

Campus Network Best Practices

Brief Introduction to Multihoming

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Why Multihome?

- Reliability
 - One connection to the Internet can leave the network isolated if:
 - Local router fails (hardware, config, software bug)
 - Link fails (fiber cut, carrier failure)
 - ISP fails (hardware, config, software bug)

Why Multihome?

- Evaluate Impact
 - How critical is access to the Internet in my organization?
 - Loss of productivity
 - Loss of revenue
 - Bad reputation

Why Multihome?

- Supplier diversity
 - More leverage when dealing with your providers about:
 - Service quality
 - Service cost
 - If you don't have an alternative, will they listen to you?

Multihoming Definition

- More than one link connecting your network to the rest of the Internet
 - Two or more links to the same ISP
 - Two or more links to different ISPs

Autonomous System Number

- Uniquely identifies a network in the global routing system (BGP)
- Two ranges
 - 0-65535 original 16-bit range
 - 65536-4294967295 32-bit range
- Distributed by Regional Internet Registries
 - AFRINIC, APNIC, ARIN, LACNIC, RIPE

Private ASNs

- Range 64512 – 65534
 - Used in some cases when a globally unique identifier is not necessary
 - Cannot be announced to the global Internet
 - Similar to private IP addresses (RFC1918)

PA vs. PI Address Space

- Provider Aggregatable (PA) address space
 - You obtain an IP block from your ISP
 - If you change ISPs, you lose that block
 - Renumbering can be a headache
 - Can complicate your multihoming setup!

PA vs. PI Address Space

- Provider Independent (PI) address space
 - You obtain your IP block from a Regional Internet Registry (RIR)
 - It means that the block is assigned to you, independently of who provides your service
 - Ideal for multihoming because:
 - Any number of providers can announce your block
 - It will be much simpler

Basic Principles

- Traffic Flow:

Announcing address space attracts traffic

- If you advertise an IP block out one link, the traffic towards you will come down that link
- This is a useful property that you can take advantage of

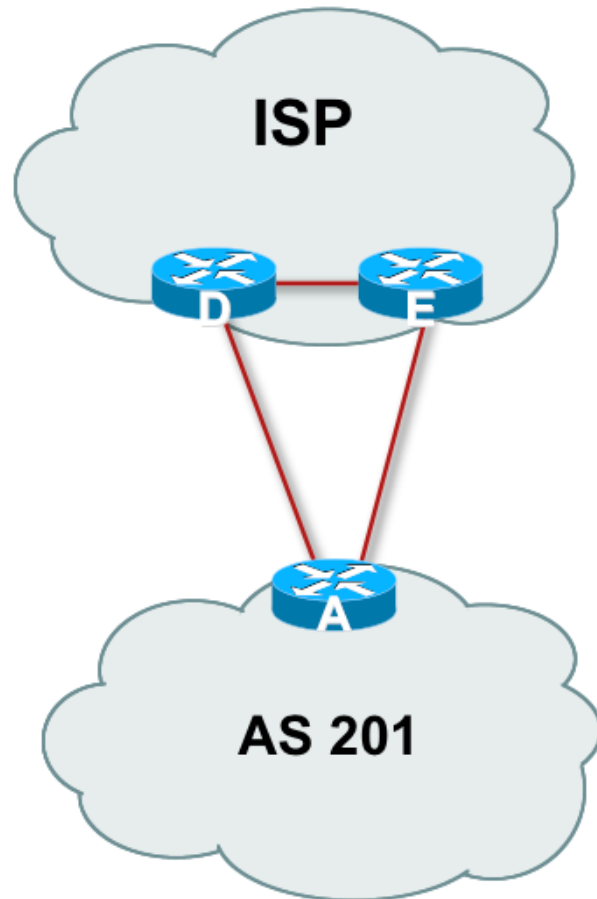
Basic Principles

- Longest Prefix Match:
 - Routers will select the most specific block
 - For Example:
 - If a router has to route a packet to 10.10.10.1, and has to decide between two entries in the table:
 - 10.10.0.0/16
 - 10.10.10.0/24
 - Which one will it use?

