Assignment 1, Cloud Computing

Exercise 1: Understanding Cloud Computing Models

What are the main differences between IaaS, PaaS, and SaaS?

	IaaS	PaaS	SaaS
Control	High control over infrastructure and OS.	Moderate Control.	Minimal control.
Flexibility	High flexibility in configuration.	Moderate flexibility with tools and platforms.	Low flexibility which is limited by the capabilities of the provider.
Use cases	Hosting websites, virtual data centers, disaster recovery.	Developing web applications, APIs, and mobile backends.	Email, CRM, collaboration tools.

Which GCP services fall under each of these models?
IaaS: Google Compute Engine, Google Cloud Storage
PaaS: Google App Engine, Google Cloud Functions
SaaS: Google Apps, Google Workspace

Provide a real-world example where each cloud service model might be the most appropriate choice.
IaaS: An online based startup is facing the problem of low web traffic. Hence, it is forced to quickly grow its infrastructure. It utilizes Google Compute Engine to create virtual servers so as to create machines and skip the cost of buying physical units.

PaaS: A development team has set a goal to develop the web app within the shortest time frame possible. That is why they chose Google App Engine to be able to concentrate on coding and deploying applications instead of servers.

SaaS: A startup looks for a simple tool to manage all organizational emails and documents. Which they use Google Workspace for, to have all the tools and apps they need in one space, which is easy to access.

Exercise 2: Exploring Google Cloud Platform's Core Services

What is the primary use case of Compute Engine?
The main application of Google Compute Engine is to enable business/organisations to have scalable virtual machines for hosting websites,

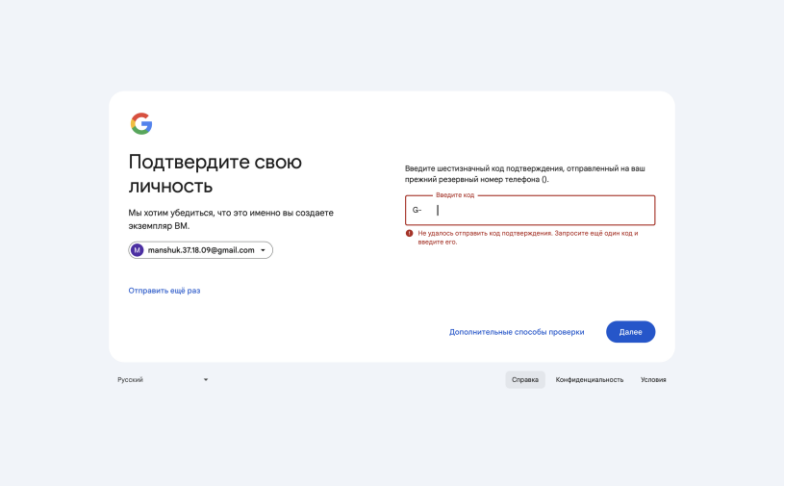
running applications among others uses such as data analysis and highly computational tasks.

How does Google Kubernetes Engine (GKE) simplify the management of containerized applications?
GKE manages containerized applications by doing a large amount of work that would otherwise have to be manually done in establishing Kubernetes clusters. It does things such as updates, scalability and load balancing without having developers to necessarily worry about such things since they can easily concentrate on their application development.

What advantages does Cloud Storage offer for data management?
First, it affords the capacity to add more information as you like or require without a physical barrier to the extension of this capability. One more advantage is high availability and durability, so your data is secure and can be viewed at any time. In addition, it improves the ease of backing up and disaster recovery operations because you can simply create and restore a backup. Moreso, it can be used hand in hand with other Google Cloud services, which make it handy in managing data in your applications.

Why would a business choose BigQuery for their data analysis needs?
It provides them serverless architecture, this is they do not need to deal with infrastructure. BigQuery uses SQL, which enables analysts to query this database without necessarily having to program IT. Also, it is very compatible with other Google Cloud solutions and can perform machine learning right from the application, providing businesses with insights in a short span of time.

Exercise 3: Creating and Managing Virtual Machines with Compute Engine



I couldn’t create a VM, because the code didn’t come, and after several attempts it was blocked for 4 hours several times.

