International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
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Q.3905

(02/2016)

SERIES Q: SWITCHING AND SIGNALLING

Testing specifications – Testing specifications for next generation networks

Conformance test plan for number portability requirements defined by ITU-T Q-Suppl.4

Recommendation ITU-T Q.3905

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Recommendation ITU-T Q.3905

Conformance test plan for number portability requirements defined by ITU-T Q-Suppl.4

Summary

Recommendation ITU-T Q.3905 describes the test specifications for compliance testing against ITU-T Q-Suppl.4 *"Number portability – Capability set 1 requirements for service provider portability (All call query and Onward routing)"*. There are mandatory and optional test suites which can be used for testing of:

– different network scenarios of number portability (the onward routing and all call query);

– signaling requirements for establishing the number portability;

– interconnection among providers and call routing between ported and non-ported end-users.

Additionally, this Recommendation gives the operational procedures for organizing a particular test event.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Q.3905	2016-02-13	11	11.1002/1000/12700

Keywords

Call query, ITU-T E.164, number portability, numbering plan, onward routing, testing.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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Conformance test plan for number portability requirements defined by ITU-T Q-Suppl.4

1 Scope

This Recommendation describes conformance test plan for number portability requirements defined by ITU-T Q-series Recommendations – Supplement 4. The conformance test plan for number portability includes test configurations, network scenarios and test cases to verify conformance number portability solutions against requirements defined by ITU-T Q-series Recommendations – Supplement 4.

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; 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.

[ITU-T Q.3933] ITU-T Recommendation Q.3933 (2015), *Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined in [b-ITU-T Q-Suppl.4]:

3.1.1 address: A string or combination of decimal digits, symbols and additional information which identifies the specific termination point(s) of connection in a public network(s) or, where applicable, in interconnected private network(s).

3.1.2 end user's number: The ITU-T E.164 number used by the calling party to establish a call to the end user. This number is also used for presentation services like calling line identification (CLI) and connected line identification presentation (COLP).

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

3.1.4 donor service provider: The service provider from whom the number was initially ported.

3.1.5 originating network: The network serving a calling end user.

3.1.6 portable number: An entire E.164 number identified by an appropriate authority which is subject to number portability.

3.1.7 ported number: An end user's E.164 number that has been subject to number portability.

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

3.1.9 recipient service provider: The service provider to whom the number is ported.

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

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

3.1.12 originating network: The network serving a calling end user.

3.1.13 transit network(s): A network between two networks.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ACQ	All Call Query
BS	Base Station
CCS	Common Channel Signaling
CdPN	Unchanged Called Party Number
CLI	Calling Line Identification
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	Connected Line Identification Presentation
COLR	Connected Line Identification Restriction
DB	Database
DDI	Direct Dial-in
DLE	Destination Local Exchange
HLR	Home Location Register
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
IN	Intelligent Network
MOS-a	Mean Opinion Score-audio
MSC	Mobile Switching Centre
MSN	Multiple Subscriber Number
NP	Number Portability
NPCDB	Number Portability Central Database
NPDB	Number Portability Database
NPLDB	Number Portability Local Database
NP ID	NP Indicator
OLE	Originating Local Exchange
OR	Onward Routing
POI	Point of Interconnection
PSTN	Public Switched Telephone Network

REX	Recipient Exchange
RNID	Recipient Network ID
SCP	Service Control Point
SMS	Short Message Service
SMSC	Short Message Center
SMS-GW	Short Message Service Gateway
SRF	Signaling Relay Function
SSP	Service Switching Point
TS	Transit Exchange
QoS	Quality of Service

5 Conventions

None.

6 Network Scenarios

[b-ITU-T Q-Suppl.4] describes three network service scenarios for implementing number portability. In accordance with the functionality, there are two groups of service scenarios:

– The first group is based on the method "all call query";

– The second is based on the method "onward routing".

The first scenario deals with the originating network/exchange which is not connected directly to number portability database (NPDB). In this case, the originating network/exchange forwards a request to the initiating network/exchange to obtain routing information.

The second scenario is based on the fact that the initiating network/exchange also plays the role of the originating network/exchange of the calling subscriber. In this scenario, the request for routing information has to be sent to the number portability central database (NPCDB) through the donor network/exchange.

In the third scenario donor network/exchange acts as an initiating network/exchange and requests the routing information in their number portability local database (NPLDB).

The first and second scenarios belong to the first group which is related to "all call query", while the third scenario belongs to the second group which is related to "onward routing".

Accordingly, the signalling transfer for the methods "all call query" and "onward routing" are shown in Figures 6-1 and 6-2 accordingly [b-ITU-T E.164 Suppl.2].

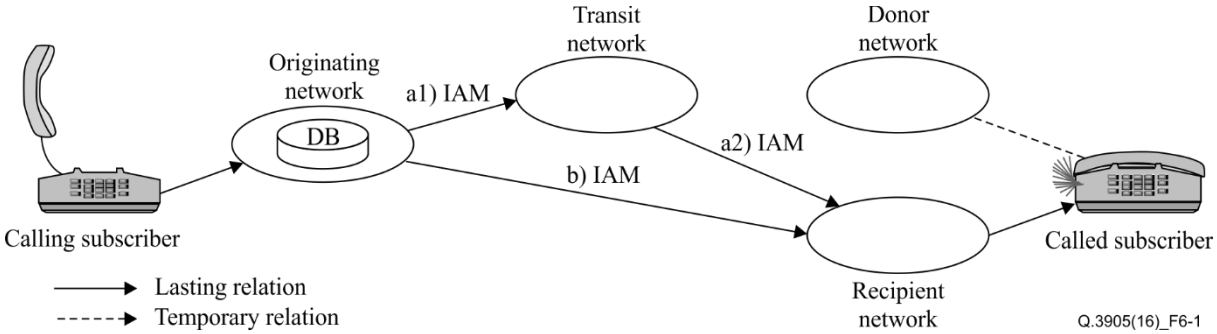

Figure 6-1 – The signalling transfer for the method "all call query"

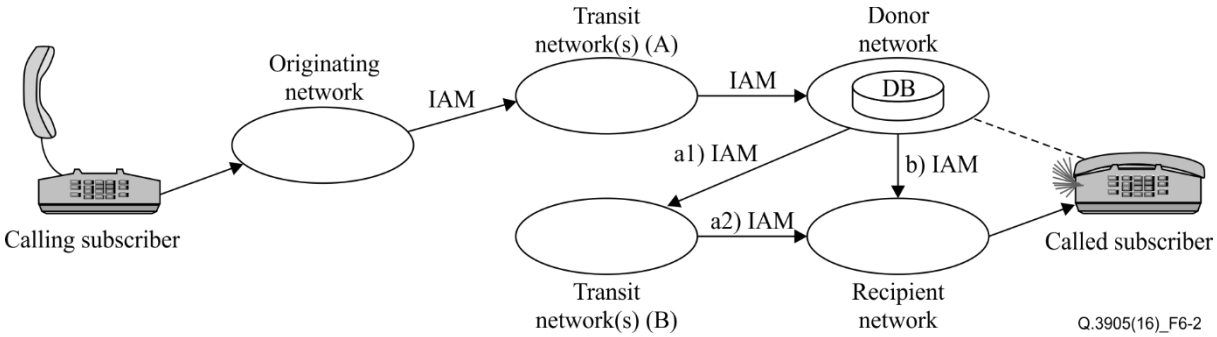

Figure 6-2 – The signalling transfer for the method "onward routing"

This test specification shows the principle used to test all service scenarios mentioned above.

7 Signalling requirements and conformance test cases

This clause provides a list of requirements and relevant test specifications for number portability defined by [b-ITU-T Q-Suppl.4].

Table 1 – List of requirements and relevant testing specifications for implementing number portability

Category	Ref. ITU-T Q-Sup.4 (clause 8, pp. 12-13)	Description of requirement (except from [b-ITU-T Q-Suppl.4])	#Test case	M/O
LNP	R-1	The signaling mechanisms that support number portability should not place any restrictions on the PSTN and ISDN services, including basic, supplementary and non-circuit-related based services	8.01	O
MNP/LNP	R-2	Number portability solutions shall allow that transit network(s) be used between originating and donor/initiating networks	8.02	M
MNP/LNP	R-3	Number portability solutions shall allow that transit network(s) be used between donor/initiating and recipient networks		
MNP/LNP	R-4	Number portability solutions shall not interfere with carrier selection	8.03	O
MNP/LNP	R-5	Interoperability of various methods must be provided e.g., the signalling must be capable of providing interworking between onward routing and other methods	8.04	M
MNP/LNP	R-6	NP should not result in the looping of calls or messages	8.05	M
MNP/LNP	R-7	Outgoing international calls or messages shall be unaffected	8.06	O
MNP/LNP	R-8	It shall be possible to signal an indication that the NP status, if available, of the portable number	8.07	O

Table 1 – List of requirements and relevant testing specifications for implementing number portability

Category	Ref. ITU-T Q-Sup.4 (clause 8, pp. 12-13)	Description of requirement (except from [b-ITU-T Q-Suppl.4])	#Test case	M/O
		has been determined. The indication may be included for either ported or non-ported numbers		
MNP/LNP	R-9	Only the E.164 number (not including prefixes, etc.) should be considered eligible to be ported	8.08	M
MNP/LNP	R-10	The entire E.164 number and not only part of it should be ported		M
LNP	R-11	Single numbers within a MSN can only be ported if a different access is provided to the ported number	8.09	O
MNP/LNP	R-12	Groups of contiguous numbers (e.g., DDI/multiline groups) can be ported	8.10	M
MNP/LNP	R-13	Porting of single numbers within a DDI range is not allowed		M
MNP/LNP	R-14	The privacy of the user which has ported his/her number should be guaranteed. That means that the calling/called party should not be informed that the called/calling party has ported his number	8.11	M
MNP/LNP	R-15	Number portability should not affect the dialing procedures for calls incoming to the ported number	8.12	M
MNP/LNP	R-16	The dialing procedures for calls outgoing from the ported customer should be the same as those of non-ported customers served by the same service provider	8.13	M
MNP/LNP	R-17	Introducing service provider portability must not adversely affect conformance with national or international propagation and echo standards	8.14	O
MNP/LNP	R-18	Calling line identification presentation (CLIP) supplementary service and calling line identification restriction (CLIR) supplementary service shall work in the same way as for subscribers not porting the number. For the CLIP supplementary service, if the call is originated by a calling user which has been ported, the calling line identification is the ported number. This is valid for both PSTN and ISDN subscribers	8.15	O
MNP/LNP	R-19	Connected Line Identification Presentation (COLP) supplementary service and Connected Line Identification Restriction (COLR) supplementary service shall work in the same way as for subscribers not porting the number. For the COLP supplementary service, if the called user's number has been ported, the	8.16	O

Table 1 – List of requirements and relevant testing specifications for implementing number portability

Category	Ref. ITU-T Q-Sup.4 (clause 8, pp. 12-13)	Description of requirement (except from [b-ITU-T Q-Suppl.4])	#Test case	M/O
		connected line identity presented to the calling user is the ported number. This is valid for both PSTN and ISDN subscribers		
MNP/LNP	R-20	Calls from a ported number to the emergency services should be supported by the same functionality as calls from non-ported numbers to the emergency services	8.17	M
LNP	R-21	Variable number length must be supported	8.18	O
LNP	R-22	Overlap signalling must be supported before and after obtaining the routing number	8.19	O
MNP/LNP	R-23	The redirection counter, used for the diversion services, must not be stepped at redirection by a number portability procedure	8.20	O
MNP/LNP	R-24	There shall be transparent support for NP at transit nodes		M
MNP/LNP	R-25	It shall be possible to transfer both an unchanged called party number (CdPN) and a routing number (RN) unambiguously	8.21	M
MNP/LNP	R-26	It shall be possible to indicate one or all of the following destinations with the routing number (RN): i) Recipient network ID (RNID) and/or; ii) point of interconnection (POI) and/or; iii) recipient exchange (REX). (NOTE – This list is not exhaustive.)	8.22	O
MNP/LNP	R-27	An indication in the forward direction to indicate a call to a ported number	8.23	M
LNP	R-28	In an environment of number portability, calls from ported numbers must convey both logical and physical calling party information	8.24	O
MNP/LNP	R-29	RN need not be in E.164 format	8.25	O
MNP/LNP	R-30	For incoming international calls, the incoming gateway in the network should be considered as the originating network for number portability	8.26	O
MNP/LNP	R-31	The number used to route the call is constructed as one of the following: i) Concatenated address = routing number + DN (as a single piece of information); ii) separated address = routing number and DN (as two separate pieces of information); iii) DN only.	8.27	M

Table 1 – List of requirements and relevant testing specifications for implementing number portability

Category	Ref. ITU-T Q-Sup.4 (clause 8, pp. 12-13)	Description of requirement (except from [b-ITU-T Q-Suppl.4])	#Test case	M/O
LNP	R-32	SCCP addressing based on RN for the called party should be supported	8.28	O
MNP/LNP	R-33	The sum total of the networks involved in addressing and routing non-circuit-related messages pertaining to a ported number shall be able to detect that the number has been ported and drive the identity of the appropriate destination of the message. The division of responsibilities of this among the networks depends on the architecture chosen	8.29	O
MNP/LNP	R-34	Number portability solutions should be backward compatible with nodes and services not updated for NP	8.30	M
NOTE 1 – M: mandatory tests, O: optional tests, R: requirements which are defined by [b-ITU-T Q-Suppl.4]. NOTE 2 – For simplifying and unification of testing procedures below, it is proposed to use the term "NPDB" which specifies number portability database in general.				

8 Test cases for the exchange of signalling information

This clause presents the test cases which describe a signal information exchange between an operator-recipient network/exchange, an operator-donor network/exchange and a NPDB for two methods of number portability – "all call query" and "onward routing".

