



CHAPTER 8

Layer 2 Switching

This chapter describes how to identify and resolve problems that relate to Layer 2 switching.

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- [Layer 2 Switching Problems, page 8-4](#)
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Information About Layer 2 Ethernet Switching

Nexus1000V provides a distributed, layer 2 virtual switch that extends across many virtualized hosts.

It consists of two components:

- Virtual Supervisor Module (VSM), which is also known as the Control Plane (CP), acts as the Supervisor and contains the Cisco CLI, configuration, and high-level features.
- Virtual Ethernet Module (VEM), which is also known as the Data Plane (DP), acts as a line card and runs in each virtualized server to handle packet forwarding and other localized functions.

Port Model

This section describes the following port perspectives:

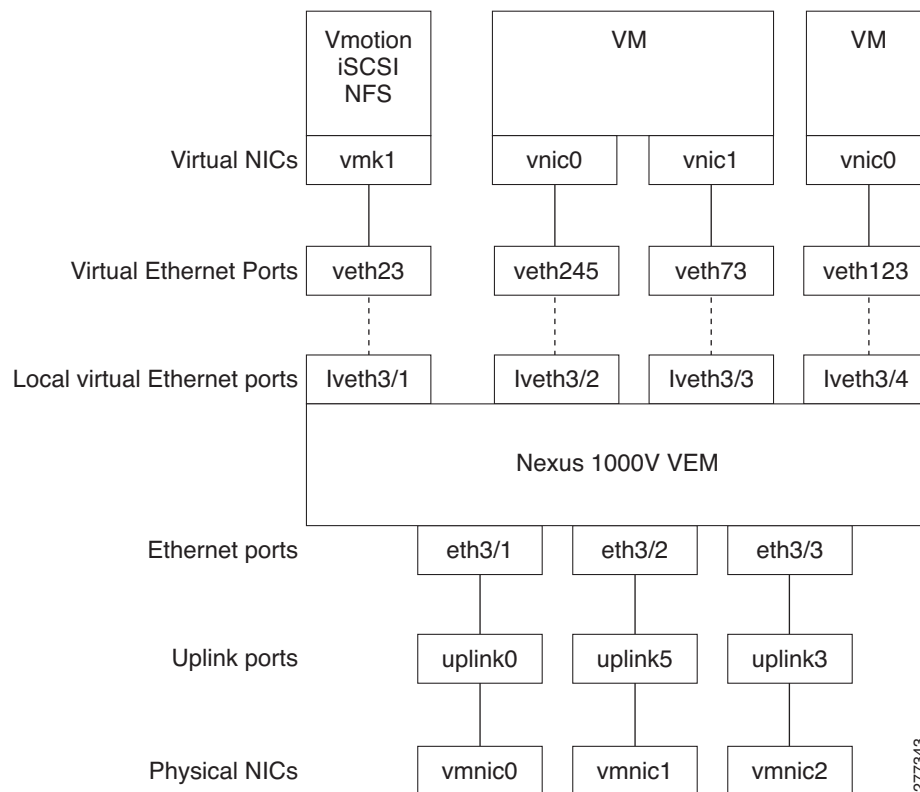
- [Viewing Ports from the VEM, page 8-2](#)
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Viewing Ports from the VEM

The Nexus1000V differentiates between virtual and physical ports on each of the VEMs. Figure 8-1 shows how ports on the Nexus1000V switch are bound to physical and virtual VMware ports within a VEM.

Figure 8-1 VEM View of Ports



On the virtual side of the switch, there are three layers of ports that are mapped together:

- **Virtual NICs:** There are three types of Virtual NICs in VMware. The virtual NIC (vnic) is part of the VM, and represents the physical port of the host which is plugged into the switch. The virtual kernel NIC (vmknic) is used by the hypervisor for management, VMotion, iSCSI, NFS and other network access needed by the kernel. This interface would carry the IP address of the hypervisor itself, and is also bound to a virtual Ethernet port. The vswif (not shown) appears only in COS-based systems, and is used as the VMware management port. Each of these types maps to a veth port within Nexus1000V.
- **Virtual Ethernet Ports (VEth):** A VEth port is a port on the Cisco Nexus 1000V Distributed Virtual Switch. Cisco Nexus 1000V has a flat space of VEth ports 0..N. The virtual cable plugs into these VEth ports that are moved to the host running the VM.

