into the entry. It might also be used to form a unique RDN for the person.

Example: skille

userPassword [X.520]

The password of the entry which allows the modification of the entry, provided that the access control permits it. The password should not be the same as any system password, unless it is sure that nobody can read it. With the current implementations this is mostly not guaranteed.

Example: 8kiu8z7e

4.4.2 Organisational Attributes

associatedDomain [RFC 1274]

The Internet domain name for an organisation or one of its units.

Example: isode.com

businessCategory [X.520]

Type of business an organisation, an organisational unit or organisational person is involved in. The values could be chosen from a thesaurus.

Example: Software Development

organizationName [X.520]

The name of the organisation. The value for the RDN should be chosen according to section 3.3. Additional names like abbreviations should be used for better search results.

```
Example:    Uni Lausanne
            Universite de Lausanne
            Universit\c2e Lausanne (with a T.61 encoded umlaut)
            University of Lausanne
           unil
```

organizationalUnitName [X.520]

The name of a part of the organisation. The value for the RDN should be chosen according to section 3.3. Additional names like abbreviations should be provided for better search results.

```
Example:    Institut fuer Angewandte Mathematik
            Mathematik
            iam
```

roleOccupant [X.520]

The person(s) in that role. This is the Distinguished Name of the entry of the person(s).

Example: CN=Beverly Pyke, O=ISODE Consortium, C=GB

searchGuide [X.520]

The currently available DUAs make no use this attribute. It seems that it is not powerful enough for real usage. Experience is needed before being able to give recommendations on how to configure it.

4.4.3 Local Attributes

localityName [X.520]

Name of the place, village or town with values in local and other languages as useful.

```
Example:    Bale
            B\c3ale (with a T.61 encoded accented character) Basel
            Basilea
            Basle
```

stateOrProvinceName [X.520]

Name of the canton, county, department, province or state with values in local and other languages as useful. If official and commonly used abbreviations exist for the states, they should be supplied as additional values

Example: Ticino
Tessin
TI

4.4.4 Miscellaneous Attributes

audio [RFC 1274]

The audio attribute uses a u-law encoded sound file as used by the "play" utility on a Sun 4. According to RFC 1274 it is an interim format. It may be useful to listen to the pronunciation of a name which is otherwise unknown.

description [X.520]

A short informal explanation of special interests of a person or organisation. Overlap with businessCategory, organizationalStatus and title should be avoided.

Example: Networking, distributed systems, OSI, implementation.

friendlyCountryName [RFC 1274]

The friendlyCountryName attribute type specifies names of countries in human readable format. Especially the country name as used in the major languages should be included as additional values to help foreign users.

jpegPhoto [RFC 1488] [8]

A colour or grayscale picture encoded according to JPEG File Interchange Format (JFIF). Thanks to compression the size of the pictures is moderate. For persons it may show a portrait, for organisations the company logo or a map on how to get there.

photo [RFC 1274]

The photo attribute is a b/w G3 fax encoded picture of an object. The size of the photo should be in a sensible relation to the informational value of it. This attribute will be replaced by jpegPhoto.

seeAlso [X.520]

Reference to another closely related entry in the DIT, e.g., from a room to the person using that room. It is the Distinguished Name of the entry.

Example: CN=Beverly Pyke, O=ISODE Consortium, C=GB

4.4.5 MHS Attributes

mhsORAddresses [X.411]

The attribute uses internally an ASN.1 structure. The string notation used for display purposes is implementation dependent. This attribute is especially useful for an integrated X.400 user agent since it gets the address in a directly usable format.

rfc822mailbox [RFC 1274]

E-Mail address in RFC 822 notation

Example: s.kille@isode.com

textEncodedORAddress [RFC 1274]

X.400 e-mail address in string notation. The F.401 notation should be used. This attribute shall disappear once the majority of the DUAs support the mhsORAddresses attribute. The advantage of the latter attribute is, that a configurable DUA could adjust the syntax to the one needed by the local mailer, where textencodedORAddress is just a string which will mostly have a different syntax than the mailer expects.

```
Example:    G=thomas; S=lenggenhager; OU1=gate; O=switch; \
            P=switch; A=arcom; C=ch;
```

4.4.6 Postal Attributes

postalAddress [X.520]

The full postal address (but not including the name) in international notation, with up to 6 lines with 30 characters each.

```
Example:    SWITCH
            Limmatquai 13
            CH-8001 Zurich
```

postalCode [X.520]

The postalCode will be the same as used in the postalAddress (in international notation).

