DevOps Project BankApp GCP ALB Instance-Group and AutoScaling

By Ritesh Kumar Singh

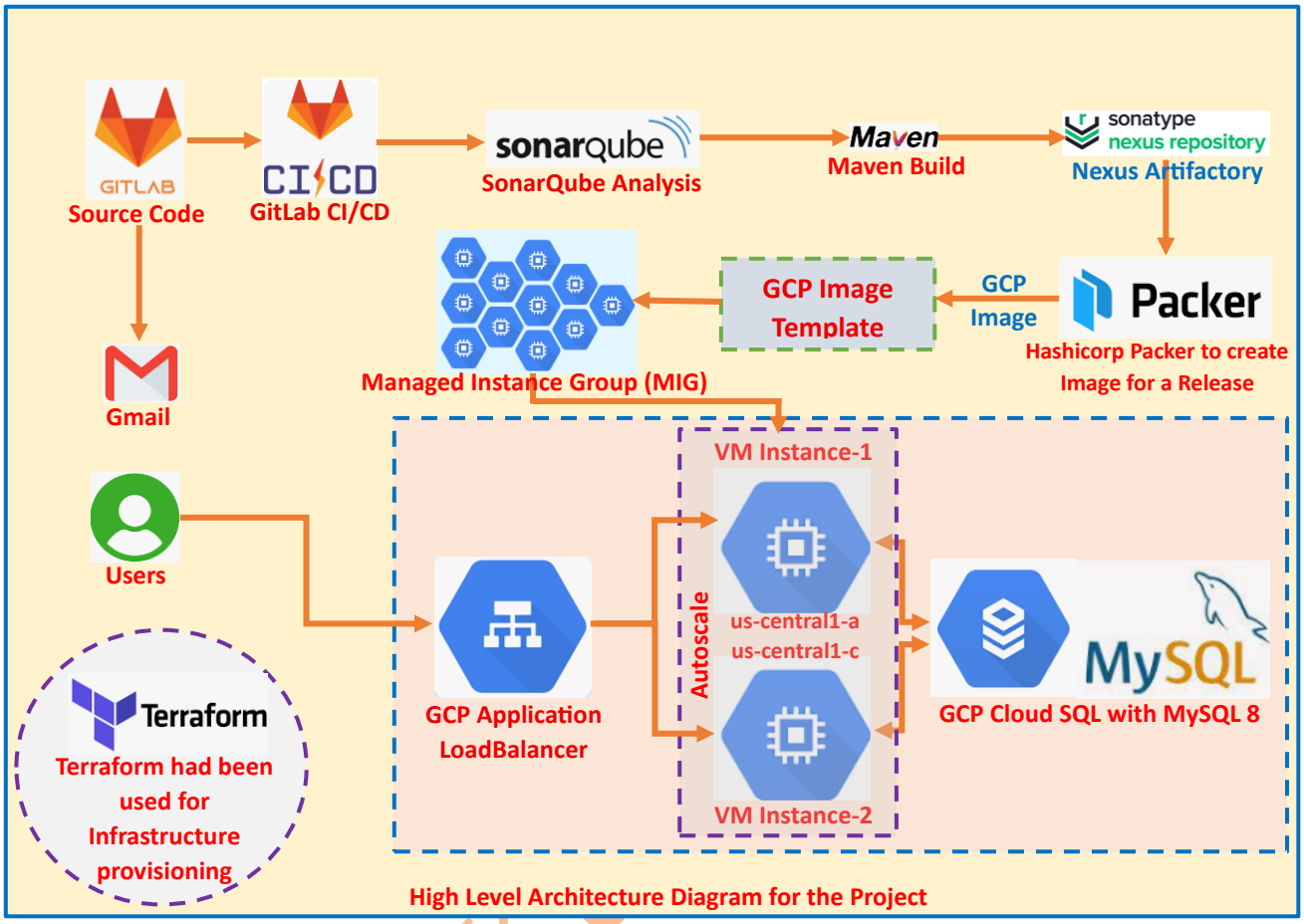
Email Address: - riteshkumarsingh9559@gmail.com

