Cloud Computing

Assignment 2

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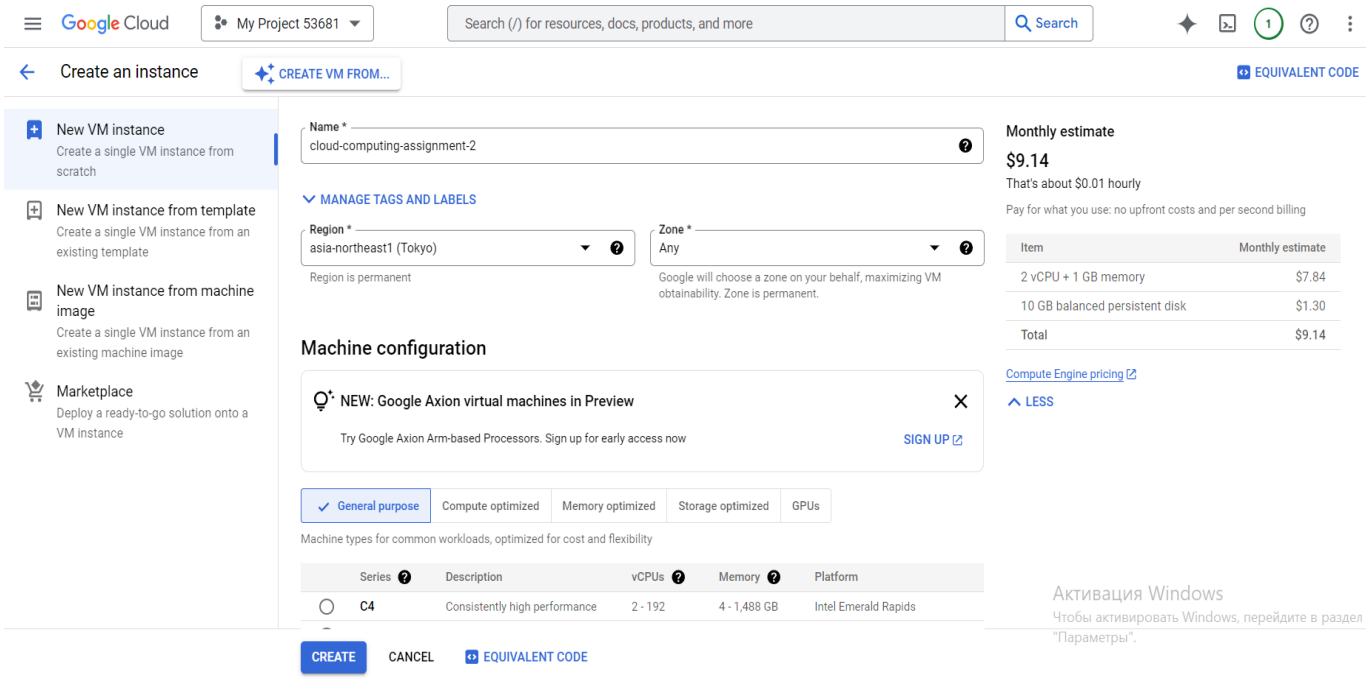
Introduction

The goal of this project is to obtain firsthand experience with Google Cloud services by investigating and configuring important components such as virtual machines (VMs), storage solutions, and networking. Students will set up a VM instance, connect to it, and install a web server to provide a basic HTML website. They will also create a Cloud Storage bucket to better understand file storage management and implement object lifecycle management. The task also includes setting up a Virtual Private Cloud (VPC) to enable safe and efficient networking for their VM. Students' grasp of cloud architecture and its applications will improve as they describe the processes involved and the configurations established. Finally, this project seeks to equip students with practical abilities for deploying and managing resources in Google Cloud, preparing them for real-world cloud computing scenarios.

Virtual Machines in Google Cloud

- VM Creation



Screenshot above showcases VM's name, "cloud-computing-assignment2", chosen region (Tokyo), zone and purpose of the machine (General purpose).

	Series	Description	vCPUs	Memory	Platform
○	C4	Consistently high performance	2 - 192	4 - 1,488 GB	Intel Emerald Rapids
○	N4	Flexible & cost-optimized	2 - 80	4 - 640 GB	Intel Emerald Rapids
○	C3	Consistently high performance	4 - 192	8 - 1,536 GB	Intel Sapphire Rapids
○	C3D	Consistently high performance	4 - 360	8 - 2,880 GB	AMD Genoa
◉	E2	Low cost, day-to-day computing	0.25 - 32	1 - 128 GB	Based on availability
○	N2	Balanced price & performance	2 - 128	2 - 864 GB	Intel Cascade and Ice Lake
○	N2D	Balanced price & performance	2 - 224	2 - 896 GB	AMD EPYC
○	T2A	Scale-out workloads	1 - 48	4 - 192 GB	Ampere Altra Arm
○	T2D	Scale-out workloads	1 - 60	4 - 240 GB	AMD EPYC Milan
○	N1	Balanced price & performance	0.25 - 96	0.6 - 624 GB	Intel Skylake

Machine type

Choose a machine type with preset amounts of vCPUs and memory that suit most workloads.
Or, you can create a custom machine for your workload's particular needs. Learn more

PRESET CUSTOM

e2-small (2 vCPU, 1 core, 2 GB memory)

Chosen machine type is e2-small, because for this assignment there is no need for something with higher memory, optimization or performance.

