Priority Queuing for Real Time Services in Diffserv IPv6 Network

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To my beloved Mother Faiza Banu , beloved Wife Mariasif, only Brother Ashu and all of my family members…….

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ABSTRACT

In real-time communication, the quality of services depends on the time at which messages are successfully delivered to the recipients. Quality of Service (QoS) requirements is typically formulated in terms of performance metrics such as Bandwidth, End-to-End Delay, Delay Jitter, and Packet Loss. Bandwidth is the average number of bits per second that can travel successfully through the network. Delay jitter, which is the maximum variation in delay experienced by packets in a single connection. In recent years, a number of new classes of distributed applications have emerged, such as remote video, multimedia conferencing, data fusion, visualization, and virtual reality. The development from data-oriented to multimedia services, i.e., from non-real-time to real-time service, requires the QoS guarantees instead of best-effort-delivery. In order to provide service guarantees, some level of quantifiable reliability, IP services must be supplemented with the ability to differentiate traffic and enable different service levels for different users and applications. This work includes developing an IPV6 network with Diffserv. The Diffserv network allows the option to priorities the data packets according to the content. Every packets that enter the Diffserv region, examined and set the priority code at their header field (called TOS) according to the priority of the packet data. This ensures the priority flow of the data to the next hop/router. To differentiate the priority of the data from the default one, the extra traffic is generated to the network. The performance of the system investigated and analyzed according to the Quality of Service CODE in the every packet, which has been assigned according to the priority of data.

ABSTRAK

Dalam komunikasi masa nyata, kualaiti perkhidmatan bergantung kepada masa suatu mesej sampai kepada penerima. Prestasi Kualiti Perkhidmatan (Quality of Service-Qos) biasanya di ukur menerusi lebar jalur, lengah penghantaran keseluruhan data, lengah penghantaran setiap bit dan kadar kehilangan paket data. Lebar jalur adalah purata bilangan bit dalam sesaat yang dapat dihantar menerusi suatu rangakaian. Lengah penghantaran ialah beza maksimum diantara masa penghantaran setiap paket. Baru-baru ini, pelbagai jenis system aplikasi teragih telah digabungkan seperti penghantaran video jarak jauh, persidangan multimedia, data fusion, visualization dan realiti maya. Ia merupakan satu perkembangan daripada aplikasi berorientasikan data kepada perhidmatan multimedia. Contohnya, dari bukan masa nyata kepada perhidmatan masa nyata yang memerlukan jaminan Qos selain penghantaran terbaik mungkin. Untuk menyediakan satu jaminan perkhidmatan pada tahap yang terbaik, perhidmatan IP perlu di lengkapkan dengan kebolehan membezakan trafik pelbagai rangkaian dan mampu melaksanakan perkhidmatan menerusi pelbagai peringkat bergantung kepada pengguna dan aplikasi. Ini termasuklah melengkapkan IPv6 dengan Diffserv. Rangkaian Diffserv membenarkan rangkaian untuk menetapkan prioriti paket data berdasarkan kandungan paket tersebut. Setiap paket yang memasuki kawasan Diffserv akan diperiksa dan ditentukan kod prioriti pada kepala paket data tersebut (TOS). Ini akan menetukan arah pengaliran pada hop/router seterusnya. Untuk membezakan priotiti data daripada proriti data biasa, trafik di dijana dan dilepaskan ke rangkaian. Prestasi rangkaian ditentukan dengan menganalisis data berdasarkan kod QoS pada setipa paket.

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INTRODUCTION

1.1. Background

The Internet Protocol (IP) and the architecture of the Internet itself are based on the simple concept that every packet is routed through a network based on the destination address contained within the packet. Each router has the routing table that identifies the appropriate next hop for all known IP destination addresses. When a packet arrives, the router simply looks up the routing table and forwards to the output port that goes to the next router. All packets, regardless of which application or service they come from, are treated equally. Routers drop packets indiscriminately when congestion occurs. Therefore IP can only provide one type of service called Best Effort (BE), and give no guarantees about when data will arrive, or how much it can deliver.

Today's networked applications—such as enterprise resource planning (ERP), data mining, e-commerce, and multimedia—are bandwidth hungry, time sensitive, and mission critical. These applications need networks to accommodate today's business priorities. Traditional networks can't recognize priority data because they handle network traffic in old-fashioned ways, such as best-effort or first-come first-served. For example, when application data enters a traditional network, the network allocates as much bandwidth as the application needs—until the network runs out of bandwidth. Mission-critical applications, time-sensitive applications, such as NetMeeting videoconferencing, can drown in a flood of less important network traffic—such as a Web newscast. Systems administrators end up facing network congestion, slow response, and packet-dropping problems.