Steps:

- I went to the Google Cloud Console and in the left sidebar clicked on Compute Engine. Clicked on “Create instance” button.
- Gave the name for the VM. Selected the region and zone to deploy the VM. Selected the VM provisioning model. Chose the machine type, then OS and Storage. Chose networking configurations. Then clicked the “Create” button to launch the VM.
- Connected to VM by clicking on the “SSH” button next to the VM in the Console. In the opened terminal wrote commands:
  “sudo apt update
  sudo apt install apache2”
- In the console selected the VM and clicked on the “Delete” button. Then clicked on the “Start” button to restart the VM. To remove the VM, selected and clicked on the “Delete” button.

What steps did you follow to create the VM?

I went to the Google Cloud Console and in the left sidebar clicked on Compute Engine. Clicked on “Create instance” button.
Gave the name for the VM. Selected the region and zone to deploy the VM. Selected the VM provisioning model. Chose the machine type, then OS and Storage. Chose networking configurations. Then clicked the “Create” button to launch the VM.

How did you connect to the VM, and what commands did you use to install the web server?

Connected to VM by clicking on the “SSH” button next to the VM in the Console. In the opened terminal wrote commands:
“sudo apt update
sudo apt install apache2”

What happens to the VM and its data when it is stopped versus when it is deleted?

When VM is stopped we can start again later without losing anything. Because the VM is turned off, but all data and settings are preserved.
When VM is deleted, we can’t recover any data stored in VM. Since deleting permanently erases the VM and all its contents.

Exercise 4: Deploying a Containerized Application on Google Kubernetes Engine (GKE)

Steps:
First, I needed a basic web application. I decided to use the application that I had made before.
Then, I wrote a Dockerfile to containerize my application.
Built the Docker image using the command: docker build -t
After building the image, I needed to push it to GCR. First, I authenticated my Docker client with Google Cloud using the command: gcloud auth configure-docker
Then, I pushed the image to GCR using the command: docker push
Went to the Google Cloud Console and navigated to the Kubernetes Engine section. Clicked "Create Cluster" and chose my settings, such as the number of nodes and the region. After creating the cluster, I authenticated my local kubectl command to use it with: gcloud container clusters
I created a deployment file to define the deployment. And applied this deployment using: kubectl apply -f
To make my application accessible from the internet, I created a service using the command: kubectl expose deployment --type=LoadBalancer --port 80 --target-port 8080
Checked if my application was running correctly using: kubectl get services

How did you create and push the Docker container to GCR?
First, I needed a basic web application. I decided to use the application that I had made before.
Then, I wrote a Dockerfile to containerize my application.
Built the Docker image using the command: docker build -t
After building the image, I needed to push it to GCR. First, I authenticated my Docker client with Google Cloud using the command: gcloud auth configure-docker
Then, I pushed the image to GCR using the command: docker push

What steps were involved in setting up the GKE cluster?
Went to the Google Cloud Console and navigated to the Kubernetes Engine section. Clicked "Create Cluster" and chose my settings, such as the number of nodes and the region. After creating the cluster, I authenticated my local kubectl command to use it with: gcloud container clusters

