

Assignment 1, Cloud Computing

Put all deliverables into github repository in your profile. Share link to google form 24 hours before defense. Defend by explaining deliverables and answering questions.

Deliverables: report in pdf Google form:

https://docs.google.com/forms/d/e/1FAIpQLSe0GyNdOYlvM1tX_1_CtIPod5jBf-ACLGdHYZq1gVZbUeBzIg/viewform?usp=sf_link

Exercise 1: Understanding Cloud Computing Models

1. **Objective:** Explore different cloud computing models and understand their key differences.
2. **Steps:**
 - o Research the three primary cloud service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
 - o Create a table comparing these models in terms of control, flexibility, and use cases.
 - o Identify examples of services offered by Google Cloud Platform (GCP) under each model.
3. **Questions:**
 - o *What are the main differences between IaaS, PaaS, and SaaS?*
 - **IaaS:** You can use the apps and data. You have control over the system.
 - **PaaS:** You look after apps and info, but not the system or the building.
 - **SaaS:** You use software that is totally managed for your needs (least amount of control).
 - o *Which GCP services fall under each of these models?*
 - **IaaS** provides basic computing resources that users can configure and manage virtual machines. **For example**, Google Cloud Storage.
 - **PaaS** is a place to make apps. You can make an app there and then put it on the PaaS to use. The PaaS takes care of the computers and the operating system. **For example**, Google App Engine.
 - **SaaS** is a program you can use on the Internet. You don't have to worry about computers and systems. **For example**, Google Workspace.
 - o *Provide a real-world example where each cloud service model might be the most appropriate choice.*
 - **Example of IaaS:** A startup creating a custom high-load web application. The company uses Google Compute Engine makes virtual machines. It helps to run an operating system and a server. It also helps to put applications on the server and to connect to the network and to a database.
 - **Example of PaaS:** Developing a mobile application with a focus on functionality rather than infrastructure. The team uses Google to make their app. It grows when people use it. Google takes care of the servers and the database.

- **Example SaaS:** A small company using cloud-based collaboration tools. The company chooses Google Workspace, for communication, document editing, calendar management and file storage. Everything is on the internet and you don't need to install anything.

Exercise 2: Exploring Google Cloud Platform's Core Services

1. **Objective:** Get acquainted with the core services provided by Google Cloud Platform.

2. **Steps:**

- Access the Google Cloud Console and navigate to the list of GCP services.
- Explore and describe the purpose of the following core services:
 - Compute Engine
 - Google Kubernetes Engine (GKE)
 - App Engine
 - Cloud Storage
 - BigQuery
- For each service, identify a potential use case in a business scenario.

3. **Questions:**

- *What is the primary use case of Compute Engine?*

The main use case for Google Compute Engine (GCE) is to **provide virtual machines** (VMs) to perform various computing tasks in the cloud. It is an IaaS service that allows users to run, manage, and configure virtual servers according to the needs of applications or infrastructure.

- *How does Google Kubernetes Engine (GKE) simplify the management of containerized applications?*

Google Kubernetes Engine (GKE) makes it easy to run and manage container apps. It has a powerful platform that helps you automate, deploy, and scale containers in Kubernetes clusters. Here are some key ways GKE makes it easier to work with containers:

- Scaling and load balancing
- Automatic updates and fixes:
- Google Cloud Monitoring and Logging

- *What advantages does Cloud Storage offer for data management?*

- Scalability
- Accessibility and reliability
- Data encryption
- Cost savings and flexibility
- Data backup and recovery

- *Why would a business choose BigQuery for their data analysis needs?*

Companies use BigQuery to analyze their data because it is **fast**, can be made bigger and is **easy to use**. Here are the main advantages and reasons why businesses prefer Google BigQuery:

- Processing large amounts of data
- Fully managed data storage
- Instant scaling
- SQL interface
- Data encryption

Exercise 3: Creating and Managing Virtual Machines with Compute Engine

1. **Objective:** Learn how to create, manage, and interact with virtual machines (VMs) using Compute Engine.

