Internet Society
Learning

Introduction to Internet Exchange Points

Concept and Models of IXPs

Port of Spain
June 2025

By Internet Society

Agenda

01 What is an IXP?

02 How do IXPs Work

03 Starting an IXP

4 IXP Infrastructure

5 IXP Global Summary

6 50/50 Vision

7 Pulse info for Trinidad

What is an IXP?

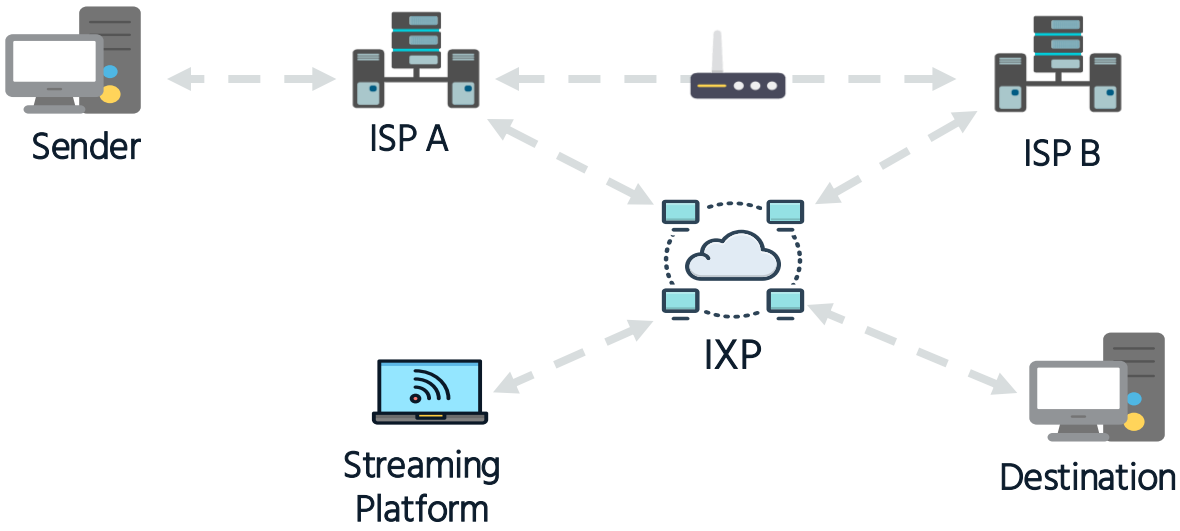
An Internet exchange point (IXP) enables local networks to efficiently exchange information at a common point within a country rather than needing to exchange local Internet traffic overseas.

An Analogy: Airports and IXPs

- IXPs facilitate data transfer like airports facilitate travel
- More connections = higher value
- Neutral facilities attract more networks

How IXPs Work?

- Networks (Autonomous Systems defined in RFC1930) connect to exchange traffic
- Border Gateway Protocol (BGP) manages routing (RFC4271)
- Peering: ISPs agree to exchange traffic directly



Do's and Don'ts

- IXPs are not, generally, involved in the peering agreements between connected ISPs;
- IXPs do not provide services that compete with its members
- IXPs do however have requirements that an ISP must meet to connect to the IXP;
- All IXPs have rules for correct use of the IXP.

IXP Startup Challenges

Technical: Switch, IP space, rack space

Organizational: Governance, neutrality

Community: Stakeholder buy-in

- Bringing together peers and forming a community
- Low initial traffic
- Choosing appropriate governance and business models
- Securing initial funding and resources.
- Addressing regulatory and policy constraints.

IXP Models and Infrastructure

Institutional and Operational Models for IXPs

Model Type	Regions	Example IXPs	Characteristics
Non-Profit	Africa, Europe	KIXP (Kenya), NAPAfrica (SA)	Neutral, often run by ISPs or associations
Commercial	North America, some EU	Equinix IXs, LINX, DE-CIX, CoreSite	For-profit, tied to datacenter businesses
Academic/Gov't	Asia, Africa	HKIX (Hong Kong), UIXP (Uganda)	Supported by universities or national institutions

Why Consider a Non-Profit Model

- Most emerging IXPs have a common objective of their founders to improve Internet connectivity rather than being built as a company
- With the involvement of non-commercial entities such as NRENs, ccTLDs, and governmental institutions, it is easier to establish an IXP as a non-profit entity
- A non-commercial entity is possibly better placed to maintain neutrality

IXP Ownership and Governance: Key Considerations and Scope

Neutrality Risk: If an ISP owns IXP infrastructure and is acquired, neutrality and operational stability may be compromised.

Donated Assets: Many IXPs begin with donated resources; clear written agreements and maintenance responsibilities are essential.

