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Abstract

This document contains the agreed draft text of Recommendation Q.769.1 as agreed by SG11 WP2 Question 12 meeting March 1999. It is one of the series of Recommendations that forms the update and addition to the ITU-T ISUP.

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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – ISDN user
part

**Signalling System No. 7 – ISDN user part
enhancements for the support of number
portability**

ITU-T Recommendation Q.769.1

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.769.1

SIGNALLING SYSTEM No. 7 – ISDN USER PART ENHANCEMENTS FOR THE SUPPORT OF NUMBER PORTABILITY

Summary

This Recommendation specifies the relevant ISDN user part enhancements for the support of number portability in a national environment.

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Foreword

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Note

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1 Scope

In a national environment with support of number portability, the existing ISUP procedures as specified in ITU-T Recommendation Q.764 [1] apply with the modifications as specified in this Recommendation.

NOTE: ISUP formats and codes are described in Recommendation Q.763 [2].

The addressing method for number portability in a network will have an impact on existing functions and services. The impact is network and implementation dependent and outside the scope of this Recommendation.

With the introduction of the procedures for number portability as defined in this Recommendation, backwards compatibility with the ISUP according to Recommendation Q.767 is not possible.

In addition to the main text, the following Annexes are part of this Recommendation:

- Annex A describes an alternative addressing method making use of a concatenated addressing format. This addressing method may typically be useful as an intermediate solution in some networks as it may limit the impact on existing functions and services.
- Annex B describes another addressing method making use of the Separate Network Routing Number Addressing method. It may be used within the network of a service provider. This addressing method may typically be useful in some networks as it may limit the impact on existing network functions and service handling.
- Annex C describes the additional network capabilities for Query on Release that may be used within the network of a service provider. These additional capabilities may typically be useful in some networks for network efficiency reasons.
- Annex D describes the additional network capabilities for Dropback that may be used within the network of a service provider. These capabilities make use of the procedures for Pivot Routing or Redirection as specified in ITU-T Recommendation Q.730 [3]. These additional capabilities may typically be useful in some networks for network efficiency reasons.
- Annex E describes the procedures for forward transfer of number portability status information that may be used within the network of a service provider. This service logic may be used in some networks in order to minimise the number of number portability data base queries and reduce the risk of looping due to number portability data base mismatches.

The use of these Annexes is up to network operator decisions, bilateral agreement, regulatory demands and/or implementation reasons. These considerations and possible pre-conditions are outside the scope of this Recommendation.

Number portability introduces new requirements to retain full service transparency of ISDN supplementary services like Completion of Calls to Busy Subscriber (CCBS), which use non-circuit related signalling. The identified relay functions to meet these requirements are elaborated in Recommendation Q.730 [3], subclause "Relay methods for non-circuit related signalling".

2 References

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

- [1] ITU-T Recommendation Q.764 (2000): "Signalling System No. 7 - ISDN User Part Signalling Procedures".

- [2] ITU-T Recommendation Q.763 (2000): "Signalling System No. 7 - ISDN User Part Formats and Codes".
- [3] ITU-T Recommendation Q.730 (2000): "Signalling System No.7 – ISDN User Part Supplementary Services".

3 Definitions

For the purpose of this Recommendation, the following definitions apply:

Directory number: A number in the national numbering scheme that is allocated to a customer for a telephony service. Allocation of the directory number is made directly by the numbering plan authority to the customer, or indirectly when blocks of numbers are managed by service providers.

Donor exchange: The initial exchange where a number was located before ever being ported.

Donor network: The initial network where a number was located before ever being ported.

Initiating exchange: An exchange that requires and obtains the routing information for number portability.

Initiating network: A network that requires and obtains the routing information for number portability.

Network routing number: A number that is derived and used by the network to route the call towards a ported number.

Originating exchange: The exchange serving a calling end user. For most incoming international calls, the originating exchange is effectively the international gateway. For carrier selection, the first exchange of the selected carrier effectively becomes the entry to the originating network for routing purposes.

