



# CHAPTER 13

## Configuring Bridged Mode

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This chapter describes how to configure the Cisco Application Control Engine (ACE) module to bridge traffic on a single IP subnet.

This chapter includes the following topics:

- [Information About Configuring Bridged Mode](#)
- [Guidelines and Limitations](#)
- [Task Flow for Configuring Bridged Mode](#)
- [Configuring Bridged Mode on the ACE](#)
- [Configuration Example for Bridged Mode](#)
- [Where to Go Next](#)

### Information About Configuring Bridged Mode

After reading this chapter, you should have a basic understanding of bridged mode, how it works in the ACE, and how to configure it.

Up to this point in this guide, you have been configuring the ACE in routed mode. Routed mode treats the ACE as a next hop in the network, typically with a client-side VLAN and a server-side VLAN in different IP subnets or even in different IP networks. The VLAN interfaces rely on IP addresses to route packets from one subnet or network to another.

In bridged mode, the ACE bridges traffic between two VLANs in the same IP subnet. The VLAN facing the WAN is the client-side VLAN. The VLAN facing the data center is the server-side VLAN. A bridge group virtual interface (BVI) joins the two VLANs into one bridge group.

As traffic passes through the client-side VLAN, the ACE evaluates the traffic with the configured service policy. Traffic that matches a policy is redirected to a server that has a dedicated VLAN interface configured on the ACE. Traffic leaving the server goes to the ACE, where it is directed out of the server side VLAN to the origin server. Traffic is routed by means of static routing. No dynamic routing protocols are required.

## Prerequisites

Bridged mode on an ACE has the following prerequisites:

- Contact your network administrator to determine which VLANs and addresses are available for use by the ACE. Then, configure VLANs for the ACE using the Cisco IOS Software (see the “Configuring VLANs for the ACE Using Cisco IOS Software” section).
- Configure a default route on the ACE to identify an IP address for the ACE to send all IP packets for which it does not have a route (see the “Configuring a Default Route” section).
- Configure an access list to allow traffic (see the “Configuring an ACL” section).

## Guidelines and Limitations

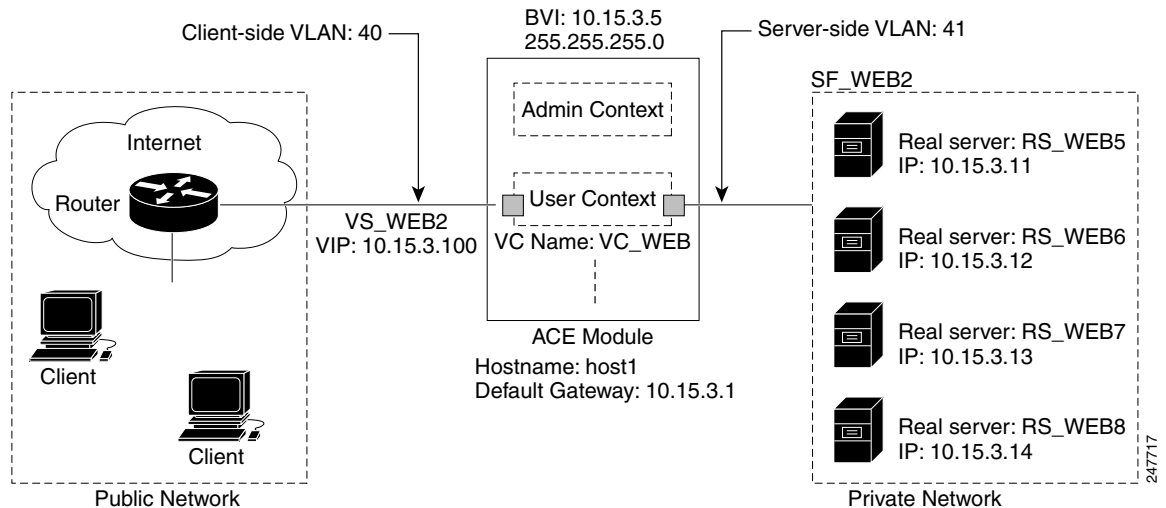
Bridged mode on the ACE has the following configuration guidelines and limitations:

- The ACE supports 4,094 BVIs per system.
- The ACE supports a maximum of 8,192 interfaces per system that include VLANs, shared VLANs, and BVI interfaces.
- When you configure a bridge group on an interface VLAN, the ACE automatically makes it a bridged interface.
- The ACE supports a maximum of two Layer 2 interface VLANs per bridge group.
- The ACE does not allow shared VLAN configurations on Layer 2 interfaces.
- Because Layer 2 VLANs are not associated with an IP address, they require extended access control lists (ACLs) for controlling IP traffic. You can also optionally configure EtherType ACLs to pass non-IP traffic.
- The ACE does not perform MAC address learning on a bridged interface. Instead, learning is performed by ARP. Bridge lookup is based on the bridge-group identifier and destination MAC address. A bridged interface automatically sends multicast and broadcast bridged traffic to the other interface of the bridge group.
- ARP packets are always passed through an Layer 2 interface after their verification and inspection. Multicast and broadcast packets from the incoming interface are flooded to the other L2 interface in the bridge group.
- The server default gateway is the upstream router.
- By default, the ACE performs a route lookup to select the next hop to reach the client. We recommend using the mac-sticky feature, rather than the static default route, to send return traffic back in response to the client connection.

