CSC4200/5200 – COMPUTER NETWORKING

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BGP - CONTINUED

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Tennessee TECH

Apps (HTTP)

Data

Apps (HTTP)

Transport (TCP/UDP)

Segments

Transport (TCP/UDP)

Network (IP)

Packets

Network (IP)

Link (Ethernet)

Frames

Ethernet Interface

Ethernet Interface

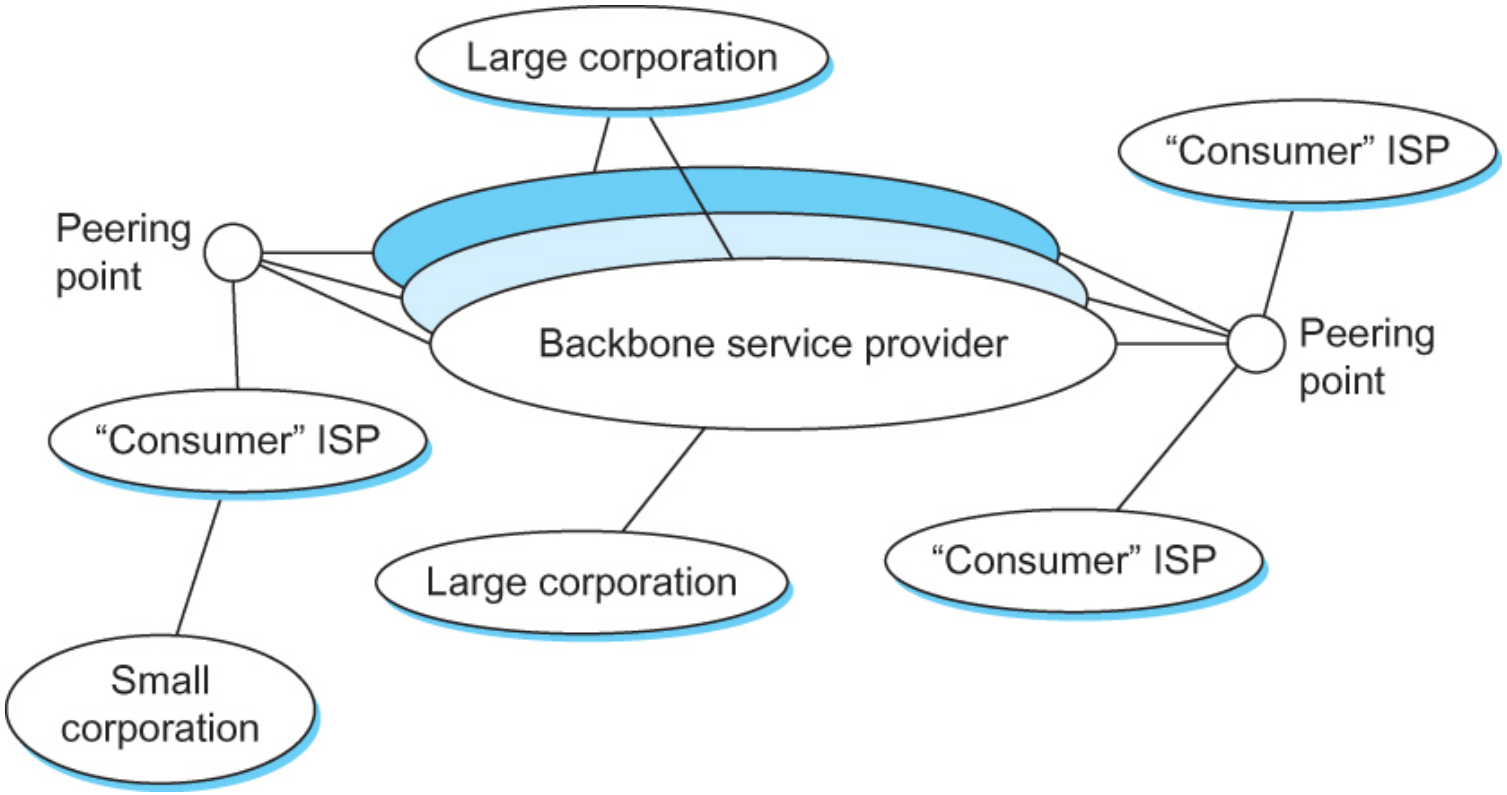
Link (Ethernet)

Bits (1010001)

So far...

- Routing
  How do we scale routing?

Internet now



Hierarchical routing - Policy

scale: with 600 million destinations:

- can't store all dest's in routing tables!
- routing table exchange would swamp links!

