



# **FRAMEWORK FOR ESTABLISHMENT OF INTERNET EXCHANGE POINTS (“IXPs”) IN THE BAHAMAS**

## **Public Consultation**

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# 1 Introduction

With this Consultation Document (the “Consultation”) the Utilities Regulation and Competition Authority (“URCA”) outlines its preliminary views on a “Framework for Establishment of Internet Exchange Points (‘IXPs’) in The Bahamas.” IXPs are the technical points, infrastructure or facilities through which Internet Service Providers (“ISPs”) and content distributors/aggregators connect with one another and are thus central to the digital infrastructure for the Internet in a country.<sup>1</sup> Essentially, IXPs serve as centralized clearinghouses for the exchange of Internet traffic between companies involved in the Internet. Aside from this, IXPs offer a range of basic and ancillary services to their members or participants like maintenance of connections and ISPs routers. Some IXPs offer more advanced services such as Service Level Agreements (“SLAs”) for users and advanced statistical analysis and monitoring. Additionally, a newly created IXP may initially offer basic connectivity services and commit to provide additional services over time.

Currently, there are no IXPs in The Bahamas. As a result, local ISPs routinely route locally generated Internet traffic destined for local users through intermediary networks and digital infrastructure in another country. In this case the traffic exits The Bahamas through an intermediary network or a switching facility in Florida and then re-enters The Bahamas. This practice often referred to as “hair-pinning”, “tromboning”, or “boomerang” routing (due to the path’s shape) is known to be inefficient, adds costs to the operations of ISPs and content distributors/aggregators, and has the potential to stifle development of a local content sector.<sup>2</sup> Hair-pinning local Internet transmission outside a country also gives rise to privacy or data protection concerns in countries that excessively depend on digital infrastructure and enterprises in another country.

URCA’s ambition is to stimulate market entry of IXPs in The Bahamas. To this end, URCA issues this Consultation paper with the following core objectives in mind:

- to promote public awareness of the contributions that IXPs can make to the development of the Internet and digital economy in The Bahamas;
- to alert potential IXP users of URCA’s framework for the entry of IXPs in the Bahamian market; and
- to ensure the regulatory framework is favorable for IXPs to operate successfully in The Bahamas.

In furtherance to the above, URCA invites written feedback from interested parties relative to the issues set out in this Consultation. Specifically, the Consultation is intended to solicit comments on:

- the demand for establishing IXPs in The Bahamas;
- the potential benefits for local IXPs;
- the enabling measures URCA considers critical to local IXPs market entry;
- IXP governance, participation, and business model for The Bahamas; and
- IXP implementation options for The Bahamas.

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<sup>1</sup>A more technical description of an IXP is available at <http://www.ix-f.net/ixp-definition.html>

<sup>2</sup> <https://dyn.com/blog/does-establishing-more-ixps-keep-data-local-brazil-and-mexico-might-offer-answers/>

## 1.1 Consultation Process

URCA appreciates that the issues under consideration in this Consultation are likely to have a significant impact upon the activities carried on by licensees and other interested parties 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. URCA will take these contributions into consideration when making its final determinations and recommendations. Details on how to respond to this Consultation are set out in Section 1.3.

Alongside this Consultation, URCA will hold workshops and open forum discussions on best practices in IXP establishment and operation. Additionally, URCA proposes establishment of an Industry Working Group to promote dialogue and consensus on a range of matters relating to the establishment and operation of IXPs in The Bahamas.

URCA urges interested parties to submit their written views and comments on the proposals and recommendations set forth in this document to URCA, to ensure that any final regulatory position is taken with full awareness and consideration of all views and opinions.

## 1.2 Legislative Framework

The legislative foundation for this Consultation is set out in the Communications Act (“Comms Act”).

Part IV of the Comms Act confers on URCA the power to grant individual and class licences to anyone that provides, operates or maintains an electronic communications network or provides an electronic communications service.

The sector’s objectives are as stated in section 4 of the Comms Act:

- “(a) To further the interests of consumers by promoting competition and in particular —
  - (i) to enhance the efficiency of the Bahamian electronic communications sector and the productivity of the Bahamian economy;
  - (ii) to promote investment and innovation in electronic communications networks and services;
  - (iii) encourage, promote and enforce sustainable competition; and
  - ...
- (b) To further the interests of persons in The Bahamas in relation to the electronic communications sector by —
  - (i) promoting affordable access to high quality networks and carriage services in all regions of The Bahamas;
  - (ii) maintaining public safety and security;
  - (iii) contributing to the protection of personal privacy;
  - ...
  - (vi) promoting availability of a wide range of content services which are of a high quality.”

Amongst other things, for the purpose of carrying into effect the sector’s objectives, section 8 of the Comms Act confers on URCA the power to:

- conduct market investigations and reviews;
- impose specific conditions on licensees determined to have Significant Market Power (“SMP”) in the relevant market(s);
- conduct ex-post competition investigations pursuant to Part XI (Competition Provisions) of the Comms Act; and
- issue regulations, technical rules and standards, and instructions.

The Comms Act (section 8) confers on URCA wide-ranging powers which are to be exercised in full compliance with principles of good regulation. As such, URCA is required to introduce regulatory and other measures which are efficient and proportionate to its purpose, and it must introduce them in a manner that is transparent, fair, and non-discriminatory (section 5). This means that where URCA believes that market forces alone are unlikely to achieve a policy objective within a reasonable timeframe, URCA may introduce regulatory measures, having due regard to the costs and implications for affected parties. However, as a general principle, market forces should be relied upon as much as possible and regulatory measures should be introduced by URCA only when market forces are unlikely to achieve the electronic communications policy objective within a reasonable timeframe.

### **1.3 Responding to this Consultation**

URCA invites written responses to this Consultation Document from all interested parties. For the purpose of this exercise, URCA has adopted two rounds of public consultation. In the first phase, respondents should submit their written representations on and objections (if any) to this document. The responses will be published by URCA as soon as possible following the end of the first phase. In the second phase, respondents may submit reply comments (in whole or in part) to the representations and objections of other respondents. The submission deadlines for initial responses and reply comments are as follows:

- Initial responses must be submitted to URCA by 5 p.m. on **16 July 2019**
- Reply comments must be submitted to URCA by 5 p.m. on **16 August 2019**

Written responses or comments on this Consultation Document should be sent to URCA’s Director of Electronic Communications, either:

- by hand to URCA’s office at Frederick House, Frederick Street, Nassau; or
- by mail to P.O. Box N-4860, Nassau, Bahamas;
- by fax to (242) 393-0153; or
- by email to [info@urcabahamas.bs](mailto:info@urcabahamas.bs).

Persons may obtain copies of this document by downloading it from the URCA website at [www.urcabahamas.bs](http://www.urcabahamas.bs).

URCA proposes to and reserves the right to make all responses available to the public by posting responses online on its website. If a response is marked confidential, reasons should be given to facilitate URCA’s evaluation of the request for confidentiality. URCA may, in its sole discretion, publish or refrain from publishing any document or submission.

#### **1.4 Structure of the Remainder of this Document**

The rest of this paper is organized in the following way:

- Section 2 – Background to the Consultation;
- Section 3 – Context for the Consultation;
- Section 4 – Assessment of Market Environment;
- Section 5 - IXP Enabling Measures;
- Section 6 - Expected Benefits for Local IXPs in The Bahamas;
- Section 7 - IXP Location, Governance, Participation, Business Model and Funding;
- Section 8 – Assessment of Implementation Options for Local IXPs; and
- Section 9 - Conclusion and Next Steps.

## 2 Background to the Consultation

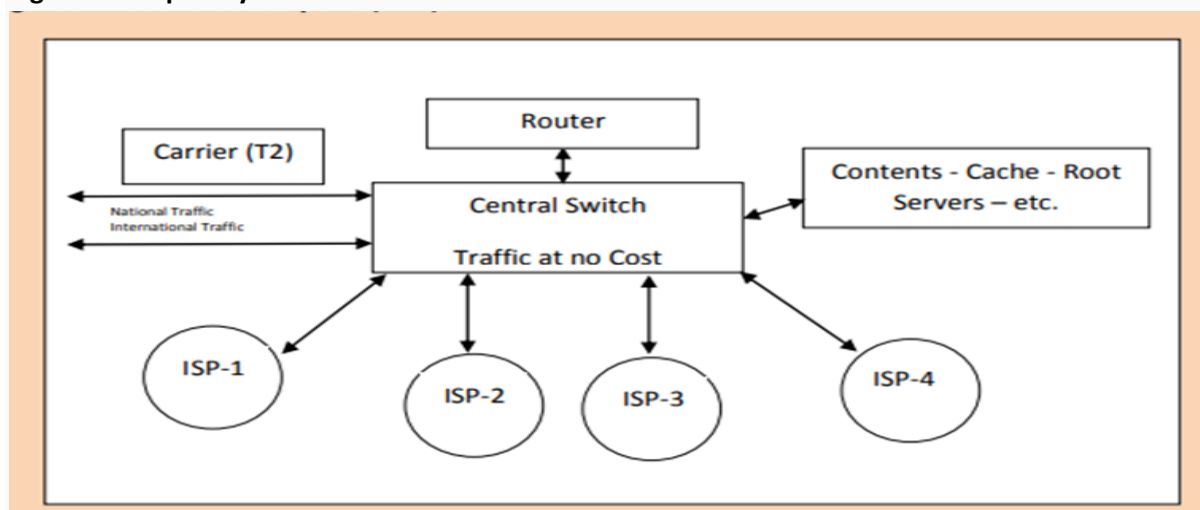
This section provides background information to the Consultation:

### 2.1 Technical and Operational Aspects of an IXP

IXPs are distinct from other communications networks or facilities and may operate under either one of two business models: for-profit and not-for-profit. The not-for-profit model is the one that is most popular in Africa, the Caribbean region, and other developing regions. A key feature of the not-for-profit model is that the IXP is not motivated by the business consideration of generating a reasonable rate of return for the investor. Some of the most successful IXPs in Europe operate on this basis. Experience teaches that an IXP operator and its members or participants must demonstrate strong commitment to collaboration. This requires the IXP to conduct business in a neutral/independent, transparent, and impartial manner. History shows that IXPs that are not sufficiently neutral and impartial will not attract wide participation or develop critical mass.

Most IXPs are Layer 2 Local Area Networks (“LANs”), meaning the second layer of the Open Systems Interconnection (“OSI”) model. URCA understands that Layer 2 is where data packets are encoded and decoded into actual bits. That is, the data link layer that enables the transfer of data between adjacent network nodes in a network segment such as a local or wide area network. URCA further understands that there are other architectures such as Asynchronous Transfer Mode (“ATM”) and Fiber Distributed Data Interface (“FDDI”). However, these are uncommon due to the complexity of the technology and speed limitations which make them technically and economically unfeasible for adoption by new IXPs.

**Figure 1: Simple Layout of an IXP<sup>3</sup>**



An IXP may be located in a single venue, in multiple venues within a country, or it can be distributed at regional or global scale. An IXP may be a simple model (e.g., a switch in a basement), or as complex as the more advanced IXPs in some European markets.