The signalling information in this case includes the information of the subscriber's number, information of number porting, the routing information and indication of the subscriber party number, received from a NPDB.

During the provision of all tests, the transport of voice and data must be analysed. The compliance with quality of service (QoS) key performance indicators (KPIs) e.g., [ITU-T Q.3933] must be ensured according to the national requirements or standards.

NOTE – The following test cases basically describe the testing scenario for MNP services. However these cases are also possible to be used for the testing of LNP services.

----------**Test case # 8.01**----------

Title: Influence of signalling exchange mechanisms on public switched telephone network (PSTN) and integrated services digital network (ISDN) services

"The signalling mechanisms that support number portability, should not place any restrictions on the PSTN and ISDN services, including: basic, supplementary and non-circuit-related based services".

This is an optional test suite which is out of the scope of this Recommendation.

----------**End of the test**----------

----------Test case # 8.02----------

Title: Transit networks and exchanges scenarios

Keywords: NPDB, transit node/exchange, call routing.

Purpose:

Verify the various types of transit networks/exchanges for NP.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The testing model of the network contains two network scenarios:

1) in the first scenario the transit networks/exchanges are not used between an originating network/exchange and the operator-donor's network/exchange. Also, they are not used between an initiating network/exchange and the operator-recipient's. In this regard, the routing of the voice-call from a calling party to the called party is established directly between customers;
2) in the second scenario the transit networks/exchanges are used between an originating network/exchange and the operator-donor's network/exchange. Also, transit networks/exchanges are used between an initiating network/exchange and the operator-recipient's network/exchange. In this regard, the routing of the voice-call from a calling party to the called party is established through the transit networks/exchanges.

Test set-up:

The network configurations for these scenarios are presented in Figures 8-1 and 8-2 (the path of transmission of a voice-call is highlighted in green for method "all call query" and blue for method "onward routing"). Green and blue colours highlight the traffic ways in case of using the methods "all call query" and "onward routing". The route of SMS transmission is also available for the above methods.

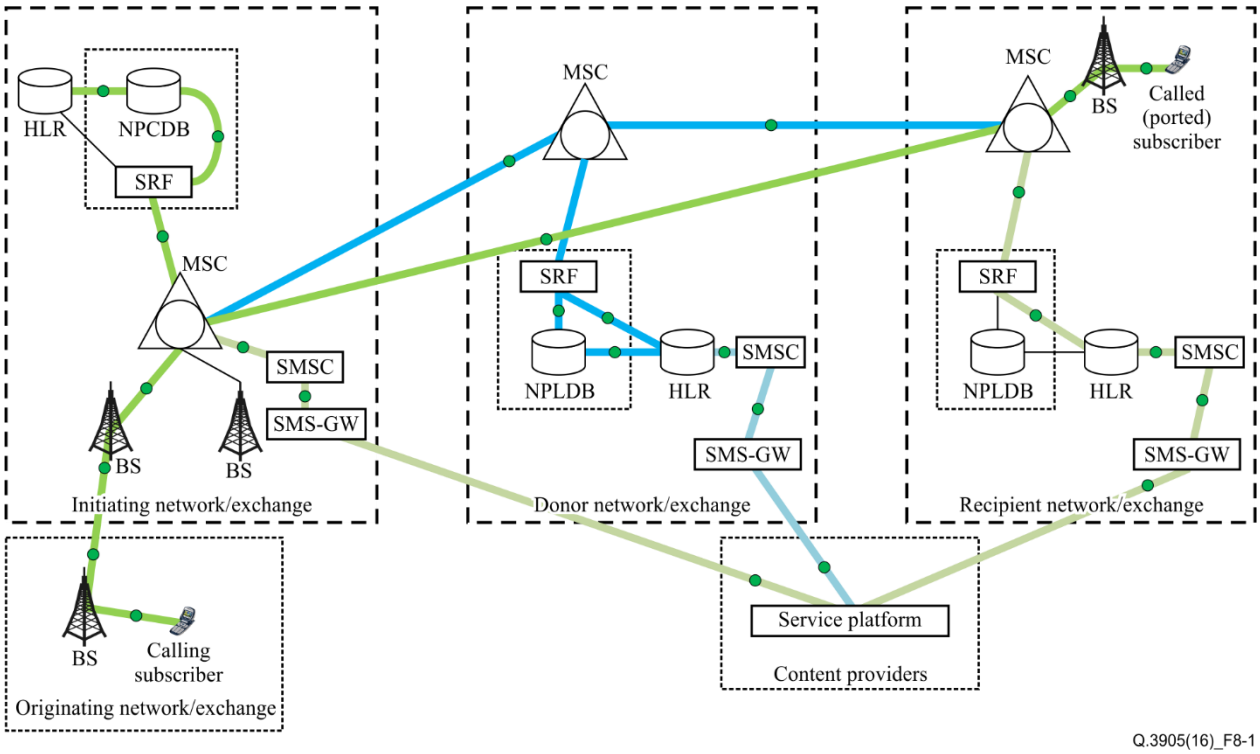

Figure 8-1 – Network configuration for the first scenario of the test case 8.02

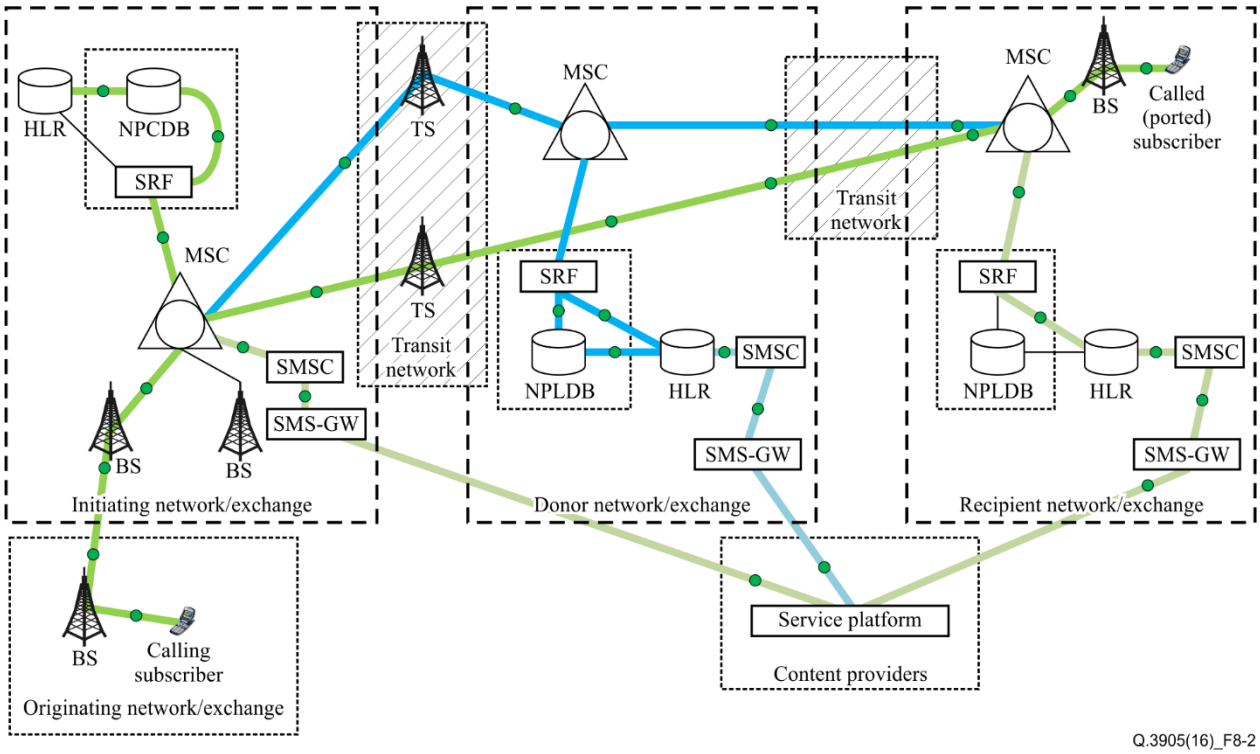

Figure 8-2 – Network configuration for the second scenario of the test case 8.02

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) the request for establishing of a voice-call connection between calling and called party has to be sent from the originating network to the operator recipient;
2) the traffic generated between initiating network/exchange and the operator-recipient's network/exchange should be captured by the traffic analyser. The traffic analyser should be allowed to capture the signalling exchange between an initiating network/exchange and a NPDB-side. Among others, the information should include the E.164 number and optionally its status (ported or not-ported E.164 number);
3) establish a voice-call between subscribers of an originating network and the operator-recipient's network;
4) exchange messages (e.g., SMS/MMS) between subscribers of an originating network and the operator-recipient's network;
5) perform measurements of signalling traffic between the originating network/exchange and the operator-donor's network/exchange (repeat steps 1-4);
6) perform testing for the second scenario (repeat steps 1-5).

Pass/fail criteria:

The test can be considered successful if the connection between subscribers was established.

The test is considered failed if the procedures mentioned above were not successfully carried out.

----------**End of the test**----------

----------**Test case # 8.03**----------

Title: Number portability solutions shall not interfere with carrier selection

The carrier selection should not influence the establishment of voice-call connection in general.

This is an optional test suite which is out of the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.04**----------

Title: Compatibility between various methods of number portability

Keywords: onward routing, all call query, the indicator of the status of number porting.

Purpose:

Checking the compatibility of various methods of number portability.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

Network configuration for emulating methods of "onward routing" and "all call query".

Test set-up:

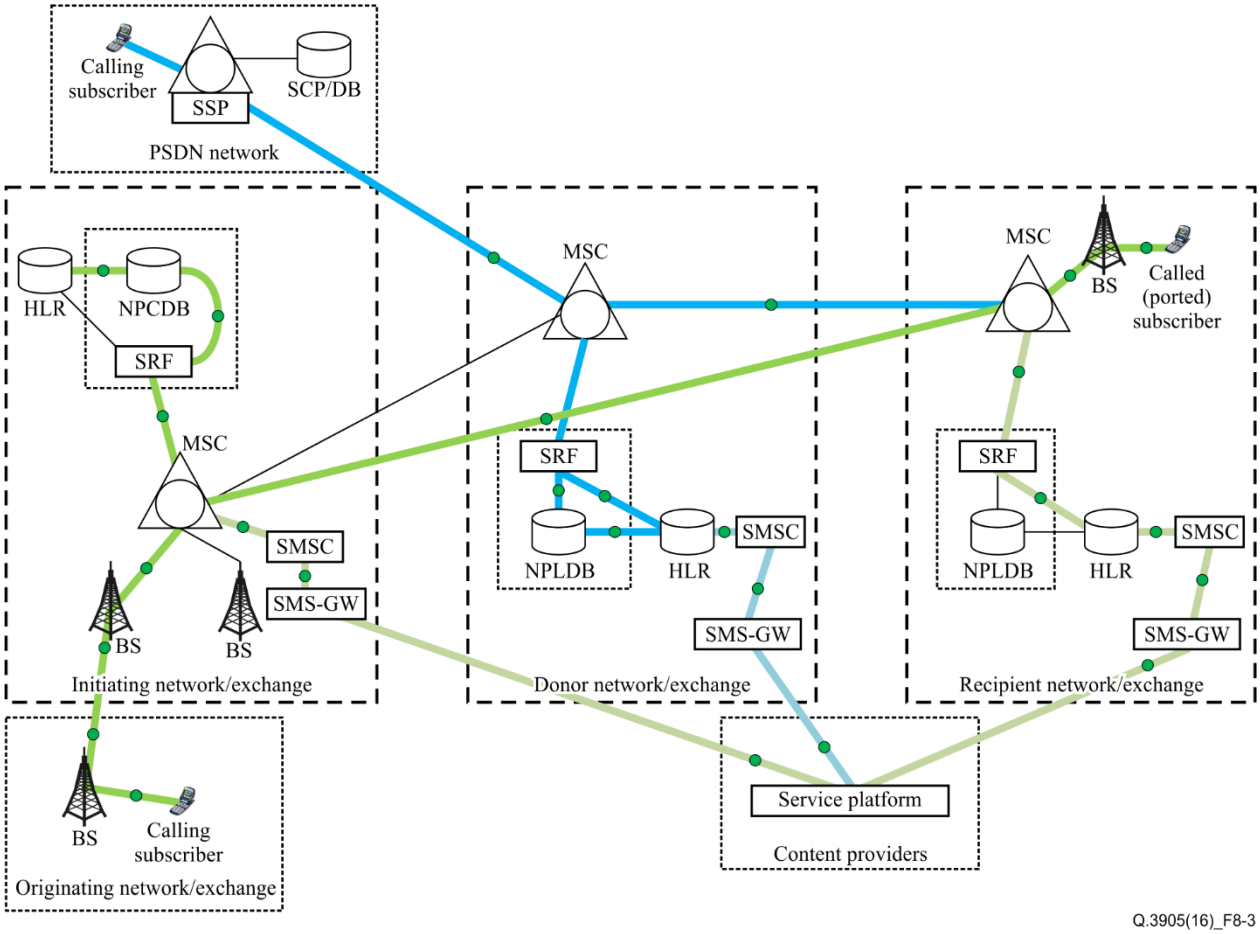

Figure 8-3 – Network configuration for the test case 8.04

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between calling and called party for the methods "onward routing" and "all call query";

   NOTE – The voice call to the called party (the ported subscriber) for the method "onward routing" should be sent from a fixed-line telephony network and/or a network of a foreign state. The voice call to the called party (the ported subscriber) for the method "all call query" should be sent from the calling party which is served in the same region as the called party (ported number);

2) all responses received from NPLDB of the operator-donor for the method "onward routing" should be monitored by the traffic analyser. These responses should contain the routing information about the operator-recipient's network and optional the indicator of the porting number status;

3) all responses received from NPCDB for the method "all call query" should be monitored by the traffic analyser. These responses should contain the routing information about the operator-recipient's network and optionally, the indicator of the porting number status;

4) after collecting all data received from steps 2-3, the data should be analysed (syntaxes of NPDB for the methods "onward routing" and "all call query");

5) check the information contained in the responses during the establishment of the connection between the calling and called party user for two types of NPDB (NPLDB and NPCDB).

