Author: Qftm

一、环境准备

1. 软件：GNS3

2. 路由：c7200

二、实验操作

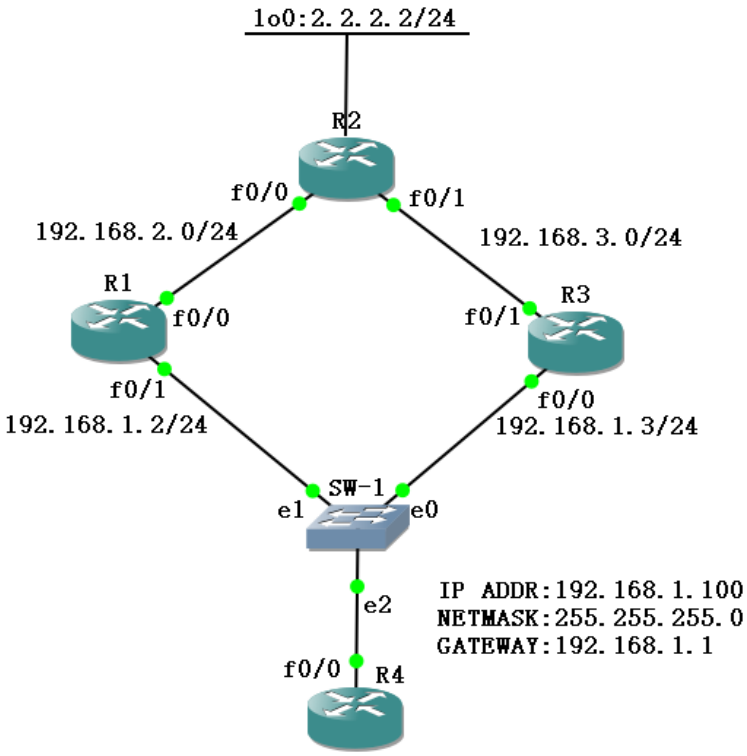
实验要求：

1、理解 HSRP 的工作原理。

2、掌握 HSRP 配置方法.

3、理解 HSRP 的抢占与跟踪作用。

实验拓扑：



实验过程：

1、 根据拓扑结构，对路由器 R1、R2、R3 配置各接口 IP 地址。

R1

```
R1#show ip int brief
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            192.168.2.1     YES manual up                    up

FastEthernet0/1            192.168.1.2     YES manual up                    up

Serial1/0                  unassigned      YES unset  administratively down down

Serial1/1                  unassigned      YES unset  administratively down down

Serial1/2                  unassigned      YES unset  administratively down down

Serial1/3                  unassigned      YES unset  administratively down down

SSLVPN-VIF0                unassigned      NO  unset  up                    up

R1#
```

R2

```
R2#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.2.2     YES manual up                    up
FastEthernet0/1            192.168.3.1     YES manual up                    up
Serial1/0                  unassigned      YES unset  administratively down down
Serial1/1                  unassigned      YES unset  administratively down down
Serial1/2                  unassigned      YES unset  administratively down down
Serial1/3                  unassigned      YES unset  administratively down down
SSLVPN-VIF0                unassigned      NO  unset  up                    up
Loopback0                  2.2.2.2         YES manual up                    up
R2#
```

R3

```
R3#show ip inter brief
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.1.3     YES manual up                    up
FastEthernet0/1            192.168.3.2     YES manual up                    up
Serial1/0                  unassigned      YES unset  administratively down down
Serial1/1                  unassigned      YES unset  administratively down down
Serial1/2                  unassigned      YES unset  administratively down down
Serial1/3                  unassigned      YES unset  administratively down down
SSLVPN-VIF0                unassigned      NO  unset  up                    up
R3#
```

R4

```
R4#show ip inter brief
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.1.100   YES manual up                    up
FastEthernet0/1            unassigned      YES unset  administratively down down
Serial1/0                  unassigned      YES unset  administratively down down
Serial1/1                  unassigned      YES unset  administratively down down
Serial1/2                  unassigned      YES unset  administratively down down
Serial1/3                  unassigned      YES unset  administratively down down
SSLVPN-VIF0                unassigned      NO  unset  up                    up
R4#
```

2、 在 R1、R2、R3 中启用 EIGRP 协议，区域号为 33，使得各路由器上可以得到全网路由。

3、 把 R4 (PC1)模拟 PC 功能，参考命令如下：

```
PC1(config)#no ip routing

PC1(config)#interface fastEthernet 0/0

PC1(config-if)#ip address 192.168.1.100 255.255.255.0

PC1(config-if)#no shutdown

PC1(config)#ip default-gateway 192.168.1.1
```

问题 1：配置后在 PC 中 ping 192.168.1.2 和 192.168.1.3 是否能通？ping 2.2.2.2 是否能通？

答： ping 192.168.1.2 和 192.168.1.3 是能通。ping 2.2.2.2 是不能通。

4、 在 R1 和 R3 上配置 HSRP 协议，有效的确保网关的冗余。

参考命令如下：

```
R1(config-if)#int f0/1

R1(config-if)#standby 33 ip 192.168.1.1   33 为 HSRP 组

R3(config-if)#int f0/0

R3(config-if)#standby 33 ip 192.168.1.1   33 为 HSRP 组
```

问题 2：配置后稍等，在 R1 和 R3 中查看 HSRP 组信息，哪个为活动，哪个为备份？

参考命令：

```
R1#show standby
```

R1

```
R1#show standby
FastEthernet0/1 - Group 33
  State is Active
    2 state changes, last state change 00:00:47
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.208 secs
  Preemption disabled
  Active router is local
  Standby router is 192.168.1.3, priority 100 (expires in 9.536 sec)
  Priority 100 (default 100)
  Group name is "hsrp-Fa0/1-33" (default)
R1#
R1#
R1#
```