<sup>3</sup>“Study on International Internet Connectivity, Focus on Internet Connectivity in Latin America and Caribbean” (March 2013) from <https://www.itu.int/en/ITU-D/Regulatory-Market/Documents/International%20Internet%20Connectivity%20in%20Latin%20America%20and%20the%20Caribbean.pdf>

Figure 1 above presents a simple layout of an IXP. It shows that an IXP’s architecture consists of network switches and routers which are interconnected in a manner that optimizes traffic exchange between multiple ISPs and content distributors. In addition to the core equipment identified, an IXP needs the inputs/resources described in Table 1 to operate fully and effectively:

**Table 1: Additional IXP Inputs/Requirements**

Space/location	The space can be small (there are successful IXPs that operate in spaces of 2m sq.) but it should be reasonably physically secure against weather and vandalism and readily accessible via fibre paths in and out. Ideally, the location should be near a major road intersection and close as possible to the centre of economic activity and population.
Power/Electricity	An IXP requires an uninterrupted power supply to ensure continuous operation of the switch, lighting, security system, etc. Therefore, depending on the stability of the national grid, an IXP may need to augment public power supply with batteries or a small generator controlled by an automatic transfer switch.
Air Conditioning	An IXP must have a reliable cooling system to keep the switch and other electronics operating reliably.
Access to Technical Resources	An IXP needs persons or volunteers with direct technical experience in with choosing, installing and configuring a switch. IXPs may coordinate with different international organizations to arrange training programs for local capacity building.
IP address space	An IXP needs a block of IPv4 addresses, and a block of IPv6 addresses, to facilitate interconnection and peering arrangements between members or participants.
Services	An IXP will need a domain name (e.g., ix.bs), a web site, an email list, a nameserver, and some logging and statistics collection.
Meeting Facility	An IXP will need a place to convene meetings of the members or participants, probably once a month until the IXP is up and running, and annually thereafter.

Companies that want to locate and exchange traffic at an IXP are collectively termed “IXP participants”<sup>4</sup> and must adhere to the IXP’s policies including its technical and operational requirements for membership or participation. The standard requirements to connect to a local IXP are that ISPs must:

- have public Autonomous System Numbers (“ASNs”);
- install backhaul links to the IXP from a port on the ISP’s router to a port on the IXP switch and one of its WAN ports to the WAN media leading back to the ISP’s infrastructure;

<sup>4</sup> Participants must operate independent Autonomous Systems to connect to an IXP. See <http://www.ixf.net/ixp-definition.html>



- have the capacity to run Border Gateway Protocol (“BGP”)<sup>5</sup> because the exchange of routes across the IXP is via BGP only; and
- establish transit or peering relationships with other participants.

## 2.2 Cost to Set-up and Operate IXPs

Evidence exists to show that IXPs are relatively inexpensive to set-up and operate. OECD researchers expressed that “New switches can be bought for around USD 500 per point” and “A second-hand switch is often more than capable of carrying the traffic of a new exchange.”<sup>6</sup> The ITU reported that the initial set-up costs<sup>7</sup> for an IXP in Kenya was around US\$6,500. Another source commented that, in general, the set-up cost to build IXPs is roughly US\$40,000, however, noting it costs one-fourth (US\$10,000) of this amount to build an IXP in Egypt.<sup>8</sup> At the same time, data obtained from Packet Clearing House shows that the set-up cost for IXPs runs from US\$4,000 to US\$40,000.<sup>9</sup>

Relative to the above, IXPs are able to reduce their start-up or initial capital outlay by accepting cash and/or in-kind support from local and international donors and volunteers. This practice is common amongst IXPs in the developing world. Same is true for IXPs in advanced economies with sophisticated Internet infrastructure. IXPs may solicit capital support for the purchase of equipment and/or in-kind support in the form of donated equipment (e.g., a used switch or a new switch), a free site to locate the IXP, and technical expertise and support for local capacity building. IXPs may also receive support from their governments in the form of duty exemption on imported equipment, electricity subsidy and a free site to locate the IXP. Again, these supporting measures serve to reduce the cost of entry for IXPs in the Caribbean region and elsewhere.

## 2.3 Core IXP Benefits in Emerging Markets

History shows that:<sup>10 11 12</sup>

- IXPs significantly reduced delays or latency in transmission (improved efficiency) and improved access speeds and service quality for end-users in Africa. Latency is the time it takes for a message to traverse the communications system from one sender to the intended point of delivery and measures these delays in milliseconds. As for Kenya latency was reduced from

<sup>5</sup><https://www.internetsociety.org/tag/bgp/>

<sup>6</sup> P.30 “OECD Digital Economy Paper Non. 232, International Cables, Gateways, Backhaul and International Exchange Points” (February 2014) available at <https://www.oecd-ilibrary.org/docserver/5jz8m9jf3wkl-en.pdf?expires=1536457897&id=id&accname=guest&checksum=B4BD591ED5D0953DC5070A30632F85D7>

<sup>7</sup>Including the costs of switches, routers, cabling, trunking cabinets and power back-up.

<sup>8</sup>“Implementation and Management of Internet Exchange Points (IXP)”, Haitham El-Nakhal (February 2014) available at

<https://pdfs.semanticscholar.org/presentation/cf89/08bc6dc3035db92c690c9c883457bdd4e6a1.pdf>

<sup>9</sup>Packet Clearing House (“PCH”) is an international organization charged with providing operational support and security to critical Internet infrastructure, including Internet exchange points and the core of the domain name system. <https://www.pch.net/about/contact>

<sup>10</sup>“Impacts of IXP – A review of the experiences of Ghana, Kenya and South Africa, Final Report” (August 2009) by Charles Amega-Selorm, Muriuki Mureithi, Dobek Pater and Russell Southwood available at <https://www.opensocietyfoundations.org/sites/default/files/ixp-impact-20090801.pdf>

<sup>11</sup>“Assessment of the impact of Internet Exchange Points – empirical study of Kenya and Nigeria”, April 2012 by Analysys Mason from <https://www.internetsociety.org/wp-content/uploads/2017/09/Assessment-of-the-impact-of-Internet-Exchange-Points-%E2%80%93-empirical-study-of-Kenya-and-Nigeria.pdf>

<sup>12</sup>“Implementation and Management of Internet Exchange Points (IXP)”, Haitham El-Nakhal (February 2014) available at <https://pdfs.semanticscholar.org/presentation/cf89/08bc6dc3035db92c690c9c883457bdd4e6a1.pdf>

200-600 milliseconds to 2-10 milliseconds and from 200-400 milliseconds to 2-10 milliseconds in Nigeria. In the case of Egypt latency was reduced from 600-2500 milliseconds to 50-250 milliseconds. Exchanging Internet traffic in-country rather than internationally reduces the number of intermediate networks and devices ('hops') the traffic has to traverse resulting in lower latency or delay in transmission and faster downloads for end-users.

- IXPs in Nigeria, Kenya, and Egypt generated annual cost savings on international transmission links of more than \$1,000,000 in each country. This cut costs for the operations of ISPs and content producers/aggregators.
- The interacting benefits from reduced latency and costs "...result in a virtuous circle that enables the IXP to grow to have critical mass", that is "becoming home to many or all of the ISPs and content aggregators in-country and bringing significant benefits to its members and surrounding ecosystem." In economic terms, IXPs generate considerable positive network effects, i.e., as membership increases, "the more valuable it becomes to join the IXP in order to be able to exchange traffic with the existing members."<sup>13</sup>
- IXPs help to promote development of local content and data centre infrastructure in Africa. This is because content that is hosted locally tends to load faster and more smoothly, reduces service providers' dependence on costly international bandwidth, and results in faster downloads (speeds) for end-users.
- The Grenadian IXP is delivering improvements for incumbent networks and end-users. This is in terms of lower network latency (faster download speeds), better traffic routing, reduced average-per-bit costs, and greater incentive to serve local content.<sup>14</sup>
- Incumbents in the United Arab Emirates ("UAE") also derive benefits from a local IXP owing to traffic growth in local markets which, in turn, increase demand for bandwidth or connectivity.<sup>15</sup>
- The presence of a local IXP helps to reduce or eliminate any data protection/privacy risks associated with boomerang routing of local traffic outside a country. History shows that traffic that is routed overseas is subject to the laws/surveillance systems of another country and can be stored and its content scanned.<sup>16</sup>

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<sup>13</sup>"Assessment of the impact of Internet Exchange Points – empirical study of Kenya and Nigeria", April 2012 by Analysys Mason from <https://www.internetsociety.org/wp-content/uploads/2017/09/>

<sup>14</sup> <https://www.caribnog.org/news/2013/3/20/grenadas-ixp-shows-growth-delivers-improved-service>

<sup>15</sup>"How Internet exchange points (IXPs) drive growth of the Internet ecosystem in the Middle East: the case of UAE-IX" (29 June 2015) by Johann Adjovi from <http://www.analysismason.com/About-Us/News/Insight/UAE-IX-case-study-Jun2015/>

<sup>16</sup>This is a major issue for countries (in the Caribbean region and Canada) that routinely send local Internet traffic through the U.S. or Europe.

### 3 Context for the Consultation

The context for this Consultation stems from a confluence of local and external factors. First, it is URCA's thinking that the practice of hair-pinning local Internet traffic abroad in combination with the high cost of international transmission links are not conducive to the development of a robust Internet and digital infrastructure in The Bahamas. The International Telecommunications Union ("ITU") reasoned that the cost of transmission links remains a major drawback to Internet development and digital economy in emerging markets. ITU underscored the need to "Optimize connectivity among major information networks by encouraging the creation and development of regional ICT backbones and Internet exchange points, to reduce interconnection costs and broaden network access."<sup>17</sup> Lamenting that "... developing countries wishing to connect to the global Internet backbone must pay for the full costs of the international leased line to the country providing the hub. More than 90 per cent of international IP connectivity passed through North America. Once a leased line is established, traffic passes in both directions, benefiting the customers in the hub country as well as the developing country, though the costs are primarily borne by the latter. These higher costs are passed on to customers [in developing countries]. On the Internet, the net cash flow is from the developing South to the developed North."<sup>18</sup>

ITU advised that the presence of local IXPs is paramount to the development of digital infrastructure and economy in emerging markets, adding that this would help to cut expenditure on international transmission links, reduce end-user pricing for access and Internet usage, improve end-user experience (i.e., faster downloads) and promote the local content sector.<sup>19</sup> As such, from an enabling-Internet-economic viewpoint, ensuring the presence of a local IXP should be a priority of many countries.