Boot disk

Name	cloud-computing-assignment-2
Type	New balanced persistent disk
Size	10 GB
Snapshot schedule	No schedule selected
License type	Free
Image	Debian GNU/Linux 12 (bookworm)

CHANGE

Chosen OS is Debian, because it was a default setting.

Firewall

Add tags and firewall rules to allow specific network traffic from the Internet

- [x] Allow HTTP traffic
- [x] Allow HTTPS traffic
- [ ] Allow Load Balancer Health Checks

Configuration of the Firewall for allowed SSH traffic.

After these steps VM Instance can be created.

- Connection

After pressing on “SSH” button it is possible to install a web server.

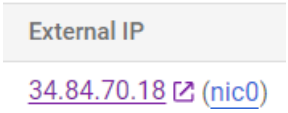
```
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
gaukhar_satbekova@cloud-computing-assignment-2:~$ sudo apt update && sudo apt install apache2
```

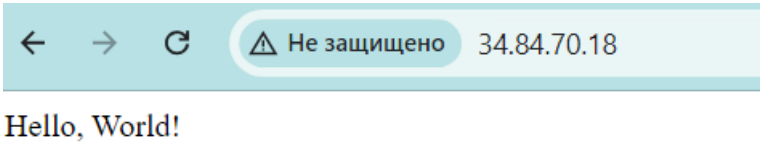
I decided to install Apache.

```
gaukhar_satbekova@cloud-computing-assignment-2:~$ echo "Hello, World!" | sudo tee /var/www/html/index.html
Hello, World!
```

The web page should display “Hello, World!” message.



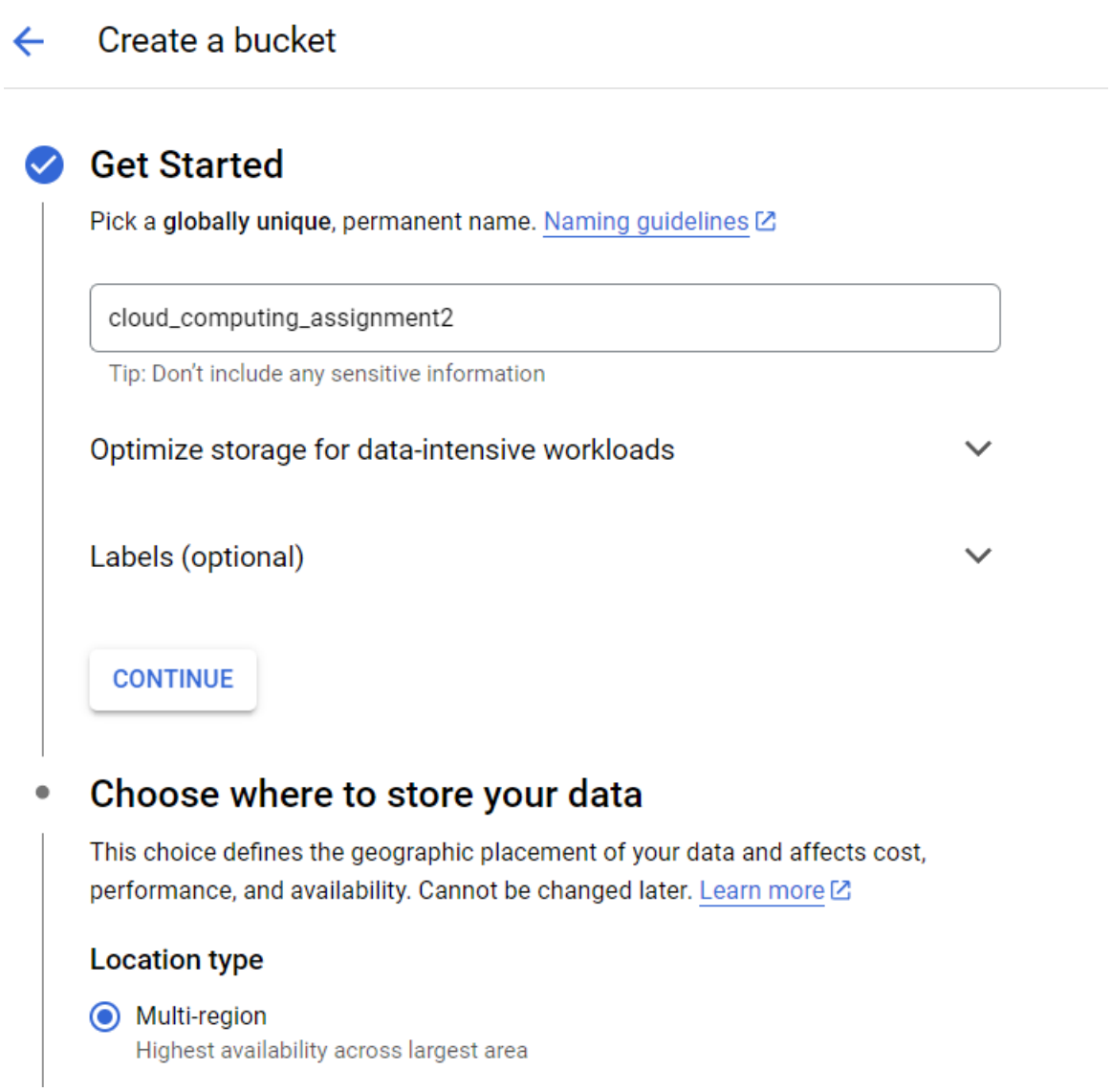
External IP of the VM should display the message from above.



