

BiDirectional Multicast (IPv6)



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Agenda



Topics:

- Recap of BIDIR-PIM Operation

Demos:

- BiDir State Tracking in Multicast

Packet Analysis:

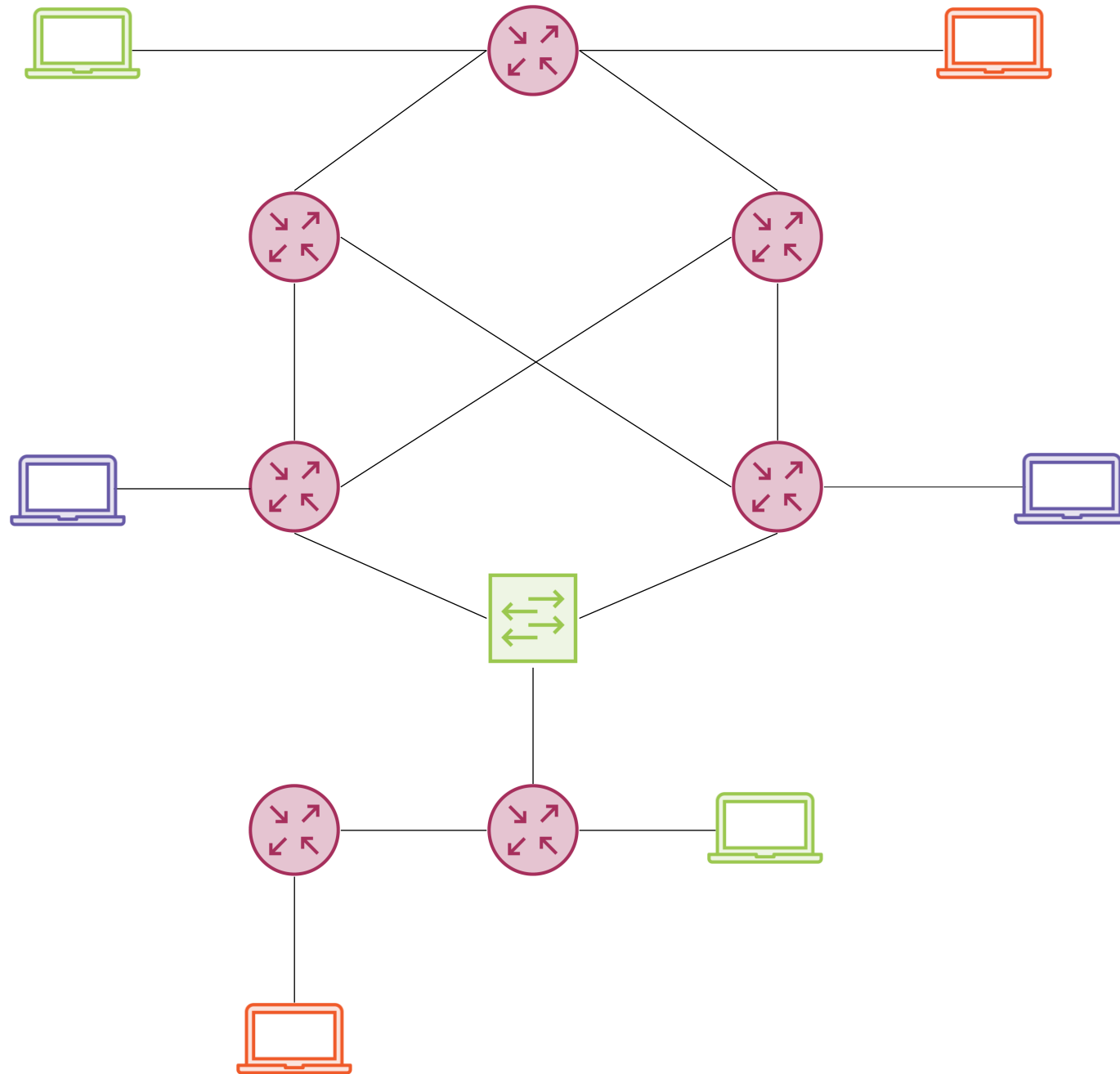
- PIM Hello (BiDir)
- PIM Join/Prune (BiDir)
- PIM DF Packets



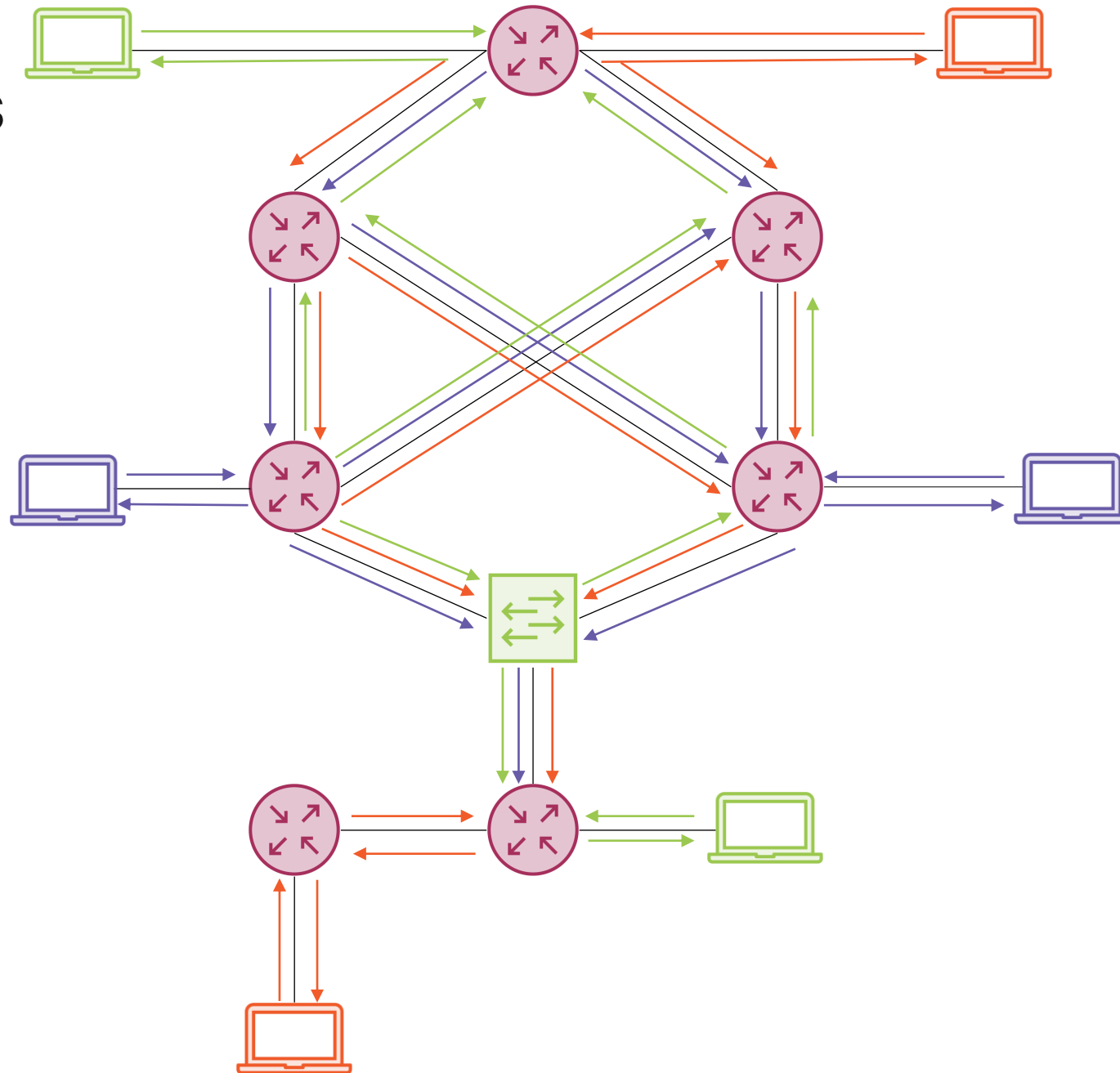
Globomantics Multicast Deployment Continues



