

# Internet Exchange Point Design

## ISP/IXP Workshops

# IXP Design

Cisco.com

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

# Internet Exchange Points

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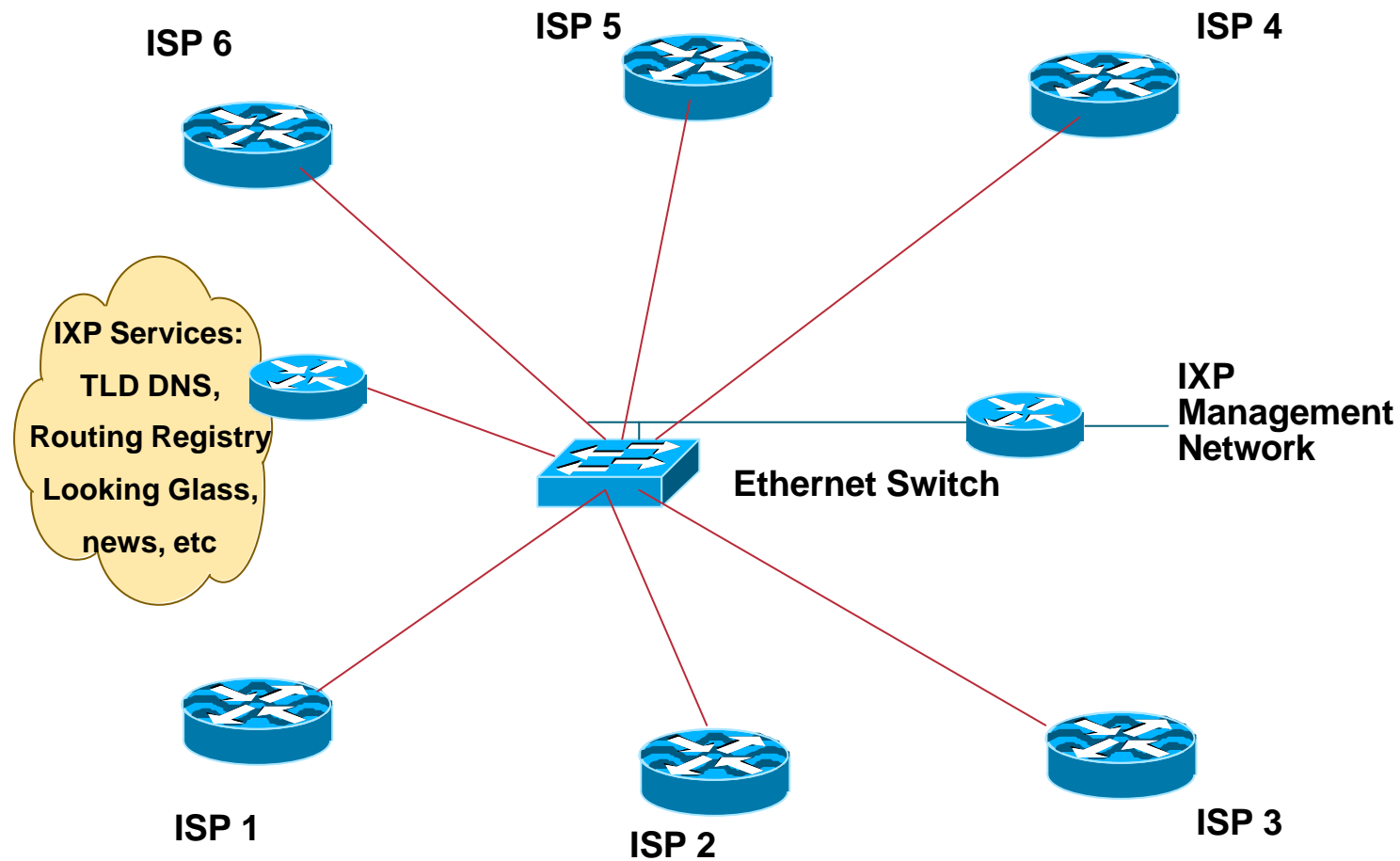
- **Layer 2 exchange point**  
ethernet, ATM or Frame Relay switch
- **Layer 3 exchange point**  
router based  
central or distributed

