Standard
Interconnection Agreement

Annex H

Technical Manual

Contents:

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 and/or in the Technical Framework Document. 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, switching 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   SWITCHED NETWORK

5.1   General Network Description

Epic's switching network is based on two national / international gateways situated at B'Kara and St. Venera. Operator interconnection with the Epic network is via these gateways. E1 links with Operator will be distributed equally between all gateways for a better conveyance of traffic within the Epic Network. Full interconnect details are available in the Technical Framework Document ('TFD') attached to the Interconnection Agreement.

5.2   Traffic routing

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

5.3   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 Epic's Signalling network - SS7 parameter settings, B-number format, Announcements, Call Diversion and Calling Party Categories.

6.2 Signalling System description

6.2.1 MTP

Epic's MTP implementation complies with the following standards:

ITU-T White Book (1993) Message Transfer Part (MTP) Q.701-Q.704, Q706 Q.710 ETSI Message Transfer Part (MTP) ETS 300 008, 2nd edition

6.2.1.1. Signalling link/linksets

Interconnection of two Interconnection Nodes will require at least a single Linkset (LS) containing one or two Signalling Links (SLs). In the latter case there will be load sharing across these SLs within the same LS. The first SL shall occupy timeslot 1 of the 2Mbit PCM (see figure 6a). Additional SLs shall occupy timeslots 2 onwards.

Each SL shall operate in the quasi-associated mode. In a quasi-associated mode, signalling follows a different route than the switched traffic to which it refers, requiring the signalling to traverse at least one intermediate node.

6.2.1.2. Network indicator

The Network Indicator in the SIO of the routing label should be set to "national network".

6.2.1.3. Policing

Epic may implement policing to restrict the routing of messages to specified destination point codes i.e. those point codes accessible from the particular Interconnection Node and as contained in the Network Plan for the Operator.

6.2.2 ISUP

Epic's ISUP implementation complies with the following standards: ITU-T White Book (1993) ISDN User Part (ISUP) Q.761-Q.764, Q.766, Q.767

ETSI ISDN User Part (ISUP) version 2 ETS 300 356, part 1 to 19

Epic reserves the right to implement ISUP screening masks to reduce the level of ISUP 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

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

6.2.2.1.2. Circuit Identification Code (CICs)

CIC values shall be allocated according to timeslot, and not Circuit Number (See Recommendation Q.723 section 2.2.3 and
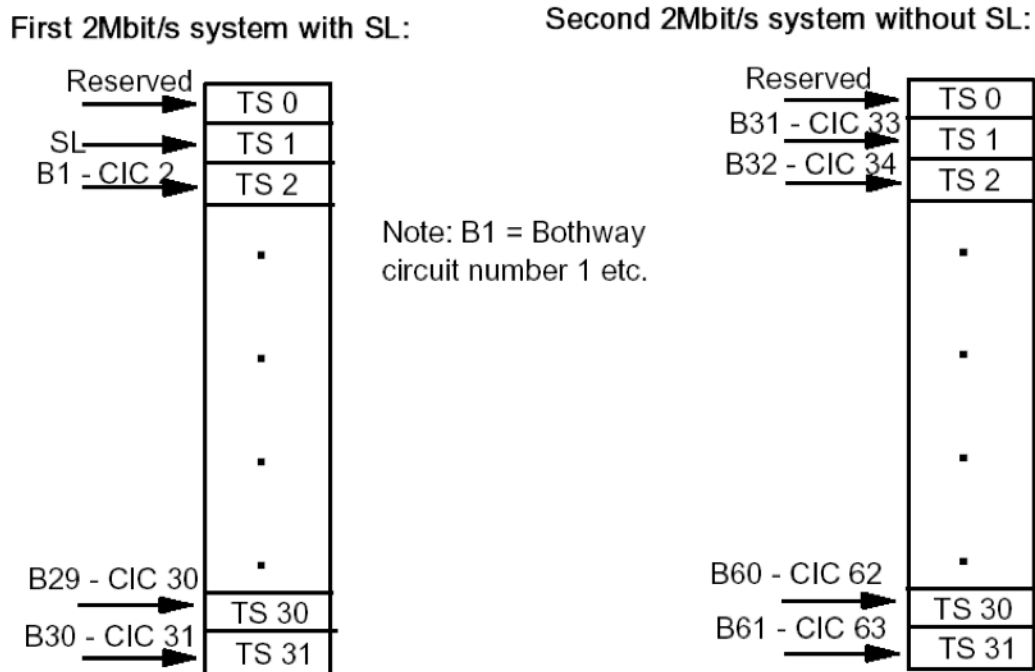
the Figure below).