One of the most common mechanisms network administrators use to improve wide area network performance is to increase the WAN bandwidth. Although this can help, it is a short-term solution to the network performance issue. Most popular applications including web browsing, email, and music downloads rely on TCP's slow start algorithm to steadily increase their own bandwidth utilization until there is a problem. Consequently, these types of applications, unrestricted, quickly consume all available network bandwidth, leaving the time sensitive applications suffering.

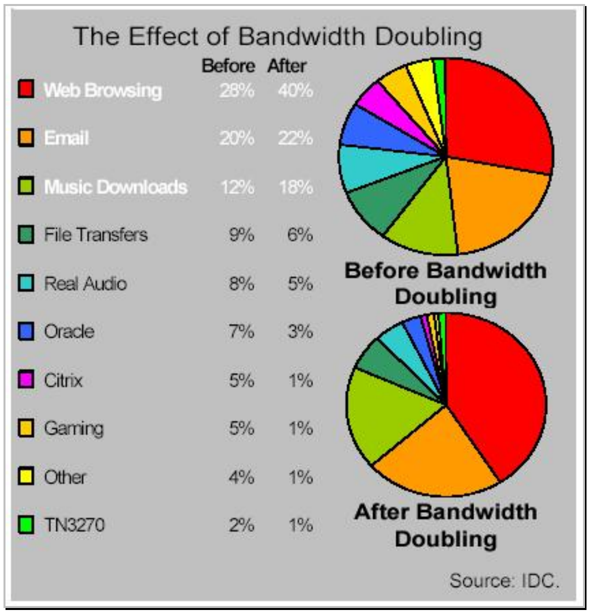

Figure 1.1: The Effect of Bandwidth Doubling

In a network utilization study done by IDC in 2000, they found that most organizations unknowingly allow the least important applications to control the network. As shown in the figure 1.1, doubling the WAN bandwidth haphazardly allocates increased amounts to the most demanding, bandwidth hungry applications which are probably not the most urgent and critical applications the organization wants running over their network.

Armed with knowledge of each application’s resource consumption and coupled with an understanding of the organization’s priorities for bandwidth utilization, network administrators become empowered to control network performance.

1.2. Problem Statement

The ongoing explosive growth of the Internet and Internet Services, increasing more and more Real Time Services Applications, which effect the network for priority. Simply throwing more bandwidth to the network is not the ultimate solution to these problems, because we can't foresee what new bandwidth-hungry applications will be in use in several months. An ill-behaved application can easily bring the network down and potentially shut down the business operation.

1.3. An Approach for Solving the Problem

To gain more effective control of the network, we need to incorporate Quality of Service (QoS). In a QoS-enabled network, we can prioritize network traffic flow, allocate network bandwidth and resources to different applications and users, enforce security to applications and users entering the network, and link business needs with desired network behavior. For example, one can guarantee that a videoconferencing application has the highest network priority and reserve a specific bandwidth, and assign others the lowest network priority and a limit on allowable bandwidth. QoS is commonly expressed in terms of throughput, delay, delay jitter, and loss rate.

1.4. Objective

The objective of the study is to develop priority queuing in router to provide QOS (Quality of Service) for real time application in DiffServ IPV6 network. The work will assign priority to the packets according the content. So the real time application will get more priority then the other application.

1.5. Scope of Research

This work includes developing an IPV6 network with Diffserv. The Diffserv network allows the option to priorities the data packets according to the content. Every packets that enter the Diffserv region, will examined and set the priority code at their header field (called TOS) according to the priority of the packet data. This ensures the priority flow of the data to the next hop/router. To differentiate the priority of the data from the default one, the extra traffic will be generated to the network. The performance of the system will be investigated and analyzed according to the Quality of Service CODE in the every packet, which will be assigned according to the priority of data.

1.6. Importance of Research

By assigning the priority of the data in every packet, we can define the IPV6 network for Real time service with,

- Minimized End-to-End delay.
- Enhanced throughput by Router.
- Priority scheduling of packet in the router.
- Maximized Reliability for traffic
- Limited Monitory Cost for conforming traffic

1.7. Thesis Outline

The content of the project are further subdivided into the chapters as follows. Chapter 1 defines the introduction of the project followed by objective and scope of the project. The importance of the project also defines in this chapter. Chapter 2 is the Implementation plan which illustrates how the project runs by time. Chapter 3 mostly elaborates the concept of IPV6, QOS, DIFFSERV and Linux traffic controlling system. It also covers the Priority Queuing concept and its implementation procedure. Chapter 4 explains the configuration system step by step. Chapter 5 is the analysis section of the project. Here it also depicts the result pictorially. Finally Chapter 6 concludes the project with summary and conclusion.

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