TCOM 515

Lecture 6

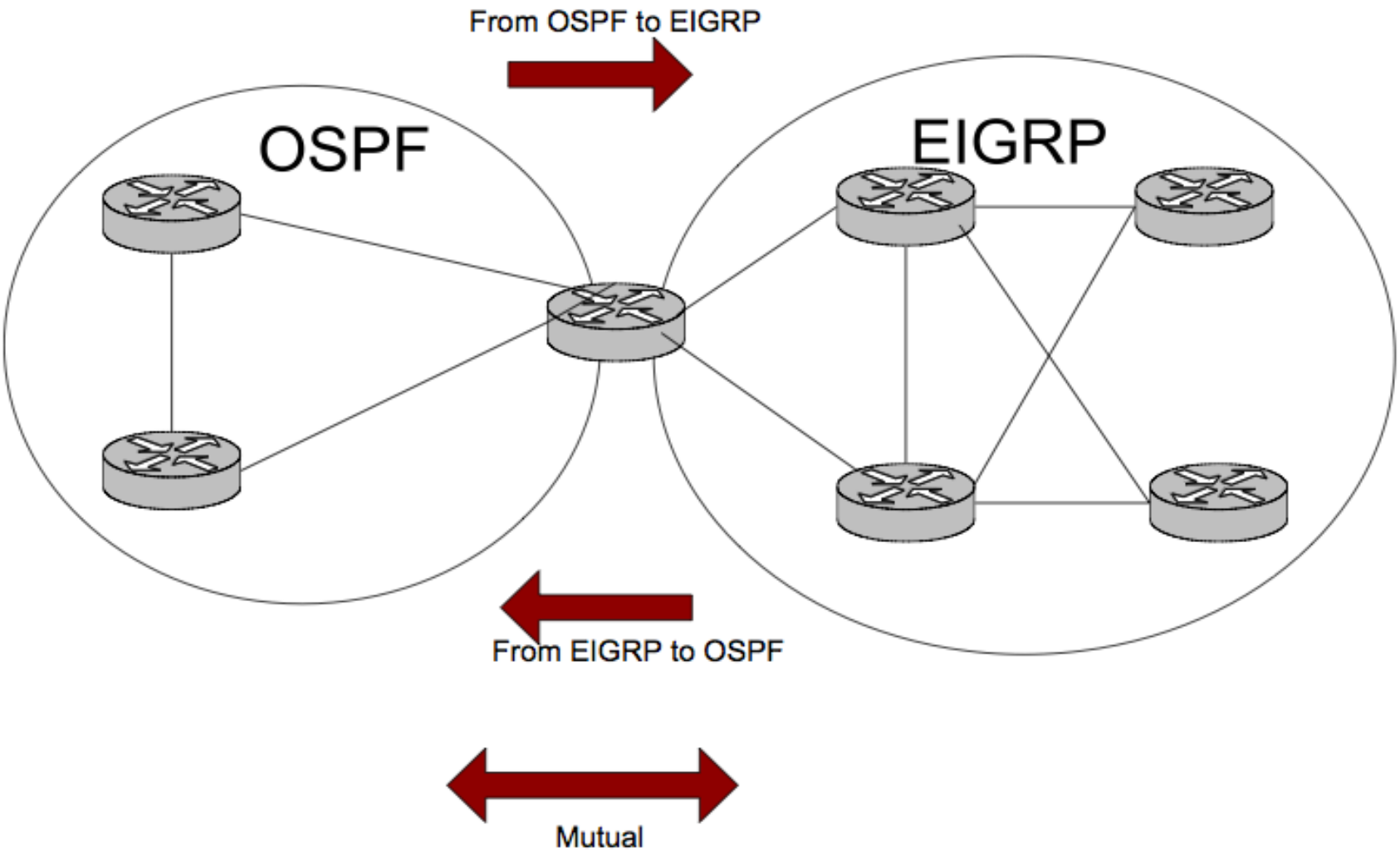
Objectives

- Route Redistribution
- Default Routes
- Route Filtering

Route Redistribution

- Route redistribution involves a router using a routing protocol to advertise routes it learned through another routing protocol, static routes or direct connections.
  - Companies can have different networks in the following scenarios,
    - Different networks due to mergers,
    - Different network implementations due to different design philosophies,
    - corporate politics
  - Redistribution can be part of well-thought-out design
  - Route redistribution is often used on the border routers, to move routes between the IGP and EGP.
  - Static routes maybe be needed to advertised into the dynamic routing protocols.
  - Route redistribution can be used to bridge legacy networks or connect vendor specific networks.
- Redistribution does not occur automatically in most cases. Only EIGRP will automatically redistribute IGRP

