Introduction to Dynamic Routing Protocol
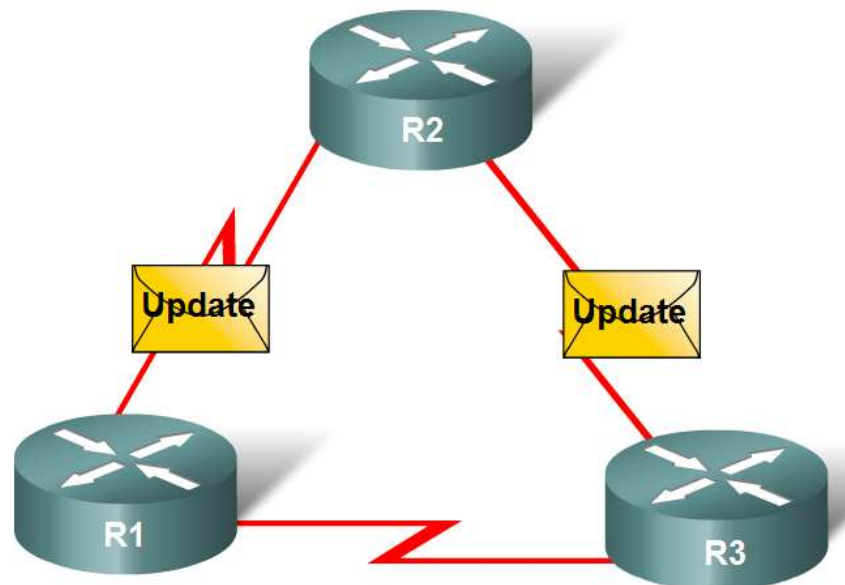
Routing Protocols and Concepts – Chapter 3

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Dynamic Routing Protocols

- Function(s) of Dynamic Routing Protocols:

  -Dynamically share information between routers.

  -Automatically update routing table when topology changes.

  -Determine best path to a destination.

Routers Dynamically Pass Updates

Dynamic Routing Protocols

- The **purpose of a dynamic routing protocol** is to:

  - Discover remote networks

  - Maintaining up-to-date routing information

  - Choosing the best path to destination networks

  - Ability to find a new best path if the current path is no longer available

Dynamic Routing Protocols

- **Components of a routing protocol**

  ## Algorithm

  In the case of a routing protocol algorithms are used for facilitating routing information and best path determination

  ## Routing protocol messages

  These are messages for discovering neighbors and exchange of routing information
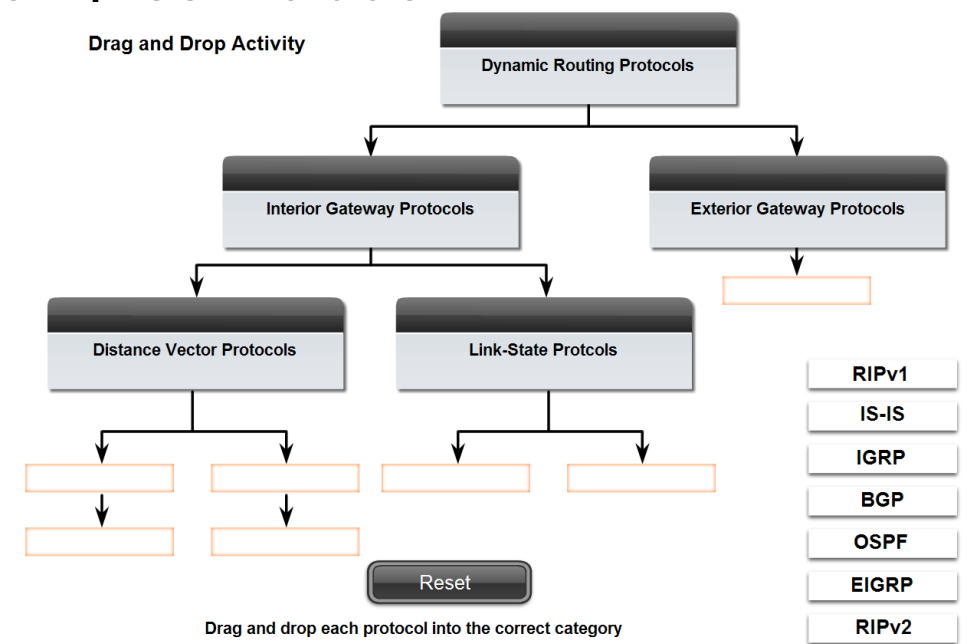
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Dynamic Routing Protocols

