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International operation – General provisions concerning Administrations

Computerized directory assistance

ITU-T Recommendation E.115

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ITU-T Recommendation E.115

Computerized directory assistance

Summary

This Recommendation specifies the protocol, called the Directory Assistance protocol, to be used for Directory Assistance information exchange among service providers. This supports assistance/inquiry as part of the international telephone operator service. This Recommendation also gives a description of the principles and procedures to be followed in interconnecting different national computerized directory assistance services.

Source

ITU-T Recommendation E.115 was approved on 6 February 2006 by ITU-T Study Group 17 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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Introduction

A Directory Assistance (DA) service allows the public to acquire primarily telephone number information, but also information about e-mail addresses; worldwide web addresses (URLs); and other addressing information necessary for establishing communication.

Service providers offering a DA service keep subscriber information typically in very efficient and elaborate databases. Service providers need to access each other's databases to provide a global service. This Recommendation specifies the protocol, called the DA protocol, to be used for DA information exchange among service providers.

The DA protocol in this Recommendation is based on the DA protocol in ITU-T Rec. E.115 (02/95) referred to as version 1 (1995). Version 1 (1995) is obsolete, but implementations of version 1 (1995) should be compatible with version 1 (2005) that replaces it.

This Recommendation specifies two versions of the DA protocol:

a) version 1 (2005) covers basic DA functionality using the ASN.1 basic encoding rules (BER) encoding as defined by ITU-T Rec. X.690; and

b) version 2 covers some enhanced functions and concepts and allows for either:

   i) XML encodings obtained using either the ASN.1 XER applied to Annex C or using the XSD in Annex D (the same XML results in both cases); or

   ii) binary encodings obtained using the ASN.1 BER applied to Annex C.

Version 1 (2005) shall be supported. Support of version 2 is optional. However, if version 2 is supported, the XML encoding (see i) of b) above) shall be supported, while support for the ASN.1 BER access is optional (see ii) of b) above and 12.3.2.1).

Annex A, which is an integral part of this Recommendation, specifies the syntax and semantics of DA keywords for version 1 (2005) giving details on how an inquiry shall be processed and giving supplementary information in replies.

Annex B, which is an integral part of this Recommendation, gives the formal ASN.1 specification of version 1 (2005) of the DA protocol.

Annex C, which is an integral part of this Recommendation, gives the formal ASN.1 specification of version 2 of the DA protocol.

Annex D, which is an integral part of this Recommendation, gives the formal XSD specification of version 2 of the DA protocol.

Annex E, which is an integral part of this Recommendation, lists the message codes returned in replies, and it lists the conditions under which they are generated.

Appendix I, which is not an integral part of this Recommendation, gives a short introduction to the NACE code used for referring to business categories.

Appendix II, which is not an integral part of this Recommendation, gives examples of encoding of the Directory Assistance messages using the ASN.1 Basic Encoding Rules.

ITU-T Recommendation E.115

Computerized directory assistance

1 Scope

This Recommendation describes the principles, procedures and protocols to be followed on organizing and operating a computerized international Directory Assistance service.

2 Normative 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; 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

2.1 ITU-T Recommendations

– 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.164 (2005), *The international public telecommunication numbering plan*.

– ITU-T Recommendation T.50 (1992), *International Reference Alphabet (IRA) (formerly International Alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange*.

– ITU-T Recommendation X.680 (2002), *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.

– ITU-T Recommendation X.690 (2002), *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*.

– ITU-T Recommendation X.693 (2001), *Information technology – ASN.1 encoding rules: XML Encoding Rules (XER), plus Amendment 1 (2003), XER encoding instructions and EXTENDED-XER*.

2.2 ISO/IEC Standards

– ISO 3166 (all parts), *Codes for the representation of names of countries and their subdivisions*.

– ISO/IEC 8859-1:1998, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No.1*.

– ISO/IEC 10646: 2003, *Information technology – Universal multiple-octet coded character set (UCS)*.

2.3 Other references

– IETF RFC 791 (1981), *Internet Protocol*.

– IETF RFC 793 (1981), *Transmission Control Protocol – DARPA Internet program – Protocol specification*.

– IETF RFC 822 (1982), *Standard for the format of ARPA Internet text messages*.

– IETF RFC 1321 (1992), *The MD5 Message-Digest Algorithm*.

– IETF RFC 1738 (1994), *Uniform Resource Locators (URL)*.

– W3C XML 1.0:2004, *Extensible Markup Language (XML) 1.0 (Third Edition), W3C Recommendation, Copyright © [4 February 2004] World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de Recherche en Informatique et en Automatique, Keio University), http://www.w3.org/TR/2004/REC-xml-20040204*.

– W3C XSD Part 0: Primer:2004, *XML Schema Part 0: Primer (Second Edition), W3C Recommendation, Copyright © [28 October 2004] World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de Recherche en Informatique et en Automatique, Keio University), http://www.w3.org/TR/2004/REC-xmlschema-0-20041028*.

– W3C XSD Part 1: Structures:2004, *XML Schema Part 1: Structures (Second Edition) W3C Recommendation, Copyright © [28 October 2004] World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de Recherche en Informatique et en Automatique, Keio University), http://www.w3.org/TR/2004/REC-xmlschema-0-20041028*.

– W3C XSD Part 2: Data Types:2004, *XML Schema Part 2: Data Types (Second Edition) W3C Recommendation, Copyright © [28 October 2004] World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de Recherche en Informatique et en Automatique, Keio University), http://www.w3.org/TR/2004/REC-xmlschema-0-20041028*.

3 Definitions

This Recommendation defines the following terms:

3.1 bilateral agreement: Certain protocol elements and keywords shall not be sent to and/or from a replying system unless there is a prior bilateral agreement between the two parties (version 1 (2005) only).

3.2 communications address: An address through which a resource is accessible, e.g., a telephone number, an e-mail address, a URL, etc.

3.3 consumer: The ultimate initiator of an inquiry and the ultimate destination of the reply. A Directory Assistance operator is a consumer.

3.4 descriptive keyword: An item that further qualifies a field within a reply (version 1 (2005) only).

3.5 functional keyword: An item that further qualifies an inquiry (version 1 (2005) only).

3.6 inquiring system: The component of a Directory Assistance system that issues inquiry messages to a replying system.

3.7 inquiry (message): The message as formatted by an inquiring system and sent to a replying system.

3.8 listing: The information about a subscriber as stored in the database of a service provider.

NOTE – Other directory specifications use the term *entry*.

3.9 reply (message): The message as formatted by a replying system and sent to the inquiring system as the reply to an inquiry.

3.10 replying system: The component of a Directory Assistance system that receives inquiry messages from an inquiring system and replies to such inquiries.

3.11 requested service: An indication of the service to be provided based on the user type, e.g., operator or public user.

3.12 selection: The part of a listing that is returned to an inquiring system as the result of an enquiry.

3.13 service provider: An organization that has access to a database with subscriber information and makes that information available on request.

3.14 socket: An endpoint of a two-way communication link between two programs running on the network. A socket is bound to a port number to allow the TCP layer to identify the application for an incoming message.

3.15 transaction: An inquiry and its corresponding reply.

3.16 transit: Routing of an inquiry through one DA system to another DA system and routing the reply back on the same route.

3.17 vendor: An organization that sells the inquiring and/or replying system software.

4 Abbreviations

This Recommendation uses the following abbreviations:

AISS	Additional Information for a Selective Search
ASN.1	Abstract Syntax Notation One
BER	ASN.1 Basic Encoding Rules
DA	Directory Assistance
FTP	File Transfer Protocol
GSM	Global System for Mobile communications
HTTP	HyperText Transfer Protocol
IETF	Internet Engineering Task Force
IP	Internet Protocol
IRA	International Reference Alphabet
ISDN	Integrated Services Digital Network
MD5	Message Digest 5
MMS	Multimedia Messaging Service
PBX	Private Branch Exchange
PSTN	Public Switched Telephone Network
RC4	Ron's Code 4
RFC	Request For Comment
SMS	Short Message Service

TCP Transmission Control Protocol

UCS Universal Multiple-Octet Coded Character Set

UMTS Universal Mobile Telecommunications System

UTF-8 UCS Transformation Format 8

XER XML Encoding Rules of ASN.1

XML eXtensible Markup Language

XSD XML Schema Definition

5 Conventions

The term "shall" is used whenever an absolute requirement is specified. The term "shall not" is used to specify that something is absolutely forbidden. The term "should" is used whenever something is recommended. The term "should not" is used whenever something is discouraged. The term "may" is used to specify that something is optional.

When protocol fields are referenced in normal text, they are differentiated from normal text by presenting them in the bold Helvetica, 9-point typeface.

An optional field or a field with a default is considered not present if the field is not included at all. For version 1 (2005) only, a field is also considered not present if it has zero length.

6 Basic concepts and models

6.1 Functional model

6.1.1 Introduction

Figure 1 shows the relationship among the different components constituting a Directory Assistance system.

The left part of the figure reflects the external behaviour of a Directory Assistance system in the form of a set of protocol specifications forming a layered structure. Adherence to these protocols ensures interoperability among systems developed by different vendors at different times. This Recommendation does not specify the structure of the Directory System application or dictate any particular database technology, only the external behaviour of the system.

The layers below the socket interface (see 6.1.5) are typically part of the operating system and provide a service to the actual Directory Assistance layers through the socket interface.

Four different phases of communications can be identified:

a) Transmission Control Protocol (TCP) connection establishment phase;

b) an application connection establishment phase with authentication and negotiation of functionalities;

c) data transfer phase with optional data encryption; and

d) TCP connection release phase.

The following subclauses introduce the components relevant to this Recommendation.

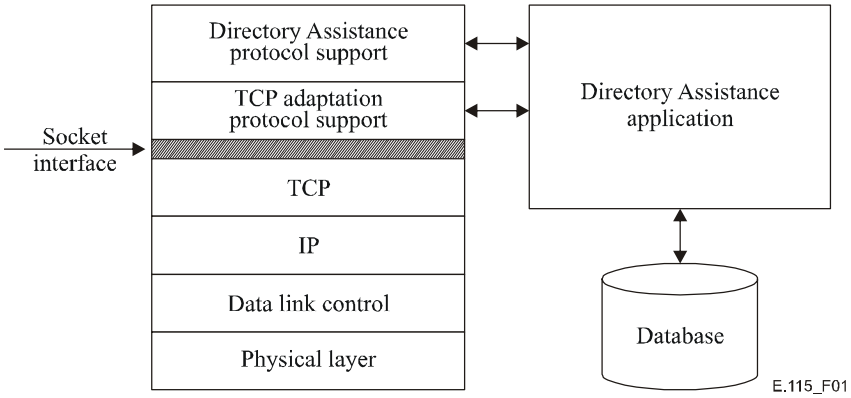


Figure 1/E.115 – Functional model for Directory Assistance

6.1.2 Directory Assistance application

The Directory Assistance application is responsible for the Directory Assistance by interfacing to and driving the Directory Assistance and TCP adaptation protocols, including interfacing to the TCP through the socket interface.

The Directory Assistance application performs the actual processing of the information transmitted over the protocol and interfaces to the directory information database as required. Although operation of this application is not subject to standardization, there are some minimum requirements on the services provided as specified by clauses 7 and 8.

6.1.3 Directory Assistance protocol

The Directory Assistance (DA) protocol is the protocol carrying the actual information processed by the Directory Assistance application.

This Recommendation specifies two versions of this protocol.

– Version 1 (2005) reflects corrections of the protocol specified by ITU-T Rec. E.115 (02/05) with some approved enhancements. The details of version 1 (2005) are specified in clause 10 and the formal specification is given in Annex B using the ASN.1 notation.

– Version 2 provides some enhancements over version 1 (2005). The details of version 2 are specified in clause 11 and the formal specification is given in Annex C using the ASN.1 notation and in Annex D using the XML Schema Definition (XSD) notation.

NOTE – The set of XML documents produced by applying the ASN.1 XER to Annex C is the same as the set of XML documents defined by the XSD in Annex D. The same semantics can also be carried by applying ASN.1 BER to Annex C.

Common protocol specifications are given in clause 9.

6.1.4 TCP adaptation protocol

The Transmission Control Protocol/Internet Protocol (TCP/IP) suite is used for interconnecting DA systems. These protocols are used widely and support is integrated within most operating systems (Windows, UNIX, etc.). Use of this well-established protocol suite provides a stable environment for Directory Assistance interworking. It allows communication over the Internet and private networks (VPNs, frame relay, leased lines, LANs, etc.).

The TCP adaptation protocol bridges the gap between the DA protocol and the service provided by TCP through the socket interface. It provides the following services to the DA protocol:

– performs authentication of peer systems;

– negotiates the type of service requested;

– negotiates the protocol version and transfer encoding used; and

– optionally performs encryption of inquiries and replies to allow communication over unsafe networks.

The details of this protocol are specified by clause 12.

6.1.5 Socket interface

A TCP socket interface is a conceptual programming interface to the services provided by the TCP layer. It is identified by a combination of an Internet Protocol (IP) address as defined by RFC 791 and a Transmission Control Protocol (TCP) port as defined by RFC 793. A TCP adaptation protocol process can communicate with a similar process in another system using this conceptual interface. Establishing an association between the corresponding sockets forms a connection between the two TCP adaptation protocol processes.

RFC 793 defines a conceptual socket interface with some pseudo-calls for establishing (OPEN) and terminating (CLOSE) connections, and for sending (SEND) and receiving (RECEIVE) messages.

NOTE – The UNIX operating system defines a real programming socket interface and, likewise, several vendors for non-UNIX operating systems supply some kind of programming socket interface.

6.1.6 Transmission Control Protocol (TCP)

TCP is a connection-oriented protocol; that is, before actual data exchange can take place a formal connection has to be established.

TCP is a reliable end-to-end transport protocol ensuring sequencing and integrity of exchanged messages with respect to incidental problems, such as transmission errors, loss of messages, out of sequence messages, etc. However, it may not ensure protection against wilful and malicious tampering with messages.

While the Internet Protocol (IP), as described in 6.1.7, allows routing between systems, the TCP provides for routing within the receiving system by use of a so-called port number that identifies the application to handle the incoming message.

6.1.7 Internet Protocol (IP)

The Internet Protocol (IP) is an end-to-end routing protocol that routes messages from end to end based on so-called IP-addresses. It can route messages over a tandem of physical networks, for example, LAN → frame relay → LAN.

6.2 Service models

For the sake of specifying the communications between two DA systems, the service models shown in Figures 2, 3 and 4 are used for modelling the external behaviour of the systems.

NOTE 1 – This does not imply that systems have to be configured in the ways shown, just that they show the same external behaviour.

Figure 2 shows the symmetric model where two service providers, possibly located in different countries, maintain subscriber databases and have access to each other databases. The ultimate user of Directory Assistance information is called the *consumer*. Consumers can be telephone operators, public users, programs, etc. A consumer at DA system A can access information in DA system B, and vice versa.

The figure shows that such systems, at least conceptually, have an inquiring system and a replying system, and that they shall not use the same connection for issuing inquiries and for replying to inquiries. That means that they shall have separate sockets for sending and receiving inquiries. A replying system may use the same IP port number for answering inquiries from several or all of its communications partners.

NOTE 2 – This does not prevent a replying system from having several IP port numbers for receiving inquiries, for either providing back up, for load-sharing systems or for separating communications partners.

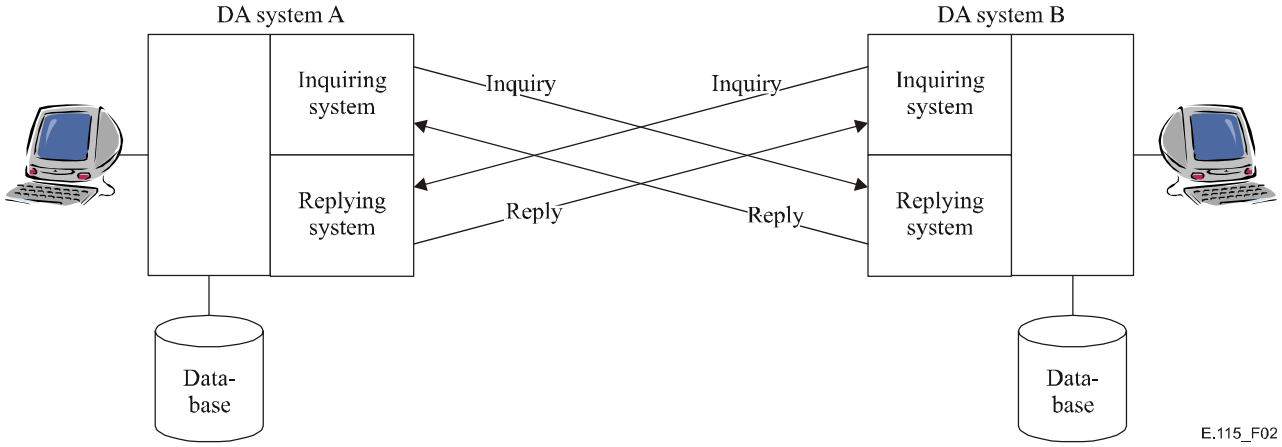


Figure 2/E.115 – Symmetric service model for Directory Assistance

Some DA systems do not maintain a subscriber database and are solely providing a DA service by accessing databases of other DA service providers, as illustrated in Figure 3.

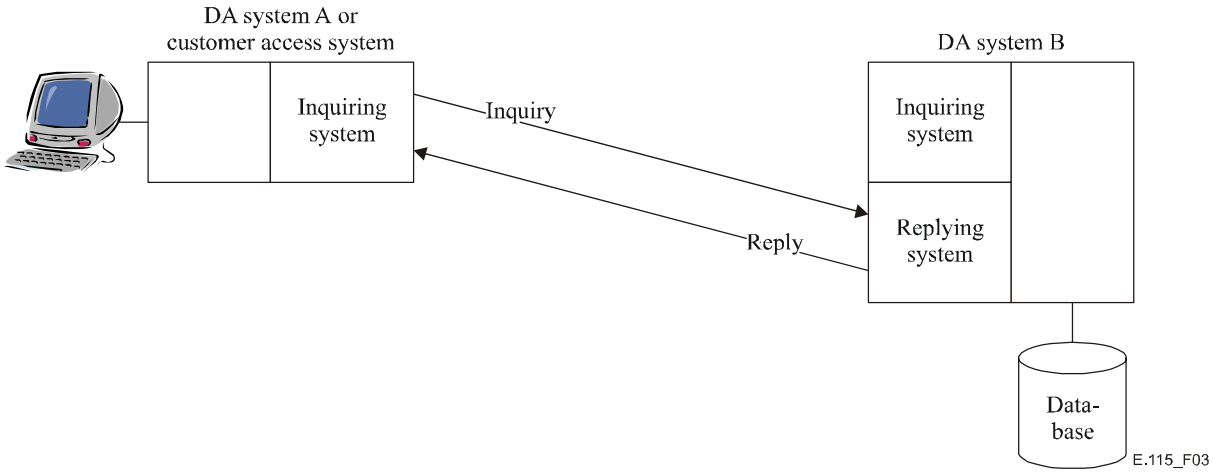


Figure 3/E.115 – Asymmetric service model for Directory Assistance

Organizations and institutions may also establish communication with a DA system using the protocols specified by this Recommendation. Figure 3 also illustrates that scenario.

Figure 4 illustrates the case where one DA system acts as a transit system between the DA system originating an inquiry and the DA system generating the original reply. The transit system may or may not have a database of its own allowing it to reply to some inquiries directly. The originating inquiring system indicates in the inquiry that it is intended to be forwarded to a particular DA system different from the one to which it is directly connected (see 11.2.3.4 and 11.2.3.5).

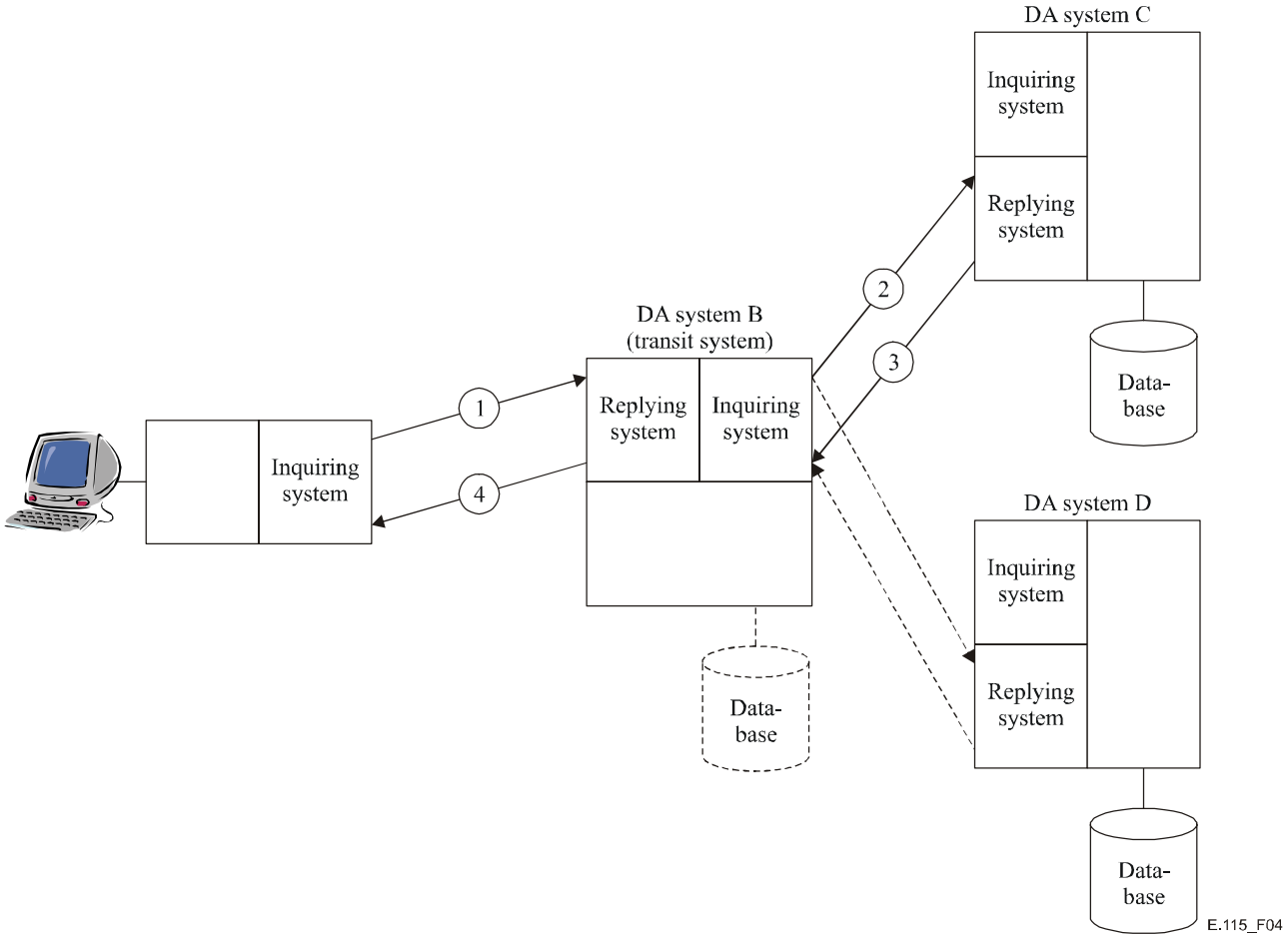


Figure 4/E.115 – Transit traffic

A DA system that can act as a transit system may have a special TCP port for inquiries to be processed directly by the system itself, and it may provide a port for each other system to which it can route inquiries (using **internationalIndicators** for version 1 (2005) or **countryName** and **providerCode** for version 2).

When a transit system receives inquiries over a connection using encryption, it should also use a connection to the destination DA system that specifies encryption.

7 Principles for the organization of an interconnected computerized international information service

For the organization of an interconnected computerized international information service, DA systems should abide by the following principles:

a) An inquiry should be formulated in such a way that the search is targeted to retrieve mostly relevant selections.

b) To overcome language difficulties, an inquiry to a replying system holding the database to be consulted shall be formulated in the language used in the country of the replying system. This means that language problems raised by certain inquiry and reply features should be resolved at the point the inquiry is made.