Consensus-Based Startups: Informal, cooperative governance works for small/startup IXPs but may not scale as the IXP grows.

Need for Structure: A formal governance model ensures neutrality, legal compliance, and financial sustainability as the IXP matures.

- IXPs may limit themselves to basic switching or offer additional services like route servers, CDN or DNS.
- Some IXPs also act as industry forums or associations, providing mailing lists, meetings, and policy engagement.
- Ultimately, scope should be guided by the IXP's mandate and member consensus—with activities transparently documented and supported by the community.

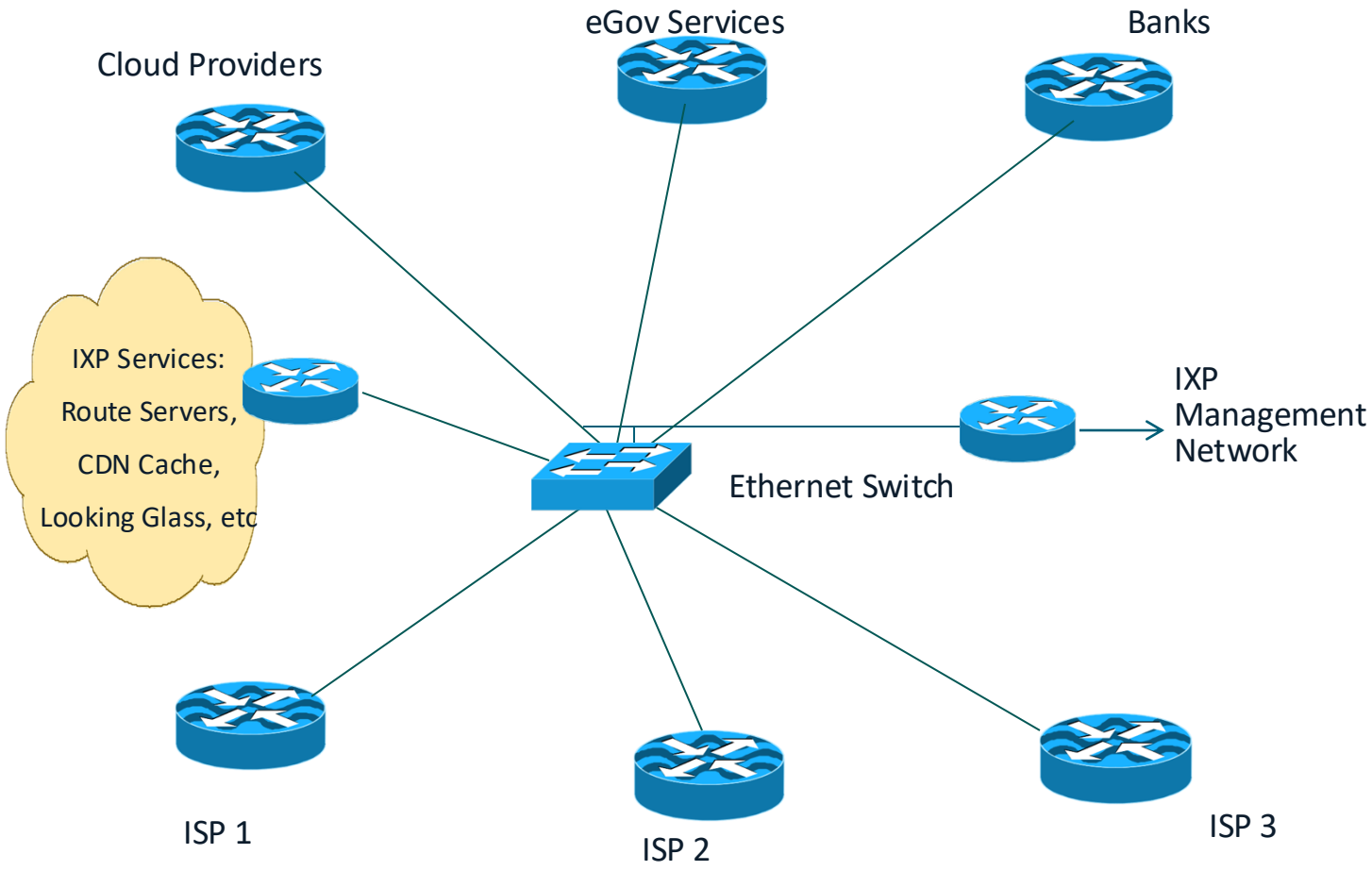
IXP Architecture: Layer 2

The vast majority of IXPs have adopted a layer 2 switched Ethernet architecture.

Layer 2 Ethernet Switch: Facilitates direct interconnection among members.