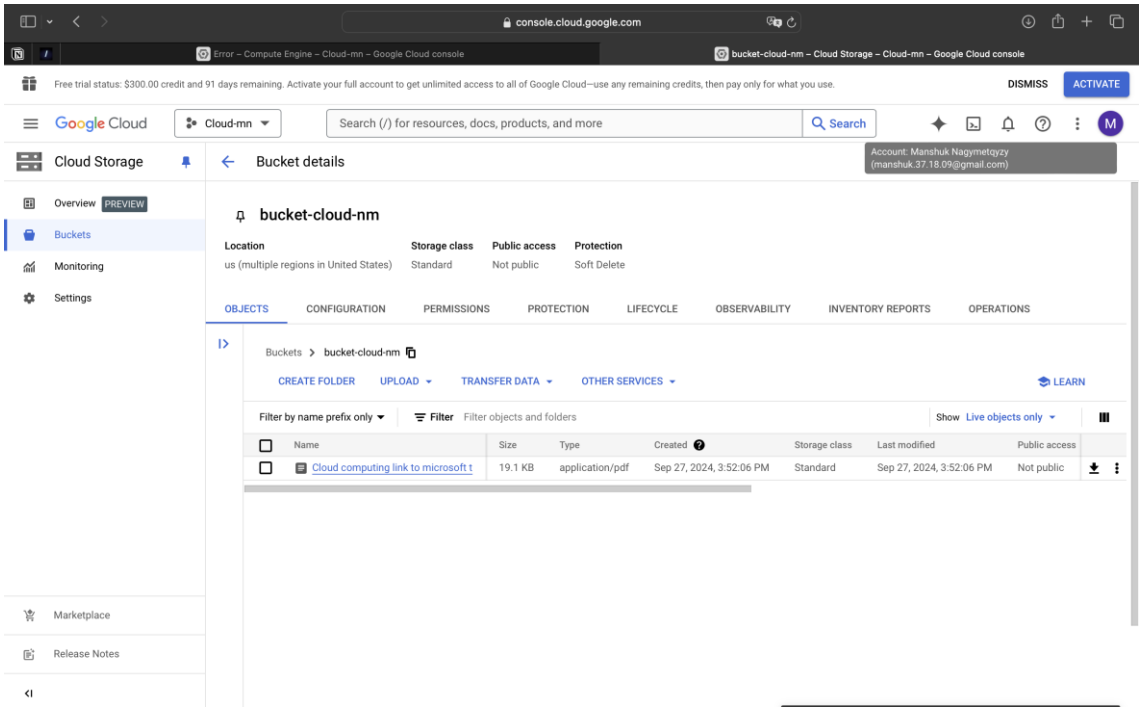
How did you verify that your application was successfully deployed and accessible?

To make my application accessible from the internet, I created a service using the command: kubectl expose deployment --type=LoadBalancer --port 80 --target-port 8080
Checked if my application was running correctly using: kubectl get services

Exercise 5: Storing and Accessing Data in Google Cloud Storage

How do you create a Cloud Storage bucket, and what options are available during setup?

Navigated to the Google Cloud Console. Selected “Cloud Storage” and clicked “Create Bucket.” Chose a name, location and configured settings. Uploaded files.



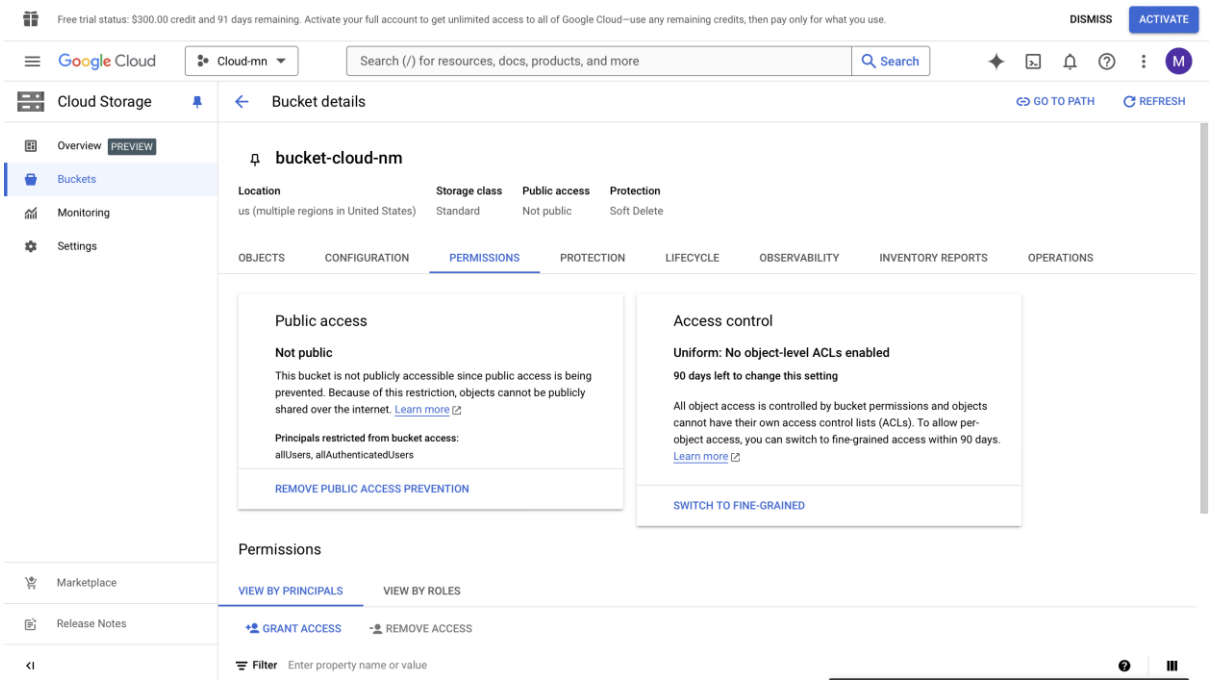
During the setup, there was options like the bucket name, location (like multi-region or single region), storage class (standard, nearline, coldline, archive), and access control settings (public or private). Also features like versioning and lifecycle management.

