

Computer Networks

VLAN and VTP

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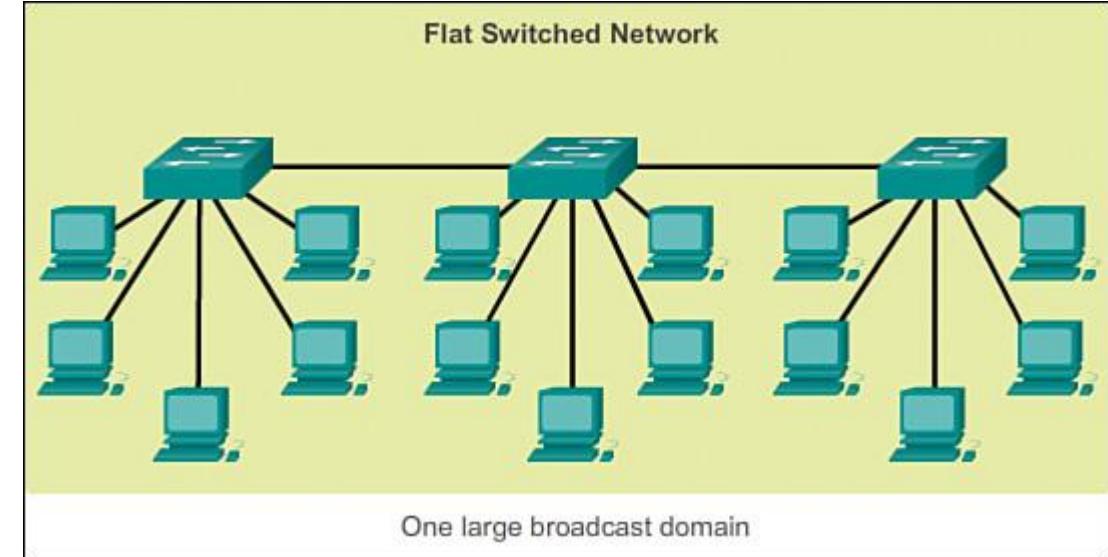


Outline

- > Flat Networks
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Flat Networks

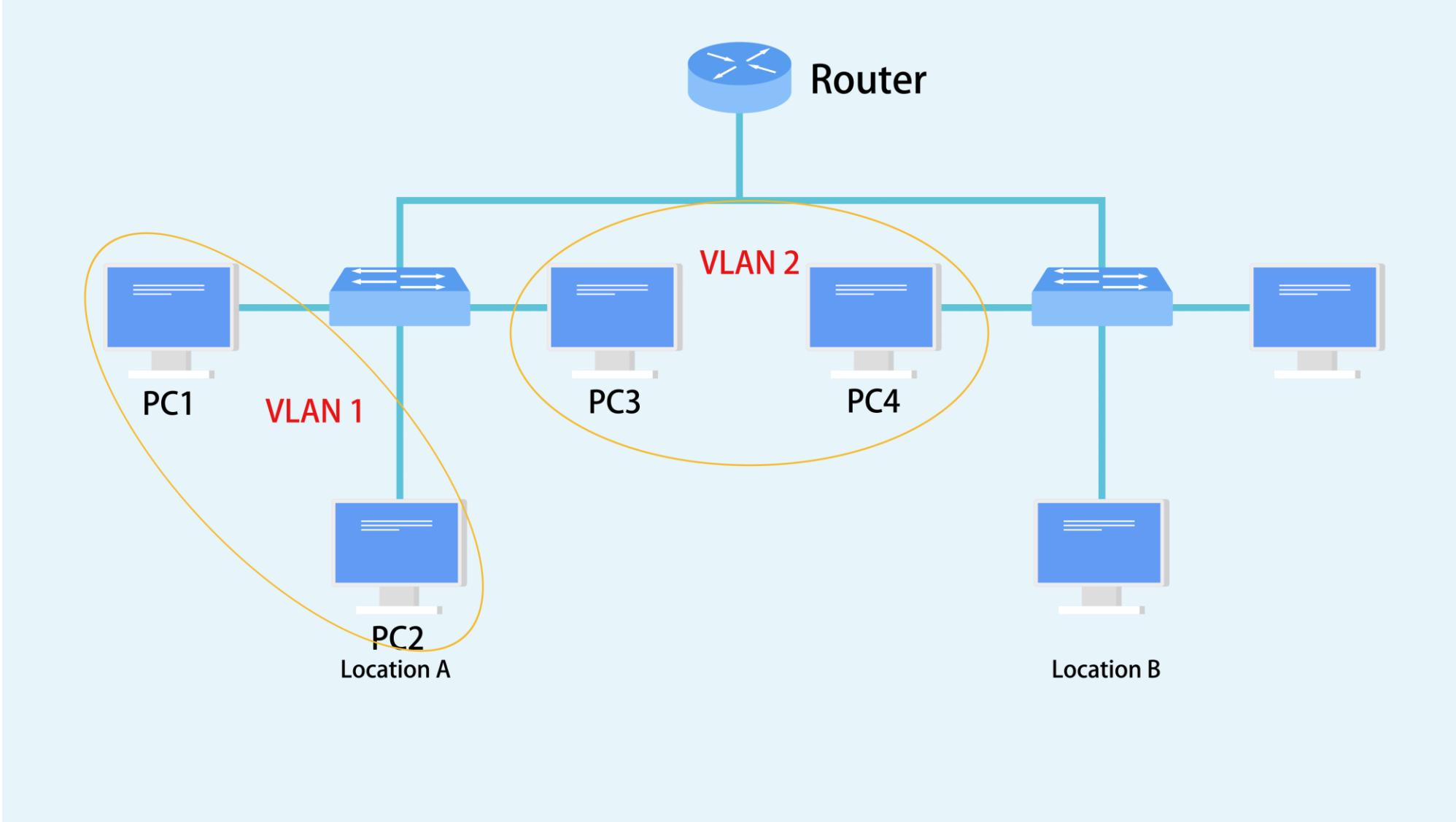
- › A flat network is a type of network architecture characterized by its simplicity and lack of hierarchical structure.
- › In a flat network, all devices are connected to a single network segment, allowing them to communicate directly with each other.
- › Cost-Effectiveness, Ease of Setup and Management, Simplified Troubleshooting.
- › Scalability Issues, Security Vulnerabilities, Limited Traffic Management.



