INTERNATIONAL TELECOMMUNICATION UNION

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SERIES F: NON-TELEPHONE TELECOMMUNICATION SERVICES

Directory services

Automated directory assistance – White pages service definition

ITU-T Recommendation F.510

ITU-T F-SERIES RECOMMENDATIONS

NON-TELEPHONE TELECOMMUNICATION SERVICES

TELEGRAPH SERVICE	F.1–F.109
Operating methods for the international public telegram service	F.1–F.19
The gentex network	F.20–F.29
Message switching	F.30–F.39
The international telemessage service	F.40–F.58
The international telex service	F.59–F.89
Statistics and publications on international telegraph services	F.90–F.99
Scheduled and leased communication services	F.100–F.104
Phototelegraph service	F.105–F.109
MOBILE SERVICE	F.110–F.159
Mobile services and multidestination satellite services	F.110–F.159
TELEMATIC SERVICES	F.160–F.399
Public facsimile service	F.160–F.199
Teletex service	F.200–F.299
Videotex service	F.300–F.349
General provisions for telematic services	F.350–F.399
MESSAGE HANDLING SERVICES	F.400–F.499
DIRECTORY SERVICES	**F.500–F.549**
DOCUMENT COMMUNICATION	F.550–F.599
Document communication	F.550–F.579
Programming communication interfaces	F.580–F.599
DATA TRANSMISSION SERVICES	F.600–F.699
AUDIOVISUAL SERVICES	F.700–F.799
ISDN SERVICES	F.800–F.849
UNIVERSAL PERSONAL TELECOMMUNICATION	F.850–F.899
HUMAN FACTORS	F.900–F.999

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION F.510

AUTOMATED DIRECTORY ASSISTANCE – WHITE PAGES SERVICE DEFINITION

Summary

Given the rapid multiplication and expansion of telecommunication services, there is a growing need for subscribers to those telecommunications services to be able to communicate with each other. In order to facilitate such intercommunications for the subscribers of the various services, operator assisted and public Directory Services will be required. The Service Definition in this Recommendation supports the provision of those Directory Services.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Introduction

This Recommendation details a service definition for the provision of electronic access to an International number information service by cooperating ROAs.

This service is suitable for use both by the operators of ROAs providing a DQ service to their customers, and by direct access of authorized customers.

The service addresses not only the provision of fixed-line telephone numbers, but also the provision of the number information of other communications media – facsimile, mobile, videotelephony, etc. The service can also provide other communication address information such as electronic mail and application process addresses.

The service definition meets the current and foreseeable future needs of the service and is designed for worldwide use if required.

The service definition provides the basis for the progressive delivery of a constantly improving DQ service. The definition allows for the functional capabilities of systems (all or individual) to be expanded, and continually evolved, within but not limited to the constraints set by the definition.

The service definition enables, and should encourage, the implementation of cooperative systems through which an efficient International DQ service is provided.

The service includes, but is significantly different from that defined by Recommendation E.115, in that it defines services for both operators, end-users and processes, provides telecommunication addresses in addition to telephone numbers and X.500 realization is expected.

Recommendation F.510

AUTOMATED DIRECTORY ASSISTANCE – WHITE PAGES SERVICE DEFINITION

(Geneva, 1997)

1 Scope

This service definition is the basis for the establishment of a truly International DQ service through the standardized interworking of numerous individual DQ information services.

This service definition provides a general framework for the provision of electronic access to international Directory Services. It defines the requirements for, and the service features associated with the provision of such Directory Services. It specifies the requirements to support Directory Services that may be offered to both Directory Service operators and to end-users. It encompasses the operational aspects of the service and includes Quality of Service and Charging and Accounting.

This service definition defines the White Pages Directory Service. However, the services and elements specified herein may be used to define other services, such as Yellow Pages.

A DQ service might have more than one access point available for retrieving information from another country. At each of these information might be retrieved from one or more national service or information providers. There may be various types and levels of service quality provided. This service definition does not define any mechanism for selection of provider and of any explicit mechanism for selection of quality of service.

This service definition assumes that information is retrieved from a single country at a time. The name of the country must be included in the request parameters. Removal of the single country restriction is for further study.

This service definition does not specify the method of implementation which may use any appropriate protocols (or combination of protocols). The terms used in this Recommendation adopt their conventional meaning (dictionary definition), and the meaning of terms, such as "attribute", should not be assumed from other (standards) documents in which they may be defined.

2 References

The following ITU-T Recommendations, and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

– ITU-T Recommendation D.37 (1996), *Accounting and settlement principles applicable to the provision of public directory services between Interconnected Directory Management Domains.*

– ITU-T Recommendation E.104 (1995), *International telephone directory assistance service and public access.*

– ITU-T Recommendation E.115 (1995), *Computerized directory assistance.*

– ITU-T Recommendation E.160 (1993), *Definitions relating to national and international numbering plans.*

–   CCITT Recommendation T.51 (1992), *Latin based coded character sets for telematic services.*

–   ITU-T Amendment 1 to ITU-T Recommendation T.51 (1995), *Latin based coded character sets for telematic services – Amendment 1.*

–   ITU-T Recommendation T.52 (1993), *Non-Latin coded character sets for telematic services.*

–   ITU-T Recommendation X.509 (1997) | ISO/IEC 9594-8:1997, *Information technology – Open Systems Interconnection – The Directory: Authentication framework.*

–   ISO 3166-1:1997, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes.*

3   Definitions

3.1   This Recommendation defines the following terms.

3.1.1   directory information: The information held within a directory associated with, and for the purpose of identifying, a communications address, as described in 7.4.2.

3.1.2   directory entry: Information associated with a particular type of real world object. An object consists of one or more attributes. This Recommendation defines the objects and the information required to support the service.

3.1.3   attribute: An attribute has a type and a value. A particular attribute type may be used in one or more directory entries. A new attribute may also be formed by the combination of (simpler) attribute types.

3.1.4   service provider: A Service Provider is the function, supported by an ROA, that supplies a Directory Service to one or more Query Service Agents.

3.1.5   query service agent: The Query Service Agent issues physical search requests to and receives responses from one or more Service Providers. The Query Service Agent may perform Service Provider selection, query modification (or rejection) on the basis of knowledge of the Directory Services offered by Service Providers to which it has access.

3.1.6   directory service: A Directory Service is a service which supports the following functionality.

3.1.6.1 Standardization of directory objects and attributes and their interpretation and utilization.

3.1.6.2 Defined Directory Information.

3.1.6.3 Unambiguous definition of the enquiries that have to be supported by the Service Providers.

3.1.6.4 Resilience to requests specifying search attributes and matching types which are not supported by the Service Provider.

3.1.6.5 Means of communicating to the Directory Service user what is required in order to fulfil request, i.e. definition of services on offer.

3.1.6.6 Defined matching rules and character sets, including its conversion and interpretation rules.

3.1.6.7 Defined handling of language translation.

3.1.6.8 Ordering of returned entries.

3.1.6.9 Definition of information returned for unsuccessful or failed searches.

3.1.7   hierarchical group: A set of directory entries which form the hierarchical external view of a larger body or organization.

3.1.8   named service: A Named Service is a Directory Service which comprises a specific set of Directory functions and Directory data that provide a coherent service. The only Named Service that is defined to date is the White Pages Directory Service defined in this Recommendation.

3.1.9   service specification: A service specification defines a specific Named Service. The specification includes the elements, which form part of all Directory Services, defined in clause 8 and the specification utilizes, where appropriate, common terminology and definitions which are defined in clause 9.

3.1.10 service data model: The Service Data Model defines the specific directory information required to support a Named Service. The Service Data Model is defined using object modelling techniques (see Annex D) and defines the data object, attributes and relationships between object types.

3.2   The following definitions are used to define directory searches in clause 10:

3.2.1   Parameter classifications (used in clause 10):

3.2.1.1 mandatory (M): A request parameter or response parameter that is mandatory shall be present.

3.2.1.2 optional (O): A request parameter or response parameter that is optional may be present.

3.2.1.3 omitted (X): A request parameter or response parameter that is omitted shall not be present.

3.2.1.4 not applicable (–): The use of this request parameter or response parameter is not applicable for the search in question.

3.2.2   predicate: A predicate (Pn) describes the conditions where a request parameter or response parameter may be mandatory, optional or omitted.

3.2.3   target object: The primary object that contains the information to which the search request applies.

3.2.4   search request parameters: The items of information including attributes that form the search request.

3.2.5   search response parameters: The items of information including attributes for the entries returned in the search response.

3.2.6   search parameters: The items of information including attributes that form both the search request and the search response.

3.2.7   SearchName: A SearchName uniquely identifies each of the searches defined in 10.5 and 10.6.

3.2.8   message: Information in the search response which is identified by a code and includes, when necessary, precise information, such as attribute types, attribute values or other identifiers, that relate to problems detected. Messages are listed in Annex A.

3.2.9   matching rule: A matching rule defines the relation between a request and the entries returned in the corresponding response. A matching rule is applied to each request parameter by the Service Provider to select entries, that satisfy the matching rule, to be contained in the response. Only entries that satisfy the matching rules for all the parameters in the request shall be contained in the response. Matching rules are indicated as MR1, MR2, etc. and are defined in 9.2.2, 9.2.3 and 9.2.4.

3.2.10 essential: The attributes that are required to supported the minimum service (defined in clause 10) are identified as essential attributes.

3.2.11 additional: The attributes that may be provided, in order to support higher levels of service (defined in clause 10), are identified as additional attributes.

4 Abbreviations

This Recommendation uses the following abbreviations.

DQ   Directory Enquiry

FTP   File Transfer Protocol

HTTP Hypertext Transfer Protocol

ISDN   Integrated Services Digital Network

NACE *Nomenclature des Activités de la Communauté Européenne*

NDC   National Destination Code

PSTN Public Switched Telephone Network

ROA   Recognized Operating Agency

RWL   Real World Locality

SIC   Standard Industry Code

SMS   Short Message Service

SMTP Simple Mail Transfer Protocol

5 Conventions

The symbols, such as MR1 to indicate WordExact matching, which are defined in clauses 7 and 9, and used in clause 10 are listed in Annex B.

The Service Data Model described in clause 10 is formally defined in Annex C using the Object Modelling notation described in Annex D.

6 Directory Services Model

This clause describes the organization of components of the service for both the delivery of Directory Services to users and the management of those services by administrators.

6.1 Directory Service use

The public Directory Service shall be accessible not only to professional Directory Service enquiry operators but also to end-users, which can be human users and application processes.

The service must allow for different facilities to be made available to different classes of user, e.g. available to operators, but not end-users. This F.510 Service supports a number of facilities but does not define specific classes of user or the combination of facilities appropriate to, or the functionality offered to, any particular class of user.

The F.510 Service supports a set of query functions that may be utilized by a local agent in order to offer appropriate facilities to different types of end-users, as shown in Figure 1.

