Caribbean Network Operators Group

GETTING READY FOR AN IXP

IP Addresses, ASN, Connectivity and other Technical Considerations and Practices

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About CaribNOG

- CaribNOG is a dedicated community of network operators and stakeholders committed to providing a regional forum for
  - ***Sharing*** *technical experiences and expertise*
  - ***Building*** *technical capacity and knowledge*
  - ***Advocating*** *relevant technical approaches and solutions for the region*

CaribNOG Objectives

- To **bring together** Caribbean Network practitioners into a functional regional community
- To **harness** the knowledge and experiences of the community
- To **build the technical expert base** necessary for building knowledge-based economies
- To **positively impact** and serve the national and regional community
- To **foster technical research** and excellence in areas of networking and Internet technologies
- To **leverage** the regional technical community to address Caribbean Internet infrastructure challenges and opportunities

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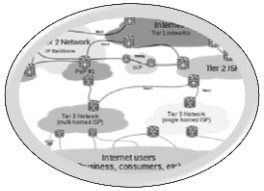
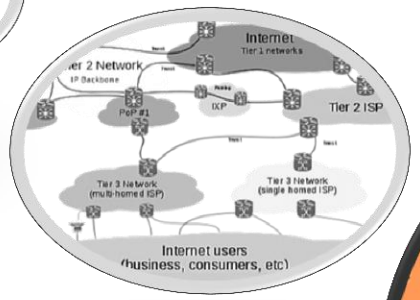
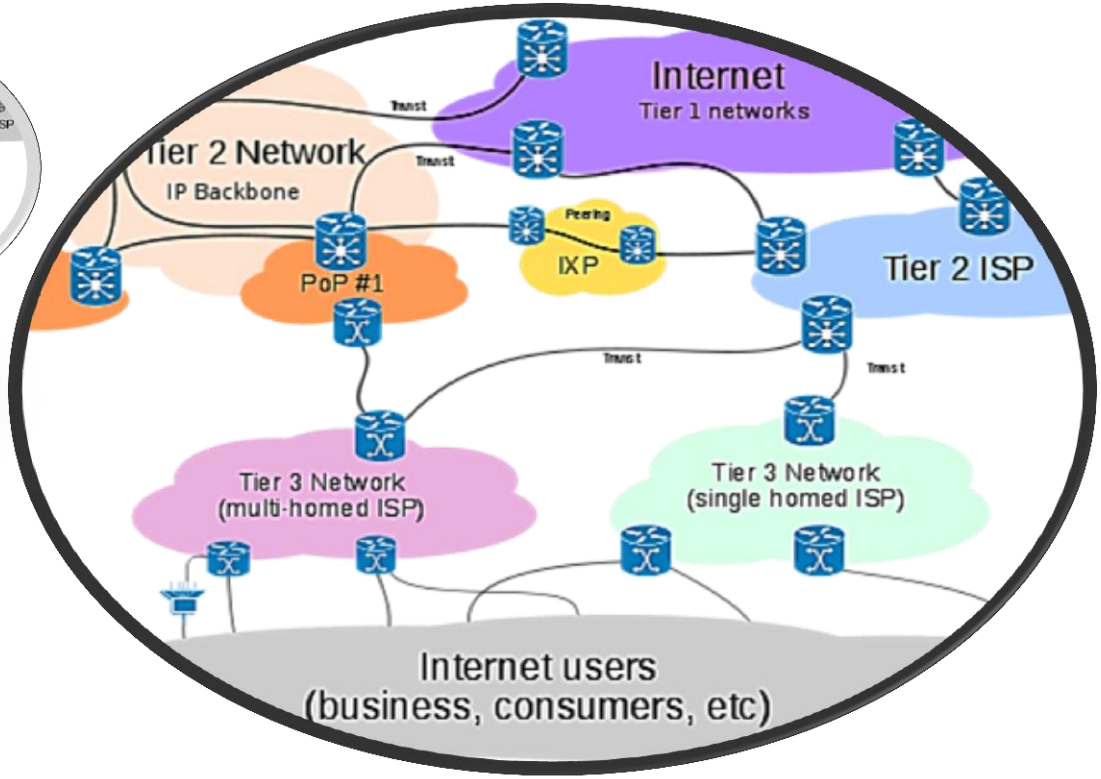
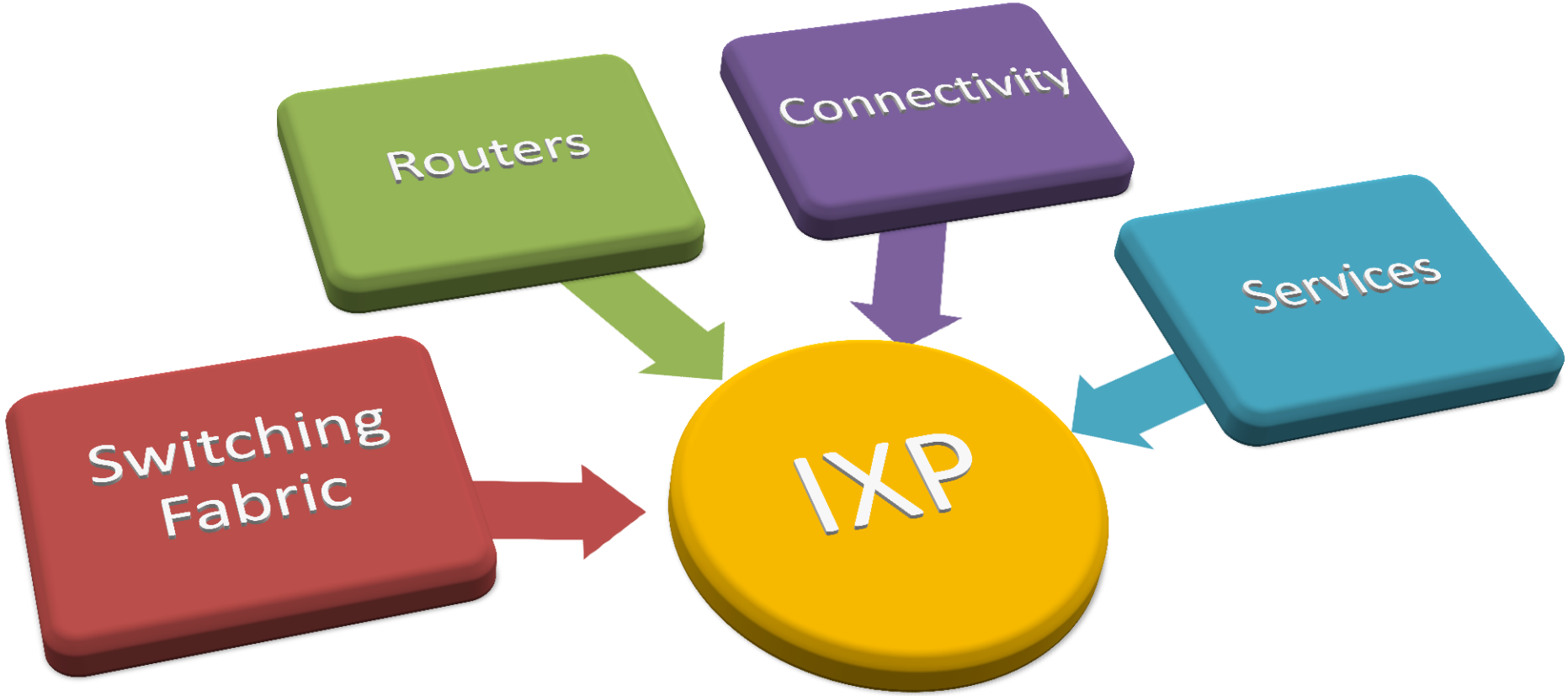




