IXP Design Considerations
Where are we?

Day 3: Stage 4
- Building a Demo IXP
  - Some presentation on Route Server
  - Will connect network on the IX

Day 2: Stage 3
- Building BGP Concept
  - Introduction to BGP
  - BGP Path control
  - Hands-On Exercise

Day 1: Stage 2
- Building the concept of Routing
  - Routing Introduction
  - How Internet Works?
  - Glue it together with Internet context
  - Some Hand-on Exercise

Day 1: Stage 1
- Demystifying IXP Concept
  - What is IXP?
  - Value of Peering
  - How to Build an IXP?
IXP Peering Options

• BLPA (Bi-Lateral Peering Agreement)
  – IXP provides layer-2 connections to ISPs in the form of switch ports
  – Each ISP will make their own peering arrangements directly with other ISPs on the same IXP based on mutual business needs

• MLPA (Multi-Lateral Peering Agreement)
  – IXP provides layer-2 connections to ISPs in the form of switch ports
  – Each ISP will peer with a route server provided by the IXP
  – Route server will collect and distribute routing information among all peers joining the MLPA on the same IXP

• Both MLPA and BLPA can be supported at the same time with Layer 2 infrastructure
IXP Capital Expenses

- Ethernet Switch(es) – a must
- Route Server(s) – desirable
- Router(s) and server(s) to support other IXP services – optional
IXP Operating Expenses

• Data Center
  – Rack Space
  – Electricity (with backup)
  – Cooling
  – CCTV Camera and other physical security measures
  – Cross-connects

• Administration and Technical support

• Equipment maintenance

• Internet transit for other IXP services – optional
IXP Organization Model

- Possible Models include:
  - Donation / sponsorship
  - Cost sharing by participants
  - Membership based organization
  - Volunteers vs Outsourcing vs Staff

- Or any combinations of above

- Neutrality is the most important, even at the beginning

- Long term sustainability is the hard part so sustainable financial model has to be established in due course
Neutral Location as Starting Point

- May choose one of the followings as starting point:
  - University
  - Technology Park
  - Carrier Neutral Data Center
  - Government Data Center

- Having multiple carrier options is the most important

- Should maintain neutrality continuously

- Expansion to multiple sites can be done gradually, coupled with growth
Requirements of IXP Site

• Proximity to the networks of the potential members/participants
• Options, availability, capacity and reliability of fiber carriers
• Support for additional fiber carriers
• 24x7 access for IXP authorized support personnel
Requirements of IXP Site

• Availability and stability of electricity supply, including UPS and backup power generator

• Sufficient cooling facilities

• Good physical security – 24x7 surveillance and access control

• Availability of additional rack space for future growth
General Guidelines – Governance

• Organisation-wise, multi-stakeholder bottom-up approach is proven to be the best approach for maximum acceptance of the community while government support is critical

• IXP should be as inclusive as possible in order to provide maximum benefits to the whole community which it serves

• Should be fair and consistent to every participant

• Should be open and transparent as much as possible
General Guidelines - Geography

• IXP should NOT be expanded beyond a metro area so as to avoid competing with participants and to maintain neutrality

• Should start with the biggest city first and gradually set up separate infrastructure in other bigger cities one by one
Services Offered

• Services offered should not compete with member ISPs (basic IXP)
  – e.g. web hosting at an IXP is a bad idea unless all members agree to it

• IXP operations should make performance and throughput statistics available to members
  – Use tools such as LibreNMS (IXP Manager) to produce IX throughput graphs for member (or public) information
Services to Offer

• ccTLD DNS
  – the country IXP could host the country’s top level DNS
  – e.g. “SE.” TLD is hosted at Netnod IXes in Sweden
  – Offer back up of other country ccTLD DNS

• Root server
  – Anycast instances of root servers (I.root-servers.net, F.root-servers.net etc are present at many IXes)

• gTLD DNS
  – .com & .net are provided by Verisign at many IXes
Services to Offer

• Route Server
  – Helps scale IXes by providing easier BGP configuration operation for participants
  – Technical detail covered later on

• Looking Glass
  – One way of making the Route Server routes available for global view (e.g. www.traceroute.org)
  – Public or members-only access
Services to Offer

• Content Redistribution/Caching
  – For example, Akamised update distribution service

• Network Time Protocol
  – Locate a stratum 1 time source (GPS receiver, atomic clock, etc) at IXP

• Routing Registry
  – Used to register the routing policy of the IXP membership (more later)