FHRP Cheat Sheet — Reference Tables

FHRP — General Overview

Provides default gateway redundancy at Layer 3
Hosts use a single virtual IP as their gateway
If active router fails, standby takes over seamlessly
No client reconfiguration required on failover
Three main protocols: HSRP, VRRP, GLBP
HSRP — Cisco proprietary (most common on Cisco)
VRRP — Open standard IEEE / IETF (RFC 5798)
GLBP — Cisco proprietary + load balancing

HSRP — Hot Standby Router Protocol

Standard	Cisco proprietary (RFC 2281 informational)
Version	HSRPv1 (IPv4) / HSRPv2 (IPv4 + IPv6)
Multicast (v1)	224.0.0.2 — UDP port 1985
Multicast (v2)	224.0.0.102 — UDP port 1985
Virtual MAC v1	00:00:0c:07:ac:<group>
Virtual MAC v2	00:00:0c:9f:f<group>
Priority	0-255 — default 100 — higher wins
Preempt	standby preempt — off by default
Hello timer	3 seconds (default)
Hold timer	10 seconds (default)
Groups	v1: 0-255 | v2: 0-4095
Auth	MD5 or plain-text (v2 recommended)

HSRP States (in order)

Initial	Starting state — no HSRP running
Learn	Waiting to learn virtual IP from active
Listen	Knows VIP — neither active nor standby
Speak	Sending hellos — contending for active/standby
Standby	Candidate to become active — monitors hellos
Active	Forwarding traffic — current active router

VRRP — Virtual Router Redundancy Protocol

Standard	Open standard — RFC 5798
Version	VRRPv2 (IPv4) / VRRPv3 (IPv4 + IPv6)
Multicast	224.0.0.18 — IP protocol 112
Virtual MAC	00:00:5e:00:01:<vrid>
Priority	1-254 — default 100 — higher wins
Priority 255	Reserved for IP address owner (auto-wins)
Preempt	ON by default (unlike HSRP)
Advertisement	1 second (default)
Master down	3 x Adv + skew time
Groups	VRID 1-255
Auth	Deprecated in VRRPv3 (was in v2)
Master	Equivalent to HSRP Active
Backup	Equivalent to HSRP Standby

GLBP — Gateway Load Balancing Protocol

Standard	Cisco proprietary — load balancing FHRP
Multicast	224.0.0.102 — UDP port 3222
Virtual MAC	00:07:b4:00:01:<group.weight>
AVG	Active Virtual Gateway — assigns MACs
AVF	Active Virtual Forwarder — forwards traffic
Priority	1-255 — default 100 — AVG election
Weighting	1-254 — default 100 — AVF load share
Hello timer	3 seconds
Hold timer	10 seconds
LB methods	Round-robin / Weighted / Host-dependent
Max AVFs	4 per group (4 virtual MACs)
Preempt	Disabled by default (like HSRP)

HSRP vs VRRP Comparison

Feature	HSRP	VRRP
Standard	Cisco proprietary	Open (RFC 5798)
Load balance	No (active/standby)	No (master/backup)
Preempt	Off by default	On by default
Virtual MAC	00:00:0c:07:ac:XX	00:00:5e:00:01:XX
IPv6 support	HSRPv2	VRRPv3
Max groups	v1:256 v2:4096	255 VRIDs
Hello/Hold	3s / 10s	1s / 3x+skew

HSRP Commands

```
interface <intf>
  standby version 2
  standby <grp> ip <virtual-ip>
  standby <grp> priority <0-255>
  standby <grp> preempt
  standby <grp> preempt delay minimum <sec>
  standby <grp> timers <hello> <hold>
  standby <grp> authentication md5 key-string <k>
  standby <grp> track <obj> decrement <val>
  standby <grp> name <name>
show standby
show standby brief
show standby vlan <id>
debug standby
```

VRRP Commands

```
interface <intf>
  vrrp <grp> ip <virtual-ip>
  vrrp <grp> priority <1-254>
  vrrp <grp> preempt
  vrrp <grp> timers advertise <msec>
  vrrp <grp> authentication md5 keystring <k>
  vrrp <grp> track <obj> decrement <val>
show vrrp
show vrrp brief
show vrrp interface <intf>
```