What are the differences between setting a bucket to public versus private?

Public buckets can be accessed from the internet by any user, while private buckets may be accessed by their owners only or by users belonging to specific roles.

How can you manage access permissions for individual files in a bucket?

By selecting the file, clicking the Permissions, and configuring settings:



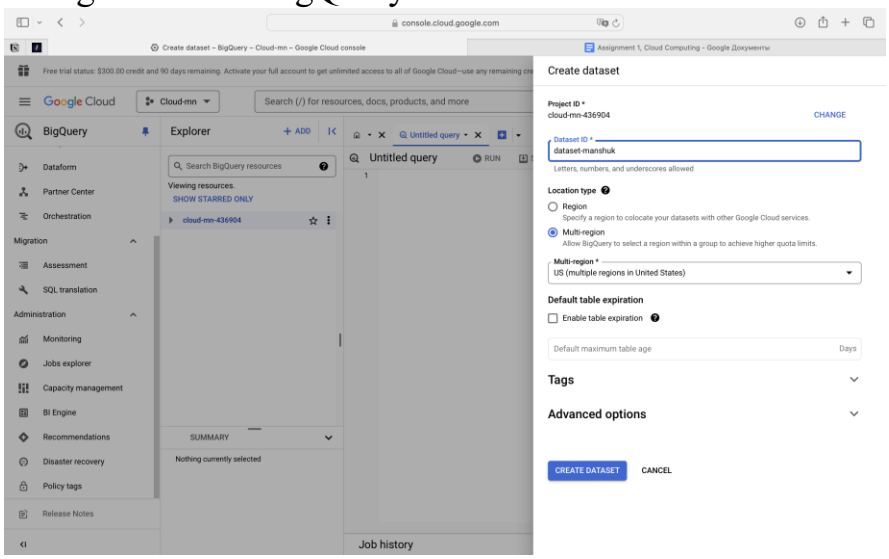
Exercise 6: Analyzing Data with BigQuery

Steps:

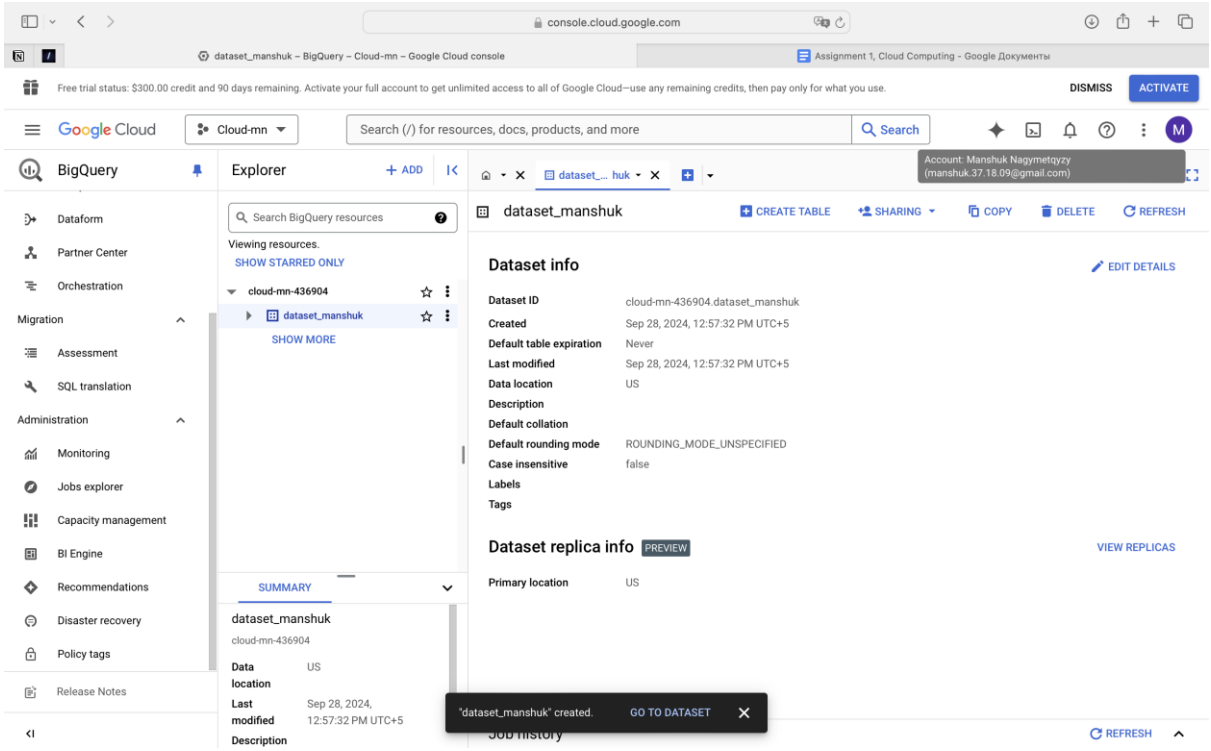
Access BigQuery in the Google Cloud Console.
Create a dataset and table by importing a sample dataset provided by Google.
Write and execute SQL queries to perform basic data analysis, such as filtering, aggregation, and sorting.
Visualize the results using Google Data Studio or another visualization tool.

