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Network Congestion Control through VTP Approach

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Abstract:-Network congestion occurs when a link or node carries large data but its quality of service deteriorates. Typical effects include queuing delay, packet loss or the blocking of new connections. It causes actual reduction in network throughput. The paper outlines VLAN Trunking Protocol (VTP) approaches to control network congestion and deliver maximum throughput. This approach helps to control network congestion and transmit packets from source to destination more effectively. Once implemented on manageable switch to make VTP server and client to control network congestion in local area network.

Keywords:-VLAN, Bursty Traffic, Delay Sensitive, High Speed Networks, Performance Metrics, Quality of Service, NVRAM

I. INTRODUCTION

In a local area network, congestion can occur when a switch consumes more bandwidth but less useful throughput (input) is available. It causes high level of packet delay and also the quality of service (QoS)[1] is extremely poor. Packets travel internally from node to node and consume bandwidth heavily. Network congestion [3] will increase as network speed increases and new effective congestion control methods are needed, especially to handle heavy traffic.It affectsactual reduction in network throughput.

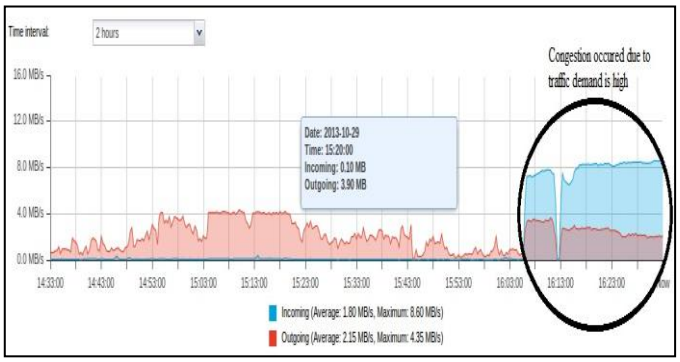

Fig. 1.Congestion occurred due to traffic demand

Typical effects include
1. Queuing delay
2. Packet loss
3. Blocking of new connections.

The data transfer between end systems in packet oriented network such as Internet occurs in shape of fixed and variable units of packets of limited size. In general packet oriented networks get congested locally therefore congestion control mechanism usually perform to improve network overall performance and hence it is achieved by controlling the load produced by the network traffic. Based on the current load condition of the network, the congestion control [3] is done through sending rate of data streams of each source which not only used to prevent congestion but also leads to high utilization of the available bandwidth.
Network protocol[4] frequently inform the sending sources about the current load conditions of the network and as a result the sources store these load conditions in the congestion control variable and these variables are accordingly used for controlling the congestion which leads to achieve high bandwidth utilization and better performance. But this approach has serious limitation i.e. additional overhead is required by the congestion control information that is transferred through the network protocol.

II. OVERVIEW

Network Congestion occurs in local area network due to high traffic demand. It is required to identify the problem,reason for these problems andthe best solution to solve them.

- **Problem:** When too many packets are transmitted through a network, congestion occurs at very high traffic, performance collapses completely, and almost no packets are delivered

- **Causes:** Bursty nature of traffic is the root cause, when part of the network no longer canhandle a sudden increase of traffic, congestion builds upon. Other factors, such as lack of bandwidth, ill-configuration and slow switches can also bring up congestion.The following may cause slow VLANs:
  1. Traffic Loop
  2. Overloaded or oversubscribed VLAN
  3. Congestion on the switch inbound path
  4. Switch management processor utilization
  5. Ingress errors on a cut through switch
  6. Software or Hardware misconfiguration
  7. Software Bugs

- **Solution:** congestion control, and two basic approaches
  – **Open-loop:** try to prevent congestion occurring by good design
  – **Closed-loop:** monitor the system to detect congestion, pass this information to where action can be taken, and adjust system operation to correct the problem (detect feedback and correct)

