

Chapter 5

Managing Routers and Virtual Routers

This chapter describes how to manage objects for routers and virtual routers in the directory and how to connect to routers so you can view or change their configurations. In this documentation, the generic term “router” means any JUNOSe router, JUNOS routing platform, or PacketCable Multimedia (PCMM)-compliant cable modem termination system (CMTS) devices. The chapter contains the following sections:

- Overview of Managing Routers and Virtual Routers on page 141
- Adding Routers and Virtual Routers to the Directory on page 144
- Configuring Interface Classification for Router Objects on page 150
- Updating Local IP Address Pools for JUNOSe VRs on page 151
- Connecting to Routers on page 154

Overview of Managing Routers and Virtual Routers

The SAE uses router and virtual router objects in the directory to manage devices as follows:

- On JUNOSe routers, the SAE manages interfaces on virtual routers. Each JUNOSe router in the SDX network and its virtual routers (VRs) must appear in the directory.
- On JUNOS routing platforms, the SAE manages interfaces. The SDX software associates a virtual router called default with each JUNOS routing platform. Each JUNOS routing platform in the SDX network and its associated VR called default must appear in the directory. The VRs are not actually configured on the JUNOS routing platform; the VR in the directory provides a way for the SAE to manage the interfaces on the JUNOS routing platform.
- For CMTS devices, which do not have interfaces, the SAE creates and manages pseudointerfaces that it associates with a virtual router. The SDX software associates a VR called default with each CMTS device. Each CMTS device in the SDX network and its associated VRs must appear in the directory. This VR is not actually configured on the CMTS device; the VR in the directory provides a way for the SAE to manage the CMTS device.

Directory Model for Router Objects

The router objects in the directory are stored in the network folder, *o = network*, *o = umc*. The router objects define:

- Interface classification scripts, which determine the default policy that the router applies to a particular interface. The router objects contain classification profiles that are represented by the auxiliary object class `umcClassificationProfile`. This class is attached to a router entry.
- Management address of the router or CMTS device.
- QoS profiles configured on the router (JUNOSe routers only).

The physical aspect of a router object is modeled by the Distributed Management Task Force (DMTF) object class `dmlChassis`. You can also attach local parameters to router objects by using the `parameterAuxClass`.

Virtual router objects are modeled in the directory by the class `umcVirtualRouter`, and they define:

- SNMP communities that the SAE uses to communicate with the virtual router. SNMP information is contained in the auxiliary class `snmpInfoAuxClass`, which can be attached to `umcVirtualRouter` objects.
- Service scopes, which determine the availability of services for subscribers who connect to the VR. The association between virtual routers and SSP services for service scoping is performed by attaching the CIM auxiliary class `dmlPhysicalElementLocationAuxClass`. This class consists of a DN attribute that points to localities that contain SSP services.
- Local address pools on the JUNOSe VR.
- CORBA reference for the SAE that manages this VR.
- Tracking plug-ins that track interfaces that the SAE manages on this VR.

For detailed information about the SDX LDAP schema, see the documentation in the SDX software distribution in the folder `/SDK/doc/ldap` or on the Juniper Networks Web site at

<http://www.juniper.net/techpubs/software/management/sdx>

Local IP Address Pools on JUNOS VRs

You can specify an unlimited number of ranges of local IP address pools for JUNOS VRs. You can specify either the first and last addresses in a range or the first IP address and a factor that indicates the start of the range. You can also specify IP addresses to exclude.

The IP pool syntax has the following format:

```
([ < ipAddressStart > < ipAddressEnd > ] |
{ < ipBaseAddress > / ( < mask > | < digitNumber > ) ( < ipAddressExclude > ) * } )
```

where:

- < ipAddressStart > —First IP address (version 4 or 6) in a range
- < ipAddressEnd > —Last IP address (version 4 or 6) in a range
- < ipBaseAddress > —Network base address
- < mask > —IP address mask
- < digitNumber > —Integer specifying the number of significant digits of the first IP address in the range
- < ipAddressExclude > —List of IP addresses to be excluded from the range
- | —Choice of expression; choose either the expression to the left or the expression to the right of this symbol
- * —Zero or more instances of the preceding group



NOTE: You can use spaces in the syntax only to separate the first and last explicit IP addresses in a range.