The delivery of the service is subject to legal and privacy rules which are outside the scope of this Recommendation.
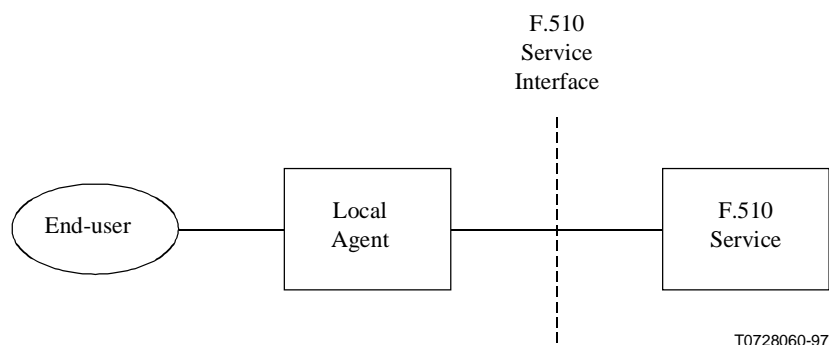
Figure 1/F.510 – F.510 Service Interface

6.1.1 Local Agent

A Local Agent provides access to a Directory Service on behalf of an end-user. The Local Agent is a person, such as an enquiry operator using computerized facilities (i.e. PC or telematic terminal), or a function (or both) that utilizes the services at the F.510 Service Interface.

A Local Agent acts on behalf of the end-user in the usage of one or more Directory Services. Typically, the Local Agent has detailed knowledge of specific Directory Services in terms of their definition, physical location and accessibility. The Local Agent provides enhanced service usability and physical data location transparency to Directory Users.

The Local Agent may also provide and control access to a range of Directory Services that provide different data and quality of service. The choice of service may also be subject to regulatory, legal or commercial considerations. This service definition does not define any parameters relating to service selection and the choice of service is outside the scope of this service definition.

6.1.2 End-user

An end-user is the ultimate consumer of Directory Services and can be a human user or application process. The end-user utilizes the services of a Local Agent in order to interact with Directory Service Providers.

6.1.3 Possible Service Scenarios

Figures 2 and 3 show different possible arrangements for the provision of operated assisted and direct access services. Services and mechanisms, such as access control, user preferences and help (assistance) may be provided by a human operator, terminal application or access service function, possibly in combination. The definition of these services and mechanisms is outside the scope of this Recommendation.
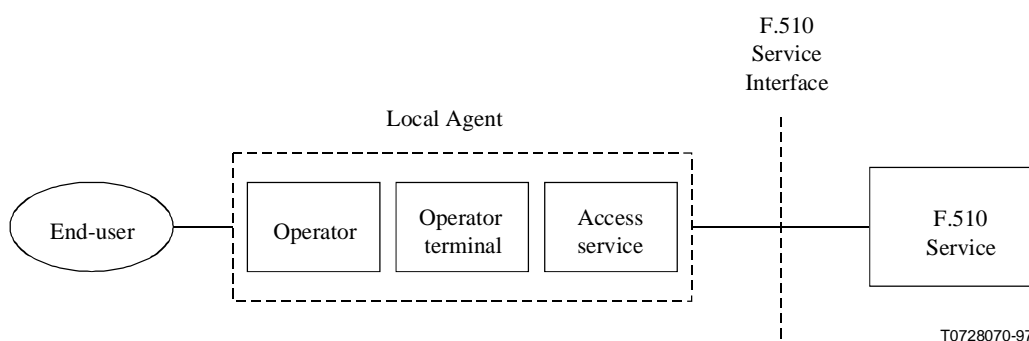
Figure 2/F.510 – Operator assisted (dial-up) Service
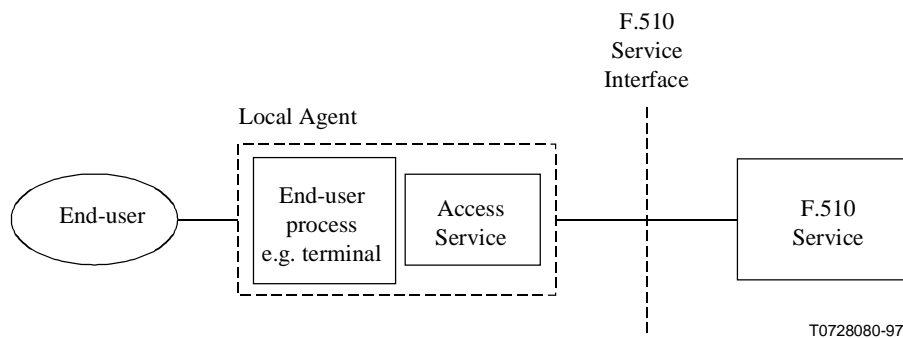
Figure 3/F.510 – Direct customer (computerized) access service

6.2 Directory Service Provision

The F.510 Service is refined into two components, as in Figure 4: the Query Service Agent and the Service Provider which interact to provide directory query services that satisfy regulatory, geographical and language differences between Directory Service users and Directory Service Providers in different domains.
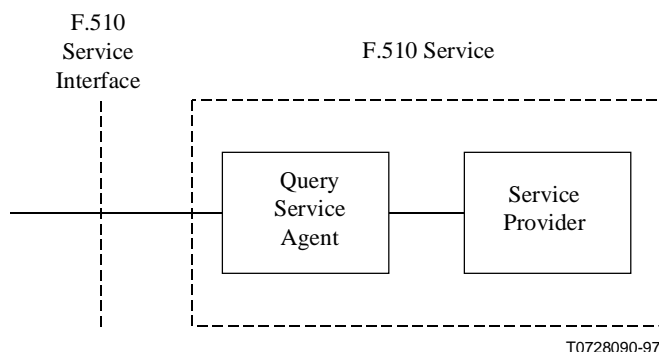
Figure 4/F.510 – F.510 Service Provision

6.2.1 Service Provider

A Service Provider is the function that supplies a Directory Service to one or more Query Service Agents. Additionally, the Directory Service Provider may regulate access to the service against a set of known legitimate Query Service Agents.

A Service Provider may utilize the services of one or more other Service Providers in order to provide a Directory Service.

6.2.2 Query Service Agent

The Query Service Agent issues physical requests to and receives responses from one or more Service Providers. The Query Service Agent may perform Service Provider selection and query modification (or rejection) on the basis of knowledge of the Directory Services offered by Service Providers to which it has access.

6.3 Directory Service Management

Directory Service Management provides the mechanisms to supply information for management decisions and the procedures to execute those decisions. Management functions are associated with the Query Service Agent and Service Provider to implement the Directory Service offered by a Service Provider and consumed by a Query Service Agent. The information and procedures required to manage the Directory Service that operates between the Query Service Agent Manager and Service Provider Manager (see Figure 5) are specified in 11.3.
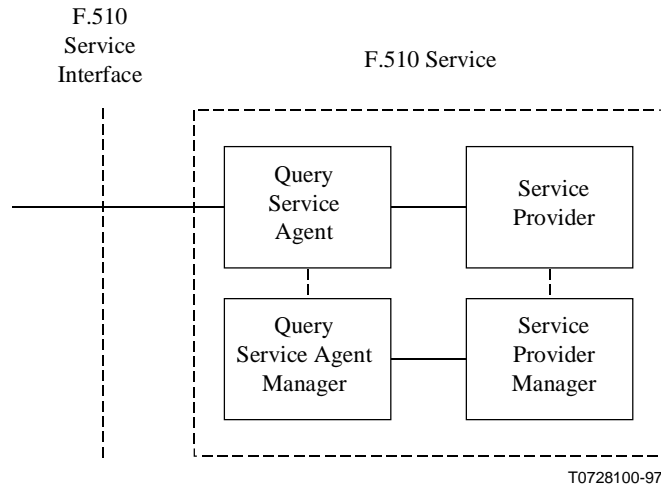
Figure 5/F.510 – F.510 Service Management

6.3.1 Service Provider Manager

A Directory Service Provider Manager performs a number of functions which cover management of Directory Services offered by a Directory Service Provider negotiated by Directory Service Administration. Typically these include operational aspects of the service provision, such as distribution of availability and physical access information. Service Provider Managers will operate in cooperation with Directory Query Service Agent Managers.

The Directory Service Provider Manager will have the capability to create, and subsequently monitor and configure, Directory Services, disseminate knowledge of the existence of Directory Services to other Directory Service Managers (both Directory Query Service Agent Managers and peer Directory Service Provider Managers) and establish usage of Directory Services through the configuration of system and communications resources.

6.3.2 Query Service Agent Manager

A Query Service Agent Manager performs a number of functions which cover negotiations of usage of Directory Services offered by Directory Service Providers and performing the configuration of the Directory Query Service Agent needed to use offered Directory Services. Query Service Agent Managers will exist for Query Service Agents and will work in cooperation with Directory Service Provider Managers.

7 Directory Information Model

The purpose of this clause is to describe the inherent structure and relationships for the information contained in subscriber listings and to provide definitions of object types for that information.

It is important that there is a common understanding and unambiguous definition of the information in order to develop specific services using that information. The information contained in subscriber listings **does not define** the services but does limit the overall scope and capability of any service.

Many items of information **could** be used to identify a particular subscriber listing (and ultimately the communication addresses and associated information for the subscriber) such as subscriber name, house number and street name.

Where information is available that is sufficiently distinguishing **and** the service provider supports a search function using that combination of attributes, then identification of the subscriber may be achieved directly.

Where such information or search function is not available, then it is usually necessary to identify information that can be used reliably to select smaller sets of subscriber listings. The information that is of this type, which is generally useful (commonly known), is Geographic Location, Business Classification and Organization Structure. This type of information may be used to aid identification of the actual attribute values held in the directory from alternate information available for searching such as alias and synonym values. For example, with reference to Figure 6, a real world locality (a) Heathrow may be used to identify the actual locality (b) London Airport that is the value (c) held in the subscriber listings.

NOTE – The terms Geography and Geographic Location Information are intended to be equivalent.

Geography, which can include information of various scope (street, town, county, region etc.), is generally known and useful for the selection of smaller sets of subscriber listings, but alternate information that identifies the same Geographic Location (place) typically exists.

Business Classification is also generally known and useful for the selection of smaller sets of subscriber listings, but no common system for the classification of business function is generally known or used and alternate information that identifies similar business functions can exist.

Organizational Structure is more complex because there are many ways and different types of information that may be used to describe an Organization. For example, a company may have a structure that is described by location, function, product or activity; an Administration may have a structure that is described by department, region and service; a family may be described by genealogy. For a particular Organizational Structure various relationships may be used to aid in searching. However, within this service definition use is only made of the hierarchical relationship that may exist between directory listings.

The general model, that is appropriate to directory enquiry services, is illustrated in Figure 6. The broken lines represent the optional relationships, while the solid lines indicate mandatory relationships. Formal models, which are subsets of the general model, on which each specific service is based are specified in clause 10.