Originating network: The network serving a calling end user. For most incoming international calls, the originating network is effectively the network containing the international gateway. For carrier selection, the first exchange of the selected carrier effectively becomes the entry to the originating network for routing purposes.

Recipient exchange: The exchange where a number is located after being ported.

Recipient network: The network where a number is located after being ported.

Transit exchange: An exchange between two exchanges, e.g. between the initiating exchange and the recipient exchange.

Transit network: A network between two networks, e.g. between the initiating network and the recipient network.

Rerouting: Pivot routing or redirection as specified in [3].

4 Abbreviations

For the purpose of this Recommendation, the following abbreviations are used:

ACM	Address Complete message
ANM	Answer message
CON	Connect message
CPG	Call Progress message
DN	Directory number
IAM	Initial Address message
ISUP	ISDN User Part
NoA	Nature of Address indicator
NRN	Network routing number

QoR	Query on Release
SAM	Subsequent Address message
SDM	Subsequent Directory Number message

5 Conventions

1. The name of each element of the following classes of terms is capitalised:

- indicators,
- parameters,
- messages,
- methods / functions.

Examples: Called Party Number parameter, Initial Address message, All Call Query, Query on Release, Separate Directory Number Addressing method, Separate Network Routing Number Addressing method.

2. The definition of a parameter value is written in *italics* and is put between quotation marks.

Example: NoA value 0000011 – "*national (significant) number*".

6 Call control and signalling procedures

This section describes the call control and signalling procedures for the methods All Call Query and Onward Routing (see [4] and [5], Bibliography).

In a number portability environment, the directory number (DN) is not sufficient to route the call. There is a need to derive a network routing number (NRN) (see [4] and [5], Bibliography). Once the NRN has been determined, the routing in the network will be based on this NRN. As the NRN is always a complete address, sending of additional digits in overlap operation applies only to the directory number (DN) information. The DN is transferred along with the call to identify the called ported subscriber. The following sections describe the handling of the NRN and DN.

6.1 Separate Directory Number Addressing method

6.1.1 Handling of network routing number and directory number

The network routing number and the directory number are transferred in the Initial Address message (IAM) as follows.

The network routing number (NRN) is transferred in the Called Party Number parameter and the directory number (DN) is transferred in the Called Directory Number parameter.

The Called Party Number parameter is coded with NoA value 0000110 – "*network routing number in national (significant) number format*", and the Called Directory Number parameter is coded with NoA value 0000011 – "*national (significant) number*".

NOTE: For specific applications, the NoA values 0000011 – "*national (significant) number*" and 0000111 – "*network routing number in network specific number format*" may alternatively be chosen by certain operators for the coding of the Called Party Number parameter, possibly with additional information to maintain the number portability routing efficiency.

6.1.2 Handling of an incomplete directory number

If the complete directory number is not available, the following procedures are required:

- a) Actions at the initiating exchange

Called directory number digits received after the Initial Address message (IAM) has been sent shall be sent in Subsequent Directory Number message(s) (SDM) instead of Subsequent Address message(s) (SAM).

b) Actions at the intermediate exchange

An intermediate exchange shall transit the SDM message and shall preserve the received additional digits related to the directory number information as part of the stored IAM information. SDMs received during the circuit selection process may be included in the IAM.

Note: The storage of additional digits is required to avoid loss of digits in case an automatic repeat attempt is required, see Recommendation Q.764, subclause 2.8.1 [1].

c) Actions at the recipient exchange

The exchange that is addressed by the NRN, i.e. the node that completes the call with the directory number, shall accept additional digits received in a SDM as part of the directory number.

6.2 Other addressing methods

Instead of the addressing method according to subclause 6.1, network operators may alternatively decide to apply the Concatenated Addressing method (see Annex A) or the Separate Network Routeing Number Addressing method (see Annex B).

NOTE: Existing ISUP procedures may be applied on the interconnection interface between networks. In this case, the DN is contained in the Called Party Number parameter with NoA value 0000011 - "*national (significant) number*", although in that case no additional routeing information is transferred.

