Consultation on the proposed changes to the Reference Access and Interconnection Offer published by The Bahamas Telecommunications Company Limited

Preliminary Determination

ECS 09/2020

Publication Date: 17 August 2020

Response Date: 15 September 2020

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1.   Introduction

The Utilities Regulation and Competition Authority ("URCA") issues for consultation a review of the changes The Bahamas Telecommunications Company Ltd. ("BTC") proposes to make to the Reference Access and Interconnection Offer ("RAIO").

A RAIO sets out the price and non-price terms and conditions under which an SMP[1] operator like BTC will permit Other Licensed Operators ("OLOs") to physically interconnect with its network. Non-price terms and conditions in a typical RAIO include clauses relating to dispute resolution, termination and suspension, service level agreements, inclusion of new services, liability, non-payment and billing disputes, the technical requirements/specifications and Quality of Service metrics for interconnection services.

Pursuant to sections 39 and 40 of the Communications Act, 2009 (referred to herein as "the Comms Act" or "the Act"), BTC was designated as having SMP in specified retail and wholesale markets and is therefore subject to SMP obligations including the requirement to permit interconnection to its network on fair, reasonable, transparent and non-discriminatory terms and conditions.[2] One of URCA's mandate is to approve terms and conditions of reference offers that are compatible with the statutory framework of the Act and other regulatory measures. The Act also requires URCA to consult with interested parties and stakeholders on matters of public significance.

The proposed changes to the BTC RAIO that are the subject of this Consultation and Preliminary Determination stem from URCA's 2016 Final Determination for BTC to provide (upon request) direct access or links to its Mobile Switching Center ("MSC"). As summarized below, BTC's compliance with this Determination was delayed. On 19 July 2019, URCA issued an Order for BTC to install the service for Aliv's traffic and to make the required changes to the BTC RAIO and the Interconnection Agreement ("IA") between BTC and Aliv. On 9 July 2020, BTC, amongst other things, submitted copies of the resulting changes to both the RAIO and the BTC/Aliv IA to URCA for review and approval.[3]

Having regard to the foregoing, URCA presents its review of the proposed changes to the BTC RAIO and offers an opportunity for comments from licensees and the general public.

1.1   Legislative Framework

URCA issues this Consultation and Preliminary Determination document in accordance with the statutory framework of the Comms Act and other regulatory measures.

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[1] Significant Market Power

[2] See ECS 11/2010 – Final Decision on Obligations Imposed on Operators with SMP available at https://www.urcabahamas.bs/wp-content/uploads/2017/02/ECS-11-2010-Final-Decision-Obligations-Imposed-on-Operators-with-Significant-Market-Power..pdf

[3] Be Aliv Limited ("Aliv") is the second cellular/mobile network in The Bahamas.

Section 99 of the Comms Act sets out the processes for issuing this Preliminary Determination. Specifically, sections 99(1)(a) and (b) of the Comms Act requires that if URCA has reason to believe that a determination is necessary, it may make determinations relating to (amongst other things):

- any obligations on a Licensee regarding the terms or conditions of any licence, including obligations in licence conditions and regulations;
- any activity set out in the Comms Act; and where the Comms Act provides for URCA to "determine" or "to make determinations"; as is the case under sections 39(1) and 116(2).

However, in making any determination,[4] URCA has to consult persons with sufficient interest under section 11 of the Comms Act and provide written reasons for its determination. Section 13(1) of the Comms Act prescribes that:

"A regulatory and other measure is likely to be of public significance if it relates to electronic communications services or networks and can lead to one or more of the following —

a) involve a major change in the activities carried on by URCA under this Act;
b) a significant impact on persons carrying on activities in those areas where URCA has functions under this Act; and
c) a significant impact on the general public in The Bahamas."

Under section 11(1) of the Comms Act, URCA shall afford persons with sufficient interest a reasonable opportunity to comment on URCA's review. URCA considers that the proposed changes to the BTC RAIO are likely to have a significant impact upon the activities carried out by licensees in The Bahamas. As such, the consultation provides an opportunity for members of the public, licensees, and other interested parties to submit written comments to URCA.

In reviewing the proposed changes to BTC's RAIO, URCA shall have regard to section 40(4) of the Act:

"SMP licensees shall -
a) not unduly discriminate against particular persons or a particular description of persons in relation to electronic communications services offered by them. Nothing done in any manner by an SMP licensee shall be regarded as undue discrimination if and to the extent that the licensee is required or expressly permitted to do such thing in that manner under this Act or any other enactment or any instrument issued pursuant to this Act or any other enactment;

b) provide technical specifications, or other relevant information about any interconnection, essential facilities or other mandated wholesale electronic communications services on a reasonable and timely basis, when the information is required by another licensee to provide its licensable services and when the information is not readily available from other sources; and

c) not adopt technical specifications for a network that prevents interconnection or interoperability with a network of a competitor."

