

Applying Multicast Protocols



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Overview



Examine IP multicast protocols used in data center deployments

- IGMP
- MLD

Examine multicast distribution trees

- Shared
- Source

IP Multicast configuration



IP Multicast



IP Multicast in Data Center Networks



Optional technology

Applications that use multicast within the data center

- IPTV
- HFT

Routing protocols

- VXLAN
- FHRP

IP Multicast

Sends data to a group of receivers at once

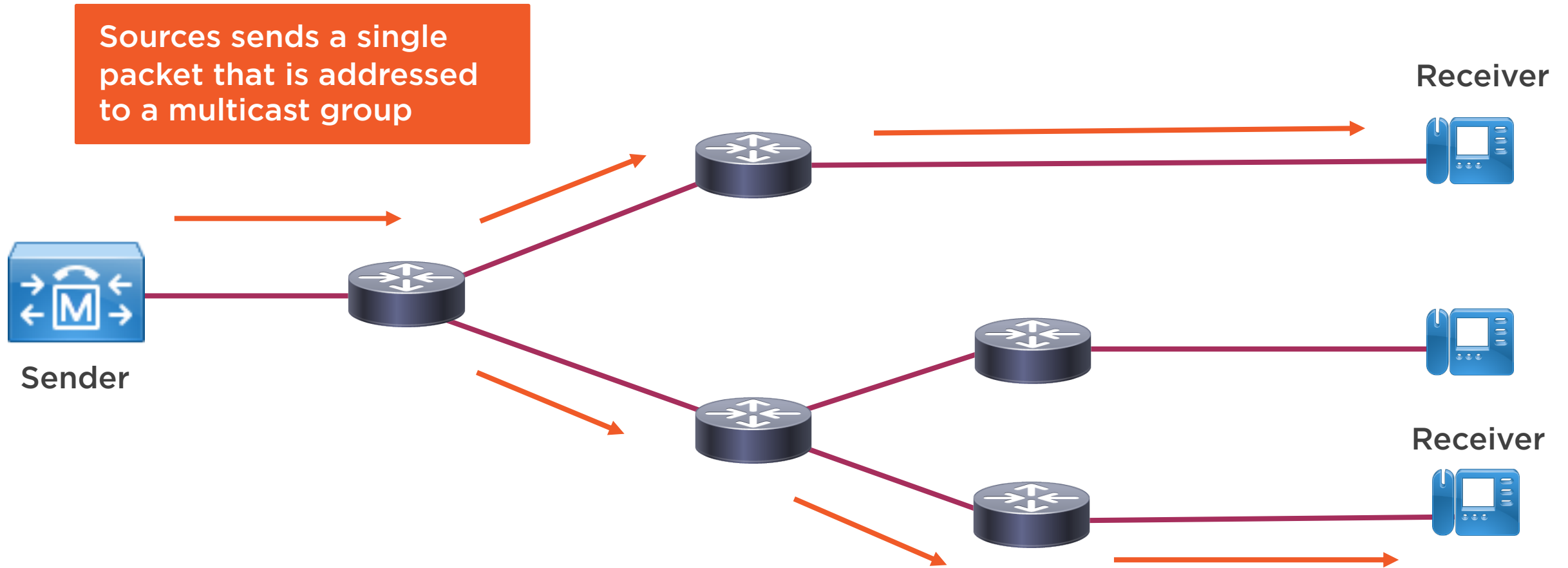
Sender sends one copy of a packet that is addressed to a group – a multicast group

Multicast routers replicate and forward the packet to all branches where receivers may exist

