



# Cisco Prime Network Registrar Components

---

Cisco Prime Network Registrar provides the tools to configure and control the servers necessary to manage your IP address space. This chapter provides an overview of the management components and concentrates on the Trivial File Transfer Protocol (TFTP) and Simple Network Management Protocol (SNMP), which are not covered in subsequent parts of this User Guide.

## Management Components

Cisco Prime Network Registrar contains two management components:

- Regional component, consisting of:
  - Web-based user interface (web UI)
  - Command line interface (CLI)
  - Central Configuration Management (CCM)
- Local component, consisting of:
  - Web UI
  - CLI
  - CCM server
  - Authoritative Domain Name System (DNS) server
  - Caching / Recursive Domain Name System (CDNS) server
  - Dynamic Host Configuration Protocol (DHCP) server
  - Trivial File Transport Protocol (TFTP) server
  - Simple Network Management Protocol (SNMP) server
  - Router Interface Configuration (RIC) server
  - Management of local address space, zones, scopes, DHCPv6 prefixes and links, and users



**Note**

---

We do not recommend configuring both DNS and Caching DNS services in one server.

---

License management is done from the regional cluster when Cisco Prime Network Registrar is installed. You must install the regional server first and load all licenses in the regional server. When you install the local cluster, it registers with regional to obtain its license.

The regional CCM server provides central management of local clusters, with an aggregated view of DHCP address space and DNS zones. It provides management of the distributed address space, zones, scopes, DHCPv6 prefixes and links, and users.

The local CCM server provides management of the local address space, zones, scopes, DHCPv6 prefixes and links, and users.

The remainder of this chapter describes the TFTP and SNMP protocols. The CCM server, web UIs, and CLI are described in [Chapter 2, “Cisco Prime Network Registrar User Interfaces.”](#) The DNS, CDNS, DHCP, and RIC servers are described in their respective sections of this guide.

## Trivial File Transfer

The Trivial File Transfer Protocol (TFTP) is a way of transferring files across the network using the User Datagram Protocol (UDP), a connectionless transport layer protocol. Cisco Prime Network Registrar maintains a TFTP server so that systems can provide device provisioning files to cable modems that comply with the Data Over Cable Service Interface Specification (DOCSIS) standard. The TFTP server buffers the DOCSIS file in its local memory as it sends the file to the modem. After a TFTP transfer, the server flushes the file from local memory. TFTP also supports non-DOCSIS configuration files.

Here are some of the features of the Cisco Prime Network Registrar TFTP server:

- Complies with RFCs 1123, 1350, 1782, and 1783
- Includes a high performance multithreaded architecture
- Supports IPv6
- Caches data for performance enhancements
- Is configurable and controllable in the web UI and using the **tftp** command in the CLI
- Includes flexible path and file access controls
- Includes audit logging of TFTP connections and file transfers
- Has a default root directory in the Cisco Prime Network Registrar *install-path/data/tftp*

### Related Topics

[Viewing and Editing the TFTP Server, page 1-2](#)

[Managing the TFTP Server Network Interfaces, page 1-3](#)

## Viewing and Editing the TFTP Server

At the local cluster, you can edit the TFTP server to modify its attributes. You must be assigned the server-management subrole of the ccm-admin role.

### Local Basic or Advanced Web UI

- 
- Step 1** From the **Operate** menu, choose **Manage Servers** under the **Servers** submenu to open the Manage Servers page (see the [“Managing Servers”](#) section on page 7-1).
- Step 2** Click the Local TFTP Server link in the left pane to open the Edit Local TFTP Server page. You can click the name of any attribute to open a description window for the attribute.
- Step 3** To unset any attribute value, check the check box in the Unset? column.

**Step 4** Click **Save** to save the changes or **Revert** to cancel the changes.

---

### CLI Commands

Use **tftp** to show the attribute values. Use **tftp set attribute=value** or **tftp enable attribute** to set or enable attributes. You can also use **tftp serverLogs show**, and **tftp serverLogs nlogs=number logsize=size**.

## Managing the TFTP Server Network Interfaces

You can manage the network interfaces for the TFTP server.

### Local Advanced Web UI

Manage the network interfaces associated with the TFTP server by clicking the **Network Interfaces** tab for the selected Local TFTP Server in the Manage Servers page. You can view the default configured network interfaces, and create and edit additional ones. To create and edit them, you must be assigned the server-management subrole of the ccm-admin role.

