

SUBJECT TO CHANGE

**APPENDIX 2**

**DIRECTED MODIFICATIONS TO SCHEDULE 1**

**SCHEDULE 1**

**PHYSICAL AND VIRTUAL (DISTANT) INTERCONNECTION**

SUBJECT TO CHANGE

**NOTE: UNLESS OTHERWISE SPECIFIED BY IMDA, IMDA CONDITIONALLY APPROVES THE PROPOSED CHANGES BY SINGTEL IN THIS DOCUMENT.**

## **SCHEDULE 1**

### **PHYSICAL AND VIRTUAL (DISTANT) INTERCONNECTION**

#### **CONTENTS**

- SCHEDULE 1A - PHYSICAL AND VIRTUAL (DISTANT) INTERCONNECTION FOR FBOs**
  - 1A ANNEXES**
- SCHEDULE 1B - VIRTUAL (DISTANT) INTERCONNECTION FOR SBOs**
  - 1B ANNEXES**

## SCHEDULE 1

### PHYSICAL AND VIRTUAL (DISTANT) INTERCONNECTION

#### 1. GENERAL

- 1.1 This Schedule details the establishment of Interconnection between SingTel's Network and the Requesting Licensee's Network and describes the forecasting and provisioning procedures for Interconnection provided under this RIO Agreement.
- 1.2 Schedule 1A and 1B contain the details on the Network interface requirements and specifications for Interconnection between SingTel's Network and the Requesting Licensee's Network. Schedule 1A details the requirements for Physical or Virtual (Distant) Interconnection for a Requesting Licensee who is an FBO for Interconnection to SingTel's Interconnect Gateway Switches, while Schedule 1B details the requirements for Virtual (Distant) Interconnection for SBOs for Interconnection to SingTel's SBO Gateway Switches.
- 1.3 If the Requesting Licensee is an FBO, the Parties will comply with Schedule 1A.
- 1.4 If the Requesting Licensee is an SBO, the Parties will comply with Schedule 1B.
- 1.5 If SingTel requires Physical Interconnection or Virtual (Distant) Interconnection with the Requesting Licensee, the Requesting Licensee will provide such Interconnection on reciprocal terms and conditions to those set out in this Schedule 1.

#### ***CLAUSE 1.6 – MODIFICATION REQUIRED***

- 1.6 SingTel shall cease offering new SS7-based interconnection arrangements with effect from 28 February 2027.

***IMDA Directed Modifications:*** *Given that Singtel is in the midst of migrating its network to IP-based, the proposed date of 28 February 2027 in clause 1.6 may not be a firm date for the cessation of SS7-based interconnection arrangements. As such, Singtel is required to propose modifications to clause 1.6 herein to make clear the said date may be subject to variation as approved by IMDA.*

**SCHEDULE 1A**  
**PHYSICAL AND/OR VIRTUAL (DISTANT) INTERCONNECTION**  
**FOR FBOs**

## SCHEDULE 1A

### PHYSICAL AND/OR VIRTUAL (DISTANT) INTERCONNECTION FOR FBOS

#### CONTENTS

1.	GENERAL .....	1
2.	INTERCONNECT CONFIGURATION .....	1
3.	POINT OF INTERCONNECTION .....	4
4.	NOT USED .....	5
5.	PHYSICAL INTERCONNECTION .....	6
6.	VIRTUAL (DISTANT) INTERCONNECTION.....	7
7.	TECHNICAL REQUIREMENTS AND SPECIFICATIONS .....	8
8.	PROVISIONING OF INTERCONNECT BANDWIDTH.....	10
9.	NOT USED .....	12
10.	DECOMMISSIONING .....	13
	<b>ANNEX 1A.1: NOT USED</b>	
	<b>ANNEX 1A.2: NOT USED</b>	
	<b>ANNEX 1A.3: REQUEST FORM FOR ACTIVATION, DEACTIVATION AND MODIFICATION OF INTERCONNECT LINKS</b>	

## SCHEDULE 1A

### PHYSICAL AND/OR VIRTUAL (DISTANT) INTERCONNECTION FOR FBOs

#### 1. GENERAL

- 1.1 Each Party agrees to interconnect and keep interconnected their respective Networks subject to and in accordance with the terms and conditions of this Schedule 1A.
- 1.2 For the avoidance of doubt and unless the Parties agree otherwise, where both Parties have established Interconnection of their respective Networks prior to the RIO Review Date:
  - (a) the existing interconnect configuration that applies between each Party's respective Network at the RIO Review Date will continue to apply; and
  - (b) the Parties need not change the Interconnection configuration of their respective Networks as may be required under this Schedule 1A.
- 1.3 The Requesting Licensee will notify SingTel whether it requires Physical Interconnection or Virtual (Distant) Interconnection under this Schedule. If there is insufficient Co-location Space at a SingTel Co-location Site to permit Physical Interconnection, SingTel shall provide Virtual (Distant) Interconnection under this Schedule 1A to the Requesting Licensee. The determination of whether sufficient Co-location Space exists will be made pursuant to the terms and conditions specified in Schedule 8A.
- 1.4 The provisions of this Schedule 1A apply to both Physical Interconnection and Virtual (Distant) Interconnection, unless otherwise indicated.
- 1.5 This Schedule 1A only applies to a Requesting Licensee which is an FBO.

#### 2. INTERCONNECT CONFIGURATION

##### ***CLAUSE 2.1 – MODIFICATION REQUIRED***

- 2.1 SingTel's Network comprises of two (2) sites located at Paya Lebar Telephone Exchange and Jurong East Telephone Exchange. Subject to clause 2.5, the Requesting Licensee must interconnect its Network with the SingTel Network at each of SingTel's Interconnect Gateway Switches (IGS).

**IMDA Directed Modifications:** Given that clause 2.5 is no longer applicable under Schedule 1A, Singtel is required to remove reference to clause 2.5 in the proposed clause 2.1 herein.

2.2 Both Parties' Networks shall interface at IGS level via a session border controller.

2.3 SingTel and the Requesting Licensee are responsible for managing and maintaining their own Interconnection Links, taking into account the need for growth, diversity and security in the Data Links. For the avoidance of doubt, there is no obligation on either Party to manage or maintain the other Party's Interconnection Links.

