

Internet Exchange Point Design

ISP/IXP Workshops

IXP Design

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

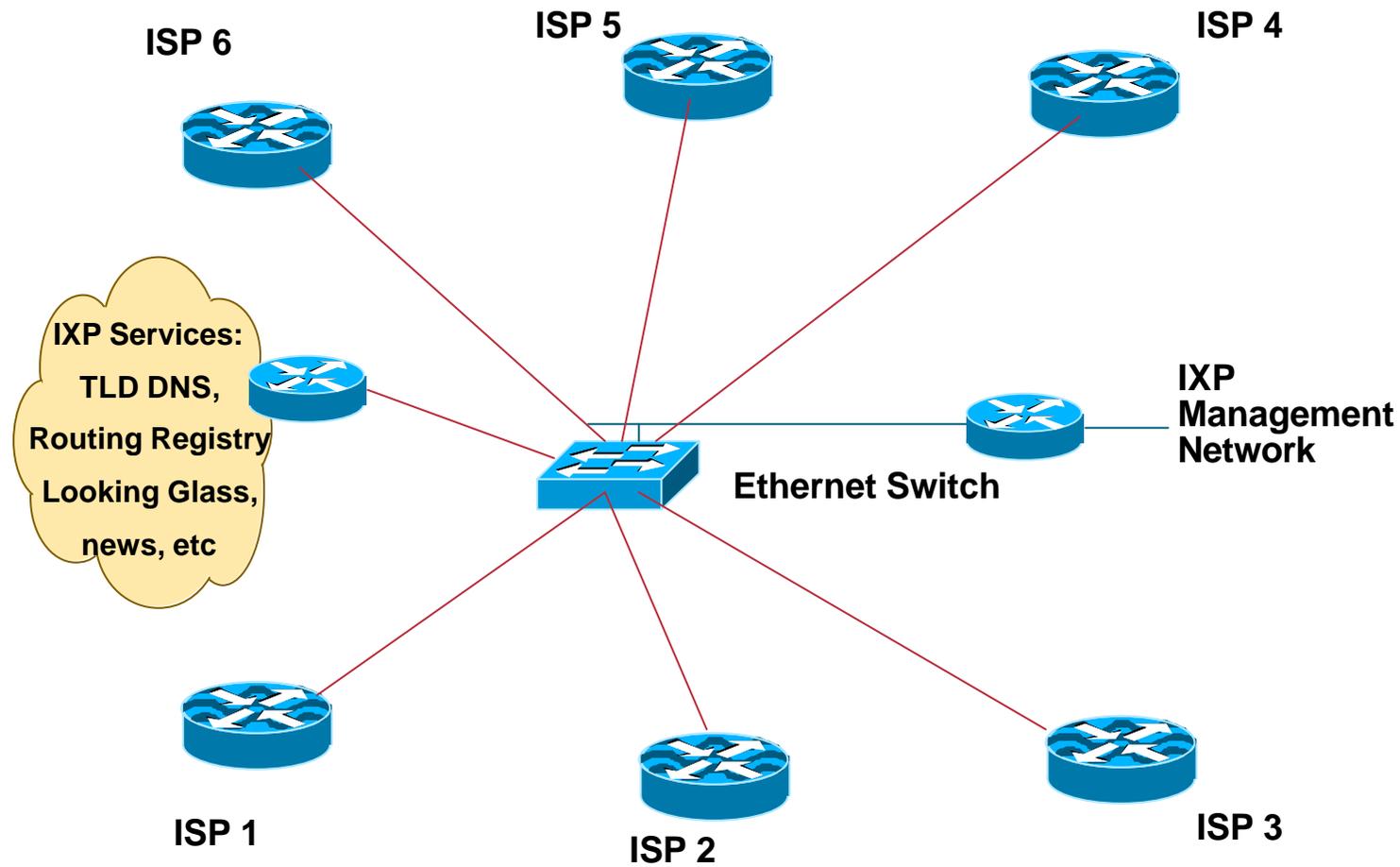
Internet Exchange Points

