# VIVA Bahrain


# REFERENCE INTERCONNECTION

# OFFER (RIO)

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# Annex H – Technical Information

| Version number: | V1.0 |
|---|---|
| Version date: | 9 June 2016 |
| Date of original Issue: | 9 June 2016 |
| Authority for issue: | |
| Approval by TRA: | |
| Next scheduled review date: | |

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**Clause**                                                    **Page number**

## 1. VOICE INTERCONNECTION

### 1.1. Overview of the VIVA Network

1.1.1    The topology of VIVA's Network is show in Figure 1 below.  The Network comprises two mobile switches / Switch Media Gateways located in Hoora and Tubli which include interconnection gateways at the same locations. Additional mobile switches/Switch Media Gateways are commissioned as required to facilitate growth in the Network.  The cellular base stations are parented on base station controllers and provide the mobile connectivity within the individual GSM cells.

Figure 1
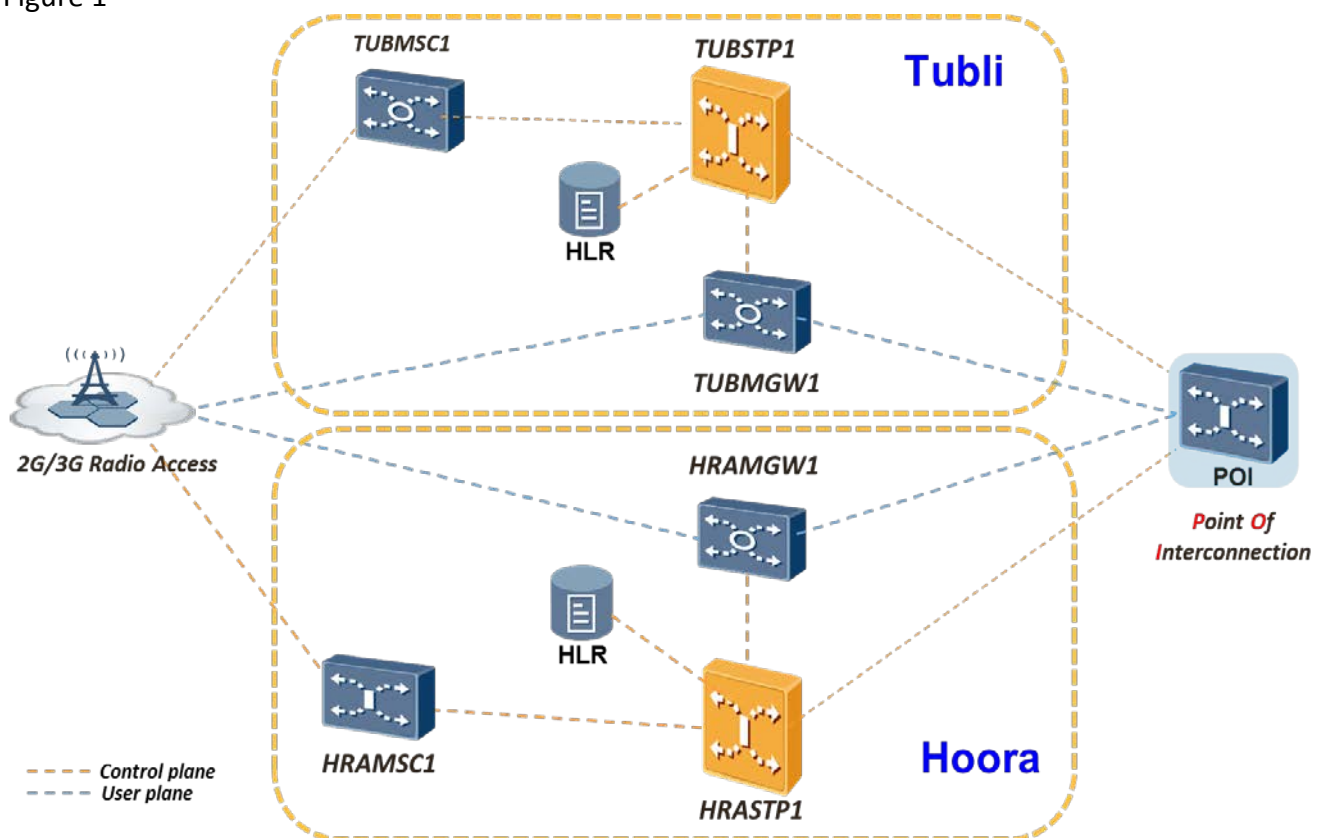
## 1.2. Interconnection

1.2.1 VIVA provides interconnection to Other Licensed Operators at interconnection gateway switches specified in Table 1 and in accordance with the technical standards and specifications as provided in this Annex H.

