Initial configuration

in body: To install Cisco Cyber Vision on a Cisco switch, you must perform the Initial configuration which steps are described in this section.

Configure the switch access

To configure each Cisco switch access refer to its corresponding installation guide available through the following links:

- Cisco Catalyst IE3x00:

  https://www.cisco.com/c/en/us/support/switches/catalyst-ie3300-rugged-series/series.html#~tab-documents

  https://www.cisco.com/c/en/us/support/switches/catalyst-ie3400-rugged-series/series.html#~tab-documents

  https://www.cisco.com/c/en/us/support/switches/catalyst-ie3400-heavy-duty-series/series.html

- Cisco Catalyst IE9x00:

  https://www.cisco.com/c/en/us/support/switches/catalyst-ie9300-rugged-series/series.html

- Cisco Catalyst 9x00:

  https://www.cisco.com/c/en/us/support/switches/catalyst-9300-series-switches/series.html#~tab-documents

  https://www.cisco.com/c/en/us/support/switches/catalyst-9400-series-switches/series.html#~tab-documents

Check the software version

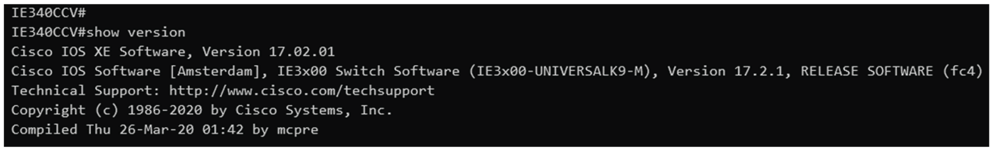
- Check the software version using the following command in the switch's CLI:

```
Show version
```

To be compatible with the Cisco Cyber Vision Sensor Application:

- the displayed version for Cisco IE3x00 and Cisco Catalyst 9x00 must be 17.02.01 or higher.
- the displayed version for Cisco IE9x00 must be 17.09.01 or higher.

For example: Cisco IE3400



```
IE340CCV#
IE340CCV#show version
Cisco IOS XE Software, Version 17.02.01
Cisco IOS Software [Amsterdam], IE3x00 Switch Software (IE3x00-UNIVERSALK9-M), Version 17.2.1, RELEASE SOFTWARE (fc4)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2020 by Cisco Systems, Inc.
Compiled Thu 26-Mar-20 01:42 by mcpre
```

If the version is lower, you must update the switch firmware. To do so, follow the links to the products page in Configure the switch access.

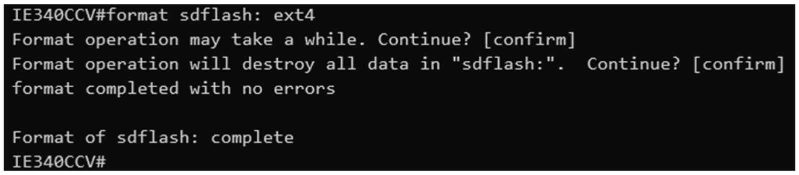
SD Card (IE3x00/IE9x00)

If not already done, insert a 4GB Cisco SD card minimum into the switch SD card slot.

Then, you format or partition the SD card.

- You can format the SD card for Ie3x00 using following command:

```
format sdflash: ext4
```



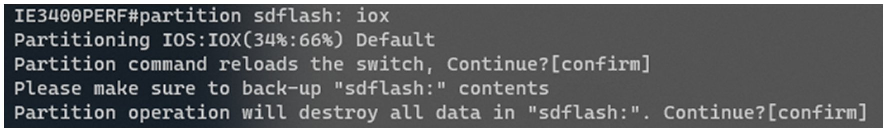
```
IE340CCV#format sdflash: ext4
Format operation may take a while. Continue? [confirm]
Format operation will destroy all data in "sdflash:".  Continue? [confirm]
format completed with no errors

Format of sdflash: complete
IE340CCV#
```

Partition command is not supported on Ie9x00.

- You can partition the SD card for Ie3x00 and Ie9x00 with following command:

```
partition sdflash: iox
```

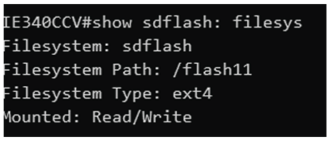


```
IE3400PERF#partition sdflash: iox
Partitioning IOS:IOX(34%:66%) Default
Partition command reloads the switch, Continue?[confirm]
Please make sure to back-up "sdflash:" contents
Partition operation will destroy all data in "sdflash:". Continue?[confirm]
```

Partition is intended for SD swap drive usage. For more information, refer to the corresponding switch user manual.

