Available online at https://ijmras.com/

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND STUDIES

ISSN: 2640 7272

Volume:03; Issue:11(2020)

Page no.- 10/10

SYSTEM-WIDE ROUTING BASED MECHANISMS FOR ALLOCATING SERVICE QUALITY TO SPECIFIC NETWORK FLOWS

Akhilesh Kumar

M.Phil., Roll No. :150125: Session: 2015-16

University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur

E-mail : akhilesh.sinha2018@gmail.com

ABSTRACT

Numerous studies have been done on the different methods that traditional networks employ to offer QoS. Most of these are just theoretical inquiries that haven't been significantly scaled-up for the Internet. One of the contributing elements may be that the proprietary protocols that the providers put in the network equipment are, for the most part, unchangeable and cannot be modified by end users. Because networking device makers want to keep their technological implementations concealed behind closed doors rather than share them with the public, programming networks is often challenging. This reduces the network's flexibility and makes controlling it more challenging. The actions of the network administrators cannot be changed in any way to fulfil the requirements of the end applications.

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India.E-mail : akhilesh.sinha2018@gmail.com*

KEYWORDS: Mechanisms, Network, network equipment,

INTRODUCTION

They might also have extra quality of service requirements, such low packet loss and jitter ratios. We do not have a firm deadline for the transmission of packets for applications that involve substantial data transfers, unlike video streaming. It’s probable that we'll have to keep an eye on the equipment's condition and send control signals in cyber-physical systems like the smart grid and home networking systems in order to start an operation. The feedback loop must be completed even if there isn't much information being provided because all sensor data and control signals must reach their destinations promptly. These all cause issues for the networks below the surface. For data transmission, the typical network design does not support quality of service (QoS).

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Unlike the case with video streaming, we do not enforce a strict deadline for the delivery of packets when it comes to applications that entail the transmission of significant amounts of data. On the other hand, we do rely on the networks to provide adequate bandwidth in order for the transfer to be finished in a time period that is satisfactory to us. This is true even if there isn't a lot of information being conveyed. All of these factors’ present challenges for the networks that lie beneath the surface. The conventional architecture of networks does not provide any support for quality of service (QoS) for the transmission of digital data.

ORGANIZATION

The other chapters of this dissertation are organized in the following fashion, which may be found throughout.

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India.E-mail : akhilesh.sinha2018@gmail.com*

This plan will be discussed in detail in Chapter 5.In Chapter 6,you will find a presentation of the conclusion, along with some suggestions for more research.

The Quality of the Service Provided One of the key reasons that was not one of the Internet's core purposes when it was initially envisioned was to ensure a particular degree of service quality. However, as time went on, Internet applications such as streaming multimedia content, online gaming, teleconferencing and other similar services emerged, and it became obvious that these services required a Quality of Service (QoS) guarantee. Over-provisioning network resources in order to fulfil quality of service criteria is an option that could be debated as being economically more realistic than changing the existing network infrastructure. This is because over-provisioning network resources allows for the fulfilment of quality of service criteria. In spite of this, there have been many various attempts made throughout the years to provide great service. These endeavors have been met with varying degrees of success.

QUALITY OF SERVICE

One of the key reasons that was not one of the Internet's core purposes when it was initially envisioned was to ensure a particular degree of service quality. However, as time went on, Internet applications such as streaming multimedia content, online gaming, teleconferencing, and other similar services emerged, and it became obvious that these services required a Quality of Service (QoS) guarantee. Over-provisioning network resources in order to fulfil quality of service criteria is an option that could be debated as being economically more realistic than changing the existing network infrastructure. This is because over-provisioning network resources allows for the fulfilment of quality of service criteria. In spite of this, there have been many various attempts made throughout the years to provide great service. These endeavors have been met with varying degrees of success.

