Networking

FHRP, VIP, VLAN & Subinterfaces

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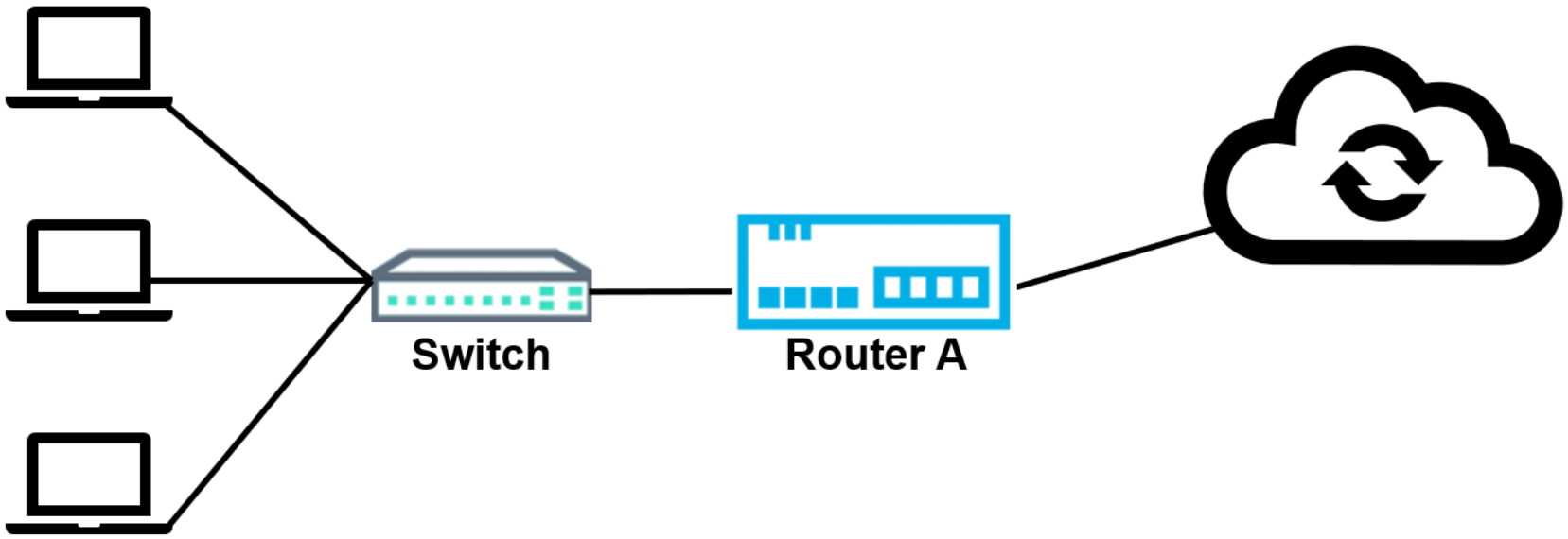
- Guiding Question: How do FHRPs, Virtual IPs, VLANs, and Subinterfaces work together to improve network redundancy, efficiency, and scalability?

- Students will:
  - Explain the purpose of First Hop Redundancy Protocols (FHRP) and how they ensure network uptime.
  - Describe how Virtual IPs (VIPs) provide redundancy and load balancing.
  - Identify the how VLANs improve efficiency and security through segmentation.