- **Advantages** of **static routing**

  - It can backup multiple interfaces/networks on a router

  - Easy to configure

  - No extra resources are needed

  - More secure

- **Disadvantages** of **static routing**

  - Network changes require manual reconfiguration

  - Does not scale well in large topologies

Classifying Routing Protocols

- **Dynamic routing protocols** are grouped according to characteristics. Examples include:

  -RIP

  -IGRP

  -EIGRP

  -OSPF

  -IS-IS

  -BGP

Drag and Drop Activity

Dynamic Routing Protocols

Interior Gateway Protocols

Exterior Gateway Protocols

Distance Vector Protocols

Link-State Protcols

RIPv1

IS-IS

IGRP

BGP

OSPF

EIGRP

RIPv2

Reset

Drag and drop each protocol into the correct category

Classifying Routing Protocols

- **Autonomous System** is a group of routers under the control of a single authority.

- **Types of routing protocols**:
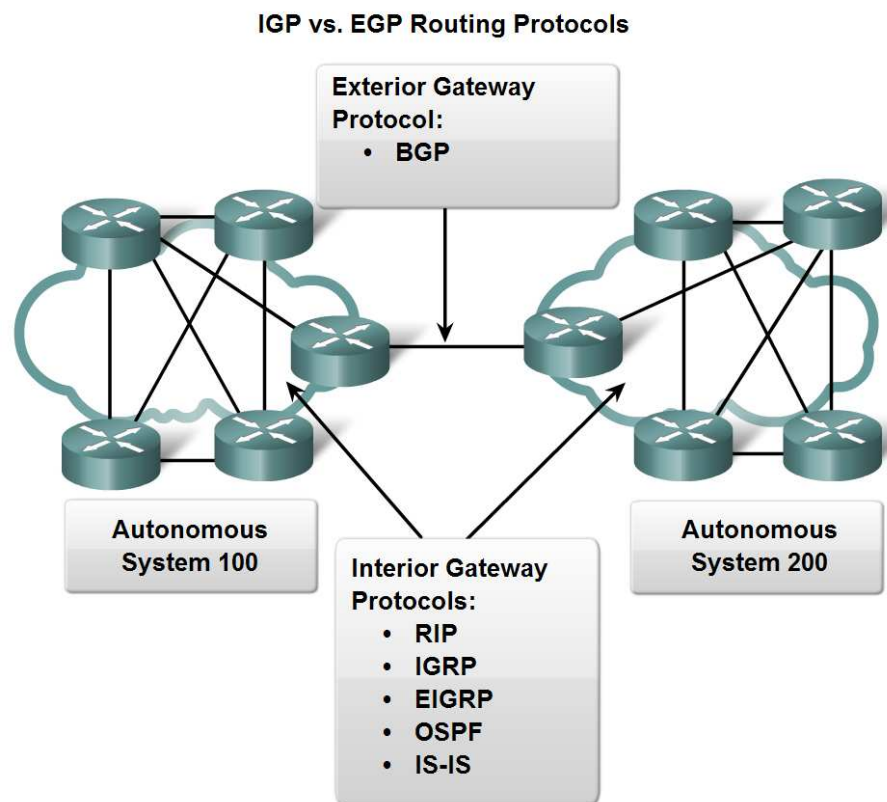
  - **Interior Gateway Protocols** (IGP)

  - **Exterior Gateway Protocols** (EGP)

IGP vs. EGP Routing Protocols

Exterior Gateway Protocol:
- BGP

Autonomous System 100

Interior Gateway Protocols:
- RIP
- IGRP
- EIGRP
- OSPF
- IS-IS

Autonomous System 200

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Classifying Routing Protocols

- IGP: **Comparison of Distance Vector & Link State** Routing Protocols

Distance vector

– routes are advertised as vectors

of distance & direction.