2. **Steps:**

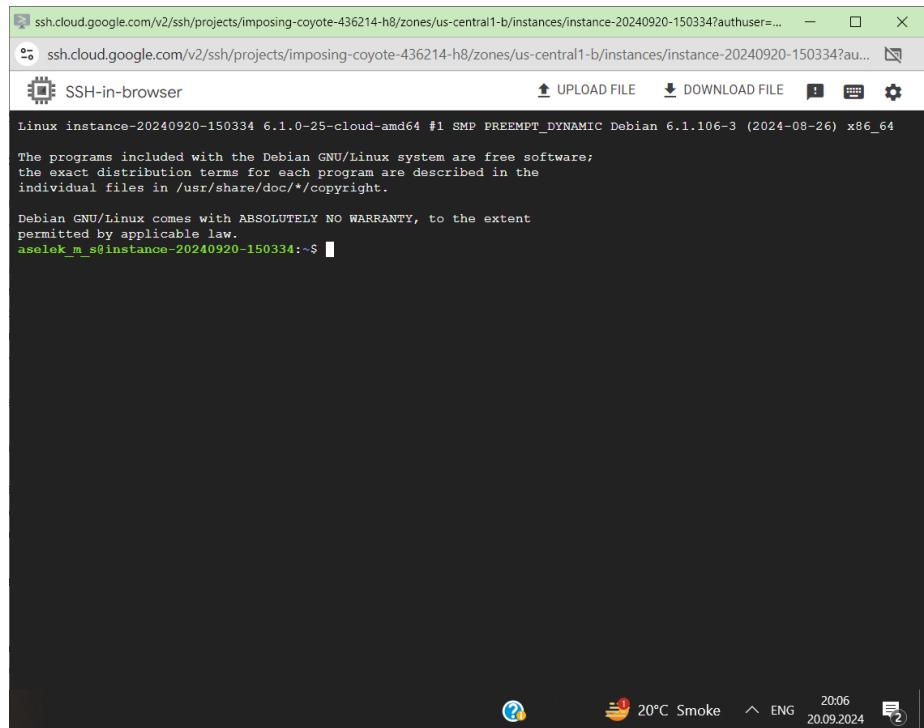
- 0 In the Google Cloud Console, navigate to Compute Engine and create a new VM instance.

The screenshot shows the Google Cloud Compute Engine interface. The left sidebar is titled 'Compute Engine' and includes sections for 'Virtual machines' (selected), 'Instance templates', 'Sole-tenant nodes', 'Machine images', 'TPUs', 'Committed use discounts', 'Reservations', 'Migrate to Virtual Machine...', 'Storage', 'Marketplace', and 'Release Notes'. The main content area is titled 'VM instances' and shows a table with one row. The table columns are: Status, Name, Zone, Recommendations, In use by, Internal IP, External IP, and Connect. The single instance listed is 'Instance-20240920-150334' in 'us-central1-b' zone, with internal IP 10.128.0.2 and external IP 34.29.184.205. Below the table are 'Related actions' buttons for 'Explore Backup and DR', 'View billing report', 'Monitor VMs', 'Set up firewall rules', 'Patch management', and 'Load balance between VMs'.

- 0 Configure the VM with specific parameters, such as the machine type, region, and operating system.

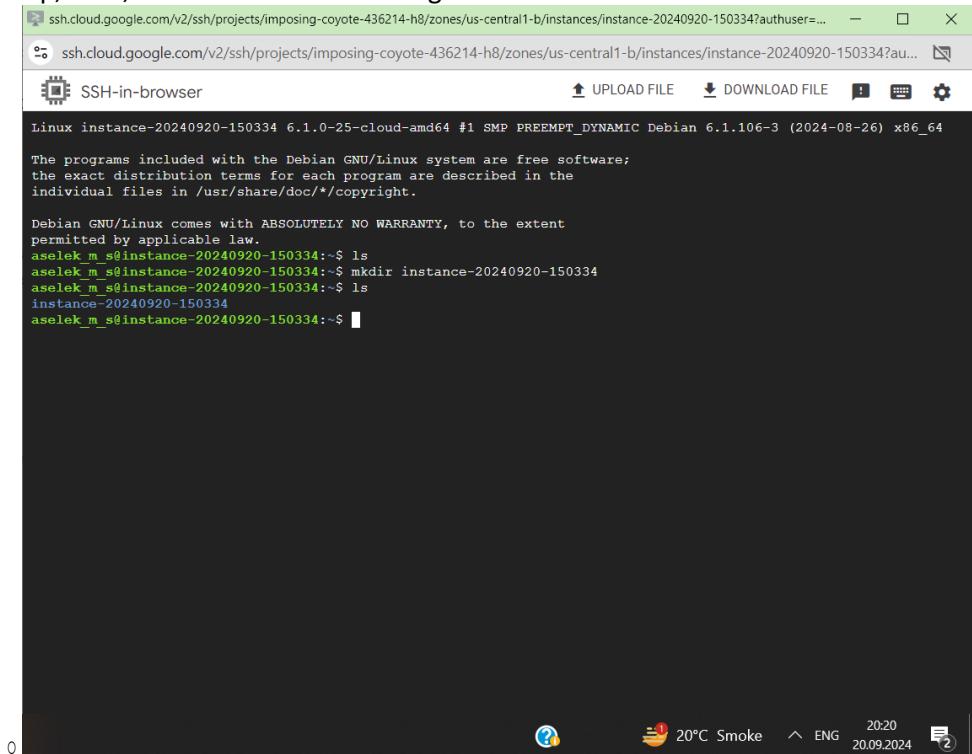
The screenshot shows the 'instance-20240920-150334' details page. The left sidebar is identical to the previous screenshot. The main content area has tabs for 'DETAILS', 'OBSERVABILITY', 'OS INFO', and 'SCREENSHOT'. The 'DETAILS' tab is selected and displays 'Basic information' for the instance. The 'Logs' section shows 'Serial port 1 (console)' with a link to 'SHOW MORE'. The 'Basic information' table includes fields like Name (Instance-20240920-150334), Instance Id (4101178331746021378), Description (None), Type (Instance), Status (Running), Creation time (Sep 20, 2024, 8:04:15 PM UTC+05:00), Zone (us-central1-b), Instance template (None), In use by (None), Reservations (Automatically choose), and Labels (None).