**CLAUSE 2.4 – MODIFICATION REQUIRED**

2.4 Unless otherwise agreed and subject to clause 2.5, the Requesting Licensee must interconnect its Network with the SingTel Network, whether by way of Physical Interconnection or Virtual (Distant) Interconnection, at each of SingTel's IGS at Paya Lebar Telephone Exchange and Jurong East Telephone Exchange.

**IMDA Directed Modifications:** Given that clause 2.4 herein is a duplication of clause 2.1 of Schedule 1A, Singtel is required to remove this clause 2.4 in entirety.

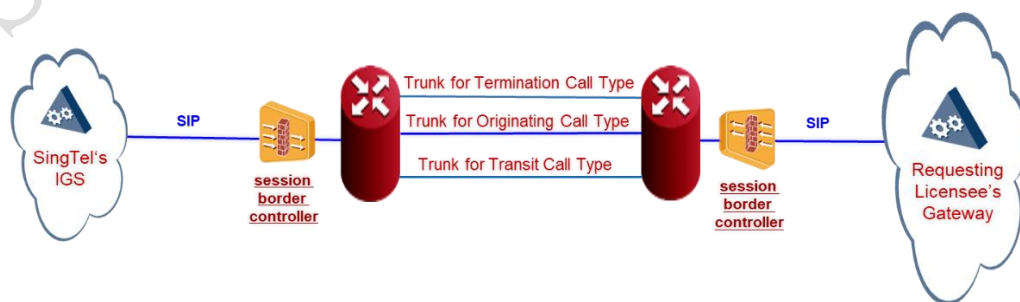
2.5 Not Used

2.6 Not Used

2.7 The Minimum Interconnection Bandwidth for Interconnection by the Requesting Licensee to a SingTel IGS is two (2) 1Gbps Data Links.

2.8 Not Used

2.9 An Interconnection Link may comprise different Trunk Groups. The Requesting Licensee must designate the Trunk Groups to handle the different Call Types.



## **CLAUSE 2.10 – MODIFICATION REQUIRED**

2.10 Either Party may, at any time, request from the other Party an agreement to interconnect their respective Systems for the provision of a new Call Type. In such a case, the Parties shall enter into good faith negotiations to agree terms for interconnection of the Parties' respective Systems for the provision of the new Call Type on fair and reasonable terms. Upon terms being agreed, this Agreement shall be amended to give effect to the agreed terms.

*IMDA Directed Modifications: IMDA notes that the proposed clause 2.10 herein does not adhere to the Code requirement, where under section 5.6.1.1 of the Code, an interconnection agreement (where one of the parties is a Dominant Telecommunication Licensee) may be modified at any time by mutual agreement of the parties, provided that the said modifications will not be effective unless approved by IMDA. As such, IMDA directs Singtel to propose modifications to clause 2.10 to comply to the Code requirement to seek IMDA's prior approval for any modification to the RIO Agreement.*

*Singtel is also required to make clear the definition of "Systems" in clause 2.10, which is not defined under this Schedule 1 or Schedule 12 Dictionary.*

## **CLAUSE 2.11 – MODIFICATION REQUIRED**

2.11 If SingTel or the Requesting Licensee wishes to interconnect their respective Networks at additional IGSs, that Party may request an additional POI and the Parties will negotiate in good faith in relation to the interconnect configuration applicable to such additional Interconnection. Each Party shall bear its own cost in relation to establishing any additional POI.

*IMDA Directed Modifications: As explained in IMDA's Decision, IMDA is of the view that Singtel's proposed removal or modification of some of the interconnection-related positions as established within the current RIO for SS7-based interconnection may not be warranted.*

*Specifically, the migration from SS7-based interconnection to IP-based interconnection primarily only entails the underlying change of the signalling protocol for voice call communications across licensees' networks, which should not affect how parties allocate the cost of establishing an additional POI.*

*IMDA notes that the current RIO for SS7-based interconnection allocates the said cost based on principle of cost causality, where the party requesting to interconnect at an additional POI is liable for any reasonable costs incurred by the other party. This is in contrast with the clause 2.11 herein which proposes that each party bears its own cost in relation to establishing an additional POI.*

*Given that the migration to IP-based interconnection would not affect the principle of cost causality in the cost allocation for the establishment of an additional POI, IMDA rejects the proposed position in clause 2.11 herein and directs Singtel to reinstate the*

*position in clause 2.10 of Schedule 1A of the RIO for SS7-based interconnection as currently published on IMDA's website.*

2.12 Neither Party shall be required to commence work on the installation of Network Facilities to support a new POI under clause 2.11 until the Parties have agreed on the interconnect configuration to apply under clause 2.11.

### **3. POINT OF INTERCONNECTION**

#### ***CLAUSE 3.1 – MODIFICATION REQUIRED***

3.1 The Parties agree that the POI for the Data Links shall be established at the Fibre Distribution Frame (**FDF**) of the Party providing the Call Origination, Call Termination, Call Transit and Emergency Service.

***IMDA Directed Modifications:** As explained in IMDA's Decision, IMDA is of the view that Singtel's proposed removal or modification of some of the interconnection-related positions as established within the current RIO for SS7-based interconnection may not be warranted.*

*As explained in IMDA's Decision, Singtel's proposed clause 3.1 is not aligned with the Code requirements under section 3 of Appendix 2 of the Code which requires that "a Dominant Telecommunication Licensee must offer to allow interconnection to occur at any technically feasible point" and that the "transmission links used for interconnection must connect at mutually agreed points". The Code requirements are further reflected in the current RIO for SS7-based interconnection which provides that the POI may be established at such other interconnection configurations as the parties may agree on.*

*Given above, IMDA directs Singtel to propose modifications to clause 3.1 herein to also include the three interconnection configuration options as stated under the same clause 3.1 of Schedule 1A of the RIO for SS7-based interconnection as currently published on IMDA's website.*

3.2 Each Party is responsible for the provisioning and maintenance of Network Facilities (including those Network Facilities which form part of the Interconnect Links and the network routing equipment) on its "side" of the POI.