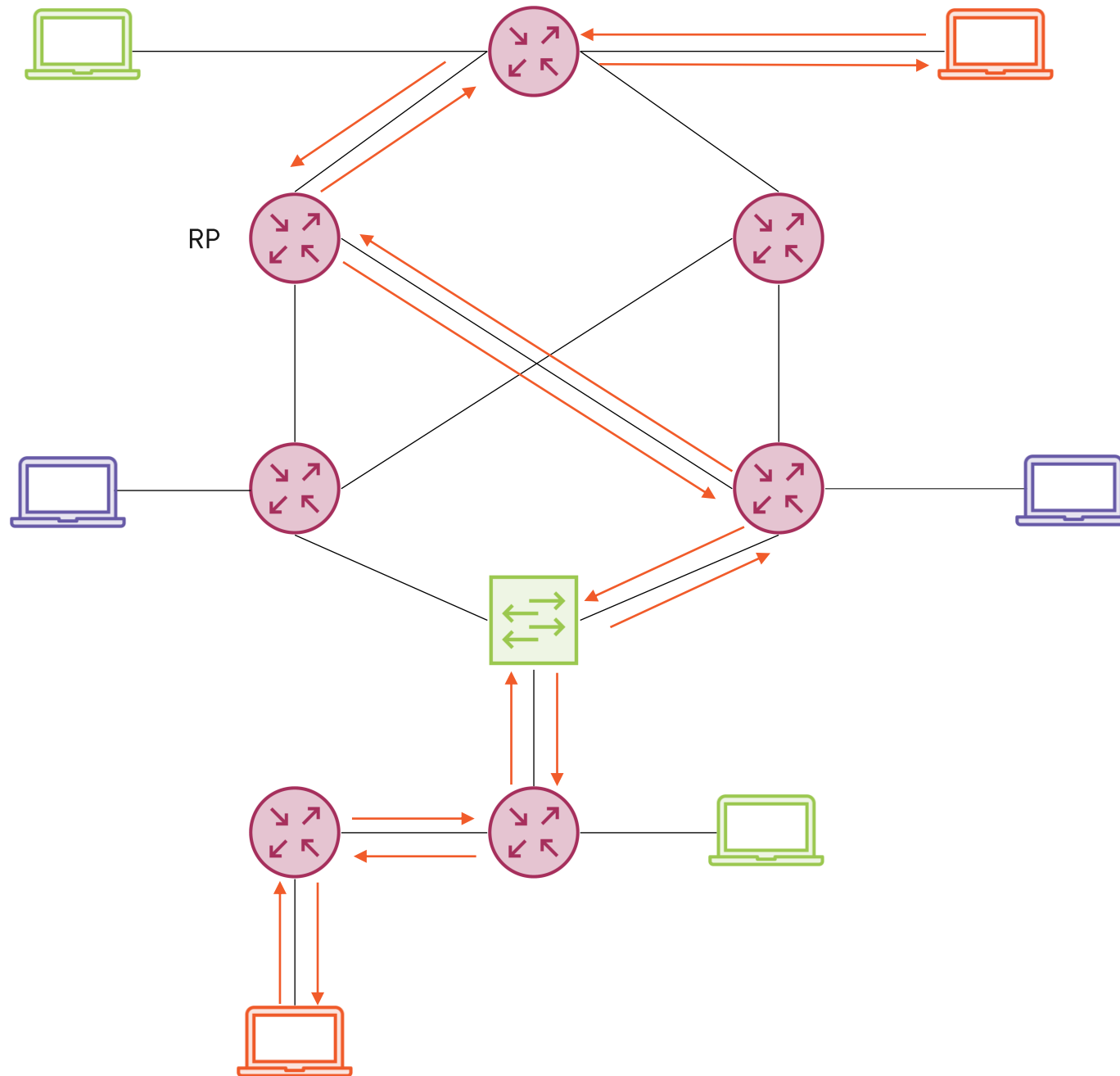
Many-to-Many Multicast



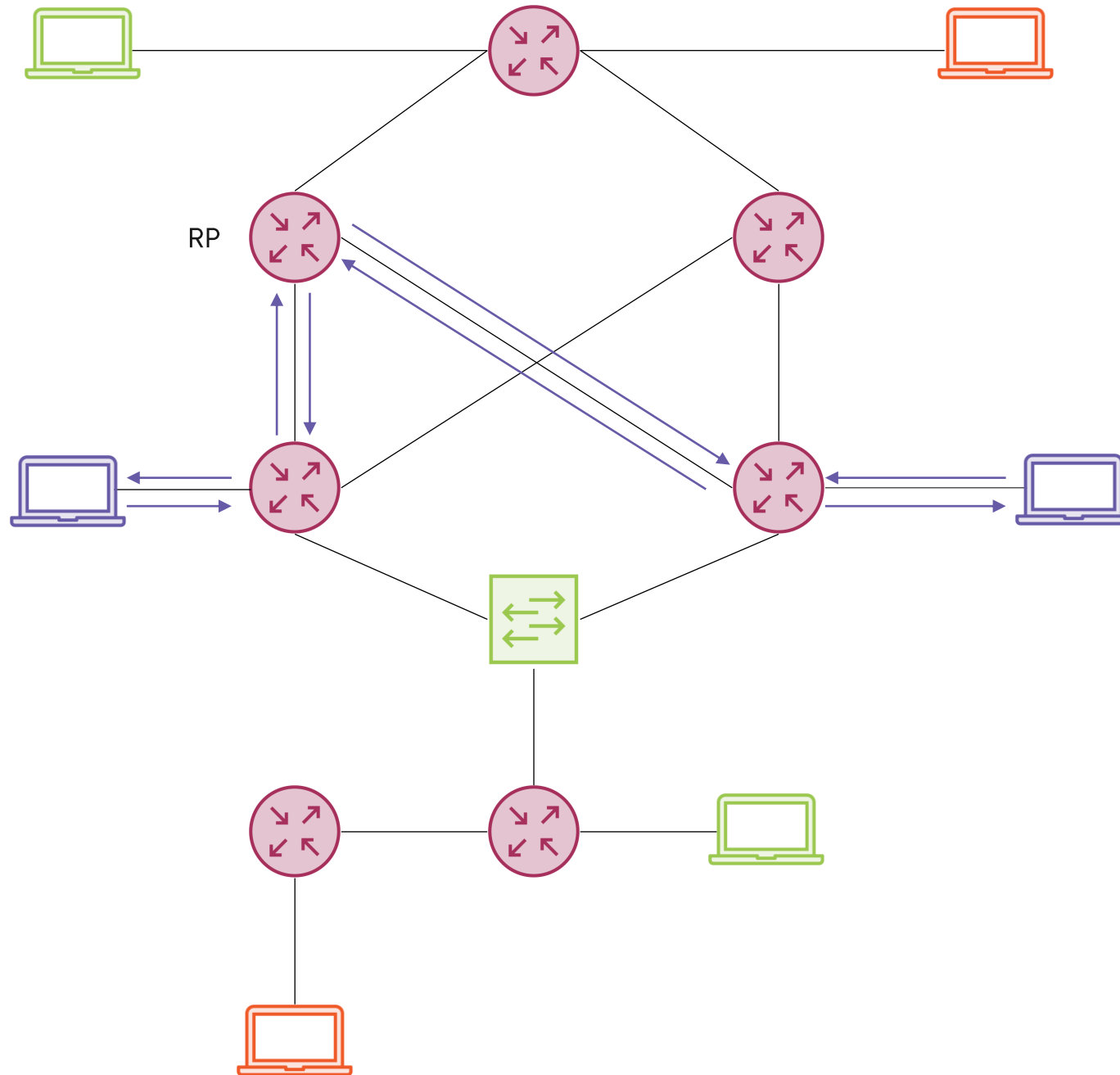
Many-to-Many Flows



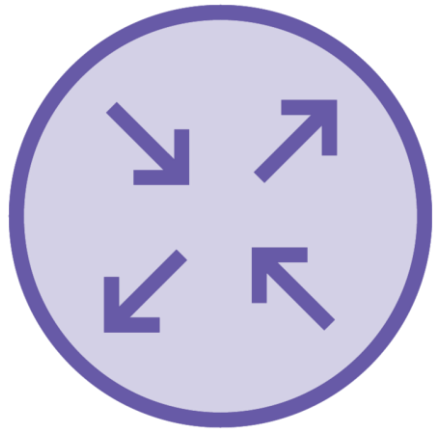
BIDIR-PIM (Orange)



BIDIR-PIM (Purple)



Designated Forwarder



Forwarding
Forwards Multicast
Up/Downstream on
Segment



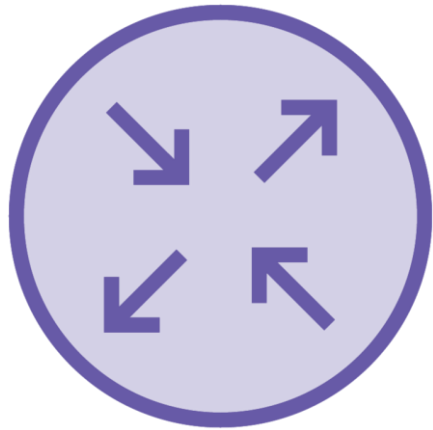