Pass/fail criteria:

The test can be considered successful if the interaction between NPLDB and NPCDB for the methods "onward routing" and "all call query" was possible.

The test is considered failed if the response's syntax received from NPDB was not accepted by another NPDB.

----------**End of the test**----------

----------**Test case # 8.05**----------

Title: Influence of the call looping to the number portability solution.

Keywords: Call looping, ported number, NPDB.

Purpose:

1) verify that in absence of looping the voice call establishment or the transfer of messages based on NP is successful;
2) verify that with looping the voice call establishment or the transfer of messages based on NP is successful.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

Ported and non-ported number subscriber should be available.

Test set-up:

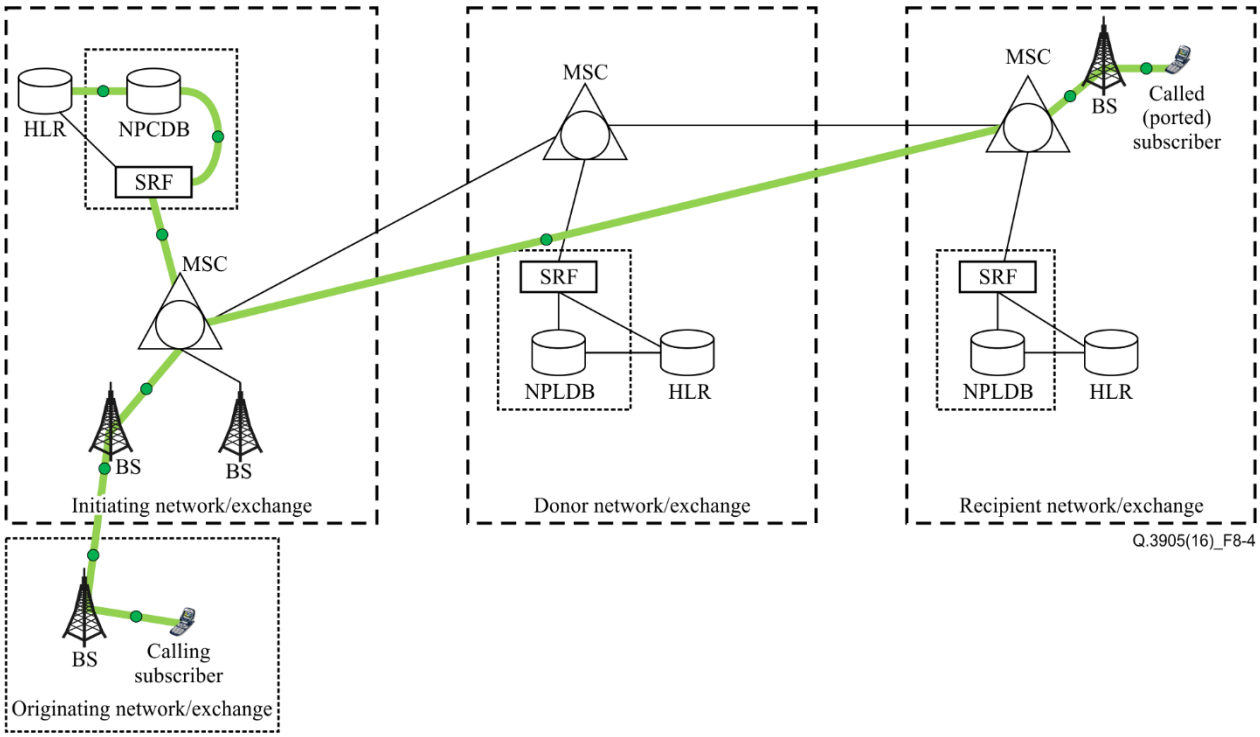

Figure 8-4 – Network configuration for test case 8.05

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) in the first step, the request for establishing of a connection between calling and called party (a test call/message) has to be sent (in this case called party number is the ported number);
2) the traffic of the request should be analysed by the traffic analyser (between NPDB and calling user). It is considered that all calls are made with the same method "all call query";
3) analyse the response from step 2 (response of NPDB) which contains the indicator of the status and the routing number of the operator-recipient;
4) based on the response establish a connection to the served user and analyse the signalling information;
5) checking the establishment with looping Steps 1-4 should be repeated with looping on the calling party side. The looping is based on a wrong data base routing information. The call shall be routed to a non-existing called party user;
6) repeat steps 1-5 for the case when the ported user is a fixed line user.

Pass/fail criteria:

The test can be considered successful if in the case of call looping the call was released.

The test is considered failed if the tests described above were not successful.

----------**End of the test**----------

----------**Test case # 8.06**----------

Title: Outgoing international calls

Keywords: Verifying the influence of number portability on outgoing international calls.

Purpose:

Verifying the influence of number portability on outgoing international calls.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

In this test case the ported number belongs to another country.

Test set-up:

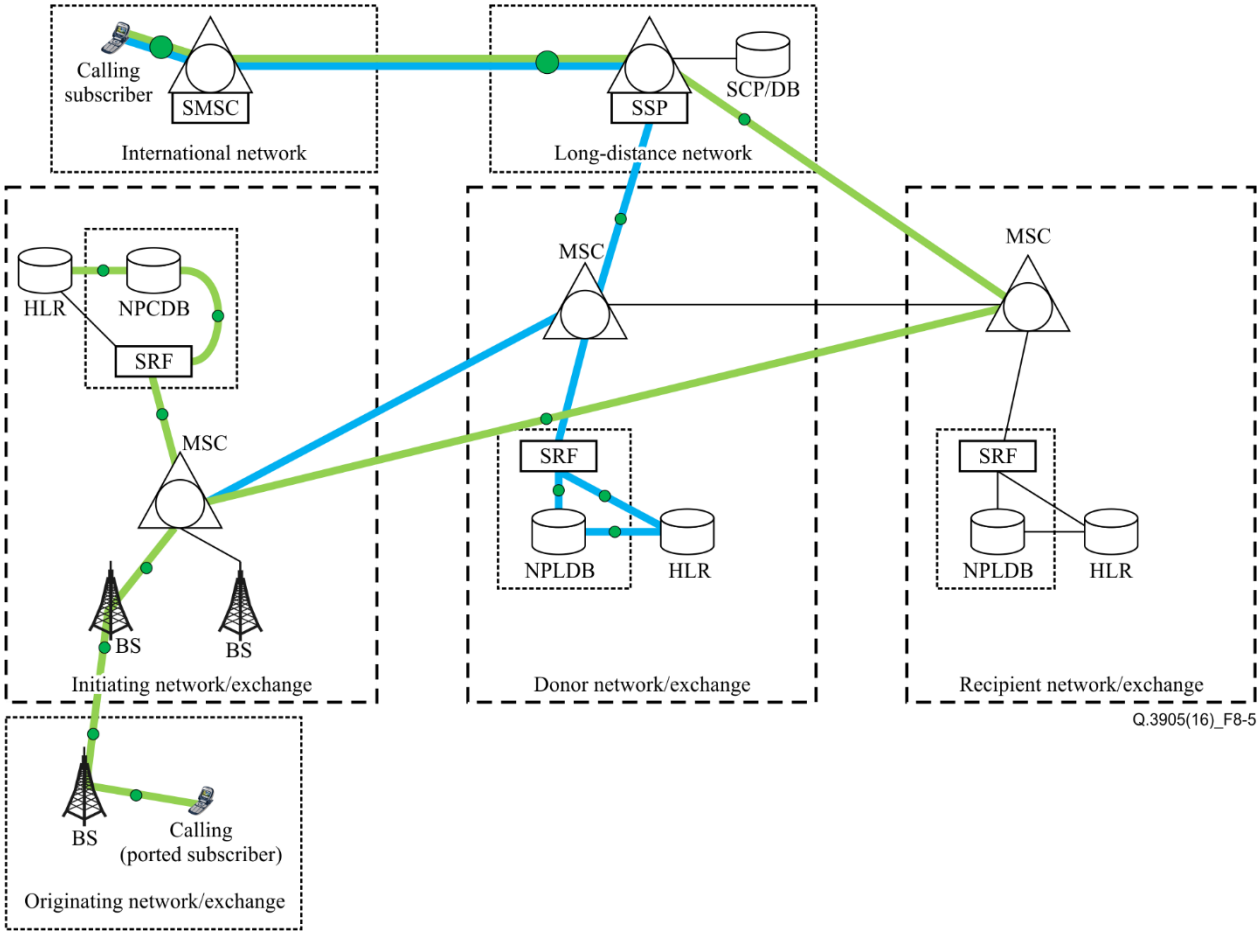

Figure 8-5 – Network configuration for test case 8.06

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection with number portability based on an outgoing international call using the method "all call query";
2) monitor the signalling traffic between the calling originating local exchange (OLE) and the destination local exchange (DLE) which is located in the other country;
3) repeat steps 1 and 2 for case of using the method "onward routing";
4) repeat steps 1-3 for the case when the ported user is a fixed line user.

Pass/fail criteria:

The test can be considered successful if the establishment of a connection between called and calling party (the user of the other country and user with ported number) was established successfully.

The test is considered failed if the outgoing international call was not successful.

----------**End of the test**----------

----------**Test case # 8.07**----------

Title: Indication of number portability

Keywords: Checking the possibility of an indication of the NP status of subscriber number.

Purpose:

Verify the NP status indication of the subscriber number.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The NPDB receives requests about the NP status of called number (from an originating or initiating network). Available NPDB methods: "onward routing" or "all call query".

Test set-up:

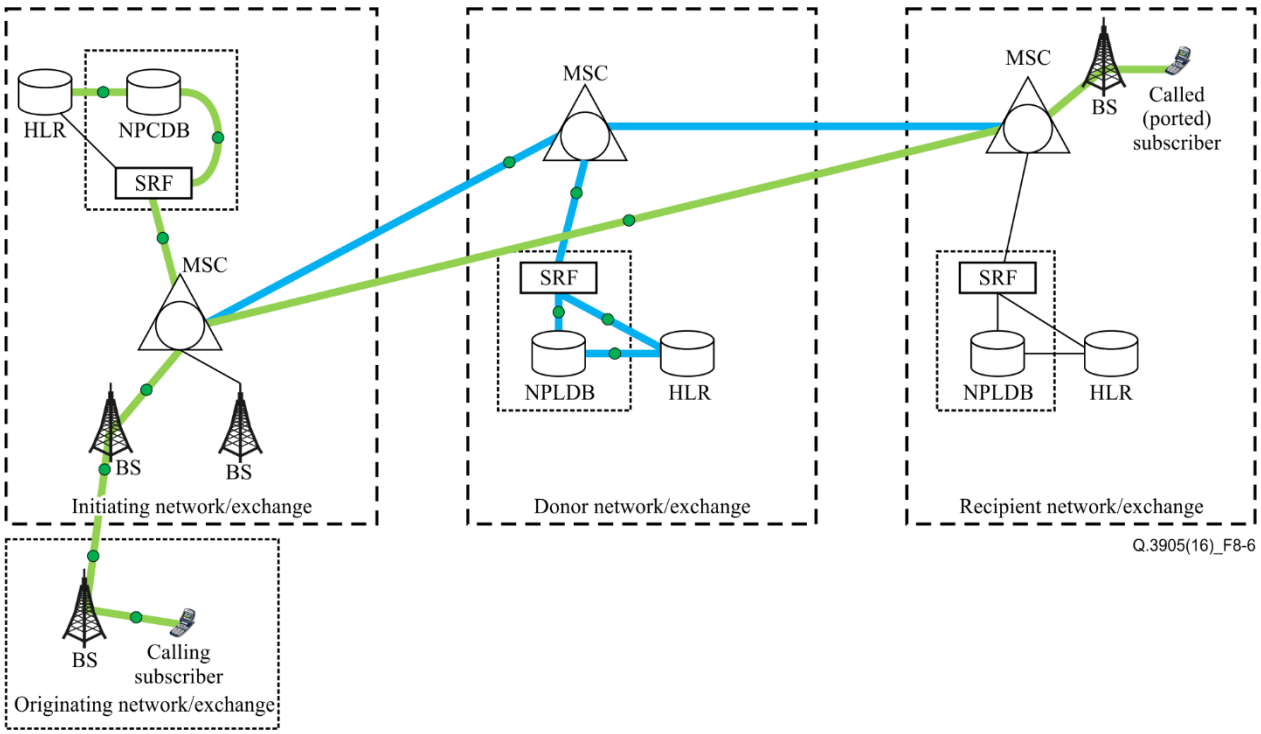

Figure 8-6 – Network configuration for test case 8.07

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) OLE sends a request to the NPLDB for establishing a connection for the method "onward routing";
2) this request should be monitored by the traffic analyser on the side of the operator-donor network;
3) monitor the NPLDB response by the traffic analyser and verify the correctness of the received information. The call number should have the status "the ported subscriber number" and the response should contain the routing information about the operator-recipient's network/exchange;

4 repeat steps 1-3 for method "all call query";

5) the information received from the NPDB for both methods should be the same – the NP status should indicate that the subscriber number is a ported number.

Pass/fail criteria:

The test can be considered successful if the responses received from the two NPDB contained the routing information about the operator-recipient's network/exchange and information that the number was ported.

The test is considered failed if the NP status contained incorrect information.

----------**End of the test**----------

----------**Test case # 8.08**----------

Title: Verifying the possibility of porting when the called party has different ITU-T E.164 number formats

Keywords: Number which has been written in format E.164; number which has been written in other format; telephone prefix.