What steps did you take to create a dataset and table in BigQuery?

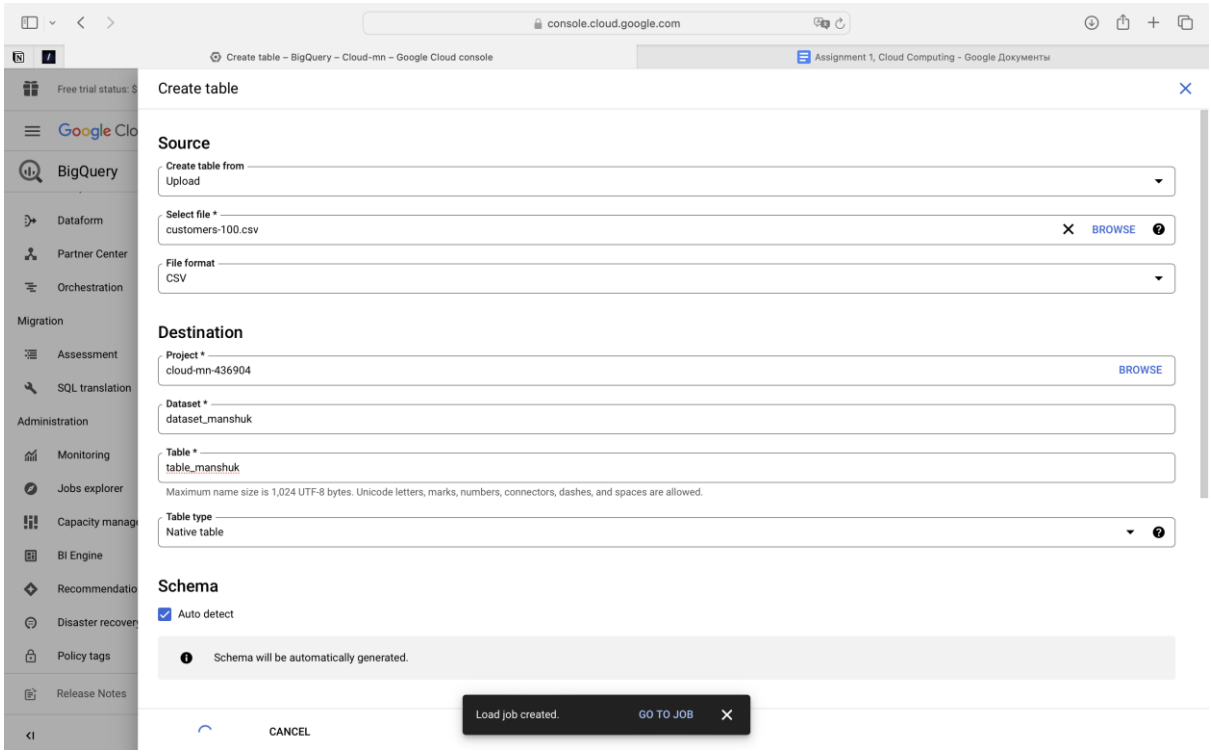
Navigated to the BigQuery Section.