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[4] Section 99(2) of the Comms Act

Additional principles relating to URCA's review are set out in URCA's Access and Interconnection Guidelines – ECS 14/2010[5] ("the Guidelines"); and relevant licence conditions. Specific to paragraphs 7 and 8 of the Guidelines:

> *"7.1   URCA may assess … any proposed amendments to an existing approved RAIO, to ensure consistency with the Comms Act, relevant licence conditions and other relevant documents.*
>
> *7.2   If URCA concludes that a RAIO, or any proposed amendments to an existing approved RAIO, is inconsistent with one or more of the documents mentioned in paragraph 7.1 above, then it will direct the SMP licensee to modify the RAIO, or the proposed amendments, accordingly.*
>
> *7.4   All earlier agreements for access and/or interconnection entered into under the RAIO must incorporate any approved amendments to the RAIO.*
>
> *8.1 The RAIO is expected to change over time as the Bahamian electronic communications sector evolves. All agreements for access and/or interconnection should be automatically amended to reflect the published approved RAIO to ensure consistency with regulatory or other measures issued by URCA.*
>
> *8.2 Where URCA has directed an SMP operator to modify the published approved RAIO, if the changes are relevant to the terms of an existing AIA ("Access and Interconnection Agreement"), the modification will be automatically incorporated into an agreement without the need for negotiation between the parties. Up-to-date RAIOs and marked up copies should be prominently posted on the SMP operator's website so other licensed operators can track changes."*

Condition 40.5 of BTC's Individual Operating Licence ("IOL") states:

> *"The SMP Licensee shall ensure that Interconnection is available at all exchanges or other relevant Network nodes, unless Interconnection at any point:*
>
> *40.5.1   is not feasible given the existing Network configuration; or*
>
> *40.5.2   would compromise the Integrity or Interoperability of an Electronic Communications system (whether the SMP Licensee's, Interconnection seeker's or a third party's system)."*

1.2   Responding to this Preliminary Determination

URCA invites written comments and submissions from members of the public, licensees and interested parties on the issues in this document.

Persons may direct their written comments or submissions to URCA's Director of Electronic Communications either:

- by hand, at URCA's office at Frederick House, Frederick Street;

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[5]https://www.urcabahamas.bs/wp-content/uploads/2017/02/ECS-14-2010-Final-Guidelines-Access-and-Interconnection-2.pdf

- by mail, to P. O. Box N-4860;
- by fax, to (242) 393-0237; or
- by email, to info@urcabahamas.bs

All comments to this consultation document should be submitted on or before 15 September 2020. URCA reserves the right to make all responses available to the public by posting responses to its website at www.urcabahamas.bs . Responses marked "confidential" should be accompanied with reasons to simplify assessment by URCA of the request for confidentiality. URCA may, in its sole discretion, choose whether to publish any confidential document or submission.

1.3   Structure of the Remainder of this Document

The remainder of the document is structured as follows:

- Section 2 - Background to this Preliminary Determination;
- Section 3 - URCA's Review of the Changes to the BTC RAIO;
- Section 4 - URCA's Preliminary Determination;
- Section 5 - Conclusion and Next Steps; and
- Annex - Requirements for Direct Connectivity and SIP Interconnection.

2   Background to this Preliminary Determination

URCA now provides background to the changes BTC proposes to make to its RAIO.

 In ECS 19/2016,[6] URCA required BTC, *inter alia*, to modify its RAIO to:

> *"b) Include details of the service specification and parameters for NewCo and other licensees to interconnect directly to one or more suitable point(s) of interconnection on BTC's cellular mobile network.*
>
> *c) Include provisions to enable NewCo and other licensees to obtain interconnection at one or more discreet points on BTC's fixed and/or cellular mobile networks, using interconnection transport links based on Internet Protocol (IP) supporting session Internet Protocol (SIP) technology."[7]*

Under ECS 19/2016, URCA also determined that:
> *"… 4   NewCo may, at any time following the date of this Final Determination, initiate interconnection negotiations with BTC by making a request to BTC to negotiate an interconnection agreement and/or provide interconnection services. Where such negotiations occur prior to URCA's approval of BTC's RAIO as amended pursuant to this Final Determination, BTC and NewCo shall negotiate and implement interconnection in good faith on and consistent with the current URCA-approved BTC RAIO or the amended RAIO as appropriate, and the matters determined in this Final Determination."*

In short, BTC is obligated to provide direct links to its MSC for OLOs' traffic based on Session Internet Protocol ("SIP") technology.

BTC holds the view that direct interconnection to its MSC was not critical to Aliv's market entry because existing OLOs are connected to BTC's fixed network for fixed-to-mobile traffic. BTC noted that mobile entrants in the Caribbean generally interconnect to a fixed network. Further, BTC said that it could not implement the direct interconnection service in time for Aliv's commercial launch. As a consequence, the BTC RAIO was not updated to include details of the said service within the timeframe specified by URCA. Further, under the terms of the initial BTC/Aliv Interconnection Agreement of September 2016, Aliv would interconnect its cellular/mobile network directly to BTC's fixed network in New Providence and Grand Bahama. As a compromise, BTC waived the fixed network transit fees in its RAIO for Aliv's traffic to BTC's mobile network. Nonetheless, the obligation for BTC to provide the said service upon request remained.

In November 2017, URCA took the position that the regulatory obligation for BTC to implement direct interconnection could have been disproportionate, unfair and risked seriously undermining BTC's ability

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[6]"Proposed Changes to the Reference Access and Interconnection Offer (RAIO) Published by the Bahamas Telecommunications Company Ltd." Available at https://www.urcabahamas.bs/wp-content/uploads/2017/02/ECS-19-2016-Statement-of-Results-Final-Determination-on-RAIO.pdf
[7] See Section 2 of the Final Determination

to maintain the proper and effective functioning of its network. In September 2018, after BTC's completion of key regulatory projects, URCA reaffirmed its 2016 Determination and stated that BTC was in a position to implement direct interconnection for Aliv's traffic to BTC's MSC. As a further step, on 15 July 2019, URCA issued an Interim Order mandating BTC to implement direct interconnection for Aliv's traffic. This was in light of repeated requests for the service from Aliv and the disruptive outages of Aliv's network interconnection with BTC's fixed network in August 2017. The Order required BTC to fully comply with Section 2 of the 2016 Final Determination and in particular, to:

> *"(a) amend its Reference Access and Interconnection Offer (RAIO) to include:*
> > *(i) details of the service and parameters for Aliv to interconnect directly to one or more suitable point(s) of interconnection on BTC's cellular mobile network, as well as specific timelines for implementation;*
>
> > *(ii) provisions to enable Aliv to obtain interconnection at one or more discreet points on BTC's mobile networks, using interconnection transport links based on Internet Protocol (IP) supporting Session Internet Protocol (SIP) technology;*
>
> *(b) submit copies of its amended RAIO (in tracked changes) to URCA and NewCo (now Aliv) within fourteen (14) calendar days …;*
>
> *(c)provide physical and operational interconnection (IP/SIP and at least one (1) direct POI to its mobile switch) within …"*

On 9 July 2020, BTC confirmed that direct mobile links to Aliv's network (based on SIP) were fully implemented and operational in New Providence and Grand Bahama and provided copies of the resulting changes to the BTC RAIO and the BTC/Aliv IA for URCA's review and approval. Under the statutory framework of the Comms Act and relevant Guidelines, URCA is tasked to review the changes put forward by BTC.

3.   URCA's Review of the Changes to BTC's RAIO

Outlined in the Annex to this Consultation and Preliminary Determination document are revisions to the RAIO made by BTC and submitted for URCA's review and approval. The revisions largely affect Annex C of BTC's RAIO. Essentially, BTC is offering direct interconnection links to its MSC based on SIP technology and incorporated the requisite non-price terms and conditions for the service in Annex C of its RAIO. In its 9 July 2020 letter to URCA, BTC advised that the service is offered on a technology neutral and non-discriminatory basis. That is to say, the service is available to fixed and mobile networks on similar terms and conditions.

As a first step in this exercise, URCA notes that the procedures for assessing and approving changes or amendments to BTC's RAIO and IAs are specified in document ECS 14/2010 *"Final Guidelines – Access and Interconnection."* URCA must also consider whether the resulting changes to BTC's RAIO are consistent with the principles for access and interconnection in The Bahamas. These include the principles of the Act, relevant licence conditions and URCA's Guidelines. Linked to this is that the implementation of direct mobile links to BTC's MSC and related terms and conditions must be in accordance with one or more objectives of the Act, in particular the objective pursuant to section 4(a)(iii) of the Act *"to encourage, promote and enforce sustainable competition"* in the Bahamian electronic communications sector.

URCA believes approval of the proposed changes would not be detrimental or harmful to any of URCA's objectives. From URCA's viewpoint, the technical requirements and related conditions for the service appear fair, reasonable, transparent, proportionate and fit-for-purpose. Furthermore, it is not apparent to URCA that the technical configuration of the service is unduly burdensome for OLOs or inconsistent with section 40(4) of the Act. In particular, URCA does not consider that the terms and conditions for the service are likely to limit its take-up by OLOs.

The direct interconnection service is already implemented on Aliv's network and there are no reports of any adverse outcomes since the implementation. Aliv deems the provisioning of the service as critical to its ability to compete efficiently and effectively with BTC and guarantee consistently high quality of service to Aliv's own subscribers. BTC echoed that the availability of the service would minimize the risk of network failure when OLOs' traffic traverses BTC's primary and secondary transmission links.

Further still, the practice of connecting directly to incumbents' MSC is not new and is considered international best practice. In fact, the practice is common in the United Kingdom and elsewhere. As such, URCA considers that access to this service would further align BTC's RAIO and the interconnection regime in The Bahamas with international standards.

URCA equally notes that Aliv did not raise any objections to the proposed non-price terms and conditions for the service. In fact, the proposed revisions to the terms and conditions of the RAIO have been incorporated into the amended IA agreed upon by Aliv and BTC.

In total, subject to cogent representations to the contrary from interested parties, URCA is inclined to approve the changes BTC proposes to make to its RAIO and the amended IA between BTC and Aliv. As a

final point, BTC shall continue to meet all reasonable requests for interconnection links based on SIP technology and in doing so, BTC shall adhere to relevant Conditions of its IOL, section 40(4) of the Act, ECS 19/2016 and the procedures outlined in Guidelines (ECS 14/2010).

Having regard to the above, URCA now invites comments from interested parties on its review and provisional decisions set out in Section 2 above. Please substantiate any responses with supporting evidence.

4.   URCA's Preliminary Determination

This section sets forth the Determination URCA proposes to make, subject to URCA's assessment of any representations and objections made by interested parties. URCA's Final Determination will be addressed to, and will be binding upon, the Licensees referred to in the Determination:

"**WHEREAS:**

(i)   Section 4(a)(iii) of the Communications Act, 2009 affirms URCA's role within the Bahamian electronic communications sector is to *encourage, promote and enforce sustainable competition*.

(ii)   Pursuant to section 40(1)(b) of the Communications Act, 2009, The Bahamas Telecommunications Company Ltd. ("BTC") is obligated to publish a reference offer ensuring equivalence of access and/or interconnection to any of those services and/or facilities in which BTC has Significant Market Power ("SMP").[8]

(iii)   Pursuant to ECS 14/2010,[9] URCA assesses and approves any proposed amendments to an existing approved Reference Access and Interconnection Offer ("RAIO") and Interconnection Agreements ("IAs")*.*

(iv)   In document number ECS 19/2016 *"Proposed Changes to the Reference Access and Interconnection Offer (RAIO) Published by the Bahamas Telecommunications Company Ltd."*, URCA required BTC, *inter alia,* to amend its RAIO to include details of direct interconnection for OLOs' traffic to BTC's mobile switch. This includes the service specification and parameters for Aliv and other licensees to interconnect directly to one or more suitable point(s) of interconnection on BTC's cellular mobile network based on SIP technology.