PIM Join
Forwards PIM Joins
Upstream for
Segment



Local Delivery
Delivers Multicast
Locally to Receivers



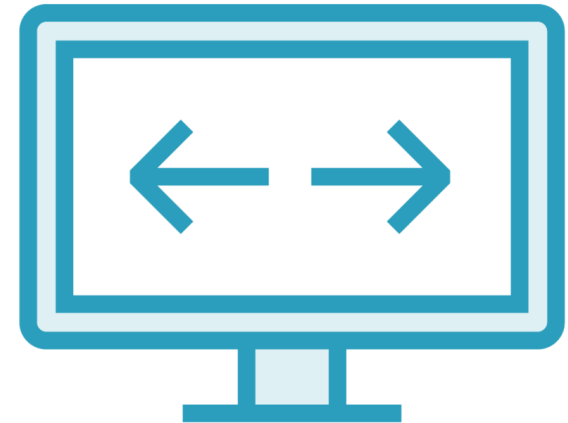
Phantom RP



**No Source
Registration**
**No Source Tracking
in BiDir PIM**



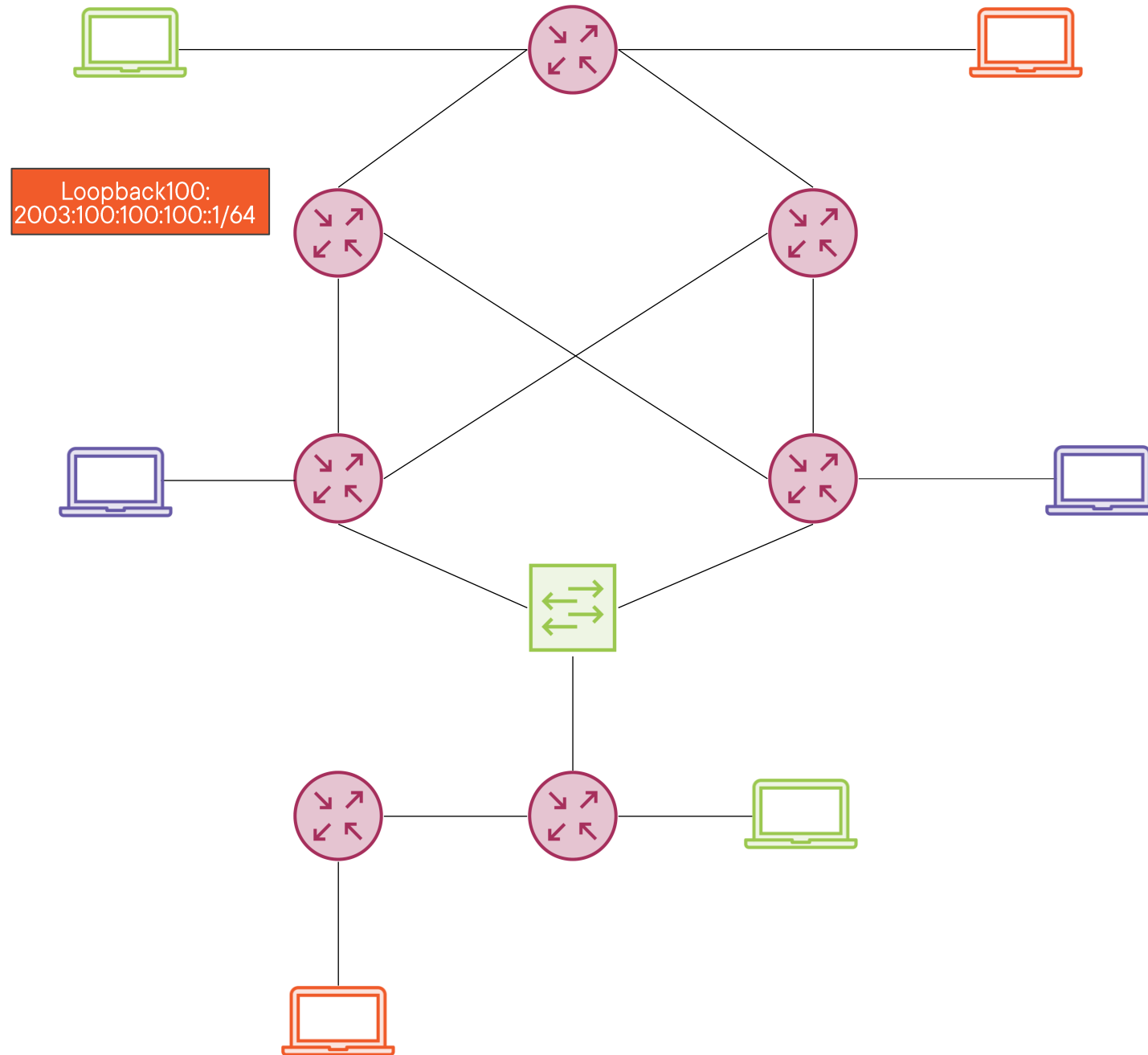
No Source Join
**RP is the root of the
shared tree**