- 224.0.0.0 /4 for IPv4
- Ff00:: /8 for IPv6

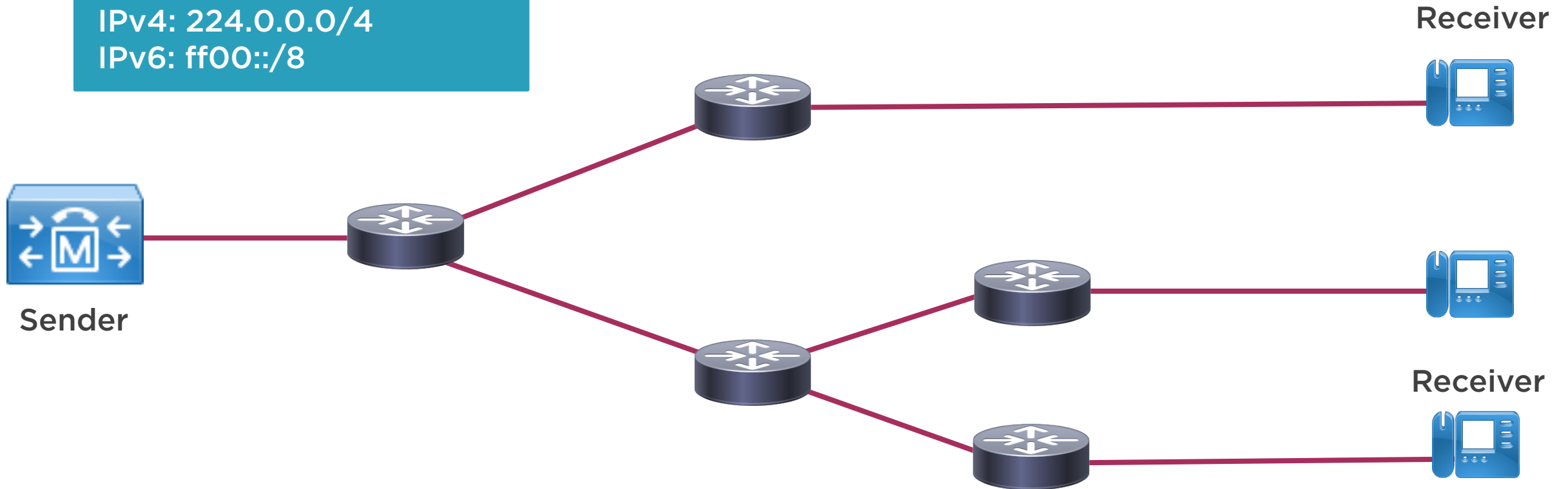


IP Multicast

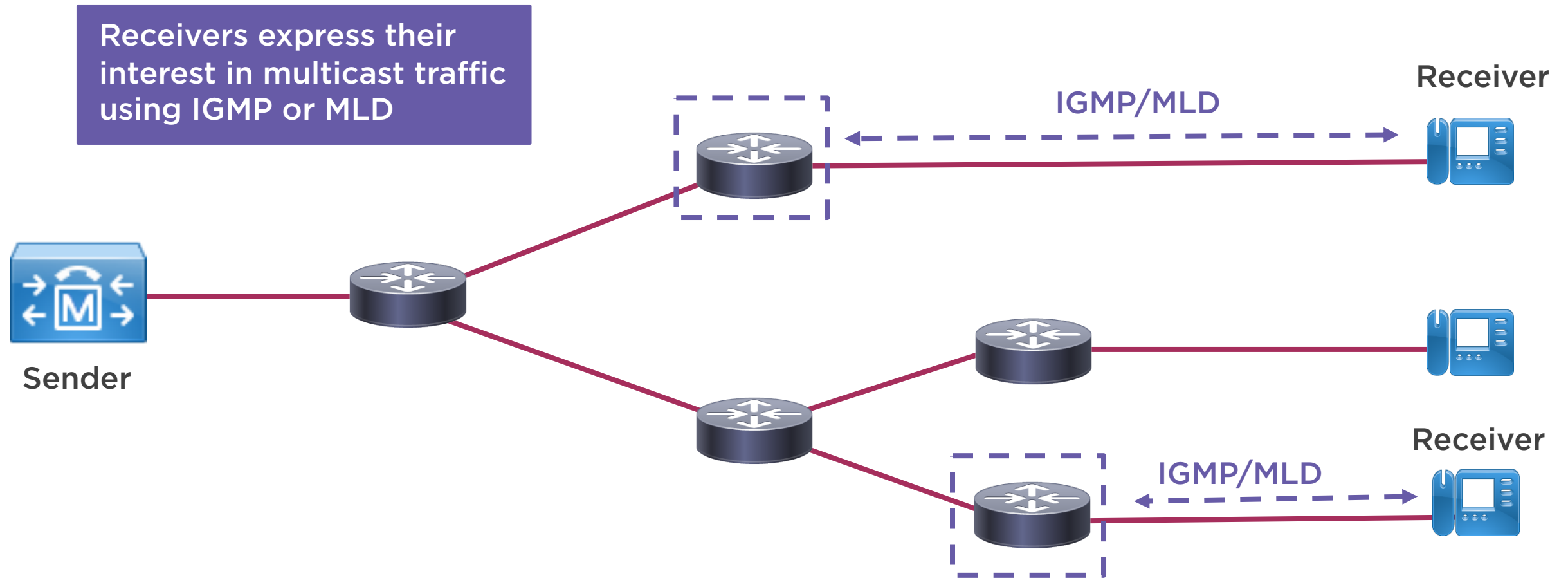


IP Multicast Group Addresses

Multicast group address
IPv4: 224.0.0.0/4
IPv6: ff00::/8

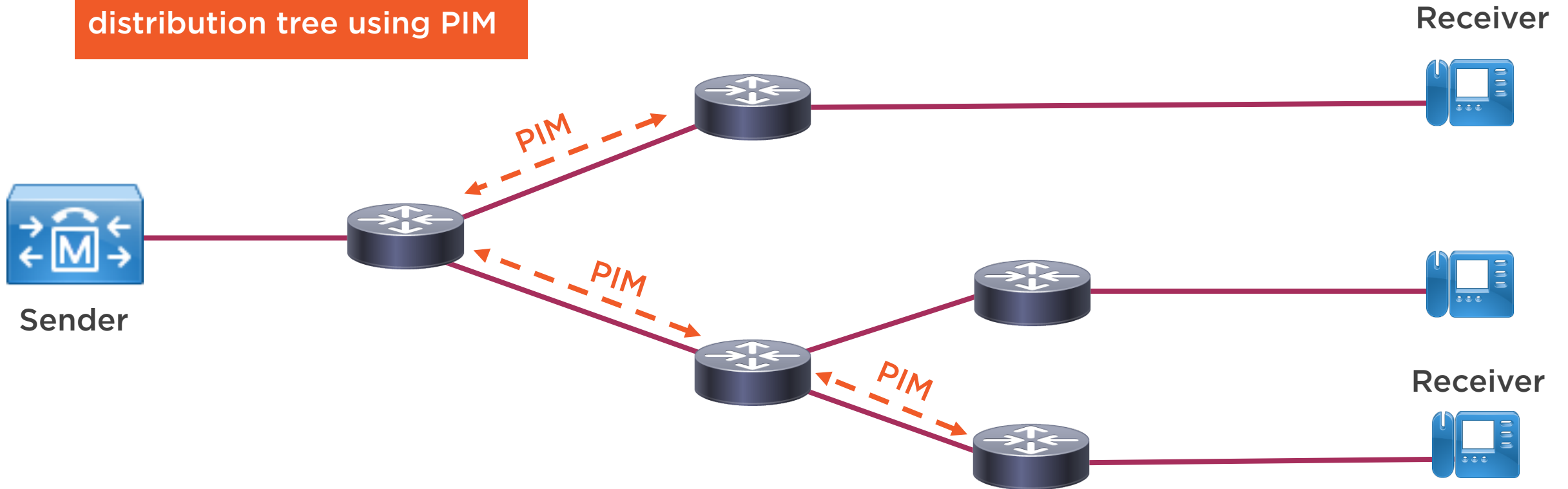


IP Multicast Receivers



PIM

Routers create a multicast distribution tree using PIM



IP Multicast Group Membership Protocols

IGMPv2 / MLDv1

Used in ASM deployments

Receiver cannot specify which source to receive multicast

IGMPv2 default on NX-OS

IGMPv3 / MLDv2

Used in SSM deployments

Receiver specifies a list of sources to receive from

MLDv2 default on NX-OS



IGMP and MLD



IGMP and MLD



Nexus starts IGMP and MLD automatically. You can't enable IGMP and MLD individually per interface