## 1.3. Location of Points of Interconnection

1.3.1 The locations of the interconnection gateways where interconnection is available are listed in Table 1.

Table 1 – Location of Points of Interconnection in VIVA's Network

| Switch Name | Location | Switch Type | Vendor | Software Model |
|-------------|----------|-------------|--------|----------------|
| HRAMSC1 | Hoora | MSOFTX3000 | Huawei | V100R009 |
| TUBMSC1 | Tubli | MSOFTX3000 | Huawei | V100R009 |
| HRAUMG1 | Hoora | UMG8900 | Huawei | V200R009C0 |
| TUBUMG1 | Tubli | UMG8900 | Huawei | V200R009C0 |

1.3.2 The list of switches provided in Table 1 will be updated periodically. Additional POIs will be determined by agreement between VIVA and the Other Licensed Operator as part of the Network Plan.

1.3.3 In order for VIVA to provide the Interconnection Services contained in this RIO to the Other Licensed Operator, that Other Licensed Operator shall establish interconnection with VIVA at Points of Interconnection offered by VIVA at one or more of the interconnection gateways listed in Table 1.

1.3.4    The terms and conditions for the provision of the Points of Interconnection and the associated Interconnection Links shall be in accordance with Annex B - Schedule 4 - Service Level Agreement for Interconnection Link .

## 1.4.    Routing

1.4.1    Interconnection Links will be used as necessary to provide interconnection routes for the conveyance of the Other Licensed Operator's traffic into the VIVA Network.   Routes will be established in accordance with the Other Licensed Operator's agreed Network Plan.

1.4.2    The Other Licensed Operator shall deliver only traffic which will terminate on the VIVA Network at the Points of Interconnection at the VIVA interconnection gateways.

1.4.3    The Other Licensed Operator will be responsible for those routes on which it sends traffic to the VIVA Network and will dimension the routes to meet the quality of service criteria stated in Annex G (*Quality of Service*).

## 1.5.    Signalling

1.5.1    The VIVA Network utilises CCITT Signalling System No.7.   VIVA provides signalling interconnection to its Network to Other Licensed Operators via two (2) STP's (acting as signalling gateways to which all VIVA switches are connected) and in accordance with the technical standards and specifications as provided in this Annex H.  The details of the STPs are specified in Table 2.

Table 2 – STP Details

| STP Name | Location | Switch Type | Vendor | Software Model |
|----------|----------|-------------|--------|----------------|
| HRASTP1 | Hoora | SG700 | Huawei | V200R005C01 |
| TUBSTP1 | Tubli | SG700 | Huawei | V200R005C01 |

## 1.6.    Specification

1.6.1    The relevant specifications with respect to Voice Call interconnection are:

- MTP3: MTP3 - ITU Q.704
- SCCP: ITU-T 1996
- ISUP ITU-T Rec. Q.761~Q.764, Q.730
- MAP Phase 3 3GPP TS 29.002 V4.11.0
- Codecs: G.711 A-law, G.711 U-law, G.729