Route Redistribution



Route Redistribution

Three things to consider in route redistribution:

1. metric
2. administrative distances
3. classful/classless capabilities

Routing protocols do not understand metrics used from other routing protocols. They may assign defaults or network administrator's may assign specific values. Assigning metrics is a very useful tool given the proper consideration and understanding of how it affects routing decision.

- RIP metric based on hops
- OSPF metric based on bandwidth
- EIGRP metric on bandwidth, delay, reliability, load, and MTU

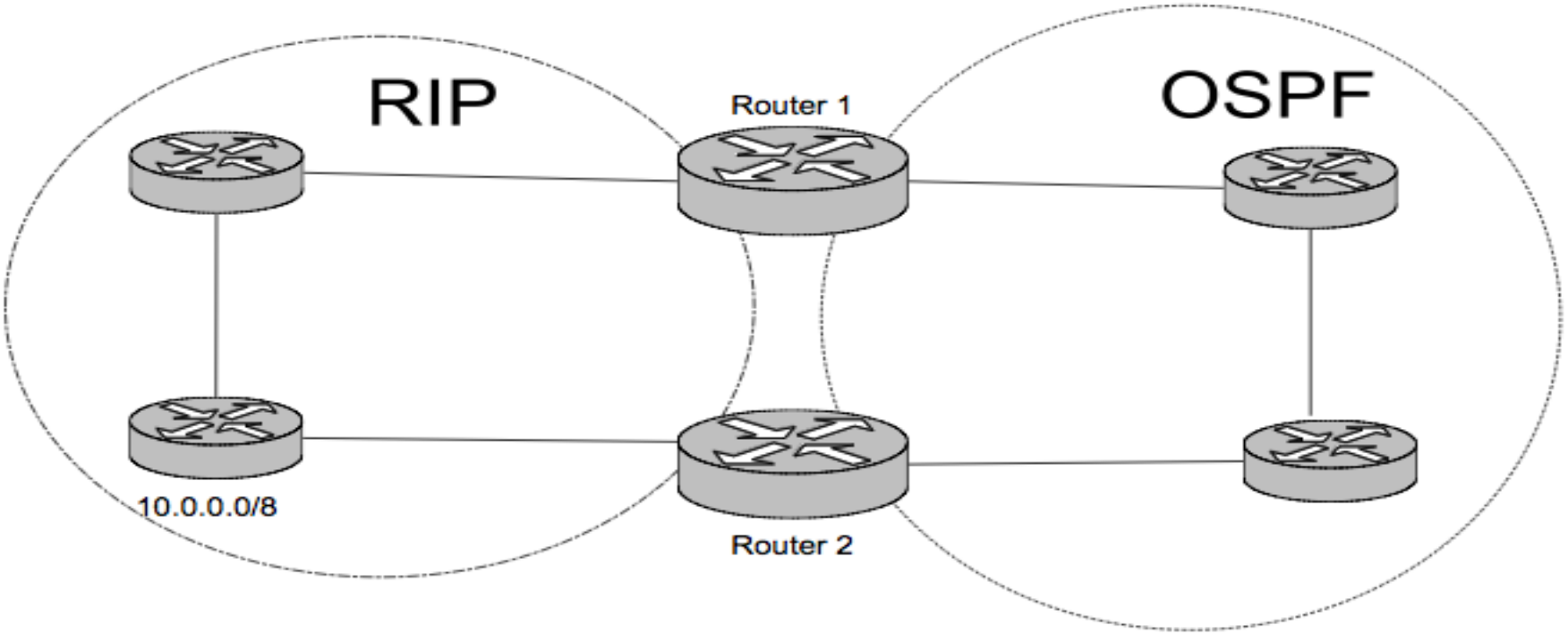
Route Redistribution

- While routing protocols use metrics to determine the best route, routers use administrative distances to determine the best source. Each type of source has a different administrative distance, the lower the distance the better the source of the route. Below are the administrative distance for each of the protocols discussed.

