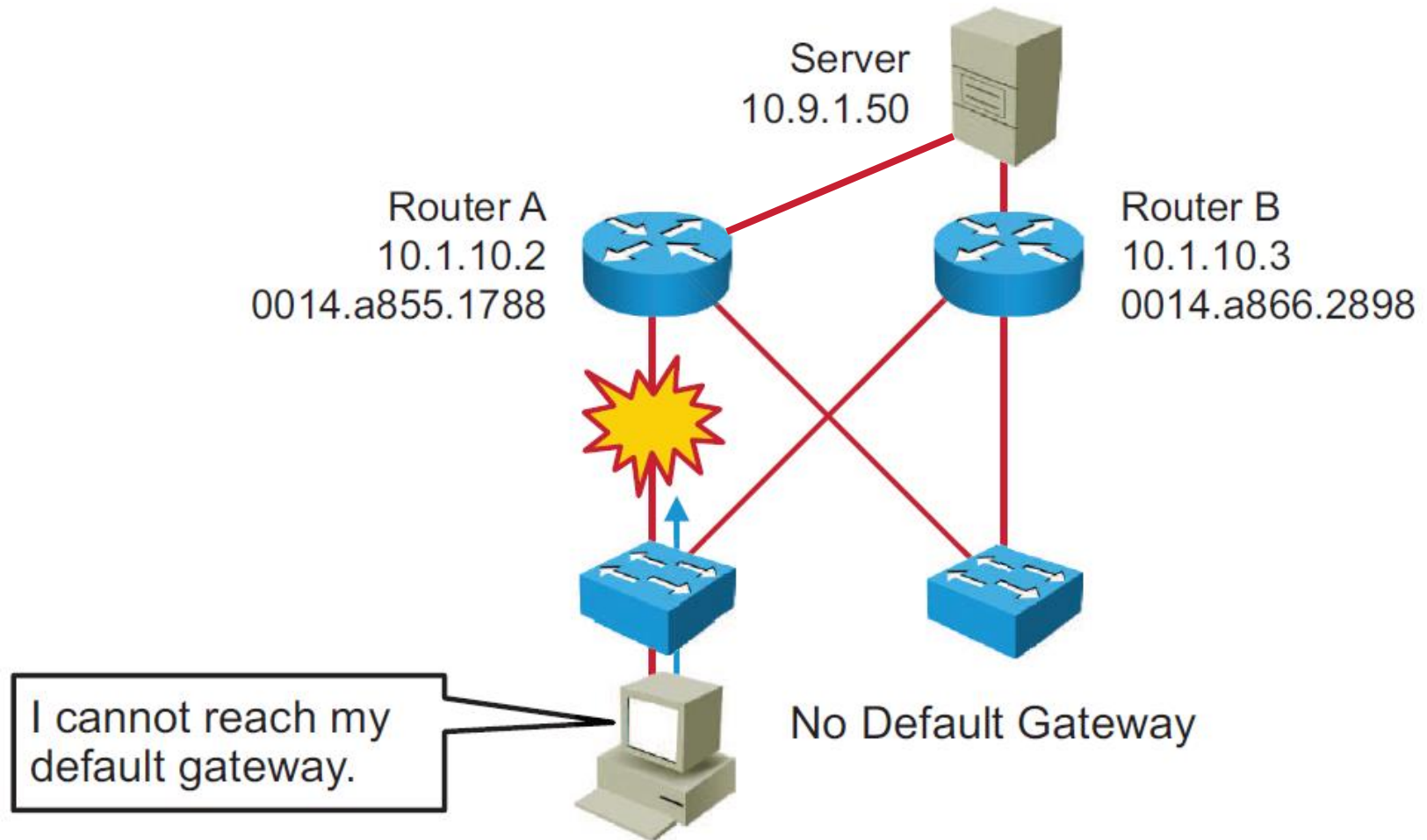




# Understanding Layer 3 Redundancy