- You can check the file system using the following command (check for ext4 and Read/Write):

```
show sdflash: filesys
```



```
IE340CCV#show sdflash: filesys
Filesystem: sdflash
Filesystem Path: /flash11
Filesystem Type: ext4
Mounted: Read/Write
```

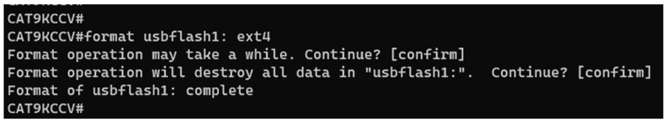
SSD Disk (Catalyst 9x00)

When a deploying a sensor on a Catalyst 9x00, you have the option to include an SSD or not. If you choose to use an SSD, follow the steps below. Otherwise, proceed to the next step: Check the date and time.

If not already done, insert a 120GB Cisco SSD disk minimum in the SSD slot.

- You can format the SSD disk using the following command:

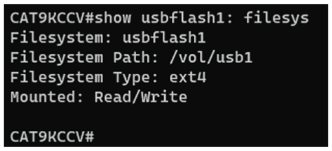
  ```
  format usbflash1: ext4
  ```



```
CAT9KCCV#
CAT9KCCV#format usbflash1: ext4
Format operation may take a while. Continue? [confirm]
Format operation will destroy all data in "usbflash1:".  Continue? [confirm]
Format of usbflash1: complete
CAT9KCCV#
```

- You can check the file system using the following command (check for ext4 and Read/Write):

  ```
  show usbflash1: filesys
  ```



```
CAT9KCCV#show usbflash1: filesys
Filesystem: usbflash1
Filesystem Path: /vol/usb1
Filesystem Type: ext4
Mounted: Read/Write

CAT9KCCV#
```

Check date and time

The internal clock of the switch must be synchronized and configured properly.

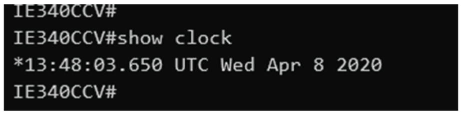
Note Unlike hardware sensors (i.e. Cisco IC3000) that fetch their time from the Center, the Cyber Vision IOX application sensor gets the time from the host (switch platform). Therefore, it is critical that the host synchronizes its time with the Center or a valid NTP server if it's synchronized with the Center. If the time difference is large (hours or more), the user should adjust the Cisco IE3400 time using the Local Manager so it is close to the reference time. If not, the synchronization may take many update cycles.

1. Check the date and time using the following command:

   ```
   Show clock
   ```

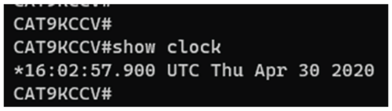
   For examples:

Cisco IE3400:



```
IE340CCV#
IE340CCV#show clock
*13:48:03.650 UTC Wed Apr 8 2020
IE340CCV#
```

Cisco Catalyst 9300:



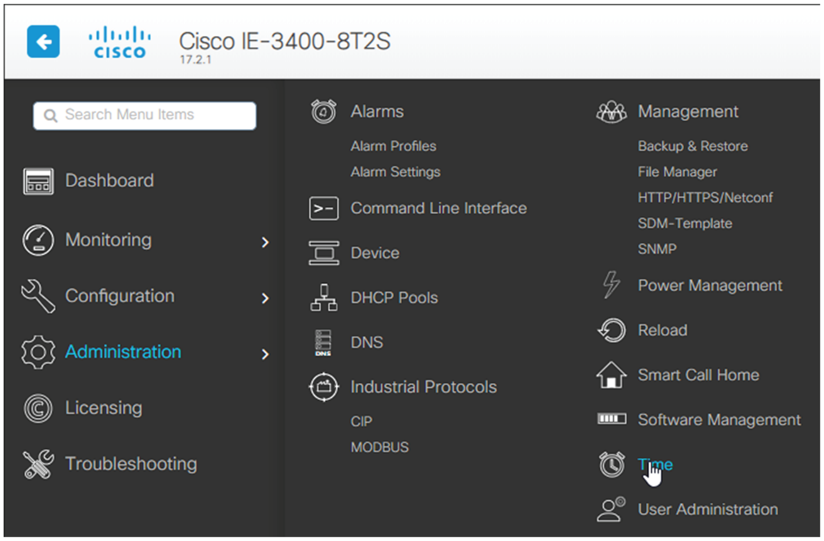
```
CAT9KCCV#
CAT9KCCV#show clock
*16:02:57.900 UTC Thu Apr 30 2020
CAT9KCCV#
```

2. If needed, adjust to the UTC time using the following command:

   ```
   clock set [hh:mm:ss] [month] [day] [year]
   ```

   Or go to the Local Manager:

   For example: Cisco IE3400



Enable IOx

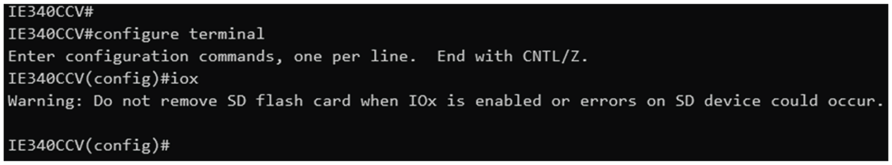
Before installing the Cisco Cyber Vision sensor on the hardware, you must enable IOx.