In Figure 6, information about Geography, Organizational Structure or Business Classification may be used to identify the value (i.e. the actual attribute values for a listing held in the directory) for Subscriber Locality, Subscriber Entry (organizational) and Subscriber Business Category, respectively that may be used to select Subscriber Entries reliably.
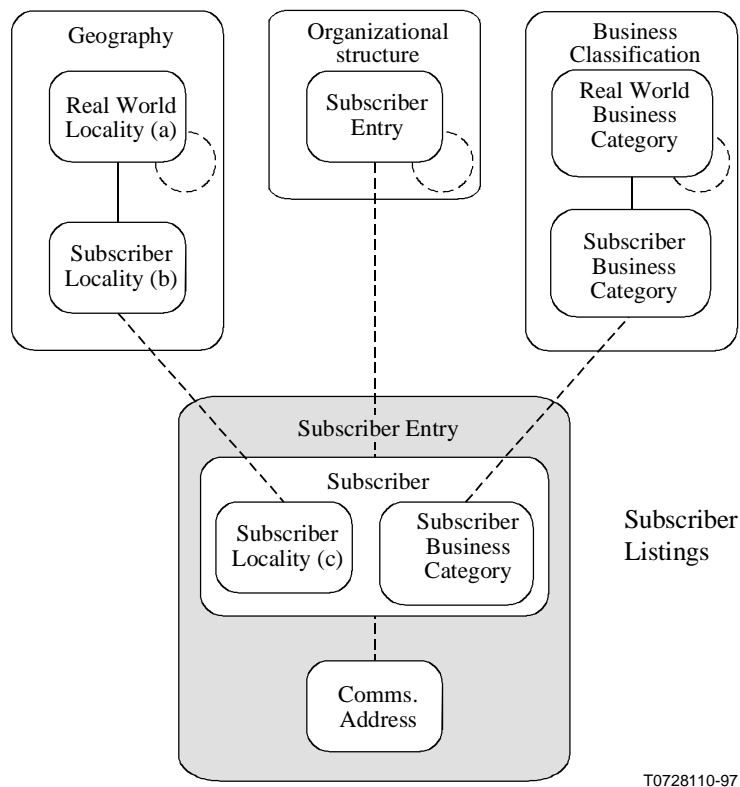
Figure 6/F.510 – Directory Information Model

Subscriber entries may be associated with structured data relating to a Geographical Location or Business Classification. Within each of these structured data sets, the entry to which a subscriber is immediately related will be related to other "real world" entries within that set. To be most useful these sets should be well structured, well-defined and have widely, generally known values.

Subscriber entries may also be related to each other through an organizational structure based on a combination of geographical, business or other data.

7.1 Geography

Structured information regarding "real world localities" enables queries to be translated or resolved into one or more "subscriber localities" to be searched.

7.1.1 Real World Locality

This term may be applied to any "named" geographic locality (or area), the name (or identifier) of which is likely to **be known and specified by** a user making an enquiry on the directory. Different types of RWL are likely to be appropriate within different countries, and while the names of such objects are likely to be known abroad, their type often will not. The most common localities will be those used as components in Postal Addresses.

It includes both political and administrative localities (Country, County, State, Province, Department, Region, City, Town, Village, Rural District, etc.) and natural geographic areas (e.g. Dovedale, Peak District). These political, administrative or natural geographic localities (or areas) may be precise, with well-defined borders, or imprecise with somewhat fuzzy borders. They may be officially named places, or local familiarly named places. The exact interpretation of each of these terms is generally fully appreciated only within the countries where they apply.

All such localities may be known by one or more alias names.

Relationships between RWLs include:

– a locality is part of another locality (strict hierarchy);

– a locality neighbours (is adjacent to) another locality;

– a locality is an alias for another locality;

– a locality roughly maps to a set of localities, e.g. Yorkshire (an area consisting of three Counties), Alps, Ameland (an island of three localities).

Which of these relationships should be represented within the directory is a local consideration for the Service Provider.

The attributes for Geographic Locality are given in Table 1. A Geographic Locality will be of a certain type, such as Country, StateOrProvince, Locality, Small Locality or Locality Street Address. Certain attributes may be complex, that is, may have more than one value, for example, LocalityName may be held in more than one language (with an indication of the language for each value).

Table 1/F.510 – Geographic Locality attributes

Attribute	Description
LocalityName	The name by which the Geographic Locality is identified.
LocalityCode	A common code used to identify a Geographic Locality, e.g. Country ID, Post Code.
LocalityNameLanguage	Language for the LocalityName.
LocalityNDC	National Destination Code for Locality (see 7.1.3 below).
LocalityDescription	Description provides additional locality information. The information, which is not structured or standardized, is held on existing directory databases. This attribute is not a mechanism to introduce data or service enhancements.
NoSubscriberInformation	Indicator to show that Subscriber data is not held for the particular Geographic Locality.

7.1.2 Subscriber Locality

A Subscriber Locality represents a convenient grouping of geographically related subscribers used to aid searching. The areas represented by these may have a direct mapping to real world localities, or may be artificially created and named, e.g. to create manageable subdivisions. All geographically based Subscriber Entries are associated with a Subscriber Locality.

The Subscriber Locality provides the means by which imprecise and unstructured RWL specified as search parameters can be translated into more well-defined search areas.

Subscriber Locality attributes are as for Geographic Locality attributes.

7.1.3 National Destination Code (NDC)

National Destination Code is defined by Recommendation E.160 and is summarized here.

The National Destination Code is a field, within the E.164 numbering plan, which combined with the subscriber's number will constitute the national (significant) number of the international ISDN number. The NDC will have a network and/or trunk code selection function.

NDC assignments are a national responsibility and therefore the NDC structure varies from one country to another.

In general numbering areas do not line up with subscriber locality boundaries and not all the communication apparatus for a subscriber are necessarily routed through a single exchange.

7.2 Business Classification

Business Classification is the system used to classify Subscribers according to their "Business".

7.2.1 Real world business category

Real world business categorization is composed of formal categories (which make up a strict hierarchy), and informal categories which may be commonly known (and hence provided in requests). Informal categories will be mapped to the formal ones in order that information provided in a request can be translated to the category with which the required entry is likely to be associated.

Standard classification of Business categories (e.g. NACE, SIC) may be adopted in order to circumvent language problems.

7.2.2 Subscriber Business Category

A Subscriber Business Category is the formal Business Category with which a Subscriber Entry is associated. The precise meaning is determined by the Service Provider.

7.3 Organizational structure

Subscriber Entries may form part of the external public view of a larger body or organization. The structure of an organization may be described by the hierarchical relationships between the Subscriber Entries that form the organization. The set of entries which form the (complete) external public view of a larger body or organization is referred to as the Hierarchical Group.

7.4 Subscriber Entry

A Subscriber Entry is associated with none, one or more communications addresses of a variety of possible types, e.g. telephone, facsimile, mobile, e-mail, EDI, videotelephone, ISDN, toll free voice telephony (also known as green numbers).

The attributes for Subscriber are given in Table 2. Certain subscriber entry attributes may be complex, having more than one value, for example, StreetAddress may be held in more than one language (with an indication of the language for each value).

Each Subscriber Entry will be optionally related to a Subscriber Locality, a Subscriber Business Category and (hierarchically) to a Subscriber Entry.

Table 2/F.510 – Subscriber attributes

Attribute	Description
SubscriberType	Categorization of Subscriber Entries into residential subscribers, organizational subscribers and governmental subscribers.
SubscriberName	Name by which the Subscriber chooses to be known in the directory. The SubscriberName is the surname for a residential subscriber and organizational name for organizational or governmental subscribers.
SecondFamilyName	The SecondFamilyName is the second surname for a residential subscriber and may be used in countries where the SubscriberName is not sufficiently unique.
GivenName	Forename or initials of residential subscriber.

Table 2/F.510 – Subscriber attributes *(concluded)*

Attribute	Description
Title	Honorific distinction of residential subscriber.
HouseIdentifier	Unit number or name and further refinements. For example, this may include building, apartment or suite number.
StreetAddress	Address street name (this may have more than one value).
StreetAddressLanguage	Language for each value of StreetAddress. See 9.3.1.
Zip/Post Code	Address zip or post code.
SubscriberAddress	The address provided in the subscriber entry; this may or may not be the correct postal address, and it will often be split into its components – house identifier, street address and zip or post code (above).
Profession	The Profession of a subscriber. The profession attribute describes the profession or job of an individual, business or department.
BusinessCategory	The BusinessCategory of an organization or Administration. It describes the activity domain in which the business or administrative authority is involved. The BusinessCategory may be a general activity, e.g. telecommunications, or a more specific activity, e.g. mobile telephony.
Language	Preferred language, that has been specified by the subscriber, in which their entry shall be displayed. In some countries there is a requirement that a subscriber should be able to specify the language in which their entry should be displayed or provided to the directory service user.
SubscriberDescription	Description provides additional subscriber information. The information, which is not structured or standardized, is held on existing directory databases. This attribute is not a mechanism to introduce data or service enhancements.
HierarchyBelow	The HierarchyBelow indicates if any Subscriber Entries exist (hierarchically) below the Subscriber Entry within the same Hierarchical Group.
HierarchyLevel	Indicates the relative position for a Subscriber Entry that is part of a Hierarchical Group. The HierarchyLevel for a Subscriber Entry is the level at which the entry occurs within the hierarchy, where the top, or root, of the hierarchy has a HierarchyLevel of zero.
EntryIdentifier	A directory entry identifier that can be used, in a request, to uniquely identify a directory entry. NOTE – This identifier can have more general use but is only used within this service definition to identify Subscriber Entries.
LinkedEntries	A directory entry identifier that may be used, in a request, to uniquely identify a related entry, e.g. a "see also" reference to another entry. This attribute may have many values.

7.4.1 Subscriber Types

Subscriber Types may optionally be used to classify different subscribers in the directory assistance service. The Subscriber Type differentiation can be utilized both in the Directory Information Model and Service Data Model. Each Subscriber Type has its own information content and naming structure. It is also possible to customize special services, which are allowed only for certain entry

types, such as search for organizations in a country. Subscribers may be classified into residential, organization, government.

In practice it is sometimes difficult for the requestor to know whether certain subscribers are classified within the directory as an organization or government; and not all countries support classification of entry types. It should be possible to retrieve both organization and government entries without the requestor knowing the exact subscriber type.

7.4.1.1 Residential

The residential entry type normally, but not necessarily, describes a person rather than an organization. The subscriber entry type normally, but not necessarily, is not associated with an administration, business or commercial service. The precise definition may vary in each country.

7.4.1.2 Organization

The organization entry type is used to describe organizations which are not part of the administrative machinery in a country.

7.4.1.3 Government

The government entry type is used to describe the entities, which are part of the administrative machinery in a country.

7.4.1.4 Alternate name forms

Subscriber listings commonly occur as alternate representations, such as acronyms and abbreviations, for the same item of information. For example, the same organization may be listed as HAL, H.A.L., H A L or Henley Ascot Limited, or the address Acacia Avenue may be represented by Acacia Av. or Acacia Ave.

To remove the need for the end-user to have knowledge of how an item should be entered or how it is stored with the Directory database, the Service Provider is advised to standardize the way in which these alternate name forms are supported, either by holding a single form and converting request parameters to the same form or by matching the request parameter against all (possible) forms.

7.4.2 Communications Address

One or more Communications Addresses are associated with each Subscriber Entry, and each address provides the "number" and type of "number" for a particular communications option. A Subscriber entry may be associated with multiple "numbers" for a variety of devices of different types.

Information that affects the usability or availability of a communication address may include: when the address is valid, within what (geographic) area the address may be used, the class of tariff associated with the address and access restriction to the address. The range of values for each classification may be extended and is not limited to those values given in Table 3. The addition of values is for further study.

