INTERNET SOCIETY REPORTS

# A Summary Report

# Promoting the Use of Internet Exchange Points: A Guide to Policy, Management, and Technical Issues


## Summary

The following report is an excerpt from a more detailed paper, Promoting the Use of Internet Exchange Points, by Mike Jensen. Those interested in a more in-depth discussion of IXPs are invited to download the original textfrom the ISOC web site at http://www.isoc.org/educpillar/resources/docs/promote-ixp-guide.pdf.



**Mike Jensen** is an independent ICT consultant who has assisted in the establishment of information and communications systems in developing countries for more than 20 years. Drawing on his hands-on experience in 40 African countries, Sri Lanka, and Brazil, Jensen offers advice to international development agencies, the private sector, NGOs, and governments in the formulation, management, and evaluation of Internet and telecommunication projects. A go-to expert and public speaker at international meetings, Jensen's primary focus is on policy and technology developments in rural telecommunication projects, community access, fibre, wireless, and satellite connectivity.





1775 Wiehle Avenue, Suite 201
Reston, VA 20190-5108, U.S.A.
+1 703 439 2120

Galerie Jean-Malbuisson 15
CH-1204 Genève, Suisse
+41 22 807 1444

03/09

## Introduction

Internet exchange points (IXPs) are a vital part of the Internet ecosystem in that they enable two users in different networks to most efficiently exchange information in the broad Internet network system. In this way, they are analogous to regional airport hubs—airlines exchange passengers between their flights in much the same way that networks exchange traffic across an IXP.

More than 300 IXPs have been set up worldwide—reflecting an increase of than 50 percent since 2006. Regionally, Latin America has experienced the fastest growth with 20 IXPs by the end of 2007—almost double the number of the previous year. However, developing countries have generally lagged behind the rest of the world in establishing IXPs. The Asia-Pacific region grew the slowest in 2007 at 15 percent, bringing the total number of IXPs in that region to a mere 67. And Africa has the fewest IXPs—only 17 of the 53 African nations had IXPs in 2007 and growth was only 21 percent over the previous year.

## Role of Internet Exchange Points

Despite strong growth in some areas of the world, by May 2007, 88 countries remain without an IXP. As a result, networks in most of these countries have no alternative but to exchange local traffic via expensive international links. In most countries the first step has been to set up a national exchange point to keep local traffic local. As shown in Figure 1, absence of an IXP results in all inter-ISP traffic (assuming ISP A, B, and C are in one country) being exchanged via international links whose costs, particularly for developing countries, are significantly higher than those of local links.

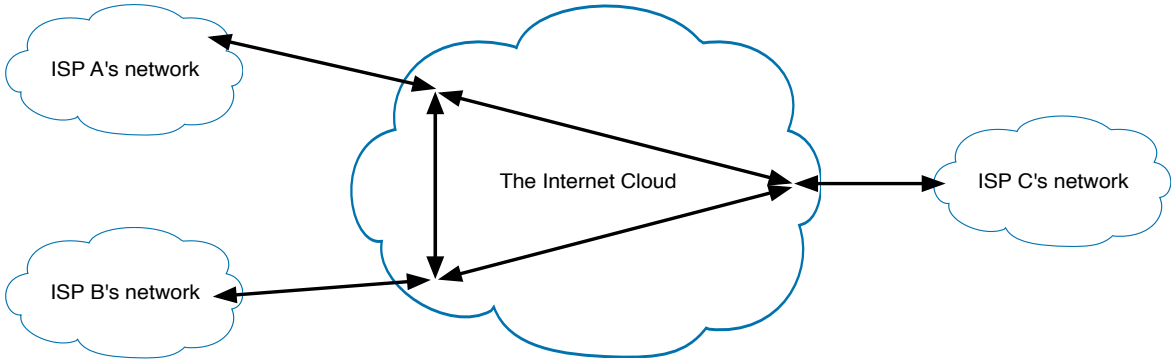


*Figure 1.*

Typically, even if only 20 percent of a nation's traffic is local, it is economically viable to offload the local traffic from the expensive links in favor of a local link interconnection offered by an IXP solution, shown in its simplest form in Figure 2 (see page 3).

Reducing operating costs by establishing a local IXP not only decreases Internet access prices to the end user, it provides faster response times to local web sites and other local Internet services. Additional exchange points may then be established to serve smaller geographic areas where it is more cost effective to keep traffic local.

IXPs also play an important role in exposing their members to transit and peering interconnection models. The transit model involves a financial settlement between two networks or operators for the exchange of traffic; the peering model is a settlement-free arrangement between both parties.