## 2.    SMS INTERCONNECTION

## 2.1.    Overview of the VIVA Network
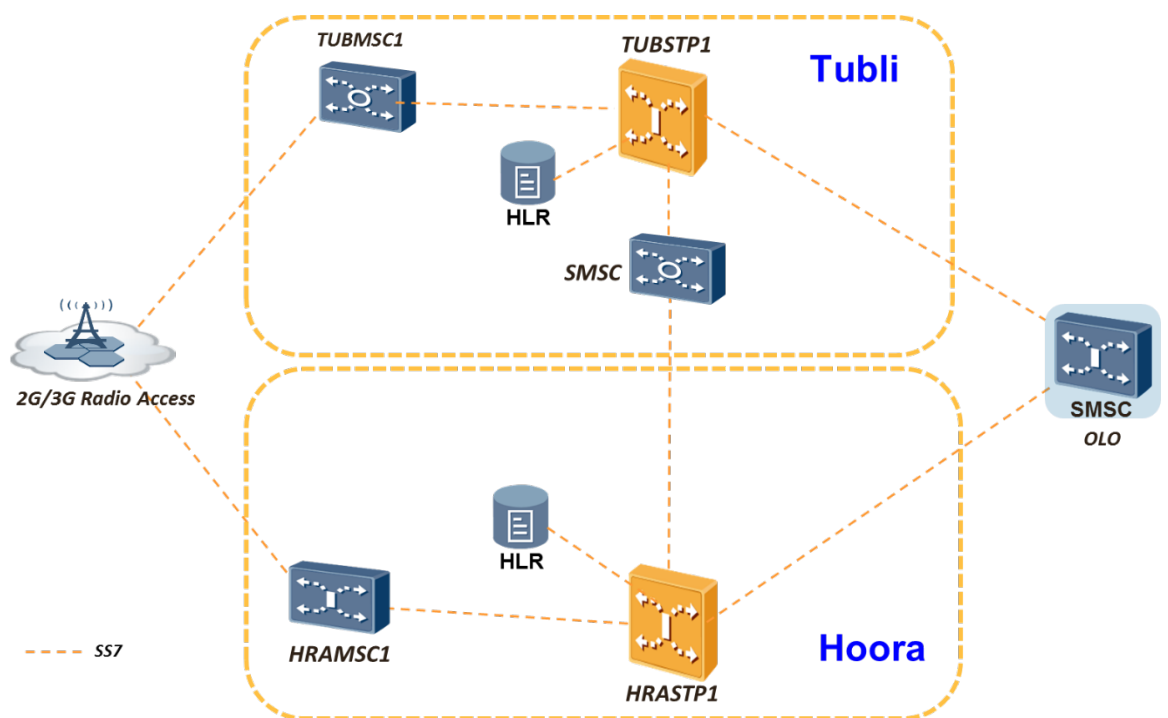


## 2.2.    Interconnection

2.2.1    VIVA provides interconnection to Other Licensed Operators to its Network via two (2) STPs.   The interconnection shall be provided at the POIs to the

interconnection gateways specified in Table 3 below and in accordance with the technical standards and specifications as provided in this Annex H.

2.3.    Location of Points of Interconnection

2.3.1    The locations of the interconnection gateways where POI's are available are listed in Table 3.

Table 3 – Location of Points of Interconnection for SMS Termination in VIVA's Network

| Switch Name | Location | Switch Type | Vendor | Software Model |
|---|---|---|---|---|
| HRAMSC1 | Hoora | MSOFTX3000 | Huawei | V100R009 |
| TUBMSC1 | Tupli | MSOFTX3000 | Huawei | V100R009 |

2.3.2    The list of switches provided in Table 3 will be updated periodically. Additional POIs will be determined by agreement between VIVA and the Other Licensed Operator as part of the Network Plan.

2.3.3    In order for VIVA to provide the Interconnection Services contained in this RIO to the Other Licensed Operator, that Other Licensed Operator shall establish interconnection with VIVA at Points of Interconnection offered by VIVA at the interconnection gateways listed in Table 3.

2.3.4    From a commercial perspective, the terms and conditions for the provision of the Points of Interconnection and associated interconnection signalling links shall be negotiated outside this RIO.

2.4.    Routing

2.4.1    Interconnection Links will be used as necessary to provide interconnection and signalling for the conveyance of the Other Licensed Operator's traffic into the VIVA Network.  Signalling will be established in accordance with the Other Licensed Operator's agreed Network Plan.

2.4.2    The Other Licensed Operator shall deliver only traffic at the Points of Interconnection to the VIVA interconnection gateways which will terminate on the Subscribers connected to the VIVA Network.

