UNIVERSITI TEKNOLOGI MARA

TIME BASED INTERNET TRAFFIC POLICING AND SHAPING WITH WEIBULL TRAFFIC MODEL

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ABSTRACT

Quality of Services for bandwidth management is a crucial task in computer network. Policing and Shaping algorithms are identified as one of the task in bandwidth control, especially in tele-traffic engineering and computer network. This thesis presents the analysis of internet traffic flows in a campus network. Real internet traffic for inbound and outbound throughput flow is collected and statistical analysis is measured to characterize the real live internet traffic parameters. Empirical cumulative distribution function (CDF) model is presented in evaluating the real traffic distribution. Anderson-Darling (AD) and Goodness of Fit test is used to identify the best fitted distribution model to the real data. Four traffic distribution which are normal, lognormal, Weibull and exponential distribution are fitted and derived. Analysis results present Weibull Distribution model is the best fitted model. Two important Weibull parameters which are shape and scale are measured. Based on the identified statistical parameters, a new Time Based Policing and Shaping algorithm is developed and simulated. Policing process drops traffic while shaping process delay traffic to the next time transmissions. Mathematical model to formulate the algorithms is derived. The new algorithms present the existence inbound traffic burst is policed at 1200 Mbyte which is maximum allowable bandwidth while for outbound traffic burst, the policing traffic is policed at 680 Mbyte utilizes the maximum allowable bandwidth. The result of implementing policing and shaping traffic shows the burst can be controlled and thus, reduce the traffic congestion in the network. Furthermore, the drop data from policing traffic process can be saved and transmitted at the next transmission. Besides the method of congestion control, varying the shape parameter of Weibull distribution also help to reduce the burst and improve the performance the internet traffic as a whole.

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INTRODUCTION

1.1 RESEARCH BACKGROUND

Nowadays, network traffic has grown tremendously due to the increasing usage of internet access. The significant growth of traffic is mainly driven by data applications, voice and video application. Network traffic is the main area to be controlled and managed in order to preserve network performance. Therefore the study of internet traffic has become very important task. It is essential to understand the overview characteristic of internet traffic. There are numerous traffic models that are used widely for traffic modeling with different categories of traffic models. Each model varies significantly from the other and suitable for modeling different traffic characteristics. Normal model has shown in [1] that normal distribution can be directly linked to the presence or absence of extreme traffic burst. However, Normal distribution is not suitable to model the traffic demand in large-scale network [2]. They show that from network traffic characterization from a point to another point in the network is a lognormal distribution, which has a slower decay than a normal distribution. While in [3], lognormal distribution is able to accurately statistical models for flow size and flow duration of traffic application. The techniques and real traffic parameter evaluation, yields changes in network performance.

Observation of invariant heavy tails in access traffic patterns of individual users has motivated [4] to investigate traffic transformation or aggregation as it traverses from access to core network. It shows that the variation of shape parameter of the Weibull distribution can capture the transformation of internet traffic which consists of sessions, flows and packet at inter-arrival level. In [5] study how the superposition of heavy-tailed renewal streams models the scaling behavior of traffic at different access networks and tiers of Internet hierarchy.

However, in [6] numerical results of throughput of network show that the network with exponential distributions of link capacities do not able to accommodate much more traffic as it is able for short range data. Exponential distribution is more suitable for non-long-tailed data. This is a sharp contrast to commonly made modeling