MALTA COMMUNICATIONS AUTHORITY

Number Portability

Testing Specifications Manual

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Contents

1 Scope

The MCA Decision of March 2005 entitled " Introducing Number Portability in Malta Report on Consultation and Decision" established number portability as one of the obligations which are required to be fulfilled by any PATS operators, and consequently needs to be set in place as from when the service provider commences to offer publicly available telephony service to any end-user.

The scope of this Testing Specification Manual is to provide prospective publicly available telephone service providers a Number Portability testing process, as well as to act as guidance to other publicly available telephone service providers already offering the number portability service both as the donor and as the recipient operator during such testing.

This manual shall also apply in the case were existing PATS operators needs to perform changes to the underlying infrastructure which would require other operators to update their processes. In this case the existing operator carrying out such changes must follow the same procedures as established for the prospective operators.

This document is divided in three main sections namely:

- IT Interface
- Network testing for mobile
- Network testing for fixed

IT interface: This section describes the various webservice testing processes to be performed by the potential entrant and established providers as donor and recipient operators.

Network testing for mobile telephony: This section describes the recommended joint mobile network testing for voice and SMS services to be conducted by the respective mobile telephony service providers.

Network testing for fixed telephony: This section describes the recommended joint fixed network testing for voice services to be conducted by the respective fixed telephony service providers.

2 Definitions

For the purpose of this document, the following definitions apply for the relevant participating operators:

Recipient Operator	The PATS operator porting-in a number to its network;
Donor Operator	The PATS operator porting-out a number from its network;
Serving Operator	The PATS operator hosting a number;
Block Operator	The numbering block owner;
New Operator	The PATS operator setting up its Number Portability functionality and responsible for co-ordinating the NP testing.

3 IT Interface Testing

3.1 About this section

This section describes a standard level of IT testing to be conducted by the New Operator and the respective service providers which use Webservices[1] to enable communications. This is separate from and in addition to any internal testing conducted by the Service Providers.

The IT Interface Testing phase is designed to take place and to be completed prior to the commencement of the Network Testing phase.

3.2 Overview

The IT test guidelines have been developed to define specific testing processes and timeframes. The IT tests are split into three phases of testing that are required to be successfully completed in the following order:

- Data Link Layer Testing
- Network Layer Testing
- Application Layer Testing

Modified arrangements to those defined in this document can be followed provided that these are clearly documented and all the parties involved are in agreement.

3.3 Test Objectives

The test objectives for (1) Data Link Layer Testing is to ensure the connectivity part between the operators is operational, (2) the Network Layer Testing is to ensure the connection between the application systems is established and (3) the Application Layer Testing is to ensure compliance of the web service applications.

[1] Refer to http://www.mca.org.mt/numbering/number-portability-np for the Inter-Operator Webservice Specifications

3.4 Test Scope

In Scope

The scope for the IT testing of the (1) Data Link Layer Testing will include end to end connectivity (VPN and Firewalls) of each service provider (2) Network Layer Testing will include connectivity through firewalls and interaction between application systems and (3) Application Layer Testing will include the format, content, and processing of the porting transactions compliant with the NP specifications.

Out of Scope

Items considered out of scope for the IT testing are:

- Archival of data;
- Network testing for Voice and SMS;
- Stress/Load testing;
- Systems and application performance.

3.5 Test Strategy

Any new operator offering the service of Number Portability must undertake the IT testing before moving on to the production environment. The testing has to be conducted in three phases namely: Data Link Layer Testing, Network Layer Testing and Application Layer Testing. The new operator must successfully complete each testing phase in the listed succession, with **all** the other PATS operators executing **all** the test scenarios, before proceeding to the next test phase.

3.6 Test Entry Criteria

The test entry criteria for the respective test phases are:

Data Link Layer Testing:

- Bilateral agreement in place with all the current PATS operators;
- A test plan is agreed upon between the parties involved;
- Exchange of VPN and Firewall setup details with all the current PATS operators.

Network Layer Testing:

- Meet exit criteria for the Data Link Layer Testing ;
- A test plan is agreed upon between the parties involved;
- Exchange of connection details for the application’s systems.

Application Layer Testing:

- Meet exit criteria for the Network Layer Testing;
- A test plan is agreed upon between the parties involved;
- Application completion and internally tested (alpha testing).
- Exchange of the web service interface definition (WSDL)

3.7 Test Exit Criteria

The test exit criteria for each phase of testing are:

- All test cases are executed and meet the expected outcome;
- Outstanding severity issues have been reviewed and evaluated.

3.8 Test Scenarios

The test scenarios for each testing phase are detailed in Annex 2 and 3 respectively.

3.9 Test Environment

- The new operator and all other operators are responsible for developing and maintaining a NP test environment in line with these specifications;
- The test environment should replicate the production environment as closely as possible;
- The Link mechanism to be used for production should also be used for testing;
- 3 test numbers from the new operator's numbering block to each other PATS operator;
- 3 test numbers from each of the other operators' numbering blocks to the new operator.

3.10 Test Schedule

The new operator must provide adequate notice of its intent to carry out IT testing with the other PATS operators involved not less than 10 working days before testing can commence. This should take into consideration the necessary time required in order to complete all the necessary tasks before any tests can be executed. Note that the new operator is required to provide the details necessary (such as VPN details and WSDLs) upon notification to carry out the IT testing with the other PATS operators.

Each participant is responsible for being ready to commence IT testing on the planned date by providing the appropriate environment, test data, supporting resources and by also ensuring that all entry criteria have been met. Following the relevant testing preparation phases; the data link layer testing phase should take place within 3 working days followed with the Network Layer testing completed within 2 working days. The application layer testing phase should take place within 5 working days followed by

the clean off and sign off test completion within 1 working day. The migration to production environment phase should be carried out over 2 working days during any scheduled migration time frames as set by the other operators involved.

Annex 1 describes the test schedule that needs to be followed.

The test schedule for the IT Interface testing may be extended under certain circumstances due to industry practices such as network data freezes which are carried out by the operators subject to MCA's authorisation. In this case the parties involved are to be appropriately notified beforehand at the earliest. Note that any modifications to the test schedule as described in Annex 1 will also directly impact the time schedule applicable to the setup and launch of the numbering resources and eventually on the planned start of service date.

3.11 Test Management

Roles and Responsibilities

Each participating operator/service provider must have at least one named test co-ordinator for each of the testing phases mentioned above.

The named test co-ordinators are responsible for (1) preparing any test data and supporting resources while ensuring that all entry criteria have been met, (2) ensuring that all test cases are executed (3) reporting and escalating any unresolved issues discovered during testing.

Test Results and Test Status Reporting

Test co-ordinators must record the test results for each of the test cases executed, irrespective of the test outcome. If the test results are different from the expected outcome, the test co-ordinator identifying such a difference is responsible for ensuring that the reasons for such an outcome are identified. In the case that the differences in these test outcomes are not due to human error (such as incorrect typing error), the test co-ordinator must then raise a fault with the other test co-ordinator/s in question.

At the end of each test day, the test co-ordinators must review the test scenarios covered and any issues that were discovered/resolved. The test co-ordinators must then produce a detailed summary including the test scenarios covered during the day, the general outcome, and any issues together with their severity levels that might have been discovered/resolved and circulate their report amongst the test co-ordinators of all the participating . Internal distribution of such a report will be the responsibility of the respective test co-ordinators.

Test Outcome Criteria

A test is classified as **pass** when the test outcome matches the expected results or when any variance between the actual and expected result can be satisfactorily explained.

A test is classified as **fail** when unexplained variances occur between the actual and expected results.

All test failures are categorised accordingly with a severity level, namely:

High: The application is not in a position in order for testing to continue.

Medium: The application is working with reduced functionality enabling limited tested to continue.

Low: Application functions are not working or are working in a very restricted manner with minimal effect on the testing.

Fault Resolution Process

In case of failing tests, the test co-ordinator must first of all notify the other party involved and record all faults into the test report or in a separate fault report in order to facilitate fault tracking. The fault must be classified under a severity level and assigned a unique reference number. All faults must be raised within a short period of time after which they have been discovered in order to minimise the effect that such a fault might have on the testing times. The test co-ordinator must report all open and closed faults in the daily test status summary.

Once a fault has been identified and resolved, depending on the severity of the fault detected, the test co-ordinator is required to either co-ordinate a complete re-run of the test cycle in the case of a high severity failure; or to re-run specific test cases within the test cycle in the case of a medium or low severity failure.

Re-running of such tests are undertaken to ensure that any fixes to the fault have been successful, and that the outcome of such fixes did not impact any other tests. Once this is achieved the test case can be considered as passed. The extent of regression testing must be agreed upon amongst the test co-ordinators in question.

Test Completion

Upon test completion, the test co-ordinator must produce a final test summary report listing all the test scenarios covered, the test results, any outstanding pending issues, and specific conclusion and recommendations. Sign off of the final test summary needs to be agreed upon by all the parties involved followed by cleaning off any test data in order to start migrating the test system onto the live environment.

At the conclusion of the IT testing, a date has to be agreed upon amongst the test co-ordinators in question when the system will be migrated to the live environment. Migration to production should

occur outside NP standard hours of operation. Once this is completed the new operator should send a 'Get Active Ported-Out Numbers' request to the Block Operator in question which shall return the list of all the ported out numbers in order for the New Operator to be in a position to update its subscriber number database.