The columns in the Network Interfaces page are:

- **Name**—Name of the network interface, such as the LAN adapter, loopback, and Fast Ethernet interfaces. If the name is under the Configured Interfaces column, you can edit and delete the interface. Clicking the name opens the Edit TFTP Server Network Interface page so that you can edit the interface name and addresses. Make the changes and then click **Save** on this page.
- **IP Address**—IP address of the network interface.
- **IPv6 Address**—IPv6 address, if applicable, of the network interface.
- **Flags**—Flags for whether the interface should be zero-broadcast, virtual, v4, v6, no-multicast, or receive-only.
- **Configure**—To configure a new network interface, click the **Configure** icon next to the interface name. This creates another interface based on the one selected, but with a more general IP address, and adds this interface to the Configured Interfaces for this TFTP Server.
- **List of available interfaces for this TFTP server**—User-configured network interfaces, showing each name and associated address. Click the interface name to edit it or click the **Delete** icon to delete it.

To return to managing the server, click **Revert**.

### CLI Commands

Use the **tftp-interface** commands.

## Simple Network Management

The Cisco Prime Network Registrar Simple Network Management Protocol (SNMP) notification support allows you to query the DHCP and DNS counters, be warned of error conditions and possible problems with the DNS and DHCP servers, and monitor threshold conditions that can indicate failure or impending failure conditions.

Cisco Prime Network Registrar implements SNMP Trap Protocol Data Units (PDUs) according to the SNMPv2c standard. Each trap PDU contains:

- Generic-notification code, if enterprise-specific.
- A specific-notification field that contains a code indicating the event or threshold crossing that occurred.
- A variable-bindings field that contains additional information about certain events.

Refer to the Management Information Base (MIB) for the details. The SNMP server supports only reads of the MIB attributes. Writes to the attributes are not supported.

The following MIB files are required:

- **Traps**—CISCO-NETWORK-REGISTRAR-MIB.my
- **DNS server**—CISCO-DNS-SERVER-MIB.my




---

**Note** The Caching DNS server requires only a subset of the DNS MIB when it is operating. Caching DNS server only supports the *server-start* and *server-stop* notification events.

---

- **DHCPv4 server**—CISCO-IETF-DHCP-SERVER-MIB.my
- **DHCPv4 server capability**—CISCO-IETF-DHCP-SERVER-CAPABILITY.my
- **DHCPv4 server extensions**—CISCO-IETF-DHCP-SERVER-EXT-MIB.my
- **DHCPv4 server extensions capability**—CISCO-IETF-DHCP-SERVER-EXT-CAPABILITY.my
- **DHCPv6 server**—CISCO-NETREG-DHCPV6-MIB.my (experimental)



**Note**

---

The MIB, CISCO-NETREG-DHCPV6-MIB is defined to support query of new DHCP v6 related statistics and new DHCP v6 traps.

---

These MIB files are available in the /misc directory of the Cisco Prime Network Registrar installation path.

The following URL includes all files except the experimental CISCO-NETREG-DHCPV6-MIB.my file:

<ftp://ftp.cisco.com/pub/mibs/supportlists/cnr/cnr-supportlist.html>

The following dependency files are also required:

- **Dependency for DHCPv4 and DHCPv6**—CISCO-SMI.my
- **Additional dependencies for DHCPv6**—INET-ADDRESS-MIB.my

These dependency files are available along with all the MIB files at the following URL:

<ftp://ftp.cisco.com/pub/mibs/v2/>

To get the object identifiers (OIDs) for the MIB attributes, go to the equivalently named .oid file at:

<ftp://ftp.cisco.com/pub/mibs/oid/>

## Related Topics

[Setting Up the SNMP Server, page 1-5](#)

[How Notification Works, page 1-6](#)

[Handling SNMP Notification Events, page 1-7](#)

[Handling SNMP Queries, page 1-10](#)

## Setting Up the SNMP Server

To perform queries to the SNMP server, you need to set up the server properties.

