Research Article

A STUDY OF INTER-VLAN'S AND INTER-VLAN'S ROUTING BASED ON CISCO PACKET TRACER SIMULATION

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ARTICLE INFO	ABSTRACT
	Network Design is one of the most critical processes in building network structure in networking. A good network design involves providing better security, prevention against network congestions, easy scalability of the network and providing performance in terms of speed, without compromising connectivity between the devices. As the need of connectivity between the devices is tremendously increasing day by day the network are also becoming larger in size and complex in understanding. In order to satisfy all the need for a good network design as well as building a network simple to administer, we established connectivity, and improved scalability and security by means of Virtual Local Area creation and maintaining the connectivity between different VLAN's using Inter-VLAN Routing technologies. However by using these we are able to create logical segmentation of the network and form separate networks and add constraints between these network to allow communication with some specific networks making the administration and scalability of the network to be performed with more ease. In this paper we discuss about Flat networks and necessity of VLAN's, and provide with a brief overview of VLAN's and Inter-VLAN Routing for improving the connectivity and solving security and scalability issues within the network and how using VLAN's improves the network performance and throughput of the network .

INTRODUCTION

Local Area Network is generally termed as the computer networks that are Located in the same area. Nowadays, Local Area Networks are also referred to as Single Broadcast domain. In a Local Area Network the user basically broadcasts the packets over the network and the packet is then received by other users connected to the network. The packets are avoided from leaving the LAN by means of a router .The major drawback of using such techniques, is that the router often takes a whole lot of time to process the incoming packets than the time taken by the bridge or the switches. The broadcast domain depends upon the design of the physical network and its connections. Additionally, Virtual Local Area Networks we originally developed as an alternative to provide a solution for using routers to contain the broadcast traffic [1].

The Virtual Local Area Network technology performs logical segmentation of networks into multiple broadcast domains, so that the packets are only received between the ports by the members who are connected within the same VLAN network or within the same VLAN group. It has abilities which enable to configure logical networks without the knowledge of physical structure of the network. While the VLAN is configured in a network, the users of the network can access their department temporarily due to logical segmentation of the network into various VLAN's at the switches. Configuring VLAN's gives flexibility in forming different networks; in order to maintain the confidentiality of the data within network [2].

Managing VLAN's sometime becomes difficult as all VLAN's formed and managed by the network administrator and thus it increases the administration cost. Additionally it often causes problems of conflict of VLAN ID's or insufficient VLAN ID's one reason because each department in an organization may have multiple Virtual networks within the department. Thus maintaining the VLAN's often becomes a problem while configuring the VLAN's on the switches [3].

Security at the cost of reduced connectivity within a network is not a good practice, although its means of providing confidentiality availability and integrity of information within the network by means of applying constrain within the

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network. Inter-VLAN Routing is a technique which permits the communication between different VLAN's possible. Configuring different interfaces on a router helps in facilitating inter-VLAN routing. VLAN's are basically unique broadcast domains which are different networks and by default are not capable of communicating with each other; Inter VLAN Routing is a method which enables different VLAN's to establish communication with each other. It is a means of forwarding the traffic from one VLAN to the other VLAN's in the network by a router [3].

Necessity of VLAN's

A Flat computer network is defines as a network in which the number of router and the switches are reduced by connecting the devices on the network to a single switch or router instead of using multiple separate switches or routers for connecting systems on the network. It may also include hubs for connecting multiple systems on a network. Flat networks typically aim to reduce the maintenance cost of the network and its administration. Therefore there is a single broadcast domain in the network unlike VLANS that have multiple different broadcast domains.
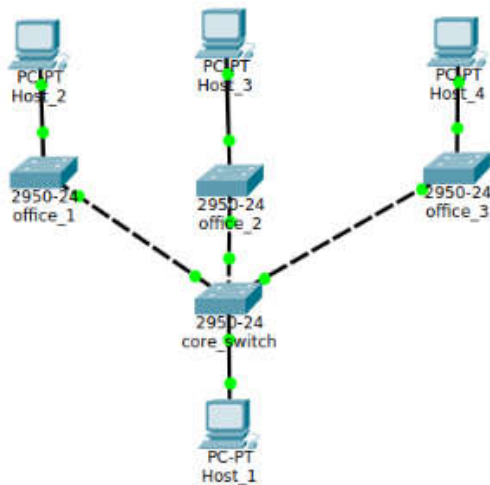

Fig 1 Representation of Broadcast Flow on a Flat Network

The topology of flat computer networks doesn't consist of multiple logical segmentations and separation of different broadcast domains also called as VLAN's and hence all devices connected to the network belong to the same network. Considering Fig.1, here Host_1 sends a message to Host_2, but due the absence of appropriate logical segmentation the message is broadcast to all the ports of the switches, except the port that receives the message. This causes unnecessary broadcast of the message to other hosts present in the network causing network traffic within the network and deducing the network performance drastically [4]

Some of the problem that occurs due to such types of flat networks is

Poor Security

Since the traffic travels through one switch is easy to sniff the information within the network and increases vulnerabilities for information confide
entiality and integrity.

