ANNEX H

Technical Manual

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1. Introduction

This Manual is a description of those features of the Operator Network that are relevant to an Operator seeking Interconnection. It describes the various Network elements and the services that are supported/offered by these elements as part of the RIO.

This Manual does not describe the details of any network that may result from an Interconnection with an Operator. These details are contained in the Network Plan at Annex E of the Interconnection Agreement. Furthermore, this Manual does not describe the operation processes which underline the provision, operation or maintenance of the Interconnection Network provided to another Operator. These are contained in the Operations and Maintenance Manual.

Due to the nature of transmission, routing and Signalling, the network is continually evolving to support new features and functionality. Enhancements which are material to the information in this Manual will result in a new issue.

2. Scope

This Manual describes the essential network functionality required to facilitate the planning and execution of an efficient Interconnection with an Operator.

3. Symbols & Abbreviations

For the purposes of this Manual, the abbreviations contained herein shall have the meaning assigned to them in Annex A of the Interconnection Agreement.

4. Definitions

For the purposes of this Manual the words and expressions in this Manual shall have the meaning assigned to them in Annex A of the Interconnection Agreement.

5. Melita Network

5.1. Traffic routing

Principles of traffic routing to and from Melita's Interconnection Nodes are described in Annex E of the Interconnection Agreement.

5.2. Numbering

All numbering plans will be in line with the National Numbering Plan.

6. Signalling Network

6.1. Introduction

This section primarily contains information on *Operator*'s Signalling network.

6.2. Signalling System description

6.2.1. SIP and SIGTRAN

Operator's SIP implementation complies, not exclusively, with the following standards:

- RFC3261
- RFC4028

Should SIGTRAN be selected as a signaling option further details will be exchanged between operators at a later stage.

6.2.1.1. SIP Signalling

Interconnection of two interconnection nodes will require at least one SIP IP Address and one RTP IP Address at both ends.

6.2.1.2. SIGTRAN Signalling

Interconnection of two Interconnection Nodes will require at least one IP Address on both ends.

6.2.2. RTP

Interconnect supports voice traffic only using the G711 codec with DTMF (RFC2833) support having payload type 101. The protocol to be used is RTP over UDP. Ptime is 20ms

Operator reserves the right to implement number screening masks to reduce the traffic supported on an interconnection to that required by the commercial interconnection agreement.

6.2.2.1. Call control procedures

6.2.2.1.1. Digit sending

Operator has a known number length and will accordingly use en-bloc sending.

6.2.2.1.2. Multiple SIP and SCCP IP Addresses

When operator has more than one IP address for each of the above protocols, Melita prefers load sharing across the IP Addresses.

6.2.2.1.3. Satellite

Not used nationally.

6.2.3. Call Diversion

Call-looping resulting from call diversions across the interconnection link/s is prohibited.

6.2.4. Calling party number formatting

Calling party number formatting must always be in E.164 format.

6.2.5. Called party number formatting

The format of the called party number should be:

- 4-digit Number Portability Routing Prefix of the addressed network preceding the Subscriber Number

This should also be reflected in the user part of the SIP-URI and the Request-URI in case of SIP.

6.2.6. Early Media

A 180 Provisional Response SIP message must not include SDP. This instructs the recipient to play tones or announcements to the user. Early media must be played following a 183 Provisional Response SIP message including SDP.

7. Communication services supported

This clause lists the telecommunication services supported by the interconnection signalling system. Operators are required to select the various services that they require so that the technical implementation of the interconnection matches the commercial interconnection agreement.

7.1. Bearer services

- RTP over UDP using G711a codec speech;
- Speech;

7.2. Supplementary Services

- Call Forwarding on Busy
- Call Forwarding on No Reply
- Call Forwarding Unconditional
- Call Hold
- Call Waiting
- CLIP
- CLIR
- Conference Call (3 Party)
- DTMF

8. Service Quality

8.1. Grade of Service from and towards Operator Interconnection Nodes

All Interconnection Paths between the Operator and the Melita Interconnection Nodes will be dimensioned based on expected both way busy hour offered traffic and a grade of service of 0.002 or better (i.e. 0.2% of offered calls across this link will experience congestion). Traffic which has been blocked on the first-choice routes will overflow on the other routes in the interconnection network, from both sides.

The network will offer high quality of service under normal conditions and will offer a degraded service to Melita under bursty/failure conditions, such that the majority of call attempts will be successful.

In case of failure of a single Interconnection Node or Transmission system, a reduced grade of service may be used.

8.2. General Quality of Service Parameters

The following service quality parameters are applicable to both Operator's and Melita's Networks. The parameters represent a minimum set, to be measured and recorded by both parties.

The current state of implementation of systems to measure and report on these parameters shall be confirmed between Operator and Melita. Both Parties shall agree on the timetable for the introduction of the measurements of these parameters.

