IXPs | Governance and Financial Models: Best Practices for Sustainability

IXP Arab Group Workshop | 11 November 2014

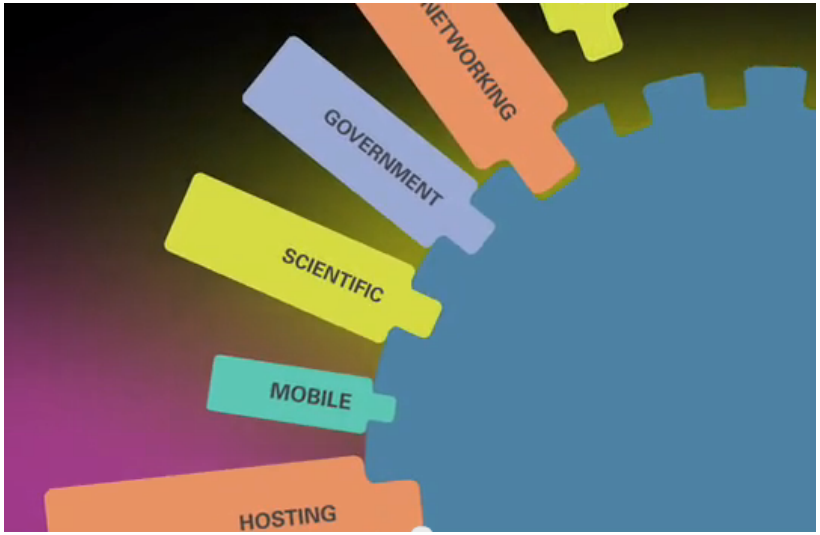
Tunis, Tunisia

The Opportunities

- Local hosting and content development e.g Google Cache model
- Approach the existing content providers like the online newspaper company and suggest that they consider local hosting as an option.
- Develop the hosting products
- Reviewing the current hosting solutions and products available
- Working in partnership with local web developers
- e-Government Services
- Building carrier neutral datacenters
- Relevant local content
- Develop local language content for e-learning, e-government services, IPTV and Software solutions.
- Regional interconnection - peering and transit opportunities.
- Voice Over IP Services

Location, Neutrality, and Ownership

- Location and neutrality are critical “deal breakers” for the establishment of the IXP.
- **Reach consensus on** a potential location and **neutrality of the IXP**



- Note: Content from AXIS I Best Practices Workshops

Location

- **Location is very important**
- **The IXP location should be neutral and low cost**
- **In considering the location of the IXP – these factors should be considered:**
  - ✓ **Space**
  - ✓ **Environmental Control**
  - ✓ **Security**
  - ✓ **Power**
  - ✓ **Access to terrestrial infrastructure**
  - ✓ **Cabling**
  - ✓ **Support**

Neutrality

- All IXPs are **owned and managed neutrally** with respect to all operators (members and non-members.
- Many ISPs have expressed strong feelings about the importance of neutrality of IXPs.
- IXPs generally abstain from carrying out any activity that may compete with member business activities or opportunities.
  - If an IXP competes with members, it may lose member support.
- The Important Point is that the ownership and management of the IXP should always remain neutral

Ownership

- Many IXPs begin with donations of equipment, rack space, labour, and other assistance. This is part of the cooperative nature of most start-up IXPs.
- For donations, written agreements are necessary to define the transaction and ownership thereafter.
- Neutrality can be at stake if one member owns parts of the IXP.
- Therefore the IXP should always maintain ownership and responsibility of its assets.

Governance - Key Considerations I Location - Neutrality and Ownership

Location Neutrality

- The ownership of the facility that houses the IXP can be a reason for "mistrust". If one member hosts the IXP, some may believe that it benefits that member more.
  - Building trust essential
- For example – if one company hosts the IXP – other members are paying circuit costs to the IXP and the host is not.
- In this case – above – a solution is for the hosting member to offer hosting services at no cost to the IXP and its members.
- Host also would pay other other costs (in this specific example) associated with hosting the IXP – power, cooling, security
- Assess energy costs before start-up (Kenya)

Location Costs

- In some instances the members may feel very strongly about being hosted in a members facility.
- In such cases the ideal situation is to find a neutral facility. There are two types of facilities;
  1. **A carrier neutral data center**
  2. **A non-data center facility neutral to all members**
- Type 1; may require an initial infrastructure investment for rack
- Type 2; will require initial infrastructure investments on power backup, air conditioning, security, racks, etc.
- Both types are subject recurring monthly operational costs unless paid for by the respective hosts.
- In most African countries Carrier Neutral facilities are not available
- Many IXPs that have started with type 2 have outgrown the space over time requiring them to move. Moving an IXP is not a simple task.
- These considerations are important to make the right decision on the location from the start

