

THE HASHEMITE KINGDOM OF JORDAN  
Telecommunications Regulatory Commission (TRC)



Regulatory Decision for Establishing an  
Internet Exchange Point (IXP) in Jordan

Telecommunications Regulatory Commission  
TRC Board Decision No. (1-6 /2020) Date (23/04/2020)

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## **Explanatory memo**

The Telecommunications Regulatory Commission (TRC) announced the public consultation documents on the Regulatory Consultation for Internet Exchange Points (IXP) in Jordan. TRC stated that the proposed regulation aims to: enhance competition in the telecom market by improving the quality and prices of Internet services, meet the growing demand for Internet services in the Kingdom, attract foreign investment to meet the needs of the market, maintain the national Internet traffic within the Kingdom of Jordan and establish the Kingdom as a regional hub for Internet traffic.

TRC draft the Internet Exchange Points (IXP) Regulatory Decision to develop a world-class internet ecosystem, position Jordan as a regional hub for international internet traffic and improve the internet usage experience for beneficiaries in Jordan.

TRC conducted a study of the current market situation and regulatory environment in Jordan. Alongside, TRC also assessed global and regional best practice benchmarks. Conclusions of this study were considered while drafting this IXP Regulatory Decision.

The public consultation for the IXP Regulatory Decision Document received many comments from interested parties in a manner, which supported TRC views in setting this IXP Regulatory Decision Document. TRC considers the participation of the sector as an important aspect in the process of establishing the final regulatory decision and took into consideration the as many as views and comments from the sector.

### **Objectives**

In line with TRC official mandate and the policy objectives the IXP Regulatory Decision are three fold:

- Support the development of a world-class internet ecosystem in Jordan, including attracting international investment in the field
- Establish Jordan as a regional hub for international internet traffic
- Improve internet usage customer/ beneficiaries experience in Jordan.

TRC considers the development of IXPs along with the Regulatory Decision as important elements in achieving its identified objectives.

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TELECOMMUNICATIONS REGULATORY COMMISSION (TRC)  
REGULATORY DECISION FOR  
ESTABLISHMENT OF INTERNET EXCHANGE POINT (IXP) IN JORDAN

**Issued Pursuant to Articles 6(a), 6(b), 6(e) of the Telecommunications**

**Law No. (13) For the Year 1995 and its amendments, and Article (56) of the General Policy for the Information and Communications Technology and Postal Sectors, 2018**

## **1 SCOPE and AIM<sup>1</sup>**

1. The following terms constitute the **TRC's** regulatory decision on the establishing and provisioning of a National Internet Exchange Point (**IXP**) to facilitate network connection through a centralized physical network access point, which is expected to minimize the upstream traffic connected to international Gateways of Internet service provider's (**ISP**) members in the **IXP**, thus avoiding additional costs, moreover exchanging and caching Internet traffic, improving the bandwidth and the quality of Internet ecosystem traffic in Jordan.

This Regulatory Decision shall come into effect as of the date of its approval by the Board of Commissioners of TRC.

## **2 DEFINITIONS**

The following words and phrases shall have the meanings assigned thereto hereunder, unless the context indicates otherwise. Any words and phrases not defined hereunder shall have the meanings ascribed thereto in the Telecommunication Law and the Regulations issued pursuant thereto:

2.1 **“Policy”**: Government of Jordan’s GENERAL POLICY FOR THE ICT AND POSTAL SECTORS issued on 2018.

2.2 **“Telecommunications Law”**: means the Telecommunications Law (Law No. 13 of 1995 of Jordan, and its amendments.

2.3 **“TRC”**: The Telecommunication Regulatory Commission of Jordan.