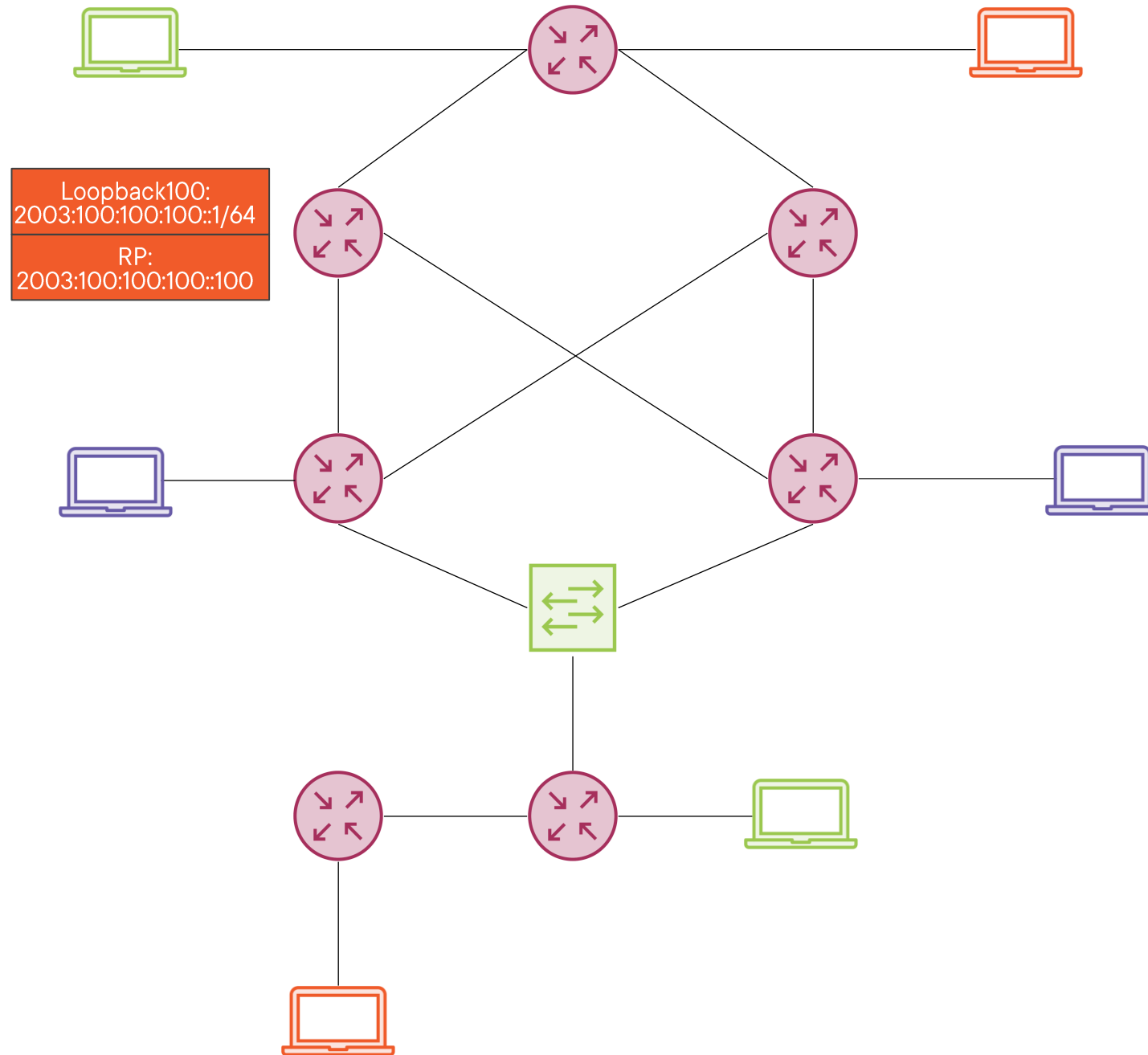
RP is Arbitrary
**RP Link is an agreed-
upon point to build a
shared tree**



