Chapter 1

Managing Policies on the E-series Router

This chapter discusses the following topics:

Policy Management Overview

This chapter introduces policy-based routing management on E-series routers. Policy management enables you to configure, manage, and monitor policies that selectively cause packets to take different paths without requiring a routing table lookup. The JUNOSe software's packet mirroring feature uses secure policies.

Policy management enables network service providers to configure services that customize the treatment of individual packet flows received on a subscriber's interface. The main tool for implementing policy management is a policy list. A policy list is a set of rules, each of which specifies a policy action. A rule is a policy action optionally combined with a classification.

Packets are sorted at ingress or egress into packet flows based on attributes defined in classifier control lists (CLACLs). You can apply policy lists to packets arriving and leaving an interface. You can use policy management on ATM, Frame Relay, generic routing encapsulation (GRE), IP, IPv6, Layer 2 Tunneling Protocol (L2TP), Multiprotocol Label Switching (MPLS), and virtual local area network (VLAN) traffic.

Policy management provides:

- Policy routing—Predefines a classified packet flow to a destination port or IP address. The router does not perform a routing table lookup on the packet. This provides superior performance for real-time applications.

- Bandwidth management—Rate-limits a classified packet flow at ingress to enforce ingress data rates below the physical line rate of a port, A rate-limit profile with a policy rate-limit profile rule provides this capability. You can construct policies to provide rate limiting for individual packet flows or for the aggregate of multiple packet flows. E-series router rate limits are calculated based on the layer 2 packet size. To configure rate limiting, you first create a rate-limit profile, which is a set of bandwidth attributes and associated actions. You next create a policy list with a rule that has rate limit as the action and associate a rate-limit profile with this rule. You can configure rate-limit profiles to provide a variety of services, including tiered bandwidth service where traffic conforming to configured bandwidth levels is treated differently than traffic that exceeds the configured values, and a hard-limit service where a fixed bandwidth limit is applied to a traffic flow. Finally, you can configure rate-limit profiles to provide a TCP-friendly rate-limiting service that works in conjunction with TCP's native flow-control functionality.

- Security—Provides a level of network security by using policy rules that selectively forward or filter packet flows. You can use a filter rule to stop a denial-of-service attack. You can use secure policies to mirror packets and send them to an analyzer.

- RADIUS policy support—Enables you to create and attach a policy to an interface through RADIUS.

- Packet tagging—Enables the traffic-class rule in policies to tag a packet flow so that the Quality of Service (QoS) application can provide traffic-class queuing. Policies can perform both in-band and out-of-band packet tagging.

- Packet forwarding—Allows forwarding of packets in a packet flow.

- Packet filtering—Drops packets in a packet flow.

- Packet mirroring—Uses secure policies to mirror packets and send them to an analyzer.

- Packet logging—Logs packets in a packet flow.

Policy management gives you the CLI tools to build databases, which can then be drawn from to implement a policy. Each database contains global traffic specifications. When building a policy, you specify input from one or more of these databases and then attach the policy to an interface. By combining the information from the various databases into policies, you can deploy a wide variety of services.

Description of a Policy

A policy is a condition and an action that is attached to an interface. The condition and action cause the router to handle the packets passing through the interface in a certain way. A policy can be attached to IP interfaces and certain layer 2 interfaces such as Frame Relay, L2TP, MPLS, and VLAN interfaces. The policies do not need to be the same in both directions.

Packets are sorted at ingress or egress into packet flows based on attributes defined in classifier control lists. Policy lists contain rules that associate actions with these CLACLs. A rule is a policy action optionally combined with a classification.

When packets arrive on an interface, you can have a policy evaluate a condition before the normal route lookup; this kind of policy is known as an *input policy*. You can also have conditions evaluated after a route lookup; this kind of policy is known as a *secondary input policy*. You can use secondary input policies to defeat denial-of-service attacks directed at a router's local interface or to protect a router from being overwhelmed by legitimate local traffic. If you have a policy applied to packets before they leave an interface, this is known as an *output policy*.

Classification is the process of taking a single data stream in and sorting it into multiple output substreams. The classifier engine on an E-series router is a combination of PowerPC processors, working with a Field Programmable Gate Array (FPGA) for a hardware assist.

In the Differentiated Services (DiffServ) architecture, two basic types of classifiers exist. The first classifier type is a multifield (MF) classifier, which examines multiple fields in the IP datagram header to determine the service class to which a packet belongs. The second type of classifier is a behavior aggregate (BA) classifier, which examines a single field in an IP datagram header and assigns the packet to a service class based on what it finds.

There are two categories of hardware classifiers, depending on the type of line module being used. ES2 4G LM, ES2 10G Uplink LM, ES2 10G LM, OC48/STM16, GE-2, and GE-HDE line modules support content-addressable memory (CAM) hardware classifiers—all other line modules support FPGA hardware classifiers.

The maximum number of policies that you can attach to interfaces on an E-series router depends on the classifier entries that make up the policy and the number of attachment resources available on the interface. JUNOSe software allocates interface attachment resources when you attach policies to interfaces. E-series routers support software and hardware classifiers. A policy can be made up of any combination of software and hardware classifiers.

Platform Considerations

Policy services are supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about policy management, see the following resources:

- RFC 2474—Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers (December 1998)
- RFC 2475—An Architecture for Differentiated Services (December 1998)
- RFC 2697—A Single Rate Three Color Marker (September 1999)
- RFC 2698—A Two Rate Three Color Marker (September 1999)
- RFC 3198—Terminology for Policy-Based Management (November 2001)

Policy Management Configuration Tasks

Perform the required tasks and also any optional tasks that you need for your policy management configuration:

1. Create a CLACL (optional).

   See *Chapter 2, Creating Classifier Control Lists for Policies*

2. Create a rate-limit profile (optional).

   See *Chapter 5, Creating Rate-Limit Profiles*

3. Create a policy list.

   See *Chapter 3, Creating Policy Lists*

4. Create a classifier group.

   See *Chapter 4, Creating Classifier Groups and Policy Rules*

5. Create one or more policy rules within the classifier group.

   See *Chapter 4, Creating Classifier Groups and Policy Rules*

6. Apply a policy list to an interface or profile.

   See *Chapter 4, Creating Classifier Groups and Policy Rules*