Purpose:

Verify the possibility of porting when the called party has different E.164 number formats (e.g., length of the number or parts of it).

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The OLE sends a request to the NPDB.

Test set-up:

OLE, NPDB, DLE.

Testing equipment:

1) The NPDB-based solution.

Test procedure:

1) Send two requests with two different profiles to NPDB;
   a) the first request should contain the telephone number using E.164 format;
   b) the second request should contain the telephone number using other format (non-E.164 format);

   NOTE – The requests specified above should contain the subscriber number without prefixes and other auxiliary or information signs.
2) NPDB should analyse the first request and send to recipient's side the notification message. In the second request the NPDB should send a notification message which does not correspond to E.164 format;
3) analyse the NPDB notification messages;
4) repeat steps 1-3 for the case when a part of the E.164 number is in the request;
5) analyse the NPDB response in both case.

Pass/fail criteria:

The test can be considered successful if the NPDB sends a notification identifying a failure.

The test is considered failed if one of the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.09**----------

Title: Porting of MSN

Keywords: Porting of MSN

Purpose:

Verifying the possibility of porting when the called party has an MSN.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The OLE sends a request to the NPDB.

Test set-up:

OLE, NPDB, DLE.

Testing equipment:

1) The NPDB-based solution.

Test procedure:

1) a request is sent to the NPDB which should contain the information of a ported MSN user;
2) NPDB should analyse the request and send the correct response to the OLE.

Pass/fail criteria:

The test can be considered successful if the NPDB sent a response with the correct MSN Number.

The test is considered failed if the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.10**----------

Title: Verifying the possibility to port a group of numbers

Keywords: The request for number porting, the request for group number porting, NPDB.

Purpose:

Verify the possibility to port a group of numbers. The possibility to port one number from the group of numbers is not allowed.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The possibility to port a group of numbers, including some partial subscriber numbers.

Test set-up:

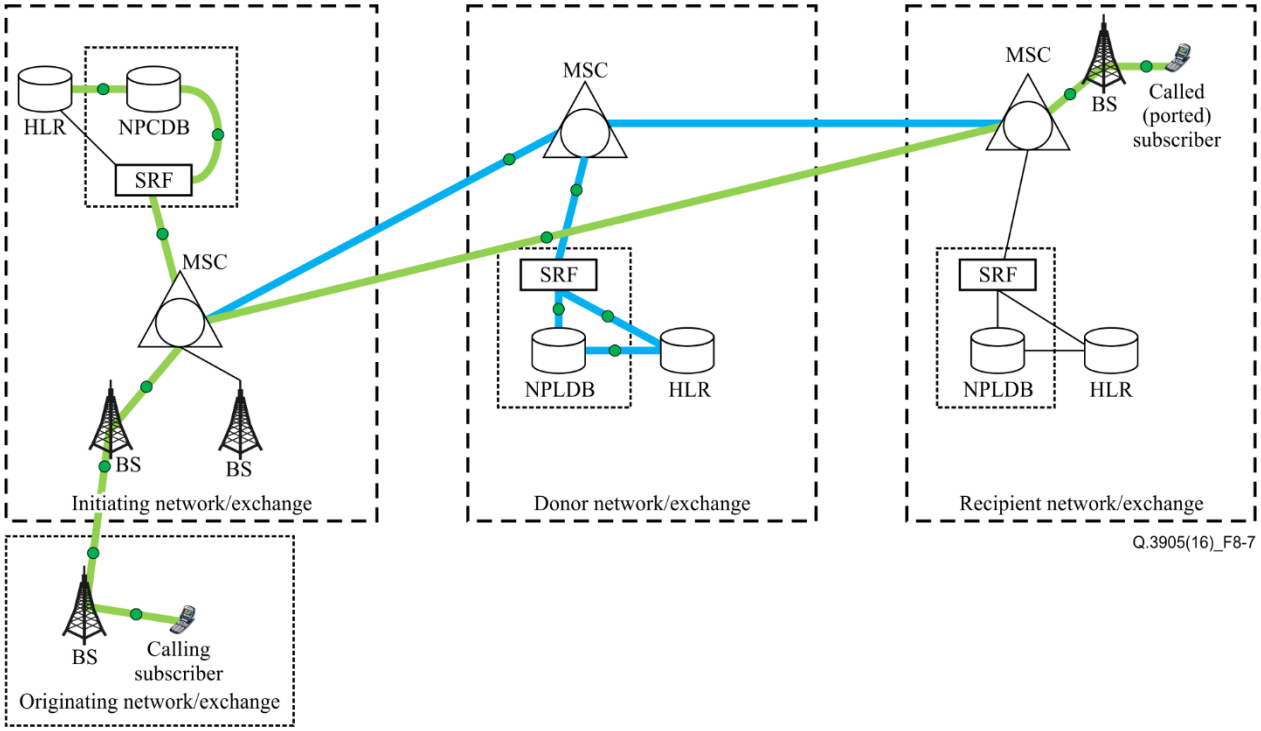

Figure 8-7 – Network configuration for test case 8.10.

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) The first request to NPDB contains the necessary default information for porting;
2) The second request should contained the information of group of numbers which are already ported;
3) verify the group requests and the possibility of porting;
4) ensure that the first response is correct and the group of number could be ported;
5) ensure that the second response consist of the failure and the group of numbers could not be ported;
6) establish a connection between the pre-configured subscriber number and one of the numbers which are from the ported group of numbers;
7) verify the possibility of porting the single number from the group of numbers. This result should be the same as that of step 5.

Pass/fail criteria:

The test can be considered successful if the request for group number porting was correctly answered from the NPDB and it was not possible to port one number from the group of numbers.

The test is considered failed if one of the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.11**----------

Title: Verifying the privacy of subscribers with ported numbers

Keywords: The ported subscriber number, non-ported subscriber number, NPDB.

Purpose:

Verifying the possibility to save the privacy of users after porting their subscriber number.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

OLE, NPDB, DLE.

Test set-up:

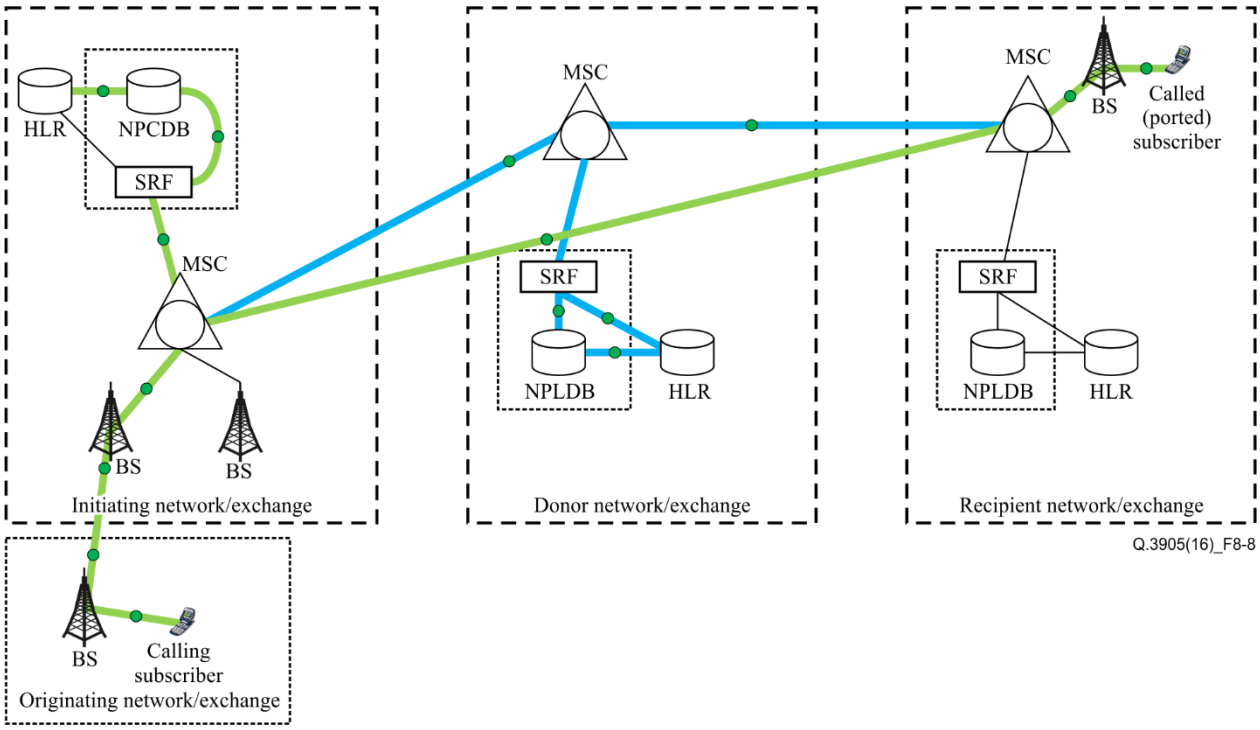

Figure 8-8 – Network Configuration for test case 8.11

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish the connection between non-ported and ported number using the routing information contained in the NPDB;
2) trace the exchange of signalling between non-ported and ported number;
3) ensure that the user is informed with a tone and/or announcement if the number was successfully ported.

Pass/fail criteria:

The test can be considered successful if the user received a tone and/or announcement in case the number was successfully ported.

The test is considered failed if the user did not receive an announcement.

----------End of the test----------

----------Test case # 8.12----------

Title: Influence of number portability on incoming calls

Keywords: Subscriber number, ported subscriber number, NPDB.

Purpose:

Checking the correctness of reception of an incoming call on ported number.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The (voice-call) connection has to be established between non-ported number and ported number.

Test set-up:

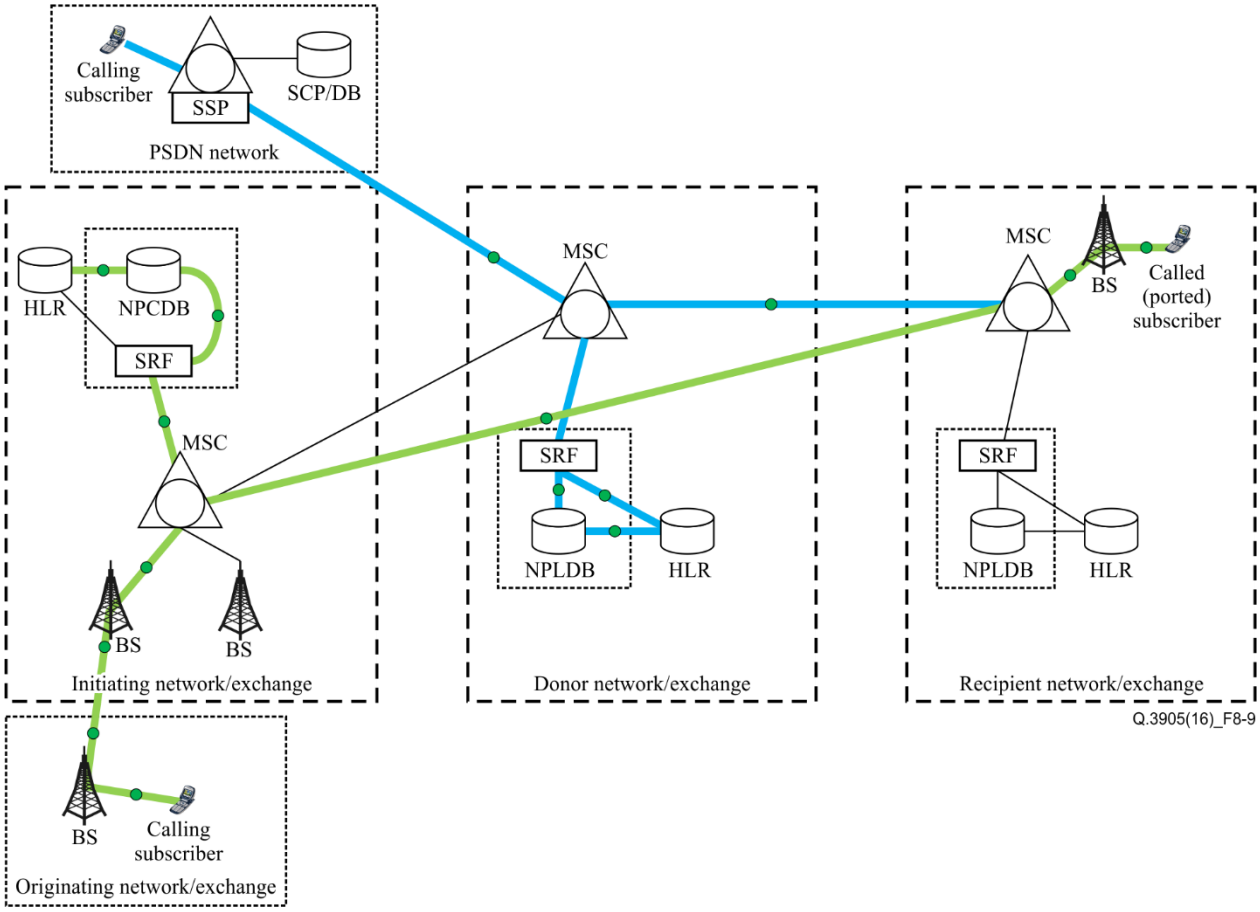

Figure 8-9 – Network Configuration for test case 8.12

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between a non-ported and ported number. The request for establishing a connection between subscribers should be sent to NPDB for obtaining the routing information;

2) verify that the NPDB sends the correct called party number in response to the OLE. The response should contain the routing information about the served called party (a ported subscriber number);

3) establish a connection between calling and called party;

4) ensure that the voice/data channel is correctly established;

5) repeat steps 1-4 for case when the calling party is a fixed telephone subscriber.

Pass/fail criteria:

The test can be considered successful if the voice call connection to the ported number was successfully established.