4 Network Testing for Mobile Telephony

4.1 About this section

This section describes the recommended network testing to be conducted by the New Operator for voice and SMS with the other PATS Mobile Service Providers. The contents of this section are separate to and in addition to any internal testing conducted by the Mobile service providers.

4.2 Overview

Number Portability is a service that is required to be implemented by all mobile service provides. These guidelines have been developed to define Mobile Number Portability (MNP) specific testing processes and timeframes.

Modified arrangements to those defined in this document can be followed provided that these are clearly documented and all the parties involved agree.

4.3 Test Objectives

- The objective of the MNP network testing is to test the network conditioning implemented by the new operator together with the other PATS mobile service providers to ensure that calls and messages are routed appropriately.

- The testing processes shall not negatively impact end customers in any way.

4.4 Test Scope

In-scope - The Network testing for voice

To include, the following test scenarios:

- The New Operator to direct route calls to all Mobile PATS numbers;
- All Mobile operators to direct route calls to the New Operator;
- The New Operator tests as a Block Owner the onward routing of calls from a fixed operator not opting for a direct routing solution[1];
- The New Operator tests as a block owner the onward routing of any in-coming international calls;
- The New Operator tests that all calls to ported-in numbers are terminated;

- Error treatments.

In-scope - The Network testing for SMS services

To include where applicable for each participant the following test scenarios:

- The New Operator to direct route SMSs to all Mobile PATS numbers;
- All Mobile operators to direct route SMSs to the new operator;
- The New Operator tests that block owners route any in-coming international SMSs[1];
- Error treatments.

[1] *Applicable also in the case when for some technical reason local calls and/or SMSs are routed to the block owner.*

Out of Scope

Items considered out of scope of these testing processes are:

- Testing of the operational porting process;
- Testing of the IT Interface component of MNP*;*
- Testing of interconnections.

4.5 Test Strategy

Each Mobile Service Provider, including the New Operator, has to setup a number of mobile telephone numbers (from their allocated number ranges) for MNP testing so that the other mobile service providers can make test calls and SMSs to test these numbers to confirm that their network conditioning is set correctly. Ideally, if technically possible, these test numbers should be set up in such a way that incoming calls are answered automatically (e.g. voice mailbox) in order to create minimal inconvenience to the operators, whilst at the same time demonstrating successful routing. These MNP test numbers shall be set up for a period of time to cover the envisaged testing period. Some of these test numbers should ideally be kept available even after the testing processes are completed to undergo any future testing. Prior to the start of the testing period, each participating mobile operator will have to implement the required network conditioning to handle calls and SMS to ported numbers.

Mobile Voice Routing methods

This document addresses two routing methods for mobile *voice* namely:-

- Direct routing applicable to all Mobile PATS operators;
- Fixed / foreign operator block owner routing.

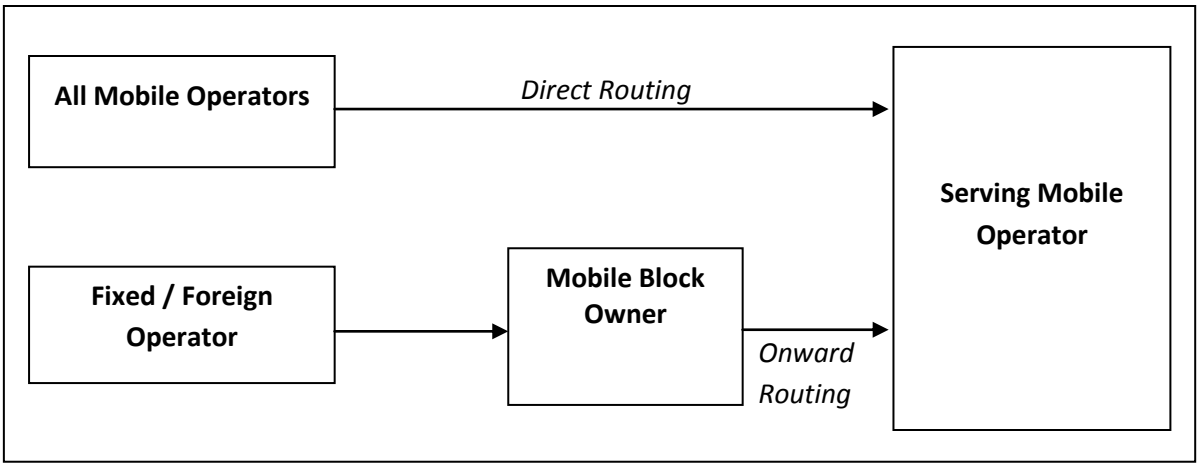
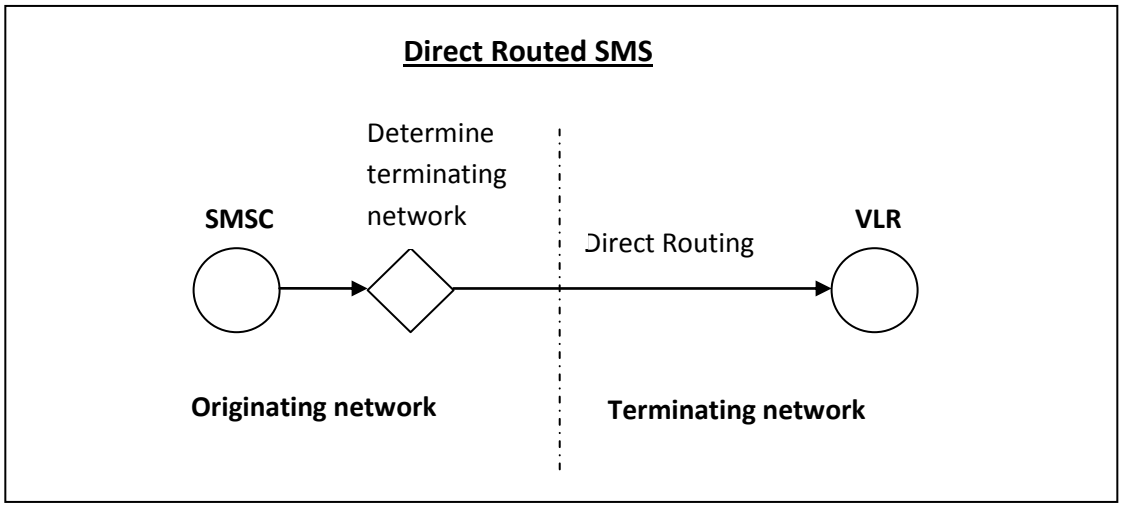


Figure 1

SMS routing methods

This document addresses two routing methods for *SMS service* namely:-

- Direct routed SMS;
- Block Owner routing for international SMS.



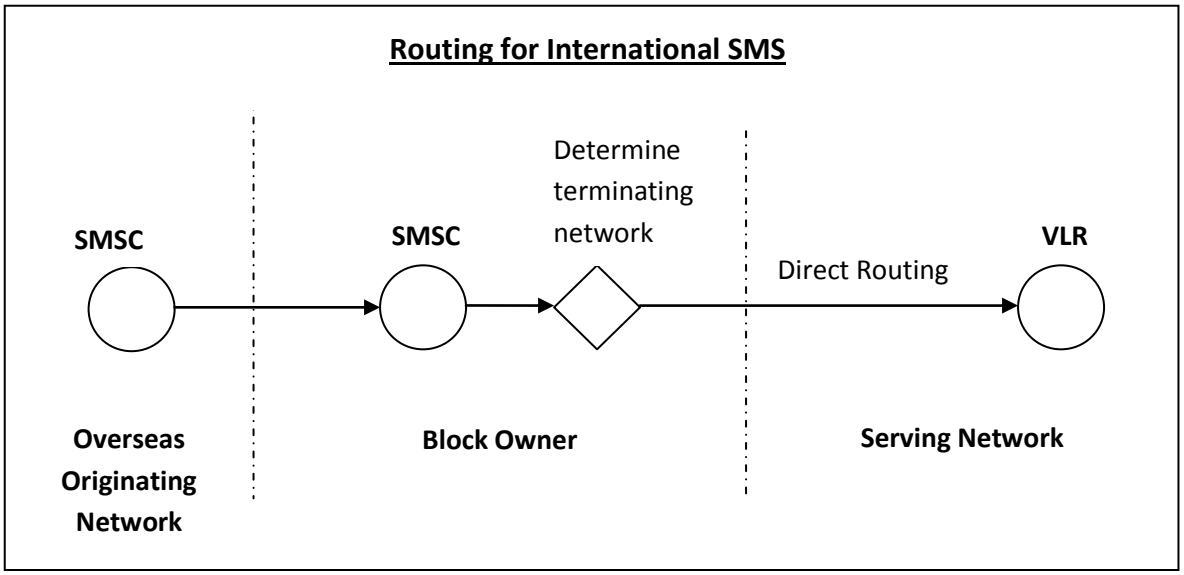


Figure 2

4.6 Routing Responsibilities

Block Owner:

- when the Block Owner is the originating mobile operator, it shall route all calls and SMSs to ported numbers directly to the serving network;
- when the Block Owner receives a call or an SMS without a routing prefix to a ported number in the Block Owner's allocated number range, the Block Owner will determine the current Serving Operator for the call or SMS and route it accordingly.

Other Originating Mobile operator:

- The originating mobile operator must determine the Serving Operator and forward the call/SMS accordingly.

