



Configuration Examples for IOS SLB

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This section provides real-world examples of IOS SLB configurations. For a complete description of the IOS SLB commands in this section, refer to the *Cisco IOS IP Application Services Command Reference*. To locate documentation of other commands that appear in this section, search online using Cisco.com.

This section includes the following examples:



Note

The IP and network addresses in these examples are generic; you must replace them with the actual addresses for your network.

- [Example How to Configure a Basic IOS SLB Network, page 2](#)
- [Example How to Configure a Complete IOS SLB Network, page 4](#)
- [Examples How to Configure IOS SLB with Firewall Load Balancing, page 5](#)
- [Examples How to Configure IOS SLB with Probes, page 12](#)
- [Example How to Configure a Layer 3 Switch with IOS SLB, page 15](#)
- [Examples How to Configure IOS SLB with NAT and Static NAT, page 17](#)
- [Examples How to Configure IOS SLB with Redundancy, page 20](#)
- [Example How to Configure IOS SLB with Redistribution of Static Routes, page 35](#)
- [Example How to Configure IOS SLB with WAP and UDP Load Balancing, page 37](#)
- [Examples How to Configure IOS SLB with Route Health Injection, page 38](#)
- [Examples How to Configure IOS SLB with GPRS Load Balancing, page 41](#)
- [Example How to Configure IOS SLB with VPN Server Load Balancing, page 51](#)
- [Examples How to Configure IOS SLB with RADIUS Load Balancing, page 52](#)
- [Example How to Configure IOS SLB with Home Agent Director, page 60](#)
- [Example How to Configure IOS SLB with Sticky Connections, page 61](#)
- [Example How to Configure IOS SLB with GTP IMSI Sticky Database, page 61](#)
- [Example How to Configure IOS SLB with ASN Sticky Database, page 62](#)
- [Example How to Configure IOS SLB with Transparent Web Cache Load Balancing, page 62](#)

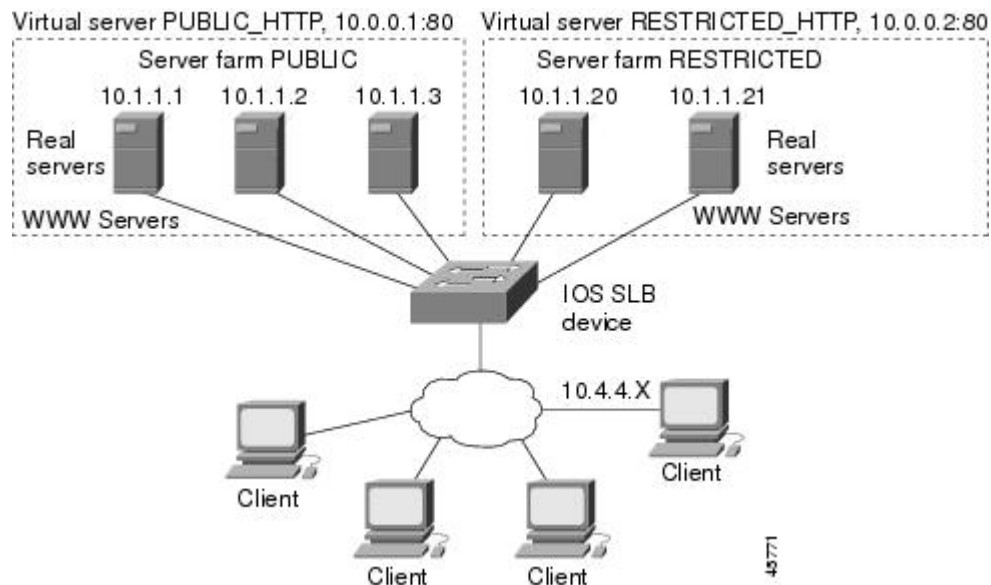
- [Example How to Configure IOS SLB with KAL-AP Agent, page 63](#)

Example How to Configure a Basic IOS SLB Network

The figure below shows a sample IOS SLB network with the following components:

- Two server farms--one configured to allow access by the public and named PUBLIC, one configured to allow limited access and named RESTRICTED.
- Five real servers configured as follows:
 - Three real servers in the PUBLIC server farm with IP addresses 10.1.1.1, 10.1.1.2, and 10.1.1.3
 - Two real servers in the restricted server farm with IP addresses 10.1.1.20 and 10.1.1.21
- Two virtual servers--one configured to allow access by the public and named PUBLIC_HTTP and one configured to allow limited access and named RESTRICTED_HTTP.
 - Virtual server PUBLIC_HTTP is configured with IP address 10.0.0.1 load balancing TCP connections on the WWW port (80).
 - Virtual server RESTRICTED_HTTP is configured with IP address 10.0.0.2 load balancing TCP connections on the WWW port (80) and allows access only from clients from network 10.4.4.0/255.255.255.0.

Figure 1: Example IOS SLB Network



The following sections include examples of the configuration commands used to configure and verify the IOS SLB network shown in the figure above.

- [Server Farm Configuration, page 3](#)
- [Virtual Server Configuration, page 3](#)
- [Restricted Client Configuration, page 3](#)

Server Farm Configuration

The following example shows the configuration for the server farm PUBLIC, associated with three real servers:

```
ip slb serverfarm PUBLIC
  real 10.1.1.1
    reassign 2
    faildetect numconns 4 numclients 2
    retry 20
    inservice
    exit
  real 10.1.1.2
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
    exit
  real 10.1.1.3
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
    end
```

The following example shows the configuration for the server farm RESTRICTED, associated with two real servers:

```
ip slb serverfarm RESTRICTED
  real 10.1.1.20
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
    exit
  real 10.1.1.21
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
    end
```

Virtual Server Configuration

The following example shows the configuration for the virtual servers PUBLIC_HTTP and RESTRICTED_HTTP:

```
ip slb vserver PUBLIC_HTTP
  virtual 10.0.0.1 tcp www
  serverfarm PUBLIC
  idle 120
  delay 5
  inservice
  exit
ip slb vserver RESTRICTED_HTTP
  virtual 10.0.0.2 tcp www
  serverfarm RESTRICTED
  idle 120
  delay 5
  inservice
  end
```

Restricted Client Configuration

The following example shows the configuration for the virtual server RESTRICTED_HTTP:

```
ip slb vserver RESTRICTED_HTTP
  no inservice
  client 10.4.4.0 255.255.255.0
  inservice
end
```

Example How to Configure a Complete IOS SLB Network

The following example provides a complete configuration using many of the commands described in this feature document:

```
ip slb probe PROBE2 http
  request method POST url /probe.cgi?all
  header HeaderName HeaderValue
!
ip slb serverfarm PUBLIC
  nat server
  real 10.1.1.1
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
  real 10.1.1.2
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
probe PROBE2
!
ip slb serverfarm RESTRICTED
  predictor leastconns
  bindid 309
  real 10.1.1.1
  weight 32
  maxconns 1000
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
  real 10.1.1.20
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
  real 10.1.1.21
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
!
ip slb vserver PUBLIC_HTTP
  virtual 10.0.0.1 tcp www
  serverfarm PUBLIC
!
ip slb vserver RESTRICTED_HTTP
  virtual 10.0.0.2 tcp www
  serverfarm RESTRICTED
  no advertise
  sticky 60 group 1
  idle 120
  delay 5
  client 10.4.4.0 255.255.255.0
  synguard 3600000
  inservice
```

Examples How to Configure IOS SLB with Firewall Load Balancing

This section contains the following examples, illustrating several different IOS SLB firewall load-balancing configurations:

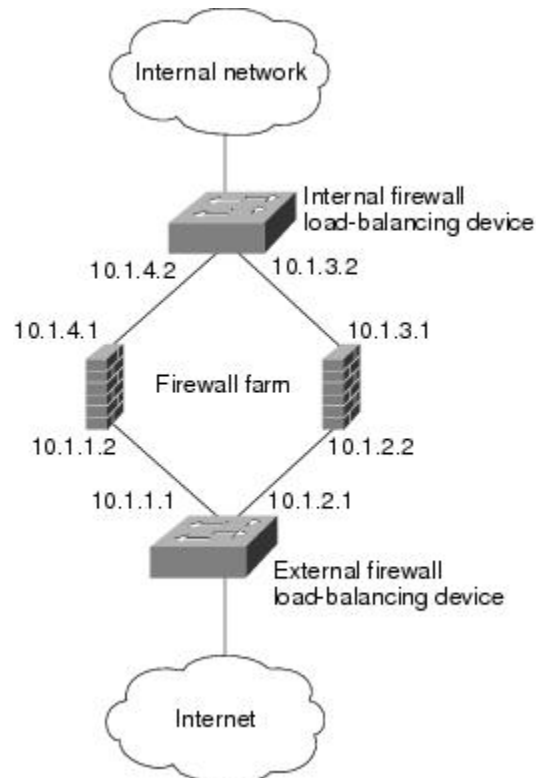
- [Example How to Configure IOS SLB with Basic Firewall Load Balancing, page 5](#)
- [Example How to Configure IOS SLB with Server Load Balancing and Firewall Load Balancing, page 7](#)
- [Example How to Configure IOS SLB with Multiple Firewall Farms, page 9](#)
- [Example How to Configure IOS SLB with Dual Firewall Load Balancing “Sandwich”, page 10](#)

Example How to Configure IOS SLB with Basic Firewall Load Balancing

The figure below shows a sample IOS SLB firewall load-balancing network with the following components:

- Two firewalls with IP addresses as shown
- An internal firewall load-balancing device on the secure side of the firewalls
- An external firewall load-balancing device on the Internet side of the firewalls
- One firewall farm named FIRE1, containing both firewalls

Figure 2: IOS SLB with Layer 3 Firewalls in Different Subnets



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When you configure IOS SLB firewall load balancing, the load-balancing devices use route lookup to recognize flows destined for the firewalls. To enable route lookup, you must configure each device with the IP address of each firewall that will route flows to that device.

In the following firewall farm configuration samples:

- The internal (secure side) firewall load-balancing device is configured with firewall IP addresses 10.1.3.1 and 10.1.4.1.
- The external (Internet side) firewall load-balancing device is configured with firewall IP addresses 10.1.1.2 and 10.1.2.2.
- [Internal Firewall Load-Balancing Device, page 6](#)
- [External Firewall Load-Balancing Device, page 6](#)

Internal Firewall Load-Balancing Device

The following example shows the configuration for ping probe PROBE1, HTTP probe PROBE2, and firewall farm FIRE1, associated with the two real servers for the load-balancing device on the internal (secure) side of the firewall:

```
!-----Ping probe
ip slb probe PROBE1 ping
!-----IP address of other load-balancing device
address 10.1.1.1
faildetect 4
!-----HTTP probe
ip slb probe PROBE2 http
!-----IP address of other load-balancing device
address 10.1.2.1
expect status 401
!-----Firewall farm FIRE1
ip slb firewallfarm FIRE1
!-----First firewall
real 10.1.4.1
probe PROBE1
!-----Enable first firewall
inservice
!-----Second firewall
real 10.1.3.1
probe PROBE2
!-----Enable second firewall
inservice
```

External Firewall Load-Balancing Device

The following example shows the configuration for ping probe PROBE1, HTTP probe PROBE2, and firewall farm FIRE1, associated with the two real servers for the load-balancing device on the external (Internet) side of the firewall:

```
!-----Ping probe
ip slb probe PROBE1 ping
!-----IP address of other load-balancing device
address 10.1.4.2
faildetect 4
!-----HTTP probe
ip slb probe PROBE2 http
!-----IP address of other load-balancing device
address 10.1.3.2
expect status 401
!-----Firewall farm FIRE1
ip slb firewallfarm FIRE1
!-----First firewall
real 10.1.1.2
```

```

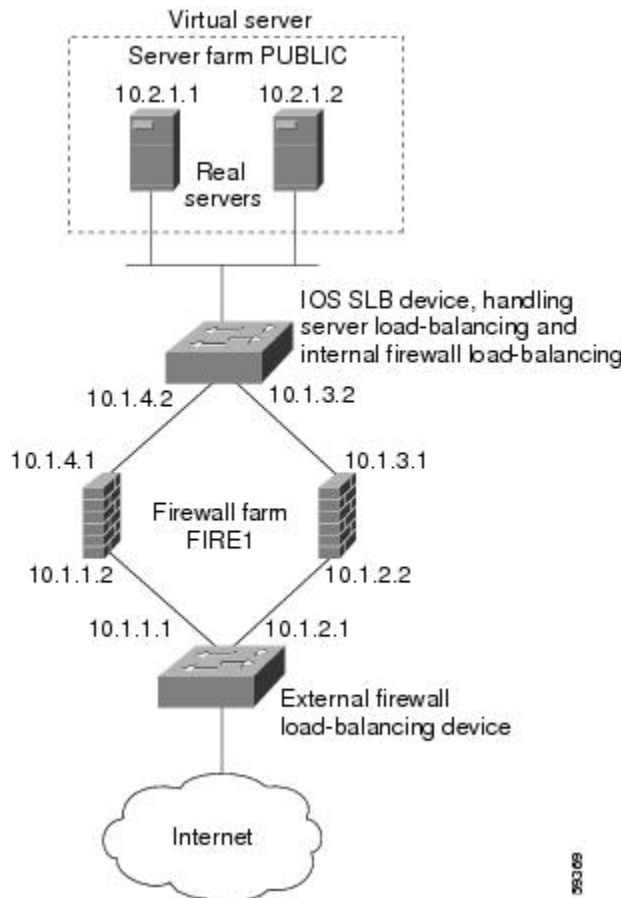
probe PROBE1
!-----Enable first firewall
inservice
!-----Second firewall
real 10.1.2.2
probe PROBE2
!-----Enable second firewall
inservice
exit
inservice
    
```

Example How to Configure IOS SLB with Server Load Balancing and Firewall Load Balancing

The figure below shows a sample IOS SLB load-balancing network with server load balancing and firewall load balancing running together, and the following components:

- Two real servers with IP addresses as shown
- One server farm named PUBLIC, containing both real servers
- Two firewalls with IP addresses as shown
- One firewall farm named FIRE1, containing both firewalls
- An internal IOS SLB device on the secure side of the firewalls, performing server load balancing and firewall load balancing
- An external firewall load-balancing device on the Internet side of the firewalls

Figure 3: IOS SLB with Server Load Balancing and Firewall Load Balancing



In the following firewall farm configuration samples:

- The internal (secure side) firewall load-balancing device is configured with firewall IP addresses 10.1.3.1 and 10.1.4.1.
- The external (Internet side) firewall load-balancing device is configured with firewall IP addresses 10.1.1.2 and 10.1.2.2.
- [Internal Server and Firewall Load-Balancing Device, page 8](#)
- [External Firewall Load-Balancing Device, page 8](#)

Internal Server and Firewall Load-Balancing Device

The following example shows the configuration for ping probes ABCPROBE and XYZPROBE, firewall farm FIRE1, and server farm PUBLIC for the load-balancing device on the internal (secure) side of the firewalls:

```
ip slb probe ABCPROBE ping
  address 10.1.1.1
ip slb probe XYZPROBE ping
  address 10.1.2.1
!
ip slb firewallfarm FIRE1
  real 10.1.4.1
    probe ABCPROBE
    inservice
  real 10.1.3.1
    probe XYZPROBE
    inservice
  inservice
!
ip slb serverfarm PUBLIC
  nat server
  real 10.2.1.1
    inservice
  real 10.2.1.2
    inservice
!
ip slb vserver HTTP1
  virtual 128.1.0.1 tcp www
  serverfarm PUBLIC
  idle 120
  delay 5
  inservice
```

External Firewall Load-Balancing Device

The following example shows the configuration for ping probes ABCPROBE and XYZPROBE and firewall farm FIRE1 for the load-balancing device on the external (Internet) side of the firewalls:

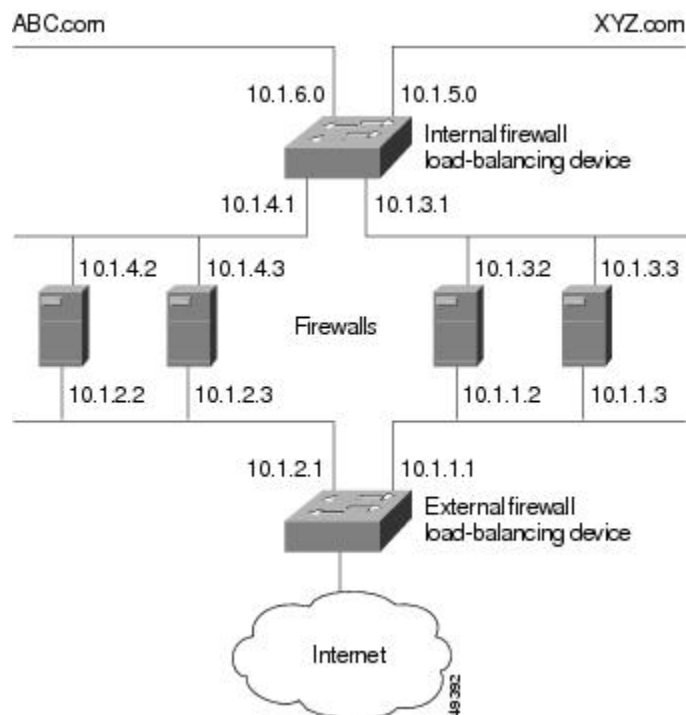
```
ip slb probe ABCPROBE ping
  address 10.1.4.2
ip slb probe XYZPROBE ping
  address 10.1.3.2
ip slb firewallfarm FIRE1
  real 10.1.1.2
    probe ABCPROBE
    inservice
    probe XYZPROBE
    inservice
```


Example How to Configure IOS SLB with Multiple Firewall Farms

The figure below shows a sample IOS SLB load-balancing network with multiple firewall farms and the following components:

- Four firewalls with IP addresses as shown
- An internal firewall load-balancing device on the secure side of the firewalls
- An external firewall load-balancing device on the Internet side of the firewalls
- One firewall farm named ABCFARM, containing the two firewalls on the left.
- One firewall farm named XYZFARM, containing the two firewalls on the right.

