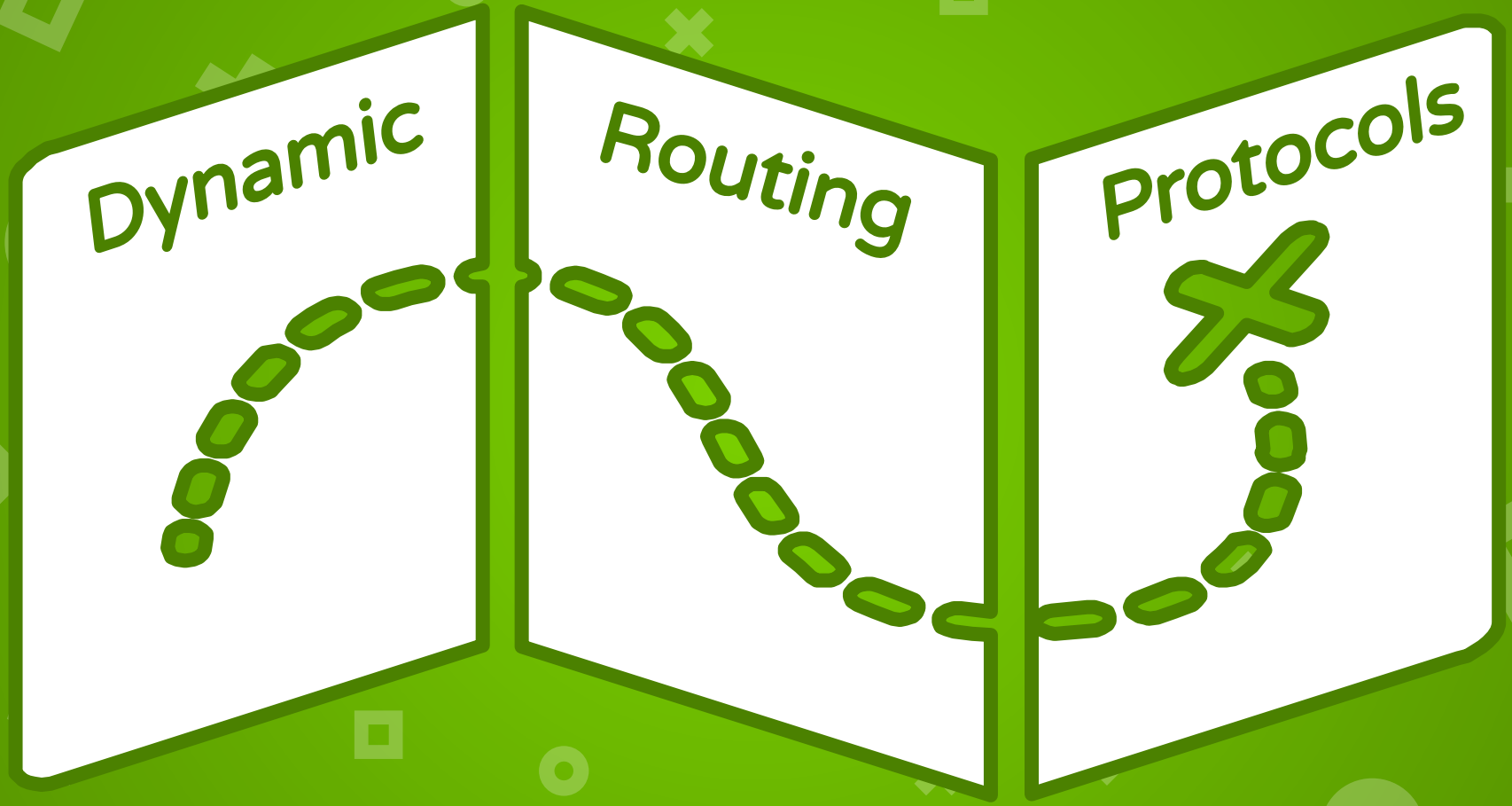

Dynamic
Routing
Protocols

Dynamic Routing Terminology

- **OSPF**: Open Shortest Path First routing protocol
- **RIPv2 routing**: Routing Information Protocol version 2
- **Link-state**: Protocol used to create a topology map
- **Distance-vector**: Protocol used to advertise distance and direction of routes
- **Default route**: Used when no other route in table matches; usually leads to general Internet
- **Route summarization**: Consolidates routing information (faster but less secure)
- **Metric**: quantitative value used to measure the distance to a given network

Purpose of Dynamic Routing Protocols

- Discovery of 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

Components of Dynamic Routing Protocols

- **Data structures** (neighbor table, topology table, routing table)
- **Routing protocol messages** discover neighboring routers and exchange routing information
- **Algorithm** for facilitating routing information and for best path determination

Dynamic vs. Static

Dynamic

- Better scalability
- Often results in faster speeds
- Less administrative oversight

Static

- Requires lots of administrative oversight
- Slightly more stable and secure
- Useful for creating default routes

How a Routing Protocol Works

1. The router sends and receives routing messages on its interfaces.
2. The router shares routing messages and information with other routers that are using the same protocol.
3. Routers exchange routing information to learn about remote networks.
4. When a router detects a topology change, the routing protocol can advertise this change to other routers.

