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Foreword

This ETSI Technical Report (ETR) was produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

This ETR aims to reflect the result of the work on the subject of Directory Management Domain (DMD) interconnection. This study was conducted in a collaborative manner by ETSI STC-TE6 and EWOS/EG DIR. According to the received mandate, the study only covers the non-commercial aspects of interconnection. For the purpose of this ETR, it was assumed that the intent was to define the technical framework governing the interconnection of DMDs belonging to some hypothetical global Directory System.

Therefore, the purpose of this ETR is:

- 1) to facilitate the development and establishment of practical Directory services, by putting in place the necessary range of technical agreements;
- 2) to provide a technical framework for that part of the global Directory system which is the responsibility of DMDs in Europe;
- 3) to provide the decision-making basis for recognition and registration of European DMDs that are considered to be within the scope of the global Directory. The criteria for recognition of co-operating DMDs should cover:
 - service and Quality of Service aspects;
 - technical compliance with the base specification and existing functional profiles;
 - the capability of providing support for recognized public or private Directory services.

Although the implicit rationale for this ETR is for establishing operational and commercial services, this does not imply that every component of the global Directory System should be "commercial", nor does it imply that, in the short term, it should support only commercial activity.

The existence of this ETR does not imply that there is a commitment from ETSI or EWOS members to provide X.500 services, or to interconnect their X.500 systems based on this ETR. It is likely that extensions to this ETR or additional documents will be needed to capture the full extent of technical agreements and procedures needed for a fully operational European Directory Service. This ETR will be updated to take into account results of on-going pilot projects such as the Eurescom Pan-European Directory Services project.

Introduction

General aspect

The global Directory is formed by the interconnection of various DMDs, either public or private. Each public or private. Each DMD is composed of one or more Directory System Agent (DSAs) and zero or more attached Directory User Agents (DUAs). From the perspective of the Directory Information Base (DIB), each DMD is responsible for managing a portion of the DIB called a Directory Information Tree (DIT) domain.

From the Directory service's point of view, DMDs may have different service policies and different service requirements, depending on the particular application of the Directory. To behave as a global system, a certain level of co-operation and interworking needs to be supported by each DMD. Co-operation between Directory Management Organizations (DMDs) involves making agreements at a management level and configuring systems according to those agreements. Interworking between DMDs is based on the capability of DSAs in the DMDs to directly interact (i.e., by chaining requests and responses) and/or to refer to those access points of the Directory (i.e., by using referral).

It is believed that conformance to standardized protocols is essential but not always sufficient to ensure interworking at the service level in a consistent manner. To be able to provide useful services to the end-user across DMS boundaries also requires some agreement between interconnected domains on a certain number of subjects, either not fully covered by or beyond the scope of the base specification i.e. service definition and quality service, schema and knowledge information distribution, the role of a First-level DSA and character repertoire support.

Within the context of commercial Directory services, bilateral or multilateral agreements which are outside the scope of this ETR, are also required on subjects such as charging, accounting and settlement procedures. Such commercial agreements may require some technical agreement on the relevant procedures to be used across domain boundaries to support charging and accounting functions.

1 Scope

This ETR provides guidelines for technical agreements regulating the interworking between DMDs. This version of the ETR covers the following issues:

- directory Management models;
- service definition;
- schema;
- knowledge information and the role of a First-level DSA;
- association management parameters;
- national languages support.

This ETR is intended to provide a template for the interconnection of Administration Directory Management Domains (ADDMDs). In addition, it also gives useful information and guidelines which could be used by Private Directory Management Domains (PRDMDs) planning to be part of the global Directory.

Although this ETR specifies requirements to be fulfilled by co-operating DMDs, it should be stressed that these requirements only apply to the external view of a domain as determined by external stimuli (e.g. incoming requests) and observation of subsequent events (e.g. outgoing results/errors).

When, within a particular DMD, the provision of a service can be isolated to a particular DSA, this ETR assumes such a DSA to comply with the relevant functional standards.

This ETR is based on the 1988 edition of the base specification although some concepts and terms belonging to the 1993 edition have also been used, mainly for explanatory purposes.

2 References

This ETR incorporates by dated and undated reference, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] CCITT X.500 Series of Recommendations (1988): "The directory".
- [2] CCITT Recommendation F.500 (1988): "International Public Directory Services".
- [3] ENV 41512 (1991): "Information systems interconnection - Common directory use".
- [4] ENV 41215 (1992): "Information technology - Functional standard for Profile A/DI31 - Directory - Behaviour of DSAs for distributed operations".
- [5] ETG 017: "Error Handling for the Directory".
- [6] ETG 027: "Security Architecture for the Directory".
- [7] ITU-T Recommendation T.61 (1993): "Character repertoire and coded character sets for the international teletex service".
- [8] ISO/IEC 10646: "Information technology - Universal Multiple-Octet Coded Character Set (UCS)".
- [9] CCITT Recommendation T.50 (1992): "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5 - Information technology - 7-bit coded character set for information interchange".