No redundancy

Because the traffic travels through a single switch or only some devices in a network failure of one switch will cause inaccessibility to the specific part of the network in case if there are no alternate parts available in the network.

Scalability and Speed

As the devices connected in the network are connected to a central switch by means of Hubs or if the devices are connected directly it creates network traffic and also causes collision in the network, additionally it also affects the network by reducing the network speed and creating an overhead at the central switch for processing of the data. Ultimately if adversely affects the network performance and also has bad effects on the scalability of the network, leading to the chances of network failure.

Over View of VLAN

A VLAN is a method which creates logical segmentation of the network, in other words it creates separate networks on the switches. This implies that separate broadcast domains are created whenever a new VLAN is created on a switch. The ports of switches can be assigned as members of the VLAN's formed on the switch. Therefore all ports are filtered out, by default which is not a member of a particular VLAN. This helps to avoid the unnecessary traffic that flows over the network, and also helps in boosting the speed of the network as well as improving the scalability, performance and security of the network.

Additionally as the VLAN technology deals with formation of separate broadcast domains it requires to facilitate a special hardware in the switches for enabling separate network. Cisco switches supports this hardware which enables formation of the VLAN's. Without the support for the hardware required for VLAN's in the switches it is impossible for creation of these VLAN's on the network. This is the main reason VLAN's are important in solving security issue and network efficiency of flat networks.
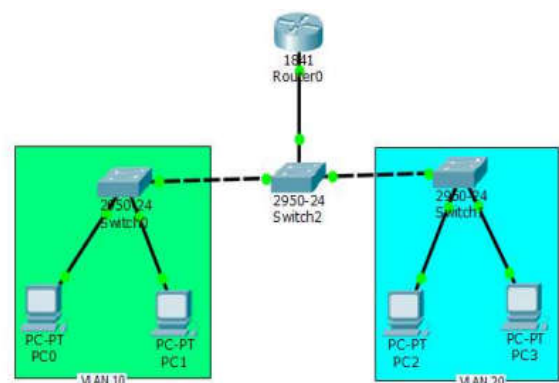

Fig 2 Representation of a VLAN

Considering Fig.2 it represents a network configured with VLAN's on the switch for creating separate broadcast domain or different networks. In this network the Host Systems in VLAN10 can communicate with the Host Systems in only VLAN10 until inter-VLAN routing is enabled within the network and similarly Host Systems in VLAN20 can communicate with the Host Systems in only VLAN20. The Creation of VLAN's in the network facilitates to avoid the

unnecessary broadcast of the message to the different port of the switches which are not a member of the specific VLAN's.

Inter-VLAN Routing

Inter-VLAN is a method which is applied on a Layer 3 switch or a router which permits to facilitate communication between different VLAN's. Router on a stick is a method which is used to establish the communication between different VLAN's simply allowing networking between different broadcast domains or different network. Establishing Router on a Stick requires creating different sub interfaces on the router, in addition by applying encapsulation to these sub interfaces created on the router. The ports are assigned as trunk port between the switch and router so that information of different VLAN's can be routed properly between the networks. Trunk ports is a feature by means of which switches are capable to transmit and receive information of different VLAN's and then routes properly between the network checking the ports specified as a member to that VLAN [4].

CONCLUSION

Network design plays a significant role in building networks that preserve to perform effective communication and provide better security within the network and hence improve the performance of the network. We have successfully studied and presented VLAN and Inter-VLAN Routing techniques comprehensively. Our major contribution is towards using VLAN's and Inter-VLAN Routing techniques for logically segmenting the network and removes vulnerabilities and network traffic caused due to the unnecessary broadcast of the packets to all ports over the network. Collaboratively, our work will help to enhance the network performance by paying attention on factors such as information confidentiality, integrity and availability in a much focused way as well as to improve the security within the network. In this context, there is a brief discussion about the vulnerabilities and inflexibility within flat networks, which are improved by implementing Inter-VLAN Routing method by the creation of different VLAN's and isolating the network to provide Security, without compromising the connectivity within the network. Additionally the necessity of VLAN's along with improvements in the network design by introducing VLAN's is also described in detail along with its positive impact on the scalability of the network for future purpose.

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