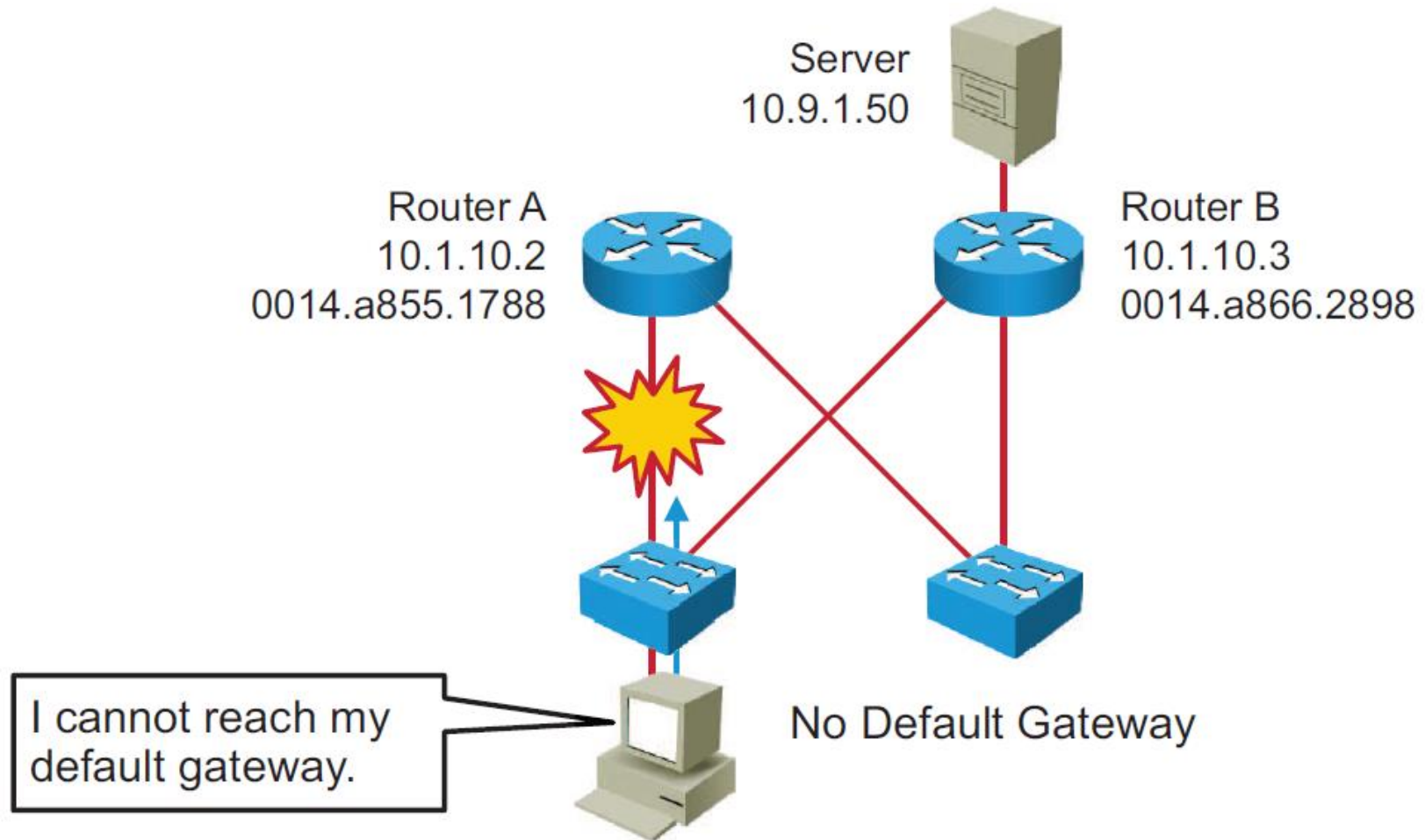# Understanding Layer 3 Redundancy