Serving Operator:

- calls and SMSs to ported numbers on the Serving Operator must be terminated by the same Serving Operator and not passed to another operator.

4.7 Test Entry Criteria

1) Bilateral Agreement in place between the New Operator with all PATS operators;
2) Test plan for voice and SMS is agreed upon between the parties involved (including the nominated test ported numbers, communication means between operators, etc);
3) Draft schedule for completion of testing;
4) Network conditioning completed and ready for testing (test numbers operational).

4.8 Test Exit Criteria

All test calls and SMSs made by the mobile network operators meet the expected outcome.

4.9 Test Cases

Please refer to Annex 4 for voice and SMS test cases.

4.10 Error Cases

The following error cases to be tested for voice have been identified:

1) Incorrect serving operator specified for calls to a ported number;
2) Incorrect serving operator specified for calls to a non-ported number;
3) Incorrect block owner.

The following error case to be tested for SMS service has been identified:-

1) Incorrect serving operator specified for SMSs to a ported number;
2) Incorrect serving operator specified for SMSs to a non-ported number;
3) Incorrect block owner.

Please refer to Annex 5 for voice and SMS error test cases.

4.11 Test Environment

Mobile service providers, including the new numbering Block Owner, are required to configure and make available the following in their network for testing purposes:

1) A non-ported test mobile number;
2) A test number ported-out to the other mobile operator involved in the NP tests;
3) A test number ported-in from the other mobile operator involved in the NP tests;
4) A test ported number which has as yet not been set up by the Serving Operator (this is required for error case testing to ensure that the call is dropped by the Serving Operator to avoid endless loops);
5) Provide a means to answer the calls made to the MNP test numbers (e.g. voicemail) and to verify messages to the test numbers (e.g. via a handset).

4.12 Test Schedule

The New Operator must provide adequate notice of its intent to carry out network testing with the other operators involved not less than 23 working days before testing can commence. This takes into consideration the necessary time required in order to complete all the necessary tasks before any tests can be executed. During this period, each participant is responsible for being ready to commence network testing on the planned date by providing the appropriate environment, test data, supporting resources and ensure that all entry criteria have been met.

Following this timeframe, the network testing should take place within 9 working days, followed by the clean off of any test data and signing the test completion within 1 working day.

Annex 1 describes the test schedule that needs to be followed.

The test schedule for the IT Interface testing may be extended under certain circumstances due to industry practices such as network data freezes which are carried out by the operators subject to MCA's authorisation. In this case the parties involved are to be appropriately notified beforehand at the earliest. Note that any modifications to the test schedule as described in Annex 1 will also directly impact the time schedule applicable to the setup and launch of the numbering resources and eventually on the planned start of service date.

4.13 Test Management

Roles and Responsibilities

Each participating operator / service provider must have at least one named test co-ordinator.

The named test co-ordinators are responsible to (1) co-ordinate the network preconditioning as well as prepare any test data / supporting resources, ensuring that all entry criteria have been met, (2) ensure that all test cases are executed (3) reporting and resolving any issues discovered during testing.

Test Results and Test Status Reporting

The test co-ordinator must record the test results for each of the test cases executed, irrespective of the test outcome. If the test results are different from the expected outcome, the test co-ordinator is responsible to ensure that the reason for such an outcome is investigated. In case the differences in the test outcome are not due to human error (like incorrect typing error), the test co-ordinator must then raise a fault with the test co-ordinator of the impacted mobile operator. At the end of each test day, the test co-ordinators must review the test scenarios covered and any issues that were discovered / resolved. The test co-ordinator must then produce a detailed summary including the test scenarios covered during the day, the general outcome, and any issues that might have been discovered / resolved and circulate it amongst the participating parties. Internal distribution of such a report will be the responsibility of the test co-ordinator.

Fault Resolution Process

Normal inter-carrier fault resolution processes are to apply.

Fall Back Approach

No fall back strategy should be necessary since testing will not involve live customer service.

Test Completion

Upon test completion, the test co-ordinator must produce a final test summary report listing all the test scenarios covered, the test results, any outstanding pending issues, and specific conclusion and recommendations. Sign off of the final test summary needs to be agreed upon by all the parties involved followed by cleaning off any test data.

5 Network Testing for Fixed Telephony.

5.1 About this section

This section describes the recommended joint network testing for voice services to be conducted by the new operator for voice with the other PATS fixed service providers. The contents of this section are separate to and in addition to any internal testing conducted by the fixed service providers.

5.2 Overview

Number Portability is a service that is required to be implemented by all fixed service provides. These guidelines have been developed to define Fixed Number Portability (FNP) specific testing processes and timeframes.

Modified arrangements to those defined in this document can be followed provided that these are clearly documented and all the parties involved are in agreement.

5.3 Test Objectives

- The objective of the FNP network testing is to test the network conditioning implemented by the New Operator together with the other PATS Fixed service providers to ensure that calls are routed appropriately.
- The testing processes shall not negatively impact end customers in any way.

5.4 Test Scope

In-scope - The Network testing for voice

To include, the following test scenarios:

- The New Operator to convey calls to all other Fixed PATS numbers (either by direct routing, or by transiting the call to the operator who shall onward route it);
- All Fixed Operators to direct or onward route calls to the New Operator;
- The New Operator tests as a block owner the onward routing of calls (including any in-coming international calls[1)];
- Error Treatments.

Out of Scope

Items considered out of scope of these testing processes are:

- Testing of the Operational porting process;
- Testing of the IT component of FNP;
- Testing of interconnections.

5.5 Test Strategy

Each fixed service provider, including the new operator, has to setup a number of fixed telephone numbers (from their allocated number ranges) for FNP testing so that the other fixed service providers can make test calls to test these numbers to confirm that their network conditioning is set correctly. Ideally, if technically possible, these test numbers should be setup in such a way that incoming calls are answered automatically (e.g. voice mailbox) in order to create minimal inconvenience to the operators, whilst at the same time demonstrating successful routing. These FNP test numbers shall be set up for a period of time to cover the envisaged testing period. Some of these test numbers should ideally be kept available even after the testing processes are completed to undergo any future testing. Prior to the start of the testing period, each participating fixed operator will have to implement the required network conditioning to handle calls to ported numbers.

Routing methods

This document addresses two routing methods namely:-

- All Fixed PATS operators routing (direct or indirect);
- Foreign operator / block owner routing

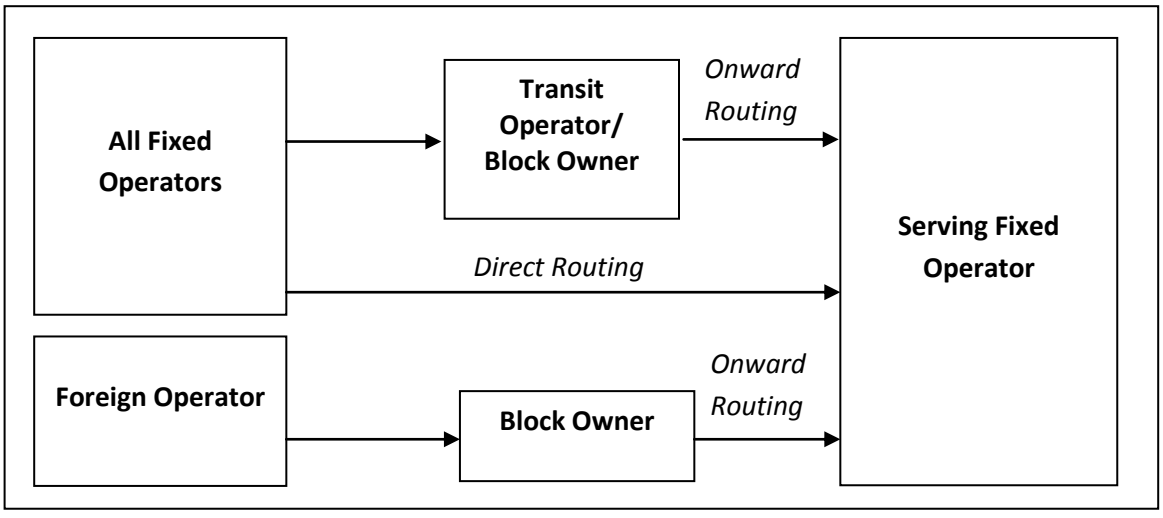


Figure 3

5.6 Routing Responsibilities

Block operator:

- when the Block Owner is the originating fixed operator, it shall ensure that all calls to ported numbers are routed to the serving network.
- when the Block Bwner receives a call without a routing prefix to a number in the Block Owner's allocated number range which has been ported, the Block Owner shall ensure that the current Serving Operator is determined and the call is routed accordingly.

Other originating fixed operator:

- originating Fixed Operator may choose whether to route a call to a ported number directly to the serving network or to route it indirectly via the block network.

Serving operator:

- calls to ported numbers on the serving network must be terminated by the same serving operator and not passed to another operator.

5.7 Test Entry Criteria

1) Bilateral agreement in place between the new operator with all PATS operators;
2) Test plan is agreed upon between the parties involved (including the nominated test ported numbers, communication means between operators, etc);
3) Draft schedule for completion of testing;
4) Network conditioning completed and ready for testing (test numbers operational).

5.8 Test Exit Criteria

All test calls made by the fixed network operator meets the expected outcome.

5.9 Test Cases

Please refer to Annex 6 for test cases.