IMPROVINGTHEQUALITYOFSERVICEFORBANDWIDTH-DEMANDINGTRAFFICFLOWS

One of the most important elements needed for the operation of both already established apps and those that will be created in the future is communication technology. Applications generate a wide variety of data traffic, all of which have unique standards for the level of service that must be provided. They could be sensitive to the amount of bandwidth or latency, or they might only receive best-effort service. They may also receive best-effort service in serving them. The simplest way to provide real-time control in industrial systems is to use dedicated networks.

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

Nevertheless, using specialized networks to address more widespread network issues is not a workable strategy. Due to the packet-switched network's architecture, which enables many data traffic streams from various sources to coexist in the same physical area, several applications can operate concurrently. The results of the performance assessments show that our strategy, as opposed to the shortest path routing method currently employed in operational networks, has the potential to greatly increase the throughput obtained by the key flows.

RELATED WORK

They proved that the task is NP-complete by showing that it is impossible to create a path that satisfies several additive metrics. They then offered a variety of path computation techniques, each of which utilized either distributed hop-by-hop routing or centralized source routing.

One controller architecture that has been suggested to guarantee quality of service for multimedia applications is Open QoS Multimedia and data traffic on a network can be separated into two groups. Dynamic routing is used by Open QoS to route multimedia traffic along routes that offer quality of service (QoS).The traditional approaches of managing data flow are used.

Another framework being created is called VSDN (Video over SDN) and its goal is to provide quality of service for multimedia flows in applications that employ video streaming. It provides a number of QoS application programming interfaces (APIs) that both the transmitter and the receiver may use to submit a QoS request for streaming video.

SOFTWARE-DEFINED NETWORKING-BASED FRAMEWORK FOR CREATING BANDWIDTH-REQUIRING FLOW PATHS

Ordered pairs are used to represent the connections between nodes. As an illustration, if node v1 is the source node and node v2 is the destination node, then (v1, v2) would be the single topological link that unites the two nodes. Each link in the network has the attribute of estimated available capacity assigned to it. Given the existence of asymmetric linkages, it is crucial to take into account the possibility that the properties of links (v1,v2) (v2,v1).

STATUS MONITORING

Despite this, they offer a rather accurate estimate of the traffic going to the lines being monitored.