Table 3/F.510 – Communications address attributes

Attribute	Values	Description
DeviceService		Identifies the type of communication service.
	Telephone	
	Facsimile	
	Videotelephone	
	E-mail	
	Pager	
	Internet	
DeviceAddress		The communication address "number" or "numbers".
	Number	The number information will depend on the DeviceAddressType and may, for example for videotelephones, be multi-valued.
DeviceAddressType		Communication address number type. The type may be generic or specific.
	PSTN	
	ISDN	
	Mobile	
	Pager	e.g. SMS
	E-mail	e.g. X.400, SMTP
	Internet	e.g. HTTP, FTP
DeviceValidity		Classification of validity. The value for DeviceValidity may also include a date and a reference to a dependent listing.
	Old	
	Current	
	New	
DeviceCoverage		The GeographicLocality within which the DeviceAddress may be used. The GeographicLocality may be "any" for international use, the country providing the number for national use or may be some other locality such as a region or city.
DeviceTariffClass		Classification of service tariff.
	Normal	
	Toll Free	
DeviceRestriction		Classification of access restriction – public, secret number, etc.
	Public	
	Secret	
DeviceQualifier		Informal, unstructured information related to the communication address, for example, to indicate that the communication address is for use in an emergency.

8 Service specification

The purpose of this clause is to describe general principles and features required of any Named Service and to describe the elements that are needed for a complete specification of each specific service.

The primary function of the Directory Service is to provide users with communications addressing information (telephone, facsimile numbers, etc.) on Organizations and Individuals they wish to contact, and about who they can supply commonly available data (name, address, etc.) which can be used in identifying the subscriber entry.

As a general principle, the extent and functionality of the service offered by any Service Provider is limited only by what the Service Provider is prepared to and capable of providing, and not by unnecessary constraints imposed in the name of uniformity. The consequence of this is that the service definition must ensure compatibility between systems providing different levels of service.

The aim is for minimal imposition on Service Providers, allowing individual Service Providers maximum freedom with regard to the service they are able to deliver. It is then critical that the service definition embodies sufficient flexibility to allow the most highly developed Service Providers to fully employ their capabilities, whilst not excluding or compromising interworking with ROAs with less sophisticated systems.

In practice, there will need to be different levels of service. The minimum level of service, comprising basic functionality and essential directory information, should by met by all cooperating Service Providers. Other levels of services, which enhance the basic functionality and directory information, can also be defined for each Named Service.

In terms of query capability, the goal for a "generic service" should be that users input whatever they know about the target object with minimal structural constraints, and that the systems apply the necessary "intelligence" to the supplied data in order to locate the target directory entries.

In the generic service, any set of known criteria (object types, attribute types, values and matching specification) can be supplied, by the user, to the Service Provider which will then apply whatever intelligence is within its means in order to identify the subscriber entries (see Table 4). The Service Provider may provide one or more of the following:

– search on locality in order to aid refinement of geographic data;

– search on category in order to aid refinement of function data;

– search on hierarchical group to aid refinement of external, public view of organization data;

– search for subscriber.

Table 4/F.510 – Generic service definition

Supplied by user:	Information required:			
	Subscriber Locality	Subscriber Category	Hierarchical Group	Subscriber
Country[b]	M	M	M	M
Locality	O[a]			O[a]
SubscriberName				O[a]
SubscriberType				O[a]
SubscriberAddress				O[a]
HierarchySelection			O[a]	O[a]
SubscriberCategory		O[a]		O[a]
CommsAddress				O[a]
[a] Matching technique selected by the user.				
[b] Note that country is just a special case of locality.				

Search features should include:

– alternative forms of "approximate matching" on any or all input attributes;

– all input fields potentially optional (the only restrictions should be those imposed by Service Provider);

– some agreed mechanism for dealing with language translation problems, e.g. character translation or use of codes;

– selection of the attributes;

– order of entries returned;

– provision of information to aid searching where searches are unsuccessful.

A number of distinct services may be defined on the basis of the generic services described above, the data held within the directory, and the enquiry services supported. Clause 10 defines the White Pages. Other Named Services, such as Yellow Pages, may also be defined on the basis of the generic services and the common elements in clause 9.

For each of these Named Services to be delivered a basic definition is specified that is mandatory; all cooperating Service Providers need to support its implementation. Any such definition ensures compatibility and compliance between its users. In addition to the basic service additional or enhanced services are defined.

9 Common service specification elements

This clause describes aspects of service specifications that are common to all services. This clause provides terminology and definitions that may be used within the specification of any Named Service.

9.1 Character set

An 8-bit environment is used which contains the Latin based character set as described in Annex D of the Amendment 1 to the T.51 Recommendation.

NOTE – Recommendations T.51 (and T.52) have replaced Recommendation T.61, which has been deleted.

The character set consists of the Primary set (see Figure D.1/T.51), designated as the G0 set and invoked in columns 2 to 7, and the Supplementary set (see Figure D.2/T.51), designated as the G2 set and invoked in columns 10 to 15.

9.2 Matching rules

The relation between a request and the corresponding reply is defined by the "Matching rules". The reply should consist of those entries in the directory where the attributes values "match" the values specified in the request. Generally, different matching rules will be used for different attributes. In order to avoid ambiguity and differing interpretations of matching, it is important that the rules for each type of matching are precisely defined.

Each character, word and string matching rule has a name, e.g. WordPhonetic, and an abbreviated reference, e.g. MR3.

9.2.1 Definitions

A **string** is a non-empty finite sequence of words.

A **word** is a non-empty finite sequence of elements from the character set given in 0 but not including the space character.

The words in a string are bounded by either space characters, the beginning of the string or the end of the string.

A **weak word** is a word that is common, such as an article, which is normally ignored by the Service Provider when matching strings. Their presence or absence does not affect matching. The set of words that are defined as weak are language and culture-dependent and is determined by the Service Provider.

A matching rule determines whether a value "matches" another value. The value contents of the directory is irrelevant for the definition of the matching rule. The matching rule will define for any pair of values whether one matches the other.

9.2.2 Character matching rules

The following rules apply when matching characters in the request to characters in the directory.

The rules in this subclause apply for the Latin based characters listed in A.4.1/T.51. For each rule case is ignored i.e. a small letter matches the corresponding capital letter and vice versa.

NOTE – Similar rules could be defined for Recommendation T.52.

9.2.2.1 CharacterMap (CR1)

The request character matches the directory character according to a mapping determined by the Service Provider. This mapping includes exact matching.

Descriptions of mappings shall be made widely available and might be agreed in standards or other groups.

A particularly important case for end-user friendliness is the matching of the basic characters A-Z with national characters listed in Figure A.2/T.51. Service Providers shall provide mappings such that it is possible to find every entry using only the characters A-Z and 0-9 in requests.

Examples of character mapping might be the matching of basic letters of Figure A.2/T.51 with those with diacritical marks, etc. in the other columns. Other mappings might be two characters matching one character or vice versa, e.g. ae matching æ, ue matching ü or ü matching ue.

9.2.2.2   CharacterExact (CR2)

The request character matches the directory character exactly.

For example: Ü matches Ü and ü, but not U or u.

9.2.3   Word matching rules

Matching a word is matching in sequence characters of the word one by one, using character matching rule CR1 or CR2.

The following rules can be applied to individual words. (Word 2 is a word from the database; Word 1 is a word in the request.)

9.2.3.1   WordExact (MR1)

Word 2 matches word 1 if and only if they are equal.

9.2.3.2   WordTruncated (MR2)

Word 2 matches word 1 if and only if word 1 results from word 2 by truncating word 2. (Truncating a word means replacing it with a non-empty initial substring.) The minimum size to which a word may be truncated shall be specified by the Service Provider.

9.2.3.3   WordPhonetic (MR3)

The word 2 matches word 1 if they are equal or word 1 matches word 2 according to a phonetic rule determined by the Service Provider.

9.2.4   String matching rules

String 2, which is a string from the database, matches string 1, which is a string in the request, if they match according to one of the following rules:

9.2.4.1   StringExact (MR4)

String 2 matches string 1 if and only if string 1 results from string 2 without any deletion of words and without any change in their ordering.

9.2.4.2   WordDeletion (MR5)

String 2 matches string 1 if and only if string 1 results from string 2 by deletion of zero or more, but not all, words from string 2 and the words present are in the same order.

9.2.4.3   WordRestrictedDeletion (MR6)

String 2 matches string 1 if and only if string 1 results from string 2 by deletion of zero or more, but never the first, words from string 2 and the words present are in the same order.

9.2.4.4   WordRotation (MR7)

String 2 matches string 1 if and only if string 1 results from string 2 by permuting zero or more of the words in string 2.

9.2.4.5   WordRotationAndDeletion (MR8)

String 2 matches string 1 if and only if string 1 results from string 2 by deletion of zero or more, but not all, words from string 2, and permuting zero or more of the remaining words in string 2.

9.2.4.6 ProviderDefined (MR9)

Local knowledge applied. This is an indication that the matching to be performed is left up to the system performing the matching, i.e. the "providing" system. ProviderDefined matching may include omission of common words and modification of words (by separation or combination) in the request. For example, modification of *Du Pont* into *Dupont*.

9.2.5 Examples

Table 5 gives examples of string values that are matched by the string value "TRUTH OR CONSEQUENCES". In this example "OR" has not been considered as a weak word.

Table 5/F.510 – Examples of string matching rules

Matching rule	String values that are matched
StringExact	"TRUTH OR CONSEQUENCES"
WordDeletion	"TRUTH CONSEQUENCES", "CONSEQUENCES
WordRestrictedDeletion	"TRUTH CONSEQUENCES", "TRUTH OR"
WordRotation	"OR CONSEQUENCES TRUTH"
WordRotationAndDeletion	"OR TRUTH"

9.3 Language differences

Many countries have more than one official language in use and directory entries may hold the value for an entry in more than one language.

Each Directory Service Provider shall declare the official languages that may be used in responses by the Directory Service.

As a general principle the language of one type of data within a directory is independent of the language for other types of data. For example, a locality with a name in French may occur in a State or Province with a name in Dutch.

It is assumed that the requirements for the support of language differences are generic and apply to all services.

9.3.1 Locality names and street addresses

A locality or street address is unambiguously identified if the locality name identifies a single locality or the street address identifies a single street within the scope of a particular search request.

Where a search matches more than one locality name (or street address), then all matching values (for all official languages) shall be returned with an indication of language.

For example

Request: Locality = Bruxelles
*   Street Address = Place du jeu de balles*

Response: Locality = Brussel (NL), Bruxelles (FR)
*   Street Address = Vossenplein (NL), Place de jeu de balles (FR)*

9.4 Ordering of responses

The ordering of responses is for further study.

9.5 Hierarchical Groups

When searching for subscriber entries, the requester need not be aware of the hierarchical relationship between entries belonging to a Hierarchical Group (i.e. need not be aware if the Subscriber Entry is a part of a Hierarchical Group).

A subscriber entry may only belong to one hierarchical group.

A search for subscribers shall return an indication against those entries that are part of a Hierarchical Group and if Subscriber Entries that are part of the same Hierarchical Group exist below the entry returned.

When searching for subscribers the information returned in the response, for each entry that satisfies the search criteria, may be specified by the following parameter (HierarchySelection):

HierarchySelection	Information Returned in the Response
Top	The Subscriber Entry with a HierarchyLevel zero for the Hierarchical Group that contains the entry that satisfies the search.
0	The Subscriber Entries that satisfy the search.
1	The Subscriber Entries with a HierarchyLevel one greater (i.e. lower in the hierarchy) than the HierarchyLevel of the entries that satisfy the search for the part of the subtree defined by the entry that satisfies the search.
All	The Subscriber Entries with a HierarchyLevel greater or equal to the HierarchyLevel of the entries that satisfy the search for the part of the subtree defined by the entry that satisfies the search.