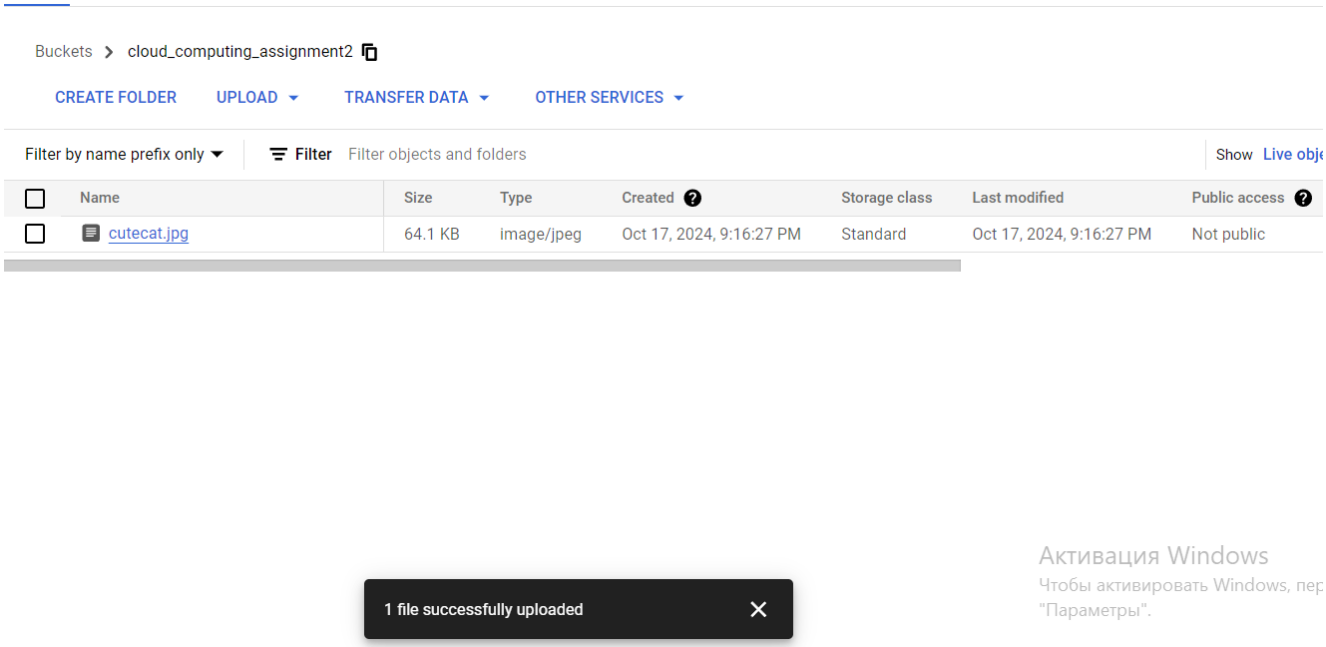
It can be seen from this screenshot that everything works properly.