The Asian Development Bank ("ADB") affirmed the above, saying "IXPs are essential in enhancing competitive opportunities, quality and affordability of Internet services. By providing physical points for ISPs to exchange traffic, IXPs centralize and economize the interconnection process. They improve the functioning of the ecosystem by enhancing the competitive environment for exchanging traffic, purchasing capacity, and offloading traffic from congested international links."<sup>20</sup>

The Caribbean Telecommunication Union's ("CTU") efforts to promote awareness of the nexus between routing economics and regulatory policy is another factor driving URCA's decision to launch this Consultation. Amongst other objectives, CTU aims to accelerate telecommunications' self-

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<sup>17</sup>"Create local and regional IXPs" available at <https://www.itu.int/itunews/manager/display.asp?lang=en&year=2005&issue=04&ipage=saveMoney&ext=html>

<sup>18</sup>"Via Africa, Creating local and regional IXPs to save money and bandwidth" Discussion paper prepared for IDRC and ITU for the 2004 Global Symposium for Regulators available at <https://www.itu.int/ITU-D/treg/publications/AfricaXPRep.pdf>

<sup>19</sup>"Via Africa, Creating local and regional IXPs to save money and bandwidth" Discussion paper prepared for IDRC and ITU for the 2004 Global Symposium for Regulators available at <https://www.itu.int/ITU-D/treg/publications/AfricaXPRep.pdf>

<sup>20</sup>"Regional: Digital Economy Study in Central and West Asia (Unleashing the Potential of the Internet in Central Asia, South Asia, the Caucasus and Beyond)" (December 2015), Asian Development Bank available at <https://www.adb.org/sites/default/files/project-document/178531/unleashing-internet-potential-central-asia-south-asia-caucasus-and-beyond.pdf>

sufficiency and local production in its member countries.<sup>21</sup> As such, there has been a strong push by the CTU and international organizations like Packet Clearing House to expand the build-out of IXPs in the Caribbean region. As discussed below, URCA notes that the CTU’s objectives are not in conflict with relevant Bahamian law or the Government’s overall vision for the electronic communications industry. URCA further notes that there is increasing build-out of Internet infrastructure and IXPs across the Caribbean region (including non-CTU countries). Currently, there are 12 IXPs located in 11 CTU countries.<sup>22</sup> The Bahamas, however, being a founding CTU member, is currently without a local IXP.

**Table 2: IXPs in CTU Markets**

Country	Internet Exchange Name	Established
Barbados	Barbados Internet Exchange	February 2014
Belize	Belize Internet Exchange Point (BIXP)	April 2016
British Virgin Islands	BVI IXP	June 2011
Cuba	NAP de Cuba	June 2001
Dominica	Dominican National IXP (DANIX)	February 2013
Grenada	Grenada Internet Exchange (GREX)	May 2011
Jamaica	Jamaica IXP	August 2014
St. Lucia	St. Lucia IXP	June 2014
St. Maarten	Open Caribbean Internet Exchange (OCIX)	October 2008
St. Vincent & Grenadines	SVGIX	January 2016
Trinidad and Tobago	Trinidad and Tobago Internet Exchange	April 2014
	Trinidad and Tobago Internet Exchange (TTIX)	January 2017

Source: <https://www.pch.net/ixp/dir>

Third, URCA is cognizant of the contributions IXPs have already made to the development of an advanced Internet ecosystem and digital economy across Europe, North America and Asia. URCA is equally seized of the tremendous benefits IXPs are delivering for their members and end-users in the developing countries of the Caribbean region, Africa, and the Middle East (Section 2.3 above).

Even more is the growing acceptance within The Bahamas that the Internet is a global phenomenon of immense economic and social importance. In particular, Internet-based economic activity is a fundamental lever for economic growth, job creation, and digital entrepreneurship. Internet-based economic activity is now an important source of economic growth and job creation and was projected to reach \$4.2 trillion in the G-20 nations by 2016, or more than 5% of GDP, according to the World Economic Forum.<sup>23</sup> The digital economy is expanding at more than 10% annually, significantly faster than the economy as a whole. In emerging markets, the Internet economy is growing at a rate of 12-25% annually with far-reaching social and economic impacts. URCA believes that development of The

<sup>21</sup>“Internet Traffic Exchange Market Developments and Policy Challenges” Working Party on Communication Infrastructures and Services Policy, Directorate For Science, Technology and Industry Committee For Information, Computer and Communications Policy, DSTI/ICCP/CISP(2011)2/FINAL available at [file:///H:/DSTI-ICCP-CISP\(2011\)2-FINAL.pdf](file:///H:/DSTI-ICCP-CISP(2011)2-FINAL.pdf)

<sup>22</sup>Current members of the CTU are Antigua & Barbuda, Anguilla, Bahamas, Barbados, Belize, British Virgin Island, Cayman Islands, Cuba, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts & Nevis, St. Lucia, St. Maarten, St. Vincent & Grenadines, Suriname, Trinidad & Tobago, and Turks & Caicos.

<sup>23</sup>[http://reports.weforum.org/delivering-digital-infrastructure/introduction-the-digital-infrastructure-imperative/?doing\\_wp\\_cron=1534549891.7385699748992919921875#view/fn-2](http://reports.weforum.org/delivering-digital-infrastructure/introduction-the-digital-infrastructure-imperative/?doing_wp_cron=1534549891.7385699748992919921875#view/fn-2)

Bahamas' digital infrastructure would help to advance economic growth and employment in the country.

Linked to the preceding point is URCA's preliminary view (at Section 4 below) that demand exists for IXPs to enter the Bahamian market. Relative to this, URCA considers that the presence of local IXPs would catalyse the measures that enable the Internet and digital economy in the Draft ECS Policy, help to achieve United Nations ("UN") Sustainable Development Goal ("SDG") 9.c.<sup>24</sup> "Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovations", support the Government's plan to create a Tech Hub in Grand Bahama and to reduce time and cost to citizens for government services. Against the foregoing background, URCA notes that various studies exist to show that the Caribbean region lacks the requisite enabling environment to foster development of Internet and Inter-related economic activity to narrow the digital gap with North America, Europe, and other markets. In terms of Internet infrastructure, one or more studies commented that The Bahamas is currently without an IXP.<sup>25</sup>

**Consultation question 1: Context for the Consultation**

Do you agree with URCA's justification for publishing this consultation on the establishment of local IXPs in The Bahamas? Please detail your response in full.

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<sup>24</sup>[https://stats.unctad.org/Dgff2016/prosperity/goal9/target\\_9\\_c.html](https://stats.unctad.org/Dgff2016/prosperity/goal9/target_9_c.html)

<sup>25</sup>"Unleashing the Internet in the Caribbean, Removing Barriers to Connectivity and Stimulating Better Access in the Region" available at [https://www.internetsociety.org/wp-content/uploads/2017/08/ISOC\\_Unleashing\\_Internet\\_in\\_Caribbean\\_20170221.pdf](https://www.internetsociety.org/wp-content/uploads/2017/08/ISOC_Unleashing_Internet_in_Caribbean_20170221.pdf)

## 4 Assessment of Market Environment

In order to determine the potential demand for local IXPs, URCA now reviews the current state of the local broadband market in terms of:

- core broadband access and backbone technologies/networks deployed by licensees;
- the organizational structure of the broadband market;
- demand for broadband access;
- local preferences for online content and services; and
- bandwidth cost and Internet traffic.

### 4.1 Broadband Access and Backbone Technologies/Infrastructure

The core broadband access infrastructure currently deployed in The Bahamas are:

- a Digital Subscriber Line (“DSL”) network (including both copper and fiber-based access network) operated by the Bahamas Telecommunications Company Ltd. (“BTC”);
- 4G/LTE cellular/mobile networks operated by BTC and Be Aliv Limited (“Aliv”); and
- a coaxial cable network operated by Cable Bahamas Ltd. (“CBL”)

Apart from the access infrastructure mentioned above, The Bahamas is served by four high-capacity undersea cable systems, as follows:

- The Americas Region Caribbean Ring System (“ARCOS-1”) is a fiber optic submarine cable system. This infrastructure is majority-owned by Columbus Networks and is 8,400 km in length with 3 landing points in The Bahamas and 21 landing points in the Eastern Caribbean, South America, and Central America.
- Bahamas Domestic Submarine Network (“BDSNi”) was activated in 2006. This cable is owned by BTC and is 3,409 km in length with 14 landing points in The Bahamas and one in Haiti.
- Bahamas Internet Cable System (“BICS”) was activated in July 2001. This cable is 1,100 km in length and is majority-owned by Caribbean Crossings Ltd., a subsidiary of CBL. It has 12 landing points in The Bahamas and overseas.
- Bahamas-2 is majority-owned by BTC and AT&T and was activated in 1996. This cable is 383 km in length with 2 landing points in The Bahamas and one in Vero Beach, Florida.

URCA understands that these undersea cable systems<sup>26</sup> can and have been used to transport a range of services and applications and can offer very high bandwidths. In its 2010 market assessment, URCA found that the supply of national and international circuits was prospectively competitive and ex-ante regulation of the market was not warranted. URCA affirmed this view in its 2014 assessment of SMP in key communications markets.<sup>27</sup> URCA, however, notes that the high cost of transmission links to route traffic over the Internet remains a major challenge for some stakeholders and is considered a barrier to entry for ISP participants to the market (see Section 4.5 below).

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<sup>26</sup>Total capacity is in excess of 1,690 Gbps.

<sup>27</sup> ECS 14/2014 issued December 2, 2014.

## 4.2 Organizational Structure of the Broadband Market

Two cellular/mobile operators compete in the Bahamian cellular/mobile market: BTC (currently the SMP or dominant operator) and Aliv (new entrant). Both companies operate national 4G/LTE networks and provide prepaid and postpaid voice and broadband access services to the Bahamian public.<sup>28</sup> The providers of broadband access at a fixed location are BTC, CBL, and a number of smaller independent ISPs.<sup>29</sup> BTC offers broadband access at a fixed location to commercial and residential customers in most, if not, all areas of The Bahamas. In contrast, CBL's broadband network and services are only available in the islands of Abaco, New Providence, Grand Bahama and Eleuthera.

Smaller Internet companies provide broadband access at a fixed location using their own network infrastructure, by gaining access to an SMP operator's network and infrastructure on commercial terms. The service provider then offers broadband retail services to end-users. URCA, however, notes that these providers offer limited service coverage and appear not to impose any competitive constraint on BTC or CBL.

URCA's 2018 update of its 2014 retail broadband market assessment<sup>30</sup> included the determination that there are two distinct geographic markets for broadband access at a fixed location:<sup>31</sup>

- the retail market for fixed broadband access in New Providence, Abaco, Eleuthera and Grand Bahama (Geographic Market 1); and
- the retail market for fixed broadband access in all areas where CBL does not currently offer retail fixed broadband services (Geographic Market 2).

URCA then concluded that CBL holds SMP in Geographic Market 1 while BTC holds SMP in Geographic Market 2.<sup>32</sup>

## 4.3 Demand for Broadband Access

Table 3 below looks at recent trends in broadband access in The Bahamas. Two key points are worth noting from the data. The first is that, The Bahamas already enjoys a high level of broadband penetration which, in URCA's view, is indicative of increasing local preferences for web content.

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<sup>28</sup>Both companies offer a range of mobile bundles consisting of mobile broadband access, voice calls and text/SMS. BTC also offers several standalone data plans, including 500MB, 1GB, 2GB, 6GB and 15GB. Aliv, on the other hand, offers the 'mifi75' mobile data-only plan which offers unlimited data per month in addition to roaming data only plans.

