# Hot Standby Routing Protocol

# First Hop Redundancy Protocols

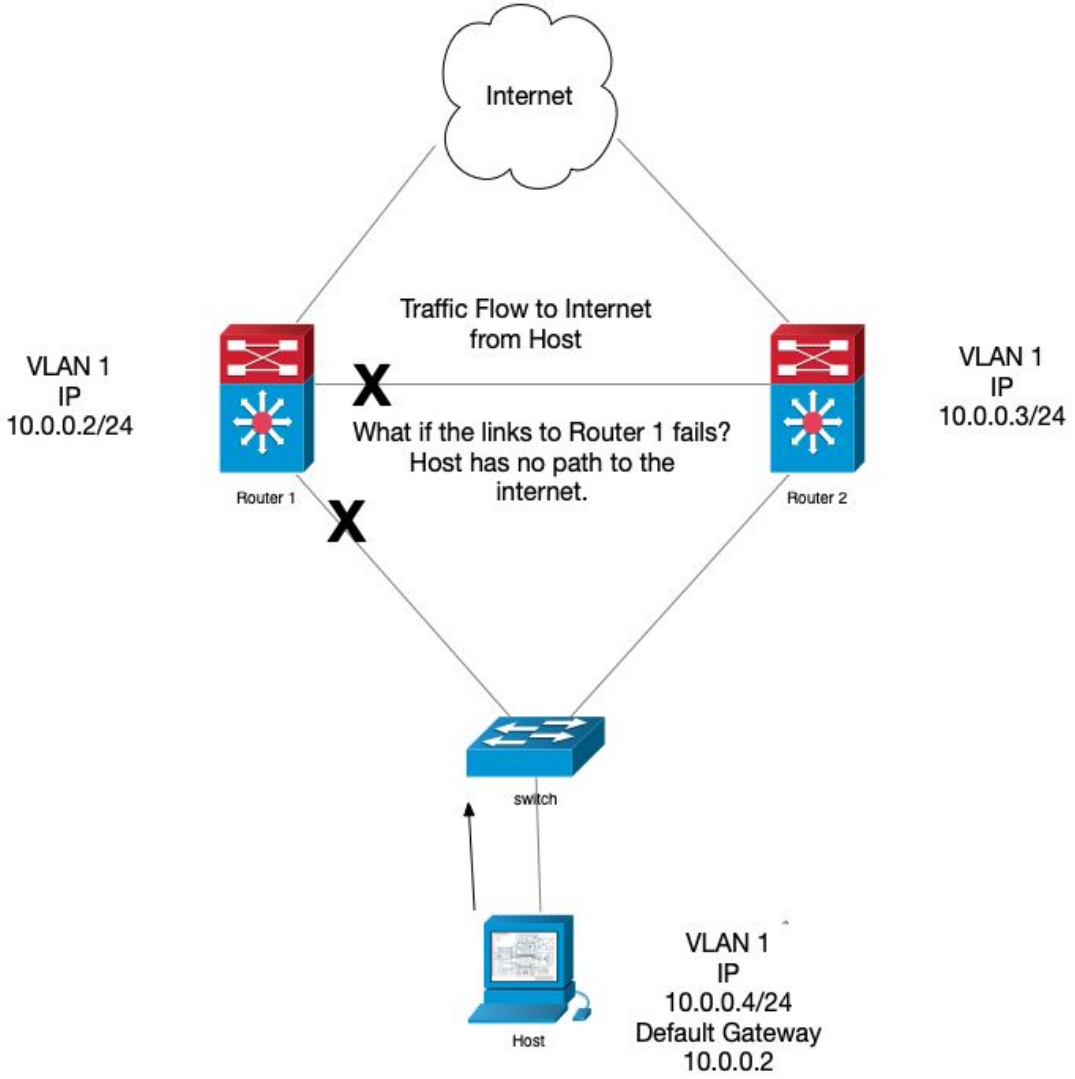
- Provide first hop network redundancy for IP Networks
- Share an IP and MAC address between two or more routers creating a virtual router.
- Allows a secondary router to take over in the event of primary router failure.
- Examples of first hop redundancy protocols are HSRP, VRRP, GLBP
- We will be focusing  on Hot Standby Routing Protocol (HSRP)

# Hot Standby Routing Protocol

- Without a first hop redundancy protocol an IP network with two or more exit points does not have redundancy in the event of a failure of one of the exit points.
- A failure of the default gateway of a host on that network will prevent that host from accessing resources outside of its own subnet.

