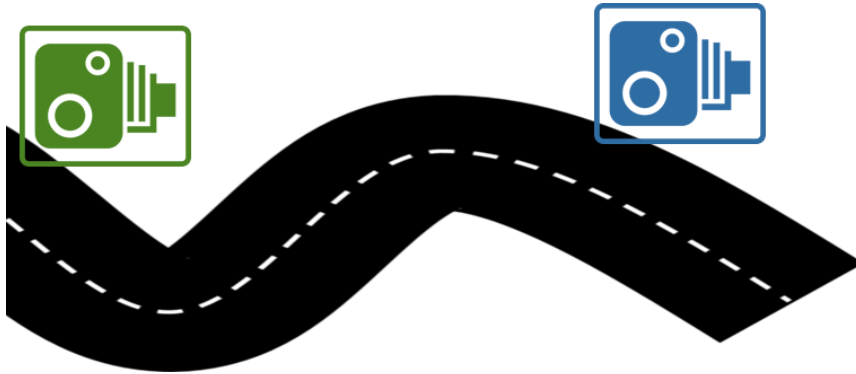# Final Exercise: Architecture for a cloud system

In this exercise you will need to perform analysis and detailed design of a cloud based system to manage a traffic control and ticketing system.

The scenario:

- We'll install cameras on public roads. These cameras will snap pictures of cars as they are passing by.
- The pictures will be uploaded to the cloud for analysis and kept there for a period of no less than 3 years.
- The data about the cars is retained forever.

You can assume that the cameras' are handled by a 3rd party and not related to you. The cameras will upload the captured images to S3 as a ZIP file containing the actual image and a JSON file with details such as the camera id and the time the image was taken.

Queries:

The system should be able to answer the following queries:
- Find me the locations for car "123-32-123" on the 2nd of July, 2020.
- Find me all the cars that passed through this particular location.
- Give me all the red cars that were within 3km of a location.
- How many cars went through a particular location at a given time frame.

In addition to the textual information, you need to also show the actual images captured if they are still retained.

Alerts:

The system should be able to register specific details and alert on them in real time.

- Raise alert if a blue Toyota is seen in the South Region for the next 6 hours.
- Raise alert for car "123-23-132" for the next 24 hours
- Raise alert if car "123-32-321" is seen *outside* 3 km from location.

Alerts should be raised via SMS / email to a designated address.

Tickets:

Some of the cameras are located in well known distance from one another, such pairs of cameras can be used to compute the speed of a car and therefore generate an automated ticket for speeding violations.

The system will allow configuring such pairs of cameras (including their distance, speed limit to generate a ticket, etc) and such tickets should be generated automatically by the system.

Sizing:

For the first year (trial run), this solution will need to handle 150 cameras, each one of them is expected to take about 12,500 pictures a day.

Second stage is full deployment, with 2,500 - 5,000 cameras deployed and the images per camera is going to rise to 17,500 pictures a day.

Deliverable:

The goal of this task is to develop the architecture of such a cloud based system. You are expected to explain how you'll take advantage of cloud resources and services in order to implement the requirements listed above.

As part of your analysis, you should should outline the following:
- The flow of data inside the cloud system and how it integrates to meet the needs of the system.
- Provide a sketch / diagram of the overall system and its major components.
- What cloud services will you use and for what purposes?
- What are the alternatives for those options that you considered and the reasons for the choices you made.
- What is the growth potential for the system?

- Including your billing and cost considerations.
- You need to detail how your solution will be cost effective over at least a five years period.

There is no coding involved in this task, you are expected to provide a document detailing the plan of action and how to go about implementing this.

Your grade will take into account the details of your design, the accuracy of your projections and the validity of the overall solution.