VEth ports are assigned to port groups.

- **Local Virtual Ethernet Ports (lveth):** Each host has a number of local VEth ports. These ports are dynamically selected for VEth ports that are needed on the host.

These local ports do not move, and are addressable by the module-port number method.

On the physical side of the switch, from bottom to top:

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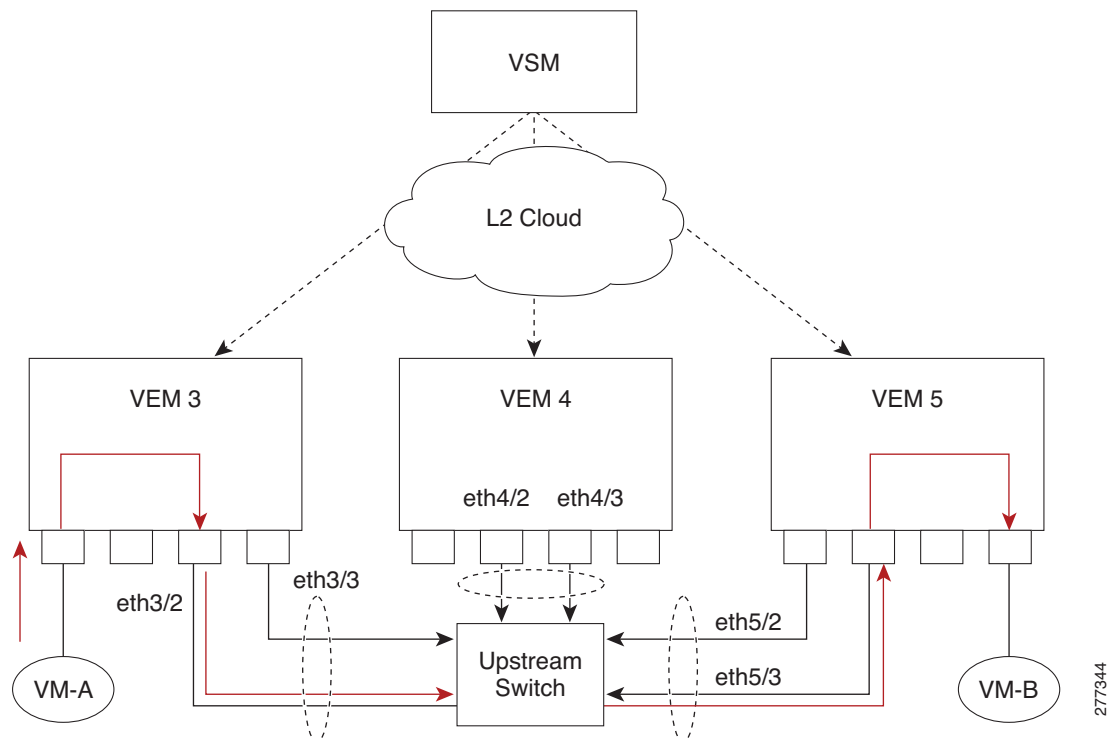
- Each physical NIC in VMware is represented by an interface called a vmnic. The vmnic number is allocated during VMware installation, or when a new physical NIC is installed, and remains the same for the life of the host.
- Each uplink port on the host represents a physical interface. It acts a lot like an lvech port, but because physical ports do not move between hosts, the mapping is 1:1 between an uplink port and a vmnic.
- Each physical port added to Nexus1000V switch appears as a physical Ethernet port, just as it would on a hardware-based switch.

The uplink port concept is handled entirely by VMware, and is used to associate port configuration with vmnics. There is no fixed relationship between the uplink # and vmnic #, and these can be different on different hosts, and can change throughout the life of the host. On the VSM, the Ethernet interface number, such as ethernet 2/4, is derived from the vmnic number, not the uplink number.

Viewing Ports from the VSM

Figure 8-2 shows the VSM view ports.

Figure 8-2 VSM View of Ports



Port Types

The following types of ports are available:

- Veths (Virtual Ethernet Interfaces) can be associated with any one of the following:

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- VNICs of a Virtual Machine on the ESX Host.
- VMKNICs of the ESX Host
- VSWIFs of an ESX COS Host.
- Eths (Physical Ethernet Interfaces) – correspond to the Physical NICs on the ESX Host.
- Po (Port Channel Interfaces) – The physical NICs of an ESX Host can be bundled into a logical interface. This logical bundle is referred to as a port channel interface.