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

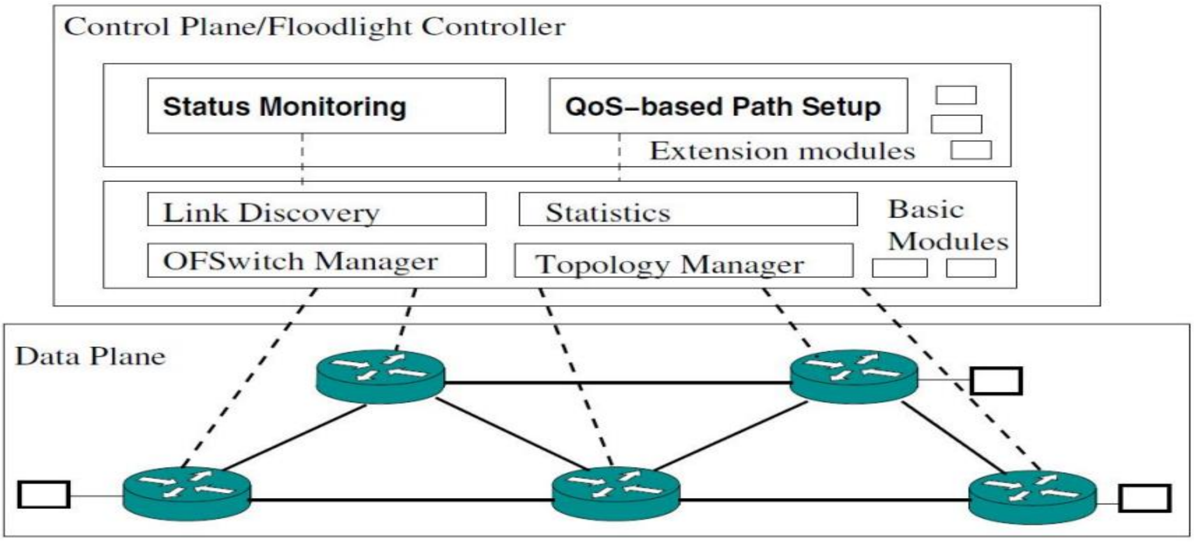

Figure 1: The SDN architecture for providing QoS supports

PROVISIONING QUALITY OF SERVICE TO LATENCY-SENSITIVE TRAFFICFLOWS

Applications that are varied and have various levels of Quality-of-Service requirements are able to be supported by computer networks that were constructed in the 21st century. These traffic flows need a higher priority than the rest of the traffic that is being routed in order to be accommodated properly. There is still more work to be done in terms of designing and developing networked systems that are capable of giving an effective latency guarantee. This effort may be broken down into two categories: planning and construction. This chapter describes a system for the provision of quality of service (QoS) to latency-sensitive traffic flows by making use of the software-defined networking (SDN) technique. This system makes available practical tools for designing, regulating, and forwarding many kinds of traffic flows that have variable degrees of priority. Those degrees can range from low to high.

Motivation

An ever-increasing number of people have shown an interest in cloud computing and virtualized computer systems over the course of the past several years. The need to maximize efficiency in the use of these computing resources while simultaneously reducing costs served as the drive for their creation. In most cases, This type of infrastructure is responsible for hosting a wide variety of applications on behalf of a number of different clients. This has been accomplished through a number of different approaches. Over-provisioning of network

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

resources is a common method utilized by many service providers in order to achieve quality of service criteria. This strategy ensures that there is enough capacity in the network to meet demand. Nevertheless, over provisioning is not the most effective solution to the issue. In order to leverage network resources in the most effective manner possible, it is vital to optimize the acquired performance while simultaneously reducing costs of both operational and capital expenditures.

This metric is used to determine the quality of service provided by a network. They mandate that the total latency of the data that is conveyed must be lower than a given threshold. Another illustration of this is the control traffic, which must be sent with the smallest amount of queueing delay feasible and may thus have a higher priority because of this need. In addition, the greatest amount of latency that an application is able to accept varies depending on the use case it is being used to. This category of network traffic has to be identified, and then it must be redirected in accordance with the regulations that are in place. This is especially true when compared to other forms of network traffic. This kind of traffic can be sent utilizing the best-effort model without resulting in a noticeably decreased level of performance.

When it comes to the construction of general networks, the T1 Working Group of the International Telecommunications Union recommends that a maximum of 400 milliseconds should not be exceeded. On the other hand, they highlight the fact that a considerable number of interactive applications. As the traffic latency increases, the impacts of the influence that it has on the experiences that are delivered by apps become more obvious. The majority of applications will have unsatisfactory performance if the delay is larger than 400 milliseconds