LinkedIn: - https://www.linkedin.com/in/ritesh-kumar-singh-41113128b/

GitHub: - https://github.com/singhritesh85

या कुन्देन्दुतुषारहारधवला या शुभ्रवस्त्रावृता
या वीणावरदण्डमण्डितकरा या श्वेतपद्मासना।
या ब्रह्माच्युत शंकरप्रभृतिभिर्देवैः सदा वन्दिता
सा मां पातु सरस्वती भगवती निःशेषजाड्यापहा ॥

DevOps Project BankApp GCP ALB Instance-Group and AutoScaling



This project deals with creation of Infrastructure using terraform and GitLab had been used as CI/CD tool. For DNS I used Google Cloud DNS. Creation of DNS zone and installation of GitLab Server do not happen daily (not included in day-to-day activity) but for your reference I had provided here the terraform script for both to create the DNS Zone and to install the GitLab Server. To make this handy I provided the terraform script to create the DNS Zone and to install the GitLab Server in the GitHub Repo https://github.com/singhritesh85/DevOps-Project-BankApp-GCP-ALB-Autoscaling.git at the path **terraform-gcp-cloud-dns** and **terraform-gitlab-server** respectively. In this project SonarQube (installed on AWS EC2 Instance) had been used for code analysis, Maven used as build tool and Nexus (installed on AWS EC2 Instance) was used as an Artifactory. Hashicorp Packer was used to create the Image for a new Release. This image will be used to create a new GCP instance template and the newly created instance template will be updated with the existing instance-group (managed instance-group) and autoscaling. The Managed Instance-Group (MIG) will create VM-Instances which will autoscale by GCP Autoscaling. In this project for Autoscaling Signals I used CPU Utilization. Finally, the BankApp application starts running in the VM-Instances (which will be created using GCP Instances-Group). The user will access the BankApp application through Application LoadBalancer. The VM-Instances in which BankApp application was running acted as backend of this Application LoadBalancer. I created the GitLab-runner (installed on GCP VM-Instances), Instance-template, Instance-Group with Autoscaling and GCP Application LoadBalancer using the terraform script present at the path **terraform-gcp-global-autoscale-application-loadbalancer** in the GitHub Repo https://github.com/singhritesh85/DevOps-Project-BankApp-GCP-ALB-Autoscaling.git. The High-Level architecture diagram of the project is as shown in the screenshot attached above.

Ritesh Kumar Singh || Email Address: - riteshkumarsingh9559@gmail.com || LinkedIn: - https://www.linkedin.com/in/ritesh-kumar-singh-41113128b/ || GitHub: - https://github.com/singhritesh85

Terraform I installed on GCP VM-Instance and state file will be kept in Cloud storage bucket (In GCP Cloud storage bucket automatically enables state lock for terraform, you do not need to explicitly enable a separate state lock feature on the GCS bucket). In this project the state file for Cloud DNS Zone and state file for GCP Instance-template, GCP Instance-Group with Autoscaling and GCP Application LoadBalancer was kept in GCP cloud storage bucket and state file for creation of GitLab Server was kept in S3 Bucket. As I already mentioned it earlier that GitLab Server installation task or Cloud DNS Zone creation tasks does not comes under daily activity but for your reference I provided terraform script in GitHub Repo https://github.com/singhritesh85/DevOps-Project-BankApp-GCP-ALB-Autoscaling.git. As a part of disaster recovery, I had created the snapshots of EBS Volume attached to the GitLab Server using the Lifecycle Manager Policy and created the snapshots at 11:00 AM and 11:00 PM UTC (twice a day). The below steps and screenshot shown how I had executed the terraform script. Created AMI of SonarQube and Nexus Server twice a day (at 11:00 AM and 11:00 PM). The GitLab runner (installed on GCP VM-Instance) and VM-Instances on which BankApp Application was running, snapshots of its associated disk (boot disk or non-boot disk) were created twice a day using GCP snapshot schedules.

