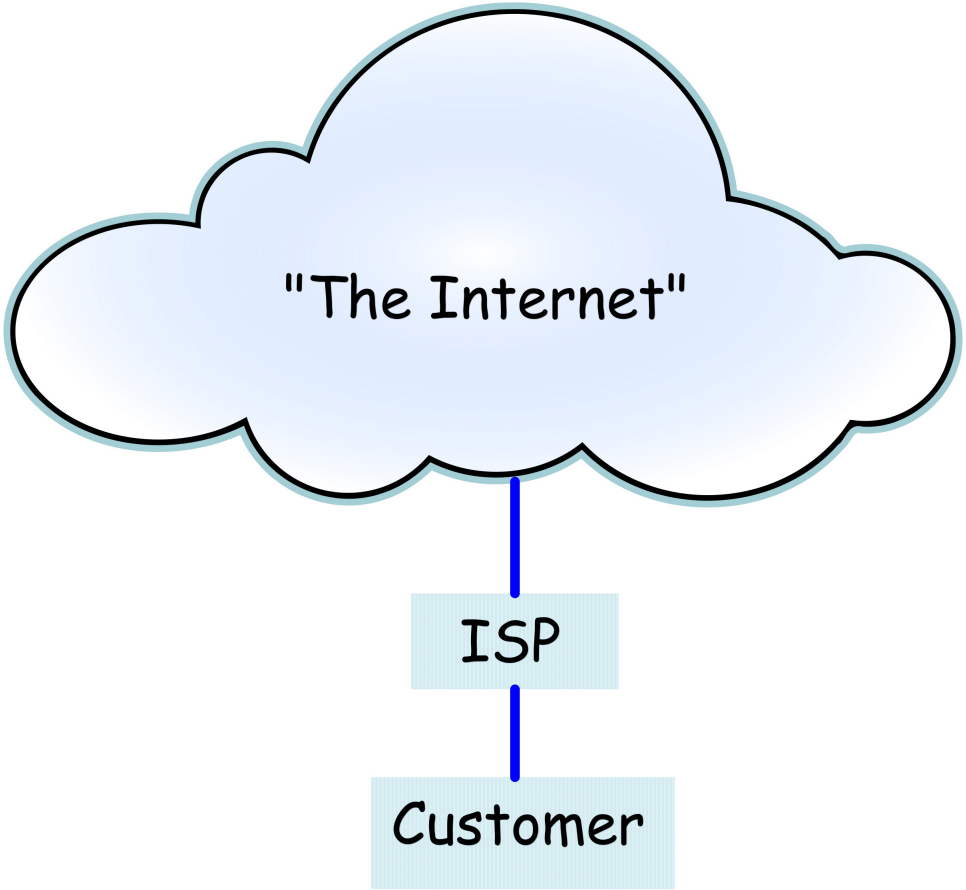
Internet Peering

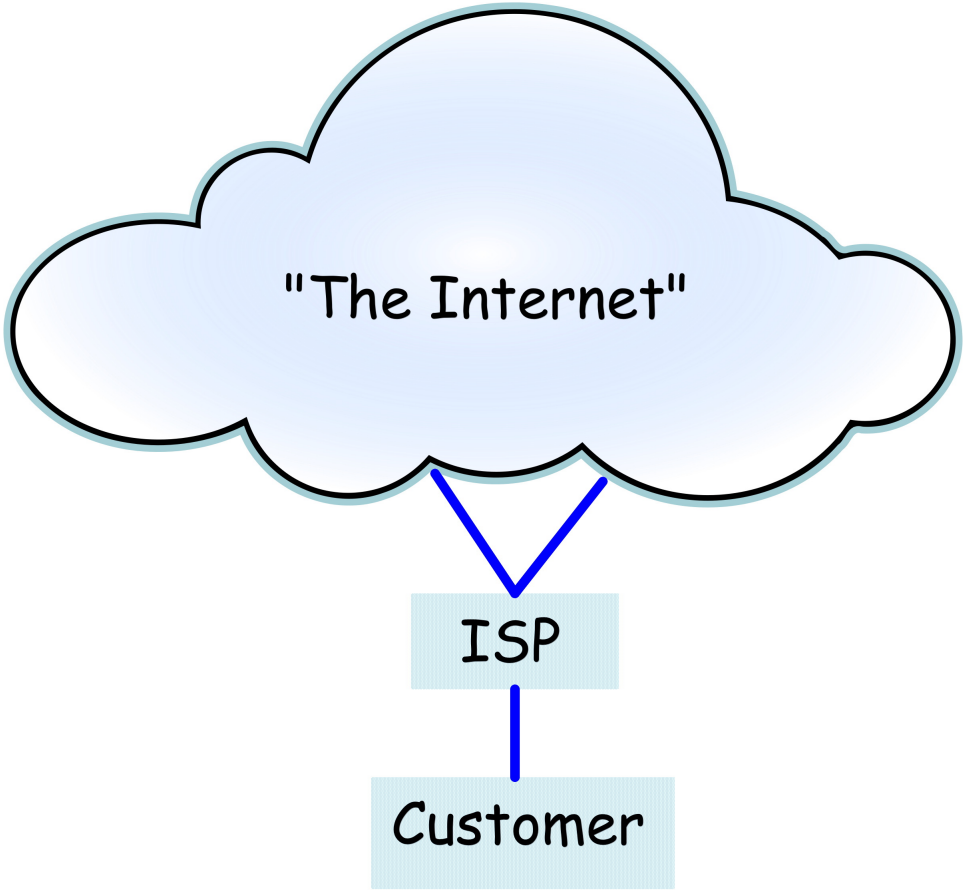
Why, How, Where, …

APNIC

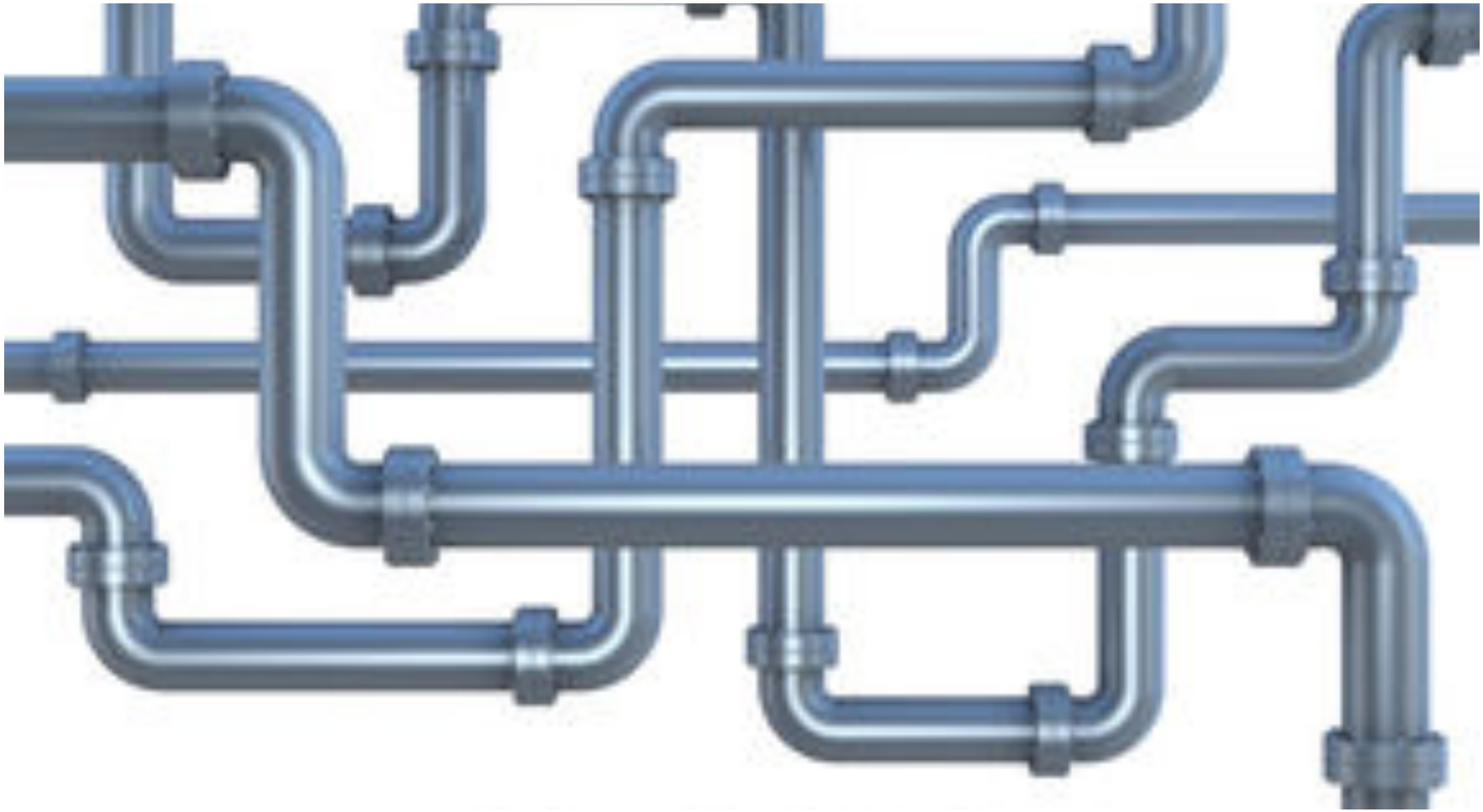
Customer's Expectation



Or maybe this



But it’s really just…



Until this happens

Or this

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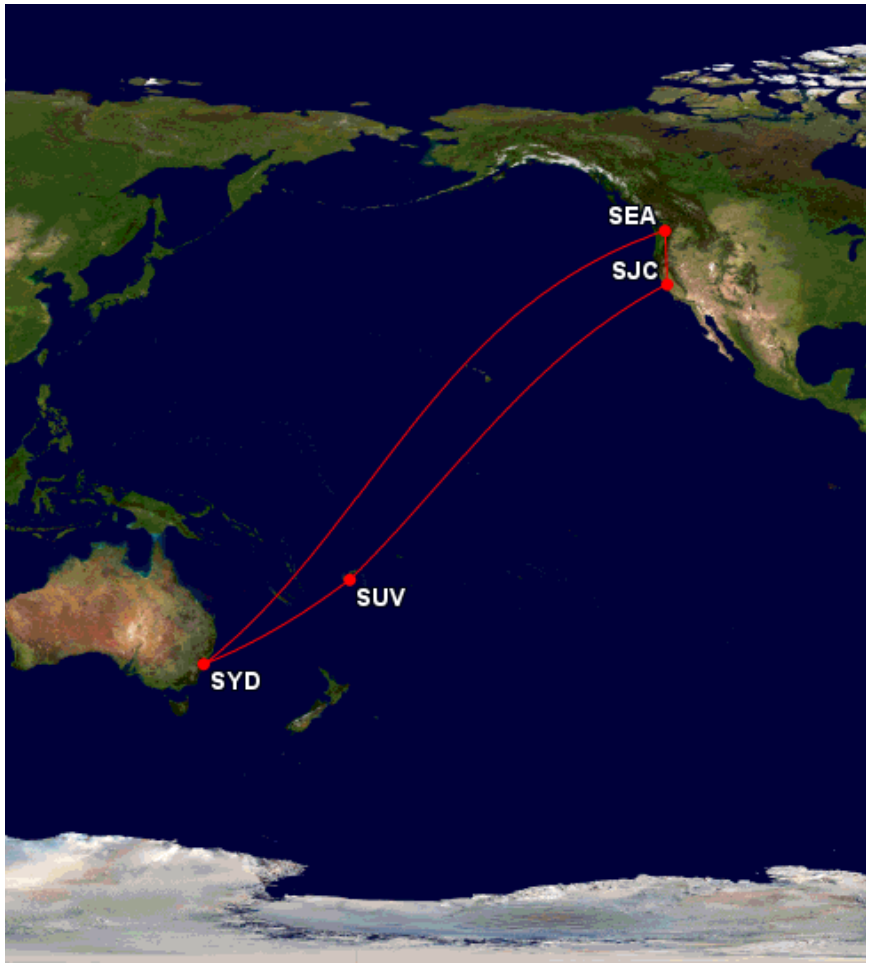
 2  core1-vl400.vcc.kidanet.com.fj (113.20.64.49)  327.221 ms  204.824 ms  12.070 ms