2.4 **“License”** means the authorization granted by the TRC, or the contract or license agreement signed between the TRC and a Person (including all appendices and schedules

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<sup>1</sup> i- Note: This document is considered as a response to the comments received from the sector in addition to the responses provided by TRC to sector comments found in TRC web link <https://trc.gov.jo/DetailsPage/ConsultingDetails?ID=97>.

ii- Noting that the TRC took into account the comments of the sector into consideration as possible..

attached thereto), to allow a Person to establish, operate, and manage a Public Telecommunications Network, or provide Public Telecommunications Services, or use Radio Frequencies pursuant to the provisions of the Telecommunications Law and the by-laws and instructions issued pursuant thereto.

2.5 **“Licensee”**: the **Person** that obtains a public telecom license (**individual** or **class**) according to the **Law**

2.6 **“Person”**: means any individual, company, corporation, partnership, joint venture, consortium, government or governmental entity.

2.7 **“IXP”**: Internet Exchange Point established in Jordan and obtained a **license** from **TRC**, also called **IX**, or peering point. Both a physical networking location and a logical networking strategy, which facilitates connection between Internet-based networks, the IXP’s physical location hosting, managing day-to-day operations, and responsibility to support joining IXP members, is assigned to a neutral authority or organization. Thus the term “IXP” in this context shall therefore refer both to Infrastructure and the entity.

2.8 **“Member”**: The licensee (operator/ISP) whom connects to the **IXP**.

2.9 **“CDN”**: Content Delivery Network is an entity that owns a geographically distributed Network of servers which work together to provide fast delivery of Internet content participating in the **IXP**.

2.10 **“Interconnection”**: means the physical and logical linking of the Telecommunications Systems in order to allow the Users of one Telecommunications Systems to communicate with Users of the same or another Telecommunications Systems or to access services provided by another Licensee. And it is subject to Interconnection Instructions issued by TRC.

2.11 **“Private Telecommunications Network”**: means the Telecommunications System operated for the benefit of a single Person or a single group of Persons under common ownership to serve their own needs.

2.12. **‘Public Network Operator’** or **‘Operator’** means a Licensee that is an operator of a Public Telecommunications Network.

2.13 **“Internet Service Provider” (ISP)**: means any telecommunications licensee who holds a license to provide access to Internet and other data networks services according to the Telecommunications Law.

2.14 **“Public Telecommunications Network”** or **‘Network’**: means a Telecommunications System or a group of Telecommunications Systems for the

offering of Public Telecommunications Services to users pursuant to the provision of the Law.

2.15 “**Public Telecommunications Services**” means a telecommunications service provided for compensation to the general public or any category thereof, in accordance with the Law.

2.16 “**Telecommunications System**” means any transmission or switching device or other device or Information system or instrument used to convey, receive or transmit Telecommunications signals for the purpose of providing Public or Private Telecommunications Services as the case may be.

2.17 “**Traffic**”: means any data relating to a communication by means of a computer system, generated by an information system that forms part in the chain of communication, indicating its origin, destination, path or route, time, date, size, duration or type of underlying network service.

2.18 “**Bilateral agreement (BA)**”: a TRC-approved Bilateral Peering Agreement (BA), where Member enters into bilateral agreement with other Members.

2.19 “**Multilateral Agreement (MA)**”: a TRC-approved agreement which will be between the **IXP** and each and every **Member**.

2.20 “**Transit**”: Traffic received from one **Operator** and routed to the Network of the same or a different Operator. In other words, the transit provider Operator handles Traffic that is neither originated nor terminated within its own Network.

2.21 “**Class License**” means a License to provide Public Telecommunications Services and/or operate Public Telecommunications Networks (i) not requiring the use of Scarce Resources, or (ii) requiring the use of Scarce Resources that have been specifically exempted by the TRC from an Individual License requirement.

2.22 “**Individual License**” means a License to provide Public Telecommunications Services and/or operate Public Telecommunications Networks that use in the provision of some or all services or operation of networks Scarce Resources that have not been specifically exempted by the TRC from an Individual License requirement.

2.23 “**Border Gateway Protocol (BGP)**”: is a standardized exterior gateway protocol designed to exchange routing and reachability information among autonomous systems (AS) on the Internet.

