Monitoring IP Multicast on Cisco Routers
User Guide
r6.1
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Chapter 1: Monitoring IP Multicast Communication

IP Multicast Communication

When a single-source network data stream (voice, video, or data) is sent to multiple destinations, this is known as IP Multicast communication. Multicast communication differs from unicast communication protocols, which send a single data stream of information to a single destination.

The eHealth® Suite offers enhanced support for IP multicast on Cisco® routers. You can monitor IP multicast on Cisco routers using the eHealth system to ensure that your service is performing as expected. When performance does not meet expectations, run eHealth reports to help you pinpoint the cause of the problem.

IP Multicast Data

A multicast source is a station that originates a data stream. A multicast group is a set of destinations with a common interest in receiving the data stream. The members of a group are usually distributed throughout an IP network and often associated with widely separated routers.

To avoid sending more copies of the data stream than necessary, multicast routing protocols construct a routing distribution tree, which is associated with each group or source/group pair. Trees control the data stream path through the network. They are constructed by multicast protocols and can be built in one of two ways:

- Opt-in protocols require the routers to indicate which multicast groups they are interested in and build a tree to connect these routers. A common opt-in protocol is Protocol Independent Multicast Sparse Mode (PIM-SM).
- Opt-out protocols require the routers to indicate which multicast groups they are not interested in. Opt-out starts with a fully connected tree and prunes it down to service only the routers which have not opted out. A common Opt-out protocol is Protocol Independent Multicast Dense Mode (PIM-DM).
Multicast data is forwarded along the branches of the tree to the interested routers for each group, avoiding routers that have not joined the group. Internet Group Management Protocol (IGMP) is a group membership discovery protocol that registers multicast destinations interested in joining a group.

License and Software Requirements

eHealth provides support for Cisco Routers running software versions 12.2.18 and later. When you discover routers using the Router technology, each router element consumes one license.

Because your network may have a large number of IP multicast elements, they are discovered in conjunction with router discovery using two environment variables. This method allows control over the types of elements you discover—enhancing eHealth performance and ensuring poller license consumption.

- EH_DISCOVER_MULTICAST - When set to yes, eHealth discovers IP Multicast Subsystem and Multicast Source Group.
- EH_DISCOVER_MULTICAST_IF - When set to yes, eHealth discovers Multicast Routing Interface and IGMP Interface elements.

To discover all elements, set both environment variables to yes.

When elements are discovered, eHealth creates a device association between the router and IP Multicast Subsystem element, as well as between all discovered elements. eHealth automatically creates groups that match the multicast source groups across multiple routers.

Element Overview

The IP multicast element types include the following:

- **IP Multicast Subsystem** - Represents the IP multicast capability on the entire router. Similar to the Application element type.

- **Multicast Source Group** - Each element represents a single multicast source group on the router. Because multiple routers usually support the same multicast group, a corresponding element should be found on multiple routers. Similar to the Application element type.

- **Multicast Routing Interface** - Similar to the LAN/WAN element type, which is used to form interfaces that support multicast routing.

- **IGMP Interface** - Similar to the LAN/WAN element type, which is used to form interfaces that transport IGMP information.
Element Naming Conventions

eHealth uses the following conventions when naming elements:

- Router: routerID-RH
- IP Multicast Subsystem: routerID-RH-Mcast
- Multicast Source Group: routerID-RH-SG-groupaddress-sourceaddress-sourcemask
- Multicast Routing Interface: routerID-RH-MC-interfaceID
- IGMP Interface: routerID-RH-IG-interfaceID

Figure 1 illustrates the Cisco IP multicast eHealth model. The shaded elements represent the multicast elements. The non-shaded elements represent the traditional router elements.

Figure 1  Cisco IP Multicast Data Model

Live Exceptions Monitoring

eHealth provides two Live Exceptions profiles to monitor IP multicast on Cisco routers. Apply these profiles to eHealth groups (or group lists) that contain these elements in order to raise alarms for failure and unusual values:

- The IP Multicast - Failure profile contains rules to indicate when there are too many multicast failures. This can indicate availability and traffic problems.
- The IP Multicast - Unusual Value profile uses Deviation from Normal rules to indicate unusual values. This can indicate unusually large numbers of invalid PIM messages.
Chapter 2: Reporting

Reports

eHealth reports provide historical and current information regarding the performance of your entire infrastructure. eHealth offers Top N, Trend, and At-a-Glance reports for IP multicast on Cisco routers. You can use these reports to gain insight into the performance of your elements.