 3  202.170.41.85 (202.170.41.85)  1.564 ms  2.537 ms  1.383 ms
 4  202.170.33.2 (202.170.33.2)  2.826 ms  2.738 ms  1.563 ms
 5  gi0-2-1-4.rcr21.b001848-1.sjc01.atlas.cogentco.com (38.122.92.249)  123.644 ms  123.736 ms ...
 6  be2063.ccr21.sjc01.atlas.cogentco.com (154.54.1.161)  124.323 ms
    be2095.ccr22.sjc01.atlas.cogentco.com (154.54.3.137)  124.578 ms
    be2063.ccr21.sjc01.atlas.cogentco.com (154.54.1.161)  123.759 ms
 7  be3144.ccr41.sjc03.atlas.cogentco.com (154.54.5.102)  124.418 ms  124.695 ms
    be3142.ccr41.sjc03.atlas.cogentco.com (154.54.1.194)  123.785 ms
 8  zayo.sjc03.atlas.cogentco.com (154.54.10.194)  126.692 ms  125.425 ms  124.132 ms
 9  ae16.cr2.sjc2.us.zip.zayo.com (64.125.31.14)  126.694 ms  123.851 ms  124.828 ms
10  ae27.cs2.sjc2.us.eth.zayo.com (64.125.30.232)  142.824 ms  142.947 ms  142.736 ms
11  ae3.cs2.sea1.us.eth.zayo.com (64.125.29.41)  142.369 ms  142.763 ms  142.015 ms
12  ae28.mpr1.sea1.us.zip.zayo.com (64.125.29.105)  142.880 ms  144.592 ms  142.519 ms
13  64.125.193.130.i223.above.net (64.125.193.130)  162.471 ms  163.139 ms  162.358 ms
14  xe-1-0-1.pe2.brwy.nsw.aarnet.net.au (202.158.194.120)  163.443 ms  162.016 ms  163.059 ms
15  ae9.bb1.a.syd.aarnet.net.au (113.197.15.57)  162.210 ms  163.574 ms  162.243 ms
16  ge-1-1-0.bb1.a.suv.aarnet.net.au (202.158.194.226)  198.100 ms  197.932 ms
```

What's wrong with this picture?