administrative autonomy

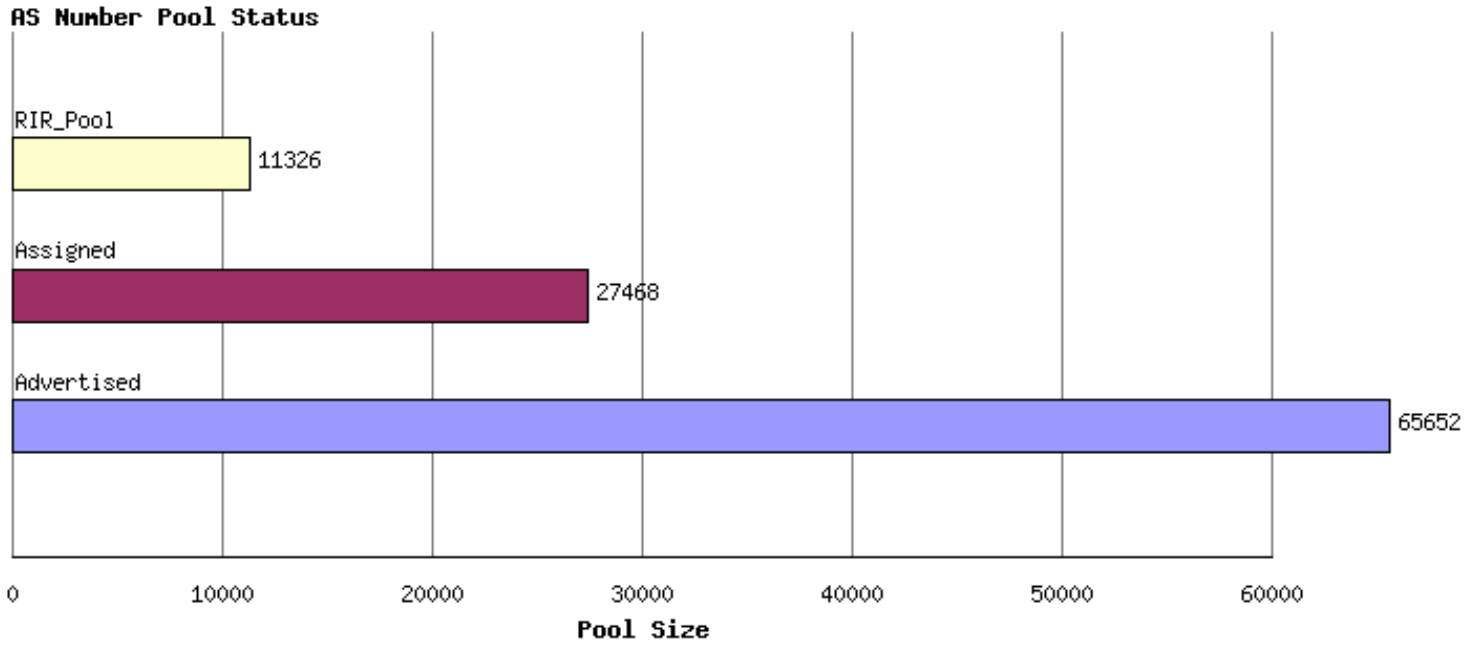
- internet = network of networks
- each network admin may want to control routing in its own network

Autonomous systems (ASes)

- AS
  - A set of routers under a single technical administration
  - Uses IGP within the AS to route packets
  - Uses BGP between Ases to route packets
- What happens inside an AS stays within that AS!
  - That is, AS decides routing metrics internally

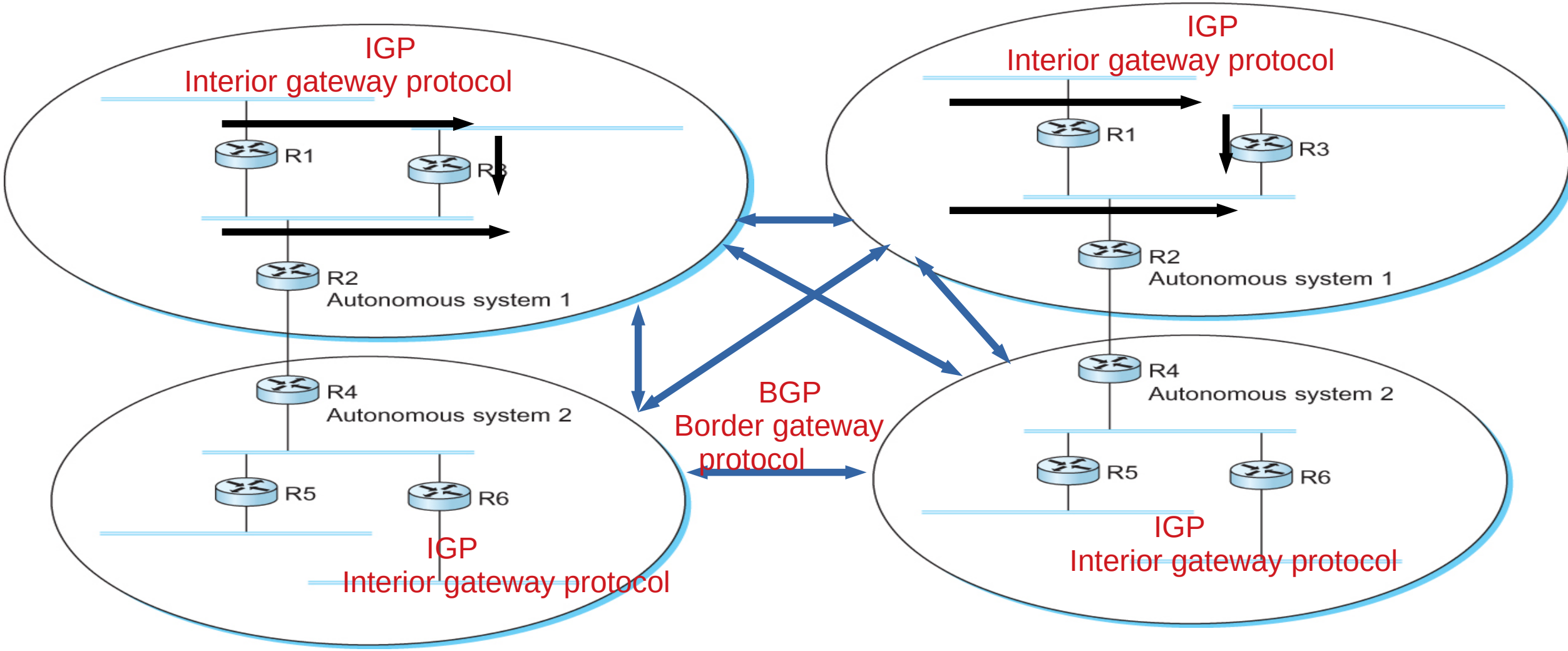
Status of ASNs

Status		AS Pool	16-bit	32-bit
IETF Reserved		95033874	1042	95032832
IANA Unallocated Pool		4199828976	0	4199828976
Allocated		104446	64494	39952
	RIR Data			
	AFRINIC	2302	1278	1024
	APNIC	19093	8539	10554
	ARIN	31567	25522	6045
	RIPE NCC	39453	25729	13724
	LACNIC	12031	3426	8605