# Hot Standby Routing Protocol

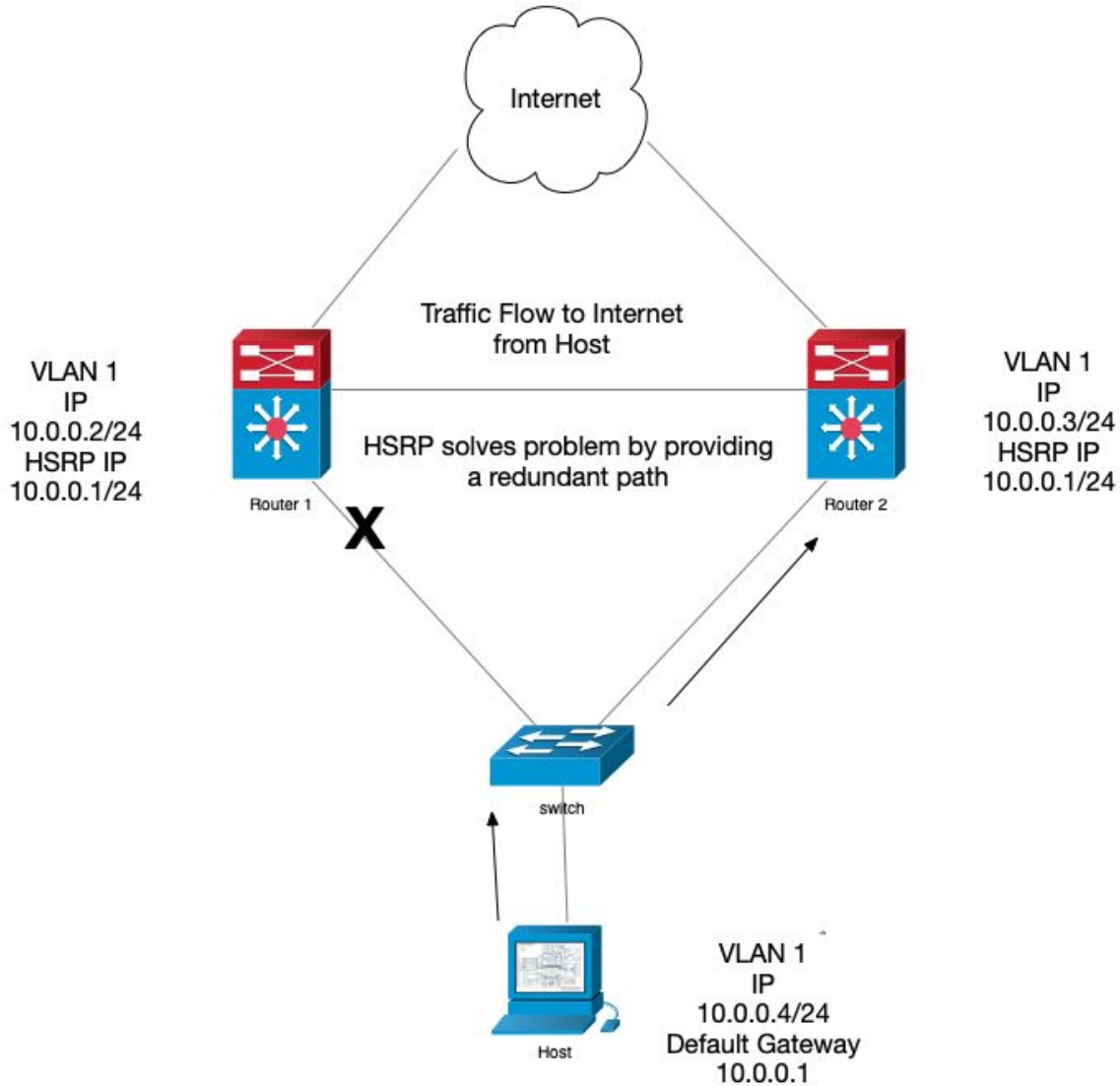
- Host default gateway is Router 1
- The links to Router 1 fails
- Even though there is a viable path to get outside the local subnet, via 10.0.0.3, the endpoint point will continue trying to send traffic via the unreachable default gateway
- Host cannot get out of the network.



# Hot Standby Routing Protocol

- HSRP solves this problem.
- With HSRP, Router 1 and Router 2 share a virtual IP.
- The Host default gateway points to this virtual IP.
- If Router 1 fails, then the Host still has a path to the internet.

# Hot Standby Routing Protocol



# Hot Standby Routing Protocol

- Using HSRP, a set of routers work in concert to present the illusion of a single virtual router. This set is known as a standby group.
- These routers share a virtual IP and MAC address.
- One router is the active router and forwards all traffic.
- One router is the standby router and takes over in case of the active router failure.
- All other routers are in Listen state. In the event of active failure one of these routers will become standby.