Figure 4: IOS SLB with Multiple Firewall Farms



In the following firewall farm configuration samples:

- The internal (secure side) firewall load-balancing device is configured with firewall IP addresses 10.1.3.1 and 10.1.4.1.
- The external (Internet side) firewall load-balancing device is configured with firewall IP addresses 10.1.1.2 and 10.1.2.2.
- [Internal Firewall Load-Balancing Device, page 9](#)
- [External Firewall Load-Balancing Device, page 10](#)

Internal Firewall Load-Balancing Device

The following example shows the configuration for ping probes ABCPROBE and XYZPROBE and firewall farms ABCFARM and XYZFARM for the load-balancing device on the internal (secure) side of the firewalls:

```
ip slb probe ABCPROBE ping
  address 10.1.2.1
ip slb probe XYZPROBE ping
  address 10.1.1.1
ip slb firewallfarm ABCFARM
  access source 10.1.6.0 255.255.255.0
  inservice
  real 10.1.4.2
    probe ABCPROBE
  inservice
  real 10.1.4.3
    probe ABCPROBE
  inservice
ip slb firewallfarm XYZFARM
  access source 10.1.5.0 255.255.255.0
  inservice
  real 10.1.3.2
    probe XYZPROBE
  inservice
  real 10.1.3.3
    probe XYZPROBE
  inservice
```

External Firewall Load-Balancing Device

The following example shows the configuration for ping probes ABCPROBE and XYZPROBE and firewall farms ABCFARM and XYZFARM for the load-balancing device on the external (Internet) side of the firewalls:

```
ip slb probe ABCPROBE ping
  address 10.1.4.1
ip slb probe XYZPROBE ping
  address 10.1.3.1
ip slb firewallfarm ABCFARM
  access destination 10.1.6.0 255.255.255.0
  inservice
  real 10.1.2.2
    probe ABCPROBE
  inservice
  real 10.1.2.3
    probe ABCPROBE
  inservice
ip slb firewallfarm XYZFARM
  access destination 10.1.5.0 255.255.255.0
  inservice
  real 10.1.1.2
    probe XYZPROBE
  inservice
  real 10.1.1.3
    probe XYZPROBE
  inservice
```

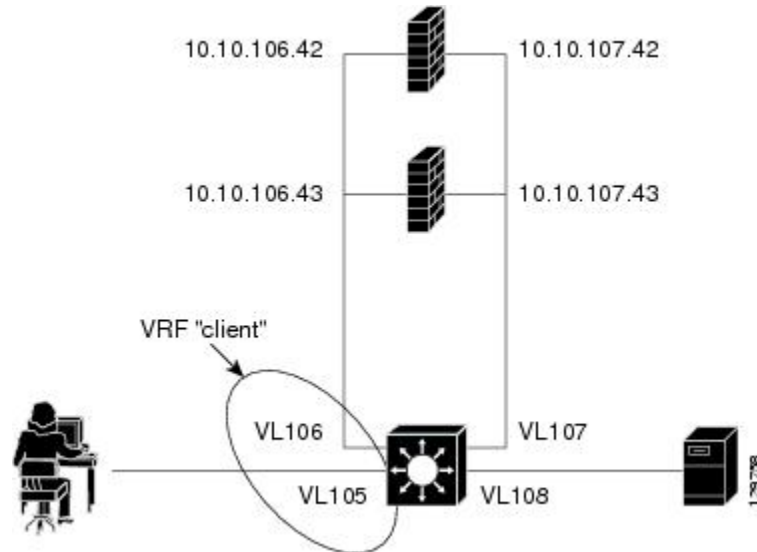
Example How to Configure IOS SLB with Dual Firewall Load Balancing “Sandwich”

The figure below illustrates a basic dual firewall load balancing “sandwich” configuration hosted on one IOS SLB device, including Virtual Private Network (VPN) routing and forwarding (VRF) and access interface configuration. VL105, VL106, VL107, and VL108 are VLANs.

**Note**

The client and server in this configuration are directly connected; in a more typical deployment, additional routes would be needed inside and outside the VRF.

Figure 5: IOS SLB with Dual Firewall Load Balancing "Sandwich"



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```
ip vrf client
 rd 0:1
 !
ip slb probe P642 ping
 address 10.10.106.42
 interval 120
ip slb probe P643 ping
 address 10.10.106.43
 interval 120
ip slb probe P742 ping
 address 10.10.107.42
 interval 120
ip slb probe P743 ping
 address 10.10.107.43
 interval 120
 !
ip slb firewallfarm CLIENT
 access inbound Vlan105
 access outbound Vlan106
 no inservice
 !
real 10.10.106.42
 probe P642
 inservice
real 10.10.106.43
 probe P643
 inservice
protocol tcp
 sticky 180 source
protocol datagram
 sticky 180 source
 predictor hash address port
 !
ip slb firewallfarm SERVER
```

```

access inbound Vlan108
access outbound Vlan107
inservice
!
real 10.10.107.42
probe P742
inservice
real 10.10.107.43
probe P743
inservice
protocol tcp
sticky 180 destination
protocol datagram
sticky 180 destination
predictor hash address port
!
mls flow ip interface-full
!
!*****
!* Switchports, port channels and trunks *
!* added to vlans 105-108 (left out for brevity) *
!*****
!
interface Vlan105
ip vrf forwarding client
ip address 10.10.105.2 255.255.255.0
!
interface Vlan106
ip vrf forwarding client
ip address 10.10.106.2 255.255.255.0
!
interface Vlan107
ip address 10.10.107.2 255.255.255.0
!
interface Vlan108
ip address 10.10.108.2 255.255.255.0
!
ip route 10.10.105.0 255.255.255.0 10.10.107.42
ip route vrf client 10.10.108.0 255.255.255.0 10.10.106.42

```

Examples How to Configure IOS SLB with Probes

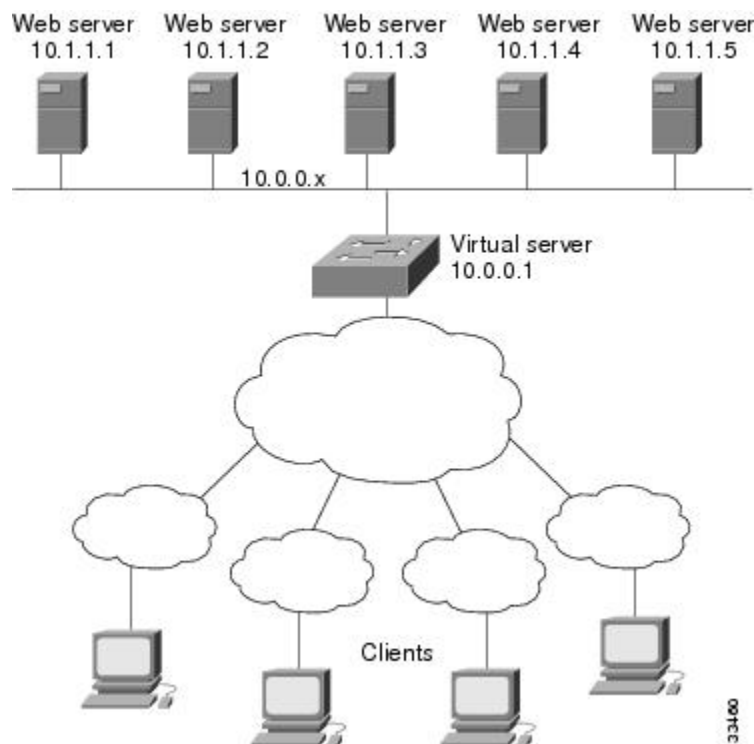
This section contains the following examples, illustrating several different IOS SLB probe configurations:

- [Example How to Configure IOS SLB with Ping and HTTP Probes, page 12](#)
- [Example How to Configure IOS SLB with Routed Probe, page 14](#)

Example How to Configure IOS SLB with Ping and HTTP Probes

The figure below shows a sample configuration with IOS SLB real server connections configured as part of a server farm, focusing on using ping and HTTP probes to monitor applications that are server load-balanced.

Figure 6: Sample Ping and HTTP Probe Topology



The topology shown in the figure above is a heterogeneous server farm servicing one virtual server. Following are the configuration statements for this topology, including a ping probe named PROBE1 and an HTTP probe named PROBE2:

```
! Configure ping probe PROBE1, change CLI to IOS SLB probe configuration mode
ip slb probe PROBE1 ping
! Configure probe to receive responses from IP address 13.13.13.13
address 13.13.13.13
! Configure unacknowledged ping threshold to 16
faildetect 16
! Configure ping probe timer interval to send every 11 seconds
interval 11
! Configure HTTP probe PROBE2
ip slb probe PROBE2 http
! Configure request method as POST, set URL as /probe.cgi?all
request method post url /probe.cgi?all
! Configure header HeaderName
header HeaderName HeaderValue
! Configure basic authentication username and password
credentials Semisweet chips
! Exit to global configuration mode
exit
! Enter server farm configuration mode for server farm PUBLIC
ip slb serverfarm PUBLIC
! Configure NAT server and real servers on the server farm
nat server
real 10.1.1.1
inservice
real 10.1.1.2
```

```

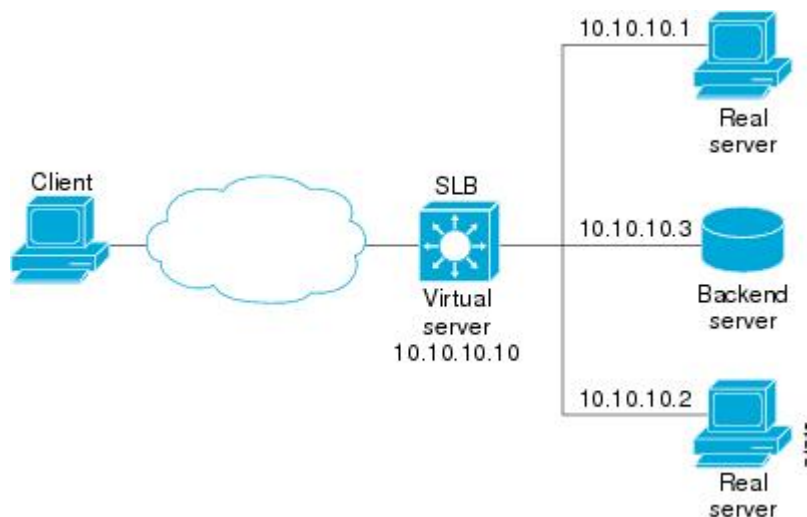
inservice
real 10.1.1.3
inservice
real 10.1.1.4
inservice
real 10.1.1.5
inservice
! Configure ping probe on the server farm
probe PROBE1
! Configure HTTP probe on the server farm
probe PROBE2
end

```

Example How to Configure IOS SLB with Routed Probe

The figure below shows a typical datacenter and IOS SLB configuration. Virtual server ACME_VSERVER is configured with two real servers (10.10.10.1 and 10.10.10.2) in server farm ACME_FARM. The user wants the real servers to fail based on the health of the backend server (10.10.10.3). To accomplish this configuration without sending health checks through the real servers, the user defines BACKEND, a routed ping probe to the backend server's IP address.

Figure 7: IOS SLB with a Routed Ping Probe



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```

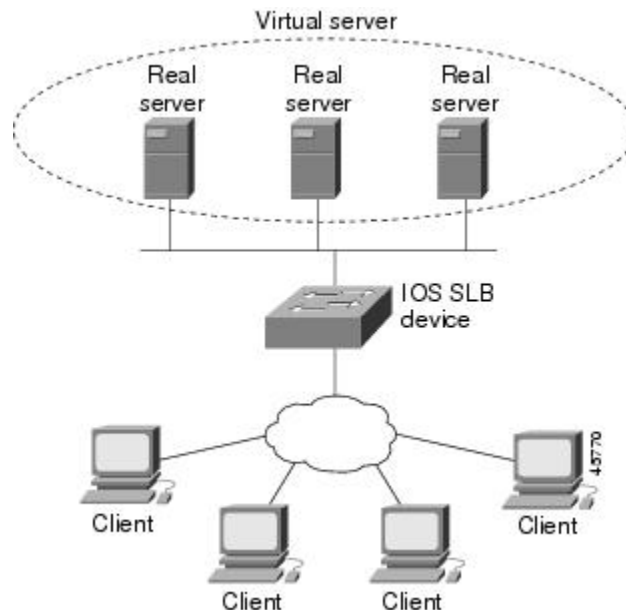
ip slb probe BACKEND ping
address 10.10.10.3 routed
ip slb serverfarm ACME_SFARM
nat server
probe BACKEND
real 10.10.10.1
inservice
real 10.10.10.2
inservice
ip slb vserver ACME_VSERVER
virtual 10.10.10.10 tcp 80
serverfarm ACME_SFARM
inservice

```

Example How to Configure a Layer 3 Switch with IOS SLB

The figure below shows a sample configuration with IOS SLB server connections configured as part of a server farm.

Figure 8: Network Configuration for IOS SLB



As shown in the following sample configuration, the example topology has three public web servers and two restricted web servers for privileged clients in subnet 10.4.4.0. The public web servers are weighted according to their capacity, with server 10.1.1.2 having the lowest capacity and having a connection limit imposed on it. The restricted web servers are configured as members of the same sticky group, so that HTTP connections and Secure Socket Layer (SSL) connections from the same client use the same real server.

The network configuration to provide the previously described IOS SLB functionality follows:

```
ip slb probe PROBE2 http
  request method POST url /probe.cgi?all
  header HeaderName HeaderValue
  header Authorization Basic U2VtaXN3ZWV0OmNoaXBz
!
ip slb serverfarm PUBLIC
  nat server
  predictor leastconns
! First real server
  real 10.1.1.1
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
! Second real server
  real 10.1.1.2
  reassign 4
  faildetect numconns 16
  retry 120
  inservice
! Third real server
  real 10.1.1.3
```

```

        reassign 4
        faildetect numconns 16
        retry 120
        inservice
! Probe
probe PROBE2
! Restricted web server farm
ip slb serverfarm RESTRICTED
predictor leastconns
! First real server
real 10.1.1.20
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
! Second real server
real 10.1.1.21
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
!
! Unrestricted web virtual server
ip slb vserver PUBLIC_HTTP
virtual 10.0.0.1 tcp www
serverfarm PUBLIC
idle 120
delay 5
inservice
!
! Restricted HTTP virtual server
ip slb vserver RESTRICTED_HTTP
virtual 10.0.0.1 tcp www
serverfarm RESTRICTED
client 10.4.4.0 255.255.255.0
sticky 60 group 1
idle 120
delay 5
inservice
!
! Restricted SSL virtual server
ip slb vserver RESTRICTED_SSL
virtual 10.0.0.1 tcp https
serverfarm RESTRICTED
client 10.4.4.0 255.255.255.0
sticky 60 group 1
idle 120
delay 5
inservice
!
interface GigabitEthernet1/1
switchport
switchport access vlan 3
switchport mode access
no ip address
!
interface FastEthernet2/1
switchport
switchport access vlan 2
switchport mode access
no ip address
!
interface FastEthernet2/2
switchport
switchport access vlan 2
switchport mode access
no ip address
!
interface FastEthernet2/3
switchport
switchport access vlan 2
switchport mode access
no ip address

```



```

!
interface Vlan2
 ip address 10.1.1.100 255.255.255.0
!
interface Vlan3
 ip address 40.40.40.1 255.255.255.0

```

Examples How to Configure IOS SLB with NAT and Static NAT

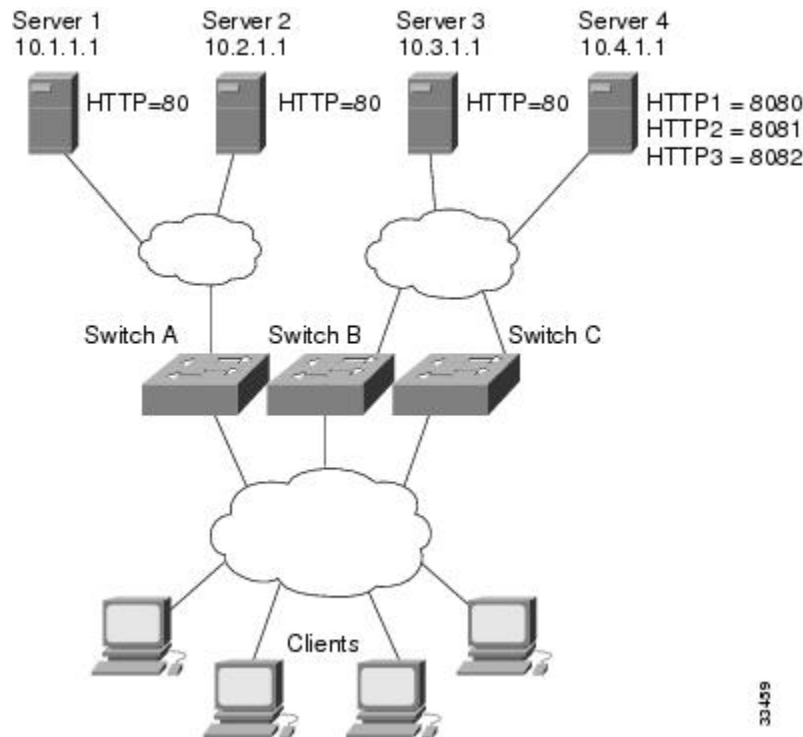
This section contains the following examples, illustrating several different IOS SLB NAT configurations:

- [Example How to Configure IOS SLB with NAT, page 17](#)
- [Example How to Configure IOS SLB with Static NAT, page 19](#)

Example How to Configure IOS SLB with NAT

The figure below shows a sample configuration with IOS SLB real server connections configured as part of a server farm, focusing on the configuration of the NAT server and address pool of clients.