2.4.3    The Other Licensed Operator will be responsible for those signalling links on which it sends traffic to the VIVA Network and will dimension the signalling links to meet the quality of service criteria stated in Annex G (*Quality of Service*).

2.5.    Signalling

2.5.1    The VIVA Network utilises CCITT Signalling System No.7.   VIVA provides signalling interconnection to its Network to Other Licensed Operators via two (2) STP's (acting as signalling gateways to which all VIVA switches are connected) and in accordance with the technical standards and specifications as provided in this Annex.  The details of the STPs are specified in Table 4.

Table 4 – STP Details

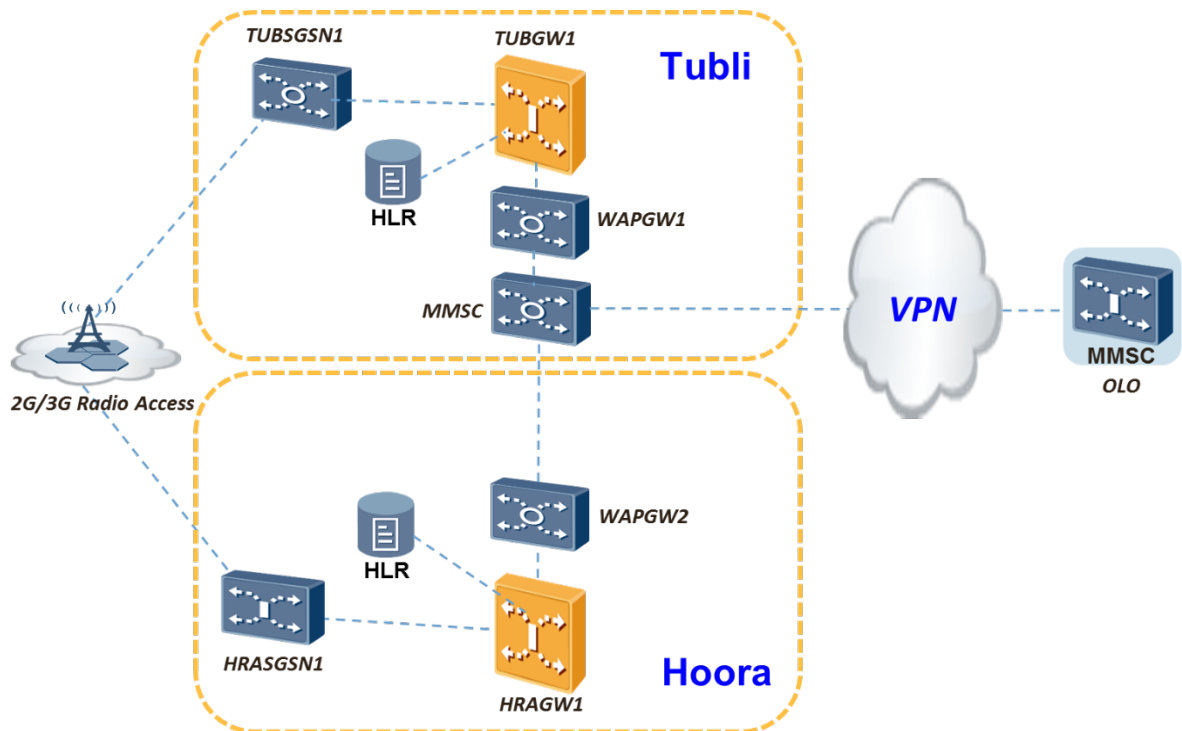| STP Name | Location | Switch Type | Vendor | Software Model |
|----------|----------|-------------|--------|----------------|
| HRASTP1 | Hoora | SG700 | Huawei | V200R005C01 |
| TUBSTP1 | Tupli | SG700 | Huawei | V200R005C01 |

2.6.    Specifications

2.6.1    The relevant specifications with respect to SMS Message interconnection are:

- MTP3: MTP3 - ITU Q.704
- SCCP: ITU-T 1996
- MAP Phase 3 3GPP TS 29.002 V4.11.0

## 3. MMS INTERCONNECTION

### 3.1. Overview of VIVA Network



### 3.2. Interconnection

3.2.1    VIVA provides interconnection to Other Licensed Operators to its Network at the MMSC specified in Table 5 and in accordance with the technical standards and specifications as provided in this Annex H.