# Hot Standby Routing Protocol

- The virtual IP can be any (non-duplicated) address within the subnet on the L3 interface.
- In most cases people will use  the first address in the subnet, or in rarer cases the last.
- The virtual MAC address is derived from the standby group number
- The HSRP MAC always starts with

0000.0c07.ac

- The last two digits are the standby group number. For example for standby group 1 we would have

0000.0c07.ac01

# Hot Standby Routing Protocol: Operation

- Routers configured for HSRP send Hello packets to multicast address 224.0.0.2.
- These Hellos are used to elect the active router and to verify availability of the active router.
- Active router is the router with the highest, configurable, priority value.
- If all routers have the default priority value, then the router with the highest IP address wins.
- If there are more than two routers, then the same process is used to determine which of the remaining routers will be standby.

# Hot Standby Routing Protocol: Operation

- Hello packets are sent every 3 seconds by default.
- The hold time is 10 seconds.
- If no hello packets are heard for 10 seconds, then that router is considered unavailable. If the active router is unavailable, then the standby transitions to active state.
- By default, when the active router comes back online, it will move into standby rather than taking back over as active to avoid further disruption of the network.

# Hot Standby Routing Protocol: Configuration

- In Cisco IOS HSRP is configured under the layer 3 interface using “standby” commands. We will walk through configuring HSRP on two routers.
- To configure the virtual IP use the command:

  standby 1 ip x.x.x.x
- The number 1 in the above command is the group number. It can be any number between 0 and 255
- This number must be the same on all routers
- You can have multiple standby groups on any layer 3 interface.
- x.x.x.x is the virtual IP this also must be the same on all routers.
- This command will get HSRP up and running.

# Hot Standby Routing Protocol: Configuration

Router1

```
interface Vlan1
 ip address 10.0.0.2 255.255.255.0
 standby 1 ip 10.0.0.1
```

Router2

```
interface Vlan1
 ip address 10.0.0.3 255.255.255.0
 standby 1 ip 10.0.0.1
```

# Hot Standby Routing Protocol: Configuration

- Router2 is active because it has the higher interface IP
- The command show standby will give you information about HSRP on the routers. This is the brief output of the command.

```
Router1#show standby brief
                     P indicates configured to preempt.
                     |
Interface   Grp  Pri P State       Active        Standby     Virtual IP
Vl1         1    100   Standby  10.0.0.3      local       10.0.0.1

Router2#show standby brief
                     P indicates configured to preempt.
                     |
Interface   Grp  Pri P State    Active        Standby       Virtual IP
Vl1         1    100   Active   local         10.0.0.2      10.0.0.1
```

# Hot Standby Routing Protocol: Configuration

- Full show standby output

Router2#show standby

Vlan1 - Group 1

State is Active  **Router 2 is active**

7 state changes, last state change 01:08:49

Virtual IP address is 10.0.0.1

Active virtual MAC address is 0000.0C07.AC01  **Derived from standby group number**

Local virtual MAC address is 0000.0C07.AC01 (v1 default)

Hello time 3 sec, hold time 10 sec

Next hello sent in 2.356 secs

Preemption disabled

Active router is local

Standby router is 10.0.0.2

Priority 100 (default 100)  **Default priority**

Group name is hsrp-Vl1-1 (default)

# Hot Standby Routing Protocol: Configuration

- Based on the show standby output you can see the priority is at default

Priority 100 (default 100)

- If we want to control which router is active, we can change that with the command

Standby 1 priority x – x being the priority value 0 – 255

- Higher priority number is preferred
- Here we change the priority on Router1 to 120

```
Router1(config)#int vlan 1
Router1(config-if)#standby 1 priority 120
Router1#show standby brief
                     P indicates configured to preempt.
                     |
Interface   Grp  Pri P State    Active          Standby         Virtual IP
Vl1         1    120   Standby  10.0.0.3        local           10.0.0.1
```

- Even though we changed the priority value higher the standby router will not take over as active by default. How do we fix this problem?

# Hot Standby Routing Protocol: Configuration

- To fix the problem presented on the previous slide we use the preempt command

Standby 1 preempt

- This commands tells a router that if it has a higher priority value it can assume active status over the current active router

```
Router1(config-if)#standby 1 pre
Router1(config-if)#standby 1 preempt


Router1#show standby brief
                     P indicates configured to preempt.
                     |
Interface   Grp  Pri P State    Active          Standby         Virtual IP
Vl1         1    120 P Active   local           10.0.0.3        10.0.0.1
```

- After adding the preempt command router 1 takes over as active because of the better priority.

# Hot Standby Routing Protocol: Configuration

- These are the basic configurations for HSRP.
- You can learn more on cisco.com

https://www.cisco.com/c/en/us/support/docs/ip/hot-standby-router-protocol-hsrp/9234-hsrpguidetoc.html