(v)   Pursuant to section 96 of the Communications Act, 2009, URCA on 15 July 2019 issued an Interim Order requiring BTC to implement URCA's 2016 Final Determination in respect of direct connectivity to BTC's mobile switch.

(vi)   In fulfilment of (v) above, on 9 July 2020, BTC confirmed that direct mobile links for Aliv's traffic were fully implemented and functional in New Providence and Grand Bahama and submitted to URCA for its consideration the resulting changes to the BTC RAIO and the BTC/Aliv Interconnection Agreement.

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[8]See ECS 11/2010 – Final Decision on Obligations Imposed on Operators with SMP available at https://www.urcabahamas.bs/wp-content/uploads/2017/02/ECS-11-2010-Final-Decision-Obligations-Imposed-on-Operators-with-Significant-Market-Power..pdf

[9]Access and Interconnection Guidelines available at https://www.urcabahamas.bs/wp-content/uploads/2017/02/ECS-14-2010-Final-Guidelines-Access-and-Interconnection-2.pdf

(vii) URCA has concluded a review of the resulting changes to the BTC RAIO.

(viii) URCA now considers it appropriate and proportionate to make a Determination regarding the implementation of interconnection links based on SIP technology and the resulting changes to BTC's published RAIO.

URCA HEREBY DETERMINES as follows:

In satisfaction to the Interim Order issued by URCA in July 2019, BTC submitted proposed revisions to URCA in 2020 for the BTC/Aliv Interconnection Agreement and its RAIO. Based on URCA's preliminary review, BTC appears compliant with URCA's requirement to:

a) allow Aliv direct access to BTC's mobile switch in New Providence and Grand Bahama;

b) amend or modify the BTC RAIO and BTC/Aliv IA incorporating the terms and conditions for direct mobile links to BTC's mobile switch; and

c) provide direct interconnection links (based on SIP technology) to Other Licensed Operators on non-price terms and conditions that are compatible with the Act, relevant licence conditions and other regulatory measures.

BTC shall continue to meet all reasonable requests for interconnection links based on SIP and in doing so, BTC shall adhere to the statutory framework of the Act, relevant Conditions of its IOL, and the procedures outlined in Guidelines (ECS 14/2010).

J. Carlton Smith
Acting CEO and Director of Electronic Communications
13 August 2020

5   Conclusion and Next steps

URCA issues this Consultation and Preliminary Determination and invites interested parties to comment on the BTC RAIO requirements for direct mobile links to BTC's mobile switch and SIP interconnection. Written responses are due no later than 15 September 2020. After review of all written comments, URCA will issue a Final Determination setting out its findings and next steps as it relates to BTC's revised RAIO.

Annex: Requirements for Direct Connectivity and SIP Interconnection

BTC offered the following amendments to Annex C of its RAIO:

> ➢ **C.6 SIP Network Topology**

C.6.1 BTC is updating its network interconnection fabric in order to accommodate new SIP interconnection requirements of other mobile operators. This effectively changes the BTC MSC to SIP capable, able to connect via BTC's SBCs independently of the FNC currently supporting all OLOs.

Key Requirements:

Mobile-Fixed traffic migration from TDM to SIP and through SBG/IBCF
Transit CDRs generation through IBCF-EMM/DCF
Integrate with the ENM system
Subscriber Projections
Network Resiliency
Network Growth and Scalability

C.6.2 The new network topology is outlined below.

