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To whom it concerns,

UCC Guidelines on IXPs

I am a doctoral researcher working in the field of Internet eXchange Points (IXP) in East Africa. Please find attached my response to the recent document dated May 2019 soliciting feedback to the proposed Guidelines on Internet eXchange Points (IXP).

Regards,

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UGANDA
COMMUNICATIONS
COMMISSION

THE UGANDA COMMUNICATIONS COMMISSION GUIDELINES ON INTERNET EXCHANGE POINTS

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1. INTRODUCTION

Uganda Communications Act of 2013 (the Act) seeks to develop a modern Communications sector, which includes telecommunications, broadcasting, radio communications, postal communications, data communication and infrastructure. This is to be achieved by a number of strategies including expanding the existing variety of communications services available in Uganda to include modern and innovative communications services.

Section 22 of the Act provides that a person shall not, establish a telecommunications station, provide telecommunications services or construct, maintain or operate telecommunications apparatus without a licence issued by the Commission.

The development of the internet ecosystem in Uganda necessitates having in place robust and secure internet infrastructure including infrastructure for interconnection of the autonomous networks for the exchange of information locally and the protection of critical infrastructure to ensure internet resilience.

2. INTERPRETATIONS

"**Act**" means the Uganda Communications Act of 2013;

"**Commission**" means the Uganda Communications Commission established under section 4 of the Act;

"**Communications services**" means services performed consisting of the dissemination or interchange of audio, visual or data content using postal, radio, or telecommunications media, data communication, and includes broadcasting;

"**Internet exchange point (IXP)**" is a network facility which enables the interconnection of more than two independent autonomous systems, primarily for the purpose of facilitating the exchange of internet traffic;

"Operator" means a person licensed to provide a communication or broadcasting service;

"Peering" means a process by which two Internet networks connect and exchange traffic;

"Peer" means two networks that agree to exchange traffic between each other's networks;

"IXP Service Provider" means any entity that owns and exercises direct

control of an Internet Exchange Point for the provision of Internet Exchange Points Services.

"**IXP member**" means any organisation that operates its own autonomous network and Peers at an IXP. This includes, but is not limited to, telecommunication Operators, Internet Service Providers (ISPs), broadcasters and media organisations, academic and research networks, Content providers, content distribution or delivery networks, government information networks, and internet resource organisations (e.g. top level domain registry).

"**Operator**" means a person licensed to provide a communication or broadcasting service;

"**Telecommunication**" means the emission, transmission or reception through the agency of electricity or electromagnetism of any sounds, signals, signs, writing, images or intelligence of any nature by wire, radio, optical or other electromagnetic systems whether or not such signs, signals, writing, images, sounds or intelligence have been subjected to rearrangement, computation or other processes by any means in the course of their transmission, emission or reception;

"**Telecommunications service**" means a service consisting of the conveyance or reception of any sounds, signs, signals, writing or images by wire, optical or other electronically guided media systems whether or not the signs, signals, writing, images, sounds or intelligence have been subjected to rearrangement, computation or other process by any means in the course of their transmission, emission or reception;

"Telecommunications apparatus" or **"telecommunication station"** means any apparatus or equipment used or intended to be used in connection with the transmission of communications by means of electricity from one place to another place either along a wire joining those two places or partly by wire from each of those two places and partly by radio communication;

Question 1:

Do you have any comment on any of the interpretations provided in section 2? If yes, please elaborate.

1) **The definition of the "IXP Member here has two tests, (1) they own an AS and (2) they peer at an IXP. In the second of these tests the interpretation needs to be more detailed. "Peer at the IXP" could mean that it must peer with the Route Collector (RC) and the Route Servers (RS) or simply peer with specific other IXP members in line with the peering inclination of each individual IXP member. I would suggest that it be mandatory to peer with the IXP RC, as it typical, for statistics purposes; however, peering with the RS should be optional as per each IXP members peering inclination.**

2) **While "Designated National Internet Exchange" or indeed "National Internet Exchange" are significant elements of these guidelines their definition are omitted from this section "interpretations".**

3. OBJECTIVE

These guidelines aim to define the regulatory framework for the establishment and operation of Internet Exchange services in Uganda in accordance with the Act and to ensure that the operation of the same, as an essential service in the communications sector, is geared towards the realisation of Uganda's digital agenda.