Virtual Local Area Network

- › A VLAN (Virtual Local Area Network) is a logical segmentation of a physical network that allows multiple devices to communicate as if they are on the same local area network (LAN), even if they are physically located on different networks.
- › This segmentation occurs at the data link layer (OSI Layer 2) and enables efficient traffic management, improved security, and reduced broadcast traffic.

Virtual Local Area Network



How VLANs Work

- › **Identification:** VLANs are identified by unique numbers ranging from 1 to 4094. Network switches assign ports to specific VLANs based on these identifiers.
- › **Tagging:** When data packets are transmitted across a network, they are tagged with their respective VLAN ID. This tagging helps switches determine which VLAN a packet belongs to and manage the traffic accordingly.
- › **Inter-VLAN Routing:** To enable communication between different VLANs, routers or Layer 3 switches must be used. This process is known as inter-VLAN routing

Advantages of Using VLANs

- › **Enhanced Security:** By restricting broadcast traffic and limiting access to sensitive information within specific VLANs, organizations can improve their overall network security.
- › **Improved Performance:** Reducing broadcast traffic leads to better performance and efficiency in data transmission across the network.
- › **Simplified Network Management:** VLANs allow for easier management of network resources and user groups without needing physical reconfiguration of the network hardware.

Access Link

- › An access link is a type of network connection that carries traffic for a single Virtual Local Area Network (VLAN). It is primarily used to connect end devices, such as computers or printers, to a network switch.
- › **Simplicity:** Access links simplify network design by allowing end devices to connect without needing complex configurations related to VLANs.
- › **Ease of Management:** Since all devices on an access link belong to the same VLAN, managing network policies and security settings becomes more straightforward.