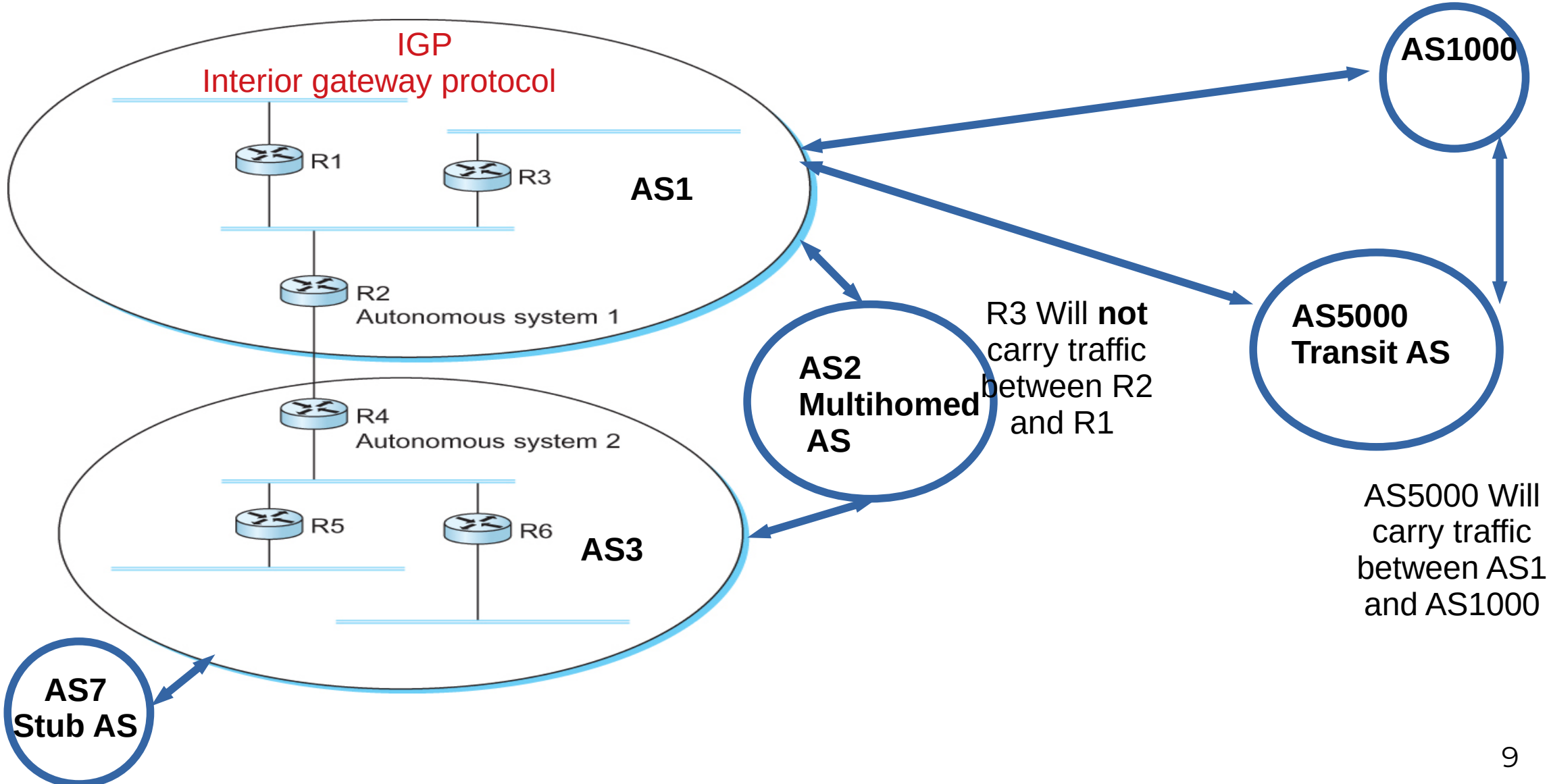
http://www.potaroo.net/tools/asn32/

Interdomain Routing



A network with four autonomous systems

BGP-4: Border Gateway Protocol



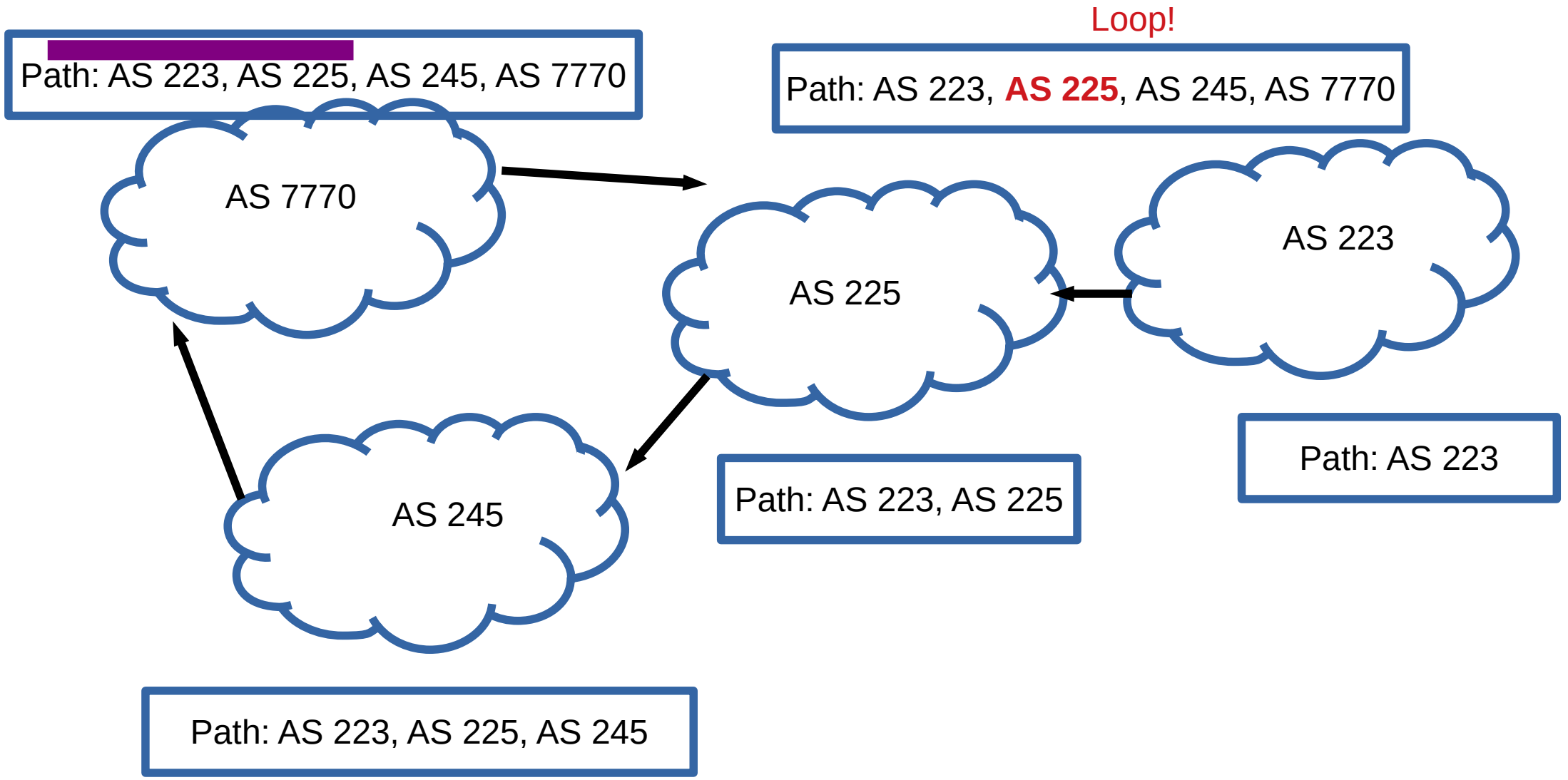
BGP - goals

- The goal of Inter-domain routing is to find **any path** to the intended destination that is **loop free**
  - **We are concerned with reachability than optimality**
  - Finding path anywhere close to optimal is considered to be a great achievement
- Why?

BGP: Path vector protocol

- Send the whole path with the routing update
- Loops are detected if an AS finds itself in the path
  - Reject if so
  - Accept otherwise
