



Data Sheet

## Cisco GLBP Load Balancing Options

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### INTRODUCTION

The purpose of this document is to discuss the options that Cisco Gateway Load Balancing Protocol (GLBP)—one of Cisco First Hop routing Protocols family—offers in regard to load balancing across multiple gateways. For those unfamiliar with GLBP an introductory paper can be found in the reference section of this document.

GLBP differs from Cisco Hot Standby Redundancy Protocol (HSRP) and IETF RFC 3768 Virtual Router Redundancy Protocol (VRRP) in that it has the ability to load balance over multiple gateways. Like HSRP and VRRP an election occurs, but rather than a single active router winning the election GLBP elects an Active Virtual Gateway (AVG). The job of the AVG is to assign virtual MAC addresses to each of the other GLBP routers and to assign each network host to one of the GLBP routers.

The routers that receive this MAC address assignment are known as Active Virtual Forwarders (AVF).

### LOAD BALANCING OPTIONS

How network hosts are assigned to each GLBP router can be altered by using one of four load balancing options outlined below. Please note, these options are not able to be deployed concurrently. There is a negligible CPU difference in the operation of either of these options.

1. None
2. Weighted
3. Host dependent
4. Round robin

### NONE

If no load-balance algorithm is specified then GLBP will operate in an identical fashion to HSRP, the AVG will only respond to Address Resolution Protocol (ARP) requests with its own Virtual Forwarder (VF) MAC address, and all traffic will be directed to the AVG with no occurrence of load balancing.

### WEIGHTED

This is the ability GLBP to place a weight on each device when calculating the amount of load sharing that will occur through MAC assignment. Each GLBP router in the group will advertise its weighting and assignment; the AVG will act based on that value.

For example, if there are two routers in a group and router A has double the forwarding capacity of router B, the weighting value of router A should be configured to be double the amount of router B.

Example of load balancing using weighted option:

```
Router1#sh run int e0/0
!
interface Ethernet0/0
 ip address 10.0.0.1 255.255.0.0
 glbp 1 ip 10.0.0.10
 glbp 1 weighting 160
 glbp 1 load-balancing weighted
end
Router1#
Router2#sh run int e0/0
!
interface Ethernet0/0
 ip address 10.0.0.2 255.255.255.0
 glbp 1 ip
 glbp 1 weighting 80
 glbp 1 load-balancing weighted
end
Router1#sh glbp
Ethernet0/0 - Group 1
 State is Standby
 7 state changes, last state change 00:00:59
 Virtual IP address is 10.0.0.10
 Hello time 3 sec, hold time 10 sec
 Next hello sent in 0.528 secs
 Redirect time 600 sec, forwarder time-out 14400 sec
 Preemption disabled
 Active is 10.0.0.2, priority 100 (expires in 9.560 sec)
 Standby is local
 Priority 100 (default)
Weighting 160 (configured 160), thresholds: lower 1, upper 160
Load balancing: weighted
 Group members:
 aabb.cc00.0100 (10.0.0.1) local
 aabb.cc00.0200 (10.0.0.2)
 There are 2 forwarders (1 active)
 Forwarder 1
 State is Active
 1 state change, last state change 00:59:30
 MAC address is 0007.b400.0101 (default)
 Owner ID is aabb.cc00.0100
 Preemption enabled, min delay 30 sec
```

**Active is local, weighting 160**

Forwarder 2

State is Listen

4 state changes, last state change 00:01:09

MAC address is 0007.b400.0102 (learnt)

Owner ID is aabb.cc00.0200

Time to live: 14399.532 sec (maximum 14400 sec)

Preemption enabled, min delay 30 sec

**Active is 10.0.0.2 (primary), weighting 80 (expires in 9.532 sec)**

**Router2#sh glbp**

Ethernet0/0 - Group 1

State is Active

2 state changes, last state change 00:30:22

Virtual IP address is 10.0.0.10 (learnt)

Hello time 3 sec, hold time 10 sec

Next hello sent in 2.760 secs

Redirect time 600 sec, forwarder time-out 14400 sec

Preemption disabled

Active is local

Standby is 10.0.0.1, priority 100 (expires in 7.732 sec)

Priority 100 (default)

**Weighting 80 (configured 80), thresholds: lower 1, upper 80**

**Load balancing: weighted**

Group members:

aabb.cc00.0100 (10.0.0.1)

aabb.cc00.0200 (10.0.0.2) local

There are 2 forwarders (1 active)

Forwarder 1

State is Listen

4 state changes, last state change 00:01:42

MAC address is 0007.b400.0101 (learnt)

Owner ID is aabb.cc00.0100

Redirection enabled, 597.732 sec remaining (maximum 600 sec)

Time to live: 14397.732 sec (maximum 14400 sec)

Preemption enabled, min delay 30 sec

**Active is 10.0.0.1 (primary), weighting 160 (expires in 7.732 sec)**

Arp replies sent: 6

Forwarder 2

State is Active

1 state change, last state change 00:59:41

MAC address is 0007.b400.0102 (default)

Owner ID is aabb.cc00.0200

Redirection enabled

```
Preemption enabled, min delay 30 sec
Active is local, weighting 80
Arp replies sent: 3
```

## HOST DEPENDENT

The MAC address of a host is used to determine which VF MAC address the host is directed towards. This ensures that a host will be guaranteed to use the same virtual MAC address as long as the number of VFs in the GLBP group is constant.