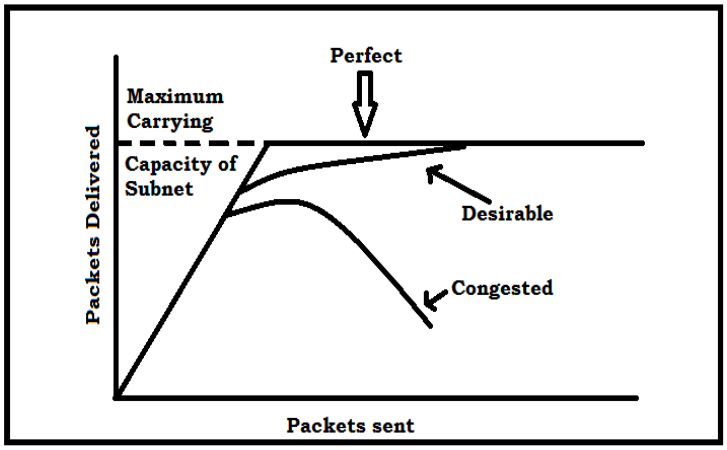

Fig. 2 Congestion Control Overview

III. OUR APPROACH

In a local area network (LAN)[2] nodes are connected through different network topologies[5]. It consists of various devices to connect these node via switches (it can be layer 2 or layer 3) and router. Congestion in a local area network occur due to internal looping and can be controlled by making a local VTP (VLAN trunking protocol)[6]server on a manageable switch and VTP clients on its adjoints switches.

VTP Modes:

1. VTP Server
- Advertise the VLAN information across theDomain
- Create, delete, modify

2. VTP Client
- Stores the VLAN information from the server
- Cannot create, delete, modify

3. VTP Transparent
- Forwards VTP advertisements
- Do not participate in VTP

Table IVtp Modes Response

Features	Server	Client	Transparent
Source VTP Message	**Yes**	**Yes**	**No**
Listen VTP message	**Yes**	**Yes**	**No**
Create VLAN's	**Yes**	**No**	**Yes**
Remembers VLAN's	**Yes**	**No**	**Yes**

IV. ALGORITHM

Following steps are implemented on manageable switches (Layer 2 or Layer 3) to control congestion in local area network:

Step 1.
Configure one switch as a VTP server and another as a VTP client. Domain name for both the switch should be same as it used to forward VTP advertisements through any configured trunk links.

Configuration of switch (Sw1) as VTP Server :
Hostname Sw1
!
Interfacevlan 1
Ip address 172.30.1.101 255.255.255.0
No shutdown
Vtp mode server
Vtp domain dtu.lan
Vtp password cisco
!
Vlan 2
Name vlan_2
!
Interfacegigabit Ethernet 0/1
Switch port mode trunk
!
Interfacefastethernet 0/1
Switch port access vlan 2

Configuration of switch (Sw2) as VTP Client:
Hostname Sw2
Interfacevlan 1
Ip address 172.30.1.102 255.255.255.0
No shutdown

Vtp mode client
Vtp domain dtu.lan
Vtp password cisco
Interfacefastethernet 0/2
Switch port access vlan 2

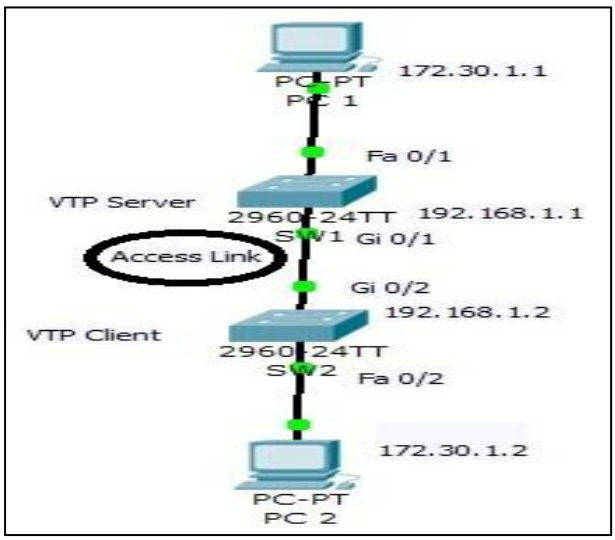

fig. 3Switch as a VTP Server and another as a Client

Step 2.
Complete all VTP requirements by configuring trunking between two switches.