Figure 6(a): Signalling Link and CIC allocations on 2 Mbit/s Connections

6.2.2.1.3. Dual seizure

The higher point code controls the even numbered circuits (CIC's) and the lower point code controls the odd numbered circuits, in the event of dual seizure. The non-controlling point code will reattempt on another circuit (ITU-T Q.764, 1993).

Method 2 shall be used.

In method 2, the circuits are divided into two hunting groups. Both MSSs get control (priority access) for the circuits in one of these hunting groups. Both MSSs get priority access to the group of circuits in the bidirectional circuit group which it controls. For these circuits, the hunting method longest time free (first in - first out) is used. For the other half of circuits, which are controlled by the other Interconnected node, the hunting method shortest time free (last in - first out) is used.

6.2.2.1.4. Hunting

Refer to **Error! Reference source not found.**.

6.2.2.1.5. Continuity Checks

Not used nationally.

6.2.2.1.6. DCME

Not used nationally.

6.2.2.1.7. Satellite

Not used nationally

6.2.2.1.8. Echo Cancellation (EC)

OHEC (Outgoing Half EC) and IHEC (Incoming Half EC) procedures will be used only for International calls and are enabled at the International gateways. They may be used towards other mobile operators if required.

6.2.3 Call Diversion

The presence of redirection information (including diversion hop counter), original called number and redirecting number in the ISUP IAM identifies the call as a diverted call. Currently only **five call diversions** are allowed on any call in Operator's Network.

Calls that are diverted are labelled as such in the optional parameter 'redirection information', field of the IAM, when sent to Operator's network. Operator will identify diverted calls outgoing to other Operators in a similar way.

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

6.2.4 Calling party categories

The Table below lists the defined CPC values for the Operator Network. Operators may use CPC values other than those listed below to support a particular service only after explicit prior agreement with Operator.

CATEGORY	ISUP CPC VALUE
Unknown	0000 0000
Operator	0000 0010
Ordinary Calling End-Customer	0000 1010
Pay Phone	0000 1111

Table 6(a): ISUP Calling Party Categories

6.2.4.1. Called party number formatting

6.2.4.1.1. Outgoing calls from Operator Network

The Called Party Number parameter shall be coded as defined in Q.763. The relevant fields (NAI, Numbering plan) shall be coded as described in Table 6b. In particular, the following association between address signals and NAI shall be adhered to;

NAI value	Address signals
National	Calls to users located within Malta. Address signals shall commence with Number Portability Routing Prefix and the STD code of the addressed user without any leading zeros. In case Number Portability Node will be unavailable, the address signals shall be the STD code of the addressed user without any leading zeros.
International	Calls to international destinations only. Address signals shall commence with the county code of the addressed network e.g. '44' for UK.

Table 6(b): NAI and address format of the Called party number parameter

6.2.4.1.2. Incoming calls to the Operator Network

The format of the Called Party number parameter fields shall be as defined in Table 6(b). Additional NAI values from the range reserved for national use (i.e. 1110000 to 1111110) may be specified in future in relation to specific services.

6.2.4.1.3. Examples of calls Incoming from Operators to Operator

- For a local number '20994444': send '051020994444' with NAI=National (significant) number;

- For an international number '00 1 671 4444 444': send '1 671 4444 444' with NAI=International number;

6.2.5 Announcements

An announcement shall always return an Address Complete (ACM) message.

6.2.5.1. Operator announcements to an incoming call from another Operator

Operator do not send back an Answer (ANM) message for a call failure announcement (e.g. for unallocated number etc.). ANM is returned for some service announcements (e.g. for talking clock).

6.2.5.2. 6.2.5.2 Other Operators announcements to Operator

ANM should not be returned to Operator when playing an announcement, e.g. call failure or busy.