# Layer 2 Exchange

## The traditional IXP

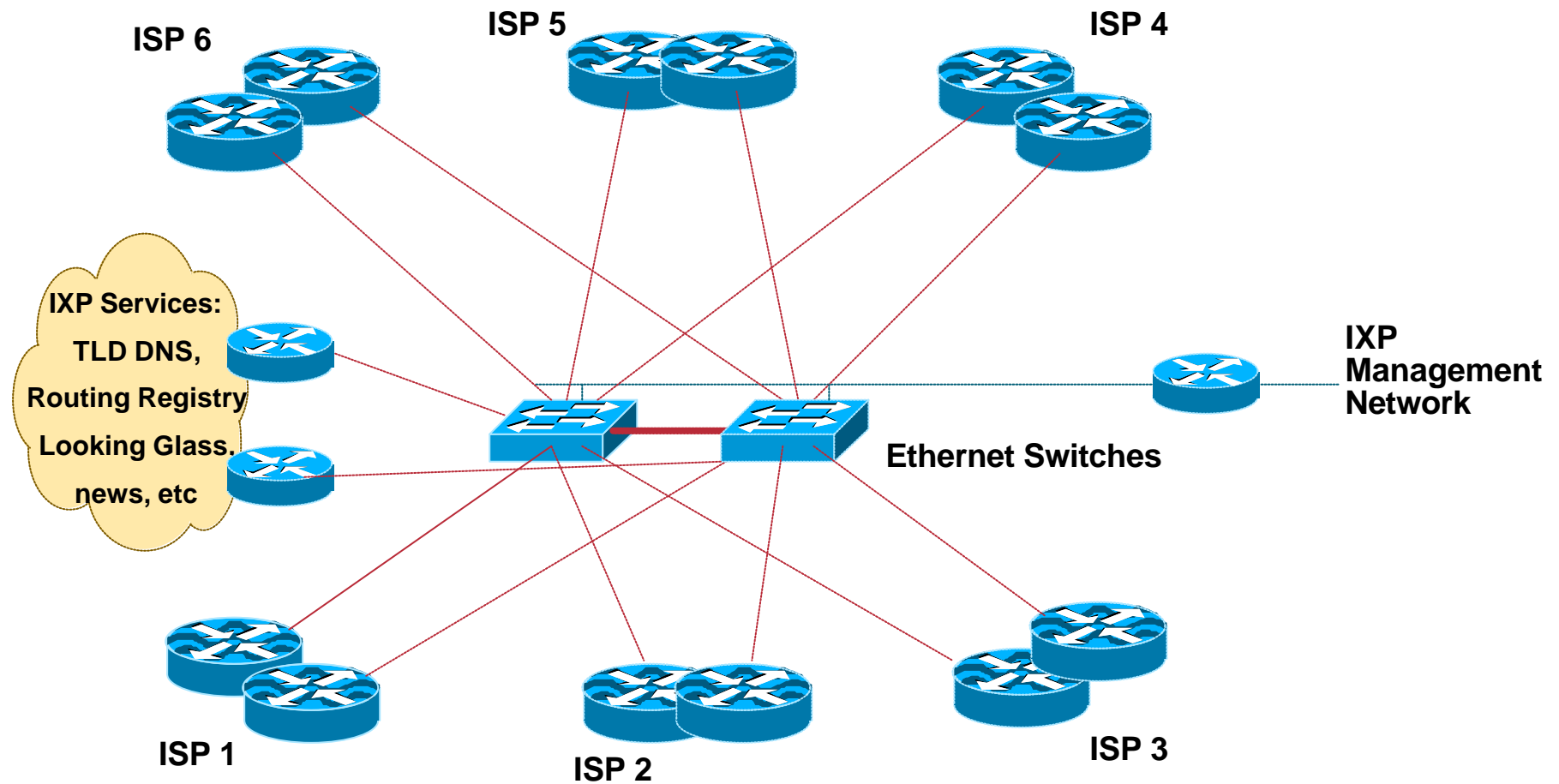
# Layer 2 Exchange

Cisco.com



# Layer 2 Exchange

Cisco.com



# Layer 2 Exchange

Cisco.com

- **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

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- **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