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

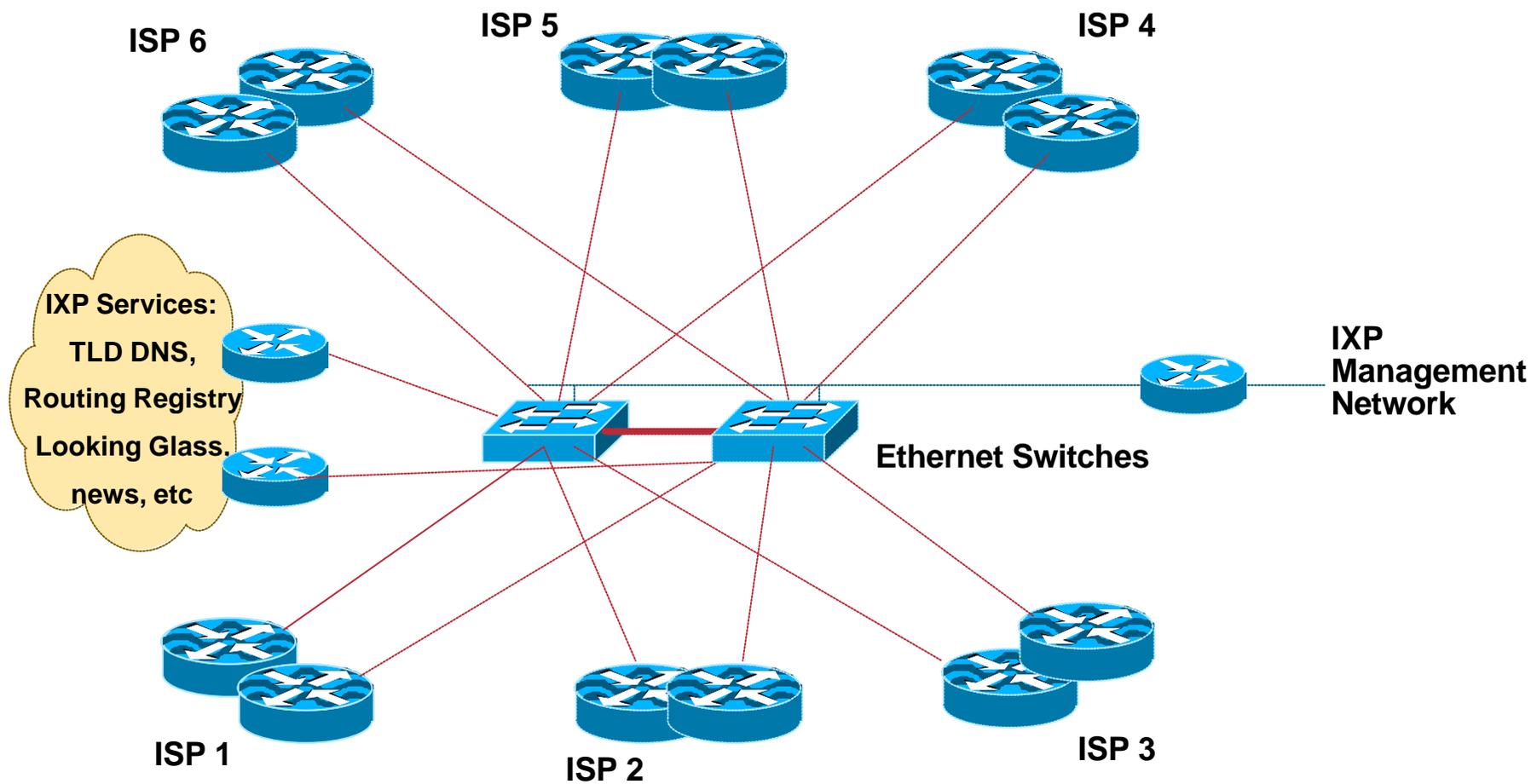
Layer 2 Exchange

The traditional IXP

Layer 2 Exchange