### 3.3. Location of Points of Interconnection

3.3.1    The locations of the interconnection MMSC where POI's are available are listed in Table 5 below.

Table 5 – Location of Points of Interconnection for MMS Message interconnection in VIVA's Network

| MMSC Name | Location | Vendor | Software Model |
|-----------|----------|--------|----------------|
| MMSC | Hoora | Huawei | V100R002C31L00007 |

3.3.2    The list of switches provided in Table 5 will be updated periodically. Additional POIs will be determined by agreement between VIVA and the Other Licensed Operator as part of the Network Plan.

3.3.3    In order for VIVA to provide the Interconnection Services contained in this RIO to the Other Licensed Operator, that Other Licensed Operator shall establish interconnection with VIVA at Points of Interconnection offered by VIVA at the MMSC listed in Table 5.

3.3.4    The terms and conditions for the provision of the Points of Interconnection and the associated Interconnection Links  shall be in accordance with Annex B - Schedule 4 - Service Level Agreement for Interconnection Link.

3.4.    Routing

3.4.1    Interconnection Links will be used as necessary to provide interconnection routes for the conveyance of the Other Licensed Operator's MMS Message traffic to the VIVA Network.  Routes will be established in accordance with the Other Licensed Operator's agreed Network Plan.

3.4.2    The Other Licensed Operator shall deliver only MMS Message traffic at the Points of Interconnection to the VIVA interconnection gateways which will terminate on the Subscribers connected to the VIVA Network.

3.4.3    The Other Licensed Operator will be responsible for those Interconnection Links on which it sends traffic to the VIVA Network and will dimension the links to meet the quality of service criteria stated in Annex G (*Quality of Service*).

## 4.    SYNCHRONISATION

4.1.    A Network requires stringent clock synchronization to meet acceptable performance levels.  Unsuitable clock synchronization may result in excessive bit slips, or high transmission error rates.  For TDM connections, clock synchronization is needed.  This section outlines a clock synchronization scheme in the VIVA Network.
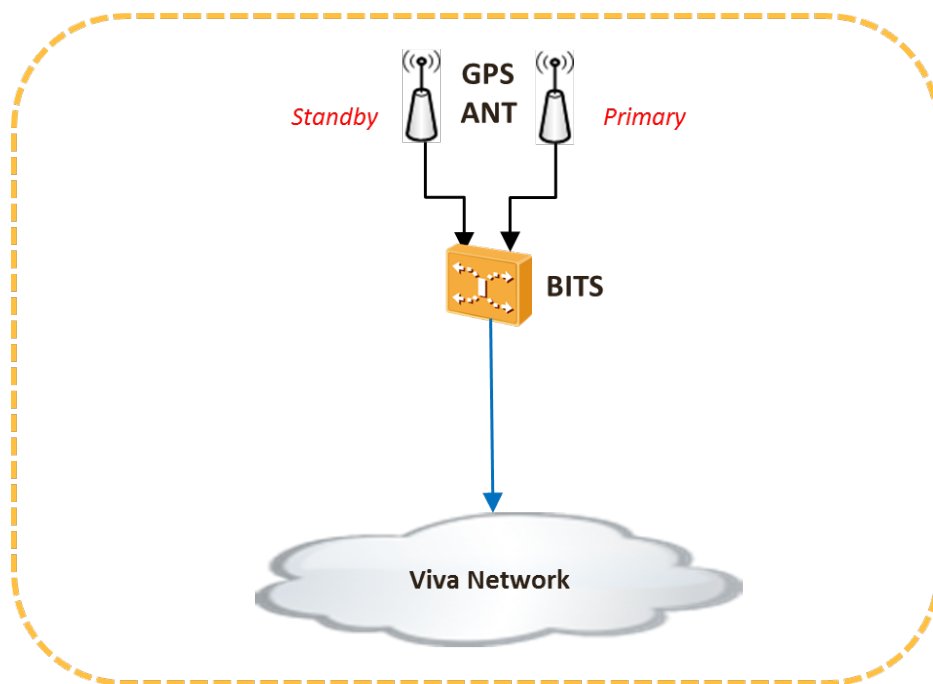


4.2.    Clock Synchronisation Configuration

4.2.1    At present, the equipment required for implementing clock synchronization for each site and the clock resource signal type is shown in Table 6 below.