Figure 9: Sample IOS SLB NAT Topology



The topology in the figure above has four web servers, configured as follows:

- Servers 1, 2, and 3 are running single HTTP server applications listening on port 80.
- Server 4 has multiple HTTP server applications listening on ports 8080, 8081, and 8082.

Server 1 and Server 2 are load-balanced using Switch A, which is performing server address translation.

Server 3 and Server 4 are load-balanced using Switch B and Switch C. These two switches are performing both server and client address translation since there are multiple paths between the clients and the servers. These switches also must perform server port translation for HTTP packets to and from Server 4.

- [Switch A Configuration Statements, page 18](#)
- [Switch B Configuration Statements, page 18](#)
- [Switch C Configuration Statements, page 19](#)

Switch A Configuration Statements

```
ip slb serverfarm FARM1
! Translate server addresses
nat server
! Server 1 port 80
real 10.1.1.1
  reassign 2
  faildetect numconns 4 numclients 2
  retry 20
  inservice
! Server 2 port 80
real 10.2.1.1
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
!
ip slb vserver HTTP1
! Manage HTTP (port 80) requests
virtual 128.1.0.1 tcp www
serverfarm FARM1
idle 120
delay 5
inservice
```

Switch B Configuration Statements

```
ip slb natpool web-clients 128.3.0.1 128.3.0.254
! NAT address pool for clients
ip slb serverfarm FARM2
! Translate server addresses
nat server
! Translate client addresses
nat client web-clients
! Server 3 port 80
real 10.3.1.1
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
! Server 4 port 8080
real 10.4.1.1 port 8080
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
! Server 4 port 8081
real 10.4.1.1 port 8081
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
! Server 4 port 8082
real 10.4.1.1 port 8082
  reassign 2
  faildetect numconns 4
  retry 20
```

```

    inservice
!
ip slb vserver HTTP2
! Manage HTTP (port 80) requests
virtual 128.2.0.1 tcp www
serverfarm FARM2
idle 120
delay 5
inservice

```

Switch C Configuration Statements

```

ip slb natpool web-clients 128.5.0.1 128.5.0.254
! NAT address pool for clients
ip slb serverfarm FARM2
! Translate server addresses
nat server
! Translate client addresses
nat client web-clients
! Server 3 port 80
real 10.3.1.1
reassign 2
faildetect numconns 4
retry 20
inservice
! Server 4 port 8080
real 10.4.1.1 port 8080
reassign 2
faildetect numconns 4
retry 20
inservice
! Server 4 port 8081
real 10.4.1.1 port 8081
reassign 2
faildetect numconns 4
retry 20
inservice
! Server 4 port 8082
real 10.4.1.1 port 8082
reassign 2
faildetect numconns 4
retry 20
inservice
!
ip slb vserver HTTP2
! Manage HTTP (port 80) requests
virtual 128.4.0.1 tcp www
serverfarm FARM2
idle 120
delay 5
inservice

```

Example How to Configure IOS SLB with Static NAT

The following example shows configuration statements for the following items:

- A DNS probe, PROBE4, configured to supply real server IP address 13.13.13.13 in response to domain name resolve requests.
- A server farm, DNS, that is configured to use server NAT and PROBE4.
- An all-port virtual server, 10.11.11.11, associated with server farm DNS, that performs per-packet server load balancing for UDP connections.
- A real server, 10.1.1.3, associated with server farm DNS, configured for static NAT and per-packet server load balancing.

```
ip slb probe PROBE4 dns
```

```

lookup 13.13.13.13
!
ip slb serverfarm DNS
  nat server
  probe PROBE4
  real 10.1.1.3
  inservice
!
ip slb vserver DNS
  virtual 10.11.11.11 UDP 0 service per-packet
  serverfarm DNS
!
ip slb static nat 10.11.11.11 per-packet
  real 10.1.1.3

```

Examples How to Configure IOS SLB with Redundancy

This section contains the following examples, illustrating several different IOS SLB configurations with redundancy:

- [Examples How to Configure IOS SLB with Stateless Backup, page 20](#)
- [Example How to Configure IOS SLB with Stateful Backup, page 28](#)
- [Example How to Configure IOS SLB with Stateful Backup of Redundant Route Processors, page 30](#)
- [Example How to Configure IOS SLB with Active Standby, page 31](#)

Examples How to Configure IOS SLB with Stateless Backup

There are several different ways in which you can configure IOS SLB stateless backup. The differences between the configurations depend on the networking capabilities of your load balancing devices, and on the capabilities of the distribution devices that direct client traffic to those load balancing devices.

- If a load balancing device is *not* capable of both Layer 2 switching and VLAN trunking, you must connect it and its real servers to a Layer 2 switch. This configuration is required in order to use HSRP on the server-side VLANs.
- If a distribution device is capable of Layer 3 switching, it can use route redistribution to direct flows to the active load balancing device.
- If a distribution device is capable of Layer 2 switching, it can use client-side HSRP on the load balancing device to direct flows to the active load balancing device.
- While HSRP offers faster failover times, routing converges quickly enough for most configurations. If you use both client-side and server-side HSRP on the load balancing devices, you must use HSRP interface tracking and priorities to synchronize the client-side and server-side HSRP groups.

This section contains the following examples, illustrating several different IOS SLB stateless backup configurations:



Note

Stateful backup is omitted from these examples in the interest of simplicity. To see an example that uses stateful backup, see the “Example: How to Configure IOS SLB with Stateful Backup” section.

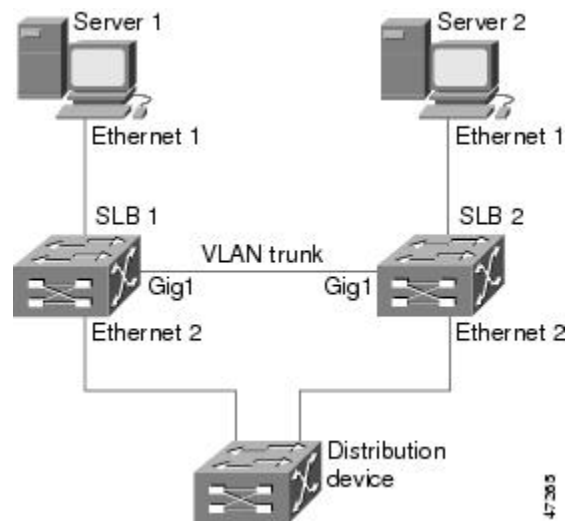
- [Example How to Configure Dynamic Routing and Trunking, page 21](#)
- [Example How to Configure Dynamic Routing and No Trunking, page 22](#)
- [Example How to Configure Static Routing and Trunking, page 24](#)
- [Example How to Configure Static Routing and No Trunking, page 26](#)

Example How to Configure Dynamic Routing and Trunking

The figure below shows a sample IOS SLB stateless backup configuration with the following characteristics:

- The IP address for real server 1 is 10.10.1.3, and for real server 2 is 10.10.1.4, routed to clients through 10.10.1.100.
- The IP address for the virtual server is 10.10.14.1.
- The IP address for VLAN 1 is 10.10.1.0, with a subnet mask of 255.255.255.0.
- The IP address for Subnet 2 is 10.10.2.0, with a subnet mask of 255.255.255.0.
- The IP address for Subnet 3 is 10.10.3.0, with a subnet mask of 255.255.255.0.
- The distribution device uses EIGRP to learn the route to 10.10.14.1 through either 10.10.2.1 or 10.10.3.1, depending on which IOS SLB is active.

Figure 10: Stateless Backup with Layer 3 and Trunking



- [SLB 1 Configuration Statements, page 21](#)
- [SLB 2 Configuration Statements, page 22](#)

SLB 1 Configuration Statements

```
ip slb serverfarm SF1
  real 10.10.1.3
    reassign 2
    faildetect numconns 4 numclients 2
    retry 20
  inservice
  real 10.10.1.4
    reassign 2
    faildetect numconns 4
    retry 20
  inservice
ip slb vserver VS1
  virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
```

```

!
interface Ethernet1
  switchport
  switchport vlan 1
interface Ethernet2
  ip address 10.10.2.1 255.255.255.0
interface vlan 1
  ip address 10.10.1.1 255.255.255.0
  standby ip 10.10.1.100
  standby priority 10 preempt delay sync 20
  standby name SERVER
  standby track Ethernet2
  standby timers 1 3
router eigrp 666
  redistribute static
  network 10.0.0.0

```

SLB 2 Configuration Statements

```

ip slb serverfarm SF1
  real 10.10.1.3
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
  real 10.10.1.4
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
ip slb vserver VS1
  virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
!
interface GigabitEthernet1
  no ip address
  switchport
  switchport trunk encapsulation isl
interface Ethernet1
  switchport
  switchport vlan 1
interface Ethernet2
  ip address 10.10.3.1 255.255.255.0
interface vlan 1
  ip address 10.10.1.2 255.255.255.0
  standby ip 10.10.1.100
  standby priority 5 preempt delay sync 20
  standby name SERVER
  standby track Ethernet2
  standby timers 1 3
router eigrp 666
  redistribute static
  network 10.0.0.0

```

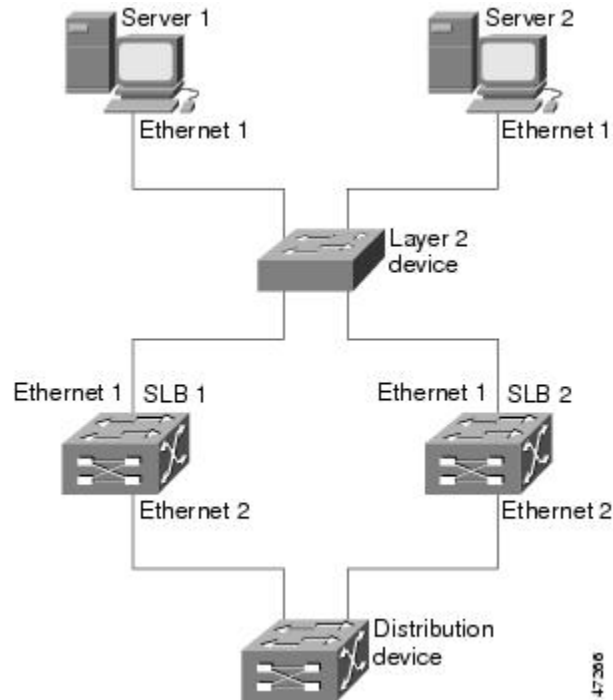
Example How to Configure Dynamic Routing and No Trunking

The figure below shows a sample IOS SLB stateless backup configuration with the following characteristics:

- The IP address for real server 1 is 10.10.1.3, and for real server 2 is 10.10.1.4, routed to clients through 10.10.1.100.
- The IP address for the virtual server is 10.10.14.1.
- The IP address for Subnet 2 is 10.10.2.0, with a subnet mask of 255.255.255.0.
- The IP address for Subnet 3 is 10.10.3.0, with a subnet mask of 255.255.255.0.

- The distribution device uses EIGRP to learn the route to 10.10.14.1 through either 10.10.2.2 or 10.10.3.2, depending on which IOS SLB is active.

Figure 11: Stateless Backup with Layer 3 and No Trunking



- [SLB 1 Configuration Statements, page 23](#)
- [SLB 2 Configuration Statements, page 24](#)

SLB 1 Configuration Statements

```
ip slb serverfarm SF1
  real 10.10.1.3
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
  real 10.10.1.4
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
ip slb vserver VS1
  virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
!
interface Ethernet1
  ip address 10.10.1.1 255.255.255.0
  standby ip 10.10.1.100
  standby priority 10 preempt delay sync 20
  standby name SERVER
  standby track Ethernet2
  standby timers 1 3
```

```

interface Ethernet2
 ip address 10.10.2.1 255.255.255.0
router eigrp 666
 redistribute static
 network 10.0.0.0

```

SLB 2 Configuration Statements

```

ip slb serverfarm SF1
 real 10.10.1.3
   reassign 2
   faildetect numconns 4
   retry 20
   inservice
 real 10.10.1.4
   reassign 2
   faildetect numconns 4
   retry 20
   inservice
ip slb vserver VS1
 virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
!
interface Ethernet1
 ip address 10.10.1.2 255.255.255.0
 standby ip 10.10.1.100
 standby priority 5 preempt delay sync 20
 standby name SERVER
 standby track Ethernet2
 standby timers 1 3
interface Ethernet2
 ip address 10.10.3.1 255.255.255.0
router eigrp 666
 redistribute static
 network 10.0.0.0

```

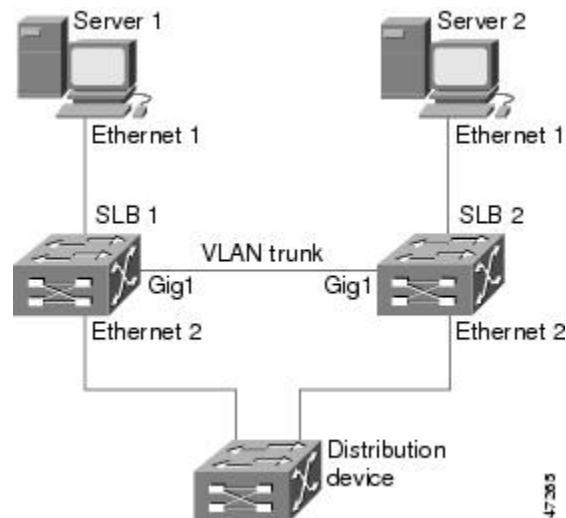
Example How to Configure Static Routing and Trunking

The figure below shows a sample IOS SLB stateless backup configuration with the following characteristics:

- The IP address for real server 1 is 10.10.1.3, and for real server 2 is 10.10.1.4, routed to clients through 10.10.1.100.
- The IP address for the virtual server is 10.10.14.1.
- The IP address for VLAN 1 is 10.10.1.0, with a subnet mask of 255.255.255.0.
- The IP address for Subnet 2 is 10.10.2.0, with a subnet mask of 255.255.255.0.
- The IP address for Subnet 3 is 10.10.3.0, with a subnet mask of 255.255.255.0.

- The configuration uses static routing to the HSRP route on the distribution device.

Figure 12: Stateless Backup with Layer 2 and Trunking



- [SLB 1 Configuration Statements, page 25](#)
- [SLB 2 Configuration Statements, page 26](#)
- [Distribution Device Configuration Statements, page 26](#)

SLB 1 Configuration Statements

```
ip slb serverfarm SF1
  real 10.10.1.3
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
  real 10.10.1.4
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
ip slb vserver VS1
  virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
!
interface Ethernet1
  switchport
  switchport vlan 1
interface Ethernet2
  ip address 10.10.2.1 255.255.255.0
  standby ip 10.10.2.100
  standby priority 10 preempt delay sync 20
  standby track vlan1
  standby timers 1 3
interface vlan 1
  ip address 10.10.1.1 255.255.255.0
  standby ip 10.10.1.100
  standby priority 10 preempt delay sync 20
  standby name SERVER
```

```
standby track Ethernet2
standby timers 1 3
```

SLB 2 Configuration Statements

```
ip slb serverfarm SF1
  real 10.10.1.3
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
  real 10.10.1.4
    reassign 2
    faildetect numconns 4
    retry 20
    inservice
ip slb vserver VS1
  virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
!
interface GigabitEthernet1
  no ip address
  switchport
  switchport trunk encapsulation isl
interface Ethernet1
  switchport
  switchport vlan 1
interface Ethernet2
  ip address 10.10.2.2 255.255.255.0
  standby ip 10.10.2.100
  standby priority 5 preempt delay sync 20
  standby track vlan 1
  standby timers 1 3
interface vlan 1
  ip address 10.10.1.2 255.255.255.0
  standby ip 10.10.1.100
  standby priority 5 preempt delay sync 20
  standby name SERVER
  standby track Ethernet2
  standby timers 1 3
```

Distribution Device Configuration Statements

```
interface Ethernet1
  switchport
  switchport distribution vlan 2
interface Ethernet2
  switchport
  switchport distribution vlan 2
interface vlan2
  ip address 10.10.2.3 255.255.255.0
  no shut
ip route 10.10.14.1 255.255.255.255 10.10.2.100
```

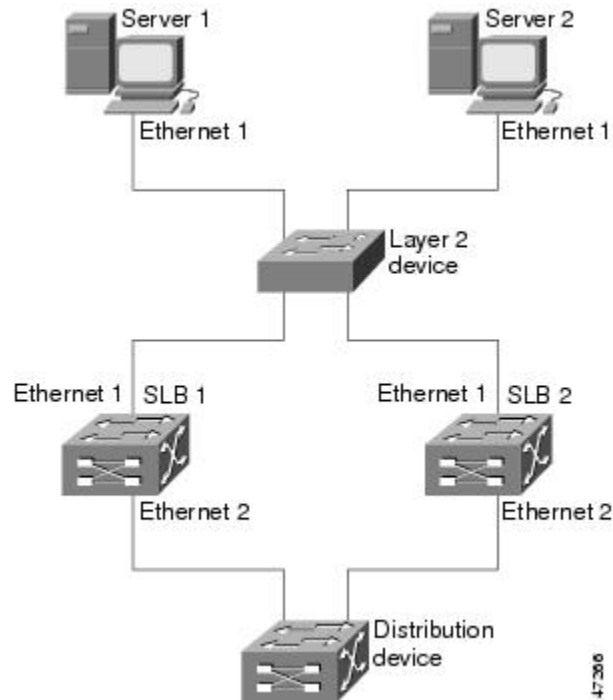
Example How to Configure Static Routing and No Trunking

The figure below shows a sample IOS SLB stateless backup configuration with the following characteristics:

- The IP address for real server 1 is 10.10.1.3, and for real server 2 is 10.10.1.4, routed to clients through 10.10.1.100.
- The IP address for the virtual server is 10.10.14.1.
- The IP address for Subnet 2 is 10.10.2.0, with a subnet mask of 255.255.255.0.

