

VIRTUAL LAN TECHNOLOGY

Ankita Hiremath*, Vishal Bhagat**,Hrishikesh Mogare***

*(Department of Master of Computer Applications, VTU/KLS Gogte Institute of Technology, Belagavi
Email:ankitaghiremath@gmail.com)

** (Department of Master of Computer Applications, VTU/KLS Gogte Institute of Technology, Belagavi
Email:bhagatvishal360@gmail.com)

*** (Department of Master of Computer Applications, VTU/KLS Gogte Institute of Technology, Belagavi
Email: hrishikeshsm@git.edu)

Abstract

One of the most challenging teaching topics in computer network technology courses is the VLAN communication experiment. If the necessary equipment is not available, the typical experimental teaching approach will not be able to meet the learning requirements of the relevant individuals. To address this issue, a virtual demonstration experiment is created. The design of a VLAN communication experiment using a virtual demonstration mode is presented in this work. Additionally provided are the software and hardware parts of the practical project's realization, as well as its characters and useful qualities. Finally, a study has been performed for a number of important variables that are present in this experimental instructional approach.

Keyword:-VLAN, computer network technology, a virtual demonstration experiment, and experimental teaching mode are some of the terms used.

1. INTRODUCTION

Given the numerous services that provide, wireless systems are now among the most common kinds of wireless communication networks. Furthermore, Wi-Fi substantially facilitates computer communication and interaction at a rate comparable with that of a traditional LAN (Local Area Networking) . VLAN is a technique that aids in the resolution of numerous performance issues. Furthermore, it provides numerous applications for wireless communication networks in determining management and security rules within a corporation. It also allows administrators to integrate any amount of isolation by splitting hosts into various domains for broadcasting. The fundamental reason for creating VLANs is traffic control; when a LAN grows as additional network equipment are included, the rate of the traffic increases.

VLANs have limited access to confidential server data by controlling traffic, boosting security, and lowering congestion levels [4]. A virtual local area network, or VLAN, is a type of network configuration that enables remote devices to interact as if they were physically present together. In order to manage network traffic, provide security, and enhance performance, it offers a mechanism to divide a network into smaller sections.

In this usage, the term "wireless connection" refers to an internet connection made via wireless technology, most commonly Wi-Fi (but it can also refer to another wireless technology).VLANs enhance bandwidth utilization and have proven to have several advantages in wireless networks. Networks Delay, throughput, and transport dropped were investigated with and without the use of a

VLAN, revealing that using a VLAN increased the latency and traffic dropped metrics but reduced the network's throughput, which is a major disadvantage of VLANs. Ad hoc routing techniques like OLSR, the DSR, and AODV have been studied to improve VLAN efficiency in mobile networks in regards to delay, throughput, and traffic loss. This study also includes an investigation into the influence of ad hoc routing algorithms (OLSR, the DSR, and AODV) in sensor networks that are wireless.[2]

A Virtual Local Area Network (virtual LAN) is a subnetworks that can gather together groupings of devices on distinct physical area networks (LANs). A local area network (LAN) is a collection of devices and computers which share a means of communication line or wireless connection to a server in the same region.[4].

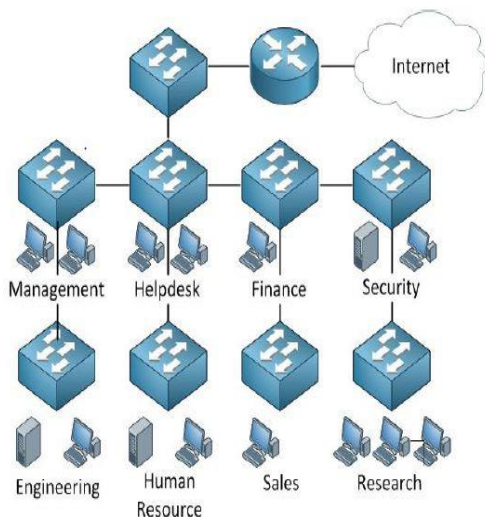


Figure 1: VLAN Overview

2. . VLAN classification

Protocol-based, static, and dynamic VLANs are examples of VLANs.