- Fintel customer in Suva
- Accessing content at the University of the South Pacific in Suva
- Packet travels > 25,000km
- Physical distance < 10km
- Adding latency
- Possibly jitter too
- Using expensive submarine capacity

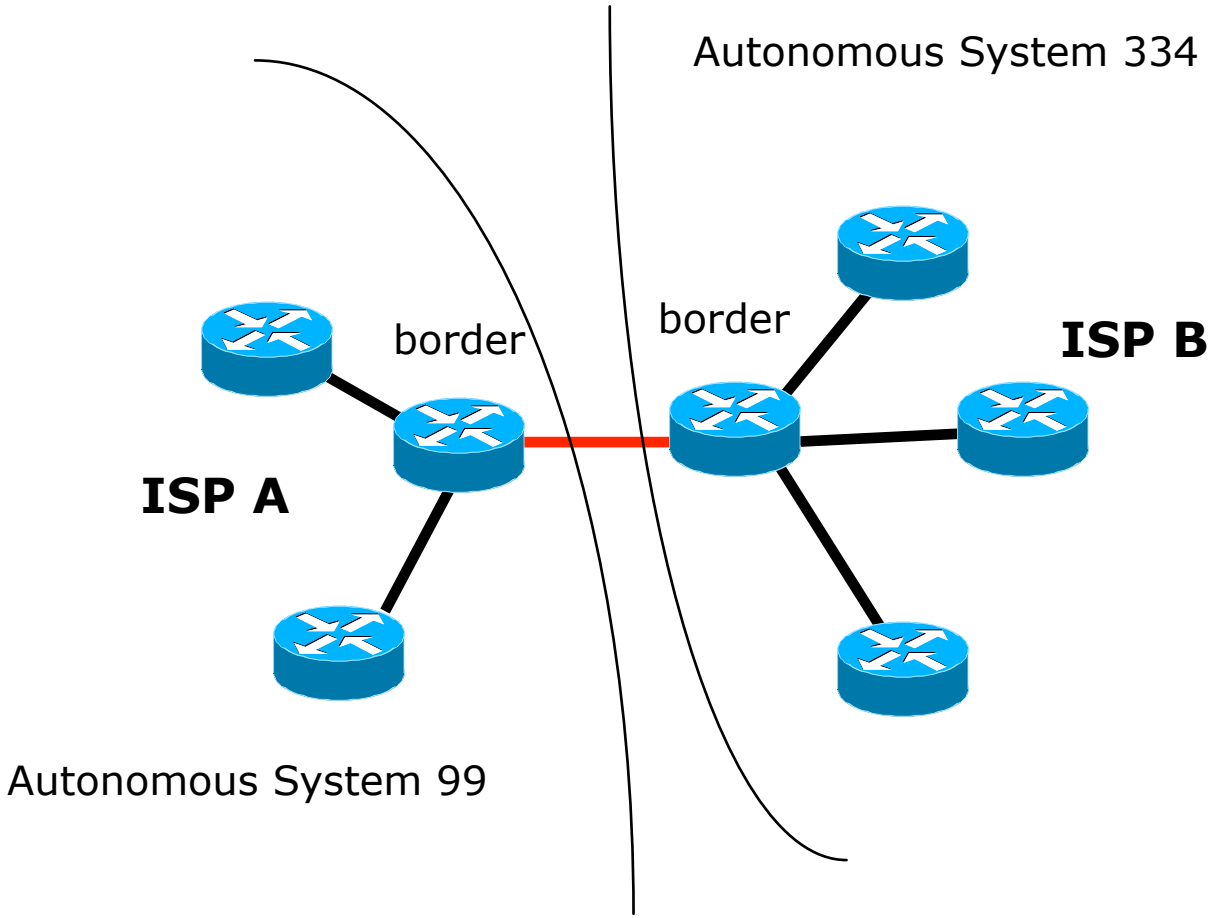
Interconnection, aka Peering

- Connection to a "peer" network
  - Exchange of traffic to customers of each peer
- Requires a circuit to the peer
  - Cost based on capacity of the link
  - May also require a cross connect in a data centre
  - Could be fixed cost or more likely monthly recurring fee
- Traffic is settlement free
- Cost is the same if zero bytes exchanged or link saturated
  - Don't saturate the link, customers will be grumpy ☺

We compete, why interconnect?

- International Connections…
  - If satellite, RTT is around 550ms per hop
  - Compared to local traffic < 10ms round trip
- International bandwidth
  - Costs significantly more than domestic bandwidth
  - Don't congest it with local traffic
    - Wastes money
  - Harms overall performance (end-user experience)

Private Interconnect



What is a Private Interconnect?