The objectives of these guidelines are to:

a) Facilitate the retention of local Internet traffic within the Ugandan local infrastructure and therefore reduce costs associated with traffic exchange between networks;
b) Facilitate the resilience of telecommunications stations and services for quality Internet services; and
c) Promote innovation and catalyse development of content in the country.

Question 2:

Do you have any comment on the objectives of the framework as highlighted in section 3? If yes, please explain.

1) I find it bizarre to regulate a shared Ethernet switch connecting members who are already highly regulated via UCC, the National IT Authority (NITA-U) and/or the Bank of Uganda (BOU). It is completely out of line with any sort of regulations one might want to put in place to encourage a healthy market. A problem statement is markedly absent from the framework.

2) Regulation is best used to resolve market problems, prevent profiteering through cartels. However in Uganda the UIXP is working well and is a non for profit organisation therefore neither of these criteria apply. These proposed regulations are not resolving a problem but will create many new, unnecessary and rather serious problems. There is no way of fixing the problems other than to roll back the regulations at a future date.

3) It is good practice for local traffic to remain local but this is best exercised through IXP members seeing business benefits rather than regulation. For example in Ireland the Internet eXchange Point (INEX) was established with funding from Irish Government via the Industrial Development Authority (IDA) with the aim of creating a conducive environment for business and the Internet to thrive but Government stopped at that. INEX is purposively not regulated by the Communications Regulator (COMREG) as such was seen as a potential barrier to the successful operation of the Internet eco-system. This approach can be observed right across the European Union (EU) where arguably the IXP models work best on the planet and are a model for many.

4. APPLICABLE LEGISLATION

This framework is developed and shall be implemented within the following legal and regulatory provisions:

- Section 5(1)(a, b, k, m, n, o, y) respectively of the Uganda Communications Act of 2013, which spells out the functions of the Commission as including:
  a) *implement the objectives of the Act;*
  b) *monitor, inspect, licence, supervise, control and regulate communications services;*
  c) *promote and safeguard the interests of consumers and Operator as regards the quality of Communications services and equipment;*
  d) *improve Communications services generally and to ensure equitable distribution of services throughout the country;*
  e) *promote competition, including the protection of Operator from acts and practices of other Operator that are damaging to competition, and to facilitate the entry into markets of new and modern systems and services;*
  f) *regulate interconnection and access systems between Operator and users of Telecommunications services;*
  g) *encourage and promote infrastructure sharing amongst licensees and to provide regulatory guidelines*

- Section 22 of the Act that provides for the licensing of Telecommunications in Uganda.

- Section 58 of the Act on Interconnection of network facilities.

- The Communications (Fair Competition) Regulations, 2005.

- The Telecommunications (interconnection) regulations, 2005

- Policies issued by the Minister of ICT & National Guidance in accordance with Section 7 of the Act including the National Broadband Policy of 2017.

Question 3:

Do you have comments on the legal and regulatory context of the framework as highlighted in section 4? If yes, please explain

1) I have no comment.

5. SCOPE

These guidelines stipulate the legal and regulatory requirements for the establishment and provision of Internet Exchange services in Uganda.

6. APPLICABILITY AND EXEMPTIONS

This guideline shall apply to any person (public and private) providing Internet Exchange services in Uganda.

> *Question 4:*
>
> *Do you have any comment on the applicability of this framework as spelt out in section 6? If yes, please explain.*

1) I have no comment.

7. REGULATORY REQUIREMENTS FOR INTERNET EXCHANGE SERVICES

7.1. IXP licensing

(a) Any person that wishes to establish and operate an Internet Exchange Point (IXP) in Uganda shall be registered and authorised by the Commission.

(b) To apply for authorisation, an eligible person shall submit to the Commission an application using the form attached in Annex 1.

(c) An IXP authorised in accordance with (b) above may offer associated services, including but not limited to, monitoring and fault detection, internet security services, transit among participants. This shall not include provision of any service for which the Commission issues a licence unless such licence is obtained.