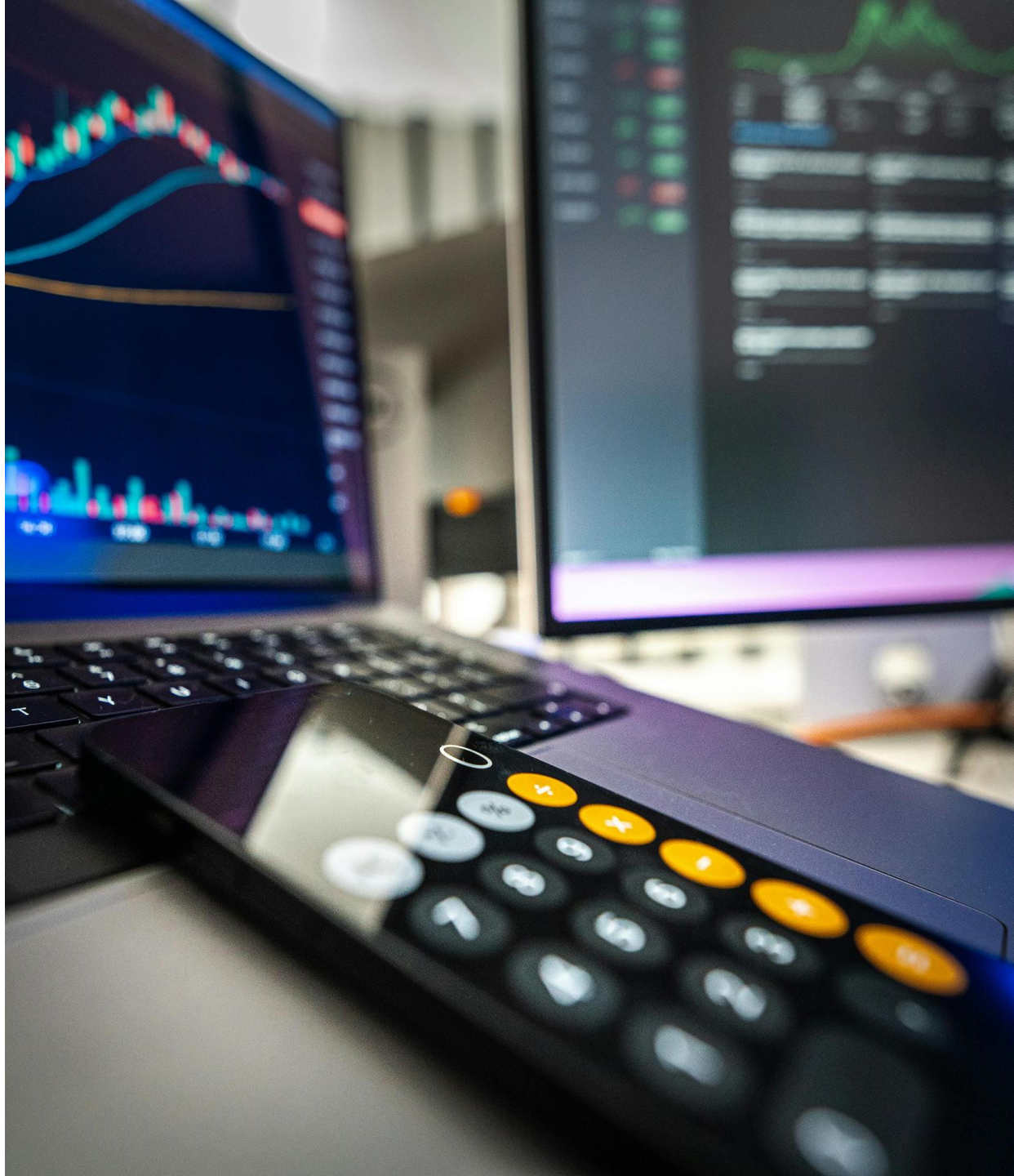
Address Space (Mandatory):
The IXP will require IP address space for the peering Switch fabric. IP addresses are requested from the regional RIR

Route Servers: Simplify the peering process by allowing multiple networks to exchange routing information.