The test is considered failed if one of the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.13**----------

Title: Number portability on outgoing calls

Keywords: Subscriber number, ported subscriber number, NPDB.

Purpose:

Ensure that the calls from a ported number can be provided to fixed and mobile telephone numbers.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The calling user is a ported number.

Test set-up:

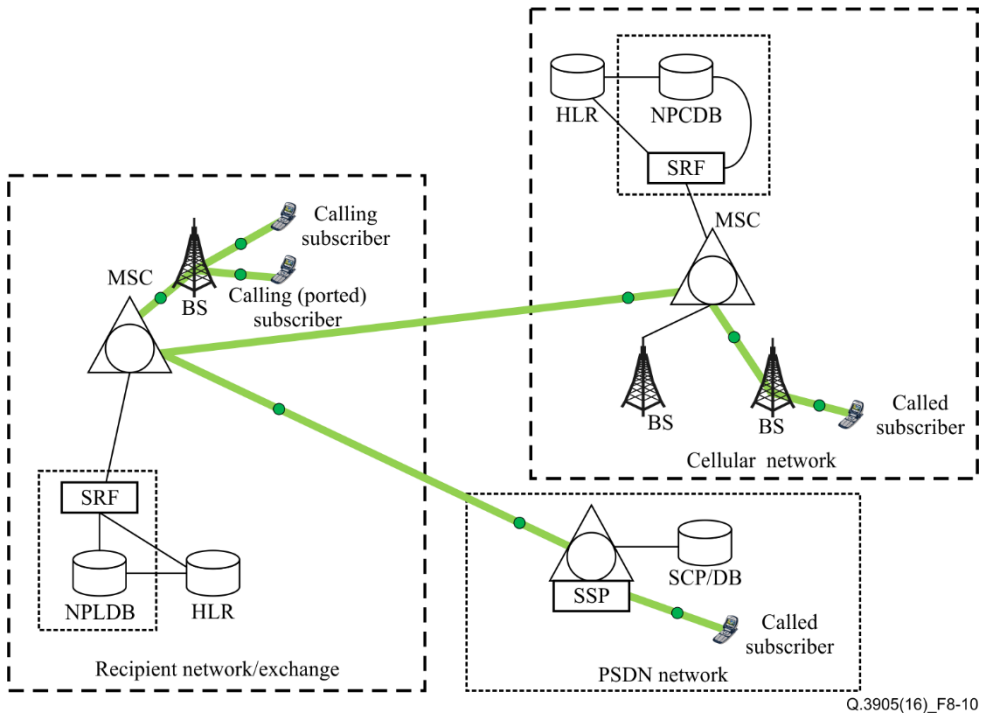

Figure 8-10 – Network configuration for test case 8.13

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a call from a ported user to a non-ported mobile user;
2) establish a connection between calling and called party;
3) ensure that the voice/data channel is correctly established;
4) repeat steps 1-3 for case when the calling party is a fixed telephone subscriber.

Pass/fail criteria:

The test can be considered successful if the call from a ported call to a non-ported number was successfully established.

The test is considered failed if one of the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.14**----------

Title: Influence of service provider portability on national or international radio resource allocation

"Introducing service provider portability must not adversely affect conformance with national or international propagation and echo standards".

The NPDB solution (in general) is a separate information system which does not have access to mechanisms of the radio resource's allocation and echo protection. It has no negative influence on allocation of national and international radio resources.

This is an optional test suite which is out of the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.15**----------

Title: Verifying the determination of ported number using the CLIP/CLIR service

Keywords: NPDB, CLIP/CLIR.

Purpose:

Verify that the presentation and restriction of the calling party number is according to the CLIP/CLIR Recommendation for ported and not ported numbers

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The non-ported and the ported user have been subscribed to the Supplementary services CLIP/CLIR.

Test set-up:

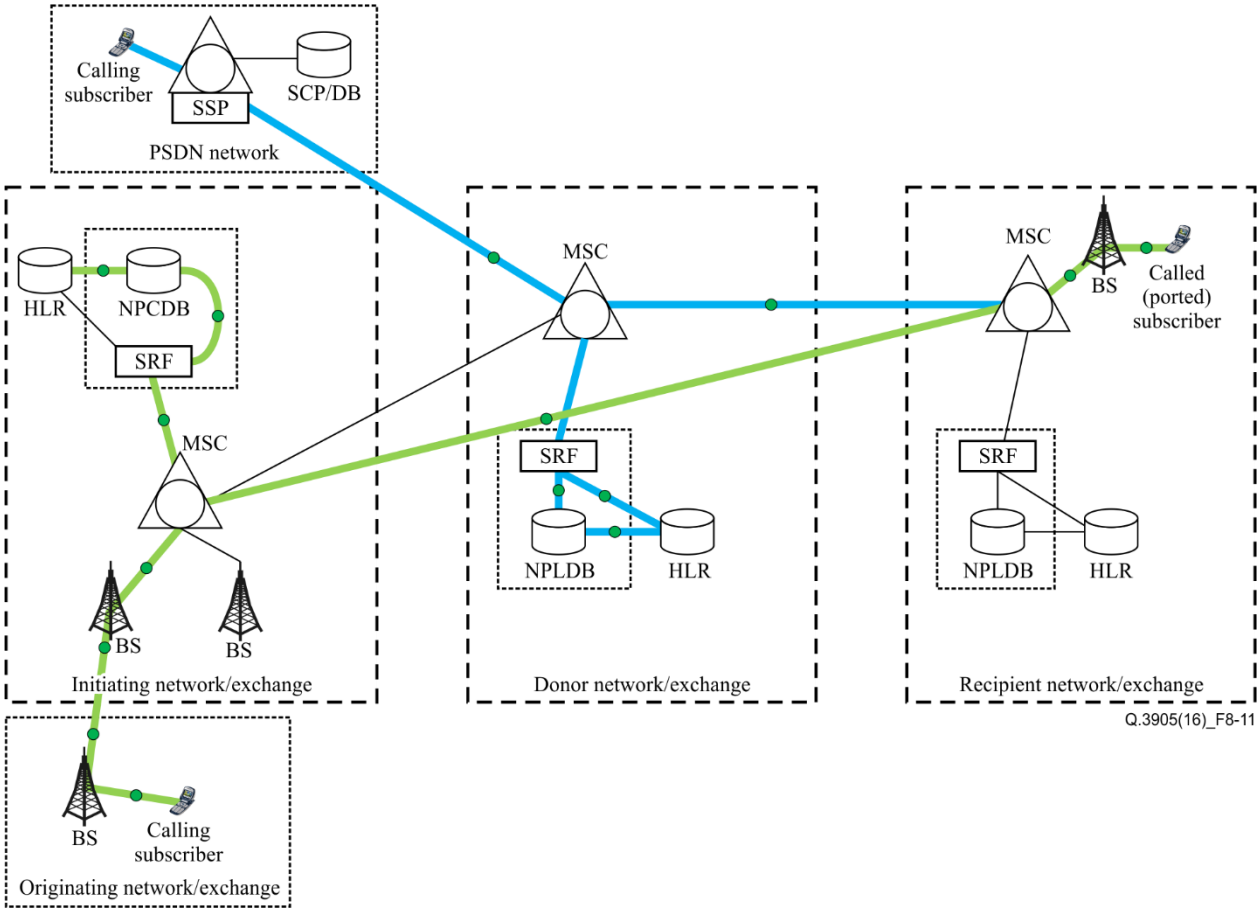

Figure 8-11 – Network configuration for test case 8.15

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a call from a ported to a non-ported user who subscribed to the supplementary service CLIP;
2) after establishing a connection, verify that the CLIP information was correctly transferred to the called user;
3) repeat steps 1-2 for the non-ported case;
4) repeat steps 1-3 establishing a call from a non-ported to a ported user who subscribed to CLIP;
5) repeat steps 1-4 for CLIR service. In this case the information concerning the calling party should not be displayed on the screen of the terminal device of the called party.

Pass/fail criteria:

The test can be considered successful if the verification of the supplementary service CLIP/CLIR was successful.

The test is considered failed if the presentation and restriction of the calling party number was not provided in accordance with the CLIP/CLIR recommendation for ported and non-ported numbers.

----------**End of the test**----------

----------Test case # 8.16----------

Title: Influence of number portability on COLP/COLR service

Keywords: NPDB, COLP/COLR

Purpose:

Verify that the connected number can be used according to the COLP/COLR recommendation for ported and not ported numbers.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The non-ported and the ported user have been subscribed to the Supplementary services COLP/COLR.

Test set-up:

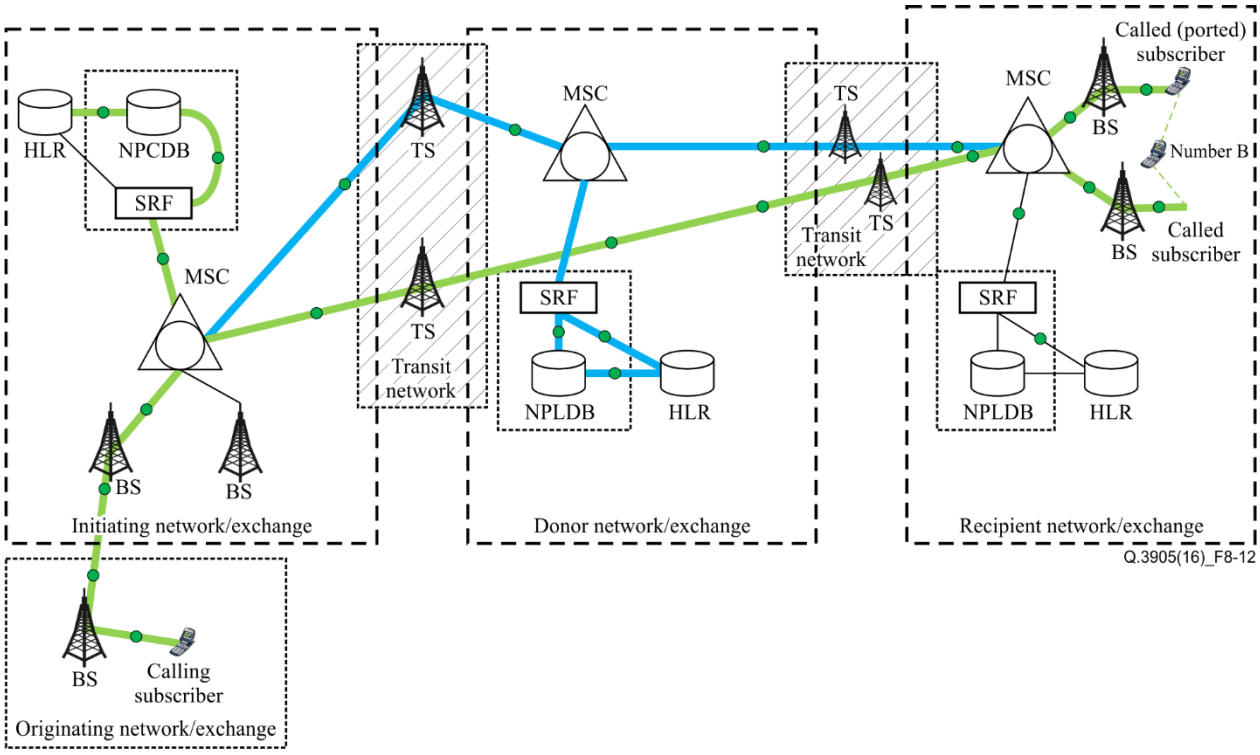

Figure 8-12 – Network configuration for test case 8.16

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between non-ported number (which has been subscribed to COLP supplementary service) and the ported number which has been subscribed to the service of the calling user "A";
2) ensure that the information of the subscriber number "B" is displayed correctly on the terminal device of calling party "A";
3) repeat steps 1-2 for the case when the called party is a non-ported number;

4) repeat steps 1-3 for the case when the called party number has been subscribed to COLR service.

Pass/fail criteria:

The test can be considered successful if COLP and COLR services worked correctly.

The test is considered failed if the COLP/COLR information was not transferred correctly.

----------**End of the test**----------

----------**Test case # 8.17**----------

Title: Influence of number portability on calls from ported numbers to emergency services

Keywords: Emergency services, ported subscriber number, NPDB.

Purpose:

Verify that an outgoing call from a ported number can be provided successfully to an emergency service.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The emergency call will be provided from a ported subscriber number.

Test set-up:

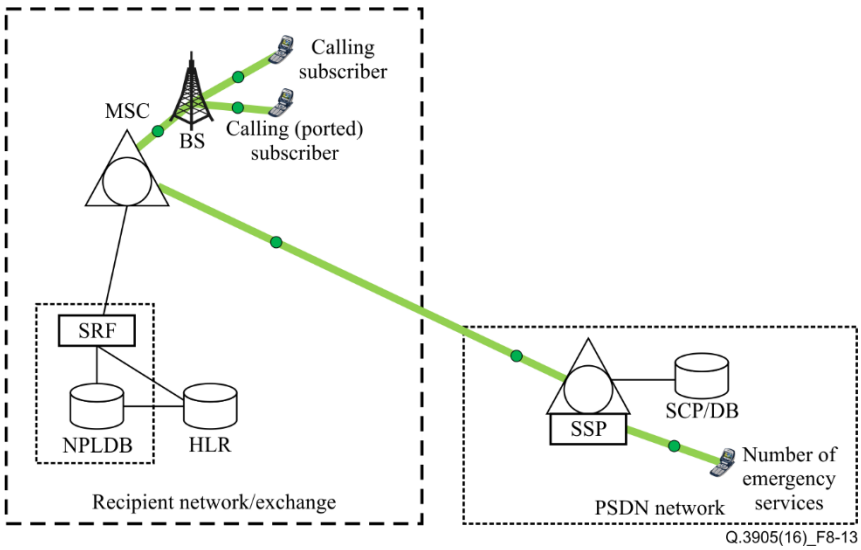

Figure 8-13 – Network configuration for test case 8.17

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between a ported number and number of the emergency service (for example, number 112);
2) monitor the signalling with the traffic analyser during the call establishment;
3) repeat steps 1-2 for the case when the calling party number is a non-ported number;

4) ensure that the call routing from the ported number to the number of the emergency serviceis the same as the call from the non-ported number.