- Add self to the path and advertise to the neighbors
- Advantage: No loops, Local decision before advertising

BGP: Path vector protocol



BGP: Allows for policy

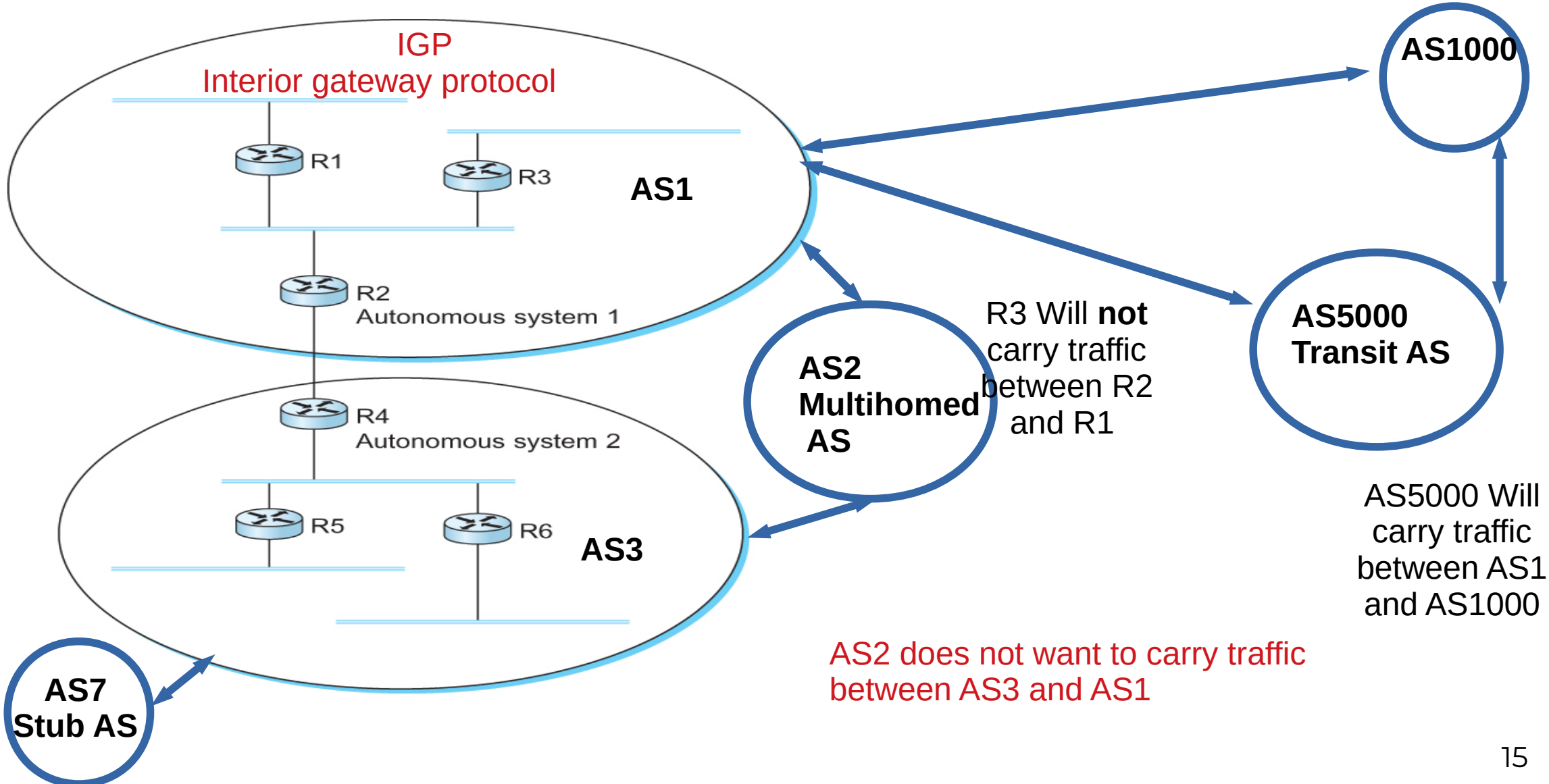
- Capable of enforcing various policies
  - AS2 → Don’t use AS1 to get to AS3
- Not part of BGP – configuration information that controls propagation of paths

BGP: Hop by Hop model and control what you tell your neighbors

- You can only tell others what you are using
  - But you control what you say

- BGP advertises only to peers
  - Tell them what you are using
  - Hop-by-hop model

What should AS2 (multihomed) tell AS3?