It shall be possible to reconstruct the correct hierarchical relationships between entries that are returned in a response.

NOTE – It is assumed that a mechanism exists that enables the Service Provider to identify the entries specified by the HierarchySelection parameter (Top, All, etc.) but the specification of such a mechanism is not part of this service definition.

For example, where the directory contains the following entries:

EntryIdentifier	HierarchyLevel	Subscriber Name for Entry		
A	0	Hilton Hotel		
B	1	Hilton Hotel	Reservations	
C	2	Hilton Hotel	Reservations	Rooms
D	2	Hilton Hotel	Reservations	Conference Facilities
E	1	Hilton Hotel	Reception	
F	1	Hilton Hotel	Bar	

The following searches will return the entries indicated:

Search For	HierarchySelection	Entries Satisfying Search Criteria	Entries Returned
Hilton Hotel Reservations Rooms	Top	C	A
Hilton	All	A, B, C, D, E, F	A, B, C, D, E, F
Hilton Re	0	B, C, D, E	B, C, D, E
Hilton Reservations	0	B, C, D	B, C, D
Hilton Reservations	1	B, C, D	C, D

A HierarchyLevel identifying that the returned entry is part of a hierarchical group and specifying the precise level for the entry would be returned for A, B, C, D, E and F.

A HierarchyBelow identifying that entries exist below the returned entry returned would be given for A and B.

9.6 Number of entries

The limit on the number of entries to be returned in the response may be specified in a request.

The limit, imposed by the Service Provider, on the maximum number of entries that can be returned in the response shall be at least 30.

When the limit is not provided in the request then the limit is the one imposed by the Service Provider.

9.7 Entry count

The Service Provider shall return the number of entries matched by the request, or, if the total number of entries matched cannot be provided, for example, because searching is suspended, a number together with an indication that the number of entries matched exceeds this number should be returned.

9.8 Alternate attribute values

A Service Provider may permit alternative attribute values, that are provided in a request, to match the attribute value of an object. In these cases the Service Provider may return a different attribute value to the one provided in the request.

For example, the SubscriberName Heathrow, in the request, may be used to identify objects for which the SubscriberName is London Airport. The SubscriberName London Airport may be returned in the response.

9.9 Weighted attribute values

This would typically be used to relax the search conditions when no entries are matched using all search criteria. An attribute, in the request, may have an AttributeWeight assigned to indicate its significance for matching entries. Attributes, in the request, that are mandatory or have an AttributeWeight assigned equal to 1 (default) must be used, by the Service Provider to identify matching entries.

The Service Provider shall return any entries matched using all search criteria, i.e. applying an AttributeWeight of 1 to all attributes in the request. The Service Provide may return any entries (in the same response) matched by ignoring any of the attributes in the request that are optional and have an AttributeWeight of zero.

For example, a search for SubscriberName *Lloyd* at HouseIdentifier *57* in StreetAddress *Acacia Avenue* where the HouseIdentifer has an AttributeWeight zero will return *Lloyd 57 Acacia Avenue* (if the entry exists) and may return *Lloyd 143 Acacia Avenue*.

9.10   Geographical extension

Local knowledge may be applied by the Service Provider to define the geographical area on which the search will be extended. Geographical Extension is only valid where the search request identifies an unambiguous StateOrProvince, Locality or Small Locality. The amount of extension may or may not be related to geographical distance, as determined by the Service Provider.

The Geographical Extension is specified in a request by two parameters:

GeographicalArea   Integer value 1 or greater, which specifies the degree of extension, as determined by the Service Provider.

IncludeAllAreas   Specifies if the geographical area to be searched includes all areas (degrees of extension), corresponding to 0 (no extension) to GeographicalArea, or if only the extension specified by GeographicalArea is to be searched.

For example, a search of the town *St. Helier* (on the island of *Jersey*) may be extended to include the whole of the island of *Jersey* when a value of 1 is specified for GeographicalArea and may be extended to include the neighbouring island of *Guernsey* when a value of 2 is specified for GeographicalArea.

10   White Pages DQ

The White Pages directory is based primarily on the identification of directory entries by name and geography.

This clause defines the White Pages Directory Service on the basis of the generic services and the common elements in clause 8. Other Named Services, such as Yellow Pages, may also be defined on the same basis.

The geographic and subscriber attributes that are required to support the minimum service are identified as essential attributes. The attributes that may be provided, in order to support higher levels of service, are identified as additional attributes.

10.1   Service Data Model

The Service Data Model described in this subclause is formally defined in Annex C using the Object Modelling notation described in Annex D.

10.1.1 Geographic Data Model

Locality, Small Locality, Locality Street Address, State Or Province and Country are types of Geographic Locality. Attributes of the same name are used to describe them. Each may have one or more alternate names.

A Country is made up of a set of States or Provinces.

A State or Province is made up of a set of Localities.

One or more Small Localities may be associated with each Locality.

A Subscriber Locality is either a Locality or a Small Locality.

One or more Locality Street Addresses may be associated with each Subscriber Locality.

10.1.2 Subscriber Data Model

One or more communication addresses may be associated with each subscriber entry.

A subscriber entry is either a governmental, organizational or residential subscriber.

A (hierarchical) group is made up of a set of one or more Subscriber Entries.

10.1.3 Association between Subscriber Data and Geographic Data

One or more Subscriber Entries may be associated with each Subscriber Locality.

10.1.4 Geographic Data

The geographic structure used to support the White Pages service is based on a formal subdivision of the country using geographic locality names commonly known to enquirers; this will generally be based on postal or political boundaries.

Geographic Locality   A named geographic area.

Each level of the geographic hierarchy is a particular type of Geographic Locality. Each instance is normally identified by its LocalityName, which needs to be unique within the larger geographic locality to which it belongs.

Attributes: LocalityName
LocalityNameLanguage
LocalityCode
LocalityNameType
NoSubscriberInformation
LocalityDescription

A Geographic Locality may be one of the following five types.

Country   As defined by ISO 3166-1. A Country is identified by its LocalityCode.

Essential Attribute: LocalityCode

StateOrProvince   The first level of division of a Country; this will be the States, Counties, or Provinces or equivalent units into which a country is subdivided. It may also be used to identify major metropolitan areas.

Essential Attribute: LocalityName

Additional Attributes: LocalityNameLanguage
LocalityCode
NoSubscriberInformation
LocalityDescription

Locality	The Geographic Locality level to which subscribers are assigned; this will correspond to the cities, major towns, or other areas into which each StateOrProvince (or Country, if StateOrProvince is absent) is subdivided.

Essential Attributes : LocalityName
NoSubscriberInformation

Additional Attributes: LocalityNameLanguage
LocalityCode
LocalityNDC
LocalityDescription

NOTE – The actual relationship between National Destination Codes and Localities is somewhat complex, due in part to National Destination Codes being related to exchanges, which cover areas which do not align precisely to the Localities. For the purpose of supporting the required service, then the simplification of National Destination Code as an attribute of Locality will suffice.

SmallLocality	A locally identified district or region of a larger town or city, or rural district. Within the data of some Service Providers, this simply acts as an alias in that it is used to identify the associated Locality to which subscribers are assigned. Where Service Providers are able to assign Subscriber entries to this level of detail then it will enable more refined searching.

Essential Attributes: LocalityName
NoSubscriberInformation

Additional Attributes: LocalityNameLanguage
LocalityCode
LocalityNDC
LocalityDescription

LocalityStreetAddress	A named street within either a Locality or a Small Locality.

Essential Attributes: LocalityName

Additional Attributes: LocalityNameLanguage
LocalityCode
LocalityDescription

10.1.5   Subscriber data

The White Pages Service is supported by the following subscriber data.

SubscriberEntry	Directory entry for a subscriber.

Essential Attributes: SubscriberName
HierarchyBelow
HierarchyLevel

Additional Attributes: HouseIdentifier
StreetAddress

<div align="center">

StreetAddressLanguage
Zip/PostCode
Profession
Language
SubscriberDescription
LinkedEntries

</div>

The directory entry for a subscriber may be one of the following three types.

ResidentialSubscriber   Directory entry for a residential subscriber.

        Essential Attributes: SecondFamilyName
                                     GivenName

Organizational Subscriber   Directory entry for an Organization.

        Additional Attributes: BusinessCategory

Governmental Subscriber   Directory entry for local or regional governmental organization/authority.

        Additional Attributes: BusinessCategory

CommsAddress   Details of communications device and address. The Device Address may be an essential or additional attribute depending upon the type of address.

        Essential Attributes: DeviceAddress
                                     DeviceAddressType

        Additional Attributes: DeviceService
                                     DeviceAddress
                                     DeviceAddressType
                                     DeviceValidity
                                     DeviceCoverage
                                     DeviceTariffClass
                                     DeviceRestriction
                                     DeviceQualifier

10.2   Search parameters

The following search parameters are defined here and used in 10.4, 10.5 and 10.6.

RequestedService   Identifies the type of service requested from the Service Provider. The value of this parameter may be used in the context of access control and charging. The range of values for RequestedService may be extended and is not limited to those given.

        OperatorService A type of service that is appropriate to an International Directory Enquiry operator.

        PublicService   A type of service that is appropriate to a general user.

PerformExactly   Where there is an indication in the request that the matching rules in the request shall be performed exactly, the Service Provider shall return an error if any requested matching rule is not supported. Otherwise, the Service Provider is permitted to apply any matching rule, defined in 9.2, and return an indication that the matching rules in the request have not been performed as requested.

EntryLimit   The limit on the number of entries to be returned in the response (see 9.6).

EntryCount   The number of entries matched by the request or a number together with an indication that the number of entries matched exceeds this number.

HierarchySelection   The number of levels to be returned in the response may be specified as zero (only entries matched by the request), one (entries immediately below those entries matched by the request), all (entries matched by the request and all entries below those entries) or top (the top level entry corresponding to the matched entry).

GeographicalArea   Integer value 1 or greater, which specifies the degree of extension, as determined by the Service Provider.

IncludeAllAreas   Specifies if the geographical area to be searched includes all areas (degrees of extension), corresponding to 0 (no extension) to GeographicalArea, or if only the extension specified by GeographicalArea is to be searched.

TargetObject   The primary object that contains the information to which the search request applies.

10.3   Predicates

The following predicates are defined here and used in the tables in 10.5 and 10.6.

P1   The parameter shall be present in the response if the parameter was selected, in the request, and a value is present in the directory. The presence of parameter values in the response may also be subject to restrictions independent of the Service Provider, for example, to meet legal or regulatory requirements.

P2   The parameter shall be present in the response if the parameter was selected, in the request, and a value is present in the directory. The presence of parameter values in the response may also be subject to restrictions imposed by the Service Provider, for example, restricting access according to RequestedService.

P3   One or both of SubscriberName and SecondFamilyName shall be present (either in the request or in the response).

P4   HierarchyLevel and EntryIdentifier shall be present in entries in the response if HierarchyBelow indicates that the entry is part of a Hierarchical Group.

P5   An indication is returned when PerformExactly was not present in the request and the matching rules in the request have not been performed as requested.

