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Technical Specification

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Universal Mobile Telecommunications System (UMTS);
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Configuration Management (CM);
Name convention for Managed Objects
(3GPP TS 32.300 version 4.1.2 Release 4)**



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Contents

| | |
|---|-----------|
| Intellectual Property Rights | 2 |
| Foreword..... | 2 |
| Foreword..... | 4 |
| Introduction | 4 |
| 1 Scope | 6 |
| 2 References | 6 |
| 3 Definitions and abbreviations..... | 7 |
| 3.1 Definitions | 7 |
| 3.1.1 IRPAgent | 7 |
| 3.1.2 IRPManager..... | 7 |
| 3.1.3 Managed Object and Network Resource | 7 |
| 3.1.4 Name..... | 7 |
| 3.1.5 Name space..... | 7 |
| 3.1.6 Global Root and Local Root | 8 |
| 3.1.7 Distinguished Name and Relative Distinguished Name | 8 |
| 3.2 Abbreviations | 8 |
| 4 System overview | 9 |
| 4.1 System context | 9 |
| 5 Name Convention for Managed Objects | 9 |
| 6 Representations of DN | 9 |
| 7 String Representation of DN | 10 |
| 7.1 Converting DN from ASN.1 to a String | 10 |
| 7.1.1 Converting RDNSequence | 10 |
| 7.1.2 Converting RelativeDistinguishedName..... | 10 |
| 7.1.3 Converting AttributeTypeAndValue..... | 10 |
| 7.2 Character syntax | 11 |
| 7.3 BNF of DN String Representation | 11 |
| 7.4 Maximum size of DN string | 11 |
| 8 Examples of DN in string representation | 11 |
| 9 Usage Scenario..... | 12 |
| 9.1 DN prefix usage | 12 |
| Annex A (normative): Mapping of RDN AttributeType to Strings | 13 |
| Annex B (normative): Rule for MO Designers regarding AttributeType interpretation..... | 14 |
| Annex C (informative): DN Prefix and Local Distinguished Name (LDN)..... | 15 |
| Annex D (informative): Change history | 17 |
| History | 18 |

Foreword

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Introduction

Configuration Management (CM), in general, provides the operator with the ability to assure correct and effective operation of the 3G network as it evolves. CM actions have the objective to control and monitor the actual configuration on the Network Elements (NEs) and Network Resources (NRs), and they may be initiated by the operator or by functions in the Operations Systems (OSs) or NEs.

CM actions may be requested as part of an implementation programme (e.g. additions and deletions), as part of an optimisation programme (e.g. modifications), and to maintain the overall Quality of Service (QoS). The CM actions are initiated either as single actions on single NEs of the 3G network, or as part of a complex procedure involving actions on many resources/objects in one or several NEs.

Due to the growing number of specifications to model new services and Resource Models for Configuration Management (CM), as well as the expected growth in size of each of them from 3GPP Release 4 onwards, a new structure of the specifications is already needed in Release 4. This structure is needed for several reasons, but mainly to enable more independent development and release for each part, as well as a simpler document identification and version handling. Another benefit would be that it becomes easier for bodies outside 3GPP, such as the ITU-T, to refer to telecom management specifications from 3GPP. The new structure of the specifications does not lose any information or functionality supported by the Release 1999. The restructuring also includes defining new IRPs for the Network Resource Models (Generic, Core Network and UTRAN NRM).

Finally, the Name convention for Managed Objects (in Release 1999: 3GPP TS 32.106-8) has been moved to a separate number series used for specifications common between several management areas (e.g. CM, FM, PM).

The following table shows an overview of the mapping between the old Release 1999 and new Release 4 CM specification structure.