Initially when I created the Instance-template and Instance-Group with Autoscaling using terraform then I disabled the auto-healing in GCP Instance Group which I enabled it later at the time of GitLab CI/CD during the New-Release. Otherwise it will unnecessarily create new vm-instances and delete the old one as initially source-code was not deployed in the vm-instances.

```
#  auto_healing_policies {   ### I disable it here otherwise old instances gets deleted as health check fails and new Instances will be created.
#    health_check      = google_compute_health_check.autohealing.id
#    initial_delay_sec = 300
#  }
```

```
gcloud compute instance-groups managed update bankapp-instance-group --project=XXXX-XXXXXXX-2XXXX6 --health-check autohealing-health-check --initial-delay 300
 --instance-redistribution-type="PROACTIVE" --region=us-central1
```

Before running any terraform script I installed aws-cli on GCP VM-Instance and created an AWS IAM user with appropriate permission to create resources in AWS and provided IAM User's **ACCESS_KEY** and **SECRET_ACCESS_KEY** using the command **aws configure** which is shown in the screenshot attached below.

To install aws cli I installed first python3.9 as shown in the screenshot attached below.

```
[root@terraform-server ~]# yum install -y python3.9
```

```
[root@terraform-server ~]# ln -s /usr/bin/python3.9 /usr/bin/python
```

```
[root@terraform-server ~]# python --version
Python 3.9.20
```

Then installed aws-cli using the commands as shown below.

curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"

unzip awscliv2.zip

sudo ./aws/install

```
[root@terraform-server ~]# cat ~/.bashrc
# .bashrc

# User specific aliases and functions

alias rm='rm -i'
alias cp='cp -i'
alias mv='mv -i'

# Source global definitions
if [ -f /etc/bashrc ]; then
        . /etc/bashrc
fi

PATH="$PATH:/usr/local/bin"
[root@terraform-server ~]# echo $PATH
/usr/local/sbin:/sbin:/bin:/usr/sbin:/usr/bin:/usr/local/bin:/root/bin
[root@terraform-server ~]# aws --version
aws-cli/1.41.14 Python/3.9.20 Linux/4.18.0-553.58.1.el8_10.x86_64 botocore/1.39.14
```

```
[root@terraform-server ~]# aws configure
AWS Access Key ID [                    ]:
AWS Secret Access Key [                    ]:
Default region name [          ]:
Default output format [      ]:
```

The first resource which I created in this project was GCP Cloud DNS.

```
[root@terraform-server ~]# gcloud --version
Google Cloud SDK 528.0.0
alpha 2025.06.20
beta 2025.06.20
bq 2.1.18
bundled-python3-unix 3.12.9
core 2025.06.20
gcloud-crc32c 1.0.0
gsutil 5.34
```

```
[root@terraform-server ~]# cat /etc/os-release
NAME="Rocky Linux"
VERSION="8.10 (Green Obsidian)"
ID="rocky"
ID_LIKE="rhel centos fedora"
VERSION_ID="8.10"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Rocky Linux 8.10 (Green Obsidian)"
ANSI_COLOR="0;32"
LOGO="fedora-logo-icon"
CPE_NAME="cpe:/o:rocky:rocky:8:GA"
HOME_URL="https://rockylinux.org/"
BUG_REPORT_URL="https://bugs.rockylinux.org/"
SUPPORT_END="2029-05-31"
ROCKY_SUPPORT_PRODUCT="Rocky-Linux-8"
ROCKY_SUPPORT_PRODUCT_VERSION="8.10"
REDHAT_SUPPORT_PRODUCT="Rocky Linux"
REDHAT_SUPPORT_PRODUCT_VERSION="8.10"
```

For Google Cloud Authentication and Authorization had been using gcloud auth login as shown in the screenshot attached below.