- [10] ISO/IEC 646 (1991): "Information technology - ISO 7-bit coded character set for information interchange".
- [11] ISO/IEC ISP 10616: "Information technology - International Standardized Profile FDI11 - Directory Data Definitions - Common Directory Use".
- [12] ENV 41502 (1991): "Information systems interconnection - Character repertoires for information received from or transmitted to the teletex service or private information processing systems using teletex technology".
- [13] ENV 41506 (1991): "Information systems interconnection - Data stream formats for information received from or transmitted to the teletex service or private information processing systems using teletex technology".
- [14] ENV 41503 (1990): "Information systems interconnection - Character repertoire and coding for interworking with telex services".

NOTE: The ISPs (International Standardized Profile) related to the Directory are being prepared jointly by EWOS/EGDIR and ETSI/TE6 under a collaborative action with other workshops. It is expected that the ISPs will in time supersede the set of existing ENVs.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETR, the following definitions apply:

Gateway DSA: Generic term for a DSA within a DMD that is directly accessible by another DSA outside the DMD.

access point: The point in the DSA from which directory services can be obtained.

ADDMD International Access Point: For an ADDMD, an access point to be used by foreign DUAs.

ADDMD International Gateway: For an ADDMD, a Gateway DSA to be used by foreign DUAs. Such a Gateway may be configured purely for transit or may also include an International Access Point.

ADDMD Subscriber Access Point: For an ADDMD, an access point to be used by subscribing DUAs.

PRDMD Public Gateway: For an PRDMD, an access point for external enquiries chained through an ADDMD.

PRDMD Public Access Point: For an PRDMD, an access point to be used by external DUAs.

PRDMD Public information: For an PRDMD, a subset of the entry information held by the PRDMD which may be made widely available to "external" users.

PRDMD Public service: A service, which may be provided by a PRDMD, aiming to allow external users to access (possibly controlled by Access Control) the PRDMD public information.

Public Information Service: A generic term for a class of Directory service whose main purpose is to provide a look-up service, either for residential customers or for business customers (corporations, organizations, etc.). Although it might be possible to consider any type of information, the basic intent is for dealing with communication and addressing information.

Rental Service: A type of service where a DMD, on behalf of some public or private organization, provides support for the creation, storage, management and a access to the DIT subtree "belonging" to the organization. By using this service, an organization may benefit from having a "virtual private directory" without the burden of implementing / managing a private directory system.

Relay Service: A service which may be provided by DMD on behalf of another DMD in order to support wide connectivity. By using the Relay Service, requests to/from the latter DMD (client of the Relay Service) can be realized by chaining the request through DSAs belonging to the DMD (provider of the Relay Service). A particular form of the Relay Service could be permit only the relaying in one direction (for example allowing incoming requests but blocking outgoing calls).

Clearing House (Central Administration Facility): A functional entity providing some or all of the following services on behalf of a collection of DMDs:

- Collection, Management and Distribution of First-level DSA information;
- Collection, Management and Distribution of DMD access point information;
- Collection, Management and Distribution of shared public information; (as described in annex B).

The following figures illustrate various types of Directory services and possible ways of combining these services.