Trunk Link

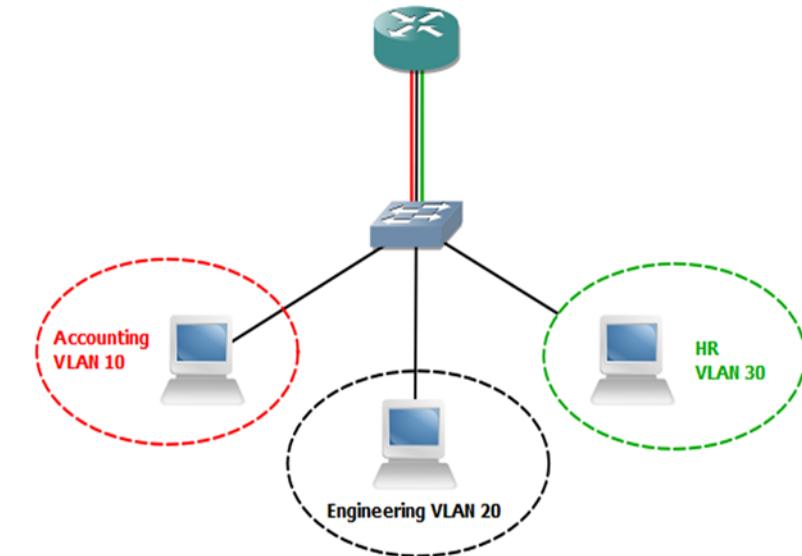
- > A trunk link is a physical connection between network devices, such as switches or routers, that carries traffic for multiple VLANs simultaneously. The key characteristics of trunk links include:
- > **VLAN Tagging:** Data frames transmitted over a trunk link are tagged with VLAN identifiers, allowing the receiving device to determine which VLAN the data belongs to. This tagging is typically done using protocols like IEEE 802.1Q, which inserts a VLAN tag into the Ethernet frame.
- > **Multiple VLAN Support:** Unlike access links that carry traffic for a single VLAN, trunk links can handle traffic from several VLANs at once. This capability is crucial for maintaining efficient communication in networks where multiple VLANs are configured.
- > **Transparent Transmission:** Trunk links can transmit packets without modifying their tags, ensuring that VLAN information is preserved throughout the network.

Trunk Port

- > A trunk port is a specific type of port on a network switch configured to handle traffic from multiple VLANs. The characteristics of trunk ports include:
- > **Configuration for Multiple VLANs:** Trunk ports are set up to accept and forward frames from various VLANs. This is essential for connecting switches in a multi-VLAN environment, allowing them to communicate effectively.
- > **Frame Marking:** When frames exit a trunk port, they are marked with their respective VLAN tags. This marking allows devices downstream to understand which VLAN the data belongs to.
- > **Connection Requirements:** A trunk port must connect to another trunk port or a device capable of understanding VLAN tagging (such as another switch or a router). This ensures that the VLAN information can be correctly interpreted and processed.