- The IP address for Subnet 3 is 10.10.3.0, with a subnet mask of 255.255.255.0.
- The configuration uses static routing to the HSRP route on the distribution device.

Figure 13: Stateless Backup with Layer 2 and No Trunking



- [SLB 1 Configuration Statements, page 27](#)
- [SLB 2 Configuration Statements, page 28](#)
- [Distribution Device Configuration Statements, page 28](#)

SLB 1 Configuration Statements

```
ip slb serverfarm SF1
  real 10.10.1.3
    reassign 2
    faildetect numconns 4
    retry 20
  inservice
  real 10.10.1.4
    reassign 2
    faildetect numconns 4
    retry 20
  inservice
ip slb vserver VS1
  virtual 10.10.14.1 tcp www
  serverfarm SF1
  idle 120
  delay 5
  inservice standby SERVER
!
interface Ethernet1
  ip address 10.10.1.1 255.255.255.0
  standby ip 10.10.1.100
  standby priority 10 preempt delay sync 20
  standby name SERVER
  standby track Ethernet2
```

```

standby timers 1 3
interface Ethernet2
ip address 10.10.2.1 255.255.255.0
standby ip 10.10.2.100
standby priority 10 preempt delay sync 20
standby track Ethernet1
standby timers 1 3

```

SLB 2 Configuration Statements

```

ip slb serverfarm SF1
real 10.10.1.3
reassign 2
faildetect numconns 4
retry 20
inservice
real 10.10.1.4
reassign 2
faildetect numconns 4
retry 20
inservice
ip slb vserver VS1
virtual 10.10.14.1 tcp www
serverfarm SF1
idle 120
delay 5
inservice standby SERVER
!
interface Ethernet1
ip address 10.10.1.2 255.255.255.0
standby ip 10.10.1.100
standby priority 5 preempt delay sync 20
standby name SERVER
standby track Ethernet2
standby timers 1 3
!
interface Ethernet2
ip address 10.10.2.2 255.255.255.0
standby ip 10.10.2.100
standby priority 5 preempt delay sync 20
standby track Ethernet1
standby timers 1 3

```

Distribution Device Configuration Statements

```

interface Ethernet1
switchport
switchport distribution vlan 2
interface Ethernet2
switchport
switchport distribution vlan 2
interface vlan2
ip address 10.10.2.3 255.255.255.0
no shut
ip route 10.10.14.1 255.255.255.255 10.10.2.100

```

Example How to Configure IOS SLB with Stateful Backup

This sample configuration focuses on the IOS SLB real server connections configured as part of a server farm, with real and virtual servers over Fast Ethernet interfaces configured with stateful backup standby connections.

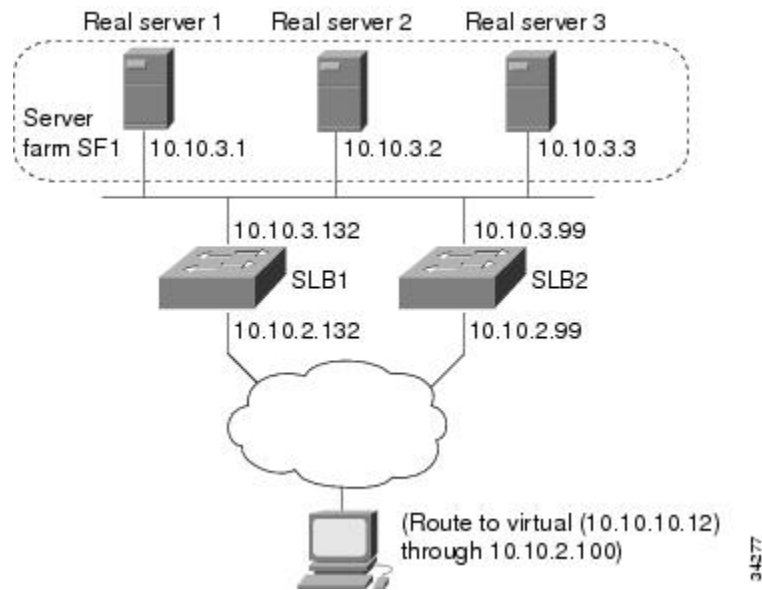
The figure below is an example of a stateful backup configuration, using HSRP on both the client and server sides to manage failover. The real servers route outbound flows to 10.10.3.100, which is the HSRP address on the server side interfaces. The client (or access router), routes to the virtual IP address (10.10.10.12) through 10.10.2.100, HSRP address on the client side.

Notice the loopback interfaces configured on both devices for the exchange of these messages. Each IOS SLB should also be given duplicate routes to the other switch loopback address. This configuration allows replication messages to flow despite an interface failure.

**Note**

To allow HSRP to function properly, the **set spantree portfast** command must be configured on any Layer 2 device between the IOS SLB switches.

Figure 14: IOS SLB Stateful Environment



- [Switch SLB1 Configuration Statements, page 29](#)
- [Switch SLB2 Configuration Statements, page 30](#)

Switch SLB1 Configuration Statements

```
ip slb serverfarm SF1
  nat server
  real 10.10.3.1
  inservice
  real 10.10.3.2
  inservice
  real 10.10.3.3
  inservice
!
ip slb vserver VS1
  virtual 10.10.10.12 tcp telnet
  serverfarm SF1
  replicate casa 10.10.99.132 10.10.99.99 1024 password PASS
  inservice standby virt
!
interface loopback 1
  ip address 10.10.99.132 255.255.255.255
!
interface FastEthernet1
  ip address 10.10.3.132 255.255.255.0
  no ip redirects
```

```

no ip mroute-cache
standby priority 5 preempt
standby name out
standby ip 10.10.3.100
standby track FastEthernet2
standby timers 1 3
interface FastEthernet2
ip address 10.10.2.132 255.255.255.0
no ip redirects
standby priority 5
standby name virt
standby ip 10.10.2.100
standby timers 1 3

```

Switch SLB2 Configuration Statements

```

ip slb serverfarm SF1
nat server
real 10.10.3.1
inservice
real 10.10.3.2
inservice
real 10.10.3.3
inservice
!
ip slb vserver VS1
virtual 10.10.10.12 tcp telnet
serverfarm SF1
replicate casa 10.10.99.99 10.10.99.132 1024 password PASS
inservice standby virt
!
interface loopback 1
ip address 10.10.99.99 255.255.255.255
!
interface FastEthernet2
ip address 10.10.2.99 255.255.255.0
no ip redirects
no ip route-cache
no ip mroute-cache
standby priority 10 preempt delay sync 20
standby name virt
standby ip 10.10.2.100
standby track FastEthernet3
standby timers 1 3
!
interface FastEthernet3
ip address 10.10.3.99 255.255.255.0
no ip redirects
no ip route-cache
no ip mroute-cache
standby priority 10 preempt delay 20
standby name out
standby ip 10.10.3.100
standby track FastEthernet2
standby timers 1 3

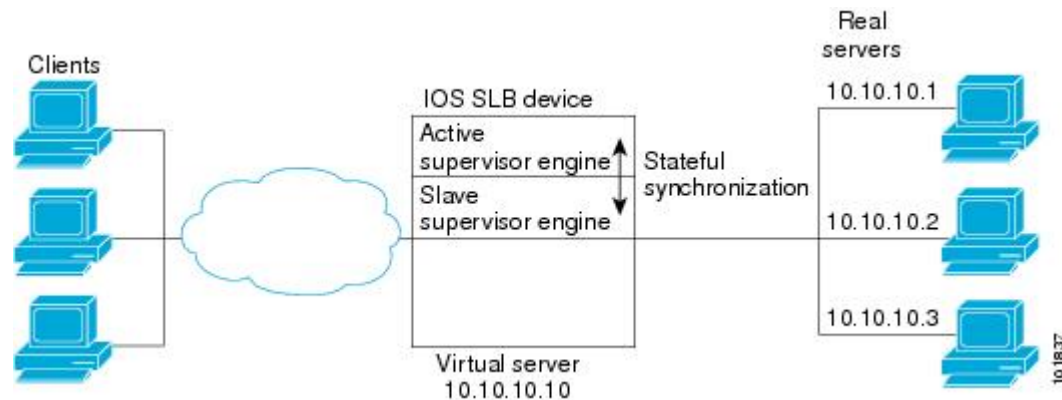
```

Example How to Configure IOS SLB with Stateful Backup of Redundant Route Processors

In the figure below, the IOS SLB device includes two Supervisor engines configured for stateful backup. If the active Supervisor engine fails, the backup Supervisor engine takes over through RPR+ with IOS SLB synchronization information already populated. IOS SLB replicates state information for virtual server

ACME_VSERVER (10.10.10.10) from the active Supervisor engine to the backup every 20 seconds. The real servers (10.10.10.1, 10.10.10.2, and 10.10.10.3) are configured in server farm ACME_SFARM.

Figure 15: IOS SLB with Redundant Route Processors



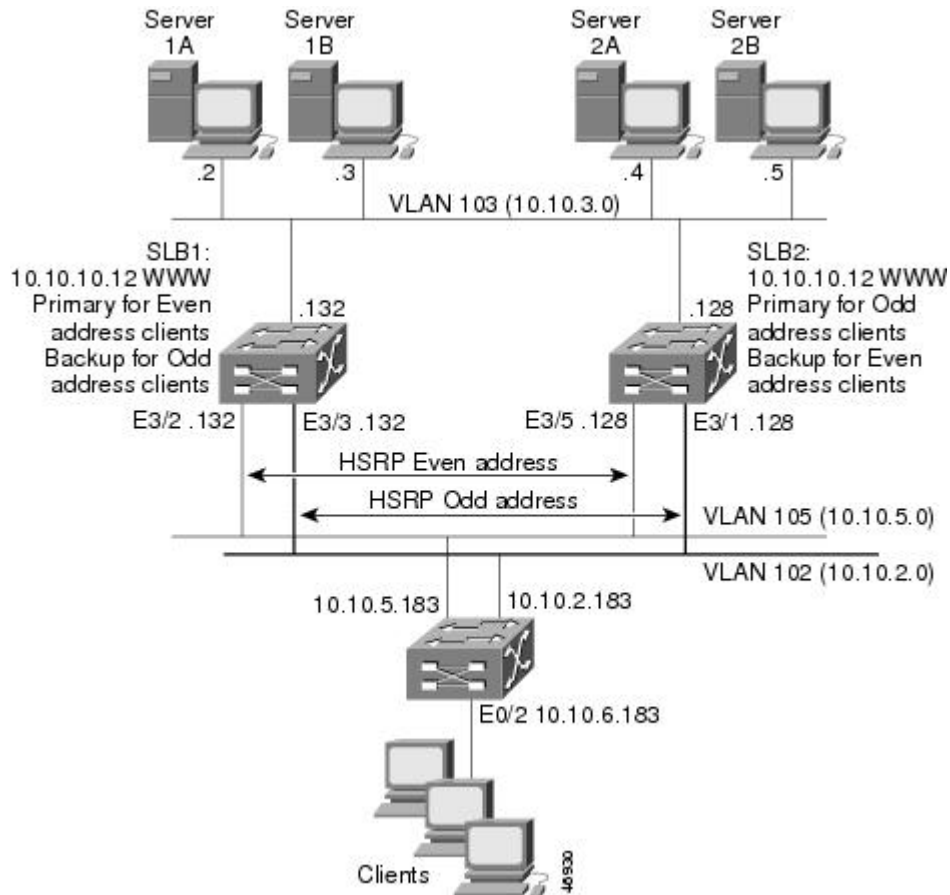
Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```
ip slb replicate slave rate 300
ip slb serverfarm ACME_SFARM
  nat server
  real 10.10.10.1
  inservice
  real 10.10.10.2
  inservice
  real 10.10.10.3
  inservice
ip slb vserver ACME_VSERVER
  virtual 10.10.10.10 tcp 80
  replicate interval 20
  replicate slave
  serverfarm ACME_SFARM
  inservice
```

Example How to Configure IOS SLB with Active Standby

The figure below shows an IOS SLB network configured for active standby, with two IOS SLB devices load-balancing the same virtual IP address while backing up each other. If either device fails, the other takes over its load through normal HSRP failover and IOS SLB stateless redundancy.

Figure 16: IOS SLB Active Standby



The sample network configuration in the figure above has the following characteristics:

- SLB 1 balances servers 1A and 1B and SLB 2 balances 2A and 2B.
- One virtual IP address (10.10.10.12 for web) is supported across the two IOS SLB devices.
- Client traffic is divided in an access router, sending clients with even IP addresses to HSRP1 (10.10.5.100) and clients with odd IP addresses to HSRP2 (10.10.2.100). SLB 1 is configured as primary for clients with odd IP addresses, and SLB 2 is primary for clients with even IP addresses.
- The IOS SLB devices balance the traffic to disjoint sets of real servers. (If client NAT was used in this example, this characteristic would not be a requirement).
- Each set of real servers has a default gateway configured to its IOS SLB device.
- The HSRP address on VLAN 105 is 10.10.5.100. The HSRP address on VLAN 102 is 10.10.2.100.
- [SLB 1 Configuration Statements, page 33](#)
- [SLB 2 Configuration Statements, page 33](#)
- [Access Router Configuration Statements, page 34](#)

SLB 1 Configuration Statements

```

ip slb serverfarm EVEN
nat server
real 10.10.3.2
  reassign 2
  faildetect numconns 4 numclients 2
  retry 20
  inservice
real 10.10.3.3
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
!
ip slb serverfarm ODD
nat server
real 10.10.3.2
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
real 10.10.3.3
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
!-----Same EVEN virtual server as in SLB 2
ip slb vserver EVEN
virtual 10.10.10.12 tcp www
serverfarm EVEN
client 0.0.0.0 0.0.0.1
idle 120
delay 5
!-----See standby name in Ethernet 3/3 below
inservice standby STANDBY_EVEN
!-----Same ODD virtual server as in SLB 2
ip slb vserver ODD
virtual 10.10.10.12 tcp www
serverfarm ODD
client 0.0.0.1 0.0.0.1
idle 120
delay 5
!-----See standby name in Ethernet 3/2 below
inservice standby STANDBY_ODD
!
interface Ethernet3/2
ip address 10.10.5.132 255.255.255.0
standby priority 20 preempt delay sync 20
!-----See standby name in SLB 2, Ethernet 3/5
standby name STANDBY_ODD
standby ip 10.10.5.100
standby track Ethernet3/3
standby timers 1 3
!
interface Ethernet3/3
ip address 10.10.2.132 255.255.255.0
standby priority 10
!-----See standby name in SLB 2, Ethernet 3/1
standby name STANDBY_EVEN
standby ip 10.10.2.100
standby track Ethernet3/2
standby timers 1 3

```

SLB 2 Configuration Statements

```

ip slb serverfarm EVEN
nat server

```

```

real 10.10.3.4
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
real 10.10.3.5
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
!
ip slb serverfarm ODD
nat server
real 10.10.3.4
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
real 10.10.3.5
  reassign 2
  faildetect numconns 4
  retry 20
  inservice
!-----Same EVEN virtual server as in SLB 1
ip slb vserver EVEN
virtual 10.10.10.12 tcp www
serverfarm EVEN
client 0.0.0.0 0.0.0.1
idle 120
delay 5
!-----See standby name in Ethernet 3/1 below
inservice standby STANDBY_EVEN
!-----Same ODD virtual server as in SLB 1
ip slb vserver ODD
virtual 10.10.10.12 tcp www
serverfarm ODD
client 0.0.0.1 0.0.0.1
idle 120
delay 5
!-----See standby name in Ethernet 3/5 below
inservice standby STANDBY_ODD
!
interface Ethernet3/1
ip address 10.10.2.128 255.255.255.0
standby priority 20 preempt delay sync 20
!-----See standby name in SLB 1, Ethernet 3/3
standby name STANDBY_EVEN
standby ip 10.10.2.100
standby track Ethernet3/5
standby timers 1 3
!
interface Ethernet3/5
ip address 10.10.5.128 255.255.255.0
standby priority 10 preempt delay sync 20
!-----See standby name in SLB 1, Ethernet 3/2
standby name STANDBY_ODD
standby ip 10.10.5.100
standby track Ethernet3/1
standby timers 1 3

```

Access Router Configuration Statements