Redundancy in a Network

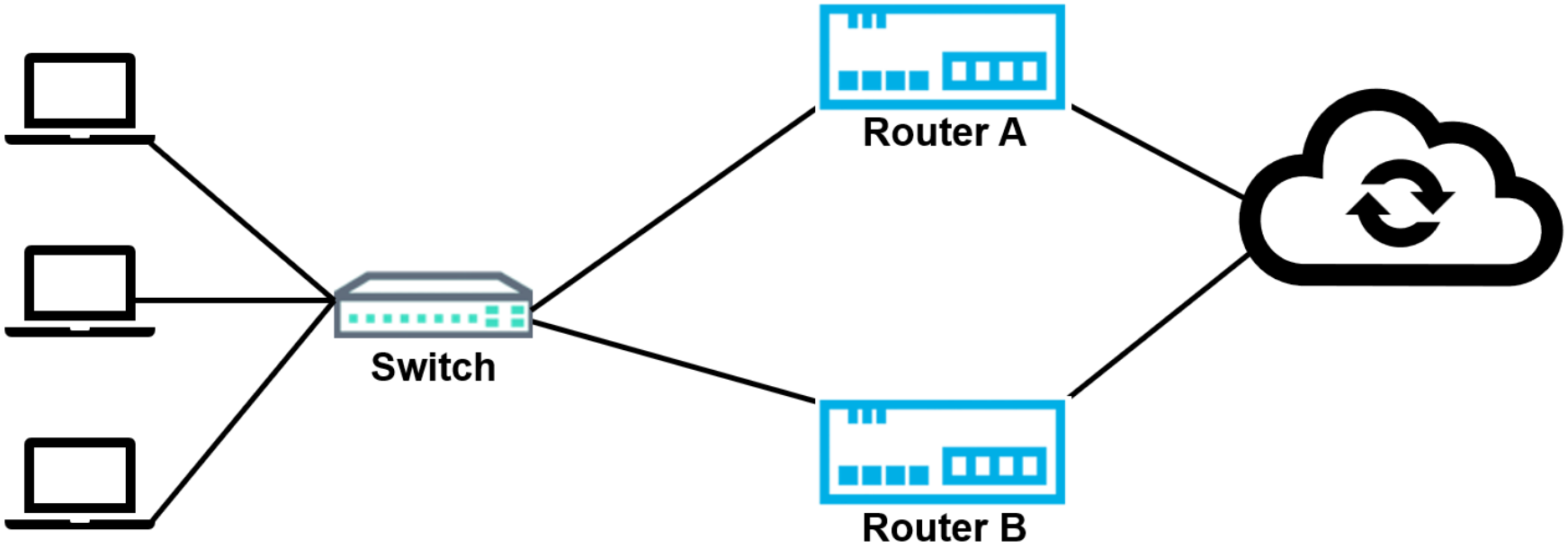
Router A is the Default Gateway for the network. What would we do if it broke?

How would we reach any devices outside of the network?



Redundancy in a Network (con't)

We can add Router B as a Standby in case Router A fails but the PCs are configured to use the Router A IP address as the Default Gateway. How can we easily point them to Router B when necessary?



Two Tools for Redundancy

1. **Virtual IP Address**
   - A VIP isn't tied to just one router or switch
   - It's a shared address for high availability
   - Helps with both redundancy and load balancing