Nexus automatically enables IGMP when you activate PIM and MLD when you activate PIMv6 on an interface



IGMPv2 and MLDv2 are the default versions in Nexus



Other versions of IGMP and MLD must be explicitly defined



```
Switch(config)# interface interface-name
```

```
Switch(config-if)# ip igmp version version
```

```
Switch(config-if)# ipv6 mld version version
```

IGMP and MLD Configuration

If different IGMP or MLD versions are required, specifically configure it on every interface



IGMP Verification

```
Switch# show ip igmp interface brief
```

```
IGMP Interfaces for VRF "default", count:3
```

Interface	IP Address	IGMP Querier	Membership Count	Version
Vlan20	10.20.20.9	10.20.20.10	0	v2
Vlan21	10.21.21.9	10.21.21.10	1	v3
loopback1	10.10.10.10	10.10.10.10	0	v2



IGMP Group

Verify if the receiver has joined the multicast group through IGMP

```
Switch# show ip igmp groups 239.1.1.1
```

```
IGMP Connected Group Membership for VRF "demo" - matching Group "239.1.1.1"
```

```
Type: S - Static, D - Dynamic, T - SSM Translated
```

Group Address	Type	Interface	Uptime	Expires	Last Reporter
239.1.1.1	D	Vlan21	00:00:51	00:02:18	10.21.21.14

```
Switch(config)# no ip igmp snooping
```

IGMP Snooping

IGMP snooping limits multicast traffic by configuring LAN ports dynamically to forward multicast traffic only to those ports that need to receive it




```
Switch(config)# vlan vlan-id
```

```
Switch(config-vlan)# no ip igmp snooping
```

IGMP Snooping

IGMP snooping limits multicast traffic by configuring LAN ports dynamically to forward multicast traffic only to those ports that need to receive it



