# PT Activity: Configuring basic HSRP (Hot Standby Router Protocol)

## Topology Diagram

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## Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| **ISP** | **Gi0/0** | 10.1.1.1 | 255.255.255.252 | N/A |
| **Gi0/1** | 10.1.1.5 | 255.255.255.252 | N/A |
| **Gi0/2** | 107.21.3.1 | 255.255.255.0 | N/A |
| **BR\_R1** | **Gi0/0** | 192.168.100.2 | 255.255.255.0 | N/A |
| **Gi0/1** | 10.1.1.2 | 255.255.255.252 | N/A |
| **BR\_R2** | **Gi0/0** | 192.168.100.3 | 255.255.255.0 | N/A |
| **Gi0/1** | 10.1.1.6 | 255.255.255.252 | N/A |
| **BR\_PC** | **NIC** | 192.168.100.100 | 255.255.255.0 | 192.168.100.1 |
| **Server** | **NIC** | 107.21.3.223 | 255.255.255.0 | 107.21.3.1 |

## Learning Objectives

* Configure STP
* Configure OSPF routing and verify functionality
* Configure HSRP and verify functionality
* Configure Ethernet interface on host PC and test failover

## Introduction

In this activity, you will perform basic STP and OSPF configuration before activating HSRP on the Branch routers. ISP, BR\_R1, BR\_R2 have already been preconfigured with hostnames and IP addresses. The DNS/Web server has also been preconfigured.

Task 1: Configure STP

Configure BR\_SW to support Rapid-PVST+ and Port Fast. This will guarantee quicker failover of HSRP:

BR\_SW>**enable**

BR\_SW#**config term**

BR\_SW(config)#**spanning-tree mode rapid-pvst**

BR\_SW(config)#**spanning-tree portfast default**

Your completion result should be 8%. If not, check for missing configuration statements.

Task 2: Configure OSPF routing

Configure OSPF on ISP, BR\_R1 and BR\_R2. Assign all interfaces to Area 0, except for Gi0/2 on ISP. ISP will advertise a default route to BR\_R1 and BR\_R2.

**Step 1. Enable OSPF on BR\_R1**

BR\_R1(config)#**router ospf 1**

BR\_R1(config-router)#**network 192.168.100.0 0.0.0.255 area 0**

BR\_R1(config-router)#**network 10.1.1.0 0.0.0.3 area 0**

BR\_R1(config-router)#**end**

**Step 2. Enable OSPF on BR\_R2**

BR\_R2(config)#**router ospf 1**

BR\_R2(config-router)#**network 192.168.100.0 0.0.0.255 area 0**

BR\_R2(config-router)#**network 10.1.1.4 0.0.0.3 area 0**

BR\_R2(config-router)#**end**

**Step 3. Enable OSPF on ISP**

ISP(config)#**router ospf 1**

ISP(config-router)#**network 10.1.1.0 0.0.0.3 area 0**

ISP(config-router)#**network 10.1.1.4 0.0.0.3 area 0**

ISP(config-router)#**default-information originate**

ISP(config-router)#**exit**

ISP(config)#**ip route 0.0.0.0 0.0.0.0 Gi0/2**

**Step 4. Verify routing**

Use the **show ip route** command on BR\_R1 and BR\_R2 to verify that OSPF is operating correctly. Both routers should be receiving a default route (type O\*E2) from ISP.

BR\_R1#**show ip route**

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter

\* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 10.1.1.1 to network 0.0.0.0

10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks

C 10.1.1.0/30 is directly connected, GigabitEthernet0/1

L 10.1.1.2/32 is directly connected, GigabitEthernet0/1

O 10.1.1.4/30 [110/2] via 192.168.100.3, 00:17:05, GigabitEthernet0/0

[110/2] via 10.1.1.1, 00:17:05, GigabitEthernet0/1

192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.100.0/24 is directly connected, GigabitEthernet0/0

L 192.168.100.2/32 is directly connected, GigabitEthernet0/0

O\*E2 0.0.0.0/0 [110/1] via 10.1.1.1, 00:17:05, GigabitEthernet0/1

Your completion result should be 56%. If not, check for missing configuration statements.

Task 3: Configure HSRP

Configure HSRP group 1 on BR\_R1 and BR\_R2 using 192.168.100.1 as the standby virtual IP address. By default, Packet Tracer supports HSRP version 2. BR\_R1 will be configured as the Active HSRP default-gateway and BR\_R2 will be configured as Standby. Preemption is configured on both routers.

Step 1. Enable HSRP on BR\_R1

BR\_R1(config)#**interface gi0/0**

BR\_R1(config-if)#**standby 1 ip 192.168.100.1**

BR\_R1(config-if)#**standby 1 preempt**

Step 2. Enable HSRP on BR\_R2

BR\_R2(config)#**interface gi0/0**

BR\_R2 (config-if)#**standby 1 ip 192.168.100.1**

BR\_R2 (config-if)#**standby 1 priority 95**

BR\_R2 (config-if)#**standby 1 preempt**

**Step 3. Verify HSRP**

After a few moments, use the **show standby** and **show standby brief** commands on BR\_R1 and BR\_R2 to verify that HSRP is operating correctly. BR\_R1 should be the Active router and BR\_R2 should be Standby.