5.10 Error Cases

The following error cases have been identified:-

1) Incorrect serving operator specified for calls to a ported number;

2) Incorrect serving operator specified for calls to a non-ported number;
3) Incorrect block owner.

Please refer to Annex 7 for error test cases.

5.11 Test Environment

Fixed service providers, including the new numbering block owner, are required to configure and make available the following in their network for testing purposes:

1) A non-ported test number;
2) A test number ported-out to the other fixed operator involved in the NP tests;
3) A test number ported-in from the other fixed operator involved in the NP tests;
4) A test ported number which has as yet not been set up by the Serving Operator (this is required for error case testing to ensure that the call is dropped by the Serving Operator to avoid endless loops);
5) Provide a means to answer the calls made to the FNP test numbers (e.g. voicemail) that demonstrates successful routing.

5.12 Test Schedule

The New Operator must provide adequate notice of its intent to carry out network testing with the other operators involved not less than 23 working days before testing can commence. This takes into consideration the necessary time required in order to complete all the necessary tasks before any tests can be executed.

During this period, each participant is responsible for being ready to commence network testing on the planned date by providing the appropriate environment, test data, supporting resources and ensure that all entry criteria have been met.

Following this timeframe, the network testing should take place within 5 working days, followed by the clean off of any test data and signing the test completion within 1 working day.

Annex 1 describes the test schedule that needs to be followed.

The test schedule for the IT Interface testing may be extended under certain circumstances due to industry practices such as network data freezes which are carried out by the operators subject to MCA's authorisation. In this case the parties involved are to be appropriately notified beforehand at the earliest. Note that any modifications to the test schedule as described in Annex 1 will also directly impact the time schedule applicable to the setup and launch of the numbering resources and eventually on the planned start of service date.

5.13 Test Management

Roles and Responsibilities

Each participating operator/service provider must have at least one named test co-ordinator.

The named test co-ordinators are responsible for (1) co-ordinate the network preconditioning as well as prepare any test data/supporting resources, ensuring that all entry criteria have been met, (2) ensure that all test cases are executed (3) reporting and resolving any issues discovered during testing.

Test Results and Test Status Reporting

The test co-ordinator must record the test results for each of the test cases executed, irrespective of the test outcome. If the test results are different from the expected outcome, the test co-ordinator is responsible to ensure that the reason for such an outcome is investigated. In case the differences in the test outcome are not due to human error (like incorrect typing error), the test co-ordinator must then raise a fault with the test co-ordinator of the impacted fixed operator. At the end of each test day, the test co-ordinators must review the test scenarios covered and any issues that were discovered / resolved. The test co-ordinator must then produce a detailed summary including the test scenarios covered during the day, the general outcome, and any issues that might have been discovered / resolved and circulate it amongst the participating parties . Internal distribution of such a report will be the responsibility of the test co-ordinator.

Fault Resolution Process

Normal inter-carrier fault resolution processes are to apply.

Fall Back Approach

No fall back strategy should be necessary since testing will not involve live customer service.

Test Completion

Upon test completion, the test co-ordinator must produce a final test summary report listing all the test scenarios covered, the test results, any outstanding pending issues, and specific conclusion and recommendations. Sign off of the final test summary needs to be agreed upon by all the parties involved followed by cleaning off any test data.

6 Test Timeframes

Number portability, being one of the obligations which are required to be fulfilled by any PATS operators, needs to be set in place as from when the service provider commences to offer telephony service to its clients. Testing of the relevant number portability components should be carried out in parallel with any preparation and testing carried out following the allocation of numbering resources as shown in figure 4 below. The relevant test entry criterion needs to be set in place prior to commencement of any test phase.

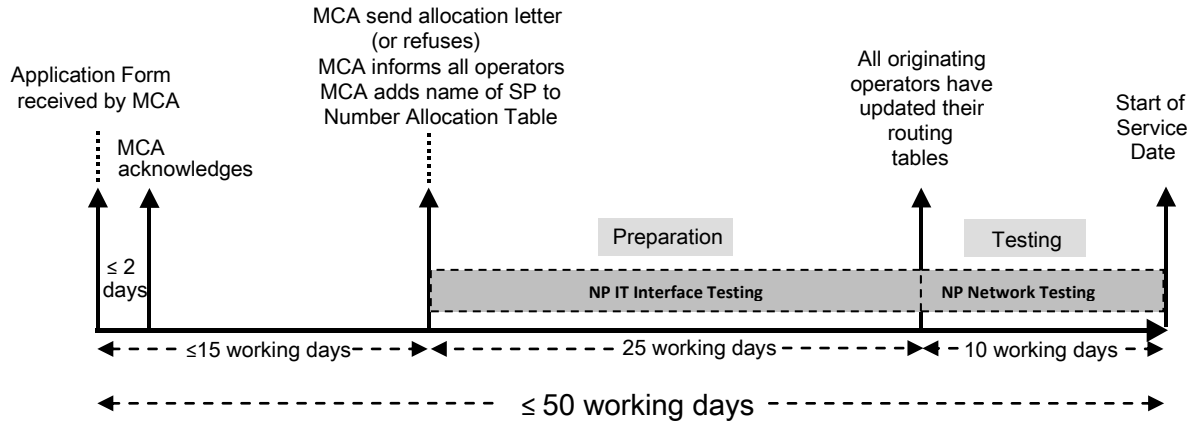
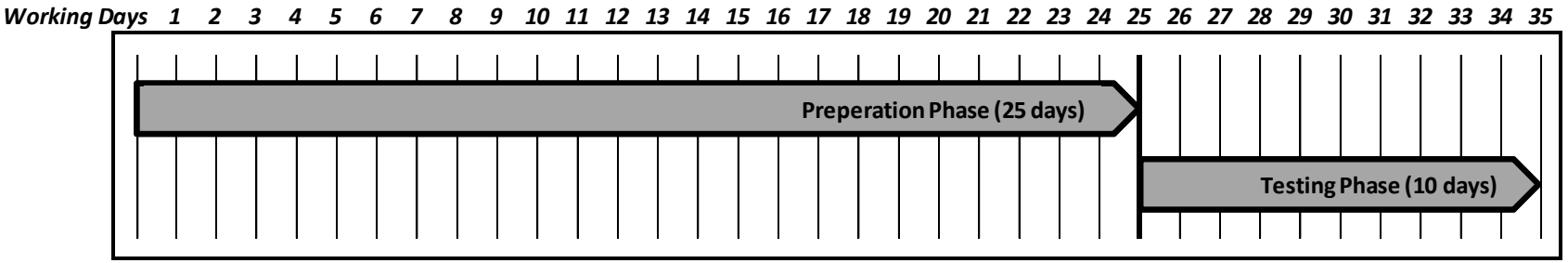


Figure 4: NP testing included during the new number block application process

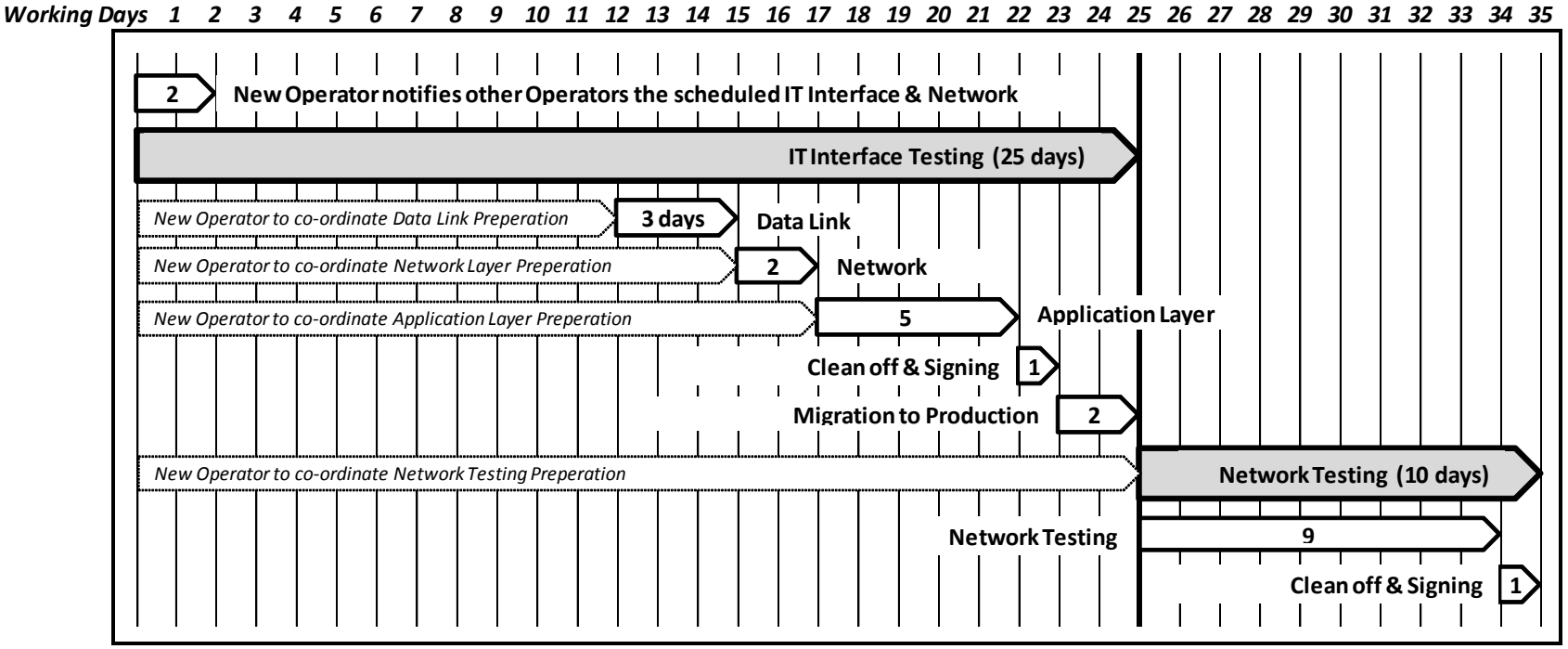
In case the set milestones cannot be adhered to, whether by the new operator or by the established operators, the parties involved need to be informed at the earliest, giving details and reasonable grounds for such a situation as well as a suggested time-line by which all targets will be met.