P6   Toll Free is the only permitted request parameter value.

10.4 Common query conditions

The following conditions apply to the searches specified in 10.5 and 10.6.

In 10.5 the search parameters that are required to support the minimum service are identified, in the tables, as essential.

The search parameters that may be provided, in order to support higher levels of service, are identified as additional.

The response to a search request is a set of entries of type TargetObject, or one or more messages (defined in Annex A) or both.

A message is identified by a code and may include one or more accompanying parameters. An accompanying parameter may be a SearchName (described in 10.5 and 10.6) identifying the search requested (or performed), an ObjectIdentifier for a matching rule (described in 9.2), a TargetObject type (described in 10.5 and 10.6), an AttributeType (described in 10.1) or a Service Parameter (described in 10.2).

Where Subscriber attributes are specified as request parameters, then it is assumed that attributes in the search request and response are associated with the appropriate Subscriber type.

Where information in the request is not appropriate, for example, providing a GivenName for an OrganizationalSubscriber, the information should be ignored by the Service Provider.

A request parameter of each type should only appear, at most, once in a request.

The matching rules specified in the tables in 10.5 and 10.6 must be supported by the Service Provider.

Any of the matching rules may be supported by the Service Provider for any Search Parameter. Matching rules are not appropriate for the PerformExactly, EntryLimit, EntryIdentifier and HierarchySelection parameters and the Service Provider need only support a test for equality for these parameters.

A string matching rule shall be specified for each request parameter and a word matching rule shall be specified for each word in each request parameter.

The character matching rule may be requested for the following parameters: StateOrProvince LocalityName, Locality LocalityName, SmallLocality LocalityName, SubscriberName, SecondFamilyName, GivenName, StreetAddress and HouseIdentifier. The default character matching rule for these attributes is CharacterMap (CR1). For other parameters the CharacterExact (CR2) always applies.

Where a Geographic Locality type is specified as a request parameter or a response parameter then the value required for the StateOrProvince, Locality, SmallLocality or LocalityStreetAddress is the LocalityName or LocalityCode and the value required for Country is the LocalityCode.

Any of the attributes listed in 10.1, including the Geographic Locality types, may be selected in the request for return in the response (subject to predicate P1 or P2).

An AttributeWeight may be specified for any optional request parameter.

The interpretation of the request parameter Locality or SmallLocality (as either a Locality or a SmallLocality) will depend on the Service Provider. Where a Service Provider has assigned Subscribers to a Locality and the request parameter values match a SmallLocality, then the Service Provider shall return Subscribers for the Locality that contains the SmallLocality.

Where Geographical Data or Subscriber StreetAddress values are returned in more than one language, then a language indicator will be used to signify the language of each value.

The following common request and response parameters apply to all searches (see Table 6):

Table 6/F.510 – Common Parameters

Search parameters	Request parameters	Response parameters
Essential		
RequestedService	M	–
TargetObject	M	–
EntryCount	X	M
Additional		
PerformExactly	O	P5
EntryLimit	O	X

10.5   Basic service offering

The searches in this subclause define the minimum service that must be supported. Table 7 specifies the SearchName that may be used to identify a search.

Table 7/F.510 – SearchNames for basic service

SearchName	Defined in subclause
Search for state or province	10.5.1
Search for locality	10.5.2
Search for subscribers within locality	10.5.3
Search for subscribers by entry identifier	10.5.4

10.5.1   Search for state or province

The system shall provide users with a list of StateOrProvince names for a country according to the search specification in Table 8. The TargetObject for the search is StateOrProvince.

Table 8/F.510 – Search for state or province

Search parameters	Request parameters	Response parameters	Word matching	String matching
Essential				
Country	M	M	MR1	MR4
StateOrProvince	O	M	MR1, MR2	MR9
Additional				
LocalityDescription	X	P2	–	–

10.5.2 Search for locality

The system shall provide users with a list of localities for a specified country according to the search specification in Table 9. The TargetObject for the search is Locality or Small Locality.

The values of StateOrProvince and Locality or SmallLocality provided in the response may be used (in a subsequent request), without change, to identify exactly an unambiguous locality (within the country).

Table 9/F.510 – Search for locality

Search parameters	Request parameters	Response parameters	Word matching	String matching
Essential				
Country	M	M	MR1	MR4
StateOrProvince	O	M	MR1, MR2	MR9
Locality or SmallLocality	M	M	MR1, MR2	MR9
NoSubscriberInformation	X	M	–	–
Additional				
LocalityNDC	X	P2	–	–
LocalityDescription	X	P2	–	–

10.5.3 Search for subscribers within locality

The system shall provide users with a list of subscribers for a specified locality according to the search specification in Table 10. The TargetObject for the search is Subscriber Entry.

If the combination of Locality or Small Locality name and StateOrProvince name (if provided) does not identify an unambiguous locality (within the country) the response is defined by *Search for locality* using only the request parameters for Country, StateOrProvince and Locality or Small Locality.

Table 10/F.510 – Search for subscribers within locality

Search parameters	Request parameters	Response parameters	Word matching	String matching
Essential				
Country	M	M	MR1	MR4
StateOrProvince	O	M	MR1, MR2	MR9
Locality or SmallLocality	M	M	MR1, MR2	MR9
SubscriberName	P3	P1	MR1, MR2	MR9
SecondFamilyName	P3	P1	MR1, MR2	MR9
SubscriberType	O	P1	MR1	MR4
GivenName	O	P1	MR1, MR2	MR9
DeviceAddress	X	P1	–	–
DeviceAddressType	O	P1	MR1	MR4
HierarchySelection	M	–	–	–
HierarchyBelow	X	P4	–	–
Group Level	X	P4	MR1	MR4
EntryIdentifier	X	P4	–	–
Additional				
StreetAddress	O	P2	MR1, MR2	MR9
HouseIdentifier	O	P2	MR1, MR2	MR9
BusinessCategory	O	P2	MR1, MR2	MR9
Profession	X	P2	–	–
ZipOrPostCode	X	P2	–	–
Language	X	P2	–	–
SubscriberDescription	X	P2	–	–
DeviceService	O	P2	MR1	MR4
DeviceAddress	X	P2	–	–
DeviceAddressType	O	P2	MR1	MR4
DeviceValidity	X	P2	–	–
DeviceCoverage	X	P2	–	–
DeviceTariffClass	P6	P2	MR1	MR4
DeviceRestriction	X	P2	–	–
DeviceQualifier	X	P2	–	–
LinkedEntries	X	P2		
GeographicalArea	O	–	–	–
IncludeAllAreas	O	–	–	–

10.5.4 Search for subscribers by entry identifier

The system shall provide users with a list of subscribers determined by the EntryIdentifier and HierarchySelection parameters according to the search specification in Table 11. The TargetObject for the search is Subscriber Entry.

The EntryIdentifier may be taken from the EntryIdentifer or a LinkedEntries value for a Subscriber obtained from a previous search.

Table 11/F.510 – Search for subscriber group entries

Search parameters	Request parameters	Response parameters	Word matching	String matching
Essential				
Country	X	M	–	–
StateOrProvince	X	M	–	–
Locality or SmallLocality	X	M	–	–
SubscriberName	X	P1	–	–
SecondFamilyName	X	P1	–	–
SubscriberType	X	P1	–	–
GivenName	X	P1	–	–
DeviceAddress	X	P1	–	–
DeviceAddressType	X	P1	–	–
HierarchySelection	M	–	–	–
HierarchyBelow	X	P4	–	–
HierarchyLevel	X	M	–	–
EntryIdentifier	M	P4	MR1	MR4
Additional				
StreetAddress	X	P2	–	–
HouseIdentifier	X	P2	–	–
BusinessCategory	X	P2	–	–
Profession	X	P2	–	–
ZipOrPostCode	X	P2	–	–
Language	X	P2	–	–
SubscriberDescription	X	P2	–	–
DeviceService	X	P2	–	–
DeviceAddress	X	P2	–	–
DeviceAddressType	X	P2	–	–
DeviceValidity	X	P2	–	–
DeviceCoverage	X	P2	–	–
DeviceTariffClass	X	P2	–	–
DeviceRestriction	X	P2	–	–
DeviceQualifier	X	P2	–	–
LinkedEntries	X	P2		
GeographicalArea	X	–	–	–
IncludeAllAreas	X	–	–	–

10.6   Enhanced service offering

Over and above the facilities provided by the basic definition, this enhanced definition allows each Service Provider to optionally offer any number of the following features.

Where a search service is supported, the table defines the minimum service that must be supported.

Table 12 specifies the SearchNames that may be used to identify a search.

Table 12/F.510 – SearchNames for enhanced service

SearchName	Defined in subclause
Search for subscribers within state or province	10.6.1
Search for subscribers within country	10.6.2
Search for street address	10.6.3
Search for subscribers by street address	10.6.4
Search for subscribers by communications address	10.6.5

10.6.1   Search for subscribers within state or province

The system shall provide users with a list of subscribers for a specified state or province according to the search specification in Table 13. The TargetObject for the search is Subscriber Entry.

If the StateOrProvince name does not identify an unambiguous locality (within the country), the response is defined by *Search for StateOrProvince* using only the request parameters for Country and StateOrProvince.

Table 13/F.510 – Search for subscribers within state or province

Search parameters	Request parameters	Response parameters	Word matching	String matching
Country	M	M	MR1	MR4
StateOrProvince	M	M	MR1, MR2	MR9
Locality or SmallLocality	X	M	–	–
SubscriberName	P3	P1	MR1, MR2	MR9
SecondFamilyName	P3	P1	MR1, MR2	MR9
SubscriberType	O	P1	MR1	MR4
GivenName	O	P1	MR1, MR2	MR9
BusinessCategory	O	P2	MR1, MR2	MR9
Profession	X	P2	–	–
StreetAddress	O	P2	MR1, MR2	MR9
HouseIdentifier	O	P2	MR1, MR2	MR9
ZipOrPostCode	X	P2	–	–
Language	X	P2	–	–
SubscriberDescription	X	P2	–	–
DeviceService	O	P2	MR1	MR4
DeviceAddress	X	P2	–	–
DeviceAddressType	O	P2	MR1	MR4
DeviceValidity	X	P2	–	–
DeviceCoverage	X	P2	–	–
DeviceTariffClass	P6	P2	MR1	MR4
DeviceRestriction	X	P2	–	–
DeviceQualifier	X	P2	–	–
LinkedEntries	X	P2		
GeographicalArea	O	–	–	–
IncludeAllAreas	O	–	–	–
HierarchySelection	M	–	–	–
HierarchyBelow	X	P4	–	–
HierarchyLevel	X	P4	MR1	MR4
EntryIdentifier	X	P4	–	–

10.6.2 Search for subscribers within country

The system shall provide users with a list of subscribers without specifying the geographical area for a specified country according to the search specification in Table 14. The TargetObject for the search is Subscriber Entry.