1. Enable IOx using the following command:

   ```
   configure terminal
   iox
   ```

   For examples:

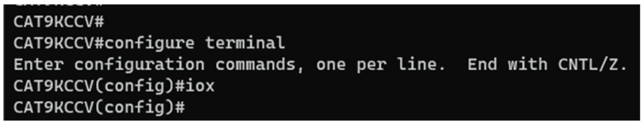
   Cisco IE3400:



```
IE340CCV#
IE340CCV#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
IE340CCV(config)#iox
Warning: Do not remove SD flash card when IOx is enabled or errors on SD device could occur.

IE340CCV(config)#
```

Cisco Catalyst 9300:



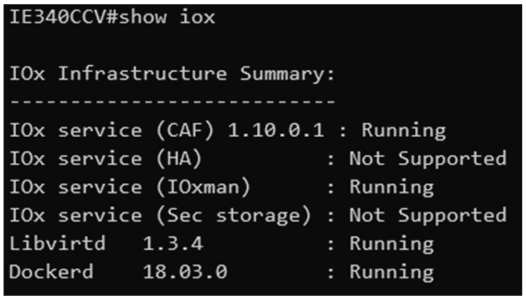
```
CAT9KCCV#
CAT9KCCV#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
CAT9KCCV(config)#iox
CAT9KCCV(config)#
```

2. Check the IOx service status using the following command:

```
exit
show iox
```

For examples:

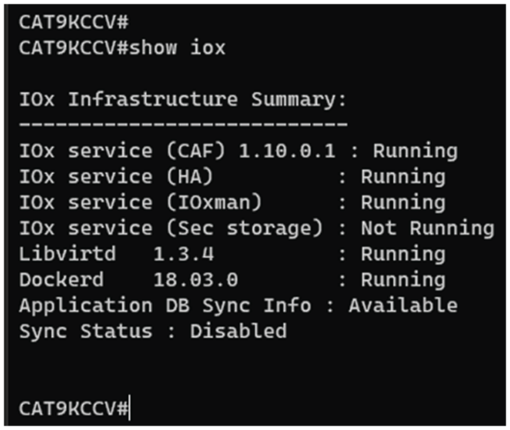
Cisco IE3400:



```
IE340CCV#show iox

IOx Infrastructure Summary:
---------------------------
IOx service (CAF) 1.10.0.1 : Running
IOx service (HA)           : Not Supported
IOx service (IOxman)       : Running
IOx service (Sec storage) : Not Supported
Libvirtd   1.3.4           : Running
Dockerd    18.03.0         : Running
```

Cisco Catalyst 9300:



```
CAT9KCCV#
CAT9KCCV#show iox

IOx Infrastructure Summary:
---------------------------
IOx service (CAF) 1.10.0.1 : Running
IOx service (HA)           : Running
IOx service (IOxman)       : Running
IOx service (Sec storage) : Not Running
Libvirtd   1.3.4           : Running
Dockerd    18.03.0         : Running
Application DB Sync Info : Available
Sync Status : Disabled


CAT9KCCV#
```

Add the necessary configuration parameters (IE3x00)

In industrial networking environments, efficient communication between internal applications and external servers is essential for seamless operations. However, the requirement for each application to have a public routable IP address, in addition to the IP address for switch management, poses challenges for network administrators. IOS version 17.14 introduces a new feature called “L3NAT for IOx Applications” to avoid to create a dedicated IP address for a Cyber Vision sensor embedded in a IE3x00 switches. 2 solutions are available to deploy a Cyber Vision sensor:

- The usage of a dedicated IP address for the Cyber Vision sensor
- The new feature in IOS 17.14, "L3NAT for IOx Applications," allows you to use the switch's management IP as a proxy for all network applications.

Sensor Configuration with an External IP Address

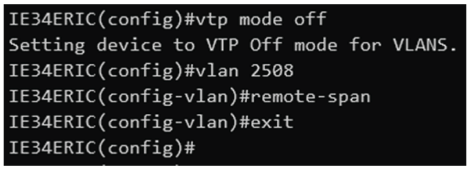
The example of configuration given below is a simple one. This configuration is only valid if a direct link exists between the Center and the switch with the embedded sensor. In this case, the dedicated port is configured with the Collection VLAN (for example, 507). In many other cases, the port used for communication between the Center and the sensor will have to be configured as trunk.