<sup>29</sup>URCA understands that Aliv offers a fixed wireless broadband product (ALIVSOHO) in all islands where Aliv operates.

<sup>30</sup>ECS 14/2014 "Assessment of Significant Market Power in the Electronic Communications Sector in The Bahamas under Section 39(1) of the Communications Act, 2009, Response to Public Consultation and Final Determination" (issued 02 December 2014) available at <https://www.urbahamas.bs/wp-content/uploads/2017/02/ECS-14-2014-Assessment-of-Significant-Market-Power-in-the-Electronic-Communications-Sector-in-The-Bahamas.pdf>

<sup>31</sup>ECS 09/2018 "Review of the Resale Broadband Obligation imposed on BTC and CBL under Section 116 and Schedule 4 of the Communications Act, 2009, Response to Public Consultation and Final Determination" (issued 31 July 2018) available at <https://www.urbahamas.bs/wp-content/uploads/2018/08/Final-Determination-Resale-Broadband-Obligation.pdf>

<sup>32</sup>ECS 09/2018 "Review of the Resale Broadband Obligation imposed on BTC and CBL under Section 116 and Schedule 4 of the Communications Act, 2009, Response to Public Consultation and Final Determination" (issued 31 July 2018) available at <https://www.urbahamas.bs/wp-content/uploads/2018/08/Final-Determination-Resale-Broadband-Obligation.pdf>

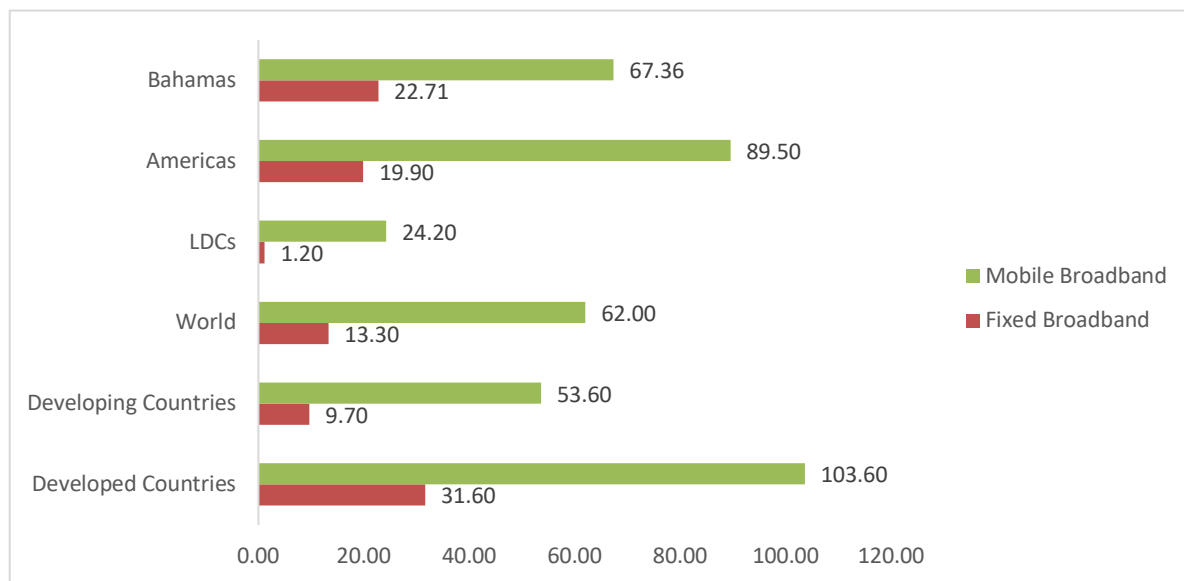
The second point is that in The Bahamas most broadband users are connected via a cellular/mobile network using either a smartphone or other wireless devices, such as a laptop, tablets with 3G/4G/LTE connectivity or a USB-dongle/data card. This is reflective of ITU data trends (Figure 2 below) showing cellular/mobile broadband penetration level outstripping fixed line broadband penetration level across the world.

**Table 3: Broadband Access in The Bahamas**

<b>Subscribers</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Fixed Broadband Subscriptions	72,490	77,168	81,018	83,759	86,868	87,067
- <i>per 100 Inhabitants</i>	19.22	20.19	20.94	21.41	22.71	22.51
Mobile Broadband Subscriptions	96,928	152,922	182,685	200,696	260,587	234,654
- <i>per 100 Inhabitants</i>	27.74	42.01	50.19	53.09	67.36	60.65

Source: URCA

**Figure 2: Broadband Penetration Per 100 Inhabitants (2017)**



Source: URCA and ITU at <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

Commenting further, the number of cellular/mobile broadband subscriptions of The Bahamas in 2018 (234,654) represented a hefty increase of 142% on the 2013 figure. At the end of 2018, broadband penetration levels in The Bahamas stood at 60.65 (cellular/mobile) and 22.51 (fixed) per 100 inhabitants. The 2018 cellular/mobile broadband penetration level was roughly 2.7 times the corresponding level for broadband access at a fixed location. By contrast, in 2013 cellular/mobile broadband penetration level was only 1.44 times the level of broadband access at a fixed location.

Beside the access points noted above, members of the public are accessing broadband services through cyber cafes and other shared access (including public Wi-Fi). As is the experience elsewhere,



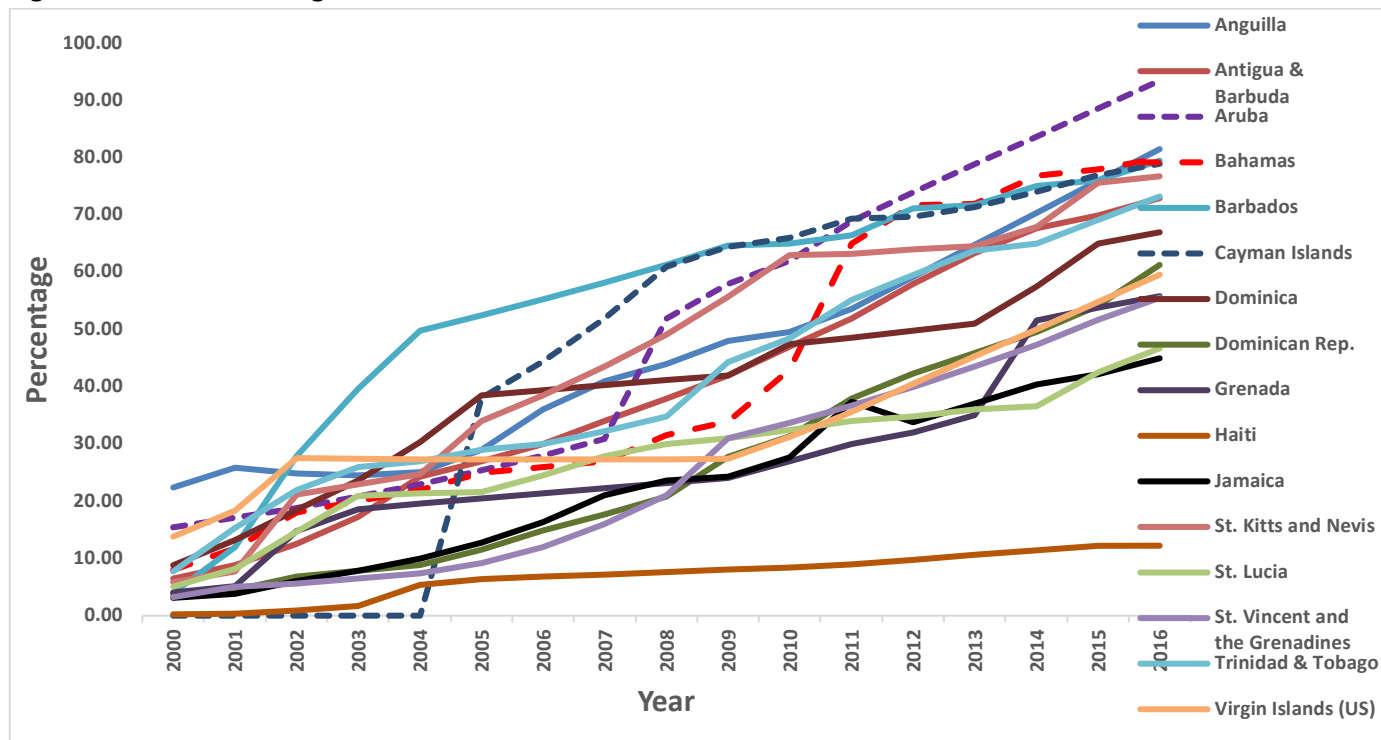
the widespread use of smartphones means that customers can connect to the Internet via Wi-Fi. Free public Wi-Fi is being encouraged in public institutions, such as post offices, schools, public libraries and airports. In the private sector, businesses are making portions of their wireless networks available to the public in commercial areas in order to enhance the customer experience.

The preceding underscores the increasing availability of broadband Internet in The Bahamas consequential to the 2009 reforms and the advent of competition in key communications markets. While the analysis underscores the economic and social importance of cellular/mobile broadband access in The Bahamas, it does not (in any way) negate the need to upgrade existing technologies and infrastructure to support further expansion in broadband access and usage. The roll-out of the Government’s public Wi-Fi programmes and other Internet-enabling measures will help to promote fast broadband on public Wi-Fi networks. Similarly, URCA’s plan to review and improve the current Universal Service (“US”) regime is targeted at increasing speed and affordability, especially for vulnerable population segments in The Bahamas.

**Consultation question 2: Demand for Broadband Connectivity in The Bahamas**  
 Do you agree with URCA that there is high penetration of broadband access in The Bahamas? Please detail your response in full.

#### 4.4 Consumer Preferences for Online Services and Content

Figure 3: Individuals using Internet in Bahamas and Selected Caribbean Markets



Source: <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

Further to Section 4.3, URCA assesses that the increasing availability of broadband access in The Bahamas is consistent with the trend towards increasing use of digital services and applications that have high demand for bandwidth and high sensitivity to latency. This is because the demand for broadband access (i.e., high speed connection to the Internet) is derived from the demand for digital

services and applications. “Digital services” envelope electronic delivery of information including data and content across multiple platforms and devices and a growing assortment of online content and services such as access to social media, streamed content, financial services, etc.

From Figure 3 (above), the percentage of individuals using the Internet in The Bahamas increased by tenfold from a base of 8% in 2000 to 80% by 2016 and appears to correlate with the increasing availability of broadband access in The Bahamas. Whilst there are marked differences between the countries, The Bahamas is among the most advanced in the region.

Anecdotal evidence suggests to URCA that, in The Bahamas, the most common activities undertaken on the Internet are web surfing/browsing, video streaming and sharing (including movies and sport), sending/receiving emails, accessing news, entertainment (including online gaming), adult content, social media networking, e-banking, online shopping, online bill payments and e-government services. This observation appears to be in line with data (Table 4) showing that the top 20 firms/websites visited by Internet users in The Bahamas include leading multinational brands (e.g., Google, YouTube, Facebook), according to web analytic company Alexa.com.<sup>33</sup> In view of this, URCA summarizes that there is high demand for popular web content in The Bahamas.