2.24 “**Autonomous system (AS)**”: is a collection of connected Internet Protocol (IP) routing prefixes under the control of one or more network operators on behalf of a single administrative entity or domain that presents a common, clearly defined routing policy to the Internet.

2.25 “**Internet protocol**” (IP): is the method or protocol by which data is sent from one terminal to another on the Internet. Each terminal on the Internet has at least one IP address that uniquely identifies it from all other terminals on the Internet.

2.26 “**eBGP**” is the protocol used to transport information to other BGP enabled systems in different autonomous systems (AS).

2.27 “**Routing Information Base RIB**”: is a routing table which is a data table stored in a router or a networked computer that lists the routes to particular network destinations, and in some cases, metrics (distances) associated with those routes.

2.28 “**RIPE NCC**”: (is an open and voluntary organization of European ISP, the Regional Internet Registry for Europe, the Middle East and parts of Asia..

2.29 “**Information system**” means: The set of programs and tools designed to create data or information electronically, send or receive it, or process it, store it, manage it, or display it by electronic means.

2.30 "**Peering**" the term used for exchanging traffic on the IXP. Peering is a bilateral agreement between two ISPs. There is no rule that governing how to peer with all other ISPs on the IXP. It is up to the individual ISP who they want to peer with.

2.31 "**User**" means any person using the services of an a telecommunications licensee.

2.32 "**Interconnection Instructions**": Instructions Issued by TRC Board Decision No.(2-1/2005) Dated (5/1/2005) And amended by TRC Board Decision No.(18-11/2010) Dated(15/6/2010). And any new approved amendments will apply.

2.33 "**Neutral**": Means that no member has a competitive advantage from the IXP location, and that the IXP itself does not favor one member over any other at all circumstances and conditions.

### 3 GENERAL PRINCIPLES

The actions taken by the TRC pursuant to this Regulatory Decision shall take the following into consideration:

3.1 Implemented in an objective and impartial manner.

3.2 Conducted in accordance with best standards of transparency taking into consideration the need to protect the national interest.

3.3 Conducted in accordance to the approvals issued by TRC with the corporation of the **IXP**.

### 4 DUTIES AND RESPONSABILITIES OF THE IXP

4.1 The **IXP** should be responsible for day-to-day operations, in addition to the ability to allow for non-profit or commercial and revenue to **Members** by facilitating **BA**'s and encouraging international **CDN**'s to join.

4.2 The **IXP** in coordination with **Members** shall provide required devices and equipment required to connect to the **IXP**, initial equipment will include all devices for functioning on Layer 2 only on the establishment phase, once a **CDN** or **person** wishes to connect to **IXP**, **Members** who share services with the **CDN** should allow Layer 3 traffic.

4.3 All **Members** should be treated on a non-discriminative basis.

4.4 The **IXP** shall sign a **MA** with each **Member** including but not limited to:

4.4.1 The Capital expenditures (CAPEX) and Operating expenses (OPEX) cost of the IXP will be divided on all **Members**.

4.4.2 Any future **Member** shall endure the costs and expenses as decided by the **IXP**, taking into consideration the expenses and cost endured by previous **Members**.

4.4.3 By default, Transit traffic will not be open at the establishment phase, unless two **Members** sign a **BA**.

4.4.4 Minimum performance and operational requirements including at least those mentioned in section 2 /APPENDIX 1.

4.5 If a **Member** wishes to withdraw from the IXP at any stage, a formal letter should be conveyed to **TRC** and **IXP** explaining the detailed reasons, **TRC** will study the justification and provide the suitable decision in coordination with the **IXP**.

4.6 **IXP** must receive a communication from the **Member** before the 31st of October that states that they want to cancel their Membership as of the 31st of December of that same year. Otherwise the **Member** will be subject to any financial commitment as stated in the **MA** signed with the **IXP**.