   Language problems, which may arise between operators, may be surmounted by using the conversion capability of computers.

c) An inquiry should give rise to only one reply message with no additional dialogue between computers. The inquiring system shall supply all the information necessary for performing the search. The reply may include several selections. The maximum number of selections returned in a reply message depends both on the limitations imposed by internal systems of service providers and on the maximum capacity of the reply. The procedure for subdividing a returned list is given in 9.4.

d) With regard to the management of messages, there is no relationship between the inquiry and the reply; where for any reason the reply to a particular question has not been obtained, the inquiry has to be reiterated by the inquiring DA system and on its own initiative.

e) Special numbers for other services such as telefax may also appear in the reply message. The order of presentation for all numbers should remain as contained in the original database to preserve the subscriber's preference for the order of usage.

8 Service specification

When operator access is given via the DA system of one service provider into the DA system of another service provider, minimum standards shall apply to the inquiry and reply process, to permit maximum flexibility in the national information service and compatibility with the international information service.

8.1 Inquiry information

8.1.1 The consumer shall request information using the details supplied by the caller, according to the format given in 10.2 for version 1 (2005) and in 11.2 for version 2.

8.1.2 At least one optional search field acting as a filter item shall be set.

8.1.3 The replying system shall reply to every inquiry. If the replying system indicates that the inquiry information supplied is insufficient, the inquiry should be repeated with more selective information.

8.2 Reply information

8.2.1 The replying system should give the information as available in the database by returning information according to the format given in 10.3 for version 1 (2005) and in 11.3 for version 2.

The computer should supply the operator not only with the country code, national destination code and subscriber number, but also with all the elements of identification required in the reply form, as shown in the database, so that, on the basis of this information, the operator can check that the reply corresponds to the inquiry for information.

8.2.2 If the list of selections in the reply is incomplete, it should be possible to obtain the next sequence of selections (see 9.4).

8.2.3 Certain specified conditions, i.e., the number is not available (secret number, no listing, etc.) or further information has to be obtained, shall be indicated by a standardized coded reply.

8.3 Conversion

The different parts of the inquiry formulated by the operator of the inquiring DA system should be converted by the inquiring system into the international standard format. The different parts of the reply transmitted in the international standard format should be converted by the inquiring system into its appropriate format.

8.4 Version 2 extensibility

Protocol version 2 and follow-on versions have a two-level version identification structure – a major version number that is only increased in case of major additions to the protocol, followed by a release identifier, which can be expressed using the figures 0 to 9 or lower case letters from a to z. The letter 'a' is considered one level higher than '9', 'b' is one level higher than 'a', etc. This release indicator is incremented one level for each new addition (which can include several new fields and/or values). When the major indicator is incremented, the release level is set back to '0'. The initial level is 2.0 (written as 20 in the protocol).

A major addition that requires a version change is an addition that makes backward compatibility impossible, e.g., introduction of new mandatory fields.

For negotiation of protocol level, see 12.3.2.1.

8.5 Functionality

8.5.1 General

The outcome of a search operation depends on the combination of the fields included in the inquiry.

This Recommendation defines five types of selection lists:

a) **subscriberList**;

b) **localityList**;

c) **businessCategoryList**;

d) **streetList**; and

e) **provinceList** (version 2 only).

It is version dependent how the replying system determines what type of list to return.

8.5.2 Version 1 (2005)

The default is that a subscriber search is to be performed. The replying system shall consider all entered fields.

A locality search shall be performed under the following conditions:

– An inquiring system indicates to the replying system that a locality search is to be performed by entering information in the **locality** field and in combination with **countyStateOrProvince**, leaving all the other inquiry fields empty and optionally using the #NEI keyword.

– When an inquiring system indicates to the replying system that a subscriber search is to be performed, but **locality**, possibly in combination with **countyStateOrProvince**, does not specify a single locality, and the #MLS keyword is not present, a **localityList** shall be returned.

If either case above is true, only the following fields shall be taken into account (when entered):

– **locality**;

– **countyStateOrProvince**; and

– **sequenceNumber** (if paging is relevant).

Table 1 describes the possible cases, and what the result would be, under the above conditions. Many keywords make exceptions to the behaviour described in this table (see comments below).

Table 1/E.115 – Functionality dependency on input fields

Locality	County, state or province name	Subscriber	Result
Not present	Not present	Not present	Message code indicating that the request cannot be honoured (corresponding message code 43)
Not present	Not present	Present	Search performed in whole country or message code indicating "not supported" (corresponding message code 41)
Not present	Present	Not present	Message code indicating that the request cannot be honoured (corresponding message code 43)
Not present	Present	Present	Search performed in whole province or message code indicating "not supported" (42)
Present	Not present	Not present	Locality list or error
Present	Not present	Present	Locality list, subscriber list or error
Present	Present	Not present	Locality list or error
Present	Present	Present	Locality list, subscriber list or error

The presence of the keywords #REV, #ADR, #MLS, #MSS, #PRO and #BUS in the inquiry changes the behaviour described above. Other types of lists may be returned instead of locality lists. For more information see Annex A.

8.5.3 Version 2

8.5.3.1 Relevant filter items

The fields within inquiry data (see 11.2.4) may be relevant as filter items as dependent on the type of search.

The way the search is performed is dependent on the values in the **requestedReplyType** and **acceptedReplyTypes** fields.

The replying system defines which filter items apply to each requested type of list. Examples are:

– **subscriberList**: at least one search filter item (e.g., **subscriberName**);

– **localityList**: **nationalDestinationCode**, **countyStateOrProvince**, **locality**, **postalCode**;

– **streetList**: **streetName**, **countyStateOrProvince**, **locality**;

– **businessCategoryList**: **headingInTheGuide**;

– **provinceList**: **countyStateOrProvince**.

8.5.3.2 Uniqueness of critical filter items

The critical filter items, i.e., filter items giving locality information and/or business category information, may individually be unique or non-unique. A critical filter item is unique in its own right if it alone identifies a state, county or province, a locality, a street or a business category. However, if such filter items are not individually unique, they may together be unique. As an

example, a locality may in itself be non-unique, but may together with county, state or province uniquely identify a particular location.

It is implementation dependent what combination of critical filter items are tried against the database to check for uniqueness.

8.5.3.3 Subscriber search

This subclause applies if the **requestedReplyType** specifies **subscriberList**.

This type of search shall be supported.

The **acceptedReplyTypes** shall be absent or shall have one or more of the following values:

– **localityList**: if no unique locality is found with the search filter then a **localityList** shall be returned.

– **streetList**: if no unique street is found with the search filter and the **streetList** is supported, then a street list shall be returned.

– **provinceList**: if no unique province is found with the search filter and the **provinceList** is supported, then a province list shall be returned.

– **businessCategoryList**: if no unique business category is found with the search filter and the **businessCategoryList** is supported, then a business category list shall be returned.

If **acceptedReplyTypes** is absent, either a **subscriberList** or an error message code shall be returned.

8.5.3.4 County, state or province search

This subclause applies if the **requestedReplyType** specifies **provinceList**.

If this type of search is not supported, then message code 45 shall be returned.

If **acceptedReplyTypes** is absent, either a **provinceList** or an error message code shall be returned.

NOTE – The **acceptedReplyTypes** will typically be absent.

8.5.3.5 Locality search

This subclause applies if the **requestedReplyType** specifies **localityList**.

This type of search shall be supported.

The **acceptedReplyTypes** shall be absent or have the following value:

– **provinceList**: if no unique county, state or province is found with the search filter, all locality filters are absent and the **provinceList** is supported, then a **provinceList** should be returned.

If **acceptedReplyTypes** is absent, either a **localityList** or an error message code shall be returned.

8.5.3.6 Street search

This subclause applies if the **requestedReplyType** specifies **streetList**.

If this type of search is not supported, then message code 45 shall be returned.

The **acceptedReplyTypes** shall be absent or have one or more of the following values:

– **localityList**: if no unique locality is found with the search filter, then a **localityList** shall be returned.

– **provinceList**: if no unique county, state or province is found with the search filter, all locality filters are absent and the **provinceList** is supported, then a **provinceList** should be returned.

If **acceptedReplyTypes** is absent, either a **streetList** or an error message code shall be returned.

When a **streetList** is returned, each selection shall have the following fields:

– **streetName**;

– **locality**;

– **countyStateOrProvince** (if necessary for unambiguity); and

– optionally, additional information in the **supplementaryData** field.

8.5.3.7 Business category search

This subclause applies if the **requestedReplyType** specifies **businessCategoryList**.

If this type of search is not supported, then message code 45 shall be returned.

The **acceptedReplyTypes** shall be absent or have one or more of the following values:

– **localityList**: if no unique locality is found with the search filter then a **localityList** should be returned.

– **provinceList**: if no unique province is found with the search filter, all locality filters are absent and the **provinceList** is supported, then a **provinceList** should be returned.

– **streetList**: if no unique street is found with the search filter and the **streetList** is supported, then a **streetList** should be returned.

If **acceptedReplyTypes** is absent, either a **businessCategoryList** or an error message code shall be returned.

9 Common protocol specification elements

9.1 Character sets, encoding and repertoire

9.1.1 General

For international traffic, the character repertoire is generally restricted to a common subset available at all consumer input stations. The minimum character set that shall be employed for inquiries and replies is listed in Table 2.

This minimum character set shall be coded in accordance with ITU-T Rec. T.50 using the IRV allocation.

The characters quotation mark ("), ampersand (&), apostrophe (') less-than sign (<) and greater-than sign (>) cannot be included in XML values.

– the quotation marks shall be replaced by """ or by """

– the ampersand shall be replaced by "&" or by "&"

– the apostrophe shall be replaced by "'" or by "'"

– the less-than-sign shall be replaced by "<" or by "<"

– the greater-than sign shall be replaced by ">" or by ">"

When XML values are received, either value shall be handled for each of the characters quotation mark ("), ampersand (&), apostrophe (') less-than sign (<) and greater-than sign (>). For example if the XML contains ">" and ">" this is converted into two greater-than signs.

NOTE – Some parsers may do the conversion automatically.

Table 2/E.115 – Basic character subset

Graphic symbol	Name	Coded representation
	Space	2/0
!	Exclamation mark	2/1
"	Quotation mark	2/2
#	Number sign	2/3
%	Percent sign	2/5
&	Ampersand	2/6
'	Apostrophe	2/7
(	Left parenthesis	2/8
)	Right parenthesis	2/9
*	Asterisk	2/10
+	Plus sign	2/11
,	Comma	2/12
–	Hyphen, minus sign	2/13
.	Full stop	2/14
/	Solidus	2/15
0	Digit zero	3/0
1	Digit one	3/1
2	Digit two	3/2
3	Digit three	3/3
4	Digit four	3/4
5	Digit five	3/5
6	Digit six	3/6
7	Digit seven	3/7
8	Digit eight	3/8
9	Digit nine	3/9
:	Colon	3/10
;	Semicolon	3/11
<	Less-than sign	3/12
=	Equals sign	3/13
>	Greater-than sign	3/14
?	Question mark	3/15
@	Commercial at (Note)	4/0
A	Latin capital letter A	4/1
B	Latin capital letter B	4/2
C	Latin capital letter C	4/3
D	Latin capital letter D	4/4
E	Latin capital letter E	4/5
F	Latin capital letter F	4/6
G	Latin capital letter G	4/7
H	Latin capital letter H	4/8
I	Latin capital letter I	4/9
J	Latin capital letter J	4/10
K	Latin capital letter K	4/11
L	Latin capital letter L	4/12
M	Latin capital letter M	4/13
N	Latin capital letter N	4/14
O	Latin capital letter O	4/15
P	Latin capital letter P	5/0
Q	Latin capital letter Q	5/1
R	Latin capital letter R	5/2
S	Latin capital letter S	5/3
T	Latin capital letter T	5/4
U	Latin capital letter U	5/5
V	Latin capital letter V	5/6
W	Latin capital letter W	5/7
X	Latin capital letter X	5/8
Y	Latin capital letter Y	5/9
Z	Latin capital letter Z	5/10
_	Low line, underline	5/15
a	Latin small letter a	6/1
b	Latin small letter b	6/2
c	Latin small letter c	6/3
d	Latin small letter d	6/4
e	Latin small letter e	6/5
f	Latin small letter f	6/6
g	Latin small letter g	6/7
h	Latin small letter h	6/8
i	Latin small letter i	6/9
j	Latin small letter j	6/10
k	Latin small letter k	6/11
l	Latin small letter l	6/12
m	Latin small letter m	6/13
n	Latin small letter n	6/14
o	Latin small letter o	6/15
p	Latin small letter p	7/0
q	Latin small letter q	7/1
r	Latin small letter r	7/2
s	Latin small letter s	7/3
t	Latin small letter t	7/4
u	Latin small letter u	7/5
v	Latin small letter v	7/6
w	Latin small letter w	7/7
x	Latin small letter x	7/8
y	Latin small letter y	7/9
z	Latin small letter z	7/10

NOTE – Not part of basic subset for version 1 (2005), but its implementation is recommended. If not implemented, it shall be replaced by (a) when representing **rfc822** (e-mail) addresses.

9.1.2 Protocol version 1 (2005)

Through bilateral agreement, the graphic characters of the extended character set defined by ISO/IEC 8859-1 may be used. The following codes points are relevant:

a) the repertoire as specified by Table 2 (Note); and

b) 10/00 (Hex 00a0) to 15/15 (Hex ff).

NOTE – The repertoire and encoding specified in a) is identical in encoding to the one specified in 9.1.1.

9.1.3 Protocol version 2

Version 2 of the DA protocol requires the use of the UCS Transformation Format 8 (UTF-8) encoding of Universal Multiple-Octet Coded Character Set (UCS) as defined by ISO/IEC 10646.

The part of the BASIC LATIN subset listed in Table 2 shall be implemented, including the @ character. This restricted BASIC LATIN subset is in the protocol represented by the **basic** ASN.1/XML value.

NOTE 1 – The encoding of this subset is identical in repertoire and encoding to the one specified in 9.1.1.

If for some local purposes a more extensive character repertoire is required, additional subsets may be selected as defined by Annex A of ISO/IEC 10646.

The **latin1** ASN.1/XML protocol value is used for selecting the LATIN-1 SUPPLEMENT as an addition to the repertoire defined by **basic**.

NOTE 2 – This character repertoire extends the graphical character repertoire to the one defined by ISO/IEC 8859-1, although the encoding is different.

9.2 Filter concept

When receiving a valid inquiry, the replying system matches relevant fields of the inquiry against similar fields of the listings in the database. The inquiry fields used for matching against listings comprise the *filter*. If the match yields TRUE for a listing, selective information from that listing, referred to as a *selection*, is formed and returned in the reply, possibly together with other similar selections.

Each inquiry field that is part of the filter is called a *filter item*. If a filter item matches a corresponding field of a listing, it is said to yield TRUE. For a filter to yield TRUE, i.e., for the filter to match a listing, all the filter items have to yield TRUE for that listing (the filter items are logical AND'ed).

NOTE – Although a selection is a candidate to be returned, local policies may prevent that selection from being returned.

Matching does not necessarily imply a simple octet-by-octet comparison, but can be more sophisticated as specified by matching rules (see 9.3).

A filter item can hold truncated information to be matched against part of the corresponding listing field.

A filter item may consist of subcomponents that individually have to match corresponding information items of the listings. The combined results may be the logical OR of the matching result of each subcomponent. As an example, see 11.2.4.14.

9.3 Matching and matching rules

A matching rule is a specification for how a particular matching should be performed.

9.3.1 Matching for version 1 (2005)

The following matching rules are defined:

a) phonetic match. This type of matching deploys an implementation-defined phonetic matching algorithm;

b) word rotation match;

c) position-sensitive match (#ALT=2).

Replying systems shall apply their standard matching, if an alternative matching rule is not provided in the #ALT keyword.

9.3.2 Matching for version 2

Matching rules for version 2 are defined in 11.2.4.21.

9.4 Paging

There is a limit on the amount of data to be returned as the result of an inquiry. If that limit is exceeded, it is necessary to split the result up into pieces, called *pages*. The inquiry indicates which page to be returned by the **sequenceNumber** field as specified in 10.2.4.11 for version 1 (2005) and in 11.2.4.10 for version 2.

In version 1 (2005), the length of a page shall be a maximum of 3000 octets, and it shall contain an integral number of selections.

In version 2, a page shall consist of an integral number of selections up to a value as determined by means outside of this Recommendation. This value shall be configurable per inquiring system.

NOTE – It is suggested that this value is set to 30.

A listing shall not exceed 10 pages (sequence numbers 0 to 9).

9.5 Hierarchical groups

Listings may have hierarchical relationship. *Hierarchical groups* form such relationships by forming a logical tree with a root called the *hierarchical top*.

NOTE – Version 1 (2005) of the protocol refers to hierarchical groups as *grouped listings*.

By referring to hierarchical relationships, it is possible in a search operation to retrieve information from listings matching a search enquiry, but also from other listings within the same hierarchical group.

Information from each listing of a hierarchical group is returned as a separate selection.

When the replying system returns selections from a hierarchical group, it shall indicate the level of the corresponding listing within that hierarchical group.

The top level of a hierarchical group has level 0.

The level indication for version 1 (2005) is expressed using the keywords #MAI and #LEV (see 9.6 and Annex A) and in version 2 it is expressed in inquiry and reply fields (see 11.2.4.22 and 11.3.4.24).

9.6 The keyword concept of version 1 (2005)

Version 1 (2005) of the DA protocol has the concept of keywords. The defined keywords are listed in Annex A.

Keywords have no defaults in the sense that if a keyword is not supplied, there is no default functionality implied by its absence.

Version 1 (2005) defines two types of keywords:

– descriptive keywords; and

– functional keywords.

A descriptive keyword consists of three upper case letters that qualifies a reply. A functional keyword consists of the number sign ("#") followed by three upper case letters that qualifies either an inquiry or a reply.

Descriptive keywords are returned in replies to signal the kind of communications address retrieved. Descriptive keywords are returned within the **supplementaryData** field in the reply (see 10.3.5.9).

Descriptive keywords may be used without bilateral agreement.

Functional keywords included in the inquiry provide additional information to tailor the search to get the wanted result. Some functional keywords may have a value assigned using the format:

#XXX=<value>

Functional keywords are supplied in the **additionalInformationForASelectiveSearch** field of the inquiry and/or reply (see 10.2.4.8 and 10.3.5.13) as detailed in Annex A.

A functional keyword shall not be used unless there is a bilateral agreement on its use.

10 Version 1 (2005) of the Directory Assistance protocol specification

10.1 Overview

A DA transaction consists of an inquiry and a reply. The format of the inquiry is shown in Figure 5. The details are given in 10.2. The format of the reply is shown in Figure 6. The details are given in 10.3.

Several transactions may be in progress simultaneously on the same connection between an inquiring system and a replying system. Replies may come back in a different order than the order of the inquiries. The originating terminal code field (see 10.2.3.3) is used for pairing inquires and replies.

10.2 Inquiry format

10.2.1 Structure of the inquiry

The structure of an inquiry is shown in Figure 5. It reflects the information as entered by an operator (or user) and formatted by the inquiring system. The information is used by the replying system to search the database for listings that match the inquiry.

Part 1					Part 2		
Message indicators	International indicators	Originating terminal code	Date and time	Message number	locality	Subscriber name	Street name or equivalent

Part 2 (end)							
House number	Forename	Heading in the guide	Profession code	Additional information for a selective search	County, state or province	Category	Sequence number

Figure 5/E.115 – Inquiry format for version 1 (2005)

The different fields of the inquiry for version 1 (2005) are described in 10.2.3 and 10.2.4.

10.2.2 Inquiry field lengths

Table 3 lists the inquiry field length, in characters, of the different fields. Some fields have a fixed length, while other fields have variable length with a specified maximum length. A compliant implementation shall be able to receive inquiry messages up to the mandatory maximum length. Version 1 (2005) implementations may, by bilateral agreements, send up to the number of characters given in the Bilateral column.

Table 3/E.115 – Inquiry field lengths for version 1

	Field	Mandatory	Bilateral
Part 1	**messageIndicators**	Exactly 4	N/A
	internationalIndicators	Exactly 8	N/A
	originatingTerminalCode	Exactly 8	N/A
	dateAndTime	Exactly 12	N/A
	messageNumber	Exactly 4	N/A
Part 2	**locality**	Max. 70	Max. 256
	subscriberName	Max. 80	Max. 256
	streetName	Max. 70	Max. 256
	houseNumber	Max. 10	Max. 256
	forename	Max. 60	Max. 256
	headingInTheGuide	Max. 30	Max. 256
	professionCode	Max. 30	Max. 256
	additionalInformationForASelectiveSearch	Max. 30	Max. 256
	countyStateOrProvince	Max. 30	Max. 256
	category	Max. 30	Max. 256
	sequenceNumber	Exactly 1	N/A

10.2.3 Part 1 of the inquiry

10.2.3.1 Message indicators

The **messageIndicators** mandatory field signals that the inquiry is a Directory Assistance inquiry. It shall be filled with the four characters: $ C R I.

If the length of the field is not exactly 4 characters, message code 22 shall be returned by the replying system.

NOTE – This field has no significance for the search, so although the inquiring system is required to fill this field exactly as specified, the replying system should not check the content of this field, only the length.

10.2.3.2 International indicators

The **internationalIndicators** mandatory field identifies the country codes of both the replying and inquiring systems. These codes consist of the country code as defined by ITU-T Rec. E.164. It has the following format:

xxxxyyyy

where:

xxxx = country code of replying system (recipient);

yyyy = country code of inquiring system (sender).

The maximum length for a country code is four characters. If less than four characters, the country code shall be right aligned and padded with zeroes.

Example: 00320031 – An inquiry goes from Netherlands to Belgium.

If the length of the field is not exactly 8 characters, message code 22 shall be returned by the replying system.

NOTE – This field is in version 2 replaced by the **countryName** and **providerCode** of the replying system.

10.2.3.3 Originating terminal code

The **originatingTerminalCode** mandatory field holds a value generated by the inquiring system. The replying system shall echo this value in the reply (see 10.3.3.3).

This field may be used by an inquiring system to pair a reply with the corresponding inquiry and thereby route the reply back to the source of the inquiry, e.g., a particular workstation.

If the length of the field is not exactly 8 characters, message code 22 shall be returned by the replying system. Otherwise, the replying system shall not check the content of this field.

10.2.3.4 Date and time

The **dateAndTime** optional field gives the date and time of the origin of the inquiry.

Format: YYMMDDHHMMSS

If this field is present, it shall be echoed unchanged by the replying system back to the inquiring system (see 10.3.3.4).

If the length of the field is not exactly 12 characters, message code 22 shall be returned by the replying system.

NOTE – This field has no significance for the search, so the replying system should not check the content of this field, only the length.

10.2.3.5 Message number

The **messageNumber** optional field holds a message number generated by the inquiring system.

If this field is present, the content shall not be checked by the replying system, but shall be echoed unchanged back to the inquiring system (see 10.3.3.5).

If the length of the field is not exactly 4 characters, message code 22 shall be returned by the replying system.

10.2.4 Part 2 of the inquiry

This part of the inquiry has basic fields as defined in 10.2.4.1-10.2.4.2 and additional fields to improve the search as defined in 10.2.4.3-10.2.4.11.

10.2.4.1 Locality

The **locality** field, when present, shall hold the name of the locality according to its exact spelling.

Abbreviations are not permitted, except for the words "Sint", "Saint", "Sankt", "San", etc., which are abbreviated by the letter "S" followed by a space.

The locality name and county, state or province name (if supported) may be truncated. If this combination, when a search for subscribers is requested, matches more than one locality, a **localityList** shall be returned, unless a multiple location search is performed as specified by the #MLS keyword (see Annex A), in which case a **subscriberList** may be returned.

If the locality information identifies a single locality, the subscriber search shall be performed.

The mandatory minimum number of characters to be input should be fixed by each service provider and be mentioned in an operator's manual. The replying system should check whether this minimum is respected.

When a word is terminated by a full stop this implies that the word is complete, when a word is not terminated by a full stop this implies that the word might be either complete or not complete. When a specification consists of more than one word, the full stop is additional to the separating space. (DEN HAAG would be specified as "DEN.☐HAAG" and not "DEN.HAAG", the ☐ is supposed to represent a space).

The matching to be performed is the following:

– words in the name may be truncated (may even be absent);

– completeness of a word may be indicated by a full stop that follows the word;

– absence of the above-mentioned full stop does not imply that the word is not complete.

To indicate that the number of words in the inquiry is complete, the character "#" may be used, and it shall then be inserted at the end of the field. Absence of the character "#" does not imply that not all words are present. If both the full stop, to indicate that the last word is complete, and the number sign are present, the full stop shall precede the number sign.