Pass/fail criteria:

The test can be considered successful if the call routing from the ported number to the number of the emergency service was established successfully.

The test is considered failed if the connection establishment between ported number and the number of the emergency service failed or the ported number had limited access to the emergency service (e.g long delay, etc.).

----------**End of the test**----------

----------**Test case # 8.18**----------

Title: Support of variable length of number

"Variable number length must be supported".

This is an optional test which is out of the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.19**----------

Title: Support of overlap signalling before and after obtaining the routing number

"Overlap signaling must be supported before and after obtaining the routing number".

This is an optional test which is out of the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.20**----------

Title: Influence on the redirection counter (during call forwarding) during the NP procedure

Keywords: Readdressing, NPDB, ported subscriber, transit network/exchange.

Purpose:

Verify if the redirection counter will increase during the number portability procedure.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The ported number has subscribed and activated call forwarding unconditional (CFU).

Test set-up:

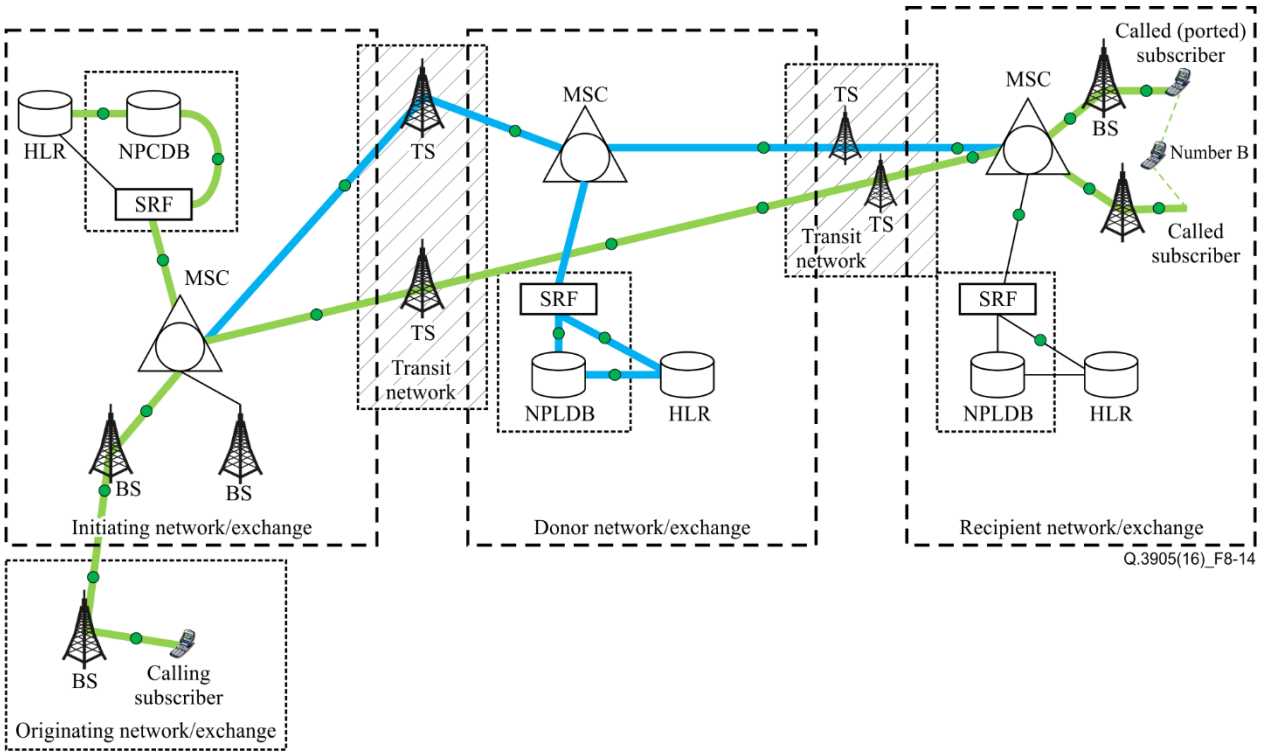

Figure 8-14 – Network configuration for test case 8.20

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) the calling user "A" is calling user B which is not ported and has activated CFU. The redirection counter has the value 1;
2) activate NP for user B;
3) the calling user "A" is calling user B which is ported and has activated CFU. The redirection counter has the value 1.

Pass/fail criteria:

The test can be considered successful if the redirection counter was not influenced by number portability procedure.

The test is considered failed if the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.21**----------

Title: The unambiguous transmission of called number and routing network number

Keywords: Unchanged called party number (CdPN), routing number, a NPDB.

Purpose:

Ensure that the transmission of the CdPN and the routing number has not been changed during the NP procedure.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The called party number is a ported subscriber number.

Test set-up:

The testing configuration corresponds on Figure 8-4.

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between non-ported and ported subscriber number;
2) check the CdPN on the NPDB side;
3) verify the response of the NPDB which contains the routing information;
4) ensure that the CdPN has not been changed;
5) repeat steps 1-4 for the case if a transit network/exchange has been used between the operator-donor and the operator-recipient network/exchange.

Pass/fail criteria:

The test can be considered successful if the routing number of the operator-recipient network/exchange and the CdPN were transferred correctly.

The test is considered failed if one of the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # 8.22**----------

Title: Support of various types of indications

Keywords: routing number, point of interconnection, recipient exchange.

Purpose:

Verify that that the transport of the following types of indication are supported:

1) recipient network ID (RNID) and/or;
2) point of interconnection (POI) and/or;
3) recipient exchange (REX).

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The exchange and point of association to a network should be selected.

Test set-up:

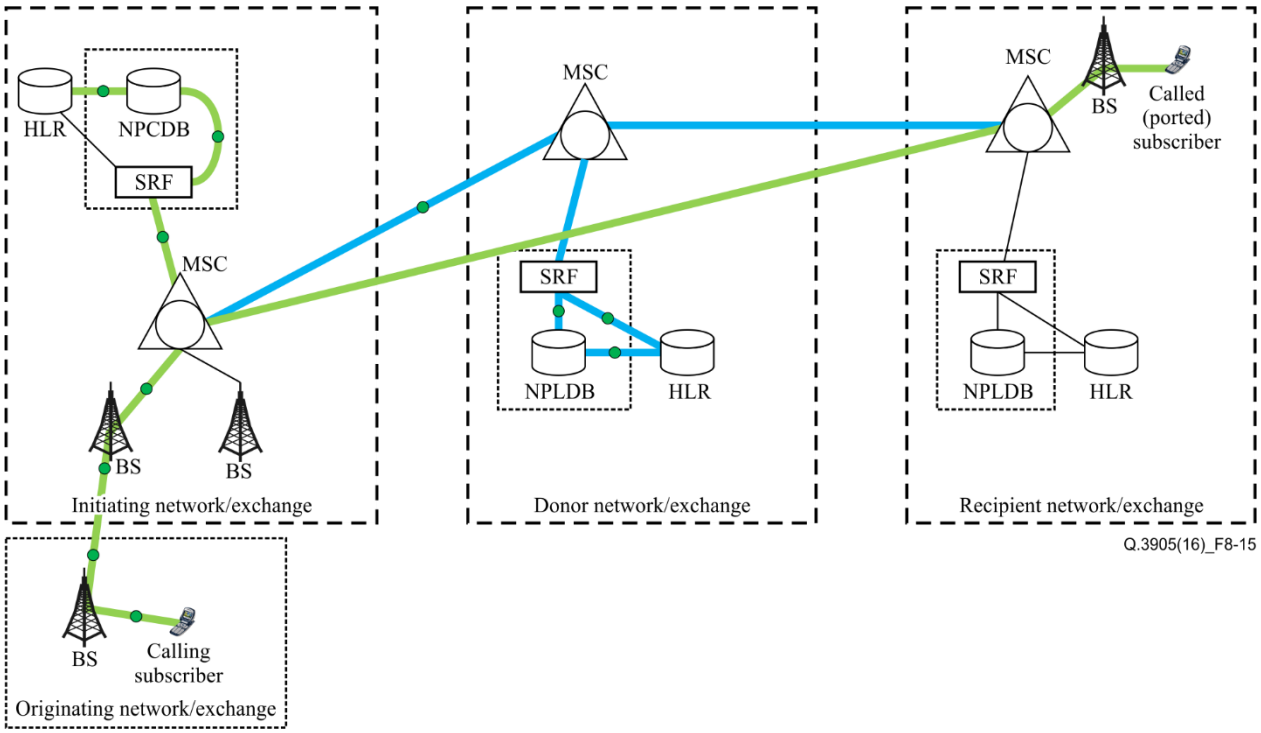

Figure 8-15 – Network configuration for test case 8.22

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a call between the calling user "A" and the ported user "B";
2) monitor the signalling between OLE and DLE;
3) verify that the request for establishment contains the routing information about the operator-recipient's network/exchange;
4) analyse the response from NPDB. The response should contain the following items:
   - the information about the ported calling party number;
   - the routing number and the presence of the identifier of the operator-recipient's network;
   - the operator-recipient exchange;
   - the point of interconnection.

Pass/fail criteria:

The test can be considered successful if the parameters describe above were transferred correctly.

The test can be considered unsuccessful if the parameters describe above were not transferred correctly.

----------**End of the test**----------

----------**Test case # 8.23**----------

Title: Indication of ported number in the forward direction

Keywords: Call indication, NPDB, the ported subscriber number.

Purpose:

Checking of the ported number indication in the forward direction

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The test configuration contains the OLE, the operator-recipient's network/exchange and transit network/exchange.

Test set-up:

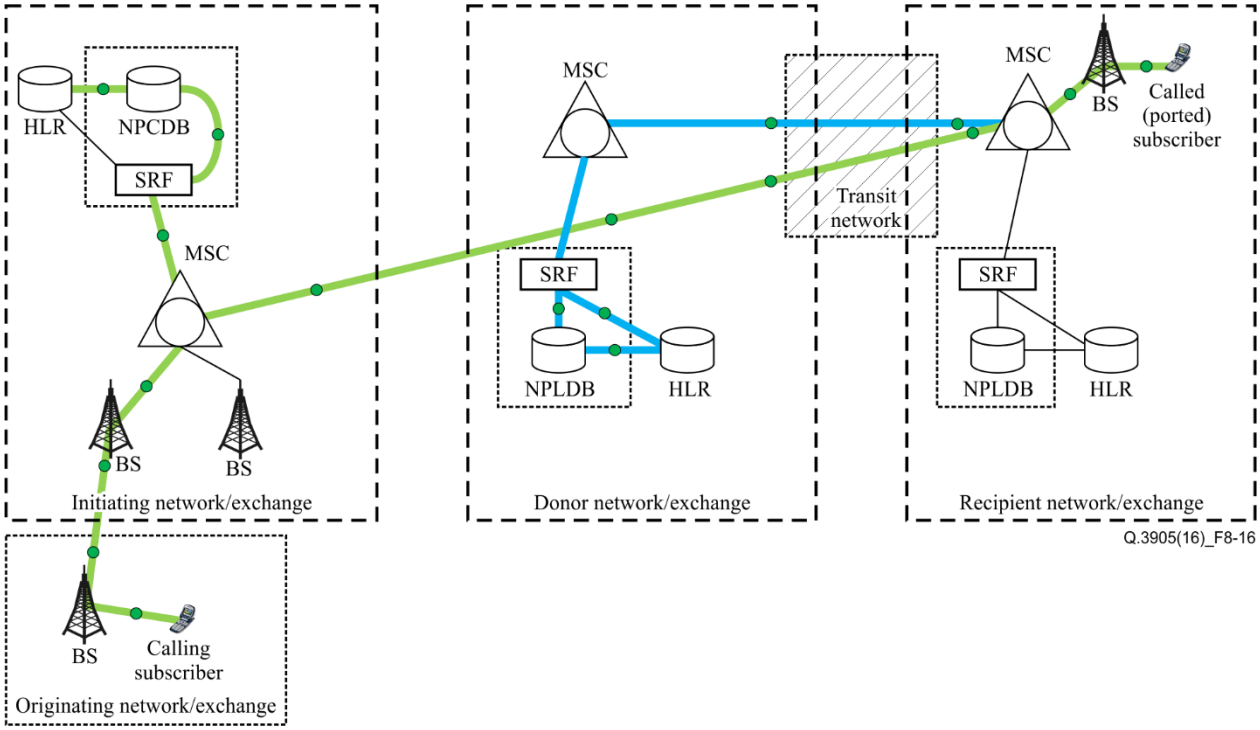

Figure 8-16 – Network configuration for test case 8.23

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) receive the routing information from the response of NPDB;
2) establish a connection between calling and called party (the ported number);
3) monitor the traffic during call forwarding from an OLE to the operator-recipient's network/exchange, with usage of a transit network/exchange;
4) analyse traces and verify that the indication of the operator-recipient exchange/network is correct;

Pass/fail criteria:

The test can be considered successful if the connection between subscribers was established using the received routing information.

The test is considered failed if the connection was not established and/or the indication of the network was incorrect.

----------**End of the test**----------

----------**Test case # 8.24**----------

Title: Verifying the possibility of the physical and logical information transmission in the case when the calling party is ported

"In an environment of number portability, calls from ported numbers must convey both logical and physical calling party information".

This is an optional test suite which is out the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.25**----------

Title: Usage of different formats of routing numbers

Keywords: Routing number, operator-recipient's network/exchange, operator-donor network/exchange.