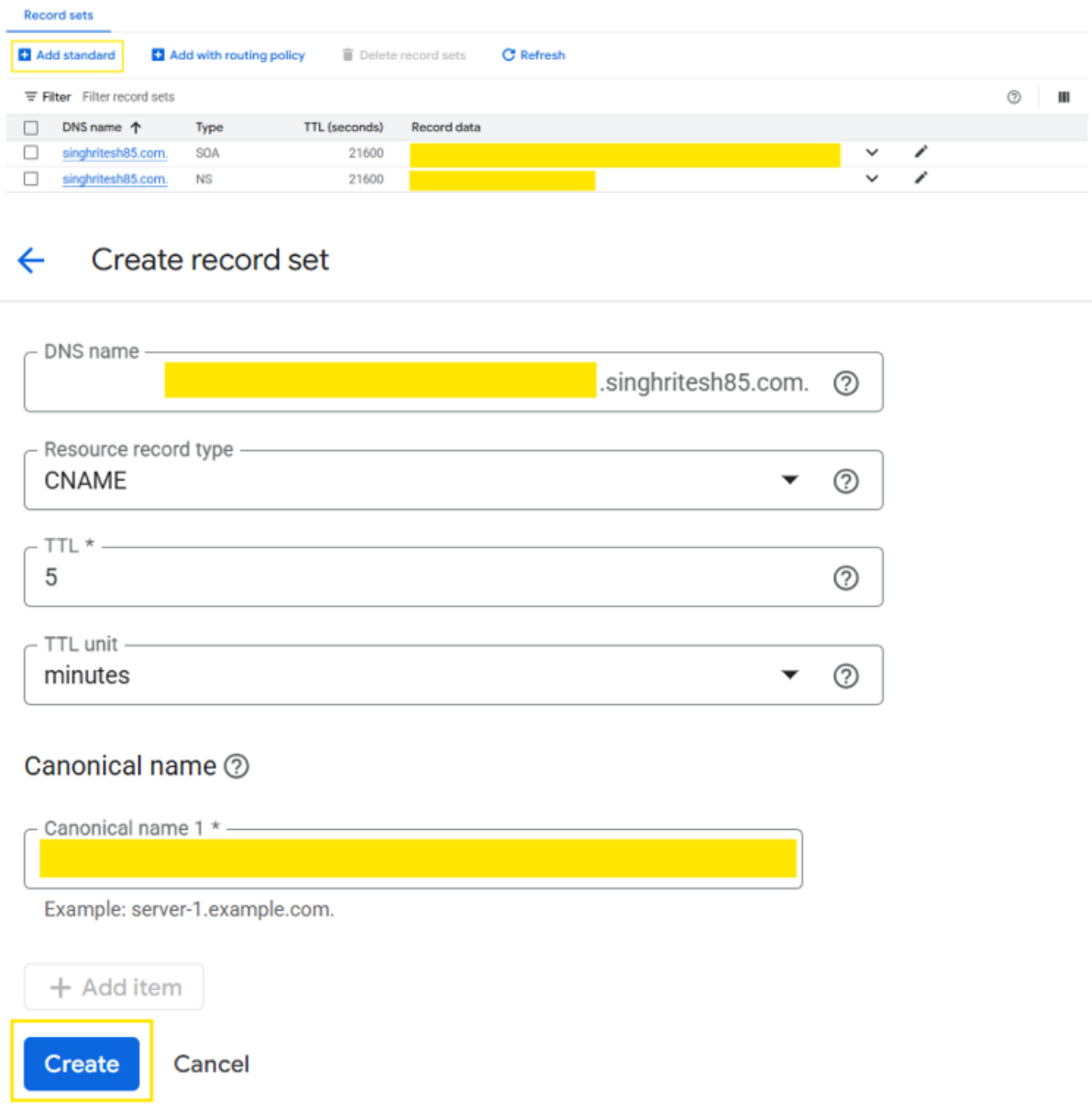
terraform init -------> initializes a working directory containing configuration files and installs plugins for required providers.

terraform validate --------> verify that terraform configuration file is correct or not