4.7 **TRC** may terminate a **Member's** membership if it feels that it has in anyway acted outside the terms and conditions that have been agreed upon or it is felt that the **Member** is causing some harm to the **IXP**

4.8 If there is a need for a redundant IXP location in the future, details shall be determined by **TRC** in coordination with the **IXP**.

## 5 GENERAL PROVISIONS

5.1 The main goal is to enable the traffic exchange locally without routing through international networks. However IXP can also be used for routing of internet traffic between the networks in Jordan and the peer or downstream networks of IXP participants in other countries. IXP serves IXP **Members** that hold licenses, and local and international Research and Education networks as well as international network services providers and Internet exchanges via the IXP Members. More details regarding General Provisions are available in APPENDIX I accompanying this Decision.

5.2 There will be no limitation for the number of **Members** allowed to join the **IXP**, taking into consideration any future issued decisions in this concern from TRC.

5.3 **IXP** and **Members** should adhere to TRC's regulatory decisions and instructions.

## 6 DISPUTE RESOLUTION

6.1 Any unresolved dispute between **Members** themselves or between **Members** and the **IXP** regarding the terms and conditions of joining the IXP or relating to any matter concerning the implementation of this Regulatory Decision, and prior to TRC intervention, the disputed parties should meet within 15 working days of written notice of the dispute from one party to the other (or such longer time as mutually agreed in writing) to negotiate in good faith in an effort to settle such dispute.

6.1 if the dispute persists, One of the disputed parties can inform TRC in writing about the dispute details, then TRC should intervene and employ easily accessible and in principle, inexpensive procedures to help resolving such dispute in a fair, transparent and timely manner.

6.3 The existence of a dispute about the terms and conditions of connection to the IXP or with regard to any matter concerning the implementation of this Regulatory Decision shall not exempt, suspend or postpone the obligation of the **Member** to connect to the **IXP** in terms of this Decision

## 7 IXP SELECTION PROCESS

The IXP Selection process shall apply to each and every new IXP location (Redundant or new) meant to serve Jordanian territories, therefore the process will help to select and evaluate multiple options fairly to be able to decide the most convenient option for the National benefit. The winning applicant should be a Neutral Entity (Refer to Definitions) meaning should have no competitive advantage from having this particular applicant as an IXP, regarding the physical location or the applicant existence. Therefore the applicant shall present what proves this information upon TRC's convenience, and based on that TRC will proceed with the evaluation, otherwise the application will be discarded.

1-TRC announces the need for initiating the IXP installment process on Public media, newspapers and any suitable mean.

2-Any number of applicants can apply by submitting a formal letter and submission of required form illustrated in section 8 of this document, within (30 days) of the date of the announcement, in which any application received after 30 day will be automatically discarded.

3-After the 30 days and within 5 working days ,TRC will therefore start the process of evaluating the applicant IXPs (out of 100%) upon the following grading criteria which is filled in dedicated form for each applicant:

- Readiness for operation in less than 3 months from the date of the application in terms of location and datacenter preparedness, and the proposed location easiness to connect optical fiber for all members as well as enough room space for future growth, and considered a low risk area. (20 marks)
- Each applicant shall prepare a proper plan, explaining the preparedness for management operations of IXP in terms of personnel, willing to cooperate with members, planning to get funds (if needed for the future), planning to attract CDNs, and future revenues from a national perspective. (40 marks)
- Answering TRC inquiries and demo Presentation at TRC premises (20 marks).
- Physical Location considered a low risk Area (safe from disasters, and away from critical zones, Datacenter should consider High availability and Redundancy at all aspects (Please refer to Appendix Section 6 Redundancy and High-Availability) in terms of having two switches, two routers, for each member and preferably from different vendors (in case any patch or update from manufacturer corrupted one at stays up and running), Multiple electricity power feeds, and multiple power sources for each device). (20 marks)

4-If no application received within the 90 days of TRC's announcement, TRC will contact two or many prospect applicants inviting them to apply accordingly, TRC has the right to consult any International or domestic organization during the evaluation process.

