

Chapter 23

Configuring Subscriber Management

This chapter describes how to set up subscriber management on the E-series router. Subscriber management integrates a variety of router features and enables you to manage your constantly changing subscriber environment without affecting the performance you provide to your customers.

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Overview

The E-series router enables customers to create a unified subscriber management, provisioning, and service delivery environment. The flexibility of the router provides a variety of methods and configurations that enable customers to dynamically provision new subscribers and quickly create new value-added services.

Two major aspects of subscriber management are subscriber provisioning and differentiated service delivery. The E-series router enables you to use both static and dynamic methods to add and delete subscribers. Important subscriber management concepts provided by JUNOS subscriber management include:

- Subscriber use of a shared medium
- Multiple subscribers using the same primary interface
- User authentication and accounting
- Differentiated services for individual subscribers

A subscriber management environment can include the following components:

- Local Dynamic Host Configuration Protocol (DHCP) server
- External DHCP server
- RADIUS server
- Session and Resource Control (SRC) software

You employ the components you need in a variety of configurations, depending on your specific requirements.

Platform Considerations

Subscriber management is 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.

Subscriber Management Attributes

E-series routers take advantage of many of the JUNOS features to enable you to create the subscriber management environment that best meets your requirements. These features include:

- Authentication—Uses RADIUS to determine whether a user can access a specific service or resource.
- Accounting—Uses RADIUS and policy management to track service usage that can be used for volume-based billing.
- Dynamic address assignment—Uses RADIUS, DHCP, and profiles to dynamically allocate IP addresses to subscribers.
- Dynamic policy management—Uses policy and quality of service (QoS) management to assign and monitor subscriber bandwidth restrictions.
- Security—Uses policy management, source address validation, and media access control (MAC) address validation to grant subscriber access and to enable the use of classification when monitoring subscriber traffic flows.
- Dynamic interfaces—Automatically creates an interface column based on a catalyst packet or event.

- **Marking**—Uses policy management marking to enable differential treatment of specific packets.
- **Policy routing**—Uses policy management routing policies to assign subscriber routes that are based on classification.

Dynamic IP Subscriber Interfaces

You can set up your subscriber management environment to create dynamic IP subscriber interfaces in two situations—when a DHCP event occurs or when a packet is detected.

In the first case, the interface is created when an external DHCP server or the DHCP local server responds to a subscriber request. In the second case, the subscriber interface is created when the router receives a packet (the packet detect feature) with a source IP address that is not in the demultiplexer table. In this second case the primary IP interface must be in autoconfiguration mode.

Subscriber management uses the following process when validating the IP source address of the packet:

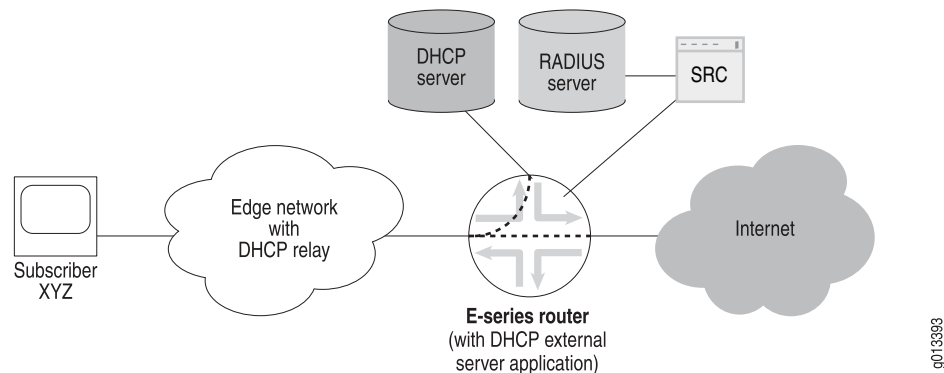
- If the address is not valid, no subscriber interface is created. A discard entry is added to the demultiplexer table, and an error message is generated.
- If the address is valid with respect to the address ranges configured on the primary IP interface, subscriber management uses packet information to select the appropriate dynamic subscriber interface profile. The commands corresponding to the profile are then used to create the subscriber interface.

Subscriber Management Procedure

Figure 15 shows a subscriber management environment that includes an external DHCP server, a RADIUS server, the SRC software, and the DHCP external server application running on the E-series router.