**Table 4: Top 20 Websites Visited by Internet Users in Bahamas**

Rank	Website	Daily Time on site (mm:ss) per visitor	Daily pageviews per visitor	Rank	Website	Daily Time on site (mm:ss) per visitor	Daily pageviews per visitor
1	Google.com	8:19	10.81	11	Bing.com	2:36	2.07
2	Youtube.com	8:51	5.06	12	Wikipedia.org	4:16	3.14
3	Facebook.com	9:28	3.54	13	Pornhub.com	8:51	3.41
4	Amazon.com	7:37	7.44	14	Msn.com	3:41	2.49
5	Yahoo.com	3:53	3.53	15	Ebay.com	9:05	6.75
6	Google.bs	4:04	4.55	16	Instagram.com	5:48	3.93
7	Live.com	3:43	3.68	17	Roblox.com	16:40	9.19
8	The startmagazine.com	20:39	7.03	18	Microsofonline.com	1:13	1.91
9	Lotterypost.com	7:05	4.10	19	Bahamas.gov.bs	3:15	2.80
10	Netflix.com	2:05	1.77	20	Islandluck.com	15:18	4.10

Source: <https://www.alexa.com/topsites/countries/BS>

From Table 4, Google, the world’s leading search engine is the most popular website visited by Bahamians. Aside from web surfing/browsing for information, Google offers an assortment of products, like emailing, that are known to be in very high demand in The Bahamas.

Further, amongst the top 20 websites visited by residents of The Bahamas are three of the most popular social networks and messenger/Chat App/VOIP platforms worldwide (Figure 4):

- Facebook the largest social network and sharing platform with more than 2.23 billion monthly active users worldwide;<sup>34</sup>

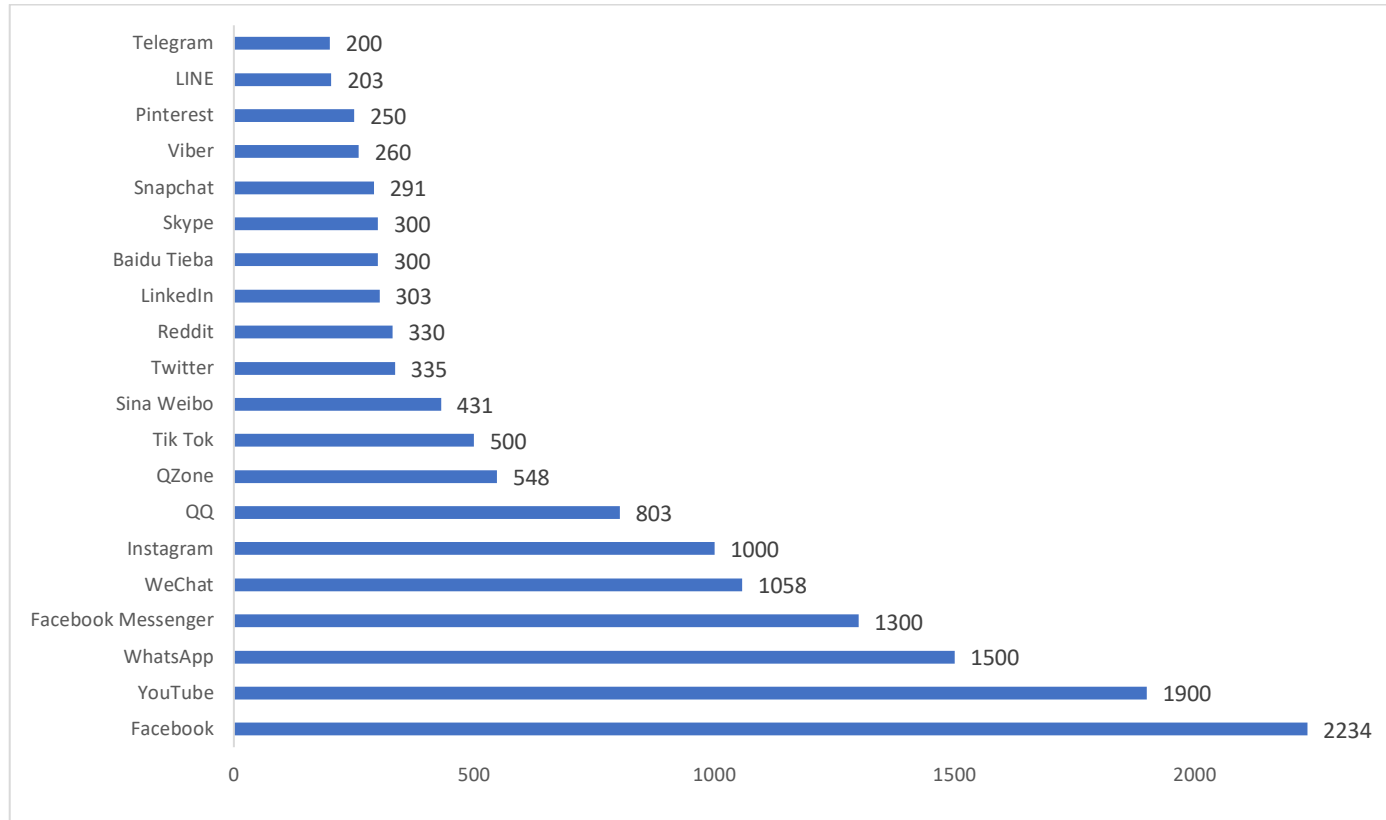
<sup>33</sup><https://www.alexa.com/topsites/countries/BS>

<sup>34</sup><https://zephoria.com/top-15-valuable-facebook-statistics/>

- YouTube (which Google owns), the second largest social network and sharing platform worldwide with 1.9 billion monthly active users and 300 hours of videos uploaded to the site every minute;<sup>35</sup> and
- Instagram, a leading photographic sharing platform with 1 billion monthly active users and 50 billion photos uploaded to its platform to date.<sup>36</sup>

Indications are that WhatsApp being the largest messenger/ChatApp platform with 1.5 billion monthly active users worldwide (Figure 4) is very popular among cellular/mobile users in The Bahamas.

**Figure 4: Number of Active Users in Millions (2018)<sup>37</sup>**



Even more, Amazon the largest e-commerce platform worldwide occupies fifth position on the list of top 20 sites visited by Bahamians. Other prominent brands like Netflix and Ebay appear to be equally popular among members of the Bahamian public.

Evidence also exists to show that an increasing number of Bahamians are signing on to social media sites, especially Facebook. With 210,000 Facebook subscribers in 2016, The Bahamas had the seventh most Facebook users in the Caribbean region.<sup>38</sup> As of March 2019 the number of Facebook subscribers in The Bahamas was approximately 211,936 or a penetration rate of 64.59% up from a base of 64% in

<sup>35</sup> <https://merchdope.com/youtube-stats/>

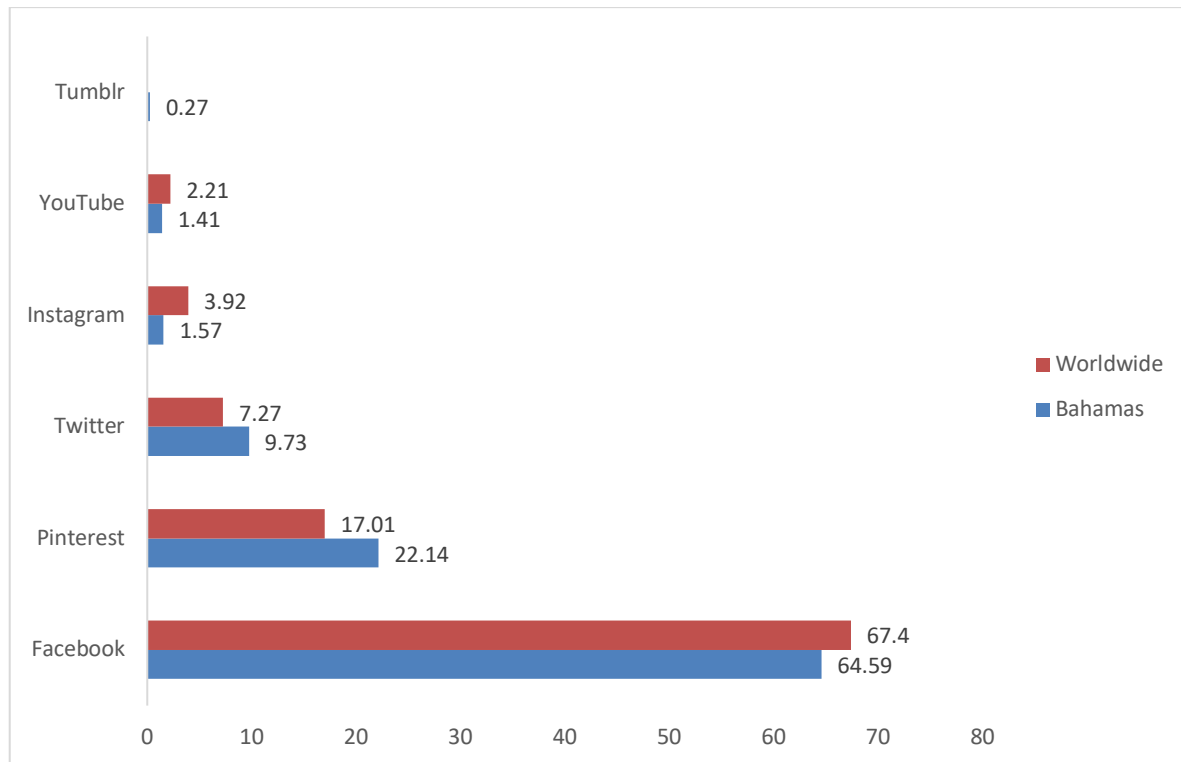
<sup>36</sup> <https://www.omnicoreagency.com/instagram-statistics/>

<sup>37</sup> <https://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research/>

<sup>38</sup> <https://www.newsamericasnow.com/10-caribbean-countries-with-the-most-facebook-users/>

2016. Note that a penetration rate of 64.59% is significantly higher than the penetration rates (Figure 5) for other social networks.

**Figure 5: Social Media Penetration Rates<sup>39</sup>**



As regards to local content, Alexa.com published that amongst the local websites frequented by residents of The Bahamas are Island Luck, Paradise Games, University of The Bahamas, websites of leading commercial banks, Bluepostal, Bahamas Local, Nassau Guardian, Tribune 242 and Bahamas.Gov.bs. URCA considers that demand exists for content that is generated locally. That is, content which is relevant and comprehensible to the residents of The Bahamas, including a wide assortment of e-government services, on-line banking, online bill payment, local news, and entertainment that meets local interests. One major commercial bank is projecting an increased use of on-line banking in The Bahamas on the premise that Bahamians want to interact with their banks through multiple channels and demand greater convenience and speeds. Similarly, URCA is expecting an increased use of digital means to pay utility bills, access local news and entertainment.

