

# Cloud Computing Assignment Report

## GCP Setup with Auto-Scaling & Security

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### Introduction





This report documents the process of setting up a Virtual Machine (VM) in Google Cloud Platform (GCP), implementing auto-scaling policies, and applying security measures such as IAM roles and firewall rules. I also tested auto-scaling by generating CPU load and observed how instances were created and deleted dynamically.

### Creating a Virtual Machine (VM)

To start, I created a virtual machine in GCP by navigating to Compute Engine > VM Instances and clicking "Create Instance."

#### Configuration Details:

- Name: cloud-assignment-02
- Region: asia-south1-c
- Machine Type: E2
- Boot Disk: Ubuntu 20.04 LTS
- Networking: Allowed HTTP & HTTPS traffic

<input type="checkbox"/>	Status	Name 	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>		<a href="#">cloud-assignment-02</a>	asia-south1-c			10.160.0.3 <a href="#">(nic0)</a>	<a href="#">34.93.216</a> <a href="#">(nic0)</a>	SSH  

### Configuring Auto-Scaling

To enable auto-scaling, I created a Managed Instance Group (MIG) using an Instance Template.

#### 1. Creating an Instance Template

1. Compute Engine > Instance Templates.
2. Clicked "Create Instance Template" and configured it similarly to my VM.
3. Saved the template.

Instance temp... [CREATE INSTANCE TEMPLATE](#) [REFRESH](#)

Instance templates are saved VM configurations used to create identical VMs, either individually or as part of managed instance groups. [Learn more](#)

Filter Filter instance templates					
<input type="checkbox"/>	Name ↑	Machine type	Image	Disk type	Actions
<input type="checkbox"/>	<a href="#">autoscale-cloud-assignment-02</a>	e2-medium	ubuntu-2004-focal-v20250213	Balanced persistent disk	

## 2. Creating a Managed Instance Group

1. Compute Engine > Instance Groups.
2. Clicked "Create Instance Group", selected Managed Instance Group, and attached my instance template.
3. Set the auto-scaling policy:
  - Scale based on CPU utilization.
  - Target CPU usage: 60%.
  - Minimum instances: 1, Maximum instances: 5.

Instance groups [CREATE INSTANCE GROUP](#) [REFRESH](#) [DELETE](#)

Instance groups are collections of VM instances that use load balancing and automated services, like autoscaling and autohealing. [Learn more](#)

Filter Enter property name or value								
<input type="checkbox"/>	Status	Name ↑	Instances	Template	Group type	Creation time	Recommendation	Autoscaling
<input type="checkbox"/>	✓	<a href="#">instance-group-1</a>	1	<a href="#">autoscale-cloud-assignment-02 (Regional)</a>	Managed	Mar 2, 2025, 12:40:48 AM UTC+05:30		On: Target CPU utilization 60

## Configuring Security

### 1. Setting Up Firewall Rules

To control network access, I configured firewall rules:

- Created a new firewall rule under VPC Network > Firewall.
- Allowed incoming HTTP & HTTPS traffic on ports 80 and 443.

Firewall policies [CREATE FIREWALL POLICY](#) [CREATE FIREWALL RULE](#)

[LEARN](#)

[REFRESH](#) [CONFIGURE LOGS](#) [DELETE](#)

Filter Enter property name or value									
<input type="checkbox"/>	Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network	
<input type="checkbox"/>	<a href="#">allow-http-traffic</a>	Ingress	Apply to all	IP ranges:	tcp:80, 443	Allow	1000	<a href="#">default</a>	▼

## 2. Setting IAM Roles for Restricted Access

To manage permissions securely:

- Went to IAM & Admin > IAM.
- There were assigned roles:
  - Compute Viewer (read-only access).
  - Compute Admin (full control).

IAM

ALLOW DENY RECOMMENDATIONS HISTORY

Permissions for project "My First Project"

These permissions affect this project and all of its resources. [Learn more](#)

☐ Include Google-provided role grants

VIEW BY PRINCIPALS VIEW BY ROLES

GRANT ACCESS REMOVE ACCESS

Filter Enter property name or value

Type	Principal	Name	Role	Security insights
<input type="checkbox"/>	573113064924-compute@developer.gserviceaccount.com	Compute Engine default service account	Editor	
<input type="checkbox"/>	b22cs023@iitj.ac.in	Harshika Arya (B22CS023)	Owner	

Example of giving (read) access to another user:

VIEW BY PRINCIPALS VIEW BY ROLES

GRANT ACCESS REMOVE ACCESS

Filter Enter property name or value

Type	Principal	Name	Role	Security insights
<input type="checkbox"/>	573113064924-compute@developer.gserviceaccount.com	Compute Engine default service account	Editor	
<input type="checkbox"/>	b22cs023@iitj.ac.in	Harshika Arya (B22CS023)	Owner	
<input type="checkbox"/>	b22cs046@iitj.ac.in	Sanika Sanjay Narmitwar (B22CS046)	Viewer	

Policy updated

## Testing Auto-Scaling

1. Went to Compute Engine > Instance Groups, selected an instance, and clicked SSH.
2. To generate CPU load, I installed the stress tool:

***sudo apt update***

***sudo apt install stress -y***

3. For Simulating High CPU Load, ran the following command:

***stress --cpu 4 --timeout 300***

4. Observing Auto-Scaling Behavior

- Checked Compute Engine > Instance Groups and saw new instances were being created.
- After 5 minutes, instances were automatically removed as CPU usage dropped.