- 0 Connect to the VM using SSH and install a basic web server (e.g., Apache or Nginx).

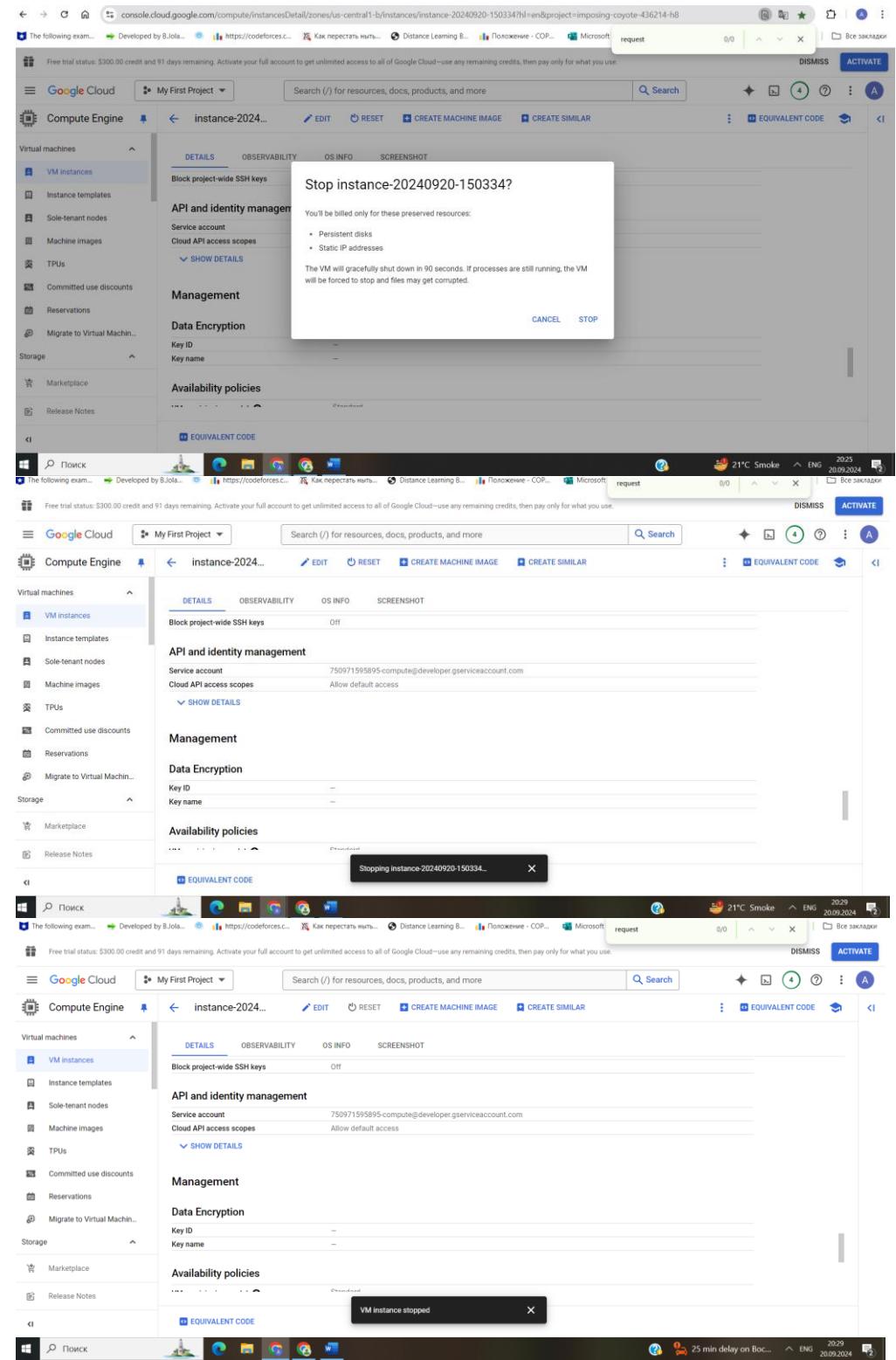


The screenshot shows a terminal window titled "SSH-in-browser" connected to a Linux instance. The terminal displays the standard Debian 6.1.106-3 (2024-08-26) x86_64 welcome message, which includes the kernel version, SMP PREEMPT_DYNAMIC, and the GNU/Linux system's copyright notice. The user prompt "aselek_m@instance-20240920-150334:~\$ " is visible at the bottom.

- 0 Stop, start, and delete the VM through the console.



The screenshot shows a terminal window titled "SSH-in-browser" connected to a Linux instance. The terminal displays the standard Debian 6.1.106-3 (2024-08-26) x86_64 welcome message. The user runs the command "ls" to list the current directory, which contains "instance-20240920-150334". Then, the user runs "mkdir instance-20240920-150334" to create a new directory. The user prompt "aselek_m@instance-20240920-150334:~\$ " is visible at the bottom.



3. Questions:

- o What steps did you follow to create the VM?

- 1) First, I logged into my account on the Google Cloud Console.
- 2) Then I opened the Compute Engine in the navigation sidebar and clicked on Virtual Machine Instances.
- 3) In the next step, I was asked to enter data as the name for my virtual machine, the region and the configuration of the machine, but in this case I left the name in the random case as I was offered by default
- 4) Then I clicked on the create button at the bottom of the page and this started the process of creating a virtual machine

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

1) I clicked on SSH and selected the "Open in browser window" option

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

1) In the case where the virtual machine is in **stop** mode. Computing resources are freed up, but data on permanent disks remains untouched.

2) As I understood the **deletion** mode in the virtual machine, the data is permanently deleted. The attached disks are saved, but the configuration and metadata are lost.

4.1 Create a simple Docker container for a web application.

The screenshot shows a Google Cloud Shell terminal window titled 'Terminal (project6-436912)'. The terminal displays the following command history:

```
Welcome to Cloud Shell! Type "help" to get started.  
Your Cloud Platform project in this session is set to project6-436912.  
Use "gcloud config set project [PROJECT_ID]" to change to a different project.  