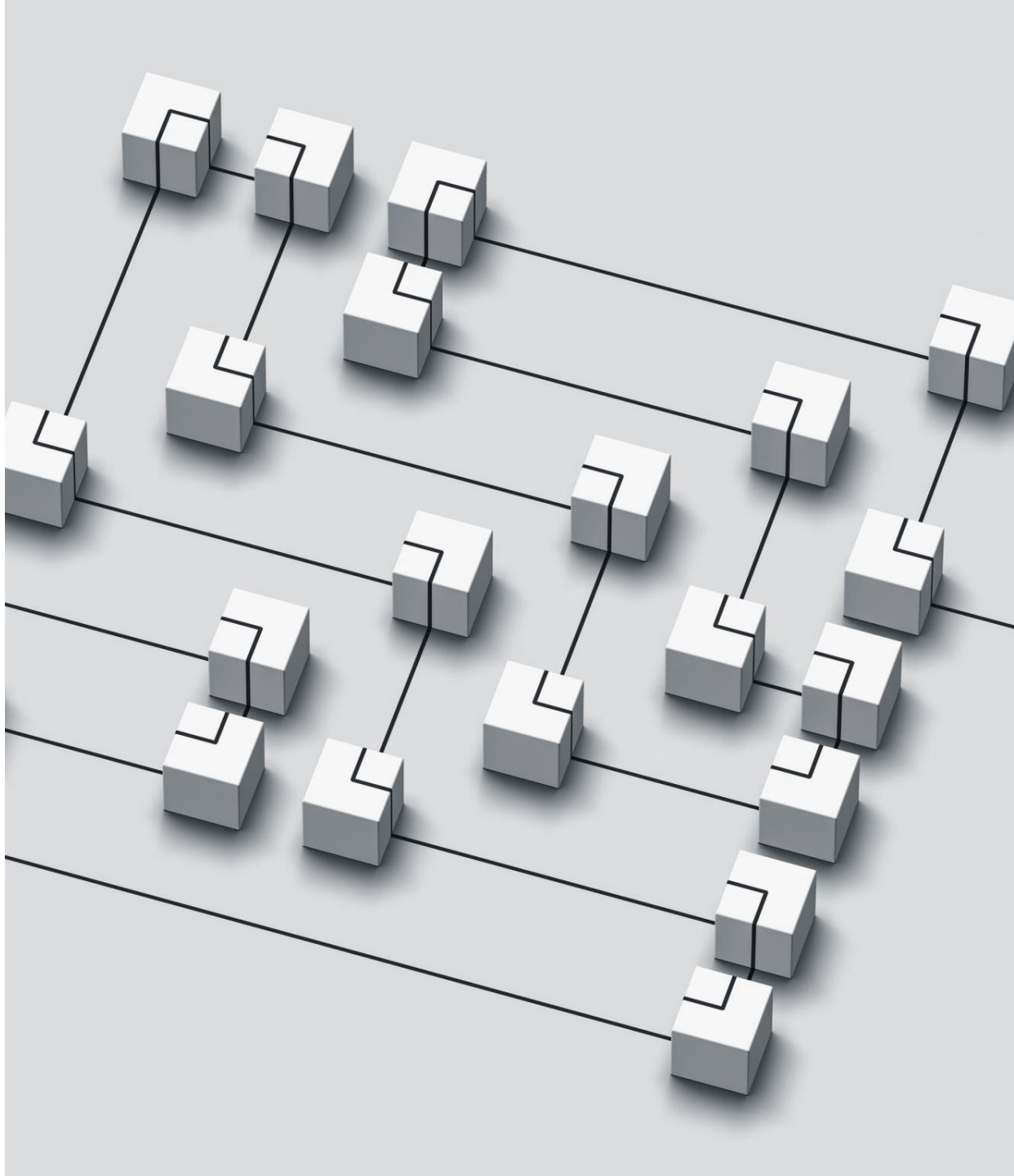
Value-Added Services

- DNS Root Instances: Enhance local DNS query resolution, improving speed.
- Route Collectors (optional): Assist in monitoring and analyzing traffic patterns for optimization.
- Traffic Monitoring and Analysis Tools: Provide insights into traffic flows, aiding in capacity planning and security.
- Content Delivery Network (CDN) Caches: Store popular content locally, reducing latency and international bandwidth usage
- Network Time Protocol (NTP) Services: Ensure synchronized time across connected networks.



Strategic Location Considerations

- Neutral Colocation Facilities: Provide equitable access to all participants.
- Proximity to Network Operators: Reduces infrastructure costs and latency.
- Access to Reliable Power and Cooling Systems: Ensures uninterrupted operations.



Personnel

It is likely that a start-up IXP will not have any directly employed staff. However, it is important to think about the role and skill sets of the personnel.