Examples BGP Policies

- Multihomed AS100 does not want to act as a transit
  - Limit advertisement
- If someone pays AS100 – yes
  - Advertise only to those who are paying
- Prefer one path over the other
  - Play with the cost, artificially increase path length and so on ← more on this late

Examples BGP Policies

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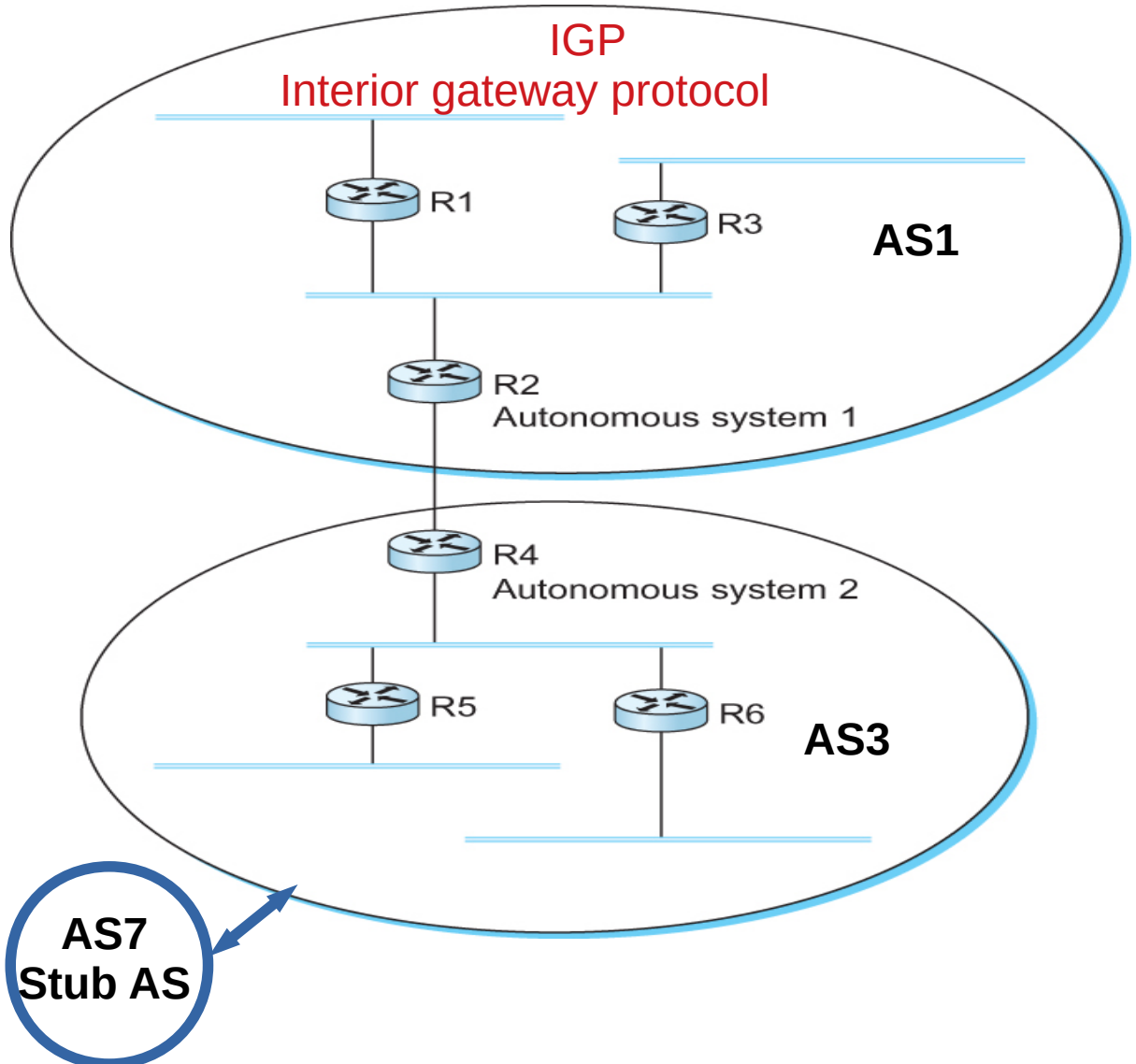
You don’t need BGP for Stub ASes