Annex 1 – NP testing timeframes

NUMBERING APPLICATION PROCESS AS FROM ALLOCATION OF NUMBER BLOCK



NUMBER PORTABILITY TESTING PROCESS



Annex 2 - IT Interface Test Scenarios

Data Link Layer Test scenarios

For the Data Link Layer Testing, 2 test scenarios are required to be carried out in addition to the other test scenarios deemed necessary to be carried out by the operators.

[1] Ping Test - Operators will PING a pre-established specific IP address at each operators end. (Note that this test scenario might not be possible since PING could be blocked by the firewall)

[2] HTTP Access - Operators using a web client will access a test web page hosted on a server of the other operator involved in the testing. (Ideally, the test server must be on the same node in which the NP server will reside)

Network Layer Test scenarios

For the Network Layer Testing, a single test scenario is required to be carried out. However additional test scenarios as deemed necessary by the operators may be carried out.

[1] Web Service Visibility – Operators will have to access each other WSDL file.

Application Layer Test scenarios

For the Application Layer Testing, a number of test scenarios are required to be carried out in addition to the other test scenarios deemed necessary to be carried out by the operators.

[1] Full Porting Scenario (new operator as the Recipient) – The new operator shall act as the recipient and commence/conclude the porting process.

[2] Full Porting Scenario (new operator as the Donor) – The new operator shall act as the donor and reply to any porting requests received.

[3] Routing Functions Scenarios – Such test cases shall cover the routing functions namely Porting Announcement and E164 Terminated.

[4] Auxiliary Functions Scenarios – Such test scenarios shall cover other supporting functions namely Abort, Get Transaction Status, Get Transactions, Get Active Ported In, Get Active Ported Out, and Get Current Operator together with other test scenarios such as Transaction Resubmissions, Delayed Resubmissions and Failing Transactions.

Detailed Application Layer test cases are listed in Annex 3.

Annex 3 – IT Interface Test Scenarios – Application Layer Test Cases

Test Case 1 – Full Mobile Porting Scenario (The new operator being the Recipient)			
Step #	Action by the operator	Test #	Expected Results
1	The recipient operator shall send a valid Authorisation Request to the donor operator	Test 1 - Authorisation Request Submission	The recipient operator shall wait for the donor to send a return code 0 *The recipient operator cannot resubmit transaction* *The recipient operator cannot proceed to the instruction request*
2	The donor operator shall send a return code 0	Test 2 – Receipt of return code 0	*The recipient operator cannot resubmit the transaction* *The recipient operator cannot proceed to the Instruction Request*
3	The donor operator shall send a valid Authorisation Response	Test 3 – Receipt of Authorisation Response	*The recipient operator cannot resubmit the Authorisation Request* The recipient operator can proceed to the Instruction Request
4	The recipient Operator shall send a valid Instruction Request to the donor operator	Test 4 – Instruction Request Submission	The recipient operator shall wait for the donor to send a return code 0 *The recipient operator cannot resubmit transaction* *The recipient operator cannot proceed to the Porting Announcement*
5	The donor operator shall send a return code 0	Test 2 – Receipt of return code 0	*The recipient operator cannot resubmit the transaction*

			The recipient operator cannot proceed to the Porting Announcement
6	The donor operator shall send a valid Instruction Response	Test 5 – Receipt of Instruction Response	*The recipient operator cannot resubmit the Instruction Request* The recipient operator can proceed to the Porting Announcement
7	The recipient operator shall send a Porting Announcement to all operators.	Test 6 – Submission of the Porting Announcement.	Within 60 seconds of receiving the Instruction Response. The recipient operator shall submit the Porting Announcement
8	The donor operator shall not respond to the Porting Announcement (for test purposes).		The recipient operator should resubmit the Porting Announcement after a pre-established time (for test purposes, the retry time shall be reduced.)
9	The recipient operator shall resubmit the Porting Announcement to the operator who did not respond with a valid return code.	Test 7 – Retry Scheme	
10	The donor operator shall respond to the Porting Announcement.		The recipient operator should not resubmit the Porting Announcement.

Test Case 2 – Full Mobile Porting Scenario (The new operator being the Donor)			
Step #	Action by the operator	Test #	Expected Results
1	The recipient operator shall send a valid Authorisation Request to the donor operator	Test 8 – Receipt of an Authorisation Request	
2	The donor operator shall send a return code 0	Test 9 – Submission of return code 0	After checking that all data is in the correct format, the donor operator shall send a successful response code
3	The donor operator shall send a valid Authorisation Response	Test 10 – Submission of Authorisation Response	The donor operator can only submit Authorisation Response for the received requests.
4	The recipient operator shall send a valid Instruction Request to the donor operator	Test 11 – Receipt of an Instruction Request	
5	The donor operator shall send a return code 0	Test 9 – Submission of return code 0	After checking that all data is in the correct format, the donor operator shall send a successful response code.
6	The donor operator shall send a valid Instruction Response	Test 12 – Submission of Instruction Response	The donor operator can only submit Instruction Response for the received requests.
7	The recipient operator shall send a Porting Announcement to all operators.	Test 13 – Receipt of a Porting Announcement	The donor operator shall update its routing tables and return a valid return code 0.
8	The donor operator shall send a valid return code to the Porting Announcement and update its routing tables accordingly.	Test 9 – Submission of return code 0	

Test Case 3 – Full Fixed/Freephone/Premium Porting Scenario (The new operator being the Recipient)			
Step #	Action by the operator	Test #	Expected Results
1	The recipient operator shall send a valid Authorisation Request to the donor operator	Test 1 - Authorisation Request Submission	The recipient operator shall wait for the donor to send a return code 0 *The operator cannot resubmit transaction* *The operator cannot proceed to the Instruction Request*
2	The donor operator shall send a return code 0	Test 2 – Receipt of return code 0	*The recipient operator cannot resubmit the transaction* *The recipient operator cannot proceed to the Instruction Request*
3	The donor operator shall send a valid Authorisation Response	Test 3 – Receipt of Authorisation Response	*The recipient operator cannot resubmit the Authorisation Request* The recipient operator can proceed to the Finalisation Request
4	The recipient operator shall send a valid Finalisation Request to the donor operator	Test 4 – Finalisation Request Submission	The recipient operator shall wait for the donor to send a return code 0 *The recipient operator cannot resubmit transaction* *The recipient operator cannot proceed to the Instruction Request*
5	The donor operator shall send a return code 0	Test 2 – Receipt of return code 0	*The recipient operator cannot resubmit the transaction* *The recipient operator cannot proceed to the Instruction Request*

6	The donor operator shall send a valid Finalisation Response	Test 5 – Receipt of Finalisation Response	*The recipient operator cannot resubmit the Finalisation Request* The recipient operator can proceed to the Instruction Request
7	The recipient Operator shall send a valid Instruction Request to the donor operator	Test 6 – Instruction Request Submission	The recipient operator shall wait for the donor to send a return code 0 *The recipient operator cannot resubmit transaction* *The recipient operator cannot proceed to the Porting Announcement*
8	The donor operator shall send a return code 0	Test 2 – Receipt of return code 0	*The recipient operator cannot resubmit the transaction* *The recipient operator cannot proceed to the Porting Announcement*
9	The donor operator shall send a valid Instruction Response	Test 7 – Receipt of Instruction Response	*The recipient operator cannot resubmit the Instruction Request* The recipient operator can proceed to the Porting Announcement
10	The recipient operator shall send a Porting Announcement to all operators	Test 8 – Submission of the Porting Announcement.	The recipient operator shall submit the Porting Announcement within 60 seconds of receiving the Instruction Response
11	The donor operator shall not respond to the Porting Announcement (for test purposes only)		The recipient operator should resubmit the Porting Announcement after a pre-established time (for test purposes, the retry time shall be reduced.)