Procedure

Step 1 Open the Cisco IE3300 10G/IE3400 CLI through ssh or via the console terminal.

Step 2 Configure a VLAN for traffic mirroring using the following commands:

```
configure terminal
vtp mode off
vlan 2508
remote-span
exit
```



```
IE34ERIC(config)#vtp mode off
Setting device to VTP Off mode for VLANS.
IE34ERIC(config)#vlan 2508
IE34ERIC(config-vlan)#remote-span
IE34ERIC(config-vlan)#exit
IE34ERIC(config)#
```

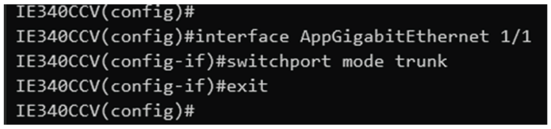
The VTP off command is performed here since VTP is enabled by default and is not compatible with a high VLAN number.

If needed, select another VLAN number and use the VTP configuration requested by the network.

Step 3 Configure the AppgigabitEthernet port for communications to reach the IOx virtual application.

If communication with the sensor is done on VLAN1, the native VLAN of the Appgigabit interface must be changed to a different value, where "xxx" is the existing VLAN in the switch.

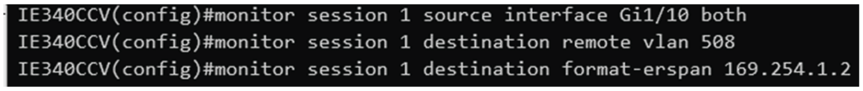
```
interface AppGigabitEthernet 1/1
switchport mode trunk
switchport trunk native vlan xxx
exit
```



```
IE340CCV(config)#
IE340CCV(config)#interface AppGigabitEthernet 1/1
IE340CCV(config-if)#switchport mode trunk
IE340CCV(config-if)#exit
IE340CCV(config)#
```

Step 4 Configure the SPAN session and add to the session the interfaces to monitor:

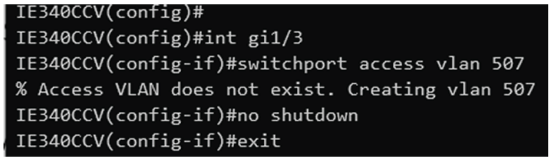
```
monitor session 1 source interface Gi1/10 both
monitor session 1 destination remote vlan 2508
monitor session 1 destination format-erspan 169.254.1.2
```



```
IE340CCV(config)#monitor session 1 source interface Gi1/10 both
IE340CCV(config)#monitor session 1 destination remote vlan 508
IE340CCV(config)#monitor session 1 destination format-erspan 169.254.1.2
```

Step 5 Configure one of the switch's ports to enable the communication between the virtual sensor and the Center:

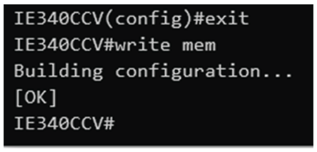
```
int gi1/3
switchport access vlan 507
no shutdown
```



```
IE340CCV(config)#
IE340CCV(config)#int gi1/3
IE340CCV(config-if)#switchport access vlan 507
% Access VLAN does not exist. Creating vlan 507
IE340CCV(config-if)#no shutdown
IE340CCV(config-if)#exit
```

Step 6 Save the configuration using the following commands:

```
exit
write mem
```



```
IE340CCV(config)#exit
IE340CCV#write mem
Building configuration...
[OK]
IE340CCV#
```

What to do next

Once you are done with the initial configuration, proceed with the application installation and deployment following one of the procedures below with in mind the IP used in the system with the l3nat_iox feature enabled:

- Procedure with the Cisco Cyber Vision sensor management extension
- Procedure with the Local Manager
- Procedure with the CLI

Sensor Configuration with Layer 3 Network Address Translation

Overview

The Layer3 Network Address Translation (L3NAT) for IOx applications is supported starting with IOS-XE release 17.14.1. This feature uses the management IP of the switch as a proxy for all applications within the routed network. The complexity and overhead associated with managing multiple public IP addresses are reduced. The IE3x00 platform supports the L3NAT feature with the Cisco Cyber Vision (CCV) IOx application. However, it cannot be used to NAT other Ethernet traffic from hosts connected to its physical Ethernet ports.

L3NAT-IOx

L3NAT is a networking technique used to translate private IP addresses in an internal network to a public IP address before packets are sent to an external network at the network layer of the OSI model. The L3NAT-IOx feature utilizes hardware components such as Application-Specific Integrated Circuits (ASICs) and Field-Programmable Gate Arrays (FPGAs) for implementation.