– incomplete view of network

topology.

–Generally, periodic

updates.

Link state

– complete view of network

topology is created.

– updates are not
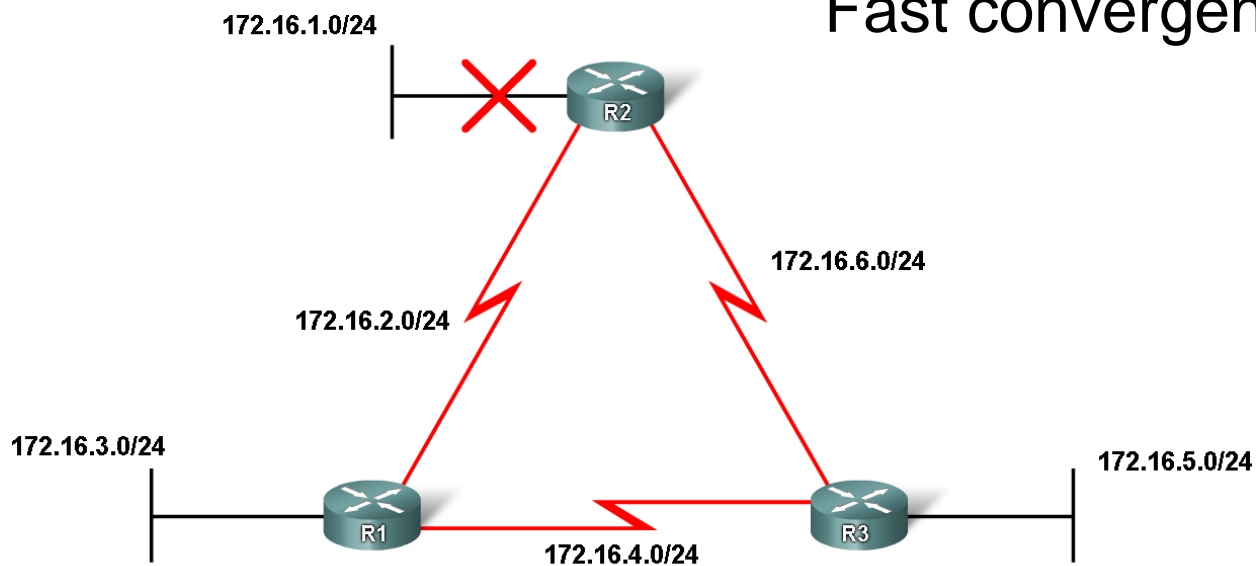
periodic.

Distance Vector Protocol Operation
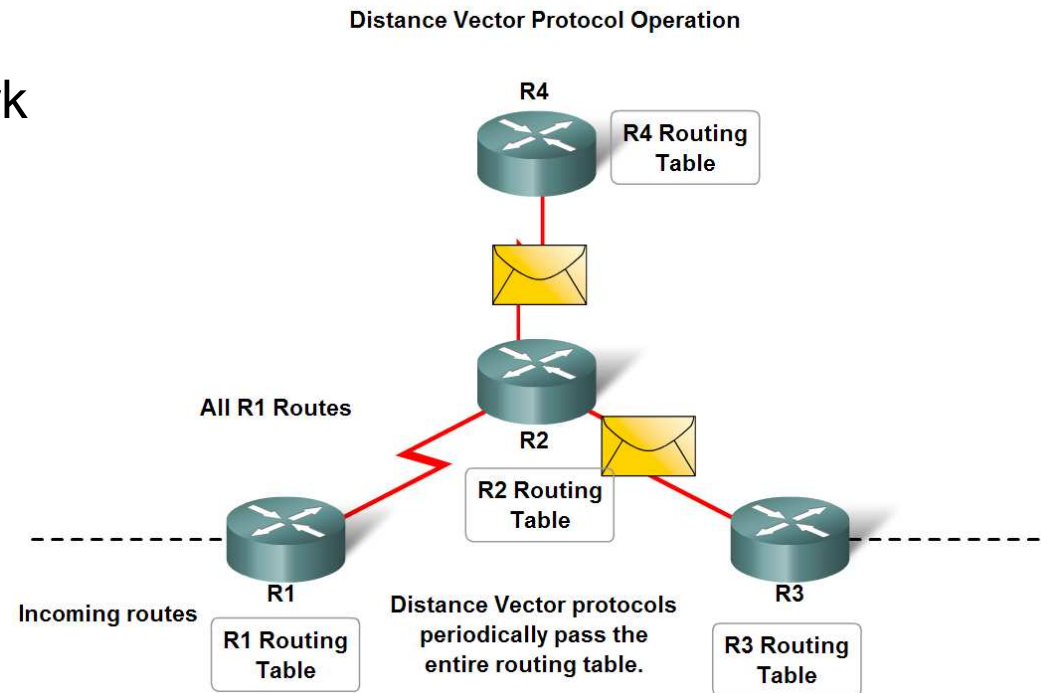
Classifying Routing Protocols

