

High Availability Routing Protocols Workbook

Below is a consolidated workbook covering **HSRP**, **VRRP**, and **GLBP** configuration exercises. A single table of contents is provided for easy navigation. Each protocol has its own section with numbered exercises.

Contents

1	Part I: HSRP Hands-On Configuration	3
1.1	Basic HSRP Configuration	3
1.2	Priority and Preemption Configuration	4
1.3	HSRP Load Balancing	4
1.4	HSRP Authentication and Security	4
1.5	Tracking Mechanisms	5
1.6	Advanced HSRP Timers and Optimization	5
1.7	IPv6 HSRP Configuration	5
1.8	HSRP Troubleshooting and Verification	5
1.9	Full Topology Implementation	6
2	Part II: VRRP Hands-On Configuration	8
2.1	Basic VRRP Configuration	8
2.2	Priority and Preemption Configuration	9
2.3	VRRP Load Balancing	9
2.4	VRRP Authentication and Security	9
2.5	Tracking Mechanisms	10
2.6	Advanced VRRP Timers and Optimization	10
2.7	IPv6 VRRP Configuration	10
2.8	VRRP Troubleshooting and Verification	10
2.9	Full Topology Implementation	11
3	Part III: GLBP Hands-On Configuration	13
3.1	Basic GLBP Configuration	13
3.2	Priority and Preemption Configuration	14
3.3	GLBP Load Balancing	14
3.4	GLBP Authentication and Security	14
3.5	Weighting and Tracking Mechanisms	15
3.6	Advanced GLBP Timers and Optimization	15
3.7	IPv6 GLBP Configuration	15

3.8	GLBP Troubleshooting and Verification	16
3.9	Full Topology Implementation	16

1 Part I: HSRP Hands-On Configuration

1.1 Basic HSRP Configuration

Exercise 1: Configure HSRP on SW1

Objective: Set up HSRP on SW1 to serve as the default gateway for VLAN 10.

Instructions:

1. Access the switch CLI.
2. Enter global configuration mode.
3. Configure VLAN 10 and assign an IP address.
4. Enable HSRP on VLAN 10 with a virtual IP address.

Commands:

```
switch(config)# interface vlan 10
switch(config-if)# ip address 192.168.1.1 255.255.255.0
switch(config-if)# standby 1 ip 192.168.1.254
```

Exercise 2: Configure HSRP on MLS1, MLS2, MLS3, MLS4

Objective: Configure multiple multilayer switches (MLS) to participate in HSRP.

Instructions:

1. Access the CLI of each MLS (MLS1, MLS2, MLS3, MLS4).
2. Enter configuration mode.
3. Configure VLAN 10 with a unique IP address.
4. Enable HSRP and assign the same virtual IP.

Commands:

```
switch(config)# interface vlan 10
switch(config-if)# ip address 192.168.1.X 255.255.255.0
switch(config-if)# standby 1 ip 192.168.1.254
```

1.2 Priority and Preemption Configuration

Exercise 3: Set HSRP Priority and Enable Preemption

Objective: Configure a specific HSRP router to be the preferred active forwarder.

Instructions:

1. Set the HSRP priority higher than the default (100).
2. Enable preemption with a delay to avoid frequent role changes.

Commands:

```
switch(config-if)# standby 1 priority 150
switch(config-if)# standby 1 preempt delay minimum 60
```

1.3 HSRP Load Balancing

Exercise 4: Configure Load Balancing using Multiple HSRP Groups

Objective: Enable load balancing using multiple HSRP groups.

Instructions:

1. Configure two HSRP groups with different priorities and virtual IPs.

Commands:

```
switch(config-if)# standby 1 ip 192.168.1.254
switch(config-if)# standby 1 priority 110
switch(config-if)# standby 2 ip 192.168.1.253
switch(config-if)# standby 2 priority 120
```

1.4 HSRP Authentication and Security

Exercise 5: Enable Authentication

Objective: Secure HSRP communications with MD5 authentication.

Instructions:

1. Configure MD5 authentication with a secure key.

Commands:

```
switch(config-if)# standby 1 authentication md5 key-string SECRET_KEY
```

1.5 Tracking Mechanisms

Exercise 6: Set Track Interface Status

Objective: Implement tracking to adjust HSRP priority dynamically.