```

interface Ethernet0/0
ip address 10.10.5.183 255.255.255.0
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
!
interface Ethernet0/1
ip address 10.10.2.183 255.255.255.0
no ip directed-broadcast

```

```

no ip route-cache
no ip mroute-cache
!
interface Ethernet0/2
 ip address 10.10.6.183 255.255.255.0
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 ip policy route-map virts
!
access-list 100 permit ip 0.0.0.1 255.255.255.254 host 10.10.10.12
access-list 101 permit ip 0.0.0.0 255.255.255.254 host 10.10.10.12
route-map virts permit 10
match ip address 100
set ip next-hop 10.10.5.100
!
route-map virts permit 15
match ip address 101
set ip next-hop 10.10.2.100

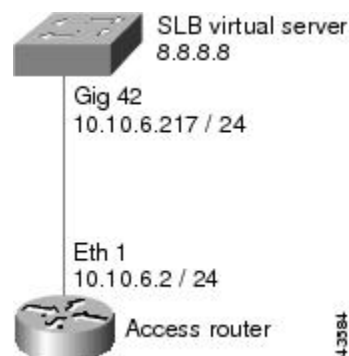
```

Example How to Configure IOS SLB with Redistribution of Static Routes

The figure below shows an IOS SLB network configured to distribute static routes to a virtual server's IP address. The route to the address is added to the routing table as **static** if you advertise the address when you bring the virtual server into service (using the **inserve** command). See the description of the **advertise** command in the *Cisco IOS IP Application Services Command Reference* for more details about advertising virtual server IP addresses.

Because the routing configuration varies from protocol to protocol, sample configurations for several different routing protocols are given.

Figure 17: IOS SLB Redistribution of Static Routes



- [Routing Information Protocol \(RIP\), page 35](#)
- [Open Shortest Path First \(OSPF\), page 36](#)
- [Interior Gateway Routing Protocol \(IGRP\), page 36](#)
- [Enhanced Interior Gateway Routing Protocol \(Enhanced IGRP\), page 36](#)

Routing Information Protocol (RIP)

Following is the RIP static route redistribution configuration for the IOS SLB switch shown in the figure above:

```
router rip
 redistribute static
 network 10.0.0.0
 network 8.0.0.0
```

Following is the RIP static route redistribution configuration for the access router that is listening for routing updates shown in the figure above:

```
router rip
 network 10.0.0.0
 network 8.0.0.0
```

Open Shortest Path First (OSPF)

Following is the OSPF static route redistribution configuration for the IOS SLB switch shown in the figure above:

```
router ospf 1
 redistribute static subnets
 network 10.10.6.217 0.0.0.0 area 0
 network 8.8.8.0 0.0.0.255 area 0
```

Following is the OSPF static route redistribution configuration for the access router that is listening for routing updates shown in the figure above:

```
router ospf 1
 network 10.10.6.2 0.0.0.0 area 0
 network 8.8.8.0 0.0.0.255 area 0
```

Interior Gateway Routing Protocol (IGRP)

Following is the IGRP static route redistribution configuration for the IOS SLB switch shown in the figure above:

```
router igrp 1
 redistribute connected
 redistribute static
 network 8.0.0.0
 network 10.0.0.0
```

Following is the IGRP static route redistribution configuration for the access router that is listening for routing updates shown in the figure above:

```
router igrp 1
 network 8.0.0.0
 network 10.0.0.0
```

Enhanced Interior Gateway Routing Protocol (Enhanced IGRP)

Following is the Enhanced IGRP static route redistribution configuration for the IOS SLB switch shown in the figure above:

```
router eigrp 666
 redistribute static
 network 10.0.0.0
 network 8.0.0.0
```

Following is the Enhanced IGRP static route redistribution configuration for the access router that is listening for routing updates shown in the figure above:

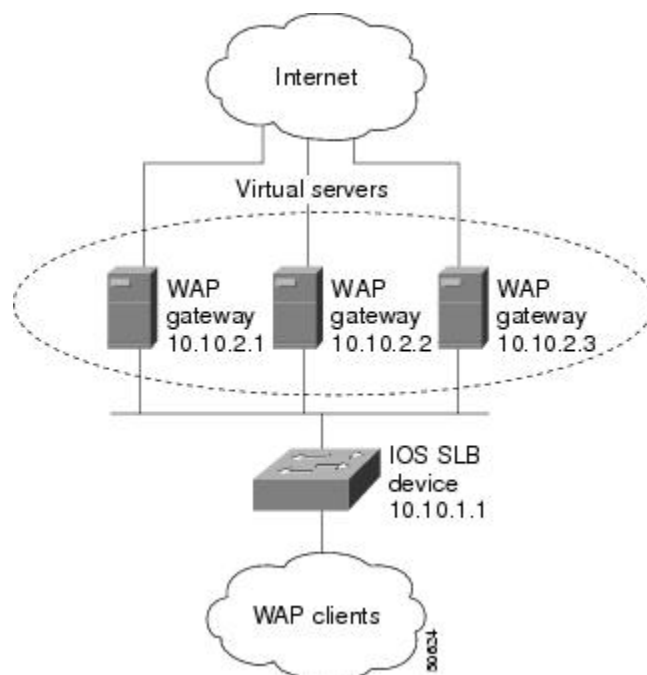
```
router eigrp 666
 network 10.0.0.0
 network 8.0.0.0
```

Example How to Configure IOS SLB with WAP and UDP Load Balancing

The figure below shows an IOS SLB network configured to balance WAP flows. In this example:

- WAP flows are balanced between WAP gateways 10.10.2.1, 10.10.2.2, and 10.10.2.3.
- The clients connect to 10.10.1.1, the IOS SLB virtual server address.
- For a given session, load-balancing decisions change if the connection idles longer than the virtual server's idle connection timer (3000 seconds in this example).

Figure 18: IOS SLB with WAP Load Balancing



There are two ways to configure IOS SLB load balancing for WAP:

- To load-balance sessions running in connection-oriented WSP mode, define a WSP probe and use WAP load balancing. WAP load balancing requires a WAP virtual server configured on one of the WAP ports.
- To load-balance sessions running in connectionless WSP, connectionless secure WSP, and connection-oriented secure WSP modes, define a ping or WSP probe and use standard UDP load balancing with a low idle timer.
- [Example How to Balance WAP Flows on UDP Port 9201](#), page 38

- [Example How to Balance WAP Flows on UDP Port 9203, page 38](#)

Example How to Balance WAP Flows on UDP Port 9201

The following example shows the configuration for the IOS SLB device shown in the figure above, which balances WAP flows on UDP port 9201 (WSP/WTP/UDP):

```
ip slb probe PROBE3 wsp
  url http://localhost/test.txt
!
ip slb serverfarm WAPFARM
  nat server
  real 10.10.2.1
  inservice
  real 10.10.2.2
  inservice
  real 10.10.2.3
  inservice
  probe PROBE3
!
ip slb vserver VSERVER
  virtual 10.10.1.1 udp 9201
  serverfarm WAPFARM
  idle 3000
  inservice
```

Example How to Balance WAP Flows on UDP Port 9203

The following example shows the configuration for the IOS SLB device shown in the figure above, which balances WAP flows on UDP port 9203 (WSP/WTP/WTLS/UDP):

```
ip slb probe PROBE1 ping
!
ip slb serverfarm WAPFARM
  nat server
  real 10.10.2.1
  inservice
  real 10.10.2.2
  inservice
  real 10.10.2.3
  inservice
  probe PROBE1
!
ip slb vserver VSERVER
  virtual 10.10.1.1 udp 9203
  serverfarm WAPFARM
  idle 3000
  inservice
```

Examples How to Configure IOS SLB with Route Health Injection

This section contains the following examples, illustrating several different IOS SLB route health injection configurations:

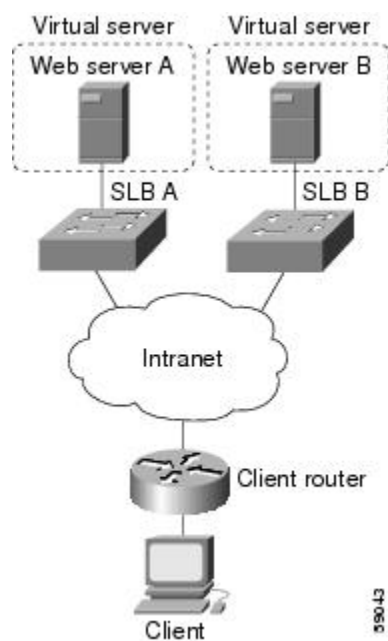
- [Example How to Configure Two Distributed Sites with One Web Server Each, page 39](#)
- [Example How to Configure Two Distributed Sites with Two Web Servers Each, page 39](#)
- [Example How to Configure Two Distributed Sites with One Web Server and a Backup IOS SLB Switch Each, page 40](#)

Example How to Configure Two Distributed Sites with One Web Server Each

The figure below shows an IOS SLB network configured with route health injection with the following characteristics:

- Both IOS SLB devices are configured with the same virtual IP address.
- Each IOS SLB device has a server farm containing only the locally attached web server as a real server.
- The path to SLB A has the lower weight.

Figure 19: Two Distributed Sites with One Web Server Each



When both web servers in the figure above are operational, the client router receives the host route from both IOS SLB devices.

If Web Server A fails, the virtual server for the virtual IP address on SLB A enters FAILED state and stops advertising the host route for the virtual IP address. The client router then begins using the route to SLB B.

When Web Server A is again available, the virtual server again advertises the host route for the virtual IP address, and the client router begins using SLB A.

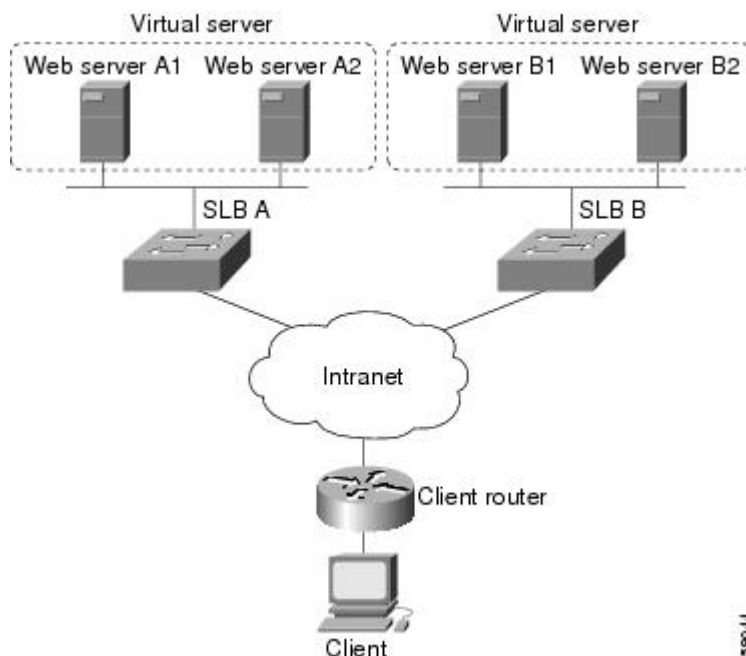
Example How to Configure Two Distributed Sites with Two Web Servers Each

The figure below shows an IOS SLB network configured with route health injection with the following characteristics:

- Both IOS SLB devices are configured with the same virtual IP address.
- Each IOS SLB device has a server farm containing two locally attached web servers as real servers.

- The path to SLB A has the lower weight.

Figure 20: Two Distributed Sites with Two Web Servers Each



When all web servers in the figure above are operational, the client router receives the host route from both IOS SLB devices.

If one web server in either server farm fails, the route continues to be advertised by the given IOS SLB device.

If both Web Server A1 and Web Server A2 fail, the virtual server for the virtual IP address on SLB A enters FAILED state and stops advertising the host route for the virtual IP address. The client router then begins using the route to SLB B.

When either Web Server A1 or Web Server A2 is again available, the virtual server again advertises the host route for the virtual IP address, and the client router begins using SLB A.

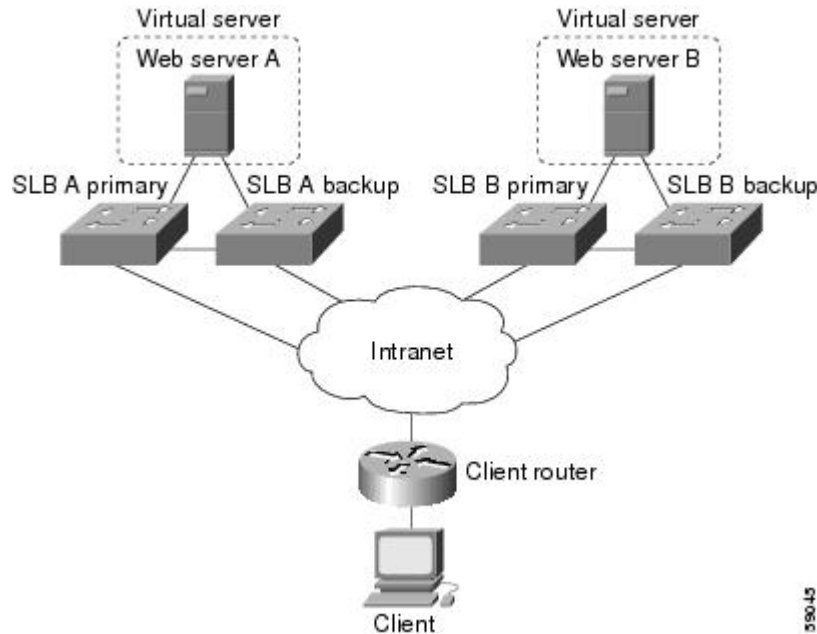
Example How to Configure Two Distributed Sites with One Web Server and a Backup IOS SLB Switch Each

The figure below shows an IOS SLB network configured with route health injection with the following characteristics:

- Both IOS SLB devices are configured with the same virtual IP address.
- Each IOS SLB device has a server farm containing only the locally attached web server as a real server.
- Each site has a primary IOS SLB device and a backup IOS SLB device.

- The path to SLB A has the lower weight.

Figure 21: Two Distributed Sites with One Web Server and a Backup IOS SLB Switch Each



When both web servers in the figure above are operational, the client router receives the host route from both SLB A Primary and SLB B Primary.

If SLB A Primary fails, SLB A Backup begins advertising the host route to the virtual IP address. If SLB A Backup also fails, the virtual server for the virtual IP address on SLB A Primary and SLB A Backup enters FAILED state and stops advertising the host route for the virtual IP address. The client router then begins using the route to SLB B Primary (or to SLB B Backup, if SLB B Primary is not available).

When either SLB A Primary or SLB A Backup is again available, the virtual server again advertises the host route for the virtual IP address, and the client router begins using SLB A Primary or SLB A Backup.

Examples How to Configure IOS SLB with GPRS Load Balancing

This section contains the following examples, illustrating several different IOS SLB configurations with redundancy:

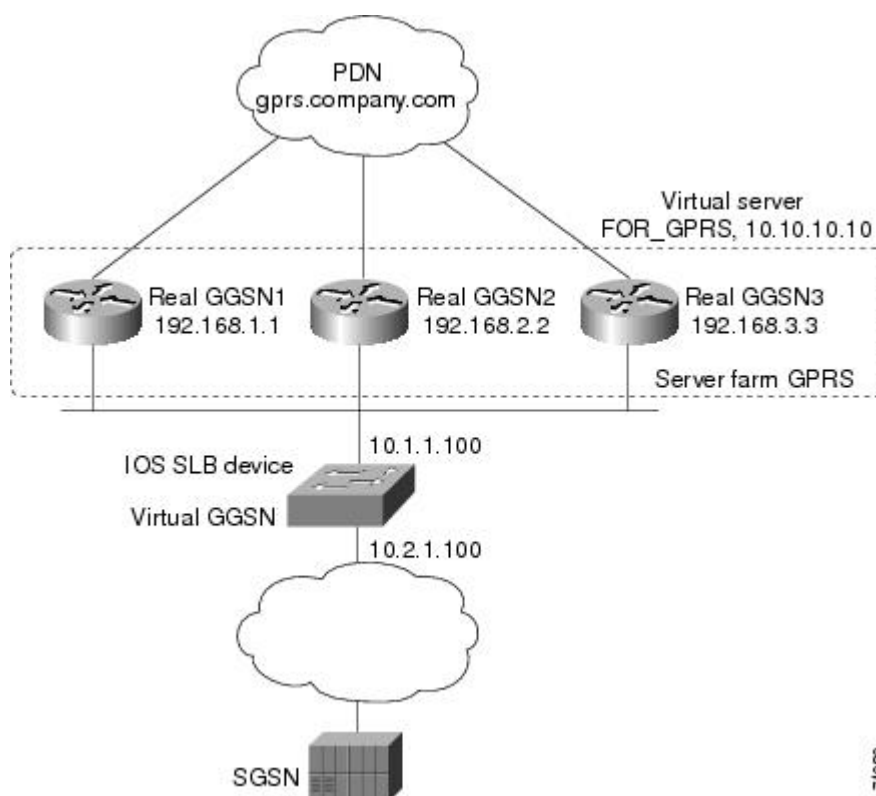
- [Example How to Configure IOS SLB with GPRS Load Balancing Without GTP Cause Code Inspection, page 42](#)
- [Example How to Configure IOS SLB with GPRS Load Balancing and NAT, page 45](#)
- [Example How to Configure IOS SLB with GPRS Load Balancing NAT and GTP Cause Code Inspection, page 48](#)
- [Example How to Configure IOS SLB with GPRS Load Balancing Maps, page 49](#)
- [Example How to Configure IOS SLB with Dual-Stack Addresses for GTP Load Balancing, page 50](#)

Example How to Configure IOS SLB with GPRS Load Balancing Without GTP Cause Code Inspection

The figure below shows a typical GPRS load-balancing configuration *without* GTP cause code inspection enabled. In this configuration:

- IOS SLB can balance GPRS flows across multiple real GGSNs. The SGSN “sees” the real GGSNs as one virtual GGSN. This configuration increases the flow-handling capability of the real GGSNs and increases the reliability and availability.
- The virtual template address of the SGSN is 10.111.111.111.
- The virtual template address of GGSN1 is 192.168.1.1.
- The virtual template address of GGSN2 is 192.168.2.2.
- The virtual template address of GGSN3 is 192.168.3.3.

Figure 22: IOS SLB with GPRS Load Balancing



Following are the configuration statements for the configuration shown in the figure above:

For more detailed GGSN configuration examples, refer to the *Cisco IOS Mobile Wireless Configuration Guide* .

- [IOS SLB Configuration Statements, page 43](#)
- [GGSN1 Configuration Statements, page 43](#)
- [GGSN2 Configuration Statements, page 44](#)
- [GGSN3 Configuration Statements, page 45](#)

IOS SLB Configuration Statements