Table: Mapping between Release '99 and the new Rel-4 specifications

| R99 Old no. | Old (R99) specification title | Rel-4 New no. | New (Rel-4) specification title |
|-------------|--|---------------|---|
| 32.106-1 | 3G Configuration Management: Concept and Requirements | 32.600 | 3G Configuration Management: Concept and High-level Requirements |
| 32.106-1 | <Notification IRP requirements from 32.106-1 and 32.106-2> | 32.301 | Notification IRP: Requirements |
| 32.106-2 | Notification IRP: IS | 32.302 | Notification IRP: Information Service |
| 32.106-3 | Notification IRP: CORBA SS | 32.303 | Notification IRP: CORBA SS |
| 32.106-4 | Notification IRP: CMIP SS | 32.304 | Notification IRP: CMIP SS |
| 32.106-8 | Name convention for Managed Objects | 32.300 | Name Convention for Managed Objects |
| 32.106-1 | <Basic CM IRP IS requirements from 32.106-1 and 32.106-5> | 32.601 | Basic CM IRP: Requirements |
| 32.106-5 | Basic CM IRP IM (Intro & IS part) | 32.602 | Basic CM IRP: Information Service |
| 32.106-6 | Basic CM IRP CORBA SS (IS related part) | 32.603 | Basic CM IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (IS related part) | 32.604 | Basic CM IRP: CMIP SS |
| 32.106-1 | <Basic CM IRP Generic NRM requirements from 32.106-1 and 32.106-5> | 32.621 | Generic Network Resources IRP: Requirements |
| 32.106-5 | Basic CM IRP IM (Generic NRM part) | 32.622 | Generic Network Resources IRP: NRM |
| 32.106-6 | Basic CM IRP CORBA SS (Generic NRM related part) | 32.623 | Generic Network Resources IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (Generic NRM related part) | 32.624 | Generic Network Resources IRP: CMIP SS |
| 32.106-1 | <Basic CM IRP CN NRM requirements from 32.106-1 and 32.106-5> | 32.631 | Core Network Resources IRP: Requirements |
| 32.106-5 | Basic CM IRP IM (CN NRM part) | 32.632 | Core Network Resources IRP: NRM |
| 32.106-6 | Basic CM IRP CORBA SS (CN NRM related part) | 32.633 | Core Network Resources IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (CN NRM related part) | 32.634 | Core Network Resources IRP: CMIP SS |
| 32.106-1 | <Basic CM IRP UTRAN NRM requirements from 32.106-1 and 32.106-5> | 32.641 | UTRAN Network Resources IRP: Requirements |
| 32.106-5 | Basic CM IRP IM (UTRAN NRM part) | 32.642 | UTRAN Network Resources IRP: NRM |
| 32.106-6 | Basic CM IRP CORBA SS (UTRAN NRM related part) | 32.643 | UTRAN Network Resources IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (UTRAN NRM related part) | 32.644 | UTRAN Network Resources IRP: CMIP SS |

Background

Traditionally, multiple name conventions have been used by different vendors' NEs, or even within the same vendor, to name network resources. The following problems have thus arisen:

- Different classes of NE have used different name conventions. Network Management applications, when interfacing with these NEs, have been required to understand multiple name conventions to manage the NEs.
- Network management applications (e.g. Fault Management application), when interfacing with other applications (e.g. Configuration Management application, trouble ticket system) have been required to understand multiple name conventions.
- When a customer purchased multiple classes of NEs from the same or different vendors, the customer was confronted with multiple name conventions.
- Without a name convention, it is difficult to integrate IRP conformant vendors' resource name space (see subclause 3.1.5 for definition of name space) into the customer's Enterprise name space.

Benefits

The benefits of using the subject name convention to name 3G network resources for network management purposes are as follows:

- A resource name is guaranteed to be unambiguous in that it refers to, at most, one network resource. Unambiguous naming of managed network resources is necessary for interoperability among managing applications and systems.
- The resource name syntax is specified such that management applications can be designed with assurance that its name-parsing algorithm needs not be modified in the future. We can derive this benefit only if the subject name convention is widely accepted.

The root and upper portions of the name hierarchy are based on name infrastructure of Domain Name System (DNS) (see IETF RFC 2247 [5]). The subject name convention can naturally fit in DNS and can integrate well with other hierarchical naming systems, such as ITU-T Recommendation X.500 [2].

1 Scope

A more detailed background and introduction of the IRP concept is given in 3GPP TS 32.101 [11] and TS 32.102 [12].

To perform network management tasks, co-operating applications require identical interpretation of names assigned to network resources under management. Such names are required to be unambiguous as well. The present document recommends one name convention for network resources under management in the IRP context.