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

- 64kbit/s unrestricted digital information;
- speech;
- 3.1 kHz audio;

7.2 Teleservices

- Telefax (Group 4)
- Telefax (Group 3)
- Telephony 7KHz
- Telephony 3.1KHz
- Videotelephony

7.3 Supplementary Services

- Call Forwarding on Busy
- Call Forwarding on No Reply
- Call Forwarding Unconditional
- Call Hold
- Call Waiting
- CLIP
- CLI
- Conference Call (3 Party)
- Closed user group

8 SERVICE QUALITY

8.1 Grade of Service from and towards Operator Interconnection Nodes

All Interconnection Paths between the Operator and the Epic Interconnection Nodes will be dimensioned based on expected bothway 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 have 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 Epic 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 Epic'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 Epic. 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

Trk Grp Id	The ID number of the trunk group
Ccts. available	The total number of circuits available on the trunk group
Actual ccts.	The actual number of circuits in service at the time of measurement
Time	The time of day at which the busy hour commences
(Busy Hour) Traffic	The total traffic intensity carried by the trunk group, measured in Erlangs during the busy hour
ASR%	The answer seizure ratio, defined as the number of answered seizures to total seizures ie. $$ASR\% = \frac{answered\,seizures}{Total\,seizures} \times 100\%$$
NER	The Network Effectiveness Ratio (NER) measures the ability of a network to deliver a call to the called terminal. Busy signals and other call failure due to user behaviour are counted as "successful call delivery" for NER calculation purposes. Unlike ASR, NER excludes the effects of customer and terminal behaviour. $$NER = 100 \times \frac{\underline{'Answered\,Calls' + 'User\,Busy' + 'Ring\,No\,Answer' + 'Terminated\,Reject'}}{Seizures}$$

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 test 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 the 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 switching elements of the Operator Network and the Epic Network in accordance with the standard BER Transmission test

procedures described in Appendix A, Annex 1.

9.1.1.2. Switching and Signalling tests

The switching and signalling tests shall be in accordance with the Operator SS7 Network National Interconnection Test Specification, which specifies the SS7 compatibility tests, ISDN end-to-end tests, CLI tests, route commissioning tests and billing tests 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 and routing to the correct number ranges;

- any number translation or Service features invoked;

- the correct operation of any specific end-to-end bearer services, supplementary services or teleservices used;

- any other specific testing that may be necessary.

The test plan agreed between Operator and Epic at the start of the provisioning process, shall define which of the specific tests defined in Operator SS7 Network National Interconnection Test Specification will be carried out. These tests selected depend on the type of service being supported over the interconnection.

The test document shall be part of the TFD available which shall form a part of the Interconnection Agreement.

9.1.2 Billing tests

Test will be carried out to:-

a) Verify call records.

b) Validate both Epic 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. The test document shall be part of the TFD available with this agreement.

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 available in TFD. During the test period the tests performed will cover (i) network compatibility for MTP-2, MTP-3 and MTP-4 levels as per ITU-T recommendations (ii) Additional voice calls scenarios. All successful calls made to the Epic Network will generate CDRs.

The testing methodology will consist of the steps detailed below.

9.1.2.1.1. Network Compatibility

This step involves Engineers at Operator and Epic making a

series of ITU-T recommended tests. These will include a selection of test from the following specifications:

a) ITU-T Q.781 - MTP level 2 test specification: Link State Control and transmission

b) ITU-T Q.782 - MTP level 3 test specification: Signaling Link

c) ITU-T Q.784 - MTP level 4 test specification: ISUP

The final test list is available as part of the TFD attached to the Interconnection Agreement.

9.1.2.1.2. Call Generation

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

For a successful call, the start time, answered time and duration of the call will be recorded. The results shall be checked for billing purposes.

The test list will be exchanged between the two operators.

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.

9.1.2.1.3. CDR production and extraction at Operator mediation Site

All call records generated during the testing period will be collected from the Operator mediation sites and transferred to the Operator billing centre.

9.1.2.1.4. CDR production and extraction at the Epic Network

Epic will collect CDRs for the duration of the testing period. The call records produced shall contain as a minimum the following fields.

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

9.1.2.1.5. Invoice Production at Operator

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

9.1.2.1.6. Reconciliation of Calls

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

9.1.2.1.7. Invoice Verification

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

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 scenarios that will be presented to Operator and Epic.
- tests to be completed for each scenario.

Note that all test mentioned in the following sections will be provided to the other Operator as part of the TFD.