R3

```
R3#show standby
FastEthernet0/0 - Group 33
  State is Standby
    1 state change, last state change 00:00:17
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.872 secs
  Preemption disabled
  Active router is 192.168.1.2, priority 100 (expires in 9.856 sec)
  Standby router is local
  Priority 100 (default 100)
  Group name is "hsrp-Fa0/0-33" (default)
R3#
R3#
```

答：在 R1 和 R3 中查看 HSRP 组信息，R1 为活动，R3 为备份。

问题 3：在 PC1 中 ping 2.2.2.2 能否 ping 通？

```
R4#ping 2.2.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 124/322/1108 ms
R4#
```

答：在 PC1 中 ping 2.2.2.2 能 ping 通。

问题 4：在 PC1 中用 traceroute 2.2.2.2 跟踪路径，数据经过哪个路由器到达 R2 的？

```
R4#
R4#traceroute 2.2.2.2

Type escape sequence to abort.
Tracing the route to 2.2.2.2

  1 192.168.1.2 20 msec 32 msec 28 msec
  2 192.168.2.2 64 msec 64 msec 60 msec
R4#
R4#
```

答：数据经过 R1 路由器到达 R2 的。

问题 5：关闭 R1 的 f0/1 接口，此时在 PC1 中 ping 2.2.2.2，能否 ping 通？

```
R4#ping 2.2.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/72/116 ms
R4#
R4#
```

答：在 PC1 中 ping 2.2.2.2，能 ping 通。

问题 6：再启动 R1 的 f1/0 接口，过段时间，查看 HSRP 组信息，哪个活动，哪个备份？

```
R1#show standby
FastEthernet0/1 - Group 33
  State is Standby
    4 state changes, last state change 00:01:04
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.224 secs
  Preemption disabled
  Active router is 192.168.1.3, priority 100 (expires in 9.872 sec)
  Standby router is local
  Priority 100 (default 100)
  Group name is "hsrp-Fa0/1-33" (default)
R1#
R1#
R1#
```

答：R3 为活动，R1 为备份。

5、 修改 R1 的 HSRP 组默认优先级，并修改工作模式为抢占模式。

参考命令如下：

```
R1(config-if)#int f0/1


R1(config-if)#standby 33 priority 150


R1(config-if)#standby 33 preempt
```

问题 7：过段时间，查看 HSRP 组信息，哪个活动，哪个备份？

R1

```
R1#show standby
FastEthernet0/1 - Group 33
  State is Active
    5 state changes, last state change 00:00:10
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.960 secs
  Preemption enabled
  Active router is local
  Standby router is unknown
  Priority 150 (configured 150)
  Group name is "hsrp-Fa0/1-33" (default)
R1#
```

R3

```
R3#show standby
FastEthernet0/0 - Group 33
  State is Standby
    4 state changes, last state change 00:00:25
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.048 secs
  Preemption disabled
  Active router is 192.168.1.2, priority 150 (expires in 11.408 sec)
  Standby router is local
  Priority 100 (default 100)
  Group name is "hsrp-Fa0/0-33" (default)
R3#
```

答：R1 为活动，R3 为备份。

6、 HSRP 除了能够对下行链路实施冗余，同时还可以对上行链路进行监测，动态的变更 Active 角色，确保网络万无一失。配置动态端口跟踪，实现对上行链路的检测。

参考命令如下：

```
R1(config)#int f0/1

R1(config-if)#standby 33 track f0/0 80

R3(config)#int f0/0
```

```
R3(config-if)#standby 33 preempt
```

问题 8：关闭 R1 的 f0/0 口查看 R1 和 R3 的 HSRP 组信息，哪个为活动，哪个为备份？

R1

```
R1#show standby
FastEthernet0/1 - Group 33
  State is Standby
    7 state changes, last state change 00:00:04
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.304 secs
  Preemption enabled
  Active router is 192.168.1.3, priority 100 (expires in 9.520 sec)
  Standby router is local
  Priority 70 (configured 150)
    Track interface FastEthernet0/0 state Down decrement 80
  Group name is "hsrp-Fa0/1-33" (default)
R1#
```

R3

```
R3#show standby
FastEthernet0/0 - Group 33
  State is Active
    5 state changes, last state change 00:00:29
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.200 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.1.2, priority 70 (expires in 8.096 sec)
  Priority 100 (default 100)
  Group name is "hsrp-Fa0/0-33" (default)
R3#
```

答：R3 为活动，R1 为备份。

问题 9：重新开启 R1 的 f0/0 口查看 R1 和 R2 的 HSRP 组信息，哪个为活动，哪个为备份？

R1

```
R1#show standby
FastEthernet0/1 - Group 33
  State is Active
    8 state changes, last state change 00:00:21
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.552 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.1.3, priority 100 (expires in 9.008 sec)
  Priority 150 (configured 150)
    Track interface FastEthernet0/0 state Up decrement 80
  Group name is "hsrp-Fa0/1-33" (default)
R1#
```

R3

```
R3#show standby
FastEthernet0/0 - Group 33
  State is Standby
    7 state changes, last state change 00:00:24
  Virtual IP address is 192.168.1.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.304 secs
  Preemption enabled
  Active router is 192.168.1.2, priority 150 (expires in 8.192 sec)
  Standby router is local
  Priority 100 (default 100)
  Group name is "hsrp-Fa0/0-33" (default)
R3#
```

答：R1 为活动，R3 为备份。