Instructions:

1. Enable tracking for an interface and set a decrement value.

Commands:

```
switch(config-if)# track 1 interface FastEthernet0/1 line-protocol  
switch(config-if)# standby 1 track 1 decrement 20
```

1.6 Advanced HSRP Timers and Optimization

Exercise 7: Configure HSRP Timers

Objective: Optimize HSRP timers for faster failover.

Instructions:

1. Adjust the hello and hold timers.

Commands:

```
switch(config-if)# standby 1 timers 3 10
```

1.7 IPv6 HSRP Configuration

Exercise 8: Enable HSRP for IPv6

Objective: Implement HSRP for IPv6 networks.

Instructions:

1. Enable HSRP for IPv6 auto-configuration.

Commands:

```
switch(config-if)# standby 1 ipv6 autoconfigure
```

1.8 HSRP Troubleshooting and Verification

Exercise 9: Verify HSRP Configuration

Objective: Use CLI commands to verify the HSRP setup.

Instructions:

1. Display a summary of HSRP groups.

2. Inspect details of a specific HSRP group.
3. Check HSRP settings on VLAN 10.

Commands:

```
switch# show standby brief
switch# show standby 1
switch# show standby interface vlan 10
```

Exercise 10: Debug HSRP

Objective: Use debugging tools to analyze HSRP behavior.

Instructions:

1. Enable HSRP packet debugging.

Commands:

```
switch# debug standby packets
```

1.9 Full Topology Implementation

Exercise 11: Configure HSRP Across the Entire Topology

Objective: Implement HSRP on all switches and the router.

On SW1:

```
interface vlan 10
ip address 192.168.1.1 255.255.255.0
standby 1 ip 192.168.1.254
standby 1 priority 150
standby 1 preempt
```

On MLS1, MLS2, MLS3, MLS4:

```
interface vlan 10
ip address 192.168.1.X 255.255.255.0
standby 1 ip 192.168.1.254
```

On R1:

```
interface FastEthernet0/1
ip address 192.168.1.254 255.255.255.0
```

Exercise 12: Test and Verify HSRP in the Network

Objective: Perform tests to ensure HSRP is working correctly.

Instructions:

1. Verify HSRP roles using CLI commands.
2. Monitor packet forwarding.
3. Simulate a router failure and observe failover behavior.

Verification Commands:

```
switch# show standby brief  
switch# debug standby packets
```

2 Part II: VRRP Hands-On Configuration

2.1 Basic VRRP Configuration

Exercise 1: Configure VRRP on SW1

Objective: Set up VRRP on SW1 to serve as the default gateway for VLAN 10.

Instructions:

1. Access the switch CLI.
2. Enter global configuration mode.
3. Configure VLAN 10 and assign an IP address.
4. Enable VRRP on VLAN 10 with a virtual IP address.

Commands:

```
switch(config)# interface vlan 10
switch(config-if)# ip address 192.168.1.1 255.255.255.0
switch(config-if)# vrrp 1 ip 192.168.1.254
```

Exercise 2: Configure VRRP on MLS1, MLS2, MLS3, MLS4

Objective: Configure multiple multilayer switches (MLS) to participate in VRRP.

Instructions:

1. Access the CLI of each MLS (MLS1, MLS2, MLS3, MLS4).
2. Enter configuration mode.
3. Configure VLAN 10 with a unique IP address.
4. Enable VRRP and assign the same virtual IP.

Commands:

```
switch(config)# interface vlan 10
switch(config-if)# ip address 192.168.1.X 255.255.255.0
switch(config-if)# vrrp 1 ip 192.168.1.254
```


2.2 Priority and Preemption Configuration

Exercise 3: Set VRRP Priority and Enable Preemption

Objective: Configure a specific VRRP router to be the preferred active forwarder.

Instructions:

1. Set the VRRP priority higher than the default (100).
2. Enable preemption to allow the highest priority router to take over.

Commands:

```
switch(config-if)# vrrp 1 priority 150
switch(config-if)# vrrp 1 preempt
```

2.3 VRRP Load Balancing

Exercise 4: Configure Load Balancing using Multiple VRRP Groups

Objective: Enable load balancing using multiple VRRP groups.