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- **Network Security Considerations**

**LAN switch needs to be securely configured**

**Management routers require TACACS+ authentication, vty security**

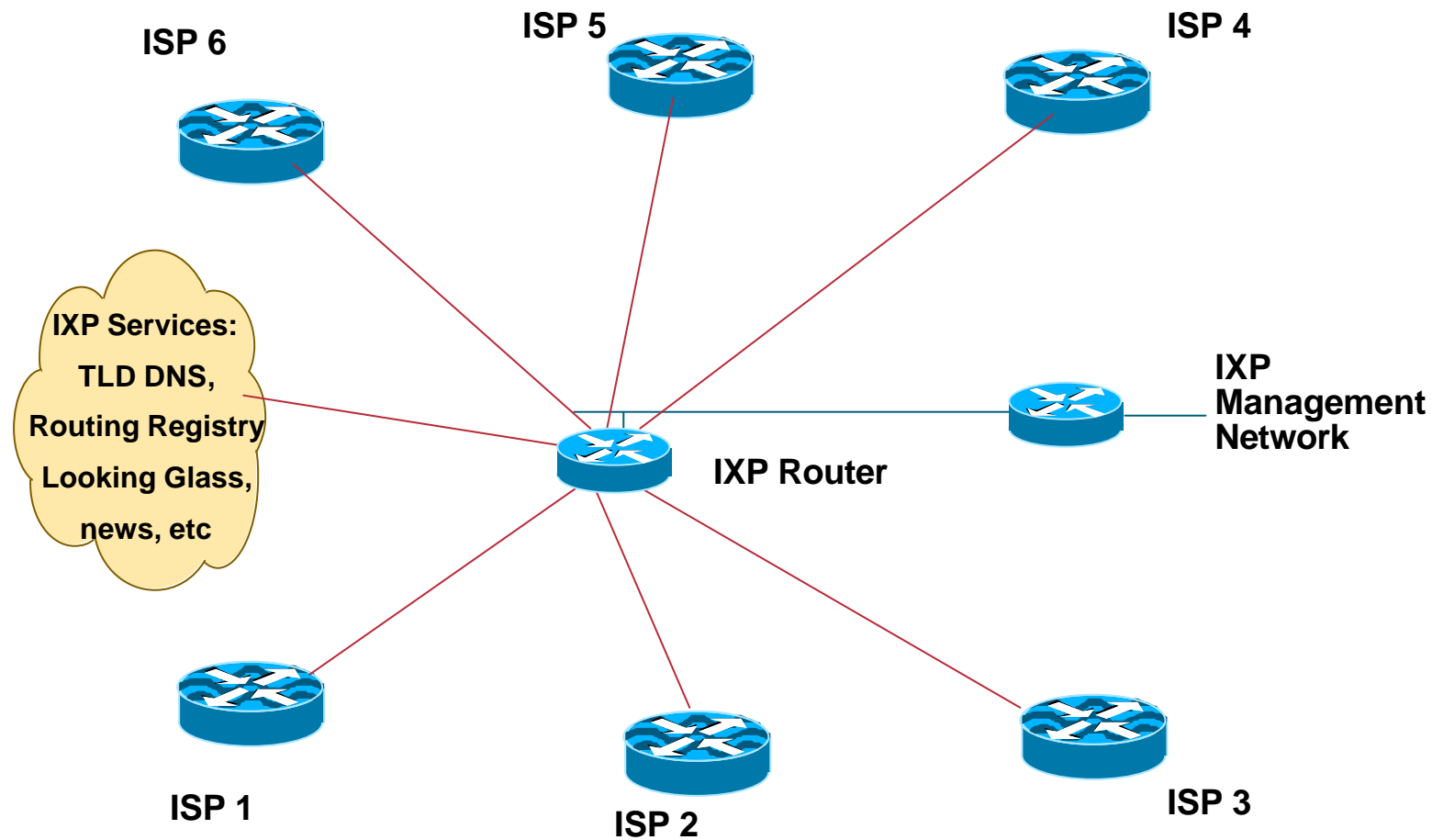
**IXP services must be behind router(s) with strong filters**