Roles and Skills

Management

Engineering and Technical Support

Office/Admin

Sales and Marketing

Future Roles

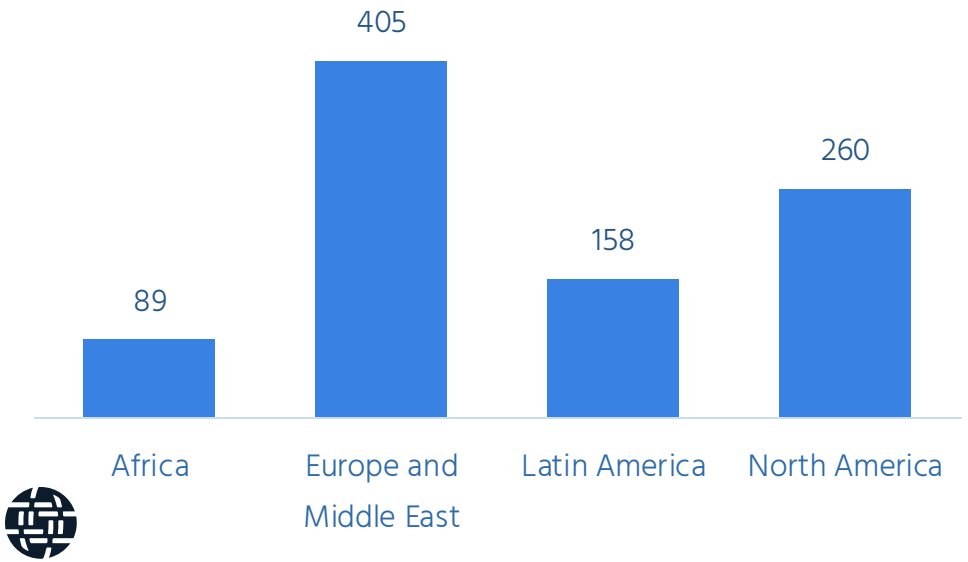
Future roles will require more specialized staff such as systems administration, webmaster, human resources, community engagement, financial control and legal representation.

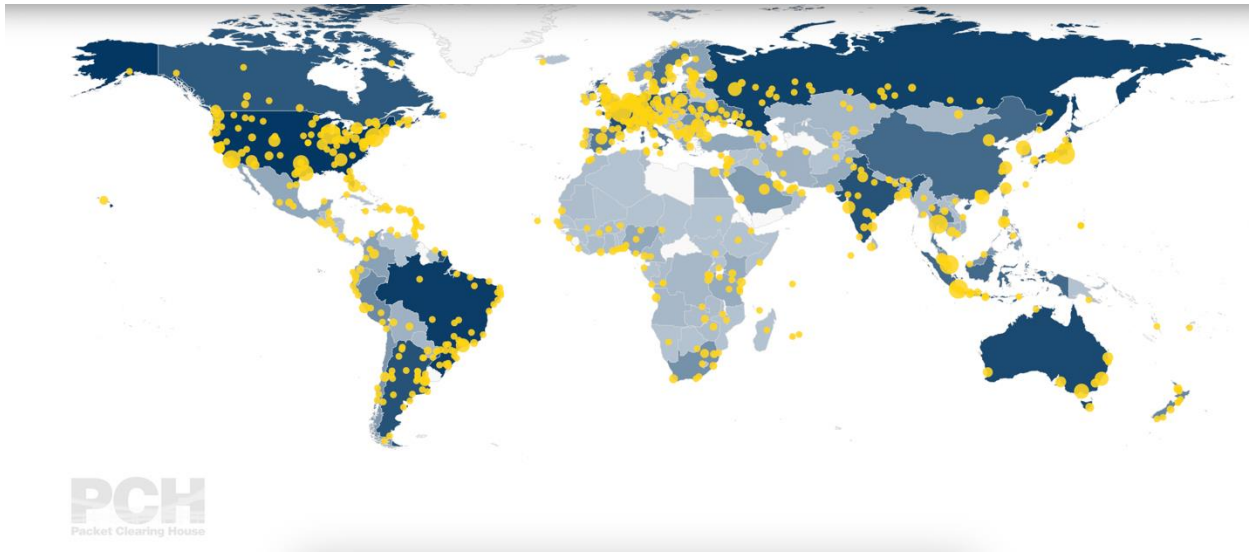
IXP Global Summary

Global Snapshot of IXPs (March 2025)

Accelerating Local Internet Growth Through Efficient Interconnection

- 700+ IXPs worldwide across 130+ countries
- IXPs serve as the backbone of local Internet ecosystems
- Increasing presence in developing regions