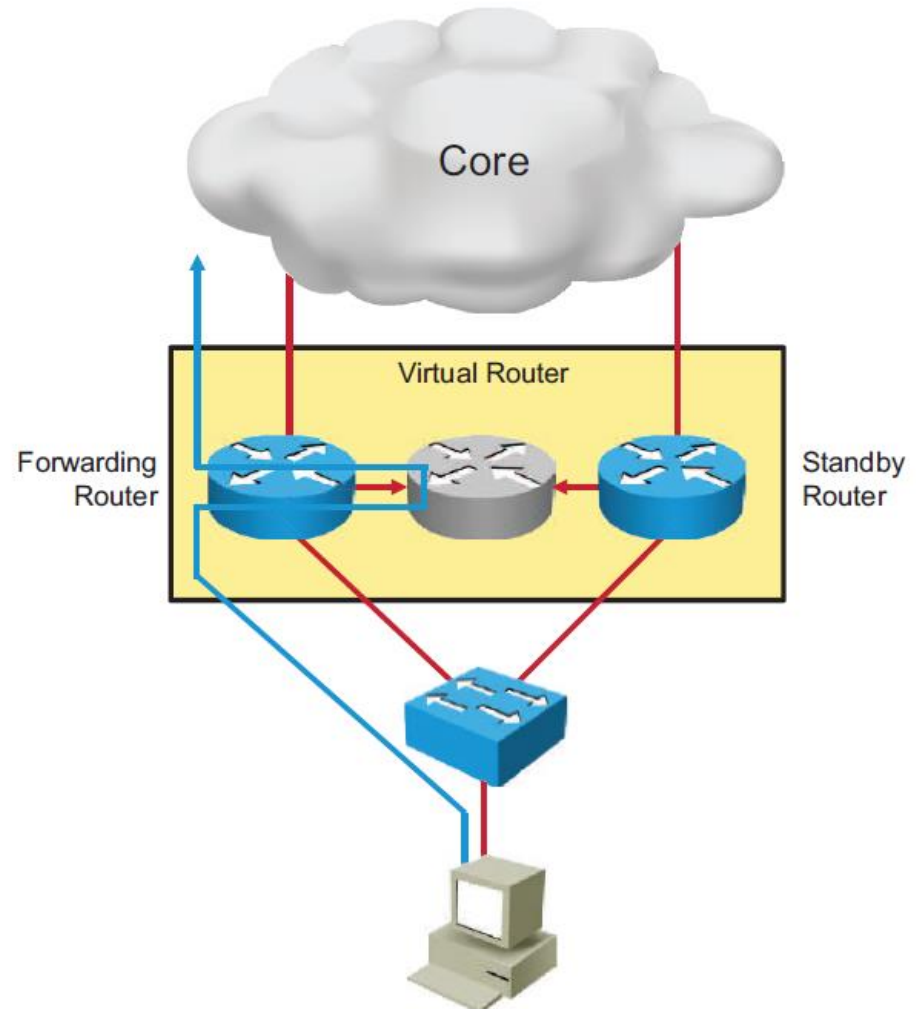
# The Need for Default Gateway Redundancy