# Layer 3 Exchange

**The wholesale transit ISP**

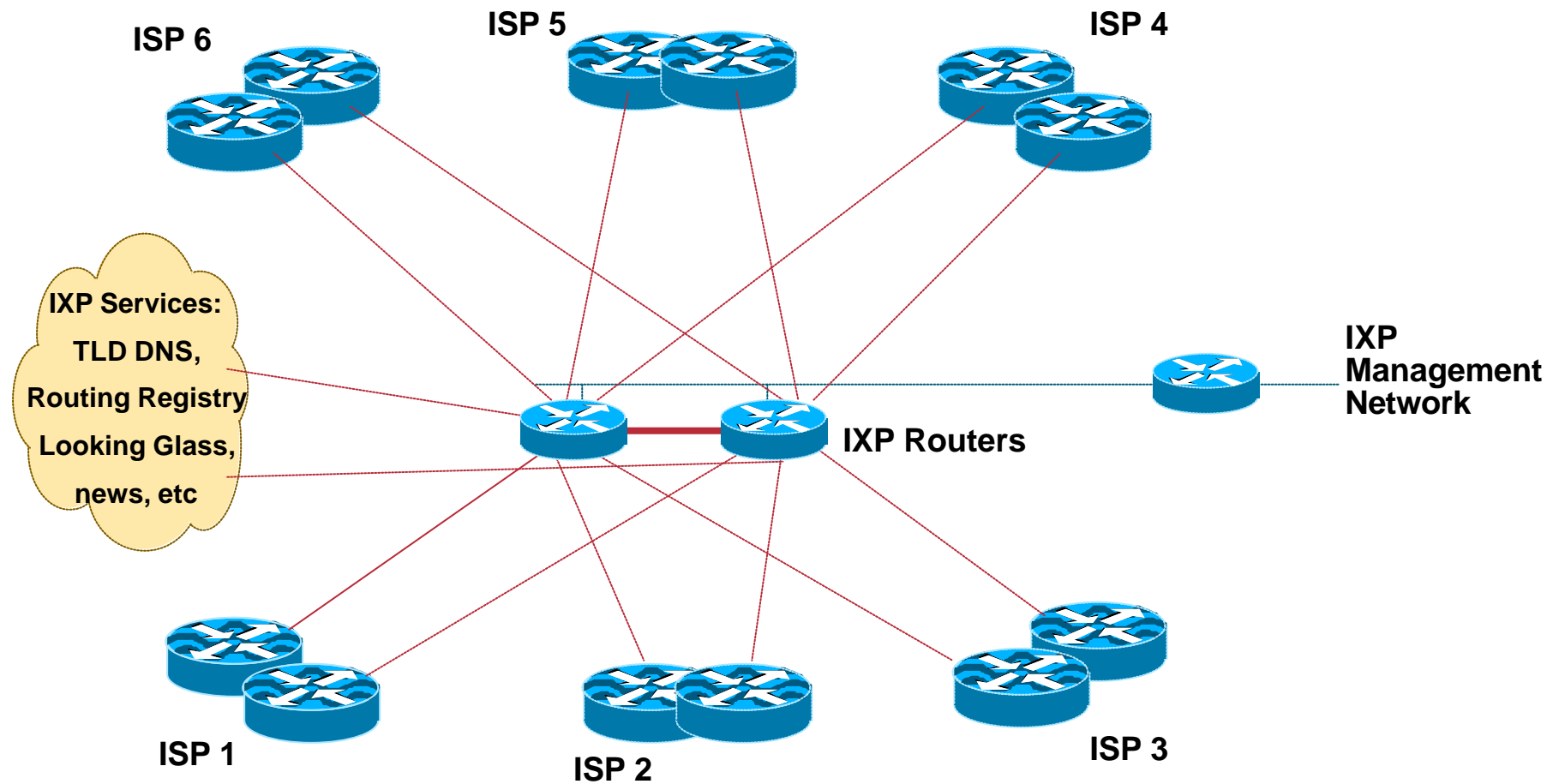
# Layer 3 Exchange

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# Layer 3 Exchange

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# Layer 3 Exchange

Cisco.com

- **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

Cisco.com

- **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

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- **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