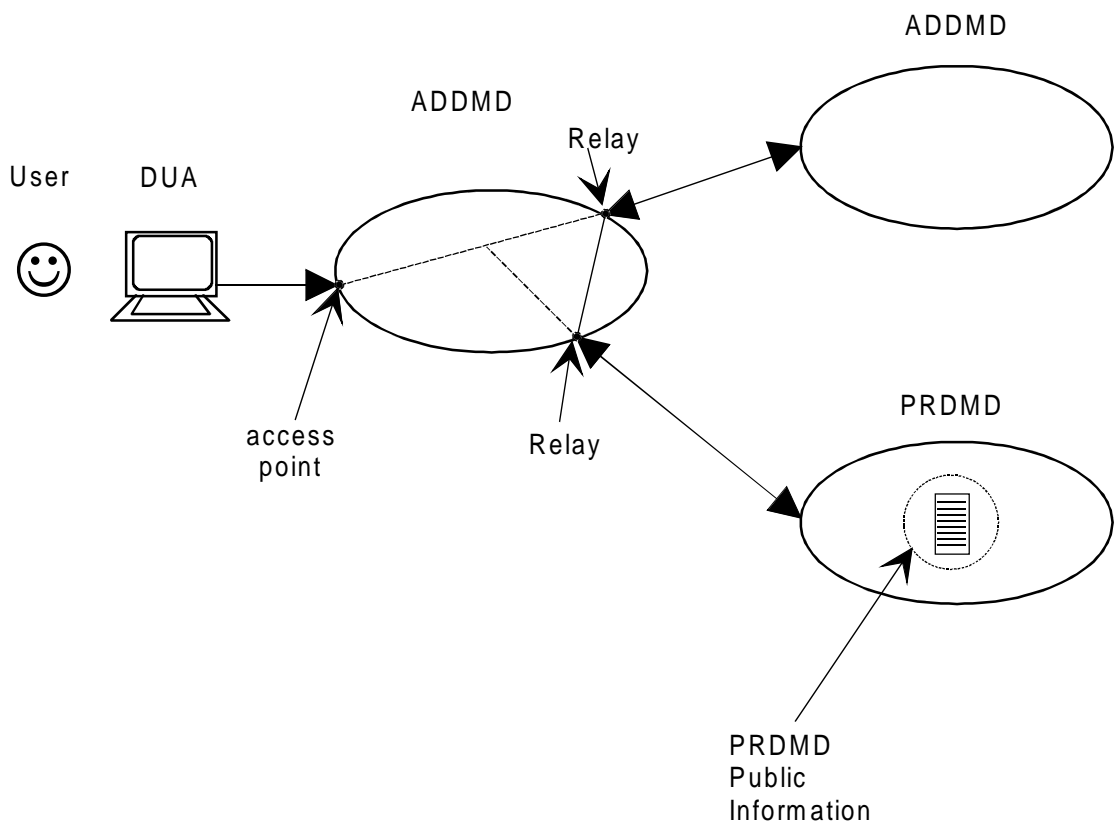


Figure 1: Public information service

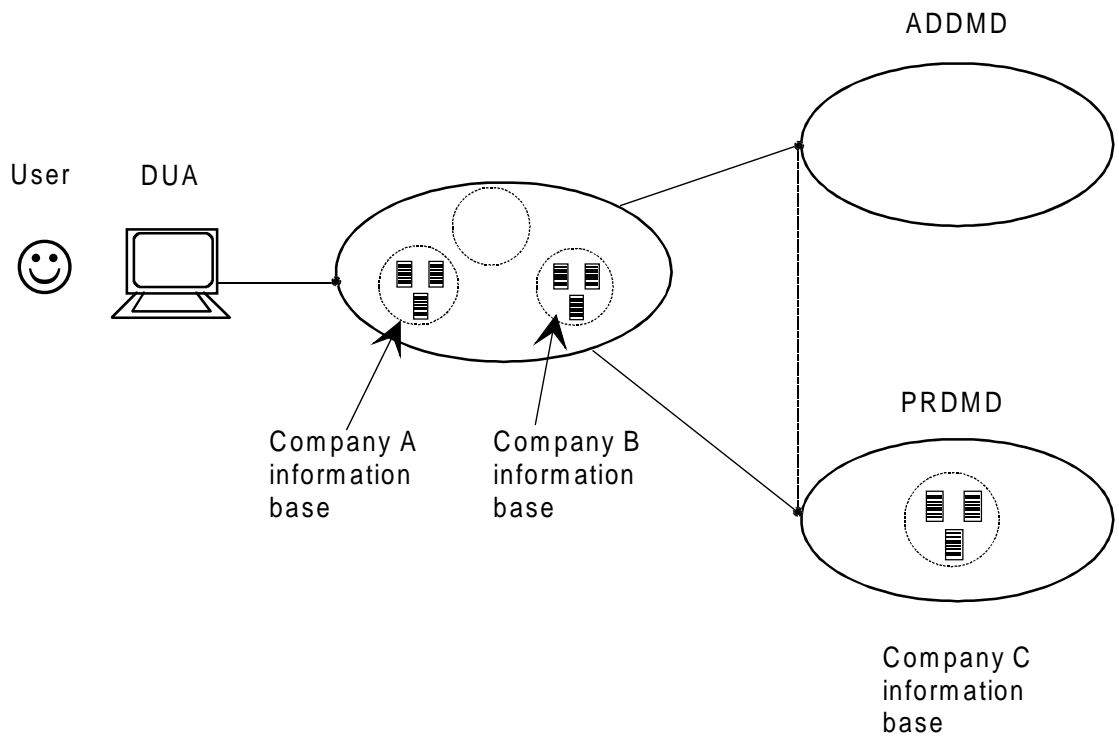


Figure 2: Rental service

3.2 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

ADDMD	Administration Directory Management Domain
APDU	Application Protocol Data Unit
CAN	Central Administration for NADF
DAP	Directory Access Protocol
DIB	Directory Information Base
DISP	Directory Information Shadowing Protocol
DIT	Directory Information Tree
DMD	Directory Management Domain
DMO	Directory Management Organization
DN	Distinguished Name
DOP	Directory Operational Binding Protocol
DSA	Directory System Agent
DSP	Directory System Protocol
DUA	Directory User Agent
FTAM	File Transfer and Access Management
IA5	International Alphabet Number 5
IRV	International Reference Version
ISDN	Integrated Services Digital Network
MHS	Message Handling Service
NADF	North American Directory Forum
PRDMD	Private Directory Management Domain
RPOA	Recognized Private Operating Agency
RDN	Relative Distinguished Name

4 Technical agreements

The technical agreements to be considered by co-operating Directory Management Organization (DMOs) address the following topics:

- a) Directory management models;
- b) Service considerations;
- c) Schema considerations;
- d) Knowledge information and the role of a First-level DSA;
- e) Association management parameters;
- f) National languages support;
- g) Error handling;
- h) Security aspects;
- i) Operational considerations;
- j) Procedures in support of charging and accounting.

For the present ETR, the topics i) and j) have been left for further study.

4.1 Directory management models

Organisational model

The organisational model of the global Directory considers two categories of DMD: ADDMDs and PRDMDs. To qualify as an ADDMD, the organization which manages a particular DMD needs to be either a public telecommunications administration or a Recognized Private Operating Agency (RPOA) offering one or more "public telecommunications services" such as telephone, facsimile, telex, Message Handling Service (MHS), Videotex, packet switching services, Integrated Services Digital Network (ISDN) services, etc.