- Local (loop) connections
  - Using leased line, dark fibre, microwave, …
- Can't be in a customer/transit relationship
- Sharing customer & infrastructure routes only
  - Routes that generate revenue for you
- Share costs
  - Two circuits, pay for one each

Results of Peering

- Both parties save money
- Local traffic stays local
- Costs typically fixed rather than volume based
- Better performance, better QoS, …
- Expensive international bandwidth available for actual international traffic
- Everyone is happy (except submarine cable and satellite owners)

Scaling peering

- Just repeat process?
- Private peering means that each ISP has to buy circuits to every other peer (perhaps 2 for redundancy)
  - For (n) peers each peer needs (n-1) half circuits
    - Eg 5 peers => 4 half circuits

Why use an Internet Exchange Point?

- Private peering relies on just the two parties making best use of the circuit
- Multiple peers => multiple circuits
- Using an Internet Exchange Point every participant only has to buy just one whole circuit
  - From their premises to the IXP fabric
- Connecting via an IXP maximises the opportunity to fill that circuit
  - Peak traffic isn't the same across all peers
  - Also can improve latency performance between peers where traffic volume wouldn't justify a dedicated circuit

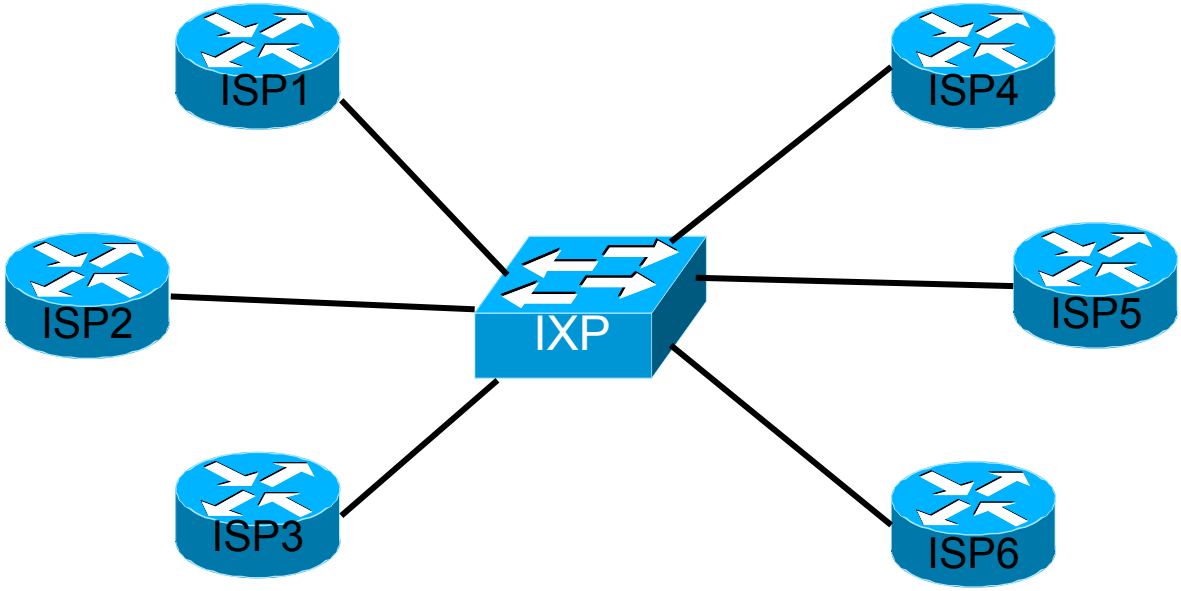
Internet eXchange Point (IXP)

- Need a location or facility that ISPs can access and can connect to each other over a common shared media
  - Eg: Ethernet switch
- Should be a NEUTRAL venue
- Needs to have multiple telco circuit providers and/or allow any licenced provider to install services
- Needs controlled environment & access

Internet eXchange Points

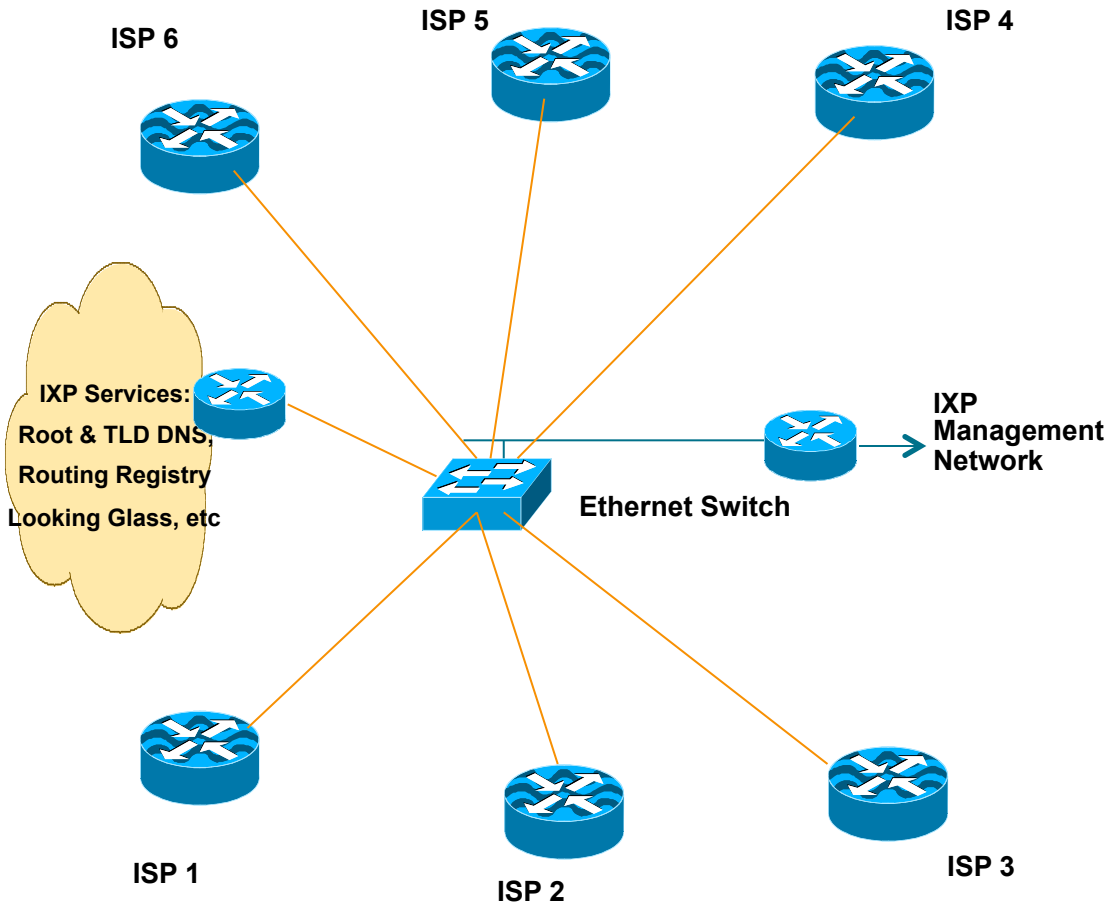
- Variety of shapes and sizes
  - Commercial
  - Community
  - Tbps to Mbps