12	The recipient operator shall send the Porting Announcement to the operator who did not respond to with a valid return code.	Test 9 – Retry Scheme	
13	The donor operator shall respond to the Porting Announcement and update its routing tables accordingly.		*The recipient operator should not resubmit the Porting Ann.*

Test Case 4 – Full Fixed/Freephone/Premium Porting Scenario (The new operator being the Donor)			
Step #	Action by the operator	Test #	Expected Results
1	The recipient operator shall send a valid Authorisation Request to the donor operator	Test 10 – Receipt of an Authorisation Request	
2	The donor operator shall send a return code 0	Test 11 – Submission of return code 0	After checking that all data is in the correct format, the donor operator shall send a successful response code
3	The donor operator shall send a successful Authorisation Response	Test 12 – Submission of Authorisation Response	The donor operator can only submit Authorisation Response for the received requests
4	The recipient operator shall send a valid Finalisation Request to the donor operator	Test 13 – Receipt of a Finalisation Request	
5	The donor operator shall send a return code 0	Test 11 – Submission of return code 0	After checking that all data is in the correct format, the donor operator shall send a successful response code
6	The donor operator shall send a valid Finalisation Response	Test 14 – Submission of Finalisation Response	The donor operator can only submit Finalisation Response for the received requests
7	The recipient operator shall send a valid Instruction Request to the donor operator	Test 15– Receipt of an Instruction Request	
8	The donor operator shall send a return code 0	Test 11 – Submission of return code 0	After checking that all data is in the correct format, the donor operator shall send a successful response code
9	The donor operator shall send a successful Instruction Response	Test 16 – Submission of Inst Response	The donor operator can only submit Instruction Response for the received requests

10	The recipient operator shall send a Porting Announcement to all operators	Test 17 – Receipt of a Porting Announcement	The donor operator shall update its routing tables and return a valid return code 0.
11	The donor operator shall send a valid return code to the Porting Announcement.	Test 11 – Submission of return code 0	

Test Case 5 – Partial Porting Scenario (The new operator being the Recipient)			
Step #	Action by the operator	Test #	Expected Results
1a	The recipient operator shall send an invalid Authorisation Request (for test purposes only)		After checking that parts of data is in an invalid format, the donor operator shall send an unsuccessful return code
2a	The donor operator shall send a return code other than 0, 1, or 2	Test 18 – Receipt of return code other than 0, 1, or 2	The recipient operator can only resubmit the transaction using the same Transaction ID. *The recipient operator cannot proceed to the Instruction Request*
3a	The recipient operator shall resubmit the correct Authorisation Request to the donor operator using the old Transaction ID	Test 19 – Resubmission of Authorisation Response	After checking that all data is in the correct format, the donor operator shall send a valid return code
4a	The donor operator shall send a return code 0		
1b	The recipient operator shall send an Abort Message to the donor operator	Test 20 – Submission of the Abort Message	The recipient operator shall no longer be able to proceed in processing the current Transaction ID. The donor operator shall reply with a successful return code
2b	The donor operator shall send a successful return code 0.		

Test Case 6 – Partial Porting Scenario (The new operator being the Donor)			
Step #	Action by the operator	Test #	Expected Results
1a	The recipient operator shall send an invalid Authorisation Request (for test purposes only)		After checking that parts of data is in an invalid format, the donor operator shall send an unsuccessful return code
2a	The donor operator shall send a return code other than 0, 1, or 2	Test 21 – Submission of a return code other than 0, 1, or 2	The recipient operator can only resubmit the transaction using the same Transaction ID. *The recipient operator cannot proceed to the Instruction Request*
3a	The recipient operator shall resubmit the valid Authorisation Request to the donor operator using the old Transaction ID.	Test 22 – Receipt of requests using old Transaction ID	The donor operator shall only process requests with the same Transaction ID for those transactions having a return code other than 0, 1 or 2.
4a	The donor operator shall send a return code 0		
1b	The recipient operator shall send an Abort Message to the donor operator	Test 23 – Receipt of the Abort Message	The donor operator shall no longer be able to proceed in processing the current Transaction ID. The donor operator shall reply with a successful return code
2b	The donor operator shall send a successful return code 0.		

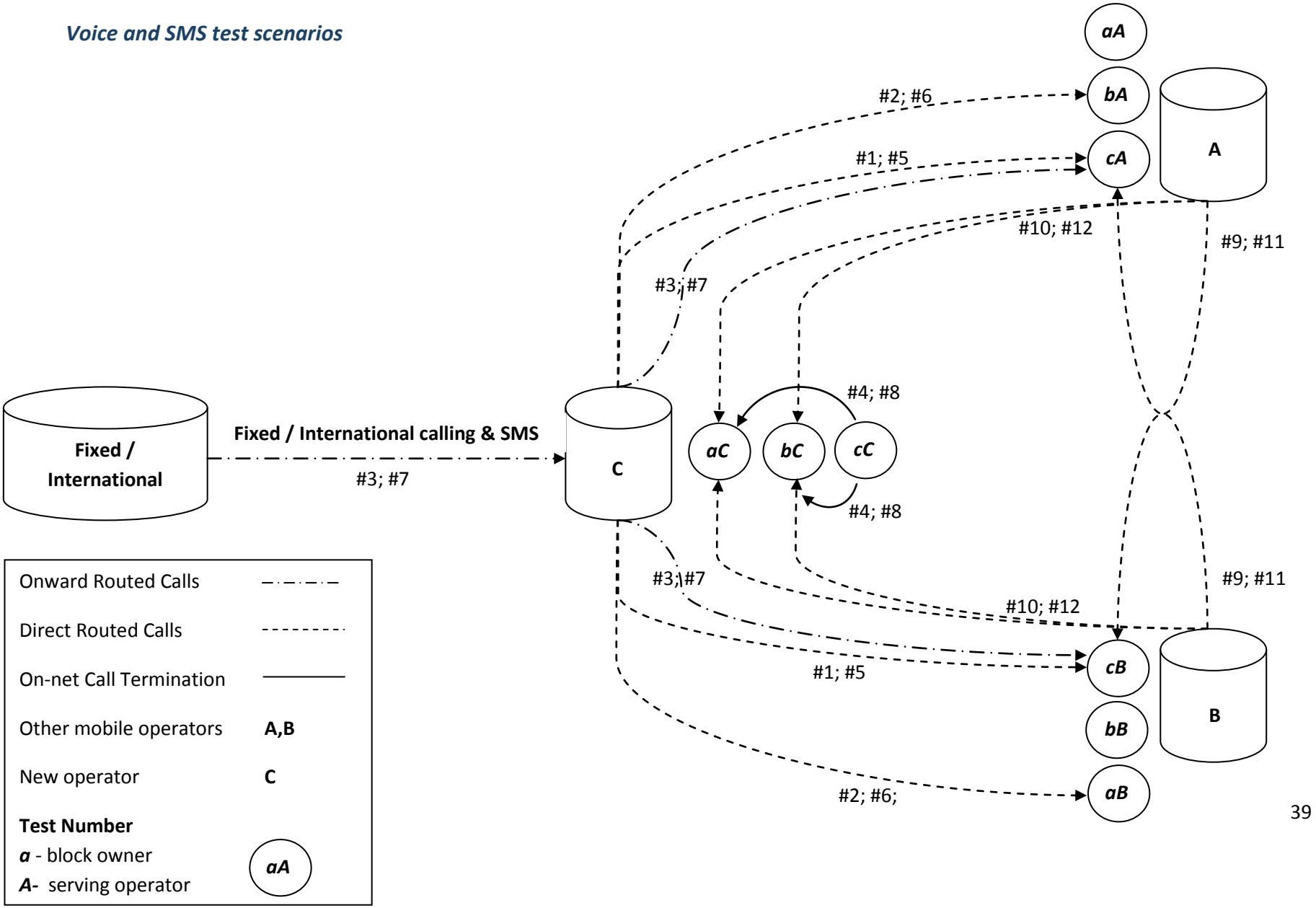
Test Case 7 – Auxiliary Functions			
Step #	Action by the operator	Test #	Expected Results
1a	The new operator as the recipient shall send a Get Transaction Status to the donor operator for the Transaction ID in Test Case 1 (Mobile) or Test Case 3 (Fixed).	Test 24 – Submission of Get Transaction Status	The donor operator shall reply to the recipient operator with the transaction status.
2a	The donor operator shall send a return code 24		
1b	The new operator as the donor shall send a Get Active Ported-In Numbers to the recipient which shall return the number in Test Case 2 or Test Case 4, or any other inserted test data	Test 25 – Submission of Get Active Ported-In	The recipient operator shall reply to the donor operator.
2b	The recipient operator shall return the list of ported in numbers (number used in Test Case 2 or Test Case 4 or any other inserted test data)		
1c	The new operator shall send a Get Active Ported-Out Numbers to the Block operator which shall return the number in Test Case 2 or Test Case 4 or any other inserted test data	Test 26 – Submission of Get Active Ported-Out	The block operator shall reply to the new operator
2c	The block operator shall return the list of ported out numbers (number used in Test Case 1 or Test Case 3, or any other inserted test data)		
1d	The new operator shall send a Get Current Operator to the other participant operator for the MSISDN used in Test Cases 1 or 2; or Test Cases 3 or 4.	Test 27 – Submission of Get Current Operator	The other operator shall reply to the new operator with the integer indicating the current terminating operator.

