

Protocol Independent Multicast



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Agenda



Topics:

- What is Protocol Independence
- How is Multicast Best Path Determined
- How Are Multicast Loops Avoided

Demos:

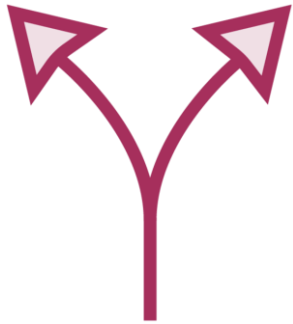
- Establishing PIM Neighbors
- Electing a PIM Designated Router

Packet Analysis:

- PIM Hello (IPv4)



What Is Protocol Independence?



**Connected
Routes**



Static Routes



OSPF



BGP



RIP

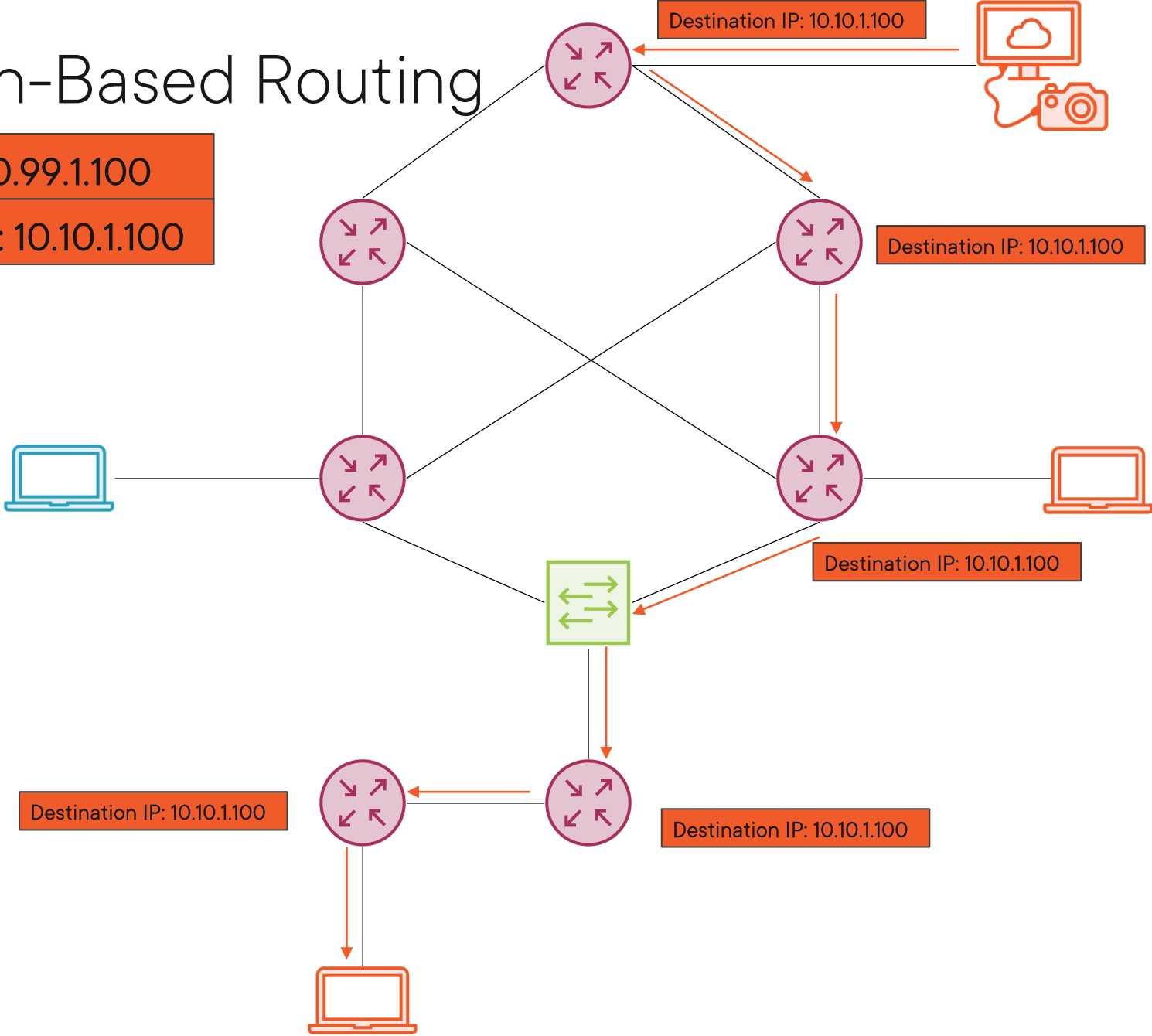


ODR



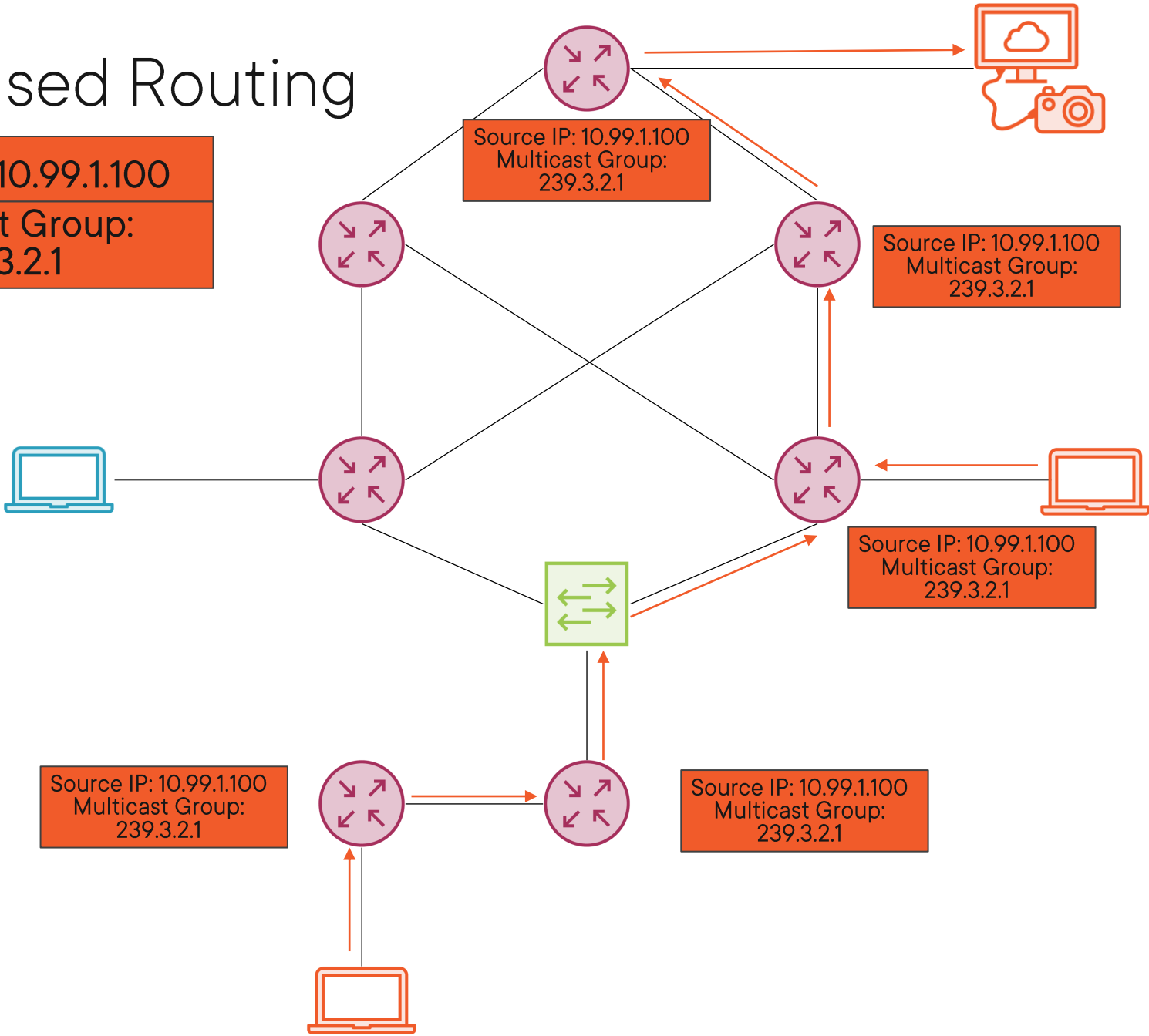
Destination-Based Routing

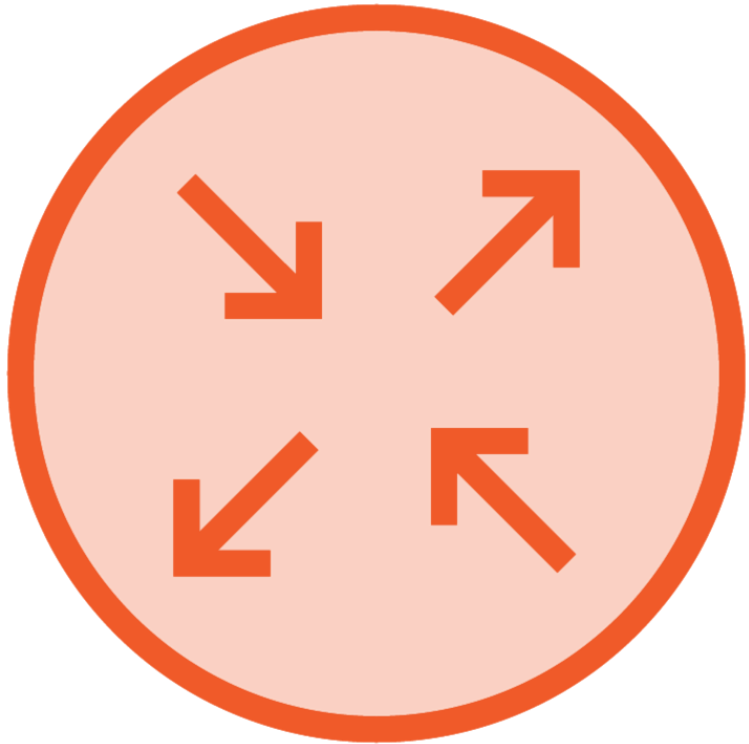
Source IP: 10.99.1.100
Destination IP: 10.10.1.100



