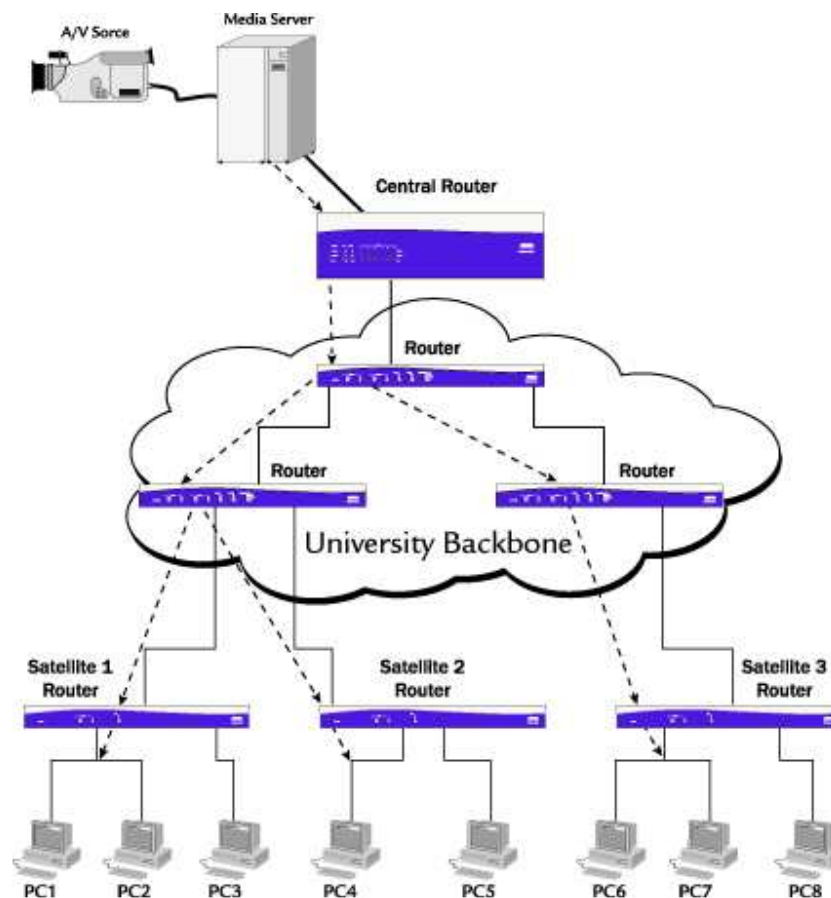


Quick Configuration Guide Configuring Multicast Routing in AOS

Configuring Multicast Routing in AOS



Introduction

This document is intended to help configure Multicast routing in AOS devices, but does not go into detail with regards to how the Multicast routing process works. For a more detailed explanation, refer to the configuration guide [Configuring Multicast Stub Routing in AOS](#).

Multicast routing in AOS devices is not configured similarly to other vendors and each topology style requires a unique configuration. This was done to run only the processes absolutely necessary to function in the manner intended, and not waste processor and memory resources running processes that serve no useful purpose in the final setup.

Software Requirements

- Device must be running AOS 8.1 or higher to operate in Stub mode.
- Device must be running AOS 11.1 or higher to operate in PIM Sparse mode.
- Device must be running AOS 12.1 or higher to operate in Fixed or Bi-Directional mode.
- PIM Sparse Mode is only supported on AOS products as outlined in the [AOS Feature Matrix](#).

Overview

AOS supports the following three types of Multicast implementations:

Stub

Stub mode is designed to allow for downstream (stub) access to a Multicast network. This mode allows the router to accept Internet Group Management Protocol (IGMP) messages and forward the messages along to a Multicast network. This mode does not run Protocol-Independent Multicast (PIM) to save processor and memory resources, and thus will not join the PIM network it connects to. This is not necessary because a Stub router will in most cases only contain a single downstream link to the Multicast network and does not need to be aware of all the multicast streams that are traversing across it, or perform any load-sharing across multiple links to the PIM network. This mode would be in use on the satellite routers in the diagram above.

PIM-Sparse

PIM-Sparse mode is designed to allow the router to be a part of the Multicast network, and participate in the PIM-Sparse routing protocol. In PIM-Sparse mode, the router is essentially part of the 'cloud'. This mode would be in use in the University Backbone and the Central Router in the diagram above. This mode will also send IGMP messages in the same manner as the 'downstream' interface of a stub configuration.

Fixed / Bi-Directional

Fixed mode is designed to allow the router to become part of a multicast group permanently and route Multicast packets without running PIM or becoming part of a multicast network. This mode was originally intended to accommodate legacy Multicast products that did not support IGMP, and could not alert the nearby Multicast router that it needed to receive the Multicast stream. In this mode, the router will not run the IGMP process and will forward all received Multicast streams specified to the 'fixed' network. This mode also has the ability to perform bi-directional Multicast routing by making the upstream and downstream connections part of the same 'fixed' groups.