If the **countyStateOrProvince** field is present and the **locality** field does not specify a location within that area, then message code 64 shall be returned, with the exception as listed below for the protocol version specific considerations.

This field may instead of a locality name hold a postal code, if the postal code can be used for locating subscribers. The reply shall include the locality name.

If the locality given is not part of the county, state or province given, but is part of another county, state or province, then the replying system may optionally return a **localityList** with this other county, state or province name together with the locality name.

10.2.4.2 Subscriber name

The **subscriberName**, when present, shall hold either the surname or trade name of the subscriber.

The subscriber's surname should be input according to its exact spelling.

Abbreviations should not be allowed. The mandatory minimum number of characters to be input should be fixed by each service provider and be mentioned in the operator's manual.

The replying system should check whether this minimum is respected. When a word is terminated by a full stop this implies that the word is complete, when a word is not terminated by a full stop this implies that the word might be either complete or not complete. When a specification consists of more than one word, the full stop is additional to the separating space.

When the subscriber's surname or trade name is replaced by initials, the characters composing the acronym shall be introduced successively without being separated by special signs or spaces.

NOTE 1 – Special signs are characters of the repertoire defined in 9.1.1 with the exception of the 26 lower case and 26 capital letters (a-z and A-Z) and the figures 0-9.

NOTE 2 – As examples, C&A or C & A shall be transmitted as CA and F.N.C.B. shall be transmitted as FNCB.

It is recommended to add the full stop when the acronym or abbreviation is fully specified (example: NATO.).

Numbers forming part of names or acronyms shall be introduced as numeric characters.

Some countries require the introduction of an additional family name (e.g., second family name, grandfather name, etc.). When relevant, this additional family name shall be entered as follows:

The additional family name shall be included in **subscriberName** field. It shall follow the subscriber name, if any, and it shall be preceded by an equals sign. There shall be no spaces before and after the equals sign. Both the subscriber name and the additional family name are filter items to match against the listings of the database.

NOTE 3 – In Annex A, only the term *second family name* is used.

Support for the additional family name is mandatory.

10.2.4.3 Name of street or equivalent

The **streetName** field, when present, shall hold the name of the street according to its exact spelling.

The words "Sint", "Saint", "Sankt", "San", etc., should be abbreviated by the letter "S" followed by a space. The mandatory minimum number of characters to be input should be fixed by each service provider and be mentioned in the operator's manual. The inquiring system should check whether this minimum is respected. When a word is terminated by a full stop this implies that the word is complete, when a word is not terminated by a full stop this implies that the word might be either complete or not complete. When a specification consists of more than one word, the full stop is additional to the separating space. Numbers forming part of the name of the street shall be introduced as numeric characters.

10.2.4.4 House number

The **houseNumber** field, when present, identifies a house within a street. A possible numerical part of the house number shall precede the possible alphabetical part without separation. Non-significant zeroes shall be omitted.

10.2.4.5 Subscriber's forename

The **forename** field, when present, holds all of the forenames. Initials or a combination of forenames and initials shall always be separated by spaces.

10.2.4.6 Heading in the guide

The **headingInTheGuide** field shall be used for holding the business category when relevant. When this field is present, it acts as a filter item.

The business category describes for a business, institutional or governmental subscriber, the activity domain in which the business, institution or administrative authority is involved.

NACE codes may be used to refer to business categories to surmount language problems (see Appendix I).

It may be a general category, e.g., telecommunications, administrations, or a more specific activity, e.g., telecommunication mobile telephony, railways.

Example:

Hospitals (Heading in the guide)		
Saint Luc		Hierarchical group
Church Street 12	number	
Reception		
Inquiries	number	
Emergencies	number	
Saint Anthony Heaven Lane 2..	number	Single entry
Saint Mary		Hierarchical group
Dead End 69	number	
Reception		
Inquiries	number	
Emergencies	number	

10.2.4.7 Profession code

The **professionCode** field shall not be present for other than residential subscribers and this field shall not be present unless there exists a bilateral agreement on its use.

This field, when present, specifies for a residential subscriber the profession, job, or academic title, and acts as a filter item.

10.2.4.8 Additional information for a selective search

The **additionalInformationForASelectiveSearch** field is used for entering functional keywords (see 9.6). Multiple keywords shall be separated by a single space.

Additional data shall only be introduced if a bilateral agreement exists on its use. Each service provider will have to identify its specific use of this field and describe it in the operator's manual.

10.2.4.9 County, State or Province

The **countyStateOrProvince** field, when present, provides search filter information about a higher-level locality. It shall not be present, unless there exists a bilateral agreement on its use.

The matching to be performed will be the following:

– a word in the name can be truncated (can even be absent);

– completeness of a word can be indicated by a full stop that follows the word;

– absence of the above-mentioned full stop does not imply the word is not complete.

10.2.4.10 Category

The **category** field, when present, supplies information about the subscriber category. When present, it will act as a filter item to narrow the selections to those only of the requested category.

One and only one of the following upper case codes shall be placed in this field: **B** for Business, **R** for Residential and **G** for Government.

10.2.4.11 Sequence number

The **sequenceNumber** field indicates which page of the reply shall be sent (see 9.4). The number 0 (zero) (or if the field is omitted) indicates the first page, the number 1 the second page, etc. This number shall not be greater than 9.

10.3 Reply format

10.3.1 Structure of the reply

The structure of a reply is shown in Figure 6. It reflects the information returned by a replying system. If relevant, this information is assumed to be converted by the inquiring system into a format suitable for the presentation to the consumer.

If the amount of information to be returned is substantial, the replying system shall split selections into pages as specified in 9.4.

Part 1					Part 2			
Message indicators	International indicators	Originating terminal code	Date and time	Message number	Message code	Country code	Message	DB selection count

Part 3							
National destination code	Subscriber number	Locality	Subscriber name	Forename	Street name or equivalent	House number	Supplementary data

Part 3 (end)						
Subscriber message	Heading in the guide	Profession code	Additional information for a selective search	County, state or province	Category	Subscriber description

Figure 6/E.115 – International reply format for version 1 (2005)

The different fields of the reply for version 1 (2005) are described in 10.3.3, 10.3.4 and 10.3.5.

10.3.2 Field lengths of reply

Table 4 lists the different fields with length requirements in characters. For variable-length fields the maximum field length is given. A compliant implementation shall be able to receive inquiry messages up to the mandatory length dependent on the version supported. Version 1 (2005) implementation may by bilateral agreements send up to the number of characters in the Bilateral column.

Table 4/E.115 – Reply field lengths for version 1

	Field	Mandatory	Bilateral
Part 1	messageIndicators	Exactly 4	N/A
	internationalIndicators	Exactly 8	N/A
	originatingTerminalCode	Exactly 8	N/A
	dateAndTime	Exactly 12	N/A
	messageNumber	Exactly 4	N/A
Part 2	messageCode	Exactly 2	N/A
	countryCode	Exactly 4	N/A
	message	Max. 80	Max. 256
	dbSelectionCount	Max. 10	N/A
Part 3	nationalDestinationCode	Max. 13	N/A
	subscriberNumber	Max. 14	N/A
	locality	Max. 70	Max. 256
	subscriberName	Max. 80	Max. 256
	forename	Max. 60	Max. 256
	streetName	Max. 70	Max. 256
	houseNumber	Max. 10	Max. 256
	supplementaryData	Max. 30	Max. 256
	subscriberMessage	Exactly 1	Max. 256
	headingInTheGuide	Max. 30	Max. 256
	professionCode	Max. 30	Max. 256
	additionalInformationForASelectiveSearch	Max. 30	Max. 256
	countyStateOrProvince	Max. 30	Max. 256
	category	Max. 30	Max. 256
	subscriberDescription	N/A	Max. 256

10.3.3 Part 1 of the reply

This part of the reply holds general information not directly related to the individual returned selections (if any).

10.3.3.1 Message indicator

The **messageIndicators** mandatory field signals that the reply is a reply to a Directory Assistance inquiry from one DA system to another DA system. It shall be filled with the four characters: $ C R I.

10.3.3.2 International indicators

The **internationalIndicators** mandatory field identifies both the codes of the country of the replying and inquiring systems. These codes consist of the country code as defined by ITU-T Rec. E.164. It has the following format:

yyyyxxxx;

where:

yyyy = country code of inquiring system (recipient);

xxxx = country code of replying system (sender).

Example: 00310032 – The reply goes from Belgium to the Netherlands.

10.3.3.3 Originating terminal code

The **originatingTerminalCode** mandatory field shall echo the corresponding field of the inquiry (see 10.2.3.3).

10.3.3.4 Date and time

The **dateAndTime** field shall, if the corresponding field is present in the inquiry (see 10.2.3.4), echo the date and time as generated by the inquiring system. Otherwise, this field shall be absent.

10.3.3.5 Message number

The **messageNumber** field shall, if the corresponding field is present in the inquiry (see 10.2.3.5), echo the message number as generated by the inquiring system. Otherwise, this field shall be absent.

10.3.4 Part 2 of the reply

This part of the reply holds additional general information not directly related to the individual returned selections (if any).

10.3.4.1 Message code

The **messageCode** mandatory field signals the outcome of the inquiry. The message codes are defined in Annex E.

NOTE – If the consumer is a human being, it is assumed that the inquiring system will convert the message code to a text message.

10.3.4.2 Country code

The **countryCode** mandatory field shall hold the common ITU-T Rec. 164 country code for the selections within Part 3 of the reply. It shall be placed in the first part of the field and padded with spaces up to four characters.

This value may be superseded for a particular selection with a value supplied by the #CCO keyword (if a bilateral agreement exists).

10.3.4.3 Message

The **message** field should only be used for urgent messages, for example to announce short interruptions that cannot be announced in time in ways normally agreed upon among service providers.

It shall be sent with every reply as long as it is relevant, but not for more than 5 minutes.

It is a free text field. The message shall be in the English language.

The following are examples of urgent messages:

– System will be down from date/time GMT until date/time GMT.

– System will be down from date/time GMT for about 10 minutes.

10.3.4.4 DB selection count

The **dbSelectionCount** optional field provides a figure that indicates the number of selections that have been found by the replying system. If this figure is prefixed by a greater-than sign (>) it indicates that the number of selections exceeds this figure.

This field shall not be included unless there exists a bilateral agreement on its use.

10.3.5 Part 3 of the reply

10.3.5.1 Structure of Part 3

If no selection was found to be returned, then one selection shall be returned echoing information from the corresponding inquiry as detailed for the individual fields.

NOTE – An inquiring system should be tolerant with respect to the presence of such an echo-selection and should rely on the message code and locally retained inquiry information.

If several communications addresses are to be returned for a given subscriber, then a selection shall be returned for each communications address.

10.3.5.2 National destination code

The **nationalDestinationCode** field shall be present when a national destination code exists, a subscriber is found, it is an **e164** type communications address and the subscriber's number may be disclosed. It shall be formatted as defined by ITU-T Rec. E.164.

This field shall be absent if the national destination code does not exist, if it is not an **e164** type communications address or if the communications address is not to be disclosed.

10.3.5.3 Subscriber number

In version 1 (2005), this field is called **subscriberNumber**, while in version 2, it is called **commAddress**.

This field is used for holding a communications address (telephone number, e-mail address, URL, etc.).

This field shall be present when a subscriber is found. Otherwise, it shall be absent.

An ITU-T Rec. E.164 number shall not include a possible national destination code.

If the communications address may be disclosed, it shall be formatted according to the type of communications address.

The type of communications address may be signalled in the **supplementaryData** field (see 10.3.5.9).

If the number is not to be disclosed, this field shall be filled with one or more capital 'X' characters.

10.3.5.4 Locality

The **locality** field holds the location under which the subscriber has been found or a locality to be returned within a **localityList** or a **streetList**.

A postal code may be returned together with the name of the locality as follows:

– If a locality list is returned and the postal code is necessary to make the locality unambiguous, then the postal code shall be placed in front of the locality name separated with a single space.

NOTE – If the postal code is not necessary for making the locality unambiguous, then the postal code may be placed in the **supplementaryData** field.

– If a subscriber list is returned, the postal code, if included, shall be placed in front of the locality name separated by a single space.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **locality** field was present in the inquiry, this field shall echo that field;

– if the **locality** field was not present in the inquiry, this field shall be absent.

When returning a **localityList**, the locality name may optionally be followed by a number sign, but it shall be followed by a number sign if it is needed in a follow-on inquiry to make the locality unambiguous.

A selection taken from the locality list and placed unchanged in the inquiry fields shall never result in a locality list as an answer.

10.3.5.5 Subscriber name

The **subscriberName** holds either the surname or trade name of the subscriber.

If a list other than a **subscriberList** is returned, this field shall be absent.

Some countries require the introduction of an additional family name. When relevant, this additional family name shall be entered as follows:

– The additional family name shall be included in the **subscriberName** field. It shall follow the subscriber name, if any, and it shall be preceded by an equals sign. There shall be no spaces before and after the equals sign.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **subscriberName** field was present in the inquiry, this field shall echo that field;

– if the **subscriberName** field was not present in the inquiry, this field shall be absent.

The support for additional family name is mandatory.

10.3.5.6 Forename

The **forename** field, when present, holds the subscriber's forename.

If a list other than a **subscriberList** is returned, this field shall be absent.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **forename** field was present in the inquiry, this field shall echo that field;

– if the **forename** field was not present in the inquiry, this field shall be absent.

10.3.5.7 Name of street or equivalent

The **streetName** field, when present, holds the name of the street or equivalent.

If a list other than a **subscriberList** or **streetList** is returned, this field shall be absent.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **streetName** field was present in the inquiry, this field shall echo that field;

– if the **streetName** field was not present in the inquiry, this field shall be absent.

10.3.5.8 House number

The **houseNumber** field identifies a house within a street. A possible numerical part of the house number shall precede the possible alphabetical part without separation. Non-significant zeroes shall be omitted.

If a list other than a **subscriberList** is returned, this field shall be absent.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **houseNumber** field was present in the inquiry, this field shall echo that field;

– if the **houseNumber** field was not present in the inquiry, this field shall be absent.

10.3.5.9 Supplementary data

If the **supplementaryData** field is present when returning a **subscriberList**, it holds supplementary information about the subscriber.

If this field is present when returning a **localityList,** it holds supplementary information about the locality.

If this field is present when returning a **businessCategoryList** it holds supplementary information about the business category such as a more general business-area description field to which the business category returned belongs (for information and display only).

When descriptive keywords (see 9.6) are to be returned, they shall be returned within this field: If there are multiple keywords included, they shall be separated by a single space.

Only standardized descriptive keywords are allowed within this field.

As discussed in 10.3.5.4, when returning a **localityList** a postal code may be returned in this field if it is considered to be supplementary information.

10.3.5.10 Subscriber message

The **subscriberMessage** optional field holds a coded message, which should be converted into text by the inquiring system.

The following codes are defined:

0 = no comment;

1 = subscriber changed address;

2 = refer to distant operator;

3 = message in freeform text giving additional information about the subscriber and to be included in this field separated by one space from the code.

10.3.5.11 Heading in the guide

The semantics of the **headingInTheGuide** field is described in 10.2.4.6.

This field shall be used for holding a business category, when relevant, for a subscriber in a **subscriberList** and when returning a **businessCategoryList**.

If a list other than a **subscriberList** or **businessCategoryList** is returned, this field shall be absent.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **headingInTheGuide** field was present in the inquiry, this field shall echo that field;

– if the **headingInTheGuide** field was not present in the inquiry, this field shall be absent.

10.3.5.12 Profession code

The **professionCode** field, when present, specifies for a residential subscriber the profession, job, or academic title.

If a list other than a **subscriberList** is returned, this field shall be absent.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **professionCode** field was present in the inquiry, this field shall echo that field;

– if the **professionCode** field was not present in the inquiry, this field shall be absent.

10.3.5.13 Additional information for a selective search

The **additionalInformationForASelectiveSearch** field holds information as specified by each service provider in the operator's manual.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **additionalInformationForASelectiveSearch** field was present in the inquiry, this field shall echo that field;

– if the **additionalInformationForASelectiveSearch** field was not present in the inquiry, this field shall be absent.

10.3.5.14 County, state or province

The **countyStateOrProvince** optional field holds county, state or province name.

If a **businessCategoryList** is returned, this field shall be absent.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **countyStateOrProvince** field was present in the inquiry, this field shall echo that field;

– if the **countyStateOrProvince** field was not present in the inquiry, this field shall be absent.

10.3.5.15 Category

The **category** optional field may supply information about the subscriber category. If a list other than a **subscriberList** is returned, this field shall be absent.

One and only one of the following upper case codes shall be placed in this field: **B** for Business, **R** for Residential and **G** for Government.

If none of the list types mentioned in 8.5 is eligible for return, then:

– if the **category** field was present in the inquiry, this field shall echo that field;

– if the **category** field was not present in the inquiry, this field shall be absent.

10.3.5.16 Subscriber description

The **subscriberDescription** optional field is used for providing additional information about the subscriber in free text (e.g., "Open 24/24 hours").

This field shall be absent for other than a **subscriberList**.

This field shall be absent unless there exists a bilateral agreement on its use.

11 Version 2 of the Directory Assistance protocol specification

11.1 Overview

A DA transaction consists of an inquiry and a reply. The format of the inquiry is shown in Figure 7. The details are given in 11.2. The format of the reply is shown in Figure 8. The details are given in 11.3.

Several transactions may be in progress simultaneously on the same connection between an inquiring system and a replying system. Replies may come back in a different order than the order of inquiries. The originating terminal code field (see 11.2.3.1) is used for pairing inquires and replies.

11.2 Inquiry format

11.2.1 Structure of the inquiry

The structure of an inquiry for version 2 is shown in Figure 7. It reflects the information as entered by a consumer and formatted by the inquiring system. The information is used by the replying system to search the database for listings that match the inquiry.

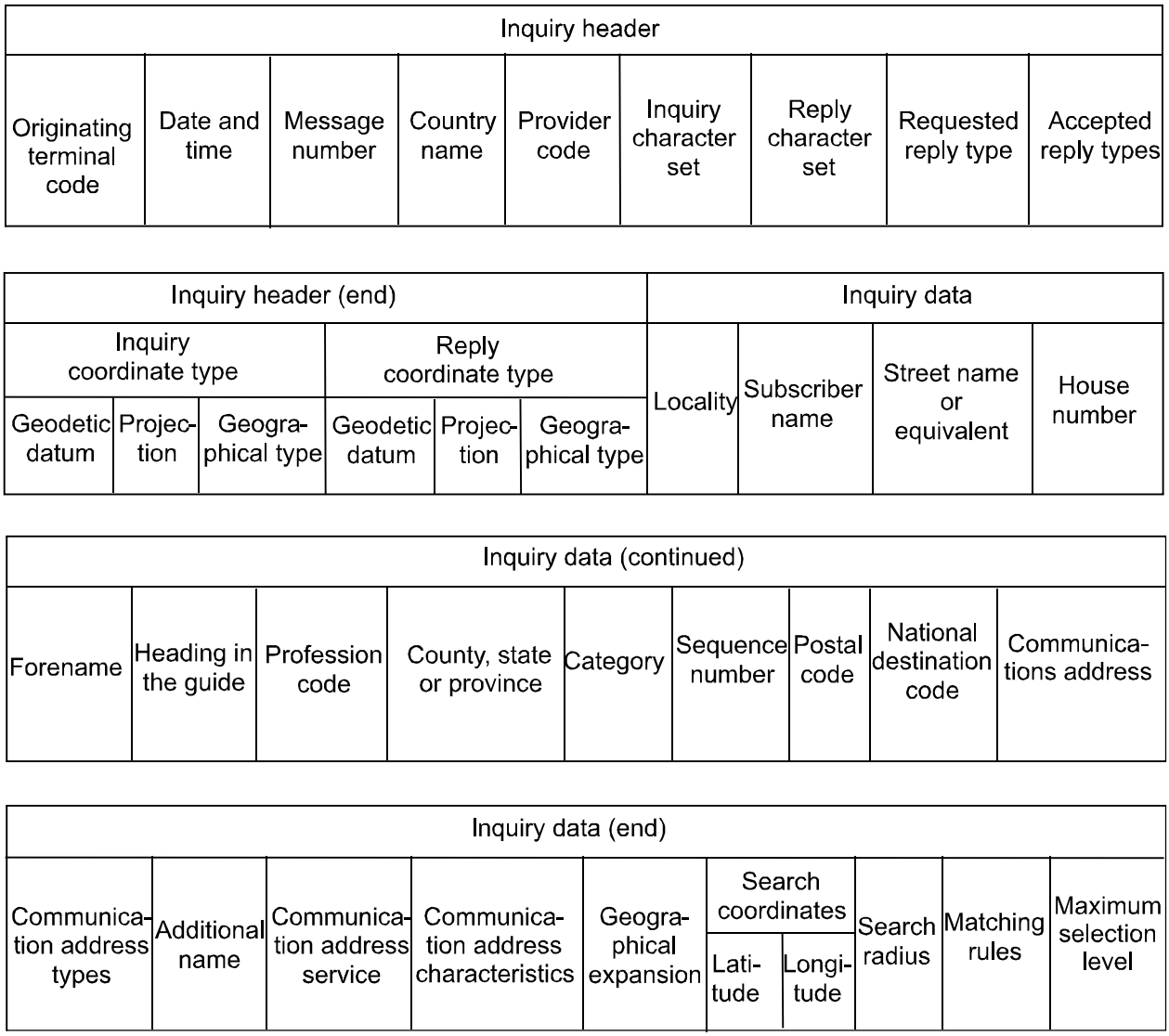


Figure 7/E.115 – Inquiry format for version 2

The different fields of the inquiry for version 2 are described in 11.2.3 and 11.2.4.

11.2.2 Inquiry field lengths

Table 5 lists the inquiry field length, in characters, of the different fields. Some fields have a fixed length, while other fields have variable length with a specified maximum length. A compliant implementation shall be able to receive inquiry messages up to the maximum or fixed length.

NOTE – A character may, in UTF-8 encoding, take more than one octet.

Table 5/E.115 – Inquiry field lengths for version 2

	Field		Length
Inquiry header	**originatingTerminalCode**		Exactly 8
	dateAndTime		Exactly 12
	messageNumber		Exactly 4
	countryName		Exactly 2
	providerCode		Exactly 3
	inquiryCharacterSet		Determined by enumerated values
	replyCharacterSet		Determined by enumerated values
	requestedReplyType		Determined by enumerated values
	acceptedReplyTypes		Determined by included subfields
	inquiryCoordinateType	**geodeticDatum**	Max. 256
		projection	Max. 256
		geographical	Max. 3
	replyCoordinateType	**geodeticDatum**	Max. 256
		projection	Max. 256
		geographical	Max. 3
Inquiry data	**locality**		Max. 256
	subscriberName		Max. 256
	streetName		Max. 256
	houseNumber		Max. 256
	forename		Max. 256
	headingInTheGuide		Max. 256
	professionCode		Max. 256
	countyStateOrProvince		Max. 256
	category		Determined by included subfields
	sequenceNumber		Max. 2
	postalCode		Max. 256
	nationalDestinationCode		Max. 14
	commAddress		Max. 256
	commAddressTypes		Determined by included subfields
	additionalName		Max. 256
	commAddressService		Determined by included subfields
	commAddressChar		Determined by included subfields
	geoExpansion		Max. 3
	searchCoordinate	**latitude**	256
		longitude	256
	searchRadius		Max. 9
	matchingRule		Determined by included subfields
	maxSelectionLevel		Max. 3

11.2.3 Inquiry header

11.2.3.1 Originating terminal code

The **originatingTerminalCode** mandatory field holds a value generated by the inquiring system. The replying system shall echo this value in the reply (see 11.3.3.1).

This field may be used by an inquiring system to pair a reply with the corresponding inquiry and thereby route the reply back to the source of the inquiry, e.g., a particular workstation.

If the length of the field is not exactly 8 characters, message code 22 shall be returned by the replying system. Otherwise, the replying system shall not check the content of this field.

11.2.3.2 Date and time

The **dateAndTime** optional field gives the date and time of the origin of the inquiry.

Format: YYMMDDHHMMSS

If this field is present, it shall be echoed unchanged by the replying system back to the inquiring system (see 11.3.3.2).

If the length of the field is not exactly 12 characters, message code 22 shall be returned by the replying system.