Purpose:

Usage of different formats of routing numbers.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The called party number is a ported subscriber number.

Test set-up:

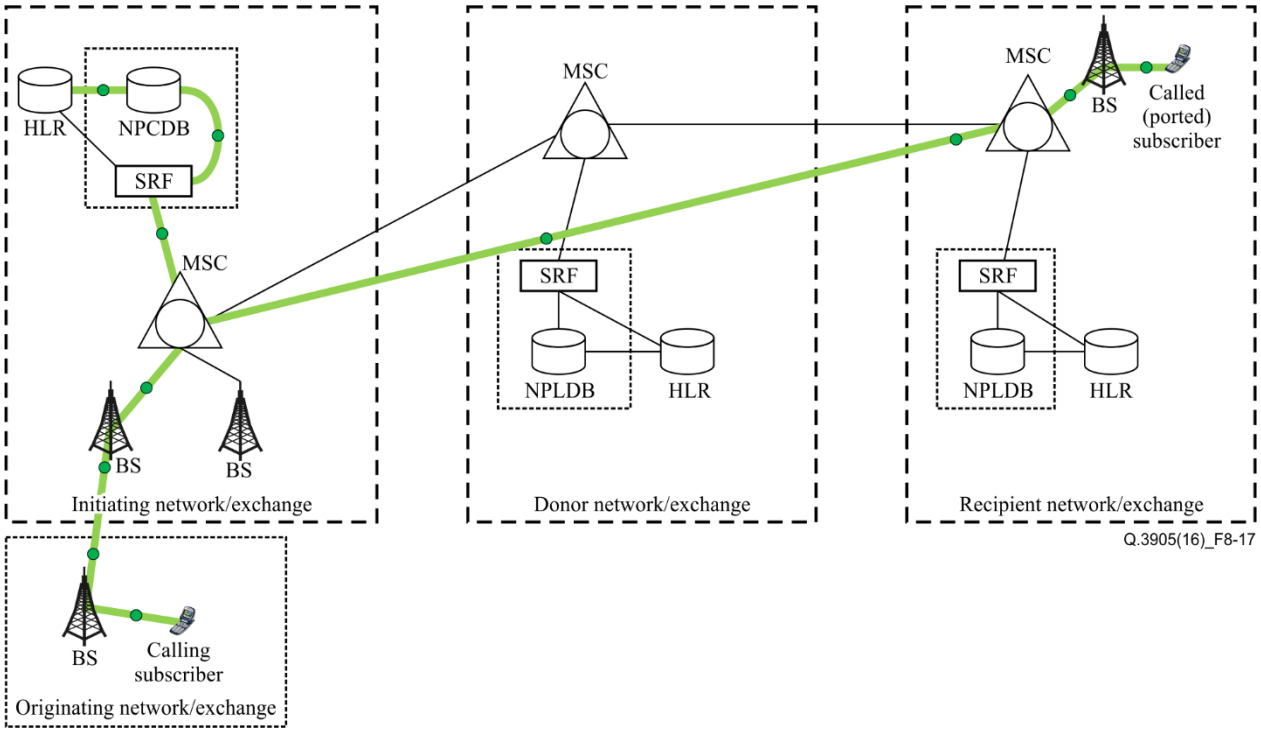

Figure 8-17 – Network configuration for test case 8.25

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) OLE has sent the request to the NPDB in order to establish a connection between calling (non-ported) party and called (ported) party;
2) NPDB should generate the response containing the routing information about the operator-recipient's network and information about called party number;
3) monitor and analyse the NPDB response.

   The response should contain the information about:

   – routing number;
   – national number;

   these numbers should be written using the E.164 format;
4) the routing number should contain the code number of the operator-recipient's network and, optionally, the code of exchange of the given network;
5) ensure that it is possible to use the syntax which is different from E.164 format, namely: the possibility of usage of hexadecimal digits, as in a range 0-F, and in a range 0-9.

Pass/fail criteria:

The test can be considered successful if an additional format (e.g., Hex) was supported.

The test is considered failed if the usage of the additional syntax was impossible.

----------**End of the test**----------

----------**Test case # 8.26**----------

Title: The incoming gateway in the network for incoming international calls should be considered as the OLE

Keywords: Network of the foreign country, the international gateway, OLE, the ported number.

Purpose:

Verify that the incoming gateway for international call could be used as OLE during the NP procedure.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The international gateway fulfil the functions of an OLE.

Test set-up:

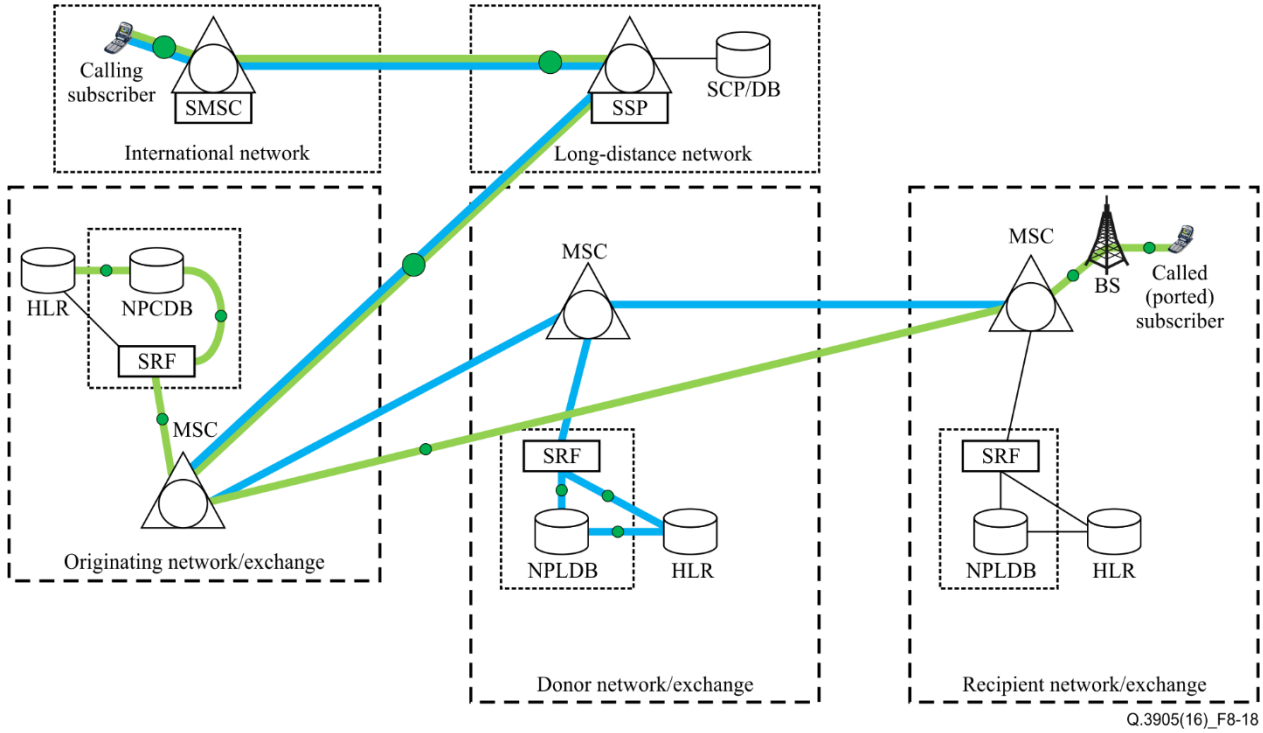

Figure 8-18 – Network configuration for test case 8.26

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between a user in a foreign state (calling party) and ported subscriber (called party) for the methods "all call query" and "onward routing";
2) monitor this establishment for both number portability methods;
3) repeat steps 1-2 for the case when the ported called party is in the foreign country.

Pass/fail criteria:

The test can be considered successful if the connection between the foreign state and the ported subscriber number was successfully established.

The test is considered failed if the connection was not established.

----------**End of the test**----------

----------**Test case # 8.27**----------

Title: Different call routing formats

Keywords: Routing number, operator-recipient's network/exchange, operator-donor's network/exchange.

Purpose:

Ensure that the following types of number formats can be used during the call establishment:

1) concatenated address (the routing and called party number are forwarded together);
2) separated address (the routing and called party number are forwarded separately);

3) only the called party has been transferred.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The "all call query" method is used for NP.

Test set-up:

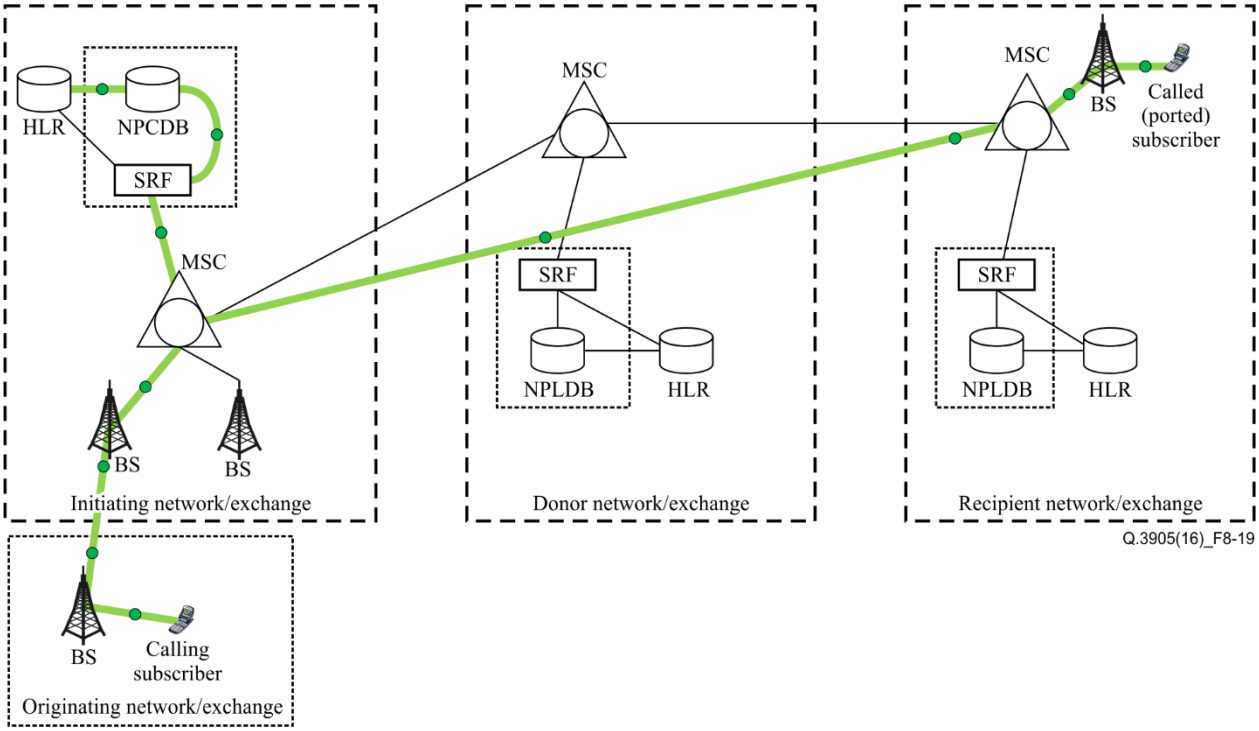

Figure 8-19 – Number configuration for test case 8.27

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) OLE should send the request to the NPDB for establishment of a connection between calling and called party (ported subscriber number) using the concatenated address;
2) the NPDB response should contain the information of the operator-recipient network and the number of the called party;
3) transport of this response should be monitored;
4) establish the connection between subscribers using the information which was received from NPDB;
5) Repeat steps 1-4 using the separated address format;
6) Repeat steps 1-4 when only the called party number has been transferred.

Pass/fail criteria:

The test can be considered successful if all three formats can be used for the call establishment.

The test is considered failed if one of the types could not be used for the call establishment.

----------**End of the test**----------

----------**Test case # 8.28**----------

Title: SCCP addressing

"SCCP addressing based on RN for the called party should be supported".

This is an optional test which is out of the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.29**----------

Title: Identification of ported number for message transfer

"The sum total of the networks involved in addressing and routing non-circuit-related messages pertaining to a ported number shall be able to detect that the number has been ported and drive the identity of the appropriate destination of the message. The division of responsibilities of this among the networks depend on the architecture chosen".

This is an optional test which is out of the scope of this Recommendation.

----------**End of the test**----------

----------**Test case # 8.30**----------

Title: Verifying that the exchanges which does not support NP can establish a connection without NPDB

Keywords: Network node, network exchange, NPDB, the ported subscriber.

Purpose:

Verify that the exchanges which does not support NP can establish a connection without NPDB.

Standard (criteria):

Clause 8 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The exchange does not support the number portability solution.