The E-series router DHCP external server application is used with other JUNOS features to provide subscriber management. Using the router's DHCP external server application for subscriber management enables you to take advantage of the following features:

- **Profile assignment**—A dynamic subscriber interface profile is associated with a specific source address by the router's packet detect feature.
- **Dynamic subscriber interface packet detection and inactivity timer**—Subscriber interfaces are dynamically created based on packet information that is identified by the packet detection feature. The inactivity timer determines when a dynamic subscriber interface expires and needs to be deleted.
- **DHCP external server application**—DHCP packets are examined to determine the state of subscribers.

Figure 15: DHCP External Server

In Figure 15, the subscriber requests an address from the DHCP server. The E-series router DHCP external server application monitors all DHCP communications between the subscriber and the DHCP server. After the subscriber receives an IP address, the subscriber can access the Internet and use the value-added services provided by the SRC software. The following list describes the various procedures performed in the subscriber management environment:

- Subscriber PC—Requests an IP address from the DHCP server
- E-series router
 - Monitors DHCP traffic between the subscriber and the DHCP server:
 - Identifies the subscriber's IP address, MAC address, giaddr, and client identifier
 - Extracts the lease time, creates a shadow lease, and starts its own lease timer that is associated with the subscriber
 - Determines the subscriber is active when the subscriber sends a packet after receiving an IP address from DHCP. The router then:
 - Processes the subscriber's IP address by using a route map
 - Extracts the dynamic subscriber interface profile (optional)

The router uses the profile to provide authentication, authorization, accounting, and address assignment. RADIUS uses the profile to obtain information for the subscriber's IP interface.
 - Creates the subscriber's dynamic subscriber interface (DSI)

- If the SRC software is configured, the router also alerts the SRC software that the subscriber's DSI and address exist.
- The DHCP external server application continues to monitor all traffic between the subscriber and the DHCP server, and periodically resets the shadow lease it originally created when the subscriber first requested an IP address. When the subscriber disconnects, the shadow lease eventually expires, at which time the E-series router performs the following:
 - Deletes the DSI
 - Alerts the SRC software that the DSI has been deleted
 - Alerts the SRC software that the subscriber's address has been deleted
- SRC software—Provides enhanced services to the subscriber.

Configuring Subscriber Management with an External DHCP Server

To configure subscriber management for clients by using an external DHCP server, as in Figure 15, use the following procedure on E-series routers:

1. Enable the DHCP external server application.

```
host1(config)#service dhcp-external
```

2. Specify each DHCP server for which to monitor traffic. You can specify a maximum of four DHCP servers.

```
host1(config)#ip dhcp-external server-address 10.10.10.1
```

3. Configure a default policy for subscribers, using a previously configured classifier group.

```
host1(config)#ip policy-list filterAll
host1(config-policy-list)#classifier-group filterGroupA
host1(config-policy-list-classifier-group)#filter
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)#exit
```

4. Configure a dynamic subscriber interface policy.

```
host1(config)#profile disableUser
host1(config-profile)#ip policy input filterAll
host1(config-profile)#ip policy output filterAll
host1(config-profile)#exit
```

5. Configure a route map.

```
host1(config)#route-map routeMapWest21
host1(config-route-map)#set ip interface-profile disableUser
host1(config-route-map)#exit
```

6. Enable autoconfiguration mode.

```
host1(config)#interface gigabitEthernet 12/0
host1(config-if)#ip address 192.168.1.1 255.255.255.0
host1(config-if)#ip auto-configure ip-subscriber include-primary
host1(config-if)#ip route-map ip-subscriber routeMapWest21
host1(config-if)#ip auto-detect ip-subscriber
host1(config-profile)#exit
```

Subscriber Management Commands

This section describes the commands that you use to configure subscriber management. For commands related to a specific component, see the appropriate documentation.