NOTE – This field has no significance for the search, so the replying system should not check the content of this field, only the length.

11.2.3.3 Message number

The **messageNumber** optional field holds a message number generated by the inquiring system.

If this field is present, the content shall not be checked by the replying system, but shall be echoed unchanged back to the inquiring system (see 11.3.3.3).

If the length of the field is not exactly 4 characters, message code 22 shall be returned by the replying system.

11.2.3.4 Country name

The **countryName** field shall always be present. The value shall be the country name of the system intended to process the inquiry and it shall consist of two characters as defined by ISO 3166.

NOTE – ISO 3166 uses the term country code, but ITU-T Rec. E.164 uses the same term for a data type having a different syntax. To avoid confusion, the ISO 3166 country code is here called country name.

This field is used together with the **providerCode** field, if present, to determine the DA system that is intended to process the inquiry. If the identified DA system is different from the recipient DA system, the recipient DA system shall forward the inquiry to the intended DA system if possible.

11.2.3.5 Provider code

The **providerCode** field shall be present if the **countryName** alone is not sufficient to identify a particular DA system.

The value shall be the code for the service provider managing the system intended to process the inquiry and it shall consist of three characters. Creation, maintenance and access to such a list are by means outside of this Recommendation.

11.2.3.6 Inquiry character set

The **inquiryCharacterSet** field indicates what character repertoire of ISO/IEC 10646 is used for the inquiry. It can take one of two values:

a) **basic**, which means that only the basic subset as defined in 9.1.3 is used; or

b) **latin1**, which means that the LATIN-1 SUPPLEMENT repertoire is used in addition to the **basic** repertoire.

If this field is absent, it defaults to **basic**.

11.2.3.7 Reply character set

The **replyCharacterSet** field indicates what character repertoire of ISO/IEC 10646 the inquiring systems wants the replying system to use for the reply. It can take one of two values:

a) **basic**, which means that only the basic subset as defined in 9.1.3 shall be used; or

b) **latin1**, which means that the LATIN-1 SUPPLEMENT repertoire is requested to be used in addition to the **basic** repertoire.

If this field is absent, it defaults to **latin1**.

11.2.3.8 Requested reply type

The **requestedReplyType** optional field indicates what selection list type (reply type) the requester is expecting. If present, one and only one of the following reply types shall be specified:

a) **subscriberList**;

b) **localityList**;

c) **businessCategoryList**;

d) **streetList**; or

e) **provinceList**.

If this field is absent, it defaults to **subscriberList**.

It is a local decision which search filter items apply to each type of list. The typical cases are:

a) **localityList**:

- **nationalDestinationCode**;
- **countyStateOrProvince**;
- **locality**;
- **postalCode**.

b) **streetList**:

- **streetName**.

c) **businessCategoryList**:

- **headingInTheGuide**.

d) **provinceList**:

- **countyStateOrProvince**.

11.2.3.9 Accepted reply types

The **acceptedReplyTypes** optional field has subfields indicating the types of accepted reply types (see below). A subfield, when present, shall always in ASN.1 encoding have the value **TRUE**. When using XML encoding, each subfield is represented by an XML attribute of the **acceptedReplyTypes** empty element, and shall, if present, always have the value **true**.

If an inquiring system indicates a type of list in the **acceptedReplyTypes**, it is to be interpreted that the inquiring system accepts receiving this type of list if the values in the corresponding search filter items would result in more than one selection in this list. If several list types are indicated, it is a local decision as to which type of list to return.

If this field is present, one or more of the following subfields shall be supplied:

a) **localityList**;

b) **businessCategoryList**;

c) **streetList**; and

d) **provinceList**.

If the requested reply type cannot be returned and this field is absent or the replying system does not support the relevant reply type, the replying system shall issue the appropriate message code.

A replying system shall not return a list type not specified in either **requestedReplyType** or **acceptedReplyTypes**.

11.2.3.10 Inquiry coordinate type

The **inquiryCoordinateType** optional field indicates the characteristics of **searchCoordinate** (see 11.2.4.19). When present it shall have the following mandatory subfields:

a) **geodeticDatum** – This subfield specifies the type of coordinate system by which the **searchCoordinate latitude** and **longitude** subfields are expressed. When using XML encoding, this subfield is an XML attribute of the empty **inquiryCoordinateType** element.

b) **projection** – This subfield specifies the technique used to represent the spherical (or ellipsoidal) image in a flat display. When using XML encoding, this subfield is an XML attribute of the empty **inquiryCoordinateType** element.

c) **geographical** – This subfield gives the syntax of the coordinates given for the **searchCoordinate latitude** and **longitude** subfields. When using XML encoding, this subfield is an XML attribute of the empty **inquiryCoordinateType** element. It shall take one of the following values:

   – **dms**, which means that the coordinates are given in the degrees-minutes-seconds format;

   – **dd**, which means that the coordinates are given in degrees and a decimal fraction of a degree; or

   NOTE 1 – **dd** 36.5 would be the same value as **dms** 36:30:00.

   – **dec**, which means that the coordinates are given as a decimal figure.

   NOTE 2 – Notation in **dec** allows any decimal figure, not necessarily related to degrees (e.g., 2920631).

11.2.3.11 Reply coordinate type

The **replyCoordinateType** optional field indicates the requested characteristics of **searchCenter** and **selectionCoordinate** of the reply (see 11.3.3.9 and 11.3.4.23). When present it shall have the following mandatory subfields:

a) **geodeticDatum** – This subfield specifies the type of coordinate system by which the **latitude** and **longitude** subfields of **searchCenter** and **selectionCoordinate** should be expressed. When using XML encoding, this subfield is an XML attribute of the empty **replyCoordinateType** element.

b) **projection** – This subfield specifies the technique that should be used to represent the spherical (or ellipsoidal) image in a flat display in the reply. When using XML encoding, this subfield is an XML attribute of the **replyCoordinateType** empty element.

c) **geographical** – This subfield gives the syntax of the coordinates that should be used for the **searchCoordinate latitude** and **longitude** subfields of **searchCenter** and **selectionCoordinate** in the reply. When using XML encoding, this subfield is an XML attribute of the **replyCoordinateType** empty element. It shall take one of the values specified in 11.2.3.10 c.

11.2.4 Inquiry data

11.2.4.1 Locality

The **locality** field, when present, shall hold the name of the locality according to its exact spelling.

Abbreviations are not permitted, except for the words "Sint", "Saint", "Sankt", "San", etc., which are abbreviated by the letter "S" followed by a space.

The locality name and county, state or province name (if supported) may be truncated. If this combination, when a search for subscribers is requested, matches more than one locality, a **localityList** shall be returned, unless a multiple location search is performed as specified by the #MLS keyword (see Annex A), in which case a **subscriberList** may be returned.

If the locality information identifies a single locality, the subscriber search shall be performed.

The mandatory minimum number of characters to be input should be fixed by each service provider and be mentioned in an operator's manual. The replying system should check whether this minimum is respected.

When a word is terminated by a full stop this implies that the word is complete, when a word is not terminated by a full stop this implies that the word might be either complete or not complete. When a specification consists of more than one word, the full stop is additional to the separating space. (DEN HAAG would be specified as "DEN.☐HAAG" and not "DEN.HAAG", the ☐ is supposed to represent a blank).

The matching to be performed is the following:

– words in the name may be truncated (may even be absent);

– completeness of a word may be indicated by a full stop that follows the word;

– absence of the above-mentioned full stop does not imply that the word is not complete.

To indicate that the number of words in the inquiry is complete, the character "#" may be used, and it shall then be inserted at the end of the field. Absence of the character "#" does not imply that not all words are present. If both the full stop, to indicate that the last word is complete, and the number sign are present, the full stop shall precede the number sign.

If the **countyStateOrProvince** field is present and the **locality** field does not specify a location within that area, then message code 64 shall be returned, with the exception, as listed below, for the protocol version specific considerations.

If the locality given is not part of the county, state or province given, but is part of another county, state or province, and the **acceptedReplyTypes** specifies **localityList,** then the replying system may optionally return a **localityList** with this other county, state or province name together with the locality name.

11.2.4.2 Subscriber name

The **subscriberName**, when present, shall hold either the surname or trade name of the subscriber.

The subscriber's surname should be input according to its exact spelling.

Abbreviations should not be allowed. The mandatory minimum number of characters to be input should be fixed by each service provider and be mentioned in the operator's manual.

The replying system should check whether this minimum is respected. When a word is terminated by a full stop this implies that the word is complete, when a word is not terminated by a full stop

this implies that the word might be either complete or not complete. When a specification consists of more than one word, the full stop is additional to the separating space.

When the subscriber's surname or trade name is replaced by initials, the characters composing the acronym shall be introduced successively without being separated by special signs or spaces.

NOTE 1 – Special signs are characters of the repertoire defined in 9.1.1 with the exception of the 26 lower case and 26 capital letters (a-z and A-Z) and the figures 0-9.

NOTE 2 – As examples, C&A or C & A shall be transmitted as CA and F.N.C.B. shall be transmitted as FNCB.

It is recommended to add the full stop when the acronym or abbreviation is fully specified (example: NATO.).

Numbers forming part of names or acronyms shall be introduced as numeric characters.

11.2.4.3 Name of street or equivalent

The **streetName** field, when present, shall hold the name of the street according to its exact spelling.

The words "Sint", "Saint", "Sankt", "San", etc., should be abbreviated by the letter "S" followed by a space. The mandatory minimum number of characters to be input should be fixed by each service provider and be mentioned in the operator's manual. The inquiring system should check whether this minimum is respected. When a word is terminated by a full stop this implies that the word is complete, when a word is not terminated by a full stop this implies that the word might be either complete or not complete. When a specification consists of more than one word, the full stop is additional to the separating space. Numbers forming part of the name of the street shall be introduced as numeric characters.

11.2.4.4 House number

The **houseNumber** field, when present, identifies a house within a street. A possible numerical part of the house number shall precede the possible alphabetical part without separation. Non-significant zeroes shall be omitted.

11.2.4.5 Subscriber's forename

The **forename** field, when present, holds all of the forenames. Initials or a combination of forenames and initials shall always be separated by spaces.

11.2.4.6 Heading in the guide

The **headingInTheGuide** field shall be used for holding the business category when relevant. When this field is present, it acts as a filter item.

The business category describes for a business, institutional or governmental subscriber, the activity domain in which the business, institution or administrative authority is involved.

NACE codes may be used to refer to business categories to surmount language problems (see Appendix I).

It may be a general category, e.g., telecommunications, administrations, or a more specific activity, e.g., telecommunication mobile telephony, railways.

For an example, see 10.2.4.6.

11.2.4.7 Profession code

The **professionCode** shall not be present for other than residential subscribers.

This field, when present, specifies for a residential subscriber the profession, job, or academic title, and acts as a filter item.

11.2.4.8 County, state or province

The **countyStateOrProvince** field, when present, provides search filter information about a higher-level locality.

The matching to be performed will be the following:

– word in the name can be truncated (may even be absent);

– completeness of a word can be indicated by a full stop that follows the word;

– absence of the above-mentioned full stop does not imply the word is not complete.

11.2.4.9 Category

The **category** field, when present, supplies information about the subscriber category. When present, it will act as a filter item to narrow the selections to be only of the requested category.

This field has subfields indicating the types of subscriber categories (see below). A subfield, shall, when present, have the value **TRUE** in ASN.1 encoding. When using XML encoding, each subfield is represented by an XML attribute of the **category** empty element, and shall, if present, always have the value **true**.

When present, one or more of the following subfields shall be supplied:

a) **business**: When present, only listings of this category shall be considered for selection;

b) **residential**: When present, only listings of this category shall be considered for selection;

c) **government**: When present, only listings of this category shall be considered for selection.

When present, this field shall be treated as a filter item. If several subfields are present, they shall individually be matched against listings and the results shall be logical OR'ed.

Not all replying systems may support all the categories. If only one subfield is included, and this category is not supported, the replying system shall return message code 40 (required service not supported). If several subfields are supplied and the replying system supports some, but not all the specified categories, then it is a local option by the replying system whether to ignore the unsupported categories and apply only the supported ones, or whether to return message code 40.

11.2.4.10 Sequence number

The **sequenceNumber** field indicates which page of the reply shall be sent (see 9.4). The number 0 (zero) (or if the field is omitted) indicates the first page, the number 1 the second page, etc. This number shall not be greater than 9. The sequence number shall be sent as a single numeric character.

NOTE – The **sequenceNumber** field is in the formal ASN.1 and XSD specification defined as having a length of one or two numeric characters to cope with possible future extensions.

11.2.4.11 Postal code

The **postalCode** field, when present, acts as a filter item to narrow the search.

11.2.4.12 National destination code

The **nationalDestinationCode** optional field acts as a filter item to narrow the search.

If present, it shall hold the telephone national destination code as defined by ITU-T Rec. E.164.

11.2.4.13 Communications address

The **commAddress** field shall be present if the inquiring system wants to perform a reverse search based on a particular communications address. If it is an ITU-T Rec. E.164 number, it shall be the complete national number, including a possible national destination code, but excluding country code.

NOTE – A reverse search is a search where the communications address is known and the corresponding subscriber identity is searched.

The type of communications address shall be signalled in the **commAddressTypes** field (see 11.2.4.14).

If the search is performed, but no subscriber is found, the message code 92 shall be returned.

In case the replying system does not support reverse searches, either in general or for the specific communications address type, the replying system shall return a message code 43 or 44, depending on whether the replying system does not support the type of search for this particular inquiring system or does not support the type of search at all.

11.2.4.14 Communications address types

The **commAddressTypes** field has subfields indicating the types of communications addresses (see below). A subfield, when present, shall in ASN.1 encoding always have the value **TRUE**. When using XML encoding (using either the Annex C specification with ASN.1/XER, or the Annex D XSD specification), each subfield is represented by an XML attribute of the **commAddressTypes** empty element, and shall, if present, always have the value **true**.

When a communications address is supplied in the **commAddress** field, this field shall in this case be present and hold one and only one subfield indicating the type of communications address (see below) that has been supplied in the **commAddress** field.

When a communications address is not supplied in the **commAddress** field, this field is optional. When present, one or more of the following subfields shall be supplied:

a) **e164**: when present, listings holding an ITU-T Rec. E.164 type communications address shall be considered for selection;

b) **rfc822**: when present, listings holding an RFC 822 type communications address (e-mail address) shall be considered for selection;

c) **rfc1738**: when present, listings holding an RFC 1738 type communications address (URL) shall be considered for selection.

When present, this field shall be treated as a filter item. If several subfields are present, they shall individually be matched against listings and the results shall be logical OR'ed.

11.2.4.15 Additional naming information

Some countries require the introduction of an additional family name (e.g., second family name, grandfather name, etc).

When an additional family name is to be included as a filter item, it shall be supplied in the **additionalName** field (without the equals sign as required for version 1 (2005)).

This field may also be used for other naming information relevant to countries or cultures.

The specific use of this field shall be specified in the operator's manual.

11.2.4.16 Communications address service

The **commAddressService** optional field specifies requirements on the type of service to be accessed through the communications address for returned subscriber selections. This field has subfields indicating types of communications address service (see below). A subfield, when present, shall in ASN.1 encoding always have the value **TRUE**. When using XML encoding, each subfield is represented by an XML attribute of the **commAddressService** empty element, and shall, if present, always have the value **true**.

When present, one or more of the following subfields shall be supplied:

a) **fax**: Only listings holding a communications address that supports fax shall be considered for selection;

b) **pbx**: Only listings holding a communications address of a PBX shall be considered for selection. This subfield shall not be included unless the **commAddressTypes** is **e164**;

c) **txt**: Only listings holding a communications address for a text telephone shall be considered for selection. This subfield shall not be included unless the **commAddressTypes** is **e164**;

d) **pub**: Only listings holding a communications address for a public telephone shall be considered for selection; This subfield shall not be included unless the **commAddressTypes** is **e164**;

e) **vid**: Only listings holding a communications address for a video telephone shall be considered for selection;

f) **pag**: Only listings holding a communications address of a pager shall be considered for selection; This subfield shall not be included unless the **commAddressTypes** is **e164**;

g) **voice**: Only listings holding a communications address that supports voice communication shall be considered for selection;

h) **data**: Only listings holding a communications address that supports data transmission shall be considered for selection;

i) **http**: Only listings holding a communications address that supports HTTP communication shall be considered for selection;

j) **ftp**: Only listings holding a communications address that supports FTP communication shall be considered for selection;

k) **eml**: Only listings holding a communications address that supports e-mail communication shall be considered for selection;

l) **sms**: Only listings holding a communications address that supports SMS communication shall be considered for selection;

m) **mms**: Only listings holding a communications address that supports MMS communication shall be considered for selection;

n) **emg**: Only listings holding a communications address that supports emergency messages shall be considered for selection.

When present, this field shall be treated as a filter item. If several subfields are included, they shall individually be matched against a particular listing and the results shall be logical OR'ed.

11.2.4.17 Communications address characteristics

The **commAddressChar** optional field specifies requirements based on the type of characteristics associated with the communications address for returned subscriber selections. This field has subfields indicating the types of communications address characteristics (see below). A subfield, when present, shall in ASN.1 encoding always have the value **TRUE**. When using XML encoding, each subfield is represented by an XML attribute of the **commAddressChar** empty element, and shall, if present, always have the value **true**.

When present, one or more of the following subfields shall be supplied:

a) **ftn**: Only listings holding an **e164** communications address that has a free tax number shall be considered for selection.

b) **mob**: Only listings holding a communications address for a mobile device shall be considered for selection.

c) **fixed**: Only listings holding a communications address for a fixed device shall be considered for selection.

When present, this field shall be treated as a filter item. If several subfields are included, they shall individually be matched against listings and the results shall be logical OR'ed.

11.2.4.18 Geographical expansion

The **geoExpansion** field, when present, shall hold a numeric character indicating the level of geographical extension. A higher number implies a higher degree of expansion. The actual mapping is determined locally by the replying system.

NOTE – Information about the expansion policy should be described in the operator's manual.

11.2.4.19 Search coordinate

The **searchCoordinate** optional field is used when performing a search in relation to a specific location and then specifies the coordinates of that location. It may specify the coordinates of the centre for a proximity search.

This field, when present, has the following mandatory subfields:

a) **latitude** – This subfield gives the latitude of the location using the syntax specified by the geographical subfield. When using XML encoding, this subfield is an XML attribute of the empty **searchCoordinate** element.

b) **longitude** – This subfield gives the longitude of the location using the syntax specified by the geographical subfield. When using XML encoding, this subfield is an XML attribute of the empty **searchCoordinate** element.

11.2.4.20 Search radius

This **searchRadius** optional field shall not be present unless the **searchCoordinate** field is present. When present, it indicates the radius of a proximity search. It shall be expressed using numeric characters. The mapping of the number to a real distance is service provider dependent and shall be specified in the operator's manual.

11.2.4.21 Matching rules

The **matchingRule** optional field is used by the inquiring system to ask for particular matching behaviour instead of the default matching performed by the replying system.

This field, when present, shall have one or more of the following Boolean subfields:

a) **wordRotation**: If it is **TRUE** in ASN.1 encoding or **true** in XML encoding, it indicates that the words in some filter items of the inquiry may not be supplied in the right order and the replying system should use word rotation matching for relevant filter items. It is a local choice as to which filter items are relevant for word rotation. If it is **FALSE** in ASN.1 encoding or **false** in XML encoding, word rotation shall not be performed on any filter item. If this subfield is absent, it is a local decision by the replying system whether to perform word rotation matching.

b) **phonetic**: If it is **TRUE** in ASN.1 encoding or **true** in XML encoding, it indicates that some filter items of the inquiry may not have the exact spelling, but might be spelled according to their pronunciation and that the replying system should perform phonetic matching for relevant filter items. It is a local choice as to which filter items are relevant for phonetic matching. If it is **FALSE** in ASN.1 encoding or **false** in XML encoding, phonetic matching shall not be performed on any filter item. If this subfield is absent, it is a local decision by the replying system whether to perform phonetic matching.

c) **alias**: Some filter items of an inquiry may have a value that does not match any value within the database of a replying system, but a synonym of that value might match. This may in particular be the case for **businessCategories**, where there may be different synonyms for particular business categories. As an example, coiffeur and hairdresser are synonyms for the same business category. If this subfield is **TRUE** in ASN.1 encoding or **true** in XML encoding, it indicates that the replying systems should apply alias matching, that it, should try to use synonyms for relevant fields. It is a local choice as to which filter items are relevant for alias matching. If it is **FALSE** in ASN.1 encoding or **false** in XML encoding, alias matching shall not be performed on any filter item. If this subfield is absent, it is a local decision by the replying system whether to perform alias matching.

When using XML encoding, these subfields are represented by XML attributes of the **matchingRule** empty element.

11.2.4.22 Maximum selection level

The **maxSelectionLevel** field allows the inquiring system to specify the maximum level of grouped listings to be searched and from which selections are to be returned.

The value is specified as a numeric character, where level **"0"** is the top level.

The default value is **"99"**.

11.3 Reply format

11.3.1 Structure of the reply

The structure of a reply for version 2 is shown in Figure 8. It reflects the information returned by a replying system. If relevant, this information is assumed to be converted by the inquiring system into a format suitable for the presentation for the consumer.

Reply header									
Originating terminal code	Date and time	Message number	Message code	Message	DB Selection count	Reply character set	Reply coordinate type		
							Geodetic datum	Projec-tion	Geogra-phical type

Reply header		Selection 1							
Search center		National destination code	Communica-tions address	locality	Subscriber name	Forename	Street name or equivalent	House number	Supplemen-tary data
Lati-tude	Longi-tude								

Selection 1 (continued)								
Subscriber message	Heading in the guide	Profession code	County, State or Province	Subscriber description	Category	Country code	Postal code	Communication address type

Selection 1 (continued)								
Communication address service	Communication address characteristics	Distance	Additional name	Selection coordinates				
				Lati-tude	Longi tude	Geodetic datum	Projec tion	Geogra-phical type

Selection 1(end)	Selection 2	Selection 3	● ● ●	Selection n
Selection level				

Figure 8/E.115 – International reply format for version 2

If the amount of information to be returned is substantial, the replying system shall split selections into pages as specified in 9.4.

The different fields of the reply for version 2 are described in 11.3.3 and 11.3.4.

11.3.2 Field lengths of reply

Table 6 lists the different fields with length requirements in characters. For variable length fields the maximum field length is given. A compliant implementation shall be able to receive reply messages up to the maximum length.

Table 6/E.115 – Reply field lengths for version 2

	Field		Length
Reply header	**originatingTerminalCode**		Exactly 8
	dateAndTime		Exactly 12
	messageNumber		Exactly 4
	messageCode		Exactly 2
	message		Max. 256
	dbSelectionCount		Max. 10
	replyCharacterSet		Determined by enumerated values
	replyCoordinateType	**geodeticDatum**	Max. 256
		projection	Max. 256
		geographical	Max. 3
	searchCenter	**latitude**	Max. 256
		longitude	Max. 256
Selection	**nationalDestinationCode**		Max. 14
	commAddress		Max. 256
	locality		Max. 256
	subscriberName		Max. 256
	forename		Max. 256
	streetName		Max. 256
	houseNumber		Max. 256
	supplementaryData		Max. 256
	subscriberMessage		Max. 256
	headingInTheGuide		Max. 256
	professionCode		Max. 256
	countyStateOrProvince		Max. 256
	subscriberDescription		Max. 256
	category		Determined by included subfields
	countryCode		Max. 3

Table 6/E.115 – Reply field lengths for version 2

	Field		Length
Selection	**postalCode**		Max. 256
	commAddressType		Determined by enumerated values
	commAddressService		Determined by included subfields
	commAddressChar		Determined by included subfields
	distance		Max. 256
	additionalName		Max. 256
	selectionCoordinate	**latitude**	Max. 256
		longitude	Max. 256
	selectionLevel		Max. 3

11.3.3 Reply header

This part of the reply holds general information not directly related to the individual returned selections (if any).

11.3.3.1 Originating terminal code

The **originatingTerminalCode** mandatory field shall echo the corresponding field of the inquiry (see 11.2.3.1).

11.3.3.2 Date and time

The **dateAndTime** field shall, if the corresponding field is present in the inquiry (see 11.2.3.2), echo the date and time as generated by the inquiring system. Otherwise, this field shall be absent.

11.3.3.3 Message number

The **messageNumber** field shall, if the corresponding field is present in the inquiry (see 11.2.3.3), echo the message number as generated by the inquiring system. Otherwise, this field shall be absent.