- A Protocol VLAN is one that handles traffic according to its protocol. Depending on the protocol, the switch will segregate or forward traffic.
- Static VLAN, also known as port-based VLAN, requires an administrator of the

network to allocate the ports that are available on the network switch to an internet-based network.

- Dynamic VLAN enables a network administrator to define network affiliation according to device characteristics rather than switch port location.[4]

2.1 How does VLAN work?

Ports (interfaces) on exchanges can be allocated to a number of VLANs, allowing systems to be separated into logical groups according to which department they belong to and establishing rules for how system within the separate groups can communicate with one another. These groupings can range from being simple and functional the computer in one VLAN can see printing devices on that VLAN, and but computer beyond that VLAN cannot) to the sophisticated and legal (computers in financial services department can't communicate with computers in trading departments, for example).[4]

Each VLAN gives all hosts linked to switch ports having the same VLAN ID data connection access. The Virtual LAN (VLAN) tags is a 12-bit field within the Ethernet connection header that allows up to 4,096 VLANs to be supported per switching domain. VLAN tagging is defined in IEEE 802.1Q and is commonly referred to as Dot1Q.[4]

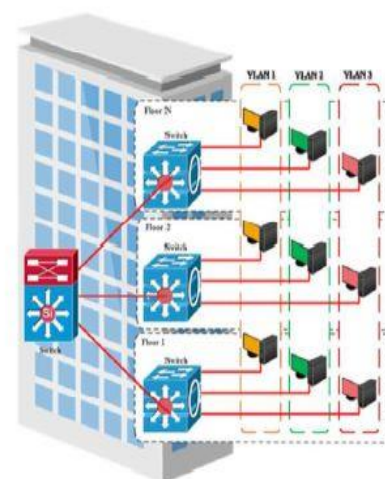


Figure 2: VLAN Based Office Network Overview.

When a removed session arrives from an associated host, the 802.1Q format is used to append the

VLAN ID tag set on that interface to the contents of the link frame header. The 802.1Q document is subsequently routed to its destination. The tag is used by each switch to maintain each VLAN's data distinct from other VLANs, only forwarding it where the VLAN is specified. Trunk lines between switches support numerous VLANs, with the tag used to keep them separate. Before the frame is delivered to the destination device, the VLAN tag is removed when it reach the destination switch port.[4].

2.2. The Advantages of VLAN

This section will go over the advantages of VLAN.

Scalability: The flexibility to add, move, and change networks is achieved at a low cost and with no effort by simply setting a switch port to support segmentation VLANs that are and assigning users to the various VLANs.

Security: VLAN can provide a more secure environment since network administrators can regulate each port. A malicious person may no longer just connect their device into any switch's port and use sniffer software to sniff or steal network traffic without being noticed. The network administrator can regulate the port and the resources it is permitted to utilize. VLANs can be used to restrict sensitive traffic originating within an enterprise department.[5]

Cost Saving: The cost of setting up or growing the network can be reduced by avoiding the need for costly network equipment such as longer cables or additional routers. VLANs will allow the network to utilize more bandwidth and resources, allowing it to run more efficiently.[5]

Simple Troubleshooting: Network managers may now more easily monitor the operations of VLANs. As a result, network faults may be simply detected, identified, and corrected.

Integrity: The network is logically divided, dividing an actual switch and distinct hosts that

aren't meant to communicate with each other. This ensures that information is not tainted when handled.[5]

3.VLAN communication experiment connotation and features

3.1. VLAN Communication Technology

Virtual Local Area Network that directly breaks down different consumers or as computers into logical work groups. Each Virtual Local Area Network (VLAN) is an unique broadcast area, and inter-VLAN unicast and multicast cannot be transmitted directly to other VLANs, hence VLANs must use a router to communicate [1].These are five structures based on the position of the router.

(1)A border routing structure is a type a distributed routing method. Because it is better to other centralized routers, it will not lead to network collapse if the router fails. However, because it requires dynamic control of various network devices, the cost for this structure is relatively high.

(2)"One-arm" networking structure: this type of structure is adequate for most messages moving within a single VLAN, but the main disadvantage is that it may generate net bottleneck difficulties when data transit between various VLANs becomes extremely large.