```

hostname GTP_SLB
!
ip domain-name gprs.com
!
ip slb serverfarm GPRS
  real 192.168.1.1
    weight 1
    faildetect numconns 1 numclients 1
  inservice
!
  real 192.168.2.2
    weight 1
    faildetect numconns 1 numclients 1
  inservice
!
  real 192.168.3.3
    weight 1
    faildetect numconns 1 numclients 1
  inservice
!
ip slb vserver FOR_GPRS
  virtual 10.10.10.10 udp 3386 service gtp
  serverfarm GPRS
  inservice
!
ip slb dfp password Password1 0
  agent 10.1.1.201 1111 30 0 10
  agent 10.1.1.202 1111 30 0 10
  agent 10.1.1.203 1111 30 0 10
!
interface FastEthernet1/0
  description TO SERVERFARM GPRS
  ip address 10.1.1.100 255.255.255.0
  no ip redirects
  duplex half
!
interface FastEthernet3/0
  description TO SGSN
  ip address 10.2.1.100 255.255.255.0
  no ip mroute-cache
  duplex half
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
ip route 192.168.1.1 255.255.255.255 10.1.1.201
ip route 192.168.2.2 255.255.255.255 10.1.1.202
ip route 192.168.3.3 255.255.255.255 10.1.1.203

```

GGSN1 Configuration Statements

```

service gprs ggsn
!
hostname GGSN1
!
ip dfp agent gprs
  port 1111
  password Password1 0
  inservice
!
ip domain-name gprs.com
!
interface loopback 1
  description LOOPBACK SAME AS IOS SLB VSERVER ADDRESS
  ip address 10.10.10.10 255.255.255.255
  no ip route-cache
  no ip mroute-cache
!

```

```

interface FastEthernet1/0
description TO SLB
ip address 10.1.1.201 255.255.255.0
ip directed-broadcast
no ip mroute-cache
duplex half
!
interface Virtual-Template1
description GTP VIRTUAL TEMPLATE
ip address 192.168.1.1 255.255.255.0
encapsulation gtp
gprs access-point-list gprs1
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
!
gprs access-point-list gprs1
access-point 1
access-point-name gprs.company.com
access-mode non-transparent
ip-address-pool dhcp-proxy-client
dhcp-server 10.100.0.5 10.100.0.6
dhcp-gateway-address 10.27.3.1
exit
!
gprs maximum-pdp-context-allowed 45000
gprs qos map canonical-qos
gprs gtp path-echo-interval 0
gprs dfp max-weight 32
gprs slb cef 10.10.10.10

```

GGSN2 Configuration Statements

```

service gprs ggsn
!
hostname GGSN2
!
ip dfp agent gprs
port 1111
password Password1 0
inservice
!
ip domain-name gprs.com
!
interface loopback 1
description LOOPBACK SAME AS IOS SLB VSERVER ADDRESS
ip address 10.10.10.10 255.255.255.255
no ip route-cache
no ip mroute-cache
!
interface FastEthernet1/0
description TO SLB
ip address 10.1.1.202 255.255.255.0
ip directed-broadcast
no ip mroute-cache
duplex half
!
interface Virtual-Template1
description GTP VIRTUAL TEMPLATE
ip address 192.168.2.2 255.255.255.0
encapsulation gtp
gprs access-point-list gprs1
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
!
gprs access-point-list gprs1
access-point 1
access-point-name gprs.company.com
access-mode non-transparent
ip-address-pool dhcp-proxy-client
dhcp-server 10.100.0.5 10.100.0.6
dhcp-gateway-address 10.27.3.1

```

```

    exit
  !
  gprs maximum-pdp-context-allowed 45000
  gprs qos map canonical-qos
  gprs gtp path-echo-interval 0
  gprs dfp max-weight 32
  gprs slb cef 10.10.10.10

```

GGSN3 Configuration Statements

```

service gprs ggsn
!
hostname GGSN3
!
ip dfp agent gprs
  port 1111
  password Password1 0
  inservice
!
ip domain-name gprs.com
!
interface loopback 1
  description LOOPBACK SAME AS IOS SLB VSERVER ADDRESS
  ip address 10.10.10.10 255.255.255.255
  no ip route-cache
  no ip mroute-cache
!
interface FastEthernet1/0
  description TO SLB
  ip address 10.1.1.203 255.255.255.0
  ip directed-broadcast
  no ip mroute-cache
  duplex half
!
interface Virtual-Template1
  description GTP VIRTUAL TEMPLATE
  ip address 192.168.3.3 255.255.255.0
  encapsulation gtp
  gprs access-point-list gprs1
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
!
gprs access-point-list gprs1
  access-point 1
    access-point-name gprs.company.com
    access-mode non-transparent
    ip-address-pool dhcp-proxy-client
    dhcp-server 10.100.0.5 10.100.0.6
    dhcp-gateway-address 10.27.3.1
  exit
!
gprs maximum-pdp-context-allowed 45000
gprs qos map canonical-qos
gprs gtp path-echo-interval 0
gprs dfp max-weight 32
gprs slb cef 10.10.10.10

```

Example How to Configure IOS SLB with GPRS Load Balancing and NAT

The following example uses the same basic configuration as in the “Example: How to Configure IOS SLB with GPRS Load Balancing Without GTP Cause Code Inspection”, including the network shown in the figure above, but with the addition of NAT:

For more detailed GGSN configuration examples, refer to the *Cisco IOS Mobile Wireless Configuration Guide*.

- [IOS SLB Configuration Statements, page 46](#)
- [GGSN1 Configuration Statements, page 46](#)

- [GGSN2 Configuration Statements, page 47](#)
- [GGSN3 Configuration Statements, page 48](#)

IOS SLB Configuration Statements

```

hostname GTP_SLB
!
ip domain-name gprs.com
!
ip slb serverfarm GPRS
  nat server
  real 192.168.1.1
  weight 1
  faildetect numconns 1 numclients 1
  inservice
!
  real 192.168.2.2
  weight 1
  faildetect numconns 1 numclients 1
  inservice
!
  real 192.168.3.3
  weight 1
  faildetect numconns 1 numclients 1
  inservice
!
ip slb vserver FOR_GPRS
  virtual 10.10.10.10 udp 3386 service gtp
  serverfarm GPRS
  inservice
!
ip slb dfp password Password1 0
  agent 10.1.1.201 1111 30 0 10
  agent 10.1.1.202 1111 30 0 10
  agent 10.1.1.203 1111 30 0 10
!
interface FastEthernet1/0
  description TO SERVERFARM GPRS
  ip address 10.1.1.100 255.255.255.0
  no ip redirects
  duplex half
!
interface FastEthernet3/0
  description TO SGSN
  ip address 10.2.1.100 255.255.255.0
  no ip mroute-cache
  duplex half
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
ip route 192.168.1.1 255.255.255.255 10.1.1.201
ip route 192.168.2.2 255.255.255.255 10.1.1.202
ip route 192.168.3.3 255.255.255.255 10.1.1.203

```

GGSN1 Configuration Statements

```

service gprs ggsn
!
hostname GGSN1
!
ip dfp agent gprs
  port 1111
  password Password1 0
  inservice
!
ip domain-name gprs.com
!
interface FastEthernet1/0

```

```

description TO SLB
ip address 10.1.1.201 255.255.255.0
ip directed-broadcast
no ip mroute-cache
duplex half
!
interface Virtual-Template1
description GTP VIRTUAL TEMPLATE
ip address 192.168.1.1 255.255.255.0
encapsulation gtp
gprs access-point-list gprs1
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
!
gprs access-point-list gprs1
access-point 1
access-point-name gprs.company.com
access-mode non-transparent
ip-address-pool dhcp-proxy-client
dhcp-server 10.100.0.5 10.100.0.6
dhcp-gateway-address 10.27.3.1
exit
!
gprs maximum-pdp-context-allowed 45000
gprs qos map canonical-qos
gprs gtp path-echo-interval 0
gprs dfp max-weight 32

```

GGSN2 Configuration Statements

```

service gprs ggsn
!
hostname GGSN2
!
ip dfp agent gprs
port 1111
password Password1 0
inservice
!
ip domain-name gprs.com
!
interface FastEthernet1/0
description TO SLB
ip address 10.1.1.202 255.255.255.0
ip directed-broadcast
no ip mroute-cache
duplex half
interface Virtual-Template1
description GTP VIRTUAL TEMPLATE
ip address 192.168.2.2 255.255.255.0
encapsulation gtp
gprs access-point-list gprs1
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
!
gprs access-point-list gprs1
access-point 1
access-point-name gprs.company.com
access-mode non-transparent
ip-address-pool dhcp-proxy-client
dhcp-server 10.100.0.5 10.100.0.6
dhcp-gateway-address 10.27.3.1
exit
!
gprs maximum-pdp-context-allowed 45000
gprs qos map canonical-qos
gprs gtp path-echo-interval 0
gprs dfp max-weight 32

```

GGSN3 Configuration Statements

```

service gprs ggsn
!
hostname GGSN3
!
ip dfp agent gprs
  port 1111
  password Password1 0
  inservice
!
ip domain-name gprs.com
!
interface FastEthernet1/0
  description TO SLB
  ip address 10.1.1.203 255.255.255.0
  ip directed-broadcast
  no ip mroute-cache
  duplex half
!
interface Virtual-Template1
  description GTP VIRTUAL TEMPLATE
  ip address 192.168.3.3 255.255.255.0
  encapsulation gtp
  gprs access-point-list gprs1
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
!
gprs access-point-list gprs1
  access-point 1
  access-point-name gprs.company.com
  access-mode non-transparent
  ip-address-pool dhcp-proxy-client
  dhcp-server 10.100.0.5 10.100.0.6
  dhcp-gateway-address 10.27.3.1
  exit
!
gprs maximum-pdp-context-allowed 45000
gprs qos map canonical-qos
gprs gtp path-echo-interval 0
gprs dfp max-weight 32

```

Example How to Configure IOS SLB with GPRS Load Balancing NAT and GTP Cause Code Inspection

The following example uses the same basic configuration as in the “Example: How to Configure IOS SLB with GPRS Load Balancing and NAT” section, including the network shown in the figure above, but with the GTP cause code inspection enabled. In this configuration:

- The GSN idle timer is set to 20 seconds.
- The GTP request idle timer is set to 15 seconds.
- The virtual server accepts PDP context creates only from International Mobile Subscriber IDs (IMSI)s with carrier code **mcc 222 mnc 22**.

Following are the configuration statements for the configuration shown in the figure above, with the addition of NAT and GTP cause code inspection support:

For more detailed GGSN configuration examples, refer to the *Cisco IOS Mobile Wireless Configuration Guide* .

- [IOS SLB Configuration Statements](#), page 49

IOS SLB Configuration Statements

```

hostname GTP_SLB
!
ip domain-name gprs.com
!
ip slb timers gtp gsn 20
!
ip slb serverfarm GPRS
nat server
real 192.168.1.1
weight 1
faildetect numconns 1 numclients 1
inservice
!
real 192.168.2.2
weight 1
faildetect numconns 1 numclients 1
inservice
!
real 192.168.3.3
weight 1
faildetect numconns 1 numclients 1
inservice
!
ip slb vserver FOR_GPRS
virtual 10.10.10.10 udp 0 service gtp-inspect
idle gtp request 15
client gtp carrier-code mcc 222 mnc 22
serverfarm GPRS
inservice
!
ip slb dfp password Password1 0
agent 10.1.1.201 1111 30 0 10
agent 10.1.1.202 1111 30 0 10
agent 10.1.1.203 1111 30 0 10
!
interface FastEthernet1/0
description TO SERVERFARM GPRS
ip address 10.1.1.100 255.255.255.0
no ip redirects
duplex half
!
interface FastEthernet3/0
description TO SGSN
ip address 10.2.1.100 255.255.255.0
no ip mroute-cache
duplex half
!
ip route 10.111.111.111 255.255.255.255 FastEthernet1/0
ip route 192.168.1.1 255.255.255.255 10.1.1.201
ip route 192.168.2.2 255.255.255.255 10.1.1.202
ip route 192.168.3.3 255.255.255.255 10.1.1.203

```

Example How to Configure IOS SLB with GPRS Load Balancing Maps

The following sample configuration enables IOS SLB to support multiple server farms behind a GPRS load balancing virtual server, using access point names (APNs) to select server farms. Server farm **farm6** is configured without an associated map, and therefore acts as a default server farm. If IOS SLB cannot match any of the other server farm maps, and a default server farm is configured, IOS SLB sends the GPRS request to the default serverfarm.

```

ip slb map 1 gtp
apn cisco*
ip slb map 4 gtp
apn abc.microsoft.com

```

```

    apn xyz.intel.com
ip slb map 5 gtp
    apn yahoo.com
!
ip slb serverfarm farm1
    real 10.0.0.1
    inservice
    real 10.0.0.2
    inservice
ip slb serverfarm farm2
    real 10.0.0.3
    inservice
    real 10.0.0.4
    inservice
ip slb serverfarm farm3
    real 10.0.0.5
    inservice
    real 10.0.0.6
    inservice
ip slb serverfarm farm4
    real 10.0.0.7
    inservice
    real 10.0.0.8
    inservice
ip slb serverfarm farm5
    real 10.0.0.9
    inservice
    real 10.0.0.10
    inservice
ip slb serverfarm farm6
    real 10.0.0.11
    inservice
!
ip slb map 1 gtp
    apn cisco*
ip slb map 4 gtp
    apn abc.microsoft.com
    apn xyz.intel.com
ip slb map 5 gtp
    apn yahoo.com
!
ip slb vserver GGSN_SERVER
    virtual 10.10.10.10 udp 0 service gtp
    serverfarm farm1 backup farm2 map 1 priority 3
    serverfarm farm4 map 4 priority 1
    serverfarm farm5 map 5 priority 4
    serverfarm farm6
    inservice

```

Example How to Configure IOS SLB with Dual-Stack Addresses for GTP Load Balancing

The following sample configuration enables IOS SLB to support dual-stack addresses for GTP load balancing.