7.2. Eligibility

An IXP may be established, operated and maintained by any of the following persons:

(a) An Operator licensed under the Act;

(b) A consortium of Operator under the Act. Where the consortium is in the form of Trust, the Operator that are named as the trustees of

the particular Trust at the time of applying for authorisation by the Commission shall be recognised as the directors of the IXP. A new authorisation shall be required when all the named licensees have ceased to be trustee;

(c) An eligible person under the Laws of Uganda; and

(d) A statutory institution established under the laws of Uganda whether an academic or government agency.

7.3. Technical requirements

(a) Every IXP shall prioritise the reliability, internal robustness and security of the IXP, ensuring continuous, quality service 24 (twenty-four) hours a day, 7 (seven) days a week throughout the entire 365 (three hundred and sixty five) days of the year.

(b) Every IXP shall not require the Internet traffic passing between any two Peers to pass through another autonomous system or alter or otherwise interfere with such traffic between Peers. The monitoring of traffic between the Peer's data shall be limited to that required for traffic analysis and management and any other national requirements under Laws of Uganda.

(c) Every IXP shall ensure that its switching platform has sufficient capacity to handle the aggregate traffic of connected Peers

(d) Every IXP shall be required to maintain an availability of the following critical network elements of 99.995%:

i. IXP Route server;
ii. High speed Switching Fabric;
iii. Authentication, authorization, and accounting (AAA);
iv. Firewall;
v. Exchange Power Supply;
vi. Caching servers; and
vii. Routers.

(e) Every IXP shall:

i. establish suitable internal policies, processes and controls in order to ensure adequate network and information security
ii. implement appropriate and proportionate technical and organisational measures to manage the risks posed to the security of the network and information systems which the IXP uses in its operations,
iii. implement appropriate measures to prevent and minimise the impact of cyber incidents affecting the security of the network and information systems used by the IXP.

iv. shall notify the Commission of any cyber security incident impacting its infrastructure, within twenty-four (24) hours of becoming aware of such occurrence.

v. shall promptly notify the Commission if they become aware of the presence of any content or other information on any IXP Member's network that may constitute a violation of the Laws of Uganda

vi. cooperate with the Commission and law enforcement agencies, and other relevant third parties for continuity of traffic in the event of a national emergency, where cases of national security arise, or in order to combat cyber threats

(f) Every IXP shall ensure that its operations conform to the Laws of Uganda, the Regulations, Policies, guidelines and standards specified by the Commission from time to time for management of quality, environment, energy and information security.

7.4. Operational requirements

a) An Internet Exchange may be operated as:
   i. A profit businesses;
   ii. A not-for profit organisation, or
   iii. A voluntary arrangement between consenting Peers

b) The rights and obligations of parties connected to IXPs shall be regulated by a formal written contract or an access policy in the case of Peers. The standard contract between IXP and licensed Operator shall be subject to review and approval by the Commission.

c) Every IXP shall define and publish its membership, Peering and pricing policies, including rules regarding traffic exchange. These policies shall indiscriminately apply to every connected Peer and shall be in accordance with Section 53 of the Act to ensure fair competition.

d) Each IXP shall offer equal opportunity for access to the same type and quality of service to the Peers limiting variations to available or appropriate technologies required to serve the specific Peer.

e) Each IXP shall undertake to complete any installation and/or maintenance work, diligently and in a timely manner observing the requirements of the various authorities as provided under the laws of Uganda.

7.5. Inspection of the IXP

a) The Commission shall have the powers to inspect at any time the IXP to assess its compliance with this framework including auditing the

levels of information and network security, and Quality of Service at the IXP.

b) The IXP shall co-operate with the Commission to facilitate such inspections and provide reasonable access to their premises including:
   i. allowing the Commission to inspect, copy or remove such documents and information (electronic or physical), as deemed relevant to the inspection; and
   ii. allowing the Commission access to any person from whom the Commission seeks relevant information for the purposes of the inspection.

c) The Commission may issue mandatory instructions to an IXP for remedying operational, technical or cyber security shortfalls.

Question 5:

Do you have any comment on any of the regulatory requirements proposed for provision of internet exchange services in Uganda as highlighted in section 7? If yes, please explain.