6.3 Actions required in the originating network

6.3.1 Onward Routeing

The originating network will apply the procedures as defined in Recommendation Q.764 [1].

6.3.2 All Call Query

When the initiating exchange is located in the originating network, it has to determine whether the DN is ported or not.

If the DN is not ported, the existing ISUP procedures apply without modification.

If the DN is ported, the initiating exchange shall derive the network routeing number and shall route the call towards the recipient network. The transfer of the NRN and DN shall be made according to subclause 6.1.

6.4 Actions required in the donor network

6.4.1 Onward Routeing

Since the donor network acts as the initiating network in this case, it shall determine whether the DN is ported or not.

If the DN is not ported, the existing ISUP procedures apply without modification.

If the DN is ported, the initiating exchange shall derive the network routeing number and shall route the call towards the recipient network. The transfer of the NRN and DN shall be made according to subclause 6.1.

6.4.2 All Call Query

When the initiating exchange is located in the donor network, the same procedures apply as specified in subclause 6.3.2.

6.5 Actions required in a transit network

6.5.1 Onward Routeing

With the Onward Routeing method, there is no impact on a transit network between the originating and the donor networks.

For a transit network between the donor network and the recipient network, the NRN and the DN are handled according to subclause 6.1.

6.5.2 All Call Query

When the initiating exchange is located in a transit network, the same procedures apply as specified in subclause 6.3.2.

For a transit network between the initiating network and the recipient network, the NRN and the DN are handled according to subclause 6.1.

6.6 Actions required in the recipient network

This section applies independently of the method used for number portability, e.g. Onward Routeing or All Call Query.

The recipient network handles the received NRN and DN according to subclause 6.1.

Depending on the agreement, the recipient network may find and use its own NRN, or use the NRN received. The NRN is used to reach the recipient exchange of the called ported subscriber. The recipient exchange uses the DN to identify the called ported subscriber and completes the call.

A.1 General

This Annex describes the procedures for the Concatenated Addressing method. It specifies the exceptions to clause 6 of this Recommendation which are needed for the support of the Concatenated Addressing method.

A.2 Exceptions to clause 6 of this Recommendation

To 6 Call control and signalling procedures:

No exception.

To 6.1.1 Handling of network routing number and directory number:

The text is replaced by the following:

The network routing number and directory number are transferred in the Initial Address message as follows.

The DN is contained in the Called Party Number parameter and is prefixed by some digits used as a NRN. Two alternatives for the coding of the NoA parameter field are possible:

NoA value 0000011 - "*national (significant) number*";

NoA value 0001000 - "*network routing number concatenated with called directory number*".

To 6.1.2 Handling of an incomplete directory number:

Not applicable. Overlap procedures as described in Recommendation Q.764 subclause 2.1.2 [1] apply.

To 6.2 Other addressing methods:

In this case, the Concatenated Addressing method is applied.

To 6.3 Actions required in the originating network:

To 6.3.1 Onward Routing:

No exception.

To 6.3.2 All Call Query:

No exception.

To 6.4 Actions required in the donor network:

To 6.4.1 Onward Routing:

No exception.

To 6.4.2 All Call Query:

No exception.

To 6.5 Actions required in a transit network:

To 6.5.1 Onward Routeing:

No exception.

To 6.5.2 All Call Query:

No exception.

To 6.6 Actions required in the recipient network:

No exception.

B.1 General

This Annex describes the procedures for the Separate Network Routeing Number Addressing method. It specifies the exceptions to clause 6 of this Recommendation which are needed for the support of the Separate Network Routeing Number Addressing method.

B.2 Exceptions to clause 6 of this Recommendation

To 6 Call control and signalling procedures:

No exception.

To 6.1.1 Handling of network routeing number and directory number:

The text is replaced by the following:

The network routeing number and directory number are transferred in the Initial Address message as follows.

The NRN is transferred in the Network Routeing Number parameter. The DN is transferred in the Called Party Number parameter with NoA value 0000011 - "*national (significant) number*".

To 6.1.2 Handling of an incomplete directory number:

Not applicable, the text is replaced by the following:

Overlap procedures as described in Recommendation Q.764 subclause 2.1.2 [1] apply with the following exception.