Instructions:

1. Configure two VRRP groups with different priorities and virtual IPs.

Commands:

```
switch(config-if)# vrrp 1 ip 192.168.1.254
switch(config-if)# vrrp 1 priority 110
switch(config-if)# vrrp 2 ip 192.168.1.253
switch(config-if)# vrrp 2 priority 120
```

2.4 VRRP Authentication and Security

Exercise 5: Enable Authentication

Objective: Secure VRRP communications with authentication.

Instructions:

1. Configure authentication with a secure key.

Commands:

```
switch(config-if)# vrrp 1 authentication text SECRET_KEY
```

2.5 Tracking Mechanisms

Exercise 6: Set Track Interface Status

Objective: Implement tracking to adjust VRRP priority dynamically.

Instructions:

1. Enable tracking for an interface and set a decrement value.

Commands:

```
switch(config-if)# track 1 interface FastEthernet0/1 line-protocol  
switch(config-if)# vrrp 1 track 1 decrement 20
```

2.6 Advanced VRRP Timers and Optimization

Exercise 7: Configure VRRP Timers

Objective: Optimize VRRP timers for faster failover.

Instructions:

1. Adjust the advertisement interval.

Commands:

```
switch(config-if)# vrrp 1 timers advertise 3
```

2.7 IPv6 VRRP Configuration

Exercise 8: Enable VRRP for IPv6

Objective: Implement VRRP for IPv6 networks.

Instructions:

1. Enable VRRP for IPv6 with a link-local address.

Commands:

```
switch(config-if)# vrrp 1 ipv6 address FE80::1
```

2.8 VRRP Troubleshooting and Verification

Exercise 9: Verify VRRP Configuration

Objective: Use CLI commands to verify the VRRP setup.

Instructions:

1. Display a summary of VRRP groups.

2. Inspect details of a specific VRRP group.
3. Check VRRP settings on VLAN 10.

Commands:

```
switch# show vrrp brief
switch# show vrrp 1
switch# show vrrp interface vlan 10
```

Exercise 10: Debug VRRP

Objective: Use debugging tools to analyze VRRP behavior.

Instructions:

1. Enable VRRP packet debugging.

Commands:

```
switch# debug vrrp packets
```

2.9 Full Topology Implementation

Exercise 11: Configure VRRP Across the Entire Topology

Objective: Implement VRRP on all switches and the router.

On SW1:

```
interface vlan 10
ip address 192.168.1.1 255.255.255.0
vrrp 1 ip 192.168.1.254
vrrp 1 priority 150
vrrp 1 preempt
```

On MLS1, MLS2, MLS3, MLS4:

```
interface vlan 10
ip address 192.168.1.X 255.255.255.0
vrrp 1 ip 192.168.1.254
```

On R1:

```
interface FastEthernet0/1
ip address 192.168.1.254 255.255.255.0
```

Exercise 12: Test and Verify VRRP in the Network

Objective: Perform tests to ensure VRRP is working correctly.

Instructions:

1. Verify VRRP roles using CLI commands.
2. Monitor packet forwarding.
3. Simulate a router failure and observe failover behavior.

Verification Commands:

```
switch# show vrrp brief  
switch# debug vrrp packets
```

3 Part III: GLBP Hands-On Configuration

3.1 Basic GLBP Configuration

Exercise 1: Configure GLBP on SW1

Objective: Set up GLBP on SW1 to serve as the default gateway for VLAN 10.

Instructions:

1. Access the switch CLI.
2. Enter global configuration mode.
3. Configure VLAN 10 and assign an IP address.
4. Enable GLBP on VLAN 10 with a virtual IP address.

Commands:

```
switch(config)# interface vlan 10
switch(config-if)# ip address 192.168.1.1 255.255.255.0
switch(config-if)# glbp 1 ip 192.168.1.254
```

Exercise 2: Configure GLBP on MLS1, MLS2, MLS3, MLS4

Objective: Configure multiple multilayer switches (MLS) to participate in GLBP.

Instructions:

1. Access the CLI of each MLS (MLS1, MLS2, MLS3, MLS4).
2. Enter configuration mode.
3. Configure VLAN 10 with a unique IP address.
4. Enable GLBP and assign the same virtual IP.

