CS 640 Introduction to Computer Networks

Lecture 23

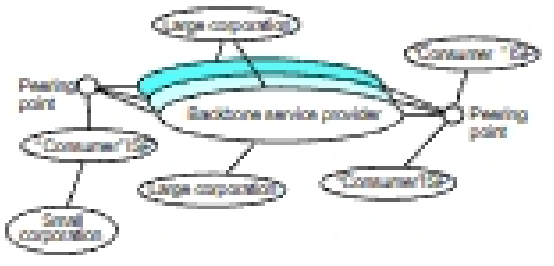
Based on slides by Tim Griffin

Today's lecture

- Inter-domain routing
  - Architecture and relationships between networks
  - BGP
    - Introduction
    - Implementing peering relationships
    - Backups and multihoming
    - Hot potato/cold potato

Internet Structure

Today



Autonomous Systems (ASes)

An autonomous system is an autonomous routing domain that has been assigned an Autonomous System Number (ASN).

… the administration of an AS appears to other ASes to have a single coherent interior routing plan and presents a consistent picture of what networks are reachable through it.

RFC 1930: Guidelines for creation, selection, and registration of an Autonomous System

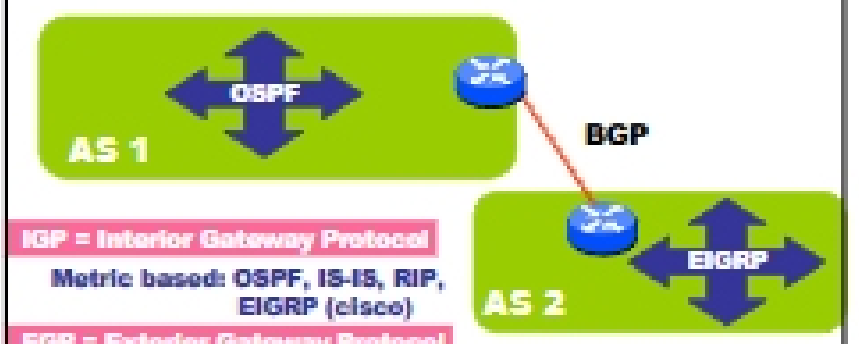
How Are Forwarding Tables Populated to implement Routing?

Statically	Dynamically
Administrator manually configures forwarding table entries	Routers exchange network reachability information using ROUTING PROTOCOLS. Routers use this to compute best routes
+ More control	+ Can rapidly adapt to changes in network topology
+ Not restricted to destination-based forwarding	+ Can be made to scale well
- Doesn't scale	- Complex distributed algorithms
- Slow to adapt to network failures	- Consume CPU, Bandwidth, Memory
	- Debugging can be difficult
	- Current protocols are destination-based

In practice : a mix of these.

Static routing mostly at the "edge"

Architecture of Dynamic Routing



IGP = Interior Gateway Protocol

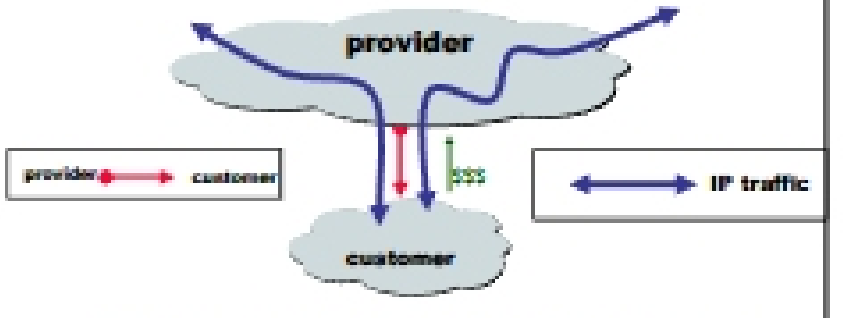
Metric based: OSPF, IS-IS, RIP, EIGRP (cisco)

EGP = Exterior Gateway Protocol

Policy based: BGP

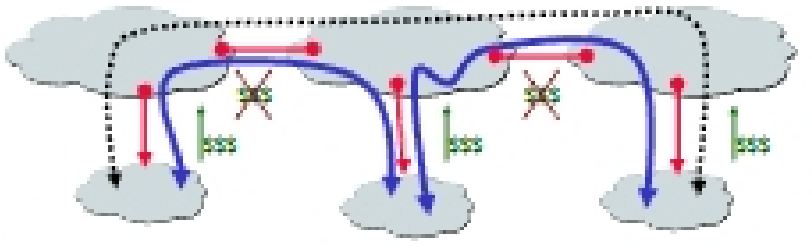
The Routing Domain of BGP is the entire Internet

Customers and Providers



Customer pays provider for access to the Internet

The "Peering" Relationship

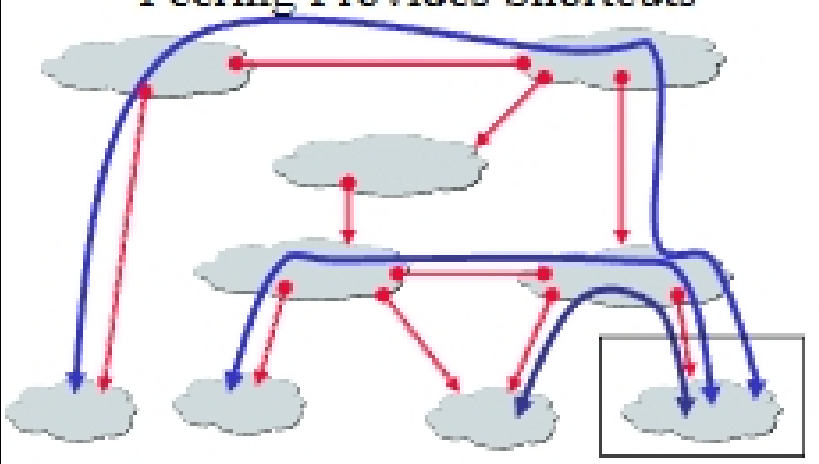


Peers provide transit between their respective customers

Peers do not provide transit between peers

Peers (often) do not exchange $$$

Peering Provides Shortcuts



Peering also allows connectivity between the customers of "Tier 1" providers.