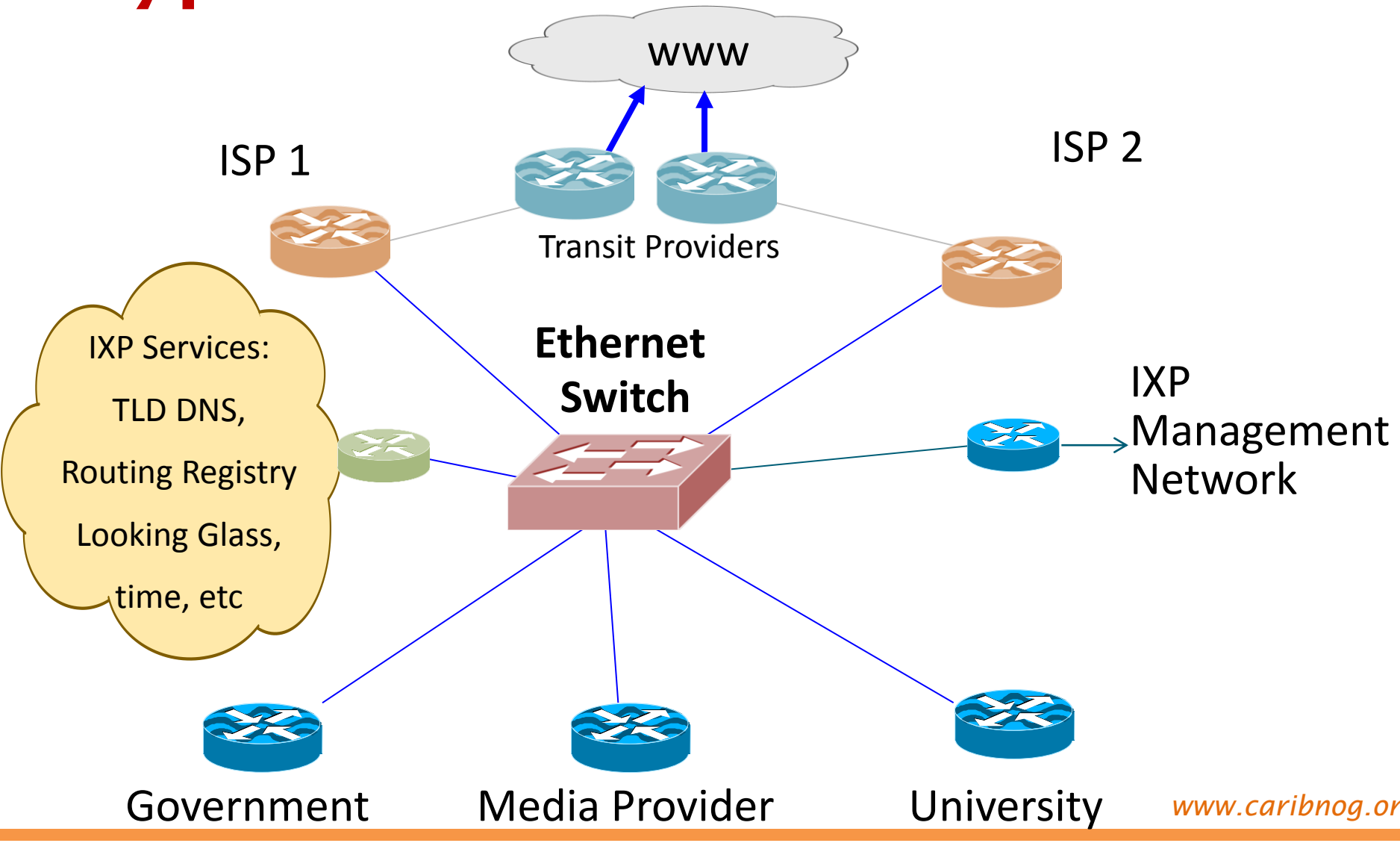


ARCHITECTURE OF AN IXP

Architecture of an IXP



Typical Architecture of an IXP



IXP Architecture - Switching

- The IXP Core is an Ethernet switch

- Has superseded all other types of network devices for an IXP
  - *From the cheapest and smallest 12 or 24 port 10/100 switch*
  - *To the largest 32 port 10GigEthernet switch*

- Many IXs being with a switch located in one equipment rack dedicated to IXP
  - *May also include other IXP operational equipment*

IXP Architecture - Routers

- Each ISP participating in the IXP brings a router to the IXP location
- Router needs:
  - *One Ethernet port to connect to IXP switch*
  - *One WAN port to connect to the WAN media leading back to the ISP backbone*
  - *To be able to run BGP*
- Routers from participant ISPs located in neighbouring/adjacent rack(s)
  - *Copper (UTP) connections made for 10Mbps, 100Mbps or 1Gbps connections*
  - *Fibre used for 10Gbps and 40Gbps*