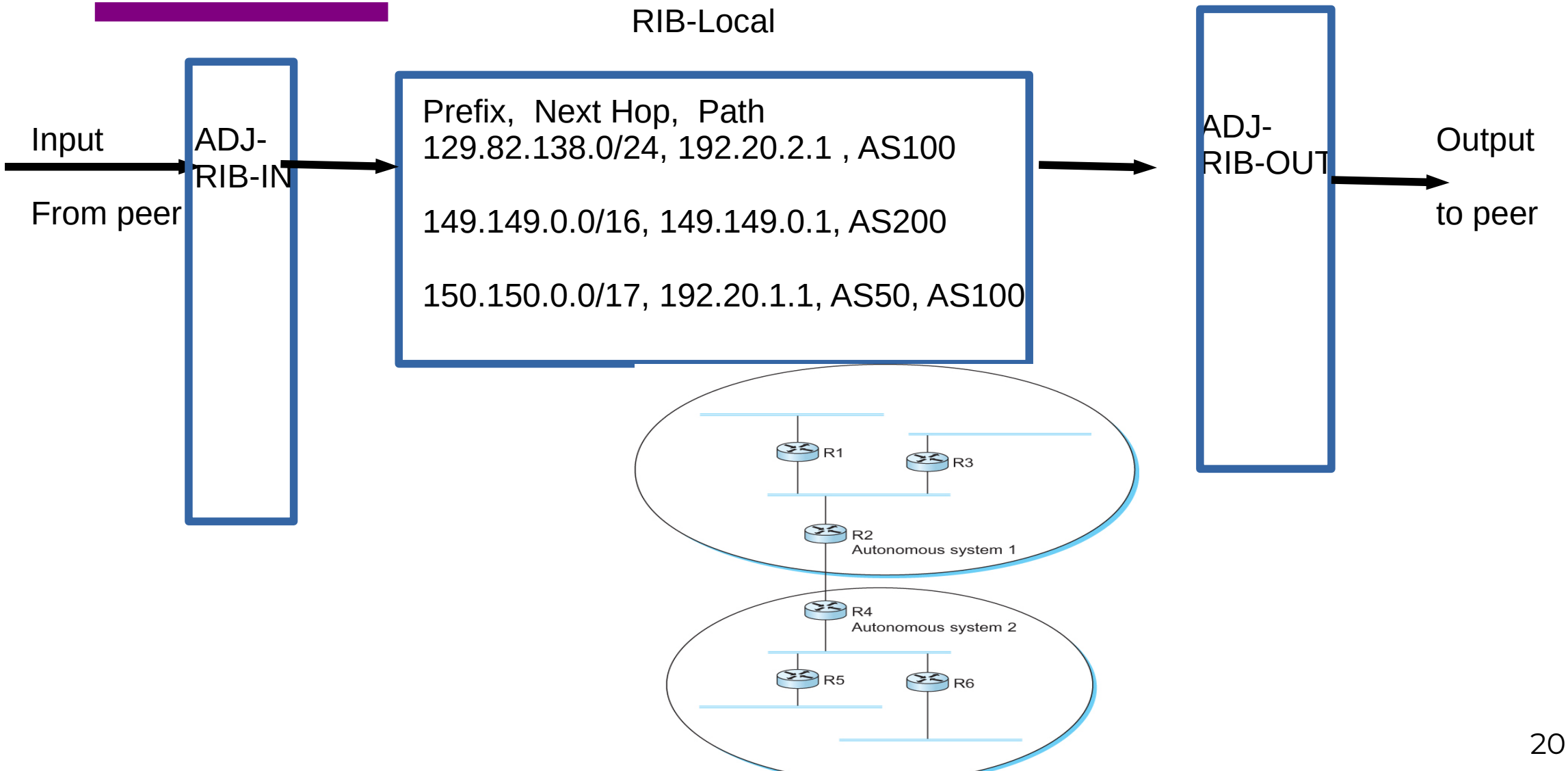


Default IP route should be sufficien

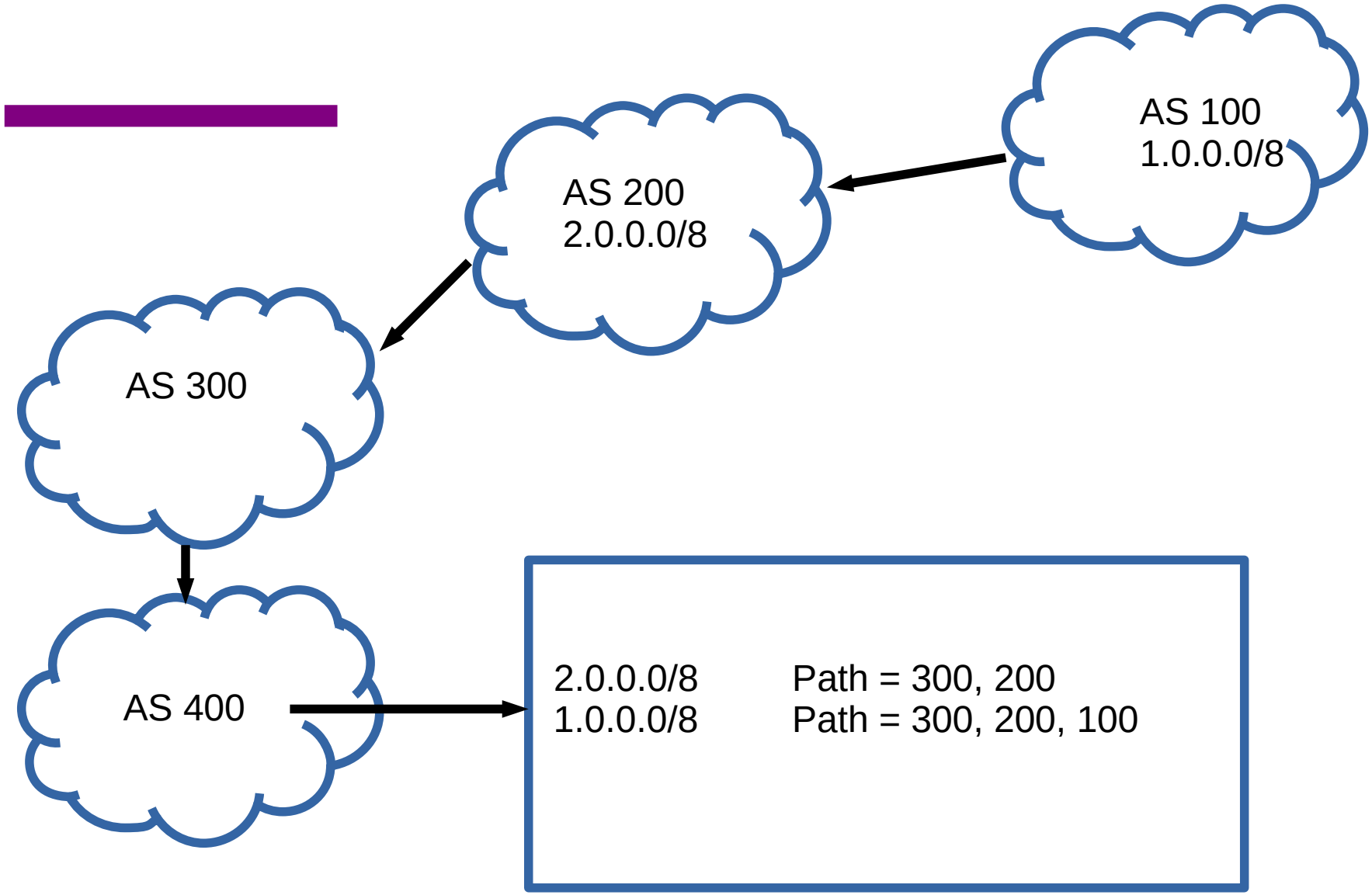
BGP Messages

- Open – Open a TCP connection to a peer
- Update – Update route attributes or withdraw
- Notification – Error notification, close connection
- Keep alive – Periodic update to peers