aselek_m_@cloudshell:~/project6-436912$ mkdir asset  
aselek_m_@cloudshell:~/project6-436912$ cd asset  
aselek_m_@cloudshell:~/asset (project6-436912)$ echo "from flask import Flask  
  
app = Flask(__name__)  
  
@app.route('/')  
def hello():  
    return "Hello, World!"  
  
if __name__ == '__main__':  

```

4.1.1. Push the container image to Google Container Registry (GCR).

The screenshot shows the 'Product details' page for the 'Kubernetes Engine API' in the Google Cloud Marketplace. The page includes the following sections:

- Kubernetes Engine API** (Google Enterprise API)
- Description: Builds and manages container-based applications, powered by the open source Kubernetes technology.
- Buttons: **ENABLE** and **TRY THIS API**.
- OVERVIEW** tab is selected.
- Additional details**: Type: SaaS & APIs, Last product update: 8/13/24.
- A message box at the bottom states: "Now viewing project 'My First Project' in organization 'No organization'".

The screenshot shows the 'Enable access to APIs' interface. It includes the following elements:

- Confirm project** checkbox (checked).
- Enable APIs** checkbox (checked).
- You are about to enable:** list: Compute Engine API, Artifact Registry API, Kubernetes Engine API.
- ENABLE** button.

4.1.2. Create a GKE cluster in Google Cloud Console

Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to **imposing-coyote-436214-h8**.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)\$ export PROJECT_ID=PROJECT_ID
aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)\$ echo \$PROJECT_ID
PROJECT_ID
aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)\$ gcloud config set project \$PROJECT_ID
WARNING: INVALID_ARGUMENT: Request contains an invalid argument.
Are you sure you wish to set property [core/project] to PROJECT_ID?
Do you want to continue (Y/n)? y
ERROR: (gcloud.config.set) The project property must be set to a valid project ID, not the project name [PROJECT_ID]
To set your project, run:
\$ gcloud config set project PROJECT_ID
or to unset it, run:
\$ gcloud config unset project
aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)\$ gcloud config set project \$PROJECT_ID
WARNING: INVALID_ARGUMENT: Request contains an invalid argument.
Are you sure you wish to set property [core/project] to PROJECT_ID?
Do you want to continue (Y/n)? y
ERROR: (gcloud.config.set) The project property must be set to a valid project ID, not the project name [PROJECT_ID]
To set your project, run:
\$ gcloud config set project PROJECT_ID
or to unset it, run:

At first everything went right, but in the end when it was necessary to set the ID of my project for Google Cloud CLI, I inserted the wrong ID, but I solved this problem and here is the result

```
aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)$ gcloud config set project imposing-coyote-436214-h8  

Updated property [core/project].  

aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)$
```

4.1.3 Deploy the containerized application to the GKE cluster.

Successfully created a deploy using the following command:

```
aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)$ gcloud artifacts repositories create hello-repo \  

--repository-format=docker \  

--location=us-west1 \  

--description="Docker repository"  

Create request issued for: [hello-repo]  

Waiting for operation [projects/imposing-coyote-436214-h8/locations/us-west1/operations/d95b01d9-757a-4908-9365-197ec8df897a] to complete...done.  

Created repository [hello-repo].  

aselek_m_s@cloudshell:~ (imposing-coyote-436214-h8)$
```

4.1.4 Expose the application to the internet and verify its accessibility.

Due to the fact that it costs money, I was unable to successfully deploy my application.

Get an external IP address:

```
kubectl get services
```

```
http://<EXTERNAL_IP>/
```

4 Questions:

- How did you create and push the Docker container to GCR?

I created a Docker image using the docker buildt mywebapp command., then sent it to Google Container Registry (GCR) with the docker push command gcr.io/PROJECT_ID/my-web-app. Before that, I performed authentication using icloud auth configure-docker.

- What steps were involved in setting up the GKE cluster?

To configure the GKE cluster, I selected Kubernetes Engine in the Google Cloud Console, clicked Create cluster, specified the parameters (cluster type, region, number of nodes), and then clicked Create.

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

I made sure of the successful deployment by obtaining the external IP address of the service through the `kubectl get services` command and checking the availability of the application by opening this address in the browser.

5.1 Create a new Cloud Storage bucket in the Google Cloud Console.

The screenshot shows the Google Cloud Storage Bucket details page for a bucket named 'assel_bucket'. The bucket is located in the 'asia (multiple regions in Asia)' region, has a 'Standard' storage class, and is set to 'Not public'. The 'OBJECTS' tab is selected, showing a 'Folder browser' with a single folder named 'assel_bucket'. The folder contains no objects. There are tabs for 'CONFIGURATION', 'PERMISSIONS', 'PROTECTION', 'LIFECYCLE', 'OBSERVABILITY', 'INVENTORY REPORTS', and 'OPERATIONS'. On the right, there are buttons for 'CREATE FOLDER', 'UPLOAD', 'TRANSFER DATA', and 'OTHER SERVICES'. A sidebar on the left lists 'Overview', 'Buckets', 'Monitoring', and 'Settings'. A bottom navigation bar includes links for 'Marketplace' and 'Release Notes'.

5.2 Upload various types of files (e.g., text, images, videos) to the bucket.

The screenshot shows the same Google Cloud Storage Bucket details page for 'assel_bucket'. This time, the 'OBJECTS' tab shows a 'Folder browser' with a folder named 'Assel/'. Inside 'Assel/' is a file named 'Assignment 1_Cloud Computing (.docx)'. A success message at the bottom left says '1 file successfully uploaded'. A notification bar at the bottom right displays 'Uploads and Project5 operations' with a list item 'Assignment 1_Cloud Computing (.ASSEL).docx Complete'. The rest of the interface is identical to the previous screenshot, including the sidebar and bottom navigation.

5.3 Set access permissions for the bucket and test public and private access to the files.

Public:

The screenshot shows the 'Grant access to "asse1_bucket"' dialog. In the 'Resource' section, 'asse1_bucket' is selected. Under 'Add principals', 'allUsers' is listed. In the 'Assign roles' section, 'Storage Object Viewer' is selected. A note explains that this role grants access to view objects and their metadata, excluding ACLs. Buttons for 'SAVE' and 'CANCEL' are at the bottom.

Private:

The screenshot shows the 'Permissions for asse1_bucket' dialog. Under 'Public access', it is set to 'Not public'. In the 'Access control' section, it states 'Uniform: No object-level ACLs enabled'. A note says 'Edit or delete roles below, or select "Add Principal" to grant new access.' A checkbox for 'Show inherited roles in table' is checked. The 'Role / Principal' table lists 'Storage Legacy Bucket Owner (2)' and 'Storage Legacy Bucket Reader (1)'. A 'Policy updated' message is shown at the bottom.