- **Convergence** is defined as when all routers' routing tables are at a state of consistency

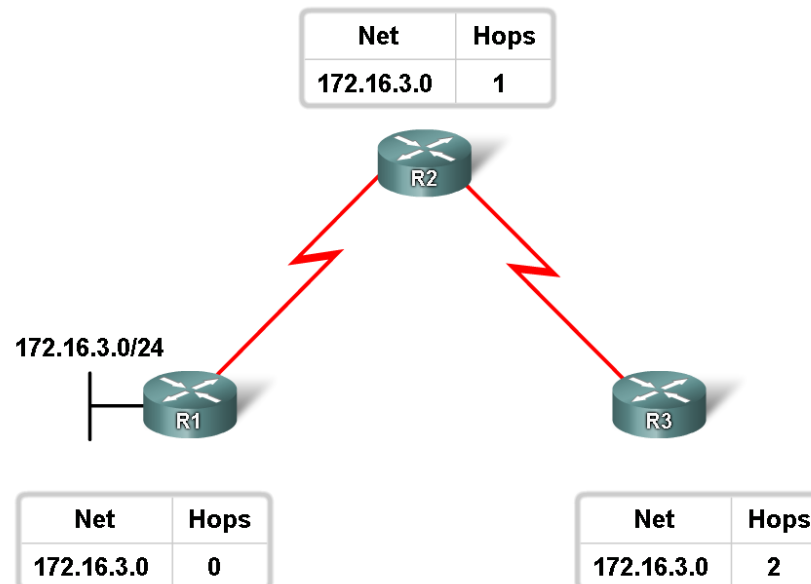Comparing Convergence

Slow convergence: RIP
Fast convergence: OSPF

172.16.1.0/24

R2

172.16.6.0/24

172.16.2.0/24

172.16.3.0/24

172.16.5.0/24

R1

R3

172.16.4.0/24

Routing Protocols Metrics

- **Metric**

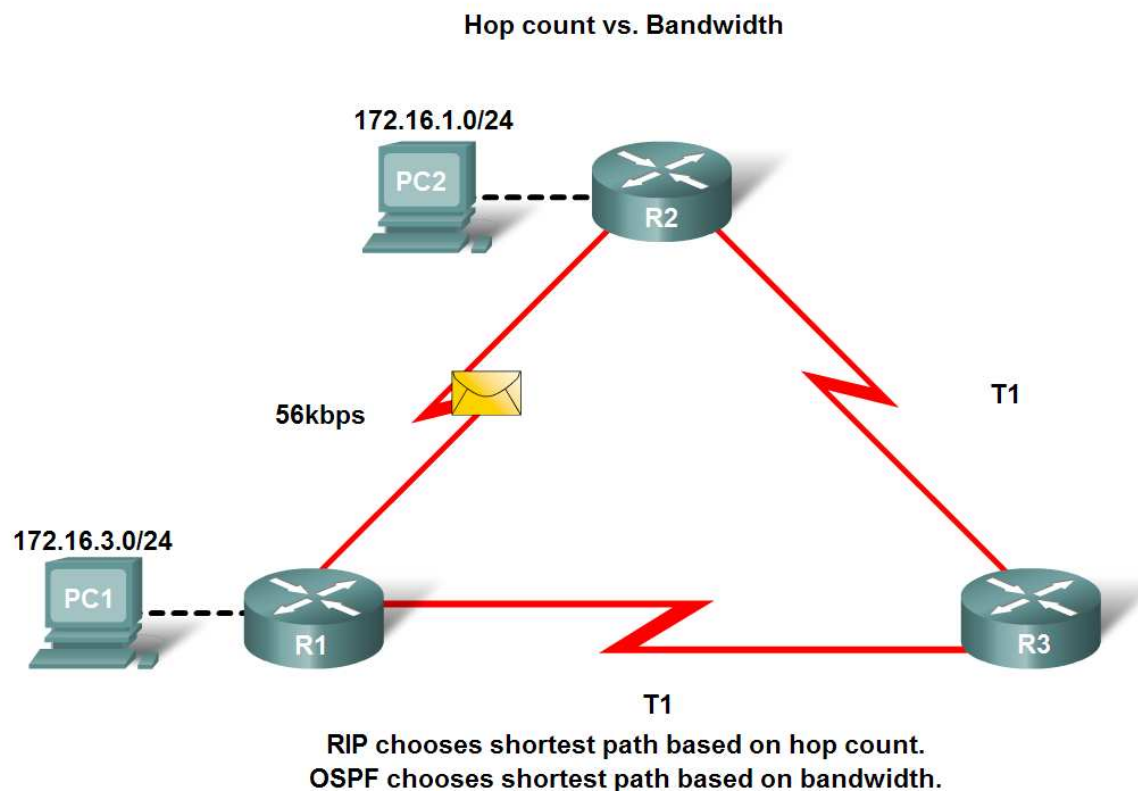   A value used by a routing protocol to determine which routes are better than others.

Metrics

Routing Protocols Metrics

▪ Metrics used in IP routing protocols

-Bandwidth

-Cost

-Delay

-Hop count

-Load

-Reliability

Hop count vs. Bandwidth

172.16.1.0/24

PC2

R2

56kbps

T1

172.16.3.0/24

PC1

R1

R3

T1

RIP chooses shortest path based on hop count.
OSPF chooses shortest path based on bandwidth.

Routing Protocols Metrics

- The Metric Field in the Routing Table

- **Metric** used for each routing protocol
  - RIP - hop count
  - IGRP & EIGRP - Bandwidth (used by default), Delay (used by default), Load, Reliability
  - OSPF – Cost, Bandwidth (Cisco's implementation)

Routing Protocols Metrics

- **Load balancing**

  This is the ability of a router to distribute packets among multiple same cost paths

