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Modeling Network Optimization by Optimize the Current Network by physical and logical architectures to improve the Quality of Services (QoS)

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Abstract:
The increasing number of network users makes demand for the Quality of services. The Primary goals of Quality of services (QoS) are bandwidth management, controlled jitter, latency and improved loss characteristics to provide satisfactory services for users. Shaping network optimization is crucial things for network administrators. To implement the Network QoS, by optimizing the current network by physical and logical architectures is a best practice. The algorithms we used for logical architecture Weighted Random early detection (WRED) and for physical and data link layers architecture minimum spanning tree. To assess the existing networks we have used both the qualitative and quantitative data. For qualitative data we used Wire shark and for the quantitative data we have used from the collected data by questionnaire, interview and site visiting in ICT. This research was done inside Wolaita Sodo University Campus.

Keywords: QoS, WRED, LAN, WFQ

I. INTRODUCTION

Successful network designs, the sort that grow and evolve smoothly, require knowledge of how the traffic flows in your network. Most of this knowledge is available from network management software. Basically in research, we will have implemented two ways of network optimizations mechanisms those use to implements LAN Quality of Services. By Modeling Local Area Network to express the performance of a TCP transfer as a function of packet loss rate, round-trip time (RTT), and receiver advertised window by using Markov Chain and TCP Vegas model [22].

Mainly the physical topology of devices and the design of network minimizes the network performances if it is not well preplanned. Before launching the infrastructures, designing a network model is mandatory. The network model will be used as blueprint. A network model is a database model that should be created in a flexible manner to representing objects and their relationships [7].

In Schema, the object types are nodes and relationship types are arcs. This design approach gives a proper way to QoS implementation. The Internet Engineering Task Force (IETF) defines two major models for QoS on IP-based networks: Integrated Services (Intserv) and Differentiated Services (Diffserv). These models contain different types of mechanisms that provide good solutions for network traffic [13]. In layer 2 devices for examples switches and bridges the packet queuing techniques of network optimization are follows.

- ✓ Shortest path first
- ✓ Maximum flow
- ✓ Minimum spanning tree
- ✓ Minimum cost flow

In layer 3 devices such as router or core switch there is limited memory to flow traffic inside. If the packet size is high there will be traffic congestion. The overflow of arriving traffic is handled by queuing algorithm [14].

1.1 Packets, flows and sessions

Some terminology should be introduced at this point because traffic can be viewed at different levels, as shown in Fig.1. When the need arises, a host will establish a session with another host. A session is associated with a human activity. For example, a client host will open a TCP connection to port 21 on a server to initiate a FTP session.

The TCP connection will be closed at the end of the FTP session. Or a session may be viewed as the time interval when dial-up user is connected to an ISP. For connection-oriented networks such as ATM, a session is a call established and terminated by signaling messages.

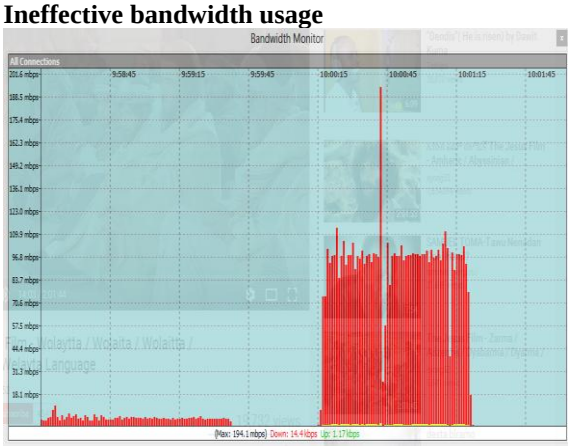
II. METHODOLOGY.

The method employed and the type of data required in this study depends on the nature of specific objectives. First the problem is classified in to two major parts, technical part and non-technical part.

The technical part addresses the problem of designing and modeling the network architecture and traffic flows by using different network simulations and modeling tools such as Wire shark and bandwidth monitoring called Bandwidth monitor. The second, non technical part is accomplished by using different questionnaire and getting the usable information from the users of the network in Wolaita Sodo University.

III. RESULTS

Ineffective bandwidth usage



Y- Bandwidth and X- Time measured in hh:mm:ss

Figure.1. Bandwidth measurement of WSU LAN through Bandwidth monitor

From Figure 1, the maximum bandwidth consumptions of the university network out of the total **300Mbps** from ISP is only **194.1 Mbps**. The network consumptions have a big role in the network the quality of services. If the bandwidth used effectively means there is Quality of services in the LAN. To know the existence of the QoS in the network the network should contains the consistent speed and performances based on the purchased bandwidth from the ISP. The Figure 2 shows the packet flow control by using MTU and TCP.