Concerning PRDMDs, the base standard makes the following statements:

- provision of support for private directory systems falls within the framework of national regulations;
- internal operation and configuration of PRDMDs are not within the scope of CCITT Recommendation F.500 [2].

From the perspective of technical capabilities, the base standard does not distinguish between ADDMDs and PRDMDs.

The organisational model of DMDs is identical to the CCITT Recommendation F.500 [2] model.

From the CCITT/ITU-T viewpoint, there is in principle a clear difference of scope between the X-series (dealing with system/protocol aspects) and the F-series of Recommendations (covering service aspects as seen by the end-user). The scope of CCITT Recommendation F.500 [2] is the definition, from the perspective of CCITT/ITU-T of an agreement between CCITT X.500 [1] service providers to:

- offer Public Directory services in accordance with the defined service description and quality of service;
- interconnect their systems and interwork for the purpose of providing an international service;
- comply with a set of prescribed rules covering notably schema specification, character repertoire and encoding rule support, operational procedures and error handling.

CCITT Recommendation F.500 [2] does not intend to restrict any other kind of application of series of CCITT Recommendation X.500 [1] which may be envisaged.

Administrative model

From an administrative and operational perspective, the DMO is responsible for managing the collection of DUAs and DSAs, components of the DMD, and the specific DIT domain belonging to the DMD. This activity is modelled as a set of Domain Administration functions. The 1993 edition of the base specification provides a conceptual Administrative model to clarify the nature and scope of the (Administrative) Authorities responsible for this management and the means by which their authority can be exercised.

From the 1993 edition viewpoint, the overall Administrative Authority can be represented as having two aspects: DIT Domain Administrative Authority and DMD Administrative Authority.

The former is responsible for the definition and enforcement of the DIT domain policy whilst the latter is mainly concerned about the policy governing the behaviour of DSAs.

Furthermore, the DIT domain administration requires the execution of functions related to different aspects of:

- naming and subschema administration;
- security administration.

The DMD Administrative Authority deals with DSA Administration and the main objective is to control, by enforcement of rules dealing with DMD policies, the actual operational behaviour of DASs. As an example, a DMO can use DMD policy to restrict the normal user service to interrogation operations only, in accordance with CCITT Recommendation F.500 [2].

The 1993 edition represents operational information within the framework of the DIT as special attributes (operational attributes). In addition, optional extensions to the Directory Access Protocol (DAP) are defined to allow users (notably administrative users) to access operational information.

As the global Directory results from the interconnection of numerous DMDs, generally the interaction between DSAs belonging to different domains depends on the inter-domain agreement. Such agreement may concern various aspects e.g. technical, operational, commercial or legal. However, within the context of this ETR only the technical aspect is addressed.

The technical aspect of the agreement will typically cover: service specification, schema, distribution of access point information, the role of a First-level DSA, association management parameters, national language support, error handling and security requirements.

For the purpose of this ETR, the following material (subclauses 4.2 to 4.10 and annexes A to C) could serve as a common framework for defining the technical aspect of bi/multilateral agreements among European DMOs.

4.2 Service considerations

The following services are considered by this ETR:

- Public Information Service;
- Rental Service;
- PRDMD's Public Information Service;
- Relay Service.

This does not imply that any DMD has to provide one or more of these services. In particular, a DMO responsible for a specific PRDMD may choose to provide or not the PRDMD's Public Information Service.

This ETR also makes the assumption that DMOs will comply with the technical agreements specified hereafter, in particular those regarding service description and quality of service.

4.2.1 Public Information Service

The Public Information Service serves the purpose of helping the (human) user of telecommunication services to look up or search for telecommunication subscriber addressing information. This service could be considered as a straightforward extension of the existing Electronic Directory (Telephone) service (the so-called White Pages service) for dealing with various kinds of communication services: telex, datacommunications, mobile telephone, messaging services, etc.

The Public Information Service characteristics are presented below in terms of:

- a) Supported Directory operations;
- b) Service control elements;
- c) Service limitations;
- d) Quality of service.

a) Supported Directory operations:

Except for the Compare and Modify operations (AddEntry, RemoveEntry, ModifyEntry and ModifyDN) which may be optionally supported, all Directory operations including Abandon operation are provided to the user. The Abandon operation should be chained if the transferring agent considers that such a need arises and expects a good chance of the operation succeeding according to local evaluation.

b) Service control elements

All service control elements are supported, except for the priority component which may be optionally supported. A DMD which is not supporting the priority facility should react as if the received priority component has the default value "medium". However, when chaining an incoming operation towards another DMD, the original priority component remains unchanged.

c) Service limitations

This concerns List and Search operations. The purpose is to define conditions under which a List or Search operation may be performed.

There are various circumstances under which a valid List/Search operation could be denied execution, for example when it requires too much resource or when it generates too many candidate entries or when it generates subrequests to inappropriate domains. As an example, a global Search (without the Country = .. component) would usually be denied execution as it requires chaining the request to all countries. Another example is given by national Telephone Directories which usually do not permit a country-wide Search.

When such a limitation exists, it is recommended that the user should be informed by any appropriate means: advertisement, on-line user's instructions, etc.