```

ip slb serverfarm SF1
    real 172.16.88.5
    weight 1
    inservice
!
ip slb serverfarm SF2
    real 172.16.88.6
    weight 1
    inservice
!
ip slb serverfarm SF3
    real 172.16.88.7 ipv6 2342:2342:2343:FF04:2388:BB03:3329:8612
    weight 1
    inservice

```

```

!
ip slb serverfarm SF4
real 172.16.88.8 ipv6 2342:2342:2343:FF04:2388:BB03:3423:8912
weight 1
inservice
!
ip slb vserver VS2
virtual 4.3.2.1 ipv6 2342:2342:2343:FF04:2341:AA03:2323:8912 udp 0 service gtp
serverfarm sf1 backup sf2 ipv6-primary sf3 ipv6-backup sf4
idle gtp request 90
idle gtp imsi 10000000
sticky gtp imsi group 1
gtp notification cac 3
inservice

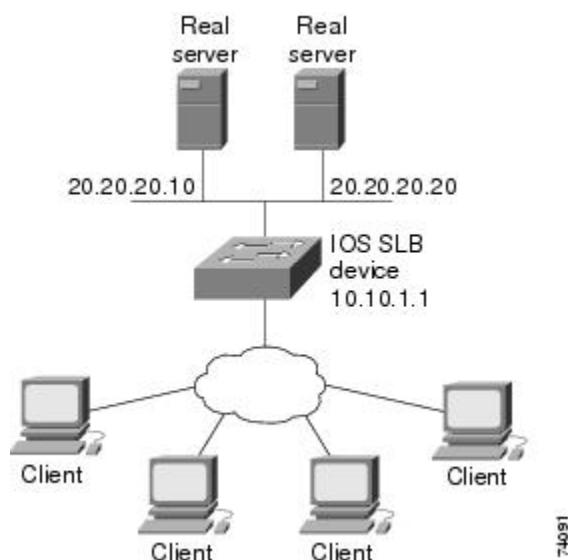
```

Example How to Configure IOS SLB with VPN Server Load Balancing

The figure below shows a typical VPN server load-balancing configuration. In this configuration:

- VPN flows are balanced between real servers 20.20.20.10 and 20.20.20.20.
- Clients connect to 10.10.1.1, the IOS SLB virtual server address.
- There is a sticky connection between the ESP virtual server and the UDP virtual server.
- The cryptographic key exchange occurs through IKE (ISAKMP; port 500).

Figure 23: IOS SLB with VPN Server Load Balancing



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```

ip slb serverfarm VPN
nat server
real 20.20.20.10
inservice
real 20.20.20.20
inservice
failaction purge
!
ip slb vserver ESP

```

```
virtual 10.10.1.1 ESP
serverfarm VPN
sticky 3600 group 69
inservice
!
ip slb vserver UDP
virtual 10.10.1.1 UDP isakmp
serverfarm VPN
sticky 3600 group 69
inservice
```

Examples How to Configure IOS SLB with RADIUS Load Balancing

This section contains the following examples, illustrating several different IOS SLB RADIUS load-balancing configurations:

- [Example How to Configure IOS SLB with RADIUS Load Balancing for a GPRS Network, page 52](#)
- [Example How to Configure IOS SLB with RADIUS Load Balancing for a Simple IP CDMA2000 Network, page 53](#)
- [Example How to Configure IOS SLB with RADIUS Load Balancing for a Mobile IP CDMA2000 Network, page 54](#)
- [Example How to Configure IOS SLB with RADIUS Load Balancing for Multiple Service Gateway Farms, page 55](#)
- [Example How to Configure IOS SLB with RADIUS Load Balancing Firewall Load Balancing “Sandwich”, page 56](#)
- [Example How to Configure IOS SLB with RADIUS Load Balancing Maps, page 58](#)
- [Example How to Configure IOS SLB with RADIUS Load Balancing Accelerated Data Plane Forwarding, page 59](#)

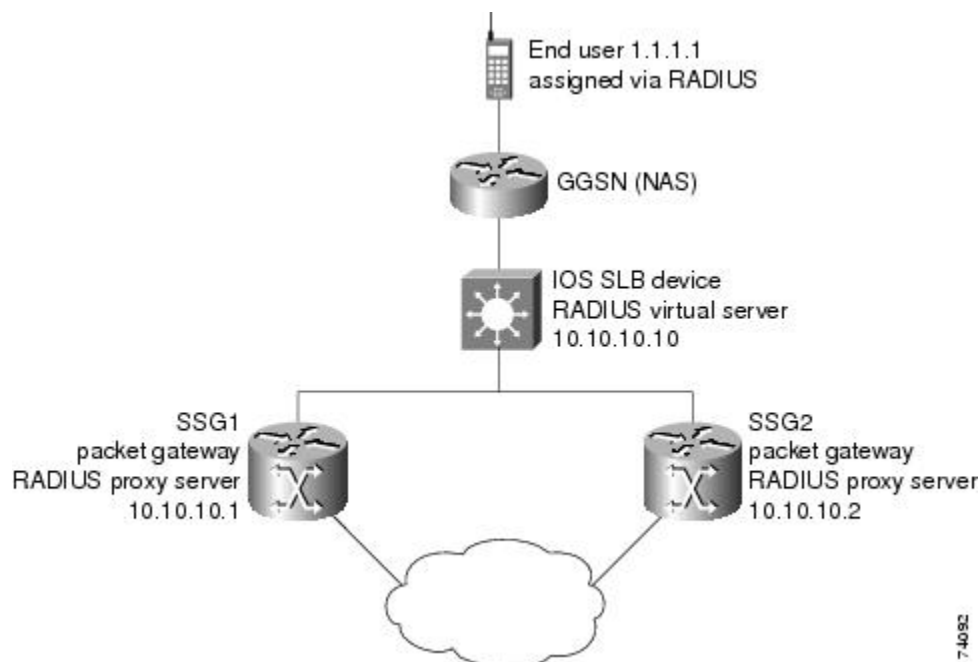
Example How to Configure IOS SLB with RADIUS Load Balancing for a GPRS Network

The figure below shows a typical IOS SLB RADIUS load-balancing configuration for a GPRS network. In this configuration:

- RADIUS requests are load-balanced between SSG RADIUS proxy servers 10.10.10.1 and 10.10.10.2.
- End-user data packets are routed to the IOS SLB device.
- End-user data packets from the 1.1.1.0 subnet are directed by IOS SLB to SSG1.

- End-user data packets from the 1.1.2.0 subnet are directed by IOS SLB to SSG2.

Figure 24: IOS SLB with RADIUS Load Balancing for a GPRS Network



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

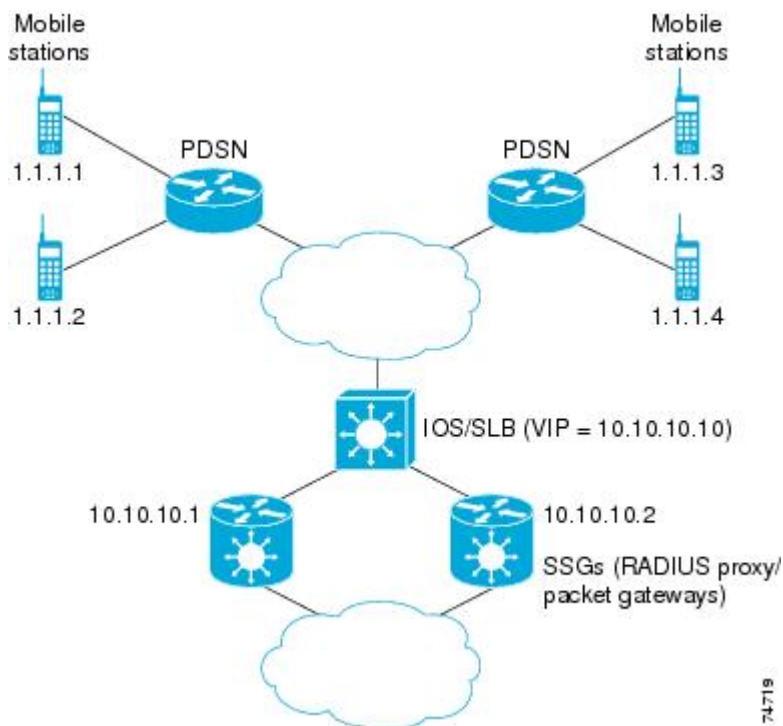
```
ip slb route 1.1.0.0 255.255.0.0 framed-ip
!
ip slb serverfarm SSGFARM
  nat server
  real 10.10.10.1
  inservice
  real 10.10.10.2
  inservice
!
ip slb vserver RADIUS_ACCT
  virtual 10.10.10.10 udp 1813 service radius
  serverfarm SSGFARM
  idle radius request 20
  idle radius framed-ip 7200
  sticky radius framed-ip group 1
  inservice
!
ip slb vserver RADIUS_AUTH
  virtual 10.10.10.10 udp 1812 service radius
  serverfarm SSGFARM
  idle radius request 20
  idle radius framed-ip 7200
  sticky radius framed-ip group 1
  inservice
```

Example How to Configure IOS SLB with RADIUS Load Balancing for a Simple IP CDMA2000 Network

The figure below shows a typical IOS SLB RADIUS load-balancing configuration for a CDMA2000 network with simple IP service. In this configuration:

- The RADIUS virtual server IP address for the PDSNs is 10.10.10.10.
- RADIUS requests are load-balanced between SSG RADIUS proxy servers 10.10.10.1 and 10.10.10.2.
- End-user data packets are routed to the IOS SLB device.
- End-user data packets from the 1.1.0.0 network are routed to the SSGs.

Figure 25: IOS SLB with RADIUS Load Balancing for a Simple IP CDMA2000 Network



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

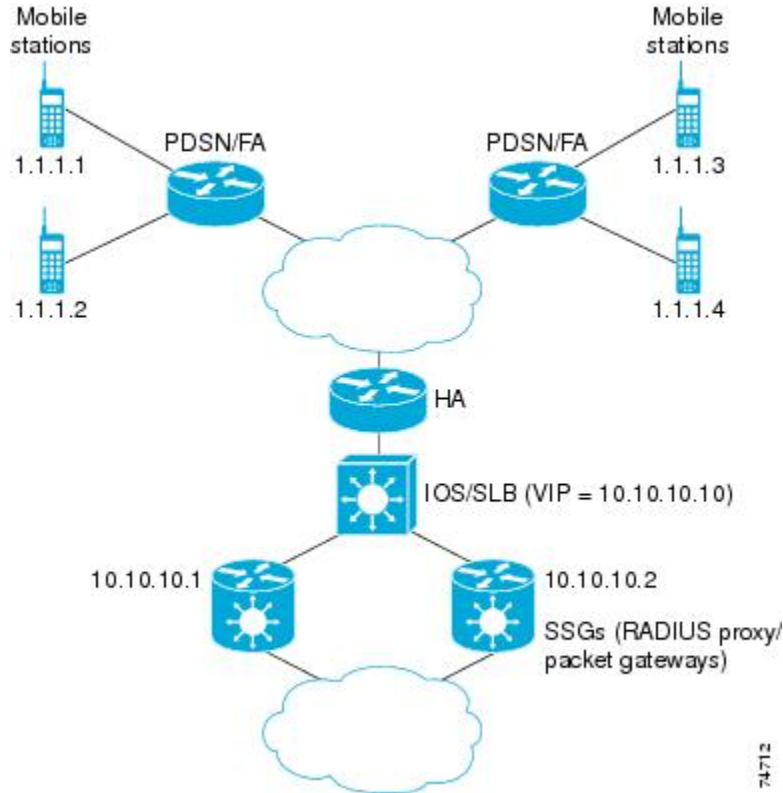
```
ip slb route 1.1.0.0 255.255.0.0 framed-ip
!
ip slb serverfarm SSGFARM
  nat server
  real 10.10.10.1
  inservice
  real 10.10.10.2
  inservice
!
ip slb vserver RADIUS_SIP
  virtual 10.10.10.10 udp 0 service radius
  serverfarm SSGFARM
  idle radius framed-ip 3600
  sticky radius username
  sticky radius framed-ip
  inservice
```

Example How to Configure IOS SLB with RADIUS Load Balancing for a Mobile IP CDMA2000 Network

The figure below shows a typical IOS SLB RADIUS load-balancing configuration for a CDMA2000 network with Mobile IP service. In this configuration:

- The RADIUS virtual server IP address for the PDSNs and the HA is 10.10.10.10.
- RADIUS requests are load-balanced between SSG RADIUS proxy servers 10.10.10.1 and 10.10.10.2.
- End-user data packets are routed to the IOS SLB device.
- End-user data packets from the 1.1.0.0 network are routed to the SSGs.

Figure 26: IOS SLB with RADIUS Load Balancing for a Mobile IP CDMA2000 Network



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```
ip slb route 1.1.0.0 255.255.0.0 framed-ip
!
ip slb serverfarm SSGFARM
  nat server
  real 10.10.10.1
  inservice
  real 10.10.10.2
  inservice
!
ip slb vserver RADIUS_SIP
  virtual 10.10.10.10 udp 0 service radius
  serverfarm SSGFARM
  idle radius framed-ip 3600
  sticky radius username
  sticky radius framed-ip
  inservice
```

Example How to Configure IOS SLB with RADIUS Load Balancing for Multiple Service Gateway Farms

The following sample configuration enables IOS SLB to balance packet flows for a set of subscribers among multiple service gateway server farms (in this sample, a server farm of SSGs and a server farm of CSGs):

```
ip slb route 1.1.0.0 255.255.0.0 framed-ip
!
ip slb serverfarm SSGFARM
nat server
real 10.10.10.1
inservice
real 10.10.10.2
inservice
!
ip slb serverfarm CSGFARM
nat server
real 20.20.20.1
inservice
real 20.20.20.2
inservice
!
ip slb vserver SSG_AUTH
virtual 10.10.10.10 udp 1812 service radius
serverfarm SSGFARM
idle radius request 20
idle radius framed-ip 7200
sticky radius framed-ip group 1
access Vlan20 route framed-ip
inservice
!
ip slb vserver SSG_ACCT
virtual 10.10.10.10 udp 1813 service radius
serverfarm SSGFARM
idle radius request 20
idle radius framed-ip 7200
sticky radius framed-ip group 1
access Vlan20 route framed-ip
inservice
!
ip slb vserver CSG_ACCT
virtual 20.20.20.20 udp 1813 service radius
serverfarm CSGFARM
idle radius request 25
idle radius framed-ip 0
sticky radius framed-ip
access Vlan30 route framed-ip
inservice
```

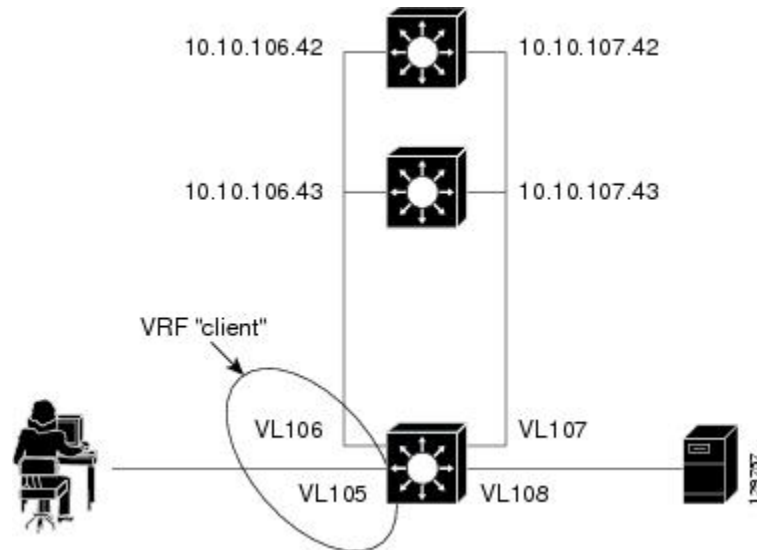
Example How to Configure IOS SLB with RADIUS Load Balancing Firewall Load Balancing "Sandwich"

The figure below shows a RADIUS load balancing/firewall load balancing "sandwich" on one IOS SLB device. In this sample configuration:

- The RADIUS load balancing virtual IP address is 5.5.5.5.
- The subscriber framed-IP network is 1.0.0.0/255.0.0.0.
- VL105, VL106, VL107, and VL108 are VLANs.
- RADIUS requests arriving on VLAN VL105 are balanced to 10.10.106.42 and 10.10.106.43.
- User traffic is stickied based on framed-IP address assignments in the 1.0.0.0 subnet.

- Firewall load balancing on the other side (10.10.107.42/43) ensures that return path traffic to the subscriber is delivered to the correct gateway.

Figure 27: IOS SLB with RADIUS Load Balancing/Firewall Load Balancing "Sandwich"



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```

ip vrf client
 rd 0:1
 !
ip slb probe P742 ping
 address 10.10.107.42
 interval 120
 !
ip slb probe P743 ping
 address 10.10.107.43
 interval 120
 !
ip slb route 1.0.0.0 255.0.0.0 framed-ip
ip slb route framed-ip deny
 !
ip slb firewallfarm SERVER
 access inbound Vlan108
 access outbound Vlan107
 inservice
 real 10.10.107.42
 probe P742
 inservice
 real 10.10.107.43
 probe P743
 inservice
 protocol tcp
 sticky 180 destination
 protocol datagram
 sticky 180 destination
 predictor hash address port
 !
ip slb serverfarm SF1
 nat server
 access Vlan106
 !
 real 10.10.106.42
 inservice
 real 10.10.106.43
 inservice

```

```

!
ip slb vserver VS1
virtual 5.5.5.5 udp 0 service radius
serverfarm SF1
sticky radius framed-ip
access Vlan105 route framed-ip
access Vlan105
inservice
!
mls flow ip interface-full
!
!*****
!* Switchports, port channels and trunks *
!* added to vlans 105-108 (left out for brevity) *
!*****
!
interface Vlan105
ip vrf forwarding client
ip address 10.10.105.2 255.255.255.0
!
interface Vlan106
ip vrf forwarding client
ip address 10.10.106.2 255.255.255.0
!
interface Vlan107
ip address 10.10.107.2 255.255.255.0
!
interface Vlan108
ip address 10.10.108.2 255.255.255.0
!
ip route 10.10.105.0 255.255.255.0 10.10.107.42
ip route vrf client 10.10.108.0 255.255.255.0 10.10.106.42