For more information about Layer 2 switching, see the *Cisco Nexus 1000V Layer 2 Switching Configuration Guide, Release 4.0(4)SV1(1)*.

Layer 2 Switching Problems

This section describes how to troubleshoot Layer 2 problems and lists troubleshooting commands. This section includes the following topics:

- [Verifying a Connection Between VEM Ports, page 8-4](#)
- [Verifying a Connection Between VEMs, page 8-5](#)
- [Isolating Traffic Interruptions, page 8-6](#)
- [Verifying Layer 2 Switching, page 8-7](#)

Verifying a Connection Between VEM Ports

To verify a connection between two veth ports on a VEM, follow these steps:

-
- Step 1** On the VSM, enter the **show vlan** command to view the state of the VLANs associated with the port. If the VLAN associated with a port is not active, then the port may be down. In this case, you must create the VLAN and activate it.
- Step 2** To see the state of the port on the VSM, enter a **show interface brief** command.
- Step 3** Enter the **module vem module-number execute vemcmd show port** command to display the ports that are present on the VEM, their local interface indices, VLAN, type (physical or virtual), CBL state, port mode, and port name.

The key things to look for in the output are:

- State of the port.
 - CBL.
 - Mode.
 - Attached device name.
 - The LTL of the port you are trying to troubleshoot. It will help you identify the interface quickly in other VEM commands where the interface name is not displayed.
 - Make sure the state of the port is up. If not, verify the configuration of the port on the VSM.
- Step 4** To view the VLANs and their port lists on a particular VEM, use the **module vem module-number execute vemcmd show bd** command:

```
n1000V# module vem 5 execute vemcmd show bd
```

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If you are trying to verify that a port belongs to a particular VLAN, make sure you see the port name or LTL in the port list of that VLAN.

Verifying a Connection Between VEMs

To verify a connection between veth ports on two separate VEMs, follow these steps:

- Step 1** Issue the **show vlan** command to check if the VLAN associated with the port is created on the VSM.
- Step 2** Issue the **show interface brief** command to check if the ports are up in the VSM.
- Step 3** On the VEM, issue the **module vem 3 execute vemcmd show port** command to check if the CBL state of the two ports is set to the value of 4 for forwarding.
- Step 4** On the VEM, issue the **module vem 3 execute vemcmd show bd** command to check if the two veth ports are listed in the flood list of the VLAN to which they are trying to communicate.
- Step 5** Verify that the uplink switch to which the VEMs are connected is carrying the VLAN to which the ports belong.
- Step 6** Find out the port on the upstream switch to which the pn1c (that is supposed to be carrying the VLAN) on the VEM is connected to.

```
n1000v# show cdp neighbors
```

```
Capability Codes: R - Router, T - Trans-Bridge, B - Source-Route-Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater,
                  V - VoIP-Phone, D - Remotely-Managed-Device,
                  s - Supports-STP-Dispute
```

Device ID	Local Intrfce	Hldtme	Capability	Platform	Port ID
swordfish-6k-2	Eth5/2	168	R S I	WS-C6506-E	Gig1/38

The PNIC (Eth 5/2) is connected to swordfish-6k-2 on port Gig1/38.

- Step 7** Log in to the upstream switch and make sure the port is configured to allow the VLAN you are looking for.

```
n1000v#show running-config interface gigabitEthernet 1/38
Building configuration...
```

```
Current configuration : 161 bytes
!
interface GigabitEthernet1/38
  description Srvr-100:vmnic1
  switchport
  switchport trunk allowed vlan 1,60-69,231-233
  switchport mode trunk
end
```

As this output shows, VLANs 1,60-69, 231-233 are allowed on the port. If a particular VLAN is not in the allowed VLAN list, make sure to add it to the allowed VLAN list of the port.

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Isolating Traffic Interruptions

Use the following steps to isolate the cause for no traffic passing across VMs on different VEMs.