Layer 2 Exchange



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

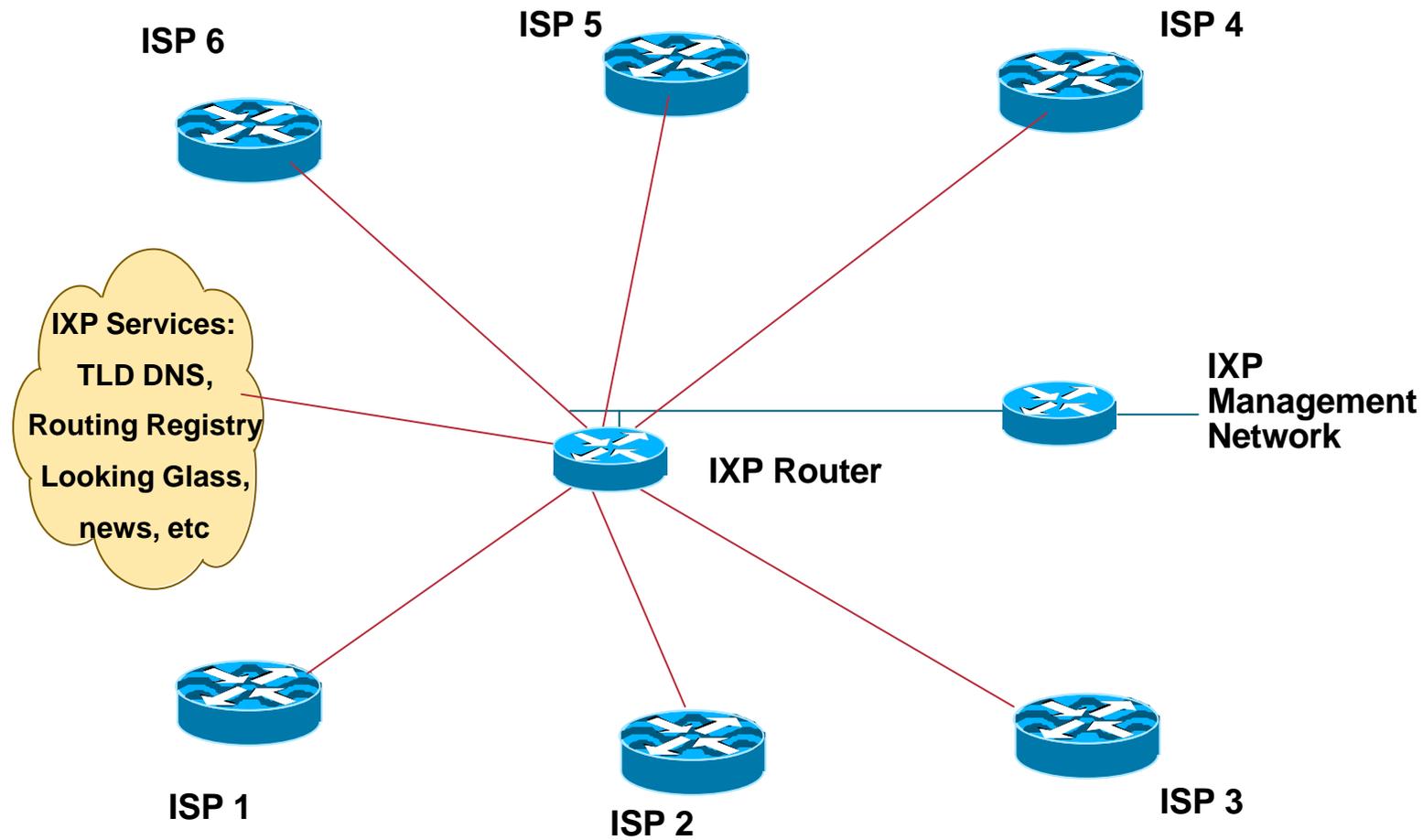
Management routers require TACACS+ authentication, vty security