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- **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

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- **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

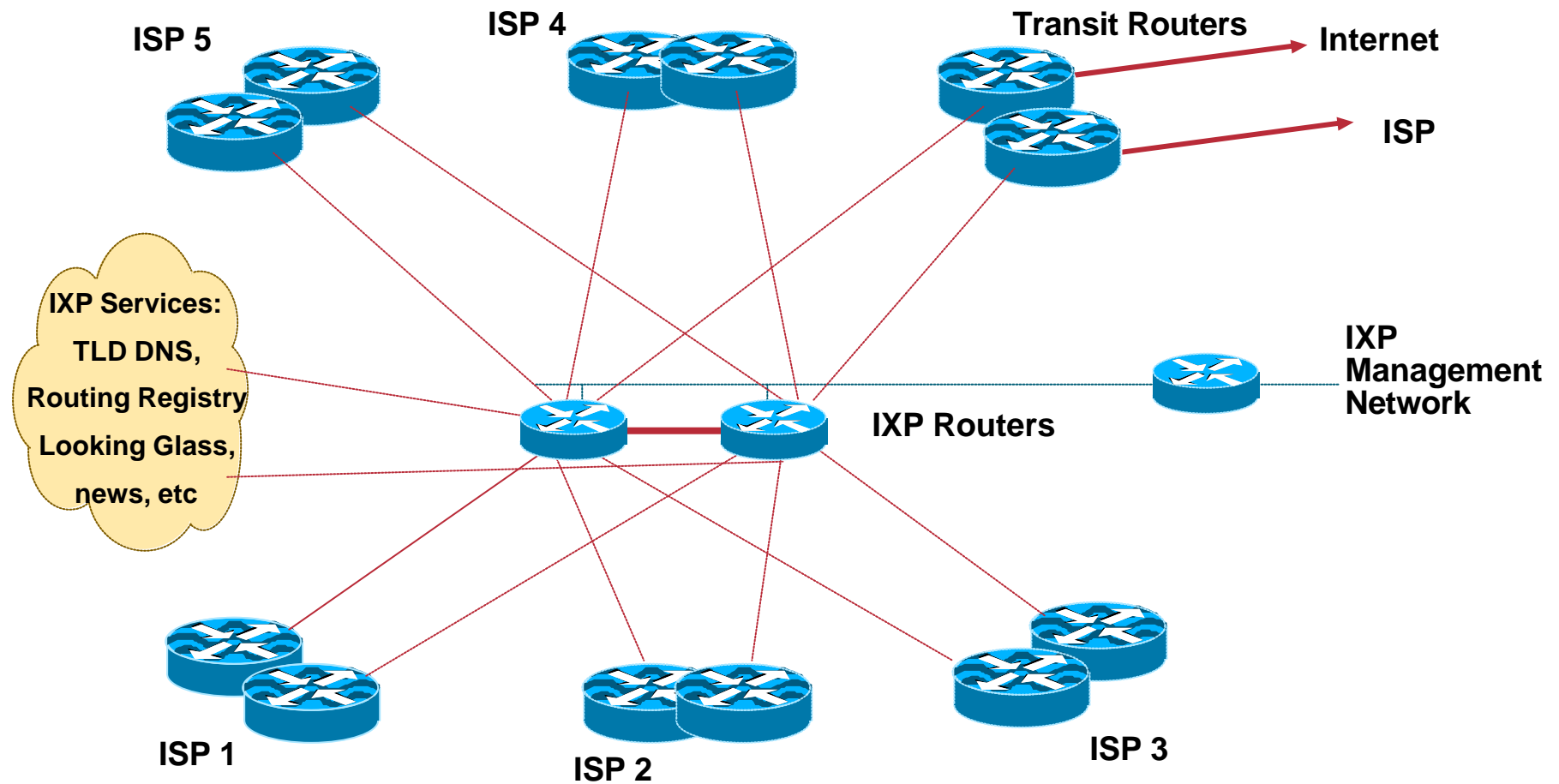
# Transit IXPs

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- **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

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# IXP Design Considerations

# Routing and Address Space

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- **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

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- **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

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- **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

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- **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

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- **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

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- **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

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- **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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