Table 6 - Clock signal type

| Site | NE Type | Clock Signal Type |
|------|---------|-------------------|
| HRAMGW1 | MGW | 2MBits (75ohm, SMB coaxial interface) |
| TUBMGW1 | MGW | 2MBits (75ohm, SMB coaxial interface) |

### 4.3. Clock Accuracy Specifications and Reliability

4.3.1 In the VIVA Network, the following clock backup mechanisms are adopted:

1) If both the primary and standby sources are available, master and slave BITS scheme will be used.

2) If only the primary or standby source is available, available BITS will be used.

3) If both the primary and standby sources are not available, the high precision crystal clock within the Switch Media Gateway can be used as a backup. The clock synchronisation information is given in Table 7.

Table 7 - Clock synchronization information

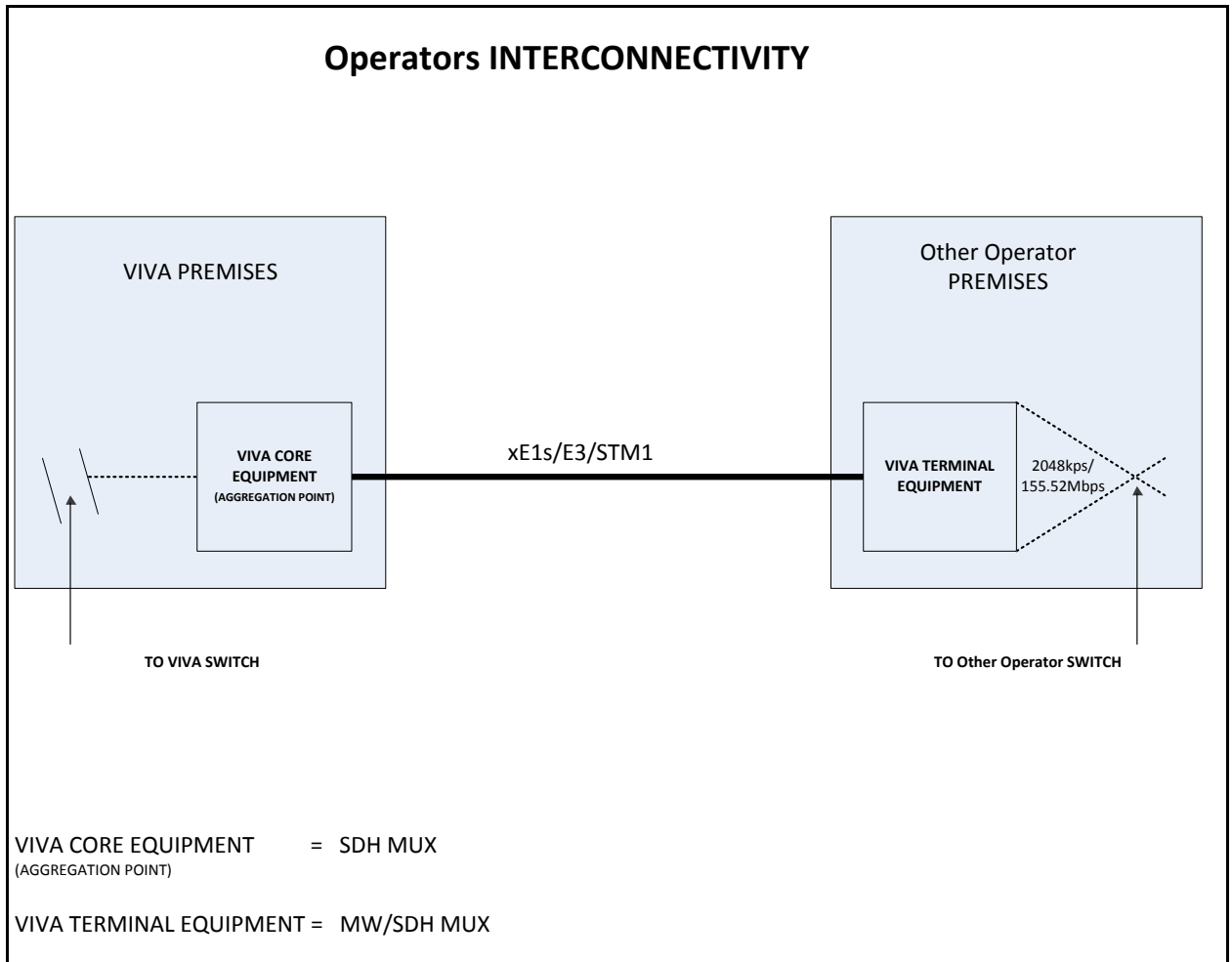| Site Name | NE Name | Clock Synchronization Source | | | |
|---|---|---|---|---|---|
| | | Priority 1 (Interface Type) | Priority 2 (Interface Type) | Priority 3 (Interface Type) | Priority 4 (Interface Type) |
| HRAMGW1 | MGW | 2MBits (75ohm, SMB coaxial interface) | 8K Line Clock (from S2L board) | N/A | N/A |
| TUBMGW1 | MGW | 2MBits (75ohm, SMB coaxial interface) | 8K Line Clock (from S2L board) | N/A | N/A |

