Traffic Flow Optimizer Application

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Introduction

- Traffic congestion leads to safety hazards and delays for commuters and businesses
- Use the HighD dataset to accurately determine and identify potential areas of congestion
- Traffic planners can reduce congestion by altering traffic signals based on information sent from the app

Objectives/Goals

- Create a traffic management system app to reduce congestion and enhance safety on highways
- Pub/Sub system employed to detect and analyze traffic congestion
- HighD dataset provides information on free-flowing traffic, jammed-up traffic, and traffic accidents
- The application determines congestion by analyzing vehicle numbers exceeding a specific threshold
- Identifying congested areas can help law enforcement and traffic planners suggest alternative routes or adjust traffic flow

Application Features

- Traffic Analysis
  - The system analyzes the HighD dataset and dynamically decides what areas are highly congested based on the parameters specified
- Pub/Sub Architecture
  - The system is based on a pub/sub architecture thus allowing any number of clients to subscribe to the system's topic and make use of the analytics

Implementation

- The application consists of the following components:
  - HighD dataset stored in a bucket
  - Create.py script that creates the topic
  - Producer.py script that accesses the HighD dataset from the bucket and dynamically publishes its analysis of the dataset to the topic
  - Consumer.py script that creates a subscriber to the topic and reads the messages published by the producer
- The system is deployed on Google Cloud Platform (GCP)

Results and Evaluation

- The application performs as expected by its requirements
  - The application accurately analyzes data in the HighD dataset to provide traffic congestion analytics
  - The application provides commuters with the time, date and number of vehicles on a congested road
  - The application performance is within acceptable limits and generally returns messages to users within seconds

Demo Video
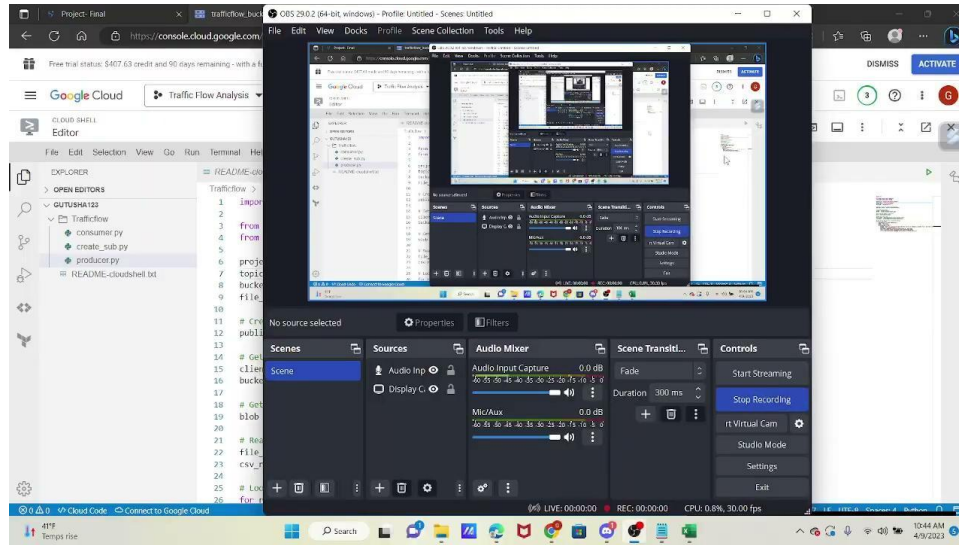
Future Plans

- We would like to turn this application into an App that can be downloaded by other users and can actually be used on the road by others
- Make the system accessible to all commuters and businesses for a more efficient transportation system.
- Consider real-time data integration from different sources to provide constant updates

Conclusion

- Traffic management system using HighD dataset can improve how we handle highway traffic
- Population increase and multiple vehicles per household contribute to congestion and safety hazards
- Pub/sub architecture detects and analyzes traffic congestion by processing HighD data
- The system has the potential to significantly reduce traffic congestion and enhance safety for commuters and businesses
- A valuable tool for any user or business to improve traffic flow and save time.