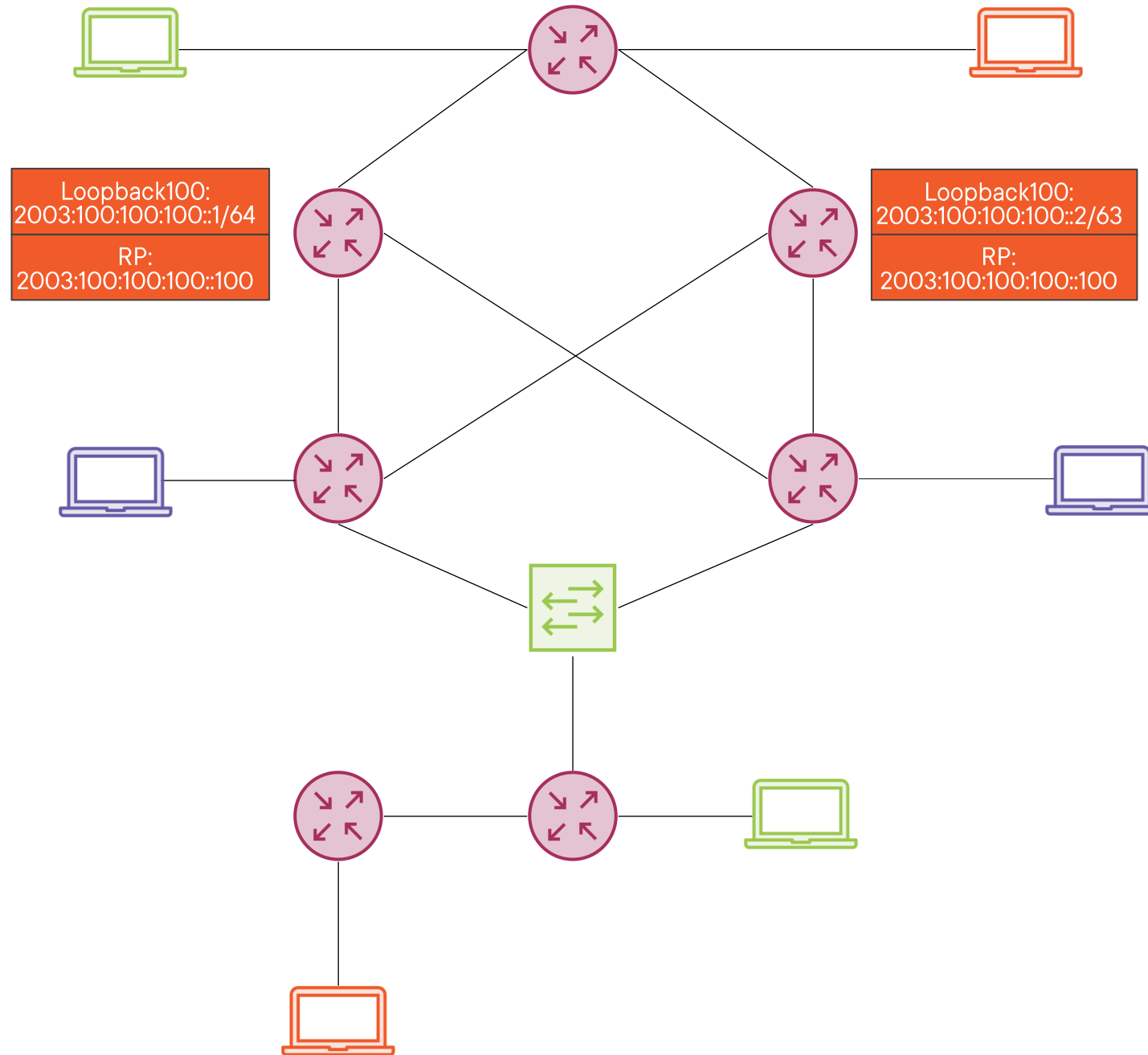
Phantom RP



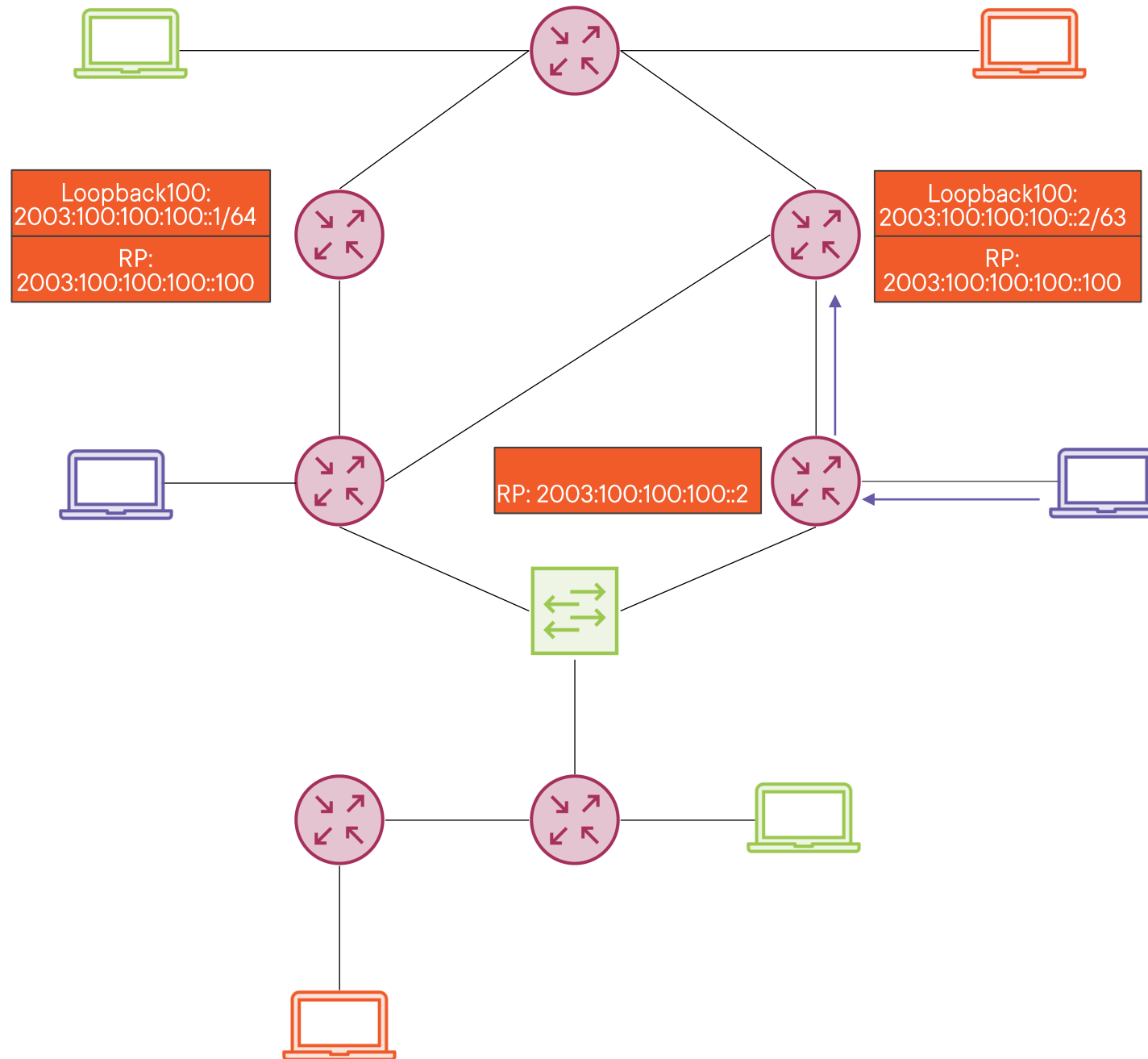
Phantom RP



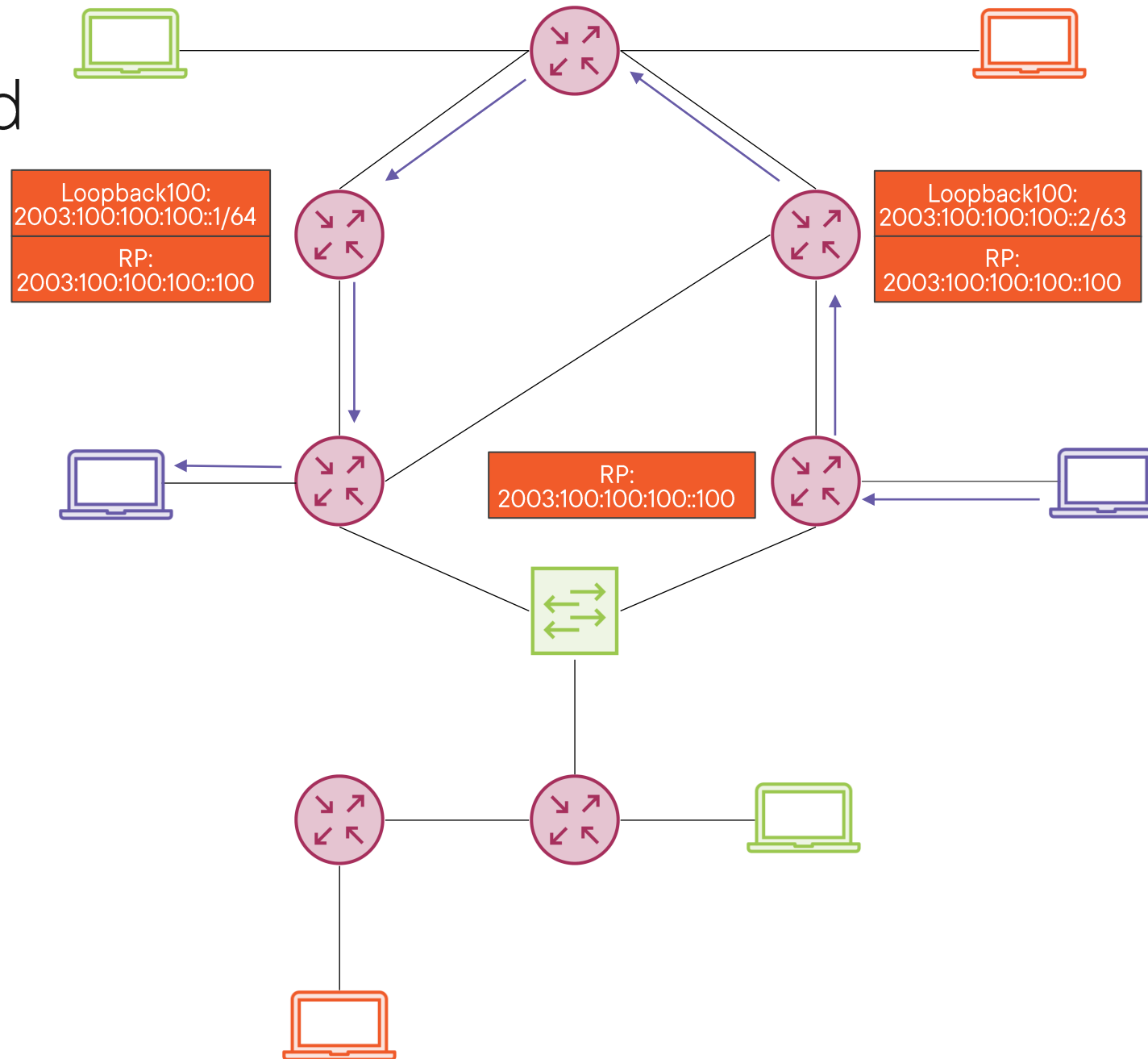
Phantom RP



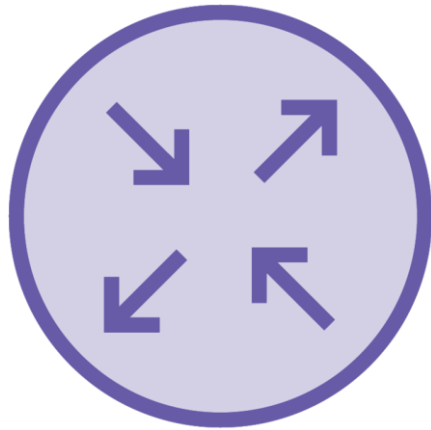
PIM Join Hijack



PIM Join Forwarded



BiDir PIM Only Works If...