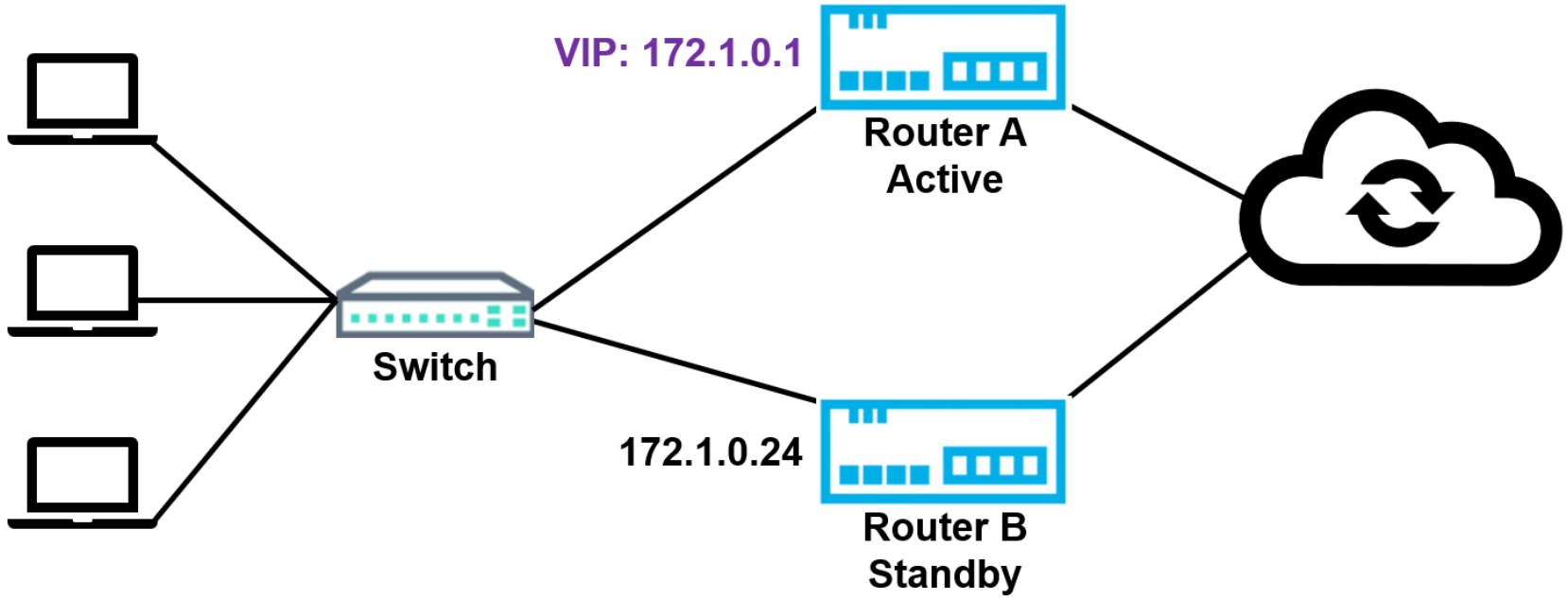
2. **First Hop Redundancy Protocol (FHRP)**
   - Keeps the default gateway available—even if one device fails
   - Uses multiple routers or switches to share the job

FHRP + VIP = Reliable Networks

- Devices are configured to use the Virtual IP address as their default gateway.
- Behind the scenes using FHRP, routers decide who's "in charge".
- If one router goes down, another takes over automatically
- Some types of First Hop Routing Protocols are able to perform load balancing between multiple routers.