Source-Based Routing

Source IP: 10.99.1.100
Multicast Group: 239.3.2.1



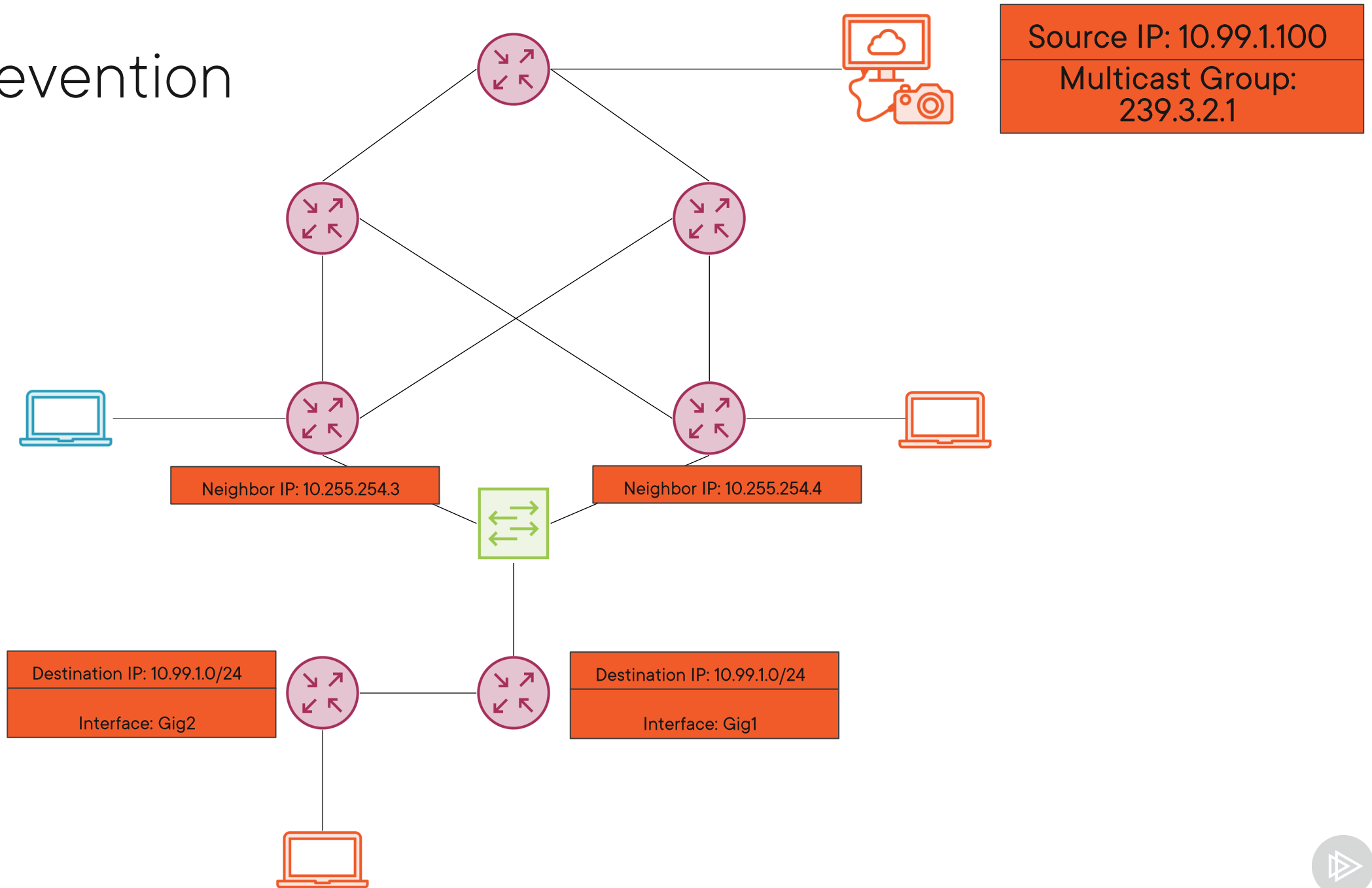


PIM Join

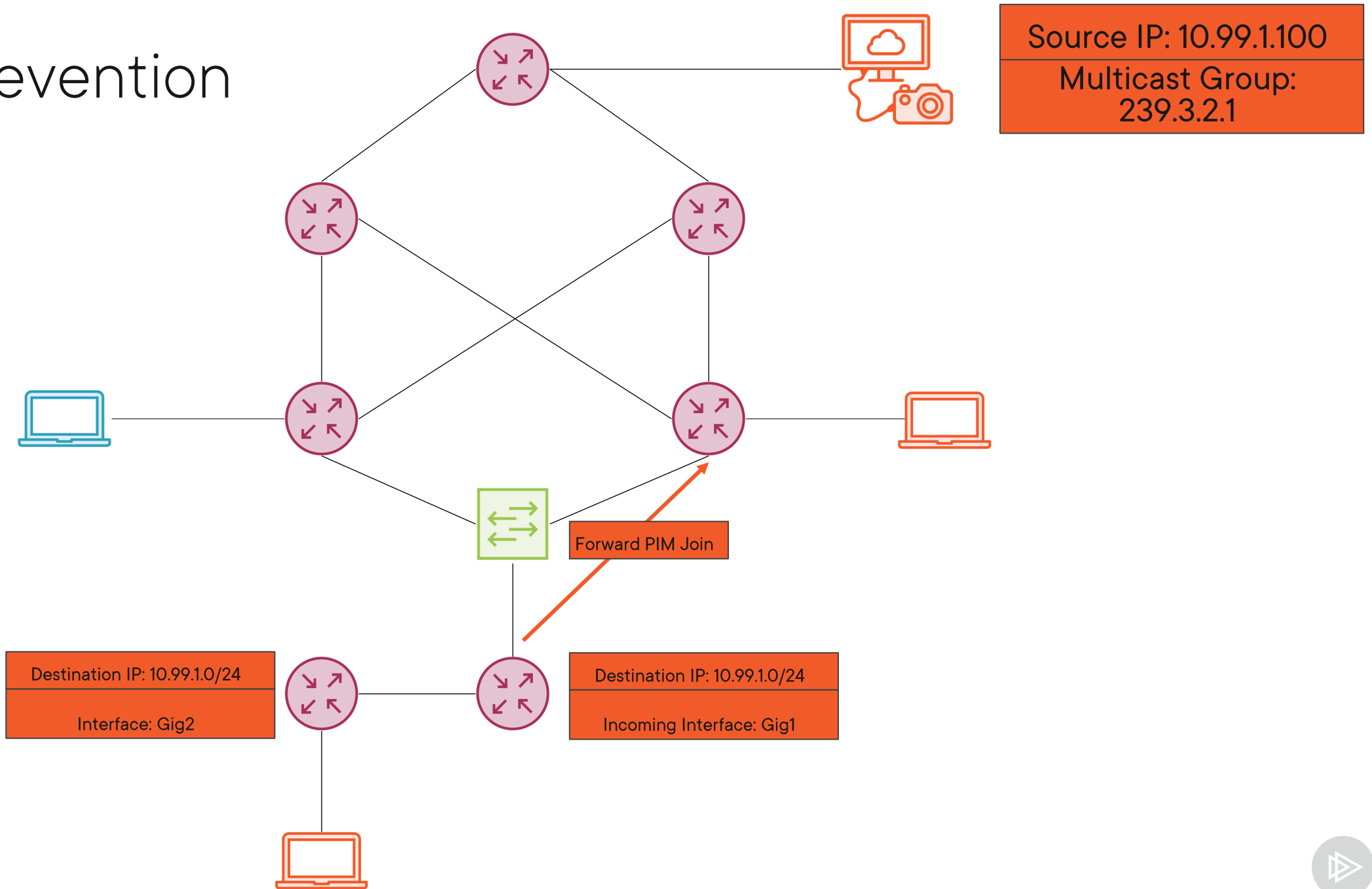
- Conveys receiver interest in multicast
- Router-to-Router signal
- Uses unicast RIB to forward to source
- If source is unknown/unable to be requested, forwards to Rendezvous Point instead