Specific to e-government services, the 2018 e-Government survey done by the UN’s Public Administration Program ranked The Bahamas 72 of 193 countries whereas in 2014 The Bahamas was ranked 92 of 193.<sup>40</sup> Despite this, the Inter-American Development Bank (“IADB”) assessed that there is low take-up of e-Government services in The Bahamas, adding that in 2017:<sup>41</sup>

- more than 40,000 tax payments and 1,308 business registrations were done manually;

<sup>39</sup> <http://gs.statcounter.com/social-media-stats/all/bahamas>

<sup>40</sup> <https://publicadministration.un.org/egovkb/en-us/About>

<sup>41</sup> <http://www.tribune242.com/news/2018/jul/09/digital-divide-40000-tax-payments-manual/>

- collectively the Registrar General’s Department (“RGD”), National Insurance Board (“NIB”) and Road Traffic Department (“RTD”) dealt with between 50,000 to upwards of 60,000 transactions for key services manually;
- at NIB, some 43,360 benefits and assistance claims along with 8,176 and 8,215 new registrations were dealt with “in person”;
- at RTD, 50,000 driver’s licence renewals were handled by non-digital means; and
- at RGD, some 31,200 birth certificate copies; 22,900 deeds search payments; 7,530 “letters of good standing”; 9,747 birth, death and marriage certificates; and 4,989 “other company services” were handled by non-digital means.

The data presented above underscores that there are significant opportunities to expand the use of e-government services in The Bahamas. The IADB noted that the Government’s intent is to increase by 70% the number of people using e-government services by 2025.<sup>42</sup>

Studies exist to show that digital literacy and the limited availability of local content and services are key factors delaying the emergence of a thriving Internet and digital sector across the developing world. Both factors are equally relevant in the Bahamian context, according to ISOC<sup>43</sup> researchers. In fact, whilst broadband access and usage across the region have improved considerably, the limited use of the Internet to fuel business innovation and service delivery in both the private and public sectors locally remains an issue. It is URCA’s view that The Bahamas is not leveraging the full potential of the Internet for driving digital entrepreneurship and business development and innovation. URCA further agrees with assertions that government and private stakeholders can stimulate demand for online content and services by adopting policies to support local content and traffic exchange.

URCA further understands that major international content providers do not have a physical presence in The Bahamas. For this reason, the popular international websites and services in The Bahamas are hosted overseas. Given prevailing practice, traffic to these sites travel over expensive international links before coming back in The Bahamas and are therefore subject to delays (increased latency) and increased packet loss. Same is true when local websites and services are hosted outside The Bahamas. Given this, URCA considers that the presence of local IXPs would induce popular web content providers to host their content in-country in order to provide quality services to end-users.

In summary, URCA considers that the high penetration of broadband access in The Bahamas is reflective of increasing local preferences for web content that have high demand for bandwidth and high sensitivity to latency. There is huge potential for online services and applications to grow in The Bahamas through development of more domestically-created content. This, in turn, would help to drive demand for access to the Internet and consumption of local content and make local hosting of websites and services a viable option for local and international firms.

**Consultation question 3: Consumer preferences for online content and services**  
 Do you agree URCA that there is increasing local preferences for web content that have high demand for bandwidth and high sensitivity to latency? Please detail your response in full. In support of your position, respondents are invited to provide relevant survey results and industry or specific company reports on the use of online content and services in The Bahamas.

<sup>42</sup><https://www.iadb.org/en/news/bahamas-encourage-competitiveness-cutting-red-tape-costs-through-digital-governance-idb>

<sup>43</sup> Internet Society

#### 4.5 Bandwidth Cost and Internet Traffic

The high cost of international transmission links reinforces URCA's view that demand exists for local IXPs in The Bahamas. As established previously (Sections 2.3 and 3), the practice of routing local Internet traffic outside a country adds costs to the operations of ISPs and content aggregators and help to keep end-user pricing for access and usage high.

URCA's assessment of leased circuits pricing finds that there is a significant cost differential between local and international bandwidth. URCA finds that BTC's international leased circuits pricing can be 10.42 to 14.19 times their equivalent local costs. Similarly, CBL's international circuits pricing can be 5.92 to 17.33 times their equivalent local costs. Alongside this is the fact that a significant amount of Internet traffic is already routed externally over expensive international transport links. URCA notes that total annual Internet traffic in The Bahamas has increased significantly in recent years and exceeded •*confidential* Gbps in 2017, up from a total of •*confidential* Gbps in 2013. Total national Internet traffic as a share of this 2017 figure was approximately •*confidential* %. As such, increases in local Internet traffic result in higher foreign exchange expenditure on international transport links.

#### **Consultation question 4: Bandwidth Costs and Internet Traffic**

Do you agree that the practice of routing local Internet traffic outside The Bahamas adds costs to the operations of local ISPs? Please detail your response in full.

## 5 IXP Enabling Measures

In this section, URCA sets forth the *enabling or policy steps* it proposes to adopt in support of IXPs' entry in The Bahamas.

### 5.1 Licensing

URCA believes that as a matter of Bahamian law, an IXP requires an URCA licence before it can commence business in The Bahamas.

In terms of background, the Comms Act confers on URCA the power to grant individual and class licences and to modify, vary, restrict the conditions of, or revoke any licence granted to a licensee. Under Part IV of the Comms Act, any person who undertakes a licensable activity in The Bahamas will require a licence unless the relevant activity is exempt. Exemptions may either be statutory exemptions, as specified in section 17(1) of the Comms Act<sup>44</sup> or non-statutory exemptions, established by a determination issued by URCA under section 17(4) of the Comms Act. URCA notes, however, that the section 17(1) exemptions of the Comms Act would not apply to an IXP operator in The Bahamas.

Pursuant to section 2 of Part I of the Comms Act:

**“carriage service”** means any service consisting in whole or in part of the conveyance of signals by means of a network, except in so far as it is a content service, including the provision of ancillary services to the conveyance of signals and conditional access or other related services to enable a customer to access a content service;

**“content service”** means a service either for the provision of material with a view to it being comprised in signals conveyed by means of a network or that is an audiovisual media service;

**“electronic communications service”** includes the provision of any carriage service or content service;

**“facility”** means any element or physical component of a network;

**“network”** means-

- (a) a transmission system for the conveyance, by the use of electrical, magnetic or electromagnetic energy, of signals of any description; and
- (b) such of the following as are used by the person providing the network and in association with it, for the conveyance of the signals –
  - (i) apparatus, equipment or facilities comprised in the network;
  - (ii) apparatus, equipment or facilities used for the switching or routing of the signals; and
  - (iii) software and stored data.

URCA preliminarily considers that the services and/or facilities to be operated by IXPs constitute “electronic communications service” and “network” as defined above and therefore licensable under the terms of the Comms Act. Upon its review of IXP regimes elsewhere, URCA notes that a typical IXP provides an array of services/facilities to its users including the ability to switch and route Internet traffic. Accordingly, URCA has reason to believe that a Bahamian IXP would similarly engage in the

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<sup>44</sup>Include the Royal Bahamas Police Force, Royal Bahamas Defence Force, the providers of fire brigade, ambulance, coast guard and other emergency services; or military services duly authorized to operate in The Bahamas.

routing or conveying of signals, in whole or in part, over a facility or network that uses switches, cables, and other technologies to deliver services to its members.

Another key issue to be decided involves the licensing conditions that should govern IXPs in The Bahamas. URCA's preliminary thinking is that the existing Class and Individual Operating Licences are unsuitable for an IXP provider. This is because both documents contain conditions that, in URCA's view, would render an IXP unresponsive to the needs of its community and make it less likely to succeed. On this point, URCA notes the position taken by leading industry experts on the importance of light-touch regulation to an IXP's success. URCA appreciates that IXPs must be agile in order to be successful and recognizes that the imposition of onerous licensing conditions/obligations or entry requirements would defeat the purpose.

Against the foregoing background, URCA proposes to create a fit-for-purpose or restricted Class Licences to allow operation of local IXPs. URCA, in principle, considers that it would impose licence conditions that it deems essential as a matter of Bahamian law or for the effective functioning of the exchange. For instance, as a matter of Bahamian law, IXPs must adhere to the ex-post competition provisions of the Comms Act, and local privacy/data protection laws.

Consistent with the principle of light-touch regulation, URCA has no intention to impose ex-ante price control regulation, network quality of service, and peering requirements (at least initially) on IXPs. As to the latter, URCA finds that most regulators do not prescribe peering/interconnection arrangements between IXP users. The thinking is that users of an exchange need complete freedom to establish these relationships as they see fit. While URCA has no reason to think the situation should be any different in The Bahamas at this time, URCA would mandate peering if proven necessary for an IXP's success.

Lastly, URCA notes that it is too early to determine the full and final scope of the new licence it proposes to create. Once the IXP Business model has been determined URCA will go through a consultative process required under the Comms Act as a regulatory measure of public significance, prior to establishing the final IXP licence conditions.

## **5.2 Fees and Contributions by IXPs**

URCA has the power and duty to collect certain fees from licensees under Part XVI of the Comms Act. These fees include the Communications Licence Fee, Spectrum Fees, UAT Fee, and URCA administrative and regulatory fees. Additionally, licensees may be required to make contributions to the Universal Service Fund for the purposes of Part VII ("Universal Service") of the Comms Act.

Mindful of the need for the IXP to be viable and self-sustaining, URCA is prepared to consider the options presented regarding the payment of URCA, Comms and UAT fees by the IXP in the initial start-up phase. However, as a general position, licensed operators are required to pay their share of the costs of regulation in The Bahamas, which are the basis on which URCA and UAT fees are levied. URCA is not aware of any regime that requires IXPs to contribute to a Universal Service Fund ("USF") and is of the preliminary view that this would be the appropriate approach to the USO regime in The Bahamas. URCA's final position on fees will be predicated on the IXP model ultimately chosen for The Bahamas.



### **5.3 Localizing Internet Traffic inside The Bahamas**

URCA advises that there is nothing in relevant Bahamian law or other measures that require Internet infrastructure companies to keep domestic Internet traffic inside The Bahamas. URCA is concerned that a decision by a major ISP to continue to route domestic traffic externally could undermine entry of an IXP in The Bahamas. Given URCA's intent, URCA proposes to require Internet infrastructure companies (including cellular/mobile) to keep local Internet traffic in The Bahamas unless exceptional circumstances prevent it. URCA proposes to implement this measure either by way of an amendment to existing licences or by way of a separate regulatory measure.

### **5.4 Access to Infrastructure**

Access to domestic and international infrastructure is essential to the development of an Internet-based economy and society. In particular, access to domestic infrastructure is needed to bring traffic from international gateways to an ISP's Point of Presence to send/receive traffic. Likewise, international infrastructure is crucial to connect domestic networks with international users and web content.

URCA reiterates that access to these facilities is crucial to the development of the Internet and digital infrastructure in The Bahamas. URCA notes that in markets with limited facilities-based competition in backhaul infrastructure, the regulatory environment ensures that IXP users can gain access to existing infrastructure and capacity.