Load Balancing Across Equal Cost Paths
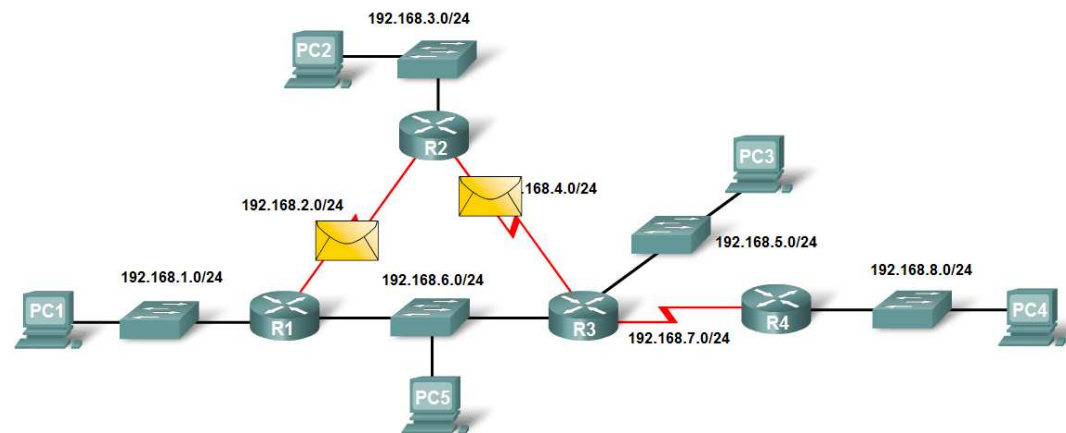

```
R2#show ip route
<output omitted>

R    192.168.6.0/24 [120/1] via 192.168.2.1, 00:00:24, Serial0/0/0
                    [120/1] via 192.168.4.1, 00:00:26, Serial0/0/1
```
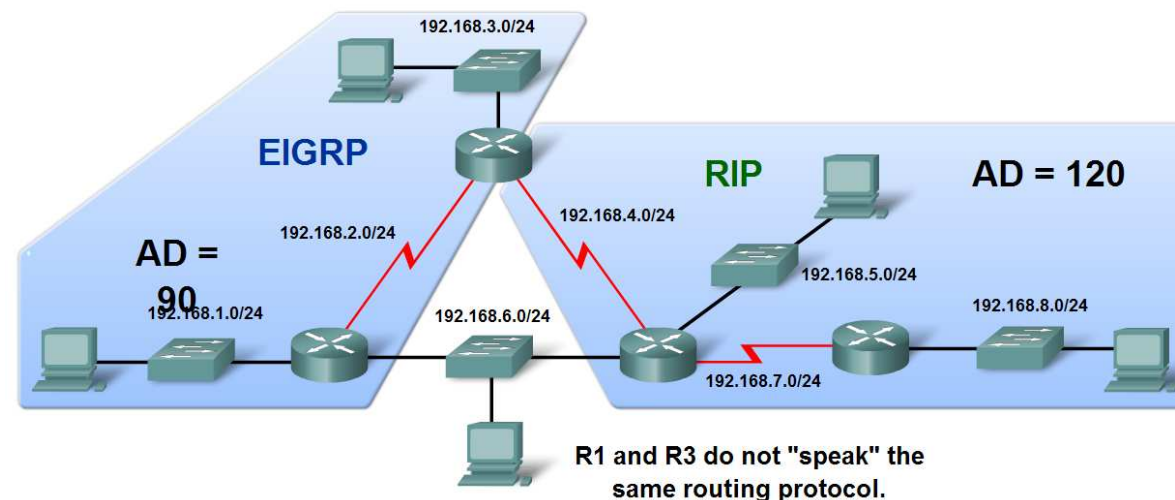
Administrative Distance of a Route

- **Purpose of Administrative Distance**

  It's a numeric value that specifies the preference of a particular routing protocol

Comparing Administrative Distances

192.168.3.0/24

EIGRP

RIP   AD = 120

192.168.2.0/24   192.168.4.0/24

AD = 90   192.168.5.0/24

192.168.1.0/24   192.168.6.0/24   192.168.8.0/24

192.168.7.0/24

R1 and R3 do not "speak" the same routing protocol.

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Administrative Distance of a Route

■ **Dynamic Routing Protocols**

Default Administrative Distances

Route source	Default AD
Connected interface	0
Static	1
EIGRP summary route	5
eBGP	20
EIGRP (Internal)	90
IGRP	100
OSPF	110
IS - IS	115
RIP	120
EIGRP (External)	170
iBGP	200
Unknown	255

Administrative Distance of a Route

- **Directly connected routes**

  Have a default **AD of 0**

- **Static Routes**

  Administrative distance of a static route has a **default value of AD of 1**

Administrative Distance of a Route

- **Directly connected routes**

  -Immediately appear in the routing table as soon as the interface is configured

```
R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 3 subnets
C       172.16.1.0 is directly connected, FastEthernet0/0
C       172.16.2.0 is directly connected, Serial0/0/0
S       172.16.3.0 is directly connected, Serial0/0/0
C    192.168.1.0/24 is directly connected, Serial0/0/1
S    192.168.2.0/24 [1/0] via 192.168.1.1
```

Summary

- **Dynamic routing protocols** fulfill the following functions
  - Dynamically share information between routers
  - Automatically update routing table when topology changes
  - Determine best path to a destination
- **Routing protocols are grouped as either**
  - Interior gateway protocols (IGP)**Or**
  - Exterior gateway protocols(EGP)

Summary

- **Metrics** are used by dynamic routing protocols to calculate the best path to a destination.

- **Administrative distance** is an integer value that is used to indicate a router's "trustworthiness"

- **Components of a routing table** include:

    - Route source

    - Administrative distance

    - Metric

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