**Every Router Agrees
on Same RP
Address/Link**



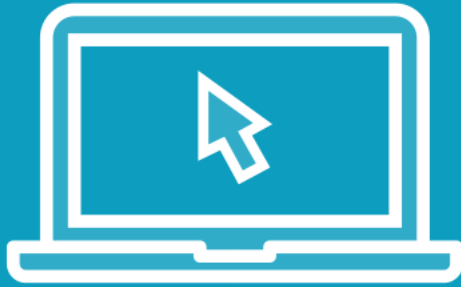
**Source Traffic
Forwarded Upstream
to RP Link**



**PIM Joins Forwarded
Upstream to RP Link
to Build OIL**



Demo

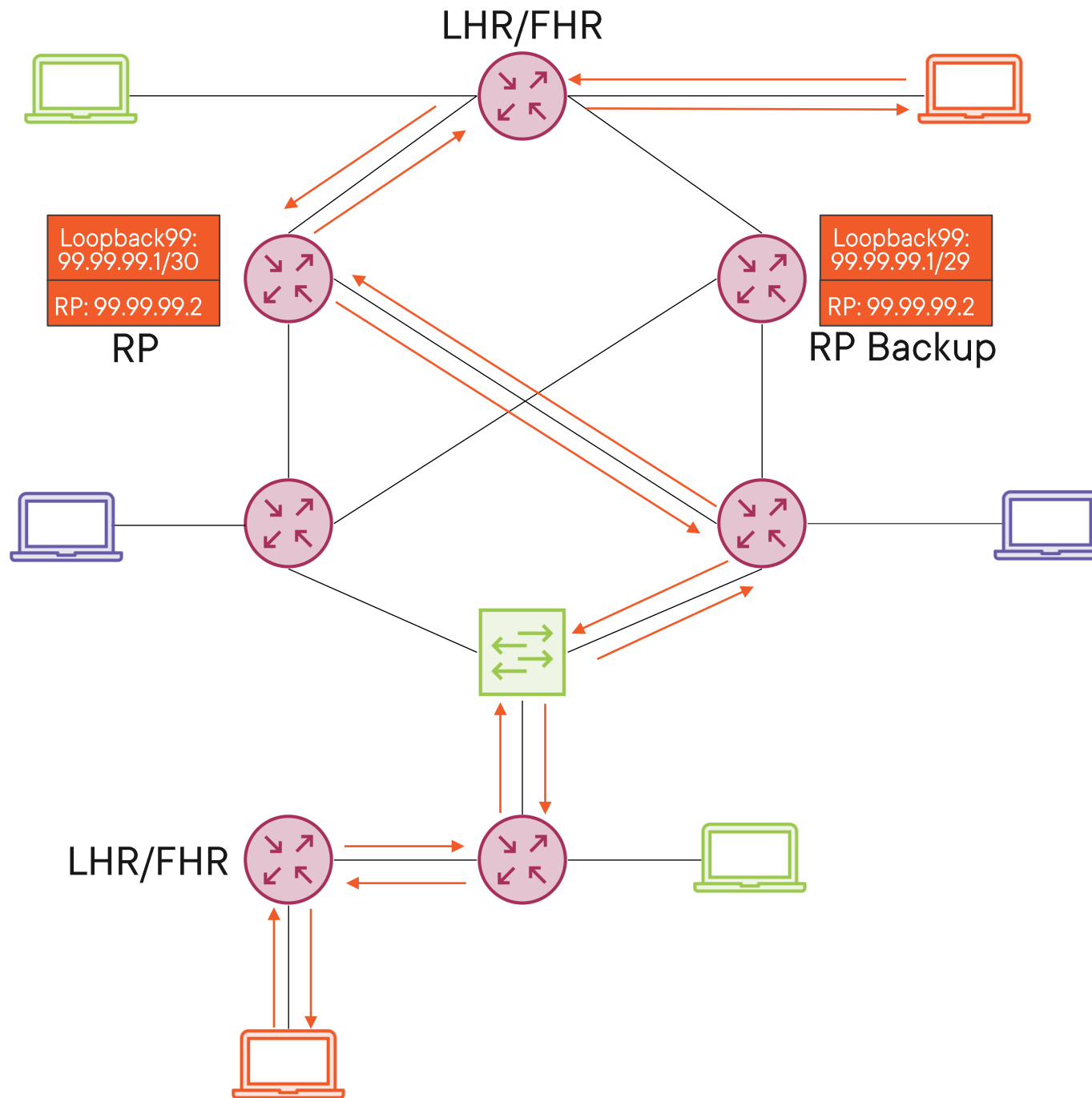


BIDIR-PIM Multicast State Tracking

- Show IGMPv3/PIM Join from LHR
- Show Source Flow from FHR
- Show RP/Shared Tree Flow