- DHCP—*Chapter 17, DHCP Overview*
- Policies—*JUNOS Policy Management Configuration Guide*
- QoS—*JUNOS Quality of Service Configuration Guide*
- Route maps—*JUNOS IP Services Configuration Guide, Chapter 1, Configuring Routing Policy*
- SRC software—SRC software documentation set

clear ip demux

- Use to clear all dynamically created demultiplexer table entries associated with the route-map processing of the **set ip source-prefix** command.
 - **deny**—Drop addresses that appear in the source address range
 - **primary**—Associate the source prefix with the primary IP interface
- Example


```
host1(config-if)#clear ip demux
```
- There is no **no** version.

domain

- Use to specify a domain for an IP service profile.
- The domain is included in a username that is dynamically created by JUNOS subscriber management.
- The specify a domain name with up to 32 ASCII characters.
- Example
`host1(config-service-profile)#domain eastcoast`
- Use the **no** version to remove the domain from the IP service profile.

include circuit-identifier

- Use to include the circuit identifier in the username that is dynamically created by JUNOS subscriber management.
- Specify one of the following circuit types: atm or vlan.
- Use the optional **prepend-circuit-type** keyword to specify that the circuit type is prepended to the circuit identifier in the username.
- Example
`host1(config-service-profile)#include circuit-identifier atm prepend-circuit-type`
- Use the **no** version to disable inclusion of the circuit identifier in the username.

include dhcp-option 82

- Use to include a suboption of the DHCP relay agent information option (option 82) in the username that is dynamically created by JUNOS subscriber management.
- Specify one of the following suboptions: **agent-circuit-id** or **agent-remote-id**.
- Example
`host1(config-service-profile)#include dhcp-option 82 agent-circuit-id`
- Use the **no** version to disable inclusion of the suboption in the username.

include hostname

- Use to include the router hostname in the username that is dynamically created by JUNOS subscriber management.
- Example
`host1(config-service-profile)#include hostname`
- Use the **no** version to disable inclusion of the router hostname in the username.

include ip-address

- Use to include the IP address in the username that is dynamically created by JUNOS subscriber management.
- Example
host1(config-service-profile)#**include ip-address**
- Use the **no** version to disable inclusion of the IP address in the username.

include mac-address

- Use to include the MAC address identifier in the username that is dynamically created by JUNOS subscriber management.
- Example
host1(config-service-profile)#**include mac-address**
- Use the **no** version to disable inclusion of the MAC address in the username.

include virtual-router-name

- Use to include the virtual router name in the username that is dynamically created by JUNOS subscriber management.
- Example
host1(config-service-profile)#**include virtual-router-name**
- Use the **no** version to disable inclusion of the virtual router name in the username.

ip auto-configure ip-subscriber

- Use to configure an IP interface to support creation of dynamic subscriber interfaces. The specified IP interface is considered the primary interface.
- The router creates the required dynamic subscriber interfaces when the IP address is assigned to the associated subscriber. The address might be assigned by an external DHCP server, the DHCP local server, or the packet detect feature.
- Use the **include-primary** keyword to specify that the primary interface can be assigned to a subscriber. Use the **exclude-primary** keyword to specify that the primary interface cannot be used for subscribers. The primary interface is not assigned to a subscriber by default.
- You can issue this command from Interface Configuration mode, Subinterface Configuration mode, or Profile Configuration mode.
- Example
host1(config-if)#**ip auto-configure ip-subscriber include-primary**
- Use the **no** version to disable creation of dynamic subscriber interfaces associated with this primary IP interface. Use the **no** version with the **include-primary** keyword to specify that the primary interface is not assigned to a subscriber. Use the **no** version with the **exclude-primary** keyword to specify that the primary interface is assigned to a subscriber.

ip auto-detect ip-subscriber

- Use to set the router packet detect feature and specify that IP automatically detect packets that do not match any entries in the demultiplexer table. When an unmatched packet is detected, an event is generated that determines whether to create a dynamic subscriber interface or configure an existing interface.
- You can issue this command from Interface Configuration mode or Profile Configuration mode.
- Example
host1(config-if)#**ip auto-detect ip-subscriber**
- Use the **no** version to restore the default, in which packet detection is disabled.

ip destination-prefix

- Use to specify a destination address for a subscriber interface or for a primary IP interface.
- Use the **deny** keyword to drop all packets that match the command.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example
host1(config-if)#**ip destination-prefix 10.0.0.0 255.0.0.0**
- Use the **no** version to remove the association between the interface and the specified IP destination address and mask.