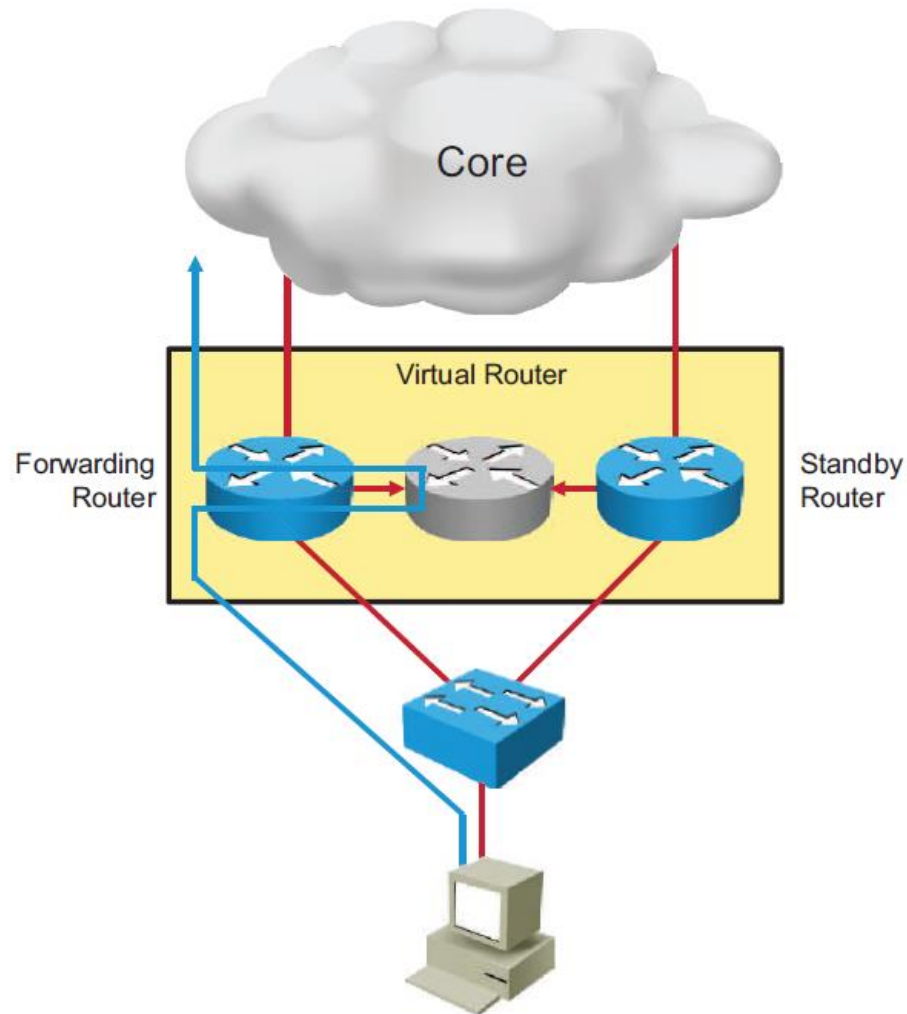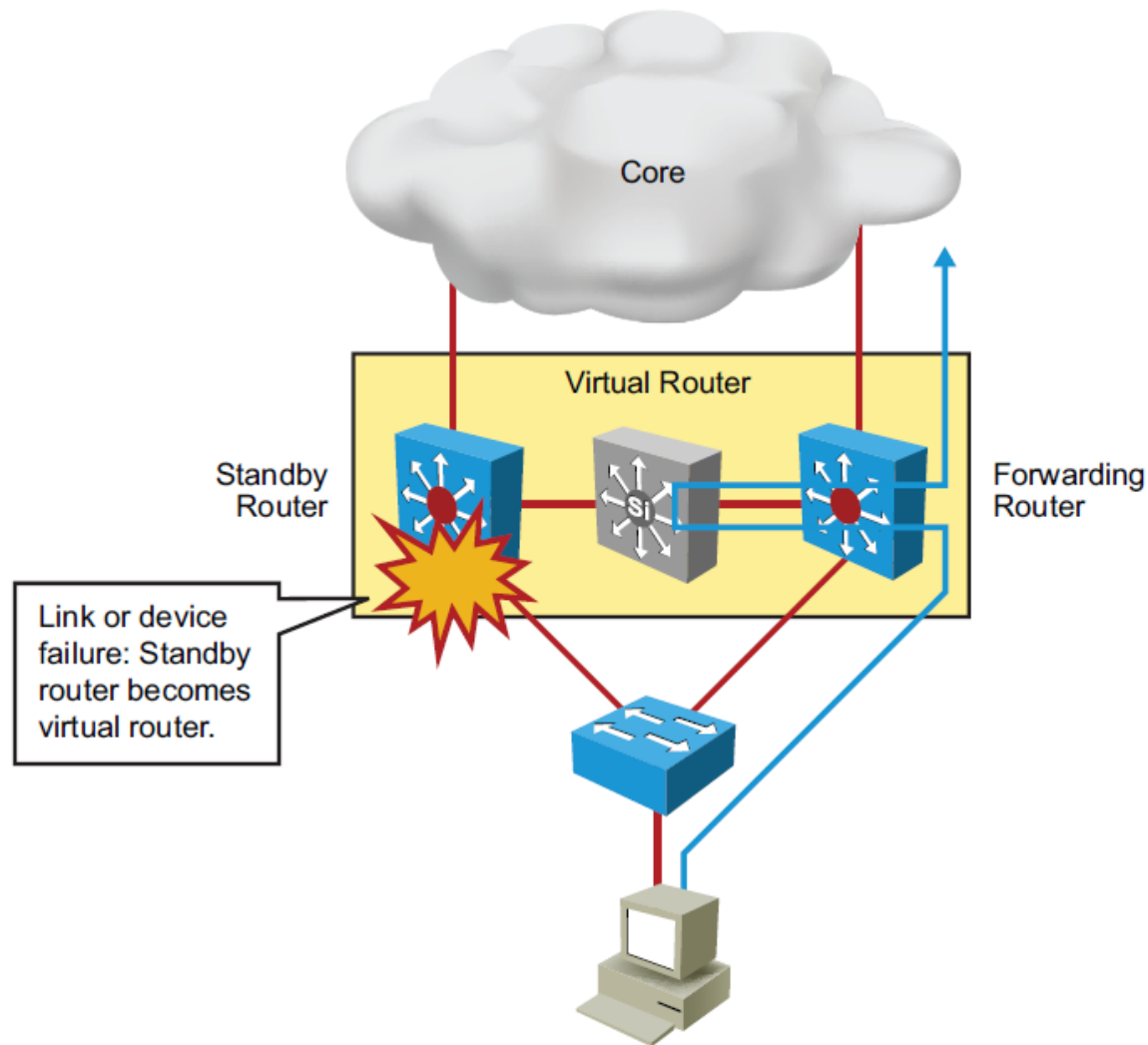