

Chapter 13

Multicast Administrative Scoping

You use multicast scoping to limit multicast traffic by configuring it to an administratively defined topological region. Multicast scoping controls the propagation of multicast messages—both multicast group joins upstream toward a source and data forwarding downstream. Scoping can relieve stress on scarce resources, such as bandwidth, and improve privacy or scaling properties.

This section discusses the following topics that provide information about configuring multicast scoping:

Multicast Scoping Overview on page 107

Configure Multicast Scoping on page 108

Multicast Scoping Configuration Statements on page 112

For multicast scoping configuration examples, see “Example: Configure Multicast Scoping Using the Scope Statement” on page 109 and “Example: Configure Multicast Scoping Using the scope-policy Statement” on page 111.

Multicast Scoping Overview

IP multicast implementations can achieve some level of scoping by using the time-to-live (TTL) field in the IP header. However, TTL scoping has proven difficult to implement reliably, and the resulting schemes often are complex and difficult to understand.

Administratively scoped IP multicast provides clearer and simpler semantics for multicast scoping. Packets addressed to administratively scoped multicast addresses do not cross configured administrative boundaries. Administratively scoped multicast addresses are locally assigned, and hence are not required to be unique across administrative boundaries.

The administratively scoped Internet Protocol version 4 (IPv4) multicast address space is the range 239.0.0.0 through 239.255.255.255.

The structure of the IPv4 administratively scoped multicast space is based loosely on the Internet Protocol version 6 (IPv6) addressing architecture described in RFC 1884.

There are two well-known scopes:

IPv4 local scope—This scope comprises addresses in the range 239.255.0.0/16. The local scope is the minimal enclosing scope and is not further divisible. Although the exact extent of a local scope is site-dependent, locally scoped regions must not span any other scope boundary and must be contained completely within or be equal to any larger scope. If scope regions overlap in an area, the area of overlap must be within the local scope.

IPv4 organization local scope—This scope comprises 239.192.0.0/14. It is the space from which an organization should allocate subranges when defining scopes for private use.

The ranges 239.0.0.0/10, 239.64.0.0/10, and 239.128.0.0/10 are unassigned and available for expansion of this space.

Two other scope classes already exist in IPv4 multicast space: the statically assigned link-local scope, which is 224.0.0.0/24, and the static global scope allocations, which contain various addresses.

All scoping is inherently bidirectional in the sense that join messages and data forwarding are controlled in both directions on the scoped interface.

Configure Multicast Scoping

You can configure multicast scoping with a scoping statement or with a scoping policy statement. To configure multicast address scoping with either option, include the following routing options multicast statement:

```
multicast {
  scope scope-name {
    interface [ interface-names ];
    prefix destination-prefix;
  }
  scope-policy policy-name;
}
```

You can configure this statement at the following hierarchy levels:

[edit routing-options]

[edit logical-routers *logical-router-name* routing-options]

For an overview of logical routers and a detailed example of logical router configuration, see the logical routers chapter of the *JUNOS Internet Software Feature Guide*.

You cannot use the scope and scope-policy statements together. If you try, you will not be able to successfully commit the configuration. The policy statement referenced by the scope-policy statement must be properly configured at the policy-options hierarchy level. For more information on configuring policy statements, see the *JUNOS Internet Software Policy Framework Configuration Guide*.

If you configure multicast scoping using the scope statement, the names of the defined scopes, prefixes, and interfaces will be displayed as part of the show multicast scope command output. If you configure multicast scoping using the scope-policy statement, only the name of the scope policy will be displayed as part of the show multicast scope command output.

This section discusses the following topics that provide information about the two ways to configuring multicast scoping:

Configure Multicast Scoping Using the Scope Statement on page 109

Example: Configure Multicast Scoping Using the Scope Statement on page 109

Configure Multicast Scoping Using the scope-policy Statement on page 110

Example: Configure Multicast Scoping Using the scope-policy Statement on page 111

Configure Multicast Scoping Using the Scope Statement

To configure multicast scoping using the scope statement, specify a name for the scope, the set of router interfaces on which you are configuring scoping, and the scope's address range.

When you configure multicast scoping with the scope statement, all scope boundaries must include the local scope. If this scope is not configured, it is added automatically at all scoped interfaces. The local scope limits the use of the multicast group 239.255.0.0/16 to an attached local-area network.

For information about supported standards for multicast scoping, see “IP Multicast Standards” on page 28.

Example: Configure Multicast Scoping Using the Scope Statement

This example configures multicast scoping using the scope statement, creating four scopes: local, organization, engineering, and marketing.

If you have a Tunnel Physical Interface Card (PIC) in your router and you configure a tunnel interface to use IP-IP encapsulation, you can configure the local scope. For more information about configuring tunnel interfaces, see the *JUNOS Internet Software Services Interfaces Configuration Guide*.