Connected Interface	0
Static Route	1
EIGRP Summary	5
External BGP	20
EIGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
EGP	140
External EIGRP	170
Internal BGP	200

- Administrative distances pose a problem when a route is redistributed from a protocol with a higher admin distance to a protocol with a lower admin distance. In this case, the redistributed route would be preferred over the original route.

Route Redistribution issue with Admin Distance



1.Router 1 and 2 are redistributing RIP into OSPF, 10.0.0.0/8 will become OSPF route (E2)
2. Router 2 will use the path through the OSPF network to get to 10.0.0.0/8 because the OSPF route has lower AD. This is not the optimal route

Route Redistribution

- Redistribution of routes between routing protocols that only do classful routing to those that do classless routing and vice versa can behave differently than expected.

- Classful routing protocols may not advertise a given route or may summarize up to the assigned class subnet causing problems and outages.

- Network administrators should only redistribution between classful and classless subnet when necessary and only specific routes needed.

Configuring Redistribution

- Under router protocol configuration
  - “redistribute” and source of routes
  - Specify metric for routes
  - Filters and route-maps
- Routes to be redistributed must be in routing table
- Mutual route redistribution is not recommended, need to use filters

Redistribution Examples

- Redistribution form one IGP to another
  - OSPF to EIGRP, and vice versa
  - OSPF to RIP and vice versa
  - RIP to EIGRP
- Redistribution between IGP and EGP
  - OSPF/EIGRP/RIP into BGP
- Redistribution from static to routing protocol
  - Static route to a routing protocol
- Redistribution from connected to routing protocol
  - Directly connected routes to a routing protocol

Redistribution into different protocols

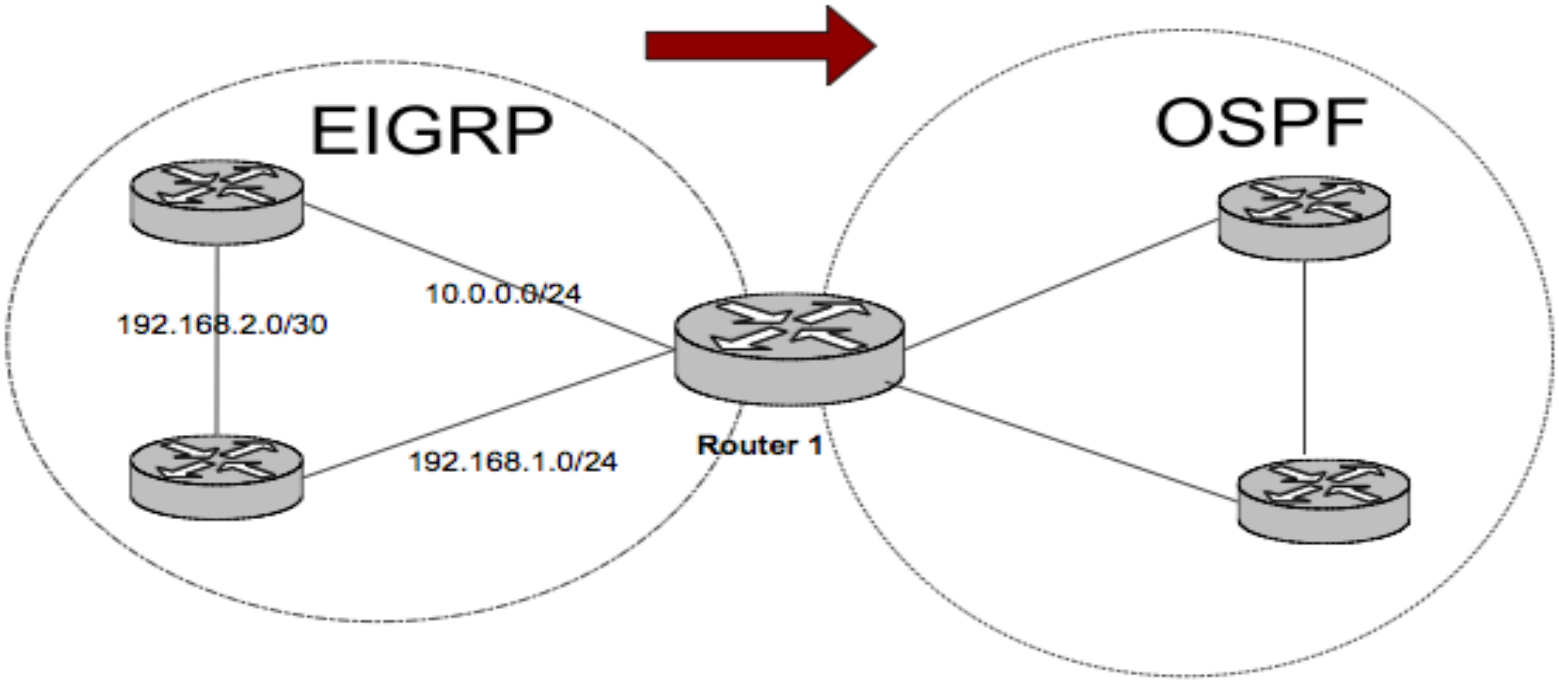
OSPF
- Redistributed routes become external routes,
  1. External type 2
  2. External type 1
- Assign default metric of 20, and 1 for BGP routes
- Classful by default
- Summarization can be enabled for external routes
- Route filters