When a Cyber Sensor application communicates with the external CCV server, the NAT protocol translates the source private IP address of the Cyber Sensor Application to the public IP address of the Management Switched Virtual Interface (SVI) of the switch. This translation allows the packets to navigate through the external network, gives the impression that they originate from the switch management SVI IP address.

When the external CCV server communicates with the Cyber Sensor Application, the NAT protocol reverses the translation. Incoming packets addressed to the public IP address of the switch management SVI are translated to the private IP address of the destination Cyber Sensor Application. This ensures seamless communication between the application and external servers.

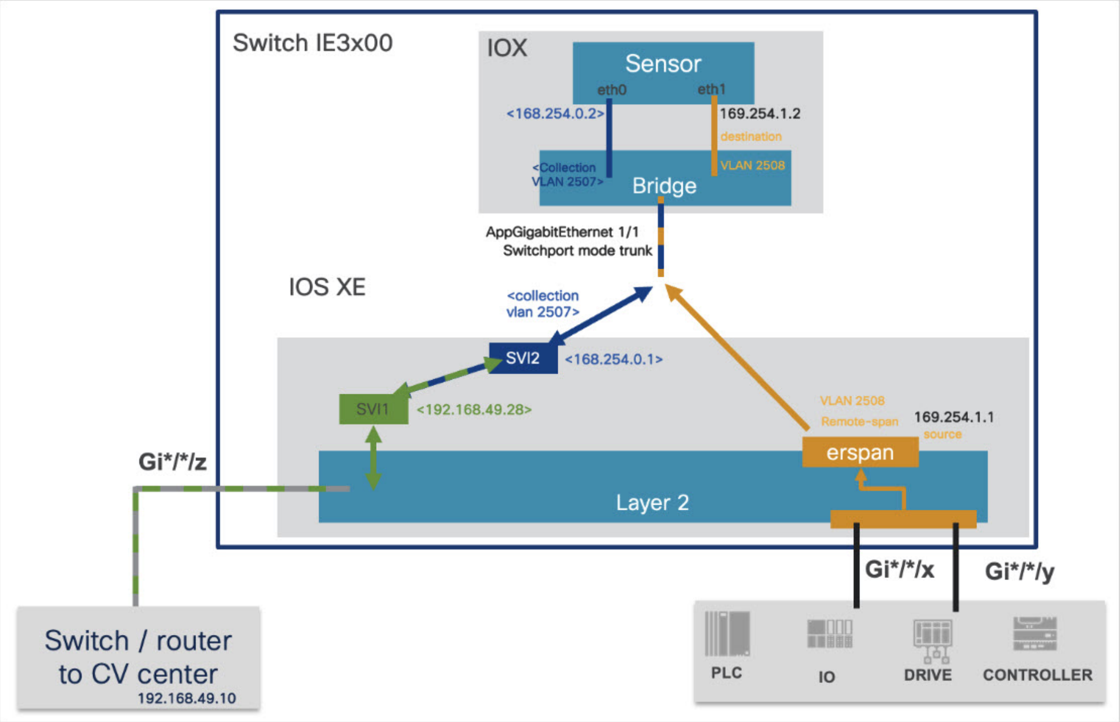
Guidelines and Restrictions

The guidelines and restrictions for L3NAT-IOx are as follows:

- This feature only works with the CCV application and doesn't support any other IOx applications.
- Only static translation is supported.
- Translation is restricted to TCP and UDP packets exclusively.
- Users need to set up an extra SVI on IE for the private network used by the application. The IP assigned to this SVI will act as the default gateway for the application.
- This feature requires a Network Advantage license.
- You can not retrieve L3NAT-IOx statistics using YANG with Network Configuration Protocol (NETCONF).

Configuring L3NAT-IOx

The configuration example is based on the following topology:



The above diagram shows application hosting on the switch using a Private IP address. The CCV sensor application is installed on the access devices connected to hosts. Devices located in the 192.168.49.0/24 network are assigned management IP addresses. The CCV sensor is installed using the private IP network 169.254.0.1/30.