- Step 1** In output of the **show port-profile name** command, verify the following information:
- The control and packet VLANs that you configured are present (in the example, these are 3002 and 3003)
 - If the physical NIC in your configuration carries the VLAN for VM, then that VLAN is also present in the allowed VLAN list.

```
n1000v#show port-profile name alluplink
port-profile alluplink
  description:
  status: enabled
  capability uplink: yes
  system vlans: 3002,3003
  port-group: alluplink
  config attributes:
    switchport mode trunk
    switchport trunk allowed vlan 1,80,3002,610,620,630-650
    no shutdown
  evaluated config attributes:
    switchport mode trunk
    switchport trunk allowed vlan 1,80,3002,3003,610,620,630-650
    no shutdown
  assigned interfaces:
    Ethernet2/2
```

- Step 2** Inside the VM, use the following command to verify that the Ethernet interface is up.

ifconfig -a

If not, consider deleting that NIC from the VM, and adding another NIC.

- Step 3** Using any sniffer tool, verify that ARP requests and responses are received on the VM interface.

- Step 4** On the upstream switch, use the following commands to look for the association between the IP and MAC address:

debug arp

show arp

Example:

```
n1000v_CAT6K# debug arp
ARP packet debugging is on
11w4d: RARP: Rcvd RARP req for 0050.56b7.3031
11w4d: RARP: Rcvd RARP req for 0050.56b7.3031
11w4d: RARP: Rcvd RARP req for 0050.56b7.4d35
11w4d: RARP: Rcvd RARP req for 0050.56b7.52f4
11w4d: IP ARP: rcvd req src 10.78.1.123 0050.564f.3586, dst 10.78.1.24 Vlan3002
11w4d: RARP: Rcvd RARP req for 0050.56b7.3031
n1000v_CAT6K#
```

Example:

```
n1000v_CAT6K# sh arp
Protocol  Address          Age (min)  Hardware Addr  Type   Interface
Internet  10.78.1.72       -          001a.6464.2008 ARPA   Vlan140
Internet  7.114.1.100     -          0011.bcac.6c00 ARPA   Vlan410
Internet  41.0.0.1        -          0011.bcac.6c00 ARPA   Vlan1161
Internet  7.61.5.1        -          0011.bcac.6c00 ARPA   Vlan3002
Internet  10.78.1.5       -          0011.bcac.6c00 ARPA   Vlan3002
```

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```

Internet 7.70.1.1          - 0011.bcac.6c00  ARPA  Vlan700
Internet 7.70.3.1          - 0011.bcac.6c00  ARPA  Vlan703
Internet 7.70.4.1          - 0011.bcac.6c00  ARPA  Vlan704
Internet 10.78.1.1         0 0011.bc7c.9c0a  ARPA  Vlan3002
Internet 10.78.1.15        0 0050.56b7.52f4  ARPA  Vlan3002
Internet 10.78.1.123      0 0050.564f.3586  ARPA  Vlan3002

```

Step 5 You have completed this procedure.

Verifying Layer 2 Switching

Use the following commands to display and verify the Layer 2 MAC address configuration.

Command	Purpose
show mac address-table	Displays the MAC address table to verify all MAC addresses on all VEMs controlled by the VSM. See Example 8-1 on page 8-8
show mac address-table module <i>module-number</i>	Displays all the MAC addresses on the specified VEM.
show mac address-table static <i>HHHH.WWWW.HHHH</i>	Displays the MAC address table static entries. See Example 8-2 on page 8-9
show mac address-table address <i>HHHH.WWWW.HHHH</i>	Displays the interface on which the MAC address specified is learned or configured. <ul style="list-style-type: none"> For dynamic MACs, if the same MAC appears on multiple interfaces, then each of them is displayed separately. For static MACs, if the same MAC appears on multiple interfaces, then only the entry on the configured interface is displayed.
show running-config vlan <vlan-id>	Displays VLAN information in the running configuration.
show vlan [all-ports brief id < <i>vlan-id</i> > name < <i>name</i> > dot1q tag native]	Displays VLAN information as specified. See Example 8-3 on page 8-9 .
show vlan summary	Displays a summary of VLAN information.
show interface brief	Displays a table of interface states. See Example 8-4 on page 8-10 .
module vem <i>module-number</i> execute vemcmd show port	On the VEM, displays the port state on a particular VEM. This command can only be used from the VEM. See Example 8-5 on page 8-10 .
module vem <i>module-number</i> execute vemcmd show bd command	For the specified VEM, displays its VLANs and their port lists. See Example 8-6 on page 8-10 .

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Command	Purpose
module vem <i>module-number</i> execute vemcmd show trunk	For the specified VEM, displays the VLAN state on a trunk port. <ul style="list-style-type: none"> If a VLAN is active on a port, then its CBL state should be 4. If a VLAN is blocked, then its CBL state is 1. See Example 8-7 on page 8-11 .
module vem <i>module-number</i> execute vemcmd show l2 <i>vlan-id</i>	For the specified VEM, displays the VLAN forwarding table for a specified VLAN. See Example 8-8 on page 8-11 .
show interface <i>interface_id</i> mac	Displays the MAC addresses and the burn-in MAC address for an interface.

Example 8-1 show mac address-table Command



Note The Cisco Nexus 1000V MAC address table does not display multicast MAC addresses.



Tip VEM indicates on which VEM this MAC is seen.

N1KV Internal Port refers to an internal port created on the VEM. This port is used for control and management of the VEM and is not used for forwarding packets.