5-TRC will review and evaluate all applications in which the time will depend on the number of applicants, and evaluate according to the application form, and inform the winning applicant by a formal signing ceremony. All other applicants will receive a sealed envelope with the results maintain their right to apply for any further IXP in the future.

6-TRC has the right to perform audit checks to the IXP any time at any condition (s).

## 8 Selection Check-List Evaluation Form

P.S: All sections are mandatory; please provide all required attachments and suitable supplementary documents when submitting this form.

### A- General Information

Organization Name:

Organization Description Details (Scope of work, Website, Headquarters and Affiliations, Offices in Jordan, Operating countries..etc.)

### Authorized Personnel/s Names

Full Name:

Position :

Email :

Mobile No.

Office Number:

Fax:

☐ I certify that all provided information is true and reliable, and I shall provide an approved copy of the following documents:

☐ National ID card for authorized personnel.

☐ Trade Name Registry issued from Ministry of Industry, trade and supply ([www.mit.gov.jo](http://www.mit.gov.jo) )

☐ Statement of non-bankruptcy or ☐ formal signed credit report.

## B- Business Mindset

Through the preparation of the IXP project, Please explain in details how your organization will fulfill and plan the following tasks:

Communicate the prospect participants or members, bringing them together, installing the technology and successfully launch the IXP, please specify duration for this task while providing details.



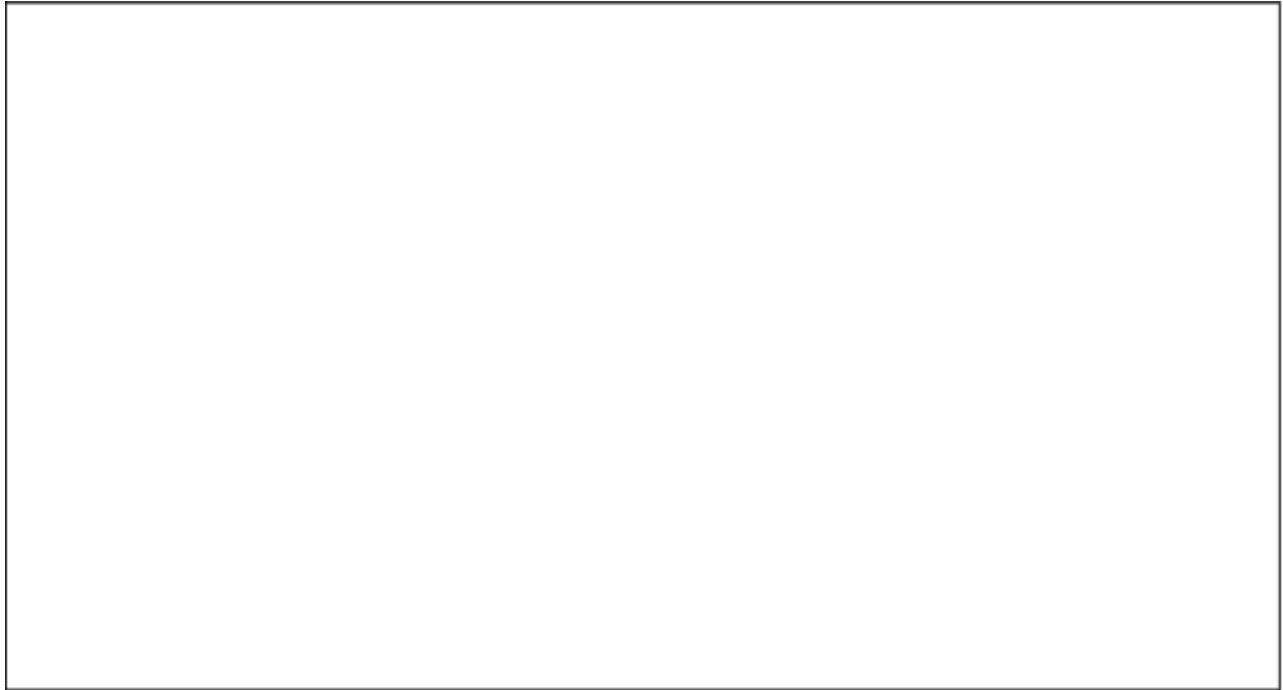
☐ I will submit the project plan with duration to TRC.