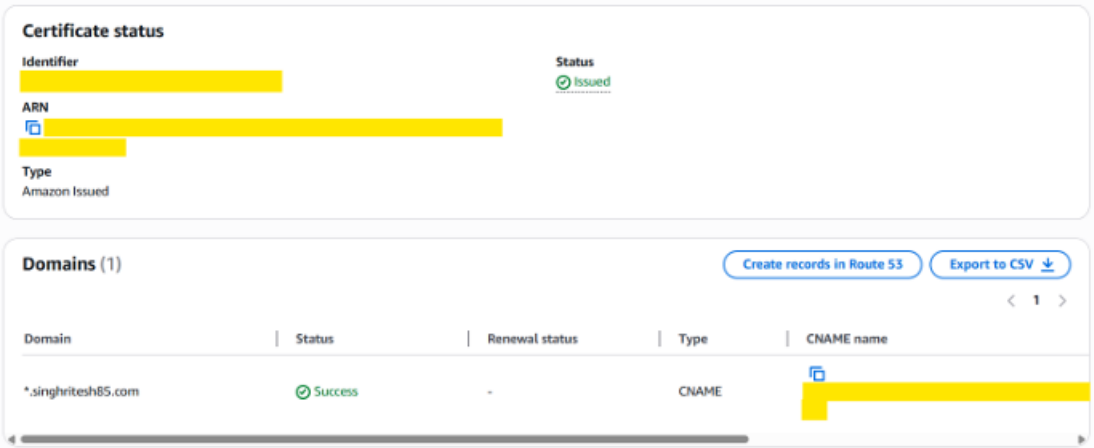
terraform plan ---------> Check which resources are going to be created.

Then you can run the command **terraform apply -auto-approve** -----> Finally, Create the resources.

Then I updated the Domain Name Provider's nameserver after that In AWS Account I requested a Public SSL Certificate and got it validated using the GCP Cloud DNS record set of Type CNAME as shown in the screenshot attached below.



Finally, the SSL Certificate in AWS Certificate Manager got issued as shown in the screenshot attached below.



terraform init -------> initializes a working directory containing configuration files and installs plugins for required providers.

terraform validate --------> verify that terraform configuration file is correct or not

terraform plan ---------> Check which resources are going to be created.

Then you can run the command **terraform apply -auto-approve** -----> Finally, Create the resources.