Example: Ranges for IP Address Pools

This example shows four ranges for the IP address pool.

```
([10.10.10.5 10.10.10.250]
{10.20.20.0/24}
{10.21.0.0/255.255.0.0}
{10.20.30.0/24,10.20.30.1})
```

- The first range (a simple range) specifies all the IP addresses between the two IP addresses 10.10.10.5 and 10.10.10.250.
- The second range specifies all the IP addresses in the range 10.20.20.0 to 10.20.20.255.
- The third range uses a network mask to specify all the IP addresses in the range 10.21.0.0 to 10.21.255.255.
- The fourth range specifies all the addresses of the network 10.20.30.0 to 10.20.30.255, excluding the address 10.20.30.1.

Adding Routers and Virtual Routers to the Directory

You can use SDX Admin to detect operative routers and configured JUNOSe VRs in the SDX network and add them to the directory. This operation automatically creates a VR called default in the directory for each detected JUNOS routing platform. However, if you use an LDAP client other than SDX Admin, or if you want to add inoperative routers, unconfigured JUNOSe VRs, or router objects for CMTS devices, you must add each router and VR individually.



NOTE: You must define connected SAEs for each router in the virtual router object of the directory. This step is required for the SAE to work with the router. See *Configuring Connected SAEs on page 150*.

Adding Operative Routers and Configured JUNOSe VRs with SDX Admin

To simultaneously add to the directory routers and JUNOSe VRs that are currently operative and have an operating SNMP agent:

1. In the SDX Admin navigation pane, select *o = Network*, and right-click.
2. Select Discover Network.

The Discover Network dialog box appears.

3. Enter the IP address, the prefix of the network, and the SNMP community string.
4. Click OK.

Objects for all routers and JUNOSe VRs that meet the criteria you specified appear under the Networks object in the navigation pane. For each JUNOS routing platform, the software creates one VR called default. You can modify the configuration of these objects. For information about configuring these objects, see *Adding Routers Individually on page 145* and *Adding Virtual Routers Individually on page 146*.

Adding Routers Individually

To add a router with an LDAP client other than SDX Admin, use the object class `d1m1ManagedElement`. For information about the object classes and their associated attributes, see the LDAP schema in the SDX software distribution in the folder `SDK/doc/ldap` or on the Juniper Networks Web site at

<http://www.juniper.net/techpubs/software/management/sdx>

The name of the router, which is case sensitive, must exactly match the name configured on the router.

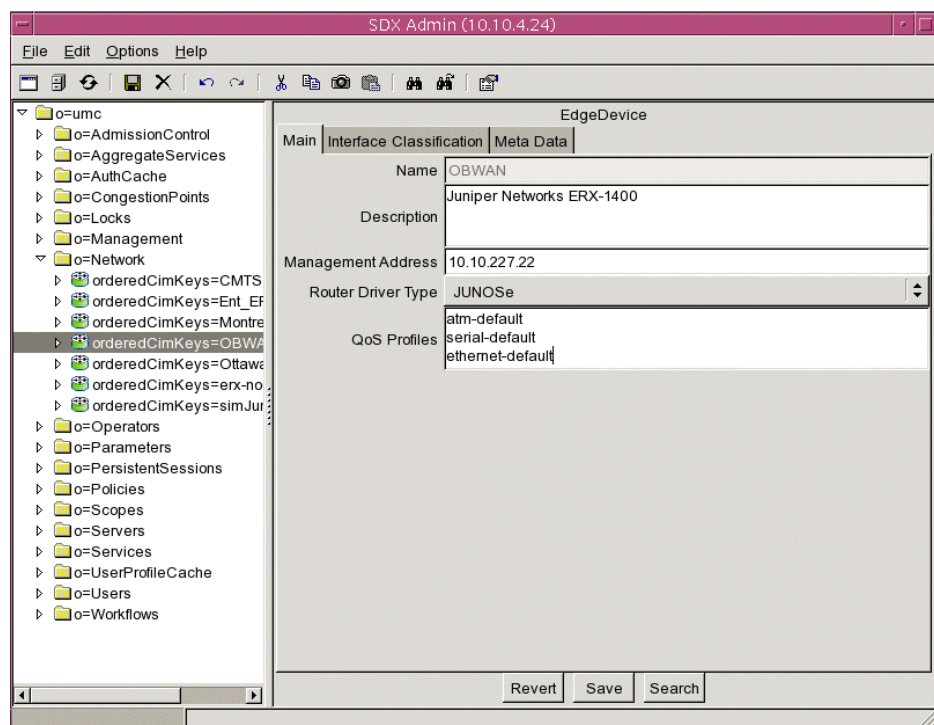
To add a single router to the directory with SDX Admin:

1. In the navigation pane, highlight `o = Network`, and right-click.
2. Select `New > EdgeDevice`.

The New EdgeDevice dialog box appears.

3. In the New EdgeDevice dialog box, enter the name of the router exactly as it is configured in the JUNOS or JUNOSe software, or enter the name of the CMTS device, and click OK.

The name of the new device appears in the navigation pane, and information about the router appears in the EdgeDevice pane.



4. Use the field descriptions in *Router Fields* on page 146 to configure the router, and then click Save.

Router Fields

Use the fields in this section to configure routers.

Description

- Information about this device; keywords that the SDX find utility uses.
- Value—Text string
- Example—ERX-1400 router located in Ottawa

Management Address

- IP address of the router or CMTS device. If you add a router using the discover network feature, the software automatically adds the IP address of the first SNMP agent on the router to respond to the discover request.
- Value—IP address
- Example—192.0.1.1

Router Driver Type

- Type of device that this directory object will be used to manage.
- Value
 - JUNOSe—JUNOSe router
 - JUNOS—JUNOS routing platform
 - PCMM—CMTS device
- Default—No value

QoS Profiles

- For JUNOSe routers, specifies QoS profiles that are configured on the router. To update this list, see *SDX Software Basics Guide, Chapter 19, Managing QoS Services on JUNOSe Routers*.
- Value—List of QoS profiles on separate lines
- Example—atm-default

Adding Virtual Routers Individually

To add a VR with an LDAP client other than SDX Admin, use the object class `umcVirtualRouter`. For information about the object classes and their associated attributes, see the documentation for the LDAP schema in the SDX software distribution in the folder `SDK/doc/ldap` or on the Juniper Networks Web site at

<http://www.juniper.net/techpubs/software/management/sdx>

- For JUNOSe routers, the name of the VR, which is case sensitive, must exactly match the name of the VR configured on the router.
- For JUNOS routing platforms and CMTS devices, create one VR with the name default.

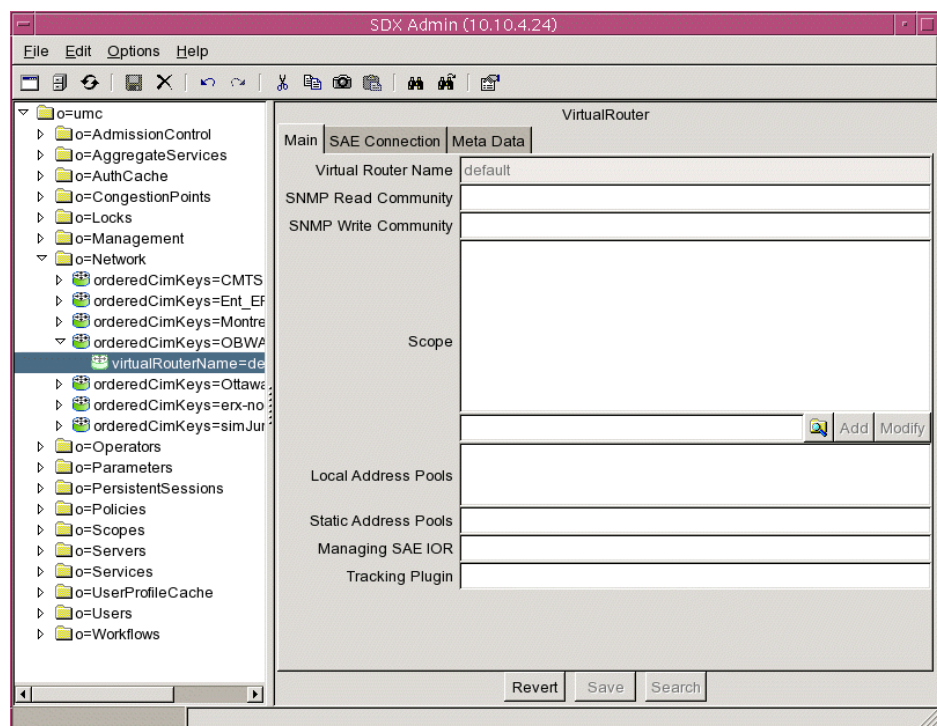
To add a VR to the directory with SDX Admin:

1. In the navigation pane, highlight the device to which you want to add the VR, and right-click.
2. Select New > VirtualRouter.

The New VirtualRouter dialog box appears.

3. Enter the name of the VR, and click OK.
 - For JUNOSe routers, the name of the VR, which is case sensitive, must exactly match the name of the VR configured on the router.
 - For JUNOS routing platforms and CMTS devices, use the name default.

The name of the new VR appears in the navigation pane, and the VirtualRouter pane appears.



4. Set the parameters in the Main tab in the VirtualRouter pane. See *Configuration Parameters for Virtual Routers* on page 148.

5. Select the SAE Connection tab in the VirtualRouter pane, and add SAEs that are connected to the router or CMTS device. See *Configuring Connected SAEs* on page 150.



NOTE: This step is required for the SAE to work with the router or CMTS device.

6. Click Save in the VirtualRouter pane.

Configuration Parameters for Virtual Routers

Use the fields in this section to define virtual router objects.

SNMP Read Community

- SNMP community name associated with SNMP read-only operations for this VR.
- Value—Text string
- Example—admin

SNMP Write Community

- SNMP community name associated with SNMP write operations for this VR.
- Value—Text string
- Example—public

Scope

- Service scopes assigned to this VR—See *Configuring Service Scopes* on page 50.
- Value—Text string
- Example—POP-Westford

Local Address Pools

- List of IP address pools that a JUNOS VR currently manages and stores. (see *SDX Components Guide, Vol. 2, Chapter 12, Locating Subscriber Information*.)
- Value—List of IP address pools. For information about the syntax for IP pools, see *Local IP Address Pools on JUNOS VRs* on page 143.
- Guidelines—If you do not configure the **PoolPublisher** router initialization scripts for a JUNOS router (see *SDX Components Guide, Vol. 1, Chapter 1, Overview of the SAE*), configure this field for the JUNOS VR.
- Default—No value
- Example—([10.10.10.5 10.10.10.250] {10.20.20.0/24})

Static Address Pools

- List of IP address pools that a JUNOS VR manages but does not store. You can configure these address pools only in the SDX software.
- Value—See the field Local Address Pools.
- Guidelines—Configure this field on JUNOS and CMTS VRs only.
- Default—No value
- Example—([10.10.10.5 10.10.10.250] {10.20.20.0/24})

Managing SAE IOR

- CORBA reference for the SAE managing this VR.
- Value—One of the following items:
 - The actual CORBA reference for the SAE
 - The absolute path to the IOR file
 - A corbaloc URL in the form corbaloc:: <host > :8801/SAE
 - <host > is the name or IP address of the SAE host.
- Default—No value
- Guidelines—The **PoolPublisher** and **IorPublisher** router initialization scripts provide this information when the router connects to the SAE. For information about router initialization scripts, see *SDX Components Guide, Vol. 1, Chapter 1, Overview of the SAE*. If you do not select one of these router initialization scripts, enter a value in this field.
- Example—One of the following items:
 - Absolute path—`/opt/UMC/sae/var/run/sae.ior`
 - corbaloc URL—`corbaloc::boston:8801/SAE`
 - Actual IOR—`IOR:0000000000000002438444C3A736D67742E6A756E697...`