1) **(7.4d) There is obviously a need for IXPs to have a charge model that is equitable and fair; however, it is also necessary for the IXP to be free to define product sets based on the differing requirements of the various IXP members. For example, the current directive of UCC in relation to UIXP that prevents the withdrawal of service from networks who are not willing to pay for it. This is counter to business norms, a threat to the IXP funding stream and the IXPs ability to provide services. While UIXP is a non-for-profit it still requires funding to operate.**

2) **(7.5b) These appear to be excessive powers without oversight. These powers are more typically vested in the police with oversight by the courts and typically exercised via a court order.**

3) **(7.5c) Has the commission sufficient expertise in the running of IXPs to interfere in the running of an IXP business? If the IXP does not carry out is function it will go out of business. Does the commission issue such instructions to ISPs? and in such cases has the commissions instructions improved these businesses?**

8. STAKEHOLDER RESPONSIBILITIES

8.1. IXP

Each IXP shall:

a) ensure the continuity of its infrastructure, including installation of redundancy systems to guarantee business continuity;

b) submit a comprehensive report quarterly or as required by the Commission including service quality, traffic load and Peers; and

c) Be responsible for promotion, management, maintenance, and operation of the infrastructure of the IXP.

8.2. Operators

Each Operator shall:

a) connect to at least one of the authorised IXPs in order to increase local internet traffic and improve internet quality; and

b) ensure local traffic remains local by switching such traffic at the Internet exchange all the time.

8.3. The Commission shall define the regulatory environment in which IXP shall operate towards the realisation of objectives of the Uganda Communications Act of 2013.

Question 6

Do you have any comment on the stakeholder's responsibilities specified in the provision of section 10? If yes, please elaborate

1) **These responsibilities defined for the IXP (8.1) are an obvious aspirations for any IXP; however, the commission has more responsibility that those listed to define a regulatory environment (8.3). There must also be a responsibility to facilitate and promote business to develop with minimal interference and such inputs from UCC should only be in exceptional circumstances to prevent market failure.**

2) **(8.2) This is an example of unnecessary interference. It is a business decision for an ISP to connect to an IXP or not. It would be better for UCC to promote IXPs such that the business decision for ISPs to connect becomes obvious.**

   In markets where ISP connection to IXPs is made mandatory typically has the opposite effect than that intended. For example Tanzania has gone down a similar route and despite the fact that ISPs are peering with the IXPs in Mwanza (MIXP), Zanzibar (ZIXP), Arusha (AIXP) and Dodoma (DIXP) they switch traffic measured in kb/s while the original Tanzania IXP (TIX), which was built before this framework, switches approximately 6 Gb/s.

9. CONDITIONS, RIGHTS AND OBLIGATIONS OF A DESIGNATED NATIONAL INTERNET EXCHANGE POINT

a) The IXP must be Operator neutral, not for profit and owned by the IXP members.
b) The IXP shall operate a cost-sharing model for its Peering members with exchange of traffic done based on settlement free/cost-neutral transactions.
c) The IXP shall have full time team contracted to oversee its daily operations.
d) All infrastructure and personnel of the IXP Provider shall be located in Uganda.
e) The Governance model of the IXP shall comprise of the following:
   i) Three (3) individuals elected by the IXP members. Two (2) of these shall be from among the Peers and one (1) from the local internet community ,
   ii) The head of the management team of the IXP, and
   iii) A representative from the Ministry of ICT & National Guidance.
f) The IXP shall facilitate multilateral Peering on agreed terms and conditions.
g) The IXP shall communicate any change to its processes, membership fees, or governance in a timely manner to its members.
h) The IXP shall use existing communications infrastructure. Where such is not available, the IXP shall seek prior approval from the Commission to install or establish such infrastructure.
i) Any provider of Internet service to/for government organizations shall connect to the designated national IXP.
j) All IXPs authorised in accordance with the provisions of section 7.1 shall Peer with the designated national IXP.
k) The designated national IXP shall have the liberty to provide both public and private Peering services.