The Public Information Service as defined by this ETR should at least provide the following capabilities:

Residential Subscriber Search - for the purpose of searching addressing information related to a residential subscriber as identified by the combination of subscriber's name and location (country and locality);

Business Category Search - for the purpose of searching addressing information related to companies, commercial organizations, administrations and governmental agencies as identified by the combination of Business Category information and location (country and optionally locality);

Organisation Name Search - for the purpose of searching information related to some organization as identified by the combination of Organization name and location (country and optionally locality);

Locality List - for the purpose of listing locality names. It should be possible to list either all localities subordinate to a country entry or all localities subordinate to some locality entry or some "StateOrProvince" entry;

Business Category List - for the purpose of listing information related to the business classification scheme.

d) Quality of Service

At this stage, there is simply not enough experience of live X.500 operational systems to derive realistic performance measurements. Input concerning the user's performance requirements is needed.

It follows that the present text should be viewed as a preliminary proposal only and is for further study. It is proposed to define the Quality of Service by the following parameters:

- Availability: the Public Information Service should be available 24 hours a day, seven days a week;
- Access waiting time: this parameter measures the elapsed time between the sending of a Bind request with "none" or "simple" authentication and the receipt of the corresponding Bind result/error. The measurement is made at the Application level. The Access waiting time should typically be measured in terms of seconds;
- (End-to-end) Response time: the end-to-end response time is defined as the elapsed time between the sending of the Application Protocol Data Unit (APDU) containing a Directory operation and the receipt of the ADPU containing the corresponding Result/Error. The end-to-end response time should typically be measured in terms of seconds;
- (DSP) Response time: similarly we could consider two values, one for DSA Bind and one for the hypothetical chained operation. These values should be compatible with the selected end-to-end response times;
- Availability of updated information: up to date information should be made available to the user as soon as possible.

4.2.2 Rental Service

The Rental Service basically serves the needs of medium to large business customers which may have a strong requirement for having a private company (or corporate) directory without having the necessary conditions for implementing their own private system. By subscribing to the Rental Service, such a private directory could be implemented as a particular subtree belonging to the DIT domain of the service provider.

As the cost of implementing a Directory service or upgrading the existing system could be rather high, such a Rental Service directed towards the business market could provide some additional motivation from the technical viewpoint, the 1993 edition of the standard provides additional concepts and enhancements (e.g. Access Control) which would help in developing such a service.

Obviously, the Rental Service should not only provide a storage capability for holding the private directory and some basic look-up capability but also more advanced features such as management autonomy, operations, Subschema management facilities and operational facilities such as logging and reporting could be considered essential for this type of service.

4.2.3 PRDMD's Public Information Service

Some PRDMDs may have a requirement for publishing/advertising a subset of their information base, typically public data or possibly more confidential data subject to access control, for example to facilitate business contact with potential customers.

One possible solution is by the use of the existing infrastructure of a public service provider for relaying interrogation requests initiated by external users. Such a service could be provided as a component of the Public Information Service (with Access Control capability).

Another possibility could be to replicate the public subset of the PRDMD information into some ADDMD domain and to take advantage of the Rental Service for providing external access to the public subset.

4.2.4 Relay Service

The Relay Service may be offered by a DMD (the server) to another DMD (the client) meaning that the provider relays an incoming request to the client and the corresponding result/error to the initiator of the request. In addition, the provider DMD could also serve as a gateway to the outside world, allowing access to the rest of the Directory from the client DMD.

4.3 Schema considerations

The base specification and existing profiles (particularly ENV 41512 [3]) give guidelines and rules governing what and how information could be represented within the Directory schema. Although it is recognized that, within a domain, the primary responsibility for defining the particular subschema to meet the requirements of the DMO lies with the Administrative Authority, it is nevertheless recommended that well-defined coordination mechanisms be implemented in order to achieve a large degree of commonality across co-operating domains.

Within the context of a multi-provider global Directory, it would appear very desirable that the user's perception of the offered service be preserved, independently of the accessed domain. As an example, it would be very confusing for the user if, when looking up the telephone number of a subscriber, different types of operations need to be used, depending on the particular DIT scheme implemented by the holding DMD!

This objective could be achieved to some extent if:

- selected attributes and object classes already defined by the base specification and ENV 41512 [3], supplemented if necessary by annex C of this ETR, are used within every subschema;
- subschema structure is within the framework of the ENV 41512 [3].

Within the context of a multiple-provider Directory, a common user's view of the service could be ensured if, for a given application of the Directory, there is some agreement between service providers for supporting a common DIT structure. This is the approach suggested by the CCITT Recommendation F.500 [2] and the TPH500 project (related to the Telephone Directory Assistance service).

The alternative might be to preserve DMO's autonomy regarding subschema specification, particularly where naming structure is concerned. The consequence would be that a real object - a locality, a residential person, etc. - may be listed by several DMDs under different Distinguished Names (DNs). However, the unique user's view can still be retained if, for example, the Name-Sharing approach as described in annex B of this ETR could be adopted.

4.4 Knowledge information and the role of a First-level DSA

It is a basic requirement of the Directory that, subject to Access control, the user should be able to retrieve information from any DMD by accessing any DSA which is not necessarily a component of the holding DMD. It follows that any DSA (or DMD) has directly or indirectly some knowledge about the information held by and the access point of other DSAs or (DMDs).

