Integrate SR-PCE

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SR-PCE Integration Workflow

This section explains the steps in integrating Cisco SR-PCE with Crosswork Network Controller.

The compatible versions of SR-PCE are Cisco IOS XR 7.11.1.

1. Install the compatible version of Cisco SR-PCE

Select the type of SR-PCE (for VMware ESXi or AWS) and follow the relevant install instructions in the Cisco IOS XRv 9000 Router Installation Guide.

2. Configure SR-PCE

Follow the instructions in Configure SR-PCE, on page 1.

3. Add SR-PCE provider and verify connectivity

Follow the instructions in Add Cisco SR-PCE Providers, on page 4.

Configure SR-PCE

This section explains how to configure SR-PCE after you have installed it.

Note The Cisco IOS XRv 9000 is the recommended platform to act as the SR-PCE.

Table 1: Configure SR-PCE

Step	Command or Action	Description
1	**configure** Example: `RP/0/RP0/CPU0:router# configure`	Enters mode.
2	**pce** Example: `RP/0/RP0/CPU0:router(config)# pce`	Enables PCE and enters PCE configuration mode.
3	**address ipv4** *address* Example: `RP/0/RP0/CPU0:router(config-pce)# address ipv4 192.168.0.1`	Configures a PCE IPv4 address.
4	**state-sync ipv4** *address* Example: `RP/0/RP0/CPU0:router(config-pce)# state-sync ipv4 192.168.0.3`	Configures the remote peer for state synchronization.
5	**tcp-buffer size** *size* Example: `RP/0/RP0/CPU0:router(config-pce)# tcp-buffer size 1024000`	Configures the transmit and receive TCP buffer size for each PCEP session, in bytes. The default buffer size is 256000. The valid range is from 204800 to 1024000.
6	**password** {**clear** | **encrypted**} *password* Example: `RP/0/RP0/CPU0:router(config-pce)# password encrypted pwd1`	Enables TCP MD5 authentication for all PCEP peers. Any TCP segment coming from the PCC that does not contain a MAC matching the configured password will be rejected. Specify if the password is encrypted or clear text. **Note** TCP-AO and TCP MD5 are never permitted to be used simultaneously.

Step	Command or Action	Description
7	**tcp-ao** *key-chain* [**include-tcp-options**] [**accept-ao-mismatch-connection**] Example: `RP/0/RP0/CPU0:router(config-pce)# tcp-ao pce_tcp_ao include-tcp-options`	Enables TCP Authentication Option (TCP-AO) authentication for all PCEP peers. Any TCP segment coming from the PCC that does not contain a MAC matching the configured key chain will be rejected. • **include-tcp-options**—Includes other TCP options in the header for MAC calculation. • **accept-ao-mismatch-connection**—Accepts connection even if there is a mismatch of AO options between peers. **Note** TCP-AO and TCP MD5 are never permitted to be used simultaneously.
8	**segment-routing** {**strict-sid-only** | **te-latency**} Example: `RP/0/RP0/CPU0:router(config-pce)# segment-routing strict-sid-only`	Configures the segment routing algorithm to use strict SID or TE latency. **Note** This setting is global and applies to all LSPs that request a path from this controller.
9	**timers** Example: `RP/0/RP0/CPU0:router(config-pce)# timers`	Enters timer configuration mode.
10	**keepalive** *time* Example: `RP/0/RP0/CPU0:router(config-pce-timers)# keepalive 60`	Configures the timer value for locally generated keep-alive messages. The default time is 30 seconds.
11	**minimum-peer-keepalive** *time* Example: `RP/0/RP0/CPU0:router(config-pce-timers)# minimum-peer-keepalive 30`	Configures the minimum acceptable keep-alive timer that the remote peer may propose in the PCEP OPEN message during session establishment. The default time is 20 seconds.
12	**reoptimization** *time* Example: `RP/0/RP0/CPU0:router(config-pce-timers)# reoptimization 600`	Configures the re-optimization timer. The default timer is 1800 seconds.
13	**exit** Example: `RP/0/RP0/CPU0:router(config-pce-timers)# exit`	Exits timer configuration mode and returns to PCE configuration mode.

What to do next:

Return to the installation workflow:

- VMware: Install Cisco Crosswork Network Controller on VMware vCenter
- AWS EC2: Install Cisco Crosswork Network Controller on AWS EC2

Sample SR-PCE config

This is a sample SR-PCE configuration:

```
pce
address ipv4 1.1.1.98
api
  user cisco                                {This is the username and password that the
credential profile used for the PCE will need to have for HTTP}
   password encrypted 032752180500701E1D48
!
```

Add Cisco SR-PCE Providers

Cisco Segment Routing Path Computation Elements (Cisco SR-PCE) providers supply device discovery, management, configuration-maintenance and route-calculation services to the Cisco Crosswork applications. At least one SR-PCE provider is required in order to learn and discover SR policies, Layer 3 links, and devices. You have the option to configure a second SR-PCE as a backup. Both SR-PCE devices must be connected to the same network as Crosswork Network Controller does not support managing more than one domain.

Note To enable Cisco Crosswork application access to an SR-PCE as an SDN controller on the management domain, SR-PCE needs to be added as a provider.

Follow the steps below to add (through the UI) one or more instances of Cisco SR-PCE as providers.

Before you begin

You will need to:

- Configure a device to act as the SR-PCE. See SR configuration documentation for your specific device platform to enable SR (for IS-IS or OSPF protocols) and configure an SR-PCE (for example: *Segment Routing Configuration Guide for Cisco NCS 540 Series Routers*).
- Create a credential profile for the Cisco SR-PCE provider. This should be a basic HTTP text-authentication credential (currently, MD5 authentication is not supported). If the Cisco SR-PCE server you are adding does not require authentication, you must still supply a credential profile for the provider, but it can be any profile that does not use the HTTP protocol.
- Know the name you want to assign to the Cisco SR-PCE provider. This is usually the DNS hostname of the Cisco SR-PCE server.
- Know the Cisco SR-PCE server IP address.