11.3.3.4 Message code

The **messageCode** mandatory field signals the outcome of the inquiry. The message codes are defined in Annex E.

NOTE – If the user is a human being, it is assumed that the inquiring system will convert the message code to a text message.

11.3.3.5 Message

The **message** field should only be used for urgent messages, for example to announce short interruptions that cannot be announced in time in ways normally agreed upon among service providers.

It shall be sent with every reply as long as it is relevant, but not for more than 5 minutes.

It is a free text field. The message shall be in the English language.

The following are examples of urgent messages:

– System will be down from date/time GMT until date/time GMT;

– System will be down from date/time GMT for about 10 minutes.

11.3.3.6 DB selection count

The **dbSelectionCount** optional field provides a figure that indicates the number of selections that have been found by the replying system. If this figure is prefixed with a greater-than sign (>) it indicates that the number of selections exceeds this figure.

11.3.3.7 Reply character set

The **replyCharacterSet** field indicates what character repertoire of ISO/IEC 10646 is used for the reply.

If this field is absent, the character repertoire used is the one implicitly or explicitly requested by the inquiring system (see 11.2.3.7). If present, it shall take one of two values:

a) **basic**, which means that only the basic subset as defined in 9.1.3 is used; or

b) **latin1**, which means that the LATIN-1 SUPPLEMENT repertoire is used in addition to the **basic** repertoire. This value shall not be specified unless, the inquiring system requested **latin1** (possibly by default).

11.3.3.8 Reply coordinate type

The **replyCoordinateType** optional field indicates the characteristics of **searchCenter** and **selectionCoordinate** of the reply (see 11.3.3.9 and 11.3.4.23). When present it shall have the following mandatory subfields:

a) **geodeticDatum** – This subfield specifies the type of coordinate system by which the **latitude** and **longitude** subfields of **searchCenter** and **selectionCoordinate** are expressed. When using XML encoding, this subfield is an XML attribute of the empty **replyCoordinateType** element.

b) **projection** – This optional subfield specifies the technique that is used to represent the spherical (or ellipsoidal) image in a flat display. When using XML encoding, this subfield is an XML attribute of the **replyCoordinateType** empty element.

c) **geographical** – This subfield gives the syntax of the coordinates that is used for the **searchCoordinate latitude** and **longitude** subfields of **searchCenter** and **selectionCoordinate**. When using XML encoding, this subfield is an XML attribute of the **replyCoordinateType** empty element. It shall take one of the values specified in 11.2.3.10 c).

11.3.3.9 Search centre

The **searchCenter** field shall be present if a proximity search has been performed. Otherwise, it shall be absent. It gives the coordinates for the centre of the proximity search.

11.3.4 Selections

11.3.4.1 Structure of selections

If no selection was found to be returned, then selections shall be absent.

If several communications addresses are to be returned for a given subscriber, then a selection shall be returned for each communications address.

11.3.4.2 National destination code

The **nationalDestinationCode** field shall be present when a national destination code exists, a subscriber is found, it is an **e164** type communications address, and the subscriber's number may be disclosed. It shall be formatted as defined by ITU-T Rec. E.164.

This field shall be absent if the national destination code does not exist, if it is not an **e164** type communications address, or if the communications address is not to be disclosed.

11.3.4.3 Communications address

The **commAddress** field is used for holding a communications address (telephone number, e-mail address, URL, etc.).

This field shall be present when a subscriber is found. Otherwise, it shall be absent.

An ITU-T Rec. E.164 number shall not include a possible national destination code.

If the communications address may be disclosed, it shall be formatted according to the type of communications address.

The type of communications address shall be signalled in the **commAddressType** field (see 11.3.4.18).

If the number is not to be disclosed, this field shall be filled with seven upper case 'X' characters.

11.3.4.4 Locality

The **locality** field holds the location under which the subscriber has been found or a locality to be returned within a **localityList** or a **streetList**.

A postal code shall not be supplied in this field as for version 1 (2005), but may be supplied in the **postalCode** field (see 11.3.4.17).

When returning a **localityList**, the locality name may optionally be followed by a number sign, but it shall be followed by a number sign if it is needed in a follow-on inquiry to make the locality unambiguous.

A selection taken from the locality list and placed unchanged in the inquiry fields shall never result in a locality list as an answer.

11.3.4.5 Subscriber name

The **subscriberName** holds either the surname or trade name of the subscriber.

If a list other than a **subscriberList** is returned, this field shall be absent.

11.3.4.6 Forename

The **forename** field, when present, holds the subscriber's forename.

If a list other than a **subscriberList** is returned, this field shall be absent.

11.3.4.7 Name of street or equivalent

The **streetName** field, when present, holds the name of the street or equivalent.

If a list other than a **subscriberList** or **streetList** is returned, this field shall be absent.

11.3.4.8 House number

The **houseNumber** field identifies a house within a street. A possible numerical part of the house number shall precede the possible alphabetical part without separation. Non-significant zeroes shall be omitted.

If a list other than a **subscriberList** is returned, this field shall be absent.

11.3.4.9 Supplementary data

If the **supplementaryData** field is present when returning a **subscriberList**, it holds supplementary information about the subscriber.

If this field is present when returning a **localityList**, it holds supplementary information about the locality.

If this field is present when returning a **businessCategoryList** it holds supplementary information about the business category such as a more general business-area description field to which the business category returned belongs (for information and display only).

11.3.4.10 Subscriber message

The **subscriberMessage** optional field holds a coded message, which should be converted into text by the inquiring system.

The following codes are defined:

0 = no comment;

1 = subscriber changed address;

2 = refer to distant operator;

3 = message in freeform text giving additional information about the subscriber and to be included in this field separated by one space from the code.

11.3.4.11 Heading in the guide

The semantics of the **headingInTheGuide** field is described in 10.2.4.6.

This field shall be used for holding the business category when relevant for a subscriber in a **subscriberList** and when returning a **businessCategoryList**.

If a list other than a **subscriberList** or **businessCategoryList** is returned, this field shall be absent.

11.3.4.12 Profession code

The **professionCode** field, when present, specifies for a residential subscriber the profession, job, or academic title.

If a list other than a **subscriberList** is returned, this field shall be absent.

11.3.4.13 County, State or Province

The **countyStateOrProvince** optional field holds the county, state or province name.

If a **businessCategoryList** is returned, this field shall be absent.

11.3.4.14 Subscriber description

The **subscriberDescription** optional field is used for providing additional information about the subscriber in free text (e.g., "Open 24/24 hours").

This field shall be absent for other than a **subscriberList**.

11.3.4.15 Category

The **category** optional field may supply information about the subscriber category (see below). If a list other than a **subscriberList** is returned, this field shall be absent.

A subfield, when present, shall in ASN.1 encoding always have the value **TRUE**. When using XML encoding, each subfield is represented by an XML attribute of the **category** empty element, and shall, if present, always have the value **true**.

When present, one or more of the following subfields shall be present:

a) **business**: When present, it indicates that the selection is for a business subscriber;

b) **residential**: When present, it indicates that the selection is for a residential subscriber;

c) **government**: When present, it indicates that the selection is for a governmental subscriber.

11.3.4.16 Country code

The **countryCode** optional field shall hold the ITU-T Rec. 164 country code for the selection. It is mandatory for selections containing ITU-T Rec. E.164 address types.

11.3.4.17 Postal code

The **postalCode** optional field provides the postal code for the selection.

If a list other than a **subscriberList**, a **localityList** and a **streetList** is returned, this field shall be absent.

11.3.4.18 Communications address type

The **commAddressType** field shall be present if the **commAddress** field (see 11.3.4.3) holds a communications address that may be disclosed. Otherwise, this field shall be absent.

When present, this field shall hold one of the following values:

a) **e164**: when the returned communications address has a syntax as defined by ITU-T Rec. E.164.

b) **rfc822**: when the returned communications address has a syntax as defined by RFC 822 (e-mail address syntax).

c) **rfc1738**: when the returned communications address has a syntax as defined by RFC 1738 (URL syntax).

11.3.4.19 Communications address services

The **commAddressService** field shall be absent if the **commAddress** field (see 11.3.4.3) does not hold a communications address that may be disclosed.

This field has subfields indicating types of communications address services (see below) associated with the **commAddress**. A subfield, when present, shall in ASN.1 encoding always have the value **TRUE**. When using XML encoding, each subfield is represented by an XML attribute of the **commAddressService** empty element, and shall, if present, always have the value **true**.

This field indicates what service(s) can be obtained through the supplied communications address. When the **commAddress** field is present, one or more of the following subfields shall be present:

a) **fax**: When a fax service can be obtained at the communications address.

b) **pbx**: When the communications address is for a PBX.

c) **txt**: When the communications address is for a text telephone.

d) **pub**: When the communications address is for a public telephone.

e) **vid**: When the communications address is for a video telephone.

f) **pag**: When the communications address is for a pager.

g) **voice**: When voice communications can be conducted through the communications address.

h) **data**: When data communications can be conducted through the communications address.

i) **http**: When HTTP-type communications can be conducted through the communications address (e.g., Web services).

j) **ftp**: When the File Transfer Protocol (FTP) is supported through the communications address.

k) **eml**: When e-mail service is supported through the communications address.

l) **sms**: When Short Message Service (SMS) is supported through the communications address.

m) **mms**: When Multimedia Messaging Service (MMS) is supported through the communications address.

n) **emg**: When emergency messages are supported through the communications address.

11.3.4.20 Communications address characteristics

The **commAddressChar** field shall be absent if the **commAddress** field (see 11.3.4.3) does not hold a communications address that may be disclosed.

This field has subfields indicating communications address characteristics (see below). A subfield, when present, shall in ASN.1 encoding always have the value **TRUE**. When using XML encoding, each subfield is represented by XML attributes of the **commAddressChar** empty element, and shall, if present, always have the value **true**.

This field indicates what characteristics are associated with the communications address. When present, it shall include one or more of the following subfields:

a) **ftn**: When the communications address is a tax-free telephone number.

b) **mob**: When the communications address is for a mobile telephone.

c) **fixed**: When the communications address is for a fixed-line telephone.

d) **prn**: When the communications address is a premium rate telephone number.

e) **npn**: When the communications address is a personal country-wide telephone number.

f) **upn**: When the communications address is a personal worldwide number.

g) **old**: When the communications address has been valid, but is now obsolete.

h) **adv**: When the communications address comes from an advertising listing.

i) **nmk**: When the communications address shall not be used for marketing.

11.3.4.21 Distance

The **distance** field shall be present if a proximity search has been performed. Otherwise, it shall be absent. It gives the distance from the centre of the proximity search to this selection's position.

The value shall be a character-encoded number. The mapping of the number to a real distance is service provider dependent and shall be specified in the operator's manual.

11.3.4.22 Additional naming information

When an additional family name is to be returned (see 11.2.4.15), it shall be supplied in the **additionalName** field (without the equals sign).

This field may also be used for returning other naming information relevant for countries or cultures.

The specific use of this field shall be specified in the operator's manual.

The support for additional family name is mandatory.

11.3.4.23 Selection coordinate

The **selectionCoordinate** field gives the coordinates of the selection.

If the replying system has coordinates available within a selected listing, it should return them in the selection.

This field has the subfields **latitude** and **longitude** with the same meaning and encoding requirements as specified in 11.2.4.19.

11.3.4.24 Selection level

The **selectionLevel** field, if present, shall hold a number that indicates the level of the corresponding listing within a hierarchical group (see 9.5).

If this field is not present, it defaults to zero.

If a list other than a **subscriberList** is returned, this field shall be absent and its default shall be ignored.

12 TCP adaptation protocol

12.1 Introduction

The TCP adaptation protocol provides support for DA protocol version negotiation and provides security in the form of authentication and encryption.

12.2 Security

12.2.1 Authentication

The replying system may not know the socket of the inquiring system and, even if it does, the socket does not provide a secure identity as it can easily be masqueraded by an outside party. The TCP adaptation protocol provides additional authentication through a negotiation procedure during the application connection establishment (see 12.3).

The authentication mechanism is based on the MD5 algorithm. This mechanism requires that both the inquiring and replying systems agree on a common password.

The length of the password shall be at minimum 6 characters and at maximum 16 characters, where the characters shall be selected from the repertoire defined in 9.1.1.

This password must be kept in confidence. If this password is compromised by a third party obtaining it, the authentication mechanism is compromised. In particular, a replying system must rely on the inquiring system to protect the password.

The mechanism uses the four-way negotiation exchange detailed in 12.3.

1) After reception of the first message from the inquiring system, the replying system generates and sends a non-encrypted random number using numeric characters (arbitrary length and value).
2) The inquiring system concatenates the random number with the shared password (<random number><password>); and then by using the MD5 algorithm, as defined by RFC 1321, it generates a 128 bit digest (fingerprint) and sends that back to the replying system.

   Example: Let us assume that the bilaterally agreed password is "345678". If the random number generated by the replying system is "8171", then the input of the MD5 message-digest algorithm is "8171345678" (383137313334353637 38'H).
3) The replying system produces a 128-bit MD5 digest exactly as the inquiring system and compares that with the one received from the inquiring system. If it matches, authentication is completed and the connection is assumed to be secure. Otherwise, the TCP connection shall be aborted.

The length of the password determines how much effort it takes to forge the password if the random number has been disclosed in some way.

The implementation and use of this authentication procedure is mandatory.

12.2.2 Encryption

Encryption is an optional facility. In cases where confidentiality is required the DA inquiries and replies may be encrypted. The RC4 encryption algorithm shall be used. The key to be used for encryption and decryption is generated by both the inquiring and replying system in the following way:

1) The password and random number used for the authentication procedure are concatenated, this time in reversed order (<password><random number>).

2) An MD5 digest is generated over the result of the concatenation. This 128-bit digest is used as the RC4 encryption key.

12.3 Application connection establishment

12.3.1 Message format and general procedure

A TCP connection (see 13.1) shall be established before an application connection can be established.

Application connection establishment involves a negotiation about the conduct of the application data exchange. This negotiation is based on the "four-way-handshake" mechanism shown in Figure 9.

If all stages of that information interchange occurs correctly, the application connection is established and DA transactions (inquiry/reply) can be transmitted over the connection (see 12.4). Otherwise, the TCP connection is aborted after the last message exchange (stage 4), with the reason for reset provided in the *Diagnostic code* field.

The inquiring system is not required to send inquiries immediately after the connection establishment. The normal inactivity timers shall be used (see 13.3.1).

To protect against missing negotiation messages, the systems shall after a time-out period close the TCP connection. This time-out shall be at least 1 second and not more than 20 seconds with a recommended value of 8 seconds.

If a connection establishment fails, the inquiring system should wait for a while before making a subsequent connection establishment attempt. At least one minute should elapse between each connection establishment attempt, but five minutes is the recommended wait period.

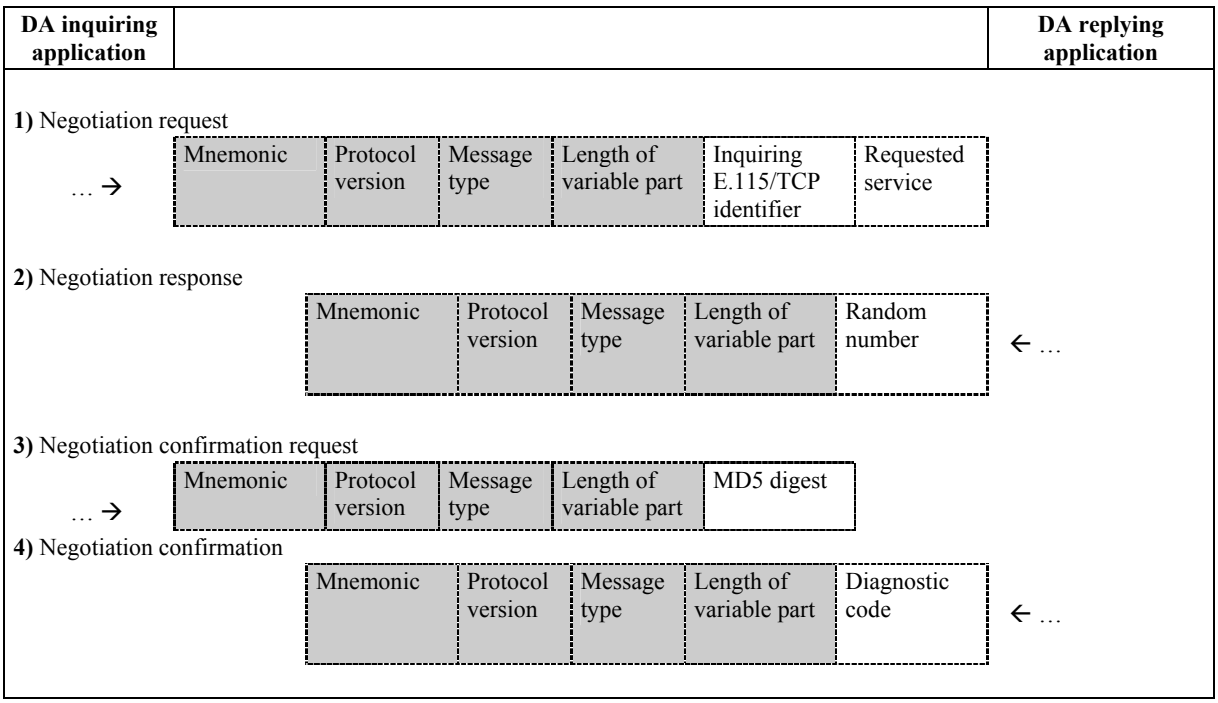


Figure 9/E.115 – Application establishment exchange

12.3.2 Field descriptions

12.3.2.1 Fields common for all four message types

The fixed-length header contains four fields and is handled by the DA applications to determine directory messages, protocol version, type of message and size of the variable part to be processed.

a) *Mnemonic* – This field indicates that the indicator identifies a message to the international inquiry service; 4 characters: Form: EIDQ.

b) *Protocol Version* – Identifies the DA protocol version to be used. It is a 4-character field and shall have one of the following values:

- 0100: DA protocol version 1 (2005);
- 02rX: DA protocol version 2 using XML encoding;
- 02rA: DA protocol version 2 using ASN.1 BER encoding.

NOTE 1 – Under this encoding, the obsolete version 1 (1995) from ITU-T Rec. E.115 (1995), if it were to be used, would be encoded 0000.

A replying system shall support version 1 (2005) and if a replying system supports version 2, it shall support the XML encoding and may optionally support the ASN.1 BER encoding.

There are two aspects of version negotiation, namely the major version negotiation and release negotiation (see 8.4). The major version negotiation principle is shown in Figure 10.

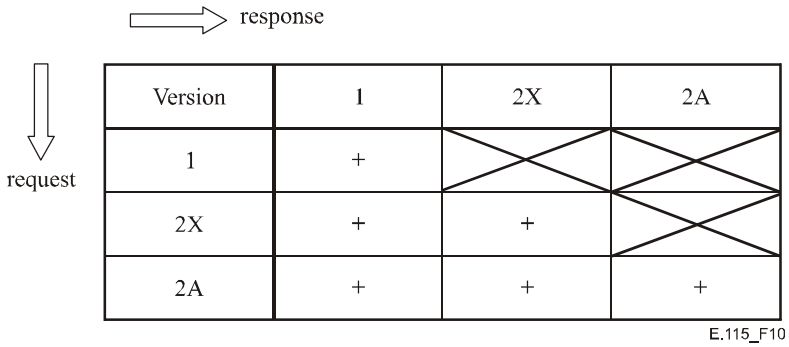


Figure 10/E.115 – Version negotiation

i) If the request specifies version 1 (2005), then version 1 (2005) shall also be specified in the response. If the request specifies version 2 with XML encoding, then version 1 (2005) or version 2 with XML shall be specified in the response. If the request specifies version 2 with ASN.1 BER encoding, then any major version may be specified in the response.

NOTE 2 – Although obsolete, version 1 (1995) from ITU-T Rec. E.115 (1995) shall be treated in the same way as version 1 (2005).

ii) If the inquiring system suggests version 2 (with XML or ASN.1 BER encoding) and the response also specifies version 2, then the release indicator in the response shall be equal to or less than the one specified in the request. The inquiring system shall not use protocol elements that are not defined for the release specified in the response.

If the inquiring system does not accept the proposal from the replying system, it shall close the connection.

If the protocol version negotiation is successful, the protocol version field for all subsequent exchanges shall indicate the agreed protocol version.

c) *Message Type* – Identifies the type of message; 2 characters:

– "Negotiation request"; Form: NI

– "Negotiation response"; Form: NR

– "Negotiation confirmation request"; Form: CI

– "Negotiation confirmation"; Form: CR

d) *Length of variable part* – Identifies the length in octets of the directory message; encoded as an unsigned binary number within 2 octets, the leftmost bit of the field being the most significant bit. For instance, *2612* will be encoded *0x0A 0x34*.

An implementation shall check the correctness of this length field by comparing it with the actual length of the inquiry or reply. If the length field does not match that length, the connection shall be aborted.

12.3.2.2 Fields specific for negotiation request

The negotiation request has two specific fields for identification of the inquiring system and for a specification of the type of service wanted (requested service):

a) *Inquiring system identifier* – 8 characters: aligned from the left (if necessary, padded with spaces);

The *Inquiring system identifier* field is used by the replying system to associate a connection to the inquiring system, manage the service specification associated, the billing aspects, etc. The value of this field is bilaterally agreed upon between inquiring and replying service providers.

As an option, a cross check of this identifier against the calling TCP/IP address (when known) is sensible as an extra check that this identifier is consistent with the network address of the inquiring DA system (see 12.1).

If the inquiring system identifier is invalid, the replying system shall close the connection.

b) *Requested service* – 8 characters: aligned from the left (if necessary, supplemented by spaces).

The type of requested service is used to manage a more precise service specification for a given inquiring E.115/TCP application.

The following codes have been defined:

- PUBLIC Electronic directory service
- OPERATOR Directory assistance service
- SECUREP Secure Electronic directory service using encryption
- SECUREO Secure Directory assistance service using encryption

NOTE – New codes may be defined in the future.

If the inquiring system specifies either an unknown requested service or a requested service it does not support, the replying system shall close the connection.

12.3.2.3 Field specific for negotiation response

The replying system sends a Negotiation Response with a random number.

The structure and coding of this information format use the following ASN.1-like notation:

- 1010 0000 (the ASN.1 tag);
- LENGTH of random number encoded as an unsigned binary number;
- Random number having a length of minimum 8 octets and maximum 100 octets, where each octet is coded as an unsigned number taking any value from 0 to 255.

12.3.2.4 Field specific for negotiation confirmation request

The negotiation confirmation request has one specific field. This field is used by the inquiring system to send an MD5 digest of the random number and password as discussed in 11.2.1:

- 1010 0001 (the ASN.1 tag);
- LENGTH of MD5 digest encoded as unsigned binary number (always 16);
- MD5 digest.

When generating the MD5 digest, only the actual random number shall be used, i.e., the tag and the length fields are not included.

12.3.2.5 Field specific for negotiation confirmation

The negotiation confirmation has one specific field. This field is used by a replying system to return a two-character diagnostic code indicating the result of the negotiation.