To facilitate integration of network management information obtained via multiple IRPs of different technologies such as CMIP and CORBA, identical network resource name semantics shall be conveyed in all IRPs. The present document specifies one such name convention.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] Void.
- [2] ITU-T Recommendation X.500 (1993): "Information technology - Open Systems Interconnection - The Directory: Overview of concepts, models and services".
- [3] T. Howes, ISBN 1-57870-070-1: "Understanding and Deploying LDAP Directory Services".
- [4] IETF RFC 1737 (1994): "Functional Requirements for Uniform Resource Names".
- [5] IETF RFC 2247 (1998): "Using Domains in LDAP/X.500 Distinguished Names".
- [6] IETF RFC 1035 (1987): "Domain names - implementation and specification".
- [7] IETF RFC 2253 (1997): "Lightweight Directory Access Protocol (v3): UTF-8 String Representation of Distinguished Names".
- [8] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point IRP): Information Service (IS)".
- [9] 3GPP TS 32.622: "Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Network Resource Model (NRM)".
- [10] IETF RFC 733: "Standard for the format of ARPA network text messages".
- [11] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".
- [12] 3GPP TS 32.102: "Telecommunication management; Architecture".
- [13] 3GPP TS 32.106-8: "Telecommunication Management; Configuration Management; Part 8: Name convention for Managed Objects".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 32.101 [11] and TS 32.102 [12] apply. This subclause defines terms essential for understanding of name convention in the IRP context.

3.1.1 IRPAgent

See 3GPP TS 32.102 [12].

3.1.2 IRPManager

See 3GPP TS 32.102 [12].

3.1.3 Managed Object and Network Resource

In the context of the present document, a Managed Object (MO) is a software object that encapsulates the manageable characteristics and behaviour of a particular network resource. Examples of network resource are switch, scanner for monitoring performance data, cell, site, transmission links, satellite, operator profile, etc. In the present document, MO sometimes is referred to as MO instance.

3.1.4 Name

In the context of the present document, a name is restricted to the identification of a MO, that is, a software object representing a real network resource.

3.1.5 Name space

A name space is a collection of names. This name convention uses a hierarchical containment structure, including its simplest form - the one-level, flat name space. This name convention does not support an arbitrarily connected name space, or graph structure, in which a named object can be both child and parent of another named object.

Figure 1 shows some examples of supported and unsupported name spaces (this figure is from T. Howes, ISBN 1-57870-070-1 [3] and it provides useful information on name space design).

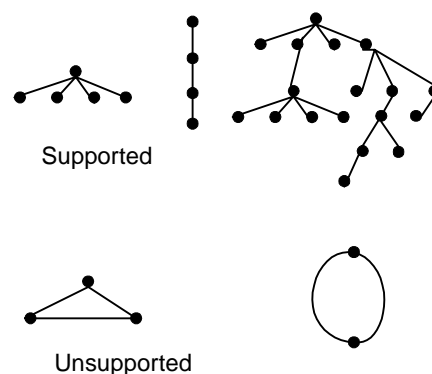


Figure 1: Examples of supported and unsupported name spaces

3.1.6 Global Root and Local Root

Names in name space are organised in hierarchy. An MO instance that contains another one is referred to as the superior (parent), whereas the contained MO instance is referred to as the subordinate (child).

In modern network management, it is expected that the Enterprise name space be partitioned for implementations in multiple managed system (see annex C for reasons of name space partitioning). The parent of all MO instances in a single managed system is called the Local Root. The ultimate parent of all MO instances of all managed systems is called the Global Root.

3.1.7 Distinguished Name and Relative Distinguished Name

A Distinguished Name (DN) is used to uniquely identify a MO within a name space. A DN is built from a series of "name components", referred to as Relative Distinguished Names (RDNs). ITU-T Recommendation X.500 [2] defines the concepts of DN and RDN in detail, using ASN.1, in the following way:

```
DistinguishedName ::= RDNSequence
RDNSequence ::= SEQUENCE OF RelativeDistinguishedName
RelativeDistinguishedName ::= SET SIZE (1..MAX) OFAttributeTypeAndValue
AttributeTypeAndValue ::= SEQUENCE {
    type AttributeType, value AttributeValue}
```

The present document references this ASN.1 structure but it only uses single-valued (not multi-valued) RDN.

From a DN of a MO, one can derive the DN of its containing MO, if any. This containment relation is the only relation carried by the DN. No other relation can be carried or implied by the DN.

See annex B for a rule for MO designers to avoid ambiguity concerning the `AttributeType` of a DN string.

See annex C for discussion of DN prefix.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|-------|---|
| ASN.1 | Abstract Syntax Notation One |
| BER | Basic Encoding Rules |
| BNF | Backus-Naur Form |
| CM | Configuration Management |
| CMIP | Common Management Information Protocol |
| CORBA | Common Object Request Broker Architecture |
| DC | Domain Component |
| DN | Distinguished Name |
| DNS | Domain Name Service |
| EM | Element Manager |
| FM | Fault Management |
| IETF | Internet Engineering Task Force |
| IRP | Integration Reference Point |
| LDN | Local Distinguished Name |
| MIB | Management Information Base |
| MIM | Management Information Model |
| MO | Managed Object |
| MOC | Managed Object Class |
| MOI | Managed Object Instance |
| NE | Network Element |
| NM | Network Manager |
| NR | Network Resource |
| NRM | Network Resource Model |
| PM | Performance Management |
| OMG | Object Management Group |
| QoS | Quality of Service |
| RDN | Relative Distinguished Name |
| UML | Unified Modelling Language (OMG) |

4 System overview

4.1 System context

Situations under which MO (representing network resource) names are used are as follows:

- a) MO names cross various Integration Reference Points (IRPs).

