

Multilayer Switching

Halmstad University

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Module 5: Implementing High Availability in a Campus Environment

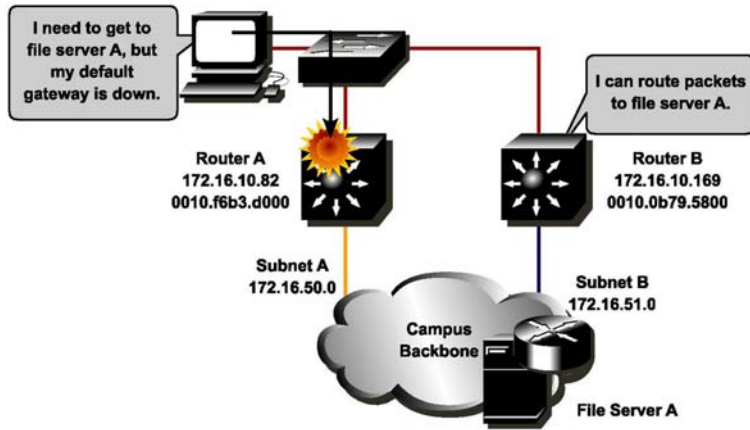
- **Hot Standby Routing Protocol (HSRP)**
- **Virtual Router Redundancy Protocol (VRRP)**
- **Gateway Load Balancing Protocol (GLBP)**

Routing Issues: Using Default Gateways

FIGURES

1

2



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Router redundancy

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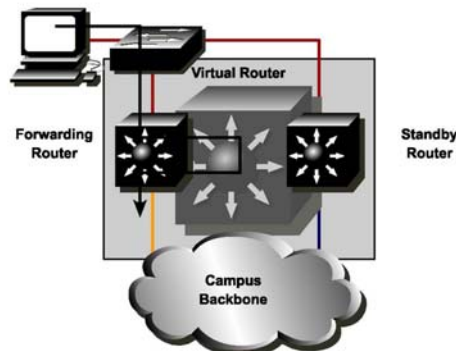
Router Redundancy

FIGURES

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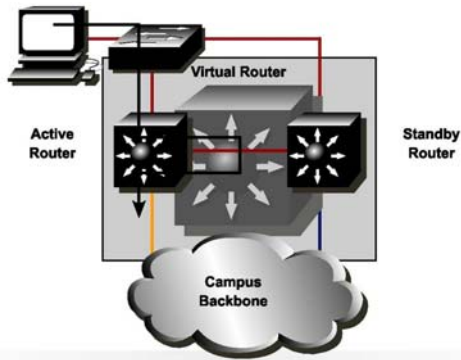
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HSRP

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HSRP FIGURES

- 1
- 2



Standby group:
The set of routers participating in HSRP that jointly emulate a virtual router.

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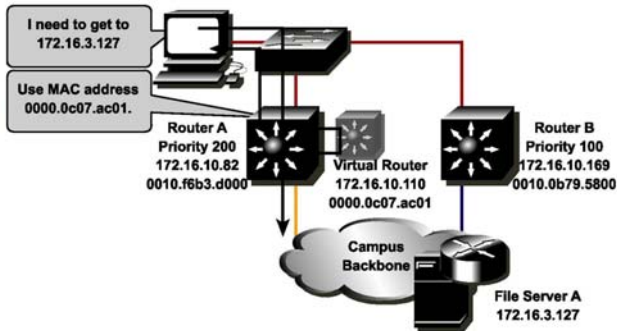
HSRP

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The Active Router

FIGURES

- 1
- 2
- 3
- 4
- 5
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The active router responds to ARP requests with the MAC address of the virtual router.

