BGP Review

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Background

• The internet is organized as autonomous systems (AS)
  ✓ A corporation’s internal network

• Hierarchically aggregate routing information in a large internet
The interdomain routing problem

• Each AS determines its own routing policies
  ✓ One AS only wants to send and receive packets from the Internet
  ✓ One AS can carry transit traffic for others if you pay this service

• Political considerations
  ✓ Never send traffic from the Pentagon on a route through Iraq

• Security considerations
  ✓ Traffic starting or ending at Apple should not transit Google

• Economic considerations
  ✓ Use cheaper service
Routing policy example

- A routing policy decides what traffic can flow over which of the links between ASes
- Provider, Customer, Peer
Terminology

• Autonomous system traffic
  ✓ Local traffic: originates at or terminates on nodes within an AS
  ✓ Transit traffic: passes through ASes

• Three types of AS
  ✓ Stub AS: a single connection to one other AS, local traffic
  ✓ Multihomed AS: an AS that has connections to more than one other AS, local traffic
  ✓ Transit AS: an AS that has connection to more than one other AS, carry both transit and local traffic
Basics of BGP

• Two routers:
  ✓ Border routers → through which packets enter and leave the AS
  ✓ BGP speaker → advertisements, usually the same as border routers

• Path-vector protocol
  ✓ Next hop router
  ✓ AS Path: a list of autonomous systems to reach a particular network
  ✓ Routers communicate with each other by establishing TCP connections
A BGP route advertisement example

- Each router that sends a route outside the AS prepends its own AS number to the route
Loop detection

- Unique AS number
  - BGP current version: AS number is 16 bits
Route selection

• Routes via peered networks are chosen in preference to routes via transit providers
  • Free

• Shorter AS paths are better

• Prefer the route that has the lowest cost within the ISP
  ✓ See previous example
One example

• Given the following network,
  ✓ Consider a network with 7 ASes.
  ✓ AS1 is the provider for AS2 and AS3
  ✓ AS2 is the provider for AS4 and AS5
  ✓ AS3 is the provider for AS6 and AS7
  ✓ AS2 and AS3 are peers

• Questions?