### Local Basic or Advanced Web UI

- 
- Step 1** From the **Operate** menu, choose **Manage Servers** under the **Servers** submenu to open the Manage Servers page (see the [“Managing Servers” section on page 7-1](#)).
- Step 2** Click the **Local SNMP Server** link to open the Edit Local SNMP Server page.
- Step 3** The *Community string* attribute is the password to access the server. (The community string is a read community string only.) The preset value is **public**.
- Step 4** You can specify the Log Settings, Miscellaneous Options and Settings, and Advanced Options and Settings:
- *trap-source-addr*—Optional sender address to use for outgoing traps.
  - *server-active*—Determines whether the SNMP server is active for queries. The default value is true. If set to false, the server will run, but is not accessible for queries and does not send out traps.
  - *cache-ttl*—Determines how long the SNMP caches responds to queries, default to 60 seconds.
- Step 5** To manage the SNMP server interfaces in the Advanced mode, click the **Network Interfaces** tab. You can view the default configured network interfaces, and create and edit additional ones. To create and edit them, you must be assigned the server-management subrole of the ccm-admin role. The interface properties are similar to those for the TFTP server (see the [“Managing the TFTP Server Network Interfaces” section on page 1-3](#)).
- Step 6** To manage trap recipients for the server:
- a. Click the **Trap Recipients** tab.
  - b. Enter the name and IP address of a trap recipient (both are required).
  - c. Click **Add Trap Recipient**.
  - d. Repeat for each additional trap recipient.
  - e. To set the port, community string, and agent address for a trap recipient, click its name on the Trap Recipients tab to open the Edit Trap Recipient page, then set the values.
- Step 7** Complete the SNMP server setup by clicking **Save**.
- 

### CLI Commands

To set the community string in the CLI so that you can access the SNMP server, use **snmp set community=name**. Use **snmp set trap-source-addr** to set the trap source address. Use **snmp disable server-active** to deactivate the SNMP server and **snmp set cache-ttl=time** to set the cache time-to-live.

To set trap recipients, use **trap-recipient**, in the following syntax to include the IP address:

```
nrcmd> trap-recipient name create ip-addr=ip-addr
```

You can also add the *agent-address*, *community*, and *port-number* values for the trap recipient.

Other SNMP-related commands include **snmp disable server-active** to prevent the server from running when started and the **snmp-interface** commands to configure the interfaces. The **addr-trap** command is described in the [“Handling SNMP Notification Events” section on page 1-7](#).

## How Notification Works

Cisco Prime Network Registrar SNMP notification support allows a standard SNMP management station to receive notification messages from the DHCP and DNS servers. These messages contain the details of the event that triggered the SNMP trap.

Cisco Prime Network Registrar generates notifications in response to predetermined events that the application code detects and signals. Each event can also carry with it a particular set of parameters or current values. For example, the *free-address-low-threshold* event can occur in the scope with a value of 10% free. Other scopes and values are also possible for such an event, and each type of event can have different associated parameters.

Table 1-1 describes the events that can generate notifications.

**Table 1-1** SNMP Notification Events

Event	Notification
Address conflict with another DHCP server detected ( <i>address-conflict</i> )	An address conflicts with another DHCP server.
DNS queue becomes full ( <i>dns-queue-size</i> )	The DHCP server DNS queue fills and the DHCP server stops processing requests. (This is usually a rare internal condition.)
Duplicate IP address detected ( <i>duplicate-address</i> and <i>duplicate-address6</i> )	A duplicate IPv4 or IPv6 address occurs.
Duplicate IPv6 prefix detected ( <i>duplicate-prefix6</i> )	A duplicate IPv6 prefix occurs.
Failover configuration mismatch ( <i>failover-config-error</i> )	A DHCP failover configuration does not match between partners.
Caching DNS forwarders not responding ( <i>forwarders-not-responding</i> )	Forwarding servers stop responding to the Caching DNS server.
DNS forwarders responding ( <i>forwarders-responding</i> )	Forwarding servers respond after having been unresponsive.
Free-address thresholds ( <i>free-address-low</i> and <i>free-address-high</i> ; or <i>free-address6-low</i> and <i>free-address6-high</i> )	The high trap when the number of free IPv4 or IPv6 addresses exceeds the high threshold; or a low trap when the number of free addresses falls below the low threshold after previously triggering the high trap.
High-availability (HA) DNS configuration mismatch ( <i>ha-dns-config-error</i> )	An HA DNS configuration does not match between partners.
HA DNS partner not responding ( <i>ha-dns-partner-down</i> )	An HA DNS partner stops responding to the DNS server.
HA DNS partner responding ( <i>ha-dns-partner-up</i> )	An HA DNS partner responds after having been unresponsive.

