Internet Exchange Point Design

ISP/IXP Workshops
IXP Design

- Layer 2 Exchange Point
- Layer 3 Exchange Point
- Transit Exchange Point
- Design Considerations
Internet Exchange Points

- Layer 2 exchange point
  ethernet, ATM or Frame Relay switch
- Layer 3 exchange point
  router based
  central or distributed
Layer 2 Exchange

The traditional IXP
Layer 2 Exchange

ISP 1

ISP 2

ISP 3

ISP 4

ISP 5

ISP 6

Ethernet Switch

IXP Management Network

IXP Services:
TLD DNS, Routing Registry, Looking Glass, news, etc
Layer 2 Exchange

IXP Services:
- TLD DNS,
- Routing Registry
- Looking Glass,
- news, etc.

Ethernet Switches

ISP 1
ISP 2
ISP 3
ISP 4
ISP 5
ISP 6

IXP Management Network
Layer 2 Exchange

- Two switches for redundancy
- ISPs use dual routers for redundancy or loadsharing
- Offer services for the “common good”
  - Internet portals and search engines
  - DNS TLD, News, NTP servers
  - Routing Registry and Looking Glass
Layer 2 Exchange

• Requires neutral IXP management
  usually funded equally by IXP participants
  24x7 cover, support, value add services

• Secure and neutral location

• Configuration
  private address space if non-transit and no value add services
  ISPs require AS, basic IXP does not
Layer 2 Exchange

• Network Security Considerations

  LAN switch needs to be securely configured

  Management routers require TACACS+ authentication, vty security

  IXP services must be behind router(s) with strong filters
Layer 3 Exchange

The wholesale transit ISP
Layer 3 Exchange

IXP Services:
- TLD DNS,
- Routing Registry
- Looking Glass,
- news, etc

IXP Router

ISP 1

ISP 2

ISP 3

ISP 4

ISP 5

ISP 6

IXP Management Network
Layer 3 Exchange

IXP Services:
- TLD DNS,
- Routing Registry
- Looking Glass,
- news, etc

IXP Routers

ISP 1
ISP 2
ISP 3
ISP 4
ISP 5
ISP 6

IXP Management Network
Layer 3 Exchange

- Two routers for redundancy
- ISPs use dual routers for redundancy or loadsharing
- Offer services for the “common good”
  - Internet portals and search engines
  - DNS TLD, News, NTP servers
  - Routing Registry and Looking Glass
Layer 3 Exchange

- Requires neutral IXP management
  usually funded equally by IXP participants
  24x7 cover, support, value add services
  BGP configuration skills essential

- Secure and neutral location

- Configuration
  private address space if non-transit and no value add services
  ISPs and IXP require AS
Layer 3 Exchange

• Network Security Considerations

Core IXP router(s) require strong security, preferably with BGP neighbour authentication

Management routers require TACACS+ authentication, vty security

IXP services must be behind router(s) with strong filters
Layer 2 versus Layer 3

• Layer 3
  IXP team requires good BGP knowledge
  Rely on 3rd party for BGP configuration
  Less freedom on who peers with whom
  Could potentially compete with IXP membership
  Easier to distribute over wide area
Layer 2 versus Layer 3

• **Layer 2**
  
  IXP team does not need routing knowledge
  
  Easy to get started
  
  More complicated to distribute over wide area
  
  ISPs free to set up peering agreements with each other as they wish
Transit Exchanges
Transit IXPs

- Provides local Internet exchange facility to members
- Also provides transit to Internet or upstream ISP
- Usually operated as a commercial service
- Usually layer 3 design
Layer 3 Transit Exchange

- ISP 1
- ISP 2
- ISP 3
- ISP 4
- ISP 5
- Transit Routers

IXP Routers

IXP Services:
- TLD DNS,
- Routing Registry
- Looking Glass,
- news, etc

Internet

IXP Management Network

ISP
IXP Design Considerations
Routing and Address Space

- ISP border routers should not be configured with default route or carry full Internet routing table
- Use private addresses if possible – public address space means IXP network could be leaked to Internet which may be undesirable
Hardware

• Don’t mix port speeds
  if 10Mbps and 100Mbps connections available, terminate on different switches (L2 IXP)

• Don’t mix transports
  if terminating ATM PVCs and G/F/Ethernet, terminate on different devices

• Insist that IXP participants bring their own router
  moves buffering problem off the IXP
  security is responsibility of the ISP, not the IXP
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
Services to Offer

• **TLD DNS**
  the country IXP could host the country’s top level DNS
  e.g. “UK.” TLD is hosted at LINX in London

• **Usenet News**
  Usenet News is high volume
  could save bandwidth to all IXP members
Services to Offer

• Route Collector
  All IXP members peer with the route collector
  Route collector shows the reachability information available at the exchange
  Requires a simple router with large memory

• Looking Glass
  One way of making the Route Collector routes available for global view
  Public or members only access
Services to Offer
Route Server

- Reduces admin burden on IXP member routers
  only BGP session is with Route Server
  Route Server supplies all paths it knows to the IXP member routers – no best path selection
- Can use private AS
  Route Server software does not prepend its AS to the AS path
- RSd (from Merit Network) commonly used
Services to Offer

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

- **Multicast**
  Provide MBONE and other multicast services for the common good
Services to Offer
Routing Registry

- Routing Registry is used to register the routing policy of the IXP membership
documenting peering relationships
auto-configuring of peer routers
- Alternative is to use the public Internet Routing Registry (IRR)
IXP Design

Summary
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• L2 IXP – most commonly deployed
typically based around ethernet or ATM switches

• L3 IXP – nowadays generally a marketing concept used by wholesale ISPs
doesn’t offer the same flexibility as L2
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