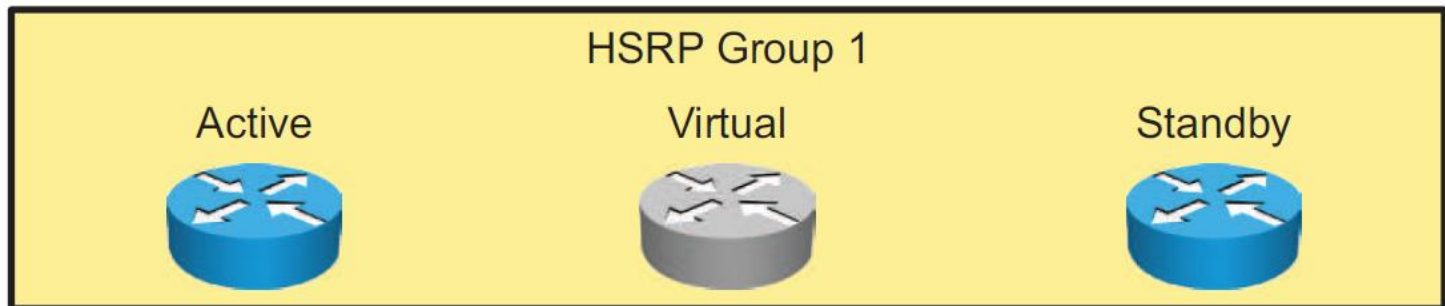
The Need for Default Gateway Redundancy