Over time, increased traffic and membership can increase demands on the infrastructure and management of the IXP. To cope, an IXP might need new or additional equipment, more space, and/or more people to run it, how will your organization cope with the future growth?



An IXP must be visible. The visibility is important and a mixture of awareness raising and branding (influence how people see you, eg stable, secure, value of the IXP, to be able to turn it to a

competitive through attracting CDN's like Google Global Cache (GGC) or Amazon Cloud Front CDN Services, How your organization plans to achieve that and influence the market?



The IXP location should easily acquire infrastructure, optic cable connectivity, safely monitored, well equipped, and having enough room space ready to expect future growth and sustainability is crucial for the success, explain your organization's available option/s for the IXP physical location and how it will help to the project success.



☐ I will provide sketch diagram for the IXP proposed data center topology and equipment.

THE HASHEMITE KINGDOM OF JORDAN  
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**-APPENDIX I-**

*Of*

Regulatory Decision for Establishing an  
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# TELECOMMUNICATIONS REGULATORY COMMISSION (TRC)

## Regulatory Decision for Establishing an

## Internet Exchange Point (IXP) in Jordan

This document is supplementary and an essential part of the Regulatory decision for Establishing an Internet Exchange Point (IXP) in Jordan, the document will tend to illustrate more in depth look of main pillars of establishing an Internet Exchange point in Jordan, from a technical perspective.

Note: any difficulties to explain any term, word or a definition please review section 2 “Definitions” of the Regulatory decision.

### 1 Peering

1.1 IXPs shall be connected to each point. IXP connection topology shall be organized at Layer2.

1.2 Members who will exchange cross-country traffic should provide not less than 10 Gbps uplink speed.

1.3 In order to increase local internet traffic and improve quality, ISP can connect to the IXP and if provide internet service for public organizations, shall connect to the IXP located at the National Datacenter

1.4 Rights and obligations of parties connected to the IXP shall be regulated by the MA mentioned in section (2) that will be between the **IXP** and the **Member**, and the **BA** between two **Members**. both MA and BA specify all technical conditions and all other details, and shall be reviewed and approved by TRC.

1.5 Connection line connecting IXPs shall be not less than 10 Gbps and connection lines connecting Members shall be not less than 1Gbps in terms of capacity.

1.6 BGP, one of the dynamic connection types, shall be used for IXP.

1.7 IXPs shall offer the same service and technical conditions for the Member.

1.8 IXPs shall organize activities regarding creation and update of routing table which will be used in local internet traffic exchange.

1.9 Only own network information or IP address obtained from NITC and/or RIPE NCC shall be transmitted to IPXs.

1.10 Local traffic routing shall be done according to the routing table generated by the use of eBGP from routing table of special license holders registered at IPXs

1.11 If transmission facility utilization reaches 80% in the IXP, either transmission facility channel or equipment shall be extended.

1.12 Each **Member** shall have transmission channel and connection completely separated from any other internet connection transmission channel and connection, and shall not put speed limit for transmission facility, channel and IP network equipment and for its software.

## **2 Minimum Performance and Operational Requirements**

2.1 All critical components of the IXP should be up for 99.95 % of time in a quarter. These Critical components are mainly IXP routers/Switches, interface module on which the links of the ISPs are terminated and any other equipment which affects the IXP traffic. Non critical faults which do not affect IXP traffic like failure of one power supply module should be rectified by IXP within max of 12 hours.

2.2 Switching architecture of IXP shall be non-blocking, so that it does not introduce any delay.

2.3 Uninterrupted power shall be ensured to the equipment of the ISP and IXP router itself in the IXP node. Power availability can be 99.00% in a quarter

2.4 IXP shall ensure proper environment (Proper Air conditioning with Humidity control) for IXPing the equipment's of IXP members.