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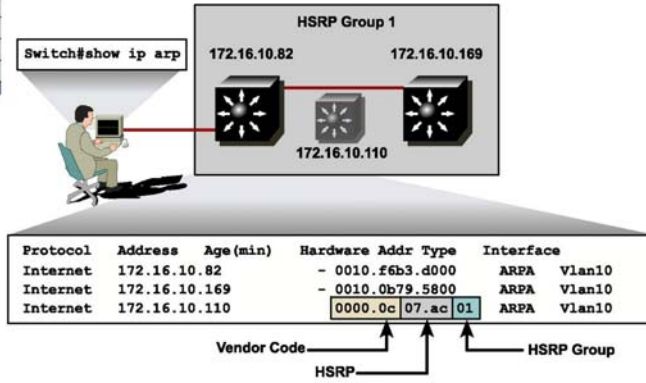
HSRP

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The Virtual Router MAC Address

FIGURES

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- 3
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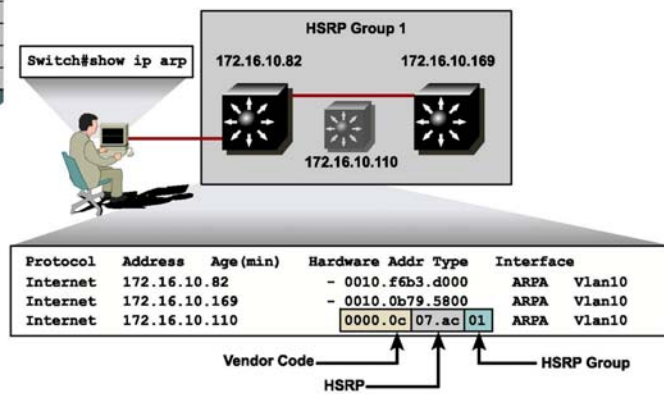
HSRP

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The Virtual Router MAC Address

FIGURES

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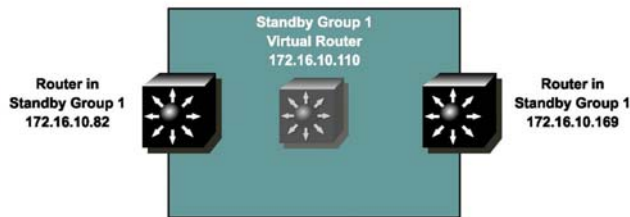
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HSRP states

HSRP States

FIGURES

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An HSRP router can be in one of six states:

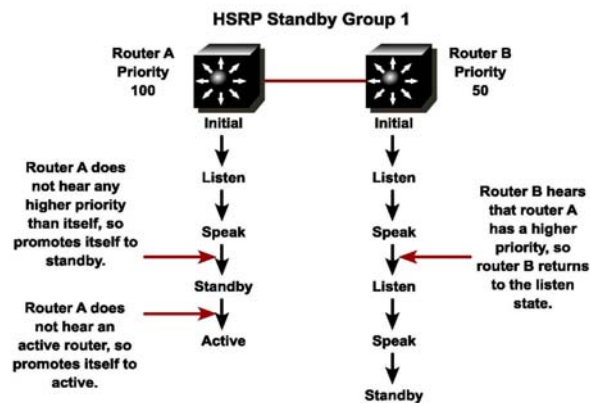
- Initial
- Learn
- Listen
- Speak
- Standby
- Active

HSRP states

HSRP State Transition

FIGURES

- 1
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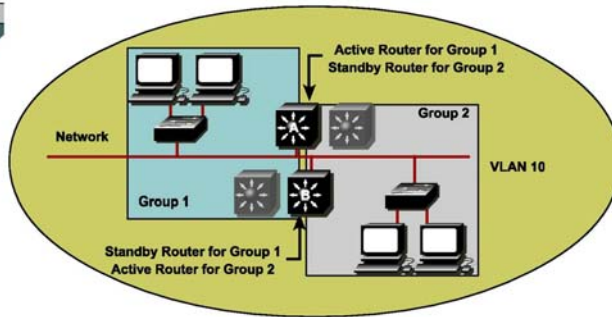


HSRP groups

Multiple HSRP Groups

FIGURES

1
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To load balance with routers, assign router interfaces to multiple groups on the same subnet.