The routeing is performed based on the contents of the Network Routeing Number parameter. The digits in the SAMs are not relevant for routeing the call, but relate only to the DN. The SAMs have to be processed accordingly.

To 6.2 Other addressing methods:

In this case, the Separate Network Routeing Number Addressing method is applied.

To 6.3 Actions required in the originating network:

To 6.3.1 Onward Routeing:

No exception.

To 6.3.2 All Call Query:

No exception.

To 6.4 Actions required in the donor network:

To 6.4.1 Onward Routeing:

No exception.

To 6.4.2 All Call Query:

No exception.

To 6.5 Actions required in a transit network:

To 6.5.1 Onward Routeing:

No exception.

To 6.5.2 All Call Query:

No exception.

To 6.6 Actions required in the recipient network:

No exception.

C.1 General

This Annex describes the procedures for the support of Query on Release.

NOTE: Since this number portability method may result in an increased number of Release messages from specific destinations (and in particular Release messages before answer), measures may be necessary to avoid possible blocking of circuits and possible faulty generation of alarms as a result of the deployed network management functionality.

C.2 Procedures for QoR with the forward and the backward indications

This procedure requires the use of optional forward information. The procedure provides a general mechanism that can be used by an exchange that decides that the call should be released because the called number is ported out. If the QoR Capability parameter is present in the IAM, such an exchange can invoke the QoR mechanism to request a preceding exchange, involved in the call, to route that call to the recipient network. If none of the preceding nodes support QoR (i.e. the QoR Capability parameter is not received), then this exchange shall forward the call on to the new called number (e.g. using Onward Routeing as a fall back method).

General interactions with supplementary services are for further study.

C.2.1 Normal procedures

C.2.1.1 Originating exchange

An originating exchange that wishes to offer to perform the QoR function shall store the sent IAM information (and the SAM information, if any) and shall send the QoR Capability parameter in the IAM with a parameter compatibility information. The IAM information (and the SAM information, if any) must be retained until:

- the ACM message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Event indicator (Event Information parameter) set to "*alerting*", or
- the CON message, or
- the ANM message,

is received.

C.2.1.2 Intermediate exchange

The intermediate exchange with QoR capability (capable to perform the query) shall store the received IAM (and the SAM information, if any) and shall pass unchanged the QoR Capability parameter along with parameter compatibility information to the subsequent exchange.

An intermediate exchange may also be the first exchange to indicate that QoR is possible, in which case it performs the actions described for the originating exchange in subclause C.2.1.1.

The IAM information (and the SAM information, if any) must be retained until:

- the ACM message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Event indicator (Event Information parameter) set to "*alerting*", or
- the CON message, or
- the ANM message,

is received.

The intermediate exchange with no QoR capability (it is not capable to perform the query but it may know about the QoR Capability parameter) shall pass the QoR Capability parameter unchanged along with parameter compatibility information to the subsequent exchange either because it has the knowledge of the QoR Capability parameter or through the normal compatibility procedures.

C.2.1.3 Gateway exchange

A gateway exchange shall discard the QoR Capability parameter either because it has the knowledge of this parameter or through the normal compatibility procedures.

C.2.1.4 Donor exchange

An exchange which determines that a called number is ported out and which wishes to invoke the QoR procedure shall check the presence of the QoR Capability parameter to determine whether QoR is possible for the current call. If QoR is possible, it shall release the call, using the cause value #14 (QoR: ported number).

C.2.1.5 Exchange receiving a Release message with the QoR cause value

The actions at an exchange having the QoR capability and receiving a Release message with the cause value #14 (QoR: ported number) will depend on whether the IAM received from the prior exchange, if any, had included a QoR Capability parameter and on the service logic at that exchange as follows:

1. If a prior exchange had the QoR capability and the service logic determines that a prior exchange should perform the query, then the Release message is passed back unchanged.
2. If
 - the service logic determines that this exchange should perform the query, or
 - there is no exchange with the QoR capability, or
 - there is no prior exchange,

then the exchange (having the QoR capability) should perform the query to the database and progress the call.