# Configuring Bridged Mode on the ACE

This section describes how to configure bridged mode using the example shown in [Figure 13-1](#).

**Figure 13-1** Example of Bridged Mode



The configuration of the example setup is as follows:

- A virtual server VS\_WEB2 is created with a virtual IP address 10.15.3.100 to forward the client traffic from VLAN 40 to the servers in VLAN 41.
- There are four real servers grouped into the server farm SF\_WEB2.
- VLAN 40 is assigned to the ACE and is used for client-side traffic. VLAN 41 is assigned to the ACE and is used for server-side traffic.
- A BVI with the IP address 10.15.3.5 configures the two VLANs into one bridge group.

This section contains the following topics:

- [Prerequisites](#)
- [Configuring Server Load Balancing](#)
- [Configuring the VLANs and a BVI](#)

## Task Flow for Configuring Bridged Mode

Follow these steps to configure bridged mode on the ACE:

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- Step 1** Configure the real servers and server farm.
  - Step 2** Configure a TCP probe and associate it with the server farm.
  - Step 3** Configure the VIP address where clients are to send requests.
  - Step 4** Create the policy for load-balancing traffic.
  - Step 5** Create a service policy.
  - Step 6** Create the client and server VLANs and associate them with a BVI.

- Step 7** Configure the mac-sticky feature on the client VLAN interface.
- Step 8** Apply the access group and service policy to the interface.
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## Configuring Server Load Balancing

### Procedure

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- Step 1** Add the four real servers (see the “Configuring Real Servers” section in [Chapter 6, Configuring Server Load Balancing](#)), using the following real server names, descriptions, and IP addresses and place each server in service:
- Name: RS\_WEB5, Description: content server web-five, IP Address: 10.15.3.11
  - Name: RS\_WEB6, Description: content server web-six, IP Address: 10.15.3.12
  - Name: RS\_WEB7, Description: content server web-seven, IP Address: 10.15.3.13
  - Name: RS\_WEB8, Description: content server web-eight, IP Address: 10.15.3.14
- Step 2** Group these real servers into a server farm (see the “Creating a Server Farm” section in [Chapter 6, Configuring Server Load Balancing](#)) and place each server in service. In this example, name the server farm SF\_WEB2.
- Step 3** Configure a TCP probe to check the health of all the real servers in the server farm and associate the probe with the server farm. See the “Configuration Example for Bridged Mode” section.
- Step 4** Create a virtual server traffic policy (see “Creating a Virtual Server Traffic Policy” section, in [Chapter 6, Configuring Server Load Balancing](#), Steps 1 through 12). For this example, do the following:
- Create a Layer 7 policy map for the action when the client request arrives and is sent to the server farm, name the load-balancing policy HTTP\_LB, configure a default class map, and associate the server farm SF\_WEB2.
  - Create a Layer 3 and Layer 4 class map to define the VIP where the clients will send their requests, and name the class map VS\_WEB2 with a match virtual address of 10.15.3.100 with a match on any port.
  - Create a Layer 3 and Layer 4 multi-match policy map to direct classified incoming requests to the load-balancing policy map. In this example, name the policy HTTP\_MULTI\_MATCH, associate the VS\_WEB2 class map and the HTTP\_LB policy map. and then enable the VIP for load-balancing operations by placing it in service.
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## Configuring the VLANs and a BVI

You can configure bridged mode by creating the client-side and the server side VLANs on the ACE and associating them with a BVI.

### Procedure

	Command	Purpose
Step 1	<b>changeto</b> <i>context</i>  <b>Example:</b> host1/Admin# changeto VC_WEB host1/VC_WEB#	Changes to the correct context if necessary. Check the CLI prompt to verify that you are operating in the desired context.
Step 2	<b>config</b>  <b>Example:</b> host1/VC_WEB# config host1/VC_WEB(config)#	Enters configuration mode.
Step 3	<b>interface vlan</b> <i>vlan_id</i>  <b>Example:</b> host1/VC_WEB(config)# interface vlan 40 host1/VC_WEB(config-if)#	Accesses the interface for the client-side VLAN.
Step 4	<b>description</b> <i>string</i>  <b>Example:</b> host1/VC_WEB(config-if)# description Client_side	Enters a description of the VLAN.
Step 5	<b>bridge-group</b> <i>number</i>  <b>Example:</b> host1/VC_WEB(config-if)# bridge-group 1	Assigns the VLAN to the BVI.
Step 6	<b>mac-sticky</b> enable  <b>Example:</b> host1/VC_WEB(config-if)# mac-sticky enable	Enables the mac-sticky feature for a VLAN interface.
Step 7	<b>access-group input</b> <i>acl_name</i>  <b>Example:</b> host1/VC_WEB(config-if)# access-group input INBOUND	Applies the ACL to the VLAN.
Step 8	<b>service-policy input</b> <i>policy_name</i>  <b>Example:</b> host1/VC_WEB(config-if)# service-policy input HTTP_MULTI_MATCH	Applies the multi-match policy map to the VLAN.
Step 9	<b>no shutdown</b>  <b>Example:</b> host1/VC_WEB(config-if)# no shutdown	Places the VLAN in service.