General AOS Multicast Routing

Multicast routing operates on top of the Unicast routing table, and makes assumptions based upon what the Unicast routing table states. Therefore, to successfully route Multicast traffic from the source to the destination, a properly functioning Unicast routing table must be in place. It does not matter whether the Unicast route table was built using static routes or dynamically with routing protocols, such as RIP, OSPF, or BGP. The easiest way to determine if the Unicast route table is correct is to ping the Multicast source from the destination. If it is successful, there should not be an issue routing the Multicast streams.

Also, for any Multicast routing to take place, Multicast routing must be enabled. This can be done with the following command (from global configuration mode):

Router(config)# ip multicast-routing

Stub Configuration

To create a Stub router configuration in AOS, the Upstream & Downstream interfaces must be specified, the Multicast helper address must be specified, and Multicast forwarding (helper) must be enabled on the downstream interfaces.

To specify the Upstream and Downstream interfaces, simply apply the following command to the relevant interfaces (from interface configuration mode):

Router(config-int)# ip mcast-stub <upstream / downstream>

The helper address is where the multicast updates should be sent. In most cases, this will be the IP address of the Multicast source, Rendezvous Point (RP), or the IP address of the next hop from the Upstream interface. If the 'cloud' is running PIM, it shouldn't matter which address it is forwarded to, because as soon as one node learns of the need to send a stream to the end device, it will inform the rest of the 'cloud'. To specify the helper address, apply the following command (from global configuration mode):

Router(config)# ip mcast-stub helper-address <IP Address>

The final step is to enable use of the helper, and allow the router to forward IGMP requests to the 'cloud'. To do this, apply the following command to every downstream interface (from interface configuration mode):

Router(config-int)# ip mcast-stub helper-enable

Stub Example Configuration

```
ip multicast-routing
ip mcast-stub helper-address <IP Address>
!
interface ppp 1
  ip mcast-stub upstream
!
interface eth 0/1
  ip mcast-stub downstream
  ip mcast-stub helper-enable
```

PIM-Sparse Configuration

PIM Sparse Mode is only supported on the AOS Products as outlined in the [AOS Feature Matrix](#), available online at <https://supportcommunity.adtran.com>.

To create a PIM-Sparse configuration in AOS, the protocol will need to be enabled on each interface that will participate, and the protocol itself will have to be setup with the Rendezvous Point (RP) specified.

To enable an interface to participate in PIM-Sparse mode, apply the following command (from interface configuration mode):

Router(config-int)# ip pim sparse-mode

PIM-Sparse mode can be further configured with the following parameters on a per-interface basis, but should not be changed unless instructed to by the Multicast network administrator:

Router(config-int)# ip pim-sparse dr-priority <value>

Use the **ip pim-sparse dr-priority** command to specify the priority for the designated router (DR). This command modifies the routers priority in the DR election process. Use the no form of this command to return to the default value.

Router(config-int)# ip pim-sparse hello-timer <value>

Use the **ip pim-sparse hello-timer** command to specify protocol-independent multicast (PIM) sparse hello timer period. This is the time interval at which periodic hellos are sent out on all interfaces of a PIM-capable router. Use the no form of this command to return to the default value.

Router(config-int)# ip pim-sparse nbr-timeout <value>

Use the **ip pim-sparse nbr-timeout** command to specify protocol-independent multicast (PIM) sparse neighbor timeout. This is the time interval after which a PIM-capable router will consider a neighbor not present. Use the no form of this command to return to the default value.

Router(config-int)# ip pim-sparse override-interval <value>

Use the **ip pim-sparse override-interval** command to specify the protocol-independent multicast (PIM) sparse join/prune override interval. This delay interval is the period after a join/prune that another router on the LAN may override a join/prune. Use the no form of this command to return to the default value.

Router(config-int)# ip pim-sparse propagation-delay <value>

Use the **ip pim-sparse propagation-delay** command to specify the expected propagation delay for join/prune messages. Set the propagation delay (in milliseconds) to estimate the amount of delay found in the local link. Use the no form of this command to return to the default value.