IXP Architecture - Connectivity

- IXP must be situated in a well connected physical location, ideally one with
  - *Access to dark fiber; other connectivity*
  - *Redundant data circuits*
  - *Supporting infrastructure: power, security and controlled environment*
- ISPs establish backhaul connections to their respective datacenters
- Co-location facilities situated near to the exchange

IXP Architecture - Services

Root Server

- Anycast instances of root servers

Network Time Protocol

- Stratum 1 time source located at IX

Content Redistribution

- Akamai; Google caches; Shareware/freeware downloads

Looking Glass

- Shows the reachability information available at the IX

Routing Registry

- Register the routing policy of IXP members

Monitoring Infrastructure

- CSIRT tools
- Traffic analysis

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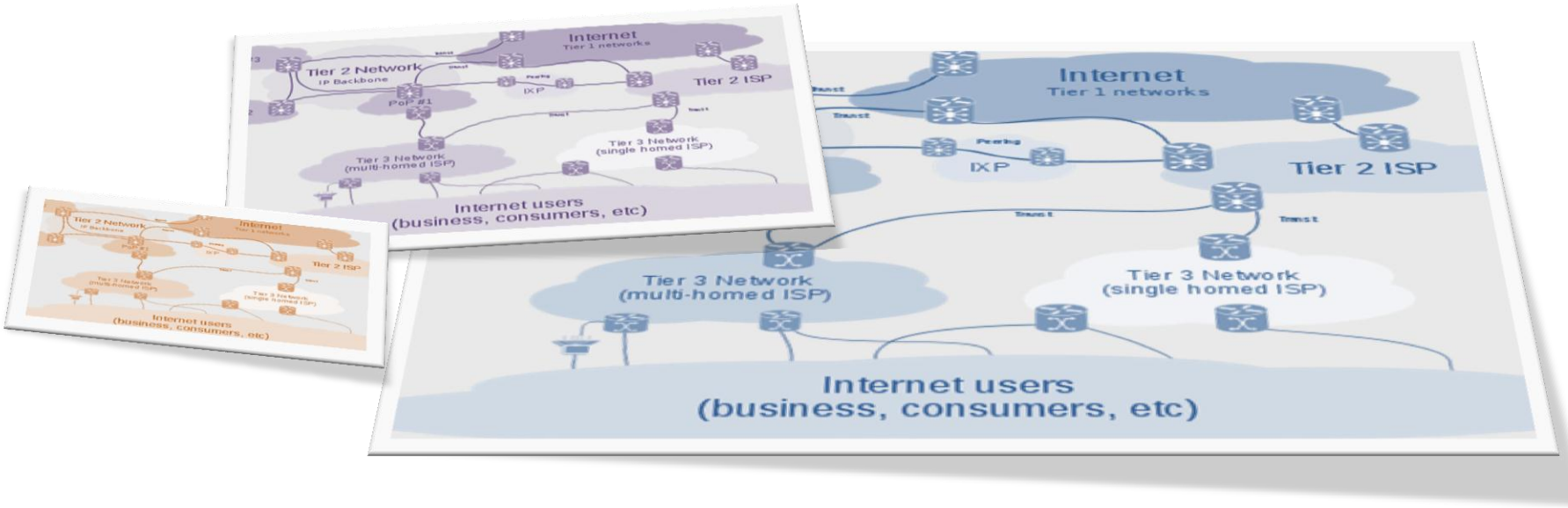