As previously mentioned, there is no SMP access obligations in place in respect of national and international circuits. In this regard, URCA notes its power pursuant to the Comms Act to:

- impose ex-ante access obligations on dominant operators;
- carry-out ex-post competition inquiries; and
- issue regulation and other instruments in fulfilment of its objectives.

#### **Consultation Question 5: IXP Enabling Measures**

Do you agree with the supporting measures URCA proposes to adopt to stimulate entry of IXPs in The Bahamas? Please detail your response in full.

### **5.5 Principles for Regulation and Other Measures**

URCA is satisfied that the IXP-supporting measures contemplated are not out of step with mainstream thinking or the principles for regulation and other measures at section 5 of the Comms Act. URCA is not aware of any jurisdiction in which an IXP was found to impose an unfair or disproportionate burden on major infrastructure companies. Moreover, the proposed measures are consistent with ISOC's policy steps to promote local content and traffic exchange (in Figure 6 below). URCA thus summarizes that the policy steps outlined above are:

- transparent, fair and non-discriminatory;
- efficient and proportionate to their purpose;
- necessary to promote the overall objectives of the Comms Act, as explained at Section 6.1 below;
- expected to generate positive benefit/cost for licensees and end-users in The Bahamas; and
- in tandem with URCA's power to issue regulation or other measures where URCA believes market forces are unlikely to promote the sector's objectives in a timely manner.

**Consultation Question 6: Principles for Regulation and Other Measures**

Do you agree with URCA's assessment of the enabling measures discussed? Please detail your response in full.

**Figure 6: Policies to Support Local Content and Traffic Exchange**

Policymakers should:

- Connect their e-government services to local IXPs to provide an incentive for ISPs to connect, and provide more reliable access to government services for citizens
- Ensure legal and policy clarity for local content developers, hosting providers, CDNs, and data centres. This can include intermediary liability protection to increase the willingness to host third-party content. Policies should not unduly restrict the ability of carrier-neutral data centres to host content
- Design online services to serve citizens while also driving use, increasing skills and employment for local programmers, and content hosted at local data centres
- Consider and mitigate where appropriate the cost to local ISPs, IXPs, hosting providers and data centres of electricity and equipment. Electricity is a critical input for a data centre, where high cost or poor reliability can significantly increase the cost and risk of hosting content locally in comparison with international alternatives. Governments should also consider the impact of high duties and taxes on equipment imports, and long and unpredictable customs checks. These significantly raise the cost of hosting and access infrastructure and make these organizations less resilient and responsive
- Avoid mandating a requirement for local hosting of content or data. Instead, promote an environment that makes local hosting a viable option for content producers and distributors
- Ensure they do not place constraints through licensing or regulation on operators' ability to connect and peer at an IXP
- Remove barriers to entry for IXP operation and peering, and promote bottom-up community development and support for IXPs.

Source: <https://www.internetsociety.org/wp-content/uploads/2017/08/bp-EnablingEnvironment-20170411-en.pdf>

## 6 Expected Benefits for Local IXPs in The Bahamas

URCA now highlights the potential benefits for The Bahamas with the entry of local IXPs, taking into account the discussions in the preceding sections.

### 6.1 URCA's Objectives for Establishing Local IXPs

As a first step, URCA restates that there are compelling reasons to promote IXP entry in The Bahamas. This, in URCA's view, would:

- promote the overall objectives at section 4 of the Comms Act by furthering “the interests of consumers by promoting competition” and furthering “the interests of persons in The Bahamas in relation to the electronic communications sector”;
- catalyse the measures that enable the Internet and digital economy in the Draft ECS Policy;
- help to achieve UN SDG 9.c. “Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovations”;
- support CTU's vision to encourage telecommunications' self-sufficiency and local production;
- support Government's plan to create a Tech Hub in Grand Bahama and digital transformation in the delivery of public services; and
- align local infrastructure for the Internet and digital economy with global best practice.

Specifically, URCA considers that the enabling or policy steps discussed in Section 5 (above) should help to advance the following specific objectives, which in URCA's view, are in harmony with all of the above:

- facilitate efficient and more productive routing of Internet traffic;
- facilitate market expansion by existing ISPs and further market entry by new players;
- attract international businesses to The Bahamas;
- contribute to the protection of personal privacy; and
- promote affordable access to a wide range of carriage and content services which are of a high quality.

#### **Consultation question 7: Objectives for Establishing IXPs in The Bahamas**

Do you agree with URCA's objectives for the entry of IXPs in The Bahamas? Please detail your response in full.

### 6.2 Expected Benefits for IXPs in The Bahamas

In the totality of the above, URCA summarizes the benefits an IXP could be expected to bring to the Bahamian market, as follows:

- **Reduction of network's operational costs:** This is one of the core direct benefits for establishing IXPs in The Bahamas. URCA identifies four possible sources of cost savings for local ISPs. The first stems from the high pricing for international transmission links. Having a local exchange should induce ISPs to connect and exchange traffic inside The Bahamas rather than abroad. Thus, ISPs avoid the high cost for international transmission links. Second, by connecting and exchanging traffic at a local IXP, ISPs avoid paying the costs of establishing dedicated links to each other. Further, ISPs can search for beneficial peering arrangements or sessions and more cost-effective and efficient traffic exchange. Also, ISPs generate cost savings by aggregating their traffic and jointly negotiating lower bandwidth pricing with major transmission companies.

- **Enhanced Internet Reliability and Robustness:** In this case, a local IXP gives local operators greater control and autonomy over routing and traffic management, thus allowing for efficient resolution of technical quality defects. Also, the technical set-up of an IXP's infrastructure enables it to provide back-up or redundancy in the event of an outage on international links which ensures continuity of in-border operation during the disruption. This is especially critical for online applications and services (e.g., banking and e-government services).

Most importantly, keeping local Internet traffic local should reduce delays or the latency of transmission. This is especially important for users of bandwidth sensitive services such as Video streaming/audio, Videoconferencing, e-governance, e-education, e-banking, telemedicine, e-commerce, and Internet Protocol Television ("IPTV").

It should also result in more Bahamians establishing similar business models, which in total will lead to even greater benefits to end-users by resulting in lower subscription costs for services from traditional operators while also achieving policy objectives centered around accessibility and affordability.

- **Data Protection/Privacy:** One of the explicit objectives of Bahamian communications policy, is to further the interests of persons in The Bahamas by contributing to the protection of personal privacy. However, The Bahamas' dependence on digital infrastructure and enterprises in another country means that emails and electronic messaging sent to or by government officials to a local recipient travel over an international link and therefore become subject to the laws of another country and can be stored and its contents scanned. Using a local exchange to aggregate and keep Internet traffic local should reduce or eliminate any data protection /privacy risks associated with boomerang routing.

URCA further summarizes that IXPs would deliver **additional benefits** for their members or participants in several ways:

- Promote more affordable retail pricing for broadband access and usage. The extent of this benefit depends on the level of cost savings local ISPs passthrough to end-users. It will also depend on how competition develops post establishment of a local IXP.
- Enhanced end-user experience owing to the technical improvements (as noted above) and the advent of a wider range of online content that is relevant and comprehensible to local users.
- Stimulate development of a local content sector in The Bahamas. URCA restates that there is huge potential for online services and content to grow in The Bahamas through development of domestically created content. Indeed, successful IXPs can "...create a local environment that attracts a variety of other services, including Domain Name Servers (DNS), root-server mirrors, time servers, and content and web caches and serve as a hub for technical activity."<sup>45</sup> As URCA has already noted and discussed, the presence of local IXPs has spurred growth and development of the local content sector in Africa and elsewhere. Government may connect

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<sup>45</sup><https://www.internetsociety.org/policybriefs/ixps/>

their e-government services to a local IXP to ensure more reliable access to public services for Bahamians.

The presence of a local exchange can fuel further development of a local content sector in two other important ways. In the first instance, it encourages local hosting of Bahamian websites and services. As explained, content that is hosted abroad loads much slower and, in turn, impacts the quality of service received by end-users. On the converse, when local content previously hosted abroad is moved in-country this should load faster and more smoothly (reduce latency) and result in improved delivery speeds and service quality and enhanced end-user experience.

Secondly, the presence of local IXPs may entice YouTube and other international brands to establish caches or servers in The Bahamas to meet demand for country or regional specific content. This is the experience in other regions and is the case in Caribbean countries with local exchanges (e.g., Curacao and Grenada). In short, the presence of local IXPs may induce local hosting of global services and applications that require high bandwidth usage and help to boost development of a local content industry.

- Engender entry and competition as the cost savings noted above result in lower barriers to entry and create a more level playing field for competition to flourish. In turn, competition then leads to more affordable retail prices and incentives for service providers to bring new and innovative services to market. Indeed, increases in Internet usage are known to drive requirements for infrastructure investment by online service providers (including content delivery networks), according to a recent study by Analysys Mason.<sup>46</sup>

On top of these benefits are the secondary **contributions IXPs can make to the wider macro-economy in The Bahamas**. This is in terms of the balance of payment impact (savings in foreign exchange expenditure on international bandwidth) and improved productivity and competitiveness. A thriving content sector has the potential to create high paying jobs and promote economic diversification. IXPs may help to improve The Bahamas' ranking in the annual Doing Business assessments conducted by the World Bank. There is also a distinct opportunity for a Bahamian IXP to evolve into a regional hub where regional and international firms connect and exchange traffic.

**Consultation question 8: Expected Benefits for IXPs in The Bahamas**

Do you agree with the benefits URCA has identified for IXPs in The Bahamas? Please detail your response in full.

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<sup>46</sup>“Infrastructure Investment by Online Service Providers” by David Abecassis, Richard Morgan, Shahan Osman (December 2018) at <http://www.analysismason.com/Consulting/content/reports/Online-service-providers-Internet-infrastructure-Dec2018/>

## 7 IXP Location, Governance, Participation, Business Model and Funding

Below, URCA sets forth **recommendations** regarding IXP location, governance and decision-making, membership or participation, business model and funding for The Bahamas.

### 7.1 Location Neutrality

URCA recommends that Bahamian IXPs should be hosted at a neutral location or site. According to the ITU, “Where that neutral ground is found depends on a number of factors, including: the context and maturity of the industry, geographical convenience, financial support from third parties and agreement on what neutral means to the different parties involved.”<sup>47</sup> URCA, however, notes that by industry standards, a neutral location is generally taken to mean a site/venue which is neither operated nor owned by any of the IXP members or participants, such as:

- a new site where a data centre for the IXP could be constructed;
- an existing site owned by a party that does not operate in the electronic communications industry;
- a site provided by the government or the regulator; or
- a site provided by an educational organization or a private donor.

URCA considers that if the IXP were to be hosted at a site with links to a data centre, communications operators or a communications operator-owned site, there would be a need to ensure fair and non-discriminatory access for all parties to the IXP at all times plus the need for clear separation between hosting and operating decision. Further, the chosen location/site needs to be: equipped with reliable power supply and air-conditioning, secure against weather and vandalism, accessible to fiber and wireless infrastructure, and be ready and immediately operational. In the final analysis, the IXP operator in consultation with others would need to assess the suitability and cost effectiveness of different possible locations before coming to a final decision on where to locate the IXP.

