



GRAND DUCHY OF LUXEMBOURG
Ministry of Foreign Affairs

Directorate for Development Cooperation



European Union Africa
Infrastructure Trust Fund

IXP Policy Considerations



IXP MODELS

Institutional and Operational Models for IXPs

○ A variety of institutional models have been adopted to operate IXPs. They fall into four categories:

- ✦ Nonprofit industry associations of ISPs
- ✦ Operator-neutral commercial and for-profit companies
- ✦ University and government agencies
- ✦ Informal associations of networks

Commercial vs. Non-Commercial

- Most European IXPs grew from non-commercial ventures, such as research organisations
- Most African IXPs were established by ISP Associations and Universities
- By comparison, in the US the majority of IXPs are commercial, and some commercially run IXPs have emerged in Europe
- Most of the emerging IXPs have opted for a non-commercial approach.

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.
- The involvement of non-commercial entities such as NRENs, ccTLDs and governmental institutions, it is easier to establish an IXP as non-profit entity
- A non-commercial entity is possibly better placed to maintain neutrality.

IXP Neutrality

- Whether commercial or not, virtually all IXPs are owned and managed neutrally with respect to carriers, ISPs and co-location providers.
- An example that is often quoted is a group of IXPs in the US, which are owned and run by a carrier. The only circuits that may be used to gain access to the IXPs must be purchased from that carrier, thus producing a monopoly situation.
- Many ISPs have expressed strong feelings about the importance of neutrality of IXPs, and most of the larger European IXPs attribute their success to their neutrality.

Cont'd ...

- IXPs generally prohibit themselves from carrying out any activity that may compete with member/customer business activities.
- If an IXP competes with members/customers it could lose their support.
- The important point is that the ownership and management of the IXP should always remain neutral.

Cont'd ...

- In many examples of the creation of an IXP there is no formal body - the IXP is run and managed by general consensus between the parties involved (often the ISPs which will benefit from the presence of an IXP).
- This is probably the most efficient and easiest mechanism for a start up IXP.
- There are issues that arise as an IXP grows that suggests that a 'free form' purely consensual based model will not scale.
- The 'consensual' based model can still be true when the IXP has been developed from an established organisation such as a research or academic institution.

Scope of the IXP

- The scope of activities that the IXP should carry out is worthy of early consideration.
- Although this is likely to be a matter for continual assessment as the IXP grows, and the profile and requirements of its members changes
- Some IXPs limit themselves to purely providing a switched infrastructure,
- Others offer extra technical services (e.g. route servers, private interconnects)
- some IXPs carry out non-technical activities for the benefit of its members, acting, to varying extents, as industry associations.

Cont'd ...

- These latter activities can be contentious, some ISPs want their fees to fund only the IXP physical infrastructure.
- Also these activities can often be country specific, and therefore being of limited benefit to ISPs not based in the country of the IXP.
- Most IXPs have mailing lists and meetings for their members.
- This means the IXP can be a natural forum for discussion of subjects of interest to the industry in general.

Cont'd ...

- How far an IXP should involve itself in these activities is, of course, a matter for the individual IXP, its mandate, and its members wishes.
- Whatever involvement the IXP decides to have outside of providing the basic switch infrastructure, it is important that it has the support of its membership, and that the activities are documented so that there is transparency for existing and prospective new members.

BUSINESS POLICY CONSIDERATIONS

IXP Peering and Interconnection Policies

○ Open peering Policy

- ✦ Develop an open peering policy to encourage non-traditional members such as CDNs, Government, Academia, Banks, etc to peer
- ✦ Initiate Strategies to grow membership – marketing, public seminars, “tell the story why is this a good business

○ Regional Interconnection Policy

- ✦ Encourage members to exploit the cross-border interconnection opportunities by negotiating fair contracts with Infrastructure Operators and International bandwidth providers.
- ✦ Assist operators and members take advantage of regional Interconnection opportunities and become Regional carriers

○ Transit Policy

- ✦ The ability to attract carriers and transit providers at an IXP is important to grow the value and traffic at an IXP.
- ✦ This policy is subject to national regulations on Internet transit.

IXP Peering Agreements

○ A Peering agreement is applicable to all members who choose to peer an IXP.

○ There are three main peering agreements implemented by IXPs

○ Bilateral Peering (BLPA)

✦ This agreement requires every member to have a bilateral agreement with each member at the IXP.

✦ It is commonly found in most developed IXPs due to the right of refusal, to peer granted to each member, to peer with any member for commercial purposes

○ Multi-lateral Peering (MLPA)

✦ This agreement requires every member to peer multi-laterally with every member at an IXP. The agreement is not often enforced.

✦ The MLPA is useful in trying to grow peering value at an IXP

✦ A Mandatory version of this agreement (MMLPA) is commonly found in startup IXP in developing worlds due to its ability to force incumbents to peer with others at the IXP. MMLPA is enforced using a Route-Server IXP Topology

○ Hybrid Peering Agreement (HPA)

✦ This agreement supports both the BLPA and MLPA.

✦ Eliminates the need for a competing IXP in the same location to serve unsupported policy.

✦ A Route-Server is often used for MLPA members.

BUSINESS MODELS OPTIONS

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)

OPros

- ➔ 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

OCons

- ➔ 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 modelled 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

OPros

- ➔ 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

OCons

- ➔ 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
- ➔ Medium-Complex operational structures and management



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