```
n1000v# show mac address-table
Legend:
      * - primary entry, G - Gateway MAC, (R) - Routed MAC
      age - seconds since last seen
      VEM      VLAN      MAC Address      Type      age      Ports
-----+-----+-----+-----+-----+-----+-----
*   3         1         0002.3d22.e300   static    -        N1KV Internal Port
*   3         1         0002.3d22.e302   static    -        N1KV Internal Port
*   4         1         0002.3d22.e303   static    -        N1KV Internal Port
*   3         1         0002.3d32.e300   static    -        N1KV Internal Port
*   3         1         0002.3d32.e302   static    -        N1KV Internal Port
*   4         1         0002.3d32.e303   static    -        N1KV Internal Port
*   3         1         0002.3d62.e300   static    -        N1KV Internal Port
*   3         1         0002.3d62.e302   static    -        N1KV Internal Port
*   4         1         0002.3d62.e303   static    -        N1KV Internal Port
   4         1         0023.7d34.f4e2   dynamic   23       Eth4/2
   3         115        0002.3d42.e302   dynamic    0        N1KV Internal Port
   4         115        0002.3d42.e303   dynamic    0        N1KV Internal Port
   4         115        0050.56bb.49d9   dynamic    0        Eth4/2
   3         115        0050.56bb.49d9   dynamic    0        Eth3/4
   3         116        0002.3d22.e302   dynamic    1        N1KV Internal Port
   4         116        0002.3d22.e302   dynamic    1        Eth4/2
   4         116        0002.3d22.e303   dynamic    1        N1KV Internal Port
   3         116        0002.3d22.e303   dynamic    1        Eth3/4
```


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Example 8-2 show mac address-table address Command



Tip This command shows all interfaces on which a MAC is learned dynamically. In this example, the same MAC appears on Eth4/2 and Eth3/4.

```
n1000v# show mac address-table address 0050.56bb.49d9
Legend:
      * - primary entry, G - Gateway MAC, (R) - Routed MAC
      age - seconds since last seen
      VEM   VLAN      MAC Address      Type      age      Ports
-----+-----+-----+-----+-----+-----
      4     115      0050.56bb.49d9  dynamic   0        Eth4/2
      3     115      0050.56bb.49d9  dynamic   0        Eth3/4
```

Example 8-3 show vlan Command



Tip This command shows the state of each VLAN created on the VSM.

```
n1000v# show vlan

VLAN Name                Status      Ports
-----+-----+-----+-----+-----+-----
  1   default                active      Eth3/3, Eth3/4, Eth4/2, Eth4/3
110  VLAN0110                 active
111  VLAN0111                 active
112  VLAN0112                 active
113  VLAN0113                 active
114  VLAN0114                 active
115  VLAN0115                 active
116  VLAN0116                 active
117  VLAN0117                 active
118  VLAN0118                 active
119  VLAN0119                 active
800  VLAN0800                 active
801  VLAN0801                 active
802  VLAN0802                 active
803  VLAN0803                 active
804  VLAN0804                 active
805  VLAN0805                 active
806  VLAN0806                 active
807  VLAN0807                 active
808  VLAN0808                 active
809  VLAN0809                 active
810  VLAN0810                 active
811  VLAN0811                 active
812  VLAN0812                 active
813  VLAN0813                 active
814  VLAN0814                 active
815  VLAN0815                 active
816  VLAN0816                 active
817  VLAN0817                 active
818  VLAN0818                 active
819  VLAN0819                 active
820  VLAN0820                 active
VLAN Name                Status      Ports
-----+-----+-----+-----+-----+-----
-----+-----+-----+-----+-----+-----
```

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Remote SPAN VLANs