The knowledge information to be held and managed by a DSA depends on whether or not the particular DSA is acting as a First-level DSA. A First-level DSA is associated with one or possibly several entries immediately subordinate to the root of the DIT. Such an entry can be either a Country entry or an International Organization entry. The case of a First-level DSA associated with an International organization is for further study. The basic functionality of such a First-level DSA is to permit international interworking and navigation within a country based on the following knowledge information:

- for each of the immediate subordinates of the root which are different from the ones already held, the Relative Distinguished Name (RDN) of that object and the access point information for at least one First-level DSA. Such references will allow international interworking;
- subordinate references pointing to the DSAs holding entries subordinate to the corresponding country entry (or entries). These references cater for navigation between DMDs operating under the administrative authority of the (single) DMD responsible for holding this particular First-level DSA.

Annex B (DMD's registration procedure) presents the concept of a Directory Administration Facility which may serve the purpose of managing the set of knowledge information.

In addition, the following circumstances are envisaged:

- from a conceptual viewpoint, for a given country there will be a single First-level DSA holding the single associated country entry. It is strictly a national matter to decide on how ADDMDs will be responsible for managing the issue of First-level DSAs;
- for political, performance and availability reasons, it may be possible that additional DSAs may also hold copies of First-level DSA information. These DSAs may be termed "Shadow First-level DSAs";
- however, if such a Shadow First-level DSA is implemented, the level of service and the quality of service should remain unaffected;
- the set of First-level DSAs are interconnected with interworking between them performed by use of DSP;
- it is assumed that, by on-line procedure or off-line co-ordination activity, bilateral agreements or all other means, knowledge information held by these First-level DSAs will be generally up to date and consistent. However, this ETR does not mandate any particular mechanism or procedure for this purpose;
- each ADDMD willing to provide a First-level DSA needs to satisfy the interconnection requirement, collaborate with other ADDMDs for the purpose of managing the Root context information and finally ensures an acceptable Chaining performance compatible with the (end-to-end) quality of service being defined by this ETR;
- it is possible that a PRDMD may operate a First-level DSA; in such a case, the PRDMD also needs to satisfy the requirements related to the First-level DSA capability;
- it is possible that interworking may be greatly enhanced by the use of additional information describing DMD-specific service policies and DSA operational state.

As an example, a First-level DSA may use this information to avoid chaining a Modify operation to a particular DMD if it is known that such an operation is not supported by that DMD. DSA operational status information could be used to prevent chaining towards out-of-order or overloaded DSAs.

However, this ETR does not intend to define a recommended procedure for this purpose.

4.5 Association management parameters

Interworking between DMDs implies the exchange by appropriate means of operational information of mutual interest, particularly the following set of association parameters:

- access point information;
- mode(s) of mutual authentication: None, Name only, Simple Authentication with Name and Password, StrongAuthentication together with associated credentials;
- use of digital signature on operations;
- association establishment mode:
 - permanent (the association will normally be established only once at the system start time, the association will remain established except in the case of hardware or software failure or where there are problems with the communication facilities);
 - per operation (the association will be established when required, one or possibly more operations performed and then disconnected);
- time out on low traffic (the association is disconnected if the total number of operations sent over this association in a certain period of time is smaller than some agreed upon lower bound);
- time window (e.g. the association is established between 9 a.m. and 5 p.m. every day).
- association initiator: could be asymmetric (one DSA is selected for initiating/restarting the connection) or symmetric (each DSA could take the initiative);
- upper bound on the number of outstanding operations;
- possible restrictions on the type of operations (for example, no Modify operations);
- upper bound on the number of Directory System Protocol (DSP) associations between the pair of DSAs;
- administrative limits (e.g. time or size limits).

It should be noted that time management between DSAs may be required for supporting the association management.

4.6 National languages support

From the human user, there is a requirement to be able to interact with the Directory in his own national language. In some countries, there may be more than one national language (for example, Canada has two national languages: French and English). In some other countries, in addition to the national language it may be required to support also one or several regional languages. This is termed "national languages support" in this ETR. Within the context of the global Directory this requirement raises several issues, notably the character set issue (ITU-T Recommendation T.61 [7] string versus the future ISO 10646 [8] string or the UNICODE alternative?) and the naming issue (e.g. the concept of equivalent names, for example one name form expressed in printable string and one equivalent name form using Greek character).

This topic will be examined by the standardization community under the work item entitled "Internationalization of the Directory".

As it is probably not economically justified to require that any Directory User Agent (DUA) / DSA need fully support the ITU-T Recommendation T.61 [7] string, particularly when the national language could be handled more simply by using only printable string, the realistic scenario may well be so that some DMDs are using printable string only, some others may use ITU-T Recommendation T.61 [7] string. Some DMDs may also structure their subschema in such a way that either printable string or the ITU-T Recommendation T.61 [7] string could be used for accessing the database.

The following suggestions are made:

For DUAs:

Depending on the required application and the range of "supported languages" there will be several types of DUAs, from the "simple" printable string only DUA to the, presumably more complex, ITU-T Recommendation T.61 [7] model. This ETR does not mandate any particular DUA configuration. It is entirely the user's responsibility to select the appropriate DUA configuration, depending on the expected use of the Directory.