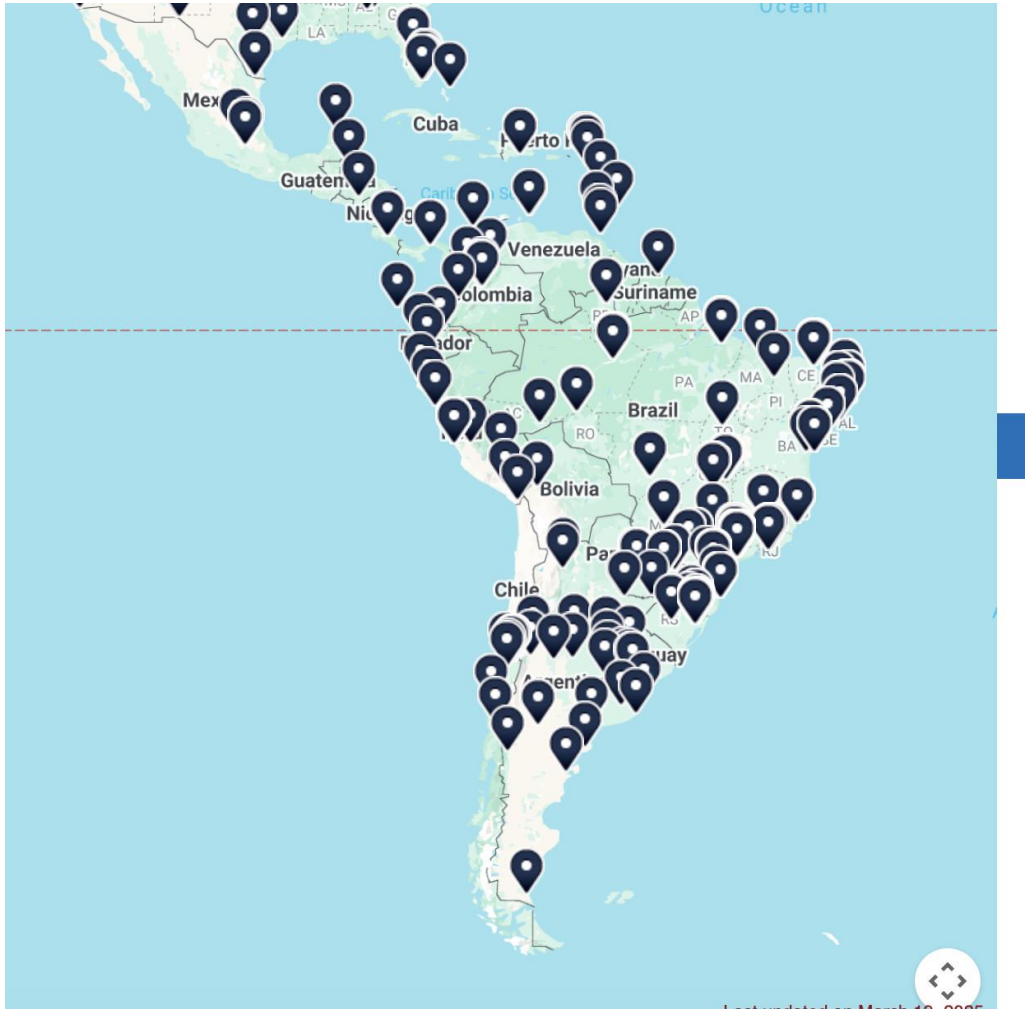


Summary of North America IXP

- 250+ IXPs in Canada and USA
- Majority are commercial (Equinix, CoreSite, etc.)
- High use of private interconnects between large networks
- IXPs often bundled with datacenter offerings