Storage Solutions in Google Cloud

- Bucket Creation

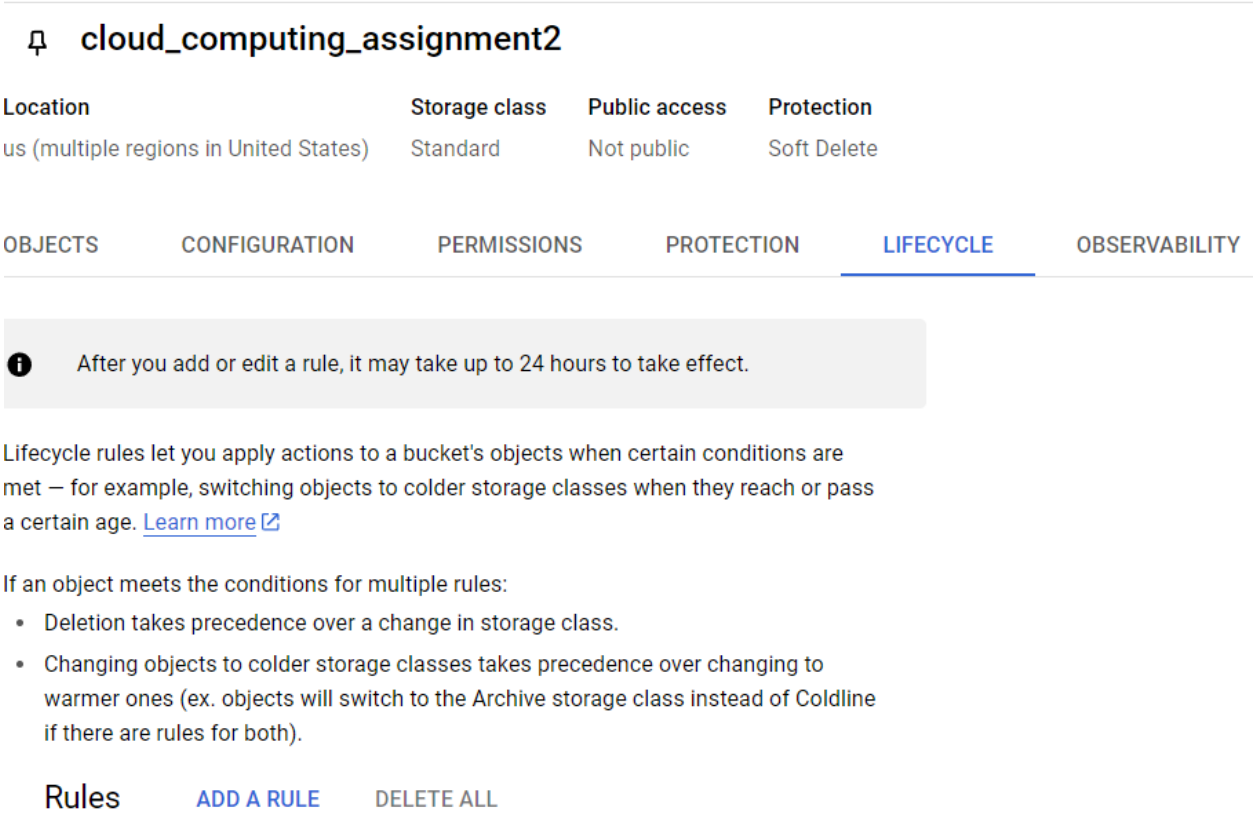


Creating bucket named "cloud_computing_assignment2" with Multi-region location type. This bucket is set to be private.

