QSroute : A QoS aware routing scheme for Software Defined Networking

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***Abstract*— The increasing demand for bandwidth-intensive network applications, such as video streaming, multimedia, and Internet of Things (IoT) applications, necessitates improved resource management to protect the network without compromising Quality of Service (QoS). Meeting these challenges requires a centralized view of all available network resources. Software Defined Networking (SDN), an emerging technology, provides a centralized view and control of network resources. This feature enables administrators to programmatically define and manage network behavior, including routing, making it more flexible and adaptable. This study proposes a QoS-aware routing scheme for SDN that considers available bandwidth, packet delay, and packet loss to determine the optimal routing path. Optimal paths are selected based on meeting predefined threshold criteria. The study concludes by discussing potential directions for future research in this field.**

Keywords—Software Defined Networking (SDN), Quality of Service (QoS), QoS Aware Routing

I. INTRODUCTION

In recent years, Software Defined Networking (SDN) has emerged as a revolutionary paradigm in computer networking, offering unprecedented flexibility and programmability to network infrastructure. By decoupling the control plane from the data plane, SDN enables network administrators to manage and orchestrate network resources centrally, improving scalability, efficiency, and agility. However, as SDN continues to evolve, there is a growing need to address the challenges associated with Quality of Service (QoS), ensuring that network traffic is delivered in a reliable and timely manner to meet application requirements [1].

QoS refers to the set of metrics and mechanisms used to measure and ensure the performance and reliability of network services. QoS has been primarily addressed in traditional networking by implementing specialized routing protocols and traffic engineering techniques. However, SDN's dynamic and programmable nature introduces new opportunities and challenges in the context of QoS provisioning. SDN enables fine-grained control over network flows and resources, allowing for more flexible QoS management approaches [2]. Therefore, SDN provides an ability to adhere to problems of various high-level applications and imparts to enhance QoS to the end-users.

The various applications such as streaming, online gaming, Internet of Things (IoT), and multimedia require better service delivery to ensure QoS to end users. Existing Internet architecture routing is limited to providing best-effort service delivery for all [3]. Due to this limitation, it fails to satisfy the QoS guarantee for each end-user application. By exploiting SDN's programmability and centralized control, dynamic routing decisions are made based on real-time network conditions and QoS metrics. The routing can consider bandwidth, latency, jitter, throughput, queue length, and packet loss to make intelligent routing decisions [4] that optimize QoS and maximize network resource utilization.

This paper proposes a QoS-aware routing scheme for SDN based on available bandwidth, packet delay, and packet loss. This scheme considers all three QoS metrics in finding the optimal route from the source node to the destination node.

We organize the paper according to different sections. Section II discusses the related work that build the foundation of our study. Section III illustrates the QSroute network architecture. Section IV discusses the proposed approach and the drawback of the study. Finally, Section V consists of the conclusion and future work.

II. RELATED WORK

This section addresses the state-of-the-art that various researchers have considered to improve the QoS in SDN.

Sun et al.[5] investigated the problem of intelligent traffic flow routing generated by IoT applications. The QoS requirements for different types of traffic flows in IoT applications vary. To ensure QoS requirements for traffic flows, the authors introduced a data flow classification