International Journal of Emerging Engineering Research and Technology
Volume 2, Issue 8, November 2014, PP 72-75
ISSN 2349-4395 (Print) & ISSN 2349-4409 (Online)

Bandwidth Monitoring and Reduction with Firewall Operation

Purnata Shingade[1], Aparna Koul[1], Shubham Shahane[1], Bipin Patil[1]

[1]Computer Engineering, Dnyanganga College of Engineering and Research, Pune, India

Abstract: *Internet connectivity is characterized by maximum usage as well as abuse in various organizations. The usage of the bandwidth goes beyond expectations, as there is no efficient monitoring of the resources. The abused use of the allocated bandwidth leaves the network administrator to pull his hair out over. Although various tools are being employed for the end-to-end measurement and monitoring of the bottleneck link capacity and its available bandwidth, they lack in their capacity for producing an efficient output. Our bandwidth monitoring system deals with some of the serious drawbacks of the existing systems. With the help of packet pair algorithm, we are designing our system with a different approach, to eradicate the abuses to the existing system. The usage of the bandwidth is controlled, so that an organization pays minimum to the ISP. We have thus showed through the experimental results that our system is resilient to the bandwidth monitoring and unauthorized usage of the internet connectivity through IP tracking and IP blocking.*

Keywords: *End-to-end measurement, Bottleneck link capacity, Available bandwidth, Bandwidth monitoring, Abuses, Packet pair algorithm, IP tracking, IP blocking*

1. INTRODUCTION

The usage of the internet is being abused due to its misuse in a variety of ways, leading to the wastage of bandwidth, introduction of viruses in the system, spyware, etc. Many organizations spend large amount of money to the ISP provider but the overall estimated cost of the bandwidth used for actual productive purpose proves to be too less than what is being paid [1]. In such situations, it becomes mandatory for a network administrator to manage the resources, which will lead to the optimized use of the resources. The bandwidth monitoring system is employed in order to find the usage of the available and bottleneck bandwidth and to control it from exceeding beyond the maximum value [1][2]. The firewall operation blocks the usage of unauthorized websites using their IP address, thereby minimizing the excess use of the allocated bandwidth [4]. Although the present system monitors the excess usage of bandwidth and ceases the access to unauthorized websites, one can surely download his personal documents saved on the Google Drive. This usage goes unnoticed most of the times, which proves the inefficiency of the system. For example, an employee access social networking sites like Facebook, Twitter, etc. during work hours, which abuses the efficient usage of the bandwidth. If the network administrator is aware of this loss, he/she can directly prohibit the person from using the bandwidth and thereby actions can be taken against the employee [7].

1.1. Related Work

The system possesses certain drawbacks, due to which, the use of an efficient algorithm for system design becomes vital. The packet pair probing algorithm helps in the proper estimation of the bandwidth usage. Although this is a traditional algorithm, Lai and Baker have made improvements leading to the greater efficiency of this algorithm by introducing passive packet pair implementation, by using the existing network traffic. There are contributions to the bandwidth measurements by Van Jacobson who used the Pathchar algorithm, and Bolot who has used Probe packets technique. These techniques have a traditional approach as compared to the packet pair probing technique and most of their drawbacks are eliminated in packet pair probing algorithm.

1.1.1. Drawbacks of the Existing System

1. The existing system allows the access to certain websites in Linux operating system, which are being blocked in the Windows operating system.

2. There is poor accuracy, scalability and agility in adapting changes.
3. Lack of statistical robustness, flexibility in deployment.
4. Inaccuracy when used on a variety of traffic types.

1.2. Proposed System

Our proposed system enables the network administrator to know the content, which is being used or being downloaded at the user's end, while he is monitoring the bandwidth usage. This assigns the administrator, the power to decide the status of the content as valid or invalid and if it is invalid content, then block the user whose bandwidth usage exceeds the maximum value. If the content is a valid content, the administrator will thus allow the user to go o with his current task, but he will be assigned a reduced bandwidth. Thus, our system deals with monitoring, controlling and reducing the asssigned bandwidth. It should be noted that the technique of monitoring is applied to all the nodes, but the technique of controlling and reduction are applied to the node which exceeds in its bandwidth usage.

Advantages of the Proposed System

1. As the technique of controlling is applied only to the node whose bandwidth usage exceeds the maximum value, which makes the system simple, yet effective.
2. It thus leads to automatic control of the bandwidth being used.
3. The network administrator need not call or enquire about the content being downloaded or used, he can simply monitor and relax as the reduction technique will soon become active, the moment bandwidth usage exceeds its maximum limit.