## 5. NUMBERING

### 5.1. Number Ranges

5.1.1 The number ranges relevant to VIVA in regard of this RIO are those allocated by the TRA for the use in mobile Telecommunication Networks in the Kingdom of Bahrain only.

6.    **OPERATERS INTER-SITE CONNECTIVITY:**

6.1.1    It is a service to establish the link between Other Licensed Operator's switch and VIVA Gateway switch to connect two network elements at VIVA site and the licensed Operator to enable required services,  listed in this document such as Voice interconnection, by using different physical and logical connections by referring to ITU standards.

6.1.2    The physical carrier medium is considered on either wireless microwave or, optical fiber, whereas; initial capacity setup & not limited to: E1 (2048Kbps), E3 (34Mbps), DS3 (45 Mbps) and STM1 (155.52Mbps), however it may be expanded as per the agreed requirement.

6.1.3    The figure below (Operators interconnectivity) shows the functional overview of transmission connectivity:

**Operators INTERCONNECTIVITY**

VIVA PREMISES

Other Operator
PREMISES

VIVA CORE
EQUIPMENT
(AGGREGATION POINT)

xE1s/E3/STM1

VIVA TERMINAL
EQUIPMENT

2048kps/
155.52Mbps

TO VIVA SWITCH

TO Other Operator SWITCH

VIVA CORE EQUIPMENT        =  SDH MUX
(AGGREGATION POINT)

VIVA TERMINAL EQUIPMENT =   MW/SDH MUX

6.2.    Physical Attributes/Characteristics

6.2.1    The provided physical connection interface  is required to be compatible with customer site switch interface, hence the physical interface provided is based on ITU-T Rec. G.703/G.957.

6.3.    Transmission Link Connectivity Type

6.3.1    Transmission Link Connectivity feasibility depends on operator's geographical and physical location. Following two types of approaches are considered:

Guided type:

- It is either the fiber cable or the co-axial cable (Intra-Site).

Un-Guided type:

- It is the Microwave link, which complies with Telecommunications Regulatory Authority policy and approved frequency.

6.4.    Qualitative performance compliance

6.4.1    The link connectivity Performance required to meet the key performance index set for different services to assure provided service quality, hence, provided connectivity service shall complies in-accordance with ITU-T Rec: G.828, which in also includes, Bit Error Rate Test (BERT).

**Document History and Version Control**

| Name of document: | Technical Information |
|---|---|
| Author: | VIVA |
| Authorised Officer: | |
| Description of document: | Contains all the Technical Information related to the Interconnection Services provided by VIVA |
| Approved by: | |
| Date of approval: | |

| Version Number | Version Date | Amendment Details |
|---|---|---|
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