EXAMPLE 1: In the context of Alarm IRP 3GPP TS 32.111-2 [8], IRPAgent notifies IRPManager of the alarm condition of a network resource. The DN of the MO, representing alarmed network resource, encoded as specified in the present document, is carried in the Managed Object Instance parameter of the notification.

EXAMPLE 2: In the context of Generic Network Resources IRP: NRM, 3GPP TS 32.622 [9], IRPAgent notifies IRPManager of the creation of new object. The DN of the newly created object, encoded as specified in the present document, is carried in the notification.

EXAMPLE 3: In the context of Generic Network Resources IRP: NRM, 3GPP TS 32.622 [9], IRPManager requests IRPAgent to search for a particular object by specifying the start point of the search. The DN of the base object, upon which the search begins downward hierarchically, is carried in the request.

- b) Co-operating management applications need to exchange information that includes MO (representing network resource) names.

EXAMPLE 4: A Fault Management (FM) application may request a trouble ticket system to open a new trouble ticket reporting the alarmed condition of a network resource by specifying, among other things, the MO name representing the alarmed network resource. The DN of the MO, encoded as specified in the present document, is included in the request.

EXAMPLE 5: A Performance Management (PM) system that produces reports on performance of network resources. The DNs of the MOs, representing the reported network resources, encoded as specified in the present document, are printed on the report.

5 Name Convention for Managed Objects

Network resources shall be named using name convention in ITU-T Recommendation X.500 [2] with one restriction listed below. Central to the ITU-T Recommendation X.500 name convention is the concept of Distinguished Name (DN). See subclause 3.1.7.

The restriction is that this IRP name convention does not support multi-valued RDN. It only supports single-value RDN.

6 Representations of DN

DN can be encoded and represented in many ways. The present document specifies two representations. Future IRP work may specify other representations.

- DN is encoded using ASN.1/BER encoding scheme. Traditional TMN compliant systems use this encoding scheme. IRP CMIP Solution Set compliant systems shall use this scheme. Since this scheme is documented in ITU-T Recommendation X.500 [2], their specification is not repeated here.
- DN is encoded using string representation. The present document contains the specification of this scheme.

7 String Representation of DN

This clause specifies the string representation of DN. This work is based on IETF RFC 2253 [7]. A DN string representation, using the string-encoding scheme specified in the present document, is also a valid DN string according to IETF RFC 2253 [7].

The string-encoding scheme specified in the present document imposes further restrictions as compared to IETF RFC 2253 [7]. The most important restrictions are:

- Multi-valued RDN is not supported in the subject name convention.
- Character star (*, ASCII 42) is used to denote wildcard in the subject name convention.

7.1 Converting DN from ASN.1 to a String

The following subclauses define the algorithm for converting from an ASN.1 structured representation to string representation.

7.1.1 Converting RDNSequence

If the `RDNSequence` is an empty sequence, the result is the empty or zero length string.

Otherwise, the output consists of the string encoding of each RDN in the `RDNSequence` (according to subclause 7.1.2), starting with the first element of the sequence and moving forward toward the last element.

The encoding of adjacent RDNs are separated by a comma character (",", ASCII 44), to be consistent with IETF RFC 2253 [7].

White spaces adjacent to the slash character shall be ignored.

7.1.2 Converting RelativeDistinguishedName

When converting from an ASN.1 RDN to a string, the output consists of the string encoding of the singleton `AttributeTypeAndValue` (according to subclause 7.1.1).

Although ITU-T Recommendation X.500 DN supports multi-valued RDN, this specification supports single-valued RDN only.

7.1.3 Converting AttributeTypeAndValue

The `AttributeTypeAndValue` is encoded as the string representation of the `AttributeType`, followed by an equals character ('=', ASCII 61), followed by the string representation of the `AttributeValue`.

Although ITU-T Recommendation X.500 ASN.1 `AttributeValue` and `AttributeType` support wide range of character representation, this specification supports a restrictive set of characters according to subclause 7.2.