  - Single location or Metropolitan Area scoped
  - Purely a traffic exchange
  - Value added services
- Layer 2 exchange point
  - Ethernet Switches (100Gbps/10Gbps/1Gbps/100Mbps)

Internet eXchange Point

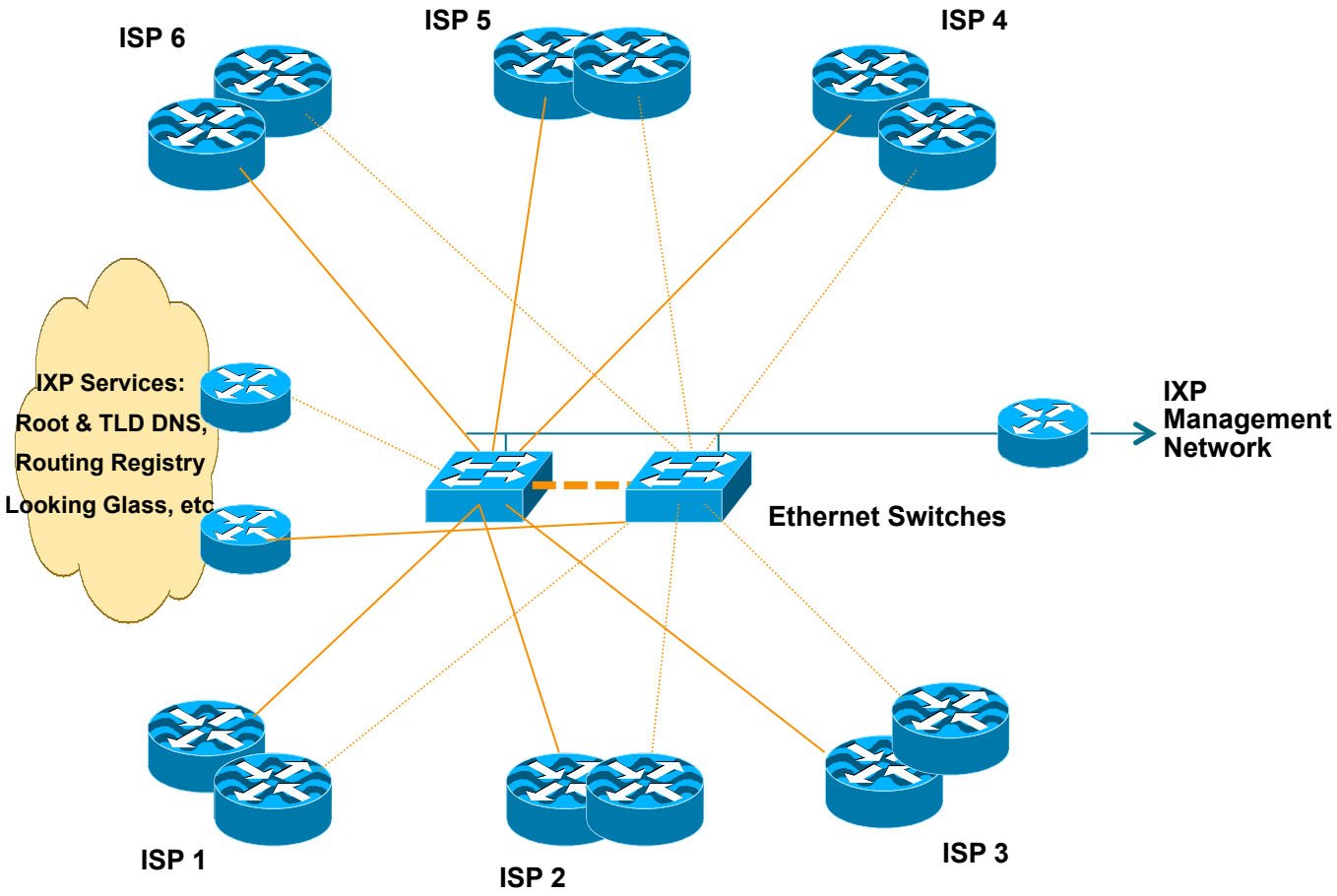


- Border routers in different Autonomous Systems

Typical Exchange



Or with more redundancy



Internet Exchange Point

- Two switches for redundancy
- ISPs use dual routers for redundancy or load sharing
- Offer services for the “common good”
  - Internet portals and search engines
  - DNS Root & TLDs, NTP servers
  - Routing Registry and Looking Glass

Internet Exchange Point

- 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
  - Otherwise public IPv4 (/24) and IPv6 (/48, /56, /64)
  - ISPs require AS, basic IXP does not

Internet Exchange Point

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

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