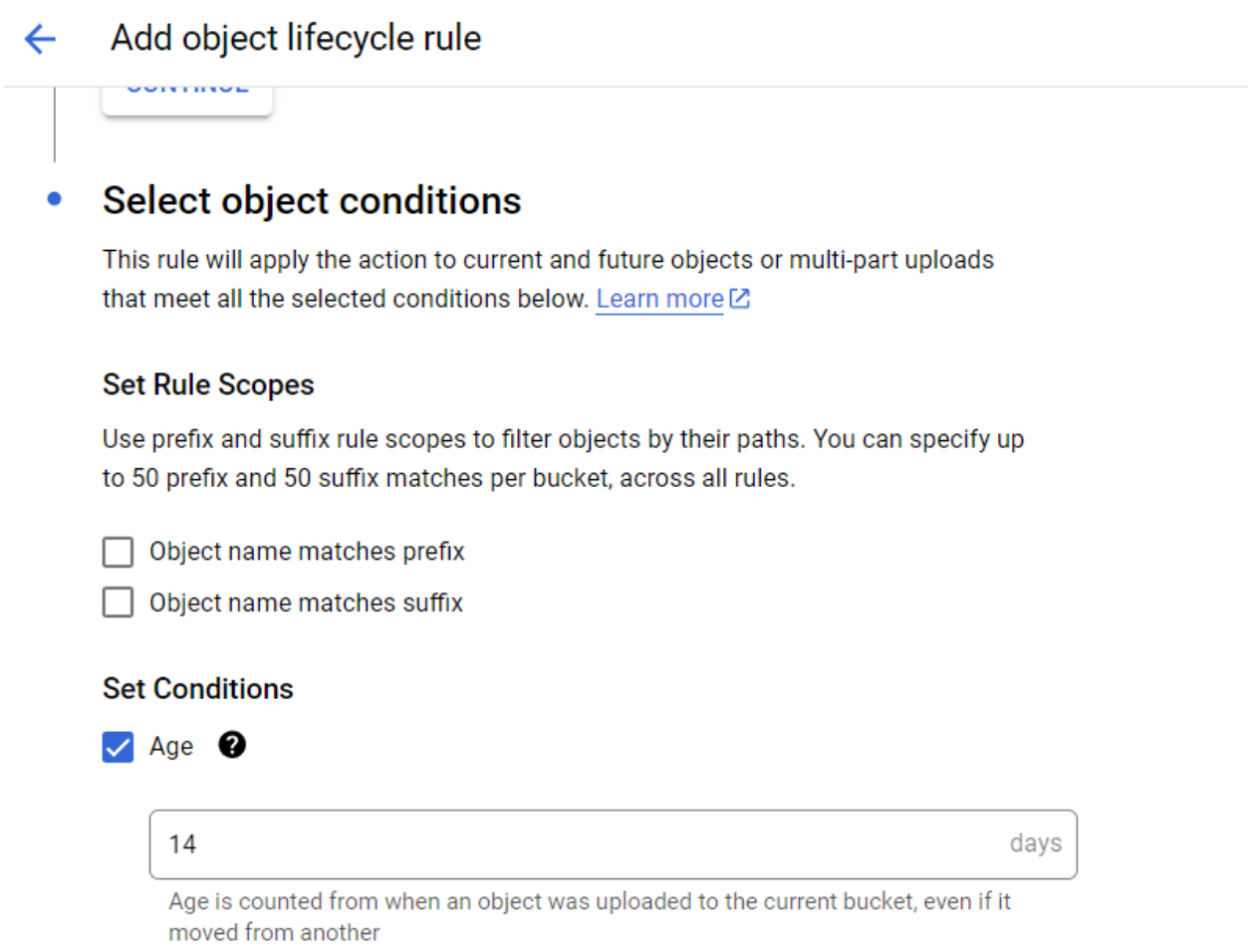


One JPEG file named “cutecat” is uploaded to the bucket.

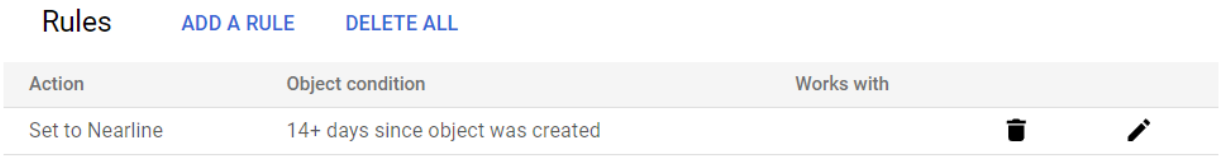
- Lifecycle management



Going to “Lifecycle” tab to add the lifecycle rule.



Adding the “Age” condition to the rule and setting it to 14 days.



New rule with Age condition is added.

- Findings

Cloud Storage in Google Cloud has a wide range of applications, making it a useful tool for many business requirements. One such application is data backup and archiving. Organizations may securely store vital files, databases, and other critical data, ensuring that it is always available and protected from local hardware failures. Additionally, historical data that is not regularly accessible can be archived while remaining stored for compliance or future reference.

Another common use case for Cloud Storage is media hosting. Cloud Storage can let websites, mobile applications, and media services store photographs, videos, and other media data. This enables scalable and high-performance delivery to users, particularly when combined with a content delivery network (CDN).

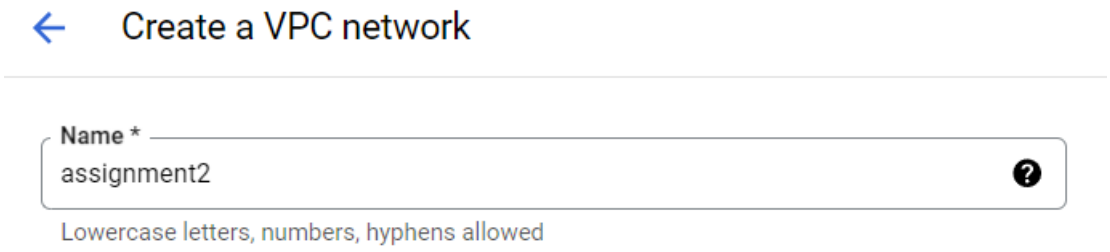
Disaster recovery is another important area where Cloud Storage thrives. Organizations can replicate their data across many geographic locations to assure availability even in the case of a

disaster, acting as a central repository for restoring key information and ensuring business continuity.