IXP DESIGN CONSIDERATIONS

IXP Design: Peering

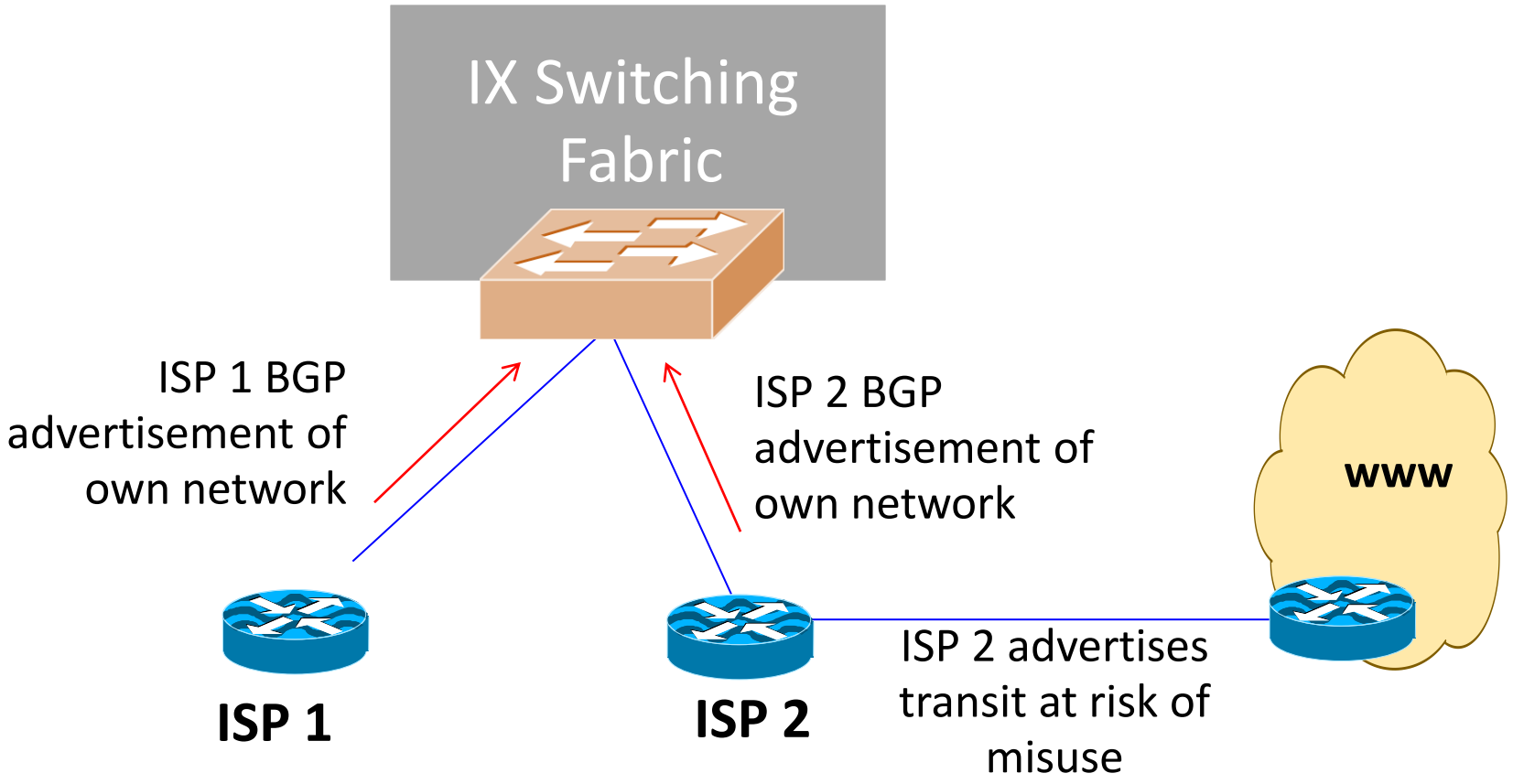
- Multilateral or bilateral peering policy
  - *Based on their own requirements and business relationships*
- Each participant needs to run BGP
  - *They need their own Public AS number, not private ASN*
- Each participant configures external BGP with the other participants in the IXP
  - *Peering with all participants or Peering with a subset of participants*

IXP Design: Routing

- ISP border routers at the IXP generally should not be configured with a default route or carry the full Internet routing table
  - *Carrying default or full table opens ISP to abuse by non-peering IXP members*
  - *Only carry routes offered to IXP peers on the IXP peering router*

- Note: Some ISPs offer transit across IX fabrics
  - *They do so at their own risk*

IXP Design: Routing



IXP Design: Routing

- ISP border routers at the IXP should not be configured to carry the IXP LAN network within the IGP or iBGP
  - *Set BGP next-hop to local router (Cisco IOS next-hop-self)*
- IXP router should only advertise routes to ISP peers; no additional advertisements
  - *If connection from backbone to IXP router goes down, normal BGP failover will then be successful*