# Default Gateway Redundancy

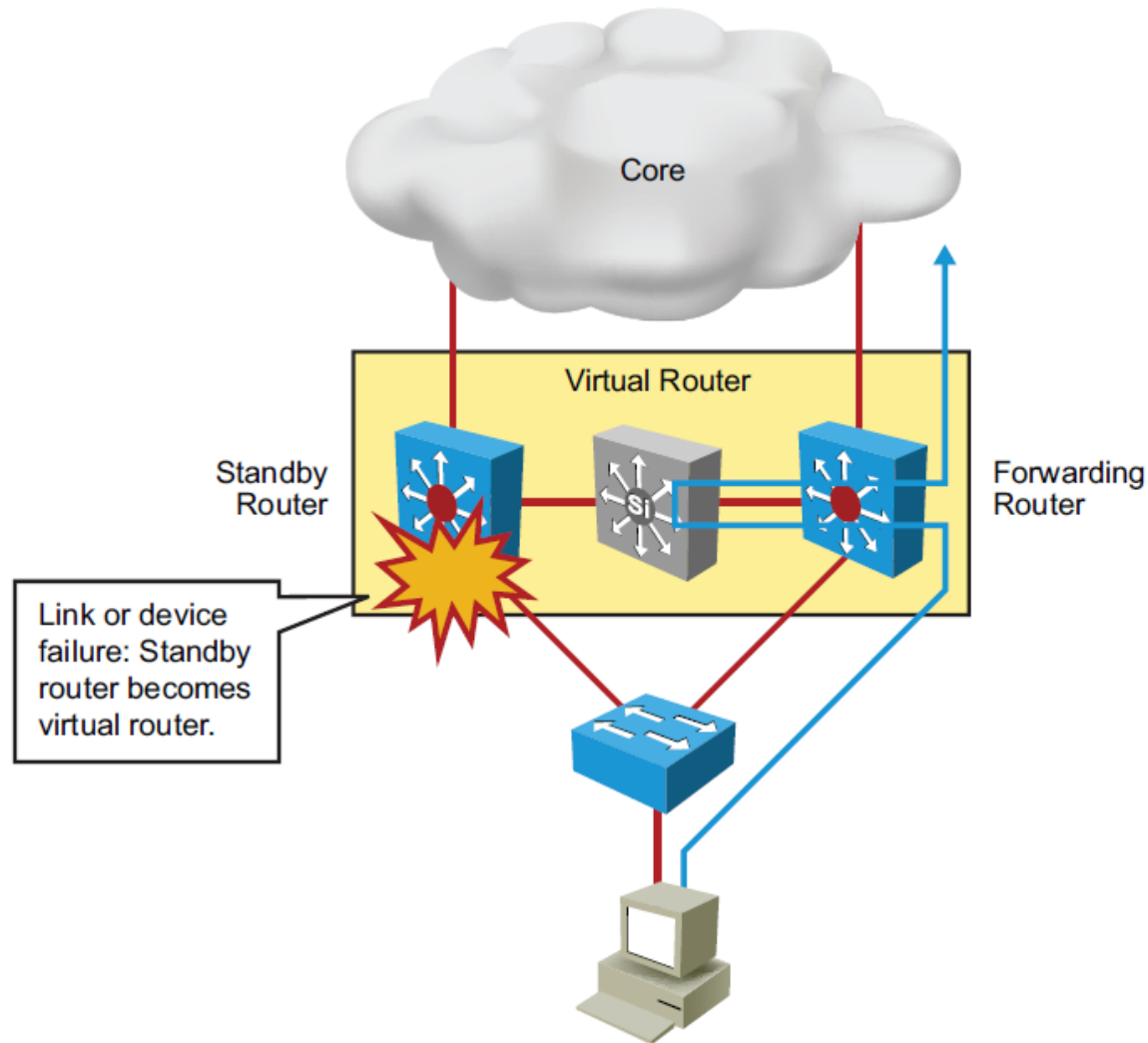
## **FHRP** (First Hop Redundancy Protocol)

- Gateway redundancy
- **HSRP** (Hot Standby Router Protocol): Cisco proprietary
- **VRRP** (Virtual Router Redundancy Protocol): open standard (IETF - RFC 5798)
- **GLBP** (Gateway Load Balancing Protocol): Cisco proprietary protocol that permits load balancing as well as redundancy



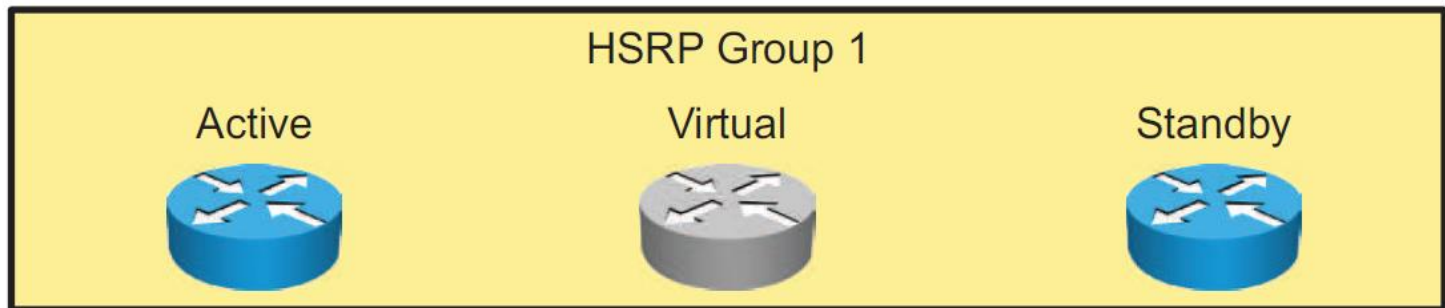
Default Gateway: IP of Virtual Router

# Default Gateway Redundancy (Cont.)



# HSRP

- HSRP defines a group of routers -- one active and one standby.
- Virtual IP and MAC addresses are shared between the two routers.
  - Virtual MAC Address for HSRP v1: 0000.0c07.acXX
  - Virtual MAC Address for HSRP v2: 0000.0c9f.fXXX
- To verify HSRP state, use the *show standby* command.
- HSRP is Cisco proprietary, and VRRP is a standard protocol.