3.3 The cost of the installation, maintenance and operation of the Network Facilities on each Party's side of the POI which form part of the Interconnect Link(s) shall be borne by that Party.

3.4 Each Party will ensure that its Network Facilities which form part of the Interconnection Link(s) are provisioned and maintained with Interconnect Bandwidth in accordance with the ordered Bandwidth under this Schedule 1A.

***CLAUSE 3.5 – MODIFICATION REQUIRED***

3.5 The Requesting Licensee may request the modification of an Interconnection Link by completing the request form set out in Annex 1A.3. SingTel will consider the request for modification and approve or reject the request for modification by written notice to the Requesting Licensee within fourteen (14) Calendar Days of receipt of a duly completed request form from the Requesting Licensee. If SingTel agrees to such a modification, SingTel will undertake the modification in accordance with that request. The Requesting Licensee will be liable for any costs incurred by SingTel in performing the modification of the Interconnection Link. If SingTel rejects the request for modification, it will specify the reasons in its written notice to the Requesting Licensee. SingTel may reject a request for modification of an Interconnection Link on reasonable grounds including (without limitation) where the requested modification:

- (a) would have, or would likely have, the effect of impairing, disrupting or damaging SingTel's Network or SingTel's equipment or other Interconnection Links;
- (b) is not technically feasible;
- (c) would cause, or would likely cause, SingTel to be in breach of any applicable laws, regulations or its licence; or
- (d) does not contain all the necessary information or is illegible.

***IMDA Directed Modifications:*** *One respondent to the public consultation commented that besides Requesting Licensees, Singtel might also need to modify an Interconnection Link. As such, IMDA directs Singtel to propose modifications to clause 3.5 herein to provide for a reciprocal position.*

3.6 The Requesting Licensee shall not conduct penetration testing of any kind of SingTel's Network or SingTel's equipment or other Interconnection Links.

***CLAUSE 4 – MODIFICATION REQUIRED***

**4. NOT USED**

4.1 Not Used

4.2 Not Used

4.3 Not Used

4.4 Not Used

**IMDA Directed Modifications:** As explained in IMDA’s Decision, IMDA is of the view that Singtel’s proposed removal or modification of some of the interconnection-related positions as established within the current RIO for SS7-based interconnection may not be warranted.

IMDA notes that the proposed RIO does not lay out the procedures for Requesting Licensee and Singtel to discuss alternative location for the POI at any technically feasible point. This would not be aligned with the Code requirement under section 3 of Appendix 2 of the Code which requires that “a Dominant Telecommunication Licensee must offer to allow interconnection to occur at any technically feasible point”.

As such, IMDA directs Singtel to reinstate the same clause 4 of Schedule 1A of the RIO for SS7-based interconnection as currently published on IMDA’s website, which has laid out the procedures for parties to discuss alternative location for the POI at any technically feasible point.

## 5. PHYSICAL INTERCONNECTION

### CLAUSE 5.1 – MODIFICATION REQUIRED

5.1 Figure 1 depicts a possible configuration of the Physical Interconnection of the Interconnection Links between SingTel’s Network and the Requesting Licensee’s Network and the location of the POI.

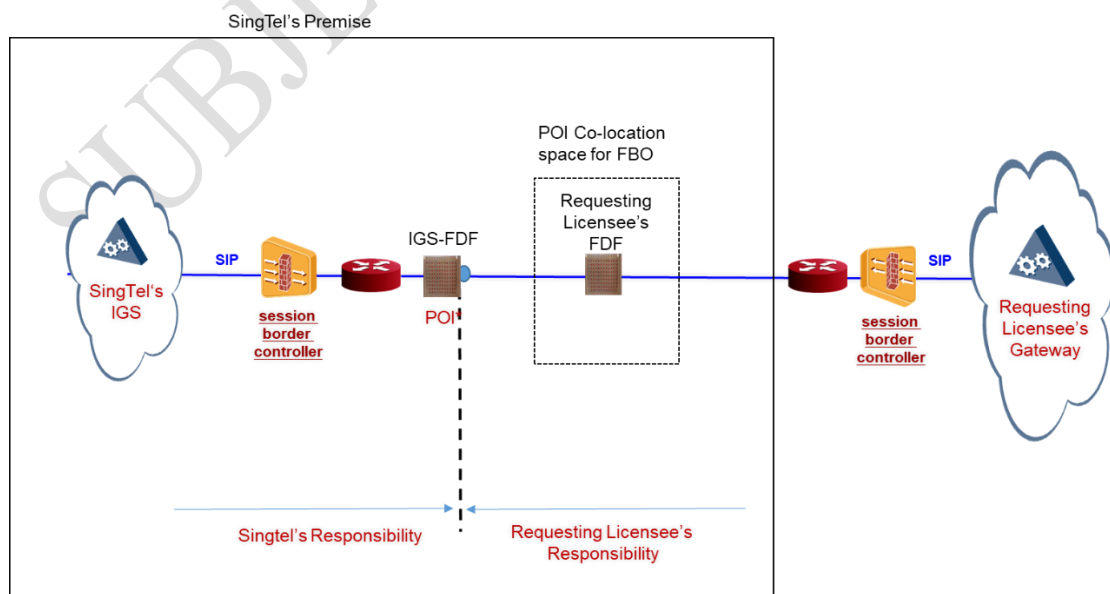


Figure 1: FBO Physical Interconnection

**IMDA Directed Modifications:** One respondent to the public consultation submitted that it was unclear in Figure 1 whether Singtel would prohibit the installation of active equipment (such as transmission multiplexer (“MUX”)) within the POI co-location space for FBO Requesting Licensee.

Pursuant to section 5.3.5 of Appendix 2 of the Code, “a Dominant Telecommunication Licensee must not restrict the type of equipment co-located so long as it is telecommunication equipment of a type customarily located in a telecommunication operator’s exchange building or other network locations”.

As such, for clarity to Requesting Licensee, IMDA directs Singtel to propose modifications to Figure 1 to make clear that Singtel would not restrict the type of telecommunication equipment (such as MUX) co-located within the POI co-location space for FBO Requesting Licensee.