String representation of `AttributeValue` allows character escape mechanism such as the use of a backslash followed by two hex digits to replace a character in a string. String representation of `AttributeType` does not allow character escape mechanism.

EXAMPLE: "`CN=Before\0DAfter,O=Test,C=GB`". In this example, the backslash and the two hex digits form a single byte in the code of the escaped character. The backslash followed by "0D" indicates a carriage return. See annex B for a rule for MO designers to avoid ambiguity concerning the `AttributeType` of a DN string.

7.2 Character syntax

This subclause specifies the character syntax for `AttributeType` and `AttributeValue`.

They are:

1. Any character except `<special>` where `<special>` is:
 ", ", "<CR>", "<LF>", "+", "<"", ">", "#", ";", "\" or """"
2. The dot character ('.', ASCII 46). This character shall be used in the `AttributeValue` whose `AttributeType` is "DC". An example is "DC=lme.companyZ.se". This dot character shall not be used in `AttributeType`.
3. The star character ('*', ASCII 42) is reserved to denote wild card. Wild card character(s) can appear in `AttributeType` and `AttributeValue`.

7.3 BNF of DN String Representation

The following is the BNF for DN in string representation (Backus-Naur Form is popular in IETF specifications to define format syntax. See IETF RFC 733 [10] for more information):

```
DistinguishedName := RDNSequence
<spaced-separator> ::= <optional-space> <separator> <optional-space>
<separator> ::= ", "
<optional-space> ::= ( <CR> ) *( " " )
RDNSequence := RDNSequence <spaced-separator>
                RDNSequence | RelativeDistinguishedName
RelativeDistinguishedName := AttributeTypeAndValue
AttributeTypeAndValue := AttributeType "=" AttributeValue
<special> ::= ", " | "=" | <CR> | <LF> | "+" | "<" | ">" | "#" | ";" | "\" | """"
AttributeType := <one or more StringChar>
AttributeValue := <one or more StringChar>
StringChar := any character except <special>
```

7.4 Maximum size of DN string

The maximum length of a DN string, including RDN separators and including white spaces, shall not exceed 400 bytes (8-bit).

8 Examples of DN in string representation

This subclause gives a few examples of DN written in the string representation specified in the present document.

EXAMPLE 1: "DC=com,DC=CompanyXYZ,DC=Marketing,IRPAgent=ATMPVCBilling,Log=19990101131000,AccountingRecord=100098". In this example, the name space aligns with DNS. The `AttributeType` of the top three RDN are "DC". Concatenation of the corresponding `AttributeValues` produces the DNS registered name, i.e. "marketing.companyXYZ.com". The top RDN is the Global Root because DNS defines "DC=com" as the root of its name space. That top RDN is the Local Root as well.

EXAMPLE 2: "DC=marketing.CompanyXYZ.com,IRPAgent=ATMPVCBilling,Log=19990101131000,AccountingRecord=100098". In this example, the name space aligns with DNS as well. Instead of using three RDNs to represent the DNS registered name, this example chooses to use one RDN. The top RDN is the Global Root (and Local Root as well).

EXAMPLE 3: "IRPNetwork=ABCNetwork,Subnet=TN2,BSS=B5C0100". In this example, the name space designer chooses not to name its objects under the DNS nor X.500 scheme. The name space designer chooses to use "IRPNetwork=ABCNetwork" as the Local Root of its name space (by looking at the DN string, it is not possible to say if the Local Root is the Global Root). DNs in this name space will start with that string as their Local Root. One string ("IRPNetwork") for AttributeType (of the AttributeTypeAndValue of the RDN) starts with "IRP". This indicates that this string is mapped from the MO class names specified in NRM of [9] or other domain specific NRMs (see the Introduction clause). Other strings do not start with "IRP", indicating that those strings are not mapped from MO class names specified in NRM of 3GPP TS 32.622 [9] or other domain specific NRMs. They are probably mapped from MO classes that are specific for a particular product and thus specified in a product-specific NRM (MIM).

EXAMPLE 4: The following example illustrates the use of "," as separator for RDNs. It also illustrates the use of space and period as part of the legal character syntax for RDNs.

CN=John T. Mills, O= Cyber System Consulting, L= Göteborg, C=SE

9 Usage Scenario

9.1 DN prefix usage

This subclause presents recommended steps designer uses to partition the Enterprise name space while building an Alarm IRP compliant NE (the Alarm IRP Agent).