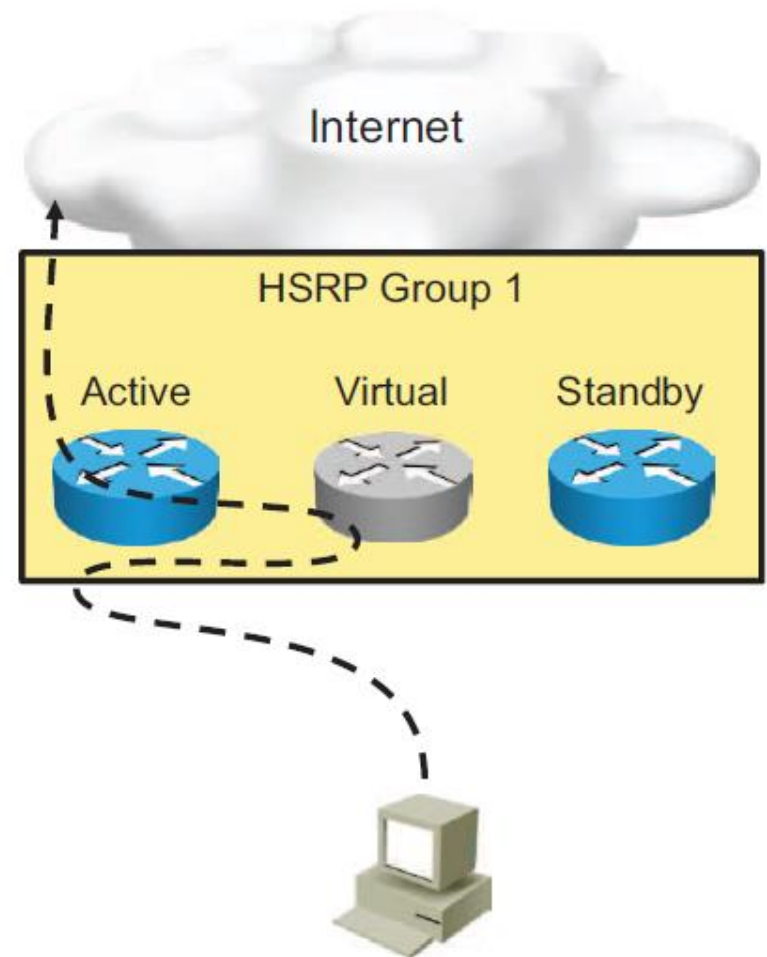
# HSRP (Cont.)

## 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

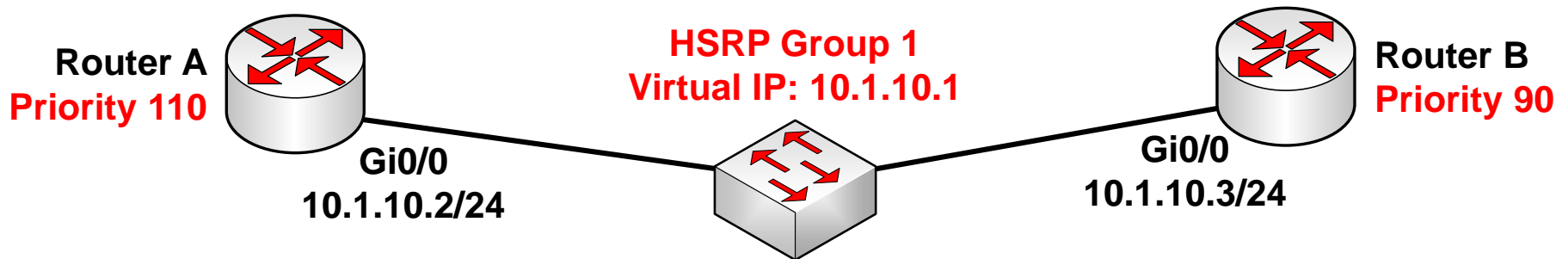


# HSRP states

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

# Configuring HSRP

- The router in an HSRP group with the **highest** priority becomes the Active router (default priority: 100)  $\longrightarrow 0 \rightarrow 255$
- 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 (non-preempt by default).



```
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)
```

# HSRP Verification (Cont.)

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 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