2d	The other operator shall return the integer representing the network currently serving the number		
1e	The new operator as the recipient shall send a Termination Announcement to all operators to inform them that the service has been terminated from the recipient's network.	Test 28 – Submission of Termination Announcement	The other operators shall update their routing tables and acknowledge receipt of such an announcement to the recipient operator with the return code 0.
2e	The other operators shall update their routing tables and acknowledge receipt of such an announcement with the return code 0.		
1f	The other operator shall send a Get Transaction Status to the new operator for the Transaction ID in Test Cases 1 or 2 / Test Cases 3 or 4	Test 29 – Receipt of Get Transaction Status	The new operator shall reply to the other operator with the transaction status.
2f	The new operator shall send a return code 24		
1g	The other operator shall send a Get Active Ported-IN Numbers to the new operator shall return the number in Test Case 1 or any other inserted test data	Test30 – Receipt of Get Active Ported-In	The new operator shall reply to the other operator with a list of ported-in numbers.
2g	The new operator shall return a list of ported in numbers (including the number used in Test Case 1 or any other inserted test data)		
1h	The other operator shall send a Get Active Ported-Out Numbers to the new operator (as the block operator) which shall return the number in Test Case 2 or any other inserted test data	Test 31 – Receipt of Get Active Ported-Out	The new operator shall reply to the participant operator.
2h	The new operator shall return the list of ported out numbers (including the number used in Test		

	Case 2 or any other inserted test data)		
1i	The other operator shall send a Get Current Operator to the new operator for the MSISDN used in Test Cases 1 or 2; or Test Cases 3 or 4.. or for any test data inserted.	Test 32 – Receipt of Get Current Operator	The new operator shall reply to the other operator with the integer indicating the serving operator.
2i	The new operator shall return the integer representing the serving operator		
1j	The new operator shall receive a Termination Announcement informing it that a service has been terminated froma recipient's network.	Test 33 – Receipt of Termination Announcement	The new operators shall update its routing table accordingly and acknowledge receipt of such an with the return code 0.
2j	The new operators shall update its routing table and acknowledge receipt of such an announcement with the return code 0		

Annex 4 – Networking Testing for Mobile Telephony

Voice and SMS test scenarios



Annex 4 – Networking Testing for Mobile Telephony

Test cases to be run by 'new' operator implementing MNP (Operator C)		
Test #	Test Case	Comments
1	Direct Route calls from own subscribers to own block numbers ported to all other mobile operators.	Calls from *cC* to *cA, cB* etc...
2	Direct Route calls from own subscribers to all other mobile operators' block numbers which have been ported to another operator.	Calls from *cC* to *bA, aB*,etc...
3	Route calls originating from other operators to own block numbers ported to other operator (indirect routing originating either from a fixed network or international).	Calls from FF, II to *cA, cB* etc...
4	Terminate calls originating from own subscribers to other ported-in own subscribers (on-net)	Calls from *cC* to *aC, bC*, etc...
5	Direct route SMSs from own subscribers to own block numbers ported to other operators	SMS from *cC* to *cA, cB* etc...
6	Direct Route SMSs from own subscribers to other operators' block numbers which have been ported to another operator.	SMS from *cC* to *bA, aB*, etc...
7	Route SMSs originating from overseas operators to own block numbers ported to another operator.	SMS from II to *cA, cB* etc...
8	Terminate SMSs originating from own subscribers to other ported-in own subscribers (on-net)	SMS from *cC* to *aC, bC*, etc...

Test cases to be run by 'current operative' operators updating MNP (Operator A,B)		
Test #	Test Case	Comments
9	Direct Route calls from own subscribers to new operator's block numbers ported to other operators	Calls from *bB* to *cA*,/ *aA* to *cB*, etc...
10	Direct Route calls from own subscribers to new operator's ported-in subscribers.	Calls from *bB* to *aC*&*bC*,/*aA* to

		aC&*bC*, etc...
11	Direct Route SMSs from own subscribers to new operator's block numbers ported to other operators.	SMS from *bB* to *cA*, */aA* to *cB*, etc...
12	Direct Route SMSs from own subscribers to new operator's ported-in subscribers.	SMS from *bB* to *aC*&*bC*,*/aA* to *aC*&*bC*, etc...

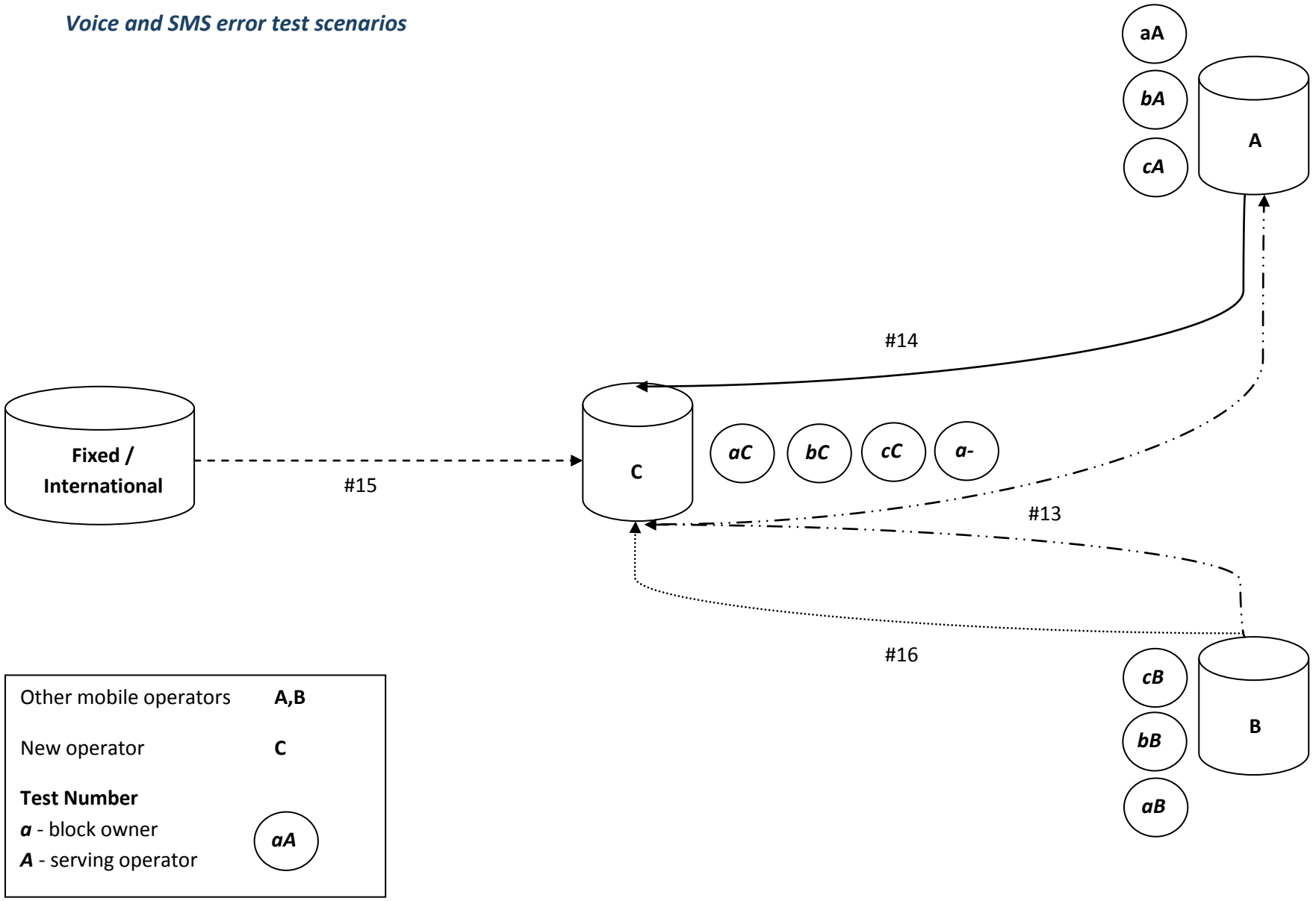
In addition to the proper call routing, the following needs to be verified for each of the test calls carried out during network testing:-

Display of CLI (where CLI is enabled)