9.1.3.1. 1st Interconnection Scenario

This scenario involves Epic's first interconnection to Operator's exchange:
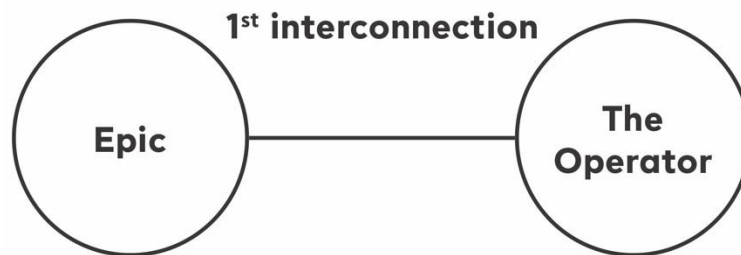
Figure 9(a): 1st interconnection Scenario

Interconnection	Tests	
1st Interconnection	MTP Compatibility Test List	
	ISUP Compatibility Test List	
	ISDN End-to-End Test List	
	CLI Tests	
	Route Commissioning Tests	
	Billing Tests	

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

9.1.3.2. Additional Interconnection Scenarios

When opening an additional interconnection, two new scenarios are possible:

a) further interconnections are provided to Operator from a different Epic exchange, see Figure 9(b);

b) a new but identical node is introduced by Operator and this node is interconnecting to a similar Epic exchange type as the first interconnection, see Figure 9(c);

The prerequisite before the commencement of these tests is the completion of the test cases specified in Table 9(a).

Interconnection	Tests	
2nd Interconnection (a)	MTP Compatibility Test List	
	ISUP Compatibility Test List	
	Route Commissioning Tests	
2nd Interconnection (b)	MTP Compatibility Test List	
	ISUP Compatibility Test List	
	Route Commissioning Tests	
	Billing Tests	

Table 9(b): Test list to be completed on additional interconnections to an Operator exchange
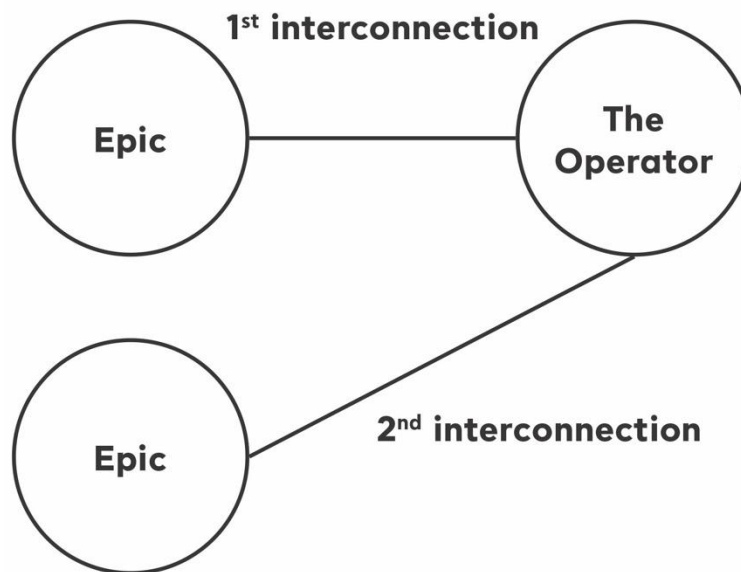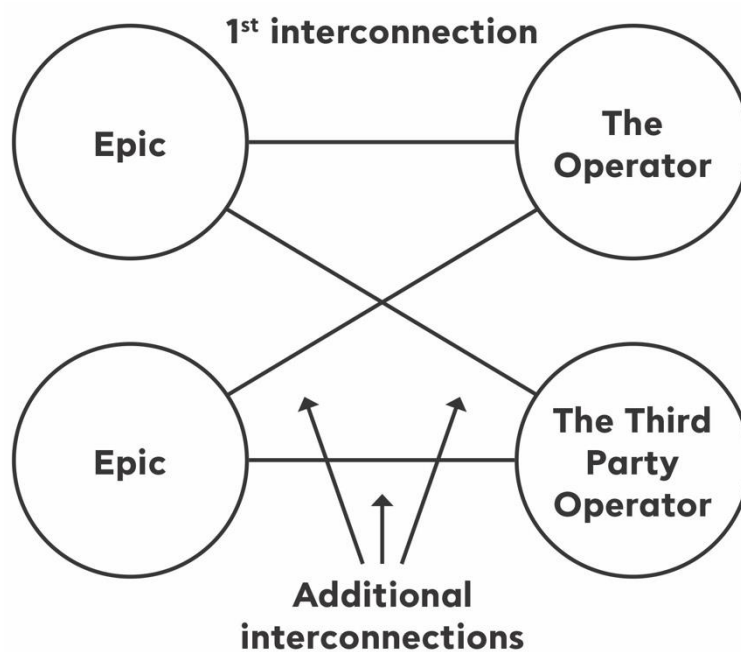
Figure 9(b): 2nd Interconnection scenario (a)

Figure 9(c): 2nd Interconnection scenario (b)