Additional service quality parameters may be introduced in line with the development of systems to gather and process the appropriate data.

8.2.1. Traffic Performance Parameters

Interconnect ID	The ID number of the interconnect
Maximum allowed simultaneous calls	The total number of simultaneous calls allowed on the interconnect
Time	The time of day at which the busy hour commences
(Busy Hour) Traffic	The peak number of simultaneous calls carried by the interconnect during the busy hour
ASR%	The answer seizure ratio, defined as the number of answered seizures to total seizures ie. $ASR\% = \frac{\text{answered seizures}}{\text{total seizures}} \times 100\%$

9. Test Requirements

9.1. Introduction

Testing is an essential part of the interconnection process. This clause describes the methodology applied by *Operator* to testing and the various types of tests that will be applied.

9.1.1. Testing and Bringing Into Service

Both parties shall agree a test plan which shall define the relationship between individual tests and the timeframe for carrying out the tests. A separate test plan shall be defined for each new or additional service supplied.

9.1.1.1. Transmission Tests

These tests shall have the objective of proving the error-free transport of information between the gateways of the *Operator* Network and the Melita Network in accordance with the relative standards.

9.1.1.2. Routing and Signalling tests

The routing and signalling tests shall be in accordance with Appendix A – Interconnection Test Specification, which specifies the end-to-end tests including CLI tests, route redundancy tests (where applicable) and Call Data Records validation to be performed.

The end-to-end tests have the objective of proving the correct operation of a set of supplied services between the two parties. These tests shall examine the correct operation of:

- network routing;
- any number translation or Service features invoked;
- the correct operation of any specific end-to-end bearer services, supplementary services or teleservices used;
- billing interfaces;
- any other specific testing that may be necessary.

The test plan agreed between *Operator* and Melita at the start of the provisioning process, shall define which of the specific tests defined in the Melita Interconnection Test Specification will be carried out. The tests selected depend on the type of service being supported over the interconnection.

9.1.2. Billing tests

Test will be carried out to:-

a) Verify call records.

b) Validate both Melita billing/invoicing procedures/systems.

This will be achieved by generating a controlled set of test calls at the appropriate level (primary, secondary & tertiary). The associated Call records generated by each Party for each call type will be checked to ensure they are correct in all details. The invoice produced by both Parties will then be compared for final verification of both Billing Systems.

A test document will be produced for each Party. An example test list is contained in Appendix A, Annex 1.

9.1.2.1. Testing Methodology:

Testing will be carried out over an agreed test period. This should be agreed by testing personnel and documented in the test sheet summary in Appendix A, Annex 1. During the test period all successful calls made to the Melita Network will generate CDRs.

The testing methodology will consist of the steps detailed below.

9.1.2.1.1. Call Generation

This step involves test personnel at *Operator* and Melita making a series of test calls over the Interconnection Links. The details of these calls will be recorded manually on test recording sheets.

Before the commencement of testing, watches should be synchronised with Operator's interconnection exchange clock. One recording sheet should be used for each individual call.

For a successful call, the duration of the call will be timed from the start of conversation to call hang up.

NOTE: The hang up time may be different for each end of the call. Both parties should time independently of each other, and complete the appropriate test recording sheet.

9.1.2.1.2. CDR production and extraction at Melita mediation Site

All call records generated during the testing period will be collected from the Melita mediation sites and transferred to the Melita billing centre. A copy of CDRs will be translated into an ASCII comma separated file for later reconciliation.

9.1.2.1.3. CDR production and extraction at the Operator Network

The Operator will collect CDRs for the duration of the testing period. These call records will be made available as an ASCII comma separated text file. The call records produced shall contain as a minimum the following fields.

- A number
- B number
- Call Start Time
- Call Duration

9.1.2.1.4. Invoice Production at Melita

The Melita billing system will produce an invoice for all calls made during the test period. This will be presented to Operator for information purposes only.

9.1.2.1.5. Reconciliation of Calls

Copies of the test recording sheets will be exchanged between Melita and Operator. The details of the test calls will be compared and both parties will produce a report outlining any discrepancies or anomalies.

9.1.2.1.6. Invoice Verification

The Operator will examine the trial invoice produced and return their comments to Melita.

9.1.2.2. Acceptance Sign-Off

When both parties have reached agreement on the two aspects of the testing

Part A…….Manually generated calls

Part B…….Invoice Production

An overall sign-off to the test will be completed.

9.1.3. Principles

This section describes the following:

- interconnection scenario that will be presented to *Operator* and Melita.
- tests to be completed for this scenario.