**Table 1-1** *SNMP Notification Events (continued)*

Event	Notification
DNS masters not responding ( <i>masters-not-responding</i> )	Master DNS servers stop responding to the DNS server.
DNS masters responding ( <i>masters-responding</i> )	Master DNS servers respond after having been unresponsive.
Other server not responding ( <i>other-server-down</i> )	A DHCP failover partner, or a DNS or LDAP server, stops responding to the DHCP server.
Other server responding ( <i>other-server-up</i> )	DHCP failover partner, or a DNS or LDAP server, responds after having been unresponsive.
DNS secondary zones expire ( <i>secondary-zone-expired</i> )	A DNS secondary server can no longer claim authority for zone data when responding to queries during a zone transfer.
Server start ( <i>server-start</i> )	The DHCP or DNS server is started or reinitialized.
Server stop ( <i>server-stop</i> )	The DHCP or DNS server is stopped.

## Handling SNMP Notification Events

When Cisco Prime Network Registrar generates a notification, it transmits a single copy of the notification as an SNMP Trap PDU to each recipient. All events (and scopes or prefixes) share the list of recipients and other notification configuration data, and the server reads them when you initialize the notification.

You can set SNMP attributes in three ways:

- For the DHCP server, which includes the traps to enable and the default free-address trap configuration if you are not specifically configuring traps for scopes or prefixes (or their templates).
- On the scope or prefix (or its template) level by setting the *free-address-config* attribute.
- For the DNS server, which includes a *traps-enabled* setting.

To use SNMP notifications, you must specify trap recipients that indicate where trap notifications should go. By default, all notifications are enabled, but you must explicitly define the recipients, otherwise no notifications can go out. The IP address you use is often **localhost**.

The DHCP server provides special trap configurations so that it can send notifications, especially about free addresses for DHCPv4 and DHCPv6. You can set the trap configuration name, mode, and percentages for the low threshold and high threshold. The mode determines how scopes aggregate their free-address levels.

### DHCP v4 Notification

The DHCP v4 modes and thresholds are (see also the [“Handling Deactivated Scopes or Prefixes”](#) section on page 1-8):

- **scope mode**—Causes each scope to track its own free-address level independently (the default).
- **network mode**—Causes all scopes set with this trap configuration (through the scope or scope template *free-address-config* attribute) to aggregate their free-address levels if the scopes share the same *primary-subnet*.
- **selection-tags mode**—Causes scopes to aggregate their free-address levels if they share a primary subnet and have a matching list of selection tag values.

- **low-threshold**—Free-address percentage at which the DHCP server generates a low-threshold trap and re-enables the high threshold. The free-address level for scopes is the following calculation:  

$$\frac{100 * \text{available-nonreserved-leases}}{\text{total-configured-leases}}$$
- **high-threshold**—Free-address percentage at which the DHCP server generates a high-threshold trap and re-enables the low threshold.

## DHCP v6 Notification

The DHCP v6 modes and thresholds are (see also the [“Handling Deactivated Scopes or Prefixes”](#) section on page 1-8):

- **prefix mode**—Causes each prefix to track its own free-address level independently.
- **link mode**—Causes all prefixes configured for the link to aggregate their own free-address levels if all prefixes share the same link.
- **v6-selection-tags mode**—Causes prefixes to aggregate their free-address levels if they share a link and have a matching list of selection tag values.
- **low-threshold**—Free-address percentage at which the DHCP server generates a low-threshold trap and re-enables the high threshold. The free-address level for prefixes is the following calculation:  

$$\frac{100 * \text{max-leases} - \text{dynamic-leases}}{\text{max-leases}}$$
- **high-threshold**—Free-address percentage at which the DHCP server generates a high-threshold trap and re-enables the low threshold.

## Handling Deactivated Scopes or Prefixes

A deactivated scope or prefix never aggregates its counters with other scopes or prefixes. For example, if you configure a prefix with **link** or **v6-selection-tags** trap mode, and then deactivate the prefix, its counters disappear from the total count on the aggregation. Any changes to the leases on the deactivated prefix do not apply to the aggregate totals.

Therefore, to detect clients for deactivated scopes or prefixes, you must set the event mode to **scope** or **prefix**, and not to any of the aggregate modes (**network**, **selection-tags**, **link**, or **v6-selection-tags**).