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

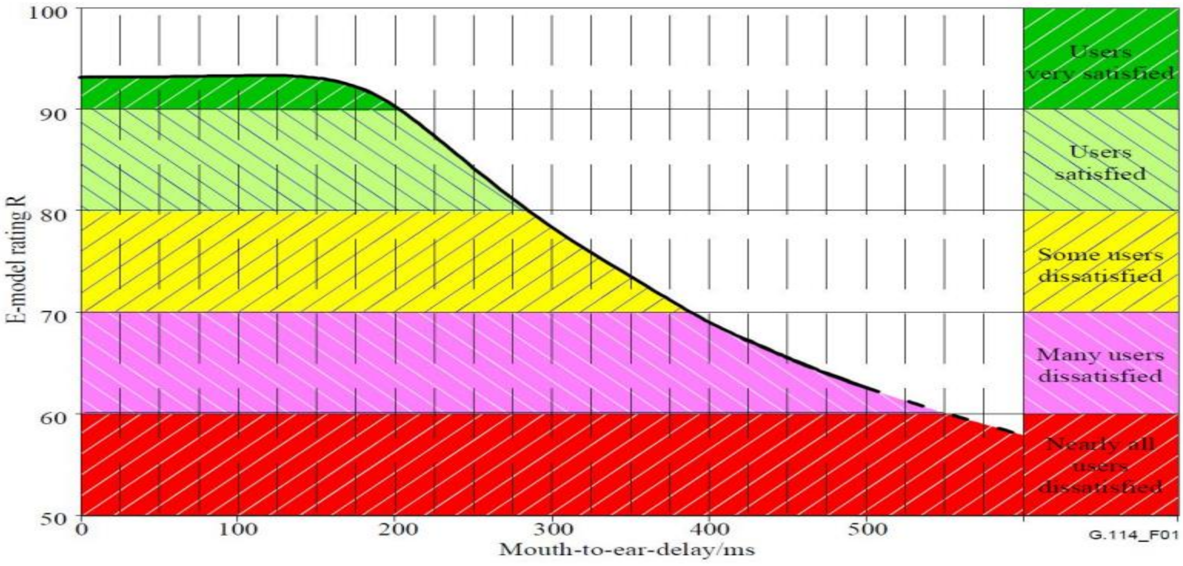

Figure 2: Effects of the total delay on users satisfaction (reprinted from [1])

There are a variety of factors that influence the latency experienced by data packets from beginning to finish of their journey over the network. One of the effects that they have is a lag in the processing of orders.

The processing system has a considerable backlog as a direct result of tasks that need a lot of computational capacity.

- Delay in the transmission of the information. The length of time that must elapse before the router or switch will be able to insert all of the packet bits into the network link.
- Propagation delay. The length of time that it takes for a single bit to make its way from the source to the destination while it is being sent across the connection. This period is referred to as the link latency. When it comes to the propagation delay, the kind of link and the distance are both important factors to consider.
- Queueing delay. The total length of time that must pass before a packet may be removed from a queue and processed by a router or switch.
- Service providers are able to reduce the amount of delay that is connected with the flow of traffic by employing strategies such as resources reservations and/or QoS-aware routing, both of which are examples of techniques that may be used.
- This is because you are guaranteeing that the flow will have a certain amount of bandwidth.
- Policies may also specify a maximum rate, with the intention of limiting flows from

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

exceeding a preset bandwidth in an effort to achieve the aim of.

We see that the majority of traffic patterns have a busty quality to them. For instance, the beginning of an HTTP session involves the downloading of an HTML page together with the related multimedia objects (such as style sheets, photos, and so on). After this, the session is inactive for a period of time until the user makes a request for another HTML page. Even among well-established TCP connections that have been operational for a long time, in consistent traffic volumes are quite prevalent.

Traffic patterns that are sensitive to latency might also be bursty at times. We focus our attention on the traffic flows that do not make up a major fraction of the network's overall traffic. These traffic flows are not sent at a high pace that is constant all the time. As a result, during their periods of in activity, they do not consume any portion of the guaranteed minimum bandwidth that has been allotted for them. On the other hand, when traffic flows of this nature are transmitted, they cannot tolerate a significant level of delay.

Using a software-defined networking (SDN) approach, we will present a method that we have developed that is aimed at the provisioning and monitoring of quality of service for latency-sensitive traffic flows. The system offers straightforward and easy-to-use procedures for designing and managing different types of traffic in the control plane. Each class is comprised of two attributes, namely: Defining characteristics: whichcontainauniqueclassnameandalistofallflowsbelongingtothisclass. Each flow is represented with a set of Open Flow match rules. QoS attributes: which contain class priority and optionally the minimum rate, the maximum rate, and required latency.

CONCLUSION

This dissertation explores a number of strategies designed to enhance the service quality for predetermined traffic patterns. A key goal of this study is to provide practical approaches and infrastructure that can reliably ensure high-quality service for a wide range of network applications. Our research centers on specific traffic patterns in the network that have unique Quality of Service needs. We've designed and tested three different methods using the SDN framework. Herein, we provide a concise overview of the most significant findings from this study:

Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

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Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*

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Akhilesh Kumar*, *University Department of COMPUTER SCIENCE: B.R.A. Bihar University, Muzaffarpur. India. E-mail : akhilesh.sinha2018@gmail.com.*