Question 7

Do you have any comment on the designation of a national internet exchange point as described in section 9 above? If yes, please elaborate

1) **The concept of a national IXP is of the mindset from the era if the national Telecoms carrier as was the case with Uganda Telecom Limited (UTL). Market liberalisation has moved beyond this so why conceive a national IXP?, a return to the past of sorts. It is also worth considering that the financial outlay to build an IXP is a small fraction of that required to establish a ISP so if one is needed then it will happen without the need for regulations like this.**

2) **If a distributed IXP interconnects the peering substrate it becomes a direct competitor of the ISPs who are the IXPs most essential members. I call this the "*IXP paradox*", compete with your members is the best way to push them away and an IXP without ISPs has no service to offer. IXPs are best served doing what they do best, offer a shared peering substrate to keep traffic local and leave transit functions to ISPs.**

3) **The mandatory connection of ISPs to IXPs will also potentially discourage foreign ISPs from establishing operations in Uganda. Such operators increase the competition on the International transit market which serves to reduce costs which can, and are, passed on to Ugandan businesses and consumers.**

4) **Rather that defining retrograde regulations, the promotion of regional technology hubs in regional cities and towns with the Uganda Investment Authority (UIA) to make such locations attractive for technology business by supporting the establishment of local IXPs and working with ISPs to ensure connectivity exists for these businesses to start and thrive.**

10. DISPUTE RESOLUTION

a) In the event of failure to resolve any differences or disputes with Peers, either party may refer the matter to the Commission for resolution.

b) The decision of the Commission shall be binding on all parties.

Question 8

Do you have any comment on the dispute resolution provisions proposed in section 10? If yes, please elaborate

1) **The ultimate arbitrator in Uganda is the courts not UCC, I believe (b) needs rewording to reflect this.**

11. ENFORCEMENT AND REMEDIAL MEASURES

a) Where a person or an IXP fails to comply with any of the terms or conditions of this framework including failing to submit information as required to be submitted under this framework, such IXP or person shall be deemed guilty of contravening the provisions of the Act.

b) Remedial action by the Commission in respect of such contravention may include:

i. issuance of a written warning with a deadline for compliance by the respective Operator;
ii. imposing fine in accordance with the Act;
iii. take any other enforcement measure the Commission shall deem as reasonable in the circumstances.

Question 9:

Do you have any remarks on the proposed enforcement provisions under this framework as spelt out in section 11? If yes, please state.

1) **I have no comment.**

12. AMENDMENT

These guidelines shall be reviewed regularly to ensure continued relevance and revised to accommodate developments in the industry.

General Comment

In the cases where there has been a regulatory intervention in IXP markets, it's either been a complete failure or else a regulatory attempt to fix other regulatory failures (e.g. trying to use IXPs to justify the perpetuation of incumbents). For example, a regulatory regime similar to this proposed framework was in India where there was an attempt to create a national IXP National Internet Exchange of India (NIXI) by diktat. For many years, this was held up as the textbook example of why IXP-by-regulation is a terrible, terrible idea, and almost guarantees failure. For 10 years in the second most populous country on earth, during a time of the explosion in the size of the wider internet market, NIXI failed to gain any real market traction. Due to a weakness in Indian regulation, it turned out that other IXPs could operate without a license and the Mumbai IX was formed. In a few short years, it completely overshadows NIXI.

I suggest that the UCC solicit some global IXP industry opinion, e.g. from the African IXP Association (AfIX), Euro-IX or some of the friendly larger IXPs who have regulatory experts like the London Internet eXchange (LINX) or the Netnod Internet Exchange in Sweden before attempting to implement this framework.

I conclude with a quote from the Internet Society in their guide to policy, management, and technical Issues relating to IXPs:

"*Governments should neither require IXPs to be licensed nor mandate peering and other policies concerning IXP operations. Governments can play a positive role to encourage networks to keep domestic traffic local. In particular, policies aimed at encouraging competitive access to leased lines and wireless connections will help lower costs associated with connecting to an IXP. Governments can also play a positive role by restraining anticompetitive behaviour of incumbents, including attempts by large carriers to block the development of IXPs.*"

Mike Jensen (2012). Promoting the use of Internet Exchange Points: A Guide to Policy, Management, and Technical Issues [online]. The Internet Society. Available at: https://www.internetsociety.org/wp-content/uploads/2012/12/promote-ixp-guide.pdf.