The use case for setting traps on deactivated prefixes, for example, is network renumbering. In this case, you might want to monitor both the new prefixes (as an aggregate, ensuring that you have enough space for all the clients) and old prefixes to ensure that their leases are freed up. You would probably also want to set the high threshold on an old prefix to 90% or 95%, so that you get a trap fired when most of its addresses are free.

## Local Basic or Advanced Web UI

Access the SNMP attributes for the DHCP server by choosing **Manage Servers** from the **Operate** menu, then click **Local DHCP Server** in the left pane. You can view the SNMP attributes under SNMP (in Basic mode) or SNMP Settings (in Advanced mode) in the Edit DHCP Server page.

The four *lease-enabled* values (free-address6-low, free-address6-high, duplicate-address6, duplicate-prefix6) pertain to DHCPv6 only. Along with the traps to enable, you can specify the default free-address trap configuration by name, which affects all scopes and prefixes or links not explicitly configured.



To add a trap configuration, do the following:

- 
- Step 1** In Advanced mode, from the **Deploy** menu choose **Traps** under the **DHCP** submenu to access the DHCP trap configurations. The List/Add Trap Configurations page appears.
  - Step 2** Click the **Add Traps** icon in the left pane to open the Add AddrTrapConfig page.
  - Step 3** Enter the name, mode, and threshold percentages, then click **Add AddrTrapConfig**.
- 

To edit a trap configuration, do the following:

- 
- Step 1** Click the desired trap name in the Traps pane to open the Edit Trap Configuration page
  - Step 2** Modify the name, mode, or threshold percentages.
  - Step 3** Click the **on** option for the *enabled* attribute to enable the trap configuration.
  - Step 4** Click **Save** for the changes to take effect.
- 

To delete a trap configuration, select the trap in the Traps pane and click the **Delete** icon, then confirm or cancel the deletion.

### Regional Basic or Advanced Web UI

In the regional web UI, you can add and edit trap configurations as in the local web UI. You can also pull replica trap configurations and push trap configurations to the local cluster on the List/Add Trap Configurations page.

### Server Up/Down Traps

Every down trap must be followed by a corresponding up trap. However, this rule is not strictly applicable in the following scenarios:

1. If a failover partner or LDAP server or DNS server or HA DNS partner is down for a long time, down traps will be issued periodically. An up trap will be generated only when that server or partner returns to service.
2. If the DHCP or DNS server is reloaded or restarted, the prior state of the partner or related servers is not retained and duplicate down or up traps can result.



#### Note

---

Other failover partner or LDAP server or DNS server or HA DNS partner up or down traps occur only to communicate with that partner or server, and therefore may not occur when the other partner or server goes down or returns to service.

---

### CLI Commands

To set the trap values for the DHCP server at the local cluster, use **dhcp set traps-enabled=value**. You can also set the *default-free-address-config* attribute to the trap configuration. For example:

```
nrcmd> dhcp set traps-enabled=server-start,server-stop,free-address-low,free-address-high
nrcmd> dhcp set default-free-address-config=v4-trap-config
```

**Note**

If you do not define a *default-free-address-config* (or *v6-default-free-address-config* for IPv6), Cisco Prime Network Registrar creates an internal, unlisted trap configuration named **default-aggregation-addr-trap-config**. Because of this, avoid using that name for a trap configuration you create.

To define trap configurations for DHCPv4 and DHCPv6, use **addr-trap name create** followed by the *attribute=value* pairs for the settings. For example:

```
nrcmd> addr-trap v4-trap-conf create mode=scope low-threshold=25% high-threshold=30%
nrcmd> addr-trap v6-trap-conf create mode=prefix low-threshold=20% high-threshold=25%
```

## Handling SNMP Queries

You can use SNMP client applications to query the following MIBs:

- CISCO-DNS-SERVER-MIB.my
- CISCO-IETF-DHCP-SERVER-MIB.my
- CISCO-IETF-DHCP-SERVER-EXT-MIB.my
- CISCO-NETREG-DHCPV6-MIB.my (experimental)