VM instances									
SUSPEND STOP START / RESUME REMOVE FROM GROUP DELETE									
Filter Enter property name or value									
<input type="checkbox"/>	Status	Name ↑	Creation Time	Template	Per instance config	Internal IP	External IP	Health Check Status	Connect
<input type="checkbox"/>	✓	<a href="#">instance-group-1-0k65</a>	Mar 2, 2025, 1:32:40 AM UTC+05:30	<a href="#">autoscale-cloud-assignment-02 (Regional)</a>		10.160.0.5 (nic0)	<a href="#">34.47.150.234</a> <a href="#">↗</a>		SSH ▾
<input type="checkbox"/>	✓	<a href="#">instance-group-1-bvh8</a>	Mar 2, 2025, 12:41:00 AM UTC+05:30	<a href="#">autoscale-cloud-assignment-02 (Regional)</a>		10.160.0.4 (nic0)	<a href="#">34.93.70.173</a> <a href="#">↗</a>		SSH ▾
<input type="checkbox"/>	🔄	<a href="#">instance-group-1-l3p9</a>	Mar 2, 2025, 1:34:32 AM UTC+05:30	<a href="#">autoscale-cloud-assignment-02 (Regional)</a>		(nic0)	None		SSH ▾
<input type="checkbox"/>	✓	<a href="#">instance-group-1-tt9z</a>	Mar 2, 2025, 1:33:48 AM UTC+05:30	<a href="#">autoscale-cloud-assignment-02 (Regional)</a>		10.160.0.6 (nic0)	<a href="#">34.93.4.215</a> <a href="#">↗</a>		SSH ▾
<input type="checkbox"/>	🔄	<a href="#">instance-group-1-tvpm</a>		<a href="#">autoscale-cloud-assignment-02 (Regional)</a>					

OVERVIEW

DETAILS

MONITORING

ERRORS

Instances by status

5 instances

3

2

Instance by health

Not configured

Autohealing off. [Configure](#)

Autoscaling

On (min 1, max 5)

Based on 1 metric and 0 schedules

Status

Updating

Creation Time

Mar 2, 2025, 12:40:48 AM UTC+05:30

Description

Target running size

5

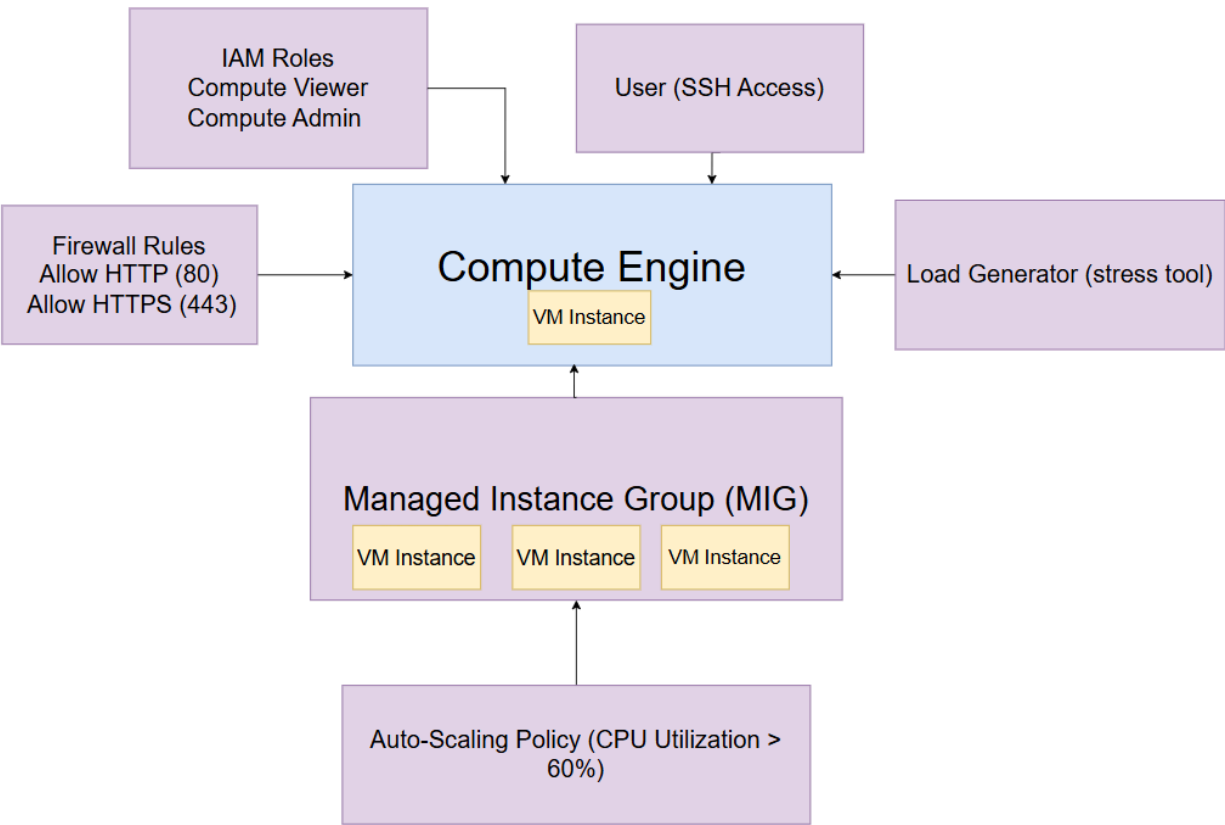
Template

[autoscale-cloud-assignment-02 \(Regional\)](#)

Location

asia-south1-c

# Architecture Design



**GitHub Repo Link:** [Repo for Cloud Assignment 02](#)

**Video Link:** [Video Walkthrough of Assignment 02](#)