Commands:

```
switch(config)# interface vlan 10
switch(config-if)# ip address 192.168.1.X 255.255.255.0
switch(config-if)# glbp 1 ip 192.168.1.254
```

3.2 Priority and Preemption Configuration

Exercise 3: Set GLBP Priority and Enable Preemption

Objective: Configure a specific GLBP router to be the preferred active forwarder.

Instructions:

1. Set the GLBP priority higher than the default (100).
2. Enable preemption with a delay to avoid frequent role changes.

Commands:

```
switch(config-if)# glbp 1 priority 150
switch(config-if)# glbp 1 preempt delay minimum 60
```

3.3 GLBP Load Balancing

Exercise 4: Configure Load Balancing

Objective: Enable round-robin load balancing among GLBP routers.

Instructions:

1. Configure the GLBP group to use round-robin load balancing.

Commands:

```
switch(config-if)# glbp 1 load-balancing round-robin
```

3.4 GLBP Authentication and Security

Exercise 5: Enable Authentication

Objective: Secure GLBP communications with MD5 authentication.

Instructions:

1. Configure MD5 authentication with a secure key.

Commands:

```
switch(config-if)# glbp 1 authentication md5 key-string SECRET_KEY
```

3.5 Weighting and Tracking Mechanisms

Exercise 6: Set Weighting and Track Interface Status

Objective: Implement tracking to adjust GLBP weighting dynamically.

Instructions:

1. Configure GLBP weighting and define upper and lower limits.
2. Enable tracking for an interface and set a decrement value.

Commands:

```
switch(config-if)# glbp 1 weighting 100 upper 90 lower 80
switch(config-if)# track 1 interface FastEthernet0/1 line-protocol
switch(config-if)# glbp 1 weighting track 1 decrement 20
```

3.6 Advanced GLBP Timers and Optimization

Exercise 7: Configure GLBP Timers

Objective: Optimize GLBP timers for faster failover.

Instructions:

1. Adjust the hello and hold timers.
2. Configure redirect timers.

Commands:

```
switch(config-if)# glbp 1 timers 3 10
switch(config-if)# glbp 1 timers redirect 600 timeout 14400
```

3.7 IPv6 GLBP Configuration

Exercise 8: Enable GLBP for IPv6

Objective: Implement GLBP for IPv6 networks.

Instructions:

1. Enable GLBP for IPv6 auto-configuration.

Commands:

```
switch(config-if)# glbp 1 ipv6 autoconfigure
```

3.8 GLBP Troubleshooting and Verification

Exercise 9: Verify GLBP Configuration

Objective: Use CLI commands to verify the GLBP setup.

Instructions:

1. Display a summary of GLBP groups.
2. Inspect details of a specific GLBP group.
3. Check GLBP settings on VLAN 10.

Commands:

```
switch# show glbp brief
switch# show glbp 1
switch# show glbp interface vlan 10
```

Exercise 10: Debug GLBP

Objective: Use debugging tools to analyze GLBP behavior.

Instructions:

1. Enable GLBP packet debugging.

Commands:

```
switch# debug glbp packets
```

3.9 Full Topology Implementation

Exercise 11: Configure GLBP Across the Entire Topology

Objective: Implement GLBP on all switches and the router.

On SW1:

```
interface vlan 10
ip address 192.168.1.1 255.255.255.0
glbp 1 ip 192.168.1.254
glbp 1 priority 150
glbp 1 preempt
glbp 1 load-balancing round-robin
```

On MLS1, MLS2, MLS3, MLS4:

```
interface vlan 10
ip address 192.168.1.X 255.255.255.0
glbp 1 ip 192.168.1.254
```

On R1:


```
interface FastEthernet0/1
 ip address 192.168.1.254 255.255.255.0
```

Exercise 12: Test and Verify GLBP in the Network

Objective: Perform tests to ensure GLBP is working correctly.

Instructions:

1. Verify GLBP roles using CLI commands.
2. Monitor packet forwarding.
3. Simulate a router failure and observe failover behavior.

Verification Commands:

```
switch# show glbp brief
switch# debug glbp packets
```