```
-----
Primary  Secondary  Type          Ports
-----
```

Example 8-4 show interface brief Command

```
n1000v# show int brief
```

```
-----
Port      VRF          Status IP Address          Speed  MTU
-----
mgmt0     --          up    172.23.232.143     1000  1500
-----

Ethernet  VLAN  Type Mode  Status Reason          Speed  Port
Interface
-----
Eth3/4    1     eth trunk up    none           1000 (D) --
Eth4/2    1     eth trunk up    none           1000 (D) --
Eth4/3    1     eth trunk up    none           1000 (D) --
-----
```

Example 8-5 module vem module-number execute vemcmd show port Command



Tip Look for the state of the port.

```
~ # module vem 3 execute vemcmd show port
  LTL   IfIndex  Vlan  Bndl  SG_ID  Pinned_SGID  Type  Admin State  CBL Mode  Name
  8     0     3969  0     2     2           2  VIRT  UP  UP  4 Access 120
  9     0     3969  0     2     2           2  VIRT  UP  UP  4 Access 121
  10    0     115   0     2     2           0  VIRT  UP  UP  4 Access 122
  11    0     3968  0     2     2           2  VIRT  UP  UP  4 Access 123
  12    0     116   0     2     2           0  VIRT  UP  UP  4 Access 124
  13    0     1     0     2     2           2  VIRT  UP  UP  0 Access 125
  14    0     3967  0     2     2           2  VIRT  UP  UP  4 Access 126
  16    1a030100  1 T   0     0     2           2  PHYS  UP  UP  4 Trunk
vmnic1
  17    1a030200  1 T   0     2     2           2  PHYS  UP  UP  4 Trunk
vmnic2
```

Example 8-6 module vem module-number execute vemcmd show bd Command



Tip If a port belongs to a particular VLAN, the port name or LTL should be in the port list for the VLAN.

```
~ # module vem 5 execute vemcmd show bd
Number of valid BDS: 8
BD 1, vdc 1, vlan 1, 2 ports
Portlist:
16 vmnic1
17 vmnic2
```

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```

BD 100, vdc 1, vlan 100, 0 ports
Portlist:
BD 110, vdc 1, vlan 110, 1 ports
Portlist:
16 vmmic1
BD 111, vdc 1, vlan 111, 1 ports
Portlist:
16 vmmic1
BD 112, vdc 1, vlan 112, 1 ports
Portlist:
16 vmmic1
BD 113, vdc 1, vlan 113, 1 ports
Portlist:
16 vmmic1
BD 114, vdc 1, vlan 114, 1 ports
Portlist:
16 vmmic1
BD 115, vdc 1, vlan 115, 2 ports
Portlist:
10 l22
16 vmmic1

```

Example 8-7 *module vem module-number execute vemcmd show trunk Command*



Tip

If a VLAN is active on a port, then its CBL state should be 4.
If a VLAN is blocked, then its CBL state is 1.

```

~ # module vem 5 execute vemcmd show trunk
Trunk port 16 native_vlan 1 CBL 4
vlan(1) cbl 4, vlan(110) cbl 4, vlan(111) cbl 4, vlan(112) cbl 4, vlan(113) cbl 4,
vlan(114) cbl 4, vlan(115) cbl 4, vlan(116) cbl 4, vlan(117) cbl 4, vlan(118) cbl 4,
vlan(119) cbl 4,
Trunk port 17 native_vlan 1 CBL 1
vlan(1) cbl 1, vlan(117) cbl 4,
~ #

```

Example 8-8 *module vem module-number execute vemcmd show l2 Command*

```

Bridge domain 115 brtmax 1024, brtcnt 2, timeout 300
Dynamic MAC 00:50:56:bb:49:d9 LTL 16 timeout 0
Dynamic MAC 00:02:3d:42:e3:03 LTL 10 timeout 0

```

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