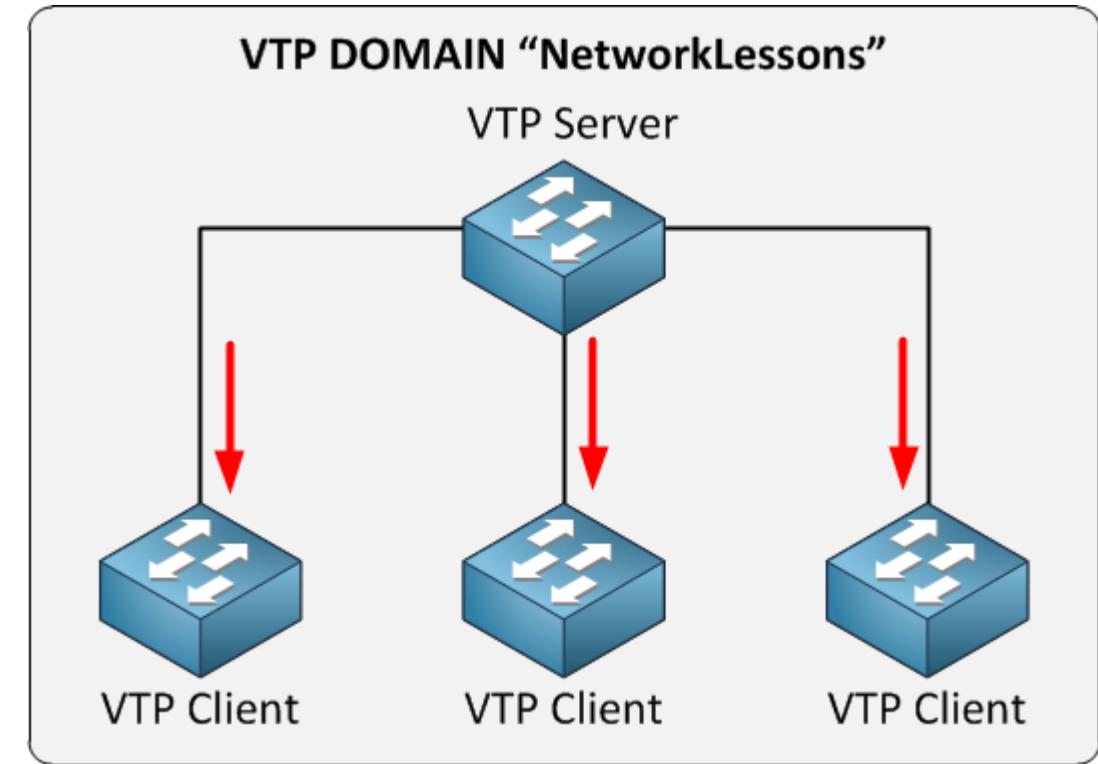
Router on a Stick

- › Router-on-a-stick is a type of router configuration in which a single physical interface manages traffic between multiple VLANs on a network.
- › The router receives VLAN tagged traffic on the trunk interface from the nearby switch, and forwards the routed traffic out to VLAN tagged destination using the same interface
- › Traditional Inter-VLAN Routing
 - The router has one physical port for each VLAN.
 - Each port has an IP address on its own VLAN.
 - Routing is the same as routing between any subnets.



VLAN Trunking Protocol

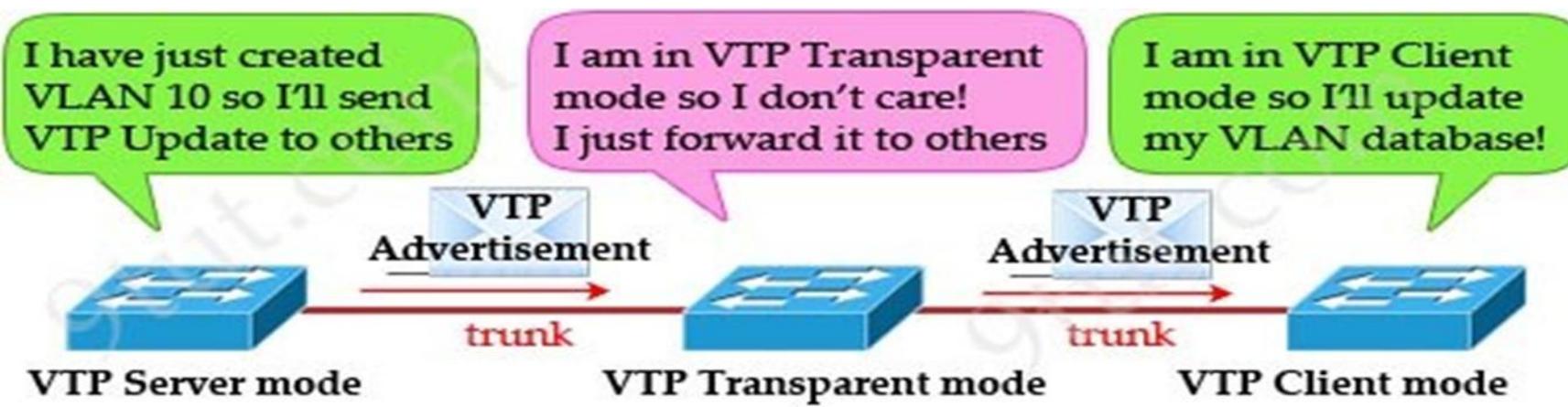
- > VLAN Trunking Protocol (VTP) is a CISCO proprietary protocol designed to manage and synchronize VLAN configurations across multiple switches in a network.
- > It operates at Layer 2 of the OSI model and facilitates the automatic distribution of VLAN information, reducing the administrative burden associated with managing VLANs in large networks.



VTP Operation Modes

- > There are three operational modes for VTP:
- > **Server Mode:** The default mode where VLANs can be created, modified, or deleted.
- > **Client Mode:** Switches in this mode receive updates from VTP servers but cannot make changes to the VLAN configuration.
- > **Transparent Mode:** Switches forward VTP messages but do not participate in VTP operations themselves. They can still pass VLAN traffic through trunk links.

VTP Operation Modes



Advantages of Using VTP

- › **Reduced Configuration Time:** In large networks with numerous switches, VTP significantly cuts down on the time required to configure VLANs since changes need only be made on one switch.
- › **Error Reduction:** By automating the propagation of VLAN configurations, VTP minimizes the risk of human error that can occur when configuring each switch individually.
- › **Dynamic Management:** VTP provides dynamic tracking and reporting of VLANs, making it easier for network administrators to manage their networks effectively.

References

- > VLAN and VTP – Provided Material
- > Online Website Research