SIP MSC Core Upgrade
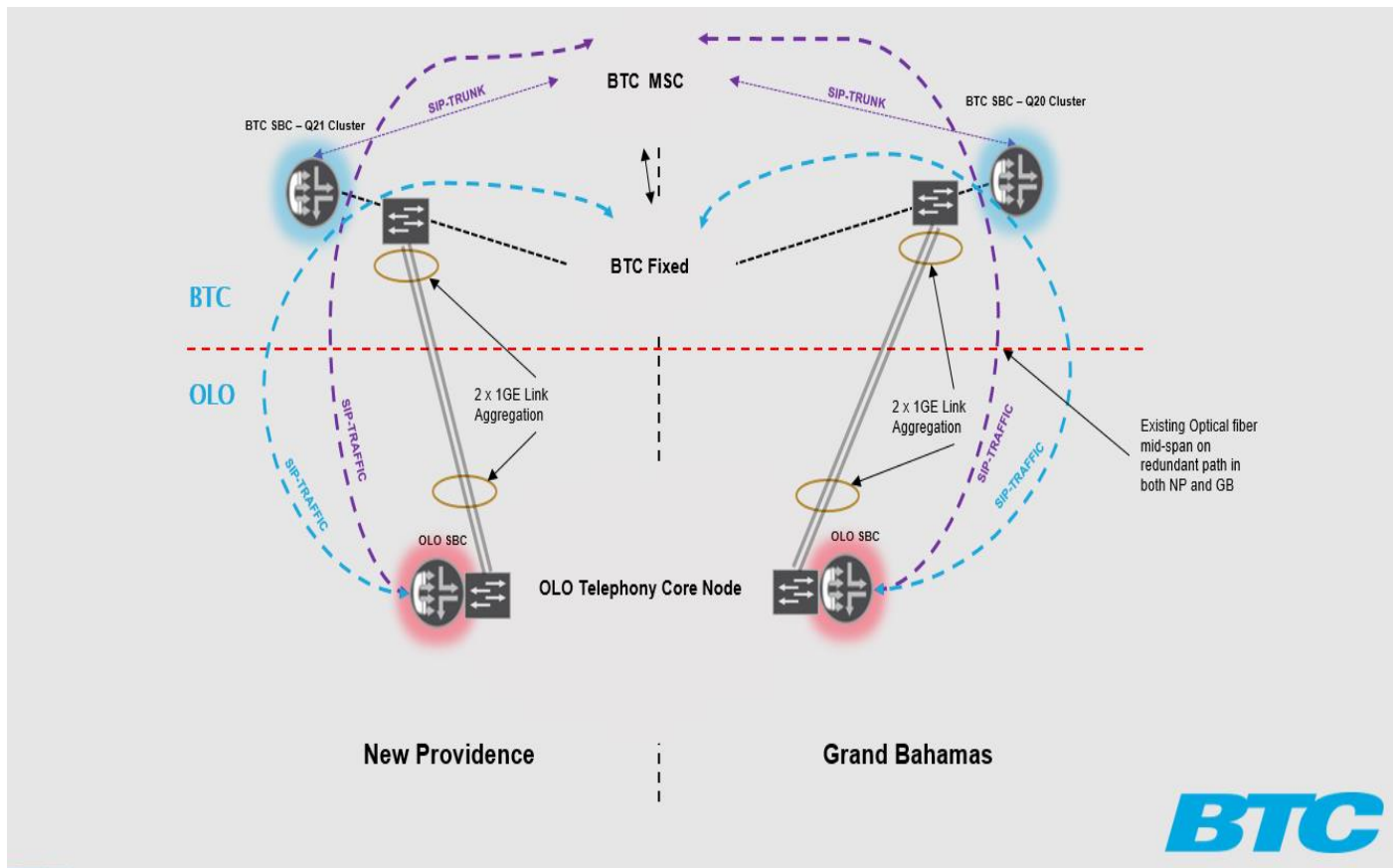
Industry Standard Technical solution

C.6.3 The above solution is based on the Session Border Gateway (SBG). SBG as IBCF and BGF (M-MGW) as I-BGF will be implemented. This will include an optimized and secured solution to integrate SBG with existing MSCs in BTC's network to interconnect and anchor the traffic from the Mobile subscribers with other operators' network. The system has been designed to meet the Erlangs requirements as provided by BTC.

C.6.4 The solution is based upon components depicted in the architecture below:

- *All SIP/VoIP related features in MSC-S's and MGw's are already active, as part of the vIMS deployment (SIP/VoIP enablement in MSS acting as MGCF/IM-MGw for the Circuit-Switch break-out/in from/to IMS).*
- *The implementation of the needed functionalities in MSS (MSC-S, MGw), the MSS is enabled to handle SIP/VoIP, including the MGw Hw module.*
- *Services needed in MSS to handle the SIP/VoIP routes to/from other mobile operators: 4 routes considered as per the current TDM.*

C.6.5 Schedule 1 contains specific SIP signaling requirements. Schedule 5 contains addition technical specifications SIP;

Basic Call Establishment

• Session establishment
– MUST support RFC 4566 "Session Description Protocol"
– MUST support RFC 3264 "Offer/Answer Model with SDP"
– Placing media on hold: "a=inactive" or "a=sendonly"
• Ringback Tone vs. Early Media
– 180 w/o SDP means apply local ringback tone
– 183 with SDP means render RTP received from remote media endpoint described in SDP
• Caller ID with Privacy (RFC 3323 & 3325)
– Calling name & number delivered in P-Asserted-Identity
– Privacy requested using Privacy
- *Call Forwarding*
– Procedures to remain in signaling path of forwarded call
 – Call-forwarding loop detection procedures
• Call Transfer using REFER/Replaces
– MUST support RFC3515 "The SIP Refer Method"
– MUST support RFC3891 "SIP Replaces Header"
– MUST support RFC3265 "SIP-Specific Event Notification"
• Call Transfer using 3PCC (INVITE/reINVITE)
– RECOMMEND support of RFC 3725 "Best Current Practices for 3PCC"
Auto Recall/Callback
– MUST support RFC 4235 "An INVITE-Initiated Dialog Event Package for SIP"
• Used to detect when target user becomes available
– INVITE to target user MUST include Call-Info header field with "purpose=answer_if_not_busy "
• Used to resolve feature interactions e.g., call-forward-busy

➤ **Schedule 5 to Annex C: Additional Technical Specifications SIP**

1.1   Introduction

1.1.1.1   This chapter describes the technical specifications applicable to the Services as described in the Service Descriptions. The specifications in this chapter are applicable to both Parties.

1.2   Technical characteristics for the Optical In-Span Joining Service

1.2.1   Principles

1.2.1.1   The Optical In-Span Joining Service is based upon the principle of one Telco ISL to one BTC ISL.

1.2.1.2   As described in the Optical In-Span Joining Service Description, the service will comprise:
- One Optical Fibre cable runs (which may consist of two or more Optical Fibre strands) from the Telco ISL to the BTC ISL (referred to as the route).