ip inactivity-timer

- Use to configure the inactivity timer value.
- A dynamically created subscriber interface is deleted if it is inactive for a period longer than the inactivity timer value.
- On static interfaces, the subscriber's access route is removed when the inactivity timer is exceeded. When the subscriber logs back in, the timer is restarted.
- The timer value can in the range 1–65335 minutes.
- A timer value of 0 specifies that dynamically created subscriber interfaces are never deleted by the inactivity timer.
- Example
host1(config-if)#**ip inactivity-timer 100**
- Use the **no** version to restore the default, in which inactivity timer feature is disabled.

ip route-map ip-subscriber

- Use to configure an interface to perform route-map processing, and to specify the route map that is applied to the IP interface subscriber. If no route map is specified, then all packets trigger the creation of a dynamic subscriber interface.
- You can issue this command from Interface Configuration mode or Profile Configuration mode.
- Example

```
host1(config-if)#ip route-map ip-subscriber bostonRouteMap
```
- Use the **no** version to delete the route map.

ip service-profile

- Use to specify a service profile name and to enter IP Service Profile Configuration mode. Service profiles contain user and password information, and are used in route maps for subscriber management and to authenticate subscribers with RADIUS.
- You can specify a service profile name with up to 32 ASCII characters.
- You can create an IP service profile and assign it to dynamic bridged Ethernet interface profile to use the subscriber management application to configure IP subscribers on dynamic bridged Ethernet interfaces to support RADIUS authentication. If your router is running stateful SRP switchover (high availability), using an IP service profile to configure subscriber authentication is preferable to using either the **subscriber** command or the **atm atm1483 subscriber** command because these commands can suspend stateful SRP switchover on the router or prevent it from becoming active.

For more information, see *Authenticating Subscribers on Dynamic Bridged Ethernet over Static ATM Interfaces* in *JUNOS Link Layer Configuration Guide, Chapter 12, Configuring Dynamic Interfaces*, or *Authenticating Subscribers on Dynamic Bridged Ethernet over Dynamic ATM Interfaces* in *JUNOS Link Layer Configuration Guide, Chapter 13, Configuring Dynamic Interfaces Using Bulk Configuration*.

- Example

```
host1(config)#ip service-profile class1Service  
host1(config-service-profile)#
```
- Use the **no** version to delete the service profile.

ip source-prefix

- Use to specify a source address for a subscriber interface.
- Use the **deny** keyword to drop all packets that match the command.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example
 host1(config-if)#**ip source-prefix 10.0.0.0 255.0.0.0**
- Use the **no** version to remove the association between the interface and the specified IP source address and mask.

ip use-framed-routes ip-subscriber

- Use to configure a static primary IP interface to use framed routes as source IP addresses when creating dynamic subscriber interfaces. The router uses the Framed-Route RADIUS attribute [22] sent in Access-Accept messages to apply framed routes to subscriber interfaces associated with the primary interface.
- Example
 host1(config-if)#**ip use-framed-routes ip-subscriber**
- Use the **no** version to disable the use of framed routes when creating dynamic subscriber interfaces associated with this primary IP interface.

password

- Use to specify the password for an IP service profile. The password is used as the dynamically created password by JUNOS subscriber management.
- You can specify a password with up to 32 ASCII characters.
- Example
 host1(config-service-profile)#**password mypassword**
- Use the **no** version to remove the password from the IP service profile.

set ip interface-profile

- Use to specify a dynamic subscriber interface profile that is used in the route map.
- Example
 host1(config)#**route-map mapForEPort**
 host1(config-route-map)#**set ip interface-profile disableUser**
- Use the **no** version to delete the interface profile from the route map.

set ip service-profile

- Use to specify the name of a subscriber's service profile that is used in the route map.
- You can specify a service profile name with up to 32 ASCII characters.
- Example
host1(config-route-map)#**set ip service-profile yourServiceProfile**
- Use the **no** version to remove the service profile from the route map.

set ip source-prefix

- Use to specify a source address range to be inserted into a specific interface, and the action to take with the range.
 - **deny**—Drop addresses that appear in the source address range
 - **primary**—Associate the source prefix with the primary IP interface
- Example
host1(config-route-map)#**set ip source-prefix 10.10.30.0 255.255.255.0 primary**
- Use the **no** version to remove the source address range from the route map.