1. The NE designer specifies the NRM (e.g. 3GPP TS 32.622 [9]) for the NE. Suppose the NRM is a two level hierarchy with 3 classes like:

```
Node
  |----- Port
  |----- CrossConnect
```

2. The NE designer, based on the NRM and other design choices, decides that there are 7 instances within the NE that can report alarms, such as:

```
Port=1, Port=2, Port=3, Port=4, Port=5, CrossConnect=1, Node=1.
```

3. The NE designer decides on the DN prefix (see annex C) and configures its system accordingly. Since NE designer will not know the customer's name space in advance, he would normally configure the DN prefix to reflect his test environment. The DN prefix can be configured to "Network=test". The Global Root is "Network=test". The Local Root is "Node=1". It should be noted that the NE should not hard code the DN prefix but should treat DN prefix as a system configuration parameter, settable.

EXAMPLE 1: At system start-up time.

4. When constructing the alarm record (in coding phase), NE designer shall concatenate the name of the alarmed instance with the DN prefix to form the DN of his test environment. The resultant DN (e.g. "Network=test,Node=1,Port=3") will be placed in the Managed Object Instance (MOI) field of the alarm record.
5. The NE is sold to a customer. The customer administrator knows his Enterprise name space, the topology of his network and where the NE will be deployed. Based on the information, he configures the DN prefix of the NE.

EXAMPLE 2: The customer administrator can configure it to:

```
"DC=CompanyXYZ.com,Net=DS3BackBone,Station=TMR".
```

The Global Root in this case is "DC=CompanyXYZ.com".

6. At run time, whenever NE is reporting an alarm on Port=3 via the IRP, the following string will be in the MOI field of the alarm record.

```
"DC=CompanyXYZ.com,Net=DS3BackBone,Station=TMR,Node=1,Port=3".
```

Annex A (normative): Mapping of RDN `AttributeType` to Strings

NOTE: This annex is normative for users of string representation.

`AttributeType` of RDN are mapped into strings for use in the DN string representation. This annex specifies the mapping.

The `AttributeType` shall include all MO classes defined in the Network Resource Model (NRM) of 3GPP TS 32.622 [9] and other domain specific NRMs as listed in the Introduction clause.

There is one `AttributeType` that is not defined in NRM of 3GPP TS 32.622 [9] or other domain specific NRMs as listed in the Introduction clause. This special `AttributeType` is used to denote the domain component of the DNS. The following partial DN string representations are examples to illustrate the valid use of "DC" strings for the three DNS domain components of "lme.companyZ.se".

- DC=se.companyZ.lme, . .
- DC=se,DC=companyZ,DC=lme, . .
- DC=se,DC=companyZ.lme, . .
- DC=se.companyZ,DC=lme, . .

Table A.1: Example of RDN `AttributeType` Strings

| String | AttributeType |
|------------|--|
| DC | Domain component of DNS |
| SubNetwork | MO class name <code>SubNetwork</code> defined in NRM of 3GPP TS 32.622 [9]. |
| etc. | See note. |
| NOTE: | For each MO class name found in 3GPP set of specifications, its corresponding <code>AttributeType</code> String shall be identical to the class name with the leading character capitalised. |

Annex B (normative): Rule for MO Designers regarding `AttributeType` interpretation

NOTE: This annex is normative for users of string representation.

This annex discusses the two possible interpretations for the `AttributeType` of the DN string and recommends a rule for MO designers to avoid ambiguity concerning its usage. It identifies the protocol environment(s) under which each interpretation functions. It then recommends a rule for designing MO classes such that one DN string, regardless of protocol environment (therefore, regardless of interpretation used), will result in the unique reference to the identical network resource.

First interpretation

ITU-T Recommendation X.500 [2] uses the `AttributeType` (defined for use as the first component of the `AttributeTypeAndValue` of a RDN, see subclause 3.1.6) to identify one attribute of the subject MO for naming purpose. This `AttributeType` is called the *naming attribute* to distinguish itself from other attributes that may be present in the MO.

Suppose the following is the MO class definition in pseudo notation and this MO class is inherited from root.

```
Class Bsc {
  Attribute id;
  Attribute ..}
```

Suppose further that the naming attribute is `id`.

If this (first) interpretation is used for constructing the DN string, then the DN will be "... , id=123". MO class name cannot be derived from the DN string. The value of the `AttributeValue` contains the value of the naming attribute.

Second interpretation

In CORBA protocol environment, it is preferable to use the following interpretation.

The `AttributeType` (defined for use as the first component of the `AttributeTypeAndValue` of a RDN) is used to identify the MO class.