The following codes have been defined:

– 00: negotiation accepted;

– 10: invalid authentication or unknown DA system (access not permitted);

– 20: protocol error or protocol version not supported;

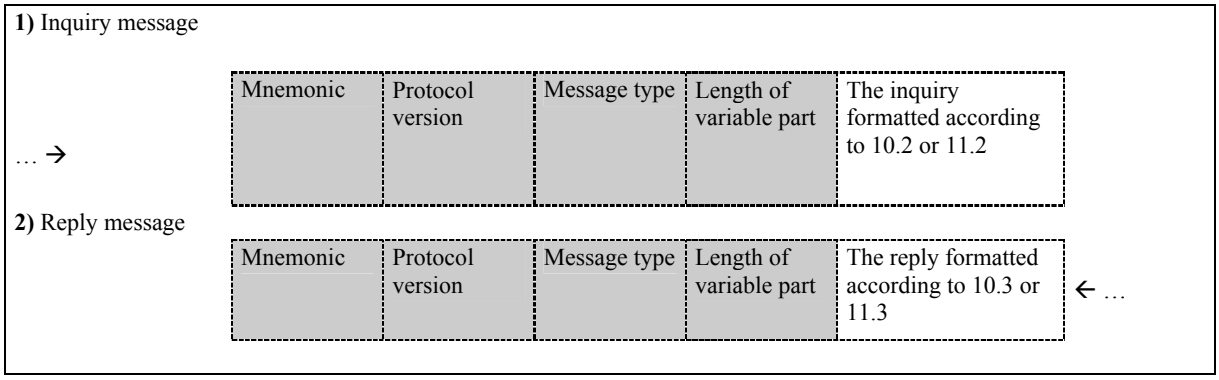
– 30: lack of resources (too many connections established);

– 40: requested service not supported or not bilaterally agreed;

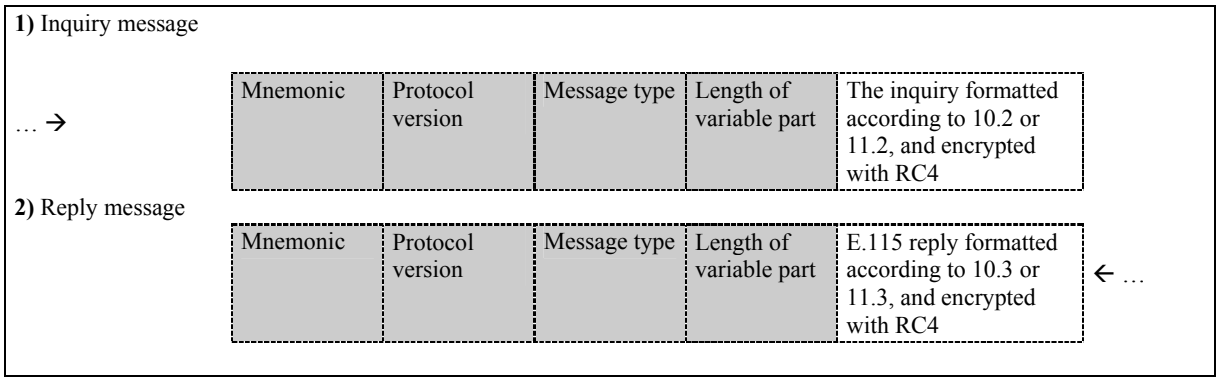
– 50: system temporarily unavailable (added for version 2.0).

12.4 Application data transfer

When connection and negotiation phases occur correctly, transactions may be interchanged between the inquiring and replying systems with the following formats:



Or;



The fixed-length header contains four fields and is used by the DA applications to determine the beginning of the message and the size of the variable part to be processed.

a) *Mnemonic* – A four-character field identifying the variable part to be a message (inquiry or reply) formatted according to the DA protocol specification given in clauses 10 and 11. This field shall be filled with the 4 characters: EIDQ.

b) *Protocol Version* – A four-character field identifying the DA protocol version used. It shall have the same value as negotiated during application connection establishment (see 12.3.2.1).

c) *Message Type* – A two-character field with the value "IM" if the variable field holds an inquiry, and with the value "RM" if the variable field holds a reply.

d) *Length of variable part* – A two-octet field giving the length in octets of the variable part (inquiry or reply) coded as an unsigned integer. As an example, 2612 would be coded as hex '0A34'.

The variable part holds the DA message (inquiry or reply) as defined by clauses 10 and 11. The DA message may be encrypted.

12.5 Application connection release

There is no explicit release of the application connection. An application is released when the supporting TCP connection is released (see 13.3).

13 Use of the service provided by TCP

The use of the service provided by TCP is expressed by reference to the conceptual calls as defined in 3.8 of RFC 793.

NOTE – An application programming interface implementation may have a different structure.

13.1 TCP connection establishment (socket connection)

Only the inquiring system may initiate a TCP connection. Such a connection has to be established before the inquiring system can send inquiries. A connection is established by the inquiring system issuing an active OPEN call and by the replying system having an outstanding passive OPEN call (see 3.4 of RFC 793).

When issuing an active OPEN, the inquiring system shall:

a) Specify the socket of the replying system as published by the replying system. It is recommended to use the port number *3611* for replying systems. However, for more flexibility and to avoid potential port assignment problems, the inquiring system shall be able to configure the port number of the replying system.

b) Set the active flag.

NOTE – Because many operating systems do not support fixed outgoing TCP ports, only dynamic allocation of port numbers is used.

An active OPEN will fail if the replying system has not issued a passive OPEN.

If duplicated equipment exists, the inquiring application may set up an active TCP Connection to this equipment, even if it already has an active TCP Connection to this DA system.

When issuing a passive OPEN, the replying system shall:

a) Specify the local port number to be used (3611 is recommended).

13.2 Data transfer

When an inquiring or replying system issues a SEND call to send an inquiry or reply, respectively:

– the PUSH flag shall be set to ensure immediate delivery; and

– the URGENT flag shall not be set.

If the number of octets received in a TCP stream is less than 12, the receiving system shall wait for the next stream of octets until 12 octets are received and it is possible to determine the variable length.

13.3 TCP connection release

The connection can be released by either:

– closing the connection, which leads to terminating gracefully the message flow; or

– aborting the connection, which leads to deletion of the ongoing messages.

For performance reasons, connections should be maintained and should not be released after each transaction.

13.3.1 Orderly release

Either side may issue a CLOSE at any time.

An inquiring system should normally not issue a CLOSE when it has outstanding inquiries.

An inquiring system should have an inactivity time-out period of, say, 15 minutes, after which it may issue a CLOSE.

A replying system should issue a CLOSE on such a connection at regular intervals to allow the authentication procedure to be repeated.

NOTE – As an example, a replying system might issue a CLOSE on a connection after having processed 1000 transactions on that connection.

A replying system should also have a prolonged inactivity timer to protect against the failure of the inquiring system to close the connection after a period of inactivity. After the expiration of such an inactivity timer, the replying system should issue a CLOSE.

When an inquiring system receives a CLOSE indication when it has outstanding inquiries on the connection in question, it should take local action with respect to the missing replies, e.g., by opening a new connection and re-transmitting the lost inquiries.

13.3.2 TCP abort

A system should only issue an ABORT whenever it detects a serious exception, such as an abnormally functioning communication partner or unsuccessful authentication.

14 Operator's manual

Each service provider that implements this Recommendation shall supply a simple operator's manual for other service providers. This manual describes principally the main characteristics of its directory assistance system to indicate the best way to inquire for the remote operators.

Annex A

Directory Assistance keywords of Directory Assistance protocol version 1 (2005)

A.1 Functional keywords table

Bilateral agreement is needed for all functional keywords.

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
Users generated				
#ADR	X	X	The presence of the keyword "#ADR" indicates that a subscriber search by street address shall be performed under the following conditions: • The geographical area shall be unambiguous, if not, a locality list is provided (general E115v1 rule); • The street name is mandatory; • All other search arguments shall be used as filters. If the combination of locality – street name specified in the query is not defined in the system the message code 64 shall be returned. **Syntax** In the request, (field 1): To retrieve a list of subscribers recorded under a given street name. In the reply, (field 2): To indicate that this functionality has actually been effected.	No data
#ALT	X	X	The presence of the keyword "#ALT" activates alternative matching rules. If no keyword is used, the alternative matching rule shall not be activated. **Note** #ALT=0 is the value for phonetic search. #ALT=1 is the value for word rotation. #ALT=2 is the value for position-sensitive search. #ALT is kept as an alternative to #ALT=0. **Syntax** In the request, (field 1): To search for subscribers with an alternative matching rule. In the reply, (field 2): To indicate that this functionality has actually been effected.	=<number>-defines type of alternative matching rule. Set to value zero or greater. Value zero is left to the discretion of the service provider to provide the best choice. The type of alternative matching rule should be defined by the service provider in the operator's manual. Default value is zero.

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
#BUS	X	X	List of business categories when the business category in the request is ambiguous. The business category can be supplied with complete or truncated words in the request. The language to be used for the business category will depend on bilateral agreement. If both the locality and the business category provided in the request are ambiguous, a locality list is provided first. A list of business categories will be returned after a valid locality has been selected. When a list of business categories is provided, the reply message shall be formatted according to the following: 1. Information to be returned – Use of the *heading in the guide* field to return the information for business category. – Optional use of the *supplementary data* field to return potential additional information such as a more general business area description field to which the business category returned belongs (for information and display only). 2. Return code to be used The return code to be used is 76 "list of business categories". **Note** When a business category list is actually returned, it shall be done in such a way that the content of the *heading in the guide* field from the reply can be used in a subsequent request without having to be modified by the requesting system. To avoid ambiguity in provision of the list, the number sign character can be used according to E.115 specifications. Data provided in the *supplementary data* field is informational only, and should not have to be sent in a subsequent request together with the *heading in the guide* field retrieved from the list.	No data

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
			Syntax In the request, (field 1): Should be provided to enable the return of a business category list. In the reply, (field 2): Shall be provided if this functionality has been activated by the service provider. If the keyword is transmitted by the requestor, the service provider may return: – a list of subscribers if the provided business category is not ambiguous; – a list of business categories if the provided category is ambiguous; – an error code if no match can be found with the provided category. If the keyword is *not* transmitted in the request, the service provider *never* returns a list of business categories (same behaviour as if no agreement has been reached).	
#GEO	X	X	Search for subscriber by geographical expansion. **Syntax** In the request, (field 1): To expand the subscriber search to neighbouring areas. In the reply, (field 2): To indicate that this functionality has actually been effected.	=<number> Set to value zero or greater which specifies the degree of expansion as determined by the service provider (the actual mapping should be described in the operator's manual). Default value is zero. Example (purely fictional): #GEO=0 search for subscribers expanded to include direct neighbouring localities. #GEO=1 search for subscribers expanded to the county associated to the entered locality.

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
#MAI	X	X	The presence of the keyword "#MAI" indicates a search for level zero entries only in databases having grouped listings. The top line of a grouped listing has the level equal to 0 (zero). **Syntax** In the request, (field 1): To search for subscribers where only the top line (level zero) of a grouped listing is returned. In the reply, (field 2): To indicate that this functionality has actually been effected.	No data
#NAT	X	X	The presence of the keyword #NAT concerns the introduction of characters that are not part of the basic E.115 character set, but are used in some countries. **Note** #NAT=ab where a is the character set for the inquiry and b the character set required in the reply, a and b could be equal to 0 or 1, 0 is the value for basic E.115 (minimum character set) and 1 is the value for ISO Latin1 (ISO-8859-1) EIDQ extended character set. **Syntax** In the request, (field 1): To specify the character set of the inquiry a and the character set required in the reply b. In the reply, (field 2): To specify the character set of the inquiry a and the character set required in the reply b.	ab a = 0: basic E.115 character set 1: *ISO 8859-1* character set b = 0: basic E.115 character set 1: *ISO 8859-1* character set Default value is #NAT=00

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
#NEI	X	X	The presence of the keyword "#NEI" indicates a search for neighbouring localities. **Syntax** In the request, (field 1): To search for localities included in the geographical area defined by the data field. In the reply, (field 2): To indicate that this functionality has actually been effected.	=<number> Set to value zero or greater which specifies the geographical area on which the search shall be performed (the actual mapping is determined by the service provider and should be described in the operator's manual). Default value is zero. Example (purely fictional): #NEI=0 search for localities expanded to include direct neighbouring localities. #NEI=1 search for localities expanded to include all those within the associated county.
#PRO	X	X	The presence of the keyword "#PRO" indicates a search for subscribers by profession. **Syntax** In the request, (field 1): To retrieve a list of subscribers recorded under a given profession. In the reply, (field 2): To indicate that this functionality has actually been effected.	No data
#PRX	X	X	Proximity search. Proximity searches are introduced within E.115 in order to enable Directory Assistance operators to search for subscribers (business listings) next to an end-user defined position in order to retrieve listings ordered by either increasing distance or including geo-coordinates. **Syntax** In the request, (field 1): Should be provided to enable the functionality in case of indication of a radius. In the reply, (field 2): Shall be provided if this functionality has been activated by the service provider.	=<number> Set to "no-value" or "number" which specifies the search distance (radius) as determined by the service provider (the actual mapping should be described in the operator's manual). =<number> corresponds to the distance between the centre of the search and the corresponding listing in reply.

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
#REV	X	X	Reverse search. In a reversed search, the number is the search argument. It shall be placed in the "subscriber name" Field. **Note** In combination with the keyword "'PRX", this keyword defines the end-user position by provision of a phone number. In this case #REV=<number> can be used. **Syntax** In the request, (field 1): To specify a reverse search. In the reply, (field 2): To indicate that this functionality has actually been effected.	No data or, for proximity search: =<number> contains the telephone number that is used as the centre point of the proximity search.
#POS	X	X	Asking and/or transmitting location (X, Y coordinates) of the source/origin point of the search. **Syntax** In the request, (field 1): Coordinates of the source/origin point for a proximity search. In the reply, (field 2): Will be used if the functionality has been activated.	empty or =<x_coordinate>, <y_coordinate> Might be completed with positioning data.
#DES		X	Providing location (through X, Y coordinates) of the retrieved subscribers. **Syntax** In the reply, (field 2): Shall be provided with the X, Y coordinates of the retrieved subscriber defined position.	=<coordinates_string> =<string2> where coordinates_string represents each retrieved listing's localization.
#MLS	X	X	Multi-locality search (MLS). If the MLS is implemented in the database, the search for a name and address will be taken in all the localities that achieve all the assumptions the operator has written in the locality field. **Syntax** In the request, (field 1): To search only for subscribers where listings are in a locality with the requested locality name. In the reply, (field 2): To indicate that this functionality has actually been effected. If no keyword is used, the type(s) of communications address provided is left to the discretion of the service provider and should be described in the operator's manual.	No data

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
#MSS	X	X	This keyword allows on a search basis to turn off the list of street address functionality and to search on the whole list of street addresses retrieved by the search. Thus, it only has an effect if the list of street address functionality has been bilaterally agreed. If the Multi-street search (MSS) is implemented in the database, the search will be performed in all the street addresses which achieve all the assumptions the operator has written in the street name field. To activate the MSS you have to write the keyword "#MSS" in the AISS field after receiving a list of street addresses. If the service provider has the restriction in the number of street addresses, the system will return an error code "64" which means "too many street names found". If there are too many listings in the reply there will come back the error code "93" which means "too many selections found". **Syntax** In the request, (field 1): Should be provided to enable the return of a search on the whole list. In the reply, (field 2): Shall be provided if this functionality has been activated by the service provider.	No data
#EML		X	This keyword allows provision of the email address (and/or URL) within the listing. **Note** The implementation of this keyword implies that the character set is extended (to support the "@" character for instance) as well as the field length (to adapt to email and URL addresses lengths). When using the limited character set, notation within RFC 2156 shall be used – "@" represented as "(a)". **Syntax** In the reply, (field 2): To return the email address of the corresponding subscriber.	=<string> The <string> contains the email address of the corresponding subscriber.
#URL		X	This keyword allows provision of the URL (and/or email) within the listing. **Syntax** In the reply, (field 2): To return the URL of the corresponding subscriber.	=<string> The <string> contains the URL of the corresponding subscriber.

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
#FAX #GSM #FTN #TEL #ISD #PBX #TXT	X	X	These keywords offer the end user (operator or public) the possibility to search for subscribers within a selection of listings regarding a specific type of communications address. They shall be used in accordance with the following syntax and be used only in an "AND" relationship: **Syntax** In the request, (field 1): To search for subscribers where only listings with the type of communications address corresponding to the keyword(s) specified are returned: #FAX (search for Fax) #GSM (search for mobile telephone numbers) #FTN (search for free tax numbers) #TEL (search for telephone numbers) #ISD (search for ISDNs) #PBX (search for switch board numbers) #TXT (search for text-telephone numbers) e.g.: #FAX means that only fax numbers shall be provided. #FAX and #FTN means that free tax fax numbers shall be provided. In the reply, (field 2): To indicate that this functionality has actually been effected. If no keyword is used, the type(s) of communications address provided is left to the discretion of the service provider and should be described in the operator's manual. **Note** These keywords are already approved as descriptive keywords (see A.2).	No data

Keyword	Authorized fields		Description	Syntax of the <data> field
	1	2		
System generated				
#LEV		X	The keyword "#LEV" shall be used in accordance with the following definition: Each line from grouped entries is considered as a single listing. To identify its position within the group, a level identifier is created. The top line has the level equal to zero. The level identifier is incremented for each new sub-grouping. **Note** This keyword is optional, if not used, the level of listing is equal to zero. **Syntax** In the reply, (field 2): To specify the level of a listing within a grouped entry (caption set).	=<number> Level identifier: number identifying the level of listing within grouped entries. The top level is equal to zero.
#CCO		X	The keyword "#CCO" allows that a single E.115 reply contains subscribers belonging to different countries. **Note** This keyword is optional, if not used, the "country code" field of part 2 is valid. **Syntax** In the reply, (field 2): To return the telephone country code of the corresponding subscriber. This country code overrides the code returned in the "country code" field of part 2.	=<string> The <string> contains the country code of the corresponding subscriber in accordance with ITU-T Rec. E.164 e.g., 357 means in relationship with France: Override the country code 33 in part 2 with 357 (Monaco).
NOTE 1 – field1 = "additional information for a selective search" field (inquiry). NOTE 2 – field2 = "additional information for a selective search" field (reply).				

A.2 Descriptive keywords table

Keyword	Reply: Supplementary data	Type of communications address
EML	X	E-mail address
FAX	X	Fax number
FTN	X	Free tax number
GSM	X	Mobile telephone number
ISD	X	ISDN number
NPN	X	Personal country-wide number
OLD	X	Old telephone number
PAG	X	Pager number
PBX	X	Switchboard number
PRN	X	Premium rate number
PUB	X	Public phone-box number
TXT	X	Text-telephone number
UPN	X	Personal worldwide number
URL	X	Internet address
VID	X	Video-telephone number

In the reply, the descriptive keyword shall only be returned if the information is available in the accessed database.

Annex B

Directory Assistance protocol version 1 (2005) in ASN.1

The BER encoding of values for the ASN.1 module defined by this annex is intended to be identical to the presumed (Note) BER encoding of the ASN.1 module defined by ITU-T Rec. E.115 (1995), except that one new field – **dbSelectionCount** – is added to the **replyPart2** data type, and one new field – **subscriberDescription** – is added to **selection** data type. These two fields shall not be present unless there exist mutual agreements on their use (see 10.3.4.4 and 10.3.5.16).

NOTE – The code given in ITU-T Rec. E.115 (1995) as ASN.1 was not valid according to the ASN.1 language, so that it has to be corrected before it can be used. For this reason all version 1 (1995) implementations have had to make changes to the ASN.1 in ITU-T Rec. E.115 (1995).

While the length restrictions for ITU-T Rec. E.115 (1995) were only reflected in the text, length restrictions are now also included in the ASN.1. The length restriction reflects the maximum length to be used when mutual agreements exist as specified in Tables 4 and 5. The mandatory length restrictions also defined by those tables are the same as defined by ITU-T Rec. E.115 (1995).

Where the text in ITU-T Rec. E.115 (1995) specifies that only numeric characters are allowed, the **NumericString** built-in ASN.1 data type is used. As the **IMPLICIT** encoding is used, this does not change the BER encoding.

```
E115v1 {itu-t recommendation(0) e(5) 115 1} DEFINITIONS ::=
BEGIN

E115String ::= IA5String

E115StringUb256 ::= E115String (SIZE(0..256))

DirectoryMessage ::= CHOICE {
  telephone [0] Telephone }

Telephone ::= CHOICE {
  inquiry [0] Inquiry,
  reply   [1] Reply }

Inquiry ::= SEQUENCE {
  inquiryPart1  InquiryPart1,
  inquiryPart2  InquiryPart2 }

InquiryPart1 ::= [ APPLICATION 0 ] IMPLICIT SET {
  messageIndicators         [0]  IMPLICIT E115String (SIZE(4)),
  internationalIndicator    [1]  IMPLICIT NumericString (SIZE(8)),
  originatingTerminalCode   [2]  IMPLICIT E115String (SIZE(8)),
  dateAndTime               [3]  IMPLICIT NumericString (SIZE(12)) OPTIONAL,
  messageNumber             [4]  IMPLICIT E115String (SIZE(4)) OPTIONAL }

InquiryPart2 ::= [ APPLICATION 1 ] IMPLICIT SET {
  locality                  [0]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberName            [1]  IMPLICIT E115StringUb256 OPTIONAL,
  streetName                [2]  IMPLICIT E115StringUb256 OPTIONAL,
  houseNumber               [3]  IMPLICIT E115StringUb256 OPTIONAL,
  forename                  [4]  IMPLICIT E115StringUb256 OPTIONAL,
  headingInTheGuide         [5]  IMPLICIT E115StringUb256 OPTIONAL,
  professionCode            [6]  IMPLICIT E115StringUb256 OPTIONAL,
  additionalInformationForASelectiveSearch
                            [7]  IMPLICIT E115StringUb256 OPTIONAL,
  countyStateOrProvince     [8]  IMPLICIT E115StringUb256 OPTIONAL,
  category                  [9]  IMPLICIT E115StringUb256 OPTIONAL,
  sequenceNumber            [10] IMPLICIT NumericString (SIZE(1)) OPTIONAL }
```

```
Reply ::= SEQUENCE {
  replyPart1  ReplyPart1,
  replyPart2  ReplyPart2,
  replyPart3  ReplyPart3 OPTIONAL }

ReplyPart1 ::= [ APPLICATION 3 ] IMPLICIT SET {
  messageIndicators        [0]  IMPLICIT E115String (SIZE(4)),
  internationalIndicators  [1]  IMPLICIT NumericString (SIZE(8)),
  originatingTerminalCode  [2]  IMPLICIT E115String (SIZE(8)),
  dateAndTime              [3]  IMPLICIT NumericString (SIZE(12)) OPTIONAL,
  messageNumber            [4]  IMPLICIT E115String (SIZE(4)) OPTIONAL }

ReplyPart2 ::= [ APPLICATION 4 ] IMPLICIT SET {
  messageCode              [0]  IMPLICIT E115String (SIZE(2)),
  countryCode              [1]  IMPLICIT E115String (SIZE(4)),
  message                  [2]  IMPLICIT E115StringUb256 OPTIONAL,
  dbSelectionCount         [3]  IMPLICIT E115String (SIZE(0..10)) OPTIONAL }

ReplyPart3 ::= [ APPLICATION 5 ] IMPLICIT SET OF Selection

Selection ::= SET {
  nationalDestinationCode  [0]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberNumber         [1]  IMPLICIT E115StringUb256 OPTIONAL,
  locality                 [2]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberName           [3]  IMPLICIT E115StringUb256 OPTIONAL,
  forename                 [4]  IMPLICIT E115StringUb256 OPTIONAL,
  streetName               [5]  IMPLICIT E115StringUb256 OPTIONAL,
  houseNumber              [6]  IMPLICIT E115StringUb256 OPTIONAL,
  supplementaryData        [7]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberMessage        [8]  IMPLICIT E115StringUb256 OPTIONAL,
  headingInTheGuide        [9]  IMPLICIT E115StringUb256 OPTIONAL,
  professionCode           [10] IMPLICIT E115StringUb256 OPTIONAL,
  additionalInformationForASelectiveSearch
                           [11] IMPLICIT E115StringUb256 OPTIONAL,
  countyStateOrProvince    [12] IMPLICIT E115StringUb256 OPTIONAL,
  category                 [13] IMPLICIT E115StringUb256 OPTIONAL,
  subscriberDescription    [14] IMPLICIT E115StringUb256 OPTIONAL }

END
```