Tracking Plug-in

- Plug-ins that track interfaces that the SAE manages on this VR. The SAE calls these plug-in instances for every interface it manages. The SAE calls these plug-ins after an interface comes up, when new policies are installed on the interface, and when the interface goes down.
- Value—Comma-separated list of plug-in instances
- Guidelines—Enter plug-in instances and NIC SAE plug-in agents that are specific to this VR. For information about configuring tracking plug-ins, see *SDX Components Guide, Vol. 1, Chapter 5, Configuring Authorization and Accounting Plug-Ins*.
- Default—No value
- Example—`nicsae, flexRadius`

Configuring Connected SAEs

Select the SAE Connection tab in the VirtualRouter pane, and add the addresses of SAEs that can manage this router or CMTS device. This step is required for the SAE to work with the router or CMTS device.

To add an SAE:

1. Type the IP address of the SAE in the field below the Connected SAE box.
2. Click Add.

To modify an SAE address:

1. Double-click the IP address of the SAE in the Connected SAE box.
2. Modify the IP address in the field below the Connected SAE box.
3. Click Modify.

To delete an SAE address:

1. Double-click the IP address of the SAE in the Connected SAE box.
2. Remove the IP address from the field below the Connected SAE box.
3. Click Delete.

Connected SAE

- SAEs that are connected to the router or CMTS device.
- Value—IP addresses
- Default—No value

Configuring Interface Classification for Router Objects

For information about creating interface classification scripts see *SDX Components Guide, Vol. 1, Chapter 4, Classifying Interfaces and Subscribers*.

Updating Local IP Address Pools for JUNOSe VRs

When you reconfigure local IP address pools on a JUNOSe VR, you must update in the directory the local IP addresses that the VR provides. To do so, you can use either SDX Admin or a command called **poolRepublish**. With SDX Admin, you can update one VR at a time. With the **poolRepublish** command, you can update simultaneously any number of VRs in the same directory.

Prerequisites

To use these features, the following prerequisites apply:

- The JUNOSe router and VR must appear in the directory.
- The VR must have an operating SNMP agent.
- The host that supports SDX Admin must be able to communicate with the VR through SNMP to allow updates of IP address pools with SDX Admin.
- The host that supports the SAE must be able to communicate with the VR through SNMP to allow updates with the **poolRepublish** command.
- You must have write permissions for the *o = Network* subtree.

Using SDX Admin

To update local IP address pools for a VR in the directory with SDX Admin:

1. In the navigation pane, expand the object *o = Network*.
2. In the navigation pane, expand the object for the router on which the VR is configured.
3. Highlight the object for the VR in the navigation pane, and right-click.
4. Select Update IP Pools.

The SDX Admin dialog box appears.

5. Enter the IP address for the VR, enter the SNMP community if the default value is incorrect, and click OK.

SDX Admin updates the local IP addresses for the VR in the directory and displays the information in the Local IP Address field of the Main tab in the VirtualRouter pane.

Using the `poolRepublish` Command

After you have installed the SAE on a host, you can use the **poolRepublish** command to update local IP address pools. For information about installing the SAE, see *SDX Software Basics Guide, Chapter 5, Installing the SDX-300 Software*.

When you use the **poolRepublish** command, you can specify multiple VRs that use the same SNMP read community. For each VR you must specify the name of the VR, the name of the JUNOSe router on which it is configured, and the VR's corresponding IP address. You must also specify the directory connection. The syntax for the command is:

```
poolRepublish { { -v <vrName> @ <routerName> -i <ipAddress> } *
-h <host> -b <baseDn> -D <bindDN> -w <password>
-c <readCommunity> ] | -H }
```

<vrName>

- Name of the VR.
- Value—Text string (value is case sensitive and must match the name in the JUNOSe configuration)
- Guideline—You must enter a value for this property.
- Example—vr-boston

<routerName>

- Name of JUNOSe router on which VR is configured.
- Value—Text string (value is case sensitive and must match the name in the JUNOSe configuration)
- Example—erx1

<ipAddress>

- VR's IP address.
- Value—IP address or text string
- Example—192.0.2.1

<host>

- IP address or name of the host that supports the directory.
- Value—IP address or text string
- Example—192.0.2.2 or ottawa

<baseDn>

- DN of the root of the tree in the directory.
- Value—DN
- Example—*o = Network, o = umc*

<bindDn>

- DN of the username for authentication with the directory server.
- Value—DN
- Example—*cn = umcAdmin, o = umc*

<password>

- Password for authentication with the directory server.
- Value—Text string
- Example—Admin123

<readCommunity>

- Name of the SNMP read community for the VR. If the SNMP read community for a VR is defined in the directory, you do not need to specify this value.
- Value—Text string
- Example—public

-H

- Displays help for this tool.