In addition, IMDA is of the view that it is unclear in the diagram title description “Figure 1: FBO Physical Interconnection” that Figure 1 depicts only one possible interconnection configuration. As such, for clarity to Requesting Licensee, IMDA requires Singtel to make clear in the said diagram title description, that Figure 1 depicts only one possible interconnection configuration.

5.2 The provisions in Schedule 8 will apply to access to and Co-location of Co-location Equipment at SingTel’s IGS for Physical Interconnection.

**6. VIRTUAL (DISTANT) INTERCONNECTION**

**CLAUSE 6.1 – MODIFICATION REQUIRED**

6.1 Figure 2 depicts a possible configuration of the Virtual (Distant) Interconnection between SingTel’s Network and the Requesting Licensee’s Network and the location of the POI.

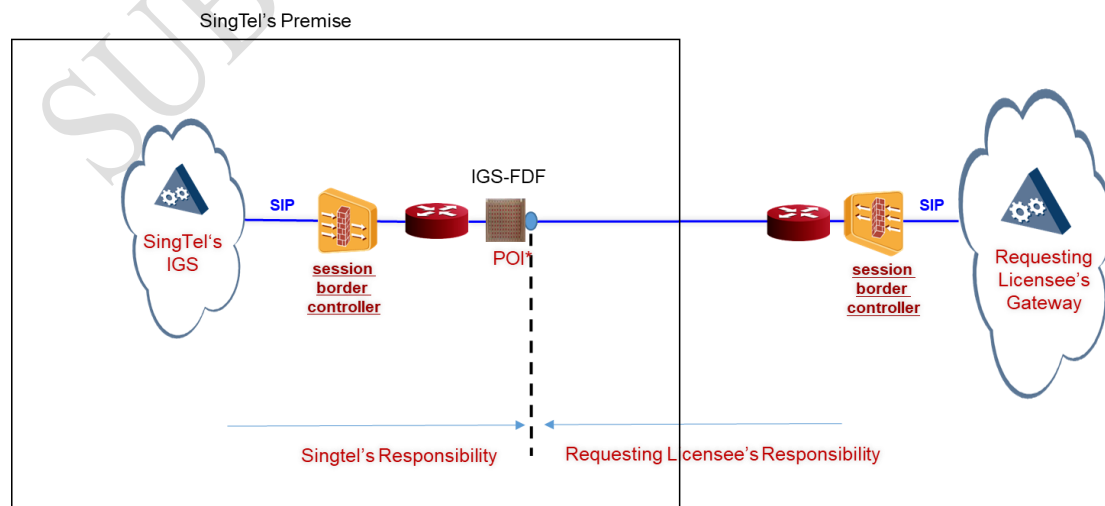


Figure 2: FBO Virtual (Distant) Interconnection

*IMDA Directed Modifications: IMDA is of the view that it is unclear in the diagram title description “Figure 2: FBO Virtual (Distant) Interconnection” that Figure 2 depicts only one possible interconnection configuration. As such, for clarity to Requesting Licensee, IMDA requires Singtel to make clear in the said diagram title description, that Figure 2 depicts only one possible interconnection configuration.*

6.2 The Requesting Licensee shall acquire Data Links from SingTel or a third party to form part of the Interconnection Link. The Requesting Licensee’s leased Interconnection Link shall consist of multiple 1Gbps Data Links terminated at a FDF in SingTel’s IGS. The Requesting Licensee is responsible for ordering sufficient Bandwidth on Data Links to enable Virtual (Distant) Interconnection to occur.

6.3 On the Requesting Licensee’s request, SingTel will lease 1Gbps Data Links to the Requesting Licensee’s Network based on SingTel’s standard terms and conditions for supply of Data Link service.

## **7. TECHNICAL REQUIREMENTS AND SPECIFICATIONS**

### **7.1 Link Connectivity**

7.1.1 The Parties shall interface with 1Gbps Data Links.

### **7.2 Protocol Handshaking**

7.2.1 The Parties shall comply with the Internet Engineering Task Force SIP standards.

7.2.2 The Requesting Licensee shall obtain its own signalling/media IP address for peering purpose from the Authority.

7.2.3 The Requesting Licensee shall not use the Internet for interconnection with SingTel’s Network or SingTel’s equipment or other Interconnection Links.

7.2.4 The Parties’ IGS shall interwork on SIP protocol for the establishment of Interconnected VoIP Calls between the Parties’ Network.

7.2.5 Not Used

***CLAUSE 7.2.6(b) – MODIFICATION REQUIRED***

7.2.6 The Parties shall adhere to additional SIP protocol requirement as follows:

- (a) The Calling Party Number and Redirecting Number if available shall be conveyed for all calls across the Network Interconnection without manipulation;
- (b) The Dummy CLI received from Mobile Operators from inbound and outbound roamers shall be an eight (8) digit Dummy CLI;
- (c) The number dialled by the calling subscriber shall not be changed or amended for the routing of international outgoing calls from one Party's Network to the other Party's Network.
- (d) The Requesting Licensee shall ensure all international calls that spoof emergency numbers such as 999 and 995 are blocked within their network and the '+' sign prefix shall be appended for all international incoming calls in the CLI display when interconnection with SingTel's Network or SingTel's equipment or other Interconnection Links.

***IMDA Directed Modifications:*** *One respondent to the public consultation submitted that clause 7.2.6(b) might no longer be relevant in an IP-based interconnection environment, particularly the reference to a dummy CLI. For clarity to Requesting Licensee, IMDA directs Singtel to propose modifications to clause 7.2.6(b) to make clear the relevance of this clause in an IP-based interconnection environment, and that the "Dummy CLI" refers to the list of non-subscriber CLI used in the resolution of service issues in accordance with clause 18.6 of the RIO Main Body.*

7.3 **Not Used**

7.3.1 Not Used

7.4 **Routing**

7.4.1 The Parties shall route Interconnected VoIP Calls in accordance with the agreed arrangements applicable to that Call Type under Schedule 2.