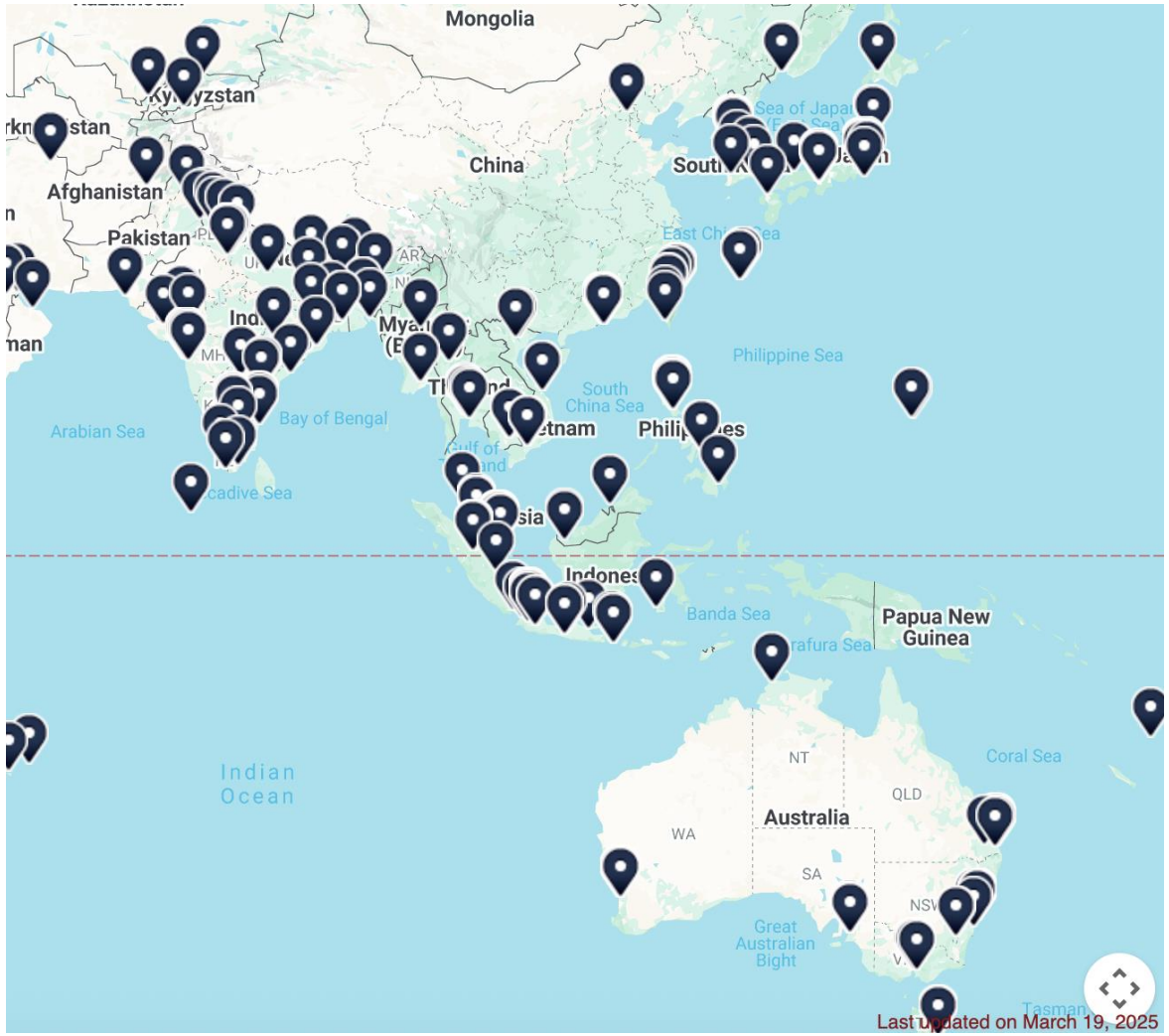
Summary of Latin America & Caribbean IXPs

- 150+ IXPs over 30 countries
- Brazil leads with 30+ IXPs operated by NIC.br
- Argentina, Colombia, Chile have active exchanges
- Regional interconnection remains a challenge; much traffic routed via Miami



Summary of Asia-Pacific IXP

- 270+ IXPs in 30+ countries
- Key IXPs: HKIX, JPIX, DE-CIX India, MyIX (Malaysia)
- Growth driven by language, content localization, cable landing stations
- Most IXPs are non-profit, university or ISP-led



Summary of Europe & Middle East IXP

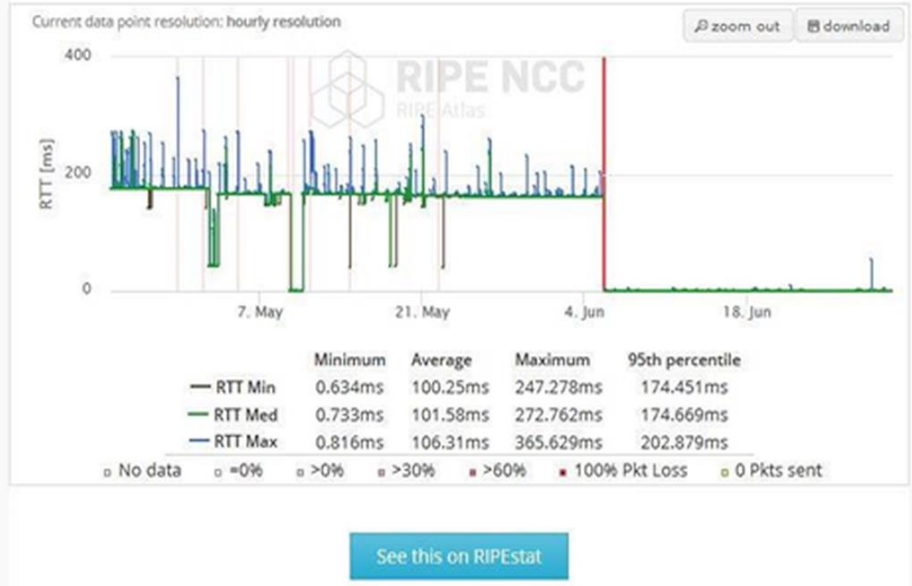
- 400+ IXPs in 50+ countries
- Europe: 180+ IXPs, home to DE-CIX (Frankfurt), AMS-IX (Amsterdam), LINX (London)
- Middle East growing fast: UAE-IX, SAIX, JEDIX
- Strong ecosystem supported by neutral colocation facilities and liberalized telecom markets