Multicast Distribution Trees

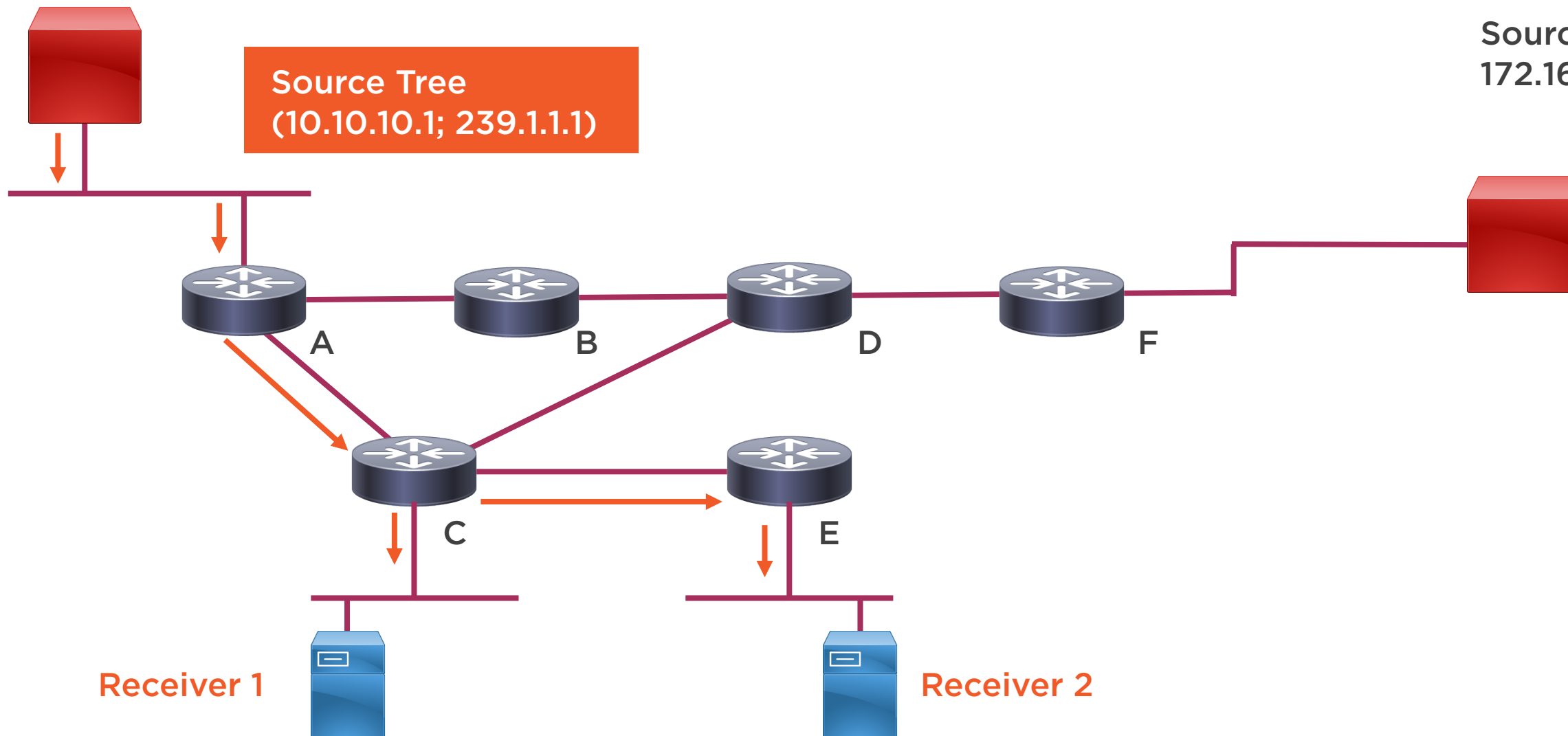


Source 1
10.10.10.1

Source Distribution Tree