Host dependent load balancing will need to be used when using statefull Network Address Translation (NAT) because it requires each host to be returned the same virtual MAC address each time it sends an ARP request for the virtual IP address.

Host dependent load balancing is not recommended for situations where there are a small number of end hosts, for example less than 20, unless there is also a requirement that individual hosts must always use the same forwarder. The larger the number of host, the less likely it is to have an imbalance in distribution across forwarders.

This method uses an algorithm designed to equally distribute hosts among forwarders, this distribution changes only when the number for forwarders permanently changes.

### Router2#

```
Router2#sh run int e0/0
!
interface Ethernet0/0
 ip address 10.0.0.2 255.255.255.0
 glbp 1 ip 10.0.0.10
 glbp 1 load-balancing host-dependent
end
```

### Router1#sh run int e0/0

```
interface Ethernet0/0
 ip address 10.0.0.1 255.255.0.0
 glbp 1 ip 10.0.0.10
 glbp 1 load-balancing host-dependent
end
```

### Router2#sh glbp

```
Ethernet0/0 - Group 1
State is Active
2 state changes, last state change 00:11:54
Virtual IP address is 10.0.0.10
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.372 secs
Redirect time 600 sec, forwarder time-out 14400 sec
Preemption disabled
Active is local
```

```
Standby is 10.0.0.1, priority 100 (expires in 7.344 sec)
Priority 100 (default)
Weighting 100 (default 100), thresholds: lower 1, upper 100
Load balancing: host-dependent
There are 2 forwarders (1 active)
Forwarder 1
State is Listen
2 state changes, last state change 00:11:24
MAC address is 0007.b400.0101 (learnt)
Owner ID is aabb.cc00.5a00
Redirection enabled, 597.344 sec remaining (maximum 600 sec)
Time to live: 14397.344 sec (maximum 14400 sec)
Preemption enabled, min delay 30 sec
Active is 10.0.0.1 (primary), weighting 100 (expires in 7.344 sec)
Forwarder 2
State is Active
1 state change, last state change 00:51:56
MAC address is 0007.b400.0102 (default)
Owner ID is aabb.cc00.5b00
Redirection enabled
Preemption enabled, min delay 30 sec
Active is local, weighting 100
Router2#
Router1#sh glbp
Ethernet0/0 - Group 1
State is Standby
4 state changes, last state change 00:12:57
Virtual IP address is 10.0.0.10
Hello time 3 sec, hold time 10 sec
Next hello sent in 1.964 secs
Redirect time 600 sec, forwarder time-out 14400 sec
Preemption disabled
Active is 10.0.0.2, priority 100 (expires in 9.984 sec)
Standby is local
Priority 100 (default)
Weighting 100 (default 100), thresholds: lower 1, upper 100
Load balancing: host-dependent
There are 2 forwarders (1 active)
Forwarder 1
State is Active
3 state changes, last state change 00:12:47
MAC address is 0007.b400.0101 (default)
Owner ID is aabb.cc00.5a00
```

```
Preemption enabled, min delay 30 sec
Active is local, weighting 100
Forwarder 2
State is Listen
MAC address is 0007.b400.0102 (learnt)
Owner ID is aabb.cc00.5b00
Time to live: 14397.864 sec (maximum 14400 sec)
Preemption enabled, min delay 30 sec
Active is 10.0.0.2 (primary), weighting 100 (expires in 7.864 sec)
Router1#
```

## ROUND ROBIN

With Round Robin each VF MAC address is used sequentially in ARP replies for the virtual IP address. Round Robin load balancing is suitable for any number of end hosts.

## REQUIRED CISCO IOS SOFTWARE VERSION

The GLBP load balancing discussed in this document has been available since the first release of GLBP, supported in the following versions:

- Cisco IOS Software Release 12.2(14)S
- Release 12.2(27)SBC1
- Release 12.2(18)SXD on the Cisco Catalyst 6500 and 7600 Series Switches
- Releases 12.2(15)T, 12.3M, 12.3T, 12.4M and 12.4T

For specific image information please check online with feature navigator, <http://www.cisco.com/go/fn>

## SUMMARY

**Host Dependent** is required when an application requires traffic flows to be tracked (for example when using NAT). **Round Robin** is recommended as the default, it is suitable for all other requirements. **Weighted** can be used if there are disparities in the capabilities of gateways in the GLBP group. **None** provides no load balancing.

## REFERENCES

### Cisco IOS IP Services

[http://www.cisco.com/en/US/products/ps6600/products\\_ios\\_protocol\\_group\\_home.html](http://www.cisco.com/en/US/products/ps6600/products_ios_protocol_group_home.html)

### GLBP Protocol Overview

[http://www.cisco.com/en/US/products/ps6600/prod\\_presentation0900aecd801790a3.html](http://www.cisco.com/en/US/products/ps6600/prod_presentation0900aecd801790a3.html)

### Cisco IOS GLBP Documentation

[http://www.cisco.com/en/US/products/ps6350/products\\_configuration\\_guide\\_chapter09186a008042fb97.html](http://www.cisco.com/en/US/products/ps6350/products_configuration_guide_chapter09186a008042fb97.html)

### Cisco IOS High Availability

[http://www.cisco.com/en/US/products/ps6550/products\\_ios\\_technology\\_home.html](http://www.cisco.com/en/US/products/ps6550/products_ios_technology_home.html)



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