C.2.2 Exceptional procedures

If a Release message with the cause value #14 (QoR: ported number) is received in the originating exchange and that exchange had not sent the QoR Capability parameter in the IAM, the call shall be released with cause value #31 (normal, unspecified).

C.3 Procedures for QoR with the backward indication only

These procedures apply within networks where at least one exchange always exists with QoR capability. They provide a general mechanism that can be used by an exchange that decides that the call should be released because the called number is ported out. Such an exchange can invoke the QoR mechanism to request a preceding exchange involved in the call to route that call to the recipient network.

General interactions with supplementary services are for further study.

C.3.1 Normal procedures

C.3.1.1 Originating exchange

An originating exchange that wishes to offer to perform the QoR function shall store the sent IAM information (and the SAM information, if any).

The IAM information (and the SAM information, if any) must be retained until:

- the ACM message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Event indicator (Event Information parameter) set to "*alerting*", or
- the CON message, or
- the ANM message,

is received.

C.3.1.2 Intermediate exchange

The intermediate exchange that wishes to offer to perform the QoR function shall store the received IAM (and the SAM information, if any).

The IAM information (and the SAM information, if any) must be retained until:

- the ACM message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Called Party's Status indicator (Backward Call Indicators parameter) set to "*subscriber free*", or
- the CPG message with a Event indicator (Event Information parameter) set to "*alerting*", or
- the CON message, or
- the ANM message,

is received.

C.3.1.3 Donor exchange

An exchange which determines that a called number is ported out and wishes to invoke the QoR procedure shall release the call, using the cause value #14 (QoR: ported number).

C.3.1.4 Exchange receiving a Release message with the QoR cause value

The actions at an exchange receiving a Release message with the cause value #14 (QoR: ported number) will depend on the service logic at that exchange as follows:

1. If the service logic determines that a prior exchange should perform the query, then the Release message is passed back unchanged.
2. If
 - the service logic determines that this exchange should perform the query, or
 - there is no prior exchange,

then the exchange should perform the query to the database and progress the call.

C.3.2 Exceptional procedures

If a Release message with cause value #14 (QoR: ported number) is received in an exchange which is not capable to perform the query, and there is no prior exchange, then the call shall be released with cause value #31 (normal, unspecified).

D.1 General

This Annex describes the procedures for the support of the Dropback method.

These procedures make use of the Pivot Routing mechanism or Redirection mechanism as specified in Recommendation Q.730 [3]. Which mechanism is used is left to the network operator.

NOTE: Since this number portability method may result in an increased number of Release messages from specific destinations (and in particular Release messages before answer), measures may be necessary to avoid possible blocking of circuits and possible faulty generation of alarms as result of the deployed network management functionality.

D.2 Actions required in the networks involved in the first leg

This section describes the behaviour of the networks involved in the first leg, i.e. the leg from the originating network to and including the donor network.

D.2.1 Actions required in the originating network

The originating network will apply the procedures as in Recommendation Q.764 [1].

An originating network that offers to perform the rerouting function (i.e. Pivot Routing or Redirection function) shall send the appropriate parameter(s) in the IAM according to Recommendation Q.730 [3]. The originating network shall include in the IAM the Pivot Routing (or Redirect) Forward Information parameter with Performing Pivot (or Redirect) indicator with the appropriate Performing Pivot (or Redirect) Reason value(s) (e.g. "service provider portability") and Pivot (or Redirect) Possible indicator value(s).

D.2.2 Actions required in the transit network

The transit network in the first leg will apply the procedures as in Recommendation Q.764 [1].

A transit network may also be the first network to indicate that a rerouting function is possible (or is possible for a particular reason), in which case it performs the actions described for the originating network in subclause D.2.1.

D.2.3 Actions required in the donor network

Since the donor network acts as the initiating network for Dropback, it shall determine whether the directory number (DN) is ported or not.

If the result is that the DN is not ported, the existing ISUP procedures apply without modification.