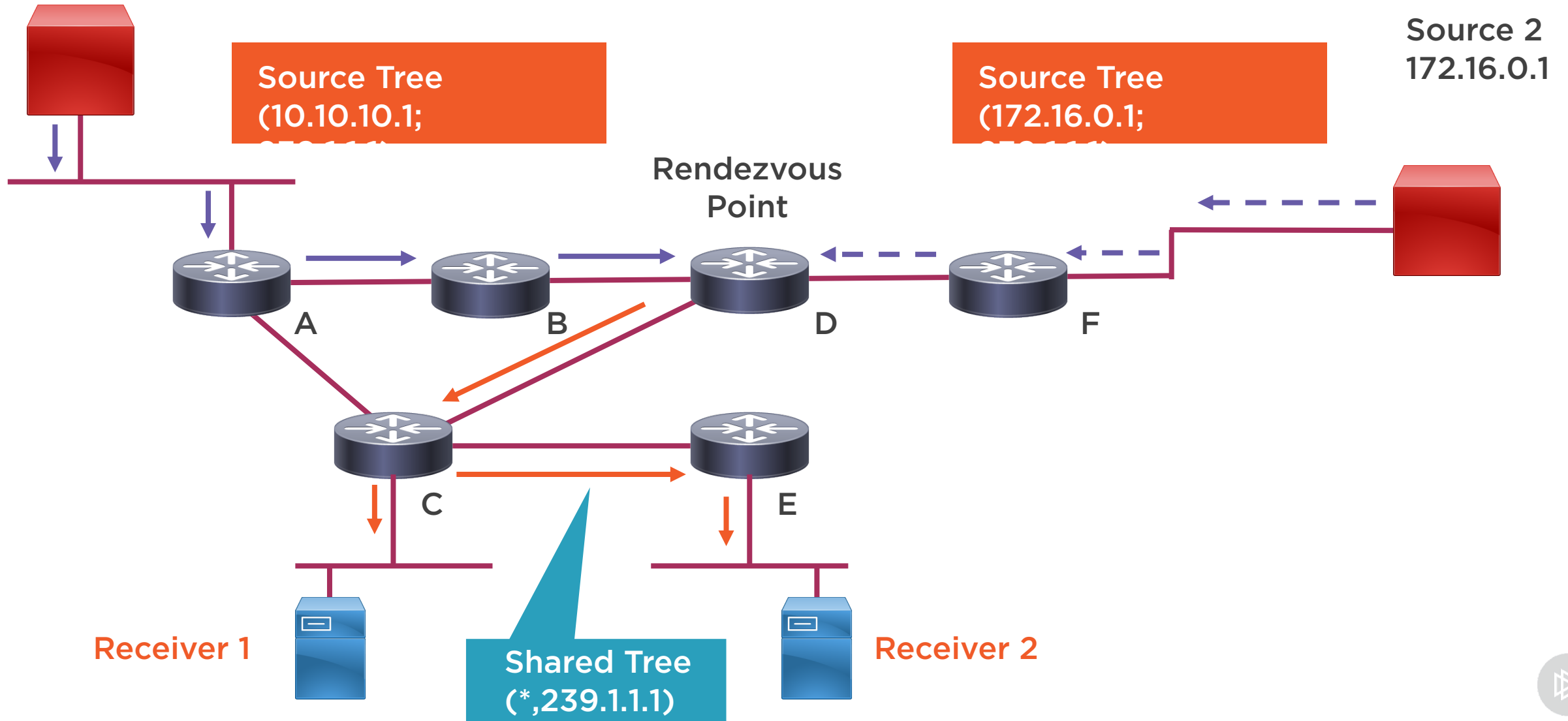
Source 2
172.16.0.1

Source Tree
(10.10.10.1; 239.1.1.1)