At-a-Glance Reports

At-a-Glance reports contain a set of pre-defined charts that provide insight into the performance of the elements. You can use the At-a-Glance reports to compare variables and look for combinations of problems that could indicate problem sources. From the charts, you can drill down to Trend reports and view performance data in greater detail. The eHealth software supports drilldowns between the At-a-Glance reports associated with IP multicast elements. This allows you to navigate to a higher or lower view for a resource, and enables you to review the performance of related elements. The following table lists the supported At-a-Glance charts for each IP multicast element.

<table>
<thead>
<tr>
<th>Element Type</th>
<th>Charts</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGMP Interface</td>
<td>Interface Availability (%)</td>
</tr>
<tr>
<td></td>
<td>Wrong Version Query/sec</td>
</tr>
<tr>
<td></td>
<td>Interface Joins/sec</td>
</tr>
<tr>
<td></td>
<td>Entries in Cache Table</td>
</tr>
<tr>
<td>Multicast Routing Interface</td>
<td>Interface Availability (%)</td>
</tr>
<tr>
<td></td>
<td>Received Multicast Bits/sec</td>
</tr>
<tr>
<td></td>
<td>Transmitted Multicast Bits/sec</td>
</tr>
<tr>
<td>IP Multicast Subsystem</td>
<td>Multicast Feature Availability (%)</td>
</tr>
<tr>
<td></td>
<td>Invalid PIM Registrations Received/Sec</td>
</tr>
<tr>
<td></td>
<td>Invalid Join/Prune Received/Sec</td>
</tr>
<tr>
<td>Multicast Source Group</td>
<td>Packets/sec</td>
</tr>
<tr>
<td></td>
<td>Forwarded Octets/sec</td>
</tr>
<tr>
<td></td>
<td>Bits/sec (1-second interval)</td>
</tr>
</tbody>
</table>
The linking capabilities between At-a-Glance reports follow the element hierarchy as shown in Figure 1 on page 7 where each element drills down to its subordinate element or drills up to its superordinate element. This enables you to review the performance of related elements.

**Sample At-a-Glance Report**

This sample At-a-Glance report displays two charts for the int-5001 Multicast Routing Interface element. The charts show the percentage of Interface Availability, the Multicast Bits received per second, and the Multicast Bits transmitted during a six hour period.

To run IP Multicast Subsystem and Multicast Source Group reports, select App Service as the Technology. To run Multicast Routing Interface and IGMP Interface reports, select LAN/WAN as the Technology.
**Trend Reports**

Trend reports allow you to view more granular data on a particular performance variable or set of variables for one or more elements, or for a group of elements. You can also view trends over time from both At-a-Glance and Trend reports. To review the variables that are supported for IP multicast elements, see [Supported Trend and Top N Variables on page 13](#).

**Sample Trend Report**

When you run a Trend report for one of these elements, select one or more variables. This sample Trend report shows that Availability remained consistent at 100% over a two-hour period.

<table>
<thead>
<tr>
<th>eHealth</th>
<th>Trend Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>Divide by Time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>int01-5001-RU-MC-21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability (%)</td>
</tr>
</tbody>
</table>

**Top N Reports**

Top N reports provide information on groups of elements. These reports use the same variables as Trend reports, but in addition they offer variables such as peak values. When you run Top N reports, you select a group of elements and the variables that you want eHealth to compare for each element in that group.
Sample Top N Report

When you run a Top N report, select a group of elements for which you want to view common values, and then select up to six variables for comparison. This sample Top N report displays the Multicast Rate Limit and the Octets Received for the Multicast Routing Interface elements in the selected group.

### Element Variable Report

You can use the eHealth Element Variable Report (available from the eHealth Web interface Organization Page) to obtain detailed information about the Trend variables for each element. The following is a sample Element Variable Report with the Trend variables for an IP multicast element. It shows how eHealth combines and evaluates the MIB variables to obtain the data for each Trend variable for the element.
### Supported Trend and Top N Variables

The following table lists the supported Trend and Top N variables for IP multicast elements.

<table>
<thead>
<tr>
<th>Element Type</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGMP Interface</td>
<td>Availability, Entries in Cache Table, Number of Group joins, Wrong Version IGMP Queries</td>
</tr>
<tr>
<td>Multicast Routing Interface</td>
<td>Availability, Bits In, Bits Out, Multicast Interface Rate Limit, Octets Received, Octets Transmitted, Total Octets</td>
</tr>
<tr>
<td>IP Multicast Subsystem</td>
<td>Available Time, Invalid Join/Prune Msgs Rcvd, Invalid PIM Registrations Rcvd</td>
</tr>
<tr>
<td>Multicast Source Group</td>
<td>IMP Frwrd Data as % Rate Limit, IPM In-Interface Rate Limit, Octets Rcvd by This IPM Group, Pkts Dropped by This IPM Group, Pkts Received by This IPM Group, Sent Multicast Bits in 1 Second</td>
</tr>
</tbody>
</table>