EIGRP
- Redistributed routes will become external routes with admin distance of 170
- Assign metric to bandwidth, delay, reliability, load, and MTU
- Summarization can be enabled for external routes on per interface basis
- EIGRP redistributes automatically with IGRP if same ASN is used, metric conversion done automatically

RIP v2
- Redistributed routes become RIP routes
- Metric (hops) is 0 by default

BGP
- Redistributed routes have origin code of ? (Incomplete)

Route Redistribution into OSPF



By Default (without "subnet" command)
Only 192.168.1.0/24 will be redistributed into OSPF because it is a classful route. It will be flooded in OSPF network as External type 2 (LSA type 5) with metric of 20. 10.0.0.0/24 and 192.168.2.0/30 are not classful and will not be redistributed.

If "subnet" command is used, OSPF will redistribute both classful and nonclassful routes. All three EIGRP routes will be redistributed into OSPF as External type 2 (LSA type 5).

Router 1 will become Autonomous System Border Router (ASBR)

Default Route

- Default routes are used as route of last resort. The syntax of a default route is 0.0.0.0/0
- A default route is the least specific subnet match for a destination and used when there is no other match in the route table.
- The default route is usually pointed to the ISP or to the network backbone

Default Route

- Default routes can be brought into a network through a variety of different methods and routing protocols.
  - The ISP providing Internet connectivity may send a default route only or in addition to other routes through a BGP peering. (in most cases where net is single-homed to ISP. Too many routes in bgp table)
  - That default route in BGP can be redistributed into the Interior Gateway Protocol.
  - An IGP can originate a default route from a certain router always or only if the router has received a default route from another method.
  - A static route for the default can also be configured on a router pointing to the interface that connects to the Internet or the backbone.
- Default routes is very useful in hub and spoke topologies.
  - OSPF can originate default route for stub areas.

Configuring Default Route

- Static
  - IP route 0.0.0.0/0 192.168.0.1
- Default network
  - IP default-network 192.168.0.0
- BGP
  - neighbor 192.168.0.1 default-originate
- OSPF
  - Default-information originate
  - Automatic default route generation for stubby networks

Route Filtering

- Route filters used for control route advertisements
- Route filters are commonly used for redistribution
- Route filters can be used for security and route table size management
- Route filtering is usually accomplished with access control lists (ACL) and route-maps.
- Route filters are deployed at the interconnecting router
- Route filters have more impact on distance vector protocols than link State protocols

Access Control Lists

- Access lists were originated for security reasons but have evolved to filter traffic as well.
- Access Lists are mechanisms that are applied to an interface or a routing process to filter the traffic.
- ACLs may be applied inbound or outbound on an interface.
- Access lists check for matches, the network is either **permitted** or **denied**.
- ACLs have an implicit or unwritten deny for all traffic not permitted.

Route-Maps

- Similar to ACLs, but can do more than permit and deny. Can also be used to change route information
- Mostly used for route redistribution and policy routing
- Consists of “match” and “set” statements, in addition to permit and deny
- Match criteria is usually an ACL

Summary

- Route Redistribution
- Default Routes
- Route Filtering
- Reading Assignment Chapters:11 -14