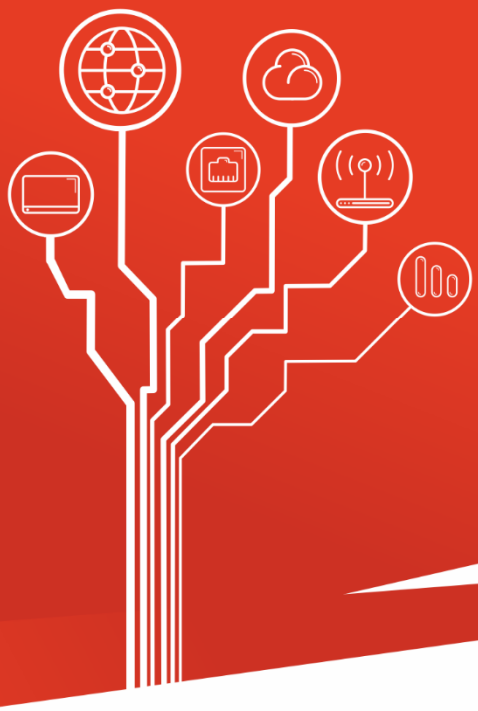
CHAPTER 13



HOT STANDBY ROUTER PROTOCOL

COMPUTER NETWORKS IN PACKET TRACER

FOR ADVANCED USERS

13 Hot Standby Router Protocol

13.1 FHRP – Type Protocols

What are FHRP protocols (**First Hope Redundancy Protocols**)?

FHRP protocols are special techniques that provide redundant default gateways for end devices, without the necessary additional end-user configuration. Using FHRP, two or more routers can share the same virtual IP address and MAC address and can act as a single virtual router. Hosts on the network are configured with the shared IP address as the default gateway. An example is the Cisco **Hot Standby Router Protocol (HSRP).**

What is Cisco HSRP?

Cisco HSRP (Hot Standby Router Protocol) is a redundant protocol for establishing a fault-tolerant default gateway.

Version	Designed for protocol	Group address	UDP port	Range of virtual MAC addresses
1	IPV4	224.0.0.2	1985	00:00:0C:07:AC:XX
1	IPV4	224.0.0.102	1985	00:00:0C:9F:FX:XX
2	IPV6	FF02::66	2029	00:05:73:A0:0X:XX

Table 13.1 HSRP versions

13.2 HSRP Configuration (Exercise 35).

In this exercise, we will demonstrate the idea of HSRP on routers R-AUSTIN and R-BOSTON, which serve as default gateways for hosts PC-CALIFORNIA and PC-DALLAS.

Required equipment:

- PC-PT – 2 pts
- Switch 2950-24TT – 2 pts
- Router 1841 – 3 pts

Device	Model	Interface	IP/Mask	Default gate
PC-CALIFORNIA	PC-PT	Fa0	1.1.1.1/8	1.1.1.2
PC-DALLAS	PC-PT	Fa0	4.1.1.1/8	4.1.1.2
R-AUSTIN	1841	Fa0/0	1.1.1.2/8	-
R-AUSTIN	1841	Fa0/1	3.1.1.2/8	-
R-BOSTON	1841	Fa0/0	1.1.1.3/8	-
R-BOSTON	1841	Fa0/1	3.1.1.3/8	-
R-DALLAS	1841	Fa0/0	3.1.1.1/8	-
R-DALLAS	1841	Fa0/1	4.1.1.2	-

Table 13.2 Network addressing (Austin, California, Boston, Dallas)

