

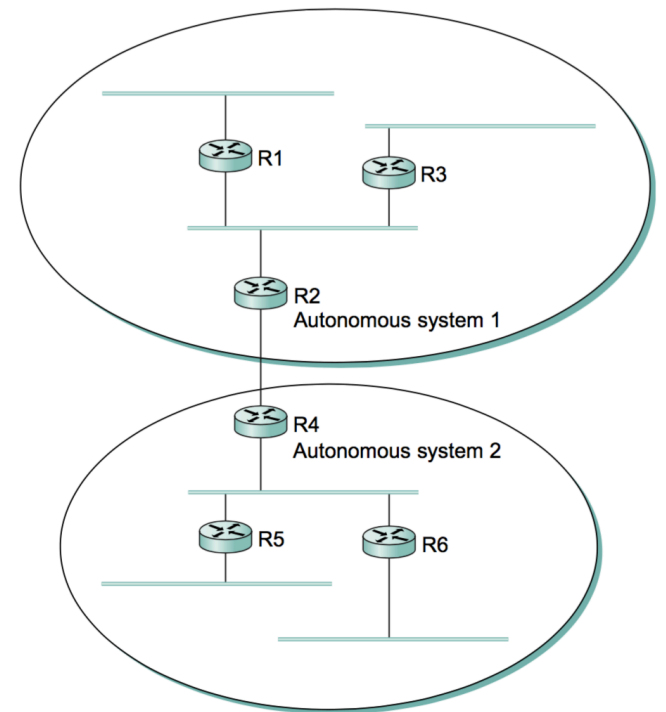
BGP Review

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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