(3)Server-based/Client-based routing structure: In terms of physical form, this type of structure functions similarly to the One-arm router structure.

(4)The MPOA (Multi-protocol across ATM) framework: this type of structure defined by ATM is used in ATM networks.

(5)Three-layer switch structure: This type of structure uses three-layer switches that incorporate switch & routing features in order to send messages across distinct VLANs. This technology has the advantage of simplifying network structure and decreasing network latency [2-3].

In comparison to other routing technologies, three-layer switches can overcome network bottleneck problems produced by routers due to faster data transmission speeds. As a result, this approach is the primary method in practical work.[3]

3.2. Experimental teaching mode meaning and characteristics of Virtual LAN Technology.

With the advancement in multimedia devices, experimental teaching methods have evolved from traditional experiments (using real laboratory equipment) to virtual experiments, remote control experiments, and demonstration experiments. Advancements in VLAN technology beyond that period.

Virtual experimentation, as the term implies, is the use of virtual reality equipment to imitate many types of real experiment scenarios inside a computer system. When students log in to the virtual laboratory, they can create built-in connections by dragging necessary virtual equipment with their mouse.

According to the relevant legislation and equations, computers can simulate certain scheduled experiment projects as if they were in the real world, such as the "Virtual Frog" study in Biology [4].

When compared to virtual experiments, remote control experiments can provide students with on-site feelings and experimental effects; nevertheless, this mode has the following drawbacks: first, the construction and maintenance costs of this mode are extremely high. Second, due to network capacity constraints, the amount of internet-based experimenters is limited.

The recoding of a real experiment is posted on the internet by Demonstrate Experiment, and experimenters can understand the operation and fundamental configuration of the procedure through this video.

Furthermore, one new mode combines many experimental teaching moods. The mode that

combines virtually research & show research (virtual show experiment) is extensively utilized because it has an exciting future with a low price, simple operation, broad applicability, and several other advantages. Using the VLAN communications research as an example, researchers can not only grasp the core theory and basic configuration of a VLAN through the demonstration experiment, but also get further understanding of the procedure by realizing the switch instructions. Table 1 demonstrates the cost and applicability of these experimental teaching methods to the experimenters (mostly distance education students).[3]

3.3. VLAN communication experiment design.

(1) The experimenting content design

VLANs can control broadcast storms by allocating network bandwidth, and data transmission between VLANs should use routing services. We typically employ routers as trunk equipment. In general, routers are employed as necessary equipment. "One-arm" routing structure gets a lot of interest in computer engineering because it can reduce high-latency route of backbone networks and also attracts a lot of focus, thus this experiment is essential [3].

However, due to its limited speed and other restrictions, the router will become the network's bottleneck, and three-layer switch technology efficiently solves this problem. Furthermore, the three-layer switch is gaining popularity in businesses and colleges due to its high performance/price ratio. As a result, the design of a VLAN communications experiment based on a three-layer switch is required in network planning.

The goal of the a VLAN communications experiment is to teach experimenters how to partition VLANs, gain theoretical understanding about LANs, and enhance practical operational skills. The structure of the VLAN communication experiment is hierarchical in the sense that each level is the key to the following level in order to

reach the target. Figure 1 depicts a goal hierarchical structure of the VLAN communication experiment. [3].

4. VLAN Management:

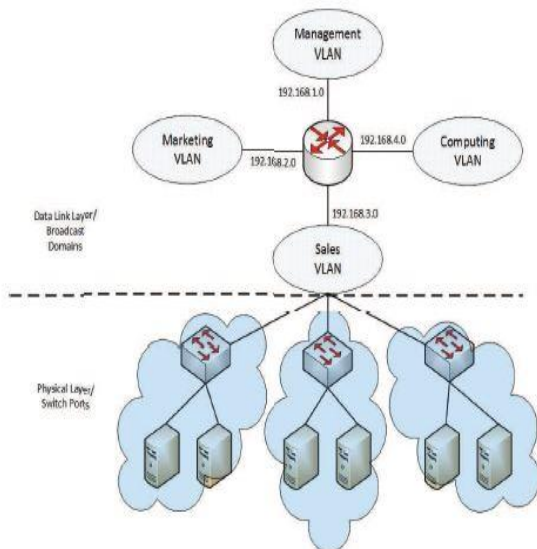


Figure 1. VLAN Operation.