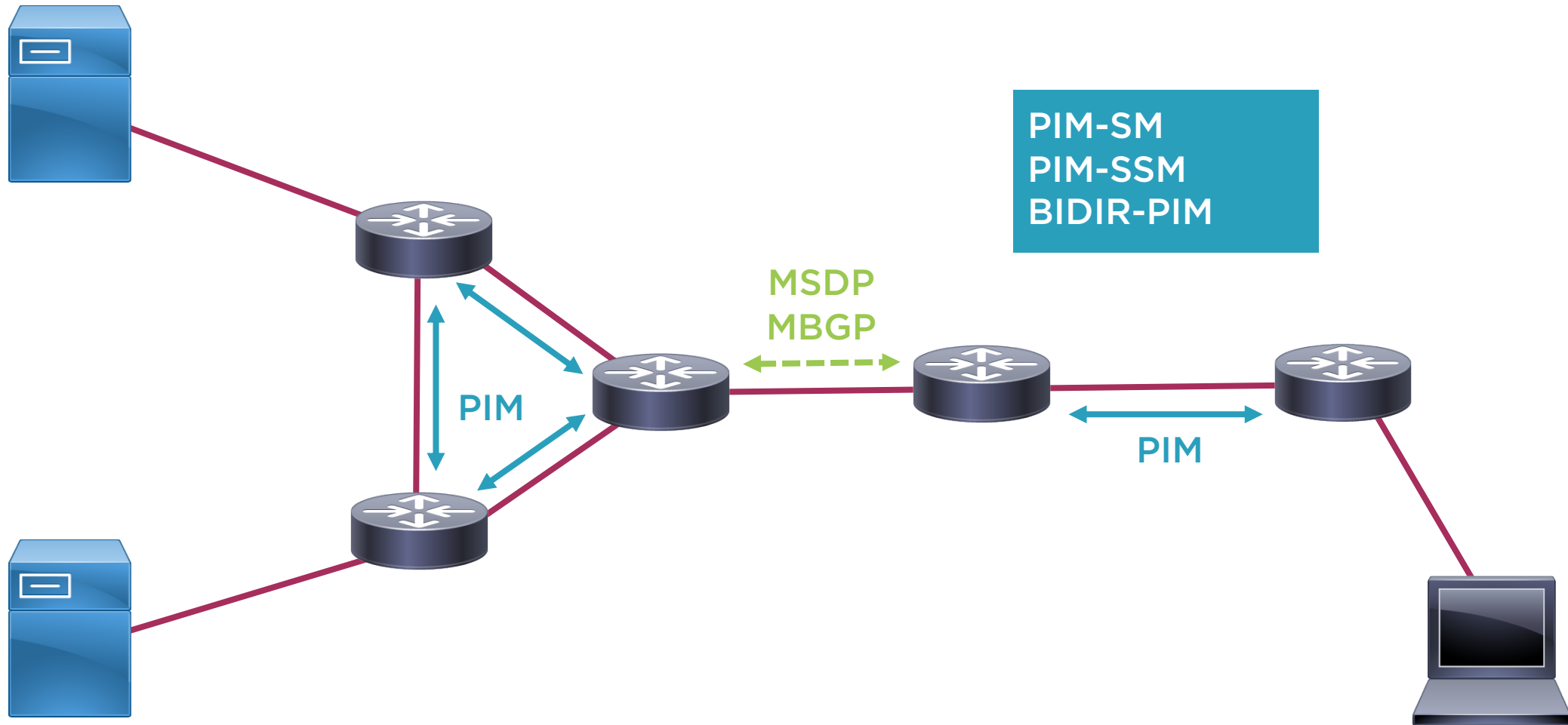


Source 1
10.10.10.1

Shared Distribution Tree



IP Multicast Protocols



IP Multicast Interdomain Protocols

MSDP

**Announces multicast sources
between RPs in different
domains**

MBGP

**Exchanges IP prefix
information for multicast RPF
between two autonomous
systems**



PIM Modes

PIM-SM uses RP as a central point where routers can register multicast sources on directly connected subnet

PIM-DM builds SPF tree by flooding multicast traffic to all branches, then prunes back where no receivers are present. Not supported on NX-OS

BIDIR-PIM is used for many to many multicast applications. Allows traffic to flow both up and down the shared tree from RP. Used with VXLAN

PIM-SSM used in source specific multicast deployments. Uses only source-based trees. Requires receivers to signal source that it's interested in using IGMP3



IP Multicast Configuration




```
SwitchA(config)# feature pim
```

```
Switch(config)# interface ethernet 1/1-2
```

```
Switch(config-if-range)# ip pim sparse-mode
```

```
Switch(config)# ip pim rp-address 10.10.10.10 group-list 224.0.0.0/9
```

PIM-SM Configuration

Enabling IP PIM-SM multicast and IGMP for an interface

Configuring a static RP address



Auto RP



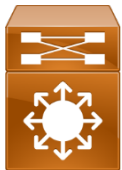
Auto-RP defines multiple candidate RPs, so that if an RP fails, other candidate RP can assume the responsibility of the RP



A candidate RP sends RP announcement messages to the RP announce group (224.0.1.39) to announce the router as a candidate for RP for a specific multicast group



A mapping agent joins the RP announce group (224.0.1.39) to receive RP candidate announcements, saves, and selects the highest IP address as the RP for the group



The mapping agent then multicasts its group-to-RP mapping to the RP discovery group (224.0.1.40), which Cisco routers automatically join to learn about RP for each group



```
SwitchRP(config)# ip pim auto-rp rp-candidate ethernet 2/1 group-list  
239.0.0.0/24
```

```
SwitchMA(config)# ip pim auto-rp mapping-agent ethernet 2/1
```

Auto-RP Configuration

To implement Auto-RP, you need to configure one or more RP candidates and one or more mapping agents



PIM Verification

```
Switch# show ip pim interface brief
```

```
!
```

```
Switch# show ip pim neighbor
```

```
!
```

```
Switch# show ip pim rp
```

```
!
```

```
Switch# show ip pim group-range
```

```
!
```

```
Switch# show ip mroute 239.1.1.1
```



Summary



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- IGMP
- MLD

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IP Multicast configuration