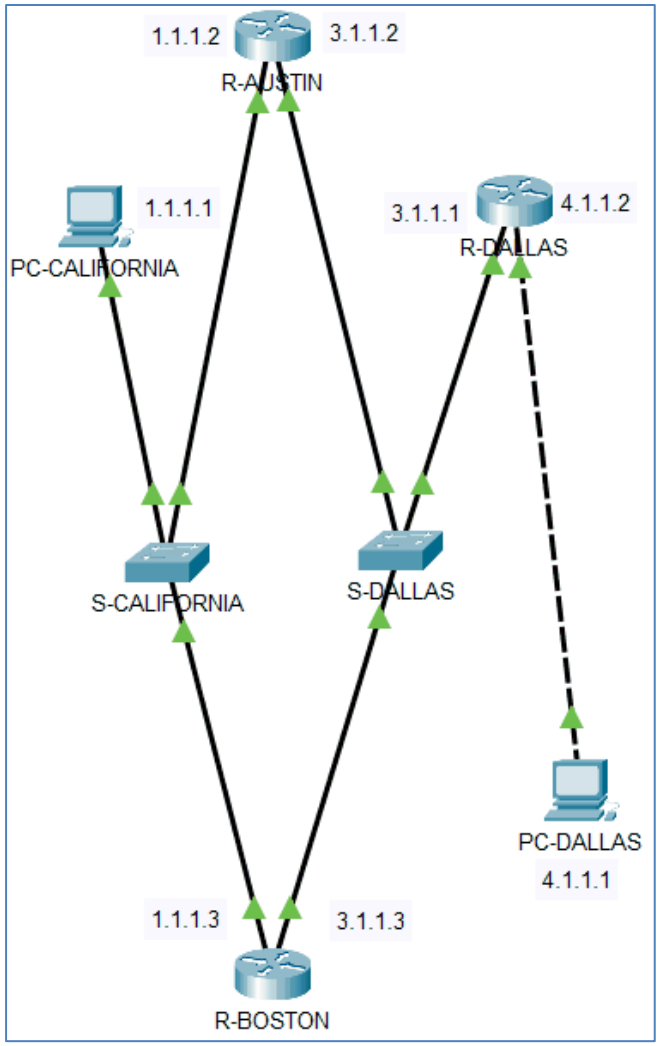


Figure 13.1 Network topology

Step 1. Make and configure the network according to the given assumptions.

Step 2. Configure RIPV1 dynamic routing correctly**.**

Step 3. Test the packet path from PC-CALIFORNIA to PC-DALLAS.

```
C:\>tracert 4.1.1.1

Tracing route to 4.1.1.1 over a maximum of 30 hops:

  1    0 ms       0 ms       0 ms       1.1.1.2
  2    0 ms       0 ms       0 ms       3.1.1.1
  3    1 ms       0 ms       0 ms       4.1.1.1
```

Figure 13.2 The path of the package goes through R-AUSTIN and R-DALLAS.