Location Requisite Priorities

- Not all locations will meet the IXP requirements discussed earlier
- Therefore some flexibility is necessary to settle on a location
- The priorities that should be given to any location are in the following order;
  1. Space
  2. Reliable Power supply
  3. Access to terrestrial infrastructure
  4. High-sight for wireless connectivity
  5. Security

Incentives

Africa and Latin America Leading Annual IXP Growth Rates

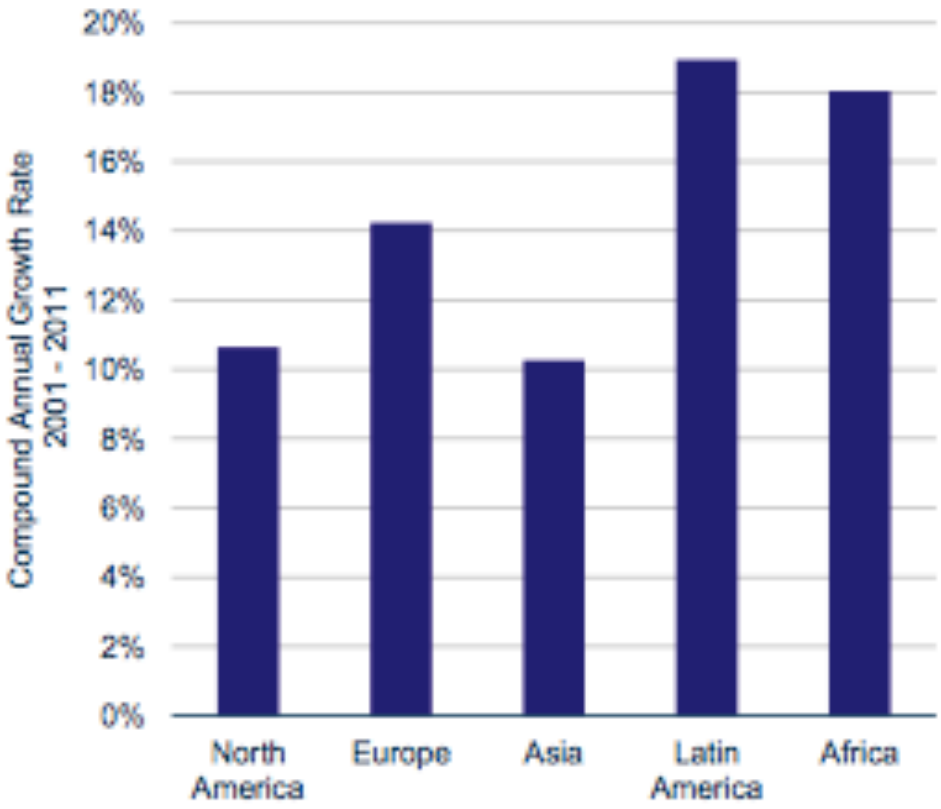


Figure 3.3: Compound annual growth rate in IXPs, by region, 2001-2011 [Source: Packet Clearing House (www.pch.net), Analysys Mason estimates]

Source: Kende, M., Report for the Internet Society:
How the Internet continues to sustain growth and innovation, October 2012
Data from Packet Clearing House and AnalysysMason estimates

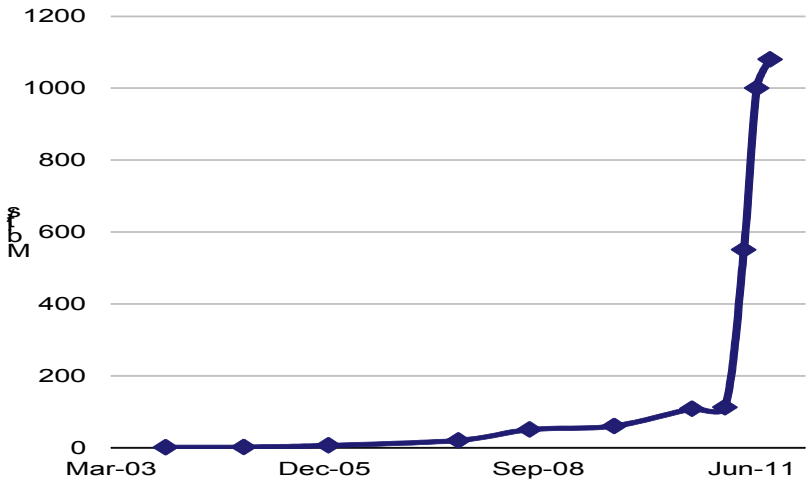
CDN Caches: Localizing International Content