Configure the organization scope on an IP-IP encapsulation tunnel interface and a SONET/SDH interface. Configure the engineering and marketing scopes on an IP-IP encapsulation tunnel interface and two SONET/SDH interfaces. The JUNOS software can scope any user-configurable IPv6 or IPv4 group.

```
[edit]
routing-options {
  multicast {
    scope local {
      interface gr-2/1/0;
      prefix fe00::239.255.0.0/128;
    }
  }
}
```

```

scope organization {
  interface [gr-2/1/0 so-0/0/0];
  prefix 239.192.0.0/14;
}
scope engineering {
  interface [ip-2/1/0 so-0/0/1 so-0/0/2];
  prefix 239.255.255.0/24;
}
scope marketing {
  interface [gr-2/1/0 so-0/0/2 so-1/0/0];
  prefix 239.255.254.0/24;
}
}
}

```

If you configure multicast scoping with the scope statement, you cannot use the scope-policy statement on the same router. If you try to commit a configuration using both, the configuration checkout will fail. To verify that group scoping is in effect, use the show multicast scope command:

```

user@host> show multicast scope

```

Scope name	Group prefix	Interface	Resolve Rejects
local	fe00::239.255.0.0/128	gr-2/1/0	0
organization	239.192.0.0/14	gr-2/1/0 so-0/0/0	0
engineering	239.255.255.0/24	ip-2/1/0 so-0/0/1 so-0/0/2	0
marketing	239.255.254.0/24	gr-2/1/0 so-0/0/2 so-1/0/0	0

For more information, see the *JUNOS Internet Software Routing Protocols Configuration Guide*.

Configure Multicast Scoping Using the scope-policy Statement

To configure multicast scoping using the scope-policy statement, specify a policy name for the scope. The referenced policy must be correctly configured and contain the set of router interfaces on which you are configuring scoping, and the scope's address range configured as a series of router filters.

Only the interface, route-filter, and prefix-list match conditions are supported for multicast scoping policies. All other configured match conditions are ignored. The only actions supported are accept, reject, and the policy flow actions next-term and next-policy. The reject action means that joins and multicast forwarding are suppressed in both directions on the configured interfaces. The accept action allows joins and multicast forwarding in both directions on the interface. By default, scoping policies apply to all interfaces. The default action is accept.

For more information on configuring route filters and policies, see the *JUNOS Internet Software Policy Framework Configuration Guide*.

In contrast to scoping with the scope statement, scoping with scope-policy does not automatically add the local scope at scope boundaries. You must explicitly configure the local scope boundaries when you use the scope-policy statement. The local scope limits the use of the multicast group 239.255.0.0/16 to an attached local-area network.

For information about supported standards for multicast scoping, see “IP Multicast Standards” on page 28.

Example: Configure Multicast Scoping Using the scope-policy Statement

This example configures a scope-policy statement named allow-Auto-RP-on-backbone, allowing packets for Auto-RP groups 224.0.1.39/32 exact and 224.0.1.40/32 exact on backbone-facing interfaces, and rejecting all other addresses in the 224.0.1.0/24 or longer and 239.0.0.0/8 or longer address ranges.

First, configure the policy allow-Auto-RP-on-backbone at the policy-options hierarchy level:

```
[edit]
policy-options {
  policy-statement allow-Auto-RP-on-backbone {
    term allow-Auto-RP {
      from {
        /* backbone-facing interfaces */
        interface [ so-0/0/0.0 so-0/0/1.0 ];
        route-filter 224.0.1.39/32 exact;
        route-filter 224.0.1.40/32 exact;
      }
      then {
        accept;
      }
    }
    term reject-these {
      from {
        route-filter 224.0.1.0/24 orlonger;
        route-filter 239.0.0.0/8 orlonger;
      }
      then reject;
    }
  }
}
```

By default, the scope policy applies to all interfaces. For more information on route filters, see the *JUNOS Internet Software Policy Framework Configuration Guide*.

Then apply the scope policy allow-Auto-RP-on-backbone at the routing-options hierarchy level:

```
[edit]
routing-options {
  multicast {
    scope-policy allow-Auto-RP-on-backbone;
  }
}
```

If you configure multicast scoping with the scope-policy statement, you cannot use the scope statement on the same router. To verify that the scope policy is in effect, use the show multicast scope command:

```
user@host> show multicast scope
Scope policy: [ allow-Auto-RP-on-backbone ]
```

Multicast Scoping Configuration Statements

The following sections explain each of the multicast scoping configuration statements. The statements are organized alphabetically.

interface

Syntax	interface [<i>interface-name</i>];
Hierarchy Level	[edit routing-options multicast scope <i>scope-name</i>], [edit logical-routers <i>logical-router-name</i> routing-options multicast scope <i>scope-name</i>]
Description	Configure the set of interfaces for multicast scoping.
Usage Guidelines	See “Configure Multicast Scoping Using the Scope Statement” on page 109.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

prefix

Syntax	prefix <i>destination-prefix</i> ;
Hierarchy Level	[edit routing-options multicast scope <i>scope-name</i>], [edit logical-routers <i>logical-router-name</i> routing-options multicast scope <i>scope-name</i>]
Description	Configure the prefix for multicast scopes.
Options	<i>destination-prefix</i> —Address range for the multicast scope.
Usage Guidelines	See “Configure Multicast Scoping Using the Scope Statement” on page 109.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

scope

Syntax	<code>scope <i>scope-name</i> { interface [<i>interface-name</i>]; prefix <i>destination-prefix</i>; }</code>
Hierarchy Level	[edit routing-options multicast], [edit logical-routers <i>logical-router-name</i> routing-options multicast]
Description	Configure multicast scoping.
Options	<i>scope-name</i> —Name of the multicast scope.
Usage Guidelines	See “Configure Multicast Scoping Using the Scope Statement” on page 109.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

scope-policy

Syntax	<code>scope-policy <i>policy-name</i>;</code>
Hierarchy Level	[edit routing-options multicast], [edit logical-routers <i>logical-router-name</i> routing-options multicast]
Description	Apply a policy for scoping. The policy must be correctly configured.
Options	<i>destination-prefix</i> —Address range for the multicast scope.
Usage Guidelines	See “Configure Multicast Scoping Using the scope-policy Statement” on page 110.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