2.5 Augmentation of IXP members' bandwidth to IXP: - IXP member shall augment its bandwidth to IXP, if the utilization of the existing link exceeds 80% of the capacity for 4 hrs. in a day and for 7 days. Such capacity management shall be through increase of capacity and not through reduction routes announced. The augmentation should normally be completed within a period of one month after IXP reported to the concerned IXP member. This time should be extendable by one more month in valid cases like IXP member having tangible problem and in case some additional equipment's are required to be procured.

2.6 Facility for ensuring security of IXP equipment like access control, monitoring and keeping records of entry in equipment room etc..

2.7 IXPs shall regularly and transparently distribute information to Members in conformity to Quality level determined by the following indicators:

- Packet loss
- Packet delay
- Packet Utilization
- CPU usage information of IXPs and IXP member
- Connection types of all IXP members connected to IXPs and their load
- IXPs shall ensure reliable and constant service and monitoring (24x7x365) Activities.

## **3 GENERAL PROVISIONS**

3.1 It shall be an obligation of an IXP to accept connection with Operator/ISP in accordance with the following:

- It shall be the obligation of every **Member** to connect its computer system and to keep it connected at all times (24/7) to the IXP for the purpose of facilitating the efficient routing and connection of Internet Protocol transit networks within Jordan and of minimizing the use of international Gateways for Internet Protocol traffic between Internet users in Jordan.
- It shall be the obligation of every IXP **Member** to distribute and receive routing information for local traffic data to or from all **Members** of the IXP.

3.2 The IXP shall be entitled to demand such a reasonable extent of traffic data and engineering data from IXP Members as is necessary and proportionate for it to be able to perform its functions efficiently.

3.3 Any data collected by the IXP in terms of this regulatory decision shall be kept confidential subject to any obligation of disclosure in accordance with the applicable Legislations.

3.4 The IXP Members shall comply with the telecommunications law and regulations in respect of any data collected in pursuance of this regulatory decision.

## **4 OPERATIONS MANAGEMENT**

4.1 IXP shall have a system to monitor the traffic statistics of the IXP. Typically incoming and outgoing bits of each port, and sum all those up to create an aggregated statistic.

4.2 IXP provides statistics to members showing the amount of traffic exchanged per peering and any usable statistics and monitoring Keep-Alive messages.

4.3 The following principles shall be complied by the IXP for troubleshooting:

- When troubleshooting occurs, immediately inform related parties by using fully automated control system.
- Involved members shall quickly repair and troubleshoot.
- IXP should Record troubleshooting type/classification, period and solutions, and analyze.
- IXP should agree with all Members to define proper down-time in the MA.

4.4 IXP Data center standard security operations should be according to ISO 27001.

## **5 TECHNICAL REQUIREMENTS**

### **5.1 Physical Connection**

5.1.1 Slower speed Ethernet interfaces (10/100) should be configured with duplex, speed and other configurations and not be auto-sensing. GigE and higher speed interfaces should be configured to be auto negotiating.

5.1.2 Category 5e or higher cables should be for copper connects

5.1.3 Single-mode Fiber for optical connects.

5.1.4 Use of standards based 1000 Base-LX, 10GBase-LR, 10GBase-ER, 100GBase-LR4, and 100GBase-ER4 optics (or their MSA approved -lite or newer versions).

5.1.5 The ports should support IEEE 802.3ad Link Aggregation (LACP) or multipath to distribute load across multiple connect ports.

## **5.2 Ethernet MAC Layer**

5.2.1 Frames forwarded towards the interconnect ports shall have one of the following ether types:

0x0800 – IPv4

0x0806 – ARP

0x86dd – IPv6

5.2.2 Frames forwarded on the connection circuits should have same source MAC address. For link-aggregated ports, all Member interfaces should be treated as a single circuit.