Summary of IXPs in Africa (2024)

- 80+ IXPs in over 40 countries
- Notable IXPs: NAP Africa (South Africa), KIXP (Kenya), IXPN (Nigeria)
- Rapid growth due to ISOC/AXIS initiatives and policy support
- Key trend: More CDNs and Root DNS instances hosted locally

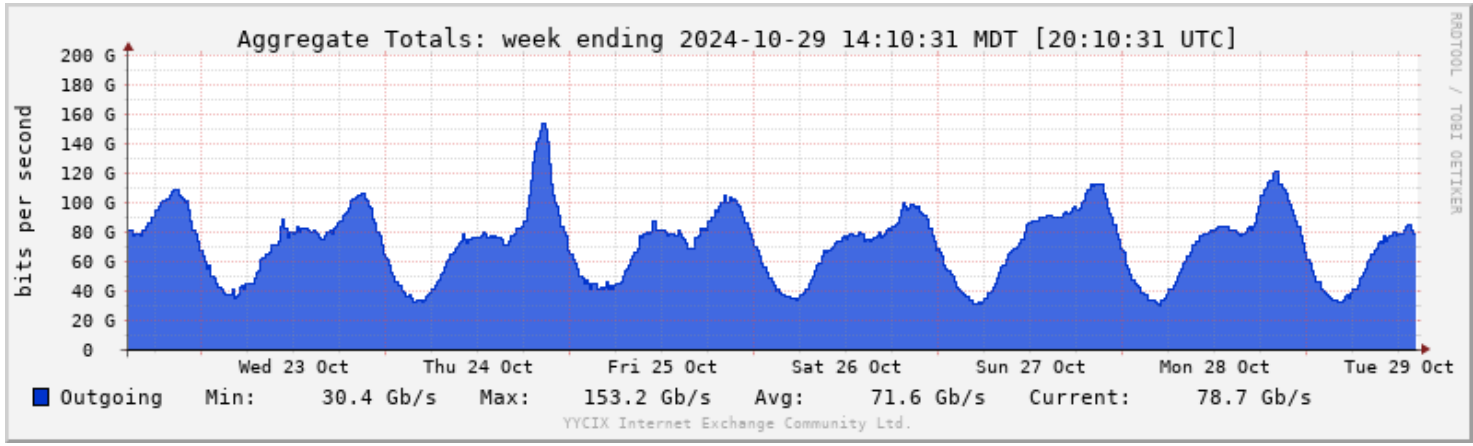
Success Stories

- Panama DNS K Route servers saved 240 MS on route lookup time for its members of the IXP in 2023 through the +Raices program in RIPE and LACNIC



- YYCIX Calgary Canada had 14 members in its first year and now has over 70. It has saved millions on international transit for its members and assisted in better experience for its residents.

- On average members are saving between 15 and 30% of traffic internationally. This grows each year with more local content coming online and the IXP deals with peaks of over 100Gb of traffic daily.



50/50 Vision

Our 50/50 IXP Vision

50%
Locally accessible

IXP

50%
International Internet
Traffic

When we reach this goal, the people who need it most will have faster, stronger, and cheaper Internet access.

50/50 IXP Vision Partners

For **technical communities**, we seek engagement between local stakeholders to support knowledge exchange and organize events and peering forums to share best practices.

For **policymakers**, we seek policies that promote open markets, foster strong technical communities, and streamline regulatory processes.

The Internet Society's organization members, individual members, chapters, special internet groups, and partners play an integral role by taking training courses and defending peering in their communities.

Information from ISOC Pulse - Trinidad

Internet Exchange Points

2

IXPs in Trinidad and Tobago

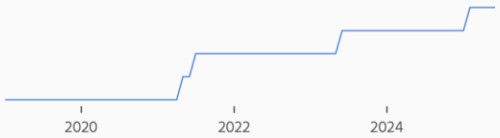
6

Americas average

59% of 17

registered networks connect via an IXP

View Trinidad and Tobago in the IXP Tracker



Total number of IXP members in Trinidad and Tobago

Locally cached content

14%

of the top 1000 websites in Trinidad and Tobago can be accessed through an in-country server or cache

71%

Americas average

2025

The Internet is for everyone.

A small contribution can make a big difference.
100% of your donation helps to fund our work.

Gracias. Merci. Thank you.

Acknowledgement and Attribution

This presentation contains content and information originally developed and maintained by the following organization(s) and provided for the African Union AXIS Project.

http://www.euro-ix.net