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

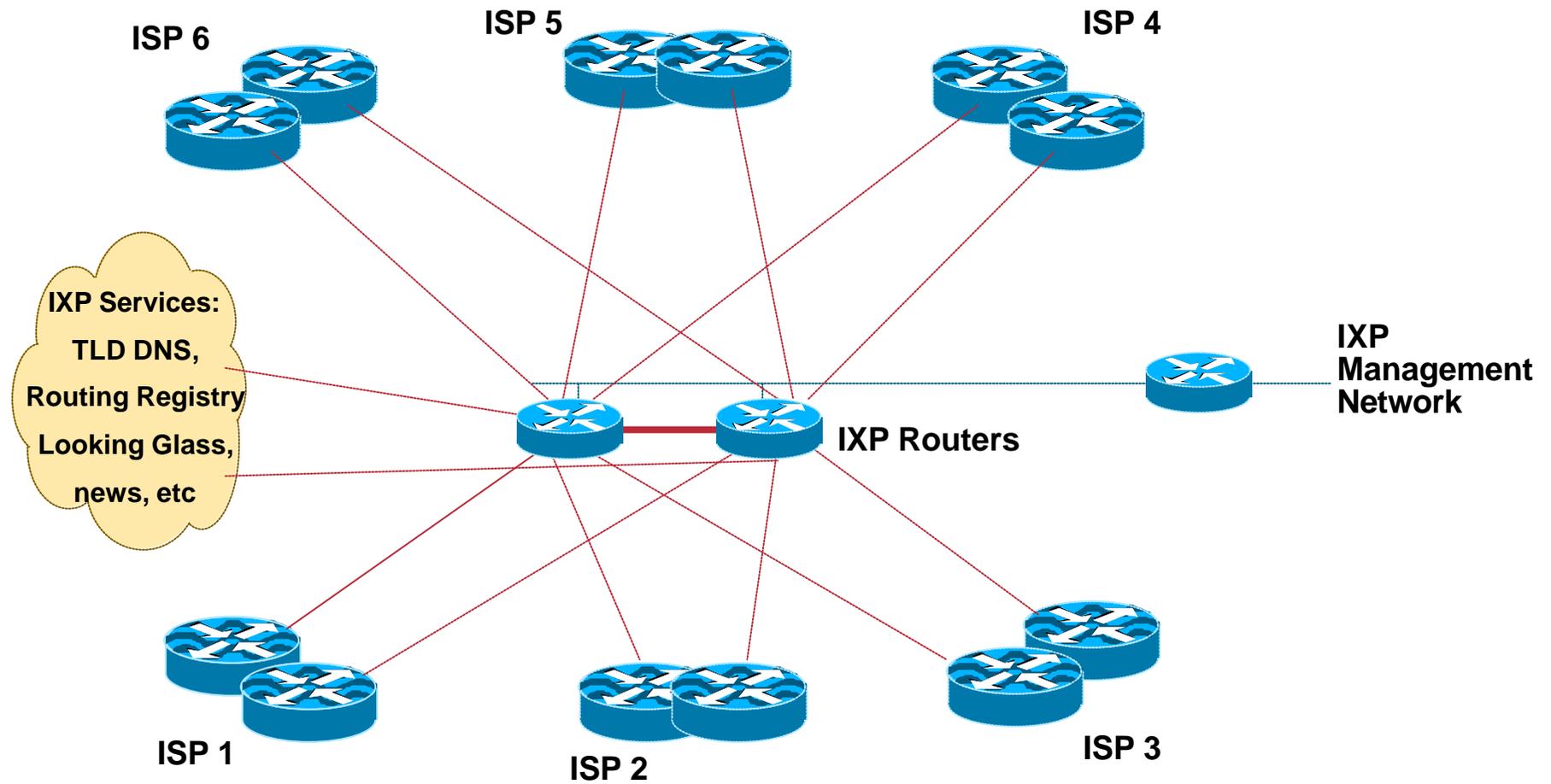
Layer 3 Exchange

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**

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

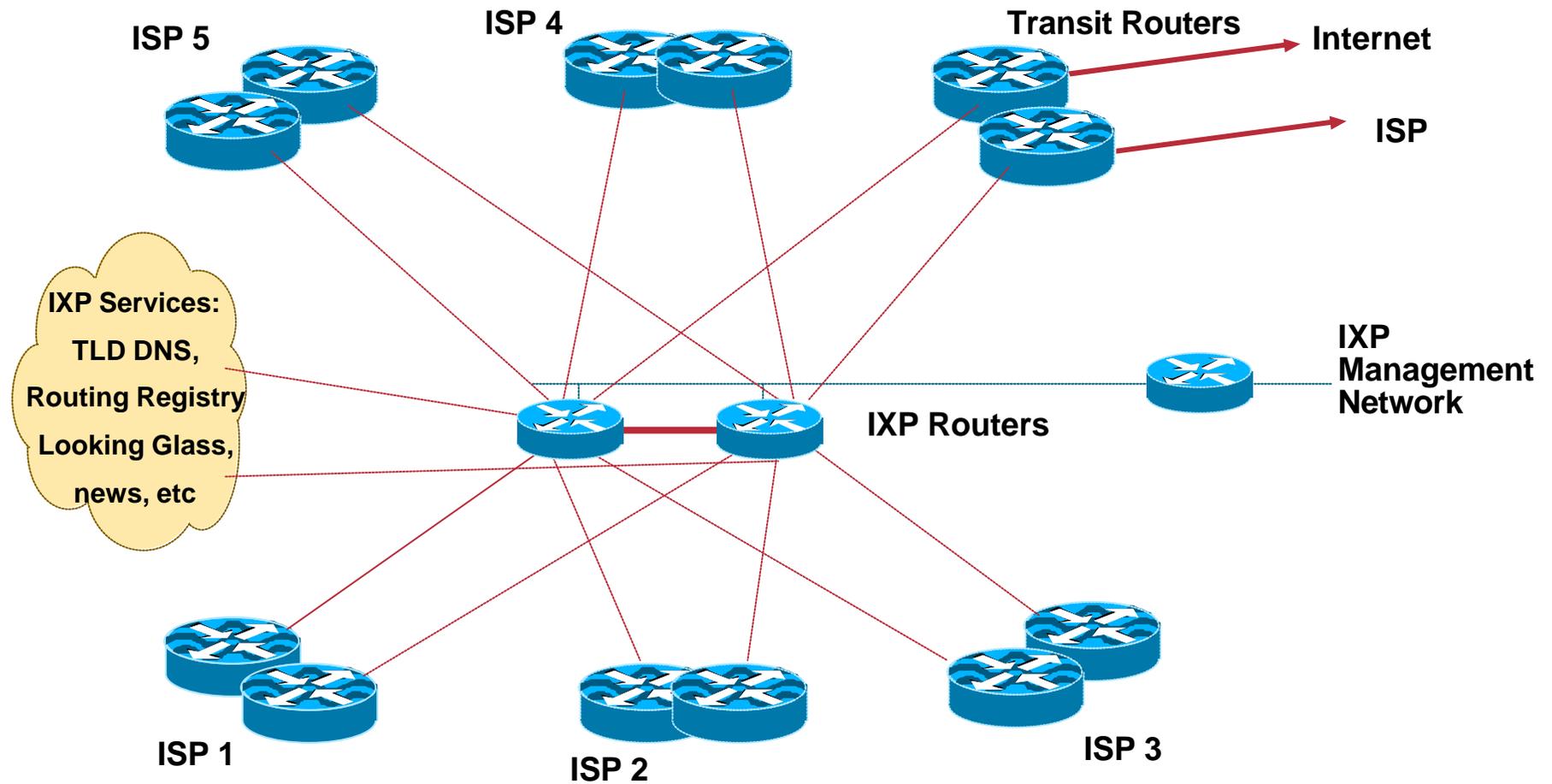
ISPs free to set up peering agreements with each other as they wish

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



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

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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

Summary

- **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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