Table 14/F.510 – Search for subscribers within country

Search parameters	Request parameters	Response parameters	Word matching	String matching
Country	M	M	MR1	MR4
StateOrProvince	X	M	–	–
Locality or SmallLocality	X	M	–	–
SubscriberName	P3	P1	MR1, MR2	MR9
SecondFamilyName	P3	P1	MR1, MR2	MR9
SubscriberType	O	P1	MR1	MR4
GivenName	O	P1	MR1, MR2	MR9
BusinessCategory	O	P2	MR1, MR2	MR9
Profession	X	P2	–	–
StreetAddress	O	P2	MR1, MR2	MR9
HouseIdentifier	O	P2	MR1, MR2	MR9
ZipOrPostCode	X	P2	–	–
Language	X	P2	–	–
SubscriberDescription	X	P2	–	–
DeviceService	O	P2	MR1	MR4
DeviceAddress	X	P2	–	–
DeviceAddressType	O	P2	MR1	MR4
DeviceValidity	X	P2	–	–
DeviceCoverage	X	P2	–	–
DeviceTariffClass	P6	P2	MR1	MR4
DeviceRestriction	X	P2	–	–
DeviceQualifier	X	P2	–	–
LinkedEntries	X	P2		
HierarchySelection	M	–	–	–
HierarchyBelow	X	P4	–	–
HierarchyLevel	X	P4	MR1	MR4
EntryIdentifier	X	P4	–	–

10.6.3   Search for street address

The system shall provide users with a list of street addresses, specifying part of a street address according to the search specification in Table 15. The TargetObject for the search is Street Address.

Table 15/F.510 – Search for street address

Search parameters	Request parameters	Response parameters	Word matching	String matching
Country	M	M	MR1	MR4
StateOrProvince	O	M	MR1, MR2	MR9
Locality or SmallLocality	O	M	MR1, MR2	MR9
StreetAddress	M	M	MR1, MR2	MR9
ZipOrPostCode	X	P2	–	–
LocalityDescription	X	P2	–	–

10.6.4 Search for subscribers by street address

The system shall provide users with a list of subscribers for a specified street address according to the search specification in Table 16. The TargetObject for the search is Subscriber Entry.

Table 16/F.510 – Search for subscribers by street address

Search parameters	Request parameters	Response parameters	Word matching	String matching
Country	M	M	MR1	MR4
StateOrProvince	O	M	MR1, MR2	MR9
Locality or SmallLocality	O	M	MR1, MR2	MR9
SubscriberName	O	P1	MR1, MR2	MR9
SecondFamilyName	O	P1	MR1, MR2	MR9
SubscriberType	O	P1	MR1	MR4
GivenName	O	P1	MR1, MR2	MR9
BusinessCategory	O	P2	MR1, MR2	MR9
Profession	X	P2	–	–
StreetAddress	M	P2	MR1, MR2	MR9
HouseIdentifier	O	P2	MR1, MR2	MR9
ZipOrPostCode	X	P2	–	–
Language	X	P2	–	–
SubscriberDescription	X	P2	–	–
DeviceService	O	P2	MR1	MR4
DeviceAddress	X	P2	–	–
DeviceAddressType	O	P2	MR1	MR4
DeviceValidity	X	P2	–	–
DeviceCoverage	X	P2	–	–
DeviceTariffClass	P6	P2	MR1	MR4
DeviceRestriction	X	P2	–	–

Table 16/F.510 – Search for subscribers by street address *(concluded)*

Search parameters	Request parameters	Response parameters	Word matching	String matching
DeviceQualifier	X	P2	–	–
LinkedEntries	X	P2		
GeographicalArea	O	–	–	–
IncludeAllAreas	O	–	–	–
HierarchySelection	M	–	–	–
HierarchyBelow	X	P4	–	–
HierarchyLevel	X	P4	MR1	MR4
EntryIdentifier	X	P4	–	–

10.6.5 Search for subscribers by communications address

The system shall provide users with a list of subscribers for a communications address according to the search specification in Table 17. The TargetObject for the search is Subscriber Entry.

Table 17/F.510 – Search for subscribers by communications address

Search parameters	Request parameters	Response parameters	Word matching	String matching
Country	M	M	MR1	MR4
StateOrProvince	X	M	–	–
Locality or SmallLocality	X	M	–	–
SubscriberName	X	P1	–	–
SecondFamilyName	X	P1	–	–
SubscriberType	X	P1	–	–
GivenName	X	P1	–	–
BusinessCategory	X	P2	–	–
Profession	X	P2	–	–
StreetAddress	X	P2	–	–
HouseIdentifier	X	P2	–	–
ZipOrPostCode	X	P2	–	–
Language	X	P2	–	–
SubscriberDescription	X	P2	–	–
DeviceService	O	P2	MR1	MR4
DeviceAddress	M	P2	MR1	MR4
DeviceAddressType	O	P2	MR1	MR4
DeviceValidity	X	P2	–	–
DeviceCoverage	X	P2	–	–
DeviceTariffClass	X	P2	–	–
DeviceRestriction	X	P2	–	–

Table 17/F.510 – Search for subscribers by communications address *(concluded)*

Search parameters	Request parameters	Response parameters	Word matching	String matching
DeviceQualifier	X	P2	–	–
LinkedEntries	X	P2		
HierarchySelection	M	–	–	–
HierarchyBelow	X	P4	–	–
HierarchyLevel	X	P4	MR1	MR4
EntryIdentifier	X	P4	–	–

11   Directory Service Management Service Profile

11.1   Introduction

The Directory Service Management Service Profile defines representation for directory functions for the purpose of management. The representation takes the form of a structured information set termed a "managed object".

Additionally, the profile will define a number of management procedures which enable the information embodied within managed objects to be utilized by Directory Service Managers and Administrators. There are three types of management procedures.

–   Notifications: A notification procedure signifies that an event has occurred related to the provision of a query service, and the notification is a message broadcast by the Directory Service Provider Administrator of the service to peer service managers.

–   Request: A request procedure allows a Directory Service Provider Administrator to request access to a service offered by another domain. The results of a request are conveyed within a separate notification.

–   List: A list procedure is used by a Directory Service Provider Administrator to view the attributes of services offered by other domains.

All management procedures are effected by the Service Manager function on behalf of the Directory Service Provider Administrator.

11.2   Directory Service Managed Objects

11.2.1   Directory Service Profile Managed Objects

11.2.1.1   Directory Query Service

A Directory Query Service managed object represents a specific directory query service instance and is defined in Table 18.

Table 18/F.510 – Directory Query Service Managed Object

Attribute	Description
Service Descriptor	The Service Descriptor references a service definition. The service definition is that defined in clause 10.
Service Domain	The name of the management domain which is offering the service.
Service Usage Conditions	The identified service usage conditions are (a) Service Availability (b) Maximum number of concurrent sessions. (Note 1).
Service Usage Tariff	The Service Usage Tariff component defines tariff information for the usage of the service.
Service Usage Statistics	The Service Usage Statistics component records information on accesses to the service (Note 2) and records statistics such as failed connections, exceptions to service level agreement.
Service Special Character Mappings	Defines special character mapping pairs (character in the request, character in the directory) that define equality for character match that is supported by the Service Provider e.g. aa, Å and ü, ue. Special means matching that is not simply removal of a diacritical mark.
NOTE 1 – A definition of a user managed object is required if categorization of service usage for a Query Service Agent needs to be defined for different user groups or user types.	
NOTE 2 – Requirements for usage statistics information will be defined by Quality of Service (clause 14).	

11.2.1.2 Directory Query Service Access Point

A Directory Service Access Point managed object represents the access details required to use a specific Directory Service (both query and data Directory Services). The Directory Service Access Point managed object is defined in Table 19.

NOTE – A service is not restricted to one access point.

Table 19/F.510 – Directory Query Service Access Point Managed Object

Attribute	Description
Service Identifier	The name of the service accessible through this access point, comprizing a service domain name and service descriptor.
Service Address	The address at which the service is to be used. (The exact value of this address depends upon the type of network upon which the service is being offered. In the case of OSI/X.500 this service address will be a Presentation Address.)

11.2.2 Directory Service Operational Managed Objects

11.2.2.1 Query Service Administrator

The Service Administrator managed object represents the domain administrator user, who is responsible for management of services offered by the domain. This managed object is defined in Table 20.

Table 20/F.510 – Query Service Administrator Managed Object

Attribute	Description
Service Administrator Common Name	Simply, the name of the administrator.
Service Administrator Contact Details	This is a list of communications addresses, i.e. telephone, fax and e-mail numbers, etc.

11.3 Directory Service Management Procedures

The identified Directory Service Management procedures are described in the Table 21.

Table 21/F.510 – Directory Service Management Procedures

Procedure type	Procedure name	Descriptions
Request	Service Access	This procedure is a request by an administrator user for access to a specified service.
Notification	Creation of Service	Occurrence of creation and current availability of a service from a specific domain. Broadcast to all peer Service Managers.
	Modification of Service	Occurrence of a modification to a service. Broadcast to all Peer Service Managers.
	Deletion of Service	Occurrence of service deletion. Broadcast to all peer service managers.
	Modification of Service Access	Occurrence of a change to service access points for a particular service. Multicast only to those domains which use the access point.
	Grant of Service Access	Positive indication in response to a "request for service access". Message sent only to requester service manager.
	Grant of Service Access Denied	Denial indication in response to a "request for service access". Message sent only to requester service manager.
	Modification to Service Usage	Indication that service usage conditions have been modified.
	Modification to Service Tariff	Indication that service tariffs have been modified.
List	Offered Services	List services offered by a domain.
	Usage Statistics	List usage information for a specified service.
	Usage Conditions	List usage conditions for a specified service.
	Usage Tariffs	List usage tariffs for a specified service.

12 Operational issues

12.1 Fallback and User Support

The operational issues for Fallback and User Support are covered in Recommendation E.104.

12.2 Security

The Service Provider shall be able to authenticate the Query Service Agent when initial connection is established between Query Service Agent and Service Provider.

The actual authentication mechanism is based on ITU-T Rec. X.509 | ISO/IEC 9594-8. Simple Authentication is the minimum level that shall be used and the use of Strong Authentication is preferred.

13 Charging and accounting

The accounting model to be applied for this Recommendation is the one defined in clause 4/D.37.

The elements to be accounted for settlements are based on message codes (with possibly accompanying parameters) and optionally, the number of entries provided in each response and RequestedService. Message codes are defined in Annex A.

The actual message codes (with accompanying parameters) that will be used, and the use of number of entries for accounting, between a Query Service Agent and Service Provider will be defined *bilaterally*.

14 Quality of Service

For further study.

ANNEX A

Messages

F.510 Messages include not only errors detected while performing searches but additional information which characterizes the response to any search.

These messages will usually be used to provide an explanatory meaning to the user. The presentation of the messages to the user is a local matter.

The messages include, when necessary, precise information, such as attribute types, attribute values or other identifiers, that relate to problems detected.

F.510 Messages are categorized according to the following occurences:

– the full service cannot be offered due to technical problems (# 1).

– the whole request cannot be performed as a service has been requested that is not supported (# 2).

– the request cannot be performed as a service parameter has been requested for a given attribute that is not supported (# 3, 4).

– the search within the database has been performed but a problem in identifying the geography has been detected and no entries are returned (# 5).

– the request has been performed but the entry set returned is empty (# 6).

– the request has been performed: the entry set returned is incomplete (# 7) or complete (# 8).

NOTE 1 – F.510 messages will usually be generated by the Service Provider but some of them can also be directly generated by the Query Service Agent depending on the knowledge it has of the Service Provider offerings.

NOTE 2 – A reference is provided to each of the Messages in this Annex but the actual mapping code will be described in associated technical profiles.