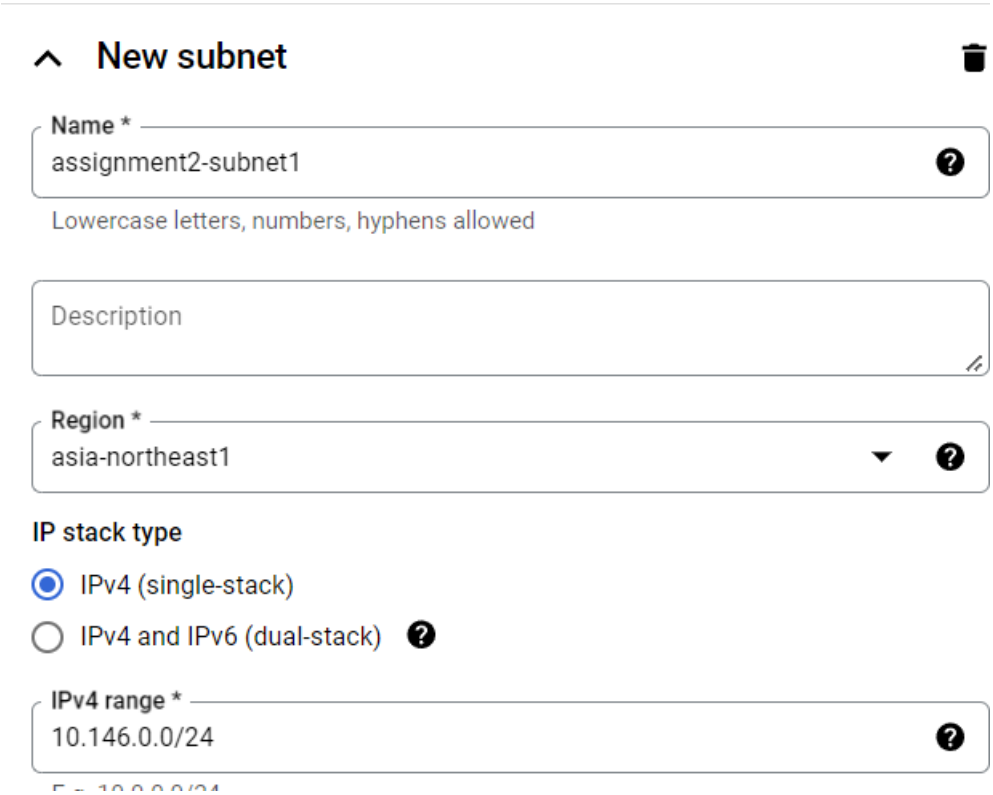
The advantages of lifecycle management in Cloud Storage are especially visible in cost optimization. Cloud Storage has several storage classes, each with its own pricing structure, including Standard, Nearline, Coldline, and Archive. Lifecycle management automates the transfer of data between different storage layers based on usage patterns. For example, infrequently accessed files can be automatically relocated to a lower-cost tier, such as Nearline or Coldline, substantially lowering storage costs. Lifecycle management also allows for the automatic destruction of files after a specified time period, which can help enterprises comply with data retention requirements or just clear up outdated information. This automatic procedure improves storage efficiency and reduces costs.

Networking in Google Cloud

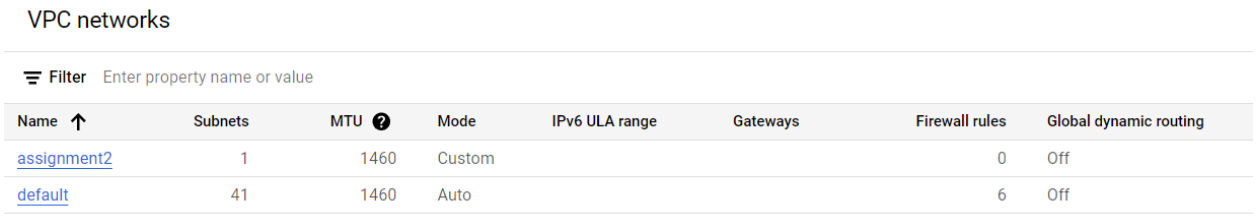
- VPC setup



Creating a new VPC network named “assignment2”.



Adding new subnet to during VPC configuration named “assignment2-subnet1”. Setting the same region as VM’s region and IPv4 range that includes VM’s private IP.



Name	Subnets	MTU	Mode	IPv6 ULA range	Gateways	Firewall rules	Global dynamic routing
assignment2	1	1460	Custom			0	Off
default	41	1460	Auto			6	Off

Created new VPC network.

Create a firewall rule

Priority *
1006

Priority can be 0 - 2147483643.