5.2.3 No broadcast or multicast traffic should be forwarded on the private connect

5.2.4 Link-local traffic should be limited to the following protocols.

## **5.3 ARP**

5.3.1 IPv6 Neighbor solicitations and advertisements

Link-local protocols are: IRDP, ICMP redirects, IEEE802 Spanning Tree, Vendor proprietary discovery protocols (e.g. CDP, EDP), Interior routing protocol broadcasts (e.g. OSPF, ISIS, IGRP, EIGRP), BOOTP/DHCP, PIM-SM, PIM-DM, DVMRP. These should be disabled on the interconnection facing interfaces

## **5.4 IP Address**

5.4.1 Private interconnection is recommended to use /31 or /30 for IPv4 link-local addresses, and /127 or /64 for IPv6 link-local addresses. IPv6 site-local addresses shall not be used. rDNS should be configured with mutual agreement

## **5.5 Routing**

5.5.1 Support Border Gateway Protocol (“BGP”) version 4 routing protocol for propagating routing information across the connection.

5.5.2 Support both IPv4 unicast and IPv6 unicast traffic as native or dual-stacked.

5.5.3 Accept any appropriately IRR-registered prefix announcements up to /24 in length for IPv4 and 4 and /48 in length for IPv6.

5.5.4 Employ a routing policy that ensures that traffic generally follows a closest-exit behavior

5.5.5 Support BGP prefix filter updates using the Internet Route Registries (“IRR”), with automated router configuration updates occurring no less than every 24 hours: RADB, ALTDB, RIPE, APNIC and ARIN

## **5.6 Forwarding Requirements**

5.6.1 Traffic on connection interfaces shall forwarded only to routes being advertised across the connection. Any kind of static shouldn’t be done.

## **5.7 Looking Glass and non-routing devices:**

5.7.1 When a BGP speaker is collecting routing information for analysis and not for immediate routing decisions, the BGP speaker may use a private AS number and should not advertise any routes.

## **5.8 Optional Requirements:**

5.8.1 These are evolving requirements, and may be required by some peers, and will be increasingly more important in coming years.

5.8.2 Support BGP prefix filters using ROAs for origin ASN validation for directly connected peers, or use RPKI based validation for all route and traffic exchange.

5.8.3 Peers may require that peering partners do not have no end-of-life equipment or software.

5.8.4 Peers may require that parties do not prioritize any Internet traffic which passes across Peers backbone, and customer links except for traffic associated with reasonable network management;

5.8.5 Peers Support a comprehensive and documented BGP community scheme for marking prefixes sent to each-other identifying: prefix origin (incl. City, State/Province, Country, Continent) and prefix type (customer, internal);

5.8.6 Support BGP community triggered packet discard (blackholing) of traffic within the Network supporting IPv4 prefixes up to /32 and IPv6 prefixes up to /128;

## **6 Redundancy and High-Availability**

6.1 Each member should use two switches (from different vendors) and two routers for redundancy and loadsharing.

6.2 The IXP operations' availability, support and services should be functional 24x7.

6.3 As IXP infrastructure increases, redundancy considerations should be applied accordingly.

6.4 IXP should use high-end equipment and raises its peer's confidence level.

6.5 All the devices shall have redundant power supplies. Multiple powers sources so each supply should be connected to a separate feed or source.

6.6 to Avoid a single point of failure for hardware, it is highly recommended to rely on modular devices, where it is possible to have redundant CPU and forwarding cards.

6.7 For each software ecosystem that is implemented in the IXP at any stage, software flow should therefore connect to modular infrastructure to avoid any single point of hardware failure and cutting the operations.

6.8 According to NIST<sup>(1)</sup>, at the level of 99.95% availability, 4.38 hours of downtime are to be expected in a year. Periods of scheduled maintenance are usually excluded as a source of downtime, IXP's acceptable up time shall be 99.95%.

NIST: National institute of standards and Technology, standards and recommendation for high availability

<https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-144.pdf>