A multi-language DUA may have the following features:

- provision of Man-Machine Interface supporting Input/Display functions in the desired languages. It is desirable that the "presentation character set" - e.g. the one used for Input/Display - is ITU-T Recommendation T.61 [7] compatible;
- for unsupported characters, a Fall back/conversion procedure should be provided;
- provision of printable string and ITU-T Recommendation T.61 [7] Encoding/Decoding functions.

For the "simple printable string DUA", as long as the equipment could safely receive and subsequently ignore or convert T.61 String, there is presently no additional requirements concerning ITU-T Recommendation T.61 [7] support.

For DSAs:

For the purpose of interworking, DSAs should have the capability of handling printable string and ITU-T Recommendation T.61 [7] string, at least during Name Resolution and pure Chaining or Pass Through procedures.

This is dealt with by ENV 41512 [3] mandating that the (static) capability of a DSA regarding "character set" should cover:

- provision of printable string and ITU-T Recommendation T.61 [7] Encoding/Decoding functions at DAP and/or DSP levels, depending on the supported application contexts;
- provision of Checking on attribute values;
- provision of Matching rules associated with the supported attribute syntaxes.

However, this does not necessarily mean that such a DSA needs to check or validate every ITU-T Recommendation T.61 [7] attribute value. This is currently expressed by ENV 41215 [4].

4.7 Error handling

Please refer to ETG 017 [5] on Error Handling for guidance on this issue.

4.8 Security aspects

Please refer to ETG 027 [6] on Security Architecture.

4.9 Operational considerations

This is for further study.

4.10 Procedures in support of Charging and Accounting

This is for future study. This subject can only be addressed when Charging and Accounting principles are defined by the concerned parties.

Annex A: DMD'S registration procedure

This annex outlines the requirement for establishing a DMD's registration procedure which may serve the procedure of organizing the development of the future Directory System. It contains preliminary material and may change based on further study and experience.

For the purpose of this ETR, it is assumed that a Directory Administration Facility will be established for providing the registration service as described in this annex. The main purpose is to establish - and subsequently manage the updating/distribution process - a registry of all co-operating DMDs within Europe. In addition, assuming that the future System may implement the Name Sharing procedure, as described in annex B, the Directory Administration Facility could also provide the necessary shared information collection and management functionality.

The registration service comprises the following aspects:

- information collection from DMDs;
- validation of input information and update of the Registry;
- information distribution to DMDs.

A.1 Information collection

DMDs are required to provide the Directory Administration Facility with the following information:

- access point of the First-level DSA that it operates together with the set of association parameters and an indication of the associated country;
- technical specifications related to various access points managed by this particular DMO;
- subschema information (possibly only a subset of ?);
- service description (supported operations, restrictions on operations, administrative limits, etc.).

The information exchange between the Directory Administration Facility and participating DMOs may take the form of physical media exchange - magnetic tape, floppy disks, etc. - or may use standardized communication protocols such as File Transfer & Access Management (FTAM) or MHS. The detailed specification is for further study.

A.2 Validation of input information/update of the registry

It is the responsibility of DMOs to provide accurate and sufficient information to the Directory Administration Facility which may then carry out the following tasks:

- consistency checks, particularly in cases of replacement or delta update;
- conversion from input data to the registry's format.

Detailed specification is for further study.

A.3 Information distribution

Two forms of distribution should be provided:

- initiated by the Directory Administration Facility using a scheduling function or triggered by a determined event such as the connection of new DSAs to the system;
- on request from DMOs.

As for the information collection, two types of information exchange - physical exchange or communication protocol - should be possible. Detailed specification is for further study.

Annex B: The North American Directory Forum (NADF) name sharing procedure

Overview

In some countries the development of commercial Directory services could take place in a competitive environment where several DMOs may hold entries related to an identical "real world object". As an example, a residential person (Mr John Smith from Mountain View California, USA) may be a customer of several different Directory service providers (Fiber Fone, Speedy Delivery) and, therefore, this person may be listed in these DMDs, possibly under different Directory names as each DMD may have specific naming rules:

- C = US, AD = Fiber Fone, L = 415, CN = John Smith;
- C = US, AD = Speedy Delivery, L = CA, CN = John Smith.

On the other hand, this "real world object" could be considered as also having a "unique" name - loosely defined as the usual name of this object : C = US, ST = CA, L = Mountain View, CN = John Smith - which could be known and shared by these DMDs.

This situation raises the following issues:

- a naming issue: what are the properties of the so-called unique name? How to "translate" one unique name into possibly several DMD specific DNs?
- a service issue: how to offer to the user the freedom either to select a specific target DMD or to collect all information about a particular real world object, irrespective of the holding DMD?
- a management issue: how to ensure that the necessary ad hoc procedure could guarantee fairness and confidentiality so that it can be acceptable for competitive DMOs?

The NADF has addressed this Name Sharing problem in the following way.

A Public DIT domain is created and co-operatively managed by the set of DMOs for the purpose of linking one "unique" object's name to possibly several related DMD specific DNs.

For each shared object, loosely defined as some object known by and listed in more than one DMD, there will be one unique entry stored in this shared DIT domain. Such an entry should contain three kinds of attribute values:

- a) the naming attributes (forming the unique name) of this entry;
- b) the set of useful attributes for searching;
- c) one or more naming link attributes, each naming link points to a corresponding entry within a service provider DIT domain.