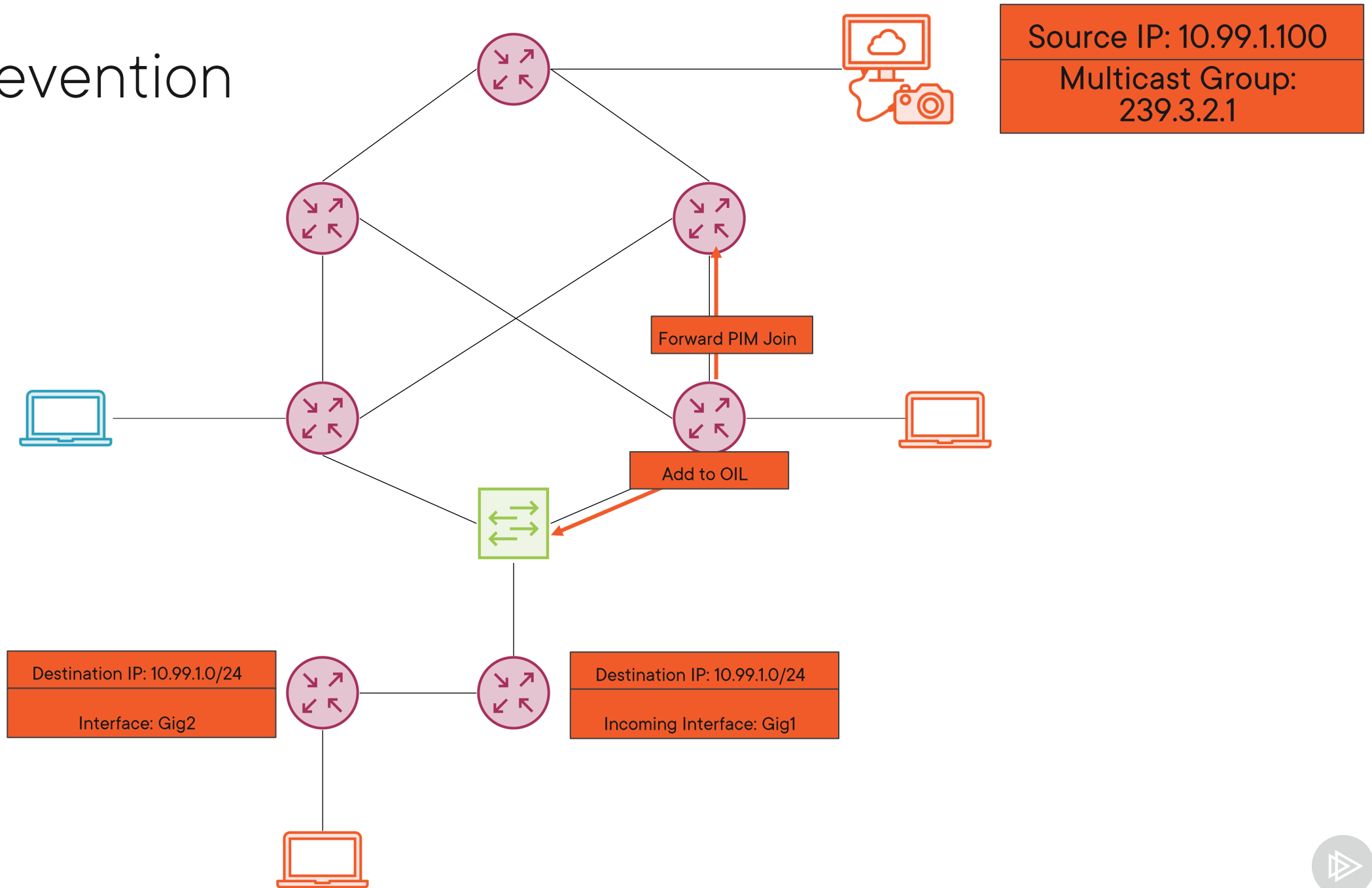
Loop Prevention



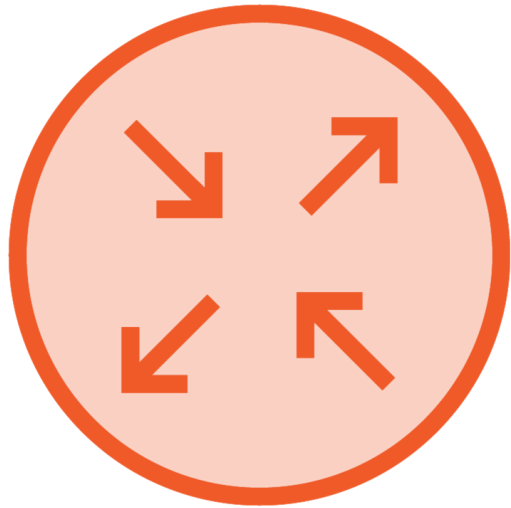
Loop Prevention



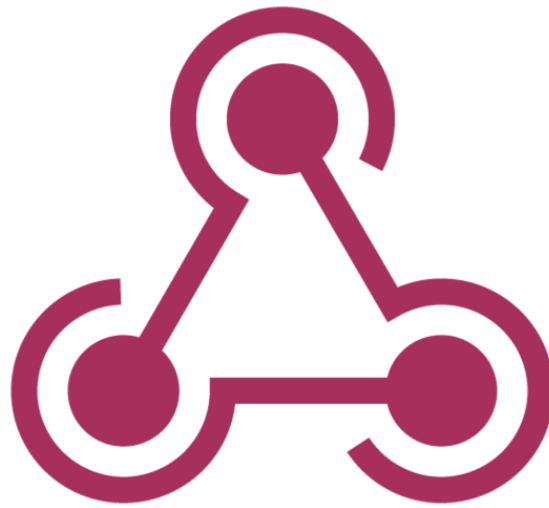
Loop Prevention



Reverse Path Forwarding Check: Why?



