Achievable

CCNA DUMP SHEET

IP routing and FHRPs

Read a routing table

Code	Prefix and mask	[AD/metric]	Next hop	Age	Exit interface
`O`	`172.16.1.0/24`	`[110/2]`	`via 10.1.1.2,`	`00:12:05,`	`GigabitEthernet0/1`
Source: OSPF	Destination, /24 mask	AD 110, OSPF cost 2	Next router	Since last update	Way out of this router

- `C`: directly connected, in the table while the interface is up/up
- `L`: local, the interface's own address as a /32

Forwarding decision

Step	Choose	Decides between
1	Longest prefix	Most mask bits that match
2	Lowest AD	Same prefix, different source
3	Lowest metric	Same prefix, same source
4	ECMP	All tied: load balance

- **Example:** to 172.31.0.20, a /27 beats a /24 beats a /16
- **Prefix beats AD:** an OSPF /27 wins over a static /24
- **No match:** the default route, or the packet is dropped

Route sources

Source	Code	AD
Connected	`C`, `L`	0
Static	`S`	1
External BGP	`B`	20
Internal EIGRP	`D`	90
OSPF	`O`	110
IS-IS	`i`	115
RIP	`R`	120
External EIGRP	`D EX`	170
Internal BGP	`B`	200
Never used		255

IPv4 static routes

Global config command	Route
`ip route 192.168.4.0 255.255.255.0 10.1.1.2`	Network
`ip route 192.168.4.100 255.255.255.255 10.1.1.2`	Host
`ip route 0.0.0.0 0.0.0.0 100.64.0.1`	Default
`ip route 192.168.4.0 255.255.255.0 172.31.255.2 5`	Floating
`ip route 192.168.4.0 255.255.255.0 g0/1 10.1.1.2`	Both

- **Both:** exit interface first, then next hop; AD goes last
- **Default:** shows as `S*`, sets the gateway of last resort
- **No default:** `Gateway of last resort is not set`
- **Floating:** AD above the primary, over 110 to back up OSPF
- **Floating:** in the running config; in the table if the primary fails
- **Needs** a next hop or exit interface; a next hop must be reachable
- **Return path:** each router on the way needs a route back
- **Verify:** `show ip route`; static routes show as `S`, `[1/0]`

Inter-VLAN routing

Router-on-a-stick

```
R1(config)# interface g0/0.2
R1(config-subif)# encapsulation dot1Q 2
R1(config-subif)# ip address 192.168.2.1 255.255.255.0
```

- **Trunk to the switch:** one subinterface per VLAN
- **Physical port:** `no shutdown`, no IP address
- **Matching native VLAN:** `encapsulation dot1Q 1 native`

Layer 3 switch

```
SW1(config)# ip routing
SW1(config)# interface vlan 2
SW1(config-if)# ip address 192.168.2.1 255.255.255.0
SW1(config-if)# no shutdown
```

- **SVI:** one per VLAN, the hosts' default gateway
- `ip routing`: off by default on some Layer 3 switches
- **Inter-VLAN traffic:** routed inside the switch

First hop redundancy protocols (FHRPs)

	HSRP: Cisco proprietary	VRRP: industry standard	GLBP: Cisco proprietary
Roles	Active forwards, standby waits	Master forwards, backup waits	AVG answers ARP, up to 4 AVFs forward
Hellos to	v1 224.0.0.2, v2 224.0.0.102	224.0.0.18	224.0.0.102
Virtual MAC	v1 0000.0C07.ACxx, v2 0000.0C9F.Fxxx	0000.5E00.01xx	0007.B400.xxxx, one per AVF
Priority	100, preempt off	100, preempt on	100, AVG preempt off, AVF on

- **Purpose:** routers share a virtual IP and MAC, the hosts' gateway
- **Each router** keeps its own IP. **Priority tie:** highest IP wins
- **Failover:** gratuitous ARP updates switch MAC tables
- **xx:** group in hex. HSRP group 1: AC01. VRRP group 121: 0179