

AFIX Technical Workshop: Session 7

Business Aspects of Internet Exchanges

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Overview

This session explores the business models applicable to an Internet Exchange, and the associated financial and business implications – including how to ensure financial sustainability and how to manage relationships. It is based heavily on Geoff Huston’s paper “Interconnection, Peering and Settlements”, which is included as part of the handout pack for this session.

What makes a successful IXP?

The IXP occupies a crucial position in the ecology of the Internet, acting as an essential common resource for competing ISPs. Given this powerful position, it’s essential that the IXP be **trusted** by all participants and stakeholders to operate reliably, consistently, transparently and without hidden agendas.

In general, the key attributes of a successful ISP are:

- It should ideally be operated by a neutral party who is not an ISP. This may be an ISP association or a non-profit organisation set up specially for this purpose.
- It should be robust and secure. In practice this means a lot of attention needs to be paid to physical details such as security and access controls, environmental controls (eg air-conditioning), power supply, access for telcos and cabling providers, and space for expansion.
- It is able to scale in size: This is a function of physical location, infrastructure, financial arrangements and network architecture.
- Its operations should be financially sound and stable – there should be no risk, for example, that an ISP will find its equipment seized because of unpaid bills!

Neutrality is one of the most important success factors, and in some ways more difficult to achieve than the others since it depends to a large extent on relationships and perceptions. Regardless of whether the IXP is run as a commercial business or not for profit, it should ideally be managed

neutrally with respect to carriers, ISPs and co-location providers. Any of these may have commercial relationships with each other or with the IXP, so it is important that the IXP is not, for example, owned by one of its stakeholders.

What of the fairly common case where the IXP is run as a co-operative venture between competing ISPs? They all stand to benefit from its operation, as do co-location providers and, in some cases, carriers. The point to remember is that neutrality does not mean none of the stakeholders should benefit from the IXP (otherwise there would be no reason for it to exist!) but rather that it should be never be perceived to be serving the interests of one stakeholder or group of stakeholders at the expense of others. For this, it is very important that the IXP should be independently owned and managed as far as possible.

Setting up an IXP: Key Business Decisions

This section sets out some of the key business decisions that need to be made in the process of setting up an IXP. What decision is best depends on the particular circumstances facing each would-be IXP; as you read this, keep in mind your own position and requirements and consider what would be your preferred option in each case.

Bear in mind that although we have simplified the issues for the sake of explanation, most of them are not, in practice, clear-cut: some factors bear on more than one question, and the response to one will affect what decision is made about others.

1. Co-operative venture or independent third party?

The first decision regards the IXP's relationship to its members – those ISPs and others who use its services. Should it be a completely independent arms'-length entity, or a co-operative venture between its members? These are some of the issues to consider:

- An independent entity may be more easily able to keep a distance from its members / clients and thus maintain its neutrality.
- An independent entity may have the option of operating on a for-profit basis. In a competitive situation where there is more than one IXP, this can help to ensure high quality of service; but in a small market where only one IXP is sustainable, a for-profit monopoly may not be desirable.
- An independent entity is a good option where some involvement by a government or regulatory agency is needed.
- Provided all the members continue to see value in participating in the exchange, a co-operative entity may make the necessary negotiation and administration easier.
- A co-operative needs to be carefully set up to avoid a "tragedy of the commons" situation: where everyone benefits from a resource but no one individual or organisation has the responsibility for maintaining it, there may be an incentive for each individual member to use the resource beyond its sustainable limits. This can be avoided if the costs of maintaining the IXP are carefully accounted for and fairly shared (see "How to be financially sustainable" below).
- Whichever option is chosen, careful thought should be given to who manages the IXP and on what terms.

2. What kind of business entity is most appropriate?

This question will be partially, but not completely answered by what decision is made on the relationship between the co-op and its members. From there, the decision as to what kind of business entity is most appropriate depends largely on whatever legal structures are available in the IXP's country of operation. Whatever kind of entity is chosen, it should be easy to administer, have sufficient legal status for it to be taken seriously when interacting with regulators and other stakeholders, and be able to enter into whatever legal agreements may be necessary.