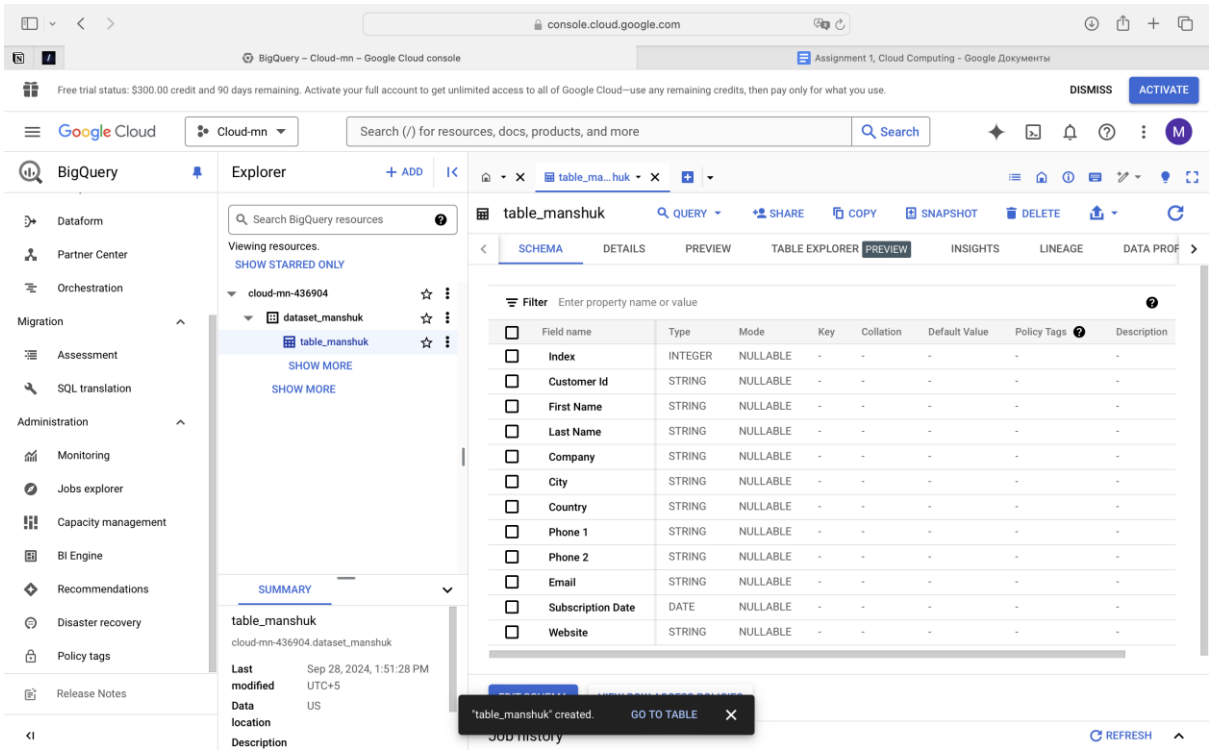


Clicked “Create Dataset” and filled in the dataset ID and other relevant options, then clicked “Create dataset”.