While every port on a switch can be assigned to a different VLAN, ports assigned to a single VLAN share broadcasts. When a device connects to a network, it immediately examines the VLAN classification of the port to which it is connected. A host must be assigned an IP address from the right subnet in order to be a member of any VLAN.

4.1. Identifying VLANs

A switch port can be assigned to only a single VLAN as opposed to all VLANs. A port can be manually configured as an accessible or transit port.

Allow the Flexible Trucking Protocol (DTP) to set the switch port mode on a per-port basis. It is possible to accomplish this by communicating with the port on either end of the connection [17]. In the switched system, there are two kinds of links.

Access Ports: A access port typically handles only one VLAN's traffic. Traffic is delivered and accepted in native forms without VLAN tagging in

this situation. Anything that arrives on a port for access is simply deemed to be a member of the VLAN allocated to the port.

Any device connecting to an accessible link is unaware of its VLAN membership; it just thinks it is part of the exact same broadcast domain and is unaware of the actual network topology. If the routing is established, access-link networks cannot send or It should be remembered that the port used for access can only be connected to one VLAN.

Trunk Port: Trunk ports, on the other hand, can support numerous VLANs at the same time. A trunk connection is a 100 or 1000 megabits per second point-to-point link that connects two switches, a switch and a router, or even a switch and a server that transmits traffic from 1 to 4094 VLANs at the same time. data to or from networks outside their VLAN. It can only make a switch's port into an access port or a trunking port, not both.[5]

5. Conclusions

Riverbed educational Edition v17.5 was used as a simulation tool for the research we conducted. This study looked into the impact of dividing networks in wireless network by introducing a virtual LAN as well as how this could improve the efficiency of systems in terms of metrics such as delay, throughput, and PDR. This study comprised 15 verifiable scenarios in both instances for a low-density system and an a high level of network. Two essential traffics (File Transfer FTP, surfing the internet HTTP, and Email) were also included. It is a significant flaw in VLANs.

Therefore, the routing methods looked at in this work could be used to increase this throughput. With the help of three ad hoc routing protocols—AODV, DSR, and OLSR—for low and high traffic density in a variety of scenarios, as well as the Riverbed Modeler Simulation program in terms of a number of quality-of-service parameters, the objective of this paper is to enhance the VLAN for the wireless network.

6.References:

- 1.The Virtual LAN Technology Report
<https://books.google.com/books?hl=en&lr=&id=N3peAAAAIAAJ&oi=fnd&pg=PR25&dq=The+Virtual+LAN+Technology+Report&ots=ikfGPD M5pL&sig=qeD6L3B7mVrkNZHHR NzEUekaFA>
- 2.Virtual Local Area Network Performance Improvement Using Ad Hoc Routing Protocols in a Wireless Network
<https://www.mdpi.com/2073-431X/12/2/28>
- 3.Design and Research of VLAN Communication Experiment Based on the WEB Environment
<https://www.sciencedirect.com/science/article/pii/S1877705812003475>
- 4.Design a VLAN (Virtual Local Area Network) Based Network
<https://journals.nauka-nanrk.kz/bulletin-science/article/view/910>
- 5.Virtual Local Area Network (VLAN): Segmentation and Security
https://www.researchgate.net/profile/Natalie-Walker-15/publication/322077322_Proceedings_of_the_Third_International_Conference_on_Computing_Technology_and_Information_Management_ICCTIM2017_Thessaloniki_Greece_2017/links/5a4369dda6fdcce19716a967/Proceedings-of-the-Third-International-Conference-on-Computing-Technology-and-Information-Management-ICCTIM2017-Thessaloniki-Greece-2017.pdf#page=80
- 6.Improving LAN performance Based on IEEE 802.1Q VLAN switching techniques
<https://www.iasj.net/iasj/download/3fcae198997b94b1>