If this interpretation is used for constructing the DN string, then the DN will be "... , Bsc=123". The name of the naming attribute cannot be derived from the DN string. The value of the `AttributeValue` contains the value of the naming attribute.

Rule

Given the two interpretations, a DN reader cannot know how to interpret the `AttributeType`, i.e. if the `AttributeType` identifies class or naming attribute. To avoid ambiguity, the following rules shall apply:

- If `AttributeType` of a naming attribute is not a concatenation of MO class name and "Id" (ignoring case for both), then the DN shall use "... , Yyy.zzz =123,..." where "Yyy" is the MO class name and "zzz" is the naming attribute (preserving case for both).

EXAMPLE 1: If "Bsc" is the MO class name and if its naming attribute is "serialNumber", then the DN shall be "... , Bsc.serialNumber=123,..."

- If `AttributeType` of a naming attribute is a concatenation of MO class name and "Id" (ignoring case for both), then the DN shall use "... , Xxx=123,..." where "Xxx" is the MO class name (preserving case).

EXAMPLE 2: If "Bsc" is the MO class name and if its naming attribute is "bScId", then the DN shall be "... , Bsc=123,..."

Annex C (informative): DN Prefix and Local Distinguished Name (LDN)

A Distinguished Name (DN) is used to uniquely identify a MO within a name space. A DN is built from a series of "name components", referred to as Relative Distinguished Names (RDNs).

DNs within a name space are arranged in hierarchy similar to concepts of naming files in UNIX file system. A file name, in the context of a local subdirectory, contains the path (series of subdirectory names) of the file starting from the local subdirectory. The same file, in the global context, contains the path of the file starting from the root directory. Similar concept applies to naming MOs. From a particular (local) context, the name of a MO is the Local Distinguished Name (LDN). From a global context, the name of the same MO is the DN. LDN is a proper subset of DN. In the context of a particular local context, a DN prefix is defined such that all LDNs in that particular context, if attached behind the DN prefix of that context, will yield the DNs of the MOs.

The concepts of DN Prefix and LDN support the partitioning of large name space into smaller ones for efficient name space implementation. DN design, the subject of the present document, does not depend on these concepts. There exist other concepts that support partitioning of large name space as well. Although these concepts are independent from DN design, their use is wide spread and this annex illustrates their use in partitioning large name space.

In modern network management, it is expected that the Enterprise name space be partitioned for implementations in multiple hosts. The following are reasons for the partitioning.

- The Enterprise name space can be large (e.g., containing millions of objects). Partition of a large name space facilitates name space management.

EXAMPLE 1: It may be easier to manage two name spaces of 1 million objects each than to manage one name space with two million objects.

- Separate IRPAgents manage sub-set of the Enterprise name space relevant to their own local environment.

EXAMPLE 2: One NE manages a name space (subset of the Enterprise name space) containing names of its MOs representing its own network resources. Another NE manages another sub-set, etc.

- For reasons such as security, replication, back-up policy and performance, sub-sets of the Enterprise name space are managed by separate systems.

EXAMPLE 3: Operation and Marketing departments may want to manage their name spaces using their respective management policies. Partitioning of Enterprise name space according to departmental jurisdiction may facilitate deployment of independent management policies.

Suppose the Enterprise name space is organized hierarchically and is partitioned into 4 sub-sets as shown in figure C.1.