Procedure

Step 1 Set up the SVI for the 169.254.0.x network with an IP address to be the default gateway for the application.

```
Switch(config)# int vlan 2507
```

```
Switch(config-if)# ip address 169.254.0.1 255.255.255.252
```

Step 2 Set up the SVI for the 192.168.49.10/24 network with an IP address acting as the public IP to access the CCV center.

```
Switch(config)# int vlan 49
```

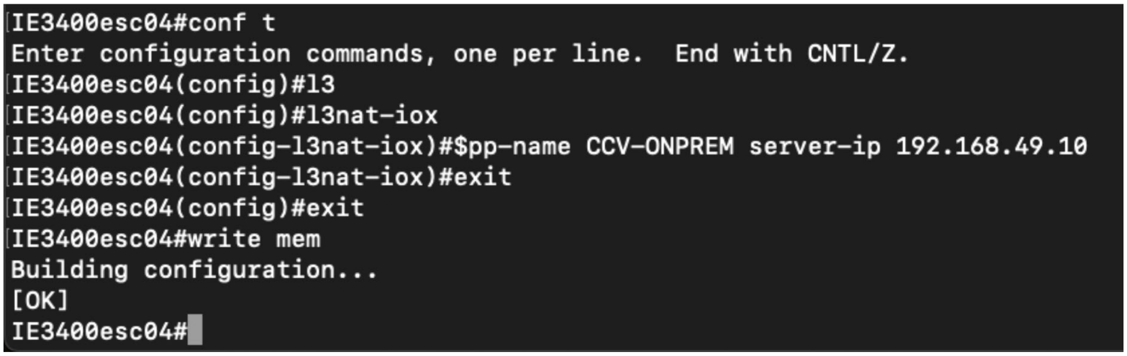
```
Switch(config-if)# ip address 192.168.49.28 255.255.255.0
```

Step 3 Configure the L3NAT-IOx.

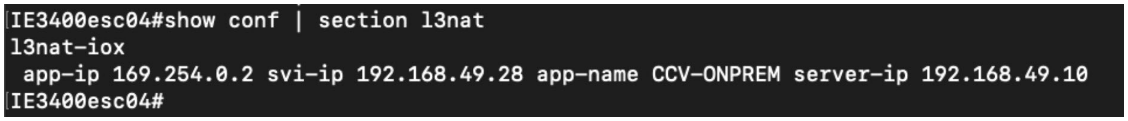
```
Switch# configure terminal
```

```
Switch(config)# l3nat-iox
```

```
Switch(config-iox-nat)# app-ip 169.254.0.2 svi-ip 192.168.49.28 app-name CCV-ONPREM server-ip
 192.168.49.10
```



```
[IE3400esc04#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
[IE3400esc04(config)#l3
[IE3400esc04(config)#l3nat-iox
[IE3400esc04(config-l3nat-iox)#$pp-name CCV-ONPREM server-ip 192.168.49.10
[IE3400esc04(config-l3nat-iox)#exit
[IE3400esc04(config)#exit
[IE3400esc04#write mem
Building configuration...
[OK]
IE3400esc04#
```



```
[IE3400esc04#show conf | section l3nat
l3nat-iox
 app-ip 169.254.0.2 svi-ip 192.168.49.28 app-name CCV-ONPREM server-ip 192.168.49.10
[IE3400esc04#
```

What to do next

Once you are done with the initial configuration, proceed with the application installation and deployment following one of the procedures below with in mind the IP used in the system with the l3nat_iox feature enabled:

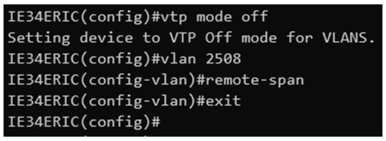
- Procedure with the Cisco Cyber Vision sensor management extension
- Procedure with the Local Manager
- Procedure with the CLI

Configuring the Other Necessary Parameters

Procedure

Step 1 Set up a VLAN for mirroring traffic with these commands:

```
configure terminal
vtp mode off
vlan 2508
remote-span
exit
```



```
IE34ERIC(config)#vtp mode off
Setting device to VTP Off mode for VLANS.
IE34ERIC(config)#vlan 2508
IE34ERIC(config-vlan)#remote-span
IE34ERIC(config-vlan)#exit
IE34ERIC(config)#
```

The VTP off command is performed here since VTP is enabled by default and is not compatible with a high VLAN number.

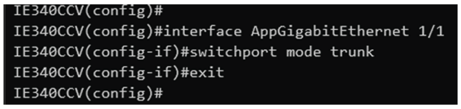
If needed, select another VLAN number and use the VTP configuration requested by the network.