2. Approach Overview

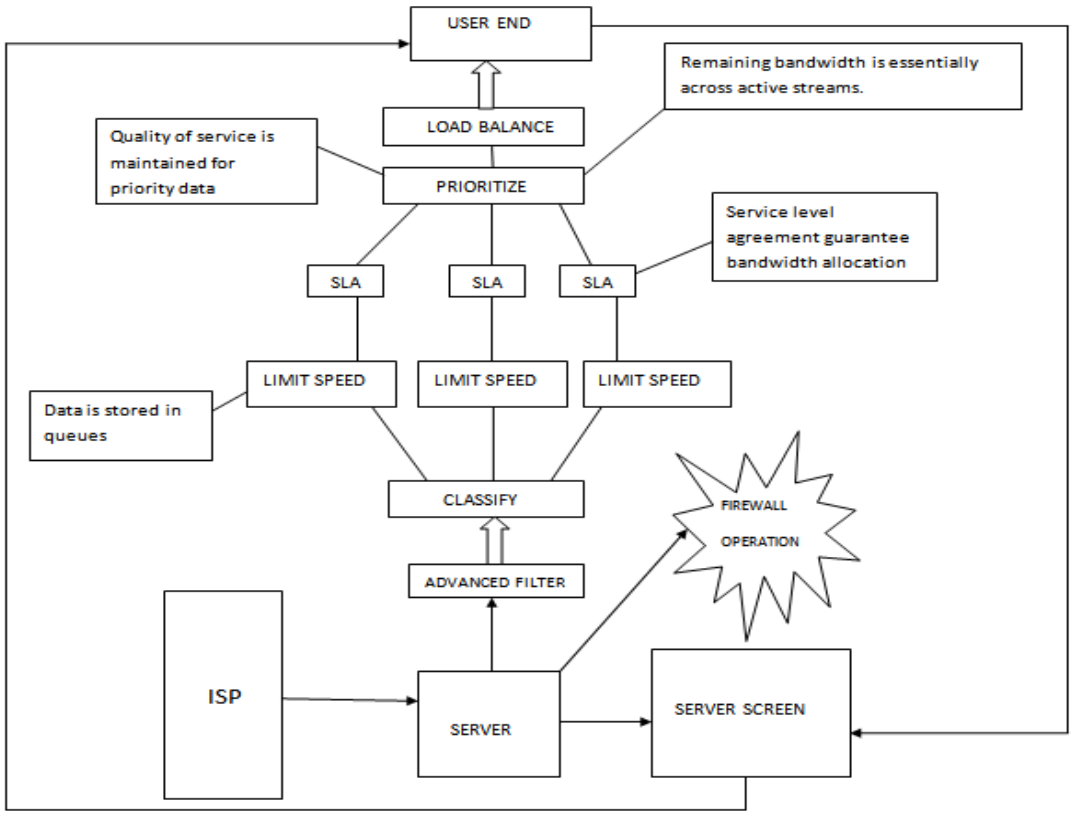

Fig2.1 *Control Flow of the System*

The complete system comprises of the four main operations namely- allocated bandwidth monitoring, providing the firewall operation, controlling the excess bandwidth usage and reducing the bandwidth allocation when its value hits the maximum predetermined value. The network administrator monitors the usage of the bandwidth by the users and he controls the bandwidth usage by applying the reducing technique to the user, whose bandwidth exceeds the maximum value.

3. ALGORITHM

3.1. Packet Pair Algorithm

The Packet Pair Probing algorithm helps has proved to be a reliable technique for measuring the bottleneck link capacity on a path through network, thereby monitoring the usage of the allocated bandwidth. The basic Packet Pair algorithm relies on the fact that if two packets are queued next to each other at the bottleneck link, then they will exit the link, seconds apart:

$$t = s2 / bn1$$

Here s2 is the size of the second packet and bn1 is the bottleneck bandwidth. This is known as the 'bottleneck separation'. The Fig. 3.1 shows the path of the travelling packets from their source to destination and the bottleneck bandwidth.

