



# Internet Exchange Point Design

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## IXP Design

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

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## Internet Exchange Points

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

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## Layer 2 Exchange

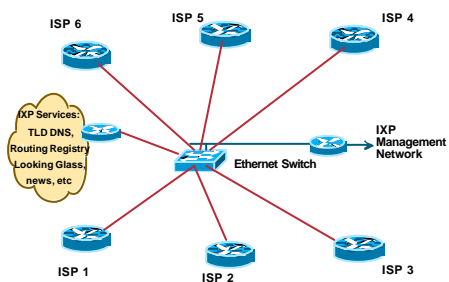
The traditional IXP

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## Layer 2 Exchange

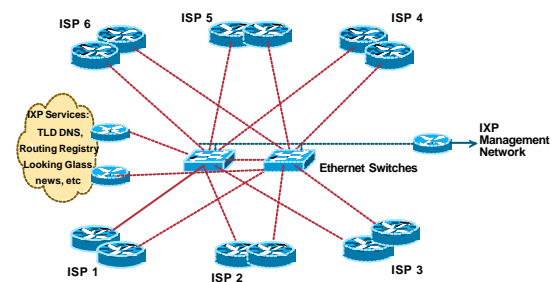


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## Layer 2 Exchange



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## 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

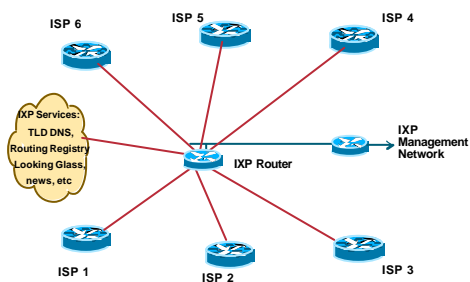
- Network Security Considerations
  - LAN switch needs to be securely configured
  - Management routers require TACACS+ authentication, vty security
  - IXP services must be behind router(s) with strong filters



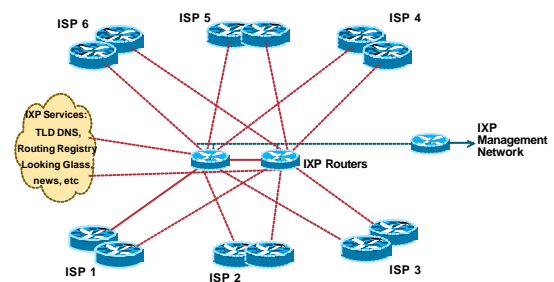
## Layer 3 Exchange

The wholesale transit ISP

## Layer 3 Exchange



## Layer 3 Exchange



## 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

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## 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

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## 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

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## 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

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## 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

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## Transit Exchanges

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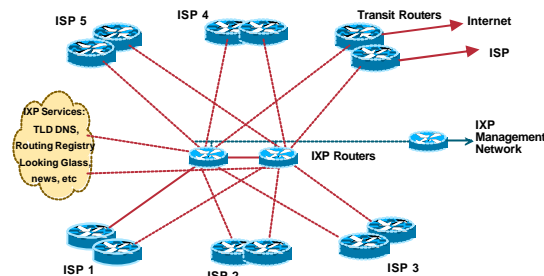
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## Transit IXPs

- 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



## 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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