```

Example How to Configure IOS SLB with RADIUS Load Balancing Maps

The following sample configuration enables IOS SLB to support multiple server farms behind a RADIUS load balancing virtual server, using RADIUS calling station IDs and usernames to select server farms. Server farm **farm3** is configured without an associated map, and therefore acts as a default server farm. If IOS SLB cannot match any of the other server farm maps, and a default server farm is configured, IOS SLB sends the RADIUS request to the default serverfarm.

```

ip slb serverfarm CSGFARM
predictor route-map rlb-pbr
ip slb serverfarm AAAFARM
nat server
real 10.10.10.1
inservice
real 10.10.10.2
inservice
ip slb vserver RADIUS_ACCT
virtual 10.10.10.10 udp 1813 service radius
serverfarm CSGFARM
radius inject acct 1 key 0 cisco
inservice
ip slb vserver RADIUS_AUTH
virtual 10.10.10.10 udp 1812 service radius
serverfarm AAAFARM
radius inject auth 1 calling-station-id
radius inject auth timer 45
radius inject auth vsa cisco
inservice
!
interface vlan 100
ip policy route-map rlb-pbr
!
access-list 1 permit 0.0.0.1 255.255.255.254
access-list 2 permit 0.0.0.0 255.255.255.254
!
route-map rlb-pbr permit 10

```

```

match ip address 1
set ip next-hop 10.10.10.1
!
route-map rlb-pbr permit 20
match ip address 2
set ip next-hop 10.10.10.2

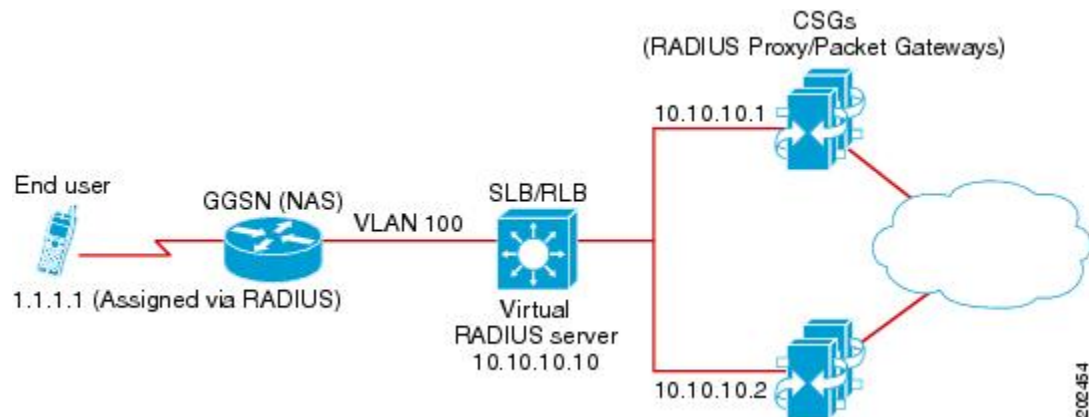
```

Example How to Configure IOS SLB with RADIUS Load Balancing Accelerated Data Plane Forwarding

The following IOS SLB configuration has the following characteristics:

- There is a virtual RADIUS server with IP address 10.10.10.10 that manages Network Access Server (NAS) devices.
- There are two packet gateways with IP addresses 10.10.10.1 and 10.10.10.2.
- RADIUS traffic destined for the virtual RADIUS server is distributed between the packet gateways, based on mapped framed-IP addresses, according to route map **rlb-pbr**.
- Server farm CSGFARM is configured with real IP addresses that match the possible results for route map **rlb-pbr**.
- End user traffic arriving on VLAN 100 is routed to the correct Cisco Content Services Gateway (CSG) based on access control lists (ACLs):
 - ACL 1 sends IP addresses ending in odd numbers to the CSGs behind packet gateway 10.10.10.1.
 - ACL 2 sends IP addresses ending in even numbers to the CSGs behind packet gateway 10.10.10.2.

Figure 28: IOS SLB with RADIUS Load Balancing Accelerated Data Plane Forwarding



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```

ip slb serverfarm CSGFARM
predictor route-map rlb-pbr
ip slb serverfarm AAAFARM
nat server
real 10.10.10.1
inservice
real 10.10.10.2
inservice
!
ip slb vserver RADIUS_ACCT
virtual 10.10.10.10 udp 1813 service radius
serverfarm CSGFARM
radius inject acct 1 key 0 cisco

```

```

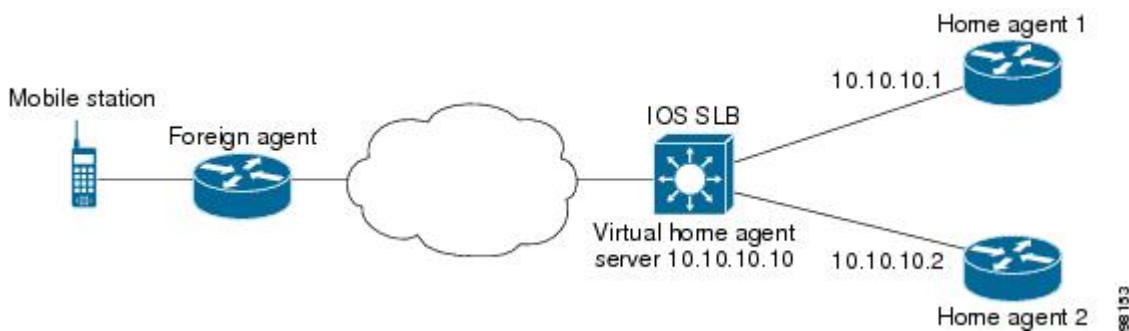
inservice
!
ip slb vserver RADIUS_AUTH
virtual 10.10.10.10 udp 1812 service radius
serverfarm AAAFARM
radius inject auth 1 calling-station-id
radius inject auth timer 45
radius inject auth vsa cisco
inservice
!
interface vlan 100
ip policy route-map rlb-pbr
!
access-list 1 permit 0.0.0.1 255.255.255.254
access-list 2 permit 0.0.0.0 255.255.255.254
!
route-map rlb-pbr permit 10
match ip address 1
set ip next-hop 10.10.10.1
!
route-map rlb-pbr permit 20
match ip address 2
set ip next-hop 10.10.10.2

```

Example How to Configure IOS SLB with Home Agent Director

The following sample configuration enables IOS SLB to balance Mobile IP RRQs among multiple home agents.

Figure 29: IOS SLB with Home Agent Director



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

```

ip slb serverfarm HA_FARM
nat server
real 10.10.10.1
inservice
real 10.10.10.2
inservice
ip slb vserver VIRTUAL_HA
virtual 10.10.10.10 udp 434 service ipmobile
serverfarm HA_FARM
inservice

```

Example How to Configure IOS SLB with Sticky Connections

The following sample configuration assigns all HTTP connections from a subnet to the same real server in server farm PUBLIC:

```
ip slb vserver http
  serverfarm PUBLIC
  sticky 30 group 1 netmask 255.255.255.248
  virtual 20.20.20.20 tcp 80
  inservice
```

The following sample configuration adds HTTPS connections to the above configuration, using the same sticky information but with a different virtual server:

```
ip slb vserver https
  serverfarm PUBLIC
  sticky 30 group 1 netmask 255.255.255.248
  virtual 20.20.20.20 tcp 443
  inservice
```

Now, all HTTP *and* HTTPS connections from the subnet are assigned to the same real server. For example, if a user connects to HTTP, then a second user connects to HTTPS, both connections are assigned to the same real server.

Example How to Configure IOS SLB with GTP IMSI Sticky Database

The following sample configuration shows how to enable the IOS SLB GTP IMSI sticky database:

```
ip slb serverfarm GGSN_FARM
  failaction gtp purge
  real 10.20.10.1
    weight 1
    faildetect numconns 255 numclients 8
    inservice
  !
  real 10.20.10.2
    weight 1
    faildetect numconns 255 numclients 8
    inservice
  !
  real 10.20.10.3
    weight 1
    faildetect numconns 255 numclients 8
    inservice
  !
ip slb vserver GGSN_SERVER1
  virtual 10.10.10.10 udp 3386 service gtp
  serverfarm GGSN_FARM backup GGSN_FARM
  idle gtp request 90
  idle gtp imsi 10000000
  sticky gtp imsi group 1
  gtp notification cac 3
  inservice
  !
ip slb vserver GGSN_SERVER2
  virtual 10.10.10.10 udp 2123 service gtp
  serverfarm GGSN_FARM backup GGSN_FARM
  idle gtp request 90
  idle gtp imsi 10000000
  sticky gtp imsi group 1
```

```
gtp notification cac 3
inservice
```

Example How to Configure IOS SLB with ASN Sticky Database

The following sample configuration shows how to enable the IOS SLB ASN sticky database:

```
ip slb entries sticky 15000 800000
ip slb serverfarm ASNLB_FARM
  failaction asn purge
!
  real 10.20.10.1
    weight 1
    faildetect numconns 255 numclients 8
    inservice
!
  real 10.20.10.2
    weight 1
    faildetect numconns 255 numclients 8
    inservice
!
  real 10.20.10.3
    weight 1
    faildetect numconns 255 numclients 8
    inservice
!
ip slb vserver ASNLB_SERVER
virtual 10.10.10.10 udp 0 service asn
serverfarm ASNLB_FARM
idle asn request 90
idle asn msid 100000
sticky asn msid group 1
gw port 63082
replicate casa 100.100.100.102 100.100.100.101 1024 password hello
inservice
```

Example How to Configure IOS SLB with Transparent Web Cache Load Balancing

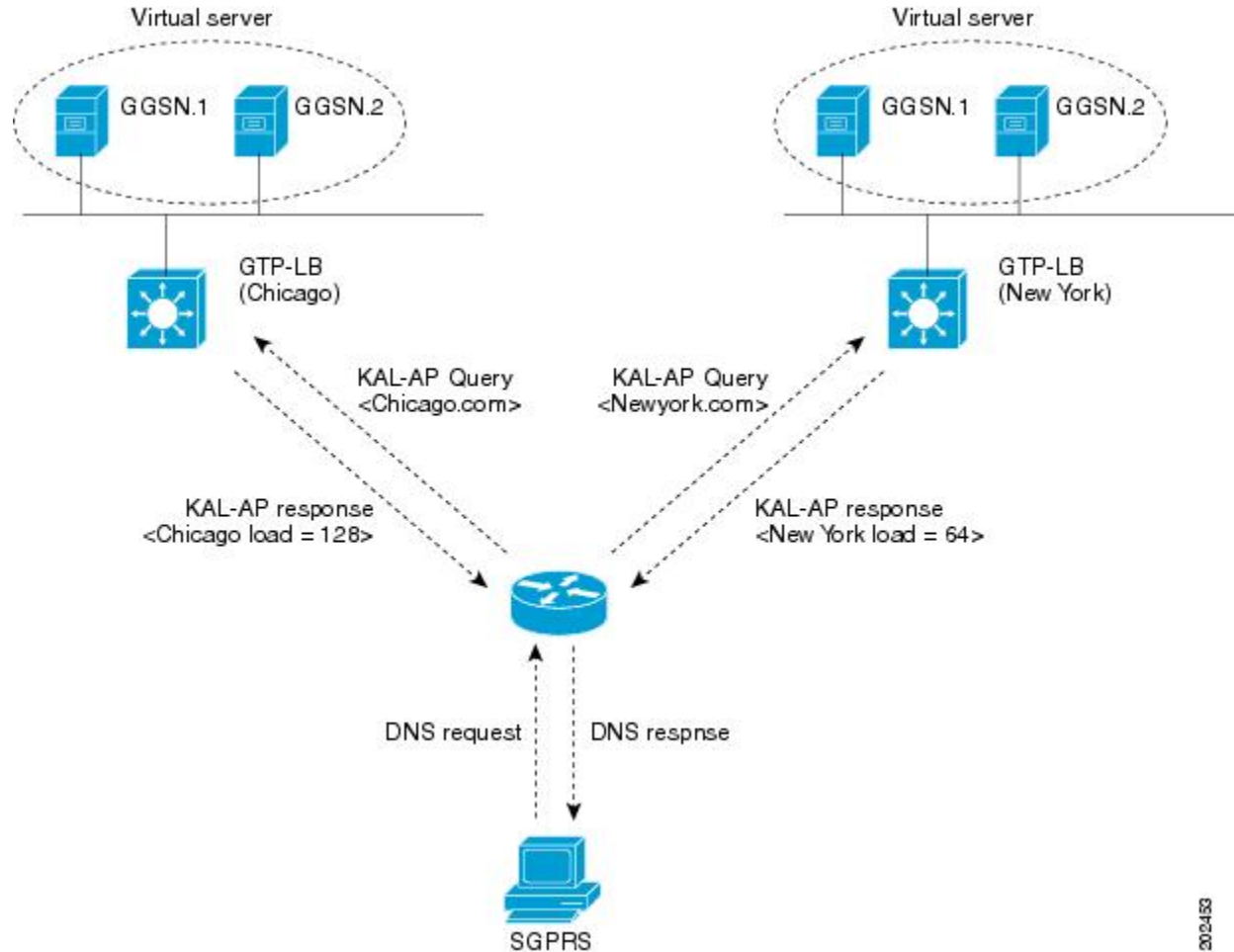
In the following sample configuration, virtual server WEBCACHE examines all web flows passing through the load-balancing device and dispatches them to server farm WEBCACHE-FARM. The **client exclude** statement ignores flows originating from subnet 80.80.7.0, enabling the real servers 80.80.7.188 and 80.80.7.189 to communicate with the Internet as needed.

```
ip slb serverfarm WEBCACHE-FARM
  real 80.80.7.188
    inservice
  real 80.80.7.189
    inservice
ip slb vserver WEBCACHE
virtual 0.0.0.0 0.0.0.0 tcp www
serverfarm WEBCACHE-FARM
client 80.80.7.0 255.255.255.0 exclude
inservice
```

Example How to Configure IOS SLB with KAL-AP Agent

In the following sample configuration, the client is configured to send a Domain Name System (DNS) query **abcd.com** to the GSS. The Global Site Selector (GSS) in the DUBLIN site receives the requests from the client. The GSS answers the DNS query with the virtual IP address of either CHICAGO (10.0.0.100) or NEWYORK (10.0.0.200), based on the load reported by those virtual servers.

Figure 30: IOS SLB with KAL-AP Agent



Following are the IOS SLB configuration statements for the configuration shown in the figure above:

- [GSS, page 63](#)
- [Site-1 IOS SLB - CHICAGO, page 64](#)
- [Site-2 IOS SLB - NEWYORK, page 64](#)

GSS

```
shared-keepalive kalap 192.168.1.1 capp-secure enable key kap
shared-keepalive kalap 192.168.2.1 capp-secure enable key kap
```

```

!
answer vip 10.0.0.100 name CHICAGO activate
  keepalive type kalap tag 192.168.1.1 chicao.com
answer vip 10.0.0.200 name NEWYORK activate
  keepalive type kalap tag 192.168.2.1 newyork.com
!
answer-group ABCD owner System type vip
answer-add 10.0.0.100 name CHICAGO weight 1 order 0 load-threshold 254 activate
answer-add 10.0.0.200 name NEWYORK weight 1 order 0 load-threshold 254 activate
dns rule ABCDGPRS owner System source-address-list Anywhere domain-list abcd.com query a
  clause 1 vip-group      method least-loaded ttl 20 count 1 sticky disable

```

Site-1 IOS SLB - CHICAGO

```

ip slb capp udp
  peer port 6000 secret 0 kap
!
ip slb serverfarm SF
  kal-ap domain chicago.com
  farm-weight 200
  real 10.10.10.1
    inservice
  real 10.10.10.2
    inservice
!
ip slb vserver chicago
  virtual 10.0.0.100 udp 0
  serverfarm SF
  inservice
!
ip slb dfp
  agent 10.10.10.1 5000 30 0 10
  agent 10.10.10.2 5000 30 0 10
!
int vlan100
ip address 192.168.1.1 255.255.255.0

```

- [GGSN-1, page 64](#)
- [GGSN-2, page 64](#)

GGSN-1

```

gprs dfp max-weight 100
gprs maximum-pdp-context-allowed 20000
!
ip dfp agent gprs
  port 5000
  inservice

```

GGSN-2

```

gprs dfp max-weight 100
gprs maximum-pdp-context-allowed 20000
!
ip dfp agent gprs
  port 5000
  inservice

```

Site-2 IOS SLB - NEWYORK

```

ip slb capp udp
  peer port 6000

```



```
peer 192.1.1.1 secret 0 test
peer 10.100.100.100 port 1234
!
ip slb serverfarm SF
kal-ap domain newyork.com
farm-weight 6200
real 10.20.20.1
  inservice
real 10.20.20.2
  inservice
real 10.20.20.3
  inservice
real 10.20.20.4
  inservice
!
ip slb vserver chicago
virtual 10.0.0.200 udp 0
serverfarm SF
  inservice
!
ip slb dfp
agent 10.10.10.1 5000 30 0 10
agent 10.10.10.2 5000 30 0 10
!
int vlan200
ip address 192.168.2.1 255.255.255.0
```

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- [GGSN-2, page 65](#)

GGSN-1

```
gprs dfp max-weight 100
gprs maximum-pdp-context-allowed 20000
!
ip dfp agent gprs
port 5000
inservice
```

GGSN-2

```
gprs dfp max-weight 100
gprs maximum-pdp-context-allowed 20000
!
ip dfp agent gprs
port 5000
inservice
```