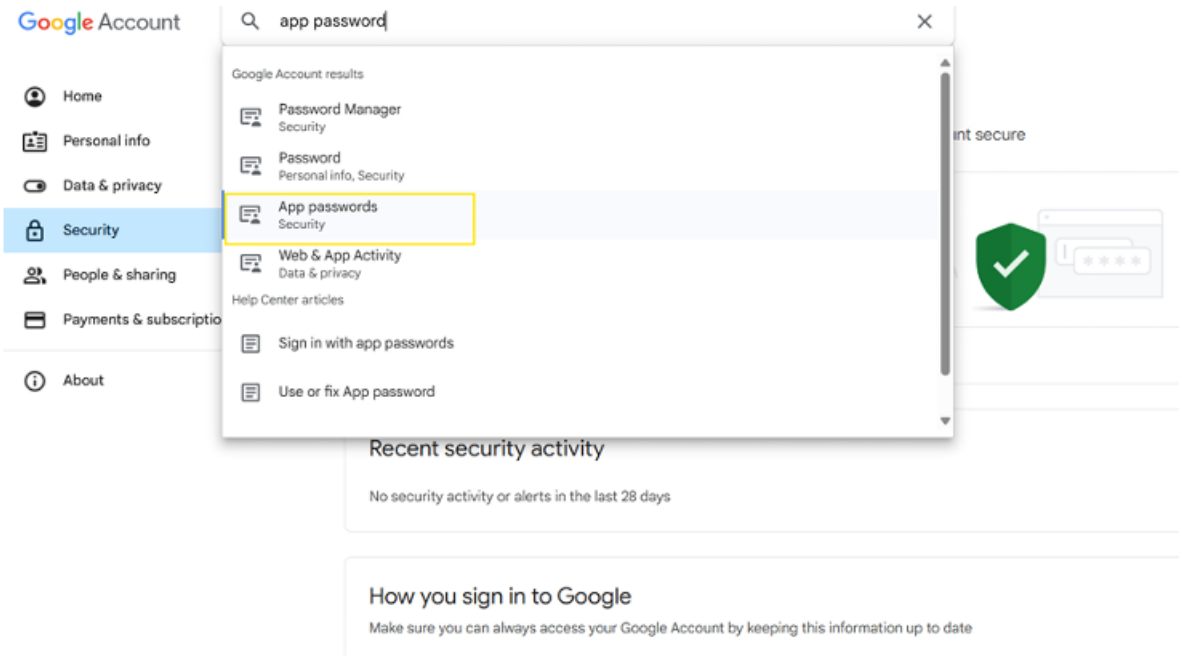
```
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: gitaly: (pid 31711) 19s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: gitlab-exporter: (pid 31720) 18s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: gitlab-kas: (pid 31000) 256s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: gitlab-workhorse: (pid 31685) 20s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: logrotate: (pid 30629) 285s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: nginx: (pid 31696) 19s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: node-exporter: (pid 31704) 19s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: postgres-exporter: (pid 31755) 15s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: postgresql: (pid 30809) 262s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: prometheus: (pid 31732) 18s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: puma: (pid 31133) 144s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: redis: (pid 30675) 279s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: redis-exporter: (pid 31723) 18s
module.gitlab.null_resource.gitlab_server (remote-exec): ok: run: sidekiq: (pid 31160) 138s
module.gitlab.null_resource.gitlab_server (remote-exec): run: alertmanager: (pid 31747) 17s; run: log: (pid 31545) 89s
module.gitlab.null_resource.gitlab_server (remote-exec): run: gitaly: (pid 31711) 21s; run: log: (pid 30745) 272s
module.gitlab.null_resource.gitlab_server (remote-exec): run: gitlab-exporter: (pid 31720) 20s; run: log: (pid 31369) 108s
module.gitlab.null_resource.gitlab_server (remote-exec): run: gitlab-kas: (pid 31000) 258s; run: log: (pid 31011) 257s
module.gitlab.null_resource.gitlab_server (remote-exec): run: gitlab-workhorse: (pid 31685) 22s; run: log: (pid 31240) 132s
module.gitlab.null_resource.gitlab_server (remote-exec): run: logrotate: (pid 30629) 287s; run: log: (pid 30637) 286s
module.gitlab.null_resource.gitlab_server (remote-exec): run: nginx: (pid 31696) 21s; run: log: (pid 31265) 125s
module.gitlab.null_resource.gitlab_server (remote-exec): run: node-exporter: (pid 31704) 21s; run: log: (pid 31333) 114s
module.gitlab.null_resource.gitlab_server (remote-exec): run: postgres-exporter: (pid 31755) 17s; run: log: (pid 31587) 83s
module.gitlab.null_resource.gitlab_server (remote-exec): run: postgresql: (pid 30809) 264s; run: log: (pid 30833) 261s
module.gitlab.null_resource.gitlab_server (remote-exec): run: prometheus: (pid 31732) 20s; run: log: (pid 31507) 96s
module.gitlab.null_resource.gitlab_server (remote-exec): run: puma: (pid 31133) 146s; run: log: (pid 31140) 145s
module.gitlab.null_resource.gitlab_server (remote-exec): run: redis: (pid 30675) 281s; run: log: (pid 30684) 280s
module.gitlab.null_resource.gitlab_server (remote-exec): run: redis-exporter: (pid 31723) 20s; run: log: (pid 31409) 102s
module.gitlab.null_resource.gitlab_server (remote-exec): run: sidekiq: (pid 31160) 140s; run: log: (pid 31168) 139s
module.gitlab.null_resource.gitlab_server: Creation complete after 12m6s [id=[redacted]]

Apply complete! Resources: 39 added, 0 changed, 0 destroyed.

Outputs:

ec2_private_ip_alb_dns = {
  "EC2_Instance_GitLab_Server_Private_IP_Address" = "10.[redacted]"
  "GitLab_ALB_DNS_Name" = "gitlab-[redacted].us-east-2.elb.amazonaws.com"
}
```