user-name

- Use to specify the username for an IP service profile. The username is used as the dynamically created username by JUNOS subscriber management.
- You can specify a username with up to 32 ASCII characters.
- Example
host1(config-service-profile)#**user-name westford211**
- Use the **no** version to remove the user name from the IP service profile.

user-prefix

- Use to specify a user prefix for an IP service profile.
- This command appends the user prefix to the username that is dynamically created by JUNOS subscriber management.
- Example
host1(config-service-profile)#**user-prefix xyz.atl**
- Use the **no** version to remove the user prefix from the IP service profile.

vlan service-profile

- Use to assign an IP service profile to a VLAN subinterface. Service profiles contain user and password information, and are used in route maps for subscriber management and to authenticate subscribers with RADIUS.
- You can specify a service profile name with up to 32 ASCII characters.
- Example


```
host1(config-profile)#vlan service-profile vlanClass1Service
host1(config-profile)#
```
- Use the **no** version to remove the service profile from the VLAN subinterface.

Configuration Examples

This section contains examples of creating dynamic usernames and shows the usernames that are generated. The examples all use the following IP policy, interface profile, and route map:

- An IP policy that restricts access.

```
host1(config)#ip policy-list restrictAccess
host1(config-policy-list)#classifier-group *
host1(config-policy-list-classifier-group)#filter
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)#exit
host1(config)#
```

- An interface profile that references the restrictAccess policy.

```
host1(config)#profile atlInterfaceProfile
host1(config-profile)#ip policy input restrictAccess
host1(config-profile)#ip policy output restrictAccess
host1(config-profile)#exit
host1(config)#
```

- A route map that references the interface profile and the atlServiceProfile service profile.

```
host1(config)#route-map atlRouteMap
host1(config-route-map)#set interface-profile atlInterfaceProfile
host1(config-route-map)#set ip service-profile atlServiceProfile
host1(config-route-map)#exit
host1(config)#
```

Each example shows the configuration of a service profile that enables RADIUS authentication.

Username with ATM Circuit Identifier and No Circuit Type

This example shows the steps to configure a service profile for a username that includes the ATM circuit identifier, but does not include the circuit type.

```
host1(config)#ip service-profile atlServiceProfile
host1(config-service-profile)#user-prefix xyzcorp.atl
host1(config-service-profile)#domain eastcoast
host1(config-service-profile)#include hostname
host1(config-service-profile)#include circuit-identifier atm
host1(config-service-profile)#exit
host1(config)#
```

The example generates the following username:

user prefix	circuit identifier	domain
-----	-----	-----
xyzcorp.atl	.2.3.32.100.	@eastcoast

The circuit identifier indicates a user at slot 2, port 3, with a virtual path identifier (VPI) of 32 and a virtual channel identifier (VCP) of 100.

Username with VLAN Circuit Identifier and Circuit Type

This example shows the steps to configure a service profile for a username that includes a VLAN circuit identifier and the circuit type.

```
host1(config)#ip service-profile atlServiceProfile
host1(config-service-profile)#user-prefix xyzcorp.atl
host1(config-service-profile)#domain eastcoast
host1(config-service-profile)#include hostname
host1(config-service-profile)#include circuit-identifier vlan prepend-circuit-type
host1(config-service-profile)#exit
```

The example generates the following username:

circuit type	user prefix	circuit identifier	domain
-----	-----	-----	-----
	xyzcorp.atl	.vlan.1.0.0.45	@eastcoast

The circuit identifier indicates a user on slot 1, port 0, no stacked vlan, and a vlan ID of 45.

Username with MAC Address

This example shows the steps to configure a service profile that generates a username that includes a MAC address.



NOTE: Including a MAC address in a username works only for DHCP users. It does not work for IP subscribers that have statically configured IP addresses.

```
host1(config)#ip service-profile atlServiceProfile
host1(config-service-profile)#user-prefix xyzcorp.atl
host1(config-service-profile)#domain eastcoast
host1(config-service-profile)#include hostname
host1(config-service-profile)#include circuit-identifier vlan
host1(config-service-profile)#include mac-address
host1(config-service-profile)#include dhcp-option 82 agent-circuit-id
host1(config-service-profile)#exit
host1(config)#
```

The example generates the following username, which includes the MAC address:

user prefix	circuit identifier	mac-address	domain
xyzcorp.atl	1.0.0.45.1234.5678.9012		@eastcoast