PIM is protocol independent



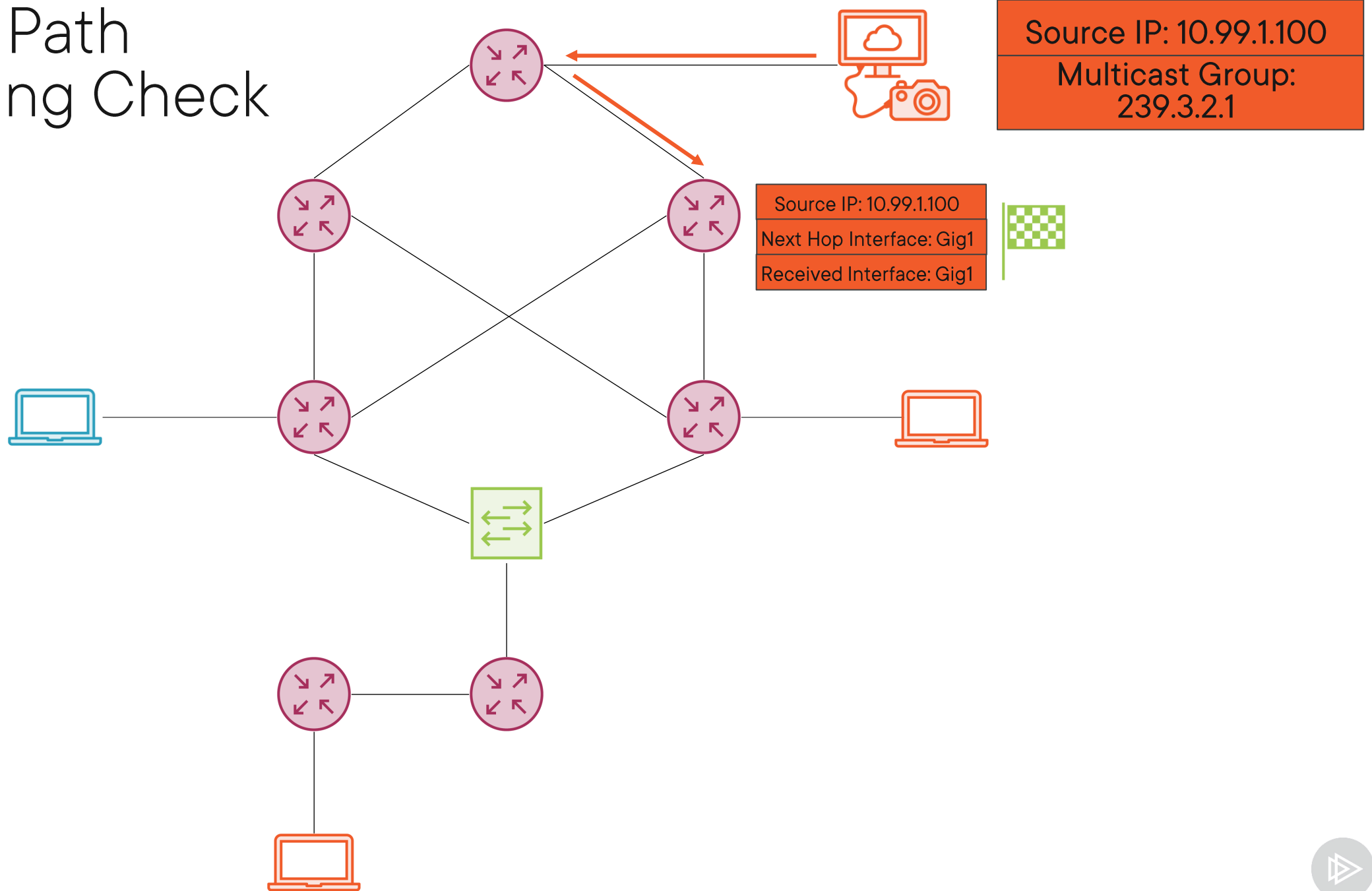
PIM has no loop avoidance



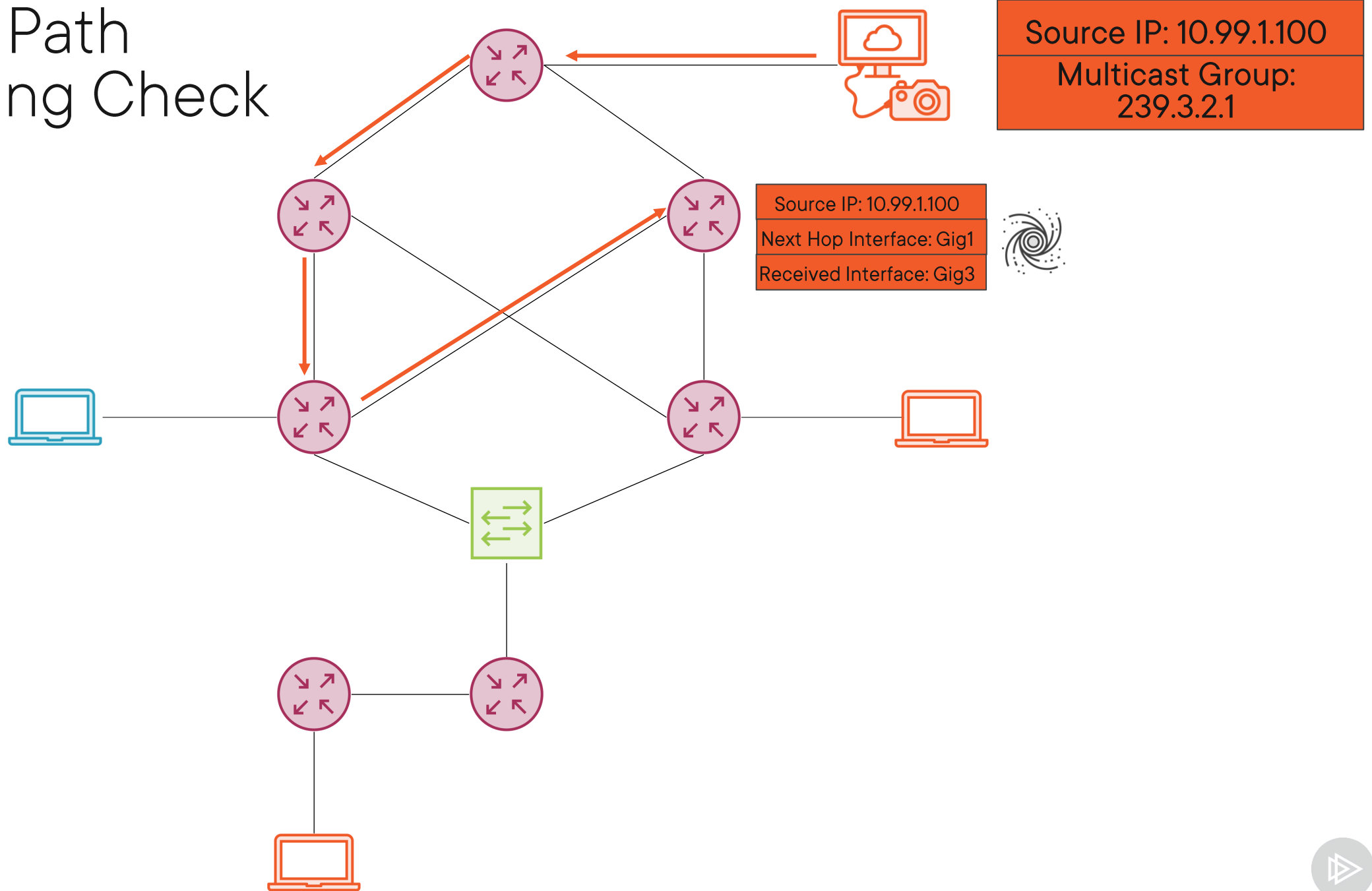
Multicast routing doesn't track best path