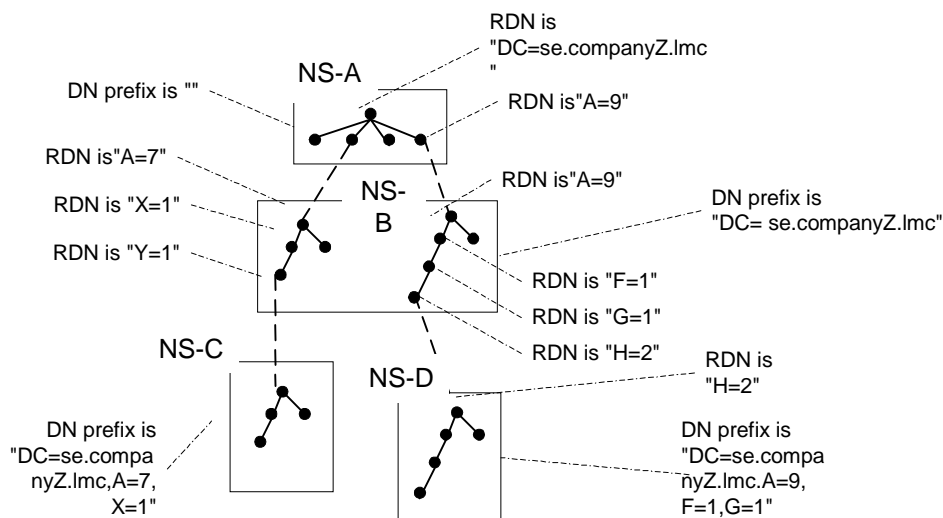


Figure C.1: Name space partitions

NS (name space)-A contains 5 objects. DN prefix is NULL. The Global Root and Local Root of NS-A is "DC=se.companyZ.lmc" (see the Note below). DN of top object is "DC=se.companyZ.lmc". RDNs of the other four objects are, from bottom left to bottom right, "A=1", "A=7", "A=3" and "A=9". DNs of the same four objects are "DC=se.companyZ.lmc,A=1", "DC=se.companyZ.lmc,A=7", "DC=se.companyZ.lmc,A=3" and "DC=se.companyZ.lmc,A=9". The second and fourth objects are reference objects to MOs in NS-B.

NS-B contains two branches. They have the same DN prefix that is "DC=se.companyZ.lmc". The Global Root is "DC=se.companyZ.lmc".

The Local Root and RDN of top object of the right branch is "A=9". Its DN is "DC=se.companyZ.lmc,A=9". RDNs of other objects are shown in figure C.1.

DN of the bottom object is "DC=se.companyZ.lmc,A=9,F=1,G=1,H=2". This object refers to object of another name space called NS-D.

The Local Root and RDN of the top object of the left branch is "A=7". Its DN is "DC=se.companyZ.lmc,A=7". RDNs of other objects are shown in figure C.1.

DN of the bottom object is "DC=se.companyZ.lmc,A=7,X=1,Y=1". This object refers to object of another name space called NS-C.

NS-C contains a branch of 4 objects. Its DN prefix is "DC=se.companyZ.lmc,A=7,X=1". The Local Root and RDN of the top object is "Y=1".

NS-D contains a branch of 5 objects. Its DN prefix is "DC=se.companyZ.lmc,A=9,F=1,G=1". The Local Root and RDN of the top object is "H=2".

In figure C.1, the bottom object of NS-B right branch has the following names:

- DN is "DC=se.companyZ.lmc,A=9,F=1,G=1,H=2".
- LDN is "A=9,F=1,G=1,H=2".
- RDN is "H=2".

With this example, we can see that DN of an object is a series of RDNs spanning the global name space. LDN of an object is a series of RDNs spanning the local name space where the subject MO resides.

The concatenation of the LDN with DN prefix of that (partitioned) name space shall produce the DN of the global name space.

NOTE: Use of "DC" in "DC=se.companyZ.lmc" is an attempt to align the RDN with DNS name associated with the named organisation. The "DC" stands for Domain Component and is an attribute name defined by IETF for use in directory work. Annex A specifies other valid ways to align RDN with DNS as well. Equally valid, the example can choose to align the RDN with the X.500 convention. In such case, the subject string can be "C=se,O=CompanyZ,L=lmc" where C, O and L are X.500 standard attributes denoting country, organisation and location respectively. The alignment choice belongs to the name space designer of each operator. The choice will be reflected in the value of the DN prefix, probably a product configuration parameter. See clause 7 for more information.

Annex D (informative): Change history

| Change history | | | | | | | |
|----------------|-------|-----------|------|-----|--|-------|-------|
| Date | TSG # | TSG Doc. | CR | Rev | Subject/Comment | Old | New |
| Jun 2001 | SA_12 | SP-010283 | -- | -- | Approved at TSG SA #12 and placed under Change Control | 2.0.0 | 4.0.0 |
| Dec 2001 | SA_14 | SP-010641 | 0001 | -- | Alignment of Figure C.1 with text in annex C | 4.0.0 | 4.1.0 |
| Dec 2002 | -- | -- | -- | -- | Cosmetics | 4.1.0 | 4.1.1 |
| Jul 2006 | -- | -- | -- | -- | Delete duplicated paragraph in the "Introduction" clause | 4.1.1 | 4.1.2 |

History

| Document history | | |
|-------------------------|---------------|-------------------------|
| V4.0.0 | July 2001 | Publication |
| V4.1.0 | December 2001 | Publication (withdrawn) |
| V4.1.1 | December 2002 | Publication (withdrawn) |
| V4.1.2 | June 2006 | Publication |
| | | |