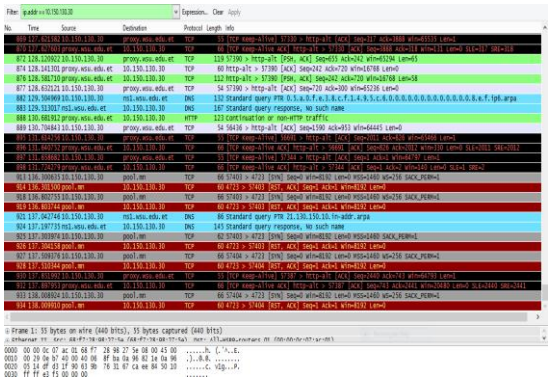


Figure. 2. Wireshark Results

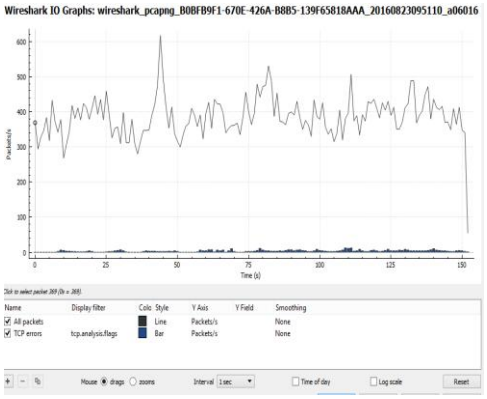


Figure. 3. Graphical modeling for packet flows.

IV. DISCUSSIONS

To optimize the existing network and improve the quality of services the following ideas must be implemented.

4.1 Modeling WRED Congestions Detection algorithm

The queuing algorithm can be solve the congestion but it will not provide any additional bandwidth. Weighted Fair Queuing (WFQ) algorithm uses packet size, weight and scheduling time as parameters. In this, the small size flows such as SSH, Telnet and voice get adequate bandwidth. The following Figure 4 explains the Modeling WRED Algorithm congestion detection to improve the network performance.

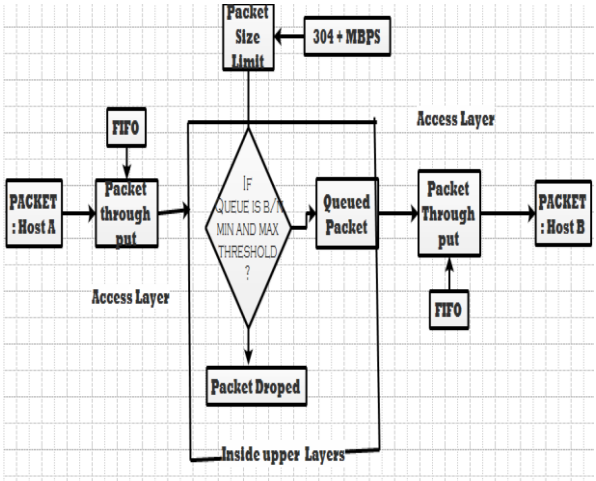


Figure.4. Modeling WRED Algorithm congestion detection

The following Figure 5 explains proposed model to improve the Network Performance.

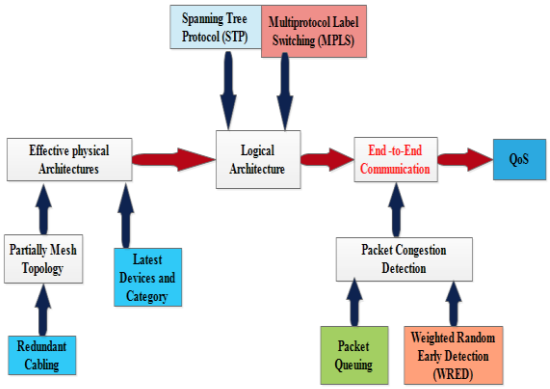


Figure .5. The Network Performance Improvement Model.

4.2 Effective Bandwidth usage to speed up the network

The purchased networks distributed through the campuses by using ethio telecom lines through virtual private Network (VPN) technology and the network management should be in the side of the Main Campus network. The conceptual framework for effective bandwidth usage is mentioned in below Fig 6.

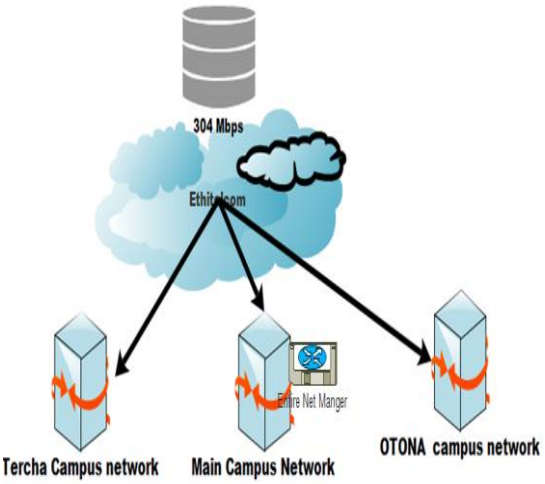


Figure. 6. Effective Bandwidth usage to speed up network

The BGP/MPLS protocols has its own benefits in network speed, stability, network quality of Services and also used to detect the denial of services(DoS). That means integrating the two protocols in different models. i.e. MPLS on core data centers and BGP on distribution layers.

V. CONCLUSION

By changing the existing network according to our proposed model and implement the necessary protocols according to our idea will improve the network performance and provide network QoS.

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