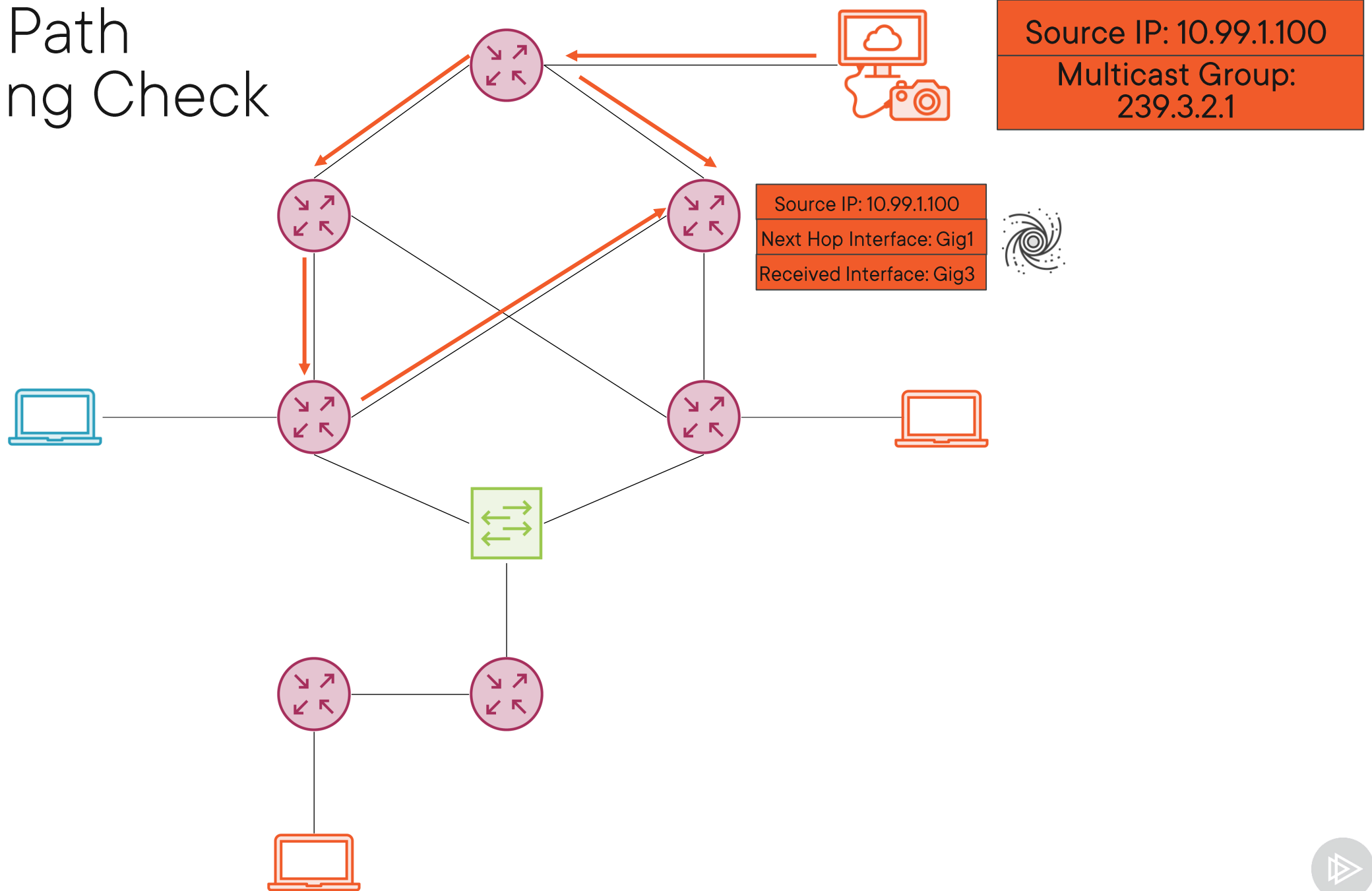
Reverse Path Forwarding Check



Reverse Path Forwarding Check



Reverse Path Forwarding Check



Verifying the RPF Check

```
LHR#show ip rpf 10.99.1.100
RPF information for ? (10.99.1.100)
  RPF interface: GigabitEthernet2
  RPF neighbor: ? (10.10.255.1)
  RPF route/mask: 10.99.1.0/24
  RPF type: unicast (eigrp 100)
  Doing distance-preferred lookups across tables
  RPF topology: ipv4 multicast base, originated from ipv4 unicast base
```



Demo

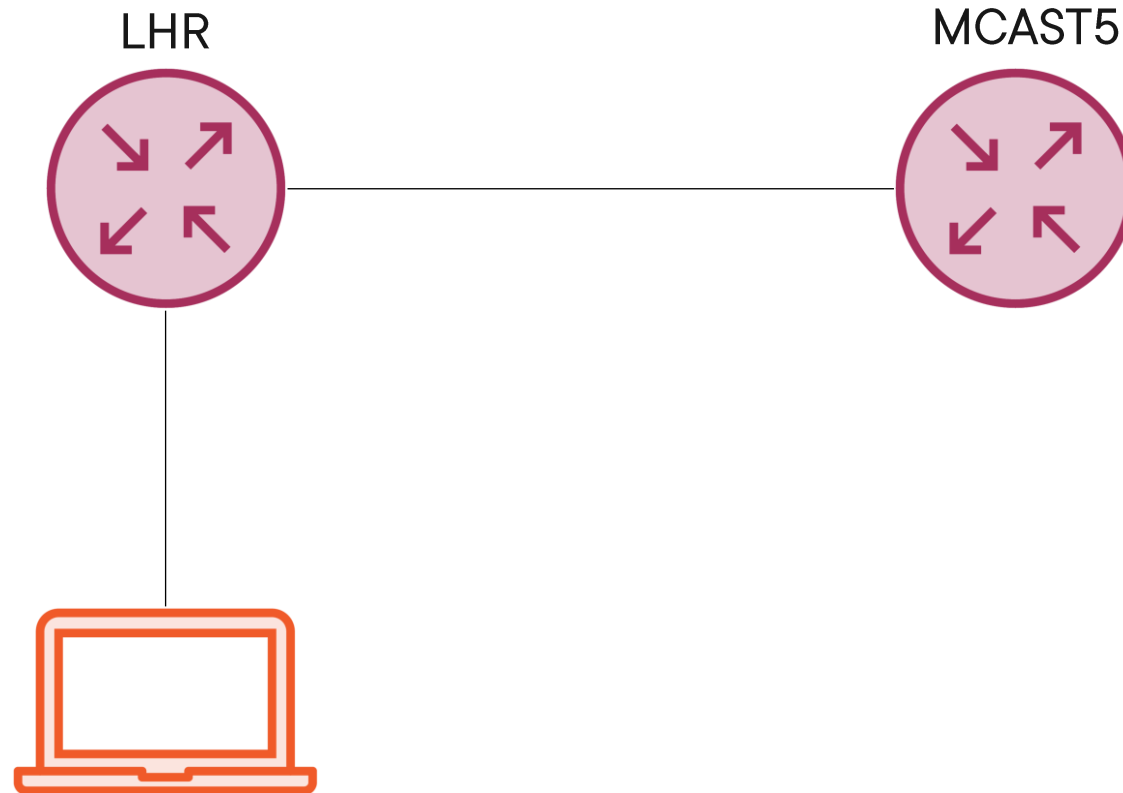


Configuring PIM Neighbors

- Create PIM neighbors to forward multicast traffic
- Debug the process to understand