Test set-up:

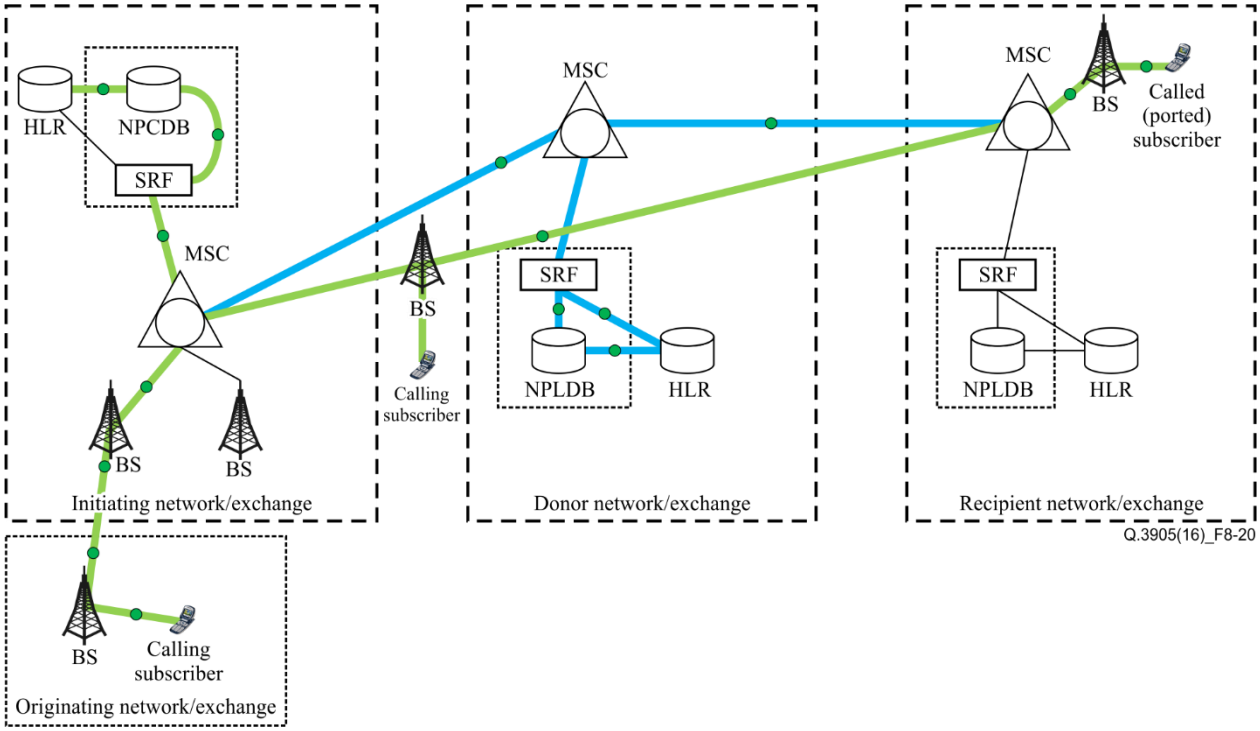

Figure 8-20 – Network configuration for test case 8.30

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) establish a connection between the ported and non-ported number and monitor the forwarding of this call;
2) emulate a node/exchange which does not support the NP procedure. This exchange should be between the initiating network/exchange and the operator-recipient's network/exchange;
3) repeat step 1 for the case when the emulated node/exchange is used as an initiating network/exchange for calling party;
4) the call from the given exchange should be forwarded to the nearest exchange/node of the initiating network which supports NP and monitor the forwarding of this call.

Pass/fail criteria:

The test can be considered successful if the nodes/exchanges which are not supporting portability are forwarded to a network which supports NP.

The test is considered failed if the criteria mentioned above does not come true.

----------**End of the test**----------

Appendix A

Verifying of the configuration of network service scenarios

(This appendix does not form an integral part of this Recommendation.)

This appendix contains the test cases which are verifying "all call query" and "onward routing" procedures.

NOTE – The test cases presented below correspond to mobile number portability procedures defined in [b-ITU-T Q-Suppl.4]. However, these NP tests can also be for local number portability, including all network(s)/exchange(s) of the fixed network(s) which are used for the voice-call routing.

----------Test case # A.01----------

Title: Standard procedure for the "all call query" method

Keywords: Routing information, originating network/exchange, initiating network/exchange, NPDB.

Purpose:

Verify the routing information procedure for ported numbers for the "all call query" method.

Standard (criteria):

Clauses 6.1.2, 6.2.1.1 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

The originating network/exchange (OLE) which is the host of the calling party, is not connected to NPDB. The called subscriber number is ported and stored in the operator-recipient's network.

Test set-up:

The network configuration should be allowed to transmit a voice/data call from an initiating network/exchange to an operator-recipient's network/exchange (the path is highlighted in green). All measured data have to be collected by protocol analyser at the reference points (see Figure A.1), which are highlighted in green. The network configuration is presented in Figure A.1.

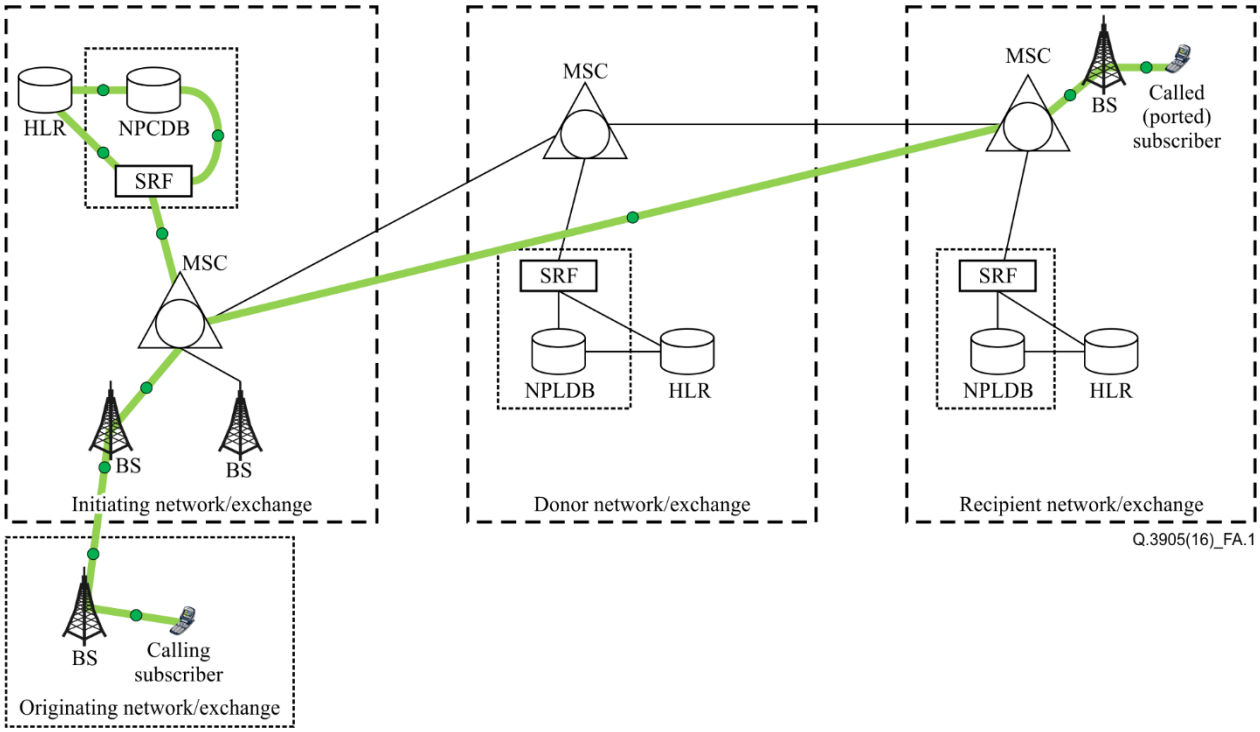

Figure A.1 – Network configuration for test case A.01

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) a request from OLE for establishment of the connection to the NPDB has to be sent;

   NOTE – In the case when the originating network/exchange has no access to NPDB, the call should be forwarded to the initiating network/exchange to verify whether the number of the called party belongs to an operator-recipient's network;

2) after establishing a test call, the request from the given network/exchange has to be sent to the NPDB to verify if the number of the called party is ported. Also, the request should provide information to obtain the routing information;
3) in case the called party number is ported, the NPDB should inform the initiating network/exchange and an operator-recipient's network/exchange with the routing information which is needed for further call establishment. In addition, the information might include the optional indicators of the ported number (e.g., NP ID, the name of the operator-donor, the name of the operator-recipient, number, etc.). In this regard, the test suite should be allowed to send the reply to the called party providing the necessary information for call routing;
4) In case the called party number is not ported the voice-call should be routed as a normal E.164 number. The relevant reply about the status of this number has to be provided from NPDB;
5) after obtaining the routing information (mostly based on the test call) the operator-recipient's network/exchange should route the voice-call, using received routing information.

Pass/fail criteria:

The test can be considered successful if the called party number was determined correctly by using NPDB and the connection between calling party and called party was established.

The test is considered failed if one of the criteria mentioned above does not come true.

----------**End of the test**----------

----------**Test case # A.02**----------

Title: Special procedures for call routing using the "onward routing" method

Keywords: Routing information, initiating network/exchange, operator-donor network/exchange.

Purpose:

Verify the special procedures for call routing using the "onward routing".

Standard (criteria):

Clause 6.2.2 of [b-ITU-T Q-Suppl.4].

Preconditions and dependencies:

Two network configurations are possible:

1) the initiating network/exchange and the operator-donor network/exchange are not united in a network/exchange or a part of each other;
2) the initiating network/exchange and the operator-donor network/exchange are united in a network/exchange.

Test set-up:

The network configuration allow to transmit a voice call from an initiating network/exchange to an operator-recipient network/exchange (the path is highlighted in blue). All measured data have to be collected by traffic analyzer at the reference point, which are highlighted in green. The network configuration is presented on Figure A.2.

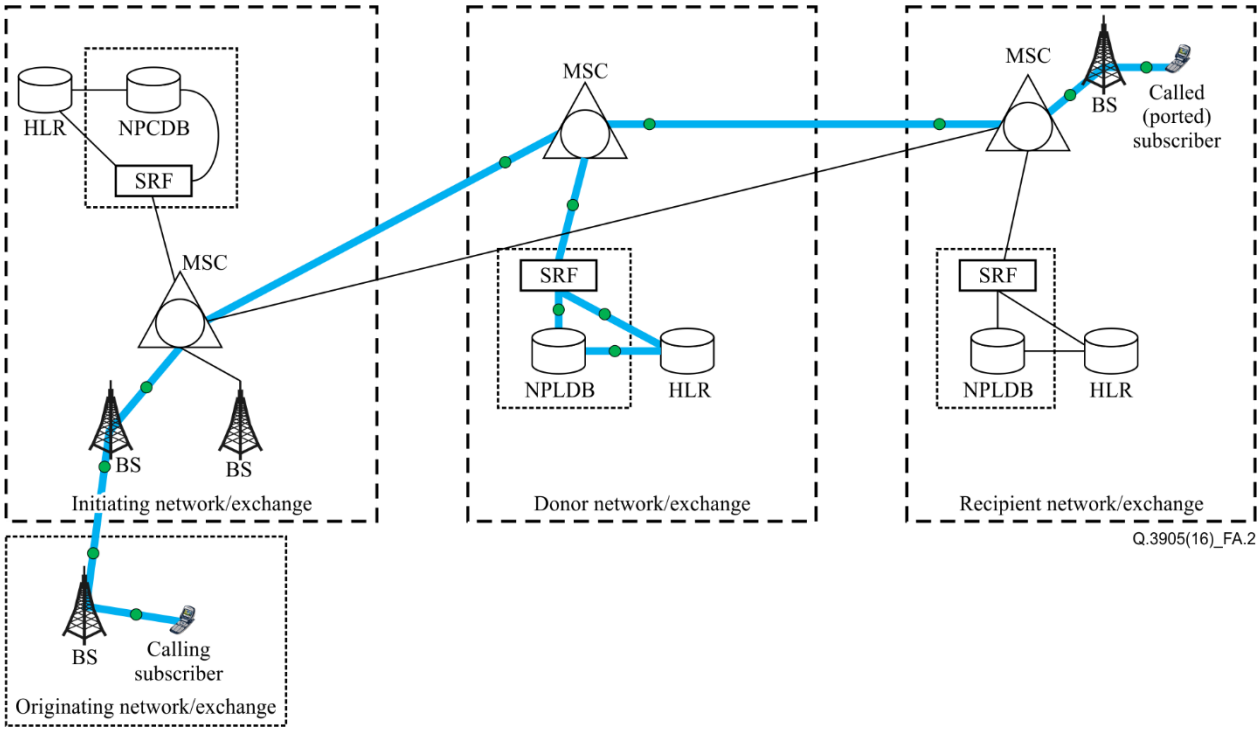

Figure A.2 – Network configuration for test case A.02

Testing equipment:

1) the traffic analyser;
2) the NPDB-based solution.

Test procedure:

1) The test steps for the first configuration of circuit network are similar to standard procedure (which was described in previous test procedure);
2) The test steps for the second configuration of circuit network will be the following:
   a) A request for establishing a connection between calling and called party (a test call) from an initiating network/exchange has to be sent;

      NOTE – In the case when the initiating network/exchange and an operator donor network/exchange is a united network/exchange, the call should not be forwarded for porting verifying to the initiating network/exchange.

   b) in this case if the called party number is in an operator-donor network (unported subscriber number) the connection between calling and called party should be established without any additional steps. The request for establishing a connection should be directly forwarded to the called party number side (in our case – to the operator-donor network/exchange);
   c) in a case when the called party number is not provided by an operator-donor network/exchange (ported subscriber number) then the test call cannot be served by the given initiating network/exchange. The call will be forwarded to another initiating network/exchange or NPDB;
   d) after obtaining the routing information from another initiating network/exchange of NPDB-side, the operator-recipient network/exchange should route the voice call, using received routing information, to the called party in order to establish the voice call connection between subscribers.

Pass/fail criteria:

The test can be considered successful if the connection between calling party and called party was established correctly.

Test is considered failed if the establishment of a connection between the calling party and called party was impossible.

----------**End of the test**----------

Bibliography

[b-ITU-T E.164 Suppl.2] Recommendation ITU-T E.164 – Supplement 2 (2014), *Number portability.*

[b-ITU-T Q-Suppl.3] Recommendation ITU-T Q-Suppl.3 (1988), *Number portability – Scope and capability set 1 architecture.*

[b-ITU-T Q-Suppl.4] Recommendation ITU-T Q-Suppl.4 (1998), *Number portability – Capability set 1 requirements for service provider portability (All call query and Onward routing.*

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