	Command	Purpose
Step 10	<b>exit</b>  <b>Example:</b> host1/VC_WEB(config-if)# exit host1/VC_WEB(config)#	Exits interface configuration mode.
Step 11	<b>interface vlan</b> <i>vlan_id</i>  <b>Example:</b> host1/VC_WEB(config)# interface vlan 41 host1/VC_WEB(config-if)#	Accesses the interface for the server-side VLAN.
Step 12	<b>description</b> <i>string</i>  <b>Example:</b> host1/VC_WEB(config-if)# description Server_side	Enters a description of the VLAN.
Step 13	<b>bridge-group</b> <i>number</i>  <b>Example:</b> host1/VC_WEB(config-if)# bridge-group 1	Assigns the VLAN to the BVI.
Step 14	<b>no shutdown</b>  <b>Example:</b> host1/VC_WEB(config-if)# no shutdown	Places the VLAN in service.
Step 15	<b>exit</b>  <b>Example:</b> host1/VC_WEB(config-if)# exit host1/VC_WEB(config)#	Exits interface configuration mode.
Step 16	<b>interface bvi</b> <i>number</i>  <b>Example:</b> host1/VC_WEB(config)# interface bvi 1 host1/VC_WEB(config-if)#	Creates the BVI.
Step 17	<b>description</b> <i>string</i>  <b>Example:</b> host1/VC_WEB(config-if)# description Client and server bridge group 1	Enters a description of the BVI.
Step 18	<b>ip address</b> <i>ip_address netmask</i>  <b>Example:</b> host1/VC_WEB(config-if)# ip address 10.15.3.5 255.255.255.0	Assigns an IP address and network mask to the BVI interface.
Step 19	<b>no shutdown</b>  <b>Example:</b> host1/VC_WEB(config-if)# no shutdown	Places the BVI in service.
Step 20	<b>Ctrl-Z</b>  <b>Example:</b> host1/Admin(config-if)# Ctrl-Z host1/Admin#	Returns to Exec mode directly from any configuration mode.

	Command	Purpose
Step 21	<b>show running-config interface</b>  <b>Example:</b> host1/Admin# show running-config interface	Displays the interface configuration.
Step 22	<b>show interface bvi number</b>  <b>Example:</b> host1/Admin# show interface bvi 1	Displays the status and statistics for the BVI interface.
Step 23	<b>copy running-config startup-config</b>  <b>Example:</b> host1/Admin# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

## Configuration Example for Bridged Mode

The following running configuration example shows a basic bridged mode configuration. The commands that you have configured in this chapter appear in bold text.

```
access-list INBOUND extended permit ip any

probe tcp TCP_PROBE1

rserver host RS_WEB5
  description content server web-five
  ip address 10.15.3.11
  inservice
rserver host RS_WEB6
  description content server web-six
  ip address 10.15.3.12
  inservice
rserver host RS_WEB7
  description content server web-seven
  ip address 10.15.3.13
  inservice
rserver host RS_WEB8
  description content server web-eight
  ip address 10.15.3.14
  inservice
serverfarm SF_WEB2
  probe TCP_PROBE1
  rserver RS_WEB5 80
  inservice
  rserver RS_WEB6 80
  inservice
  rserver RS_WEB7 80
  inservice
  rserver RS_WEB8 80
  inservice

policy-map type loadbalance first-match HTTP_LB
  class class-default
  serverfarm SF_WEB2

class-map VS_WEB2
  match virtual-address 10.15.3.100 any

policy-map multi-match HTTP_MULTI_MATCH
```

```

class VS_WEB2
    loadbalance policy HTTP_LB
    loadbalance vip inservice

interface bvi 1
    description Client and server bridge group 1
    ip address 10.15.3.5 255.255.255.0
    no shutdown

interface vlan 40
    description Client_side
    bridge-group 1
    mac-sticky enable
    access-group input INBOUND
    service-policy input HTTP_MULTI_MATCH
    no shutdown

interface vlan 41
    description Server-side
    bridge-group 1
    no shutdown

context VC_WEB
    allocate-interface vlan 40
    allocate-interface vlan 41
    member RC_WEB

ip route 0.0.0.0 0.0.0.0 10.15.3.1

```

## Where to Go Next

In this chapter, you have learned how to configure bridged mode on your ACE. For more detailed information about both bridged mode and routed mode, see the *Routing and Bridging Guide, Cisco ACE Application Control Engine*.

In the next chapter, you will learn how to configure your ACE for “one-arm” mode.