

A Novel QoS Aware Shortest Path Algorithm for VSDN

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ABSTRACT

This article describes how a rapid increase in usage of internet has emerged from last few years. This high usage of internet has occurred due to increase in popularity of multimedia applications. However, there is no guarantee of Quality of Service to the users. To fulfill the desired requirements, Internet Service Providers (ISPs) establish a service level agreement (SLA) with clients including specific parameters like bandwidth, reliability, cost, power consumption, etc. ISPs make maximum SLAs and decrease energy consumption to raise their profit. As a result, users do not get the desired services for which they pay. Virtual Software Defined Networks are flexible and manageable networks which can be used to achieve these goals. This article presents shortest path algorithm which improves the matrices like energy consumption, bandwidth usage, successful allocation of nodes in the network using VSDN approach. The results show a 40% increase in the performance of proposed algorithms with a respect to existing algorithms.

KEYWORDS

Bandwidth Usage, Energy Consumption, Network Virtualization, Reliability, Saturated Links, Service Level Agreement(Sla), Software Defined Networking, Successful Allocation, Virtual Software Define Network

1. INTRODUCTION

From last few years the use of internet has increased rapidly. New type of services and applications (e.g web browsing, e-mail, peer-to peer computing, online shopping, online gaming, VoIP, Video and audio conferencing and may more) have emerged.

This rapid use of internet has occurred due to the increase of multimedia application popularity. Multimedia has become integral part of people's life. If there is any failure in internet access users get frustrated. As they want no technical interruption in usage of internet. These Applications and services have their own infrastructure and different network requirements. For example, Video conferencing require different bandwidth than that of VoIP. To fulfill these requirements, Quality of Service(QoS) mechanism in a network is required. The current internet faces a lot of problems to cope with the increasing demands of the users. It does not provide any QoS for communication. To provide these services to users, Internet Service Provider (ISP) establish a Service Level Agreement (SLA) through which specific parameters are provided to the users. ISPs try to make more profit by two ways: 1) increasing the number of SLAs. As more the clients more will be profit. 2) decrease in consumption of energy. The current internet needs to be updated because it has no guarantee of service level.

Two approaches can be combined to overcome the problem of QoS of current internet. The first is Software Defined Networking abbreviated as SDN. This approach deploys the data plane from

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control plane. Control plane is logically centralized. Objective to logically centralize the control plane is to give the global view of whole network environment. This feature of globalization of network ease the network administrator to globally look at the network and take the decisions. In short, we can say Software Defined Network paradigm is an emerging technology in the field of networks which will deal with the current problems being faced in the network world. The other approach is Network Virtualization (NV). Network virtualization restricts LAN partitioning that resides in Ethernet Virtual LAN standards and solve the issues like scalability & multicasting in the network architectures. NV allow customization of virtual services. These two approaches are combined to get the network parameters and services which are required to get guaranteed Quality Of Service. The parameters that are considered under QoS are as:

1. **Successful Allocation:** It represents cumulative number of solved requests. Successful allocation metric can be calculated as:

$$Successful\ Allocation = \frac{\sum Active\ links}{Total\ links} * 100$$

Active links= links which are selected for the transmission of packets in the network.

Total links= total number of links in the network.

2. **Saturated Links:** allocate the links until they are almost saturated or we can say links with no available bandwidth left. It is calculated as:

$$Saturated\ link = \begin{cases} 1, & \& link(w) \geq T_{max} \\ 0, & | \quad | \quad link(w) \leq T_{min} \end{cases}$$

T_{max} = maximum saturated limit

T_{min} = minimum saturated limit

w= weight

3. **Bandwidth used:** bandwidth used by the links is calculated as:

$$Bandwidth\ used = \sum_{d=1}^N Dist(d)$$

4. **Energy Consumption:** It is per quantum of energy consumed by network from the bandwidth allocated to clients. The formula for calculating Energy Consumption is as:

$$Energy\ consumption = (TX_energy + DA_cost) * k\ bit\ data \\ + free_space * k\ bit\ data * (bandwidth_cost)^2$$

To handle the issues an energy efficient path determination technique has been proposed in the work that will extend Bandwidth Energy Efficient algorithm to avoid node risk failure.

Rest of the organization of paper is as follow: Section 2 discuss SDN approach and Network Virtualization. Section 3 defines the concept of virtual software defined networks. Section 4 gives a brief summary of related works and Gaps in literature survey. Section 5 and 6 evaluate the simulation methodology and results obtained by experiments. Section 7 concludes the paper.

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