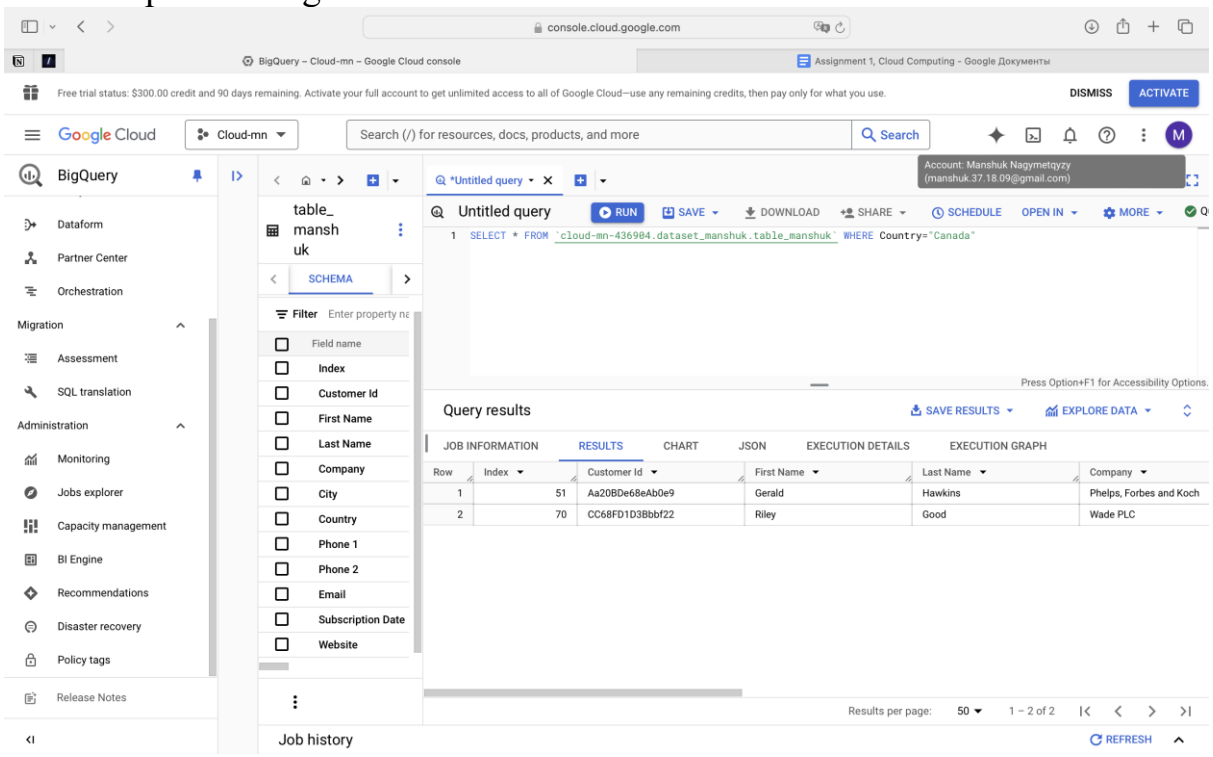


Within the dataset, clicked “Create table”. For "Source," selected upload csv file. Defined table name, schema, and other options, then clicked "Create Table."