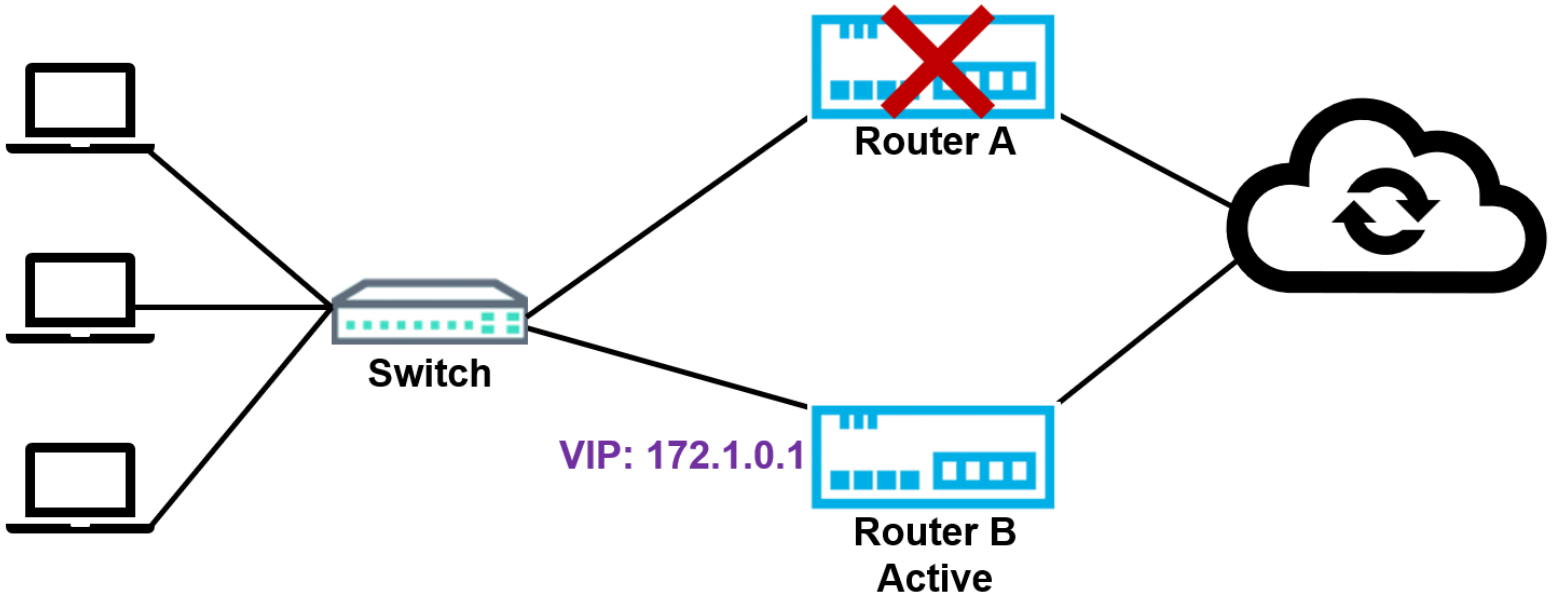
Redundancy in a Network

1. Configure the user devices with the Virtual IP address as the Default Gateway.
2. Assign the Virtual IP address to Router A and mark it as the Active router.
3. Router B has a “normal” IP address and is marked as the Standby router



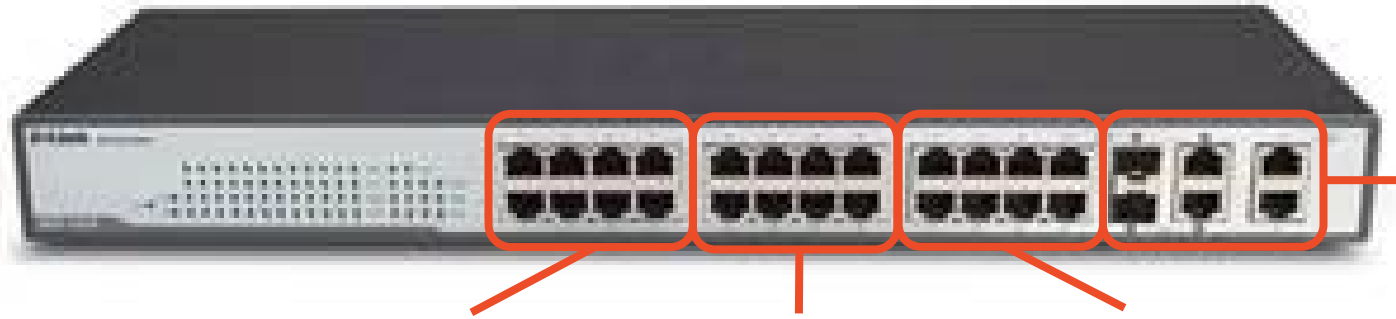
Redundancy in a Network

1. Router A experiences a problem and crashes.
2. FHRP reassigns the VIP to Router B.
3. Router B is now the Active Router and acts as Default Gateway for the network.



Virtual LANs (VLANs): Dividing a Network

- Breaks a large network into smaller, logical parts (*segments*)
- Improves security and organization
- Each VLAN is like its own mini-network
- Devices in different VLANs **need a router to talk to each other**



Router Subinterfaces

A router is connected to a switch with multiple VLANs. There is only one port and cable connecting the router and switch – so how can the router address the packet so that it ends up at the right VLAN (network segment)?

Subinterfaces are the solution.

- A subinterface is a virtual port on a router.
- Allows a single router port to handle multiple VLANs
- Each subinterface gets its own IP address and configuration

Example of VLAN and Subinterface Setup

Gig0 is the name of the router port that connects to the VLAN switch. For each VLAN, a subinterface is created and named:

- VLAN 10: Sales → Gig0/1.10
- VLAN 20: Marketing → Gig0/1.20
- VLAN 30: IT → Gig0/1.30
- Each subinterface acts as the gateway for its VLAN

Router with Subinterfaces

- The router port (Gig0) connected to the VLAN switch is configured with a Subinterface for each VLAN. While there is only one port and cable connecting the devices, the Subinterfaces create “lanes” for each VLAN’s traffic.