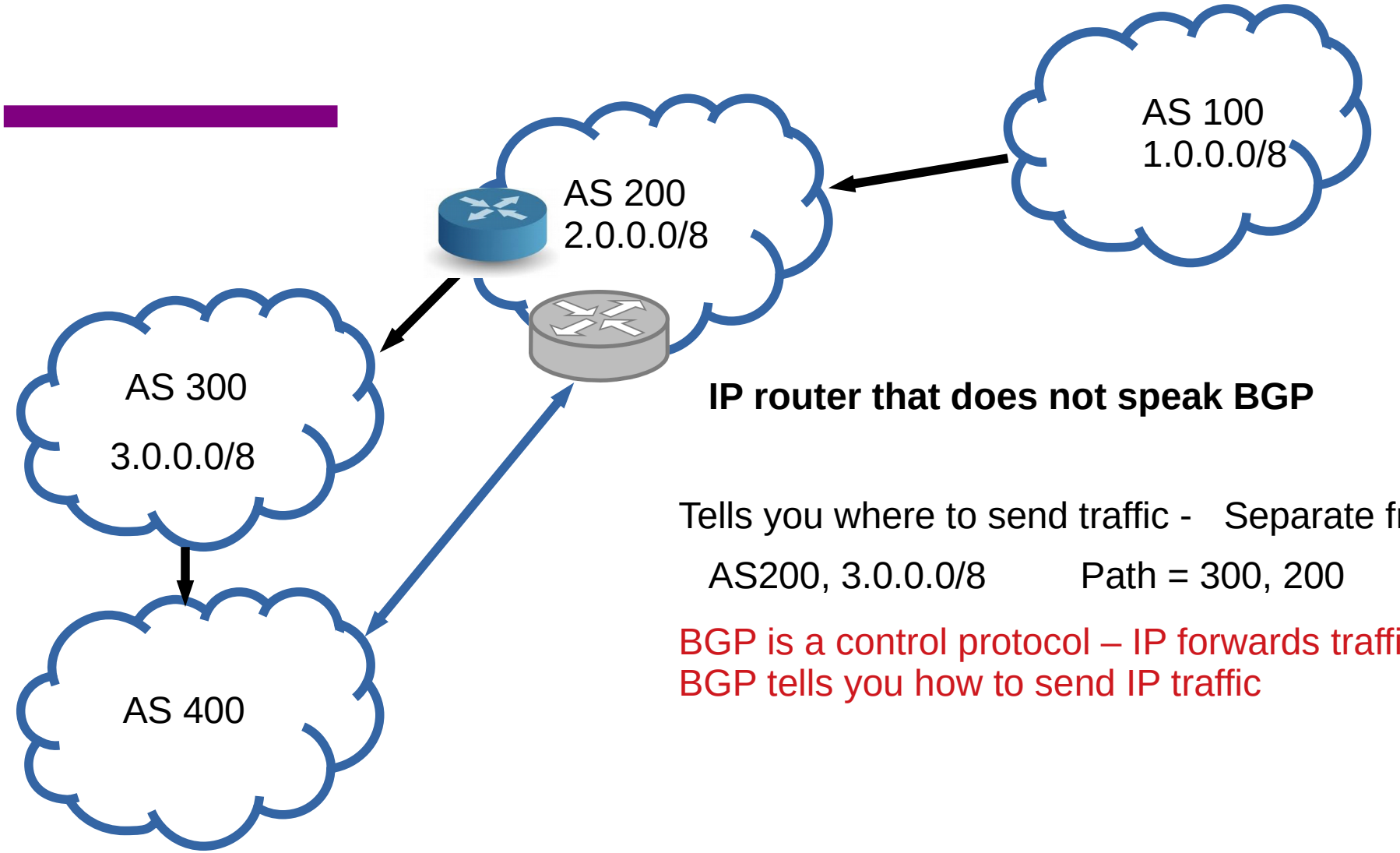
Routing Information Bases (RIB)



BGP Attributes - AS_PATH



BGP Attributes – Next hop?