3. What additional products and services to offer?

The most basic service an IXP can provide, the service which defines its purpose, is a shared switched infrastructure which enables members to exchange traffic.

On top of this, however, there are many options for additional services which make sense to offer in the IXP environment:

- Route servers.
- Facilities for private interconnect agreements.
- Facilities to provide access to transit services.
- Hosting and other co-location services.
- Non-technical services such as lobbying and networking, which a neutral entity may be in a good position to provide.

Which (if any) of these services to offer, and on what basis each is to be funded, should be clearly established to the satisfaction of all stakeholders.

4. Who owns the infrastructure and physical assets?

Many IXPs are established initially with donated or loaned equipment, rack space, labour and other assistance. This is part of the co-operative nature of IXPs, but if they are to be sustainable there should be clear answers to the following questions:

- Who owns the physical infrastructure on which the IXP's operations depend?
- If the IXP is not the owner, under what terms is the IXP allowed use of the equipment?
- What rights does the IXP have to continued use of loaned equipment in the event that the owner merges with another company, is liquidated, withdraws from the IXP, etc?
- Who is responsible for insuring and maintaining equipment?

5. How to be financially sustainable?

There are two sets of financial decisions to be made in setting up and running an IXP:

1. What payments should be made by member ISPs to the IXP for its services?
2. What payments, if any, should be made between member ISPs who use the IXP facilities to interconnect?

We will deal with each of these in turn, although the questions are to some extent interdependent:

Payments by ISPs to the IXP

IXP operating costs might include: premises; power and other utilities; telecommunications; salary costs; administration costs including legal fees, accounting fees and the like; equipment maintenance and insurance costs; equipment acquisition costs; and so on. What is the most fair and sustainable way to allocate these costs between members? There are several options:

1. Members can pay a monthly or annual **flat fee** to participate in the exchange, perhaps **graded** according to the size of the ISP or the number of racks units used at the exchange. This may be combined with an initial joining fee to cover the costs of setting up the ISP's presence.

This fee structure has the advantage of simplicity, but can become problematic if some members generate far more traffic (use more IXP resources) than others.
2. Members can pay a **sliding scale of fees according to access bandwidth or traffic volume**. This may help to overcome the problem mentioned above, where some ISPs use more of the IXP resources than others. However, if the IXP is going to charge according to access bandwidth or traffic it needs to monitor these – which may compromise the IXP's position of neutrality.
3. Members could pay fees according to a **basket of services** they access. For example, if a member uses hosting services in addition to the basic exchange functions, or uses the IXP facilities to access a transit service, these should be charged for separately.

Payments between member ISPs

Apart from covering the operating costs of the IXP, members who exchange traffic will also need to agree whether, and how, they compensate each other for exchanging traffic. There are two basic models:

1. **No payments (the “Sender Keeps All” model).** Both ISPs are paid by their clients for the service of giving them access to the entire Internet. But no ISP can do this on its own – it depends on many others, some of them unknown. For example, a single email may pass through many different servers, owned by many different companies, to reach its destination. Deciding who contributed what to this process and paying each contributor accordingly is both technically and administratively near-impossible. So, the simplest option is simply for each ISP to agree that whatever revenue they earn from their clients is enough to cover their own contribution to this grand collective venture, and leave it at that. This has the great advantage of requiring no administration at all; but in the long term it can only really work so long as both parties perceive equal benefit from their participation. If ISP A generates significantly more traffic than ISP B, for example, ISP B may begin to feel that the arrangement is not in its own best interests. In this case, a transit relationship may be more appropriate.
2. **Bilateral settlement (the telco model).** In traditional telecommunications businesses, telcos pay each other agreed fees for terminating calls initiated on each others’ networks. This works because a traditional telephone call is an end-to-end session with a clear initiation and conclusion, which occupies an entire circuit for a defined length of time. Even so, there are arguments between telcos as to how exactly to account for each one’s contribution to a successful session. In a packet-switched as opposed to a circuit-switched network, no such accounting is feasible: TCP sessions are not defined, packets may be dropped, packet paths are not pre-determined, and so on. Most of all, because of the very nature of the Internet, no ISP can offer a guaranteed end-to-end service. Unless and until all of these conditions change, the bilateral settlement model is not a feasible one for the Internet. (This topic is covered in much more detail in Geoff Huston’s paper Interconnection, Peering and Settlements, which is included in your reference pack).