The screenshot shows the Google Cloud Platform interface. On the left, the 'Bucket details' page for 'asset_bucket' is displayed, showing its location (Asia), storage class (Standard), and a folder browser containing 'Asset/'. On the right, a 'Create a transfer job' dialog is open, listing steps: 'Get started', 'Choose a source asset_bucket', 'Choose a destination asset_bucket2', 'Choose when to run job Batch • Run job once • Starting now', and 'Choose settings Never delete files'. The 'Identify your job' section has a checked checkbox for 'Autogenerate a unique, permanent job name upon creation'. The 'Manifest file' section has an unchecked checkbox for 'Provide list of files to transfer via manifest file'. The 'Choose how to handle your data' section includes options for 'Metadata options' (with 'Options are preselected to ensure backward compatibility and vary based on source and destination.'), 'ACL' (set to 'Use destination bucket's object ACLs'), 'KMS key' (set to 'Use destination bucket's encryption settings'), 'Storage class' (set to 'Use destination bucket's storage class'), and 'Temporary hold' (set to 'Preserve object's original temporary hold status').

The screenshot shows the 'Bucket details' page for 'asset_bucket'. A success message at the bottom states: 'Transfer job 'transferJobs/3639448814291658...'' created successfully. You can monitor or manage the job in Storage Transfer Service. A 'GO TO JOB' button is available. To the right, a sidebar titled 'Uploads and Project5 operations' shows a completed task: 'Assignment 1, Cloud Computing (ASSEL).docx' with a green checkmark and the status 'Complete'.

5.4 Use the Cloud Console to download, move, and delete files in the bucket.

Download:

Free trial status: \$299.98 credit and 84 days remaining. Activate your full account to get unlimited access to all of Google Cloud—use any remaining credits, then pay only for what you use.

DISMIS ACTIVATE

Google Cloud project6 bu Search

Cloud Storage Bucket details

Overview PREVIEW Buckets Monitoring Settings

Location us (multiple regions in United States) Storage class Standard Public access Not public Protection Soft Delete

OBJECTS CONFIGURATION PERMISSIONS PROTECTION LIFECYCLE OBSERVABILITY INVENTORY REPORTS OPERATIONS

Folder browser Buckets > assssskkkk > Asset1

1 object selected MANAGE HOLDS EDIT RETENTION DOWNLOAD DELETE

Filter by name prefix only Filter Filter objects and folders Show Live objects only

Name	Size	Type
Zadolzhniki 29 d 10 05 2024.xlsx	11 KB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet
Пед практика 2024-2025 (1).xlsx	19.7 KB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet

Marketplace Release Notes

Buckets > assssskkkk > Asset1

1 object selected MANAGE HOLDS EDIT RETENTION DOWNLOAD DELETE

Filter by name prefix only Filter Filter objects and folders Show Live objects only

Name	Size	Type
Zadolzhniki 29 d 10 05 2024.xlsx	11 KB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet
Пед практика 2024-2025 (1).xlsx	19.7 KB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet

Delete:

Free trial status: \$299.98 credit and 84 days remaining. Activate your full account to get unlimited access to all of Google Cloud—use any remaining credits, then pay only for what you use.

DISMIS ACTIVATE

Google Cloud project6 bu Search

Cloud Storage Bucket details

Overview PREVIEW Buckets Monitoring Settings

Location us (multiple regions in United States) Storage class Standard Public access Not public Protection Soft Delete

OBJECTS CONFIGURATION PERMISSIONS PROTECTION LIFECYCLE OBSERVABILITY INVENTORY REPORTS OPERATIONS

Folder browser Buckets > assssskkkk > Asset1

CREATE FOLDER UPLOAD TRANSFER DATA OTHER SERVICES

Filter by name prefix only Filter Filter objects and folders Show Live objects only

Name	Size	Type
Zadolzhniki 29 d 10 05 2024.xlsx	11 KB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet
Пед практика 2024-2025 (1).xlsx	19.7 KB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet

Deleting assssskkkk/Asset1/Zadolzhniki 29 d 10 05 2024.xlsx...