BR\_R1#**show standby**

GigabitEthernet0/0 - Group 1 (version 2)

State is Active

5 state changes, last state change 00:00:19

Virtual IP address is 192.168.100.1

Active virtual MAC address is 0000.0C9F.F001

Local virtual MAC address is 0000.0C9F.F001 (v2 default)

Hello time 3 sec, hold time 10 sec

Next hello sent in 0.314 secs

Preemption enabled

Active router is local

Standby router is 192.168.100.3

Priority 100 (default 100)

Group name is hsrp-Gig0/0-1 (default)

BR\_R1#**show standby brief**

P indicates configured to preempt.

|

Interface Grp Pri P State Active Standby Virtual IP

Gig0/0 1 100 P Active local 192.168.100.3 192.168.100.1

BR\_R2#**sh standby brief**

P indicates configured to preempt.

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Interface Grp Pri P State Active Standby Virtual IP

Gig0/0 1 95 P Standby 192.168.100.2 local 192.168.100.1

Your completion result should be 82%. If not, check for missing configuration statements.

Task 4: Configure Ethernet interface on host PC and test HSRP failover functionality

Step 1. Configure host PC

Configure the NIC on BR\_PC according to the information in the table. Also configure BR\_PC to use **107.21.3.223** as its DNS server.

Step 2. Test connectivity using Ping

Use a command prompt on BR\_PC to Ping the server using the URL http://**www.netacad.com**

PC>**ping <ip ADDRESS OF THE Web Server>**

Pinging 107.21.3.223 with 32 bytes of data:

Reply from 107.21.3.223: bytes=32 time=13ms TTL=126

Reply from 107.21.3.223: bytes=32 time=1ms TTL=126

Reply from 107.21.3.223: bytes=32 time=0ms TTL=126

Reply from 107.21.3.223: bytes=32 time=1ms TTL=126

Ping statistics for 107.21.3.223:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 13ms, Average = 3ms

**Step 3. Test connectivity using Tracert**

Use a command prompt to trace the physical path taken from BR\_PC to the Server. Confirm that the first hop is the physical address of BR\_R1 Gi0/0 interface (192.168.100.2)

PC>**tracert www.netacad.com<ip ADDRESS OF THE Web Server>**

to 107.21.3.223 over a maximum of 30 hops:

1 1 ms 0 ms 1 ms 192.168.100.2

2 1 ms 0 ms 0 ms 10.1.1.5

3 0 ms 1 ms 0 ms 107.21.3.223

Trace complete.

**Step 4. Test HSRP failover**

From BR\_PC, use the **ping –t** command to start a continuous sequence of pings to the Server.

PC>**ping -t <ip ADDRESS OF THE Web Server>**

On BR\_R1, shutdown the Gi0/0 interface.

BR\_R1#**config term**

BR\_R1(config)#**interface gi0/0**

BR\_R1(config-if)#**shutdown**

%HSRP-6-STATECHANGE: GigabitEthernet0/0 Grp 1 state Active -> Init

%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to administratively down

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to down

00:18:26: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.100.3 on GigabitEthernet0/0 from FULL to DOWN, Neighbor Down: Interface down or detached

Notice that BR\_R2 becomes the new Active router.

BR\_R2#

%HSRP-6-STATECHANGE: GigabitEthernet0/0 Grp 1 state Standby -> Active

Notice what occurs on BR\_PC. A change in physical gateway has occurred, but this is transparent to the host PC. It is possible for one or two pings to drop depending on how quickly BR\_R2’s hold time expires. The default hold time for HSRP is 10 seconds.

Reply from 107.21.3.223: bytes=32 time=0ms TTL=126

Reply from 107.21.3.223: bytes=32 time=0ms TTL=126

Reply from 107.21.3.223: bytes=32 time=0ms TTL=126

Request timed out.

Reply from 107.21.3.223: bytes=32 time=1ms TTL=126

Reply from 107.21.3.223: bytes=32 time=1ms TTL=126

Reply from 107.21.3.223: bytes=32 time=1ms TTL=126

Your completion result should be 100%. If not, check for missing configuration statements.

Task 5: Verify HSRP packet exchange

Step 1. Activate BR\_R1 Gi0/0 interface to allow the router to reclaim the Active status

BR\_R1#**config term**

BR\_R1(config)#**interface gi0/0**

BR\_R1(config-if)#**no** **shutdown**

BR\_R1(config-if)#

%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

%HSRP-6-STATECHANGE: GigabitEthernet0/0 Grp 1 state Standby -> Active

BR\_R1(config-if)#

Step 2. Use Simulation mode to view HSRP Hello packets

Enter Simulation mode. Select only HSRP in the filter window. Click Auto Capture / Play to see the multicast HSRP Hello packets being sent and received by both BR\_R1 and BR\_R2. Confirm the following by observing the PDU details of some of the packets:

1. Destination IP address is 224.0.0.102
2. UDP port is 1985
3. HSRP version is 0x2
4. Priority is either 100 or 95 depending on Hello viewed.
5. Group number is 1
6. Virtual IP is 192.168.100.1

**Step 3. Use Simulation mode to view ICMP packet flow from BR\_PC to Netacad server**

Create a complex PDU. Use 192.168.100.100 as the source IP address. Use 107.21.3.223 as the destination IP address. Use a sequence number if 1 and configure a one-shot time of 5 seconds. Use the Capture/Forward button to view the ICMP packet flow to and from the Netacad server, via the BR\_R1 router. Delete the cable between BR\_R1 and BR\_SW. Run the simulation again and view the packets flow to and from the server via BR\_R2 after it has become the new Active HSRP router.