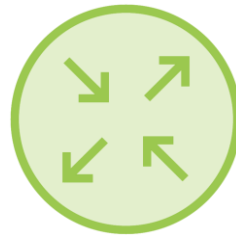
BiDir PIM State Tracking



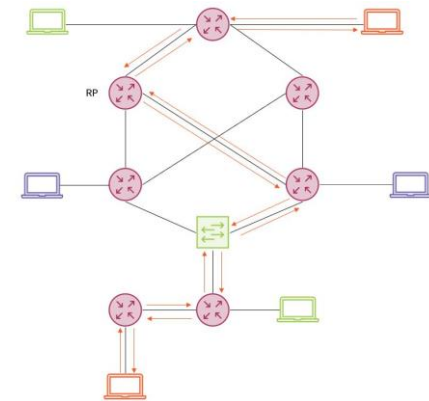
BiDir PIM Facts



DF Election
Like Spanning Tree
Protocol



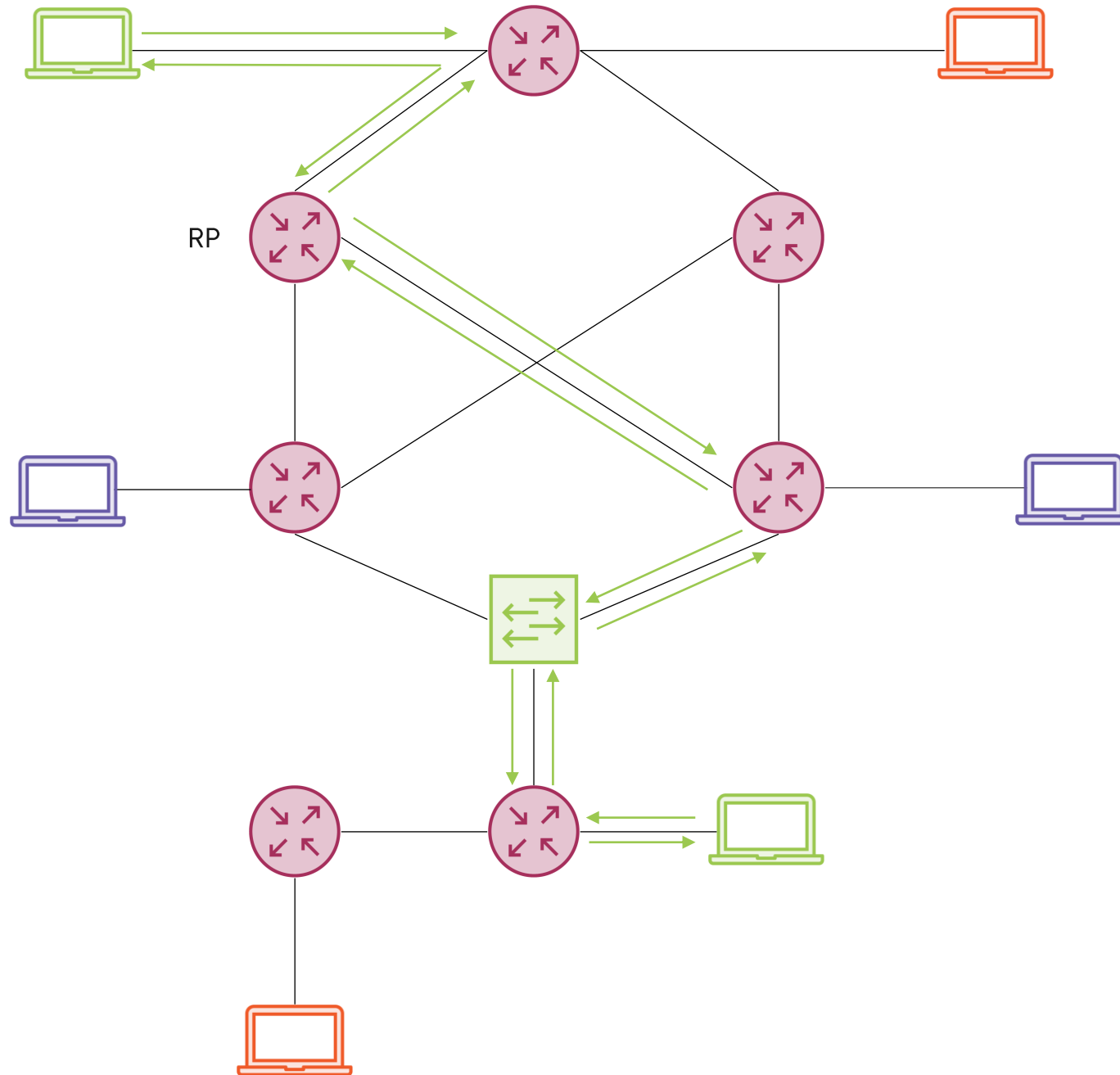
Rendezvous Point
Can be a Link instead
of a Router



Shared Tree Only
No Source Tree and
No Source Tracking



BIDIR-PIM (Green)



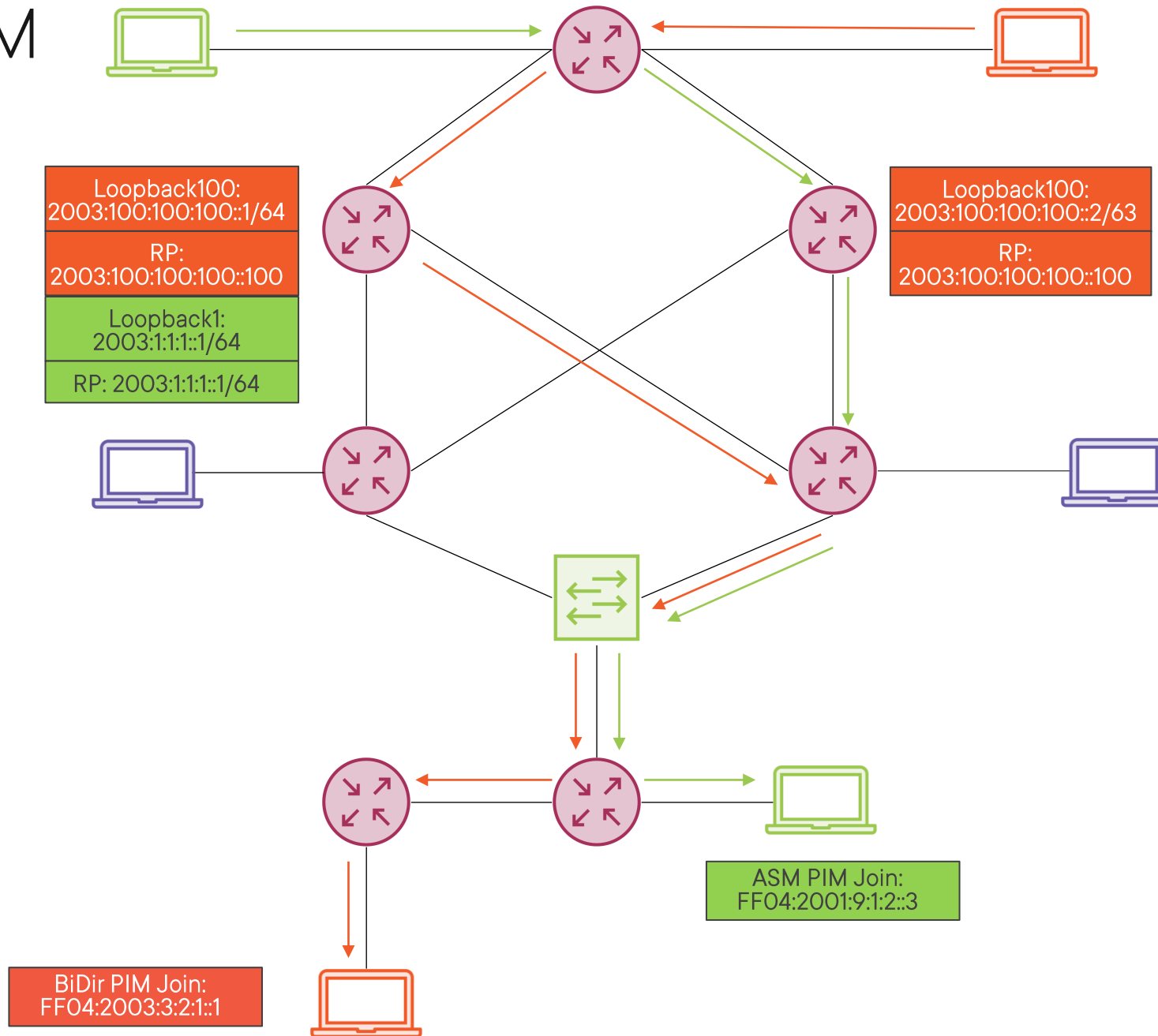
PIM Hello (BiDir)

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80:10:10:255::2	ff02::d	PIMv2	136	Hello


```
> Frame 1: 136 bytes on wire (1088 bits), 136 bytes captured (1088 bits) on interface eth0, id 0
> Ethernet II, Src: 50:00:00:09:00:01 (50:00:00:09:00:01), Dst: IPv6mcast_0d (33:33:00:00:00:0d)
> Internet Protocol Version 6, Src: fe80:10:10:255::2, Dst: ff02::d
v Protocol Independent Multicast
  0010 .... = Version: 2
  .... 0000 = Type: Hello (0)
  Reserved byte(s): 00
  Checksum: 0xba25 [correct]
  [Checksum Status: Good]
v PIM Options: 7
  > Option 1: Hold Time: 105
  > Option 2: LAN Prune Delay: T = 0, Propagation Delay = 100ms, Override Interval = 400ms
  > Option 19: DR Priority: 1
  > Option 20: Generation ID: 4066044151
v Option 22: Bidirectional Capable
  Type: 22
  Length: 0
  > Option 24: Address List
  > Option 65001: Address list, old implementation
```