Помощь Поиск 10°C Smoke ENG 19:56 27.09.2024

Upload:

The screenshot shows the Google Cloud Storage 'Bucket details' page for a bucket named 'assssskkkk'. The left sidebar includes 'Overview', 'Buckets', 'Monitoring', and 'Settings'. The main area displays bucket metadata: Location (us), Storage class (Standard), Public access (Not public), and Protection (Soft Delete). Below this are tabs for 'OBJECTS', 'CONFIGURATION', 'PERMISSIONS', 'PROTECTION', 'LIFECYCLE', 'OBSERVABILITY', 'INVENTORY REPORTS', and 'OPERATIONS'. A 'Folder browser' sidebar shows a folder structure: 'assssskkkk' > 'Asse1' > 'Asse1/'. The main content area lists objects in 'Asse1/': 'Asse1_Zadolzhniki 29 d 10 05 20...' (11 KB, application/vnd.openxmlformats-officedocument.spreadsheetml.sheet) and 'Пед практика 2024-2025 (1).xlsx' (19.7 KB, application/vnd.openxmlformats-officedocument.spreadsheetml.sheet). A success message '1 file successfully uploaded' is visible. An 'Uploads and project6 operations' sidebar shows a completed upload of 'Asse1_Zadolzhniki 29 d 10 05 2024.xlsx'.

Questions:

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

To make a bucket in Google Storage, I wrote "bucket" in the search engine on the home page. Then I could make folders and files. There are options to make, delete, move files and control who can see them (public or private).

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

The difference between a public and a private is that a public allows all people on the Internet to view its contents without a password, while a private only those who have permission.

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

Here you just need to either make the file publicly available to everyone or restrict access only to certain users.

6.1 Access BigQuery in the Google Cloud Console.

The screenshot shows the Google Cloud Console with the project 'project6' selected. The left sidebar has 'BigQuery Studio' selected under 'Analysis'. The main area displays a 'Welcome to BigQuery Studio!' message and a 'Recently opened' section with three recent queries: 'assel1111', 'assel_dataset', and 'assel123', all from the US project 'project6-436912'. Below this is a 'Try with sample data' section for the 'Google Trends Demo Query', which generates top search terms in the US from a public dataset. A 'Job history' section is also visible at the bottom.

6.2 Create a dataset and table by importing a sample dataset provided by Google.

The screenshot shows the Google Cloud Console with the project 'project6' selected. The left sidebar has 'Explorer' selected. The main area shows an 'Untitled query' window with the following SQL code:

```
-- This query shows a list of the daily top Google Search terms.
SELECT
  refresh_date AS Day,
  term AS Top_Term,
  -- These search terms are in the top 25 in the US each day.
  rank,
FROM `bigquery-public-data.google_trends.top_terms`
WHERE
  rank = 1
  -- Choose only the top term each day.
  AND refresh_date >= DATE_SUB(CURRENT_DATE(), INTERVAL 2 WEEK)
  -- Filter to the last 2 weeks.
```

The 'Query results' section shows a table with the following data:

Day	Top_Term	rank
2024-09-25	Brett Favre	1
2024-09-24	Jaguars vs Bills	1
2024-09-23	Chiefs vs Falcons	1
2024-09-22	Michigan football	1
2024-09-21	Nebraska football	1

6.3.1 Data filtering:

```
SELECT * FROM `bigquery-public-data.google_trends.top_terms` WHERE rank = 2;
```

The screenshot shows the Google Cloud BigQuery web interface. On the left, the 'Explorer' sidebar lists datasets like 'faa', 'fcc_political_ads', 'fda_drug', and 'google_trends'. Under 'google_trends', there are sub-folders for 'international_top_rising_terms', 'international_top_terms', 'top_rising_terms', and 'top_terms'. A 'SUMMARY' section indicates 'Nothing currently selected'. The main area displays a query titled 'Untitled query' with the following code:

```

1 SELECT *
2 FROM `bigquery-public-data.google_trends.top_terms` WHERE rank = 2;
3
4
5
6
7

```

The 'Query results' section shows a table with the following data:

Row	score	rank	refresh_date	dma_name	dma_id	term	week
1	null	2	2024-09-21	Portland-Auburn ME	500	Matt Gaetz	2019-11-10
2	null	2	2024-09-21	Portland-Auburn ME	500	Matt Gaetz	2019-12-15
3	null	2	2024-09-21	Portland-Auburn ME	500	Matt Gaetz	2019-12-22
4	null	2	2024-09-21	Portland-Auburn ME	500	Matt Gaetz	2020-01-05
5	null	2	2024-09-21	Portland-Auburn ME	500	Matt Gaetz	2020-01-26

Job history and other navigation elements are visible at the bottom.