Annex C

Directory Assistance protocol version 2 in ASN.1

This annex provides the ASN.1 specification for version 2 of the protocol. If the ASN.1 EXTENDED-XER encoding rules are used, the XML encoding produced is identical to an XML encoding based on the XSD specified in Annex D.

```
E115v2 {itu-t recommendation(0) e(5) 115 2} DEFINITIONS XER INSTRUCTIONS ::=
BEGIN

E115String ::= UTF8String (FROM (
    {0, 0, 0, 32}..{0, 0, 0, 122} |
    {0, 0, 0, 160}..{0, 0, 215, 255} |
    {0, 0, 224, 0}..{0, 0, 255, 253}))

E115StringUb256 ::= E115String (SIZE(1..256))

E115NumericString ::= [NAME AS "NumericString"]
           UTF8String (FROM ( {0, 0, 0, 48}..{0, 0, 0, 57} ))

SimpleAttribute ::= BOOLEAN (TRUE)

CharacterSetType ::= ENUMERATED {
  basic  (0),
  latin1 (1) }

GeographicalType ::= ENUMERATED {
  dms    (0),
  dd     (1),
  dec    (2) }

CoordinateTypeDescription ::= SEQUENCE {
  geodeticDatum             [ATTRIBUTE][TAG: 0]  IMPLICIT E115StringUb256,
  projection                [ATTRIBUTE][TAG: 1]  IMPLICIT E115StringUb256,
  geographical              [ATTRIBUTE][TAG: 2]  IMPLICIT GeographicalType }

Coordinate ::= SEQUENCE {
  latitude                  [TAG: 0] IMPLICIT E115String,
  longitude                 [TAG: 1] IMPLICIT E115String }

CommAddressService ::= SEQUENCE {
  fax                       [ATTRIBUTE][TAG: 0]  IMPLICIT SimpleAttribute OPTIONAL,
  pbx                       [ATTRIBUTE][TAG: 1]  IMPLICIT SimpleAttribute OPTIONAL,
  txt                       [ATTRIBUTE][TAG: 2]  IMPLICIT SimpleAttribute OPTIONAL,
  pub                       [ATTRIBUTE][TAG: 3]  IMPLICIT SimpleAttribute OPTIONAL,
  vid                       [ATTRIBUTE][TAG: 4]  IMPLICIT SimpleAttribute OPTIONAL,
  pag                       [ATTRIBUTE][TAG: 5]  IMPLICIT SimpleAttribute OPTIONAL,
  voice                     [ATTRIBUTE][TAG: 6]  IMPLICIT SimpleAttribute OPTIONAL,
  data                      [ATTRIBUTE][TAG: 7]  IMPLICIT SimpleAttribute OPTIONAL,
  http                      [ATTRIBUTE][TAG: 8]  IMPLICIT SimpleAttribute OPTIONAL,
  ftp                       [ATTRIBUTE][TAG: 9]  IMPLICIT SimpleAttribute OPTIONAL,
  eml                       [ATTRIBUTE][TAG: 10] IMPLICIT SimpleAttribute OPTIONAL,
  sms                       [ATTRIBUTE][TAG: 11] IMPLICIT SimpleAttribute OPTIONAL,
  mms                       [ATTRIBUTE][TAG: 12] IMPLICIT SimpleAttribute OPTIONAL,
  emg                       [ATTRIBUTE][TAG: 13] IMPLICIT SimpleAttribute OPTIONAL }

InquiryCommAddressChar ::= SEQUENCE {
  ftn                       [ATTRIBUTE][TAG: 0]  IMPLICIT SimpleAttribute OPTIONAL,
  mob                       [ATTRIBUTE][TAG: 1]  IMPLICIT SimpleAttribute OPTIONAL,
  fixed                     [ATTRIBUTE][TAG: 2]  IMPLICIT SimpleAttribute OPTIONAL }

ReplyCommAddressChar ::= SEQUENCE {
  ftn                       [ATTRIBUTE][TAG: 0]  IMPLICIT SimpleAttribute OPTIONAL,
  mob                       [ATTRIBUTE][TAG: 1]  IMPLICIT SimpleAttribute OPTIONAL,
  fixed                     [ATTRIBUTE][TAG: 2]  IMPLICIT SimpleAttribute OPTIONAL,
  prn                       [ATTRIBUTE][TAG: 3]  IMPLICIT SimpleAttribute OPTIONAL,
```

```
  npn                       [ATTRIBUTE][TAG: 4]  IMPLICIT SimpleAttribute OPTIONAL,
  upn                       [ATTRIBUTE][TAG: 5]  IMPLICIT SimpleAttribute OPTIONAL,
  old                       [ATTRIBUTE][TAG: 6]  IMPLICIT SimpleAttribute OPTIONAL,
  adv                       [ATTRIBUTE][TAG: 7]  IMPLICIT SimpleAttribute OPTIONAL,
  nmk                       [ATTRIBUTE][TAG: 8]  IMPLICIT SimpleAttribute OPTIONAL }

Category ::= SEQUENCE {
  business                  [ATTRIBUTE][TAG: 0]  IMPLICIT SimpleAttribute OPTIONAL,
  residential               [ATTRIBUTE][TAG: 1]  IMPLICIT SimpleAttribute OPTIONAL,
  government                [ATTRIBUTE][TAG: 2]  IMPLICIT SimpleAttribute OPTIONAL }

E115Message  ::= CHOICE {
  directoryMessage [TAG: 0] DirectoryMessage }

DirectoryMessage ::= CHOICE {
  inquiry [TAG: 0] Inquiry,
  reply   [TAG: 1] Reply }

Inquiry ::= SEQUENCE {
  inquiryHeader  InquiryHeader,
  inquiryData    InquiryData }

InquiryHeader ::= [ TAG: APPLICATION 0 ] IMPLICIT SET {
  --                        [TAG: 0]  This tag is obsolete for v2 - not to be reused
  --                        [TAG: 1]  This tag is obsolete for v2 - not to be reused
  originatingTerminalCode   [ATTRIBUTE][TAG: 2]  IMPLICIT E115String (SIZE(8)),
  dateAndTime               [ATTRIBUTE][TAG: 3]  IMPLICIT E115NumericString (SIZE(12))
                              OPTIONAL,
  messageNumber             [ATTRIBUTE][TAG: 4]  IMPLICIT E115String (SIZE(4)) OPTIONAL,
  countryName               [ATTRIBUTE][TAG: 5]  IMPLICIT E115String (SIZE(2)),
  providerCode              [ATTRIBUTE][TAG: 6]  IMPLICIT E115String (SIZE(3)) OPTIONAL,
  inquiryCharacterSet       [ATTRIBUTE][TAG: 7]  IMPLICIT CharacterSetType DEFAULT basic,
  replyCharacterSet         [ATTRIBUTE][TAG: 8]  IMPLICIT CharacterSetType DEFAULT
latin1,
  requestedReplyType        [ATTRIBUTE][TAG: 9] IMPLICIT ENUMERATED {
    subscriberList       (0),
    provinceList         (1),
    localityList         (2),
    streetList           (3),
    businessCategoryList (4)} DEFAULT subscriberList,
  acceptedReplyTypes        [TAG: 10]  IMPLICIT SEQUENCE {
    provinceList              [ATTRIBUTE][TAG: 0]  IMPLICIT SimpleAttribute OPTIONAL,
    localityList              [ATTRIBUTE][TAG: 1]  IMPLICIT SimpleAttribute OPTIONAL,
    streetList                [ATTRIBUTE][TAG: 2]  IMPLICIT SimpleAttribute OPTIONAL,
    businessCategoryList      [ATTRIBUTE][TAG: 3]  IMPLICIT SimpleAttribute OPTIONAL },
  inquiryCoordinateType     [TAG: 11] IMPLICIT SEQUENCE {
                              COMPONENTS OF CoordinateTypeDescription } OPTIONAL,
  replyCoordinateType       [TAG: 12] IMPLICIT SEQUENCE {
                              COMPONENTS OF CoordinateTypeDescription } OPTIONAL }

InquiryData ::= [ TAG: APPLICATION 1 ] IMPLICIT SET {
  locality                  [TAG: 0]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberName            [TAG: 1]  IMPLICIT E115StringUb256 OPTIONAL,
  streetName                [TAG: 2]  IMPLICIT E115StringUb256 OPTIONAL,
  houseNumber               [TAG: 3]  IMPLICIT E115StringUb256 OPTIONAL,
  forename                  [TAG: 4]  IMPLICIT E115StringUb256 OPTIONAL,
  headingInTheGuide         [TAG: 5]  IMPLICIT E115StringUb256 OPTIONAL,
  professionCode            [TAG: 6]  IMPLICIT E115StringUb256 OPTIONAL,
  --                        [TAG: 7]  This tag is obsolete for v2 - not to be reused
  countyStateOrProvince     [TAG: 8]  IMPLICIT E115StringUb256 OPTIONAL,
  --                        [TAG: 9]  This tag is obsolete for v2 - not to be reused
  category                  [TAG: 10] IMPLICIT SEQUENCE {
                              COMPONENTS OF Category } OPTIONAL,
  sequenceNumber            [ATTRIBUTE][TAG: 11] IMPLICIT
                              E115NumericString (SIZE(1..2)) DEFAULT "0",
  postalCode                [TAG: 12] IMPLICIT E115StringUb256 OPTIONAL,
  nationalDestinationCode   [TAG: 13] IMPLICIT E115NumericString(SIZE(1..14)) OPTIONAL,
  commAddress               [TAG: 14] IMPLICIT E115StringUb256 OPTIONAL,
  commAddressTypes          [TAG: 15] IMPLICIT SEQUENCE {
    e164                      [ATTRIBUTE][TAG: 0]  IMPLICIT SimpleAttribute OPTIONAL,
    rfc822                    [ATTRIBUTE][TAG: 1]  IMPLICIT SimpleAttribute OPTIONAL,
```

```
    rfc1738                   [ATTRIBUTE][TAG: 2]  IMPLICIT SimpleAttribute OPTIONAL }
                                OPTIONAL,
  additionalName            [TAG: 16] IMPLICIT E115StringUb256 OPTIONAL,
  commAddressService        [TAG: 17]  IMPLICIT SEQUENCE {
                              COMPONENTS OF CommAddressService } OPTIONAL,
  commAddressChar           [TAG: 18] IMPLICIT SEQUENCE {
                              COMPONENTS OF InquiryCommAddressChar } OPTIONAL,
  geoExpansion              [ATTRIBUTE][TAG: 19]  IMPLICIT
                              E115NumericString (SIZE(1..3)) OPTIONAL,
  searchCoordinate          [TAG: 20]  IMPLICIT SEQUENCE {
                              COMPONENTS OF Coordinate } OPTIONAL,
  searchRadius              [TAG: 21] IMPLICIT NumericString (SIZE(1..9)) OPTIONAL,
  matchingRule              [TAG: 22] IMPLICIT SEQUENCE {
    wordRotation              [ATTRIBUTE][TAG: 0] IMPLICIT BOOLEAN OPTIONAL,
    phonetic                  [ATTRIBUTE][TAG: 1] IMPLICIT BOOLEAN OPTIONAL,
    alias                     [ATTRIBUTE][TAG: 2] IMPLICIT BOOLEAN OPTIONAL } OPTIONAL,
  maxSelectionLevel         [ATTRIBUTE][TAG: 23] IMPLICIT
                              E115NumericString (SIZE(1..3)) DEFAULT "99" }

Reply ::= SEQUENCE {
  replyHeader  ReplyHeader,
  selections   SEQUENCE (SIZE(1..MAX)) OF Selection OPTIONAL }

ReplyHeader ::= [TAG: APPLICATION 3] IMPLICIT SET {
  --                        [TAG: 0]  This tag is obsolete for v2 - not to be reused
  --                        [TAG: 1]  This tag is obsolete for v2 - not to be reused
  originatingTerminalCode   [ATTRIBUTE][TAG: 2]  IMPLICIT E115String (SIZE(8)),
  dateAndTime               [ATTRIBUTE][TAG: 3]  IMPLICIT E115NumericString (SIZE(12))
                                 OPTIONAL,
  messageNumber             [ATTRIBUTE][TAG: 4]  IMPLICIT E115String (SIZE(4)) OPTIONAL,
  messageCode               [ATTRIBUTE][TAG: 5]  IMPLICIT E115String (SIZE(2)),
  message                   [TAG: 6]  IMPLICIT E115StringUb256 OPTIONAL,
  dbSelectionCount          [ATTRIBUTE][TAG: 7]  IMPLICIT E115String (SIZE(1..10))
                              OPTIONAL,
  replyCharacterSet         [ATTRIBUTE][TAG: 8]  IMPLICIT CharacterSetType OPTIONAL,
  replyCoordinateType       [TAG: 9]  IMPLICIT SEQUENCE {
                              COMPONENTS OF CoordinateTypeDescription } OPTIONAL,
  searchCenter              [TAG: 10] IMPLICIT SEQUENCE {
                              COMPONENTS OF Coordinate }OPTIONAL }

Selection ::= SET {
  nationalDestinationCode   [TAG: 0]  IMPLICIT E115NumericString (SIZE(1..14)) OPTIONAL,
  commAddress               [TAG: 1]  IMPLICIT E115StringUb256 OPTIONAL,
  locality                  [TAG: 2]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberName            [TAG: 3]  IMPLICIT E115StringUb256 OPTIONAL,
  forename                  [TAG: 4]  IMPLICIT E115StringUb256 OPTIONAL,
  streetName                [TAG: 5]  IMPLICIT E115StringUb256 OPTIONAL,
  houseNumber               [TAG: 6]  IMPLICIT E115StringUb256 OPTIONAL,
  supplementaryData         [TAG: 7]  IMPLICIT E115StringUb256 OPTIONAL,
  subscriberMessage         [TAG: 8]  IMPLICIT E115StringUb256 OPTIONAL,
  headingInTheGuide         [TAG: 9]  IMPLICIT E115StringUb256 OPTIONAL,
  professionCode            [TAG: 10] IMPLICIT E115StringUb256 OPTIONAL,
  --                        [TAG: 11] This tag is obsolete for v2 - not to be reused
  countyStateOrProvince     [TAG: 12] IMPLICIT E115StringUb256 OPTIONAL,
  --                        [TAG: 13] This tag is obsolete for v2 - not to be reused
  subscriberDescription     [TAG: 14] IMPLICIT E115StringUb256 OPTIONAL,
  category                  [TAG: 15] IMPLICIT SEQUENCE {
                              COMPONENTS OF Category } OPTIONAL,
  countryCode               [TAG: 16] IMPLICIT E115NumericString (SIZE(1..3)),
  postalCode                [TAG: 17] IMPLICIT E115StringUb256 OPTIONAL,
  commAddressType           [ATTRIBUTE][TAG: 18] IMPLICIT ENUMERATED {
                              e164    (0),
                              rfc822  (1),
                              rfc1738 (2) } OPTIONAL,
  commAddressService        [TAG: 19] IMPLICIT SEQUENCE {
                              COMPONENTS OF CommAddressService } OPTIONAL,
  commAddressChar           [TAG: 20] IMPLICIT SEQUENCE {
                              COMPONENTS OF ReplyCommAddressChar } OPTIONAL,
  distance                  [TAG: 21] IMPLICIT E115StringUb256 OPTIONAL,
  additionalName            [TAG: 22] IMPLICIT E115StringUb256 OPTIONAL,
  selectionCoordinate       [TAG: 23] IMPLICIT SEQUENCE {
```

```
                              COMPONENTS OF Coordinate },
  selectionLevel             [ATTRIBUTE][TAG: 24] IMPLICIT
                              E115NumericString (SIZE(1..3)) DEFAULT "0" }

ENCODING-CONTROL XER
  GLOBAL-DEFAULTS MODIFIED-ENCODINGS
  TEXT CharacterSetType:ALL, GeographicalType:ALL,
    InquiryHeader.requestedReplyType:ALL, Selection.commAddressType:ALL

END
```

Annex D

Directory assistance protocol version 2 in XSD

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <xsd:simpleType name="E115String">
      <xsd:restriction base="xsd:string">
         <xsd:pattern value="[&#x20;-&#x7A; -&#xD7FF;&#xE000;-&#xFFFD;]*"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:simpleType name="E115StringUb256">
      <xsd:restriction base="E115String">
         <xsd:minLength value="1"/>
         <xsd:maxLength value="256"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:simpleType name="NumericString">
      <xsd:restriction base="xsd:string">
         <xsd:pattern value="[0-9]*"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:simpleType name="SimpleAttribute">
      <xsd:restriction base="xsd:boolean">
         <xsd:pattern value="true"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:simpleType name="CharacterSetType">
      <xsd:restriction base="xsd:NCName">
         <xsd:enumeration value="basic"/>
         <xsd:enumeration value="latin1"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:simpleType name="GeographicalType">
      <xsd:restriction base="xsd:NCName">
         <xsd:enumeration value="dms"/>
         <xsd:enumeration value="dd"/>
         <xsd:enumeration value="dec"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:attributeGroup name="CoordinateTypeDescription">
      <xsd:attribute name="geodeticDatum" type="E115StringUb256" use="required"/>
      <xsd:attribute name="projection" type="E115StringUb256" use="required"/>
      <xsd:attribute name="geographical" type="GeographicalType" use="required"/>
   </xsd:attributeGroup>
   <xsd:attributeGroup name="Coordinate">
      <xsd:attribute name="latitude" type="E115StringUb256" use="required"/>
      <xsd:attribute name="longitude" type="E115StringUb256" use="required"/>
   </xsd:attributeGroup>
   <xsd:attributeGroup name="CommAddressService">
      <xsd:attribute name="fax" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="pbx" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="txt" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="pub" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="vid" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="pag" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="voice" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="data" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="http" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="ftp" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="eml" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="sms" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="mms" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="emg" type="SimpleAttribute" use="optional"/>
   </xsd:attributeGroup>
   <xsd:attributeGroup name="InquiryCommAddressChar">
      <xsd:attribute name="ftn" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="mob" type="SimpleAttribute" use="optional"/>
      <xsd:attribute name="fixed" type="SimpleAttribute" use="optional"/>
```

```
</xsd:attributeGroup>
<xsd:attributeGroup name="ReplyCommAddressChar">
   <xsd:attributeGroup ref="InquiryCommAddressChar"/>
   <xsd:attribute name="prn" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="npn" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="upn" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="old" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="adv" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="nmk" type="SimpleAttribute" use="optional"/>
</xsd:attributeGroup>
<xsd:attributeGroup name="Categories">
   <xsd:attribute name="business" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="residential" type="SimpleAttribute" use="optional"/>
   <xsd:attribute name="government" type="SimpleAttribute" use="optional"/>
</xsd:attributeGroup>
<xsd:complexType name="E115Message">
   <xsd:choice>
      <xsd:element name="directoryMessage" type="DirectoryMessage"/>
   </xsd:choice>
</xsd:complexType>
<xsd:complexType name="DirectoryMessage">
   <xsd:choice>
      <xsd:element name="inquiry" type="Inquiry"/>
      <xsd:element name="reply" type="Reply"/>
   </xsd:choice>
</xsd:complexType>
<xsd:complexType name="Inquiry">
   <xsd:sequence>
      <xsd:element name="inquiryHeader" type="InquiryHeader"/>
      <xsd:element name="inquiryData" type="InquiryData"/>
   </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="InquiryHeader">
   <xsd:all>
      <xsd:element name="acceptedReplyTypes" minOccurs="0">
         <xsd:complexType>
            <xsd:attribute name="provinceList" type="SimpleAttribute" use="optional"/>
            <xsd:attribute name="localityList" type="SimpleAttribute" use="optional"/>
            <xsd:attribute name="streetList" type="SimpleAttribute" use="optional"/>
            <xsd:attribute name="businessCategoryList" type="SimpleAttribute"
              use="optional"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="inquiryCoordinateType" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="CoordinateTypeDescription"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="replyCoordinateType" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="CoordinateTypeDescription"/>
         </xsd:complexType>
      </xsd:element>
   </xsd:all>
   <xsd:attribute name="originatingTerminalCode" use="required">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:length value="8"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="dateAndTime" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="NumericString">
            <xsd:length value="12"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="messageNumber" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
```

```
            <xsd:length value="4"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="inquiryCharacterSet" type="CharacterSetType" use="optional"
         default="basic"/>
   <xsd:attribute name="replyCharacterSet" type="CharacterSetType" use="optional"
         default="latin1"/>
   <xsd:attribute name="countryName" use="required">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:length value="2"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="providerCode" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:length value="3"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="requestedReplyType" use="optional" default="subscriberList">
      <xsd:simpleType>
         <xsd:restriction base="xsd:NCName">
            <xsd:enumeration value="subscriberList"/>
            <xsd:enumeration value="provinceList"/>
            <xsd:enumeration value="localityList"/>
            <xsd:enumeration value="streetList"/>
            <xsd:enumeration value="businessCategoryList"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
</xsd:complexType>
<xsd:complexType name="InquiryData">
   <xsd:all>
      <xsd:element name="locality" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="subscriberName" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="streetName" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="houseNumber" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="forename" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="headingInTheGuide" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="professionCode" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="countyStateOrProvince" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="category" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="Categories"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="postalCode" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="nationalDestinationCode" minOccurs="0">
         <xsd:simpleType>
            <xsd:restriction base="NumericString">
               <xsd:minLength value="1"/>
               <xsd:maxLength value="14"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:element>
      <xsd:element name="commAddress" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="commAddressTypes" minOccurs="0">
         <xsd:complexType>
            <xsd:attribute name="e164" type="SimpleAttribute" use="optional"/>
            <xsd:attribute name="rfc822" type="SimpleAttribute" use="optional"/>
            <xsd:attribute name="rfc1738" type="SimpleAttribute" use="optional"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="additionalName" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="commAddressService" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="CommAddressService"/>
         </xsd:complexType>
```

```
      </xsd:element>
      <xsd:element name="commAddressChar" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="InquiryCommAddressChar"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="searchCoordinate" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="Coordinate"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="searchRadius" minOccurs="0">
         <xsd:simpleType>
            <xsd:restriction base="NumericString">
               <xsd:minLength value="1"/>
               <xsd:maxLength value="9"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:element>
      <xsd:element name="matchingRule" minOccurs="0">
         <xsd:complexType>
            <xsd:attribute name="wordRotation" type="xsd:boolean" use="optional"/>
            <xsd:attribute name="phonetic" type="xsd:boolean" use="optional"/>
            <xsd:attribute name="alias" type="xsd:boolean" use="optional"/>
         </xsd:complexType>
      </xsd:element>
   </xsd:all>
   <xsd:attribute name="sequenceNumber" use="optional" default="0">
      <xsd:simpleType>
         <xsd:restriction base="NumericString">
            <xsd:minLength value="1"/>
            <xsd:maxLength value="2"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="geoExpansion" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="NumericString">
            <xsd:minLength value="1"/>
            <xsd:maxLength value="3"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="maxSelectionLevel" type="NumericString" use="optional"
         default="99"/>
</xsd:complexType>
<xsd:complexType name="Reply">
   <xsd:sequence>
      <xsd:element name="replyHeader" type="ReplyHeader"/>
      <xsd:element name="selection" type="Selection" minOccurs="0"
          maxOccurs="unbounded"/>
   </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="ReplyHeader">
   <xsd:all>
      <xsd:element name="message" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="replyCoordinateType" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="CoordinateTypeDescription"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="searchCenter" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="Coordinate"/>
         </xsd:complexType>
      </xsd:element>
   </xsd:all>
   <xsd:attribute name="originatingTerminalCode" use="required">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:length value="8"/>
```

```
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="dateAndTime" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="NumericString">
            <xsd:length value="12"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="messageNumber" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:length value="4"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="messageCode" use="required">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:length value="2"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="dbSelectionCount" use="optional">
      <xsd:simpleType>
         <xsd:restriction base="E115String">
            <xsd:minLength value="1"/>
            <xsd:maxLength value="10"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
   <xsd:attribute name="replyCharacterSet" type="CharacterSetType" use="optional"/>
</xsd:complexType>
<xsd:complexType name="Selection">
   <xsd:all>
      <xsd:element name="nationalDestinationCode" minOccurs="0">
         <xsd:simpleType>
            <xsd:restriction base="NumericString">
               <xsd:minLength value="1"/>
               <xsd:maxLength value="14"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:element>
      <xsd:element name="commAddress" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="locality" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="subscriberName" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="forename" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="streetName" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="houseNumber" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="supplementaryData" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="subscriberMessage" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="headingInTheGuide" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="professionCode" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="countyStateOrProvince" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="subscriberDescription" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="category" minOccurs="0">
         <xsd:complexType>
            <xsd:attributeGroup ref="Categories"/>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="countryCode" minOccurs="0">
         <xsd:simpleType>
            <xsd:restriction base="NumericString">
               <xsd:minLength value="1"/>
               <xsd:maxLength value="3"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:element>
      <xsd:element name="postalCode" type="E115StringUb256" minOccurs="0"/>
      <xsd:element name="commAddressService" minOccurs="0">
```

```
            <xsd:complexType>
               <xsd:attributeGroup ref="CommAddressService"/>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="commAddressChar" minOccurs="0">
            <xsd:complexType>
               <xsd:attributeGroup ref="ReplyCommAddressChar"/>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="distance" type="E115StringUb256" minOccurs="0"/>
         <xsd:element name="additionalName" type="E115StringUb256" minOccurs="0"/>
         <xsd:element name="selectionCoordinate" minOccurs="0">
            <xsd:complexType>
               <xsd:attributeGroup ref="Coordinate"/>
            </xsd:complexType>
         </xsd:element>
      </xsd:all>
      <xsd:attribute name="commAddressType" use="optional">
         <xsd:simpleType>
            <xsd:restriction base="xsd:NCName">
               <xsd:enumeration value="e164"/>
               <xsd:enumeration value="rfc822"/>