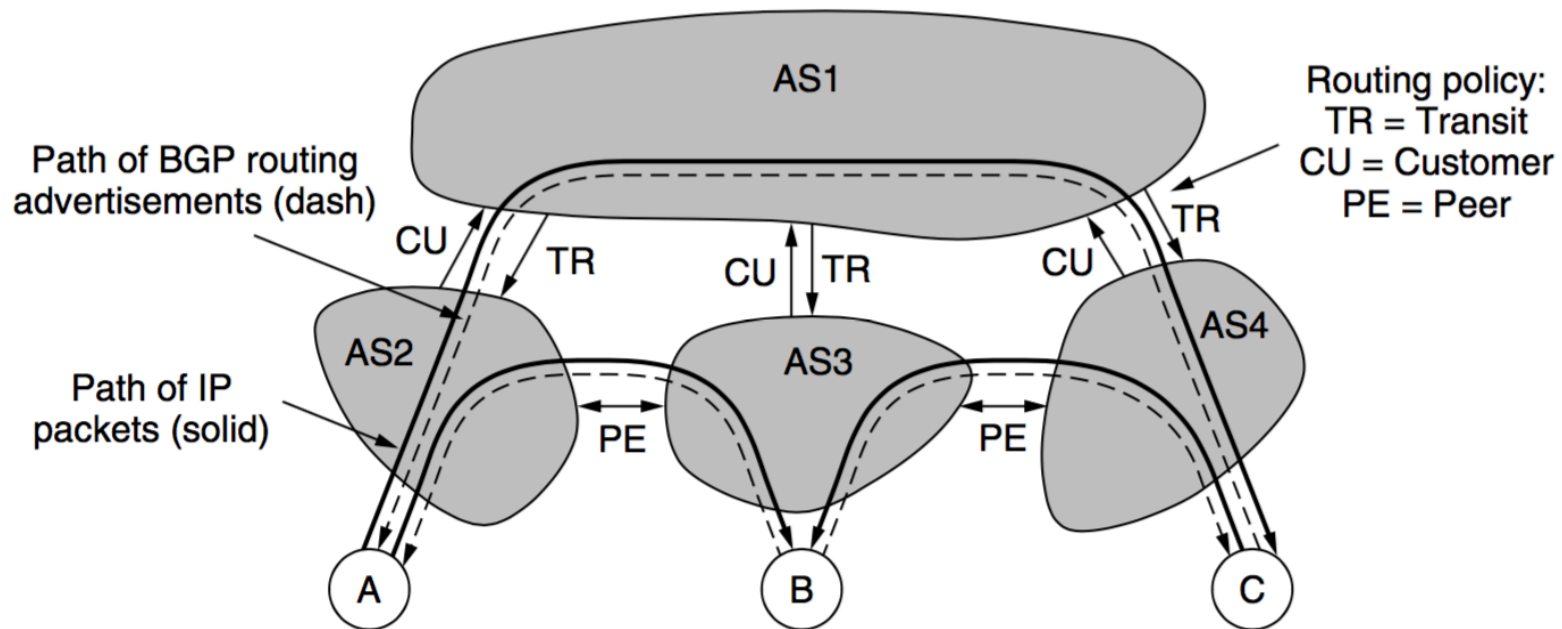


The interdomain routing problem

- 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

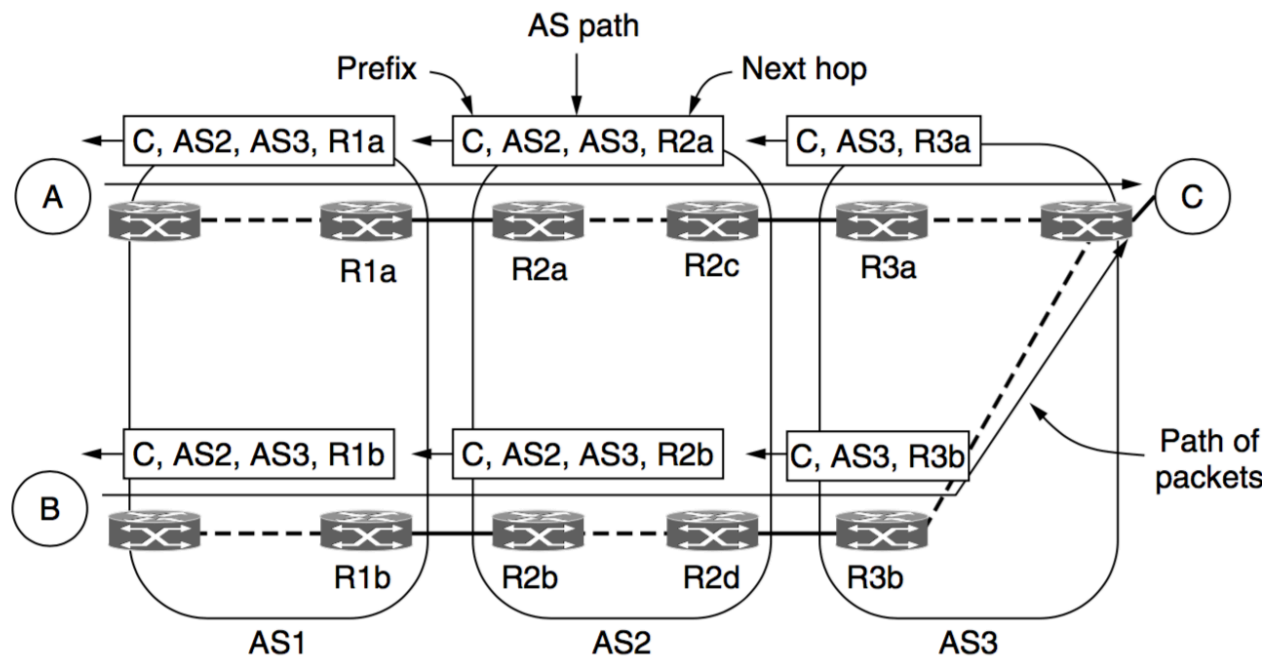
- Autonomous system traffic
 - ✓ Local traffic: originates at or terminates on nodes within an AS
 - ✓ Transit traffic: passes through ASes
- Three types of AS
 - ✓ Stub AS: a single connection to one other AS, local traffic
 - ✓ Multihomed AS: an AS that has connections to more than one other AS, local 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

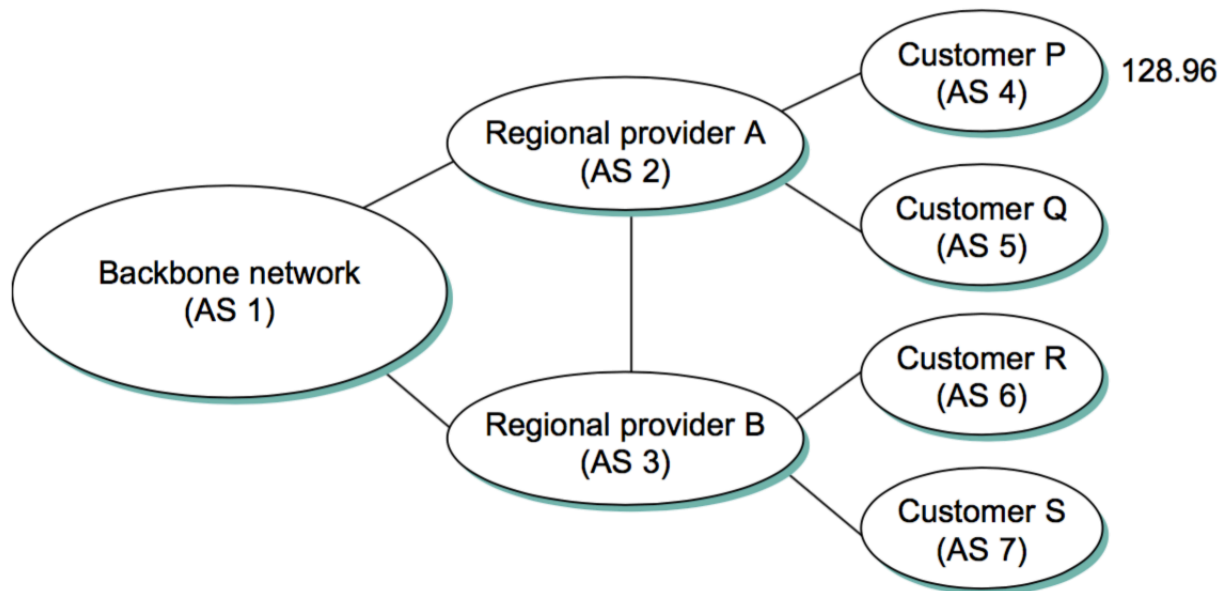
A BGP route advertisement example

- 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 ?