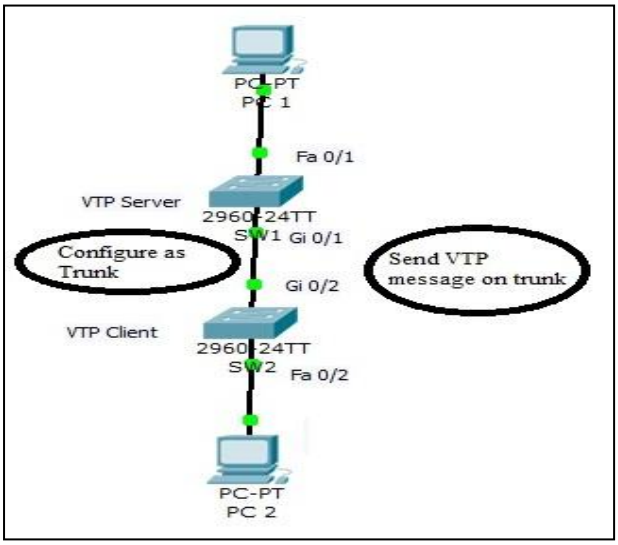

Fig. 4.Send VTP message on trunk

VTP Requirements
1) Same domain name
2) Same password (if used on either switch)
3) Messages sent only over operational trunks

Step 3.
Configure VLANs on the VTP server and confirm that the VTP client has learned about the VLANs.
Add VLAN 2 with the vlan 2 command
VTP Revision 0 +1 = 1
VTP Revision Number = 1
New VLAN 2 Learned

Add VlAN 2 with the vlan 2 command
VTP Revision Number 0 + 1 =1

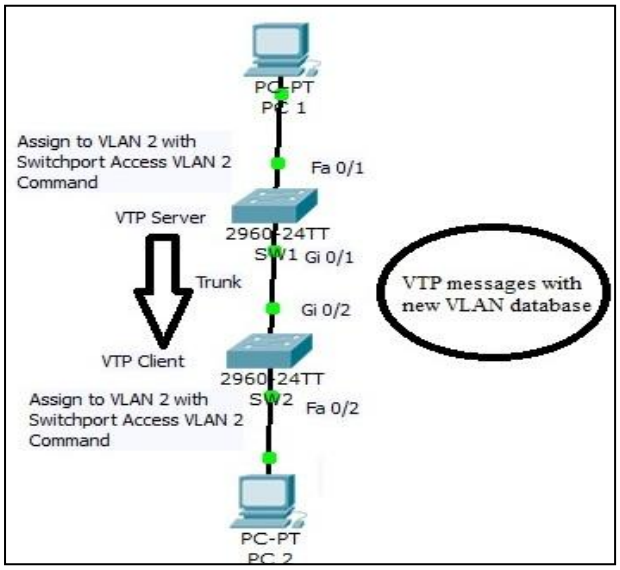

Fig. 4. VTP messages with new VLAN database

V. WORKING

Every catalyst switch is a server by default. Every network or domain requires a server to propagateVLAN [7] information throughout the network or domain. As a server switch, it will be able to create, add, and delete VLANs domain.VTP server controls any change that's to be made in the entire domain. When a change is made in the server, it will be advertised throughout the entire VTP domain. VTP server configuration is saved in the NVRAM [8].

Switches in a client mode receive information from VTP servers.VTP client switches also send and receive updates, but one difference between clients & server is that; VTP client switches can't create, change and delete VLANs.In other words, none of the ports on the client switch can be added to a new VLAN without the authorization or notification from server switch. Switches in client mode can process and forward VLAN information. VLAN information on client switches is not saved in NVRAM[8].

Switches in transparent mode don't take part in VTP domain or database. They behave more or less like servers in that they create, modify and delete VLANs because they have their own database, which is only locally important. VTP switch in transparent mode is used to forward VTP advertisements through any configured trunk links.

VI. CONCLUSION

Network congestion control based on VTP (VLAN Trunking Protocol) approach, we have outlined in this paper to control congestion in a local area network which can occur due to internal looping on a device i.e switches. It can happen by creating a loop on manageable switches, running multiple proxy's in local area network or traffic demand is high but little useful throughput is available. We have resolved these type issues occurring in a local area network through VTP approach.

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