Example: CH-8001

streetAddress [X.520]

It shall be the street where the person has its office. Mostly, it will be the street part of the postalAddress.

Example: Limmatquai 138

4.4.7 Telecom Attributes

telephoneNumber, facsimileTelephoneNumber & iSDNAddress [X.520]

The phone number in the international notation according to CCITT E.123. The separator '-' instead of space may be used according to the local habit, it should be used consistently within a country.

Format: "+" <country code> <national number> ["x" <extension>]
Example: +41 1 268 1540

telexNumber [X.520]

The telex number in the international notation

Example: 817379, ch, ehhg

5. Miscellany

This section draws attention to two areas which frequently provoke questions, and where it is felt that a consistent approach will be useful.

5.1 Schema consistency of aliases

According to the letter of the standard, an alias may point at any entry. It is beneficial for aliases to be 'schema consistent'.

The following two checks should be made:

1. The Relative Distinguished Name of the alias should use an attribute type normally used for naming entries of the object class of the main entry.

2. If the entry (aliased object) were placed where the alias is, there should be no schema violation.

5.2 Organisational Units

There is a problem that many organisations can be either organisations or organisational units, dependent on the location in the DIT (with aliases giving the alternate names). For example, an organisation may be an independent national organisation and also an organisational unit of a parent organisation. To achieve this, it is important to allow an entry to be of both object class organisation and of object class organisational unit.

6. References

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[3] The North American Directory Forum. "A Naming Scheme for C=US", RFC 1255, NADF-175, NADF, September 1991.

[4] Michaelson, G., and M. Prior, "Naming Guidelines for the AARNet X.500 Directory Service", RFC 1562, AEN-001, The University of Queensland, The University of Adelaide, December 1993.

[5] Hardcastle-Kille, S., "Using the OSI Directory to achieve user friendly naming", RFC 1484, Department of Computer Science, University College London, July 1993.

[6] Barker, P., "Preparing data for inclusion in an X.500 Directory", Research Note RN/92/41, Department of Computer Science, University College London, May 1992.

[7] Jeunink, E., and E. Huizer, "Directory Services and Privacy Issues", RARE WG-DATMAN, TF-LEGAL, Work in Progress, May 1993.

[8] Howes, T., Kille, S., Yeong, W., and C. Robbins, "The X.500 String Representation of Standard Attribute Syntaxes", RFC 1488, University of Michigan, ISODE Consortium, Performance Systems International, NeXor Ltd., July 1993.

7. Security Considerations

Security issues are not substantially discussed in this memo.

8. Authors' Addresses

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9. Appendix - Example Entries

9.1 Country

```
DN: C=CH

objectClass=top & country & domainRelatedObject & friendlyCountry
country=CH
associatedDomain=ch
friendlyCountryName=CH
friendlyCountryName=Confoederatio Helvetica
friendlyCountryName=Schweiz
friendlyCountryName=Suisse
friendlyCountryName=Svizzera
friendlyCountryName=Switzerland
```

9.2 Organisation

```
DN: O=SWITCH, C=CH

objectClass=top & organization & mhsUser & domainRelatedObject
description=Swiss Academic and Research Network
organizationName=SWIss TeleCommunication system for Higher
education\and research
organizationName=Swiss Academic and Research Network
organizationName=SWITCH
localityName=Zuerich
localityName=Zurich
localityName={T.61}Z\c8urich
stateOrProvinceName=ZH
stateOrProvinceName=Zuerich
stateOrProvinceName=Zurich
stateOrProvinceName={T.61}Z\c8urich
postalAddress=SWITCH
              Limmatquai 138
              CH-8001 Zurich
postalCode=CH-8001
streetAddress=Limmatquai 138
telephoneNumber=+41 1 268 1515
facsimileTelephoneNumber=+41 1 268 1568
seeAlso=CN=Postmaster, O=SWITCH, C=CH
mhsORAddresses=S=postmaster, O=switch; P=switch; A=arcom; C=ch;
associatedDomain=switch.ch
```