To start the PIM-Sparse protocol, create the process on the router with the following command (from global configuration mode):

Router(config)# router pim-sparse

To configure PIM-Sparse for use, create an entry within the protocol process to specify the RP, and optionally an access-list to limit which Multicast groups the unit will allow access to. The command is as follows:

Router(config-pim-sparse)# rp-address <ip address>**Router(config-pim-sparse)# rp-address <ip address> access-group
<name>**

**The access-group must reference an extended access-list.*

PIM can be further configured with the following parameters, but again should not be changed unless instructed to by the Multicast network administrator:

Router(config-pim-sparse)# join-prune-msg-interval <value>

Use the **join-prune-msg-interval** command to set a timing rate for PIM sparse join/prune messages. Use the no form of this command to return to the default setting.

```
Router(config-pim-sparse)# spt-threshold <value>
```

```
Router(config-pim-sparse)# spt-threshold infinity
```

Use the **spt-threshold** command to change the PIM Sparse Shortest Path Tree (SPT) threshold, which specifies the number of packets the router sends using the rendezvous point (RP) before switching to the SPT. Use the no form of this command to return to the default setting.

PIM-Sparse Example Configuration

```
ip multicast-routing
!
interface ppp 1
  ip pim sparse-mode
!
interface ppp 2
  ip pim sparse-mode
!
interface eth 0/1
  ip pim sparse-mode
!
router pim-sparse
  rp-address <IP Address>
```

Fixed / Bi-Directional Configuration

To create a Fixed router configuration in AOS, each interface will be placed in Fixed-Stub mode, and each Multicast group the interface will participate in must be specified.

To place an interface in Fixed-Stub mode, apply the following command (from interface configuration mode):

```
Router(config-int)# ip mcast-stub fixed
```

To specify a Multicast group an interface will permanently participate in, apply the following command (from interface configuration mode):

```
Router(config-int)# ip igmp static-group <address>
```

Fixed / Bi-Directional Example Configuration

```
ip multicast-routing
!
interface ppp 1
  ip mcast-stub fixed
  ip igmp static-group <Multicast Address>
!
interface eth 0/1
  ip mcast-stub fixed
  ip igmp static-group <Multicast Address>
```

Verification & Troubleshooting

To verify the operation of the Multicast routing table, it can be viewed with the following command (from enable mode):

Router# show ip mroute

This command will output something similar to the following:

```
IP Multicast Routing Table
Flags: S - Sparse, C - Connected, P - Pruned, J - Join SPT, T - SPT-bit Set,
F - Register, R - RP-bit Set
Timers: Uptime/Expires
(*, 225.1.0.1), 01:17:34/00:03:25, RP 192.168.0.254, Flags: SC
Forwarding Entry: Yes
Incoming interface: tunnel 2, RPF nbr 172.16.2.10
Outgoing interface list:
  eth 0/1, Forward, 01:17:34/00:03:25
```

The most important information in this output is the address entry. In the above example, a Multicast packet with a destination address of 225.1.0.1, received from any source address will be forwarded out the outgoing interfaces. This also shows the RP router for tracking purposes. If the RP cannot be contacted, the stream may not function properly, depending upon when contact was lost.

If an entry is not in the Multicast routing table for a stream that needs to traverse this router, the troubleshooting needs to begin at the destination and work back towards the source. In Multicast networks, the source will usually be streaming constantly, whether or not there is any device listening. This means that the destination will initiate the request, which is why the troubleshooting should begin there.

The first point of failure is the easiest to check out. Ping or connect to the Multicast source in a Unicast manner to ensure that the Unicast route table is operating properly.

The second point of failure is in the initial IGMP request from the end device. This will need to be debugged from the Stub router. To start the debug process, issue the following command (from enable mode):

Router# debug ip igmp

This command will create messages similar to the following:

```
04:40:42: IGMP: received v2 Report from 192.168.50.100 on vlan 1 for 239.0.0.1
04:40:43: IGMP: send v2 Report for 239.0.0.1 on ppp 1

04:40:43: IGMP: sent General Query on vlan 1
04:40:43: IGMP: received v2 Report from 192.168.50.100 on vlan 1 for 239.0.0.1
```

This shows that the router received the join message for Multicast group 239.0.0.1, forwarded it along to the router connected to the upstream interface. It also sent out a periodic query on the downstream interface to ensure that the end device is real and is still actively listening.

The next point of failure is in the Multicast routing table of either the stub router of the PIM cloud. You can check each router's table constantly, or debug all changes to the table as they happen with the following command (from enable mode):

Router# debug ip mrouting

This command will create messages similar to the following:

```
04:47:37: MRT: Add mroute (*, 239.0.0.1)
04:47:37: MRT: Add vlan 1/239.0.0.1 to the olist of (*, 239.0.0.1)

04:47:50: MRT: Remove vlan 1/239.0.0.1 from the olist of (*, 239.0.0.1)
04:47:50: MRT: Remove mroute (*, 239.0.0.1)
```

This shows that the routing entry for 239.0.0.1 was created, and the outgoing interface of VLAN 1 was added to the output list of interfaces. It also shows the messages that happen when a device leaves the Multicast group.

If at any point along the chain back to the source, the Multicast routing table updates are not received, there is most likely a mis-configuration or line error in the segment leading from the previous link in the chain.