Description

Direction of traffic

- (•) Ingress
- ( ) Egress

Action on match

- (•) Allow
- ( ) Deny
- ( ) Go to next
- ( ) Proceed to L7 inspection

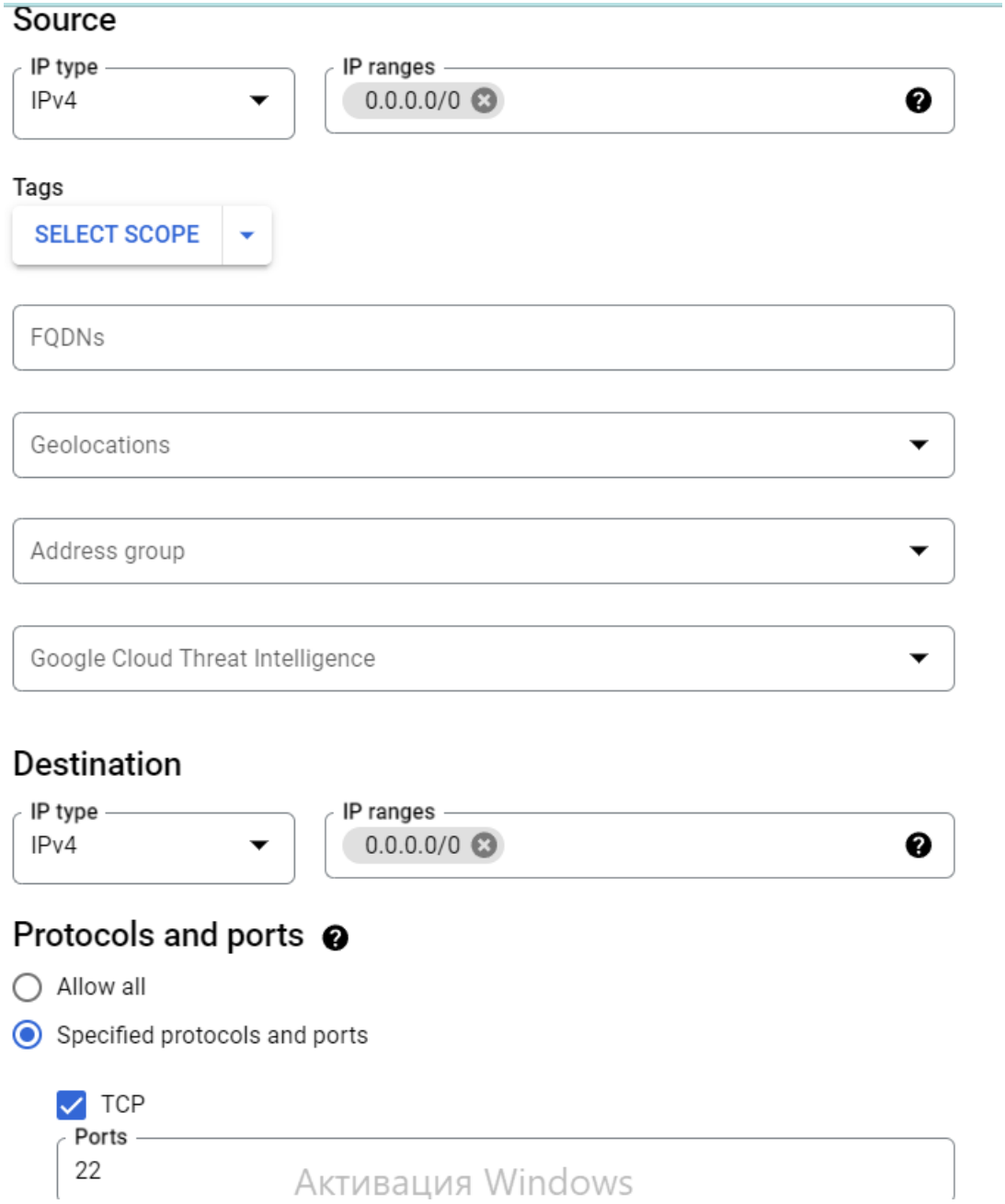
Logs

Turning on firewall logs can generate a large number of logs which can increase costs in Logging. Learn more

- ( ) On
- (•) Off

Target

- (•) Apply to all
- ( ) Service accounts
- ( ) Secure tags



Creating “allow-ssh” Firewall rule.

Create a firewall rule

Priority *
1007

Priority can be 0 - 2147483643.