7.5 **Interconnect Testing**

7.5.1 The Parties shall comply with the testing procedures in Annex A of Schedule 1 Annexures.

7.5.2 The Parties shall comply with the technical and security requirements as listed in Schedule 1 Annexures.

**8. PROVISIONING OF INTERCONNECT BANDWIDTH**

8.1 Not Used

8.2 Not Used

8.3 Not Used

8.4 Not Used

8.5 Not Used

8.6 Not Used

8.7 Not Used

8.8 Not Used

8.9 Not Used

8.10 Not Used

8.11 Not Used

8.12 **Not Used**

8.12.1 Not Used

8.12.2 Not Used

8.13 **Not Used**

8.13.1 Not Used

8.13.2 Not Used

8.13.3 Not Used

8.13.4 Not Used

8.14 **Not Used**

8.14.1 Not Used

***CLAUSE 8.15 – MODIFICATION REQUIRED***

8.15 **Ordering and Provisioning Procedure for Interconnect Bandwidth**

8.15.1 The Requesting Party shall submit its Request for Interconnect Bandwidth to the Supplying Party in the form of Annex 1A.2.

8.15.2 The Supplying Party shall process all Requests for Interconnect Bandwidth on a ‘first come, first served’ basis.

8.15.3 The Supplying Party shall respond to a Request for Interconnect Bandwidth within fifteen (15) Business Days, or any other period as may be agreed, of receipt of such request, or such other period as may be agreed. The response shall be either:

- (a) an acknowledgement that the Supplying Party is able to provide the full Interconnect Bandwidth by the “**Required By Date**”;
- (b) an acknowledgement that the Supplying Party is able to provide the Interconnect Bandwidth, but not be able to provide the quantities by the “**Required By Date**”; or
- (c) an advice that the Supplying Party is unable to provide the Interconnect Bandwidth as procurement is required.

8.15.4 When procurement is required in order to meet the request, and the Supplying Party advises the Requesting Party pursuant to clause 8.15.3, the Supplying Party shall seek confirmation of the required Bandwidth from the Requesting Party. Upon confirmation, the Supplying Party shall complete the procurement no later than it would complete such procurement for itself.

8.15.5 The Requesting Party shall not procure Interconnection Links or capacity in excess of its actual traffic requirements. Any request for additional capacity shall be accompanied by a traffic forecast submitted to SingTel and shall be subject to SingTel’s prior written approval. The Requesting Party shall be liable for any additional charges, beyond the standard Link charges, for capacity provisioned in excess of its demonstrated traffic needs.

**IMDA Directed Modifications:** *One respondent to the public consultation sought to understand whether the proposed clause 8.15 would apply to existing Requesting Licensees who had already established SS7-based interconnection with Singtel.*

*Given Singtel's proposed removal of the forecasting requirement under IP-based interconnection, it is unclear to IMDA whether this proposed clause 8.15 and the associated Annex 1A.2 are still applicable for IP-based interconnection.*

*As such, IMDA directs Singtel to propose modifications to make clear the purpose of clause 8.15 herein and the associated Annex 1A.2, including specifying whether the proposed clause 8.15 is applicable for Virtual or Physical Interconnection, for FBO or SBO, and for existing or new Requesting Licensees establishing IP-based interconnection with Singtel.*

*Singtel is also required to make clear who the "Requesting Party" and "Supplying Party" in the proposed clause 8.15 are referring to, given that these terms are not defined under this Schedule 1 or Schedule 12 Dictionary.*

**9. NOT USED**

**9.1 Not Used**

9.1.1 Not Used

9.1.2 Not Used

9.1.3 Not Used

**9.2 Not Used**

9.2.1 Not Used

9.2.2 Not Used

9.2.3 Not Used

9.2.4 Not Used

**9.3 Not Used**

9.3.1 Not Used

9.3.2 Not Used

9.3.3 Not Used

9.3.4 Not Used

## 10. DECOMMISSIONING

10.1 Subject to clauses 10.2 and 10.3, a Party (**Decommissioning Party**) may, for whatever reason upon giving no less than six (6) months prior written notice to the other Party (**Decommissioning Period**), close, replace or relocate any IGS in respect of which an Interconnection Link is connected, decommission an Interconnection Link or close a POI (**Decommissioning**).

10.2 (a) Subject to paragraph (b), the Decommissioning Party shall be responsible for and bear all direct costs incurred by both Parties in carrying out the Decommissioning. Direct costs are limited to removal of equipment and cabling at the POI or IGS. Each Party will bear its own costs of recovering its own part of the Interconnection Link.

(b) When the request for Decommissioning is at the direction of a Third Party pursuant to a legal obligation binding on the Decommissioning Party, each Party shall bear its own costs associated with the Decommissioning together with the direct costs incurred by that Party in respect of the establishment of alternative arrangements necessary to support the provision of Call Origination, Call Transit and Call Termination Services provided at the time of the Decommissioning.

10.3 If Decommissioning is to occur where Physical Interconnection has been established, the Decommissioning Party will, if requested by the other Party within thirty (30) Business Days after receiving a notice under clause 10.1, offer alternative interconnection solutions to the other Party. The alternative interconnection solutions offered must, to the extent feasible, be comparable in terms of cost and functionality and, if accepted by the other Party within sixty (60) Calendar Days from the date of the offer, must permit the full implementation of the alternative interconnection solutions. Nothing in this clause prevents the Decommissioning from occurring on the expiry of the Decommissioning Period provided that the Decommissioning Party has complied with this clause 10.3.

10.4 If Decommissioning is to occur where Virtual (Distant) Interconnection has been established:

- (a) the Requesting Licensee is the Decommissioning Party, the Requesting Licensee must also comply, where the Requesting Licensee has acquired Data Links from SingTel, with the terms and conditions under which Data Links are supplied by SingTel (including the payment of any early termination payments); or
- (b) SingTel is the Decommissioning Party, SingTel will arrange for the connection of Data Links to the alternative or relocated IGS or POI prior to the Decommissioning.

10.5 Upon the happening of an event which causes or is likely to cause significant damage to the Network of a Party or which endangers or is likely to endanger the health or safety of any person (**Emergency Event**), that Party may close or replace its IGS or a POI or Decommission an Interconnection Link without prior written notice to the other Party, provided that it notifies the other Party as soon as practicable that the Emergency Event exists and that emergency relocation work is being or will be performed. The costs incurred as a result of, or in connection with, a closure or replacement of an IGS or a POI or Decommissioning of an Interconnection Link under this clause 10.5 shall be borne as follows:

- (a) where the occurrence of the Emergency Event was caused as a result of the negligence or wilful act or omission of the first-mentioned Party, its employees, agents or contractors, that Party shall bear the costs associated with the closure, replacement or Decommissioning incurred by both Parties; and
- (b) where the occurrence of the Emergency Event was not caused as a result of the negligence or wilful act or omission of the first-mentioned Party, its employees, agents or contractors, each Party shall bear its own costs associated with the closure, replacement or Decommissioning.