Step 2 Configure the AppgigabitEthernet port for communications to reach the IOx virtual application.

```
interface AppGigabitEthernet 1/1

switchport mode trunk

exit
```



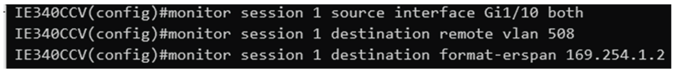
```
IE340CCV(config)#
IE340CCV(config)#interface AppGigabitEthernet 1/1
IE340CCV(config-if)#switchport mode trunk
IE340CCV(config-if)#exit
IE340CCV(config)#
```

Step 3 Configure the SPAN session and add to the monitor:

```
monitor session 1 source interface Gi1/10 both

monitor session 1 destination remote vlan 2508

monitor session 1 destination format-erspan 169.254.1.2
```

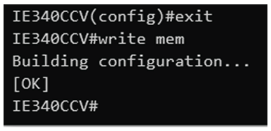


```
IE340CCV(config)#monitor session 1 source interface Gi1/10 both
IE340CCV(config)#monitor session 1 destination remote vlan 508
IE340CCV(config)#monitor session 1 destination format-erspan 169.254.1.2
```

Step 4 Save the configuration using the following commands:

```
exit

write mem
```



```
IE340CCV(config)#exit
IE340CCV#write mem
Building configuration...
[OK]
IE340CCV#
```

What to do next

Once you are done with the initial configuration, proceed with the application installation and deployment following one of the procedures below with in mind the IP used in the system with the l3nat_iox feature enabled:

- Procedure with the Cisco Cyber Vision sensor management extension
- Procedure with the Local Manager
- Procedure with the CLI

Add the necessary configuration parameters (Catalyst 9x00/IE9x00)

The configuration examples given in this section are simple ones. They are only valid if a direct link exists between the Center and the switch with the embedded sensor. In this case, the dedicated port is configured with the Collection VLAN (for example, 507). In many other cases, the port used for communication between the Center and the sensor will have to be configured as trunk.

Configuration with ERSPAN is recommended but requires routing to be enabled on the switch. If this is not possible, RSPAN is available on the Catalyst 9x00. However, note that Multicast and VLAN information will be missing with this configuration.

Configure with ERSPAN

Procedure

Step 1 Open the switch's CLI through ssh or via the console terminal.

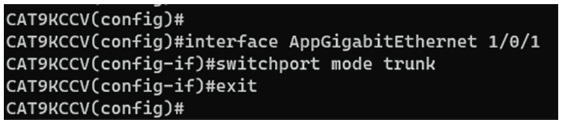
Step 2 Configure a VLAN for traffic mirroring using the following commands:

```
configure terminal
ip routing
vlan 2508
exit
int vlan 2508
ip address 169.254.1.1 255.255.255.252
no shutdown
exit
```

Step 3 Configure the AppGigabitEthernet port which will enable the communication to the IOx virtual application.

If communication with the sensor is done on VLAN1, the native VLAN of the Appgigabit interface must be changed to a different value, where "xxx" is the existing VLAN in the switch.

```
interface AppGigabitEthernet 1/0/1
switchport mode trunk
switchport trunk native vlan xxx
exit
```



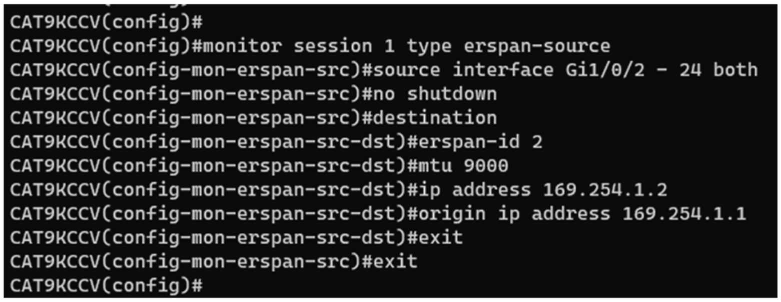
```
CAT9KCCV(config)#
CAT9KCCV(config)#interface AppGigabitEthernet 1/0/1
CAT9KCCV(config-if)#switchport mode trunk
CAT9KCCV(config-if)#exit
CAT9KCCV(config)#
```

Step 4 Configure the SPAN session and add to the session the interfaces to monitor:

Note Disabling the ip routing command for IPv4 connections and ipv6 unicast-routing command for IPv6 connections stops ERSPAN traffic flow to the destination port. Link to Catalyst 9300 manual.

```
monitor session 1 type erspan-source
source interface Gi1/0/2 - 24 both
no shutdown
destination
```

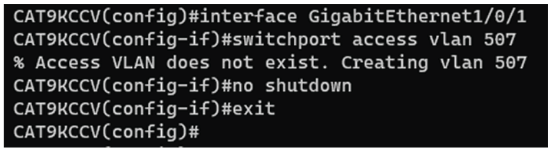
```
erspan-id 2
mtu 9000
ip address 169.254.1.2
origin ip address 169.254.1.1
exit
exit
```



```
CAT9KCCV(config)#
CAT9KCCV(config)#monitor session 1 type erspan-source
CAT9KCCV(config-mon-erspan-src)#source interface Gi1/0/2 - 24 both
CAT9KCCV(config-mon-erspan-src)#no shutdown
CAT9KCCV(config-mon-erspan-src)#destination
CAT9KCCV(config-mon-erspan-src-dst)#erspan-id 2
CAT9KCCV(config-mon-erspan-src-dst)#mtu 9000
CAT9KCCV(config-mon-erspan-src-dst)#ip address 169.254.1.2
CAT9KCCV(config-mon-erspan-src-dst)#origin ip address 169.254.1.1
CAT9KCCV(config-mon-erspan-src-dst)#exit
CAT9KCCV(config-mon-erspan-src)#exit
CAT9KCCV(config)#
```