Step 4. Simulate Fa0/0 interface failure in R-AUSTIN

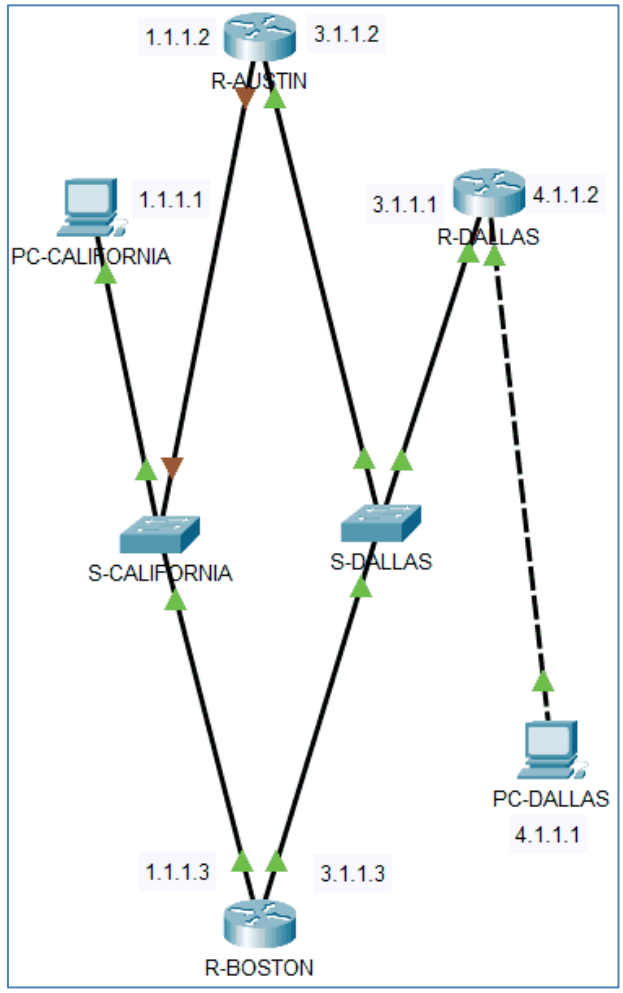


Figure 13.3 Network topology with Fa0/0 interface failure in R-AUSTIN

Step 5. Test the packet path from PC-CALIFORNIA to PC-DALLAS.

```
C:\>tracert 4.1.1.1

Tracing route to 4.1.1.1 over a maximum of 30 hops:

  1    *        *        *        Request timed out.
  2    *        *        *        Request timed out.
  3    *        *        *        Request timed out.
  4    *        *        *        Request timed out.
```

Figure 13.4 The result of the tracert command

NOTE: The default gateway in PC-CALIFORNIA is 1.1.1.2, but it has crashed, although a route through the R-BOSTON router is possible.

Step 6. Prepare the HSRP protocol configuration on R-AUSTIN.

In the R-AUSTIN router, run the commands:

```
en
conf   t
int fa0/0
standby  1  ip  1.1.1.7
standby  1  priority 110
standby  1  preempt
end
```

Step 7. Prepare the HSRP protocol configuration on R-BOSTON**.**

In the R-BOSTON router, run the commands:

```
en
conf   t
int fa0/0
standby  1  ip  1.1.1.7
standby  1  preempt
end
```

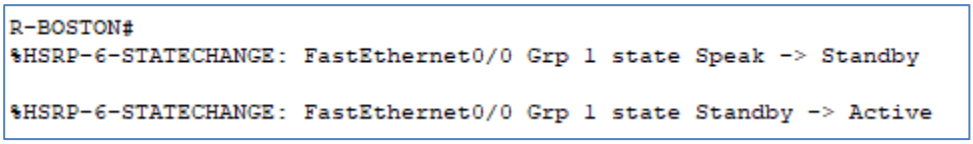


Figure 13.5 Messages after executing commands on the R-BOSTON router

Step 8. Modify the IP protocol configuration on PC- CALIFORNIA.

Set in PC- CALIFORNIA, Default gateway = 1.1.1.7

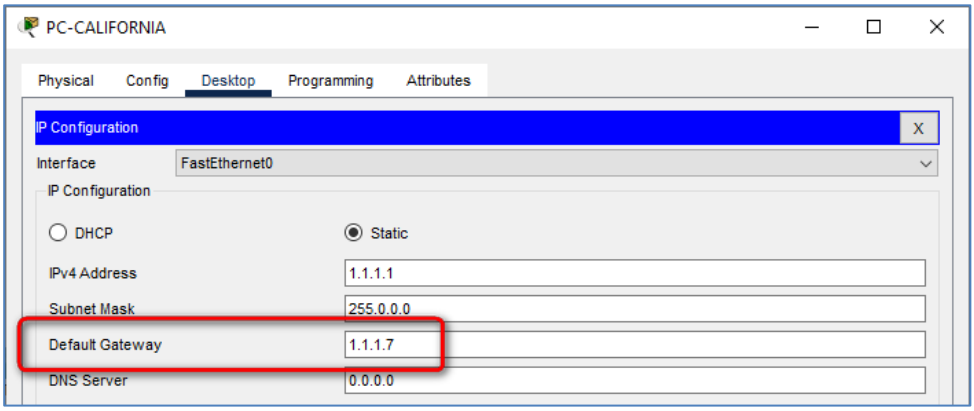


Figure 13.6 Changing the address of the default gateway in PC- CALIFORNIA

Step 9. Checking the packet route from PC-CALIFORNIA to PC-DALLAS before a failure.

```
C:\>tracert 4.1.1.1

Tracing route to 4.1.1.1 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      1.1.1.2
  2    0 ms      0 ms      0 ms      3.1.1.1
  3    0 ms      0 ms      0 ms      4.1.1.1
```

Figure 13.7 The path of the package goes through R-AUSTIN and R-DALLAS.