               <xsd:enumeration value="rfc1738"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
      <xsd:attribute name="selectionLevel" use="optional" default="0">
         <xsd:simpleType>
            <xsd:restriction base="NumericString">
               <xsd:minLength value="1"/>
               <xsd:maxLength value="3"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
   <xsd:element name="e115Message" type="E115Message"/>
</xsd:schema>
```

Annex E

Message codes for Recommendation E.115

The message codes are structured as follows:

– The first digit reflects the subdivision.

– The second digit reflects the detailed code within the subdivision.

The code giving the most detail about the message shall be used where possible.

Message codes apply for both version 1 (2005) and version 2, unless exception is explicitly mentioned.

The following codes have been defined:

20 PROTOCOL ERROR

– Default code for this subdivision.

– The inquiry message is not structured according to this Recommendation.

– The inquiry message is returned when possible (version 1 (2005) only).

21 Does not respect the ASN.1 description of this Recommendation.

– E.g., wrong structure of the inquiry message.

– Mandatory fields not present in the inquiry message.

22 The syntax in a field is not in accordance with the E.115 description:

– E.g., the data specified in field "sequence number" is not a number.

23 Characters not accepted by this Recommendation.

– The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

30 SYSTEM ERROR

– Default code for this subdivision.

– The inquiry message is returned when possible (version 1 (2005) only).

– The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

31 Database not accessible.

– E.g., locality list not working.

– Database subsystem not working.

– The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

32 Congestion within the system.

– The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

33 Error due to the application.

– Please contact the replying system administrator.

40 REQUIRED SERVICE NOT SUPPORTED

– Default code for this subdivision.

– The inquiry message is returned for version 1 (2005) only.

41 Search for the subscriber within the whole country not supported.

42 Search for the subscriber within the county, state or province not supported.

43 The system only allows this search when prior agreement exists. This gives an indication to the inquiring system that this search is possible if an agreement exists.

44 Search for the subscriber without subscriber name not supported.

45 Requested reply type not supported (version 2 only).

46 Requested matching rule not supported (version 2 only).

47 Search for the street within the whole country not supported (version 2 only).

48 Search for the street within the county, state or province not supported (version 2 only).

49 Search for the heading in the guide within the whole country not supported (version 2 only).

4A Search for the heading in the guide within the county, state or province not supported (version 2 only).

4B Inquiry coordinate type not supported (version 2 only).

4C Reply coordinate type not supported (version 2 only).

50 REQUIRED SERVICE SUPPORTED BUT SEARCH IMPOSSIBLE BY LACK OF, OR INVALID, INPUT INFORMATION

– Default code for this subdivision.

– The inquiry message is returned (version 1 (2005) only).

51 Not enough information in the locality name.

52 Not enough information in the county, state or province name.

53 Not enough information in the subscriber's name.

54 Not enough information in other fields (excluding locality, county, state or province, subscriber name, street name, heading in the guide).

55 The information in the additional information field is invalid – See operator's manual.

56 Invalid characters in the locality name – See operator's manual.

57 Invalid sequence number.

– E.g., sequence number exceeds the limit of the replying system.

– Sequence number out of numerical sequence.

58 Not enough information in the street name (version 2 only).

59 Not enough information in the heading in the guide (version 2 only).

60 UNABLE TO DETERMINE THE GEOGRAPHICAL AREA IN WHICH TO SEARCH

– Default code for this subdivision.

– These codes may only be used when the called system cannot provide additional information by using the locality list.

For an example, when a locality is not found within a specified county, state or province, all selected localities within the country are displayed in the locality list. Such functionality is not required by this Recommendation, but is not rejected by it either.

61 County, state or province name does not exist in the system.

62 Locality name does not exist in the system.

63 The combination county, state or province name – locality name does not exist in the system.

64 The combination locality – street name not defined.

- The street name does not exist within the locality.
- Too many street names found within the locality (version 1 (2005) only, message code 58 in version 2).

65 Too many selections found.

- Too many counties, states or provinces or localities found.
- The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

66 The combination locality – business category not defined (version 2 only).

67 Street name does not exist in the system (version 2 only).

68 Business category does not exist in the system (version 2 only).

70 RETURNING A LOCALITY LIST

- A default code for the locality list is not appropriate as information about a complete or incomplete selection is needed.

71 The locality list is complete – no more information can be obtained.

72 The locality list is incomplete – more information can be obtained.

73 The locality list is incomplete (10th subdivision is given) – no more information can be obtained.

74 The locality list is incomplete (10th subdivision is not reached) – no more information can be obtained.

75 The locality list is probably incomplete – no more information can be obtained.

- Due to database difficulties, the replying system cannot assure that all selections are made.
- The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

NOTE – A reply containing message code of subdivision 7 with a locality list should be sent if there is no subscriber name in the inquiry or if the locality given in the inquiry is ambiguous. Every entry in the locality list will describe a locality, it will include the locality name and the province name (if supported in that country), if there is a meaningful relationship between localities and national destination codes, the national destination code will also be included. In that case, the national destination code will be entered in the field "national destination code". Whenever there is additional information that could be useful to the end user, this will be entered in the field "supplementary data".

The combination of locality name and province name (in the locality list) will be such that they can be used for an international inquiry format message, resulting in subscribers being returned.

76 List of business categories (version 1 (2005) only).

77 List of street addresses (version 1 (2005) only).

80 RETURNING A SUBSCRIBER LIST

– A default code for the subscriber list is not appropriate as information about a complete or incomplete selection is needed.

81 The subscriber list is complete – no more information can be obtained.

82 The subscriber list is incomplete – more information can be obtained.

83 The subscriber list is incomplete (the 10th subdivision is given) – no more information can be obtained.

84 The subscriber list is incomplete (the 10th subdivision is not reached) – no more information can be obtained.

85 The subscriber list is probably incomplete – no more information can be obtained.

- Due to database difficulties the replying system cannot assure that all selections are made.
- The existence of this message code must not be taken as an invitation not to fully implement this Recommendation.

90 THE SEARCH RESULTS IN NO LOCALITY – OR SUBSCRIBER SELECTION

– Default code for this subdivision.

– The inquiry message is returned (version 1 (2005) only).

91 Heading in the guide not found.

92 No subscriber information found.

93 Too many selections found – enter more selective information.

94 No locality selection found with the specified sequence number.

95 No subscriber information found with the specified sequence number.

96 Subscriber's information not available for selected geographical area.

97 No province selection found with the specified sequence number.

98 No street selection found with the specified sequence number.

99 No business category selection found with the specified sequence number.

P0 RETURNING A PROVINCE LIST

– This set of message codes is for version 2 only.

– A default code for the province list is not appropriate as information about a complete or incomplete selection is needed.

P1 The province list is complete – no more information can be obtained.

P2 The province list is incomplete – more information can be obtained.

P3 The province list is incomplete (10th subdivision is given) – no more information can be obtained.

P4 The province list is incomplete (10th subdivision is not reached) – no more information can be obtained.

P5 The province list is probably incomplete – no more information can be obtained.

S0 RETURNING A STREET LIST

– This set of message codes is for version 2 only.

– A default code for the street list is not appropriate as information about a complete or incomplete selection is needed.

S1 The street list is complete – no more information can be obtained.

S2 The street list is incomplete – more information can be obtained.

S3 The street list is incomplete (10th subdivision is given) – no more information can be obtained.

S4 The street list is incomplete (10th subdivision is not reached) – no more information can be obtained.

S5 The street list is probably incomplete – no more information can be obtained.

B0 RETURNING A BUSINESS CATEGORY LIST

– This set of message codes is for version 2 only.

– A default code for the business category list is not appropriate as information about a complete or incomplete selection is needed.

B1 The business category list is complete – no more information can be obtained.

B2 The business category list is incomplete – more information can be obtained.

B3 The business category list is incomplete (the 10th subdivision is given) – no more information can be obtained.

B4 The business category list is incomplete (the 10th subdivision is not reached) – no more information can be obtained.

B5 The business category list is probably incomplete – no more information can be obtained.

Appendix I

NACE nomenclature

I.1 About NACE

The NACE (Nomenclature générale des Activités économiques dans la Communauté Européenne – General industrial classification of economic activities within the European Community) has been accepted as the nomenclature to be used for the international DA to represent business categories.

NACE was established in order to get a common statistical classification of economic activities within the European Community.

I.2 NACE structure

NACE has the following hierarchical structure:

– A first level consisting of headings identified by an alphabetical code (sections), an intermediate level consisting of headings identified by a two-character alphabetical code (subsections).

– A second level consisting of headings identified by a two-digit numerical code (divisions).

– A third level consisting of headings identified by a three-digit numerical code (groups).

– A fourth level consisting of headings identified by a four-digit numerical code (classes).

More detailed information can be found on the official website with the complete NACE in English http://europa.eu.int/comm/competition/mergers/cases/index/nace_all.html.

I.3 NACE at work

It is recommended for service providers to implement the NACE nomenclature. This will reduce language problems for international inquiries.

To make an inquiry, the recipient's operator enters a NACE code in the **headingInTheGuide** field. The replying system may then, if required, translate the NACE code into the matching business category for the system.

NOTE – The NACE nomenclature could also be implemented by the inquiring system. A human user could enter the business category in her or his own language and the system translates that to the corresponding NACE code.

The minimum length of the code is one character (e.g., B, fishing), the maximum is 6 (e.g., DA1583, manufacture of sugar).

Subheadings should be possible according to the NACE index but you shall always get all information with the heading.

If somebody uses subentries in the database like N851 and N852 and somebody searches for N85, then all listings with N85, N851, N852 should be delivered.

If an unknown code is provided (e.g., 12345), message code 91 shall be returned (heading in the guide not found).

The idea is to recommend the business categories of the NACE list with each provider being free to adapt his database entries in more or less detail. It might not be necessary to implement the full list but only a part of it. If, and how, it is implemented should be described in the operator's manual.

I.4 Extract from NACE

Table I.1 contains an extract of the most commonly used NACE codes. It is recommended that at least these codes be supported.

Table I.1/E.115 – NACE codes for business categories

Business category name	Nearest NACE code
Airports	I62
Banks	J65
Customs offices and border crossing points	L7521
Embassies and consulates	Q99
Hospitals, clinics and medical centres (private and public)	N8511
Hotels	H551
Insurance companies	J66
Local administration	L7510
Ministries	L75
Museums	O925
Police stations	L7524
Port and harbour administration	I61
Post offices	I6411
Railway stations	I6010
Registry offices	L7510
Restaurants	H553
Schools and universities	M80
Tourist information offices	I6330
Travel agencies	I6330

Appendix II

Examples of BER encodings

II.1 Introduction

This annex provides examples of BER encoding of the DA protocol version 1 (2005) and version 2. These examples illustrate the encoding and can possibly be an implementation aid.

The BER encoding has options. Field length may be coded in two ways (explicit-length fields and indefinite-length fields) and as the DA protocol uses the SET-constructed data type, components within such a SET may be transmitted in any order and still be compliant.

An implementation should be able to cope with such variations.

II.2 Example of ASN.1 BER encoding of the DA protocol version 1 (2005)

II.2.1 Inquiry message

1010 0000 Directory message (telephone)
LENGTH

1010 0000 Telephone (inquiry)
LENGTH

0011 0000 Inquiry
LENGTH

0110 0000 Part 1
LENGTH

1000 0000 Message indicators
LENGTH
Message indicators

1000 0001 International indicators
LENGTH
International indicators

1000 0010 Originating terminal code
LENGTH
Originating terminal code

1000 0011 Date and time (optional)
LENGTH
Date and time

1000 0100 Message number (optional)
LENGTH
Message number

0110 0001 Part 2

LENGTH

1000 0000 Locality (optional)

LENGTH
Locality

1000 0001 Subscriber name (optional)
LENGTH
Subscriber name

1000 0010 Street name (optional)

LENGTH

Street name

1000 0011 House number (optional)

LENGTH
House number

1000 0100 Forename (optional)

LENGTH
Forename

1000 0101 Heading in the Guide (optional)

LENGTH
Heading in the Guide

1000 0110 Profession code (optional)

LENGTH
Profession Code

1000 0111 Additional information for a selective search (optional)

LENGTH

Additional information for a selective search

1000 1000 County, State or Province (optional)
LENGTH
County, State or Province

1000 1001 Category (optional)

LENGTH

Category

1000 1010 Sequence number (optional)

LENGTH

Sequence number

II.2.2 Reply message

1010 0000 Directory message (telephone)

LENGTH

1010 0001 Telephone (reply)

LENGTH

0011 0000 Reply

LENGTH

0110 0011 Part 1

LENGTH

1000 0000 Message indicators

LENGTH

Message indicators

1000 0001 International indicators
LENGTH
International indicators

1000 0010 Originating terminal code
LENGTH
Originating terminal code

1000 0011 Date and time (optional)
LENGTH
Date and Time

1000 0100 Message number (optional)
LENGTH
Message number

0110 0100 Part 2
LENGTH

1000 0000 Message code
LENGTH
Message code

1000 0001 Country code
LENGTH
Country code

1000 0010 Message (optional)
LENGTH
Message

1000 0011 DB Selection Count (optional)
LENGTH
DB selection count

0110 0101 Part 3 (optional)
LENGTH

0011 0001 Selection
LENGTH

1000 0000 National destination code (optional)
LENGTH
National Destination code

1000 0001 Subscriber number (optional)
LENGTH
Subscriber number

1000 0010 Locality
LENGTH
Locality

1000 0011 Subscriber name (optional)
LENGTH
Subscriber name

1000 0100 Forename (optional)
LENGTH
Forename

1000 0101 Street name (optional)
LENGTH
Street name

1000 0110 House number (optional)
LENGTH
House number

1000 0111 Supplementary data (optional)
LENGTH
Supplementary data

1000 1000 Subscriber message (optional)
LENGTH
Subscriber message

10000 1001 Heading in the Guide (optional)
LENGTH
Heading in the Guide

1000 1010 Profession code (optional)
LENGTH
Profession code

1000 1011 Additional information for a selective search (optional)
LENGTH
Additional information for a selective search

1000 1100 County, State or Province (optional)
LENGTH
County, State or Province (optional)

1000 1101 Category (optional)
LENGTH
Category

1000 1110 Subscriber description

LENGTH

Subscriber description

0011 0001 Selection

LENGTH

1000 0000 National Destination code (optional)
LENGTH
National destination code

etc.

II.3 Example of ASN.1 BER encoding of the DA protocol version 2

II.3.1 Inquiry message

1010 0000 E115Message (DirectoryMessage)

LENGTH

1010 0000 DirectoryMessage(Inquiry)

LENGTH

0011 0000 Inquiry

LENGTH

0110 0000 InquiryHeader

LENGTH

1000 0010 originatingTerminalCode

LENGTH (=0000 1000)

Originating terminal code

1000 0011 dateAndTime (optional)

LENGTH (=0000 1010)

Date and time

1000 0100 messageNumber (optional)

LENGTH (=0000 0100)

Message number

1000 0101 countryName

LENGTH (=0000 0010)

Country name

1000 0110 providerCode (optional)

LENGTH (=0000 0011)

Provider code

1000 0111 inquiryCharacterSet

LENGTH (=0000 0001)

0000 000x, where x is 0 or 1 with default 0

1000 1000 replyCharacterSet

LENGTH (=0000 0001)

1000 1001 requestedReplyType (optional)

LENGTH (=0000 0001)

0000 0xxx, where xxx is 000 to 100 with default 000

1010 1010 acceptedReplyTypes (optional)

LENGTH

1000 0000 provinceList (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 localityList (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 streetList (optional)

LENGTH (=0000 0001)

1111 1111

1000 0011 businessCategoryList (optional)

LENGTH (=0000 0001)

1111 1111

1010 1011 inquiryCoordinateType (optional)

LENGTH

1000 0000 geodeticDatum

LENGTH

Geodetic datum

1000 0001 projection

LENGTH

Projection

1000 0010 geographical

LENGTH

Geographical

1010 1100 replyCoordinateType (optional)

LENGTH

1000 0000 geodeticDatum

LENGTH

Geodetic datum

1000 0001 projection

LENGTH

Projection

1000 0010 geographical

LENGTH

Geographical

0110 0001 InquiryData

LENGTH

1000 0000 locality (optional)

LENGTH

Locality

1000 0001 subscriberName (optional)

LENGTH

Subscriber name

1000 0010 streetName (optional)

LENGTH

Street name

1000 0011 houseNumber (optional)

LENGTH

House number

1000 0100 forename (optional)

LENGTH

Forename

1000 0101 headingInTheGuide (optional)

LENGTH

Heading in the Guide

1000 0110 professionCode (optional)

LENGTH

Profession Code

1000 1000 countyStateOrProvince (optional)

LENGTH

County, State or Province

1010 1010 category (optional)

LENGTH

1000 0000 business (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 residential (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 government (optional)

LENGTH (=0000 0001)

1111 1111

1000 1011 sequenceNumber (optional)

LENGTH

Sequence number

1000 1100 postalCode (optional)

LENGTH

Postal code

1000 1101 nationalDestinationCode (optional)

LENGTH

National destination code

1000 1110 commAddress (optional)

LENGTH

Communications address

1010 1111 commAddressTypes (optional)

LENGTH

1000 0000 e164 (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 rfc822 (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 rfc1738 (optional)

LENGTH (=0000 0001)

1111 1111

1001 0000 additionalName (optional)

LENGTH

Additional name

1011 0001 commAddressService (optional)

LENGTH

1000 0000 fax (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 bpx (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 txt (optional)

LENGTH (=0000 0001)

1111 1111

1000 0011 pub (optional)

LENGTH (=0000 0001)

1111 1111

1000 0100 vid (optional)

LENGTH (=0000 0001)

1111 1111

1000 0101 pag (optional)

LENGTH (=0000 0001)

1111 1111

1000 0110 voice (optional)

LENGTH (=0000 0001)

1111 1111

1000 0111 data (optional)

LENGTH (=0000 0001)

1111 1111

1000 1000 http (optional)

LENGTH (=0000 0001)

1111 1111

1000 1001 ftp (optional)

LENGTH (=0000 0001)

1111 1111

1000 1010 eml (optional)

LENGTH (=0000 0001)

1111 1111

1000 1011 sms (optional)

LENGTH (=0000 0001)

1111 1111

1000 1100 mms (optional)

LENGTH (=0000 0001)

1111 1111

1000 1101 emg (optional)

LENGTH (=0000 0001)

1111 1111

1011 0010 commAddressCharacteristics (optional)

LENGTH

1000 0000 fnt (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 mob (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 fixed (optional)

LENGTH (=0000 0001)

1111 1111

1001 0011 geoExpansion (optional)

LENGTH

Geographical expansion

1011 0100 searchCoordinate (optional)

LENGTH

1000 0000 latitude

LENGTH

Latitude

1000 0001 longitude

LENGTH

Longitude

1001 0101 Search radius (optional)

LENGTH

Search radius

1011 0110 Matching rule (optional)

LENGTH

1000 0000 Word rotation match (optional)

LENGTH (=0000 0001)

xxxx xxxx, where each x is 0 for false and 1 for true

1000 0001 Phonetic match (optional)

LENGTH (=0000 0001)

xxxx xxxx, where each x is 0 for false and 1 for true

1000 0010 Alias match (optional)

LENGTH (=0000 0001)

xxxx xxxx, where each x is 0 for false and 1 for true

1001 0111 Maximum selection level (optional)

LENGTH

Maximum selection level

II.3.2 Reply message

1010 0000 E115Message (DirectoryMessage)

LENGTH

1010 0000 DirectoryMessage (Reply)

LENGTH

0011 0000 Reply

LENGTH

0110 0011 ReplyHeader

LENGTH

1000 0010 originatingTerminalCode

LENGTH (=0000 1000)

Originating terminal code

1000 0011 dateAndTime (optional)

LENGTH (=0000 1010)

Date and Time

1000 0100 messageNumber (optional)

LENGTH (=0000 0100)

Message number

1000 0101 messageCode

LENGTH (=0000 0010)

Message code

1000 0110 message (optional)

LENGTH

Message

1000 0111 dbSelectionCount (optional)

LENGTH

DB selection count

1000 1000 replyCharacterSet (optional)

LENGTH (= 0000 0001)

0000 000x, where x is 0 or 1

1010 1001 replyCoordinateType (optional)

LENGTH

1000 0000 geodeticDatum

LENGTH

Geodetic datum

1000 0001 projection

LENGTH

Projection

1000 0010 geographical

LENGTH

Geographical

1010 1010 searchCenter (optional)

LENGTH

1000 0000 latitude

LENGTH

Latitude

1000 0001 longitude

LENGTH

Longitude

0011 0000 selections (optional)

LENGTH

0011 0001 Selection

LENGTH

1000 0000 nationalDestinationCode (optional)

LENGTH

National Destination code

1000 0001 commAddress (optional)

LENGTH

Communications address

1000 0010 locality (optional)

LENGTH

Locality

1000 0011 subscriberName (optional)

LENGTH

Subscriber name

1000 0100 forename (optional)

LENGTH

Forename

1000 0101 streetName (optional)

LENGTH

Street name

1000 0110 houseNumber (optional)

LENGTH

House number

1000 0111 supplementaryData (optional)

LENGTH

Supplementary data

1000 1000 subscriberMessage (optional)

LENGTH

Subscriber message

10000 1001 headingInTheGuide (optional)

LENGTH

Heading in the Guide

1000 1010 professionCode (optional)

LENGTH

Profession code

1000 1100 countyStateOrProvince (optional)

LENGTH

County, State or Province

1000 1110 subscriberDescription (optional)

LENGTH

Subscriber description

1010 1111 category (optional)

LENGTH

1000 0000 business (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 residential (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 government (optional)

LENGTH (=0000 0001)

1111 1111

1001 0000 countryCode

LENGTH

Country code

1001 0001 postalCode (optional)

LENGTH

Postal code

1001 0010 commAddressType (optional)

LENGTH

0000 00xx, where xx is 00 to 10

1011 0011 Communications address service (optional)

LENGTH

1000 0000 fax (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 bpx (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 txt (optional)

LENGTH (=0000 0001)

1111 1111

1000 0011 pub (optional)

LENGTH (=0000 0001)

1111 1111

1000 0100 vid (optional)

LENGTH (=0000 0001)

1111 1111

1000 0101 pag (optional)

LENGTH (=0000 0001)

1111 1111

1000 0110 voice (optional)

LENGTH (=0000 0001)

1111 1111

1000 0111 data (optional)

LENGTH (=0000 0001)

1111 1111

1000 1000 http (optional)

LENGTH (=0000 0001)

1111 1111

1000 1001 ftp (optional)

LENGTH (=0000 0001)

1111 1111

1000 1010 eml (optional)

LENGTH (=0000 0001)

1111 1111

1000 1011 sms (optional)

LENGTH (=0000 0001)

1111 1111

1000 1100 mms (optional)

LENGTH (=0000 0001)

1111 1111

1000 1101 emg (optional)

LENGTH (=0000 0001)

1111 1111

1011 0100 commAddressChar (optional)

LENGTH

1000 0000 fnt (optional)

LENGTH (=0000 0001)

1111 1111

1000 0001 mob (optional)

LENGTH (=0000 0001)

1111 1111

1000 0010 fixed (optional)

LENGTH (=0000 0001)

1111 1111

1000 0011 prn (optional)

LENGTH (=0000 0001)

1111 1111

1000 0100 npn (optional)

LENGTH (=0000 0001)

1111 1111

1000 0101 upn (optional)

LENGTH (=0000 0001)

1111 1111

1000 0110 old (optional)

LENGTH (=0000 0001)

1111 1111

1000 0111 adv (optional)

LENGTH (=0000 0001)

1111 1111

1000 1000 nmk (optional)

LENGTH (=0000 0001)

1111 1111

1001 0101 distance (optional)

LENGTH

Distance

1001 0110 additionalName (optional)

LENGTH

Additional name

1001 0111 selectionCoordinate (optional)

LENGTH

Selection coordinate

1001 1000 selectionLevel (optional)
LENGTH
Selection level

0011 0001 Selection

LENGTH

1000 0000 National Destination code (optional)
LENGTH
National destination code

etc.

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