If the result is that the DN has been ported, the initiating network shall derive the network routing number and invoke the Dropback procedure.

The network routing number (NRN) shall be sent back to the preceding network by using the Facility message (Pivot Routing method) or the Release message (Redirection method). The invoking reason for rerouting information (with value indicating the reason for the Dropback, e.g. "service provider portability") shall be returned within the backward message.

The network routing number (NRN) is transferred backward in the Redirection Number parameter.

The Redirection Number parameter is coded with NoA value 0000110 - "*network routeing number in national (significant) number format*".

NOTE: For specific applications the NoA values 0000011 - "*national (significant) number*" and 0000111 - "*network routeing number in network specific number format*" may be chosen by certain operators for the coding of the Redirection Number parameter, possibly with additional information to maintain the number portability routeing efficiency.

If the preceding network(s) have not offered to perform the rerouteing function, the action required in the donor network is the same as described in subclause 6.4.1.

D.3 Actions required in the networks involved in the second leg

This section describes the behaviour of the networks involved in the second leg, i.e. the leg from the donor network to and including the rerouteing network (i.e. the network which performs the Pivot Routeing or redirects the call as specified in Recommendation Q.730 [3]).

D.3.1 Actions required in the transit network

If the transit network is not the rerouteing network, it will apply the actions as described for intermediate exchanges in Recommendation Q.730 [3].

D.3.2 Actions required in the rerouteing network

The rerouteing network will apply a rerouteing procedure as specified in Recommendation Q.730 [3]. The IAM toward the recipient network will contain the NRN as received from the donor network and the DN as stored in rerouteing network.

D.4 Actions required in the networks involved in the third leg

This section describes the behaviour of the networks involved in the third leg, i.e. the leg from the rerouteing network to and including the recipient network.

D.4.1 Actions required in a transit network

For a transit network between the rerouteing network and the recipient network, the NRN and DN are handled according to clause 6.

D.4.2 Actions required in the recipient network

The actions required in the recipient network are specified in subclause 6.6.

E.1 General

This Annex describes the procedures for the support of forward transfer of number portability status information in addition to the call control and signalling procedures as defined in clause 6 of this Recommendation. These procedures provide a mechanism that may be used to signal an indication as to whether the number portability status of the called number has been determined. This indication may be included for both ported and non-porting numbers.

NOTE: Support of all or part of these procedures for the support of forward transfer of number portability status information depends on the service logic of each exchange in the network.

E.2 Normal procedures

E.2.1 Actions required at an initiating exchange

The following procedures support the handling of number portability status information on determination by an initiating exchange as to whether a call is ported or not:

- 1) If the DN is determined not to be ported, a Number Portability Forward Information parameter shall be sent in the IAM with the Number Portability Status indicator set to "*number portability query done for called number, non-porting called subscriber*".
- 2) If the DN is determined to be ported, a Number Portability Forward Information parameter shall be sent in the IAM with the Number Portability Status indicator set to "*number portability query done for called number, porting called subscriber*".

The following procedures support the handling of the Number Portability Status indicator on receipt of a Number Portability Forward Information parameter by a subsequent initiating exchange:

- 1) If the value carried in the Number Portability Status indicator is either "*no indication*" or "*number portability query not done for called number*", then the exchange shall determine whether the DN is ported or not.
 - 2) If the value carried in the Number Portability Status indicator is either "*number portability query done for called number, non-porting called subscriber*" or "*number portability query done for called number, porting called subscriber*", then the exchange may determine again whether the DN is ported or not, depending on the service logic of the exchange.
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E.3 Exceptional procedures

If an IAM is received in an initiating exchange with a Number Portability Status indicator with the value "*number portability query done for called number, porting called subscriber*" but without a network routing number, then the exchange shall determine whether the DN is ported or not.

Bibliography

The following documents contain background information.

- [4] ITU-T Supplement to the Q-Series of Recommendations: "Capability Set 1 - Portable Number Call Control for Service Provider Portability".
 - [5] ITU-T Supplement to the Q-Series of Recommendations: "Scope and Number Portability Capability Set 1 Architecture".
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