1.2.1.3   As described in the Optical In-Span Joining Service Description, a Carrier System comprises a Service Taker CTU, the matching Service Supplier CTU for the route, and the point-to-point Optical Fibre cable. Figure 1 represents a functional overview of the service.
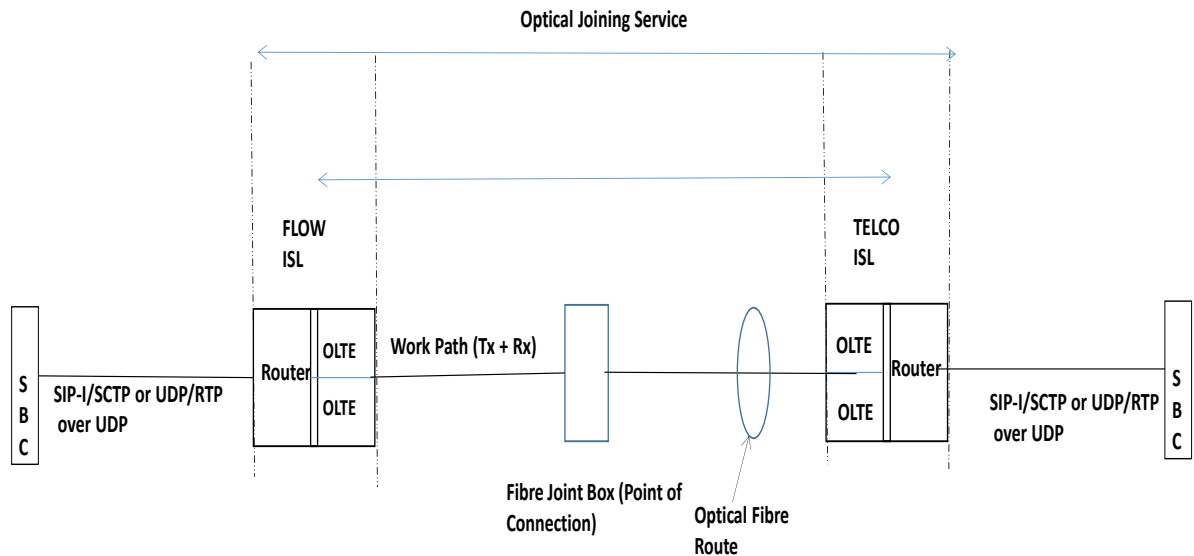

Figure 1: The Carrier System (Standard Carrier Interconnect (above))

>   CTU   Circuit Terminating Unit
>   MUX   Multiplexer
>   OLTE   Optical line Terminating Unit DSX   Digital Signal Cross-Connect
>   SBC   Session Border Controller

1.2.1.4   Single mode optical fibre cable is specified utilising 1330nm short haul interface conforming to G.957.

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1.2.2 Cable Routing & Resiliency

1.2.2.1 No physical route diversity is provided.

1.2.2.2 Cables that enter and traverse cable vaults will be protected by concrete (outside building) and mechanical armour (within building).

1.2.2.3 The physical interface between the Telco System and the BTC System will be the optical fibre interface. For the avoidance of doubt, the physical interface is not the same as the Point of Connection.
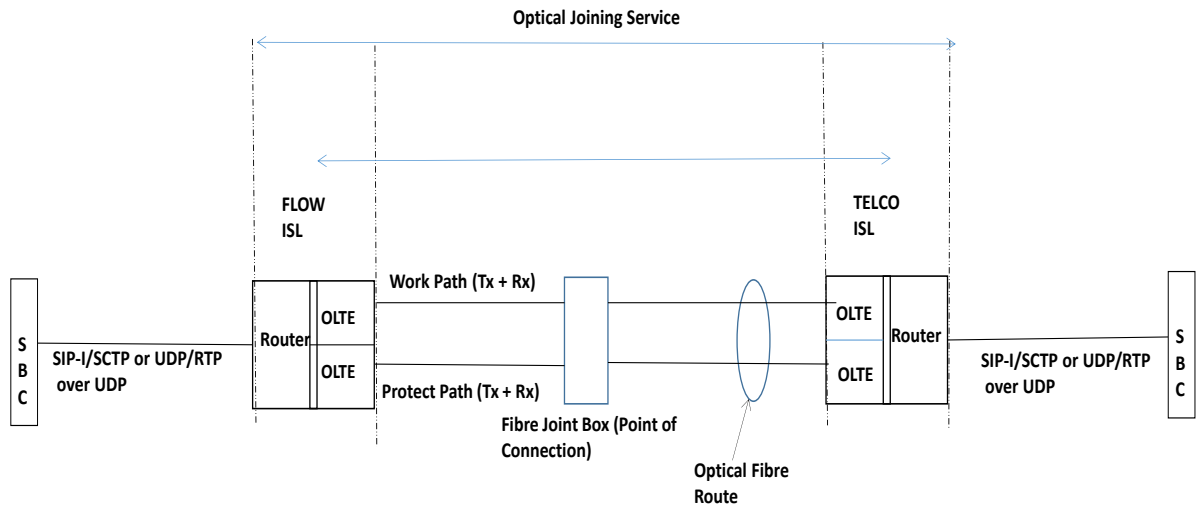

Figure 2: Carrier System resiliency

> OLTE   Optical line Terminating Unit
> SBC   Session Border Controller

1.2.3 Circuit Termination Unit Specification

1.2.3.1 BTC approved suppliers, following testing:

Manufacturer	Product
Cisco	Cisco 3800, 3900 Series Router

1.2.4 Process for accreditation of alternative CTU

1.2.4.1 All CTU equipment must conform to CISCO standards and any additional standards specified in this technical chapter.