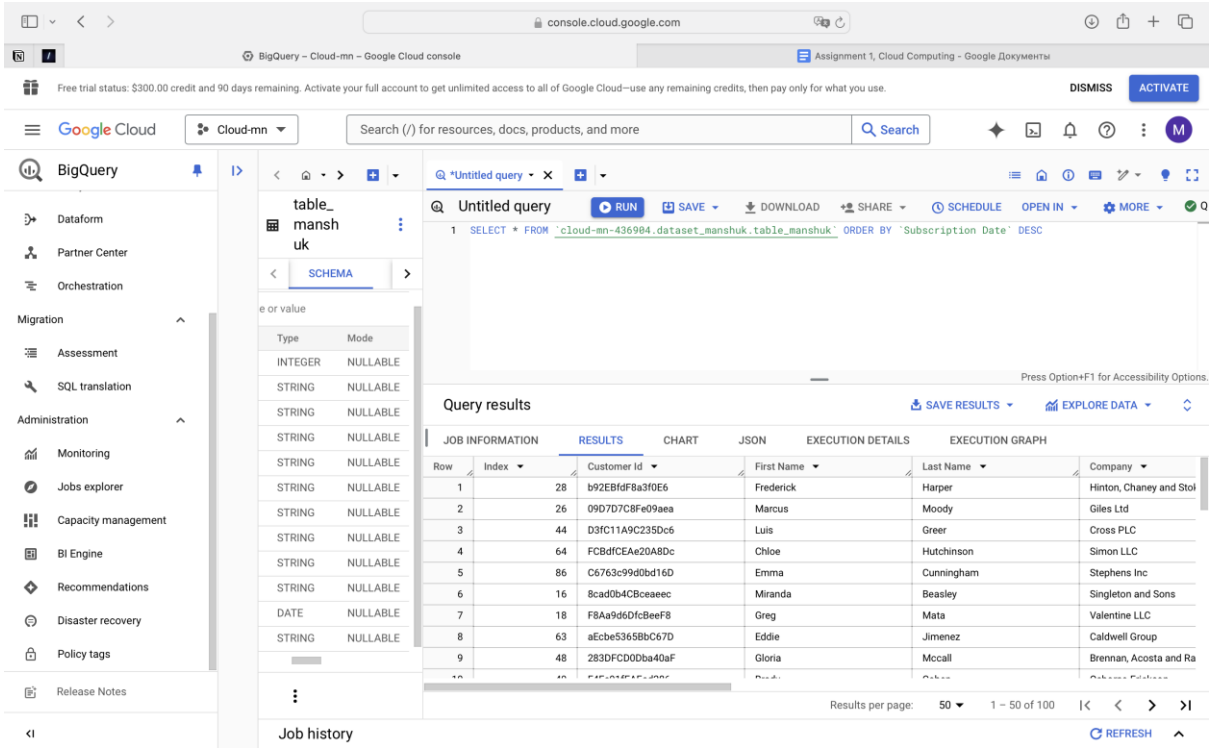




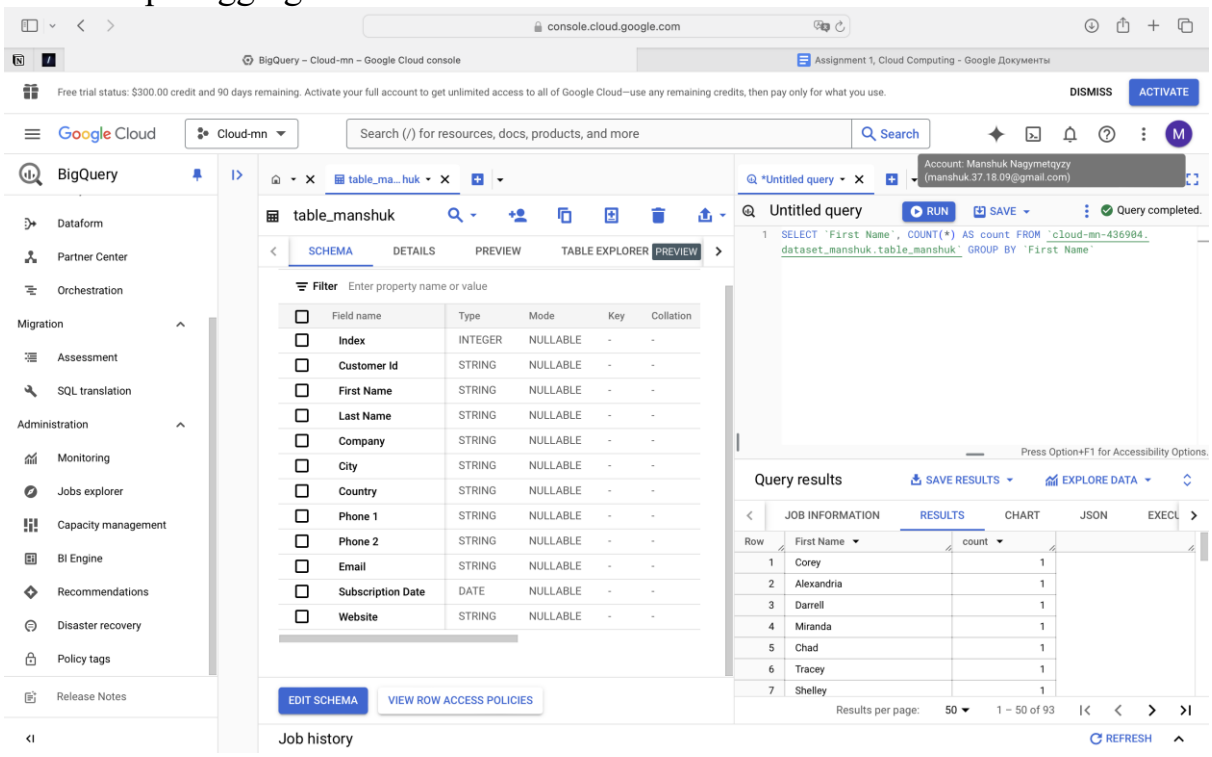
How did you write and execute SQL queries in BigQuery?
In the BigQuery console, opened the Query Editor for dataset.
For example filtering:



For example sorting:



For example aggregation:



What insights were you able to derive from the data analysis?

I gain insights into data distribution, such as the percentage of clients from various places, by grouping and summarizing data. This aids in locating prospective segmentation regions.