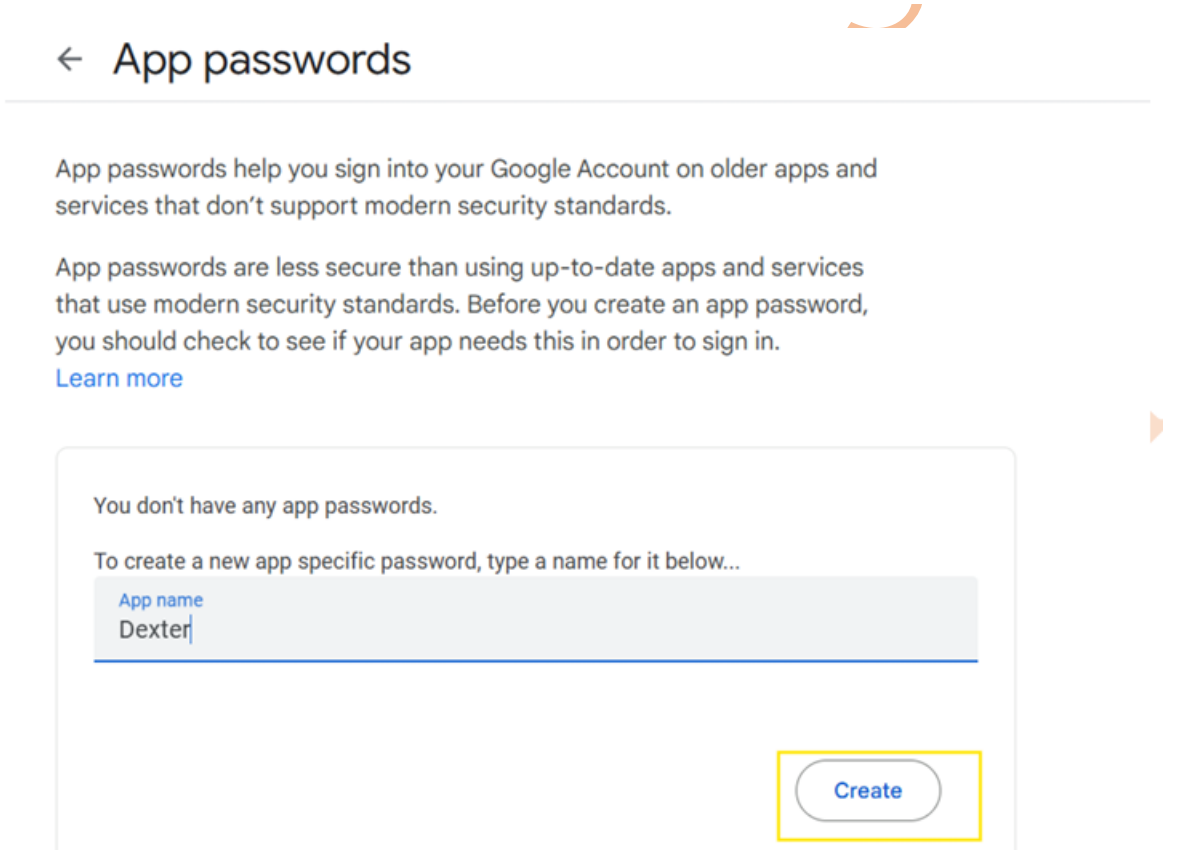
In the GitLab server the Nginx was by default installed which you can check using the command as written below.