Proper A Party, B Party and NP Routing Prefixes in **IAM** message

Annex 5 – Networking Testing for Mobile Telephony

Voice and SMS error test scenarios

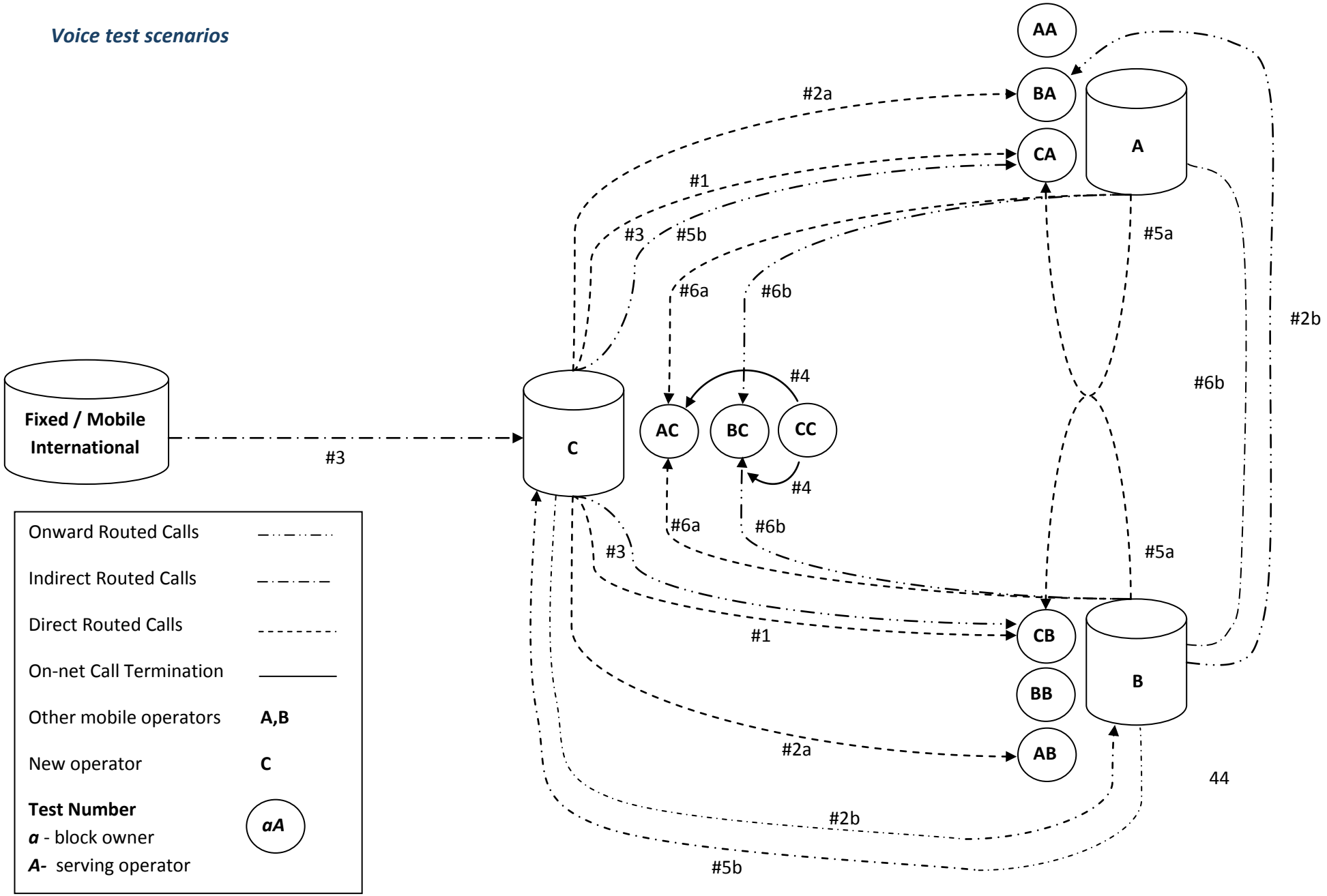


Annex 5– Networking Testing for Mobile Telephony

Error Test cases		
Test #	Test Case	Comments
13	1. Current operative operator to route a call with an incorrect routing prefix to new operator. 2. New operator to re-route call to correct serving operator.	Calls from *bB* to *bA* etc... through operator C
14	1. Currently operative operator to route a call with the correct routing prefix of the new operator and an incorrect MSISDN. 2. New operator to drop the call.	Calls from *aA* to *aB*, *a-* etc... on operator C
15	1. New operator to receive a call to a number outside its own block without a routing prefix. 2. New operator to drop the call.	Calls from *FF*, to *bA*, *aB* etc... through operator C
16	1. Current operative operator to route an SMS with an incorrect routing prefix to new operator. 2. New operator to drop the SMS	SMS from *bB* to *bA* etc... through operator C

Annex 6 – Networking Testing for Fixed Telephony

Voice test scenarios



Annex 6 – Networking Testing for Fixed Telephony

Test cases to be run by 'new' operator implementing FNP (Operator C)		
Test #	Test Case	Comments
1	Direct Route calls from own subscribers to own block numbers ported to other operators.	Calls from *cC* to *cA, cB* etc...
2a	Direct Route calls from own subscribers to other operators' block numbers which have been ported to another operator **OR**	Calls from *cC* to *bA, aB*,....
2b	Indirect Route calls from own subscribers to other operators' block numbers which have been ported to another operator via Block Operator.	Calls from *cC* to *bA*, etc...
3	Route calls originating from other operators to own block numbers ported to other operator (indirect routing originating either from a fixed, mobile or international network).	Calls from FF, MM, II to *cA*, *cB* etc...
4	Terminate calls originating from own subscribers to other ported-in own subscribers (on-net)	Calls from *cC* to *aC, bC*, etc...

In addition to the proper call routing, the following needs to be verified for each of the test calls carried out during network testing:-

Display of CLI (where CLI is enabled)

Proper A Party, B Party and NP Routing Prefixes in **IAM** message

Test cases to be run by 'current operative' operators updating FNP (Operator A,B)		
Test #	Test Case	Comments
5a	Direct Route calls from own subscribers to new operator's block numbers ported to other operators **OR**	Calls from *bB* to *cA, AA* to *cB*, etc...
5b	Indirect Route calls from own subscribers to new operator's block numbers ported to other operators	Calls from *bB* to *cA, etc*...
6a	Direct Route calls from own subscribers to new operator's ported-in subscribers **OR**	Calls from *bB* to *aC,aA* to *aC*, etc...
6b	Indirect Route calls from own subscribers to new operator's ported-in subscribers via Block Operator.	Calls from *bB* to *bC,aA* to *bC*, etc...

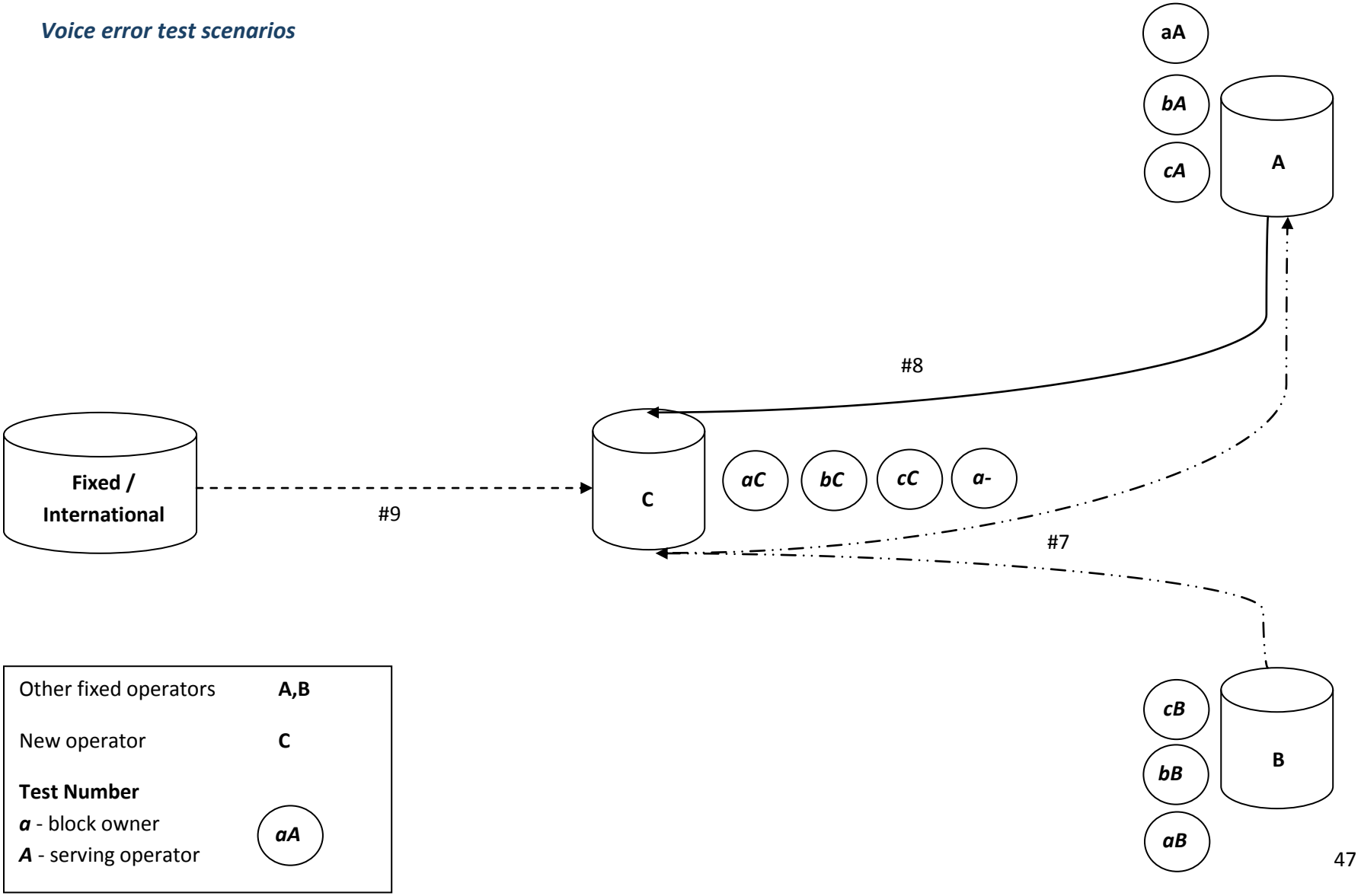
In addition to the proper call routing, the following needs to be verified for each of the test calls carried out during network testing:-

Display of CLI (where CLI is enabled)

Proper A Party, B Party and NP Routing Prefixes in **IAM** message

Annex 7 – Networking Testing for Fixed Telephony

Voice error test scenarios



Annex 7– Networking Testing for Fixed Telephony

Error Test cases		
Test #	Test Case	Comments
7	3. Current operative operator to route a call with an incorrect routing prefix to new operator. 4. New operator to re-route call to correct recipient.	Calls from *bB* to *bA* .. . . through operator C
8	3. Currently operative operator to route a call with a correct routing prefix and an incorrect MSISDN. 4. New operator to drop the call.	Calls from *aA* to *aB, a-* on operator C
9	3. New operator to receive a call to a number outside its own block without a routing prefix. 4. New operator to drop the call.	Calls from FF, MM, to *bA*, *aB*..... through operator C