Default Gateway Redundancy

HSRP

- HSRP defines a group of routers -- one active and one standby.
- Virtual IP and MAC addresses are shared between the two routers.
- To verify HSRP state, use the *show standby* command.
- HSRP is Cisco proprietary, and VRRP is a standard protocol.
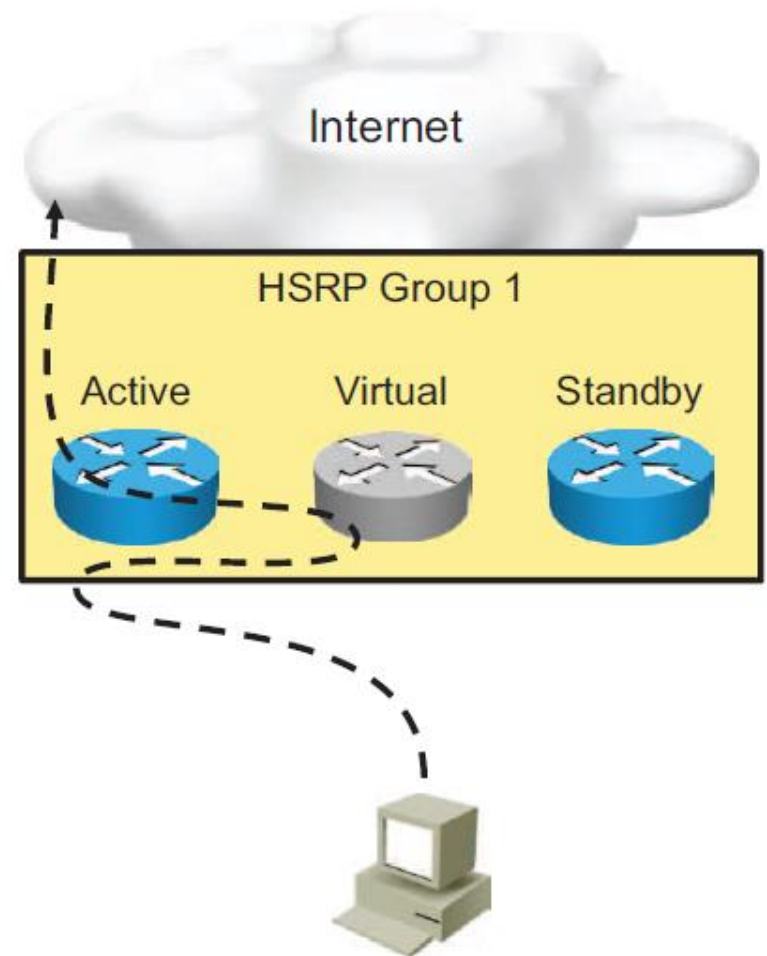
HSRP (Cont.)

Active router:

- Responds to default gateway ARP requests with the virtual router MAC address

- Assumes active forwarding of packets for the virtual router

- Sends hello messages

- Knows the virtual router IP address

Standby Router

- Listens for periodic hello messages

- Assumes active forwarding of packets if it does not hear from active router

HSRP states

State	Explanation
Initial	This is the first state when HSRP starts. You'll see this just after you configured HSRP or when the interface just got enabled.
Listen	The router knows the virtual IP address and will listen for hello messages from other HSRP routers.
Speak	The router will send hello messages and will join the election to see which router will become active or standby.
Standby	The router didn't become the active router but will keep sending hello messages. If the active router fails it will take over.
Active	The router will actively forward packets from clients and sends hello messages.

Configuring HSRP

- Routers A and B are configured with priorities of 110 and 90, respectively. The configuration of Router A is displayed. A similar configuration is required on Router B.

- The `preempt` keyword ensures that Router A will be the HSRP active router as long its interface is active and sending hellos.

HSRP
Group 1

Router A
Priority
110

Router B
Priority
90
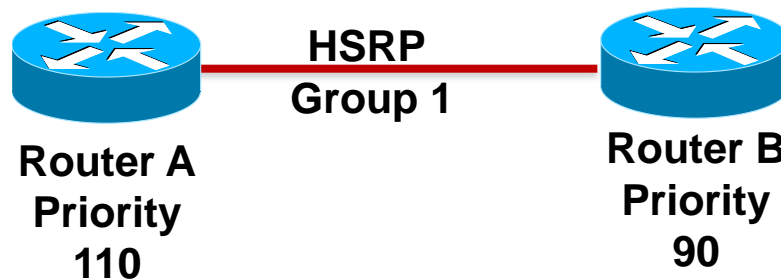
```
RouterA(config)# interface GigabitEthernet0/0
RouterA(config-if)# ip address 10.1.10.2 255.255.255.0
RouterA(config-if)# standby 1 ip 10.1.10.1
RouterA(config-if)# standby 1 priority 110
RouterA(config-if)# standby 1 preempt
```