Step 10. Checking the route of the packet from PC-CALIFORNIA to PC-DALLAS after simulating a failure at the Fa0/0 interface in R-AUSTIN.

```
C:\>tracert 4.1.1.1

Tracing route to 4.1.1.1 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      1.1.1.3
  2    1 ms      1 ms      0 ms      3.1.1.1
  3    0 ms      0 ms      0 ms      4.1.1.1
```

Figure 13.8 The path of the package goes through R-BOSTON and R-DALLAS.

Observation: Address 1.1.1.7 is the so-called default virtual gateway.

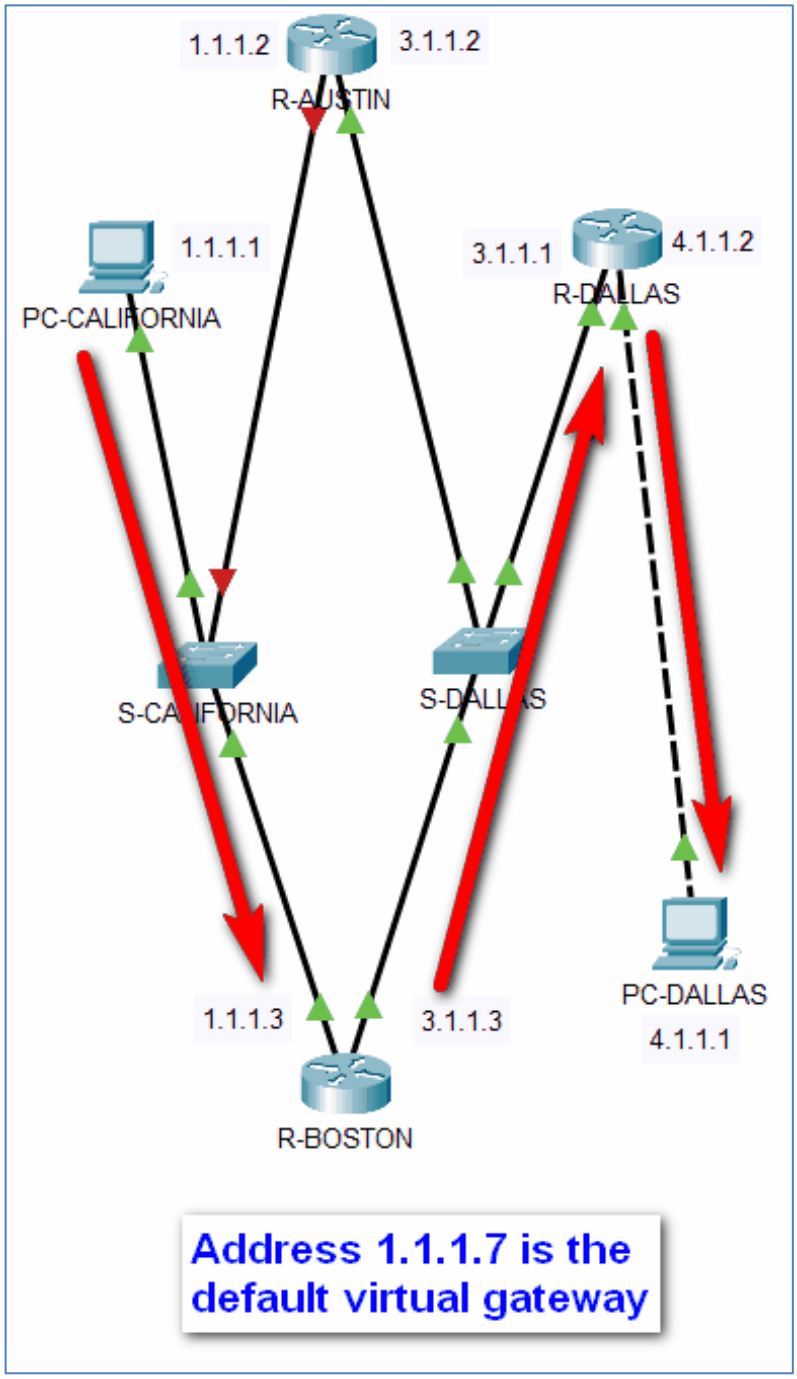


Figure 13.9 Route in case of R-AUSTIN failure

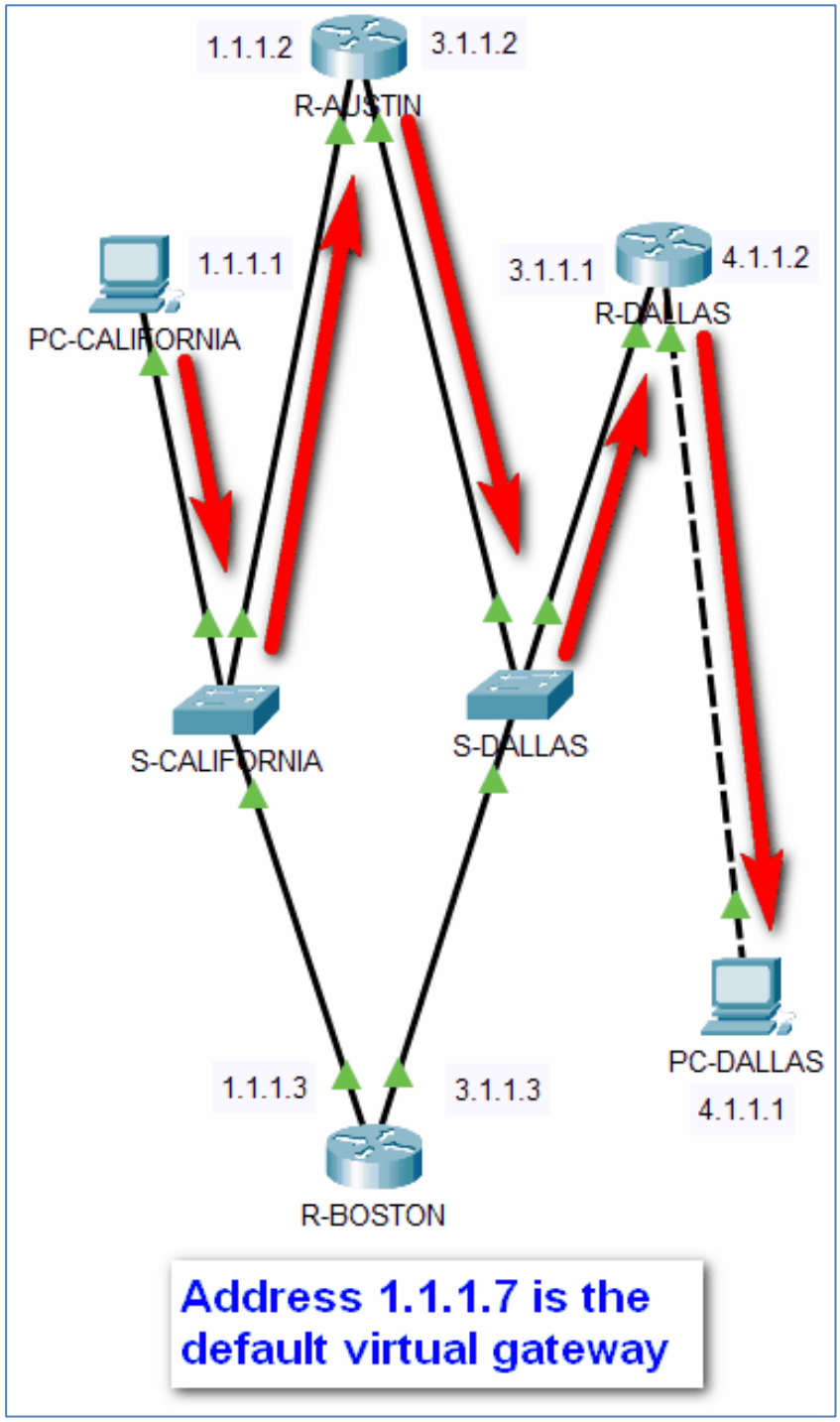


Figure 13.10 Route in case of failure R-BOSTON

13.3 HSRP Configuration (Exercise 36)

In the second example, we will demonstrate HSRP configuration on routers RTR1 and RTR3, which serve as default gateways for hosts on LAN-A and LAN-B. When configuring the HSRP protocol, a virtual gateway will be created that uses the same default gateway address for hosts on both LANs

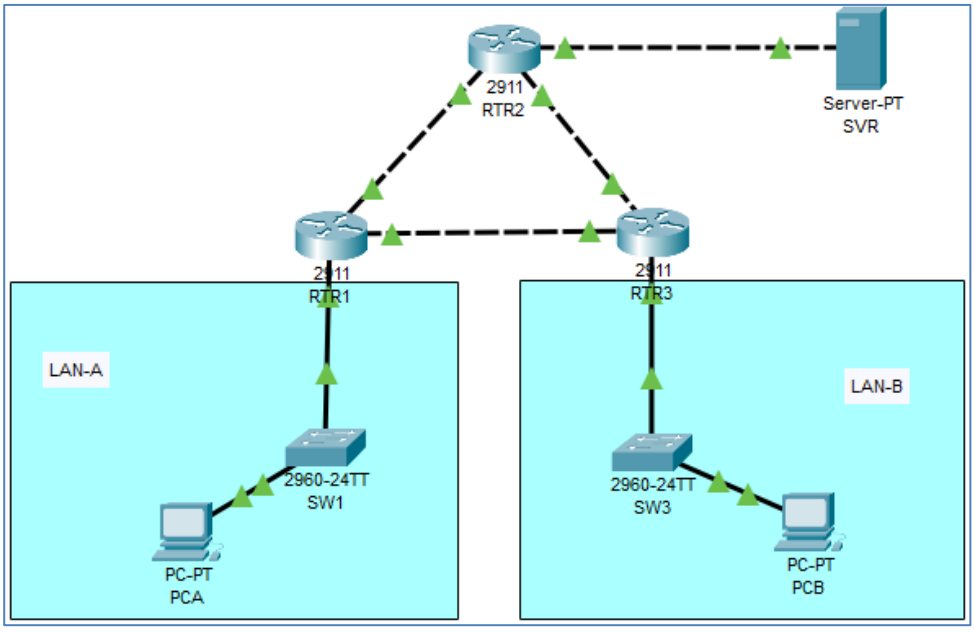


Figure 13.11 Network topology

If one gateway router becomes unavailable, the other router will take over using the same default gateway address that was used by the first router. Since the hosts on the LANs are configured with the virtual gateway's IP address as the default gateway, the hosts will regain connectivity to the remote networks once the remaining router is activated by HSRP.

Required equipment:

- Server-PT – 1 pts
- PC-PT – 2 pts
- Switch 2960-24TT – 2 pts
- Router 2911 –3 pts