Multihoming Scenarios

- Two links to the same ISP
 - Using one router
 - Using more than one router
 - Load balancing vs. backup only
- Two links to different ISPs
 - Load balancing
 - Primary + backup
 - Load balancing + Failover

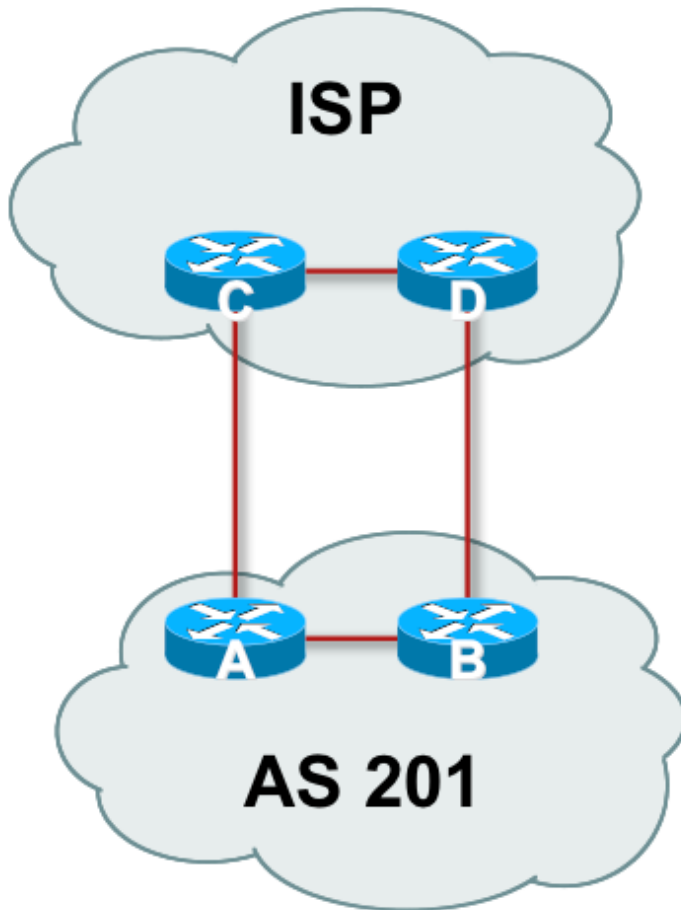
Two links to the same ISP (one router)



- You can use a private ASN (> 64511)
 - Provider removes the private ASN and announces your block as if it were the originator
- Can do load-balancing over the alternate paths (BGP multi-path)
- Still have a single point of failure (router A)



Two links to the same ISP (two routers)

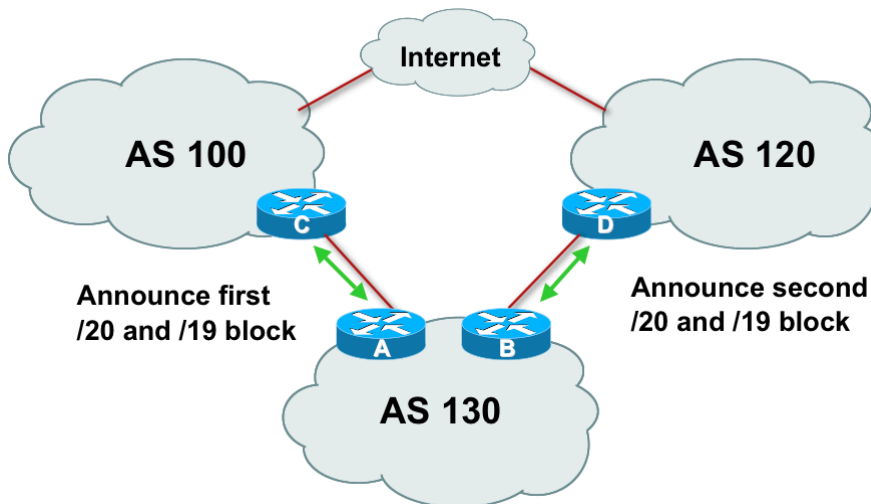


- More reliable
- Can do load balancing and failover
 - Or can use one link as primary and another as backup
- Still dependent on one ISP, though



Two links to different ISPs (with load-balancing)

- Very flexible
- Split the address space in half and announce separately for load-balancing
- Announce the whole block (/20) on both sides for failover



Questions?

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