IXP Design: IP Address Space

- Some IXPs use private addresses for the IXP LAN
  - *Public address space means the IXP network can be leaked to the Internet, which could be undesirable*
  - *Filtering RFC1918 address space by ISPs is Best Practice; this avoids leakage*
- Some IXPs use public addresses for the IXP LAN
  - *Address space is available from the RIRs*
  - *IXP terms of participation usually forbid carrying the IXP LAN addressing in the ISP backbone*

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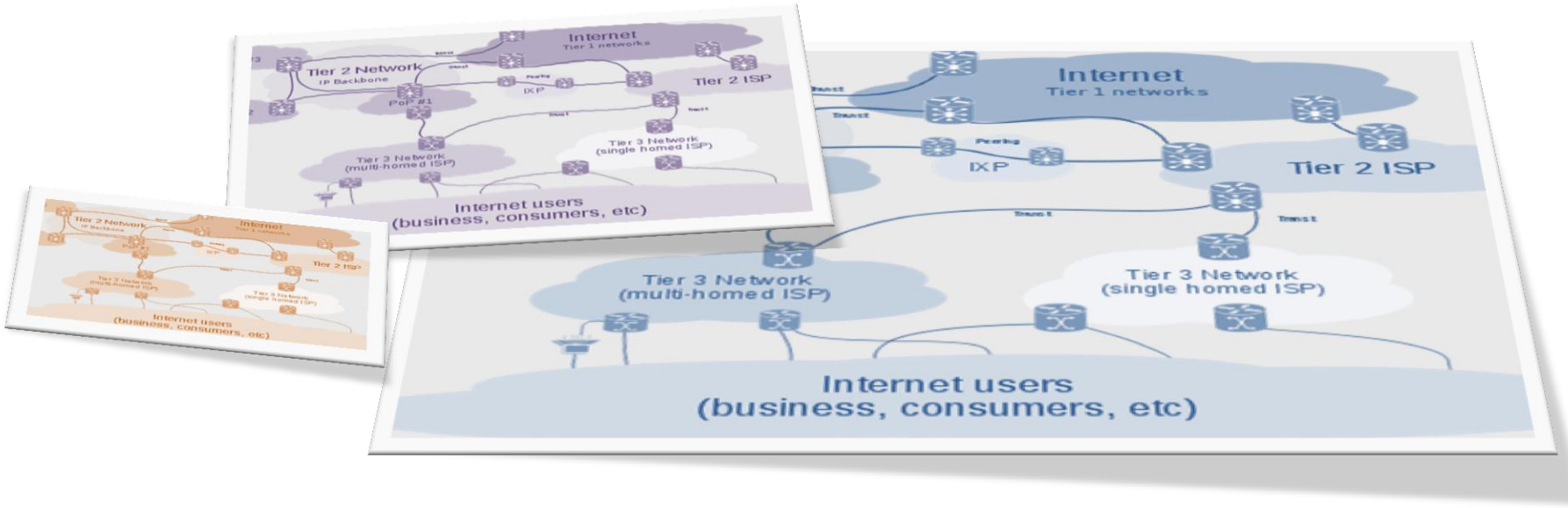

NUMBERING POLICY OPTIONS

American Registry for Internet Numbers

www.arin.net

ARIN Policy

- ARIN has specific policies that allow micro-allocations to critical infrastructure providers, including Internet exchange points
- There are two major policies specifically related to IXPs:
  - *NRPM 4.4 for IPv4 requests - https://www.arin.net/policy/nrpm.html#four4*
  - *NRPM 6.10 for IPv6 requests - https://www.arin.net/policy/nrpm.html#six10*
- An IXP requests number resources as an ARIN end-user customer

ARIN Policy: Requirements

- An IX requesting an IPv4 and/or IPv6 address block must provide the name, email address, and phone number of at least two participants in the IX
  - *The operator of the IX does not have to be an ARIN member or an ISP to request addresses*
  - *Request processing times vary, and the entire process can take up to four weeks from start to finish*
  - *ARIN staff will respond to all correspondence within 2 business days*

ARIN Policy: IP Usage

- IP addresses obtained from ARIN for an IX should be used exclusively on the IX's switch's peering fabric to interconnect participants
  - *The IP addresses should not be publicly routed or used for any other purpose*

ARIN Policy: ASN Requests

- IX's generally do not request AS numbers from ARIN
- If the IX operator needs an AS number for network activities outside of the exchange point, the operator requests an AS number under the normal policies which apply to everyone