**ANNEX 1A.1: NOT USED**

SUBJECT TO CHANGE

**ANNEX 1A.2 – MODIFICATION REQUIRED**

*IMDA Directed Modifications: As explained above in the IMDA Directed Modifications for clause 8.15 of this proposed Schedule 1A, it is unclear to IMDA whether this Annex 1A.2 and the associated clause 8.15 are still applicable for IP-based interconnection, given Singtel’s proposed removal of the forecasting requirement under IP-based interconnection.*

*Some respondents to the public consultation had commented that it was unclear how the Annex 1A.2 application form could be filled up for “No. of 1Gbps Data Links” required for “Trunk Group for Origination Call Type”, “Trunk Group for Termination Call Type” and “Trunk Group for Transit Call Type”, given that the Trunk Groups for different call types are configured on one 1Gbps Data Link. For clarity, IMDA requires Singtel to either modify Annex 1A.2 application form to make clear how to fill up the abovementioned item, or provide a sample of how Annex 1A.2 application form should be filled up.*

*In addition, Singtel is required to make clear that "Purchase Order No:" need not be filled up if the Requesting Licensee is not leasing interconnection links from Singtel, and that IP-address and location information is required to be provided for “Operator’s Switch”.*

**ANNEX 1A.2: INTERCONNECT BANDWIDTH**

Request For Interconnect Bandwidth			
Name of Operator:			
Purchase Order No:			
Required By Date:			
Operator's Switch:			
SingTel's Switch:			
	Trunk Group for Origination Call Type	Trunk Group for Termination Call Type	Trunk Group for Transit Call Type
No. of 1Gbps Data Links			

**ANNEX 1A.3: REQUEST FORM FOR ACTIVATION, DEACTIVATION AND MODIFICATION OF INTERCONNECT LINKS**

Date: \_\_\_\_\_ Application Reference Number: \_\_\_\_\_

To: Manager, Network Integration and Interconnect

- Activation of New Interconnection Links
- Deactivation of Interconnection Links
- Modification of Interconnection Links

Requesting Licensee Particulars			
Requesting Licensee Name : _____ Requesting Licensee's BRN: _____ Name : _____ Designation : _____ Signature : _____ Telephone : _____ Email : _____ Company Stamp : _____			
<b>Intended Ready For Service Date:</b> _____			
<b>Interconnection Link Information</b> (for more than 4 links, please complete a separate form)			
<b><u>IP</u></b>	<b><u>Link Ref</u></b>	<b><u>SingTel POI</u></b>	<b><u>Requesting Licensee Switch</u></b>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Call Type and Access Code (where applicable): _____			
<b>Network configuration Diagram</b> (where applicable) Please attach to this form.			
<b>Information for Modification of Interconnection Links:</b> _____ _____			

**SingTel's Reply to the Requesting Licensee**

- Application returned – incomplete/illegible
- Not Approved      Reason for Rejection      : \_\_\_\_\_
- Approved              SingTel Approval Code      : \_\_\_\_\_  
   Ready for Service Date      : \_\_\_\_\_

**On Behalf of SingTel**

Sign : \_\_\_\_\_      Contact Number : \_\_\_\_\_  
\_\_\_\_\_  
Name : \_\_\_\_\_      Email : \_\_\_\_\_  
Processed Date : \_\_\_\_\_

SUBJECT TO CHANGE

**SCHEDULE 1B**

**VIRTUAL (DISTANT) INTERCONNECTION FOR SBOs**

SUBJECT TO CHANGE

**SCHEDULE 1B**

**VIRTUAL (DISTANT) INTERCONNECTION FOR SBOS**

**CONTENTS**

1. **GENERAL** ..... 1

2. **INTERCONNECT CONFIGURATION** ..... 1

3. **POINT OF INTERCONNECTION** ..... 2

4. **TECHNICAL REQUIREMENTS AND SPECIFICATIONS** ..... 4

5. **DECOMMISSIONING** ..... 5

**ANNEX 1B.1 – REQUEST FORM FOR ACTIVATION, DEACTIVATION AND MODIFICATION OF INTERCONNECT LINKS**

SUBJECT TO CHANGE

## SCHEDULE 1B

### VIRTUAL (DISTANT) INTERCONNECTION FOR SBOS

#### 1. GENERAL

- 1.1 Each Party agrees to interconnect and keep interconnected their respective Networks subject to and in accordance with the terms and conditions of this Schedule 1B.
- 1.2 This Schedule 1B only applies to a Requesting Licensee which is an SBO.
- 1.3 For the avoidance doubt and unless the Parties agree otherwise, where both Parties have established Interconnection of their respective Networks prior to the RIO Review Date:
- (a) the existing interconnect configuration that applies between each Party's respective Network at the RIO Review Date will continue to apply; and
  - (b) the Parties need not change the Interconnection configuration of their respective Networks as may be required under this Schedule 1B.

#### 2. INTERCONNECT CONFIGURATION

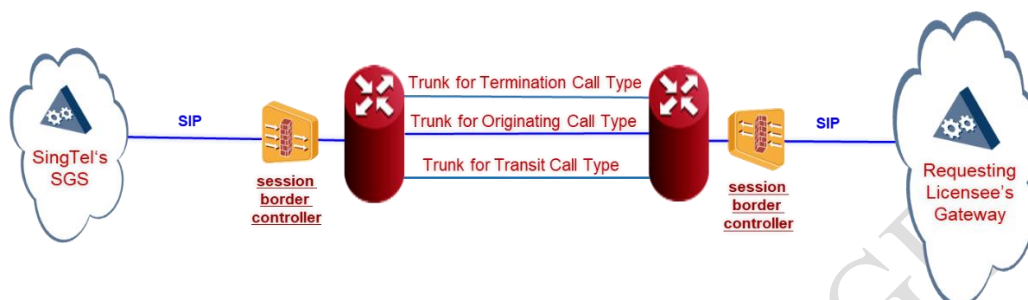
##### ***CLAUSE 2.1 – MODIFICATION REQUIRED***

- 2.1 The Requesting Licensee must interconnect its Network with the SingTel Network at SingTel's SBO Gateway Switches (**SGS**) as specified in Section 2F of Annex A.