Device	Model	Interface	IP/Mask	Default gateway
PCA	PC-PT	Fa0	192.168.1.101/24	192.168.1.1
PCB	PC-PT	Fa0	192.168.1.103/24	192.168.1.3
SVR	Server-PT	Fa0	10.100.100.2/30	10.100.100.1
SW1	2960-24TT	VLAN1	192.168.1.11/24	192.168.1.1
SW3	2960-24TT	VLAN1	192.168.1.13/24	192.168.1.3
RTR1	2911	Gi0/0	10.1.1.1/30	-
RTR1	2911	Gi0/1	192.168.1.1/24	-
RTR1	2911	Gi0/2	10.1.1.9/30	-
RTR2	2911	Gi0/0	10.1.1.2/30	-
RTR2	2911	Gi0/1	10.1.1.5/30	-
RTR2	2911	Gi0/2	10.100.100.1/30	-
RTR3	2911	Gi0/0	192.168.1.3/24	-
RTR3	2911	Gi0/1	10.1.1.6/30	-
RTR3	2911	Gi0/2	10.1.1.10/30	-

Table 13.3 Network addressing (RTR1, RTR2, RTR3, SW1, SW2)

Protocol	OSPF
Id	10
Area	0
Network	10.1.1.0/30
Network	192.168.1.0/24
Network	10.1.1.8/30
Protocol	static
Target network	0.0.0.0 0.0.0
Next hop address	10.1.1.2

Table 13.4 Routing configuration parameters for RTR1

Protocol	OSPF
Id	10
Area	0
Network	10.1.1.0/30
Network	10.1.1.4/30
Protocol	static
Target network	0.0.0.0 0.0.0
Next hop address	10.100.100.2

Table 13.5 Routing configuration parameters for RTR2

Step 1. In RTR2, make **default-information originate**

Protocol	OSPF
Id	10
Area	0
Network	10.1.1.4/30
Network	192.168.1.0/24
Network	10.1.1.8/30
Protocol	static
Target network	0.0.0.0 0.0.0
Next hop address	10.1.1.5

Table 13.6 Routing configuration parameters for RTR3

Step 2. Make and configure the network according to the given assumptions.

Step 3. Check the path of the package from PCA to SVR

```
C:\>tracert 10.100.100.2

Tracing route to 10.100.100.2 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      192.168.1.1
  2    0 ms      0 ms      0 ms      10.1.1.2
  3    0 ms      0 ms      0 ms      10.100.100.2

Trace complete.
```

Figure 13.12 The path of the packet from PCA to SVR

Step 4. Check the path of the package from the PCB to the SVR

Step 5. Configure HSRP on the LAN interface G0/1 RTR1.

```
enable
conf  t
interface Gi0/1
standby version 2
```

Step 6. Configure the IP address of the virtual default gateway.

Comments:

This address must be configured on all hosts that require default gateway services. It replaces the physical address of the router interface that was previously configured on the hosts.

Multiple HSRP instances can be configured on a router. You must specify an HSRP group number to identify the virtual interface between routers in the HSRP group. This number must be consistent between the routers in the group. The group number for this configuration is 1.

```
standby 1 ip 192.168.1.254
```

Step 7. Designate an active router for the HSRP group**.**

Comments:

This is the router that will be used as the gateway device unless it fails or the path to it becomes inactive or unusable. Specify the router's interface priority. The default value is 100. A higher value will determine which router is the active router. If the priorities of the routers in the HSRP group are the same, the router with the highest configured IP address will become the active router.

```
standby 1 priority 150
```

Comments:

RTR1 will act as the active router, and traffic from the two LANs will use it as the default gateway.

Step 8. If it is desirable for the active router to resume this role when it becomes available again, configure it with the preempt option. The active router will take over the role of the gateway when it is operational again.

```
standby 1 preempt
```

Step 9. Configure RTR3 as a standby router (Configure RTR3 interface connected to LAN-B).

```
standby version 2
standby 1 ip 192.168.1.254
```

Step 10. Check the HSRP configuration in RTR1.

```
show standby
```

Step 11. Check the HSRP configuration in RTR3.

```
show standby
```

Step 12. Check the summary of HSRP statuses in RTR1.

show standby brief

Step 13. Check the summary of HSRP statuses in RTR3.

```
show standby brief
```

13.4 List of auxiliary files

- exercise35-hsrp.pkt
- exercise36-hsrp.pkt