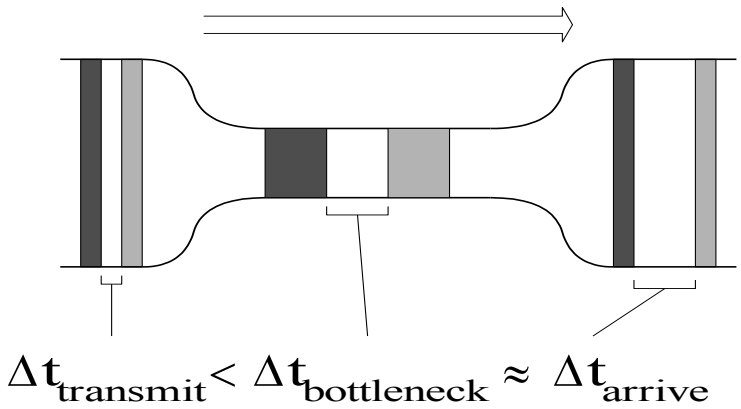

Fig3.1. *bottleneck bandwidth*

3.1.1. Links

There are four bandwidth measurements, which can be performed, namely the capacity/raw band width of a link, the end-to-end capacity of a path, the available bandwidth of a link and the available bandwidth of a path. *P* is a network path from source *S* to destination *D*. We assume that *P* is fixed and unique.

$$L = \{ l_1, l_2, l_3, \ldots l_n \}$$

3.1.2. Capacity

Here, C denotes the capacity of each link. The capacity of the link, denoted *Ci*, is the maximum possible IP layer transfer rate at that link. The end-to-end capacity of the path is then the maximum IP layer rate that this path can transfer from the source *S* to the sink *D*:

$$C = min\ Ci.$$

Thus, there are various algorithms for finding the bottleneck and available bandwidth, but the packet pair probing technique proves to be most efficient.

4. CONCLUSION

The bandwidth monitoring system thus reduces the abuse caused by the users to the allocated bandwidth. The network administrator can now relax as there are control and reduction techniques applied to the exceeding bandwidth usage. Some of the most important aspects considered during the analysis of the product's performance are its ability to prioritize and allocate network bandwidth

among hosts on a network, provide enough security as to prevent tampering with or taking over a disproportionate amount of bandwidth, centralized operations, multiplatform GUI, etc.

REFERENCES

[1] Daniele Croce, Emilio Leonardi, "Large-Scale Available Bandwidth Measurements: Interference in Current Techniques, Dec 2011

[2] Jin Cheol Kim, Younghee Lee, "An end-to-end measurement and monitoring technique for the bottleneck link capacity and its available bandwidth", Sep 13, 2013

[3] Ningning Hu, Peter Steenkiste, "Estimating Available Bandwidth Using Packet Pair Probing", Sep 9, 2002

[4] Shrinivasan Keshav, "The Packet Pair Flow Control Protocol", May 1991

[5] Kevin Lai, Mary Baker, "Measuring Bandwidth"

[6] Laura Chappell, "Advanced packet filtering" Protocol Analysis Institute, LLC www.packet-level.com.

[7] SEIFEDINE KADRY, KHALED SMAILI, "Control System for Internet Bandwidth based on Java Technology"

[8] R.S. Prasad, M.Murray, "Bandwidth Estimation: metrics, measurement techniques, and tools"

[9] Bandwidth Monitoring, Bandwidth monitoring for network-aware applications by Bolliger, R.; Gross, T.R.; High Performance Distributed Computing, 2001. *Proceedings. 10th IEEE International Symposium on 7-9 Aug. 2001* Page(s): 241 -251

[10] Nonintrusive TCP connection admission control for bandwidth management of an Internet access link by Kumar, A.; Hegde, M.; Anand, S.V.R.; Bindu, B.N.; Thirumurthy, D.; Kherani, A.A.; *Communications Magazine, IEEE , Volume: 38 Issue: 5 , May 2000* Page(s): 160 -167

AUTHORS' BIOGRAPHY

Purnata Shingade is pursuing Bachelors of Engineering Degree from Dnyanganga College of Engineering and Research, Pune-41. She is responsible for giving the module ideas and the design analysis of the system.

Aparna Koul is pursuing Bachelors of Engineering Degree from Dnyanganga College of Engineering and Research, Pune-41. She is responsible for giving the overall idea of the system.

Shubham Shahane is pursuing Bachelors of Engineering Degree from Dnyanganga College of Engineering and Research, Pune-41. He is responsible for giving the module ideas.

Bipin Patil is pursuing Bachelors of Engineering Degree from Dnyanganga College of Engineering and Research, Pune-41. He is responsible for giving the overall idea of the system.