1 Unavailable Service Access

By default: The F.510 service is out of order

1.1 System error

1.2 Traffic not supported (country not on-line)

1.3 Database not accessible

1.4 Service out of order

2 Required service not supported by the Service Provider

By default: An enhanced service has been requested that is not supported by the Service Provider

2.1 Search for service <SearchName> is not supported

2.2 Search for service <SearchName> supported but not bilaterally agreed

3 Required functionality not supported by the Service Provider

By default: A function has been requested or attribute parameter used that is not supported by the Service Provider

3.1 Matching rule <ObjectIdentifier> not supported by Service Provider for the whole service

3.2 Matching rule <ObjectIdentifier> not supported by Service Provider for this specific <AttributeType>

3.3 Inappropriate matching rule for <AttributeType>

3.4 Invalid combination of matching rules for <AttributeType>

3.5 Geographical extension feature not supported

3.6 Level of geographical extension not supported

3.7 Search with the specified HierarchySelection value not supported

3.8 Filter on <Attribute Type> for service <SearchName> not supported

3.9 Filter on <Attribute Type, Attribute Value> for service <SearchName> not supported

4 Wrong input information

By default: The search cannot be performed because inufficient or incorrect information has been provided

4.1 Mandatory <AttributeType> are missing for requested service <SearchName>

4.2 Minimum size of truncated word is required for <AttributeType>

4.3 Too many entries selected: more selective information is necessary

4.4 Invalid value for <AttributeType> because of incorrect syntax (e.g. no figures for a number)

4.5 Unrecognized value for <AttributeType> or <CommonParameter> (e.g. HierarchySelection parameter [top,0,1,all], DeviceTariffClass attribute, DeviceService attribute, DeviceAddressType attribute)

4.6 <AttributeType> required by Service Provider to perform the search

5 Undetermined geographic locality

By default: The service is unable to determine the geographic locality

5.1   The geographic locality <AttributeType, AttributeValue> does not exist

5.2   The geographic locality <AttributeType, AttributeValue> is ambiguous

5.3   The combination of geographic localities <AttributeType, AttributeValue>, <AttributeType, AttributeValue>, etc. does not exist

6 No entries returned

By default: The request is performed but no information has been returned

6.1   No subscriber entries are available under geographical area <AttributeType, AttributeValue>

6.2   No subcriber entries have been found for the requested HierarchySelection value

6.3   No subscriber entries have been found but entries exist without <AttributeValue> constraint for <AttributeType>

6.4   No entries have been found but entries exist without <AttributeType> constraint

7 Incomplete returned set of entries

By default: Outcomes are partial when returning a list of subscribers or localities

7.1   Incomplete list of <TargetObject> because administrative size limit exceeded

7.2   Incomplete list of <TargetObject> due to Service Provider congestion

8 Entries returned

By default: Entries have been returned

8.1   Entries <TargetObject> found

ANNEX B

List of symbols

The symbols listed here are defined in clauses 3 and 9 and used in clause 10.

CR1   CharacterMap character matching rule

CR2   CharacterExact character matching rule

MR1   WordExact word matching rule

MR2   WordTruncated word matching rule

MR3   WordPhonetic word matching rule

MR4   StringExact string matching rule

MR5   WordDeletion string matching rule

MR6   WordRestrictedDeletion string matching rule

MR7   WordRotation string matching rule

MR8   WordRotationAndDeletion string matching rule

MR9   ProviderDefined string matching rule

M   Mandatory

O   Optional

X   Omitted

(–)   Not Applicable

Pn   Predicate (number n)

ANNEX C

Service Data Model

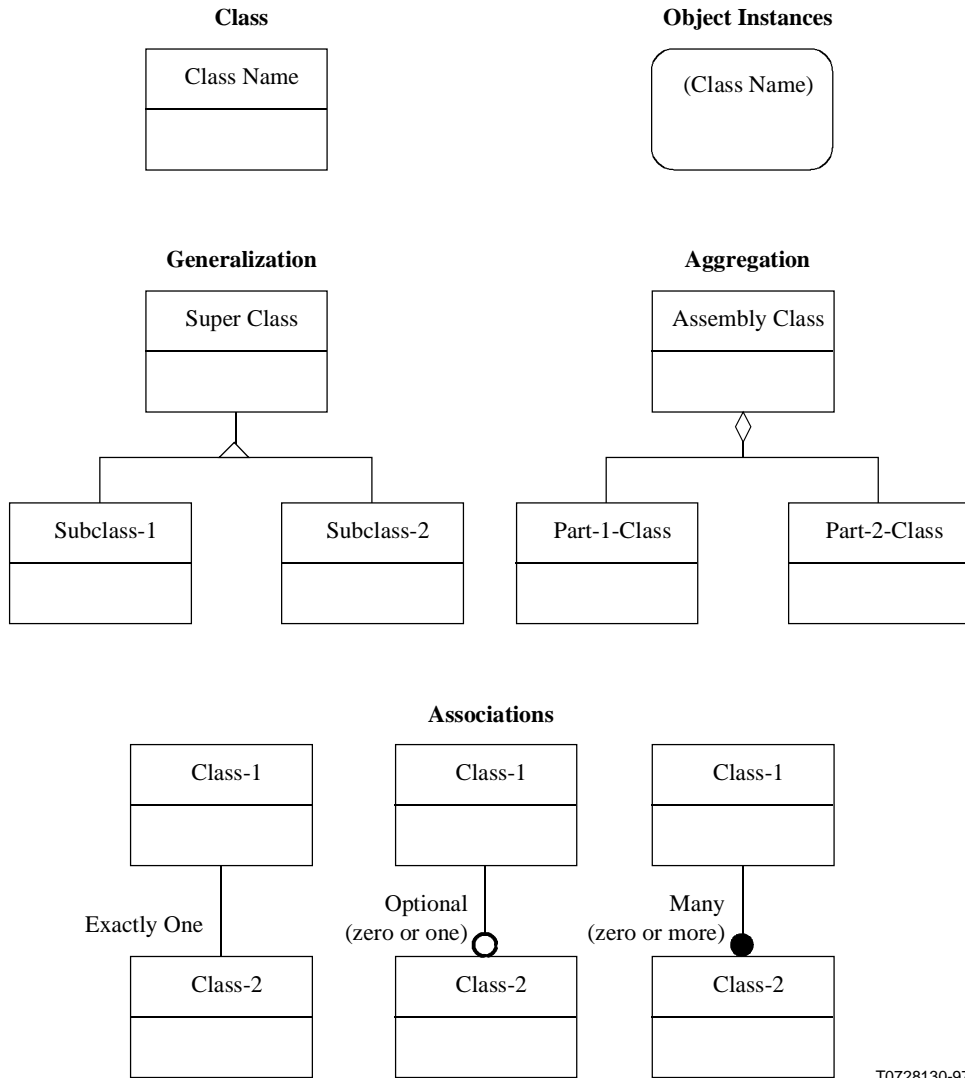The Service Data Model is described in Figure C.1 using the notation described in Annex D.
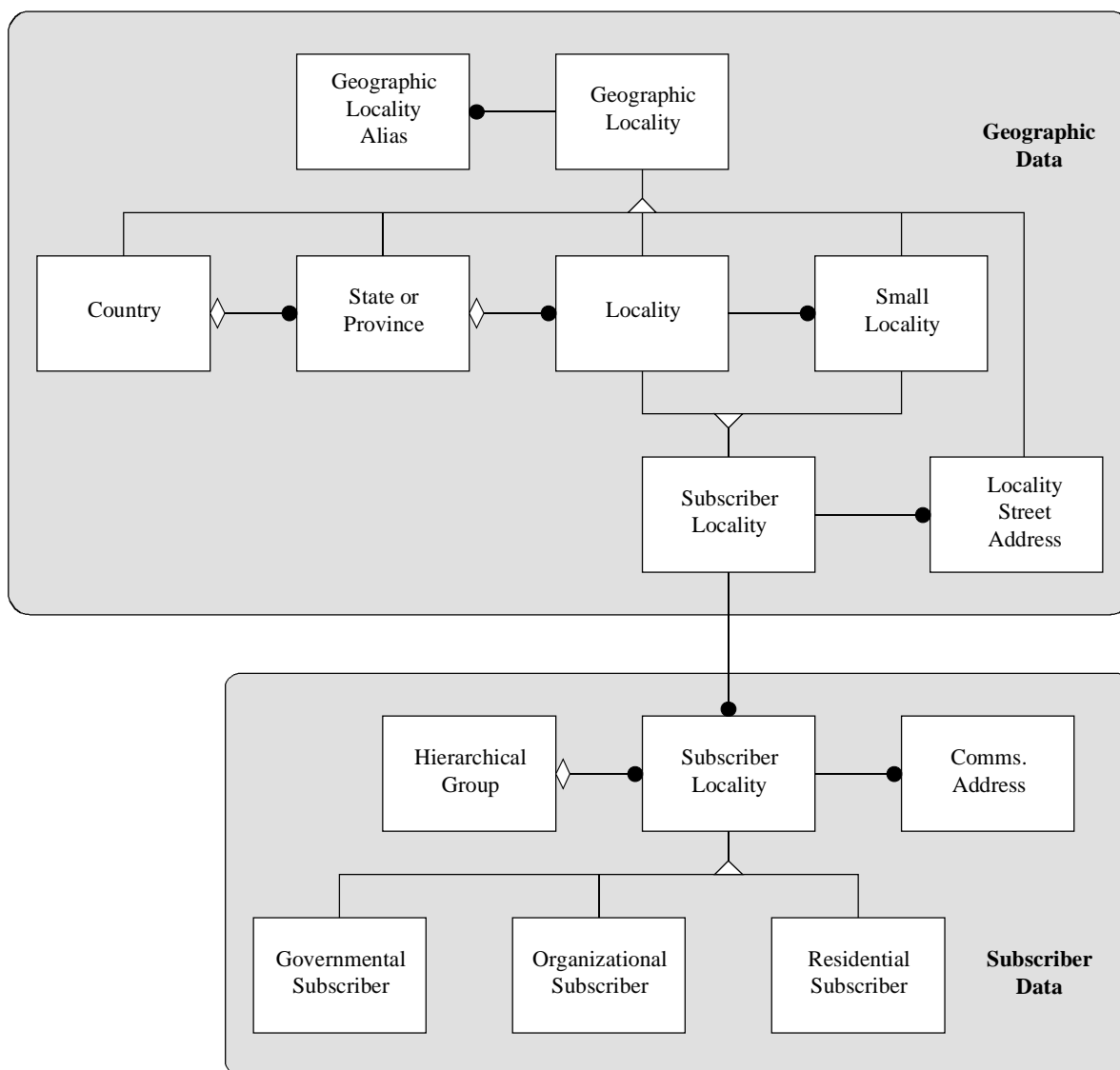
T0728120-97

Figure C.1/F.510 – CLASS DIAGRAM: White Pages Service

ANNEX D

Object Modelling Notation

Figure D.1 illustrates the notation used to describes classes, object (class) instances, relationships between classes and multiplicity of associations between classes.

Figure D.1/F.510 – Object Modelling Notation

ITU-T RECOMMENDATIONS SERIES

Series A   Organization of the work of the ITU-T

Series B   Means of expression: definitions, symbols, classification

Series C   General telecommunication statistics

Series D   General tariff principles

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