HSRP Verification

Use the `show standby` command to verify the HSRP state.

```
RouterA# show standby
GigabitEthernet0/0 - Group 1 (version 2)
  State is Active
    2 state changes, last state change 00:00:18
  Virtual IP address is 10.1.10.1
  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 2.278 secs
  Preemption enabled
  Active router is local
  Standby router is 10.1.10.3, priority 90 (expires in 9 sec)
  Priority 110 (configured 110)
  Group name is hsrp-Gig0/0-1 (default)
```

The `show standby brief` command displays a summary of the HSRP configurations.

```
RouterA# show standby brief
                    P indicates configured to preempt.
                    |
Interface      Grp   Pri P State    Active        Standby        Virtual IP
Gig0/0         1     110 P Active   local         10.1.10.3      10.1.10.1
```
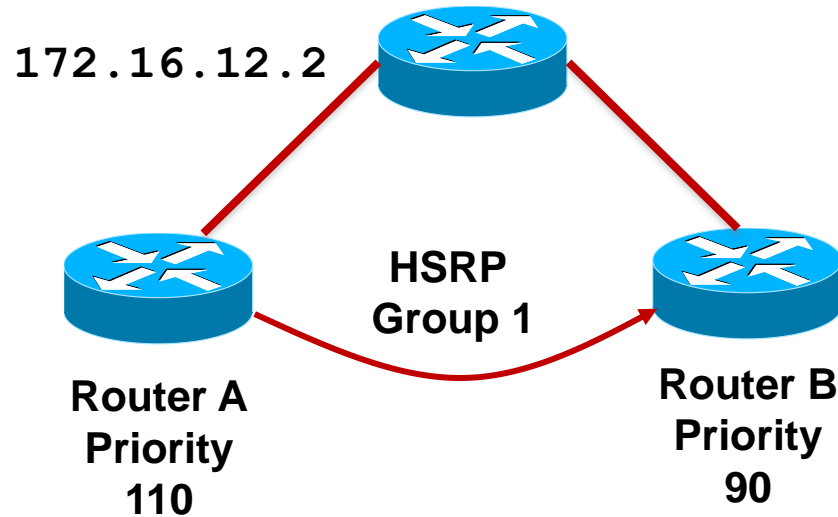
```
RouterB# show standby brief
                    P indicates configured to preempt.
                    |
Interface      Grp   Pri P State    Active        Standby        Virtual IP
Gig0/0         1     90  P Standby  10.1.10.2     local          10.1.10.1
```

HSRP and IP SLA Tracking


```
RouterA(config)#ip sla 1
RouterA(config-sla)#icmp-echo 172.16.12.2
RouterA(config)#ip sla schedule 1 start-time now life forever
RouterA(config)#track 1 ip sla 1 reachability
RouterA(config)#interface GigabitEthernet0/0
RouterA(config-if)#standby 1 track 1 decrement 30
```

HSRP vs. VRRP

	HSRP	VRRP
Protocol	Cisco proprietary	IETF – RFC 3768
Number of groups	16 groups maximum	255 groups maximum
Active/Standby	1 active, 1 standby and multiple candidates.	1 active and several backups.
Virtual IP Address	Different from real IP addresses on interfaces	Can be the same as the real IP address on an interface.
Multicast address	224.0.0.2	224.0.0.18
Tracking	Interfaces or Objects	Objects
Timers	Hello timer 3 seconds, hold time 10 seconds.	Hello timer 1 second, hold time 3 seconds.
Authentication	Supported	Not supported in RFC 3768

Gateway Load Balancing Protocol

- Allows full use of resources on all devices without the administrative burden of creating multiple groups

- Provides a single virtual IP address and multiple virtual MAC addresses

- Routes traffic to single gateway distributed across routers

- Provides automatic rerouting in the event of any failure