RIPv2 Routing

- Uses a distance-vector algorithm called the Bellman-Ford algorithm
- Uses hop count to determine best path
- Each router only has information on directly connected networks
- Sends out periodic updates
- Legacy protocol replaced by OSPF and EIGRP

OSPF Routing

- Uses a link-state algorithm called Dijkstra's algorithm (aka SPF)
- Uses bandwidth speed to determine best path
- Event-based updates
- Creates a topology map of each area
- Fast convergence
- "Areas" can be used for management and troubleshooting

LSA Flooding

- Occurs when too many LSA (Link-State Acknowledgement) messages are sent at once
- Creates latency
- Resolved by automatically designating a DR (Designated Router) and BDR (Backup DR) based on router ID
- Using a DR/BDR reduces adjacencies

Administrative Distance (AD)

- Represents reliability
- Lower AD is better
- If a router has multiple routes to the same destination, it will use the one with the lowest AD

Route Source	Administrative Distance
Connected	0
Static	1
EIGRP summary route	5
External BGP	20
Internal EIGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
External EIGRP	170
Internal BGP	200

OSPF Configuration

Step Description	Placement	Command	Category	Notes
enable ospf/enter OSPF config	every ospf router	router ospf [process id]	requirement	
assign a router ID	ospf config	router-id [router-id]	requirement	router ID is arbitrary router ID is in dotted-decimal notation
add associated networks	ospf config	network [network ip] [wildcard] area [area #]	requirement	use area 0 unless told otherwise IPs added should be all directly connected networks (minus the Internet if applicable)
set passive interfaces	ospf config	passive-interface [interface]	optional	recommended use on interfaces that do not lead to a router
disable log messages	ospf config	no log-adjacency-changes	optional	use if there are a ridiculous amount of log messages

OSPF Configuration Examples

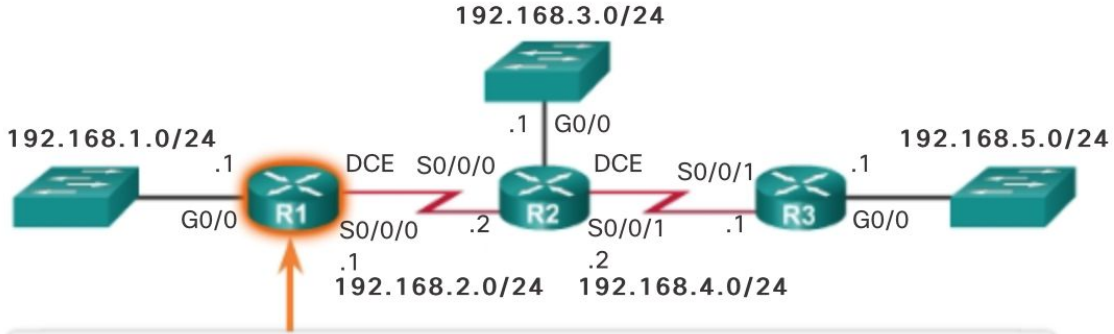
```
R1(config)# router ospf 10
R1(config-router)# network 172.16.1.0 0.0.0.255 area 0
R1(config-router)# network 172.16.3.0 0.0.0.3 area 0
R1(config-router)# network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#
```

```
R1(config)# router ospf 10
R1(config-router)# passive-interface GigabitEthernet 0/0
R1(config-router)# end
R1#
```

RIPv2 Configuration

Step Description	Placement	Command	Category	Notes
enable RIP routing/configuration	router config	router rip	requirement	
advertise directly connected networks	RIP config	network [network ip]	requirement	
set passive interfaces	RIP config	passive-interface [interface leading to a LAN]	optional	recommended
set RIP version	RIP config	version [#]	optional	
disable automatic summarization	RIP config for RIP v2	no auto-summary	optional	
create a default static route on the router directly connected to the internet	router config	ip route 0.0.0.0 0.0.0.0 [interface leading to the internet]	optional	required for internet connectivity
advertise the default route	RIP config	default-information originate	optional	required for internet connectivity

RIPv2 Configuration Examples




```
R1(config)# router rip
R1(config-router)# network 192.168.1.0
R1(config-router)# network 192.168.2.0
R1(config-router)#
```

Advertising Networks

```
R1(config)# ip route 0.0.0.0 0.0.0.0 S0/0/1 209.165.200.226
R1(config)# router rip
R1(config-router)# default-information originate
```

Configuring a Default Route

Credits

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by SlidesCarnival
- Photographs by Unsplash