***IMDA Directed Modifications: Singtel is required to make clear that "Section 2F of Annex A" in clause 2.1 herein refers to that of Schedule 1 Annexures.***

- 2.2 SingTel and the Requesting Licensee are responsible for managing and maintaining their own Interconnection Links, taking into account the need for growth, diversity and security in the Data Links. For the avoidance of doubt, there is no obligation on either Party to manage or maintain the other Party's Interconnection Links.
- 2.3 The Minimum Interconnection Bandwidth for Interconnection by the Requesting Licensee to a SingTel SGS is two (2) 1Gbps Data Links.
- 2.4 Not Used

- 2.5 An Interconnection Link may comprise different Trunk Groups. The Requesting Licensee must designate the Trunk Groups to handle the different Call Types.



- 2.6 The Requesting Licensee is responsible for the correct dimensioning of the Data Links that it will require.

### ***CLAUSE 2.7 – MODIFICATION REQUIRED***

- 2.7 If SingTel or the Requesting Licensee wishes to interconnect at additional POIs, that Party may request an additional POI and the Party will negotiate in good faith in relation to the interconnect configuration applicable to such additional Interconnection. Each Party shall bear its own cost in relation to establishing any additional POI.

***IMDA Directed Modifications:*** With reference to above *IMDA Directed Modifications for clause 2.11 of Schedule 1A, IMDA similarly rejects the proposed clause 2.7 herein and directs Singtel to reinstate the same clause 2.7 of Schedule 1B of the RIO for SS7-based interconnection as currently published on IMDA's website.*

- 2.8 Neither Party shall be required to commence works on the installation of Network Facilities to support a new POI under clause 2.7 until the Party has agreed on the interconnect configuration under clause 2.7.

### **3. POINT OF INTERCONNECTION**

- 3.1 The Parties agree that the POI will be located on the Requesting Licensee's side of the SingTel SGS Fibre Distribution Frame (**fdf**) at the SingTel SGS.
- 3.2 Each Party is responsible for the provisioning and maintenance of Network Facilities on its "side" of the POI.

- 3.3 The Interconnection between SingTel's SGS and the Requesting Licensee's Network located at a different site will be implemented by means of 1Gbps Data Links.
- 3.4 The Requesting Licensee will be responsible for the connection of the Interconnection Link between the POI and the Requesting Licensee's Network.

**CLAUSE 3.5 – MODIFICATION REQUIRED**

- 3.5 The Requesting Licensee's Interconnection Link must consist of multiple 1Gbps Data Links terminated at a FDF in SingTel's designated SGS exchanges.

*IMDA Directed Modifications: IMDA notes that Schedule 1B of the proposed RIO for IP-based interconnection does not provide for SBO Requesting Licensee to acquire 1Gbps Data Links from another licensee (besides Singtel). This would not be aligned with the same clause 3.5 of Schedule 1B of the RIO for SS7-based interconnection.*

*As explained in IMDA's Decision, this would also not be aligned with the Code requirement under section 3.4 of Appendix 2 of the Code which requires that "the Services-based Licensee may obtain the transmission link between the two nodes from either the Dominant Telecommunication Licensee or any other Facilities-based Licensee".*

*As such, IMDA directs Singtel to propose modifications to clause 3.5 herein to provide that SBO Requesting Licensee can acquire 1Gbps Data Links from Singtel or another licensee (i.e., third party).*

- 3.6 At the Requesting Licensee's request, SingTel will lease 1Gbps Data Links to the Requesting Licensee's Network based on SingTel's standard terms and conditions for supply of Data Link service.

**CLAUSE 3.7 – MODIFICATION REQUIRED**

- 3.7 The Requesting Licensee may request modification of an Interconnection Link by completing the request form set out in Annex 1B.1. SingTel will consider the request for modification and approve or reject the request for modification by written notice to the Requesting Licensee within fourteen (14) Calendar Days of receipt of a duly completed request form from the Requesting Licensee. If SingTel agrees to such a modification, SingTel will undertake the modification in accordance with that request. The Requesting Licensee will be liable for any costs incurred by SingTel in performing the modification of the Interconnection Link. If SingTel rejects the request for modification, it will specify the reasons in its written notice to the Requesting Licensee. SingTel may reject a request for modification

of an Interconnection Link on reasonable grounds including (without limitation) where the requested modification:

- (a) would have, or would likely have, the effect of impairing, disrupting or damaging SingTel's Network, SingTel's equipment or other Interconnection Links;
- (b) is not technically feasible;
- (c) would cause, or would likely cause, SingTel to be in breach of any applicable laws or regulations or its licence; or
- (d) does not contain all the necessary information or is illegible.

***IMDA Directed Modifications:** One respondent to the public consultation commented that besides Requesting Licensees, Singtel might also need to modify an Interconnection Link. As such, IMDA directs Singtel to propose modifications to clause 3.7 herein to provide for a reciprocal position.*

3.8 Requesting Licensee shall not conduct penetration test of any kind of SingTel's Network or SingTel's equipment or other Interconnection Links.

#### **4. TECHNICAL REQUIREMENTS AND SPECIFICATIONS**

##### **4.1 Link Connectivity**

4.1.1 The Parties shall interface with 1Gbps Data Links.

##### **4.2 Protocol Handshaking**

4.2.1 The Parties shall comply with the SIP Internet Engineering Task Force Specification.

4.2.2 The Requesting Licensee shall obtain its own signalling/media IP address for peering purpose from the Authority.

4.2.3 Requesting Licensee shall not use the Internet for interconnection with SingTel's Network or SingTel's equipment or other Interconnection Links.