## Institutional and operational models for IXPs

There are a variety of institutional models that have been adopted to operate IXPs. Of these models, the most common is one in which a nonprofit industry association of ISPs operates the IXP. In this model, operating costs

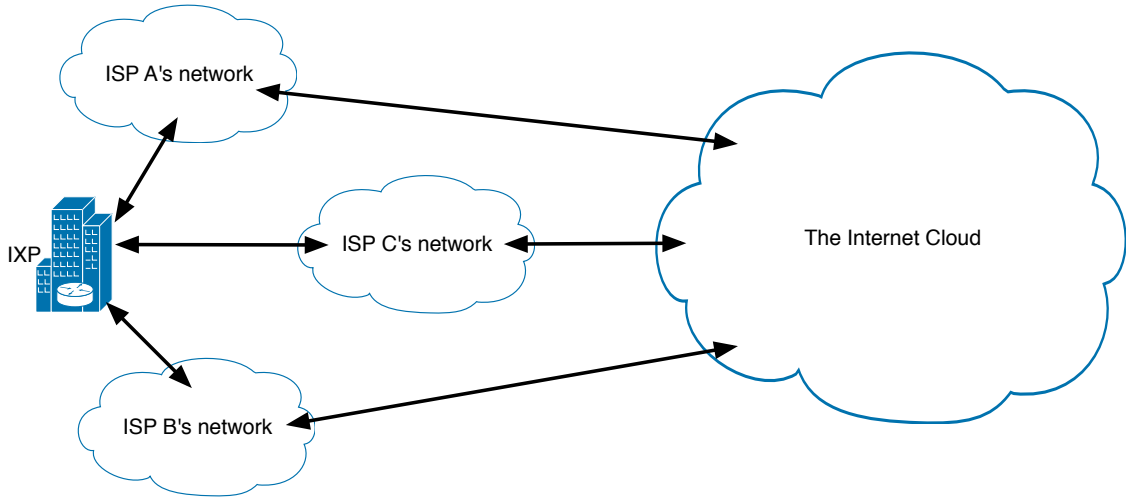


*Figure 2.*

are shared among members who pay a one-off joining fee and a monthly, quarterly, or annual operating fee. Technically, there are two predominant technical models for IXP operation. The simplest model is a Layer 3 IXP, in which IXPs exchange all traffic between member networks inside a single router. The other model is a Layer 2 IXP, in which each member provides its own router and traffic is exchanged via a simple Ethernet switch.

The requirements for traffic routing agreements between IXP members vary depending on the IXP's institutional model and other local policies. Many IXPs apply a Mandatory Multilateral Peering Agreement (MMLPA), in which anyone who connects with the IXP must peer with everyone else who is connected. Others require each network to enter into Bilateral Peering (BLP) arrangements with the other network members. Both policies have advantages and disadvantages. What is critical for the success of the IXP in either case is that the members participate in the policy formulation process.

## Practical Considerations in Establishing IXPs

The first step in considering the establishment of an IXP is to determine need. This should be based on a provisional assessment of the number of providers (at least three) that are willing to support and use the IXP.

Building stakeholder consensus and support and identifying potential policy problems and market barriers to establishing an IXP are important considerations. For example, competing commercial providers who may not be aware of the full advantages of collaboration and local traffic exchange often see the establishment of a local IXP as a threat.

To fully include the community in the process, awareness raising and training activities may be necessary. Potential members will need to be familiar with the Border Gateway Protocol (BGP), which is used for routing between networks, and each network will need to have a publicly registered Autonomous System Number (ASN) for their exchange communications. This can be obtained from the relevant Regional Internet Registry.

In many countries, costs associated with leasing space, purchasing power, and hiring staff can be high. Hosting the IXP in an existing data facility can substantially reduce these operating expenses. Examples of existing facilities that may be considered include the premises of telecom operators, university networks, data-hosting centers, or city emergency services.

The most important features of the IXP facility are reliable and redundant power supplies, air conditioning, security, space for growth, and access to communications infrastructure. Most important, the facility should retain a neutral status with its members. Proximity and accessibility of the facility are also factors to consider.

To ensure the sustainability of the project, a more detailed business plan may be developed. It should cover set-up and maintenance costs and the proposed revenue and cost recovery projections.

## General Summary and Conclusions

The primary role of an IXP is to keep local traffic local and to reduce the costs associated with traffic exchange between Internet providers. To achieve wider IXP deployment in developing countries, the following key needs must be addressed:

- Sufficient regulatory reform and liberalisation to unlock the potential within local traffic exchange
- Support of potential members, such as monopoly telecoms and other dominant players
- Establishment of neutral ISP associations capable of managing IXPs and other shared facilities on behalf of their members

Governments can play a positive role in encouraging networks to keep domestic traffic local. For example, policies designed to encourage competitive access to Internet infrastructure can help lower the costs associated with connecting to an IXP, help restrain the anticompetitive behaviour of incumbents, and promote a level playing field.