1.2.4.2 In advance of ordering, the alternative CTU manufacturer equipment specification shall be sent to the BTC Liaison Manager for technical evaluation. Further to this evaluation, some specific inter-operability testing may need to be planned and conducted.

1.2.5 Joint Box engineering drawing

1.2.5.1 The specification of the Joint Box will be provided in the form of an engineering drawing blue print.

1.3 Network Link Characteristics

1.3.1 Electrical characteristics

1.3.1.1 The Network Link is physically located between (i) the CTU and BTC Systems, and (ii) the CTU and Telco Systems.

1.3.1.2 The Network Link shall conform to the IEEE 802.3z Standards. The operational speed of the Network Link will be at 1Gbps. For the avoidance of doubt, the traffic carrying capacity of the 1 x GigE Network Link will be limited to the capacity provisioned on the Router or SBC

1.3.1.3 The duplex mode on the GigE interface shall be set to full duplex.

1.3.1.4 The maximum transmission unit (MTU) on the GigE interface shall be set to 1500 bytes.

1.3.2 Functional characteristics

1.3.2.1 Each 2.048 Mbit/s Network Link shall be transparent and independent of any traffic stream passed across it. Individual RTP media streams shall use an associated RTCP channel to report transmission performance.

1.3.2.2 The media transported in an individual RTP media stream shall be as defined in the associated SDP description carried over the SIP signalling link.

1.3.2.3 The SIP signalling shall carry embedded ISUP signalling in accordance with the ITU-T SIP-I specification Q.1912.5.

1.3.2.4 At the digital interface the analogue information shall be encoded using the 8bit, A-law characteristic in accordance with ITU-T Recommendation G.711 such that a 64kbit/s time slot at the Switch Connection can be decoded using an 8 bits, A-law decoder. The bit pattern of a free channel shall be in conformity with ITU-T recommendation Q.522, section 2.1.2. The SIP signalling shall transport a 180 RINGING message without SDP parameters meaning the originator should apply local supervisory indication (ringing) to the calling party.

1.3.3 Synchronisation

1.3.3.1 RTP media streams shall be synchronized to a common NTP source. The NTP source shall be provided from the BTC end of the network interconnection, unless otherwise agreed.

1.3.4 Safety and protection

All equipment will comply with UL 1950 and/or national safety standards whichever is the most stringent.

1.3.4.1 For high voltages, equipment will comply with ITU-T K.11.

1.3.4.2 The screen of the cable at an output port must be connected to the metal cabinet, which holds the equipment. The screen of the cable at an input port must be earthed.

1.3.5   Electromagnetic Compatibility

1.3.5.1   *All link equipment must comply with ITU-T K.43 for network equipment Electromagnetic Compatibility (EMC) requirements and must comply with any national regulations relating to electromagnetic and electrostatic compatibility.*

1.3.5.2   *All link equipment must comply with ITU-T K.42 for immunity to radiated electromagnetic energy.*

1.3.5.3   *All link equipment must comply with EN 55022 class B or FCC Part 15 for radiated and conducted emissions.*

1.3.5.4   *All link equipment must comply with any national regulations relating to electromagnetic and electrostatic compatibility.*

1.3.5.5   *The link equipment must be immune to radiated electromagnetic field of up to 3V/m.*

1.4   Network Link Quality of Service

1.4.1   Definitions

1.4.1.1   *Network Link Availability, Errored Seconds and Severely Errored Seconds are the parameters used to measure the service quality of the Network Link. These quality of service parameters are applicable to all Network Links that are delivered by BTC as well as to all Network Links that are delivered by the Telco. Measurements of these service quality parameters will be specified in units relating to calendar months.*

1.4.1.2   *The definition of Network Link Availability (%) for a Party is*

$$100 * \frac{(total\ time\ -time\ allocated\ to\ Planned\ Maintenance\ -\ time\ the\ link\ is\ not\ available\ for\ traffic\ due\ to\ faults)}{(total\ time\ -\ time\ allocated\ for\ Planned\ Maintenance)}$$

during the specified calendar month.

1.4.1.3   *The definition of Errored Second is a one second interval with one or more bit errors.*

1.4.1.4   *The definition of Severely Errored Second is a one-second period which has a bit error ratio greater than or equal to 10^{-3}.*

Quality of Service levels

1.4.1.5   *The following Quality of Service level is applicable to the Network Links:*

1.	Network Link Availability	> 99.9%
2.	Latency	22ms
3.	Error Free Packets	> 99.0%
4.	Discarded Packets	0.000%

1.5   *Signalling*

1.5.1   *Signalling Principles*

1.5.1.1 Signalling applied shall be Session Initiation Protocol (SIP) which conforms to Internet Engineering Task Force (IETF) RFC 3261 standards, as profiled by the ITU-T SIP-I specification Q.1912.5.

1.5.1.2   In principle BTC will transfer signalling messages transparently through its network. However, BTC cannot guarantee proper end-to-end inter-working of services originating or terminating outside the BTC network.

1.5.2   *Media related signalling*

1.5.2.1 Real-time Transport Protocol (RTP) which conforms to Internet Engineering Task Force (IETF) RFC 3550 & 3551 standards used for the transport of speech bearer services is supported.

1.5.3   *Protocols*

1.5.3.1 The SIP signalling shall carry embedded ISUP signalling in accordance with the ITU-T SIP-I specification Q.1912.5.

1.5.4   *Parameter fields*

1.5.4.1   Network indicator 11 (binary notation) and National Transit Domain point-codes shall be used. The CLI represents the national significant number or international number depending on the source of the call. The nature of address indicator shall be set accordingly. The address presentation restriction indicator shall not contain the values "spare" or "address not available".