9.3 Organisation Unit

```
DN: OU=SWITCHdirectory, O=SWITCH, C=CH

objectClass=top & organizationalUnit
description=The SWITCH X.500 pilot project
organizationalUnitName=SWITCHdirectory
localityName=Zurich
localityName=Zuerich
localityName={T.61}Z\c8urich
stateOrProvinceName=Zurich
stateOrProvinceName=Zuerich
stateOrProvinceName=ZH
stateOrProvinceName={T.61}Z\c8urich
postalAddress=SWITCHdirectory
              SWITCH
              Limmatquai 138
              CH-8001 Zurich
postalCode=CH-8001
streetAddress=Limmatquai 138
telephoneNumber=+41 1 268 1540
facsimileTelephoneNumber=+41 1 268 1568
```

9.4 Organizational Role

```
DN: CN=Directory Manager, O=SWITCH, C=CH

objectClass=top & organizationalRole & mhsUser
commonName=Directory Manager
description=SWITCH Directory Managers
roleOccupant=CN=Martin Berli, O=SWITCH, C=CH
roleOccupant=CN=Thomas Lenggenhager, O=SWITCH, C=CH
localityName=Zuerich
localityName=Zurich
localityName={T.61}Z\c8urich
stateOrProvinceName=Zurich
stateOrProvinceName=Zuerich
stateOrProvinceName=ZH
stateOrProvinceName={T.61}Z\c8urich
postalAddress=SWITCHdirectory
              SWITCH
              Limmatquai 138
              CH-8001 Zurich
postalCode=CH-8001
streetAddress=Limmatquai 138
telephoneNumber=+41 1 268 1540
facsimileTelephoneNumber=+41 1 268 1568
mhsORAddresses=S=switchinfo; O=switch; P=switch; A=arcom; C=ch;
```

```
DN: CN=Postmaster, O=SWITCH, C=CH

objectClass=top & organizationalRole & mhsUser
commonName=Postmaster
commonName=Helpdesk
roleOccupant=CN=Christoph Graf, O=SWITCH, C=CH
roleOccupant=CN=Felix Kugler, O=SWITCH, C=CH
roleOccupant=CN=Marcel Parodi, O=SWITCH, C=CH
roleOccupant=CN=Marcel Schneider, O=SWITCH, C=CH
telephoneNumber=+41 1 268 1520
facsimileTelephoneNumber=+41 1 268 1568
mhsORAddresses=S=postmaster; O=switch; P=switch; A=arcom; C=ch;

DN: CN=Secretary, O=SWITCH, C=CH

objectClass=top & organizationalRole & quipuObject
commonName=Secretary
roleOccupant=CN=Franziska Remund, O=SWITCH, C=CH
```

9.5 Person

```
DN: CN=Thomas Lenggenhager, O=SWITCH, C=CH

objectClass=top & person & organizationalPerson & mhsUser &
pilotObject & newPilotPerson
commonName=Thomas Lenggenhager
commonName=T. Lenggenhager
surname=Lenggenhager
description=SWITCHinfo, Project Leader
localityName=Zuerich
localityName=Zurich
localityName={T.61}Z\c8urich
stateOrProvinceName=ZH
stateOrProvinceName=Zuerich
stateOrProvinceName=Zurich
stateOrProvinceName={T.61}Z\c8urich
postalAddress=SWITCH
              Limmatquai 138
              CH-8001 Zurich
postalCode=CH-8001
streetAddress=Limmatquai 138
telephoneNumber=+41 1 268 1540
facsimileTelephoneNumber=+41 1 268 1568
mhsORAddresses=S=lenggenhager; O=switch; P=switch; A=arcom; C=ch;
userPassword=secret
textEncodedORaddress={T.61}S=lenggenhager; O=switch; P=switch; \
                              A=arcom; C=ch;
rfc822mailbox=lenggenhager@switch.ch
secretary=CN=Franziska Remund, O=SWITCH, C=CH
```