A two stage procedure will be used by the user for retrieving Directory information. Firstly, the Public DIT domain is searched for retrieving naming links and possibly the set of attributes useful for searching (possibly packaged as search guides). Secondly, in accordance with the user's selection, one or several interrogation operations will be sent to the selected DMD access point for retrieving actual user information.

A DUA local function would be necessary for handling the user interface with the Public DIT domain: display of naming links, selection procedure, etc.

To ensure fairness, efficiency, security... the responsibility for managing the Public DIT domain is held by a "neutral" entity which does not operate any Directory service. This is called the Central Administration for NADF (CAN) - whose main purpose is to manage the acquisition and distribution process for NADF shared information.

Functional specification of the CAN

This entity is responsible for managing the process of Information Sharing by co-operating DMOs members of the NADF. The scope of Shared Information modelled as the Public DIT domain covers:

- knowledge information, particularly First-level DSA information. This type of information is packaged into "knowledge entries";
- basic information regarding each member DMD Identification, access points, Name of the root of the subtree, etc. This type of information also appears as "knowledge entries";
- geographical information for the purpose of (uniquely) identifying countries and places/states/localities/provinces within a country. This type of information is packaged into "geographical entries";
- naming links information.

The CAN will provide the following functionality:

- acquire raw information from participating DMOs and produce NADF shared entry on it. In doing this, it verifies the information received from each DMO for consistency with the overall NADF information;
- acquire the information related to geographical entries from the appropriate source (the US Census information for the USA), obtain updates to it and produce the set of geographical entries;
- handle the updating procedure (either by delta or complete replacement);
- handle the distribution procedure according to the "pull" model - on request from DMOs - for delta replacement or according to the "push" model, as scheduled by the CAN itself, for complete replacement;
- be conveniently available, possibly by a seven days a week, 24 hours per day schedule if demand warrants it.

Although the NADF considers only at this stage the use of off line means - exchange of magnetic media or perhaps file transfer or message transfer protocol - for handling the acquisition/distribution process, future development may well envisage the use of the Directory Information Shadowing Protocol (DISP) and Directory Optional Binding Protocol (DOP) protocols of the 1993 edition.

Annex C: Example of additional attributes and object classes

In addition to the set of selected attributes and object classes already defined by the base specification and functional profiles, it may be useful to also consider the following additional information objects being introduced as a result of on-going experience. These information objects are mainly for the purpose of facilitating the use of the Directory service or the management of the Directory system.

NADF contribution:

Attributes

- namingLink
- reciprocalNaminglink
- logicalDSAReference
- supplementaryInformation
- nadfSearchGuide
- lastModifiedTime
- addmdName
- StateNumericCode
- PlaceNumericCode
- CountyNumericCode
- StateAlphaCode
- ansiOrgNumericCode

Object Classes

- usStateOrEquivalent
- usPlace
- usContyOrEquivalent
- usOrganization
- foreignOrganization
- nadfApplicationEntity
- nadfADDMD
- nadfObject
- publicObject
- providerObject

EWOS 92/001 contribution

Attribute

- InfoAttribute

Tph500 project

- givenName
- houseNumber

These two last attributes have been standardized in the 1993 edition of the base specification.

Annex D: Character sets

This annex aims to provide some clarifications on the character sets issue.

IA5 String

An IA5 String represents an ordered set of zero or more characters chosen from the International Reference Version (IRV) of the International Alphabet Number 5 (IA5) as defined by CCITT Recommendation T.50 [9] and ISO/IEC 646 [10]. IA5 is in fact a coded character set based on the 7 bits code table.

Printable String

A Printable String represents an ordered set of zero or more characters chosen from a subset of the printable characters. The Printable String subset contains:

capital letters A, B, , Z (26)

small letters a, b, , z (26)

special characters:

Space, Apostrophe, Left parenthesis, Right parenthesis, Plus sign, Comma, Hyphen, Fullstop, Solidus, Colon, Equal sign, Question mark (12).

A Printable String is an implicit IA5 String, therefore the coding of the Printable String character is as defined by the IA5 code table.

T.61 String

A T.61 String represents an ordered set of zero or more characters and presentation commands chosen from the set defined by ITU-T Recommendation T.61 [7] entitled "Character repertoire and coded character sets for the International Teletex Service". The Printable String is a subset of ITU-T Recommendation T.61 [7].

Coded character sets mandated by ISO/IEC ISP 10616 [11]

Following the base Specification, ISO/IEC ISP 10616 [11] requires from DSAs the support of Printable String and T.61 String. T.61 support is then further defined as mandatory for the following coded character sets: Register 102, Register 103. Optional support is permitted for other repertoires which could be derived by the T.61 extension mechanism. Also refer to ISO/IEC ISP 10616 [11] for detailed specification of T.61 string handling.

Existing ENVs dealing with ITU-T Recommendation T.61 [7] coded character sets:

ENV 41502 [12] (Register 102 and 103);

ENV 41506 [13] (Encoding rules for ENV 41502 [12]);

ENV 41503 [14] (Greek repertoire);

ENV 41503 [14] (European repertoire).

History

Document history	
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