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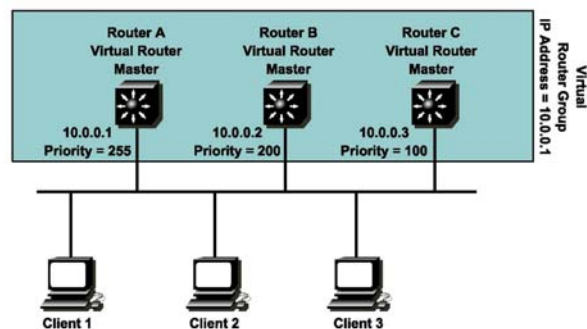
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VRRP

VRRP

FIGURE

1



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VRRP differs from HSRP in the following ways:

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- VRRP is an IEEE standard (RFC 2338) for router redundancy; HSRP is a Cisco-proprietary protocol.
- The virtual router represents a group of routers, known as a VRRP group or virtual router group.
- The active router is referred to as the master virtual router.
- The master virtual router may have the same IP address as the virtual router group.
- Multiple routers can function as backup routers.
- VRRP is supported on Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces, and with Multiprotocol Label Switching (MPLS), virtual private networks (VPNs), and VLANs.

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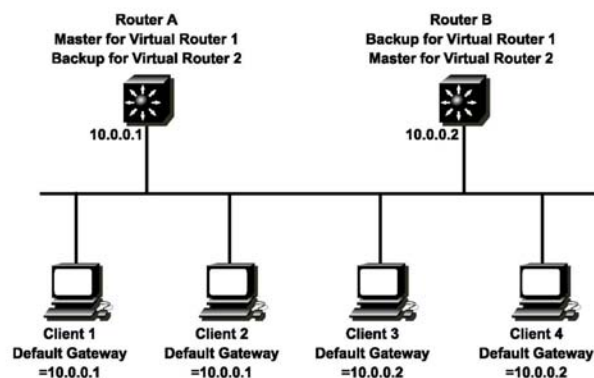
VRRP Operations Process

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VRRP Operational Process

FIGURES

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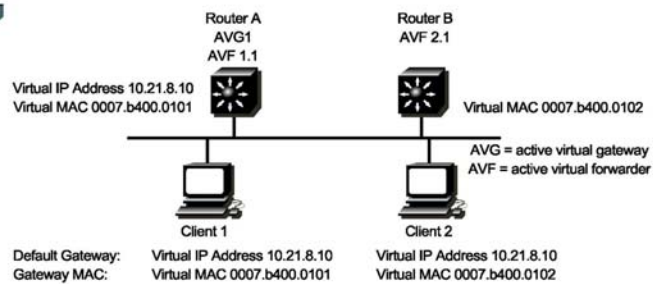
Describing GLBP

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Gateway Load Balancing Protocol

FIGURE

1



- Single virtual IP address and multiple virtual MAC addresses
- Traffic to single gateway distributed across routers
- Automatic rerouting in the event of any failure
- Full use of resources on all routers without the administrative burden of creating multiple groups

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GLBP has the following functions:

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- **Active virtual gateway (AVG):**
- **Active virtual forwarder (AVF):**
- **Communication (multicast address 224.0.0.102, (UDP) port 3222)**

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GLBP features:

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- Load sharing
- Multiple virtual routers
- Preemption
- Efficient resource utilization

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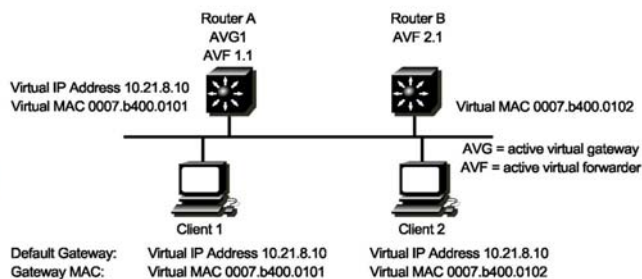
GLBP

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GLBP Operations

FIGURES

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- GLBP group members elect one AVG.
- AVG assigns the virtual MAC addresses to each member of the group.
- AVG replies to the ARP requests from clients with different virtual MAC addresses, thus achieving load balancing.
- Each router becomes an AVF for frames that are addressed to that virtual MAC address.

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GLBP

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GLBP supports the following operational modes for load balancing traffic across multiple default routers servicing the same default gateway IP address:

- Weighted load-balancing algorithm
- Host-dependent load-balancing algorithm
- Round-robin load-balancing algorithm