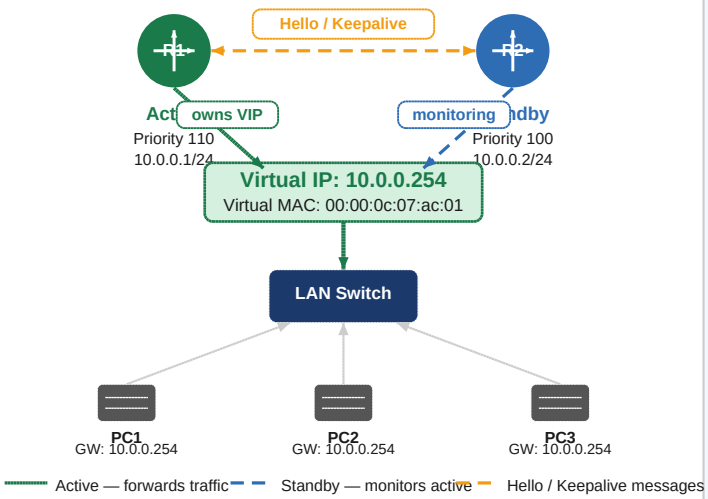
GLBP Commands

```
interface <intf>
  glbp <grp> ip <virtual-ip>
  glbp <grp> priority <1-255>
  glbp <grp> preempt
  glbp <grp> timers <hello> <hold>
  glbp <grp> load-balancing round-robin
  glbp <grp> load-balancing weighted
  glbp <grp> load-balancing host-dependent
  glbp <grp> weighting <1-254>
```

Object Tracking — Tie FHRP priority to interface state

```
track <id> interface <intf> line-protocol
track <id> ip route <prefix> reachability
standby <grp> track <id> decrement 20
If tracked object fails: priority drops → preemption triggers failover.
```

HSRP Topology — Active / Standby Failover

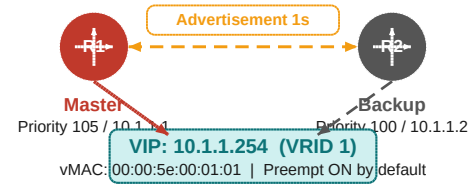


HSRP Failover — What Happens When Active Router Fails

Active stops sending Hellos — Standby waits Hold timer (10s).
Standby declares itself Active — sends Gratuitous ARP.
Gratuitous ARP updates all hosts' ARP caches with new MAC.
Traffic resumes via new Active — hosts notice no disruption.
With preempt: original Active reclaims role when it recovers.
Tune timers: standby timers msec 200 msec 600 for sub-second.

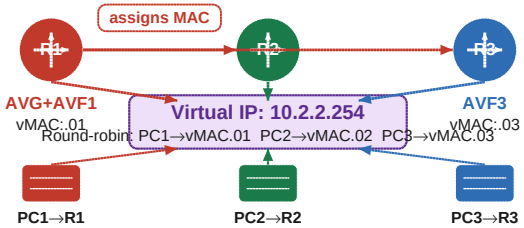
VRRP Topology & GLBP Load Balancing

VRRP — Master owns VIP (IP owner = priority 255)



■■■■■■■ GLBP — Load Balancing ■■■■■■■

GLBP — AVG assigns virtual MACs, all routers forward



GLBP vs HSRP/VRRP — When to Use Each

HSRP/VRRP: Simple redundancy — one active gateway at a time.
GLBP: Full load balancing — all routers actively forward traffic.
GLBP AVG assigns different virtual MACs to different hosts (ARP).
GLBP weighting + tracking adjusts AVF participation dynamically.

FHRP Packet Structures & State Machines

HSRP Hello Packet (UDP 1985 — multicast 224.0.0.2/102)

Version	Op Code	State	Hello■Time	Hold■Time	Priority	Group	Auth■Data	Virtual■IP
1B v1/v2	1B Hello	1B	1B 3s	1B 10s	1B	1B/2B	8B	4B

VRRP Advertisement Packet (IP proto 112 — 224.0.0.18)

Ver/Type	VRID	Priority	Cnt Addr	Auth■Type	Adv■Interval	Checksum	Virtual■IP Addr
1B	1B	1B	1B	1B	1B 1s	2B	4B each

HSRP State Machine (6 states)

INITIAL (No HSRP) → LEARN (No VIP yet) → LISTEN (Knows VIP) → SPEAK (Contending) → STANDBY (Backup) → ACTIVE (Forwarding)

Virtual MAC Address Formats

HSRP v1	00:00:0c:07:ac:<group>	group = hex HSRP group 0-255
HSRP v2	00:00:0c:9f:f<group>	group = hex 0-FFF (12-bit)
VRRP	00:00:5e:00:01:<VRID>	VRID = hex 01-FF
GLBP	00:07:b4:<group>:<AVF>:<unused>	AVF = 01-04 per group

Default Timers Comparison

Protocol	Hello / Adv	Hold / Down	Preempt
HSRP v1	3 seconds	10 seconds	Off (manual)
HSRPv2	3 seconds	10 seconds	Off (manual)
VRRP v2	1 second	3x Adv + skew	On (default)
VRRPv3	Configurable	3x Adv + skew	On (default)
GLBP	3 seconds	10 seconds	Off (manual)

HSRP Object Tracking — Priority Decrement on Failure

```
track 1 interface Gi0/1 line-protocol
standby 1 track 1 decrement 20   ← priority drops 110→90
standby 1 preempt   ← R2 (priority 100) now wins Active role
Use  ip sla  tracking for route/reachability-based failover.
```