9.1.3.1. Interconnection Scenario

This scenario involves Melita's first interconnection to *Operator*'s interconnect node/s:

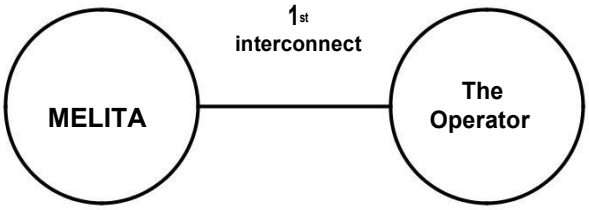


Figure 9(a): interconnection Scenario

Interconnection	Tests	Appendix A
1st Interconnection	End-to-end testing including CLI where applicable	Annex 1
	Link redundancy testing	Annex 2
	Billing Tests	Annex 3

Table 9(a): Test list to be completed on the first interconnection to a Melita's exchange

The list of tests in each Appendix acts as guidelines, and Melita reserves the right to provide a separate test plan accordingly. The test plan results will form part of this Agreement.

APPENDIX A – INTERCONNECTION TEST SPECIFICATION

10.1 Scope

The purpose of the testing activities described in this Appendix A is to verify the correct operation of the Interconnection, prior to the commencement of live service. Testing shall include, where applicable, redundancy, billing and interconnect testing.

10.2 Redundancy Testing

Where applicable, redundancy testing shall be carried out to verify the resilience of the Interconnection and the correct operation of failover mechanisms. Redundancy testing shall not apply when the Operator's nodes operate in cluster mode.

10.3 Billing Testing

The Parties shall perform billing testing to verify the accurate recording, measurement, and reporting of traffic conveyed across the Interconnection.

The Parties shall cooperate in the exchange of such information as may reasonably be required to validate billing records and charging mechanisms.

10.4 Interconnect Testing

Interconnect testing to *Operator* node is mandatory prior to the introduction of service.

Contact names and test configurations shall be agreed between the Parties closer to the start of testing.

Relevant traces should be monitored and stored if possible.

Disclaimer: Operator reserves the right to amend or extend this information if it deems necessary.

ANNEX 1 – SIGTRAN Redundancy testing

Test Case	Test Description
1	SCCP Status NOT ALLOWED SPC=2-AAAA (AAAA = Point Code)
2	SCCP Status NOT ALLOWED SPC=2-BBBB (BBBB = Point Code)
3	SCTP Association DOWN SLC0 to ST_STP1
4	SCTP Association DOWN SLC1 to ST_STP1
5	SCTP Association DOWN SLC0 to ST_STP2
6	SCTP Association DOWN SLC1 to ST_STP2

ANNEX 2 – End-to-end Testing (including CLI where applicable)

ID	Description	Direction
1	Called party clears after answer	Operator -> Melita
2	Calling party clears after answer	Operator -> Melita
3	Called party clears after answer	Melita -> Operator
4	Calling party clears after answer	Melita -> Operator
5	DTMF	Operator -> Melita
6	DTMF	Melita -> Operator
7	International transit through Melita	Melita -> Operator
8	International transit through Operator	Operator -> Melita
9	Call forwarding Unconditional (CFU) on Melita *	
10	Call forwarding Unconditional (CFU) on Operator *	
11	Call forwarding Busy (CFB) on Melita *	
12	Call forwarding Busy (CFB) on Operator *	
13	Call forwarding on Timeout (CFT) on Melita *	
14	Call forwarding on Timeout (CFT) on Operator *	
15	Long calls	Melita -> Operator
16	Long calls	Operator -> Melita
17	Validate a set of known causes for release	Melita -> Operator Operator -> Melita
	SIP 200 OK, 'Call Successful'	
	SIP 404/484, 'Unallocated/Incomplete number'	
	SIP 408, 'Request timeout'	
	SIP 486, 'User busy'	
	SIP 487, 'Cancel' for clearing before answer	
18	CLIP	Melita (national number) -> Operator
19	CLIP	Operator (national number) -> Melita
20	CLIP	Melita (international number - transited) -> Operator
21	CLIP	Operator (international number - transited) -> Melita
22	CLIR	Melita (national number) -> Operator
23	CLIR	Operator (national number) -> Melita
24	SMS (as applicable)	Melita -> Operator
25	SMS (as applicable)	Operator -> Melita

ANNEX 3 – SIP REDUNDANCY TESTS

Test #	Description	Test Purpose
1	Activation of peer SIP IP addresses	
1.1	First SIP peer IP address activation	To test that one Operator interconnection IP address can handle traffic. Disable the other peer IP address. Check that test calls to the other operator are successful.
1.2	Second SIP peer IP address	Reverse the roles of the IP addresses in section 1.1. Check that test calls still pass to/from the other Operator through the secondary IP address.
2	Load balancing	
2.1	Activate all the SIP peers to the Operator	To check the load-sharing mechanism towards the Operator. To check that incoming calls from both SIP IP peers of the Operator towards Melita are successful.

ANNEX 4 – BILLING TESTS

Verification of Call Data Records and respective charging for test cases in ANNEX 2