Description

Direction of traffic

- (•) Ingress
- ( ) Egress

Action on match

- (•) Allow
- ( ) Deny
- ( ) Go to next
- ( ) Proceed to L7 inspection

Logs

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- (•) Apply to all
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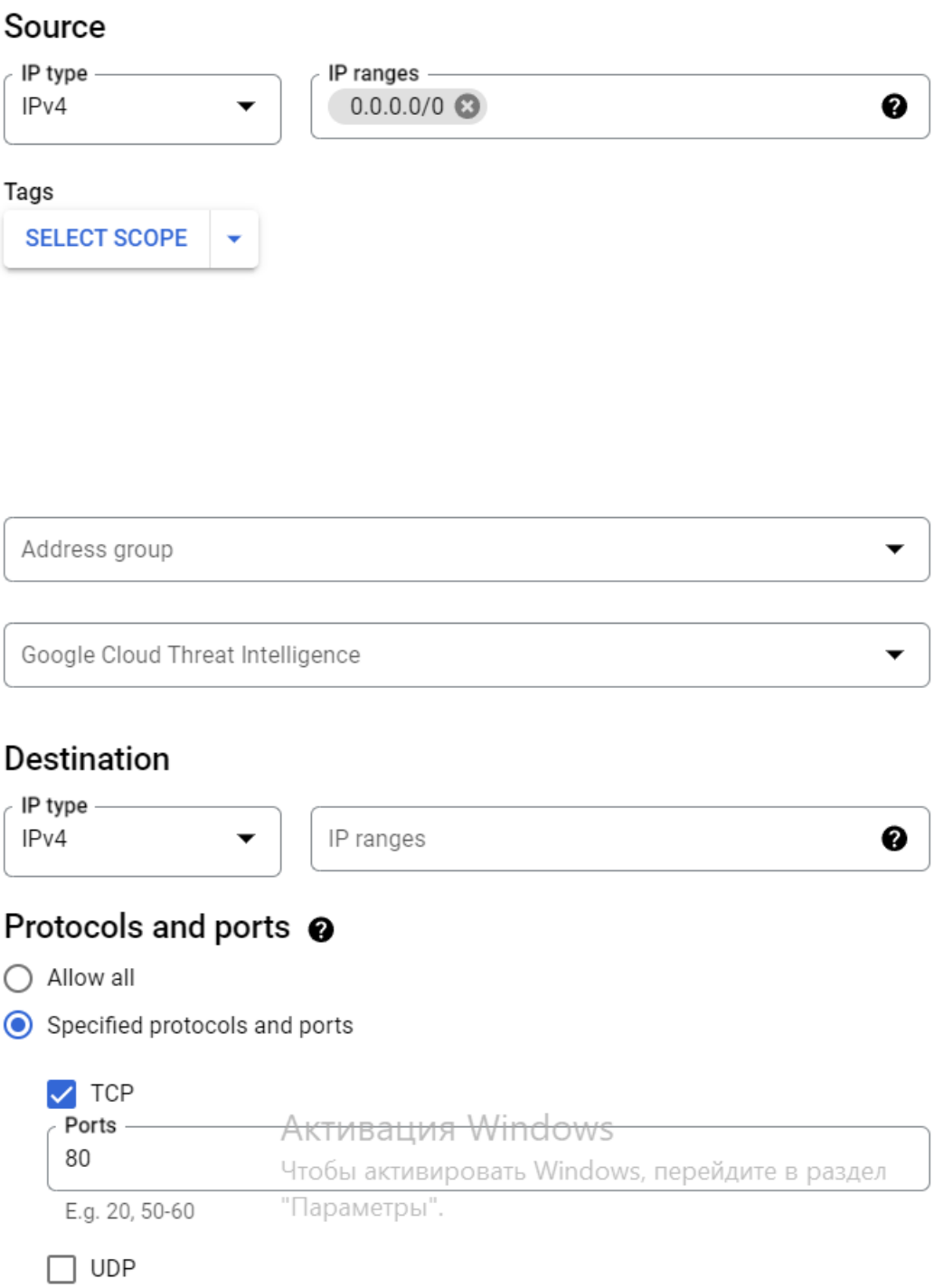

Creating “allow-http” Firewall rule.

☐	1006	–	Ingress	Appl...	**IPv4 ranges:** 0.0.0.0/0	–	tcp:22	Allow
☐	1007	–	Ingress	Appl...	**IPv4 ranges:** 0.0.0.0/0	–	tcp:80	Allow

Created Firewall rules.

Conclusion

This assignment's major takeaways include the practical skills needed to set up and administer critical Google Cloud services like as virtual machines, storage solutions, and networking setups. Students acquired hands-on experience by establishing and configuring a virtual machine, connecting to it via SSH, and installing a web server to host a basic HTML website. They also learned how to establish and manage Cloud Storage buckets, as well as how to configure object lifecycle management to reduce storage costs and increase productivity. Configuring a Virtual Private Cloud (VPC) also taught me about safe networking techniques and the need of firewall rules in protecting resources.

The possible uses for these Google Cloud services are numerous and diverse. Organizations can use virtual machines (VMs) to provide scalable computing resources for applications, website hosting, and data processing. Cloud Storage is a dependable alternative for storing massive amounts of data with simple access and management features. Networking capabilities, such as VPCs, guarantee that cloud resources are securely connected while also providing flexibility in resource distribution and administration. Overall, knowing these services provides students and professionals with the core knowledge required to create and deploy cloud-based solutions for a variety of business purposes.