1.5.5   *Signalling procedure*

1.5.5.1   In case of overlap signalling mode of operation the Address Complete Message shall be sent as soon as all digits necessary to complete the call are received.

1.5.5.2   Stop digits for indicating that the full number is transmitted shall be used where necessary.

1.5.5.3   The required called party number format, nature of address, number length (range) and signalling mode of operation as passed between the networks is specified in the Parameter Schedule.

1.6   *Traffic Handling of Services*

1.6.1   *Trunk Groups/Uniform Resource Identifiers (URI)*

1.6.1.1 Separate SIP Trunk Groups/URI per Service or for a group of services will be agreed and will be identifiable with specific IP addresses.

1.6.1.2   All trunk groups/URI will be uni-directional.

1.6.1.3   The separate Trunk Groups/URI between the Telco ISL and the corresponding BTC ISL are specified in the Parameter Schedule.

1.6.1.4   Each trunk group/URI will have a dedicated IP address

1.6.2   *Signalling Links*

1.6.2.1   Signalling Transport shall be SCTP or UDP.

1.6.2.2   BTC and the Telco will maintain equal loading of the Signalling Links.

1.6.2.3   The Signalling Links shall be used exclusively for the exchange of signalling messages.

1.6.3   Quality of Service for Termination Services, Special Access Services, and Transit Services

1.6.3.1   The Quality of Call related Termination Services, Special Access Services, and Transit Services are represented by the parameters Call Availability, Dial Set-up Delay and Propagation Delay.

1.6.3.2   Depending on the Service offered the Service Supplier has a role as:

- **originating party.** *In this role the Service Supplier handles calls from the Subscriber Connection of the calling party in the originating network to the Point of Connection.*
- **transit party.** *In this role the Service Supplier handles calls from the Point of Connection or Point of Handover as the case may be via the national transit network to the Point of Handover or Point of Connection as the case may be.*
- **terminating party.** *In this role the Service Supplier handles calls from the Point of Connection to the called Subscriber Connection of the called party in the terminating network.*

1.6.3.3   For each Quality of Service parameter, a value is defined.

1.6.4   Call Availability

1.6.4.1   The definition of Call Availability (%) is

*100 *   (total call attempts – total call releases with causes marked as network fault)*

(total call attempts)

during a specified period of time.

Release causes marked as network faults are the following causes specified in ITU-T rec. Q.850:
- *no circuit/channel available*
- *network out of order*
- *temporary failure*
- *switching equipment congestion*
- *access information discarded*
- *requested circuit/channel not available*
- *resource unavailable, unspecified*
- *bearer capability not presently available*
- *protocol error, unspecified*
- *interworking, unspecified*

1.6.4.2   The Call Availability is > 99%.   The apportionment for the Call Availability budget for Service Supplier and Service Taker is as follows:

Originating party	Transit party	Terminating party

>99.6 %	>99.8 %	>99.6 %

1.6.5   Dial Set-up Delay

1.6.5.1 Dial Set-up Delay is defined as the interval from the moment that the last digit of the called party number is keyed by the calling party to the time a relevant tone (ring tone/busy/information tone/message) is received by the calling party.

1.6.5.2 Dial Set-up Delay Quality of Service parameter shall be no more than 2350 ms for a national Call.

1.6.5.3 The apportionment for the Dial Set-up Delay value for Service Supplier and Service Taker is as follows:

Originating party	Transit party	Terminating party	Database access if applicable
575 ms	700 ms	575 ms	500 ms

1.6.6   Propagation Delay

1.6.6.1 Propagation Delay is defined as the round-trip delay between the received signal and the transmitted signal.

1.6.6.2 The Propagation Delay Quality of Service parameter shall be no more than 22ms. Both Parties will take appropriate actions (e.g., echo cancellation) if this Propagation Delay is exceeded.

1.6.6.3 The apportionment for the Propagation Delay budget for Service Supplier and Service Taker is as follows:

Originating PBX network if applicable	Originating party	Transit party	Terminating party	Terminating PBX network
5 ms	4.5 ms	3 ms	4.5 ms	5 ms

1.6.7   Calling Line Identity

1.6.7.1 All interconnect trunks will utilise Q.1912.5 signalling through which CLI will be passed transparently.

1.6.7.2 All numbers with CLI are transparent between networks. Calling Number Delivery Blocking (CNDB) shall be applied to all private numbers within the BTC System and the Telco System. BTC and the Telco should ensure that CLI associated with numbers with the CNDB feature is blocked from Subscriber Connections.

1.7   References

***ITU-T
Recommendation***

K.11	*"Principles of protection against over voltage and over current"*
K.42	*"Preparation of emission and immunity requirements for telecommunications equipment"*
K.43	*"Immunity requirements for telecommunications equipment"*
K.37	*"Public Telecommunications network equipment EMC requirements Part I: Product family overview, compliance criteria and test levels"*
UL 1950	*"Standard for Safety for Information Technology Equipment, 3rd Edition"*
T1.304-1997	*Ambient Temperature and Humidity Requirements for Network Equipment in Controlled Environments*

Voice over IP (VoIP) SIP Peering Use Cases, RFC 6405, Internet Engineering Task Force, July 2002

Session Initiation Protocol (SIP), RFC 3261, Internet Engineering Task Force, July 2002

Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part, Q.1912.5, ITU-T 2204

Internet Protocol version 4, STd-5, Internet Engineering Task Force.