Managing Relationships: 90% of the work?

As the discussion above suggests, a great deal of the work in setting up an ISP is getting all the stakeholders involved – not only members but also regulators, service providers and others – to agree to participate, or at least not to oppose the IXP. There is no handbook for this process – there are at least as many strategies as there are stakeholder groups to deal with – but it can help to consider previous cases and understand how these have been resolved. The case of the Kenya Internet Exchange Point (KIXP) is presented overleaf. During the session it will be useful to discuss other cases participants may be aware of, or what challenges they would face in their own cases.

The case of Kenya

The experience of the Kenyan ISPs in attempting to organize and launch an IXP provides a object lesson in the practical barriers that confront the deployment of IXPs in Africa.

Prior to Kenya's, there was no IXP on the African continent between Morocco and South Africa. In early 2000, the association of Kenya's competitive ISPs (i.e., those other than Telkom Kenya, the state-owned monopoly telecom), called TESPOK, undertook to organize an neutral, non-profit IXP for its members. After nearly a year of preparatory work, including the design and implementation of a capable technical operation, funding model, and legal framework, the KIXP was launched in late November 2000, located in Nairobi.

Almost immediately, Telkom Kenya filed a complaint with the Communications Commission of Kenya (CCK) arguing that the KIXP violated Telkom Kenya's exclusive monopoly on the carriage of international traffic. Within two weeks, the CCK concluded that the KIXP required a license, and ordered that it be shut down as an illegal telecommunications facility.

Telkom Kenya's legal monopoly does, in fact, extend to all fixed network infrastructure, including local, national, international, and leased lines. In Kenya, ISP services are open to competition, but ISPs rely on Telkom Kenya for underlying infrastructure. In addition, Telkom Kenya has the exclusive right to operate a national backbone for purposes of carrying international traffic.

Until KIXP, all Internet traffic in Kenya was exchanged internationally. According to TESPOK, roughly 30% of upstream traffic was to a domestic destination. During the two weeks of KIXP's operation, measurements indicated that latency was reduced from an average of 1,200- 2,000 milliseconds (via satellite) to 60-80 milliseconds (via KIXP). Likewise, monthly bandwidth costs for a 64 kbit/s circuit dropped from US \$ 3,375 to US \$200, and for a 512 kbit/s circuit from US\$ 9,546 to US \$650. [Source: TESPOK]

In response to the CCK's closure order, the Kenyan ISPs argued that the KIXP was a closed user group, and therefore would be legal under the Kenyan Telecommunications Act. Also, they noted that the local exchange of domestic Internet traffic does not contravene Telkom Kenya's international monopoly, as all international traffic would continue to flow over its international links. Telkom Kenya's opposition to KIXP was fierce, fed by the fear of losing a significant portion of its international leased line revenues.

After nearly a year of intensive efforts, including public pressure, threats of litigation, and private diplomacy, TESPOK finally received the approval of CCK in the form of a license, granted in November 2001. The commission's licensing order represented a fairly dramatic turnaround in the CCK's thinking, stating: "An IXP is not an international gateway but a peering facility that enables ISPs to exchange local traffic."

Source: Andrew McLaughlin, [Internet Exchange Points: Their Importance to Development of the Internet and Strategies for their Deployment – The African Example.](#)

Sources

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