- Know the interface you want to use to communicate between Cisco SR-PCE and the Cisco Crosswork application server.
- Determine whether you want to auto-onboard the devices that Cisco SR-PCE discovers and, if so, whether you want the new devices to have their management status set to **`off`**, **`managed`** or **`unmanaged`** when added.
- If you plan to auto-onboard devices that the Cisco SR-PCE provider discovers, and set them to a managed state when they are added to the database:
  - Assign an existing credential profile for communication with the new managed devices.
  - The credential profile must be configured with an SNMP protocol.
- For high availability, ensure that you set up two separate Cisco SR-PCE providers with unique names and IP addresses, but with matching configurations.

Step 1 From the main menu, choose **Administration** > **Manage Provider Access**.

Step 2 Click  .

Step 3 Enter the following values for the SR-PCE provider fields:

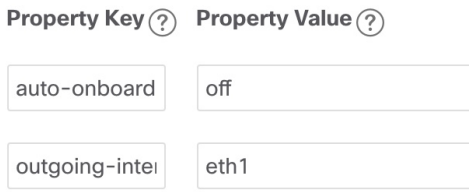
a) Required fields:

- **Provider Name**: Name of the SR-PCE provider.
- **Credential Profile**: Select the previously created Cisco SR-PCE credential profile.
- **Family**: Select **`SR_PCE`**. All other options should be ignored.
- **Protocol**: Select **`HTTP`**.
- **IP Address/ Subnet Mask**: Enter the IP address (IPv4 or IPv6) and subnet mask of the server.
- **Port**: Enter **`8080`** for the port number.
- **Provider Properties**: Enter one of the following key/value pairs in the first set of fields:

Property Key	Value
`auto-onboard`	`off` **Note** Use this option if you plan to manually (via UI or CSV import) enter all of your network devices. When devices are discovered, the device data is recorded in the Cisco SR-PCE database, but is not registered in Cisco Crosswork Inventory Management database.

Property Key	Value
auto-onboard	**unmanaged** If this option is enabled, all devices that Cisco Crosswork discovers will be registered in the Cisco Crosswork Inventory Management database, with their configured state set to **unmanaged**. SNMP polling will be disabled for these devices, and no management IP information will be included. To get these devices into the **managed** state later, you will need to either edit them via the UI or export them to a CSV make modifications and then import the updated CSV. You can also assign credential profiles by adding them to the device CSV file before import (the credential profiles must already exist).
auto-onboard	**managed** If this option is enabled, all devices that Cisco SR-PCE discovers will be registered in the Cisco Crosswork Inventory Management database, with their configured state set to **managed**. SNMP polling will be enabled for these devices, and Cisco SR-PCE will also report the management IP address (TE Router ID for IPv4, or IPv6 Router ID for IPv6 deployment). The devices will be added with the credential profile associated with the device-profile key in the SR-PCE provider configuration.
device-profile	The name of a credential profile that contains SNMP credentials for all the new devices. **Note** This field is necessary only if **auto-onboard** is set to **managed** or **unmanaged**.
outgoing-interface	**eth1** **Note** You have to set this only if you want to enable Cisco Crosswork application access to SR-PCE via the data network interface when using the two NIC configuration.
topology	**off** or **on**. This is an optional property. If not specified, the default value is **on**. If value is specified as **off**, it means that L3 topology is not accessible for the SR-PCE provider.
pce	**off** or **on**. This is an optional property. If not specified, the default value is **on**. If value is specified as **off**, it means that LSPs and policies are not accessible for the SR-PCE provider.

Figure 1: Provider Property Key and Value Example



Note If **managed** or **unmanaged** options are set and you want to delete a device later, you must do one of the following:.

- Reconfigure and remove the devices from the network before deleting the device from Cisco Crosswork. This avoids Cisco Crosswork from rediscovering and adding the device back.
- Set auto-onboard to **off**, and then delete the device from Cisco Crosswork. However, doing so will not allow Cisco Crosswork to detect or auto-onboard any new devices in the network.

b) Optional values:

- **Timeout**: The amount of time (in seconds) to wait before timing out the connection to the SR-PCE server. The default is 30 seconds.

Step 4 When you have completed entries in all of the required fields, click **Save** to add the SR-PCE provider.

Step 5 Confirm that the SR-PCE provider shows a green Reachability status without any errors. You can also view the Events window (**Administration** > **Events**) to see if the provider has been configured correctly.

Step 6 Repeat this process for each SR-PCE provider.

Note It is not recommended to modify auto-onboard options once set. If you need to modify them, do the following:

1. Delete the provider and wait until deletion confirmation is displayed in the Events window.
2. Re-add the provider with the updated auto-onboard option.
3. Confirm the provider has been added with the correct auto-onboard option in the Events window.

What to do next

- If you entered the **`auto-onboard`**/**`off`** pair, navigate to **Device Management** > **Network Devices** to add a devices.
- If you opted to automatically onboard devices, navigate to **Device Management** > **Network Devices** to view the device list. To add more node information such as geographical location details, export the device list (.csv), update it, and import it back. If geographical location data is missing, you will only be able to see device topology using the logical map.

Return to the installation workflow:

- VMware: Install Cisco Crosswork Network Controller on VMware vCenter

- AWS EC2: Install Cisco Crosswork Network Controller on AWS EC2