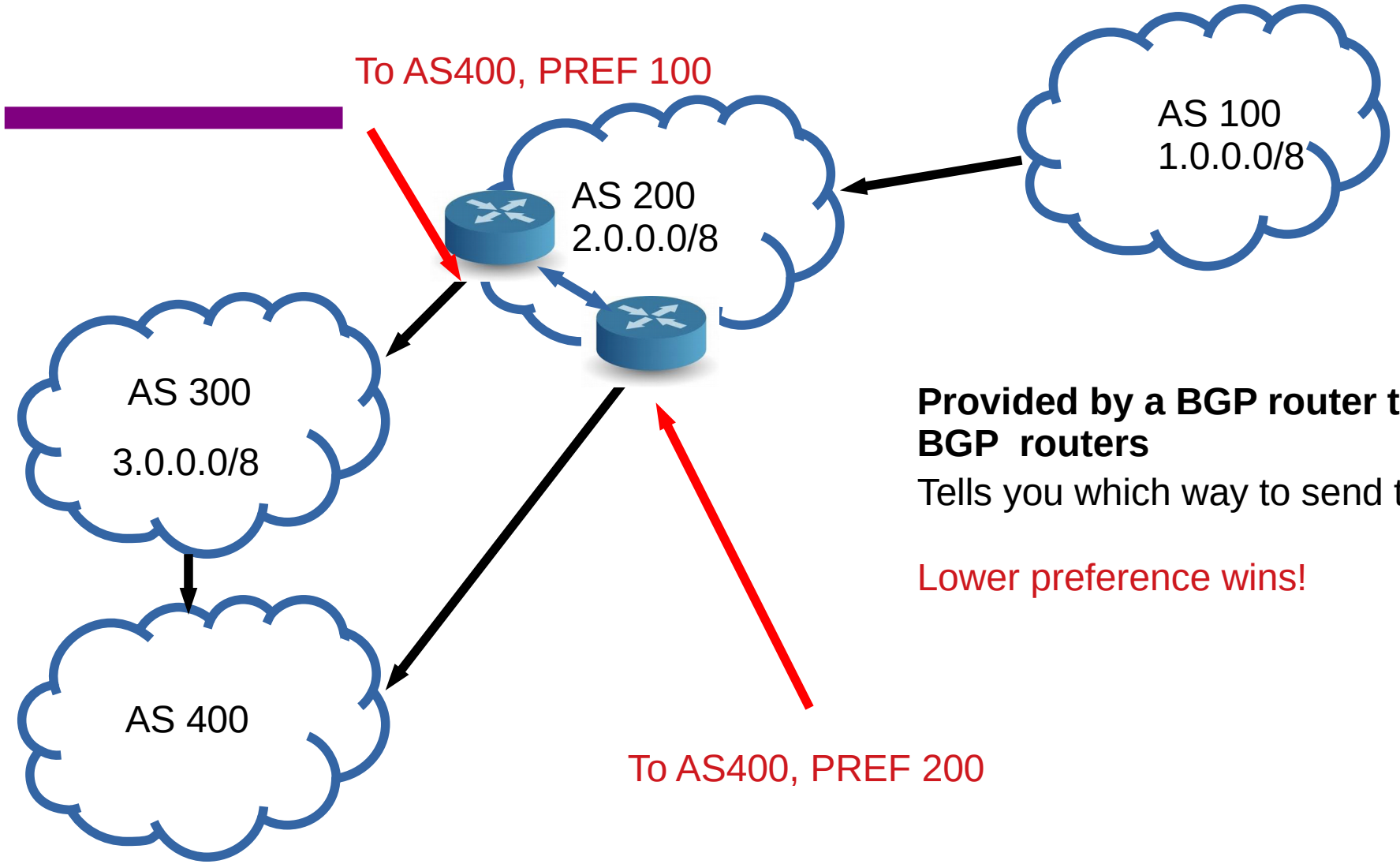
IP router that does not speak BGP

Tells you where to send traffic - Separate from BGP

AS200, 3.0.0.0/8 Path = 300, 200

BGP is a control protocol – IP forwards traffic
BGP tells you how to send IP traffic

BGP Attributes – LOCAL-PREF

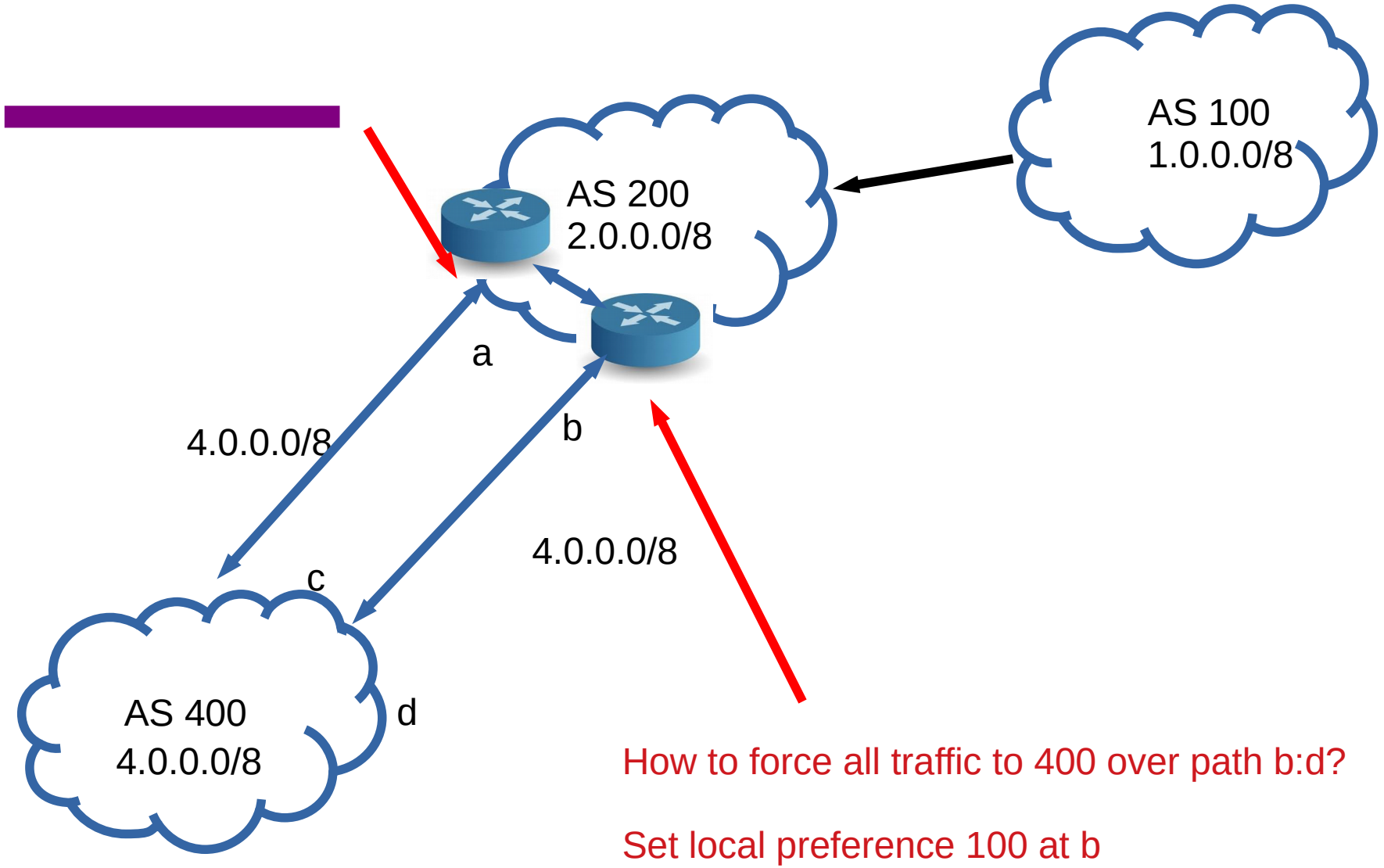


Provided by a BGP router to all other *internal* BGP routers

Tells you which way to send traffic

Lower preference wins!

BGP Attributes – LOCAL-PREF Example



How to force all traffic to 400 over path b:d?

Set local preference 100 at b
Set local preference 200 at a