When the SNMP server receives a query for an attribute defined in one of these MIBs, it returns a response PDU containing that attribute value. For example, using the NET-SNMP client application (available over the Internet), you can use one of these commands to obtain a count of the DHCPDISCOVER packets for a certain address:

```
C:\net-snmp5.2.2\bin>snmpget -m ALL -v 2c -c public
192.168.241.39:4444.iso.org.dod.internet.private.enterprises.cisco.ciscoExperiment.
ciscoIetfDhcpSrvMIB.ciscoIetfDhcpv4SrvMIBObjects.cDhcpv4Counters.cDhcpv4CountDiscovers
CISCO-IETF-DHCP-SERVER-MIB::cDhcpv4CountDiscovers.0 = Counter32: 0

C:\net-snmp5.2.2\bin>snmpget -m ALL -v 2c -c public
192.168.241.39:4444 1.3.6.1.4.1.9.10.102.1.3.1
CISCO-IETF-DHCP-SERVER-MIB::cDhcpv4CountDiscovers.0 = Counter32: 0
```

Both commands return the same results. The first one queries the full MIB attribute name, while the second one queries its OID equivalent (which can be less error prone). As previously described, the OID equivalents of the MIB attributes are located in the relevant files at the following URL:

<ftp://ftp.cisco.com/pub/mibs/oid/>

For example, the CISCO-IETF-DHCP-SERVER-MIB.oid file includes the following OID definition that corresponds to the previous query example:

```
"cDhcpv4CountDiscovers" "1.3.6.1.4.1.9.10.102.1.3.1"
```

Here are some possible SNMP query error conditions:

- The community string sent in the request PDU does not match what you configured.
- The version in the request PDU is not the same as the supported version (SNMPv2).
- If the object being queried does not have an instance in the server, the corresponding variable binding type field is set to SNMP\_NOSUCHINSTANCE. With a GetNext, if there is no next attribute, the corresponding variable binding type field is set to SNMP\_ENDOFMIBVIEW.
- If no match occurs for the OID, the corresponding variable binding type field is set to SNMP\_NOSUCHOBJECT. With a GetNext, it is set to SNMP\_ENDOFMIBVIEW.

- If there is a bad value returned by querying the attribute, the error status in the response PDU is set to `SNMP_ERR_BAD_VALUE`.

## Integrating Cisco Prime Network Registrar SNMP into System SNMP

You can integrate the Cisco Prime Network Registrar SNMP server into the SNMP server, for the system it runs on. The integration can be done in a way where the system will respond to queries for Cisco Prime Network Registrar MIB entries. On systems using NET-SNMP (and compatible servers) this is done by adding the following entries to the `/etc/snmp/snmpd.conf` configuration file

```
view systemview included .1.3.6.1.4.1.9.9
view systemview included .1.3.6.1.4.1.9.10

proxy -v 2c -c public 127.0.0.1:4444 .1.3.6.1.4.1.9.9
proxy -v 2c -c public 127.0.0.1:4444 .1.3.6.1.4.1.9.10
```

The community string `public` and the port number `4444` may have to be replaced if the Cisco Prime Network Registrar SNMP server has been configured with different values for those settings.

NET-SNMP is commonly available on Linux and other Unix-like systems. On other systems, similar mechanisms may also be available.

## Default Ports for Cisco Prime Network Registrar Services

Table 1-2 lists the default ports used for the Cisco Prime Network Registrar services.

**Table 1-2** Default Ports for Cisco Prime Network Registrar Services

Port Number	Protocol	Service
22	TCP	SSH remote login (RIC server to router)
23	TCP	Telnet (RIC server to router)
53	TCP/UDP	DNS
53	TCP/UDP	Caching DNS
67	UDP	DHCP client to server
67	TCP	Bulk or Active leasequery client to DHCP server
68	UDP	DHCP server to client
69	UDP	TFTP (optional) client to server
162	TCP	SNMP traps server to server
389	TCP	DHCP server to LDAP server
546	UDP	DHCPv6 server to client
547	UDP	DHCPv6 client to server
647	TCP	DHCP failover server to server
653	TCP	High-Availability (HA) DNS server to server
1234	TCP	Local cluster CCM server to server
1244	TCP	Regional cluster CCM server to server

**Table 1-2** *Default Ports for Cisco Prime Network Registrar Services (continued)*

<b>Port Number</b>	<b>Protocol</b>	<b>Service</b>
4444	TCP	SNMP client to server
5480	HTTPS	Virtual Appliance
8080	HTTP	Local cluster client to server web UI
8090	HTTP	Regional cluster client to server web UI
8443	HTTPS	Local cluster secure client to server web UI
8453	HTTPS	Regional cluster secure client to server web UI