PIM Hello



Demo

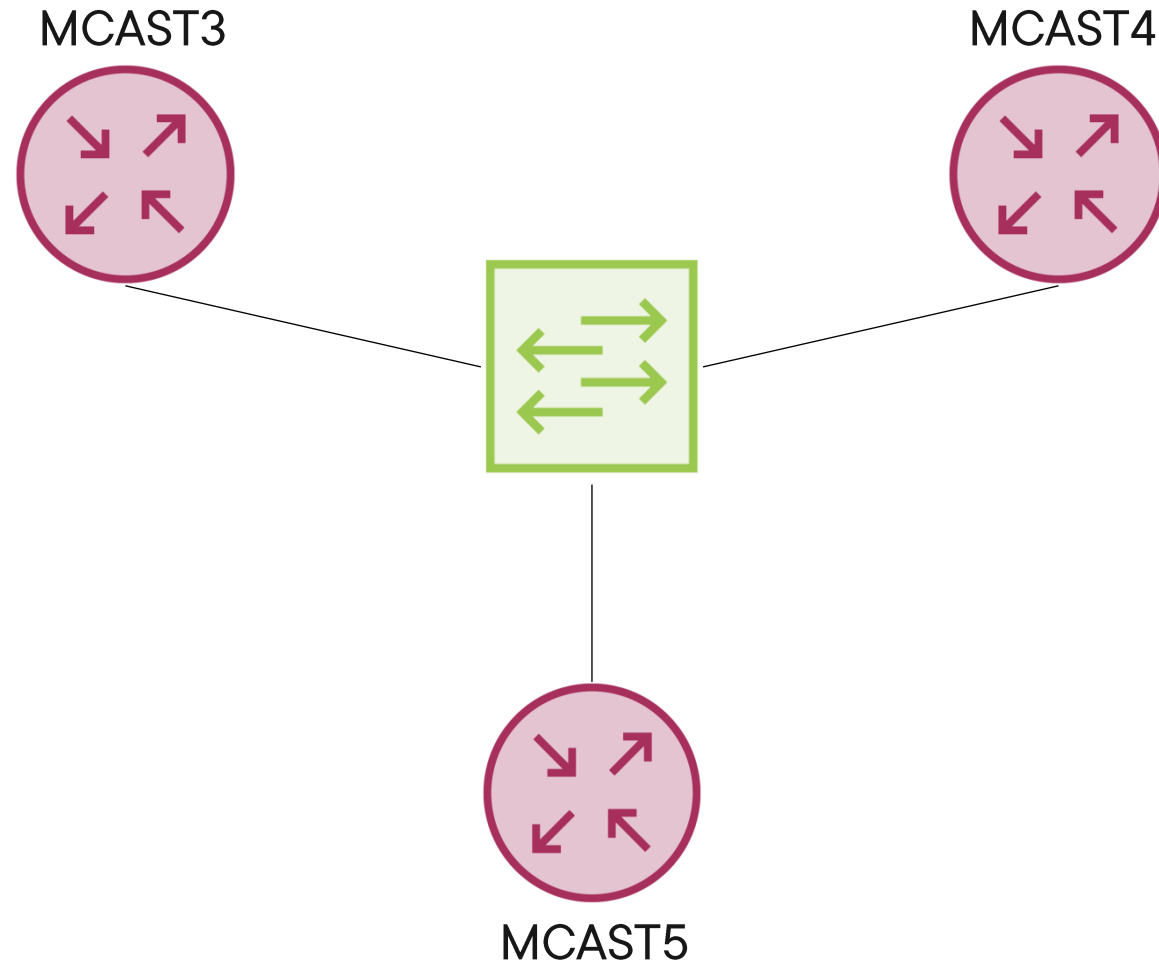


Electing a PIM Designated Router

- How a PIM DR is elected by default
- How the PIM DR election can be modified



PIM Designated Router Election



PIM Hello Packet Dissected

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	10.10.255.1	224.0.0.13	PIMv2	72	Hello
2	10.690125199	10.10.255.2	224.0.0.13	PIMv2	72	Hello

> Frame 1: 72 bytes on wire (576 bits), 72 bytes captured (576 bits) on interface eth0, id 0

▼ Ethernet II, Src: 50:00:00:06:00:01 (50:00:00:06:00:01), Dst: IPv4mcast_0d (01:00:5e:00:00:0d)

- > Destination: IPv4mcast_0d (01:00:5e:00:00:0d)
- > Source: 50:00:00:06:00:01 (50:00:00:06:00:01)
Type: IPv4 (0x0800)

▼ Internet Protocol Version 4, Src: 10.10.255.1, Dst: 224.0.0.13

- 0100 = Version: 4
- 0101 = Header Length: 20 bytes (5)
- > Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
Total Length: 58
Identification: 0x099b (2459)
- > Flags: 0x00
Fragment Offset: 0
Time to Live: 1
Protocol: PIM (103)
Header Checksum: 0xc5e9 [validation disabled]
[Header checksum status: Unverified]
Source Address: 10.10.255.1
Destination Address: 224.0.0.13

▼ Protocol Independent Multicast

- 0010 = Version: 2
- 0000 = Type: Hello (0)
- Reserved byte(s): 00
- Checksum: 0xd438 [correct]
[Checksum Status: Good]
- ▼ PIM Options: 5
 - > Option 1: Hold Time: 105
 - > Option 20: Generation ID: 4067957164
 - > Option 19: DR Priority: 1
 - > Option 21: State-Refresh: Version = 1, Interval = 0s
 - > Option 65004: RPF Proxy Vector (Cisco proprietary)



Summary



Topics:

- Protocol Independence and Multicast
- Multicast Best Path Determination
- Avoiding Multicast Forwarding Loops

Demos:

- Establishing PIM Neighbors
- Electing a PIM Designated Router

Packet Analysis:

- PIM Hello (IPv4)