##### ***CLAUSE 4.2.4(b) – MODIFICATION REQUIRED***

4.2.4 The Parties shall adhere to additional SIP requirement as follows:

- (a) The Calling Party Number and Redirecting Number if available shall be conveyed for all Calls across the Network connection without manipulation.
- (b) The Dummy CLI received from Mobile Operators from inbound and outbound roamers shall be an eight (8) digit Dummy CLI.
- (c) The number dialled by the calling subscriber shall not be changed or amended for the routing of international outgoing Calls from one Party's Network to the other Party's Network.
- (d) Not Used

*IMDA Directed Modifications: With reference to above IMDA Directed Modifications for clause 7.2.6(b) of Schedule 1A, IMDA similarly directs Singtel to propose modifications to clause 4.2.4(b) herein to make clear the relevance of this clause in an IP-based interconnection environment, and that the "Dummy CLI" refers to the list of non-subscriber CLI used in the resolution of service issues in accordance with clause 18.6 of the RIO Main Body.*

#### 4.3 Interconnect Testing

- 4.3.1 The Parties shall comply with the testing procedures in Annex A of Schedule 1 Annexures.
- 4.3.2 The Parties shall comply with the technical and security requirements as listed in Schedule 1 Annexures.

#### 4.4 Routing

- 4.4.1 The Parties shall route Interconnected VoIP Calls in accordance with the agreed arrangements applicable to that Call Type under Schedule 2.

### 5. DECOMMISSIONING

- 5.1 Subject to clauses 5.2 and 5.3, a Party (**Decommissioning Party**) may, for whatever reason, upon giving no less than six (6) months prior written notice to the other Party, close, replace or relocate any SGS in respect of which an Interconnection Link is connected, decommission an Interconnection Link or close a POI (**Decommissioning**).

- 5.2 (a) Subject to paragraph (b), the Decommissioning Party shall be responsible for and bear all direct costs incurred by both Parties in carrying out the Decommissioning. Direct costs are limited to removal of equipment and cabling at the POI.
- (b) When the request for Decommissioning is at the direction of a Third Party pursuant to a legal obligation binding on the Decommissioning Party, each Party shall bear its own costs associated with the Decommissioning together with the direct costs incurred by that Party in respect of the establishment of alternative arrangements necessary to support the provision of Call Origination, Call Transit and Call Termination Services provided at the time of the Decommissioning.
- 5.3 If Decommissioning is to occur where Virtual (Distant) Interconnection has been established:
- (a) if the Requesting Licensee is the Decommissioning Party, the Requesting Licensee must comply, where the Requesting Licensee has acquired the Data Links from SingTel, with the terms and conditions under which the Data Links are supplied by SingTel (including the payment of any early termination payments); and
- (b) if SingTel is the Decommissioning Party, SingTel will arrange for the connection of the Data Links which are supplied by SingTel to the alternative or relocated SGS or POI prior to the Decommissioning.
- 5.4 Upon the happening of an event which causes or is likely to cause significant damage to the Network of a Party or which endangers or is likely to endanger the health or safety of any person (**Emergency Event**), that Party may close or replace its SGS or a POI or Decommission an Interconnection Link without prior written notice to the other Party, provided that it notifies the other Party as soon as practicable that the Emergency Event exists and that emergency relocation work is being or will be performed. The costs incurred as a result of, or in connection with, a closure or replacement of an SGS or a POI or Decommissioning of an Interconnection Link under this clause shall be borne as follows:
- (a) where the occurrence of the Emergency Event was caused as a result of the negligence or wilful act or omission of the first-mentioned Party, its employees, agents or contractors, that Party shall bear the costs associated with the closure, replacement or Decommissioning incurred by both Parties; and

- (b) where the occurrence of the Emergency Event was not caused as a result of the negligence or wilful act or omission of the first-mentioned Party, its employees, agents or contractors, each Party shall bear its own costs associated with the closure, replacement or Decommissioning.

SUBJECT TO CHANGE

**ANNEX 1B.1: REQUEST FORM FOR ACTIVATION, DEACTIVATION AND MODIFICATION OF INTERCONNECT LINKS**

Date: \_\_\_\_\_ Application Reference Number: \_\_\_\_\_

To: Manager, Network Integration and Interconnect

- Activation of New Interconnection Links
- Deactivation of Interconnection Links
- Modification of Interconnection Links

Requesting Licensee Particulars																							
Requesting Licensee Name : _____ Requesting Licensee's BRN: _____ Name : _____ Designation : _____ Signature : _____ Telephone : _____ Email : _____ Company Stamp : _____																							
<p><b>Intended Ready For Service Date:</b> _____</p> <p><b>Interconnection Link Information</b> (for more than 4 links, please complete a separate form)</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;"><u>IP</u></th> <th style="text-align: left; border-bottom: 1px solid black;"><u>Link Ref</u></th> <th style="text-align: left; border-bottom: 1px solid black;"><u>SingTel POI</u></th> <th style="text-align: left; border-bottom: 1px solid black;"><u>Requesting Licensee Switch</u></th> </tr> </thead> <tbody> <tr> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> </tr> <tr> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> </tr> <tr> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> </tr> <tr> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> </tr> </tbody> </table> <p>Call Type and Access Code (where applicable): _____</p> <p><b>Network configuration Diagram</b> (where applicable) Please attach to this form.</p> <p><b>Information for Modification of Interconnection Links:</b></p> <p>_____</p> <p>_____</p>				<u>IP</u>	<u>Link Ref</u>	<u>SingTel POI</u>	<u>Requesting Licensee Switch</u>																
<u>IP</u>	<u>Link Ref</u>	<u>SingTel POI</u>	<u>Requesting Licensee Switch</u>																				

**SingTel's Reply to the Requesting Licensee**

- Application returned – incomplete/illegible
- Not Approved      Reason for Rejection      : \_\_\_\_\_
- Approved      SingTel Approval Code      : \_\_\_\_\_  
Ready for Service Date      : \_\_\_\_\_

**On Behalf of SingTel**

Sign : \_\_\_\_\_      Contact Number : \_\_\_\_\_  
\_\_\_\_\_  
Name : \_\_\_\_\_      Email : \_\_\_\_\_  
Processed Date : \_\_\_\_\_

SUBJECT TO CHANGE