### 7.2 Governance and Decision-Making Neutrality

As mentioned, best practices dictate that IXPs’ governance structure and procedures should be as neutral as possible and agreed upon by IXP participants or members. This is necessary to engender trust and confidence in the management and operation of IXPs. Importantly, it ensures IXP governance structure and decision-making procedures are not for the benefits of a single member or participant or a subset of members or participants. URCA thus recommends that local IXPs should be transparent, fair, and impartial in their governance structure and decision-making procedures. In line with mainstream thinking, the IXP governance structure and decision-making procedures must be documented (“IXP Policy Document”) and available to all IXP members or participants. A typical IXP Policy Document specifies:

- participation or membership requirements, including the types of organizations that may locate and exchange traffic at the IXP location;
- IXP governance process including the selection and appointment of board members, donor recognition, meeting frequency, and attendance; and
- technical requirements for traffic exchange.

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<sup>47</sup>“Create local and regional IXPs” available at <https://www.itu.int/itunews/manager/display.asp?lang=en&year=2005&issue=04&ipage=saveMoney&ext=html>

The IXP Policy Document should be discussed and agreed upon by all IXP members or participants. URCA's role, if any, in the formation and/or approval of this document will be specified in the IXP licence conditions.

### **7.3 Open Membership and Participation**

URCA recommends universal membership or participation for local IXPs. This is because, as URCA understands it, the most successful IXPs across the world allow for universal participation of market participants, regardless of their country of origin. This includes domestic facilities-based operators, overseas Internet Backbone Providers, and domestic and international ISPs and content aggregators (e.g., Google, Akamai and Netflix).

In URCA's view, universal participation would help to optimize the benefits discussed in Section 6 above as this should result in a more robust and dynamic exchange, speed up the growth in IXP membership, and establish cooperative and mentoring opportunities between local and international participants.

### **7.4 IXP Business Model**

As previously stated, IXPs in the global market operate under one of two business models: for profit or not-for-profit.<sup>48</sup> Not-for-profit IXPs are run as noncommercial businesses. Under this model the IXP may recoup its set-up costs and recurring operating costs from users. It is common practice for not-for-profit IXPs to receive cash and in-kind support from local and/or international partners. URCA understands that successful IXPs in the UK, Germany and the Netherlands;<sup>49</sup> emerging countries in Africa (including Nigeria and Kenya), the Middle East (e.g., Bahrain)<sup>50</sup> and the CTU member countries operate as not-for-profit businesses.

On the converse, IXPs in the US operate as for-profit businesses and seek to recoup their costs of operation and generate a reasonable rate of return for the investor. Having assessed the cost/benefits of both options, URCA recommends that IXPs in The Bahamas should operate as not-for-profit businesses. In this case, an IXP would not be motivated by the business consideration of making a profit but aim to invest any surplus funds in the future expansion and development of the exchange.

### **7.5 IXP Funding Model**

Linked to the IXP business model is the need for IXPs to have a secure source of funding. This is necessary if the IXP is to invest in its own infrastructure and adapt to the dynamics of its environment. History shows that not-for-profit IXPs are susceptible to volunteer fatigue and donor fatigue which in turn pose significant risk to the continuity and stability of such exchanges. As such, upon installation and launch of a local IXP, the IXP community would need to assess the long-term growth and sustainability of the IXP. It is not unusual for not-for-profit IXPs to evolve from a free-model to a fee-based model over time. URCA surmises that a not-for-profit local IXP could be funded through cash and in-kind support from local and/or international donors as well as contributions from its members

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<sup>48</sup>"On the importance of Internet eXchange Points for today's Internet ecosystem" by Nikolaos Chatzis, Georgios Smaragdakis, and Anja Feldman available at <https://arxiv.org/ftp/arxiv/papers/1307/1307.5264.pdf>

<sup>49</sup>"On the importance of Internet eXchange Points for today's internet ecosystem" by Nikolaos Chatzis, Georgios Smaragdakis, and Anja Feldman available at <https://arxiv.org/ftp/arxiv/papers/1307/1307.5264.pdf>

<sup>50</sup> <http://www.bix.bh/mou.php>

and/or users locating at the IXP. URCA, however, notes that the final position taken is one for the IXP participants to debate and determine.

**Consultation question 9: IXP Policy Document**

What is URCA's role, if any, in the formation and/or approval of an IXP Policy document? Please detail your response in full.

**Consultation question 10: IXP Location, Decision-making, Business Model and Funding**

Do you agree with URCA's recommendations regarding IXP location, governance and decision-making, participation, business model and funding? Please detail your response in full.



## 8 Assessment of Implementation Options for Local IXPs

In this section, URCA continues its recommendations on entry for IXPs in The Bahamas. Further to the discussion in the preceding section, URCA now discusses various implementation models for local IXPs in The Bahamas:

### **Option 1 - Market-led approach**

This option provides a market-led solution and is non-interventionist. That is to say, URCA would take no action to stimulate the establishment of IXPs in The Bahamas. Instead, URCA would simply rely on market forces to determine whether an IXP is favourable and set up an IXP without any intervention, beyond the granting of an IXP provider licence. URCA understands that this is not how IXPs commonly emerged in the Caribbean region and other developing regions.

In URCA's estimation, there is a very high probability that this option may not result in the creation of IXPs in The Bahamas in the near future. This means there is a significant risk that the expected benefits identified for IXPs in Section 6 above would not be met. URCA considers that continuation of the status quo (or 'do nothing') would favour only the major networks.

### **Option 2 - Multi-stakeholder owned IXP**

In this case, the IXP would be jointly owned and operated by its users and operate on a not-for-profit basis. These are common characteristics of successful IXP regimes and is URCA's preferred option.

One advantage of this option is that it is likely to be more closely aligned with market needs once stakeholders' participation in its implementation and management is provided. As such, it is likely to be most responsive to the needs of stakeholders as they have influence over the policy direction of the IXP. This option would be most compatible with attracting external players to the IXP.

On the other hand, this option may not be viable, given current market structure in The Bahamas. In particular, it is not clear to URCA that stakeholders would cooperate, as their economic interests may not be aligned. In addition, there is limited precedent for this type of ownership and operational model in The Bahamas. Thus, questions remain whether this is compatible with the state of the market.

### **Option 3 – Government-owned and operated**

Under this model, the government would own and administer the affairs of the IXP on a not-for-profit basis. This may be for a transitional period after which the IXP's ownership and/or management is transferred to the private sector. Examples of state-owned and operated IXPs are found in Egypt and Somalia. It is also one of the IXP governance models being considered for the Kingdom of Saudi Arabia. This option gives the government control over the set-up and operational decisions of the IXP. It would also ensure all participants have fair and non-discriminatory access to the IXP.

URCA, however, notes that there is the risk that a government-owned and operated IXP could operate in a manner detached from market developments and the needs of its users. Moreover, such an IXP might be less responsive to market dynamics. Lastly, potential users of an IXP might have little or no confidence in the IXP since it is not compatible with the most successful Internet governance models. There is also a trust factor regarding the government's ability to access private data.

### **Option 4 – Regulator-owned and operated**

URCA may own and administer the affairs of the IXP on a not-for-profit basis. Again, this is one of the IXP governance models being considered for the Kingdom of Saudi Arabia.<sup>51</sup> A regulator-owned and operated IXP would ensure that users have fair and non-discriminatory access to the IXP. However, it involves activities that fall outside of the regulator's core competencies, and generally falls victim to the same concerns as a government-owned and operated model. This may, however, be appropriate for a transitional period after which the IXP's ownership and/or management is transferred to the private sector.

#### **Option 5 - Outsourcing model**

Under this option, the day-to-day affairs of the IXP would be outsourced to an established IXP Provider. This approach could be used in conjunction with a variety of ownership models. For example, the IXP could be industry-owned (i.e., option 2 above), or government-owned (i.e., option 3 above) or URCA-owned (i.e., option 4 above). This option would ensure that users have fair and non-discriminatory access to the IXP. An established IXP provider would have the necessary expertise and experience to guide development of the IXP. This would also give external participants confidence in the IXP if the operator has a strong international reputation.

The downside to this option is that no local IXP expertise is developed and this may hinder plans to grow and enhance the IXP, or even develop other IXPs in the future. Further, this is a higher cost option when compared with the multi-stakeholder-owned IXP or a government-owned IXP. This is because the IXP would require remuneration to operate which would need to be funded by charges levied on users of the IXP. This would be the case under both a for-profit and not-for-profit business model although the level of the charges is likely to vary under each.

#### **Option 6 – Independent IXP provider**

Under this option, an independent local or international firm would own and operate the IXP. This model is more emblematic of a for-profit IXP business. To ensure its independence, the IXP would have no ownership, governance or decision-making relationship with any of its users including operators in the communications sector. Again, this model would ensure fair and non-discriminatory access to the IXP. As a for-profit business, the provider would require remuneration to operate the IXP and earn a reasonable rate of return for the investor. This would have to be recovered from users through the imposition of fees to use the services of the IXP.

In a nutshell, URCA notes that the above are many options and welcomes comments on other possible models. However, URCA's current preference is for a multi-stakeholder-owned and operated IXP model under option 2.

#### **Consultation question 11: Assessment of Implementation Options for Local IXPs**

Do you agree with URCA's preferred IXP model for The Bahamas? Please detail your response in full.

<sup>51</sup> <http://www.citc.gov.sa/en/pages/default.aspx>

## 9 Conclusion and Next Steps

In the totality of this Consultation, URCA, having assessed all relevant factors, considers that the presence of IXPs in The Bahamas would be in perfect alignment with URCA's objectives. URCA believes that the presence of local IXPs would complement and improve the functioning of the Internet ecosystem and digital economy in its jurisdiction.

To sum up further, URCA preliminarily concludes that demand exists for the creation of IXPs in The Bahamas. URCA also finds that IXPs are relatively inexpensive to set-up and run and would generate positive benefit-cost for users in The Bahamas. URCA, however, is concerned that reliance on market forces alone would not stimulate the formation of local IXPs in the immediate or near future. This means, absent URCA's intervention, the expected benefits of setting up IXPs in The Bahamas, as outlined in Section 6 above, would not be met.

As explained in Section 2.3 above, IXPs have proven to be the critical infrastructure to localize domestic Internet traffic and have successfully improved the efficiency and affordability of communications networks and services in developing countries. IXPs engender competition and investment in Internet infrastructure and services. Accordingly, it is URCA's viewpoint that the building of local IXPs should induce ISPs and content aggregators to connect directly with one another and exchange domestic Internet within The Bahamas, thus reducing or eliminating their dependence on expensive international links for transport.

As the views expressed are preliminary, URCA advises that it reserves the right to vary the regulatory measures it proposes to implement in light of written and reasoned comments by the respondents to this consultation. In the absence of comments, URCA would be inclined to confirm the preliminary views set forth in this Consultation Document. Therefore, URCA is urging stakeholders to submit their views and comments on the Consultation.

The submission deadlines for initial responses and reply comments are set out in Section 1.3 of this document.