To update local IP addresses using the **poolRepublish** command:

1. On the SAE host, access the folder */opt/UMC/sae/etc*.

```
cd /opt/UMC/sae/etc
```

2. Execute the command.

```
./poolRepublish -v vr1@erx1 -i 192.0.2.1 -v vr2@erx2 -i 192.0.2.3 -h 192.0.2.5  
-w admin123 -D cn=umcAdmin,o=umc -b o=Network,o=umc -c public
```

The software updates and displays the local IP address pools for each VR you specified.

```
vr1@erx1 pools: ([10.227.11.242 10.227.11.250][10.227.11.226  
10.227.11.239]{10.227.11.208/255.255.255.240}{10.227.11.240/255.255.2  
55.240}{10.227.11.224/255.255.255.240})  
vr2@erx2: ([10.227.12.242 10.227.12.250][10.227.12.226  
10.227.12.239]{10.227.12.208/255.255.255.240}{10.227.12.240/255.255.2  
55.240}{10.227.12.224/255.255.255.240})
```

For information about the syntax for IP pools, see *Local IP Address Pools on JUNOSe VRs* on page 143.

Troubleshooting

You must specify the correct arguments for the **poolRepublish** command. In addition, the specified router and directory must be available for the command to execute successfully. If you do not meet these requirements and the prerequisites (see *Prerequisites* on page 151), the **poolRepublish** command cannot execute and displays an error message.

For example, if no SNMP read community is configured in the directory for the VR and you do not specify this value when you run the **poolRepublish** command, you will see the following error message:

```
Could not perform ip pools update due to No 'snmpReadCommunity' attribute is
provided for virtual router: vr1@bigfoot
```

If you run the **poolRepublish** command again and supply this SNMP read community, the command should run correctly.

Connecting to Routers

You can access the CLIs of JUNOSe routers and JUNOS routing platforms from Policy Editor and from SDX Admin through a Telnet or SSH connection. This access allows you to display and change the configuration of the router.

You must have the Telnet or SSH applications installed and available to Policy Editor or SDX Admin. You can open multiple Telnet or SSH sessions.

Using Policy Editor

To access a router from Policy Editor:

1. In the Policy Editor window, click Tools in the menu bar; then click Manage.

The Remote Access dialog box appears.

2. Use the field descriptions in *Remote Access Fields* on page 155 to fill in the fields, and then click Save.

A Telnet or an SSH window with a JUNOSe or JUNOS CLI prompt appears.

Remote Access Fields

Use the fields in this section to configure remote access to the router.

Address

- IP address or hostname of the router.
- Value—IP address
- Default—No value
- Example—192.0.2.1

Port Number

- TCP port over which you want to connect to the router.
- Value—TCP port
- Default—No value
- Example—22

Protocol

- Type of connection
- Value—telnet | ssh
- Default—telnet
- Example—ssh

Login Name

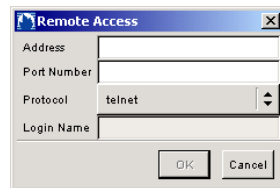
- Login name for SSH connections.
- Value—Text string
- Default—No value
- Guideline—You must enter a value for this property.
- Example—admin

Using SDX Admin

To access a router from SDX Admin:

1. In the navigation pane, expand the object *o = Network*.
2. Select the router to which you want to connect, and right-click.
3. Select Manage.

The Remote Access dialog box appears.



4. Fill in the fields (see the field descriptions in the section *Using Policy Editor* on page 154, and click OK.

A Telnet or an SSH window with a JUNOS CLI prompt appears.