6.3.2 Data aggregation:

```

SELECT dma_name,COUNT(*) AS line_count
FROM `bigquery-public-data.google_trends.top_terms`
GROUP BY dma_name

```

The screenshot shows the Google Cloud BigQuery web interface. The 'Explorer' sidebar and overall layout are similar to the previous screenshot. The main area displays a query titled 'Untitled query' with the following code:

```

1 SELECT dma_name,COUNT(*) AS line_count
2 FROM `bigquery-public-data.google_trends.top_terms`
3 GROUP BY dma_name
4 ORDER BY line_count DESC;
5
6
7
8
9

```

The 'Query results' section shows a table with the following data:

Row	dma_name	line_count
1	Portland-Auburn ME	202950
2	Greenville-New Bern-Washingto...	202950
3	Wilmington NC	202950
4	Pittsburgh PA	202950
5	Fl. Wayne IN	202950

Job history and other navigation elements are visible at the bottom.

6.3.4 Sorting data

```

SELECT dma_name,COUNT(*) AS line_count
FROM `bigquery-public-data.google_trends.top_terms`
GROUP BY dma_name
ORDER BY line_count DESC;

```

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Untitled query

```
1 SELECT dma_name,COUNT(*) AS line_count
2 FROM `bigquery-public-data.google_trends.top_terms`
3 GROUP BY dma_name
4 ORDER BY line_count DESC;
```

Query results

dma_name	line_count
Portland-Auburn ME	202950
Greenville-New Bern-Washingto...	202950
Wilmington NC	202950
Pittsburgh PA	202950
Wayne IN	202950

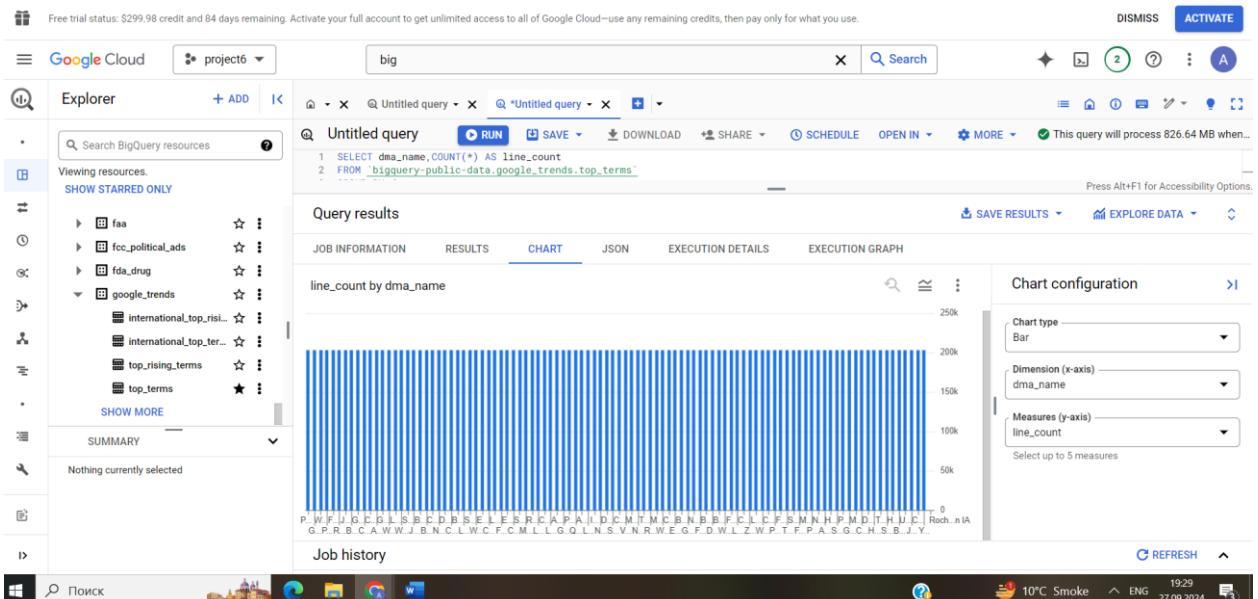
Job history

Refresh

6.4 Visualize the results using Google Data Studio or another visualization tool:

Using this SQL query

```
SELECT dma_name,COUNT(*) AS line_count
FROM `bigquery-public-data.google_trends.top_terms`
GROUP BY dma_name
ORDER BY line_count DESC;
```



3. Questions:

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

First, I went to the Google Cloud Console, then I selected a project and found BigQuery through a search engine. Then I clicked on the name of the project to open its contents. I created a dataset, entered data sets and created my own dataset.

- o How did you write and execute SQL queries in BigQuery?

I used a ready-made table provided by the Google platform itself and entered SQL queries on this base

- o What insights were you able to derive from the data analysis

I think that using BigQuery it is possible to work quickly and optimally with databases and displays their graphical representations