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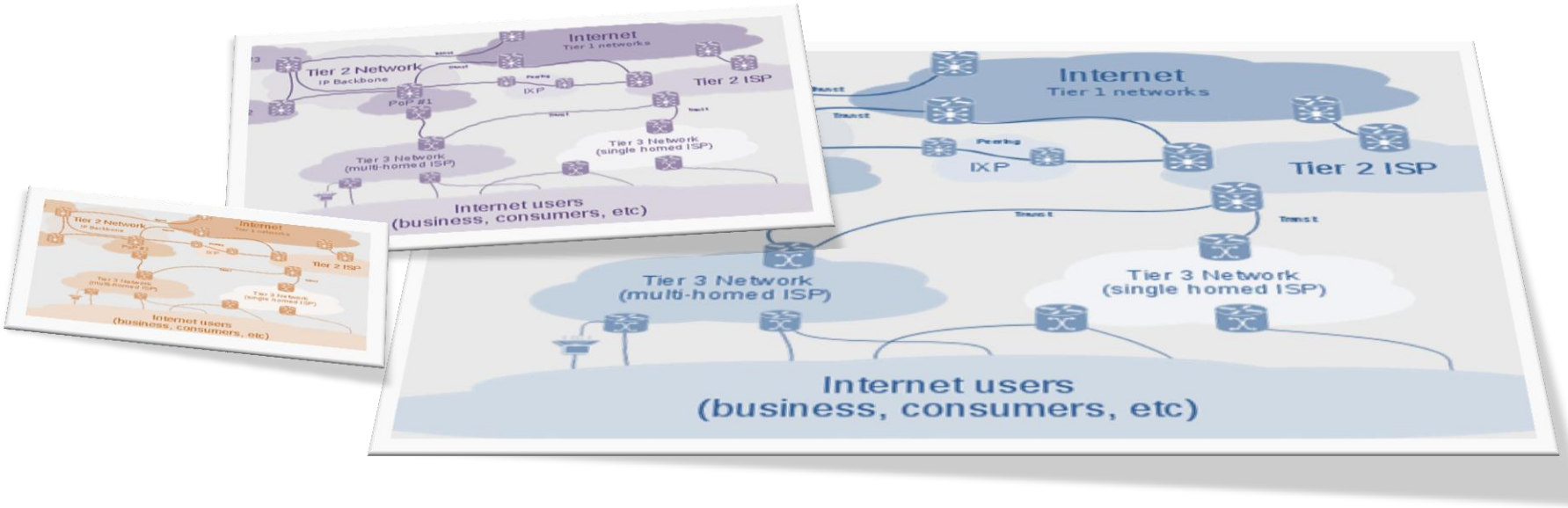

PREPARING FOR THE IXP

Preparing for the IXP

- Key areas to be negotiated between members

☑*Governance*

☑*Location*

☑*Pricing*

☑*Policy*

☑*Additional Services*

IXP Checklist

- ☑ Governance (Ownership)
  - ☑ *MOU*
  - ☑ *Non Profit*
  - ☑ *Private corporation*
  - ☑ *Corporative*
- ☑ Governance (Management)
  - ☑ *Board?*
  - ☑ *1 Vote per Member?*
  - ☑ *Money Management?*

IXP Checklist

- ☑Location
  - ☑*In/Out Town?*
  - ☑*Facility: Neutral/ISP/Gov/University?*
  - ☑ *Rent or Rent-Free?*
  - ☑*Connectivity*
  - ☑*Building Ownership*

IXP Checklist

- ☑ Pricing
  - ☑ *Free?*
  - ☑ *Flat Rate?*
  - ☑ *Traffic Based?*
- ☑ Additional Services
  - ☑ *Yes?*
  - ☑ *No?*
- ☑ Business Policy
  - ☑ *Acceptable use*
    - ☑ Key considerations?
- ☑ Technical Policy
  - ☑ *Interconnection*
    - ☑ Which Model?
  - ☑ *Technical Management*

IXP Checklist Summary

- ☑Governance (Management)
- ☑Interconnection policy
- ☑Location
- ☑Pricing
- ☑Acceptable use
- ☑Additional Services

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Thank You

www.caribnog.org

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Chair, CaribNOG Technical Coordinating Team