- In addition to creating local hosting, local cashing of Content Delivery Network content is a key opportunity

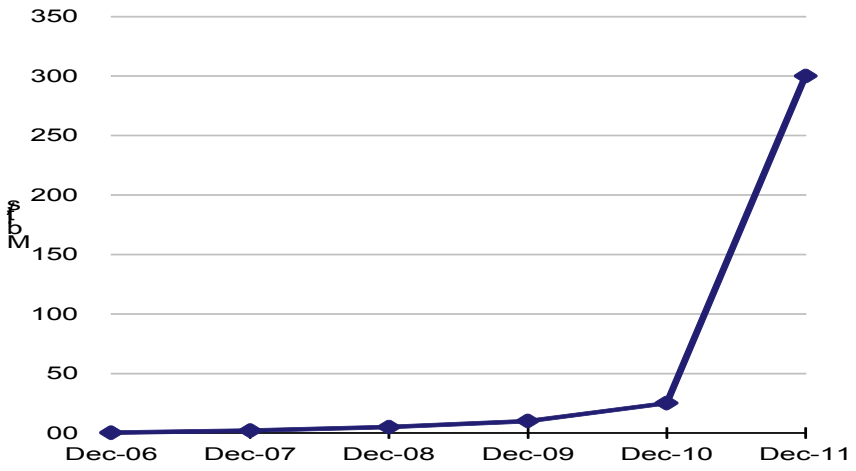
- Implementation of Google Caches and pops has had an impact on local traffic growth

- Localized Google traffic represents more than 50% of traffic exchanged at KIXP and IXPN

- CDNs report that the existence of a robust IXP is a key decision factor in decision making on cache/ pop locations



KIXP



IXPN

Measuring the Benefits and Impacts of IXPs: Kenya and Nigeria Case Study

Benefit	*KIXP*	*IXPN*	*Summary*
Latency	Reduced from 200-600 ms to 2-10 ms	Reduced from 200-400 ms to 2-10 ms	Noticeable increase in performance for end users
Local traffic exchange	1 Gbit/s peak	300 Mbit/s peak	Savings on international transit of over $1 million per year in each country
Content	Google network present locally, along with rehoming of domestic content	Same as in Kenya	Increase in usage and corresponding revenues for mobile data traffic
E-government	Kenya Revenue Authority gathers taxes online	Usage by education and research networks	Social benefits from e-government access to IXPs
Other benefits	An increasing amount of regional traffic exchanged at KIXP	Financial platforms hosted locally	Further economic benefits resulting from IXPs

- **Reduced latency and increased performance** and driving demand
- Direct **savings on international transit** ($1.5M p.a. Kenya, $1M Nigeria)
- **Facilitating e-government and education** services
- **Catalyzing local hosting and content** industry
- **Increased mobile data market** by an estimated $6 million in Kenya
- **Attracting regional traffic - KIXP**
- http://www.internetsociety.org/ixpimpact

LAC IXP Study| November 2013

- **LAC Findings:**
  - Argentina: In one city → $100.00 per Mbps pre IXP/ down to $40.00 per Mbps post IXP
  - Brazil: NIC.br | PPT Metro System 26 IXPs attracting investment/content | 600Gbps at Peak
  - Ecuador: (Pre) International transit was $100 Mbps | (post) Local traffic costs $1.00 Mbps
    - Now running RPKI
    - After CDN cache installed in Quito in 2009 -> traffic up 700%
  - **Additional Studies:**
  - **Measurement Study** in Bolivia | Raspberry Pi deployment
  - **Network efficiency** Study in Argentina | Cabase and University of Buenos Aires

LAC IXP Study can be found here: http://bit.ly/1k6NaO0

Governance/Business Models

Option 1: Free IXP

- The Uganda IXP (UIXP) and Seattle IXP are good examples of IXPs modeled on the Free business model
- The IXP location is donated or paid for by a willing sponsor.
- No membership, joining or monthly fees are charged to IXP participants
- Members contribute (donate) equipment, money, human resource and time to the IXP based on their ability and the needs

Option 1: Free IXP … (cont'd)

- **Pros;**
  - Low cost of peering for members with no additional costs other than capacity to IXP
  - Low operating costs for the IXP organization
  - Volunteer driven; less complexity on organizational structures and management
- **Cons;**
  - Difficult to scale growth when largely dependent on donations and contributions.
  - Inconsistencies and inefficiencies can arise when dealing with volunteers
  - Neutrality concerns can arise where one member is the largest contributor

Option 2: Subsidized Business Model

- The Nigeria IXP (IXPN) and Malaysia IXPs are good examples of IXPs modeled on the subsidized business model
- Certain aspects and operational costs of the IXP are met by a sponsor for a sustained period of time.
- In most cases the Governments through development fund subsidize the IXP operating costs
- The IXP meets some of the operating costs by charging members a nominal fee.