Step 5 Configure one of the switch's ports to enable the communication between the virtual sensor and the Center:

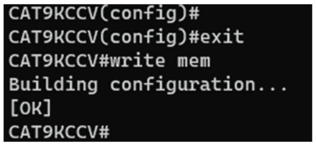
```
interface GigabitEthernet1/0/1
switchport access vlan 507
no shutdown
exit
```



```
CAT9KCCV(config)#interface GigabitEthernet1/0/1
CAT9KCCV(config-if)#switchport access vlan 507
% Access VLAN does not exist. Creating vlan 507
CAT9KCCV(config-if)#no shutdown
CAT9KCCV(config-if)#exit
CAT9KCCV(config)#
```

Step 6 Save the configuration:

```
exit
write mem
```



```
CAT9KCCV(config)#
CAT9KCCV(config)#exit
CAT9KCCV#write mem
Building configuration...
[OK]
CAT9KCCV#
```

What to do next

The initial configuration is now complete. Proceed with the application installation and deployment following one of the procedures below:

- Procedure with the Cisco Cyber Vision sensor management extension
- Procedure with the Local Manager
- Procedure with the CLI

Configure with RSPAN (Catalyst 9x00 only)

Before you begin

The VLAN configured for RSPAN (here 2508) must be filtered on all trunk ports except for the AppGigabitEthernet interface.

Procedure

Step 1 Open the switch's CLI through ssh or via the console terminal.

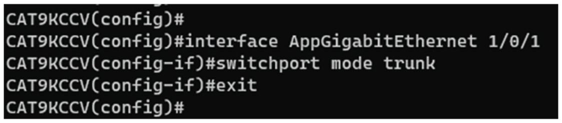
Step 2 Configure a VLAN for traffic mirroring using the following commands:

```
configure terminal
vlan 2508
exit
int vlan 2508
remote-span
exit
```

Step 3 Configure the AppGigabitEthernet port which will enable the communication to the IOx virtual application.

If communication with the sensor is done on VLAN1, the native VLAN of the Appgigabit interface must be changed to a different value, where "xxx" is the existing VLAN in the switch.

```
interface AppGigabitEthernet 1/0/1
switchport mode trunk
switchport trunk native vlan xxx
exit
```



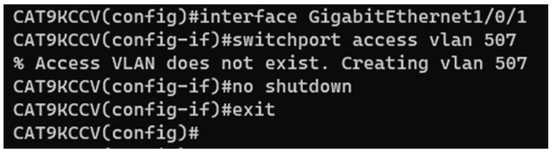
```
CAT9KCCV(config)#
CAT9KCCV(config)#interface AppGigabitEthernet 1/0/1
CAT9KCCV(config-if)#switchport mode trunk
CAT9KCCV(config-if)#exit
CAT9KCCV(config)#
```

Step 4 Configure the SPAN session and add to the session the interfaces to monitor:

```
monitor session 1 source interface Gi1/0/2 - 24 both
monitor session 1 destination remote vlan 2508
```

Step 5 Configure one of the switch's ports to enable the communication between the virtual sensor and the Center:

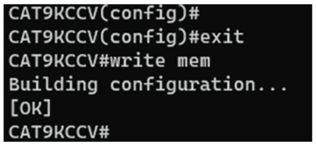
```
interface GigabitEthernet1/0/1
switchport access vlan 507
no shutdown
exit
```



```
CAT9KCCV(config)#interface GigabitEthernet1/0/1
CAT9KCCV(config-if)#switchport access vlan 507
% Access VLAN does not exist. Creating vlan 507
CAT9KCCV(config-if)#no shutdown
CAT9KCCV(config-if)#exit
CAT9KCCV(config)#
```

Step 6 Save the configuration:

```
exit
write mem
```



```
CAT9KCCV(config)#
CAT9KCCV(config)#exit
CAT9KCCV#write mem
Building configuration...
[OK]
CAT9KCCV#
```

What to do next

The initial configuration is now complete. Proceed with the application installation and deployment following one of the procedures below:

- Procedure with the Cisco Cyber Vision sensor management extension
- Procedure with the Local Manager
- Procedure with the CLI