**CSCI 492: Senior Project I**

Cloud-Based Telemetry System for SDNs

Related Work and Project Plan Report

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# Overview

## Scope

The purpose of this report is to concisely detail the existing work related to our proposed project and to provide a clear timeline of our project implementation. The related work survey portion of this report will specifically look at existing projects that have attempted a similar approach to load balancing; that is, a non-commercial, non-proprietary prototype load balancer that focuses on balancing strengths of traffic paths. Further, this portion will distinguish our proposed project from the existing work. The project planning portion will detail our implementation timeline by choosing achievable and sensible milestones for building our telemetry-driven load balancer, along with the relative time frame they will be achieved in.

## Project Overview

This project’s objective is to successfully design a dynamic, cost-effective load balancer using real-time network telemetry for SDN environments. The main function of the proposed telemetry-driven load balancer is to distribute traffic evenly across network paths based on real-time conditions. Ultimately, our project goal is to demonstrate the feasibility of a resource-efficient, scalable load balancer leveraging existing cloud-based infrastructure.

Part I

Related Work Survey

# Introduction

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Load balancing is a crucial element in the performance, reliability, and efficiency of any well-designed Software-Defined Network (SDN). Its primary purpose is to optimize network resources by distributing traffic evenly, preventing certain data paths or devices from becoming overloaded while others remain underutilized. As networks have grown more complex, the methods of traffic management have evolved dramatically. Early approaches were largely static, manual, and reactive; once traffic routes were configured, they remained unchanged unless manually adjusted by administrators. However, as network demands increased, dynamic routing protocols were introduced, allowing traffic to be automatically rerouted based on network conditions without the need for human intervention.   
Today, real-time traffic management has become far more sophisticated. Modern systems often rely on AI-driven algorithms that make intelligent, real-time decisions based on current traffic patterns and network health data. This evolution towards automated, adaptive traffic management aligns with the goals of our project: rather than developing a traditional load balancer, we are proposing a telemetry-driven prototype that adjusts traffic paths dynamically based on real-time flow statistics collected from Open vSwitch (OVS) switches. By leveraging these real-time data streams, our system aims to ensure optimal load distribution across the network.

In the context of modern SDN environments, several key technologies and algorithms play a critical role in enabling effective load balancing and real-time traffic management. OpenFlow (an early and widely-adopted protocol for SDN), allows the SDN controller to communicate directly with the forwarding plane of network devices. It provides the foundation for centralized traffic control, enabling flexible routing decisions based on real-time conditions.   
Tools like GoFlow2 and Kafka are essential for collecting, processing, and analyzing network telemetry data. GoFlow2 is used to extract detailed flow statistics from Open vSwitch (OVS) instances, providing a granular view of traffic patterns across the network. This real-time data is then streamed into Kafka, a distributed streaming platform that processes and aggregates the telemetry information, making it accessible for decision-making in load balancing.

As we build upon this architecture, our project aims to leverage these established tools to enhance real-time telemetry-driven load balancing. By integrating this telemetry data into our system, we seek to improve traffic distribution efficiency in complex network environments. However, to fully understand the landscape, it's important to review existing work in this space and differentiate our approach from related studies.

# Survey of Related Works

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# Comparison & Conclusion

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Part II

Project Planning

# Work Packets

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# Timeline

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