Option 2: Subsidized Business Model …. (cont'd)

- **Pros**
  - Low-medium cost of peering for members in addition to the cost of leasing capacity to the IXP
  - Sustained revenue to meet operational expenses
  - Easy to scale and grow due to ability to implement and maintain management/operational structures
- **Cons**
  - Uncertain future should subsidies be withdrawn or main sponsorship lost
  - Neutrality or fear of capture/control by main sponsor
  - Increased commitment for members on Governance aspects and reporting to sponsor
  - Complex operational structures and management

Option 3: Independent Business Model

- The Kenya IXP and Johannesburg IXP are good examples of IXPs modeled on the independent business model. Most developed IXPs in Europe have an independent business model.
- All aspects and operational expenses of the are met by the IXP.
- The IXPs generate revenue by charging fees for the services provided on a monthly, quarterly, bi-annually.
- Additional revenues from value added services, one-time fees, etc

Option 3: Independent Business Model

- **Pros**
  - Neutrality of the IXP is guaranteed in a self-sustained model
  - Sustained revenue to meet operational expenses
  - Easy to scale and grow due to ability to implement and maintain management/operational structures

- **Cons**
  - Medium-high cost of peering for members in addition to the cost of leasing capacity to the IXP
  - Increased commitments for members on Governance issues and reporting
  - Complex operational structures and management

Option 4: Collaborative Committee Model

- **Brazil's CGI.br brings business, government, and technical experts into one committee to provide oversight while NIC.br runs the technical infrastructure**
- **Pros**
  - **Government in an advisory role, while technical experts run the IXP**
  - **Community input considered and sustainability analyzed to maintain PTT system**
- **Cons**
  - **Potential interference in technical operations – important to allow experts to focus, and build sustainable structure**
  - **Not generally a first "level" or start-up level option**

Best Practices | Considerations For Starting-Up an IXP

- Know legal and regulatory parameters in advance of getting started/work with local government
- Obtain ASNs and IP Addresses from AfriNIC (Brice)
- Partner with Internet organizations/existing IXPs/other technical experts (PCH, NSRC) for mentoring opportunities
- Avoid giving members “weighted” roles – entities are equals at the IXP (Jamaica)
- Encourage Content Delivery Networks (CDNs) at IXP (Akamai, Google, CloudFlare, other)
- Assess energy costs before start-up (Kenya)
- Conduct a simulation of how you are going to bring equipment in, install, set-up (Slovenia)
- Check your fuel and energy “cut-off” situations (Slovenia)

Keeping IXPs in Context…

- IXPs can be a catalyst of a robust Internet environment and market.
- Many other issues are involved in promoting a robust interconnection and traffic exchange environment in a country / region.
- Barriers and bottlenecks along the service chain are various and challenging:
  - Backhaul and Leased Capacity
    - More costly to send traffic from Abuja to Lagos, than Lagos to London. Cape Town to Jo'burg similar
  - Cross-border connectivity, policy and licensing issues
  - International gateways, landing stations
- With falling international capacity prices (including around Africa), there is also opportunity to take advantage of international peering opportunities.
- ISOCs situates its IXP work within the broader interconnection and traffic exchange (ITE) context.

Assistance

- Work with an Existing IXP (mentoring opportunities)
- Work with an organization working to develop IXPs (AU, Euro-IX, ISOC, PCH, NSRC)
- Check out the IXP Toolkit: www.ixptoolkit.org (rebooting in December) – send us input
- Review Best Practices | Euro-IX: Best Current Operational Practices (BCOPs) – created by existing IXPs https://www.euro-ix.net/euro-ix-bcp
- Review more Best Practices | NANOG IXP Participant (those interfacing with IXP): http://ow.ly/E5RyF
- Attend Regional Network Operator Group (NOG) meetings: MENOG
- Attend AfPIF – African Peering Forum and Interconnection Forum: http://www.internetsociety.org/afpif/
- Contact AfriNIC – working with IXPs and local and regional community: www.afrinic.net

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The Internet Society