BiDir/ASM



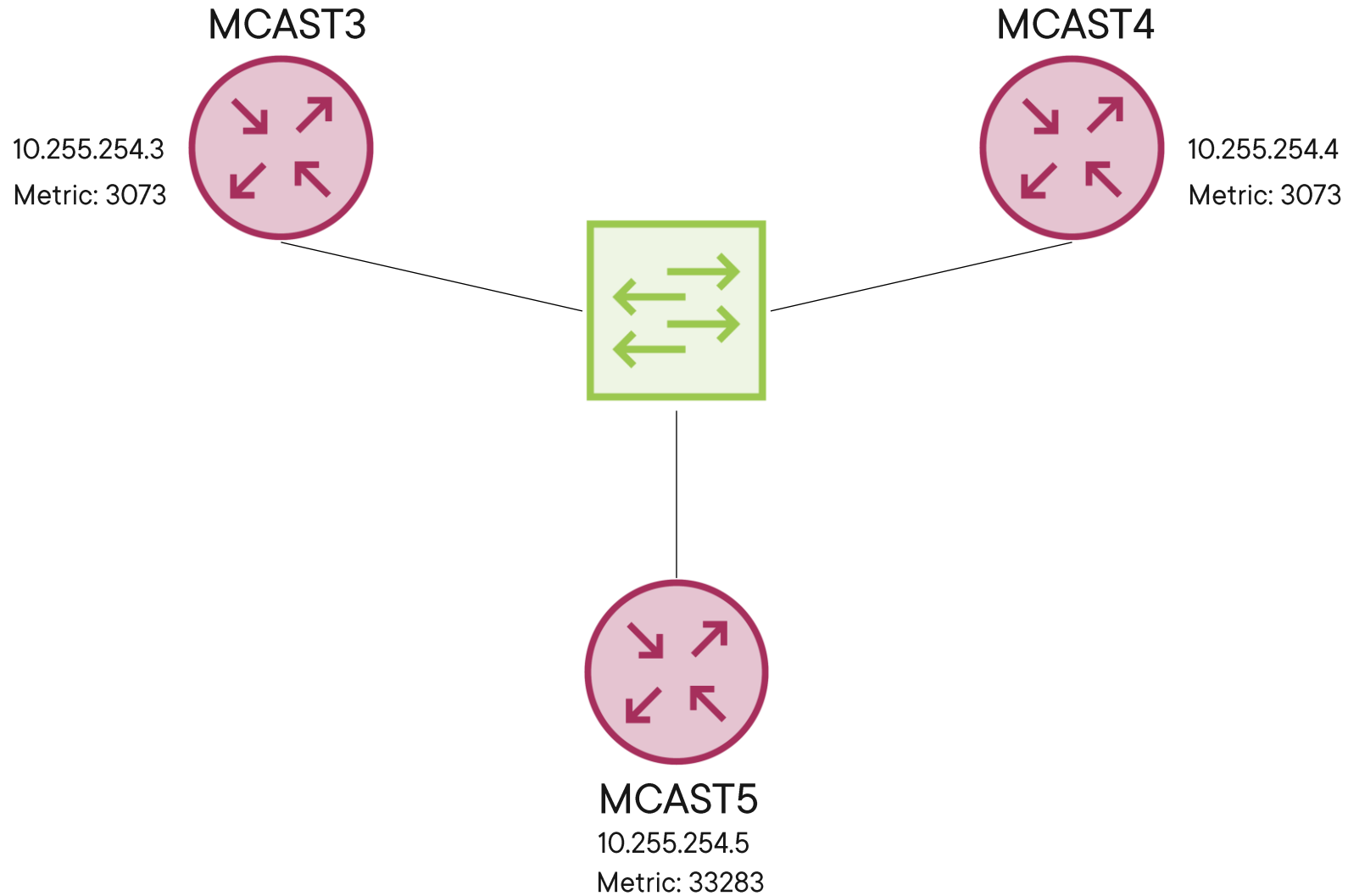
PIM Join/Prune (BiDir)

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80:10:10:255::2	ff02::d	PIMv2	124	Join/Prune


```
> Frame 1: 124 bytes on wire (992 bits), 124 bytes captured (992 bits) on interface eth0, id 0
> Ethernet II, Src: 50:00:00:09:00:01 (50:00:00:09:00:01), Dst: IPv6mcast_0d (33:33:00:00:00:0d)
> Internet Protocol Version 6, Src: fe80:10:10:255::2, Dst: ff02::d
v Protocol Independent Multicast
  0010 .... = Version: 2
  .... 0011 = Type: Join/Prune (3)
  Reserved byte(s): 00
  Checksum: 0x896e [correct]
  [Checksum Status: Good]
v PIM Options
  v Upstream-neighbor: fe80:10:10:255::1
    Address Family: IPv6 (2)
    Encoding Type: Native (0)
    Unicast: fe80:10:10:255::1
    Reserved byte(s): 00
    Num Groups: 1
    Holdtime: 210
  v Group 0
    v Group 0: ff04:2003:3:2::1/128
      Address Family: IPv6 (2)
      Encoding Type: Native (0)
      > Flags: 0x00
      Masklen: 128
      Group: ff04:2003:3:2::1
    v Num Joins: 1
      v IP address: 2003:100:100:100::100/128 (SWR)
        Address Family: IPv6 (2)
        Encoding Type: Native (0)
        > Flags: 0x07, Sparse, WildCard, Rendezvous Point Tree
        Masklen: 128
        Source: 2003:100:100:100::100
    Num Prunes: 0
```



PIM Designated Forwarder Election



DF Election (Offer)

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80:10:255:254::3	ff02::d	PIMv2	84	DF election

> Frame 1: 84 bytes on wire (672 bits), 84 bytes captured (672 bits) on interface eth0, id 0
> Ethernet II, Src: 50:00:00:01:00:00 (50:00:00:01:00:00), Dst: IPv6mcast_0d (33:33:00:00:00:0d)
> Internet Protocol Version 6, Src: fe80:10:255:254::3, Dst: ff02::d
v Protocol Independent Multicast
 0010 = Version: 2
 1010 = Type: DF election (10)
 0001 = DF Subtype: offer (1)
 0000 = DF reserved: 0
 Checksum: 0x8240 [correct]
 [Checksum Status: Good]
v PIM Options
 v RP: 2003:100:100:100::100
 Address Family: IPv6 (2)
 Encoding Type: Native (0)
 Unicast: 2003:100:100:100::100
 DF Metric Preference: 90
 Metric: 10880



DF Election (Winner)

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80:10:255:254::3	ff02::d	PIMv2	84	DF election
<pre>> Frame 1: 84 bytes on wire (672 bits), 84 bytes captured (672 bits) on interface eth0, id 0 > Ethernet II, Src: 50:00:00:01:00:00 (50:00:00:01:00:00), Dst: IPv6mcast_0d (33:33:00:00:00:0d) > Internet Protocol Version 6, Src: fe80:10:255:254::3, Dst: ff02::d v Protocol Independent Multicast 0010 = Version: 2 1010 = Type: DF election (10) 0010 = DF Subtype: DF Winner (2) 0000 = DF reserved: 0 Checksum: 0x8230 [correct] [Checksum Status: Good] v PIM Options v RP: 2003:100:100:100::100 Address Family: IPv6 (2) Encoding Type: Native (0) Unicast: 2003:100:100:100::100 DF Metric Preference: 90 Metric: 10880</pre>						



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