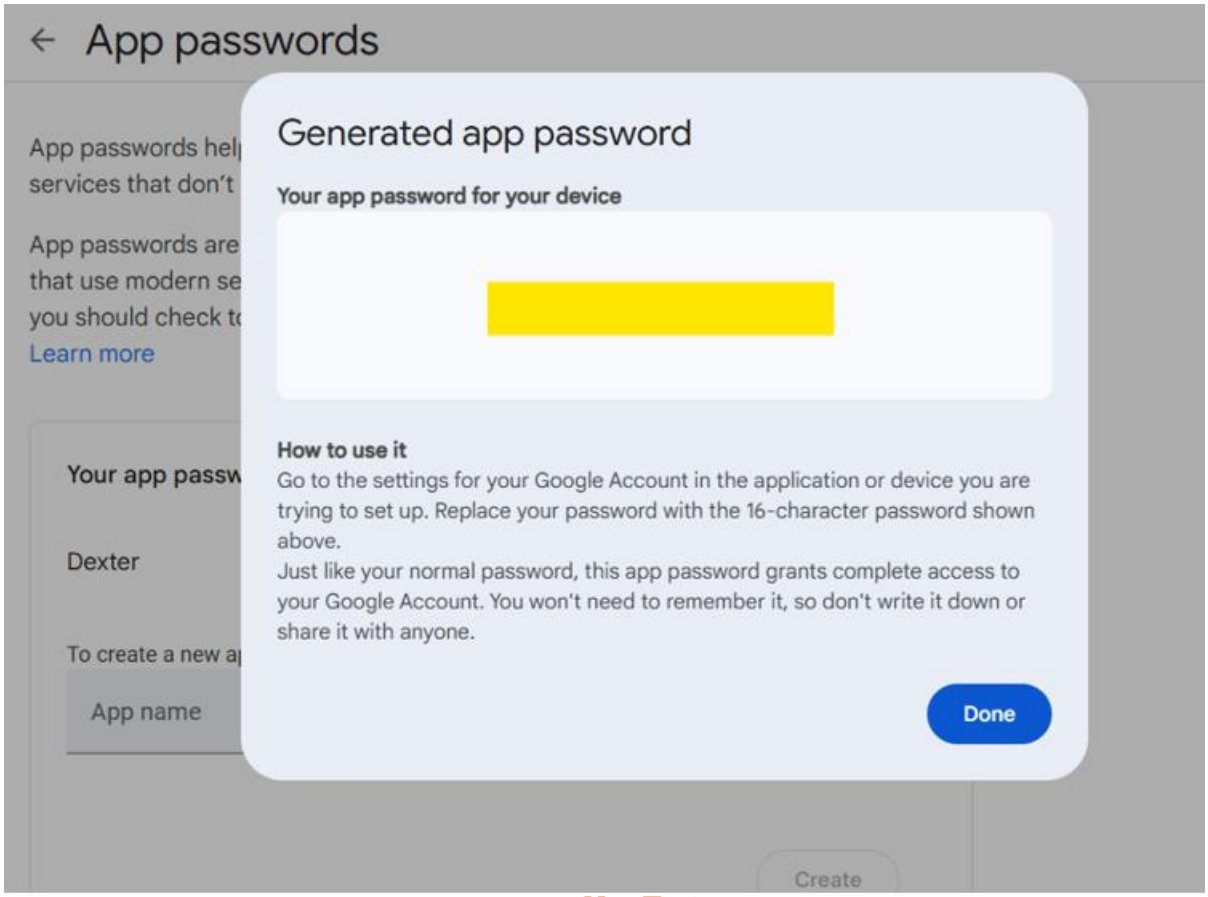
```
[root@gitlab-server ~]# gitlab-ctl status nginx
run: nginx: (pid [redacted]) [redacted]s; run: log: (pid [redacted]) [redacted]s
```

To configure Gmail to send notification to group Email ID I should have App Password for my Gmail account as shown in the screenshot attached below.

Go to your **Gmail Account > Manage your Google Account > Security** and then search for **app password** and click on **App Passwords** as shown in the screenshot attached below.


Google Account
app password
Home
Personal info
Data & privacy
Security
People & sharing
Payments & subscriptio
About
Google Account results
Password Manager
Security
Password
Personal info, Security
App passwords
Security
Web & App Activity
Data & privacy
Help Center articles
Sign in with app passwords
Use or fix App password
Recent security activity
No security activity or alerts in the last 28 days
How you sign in to Google
Make sure you can always access your Google Account by keeping this information up to date


App passwords
App passwords help you sign into your Google Account on older apps and services that don't support modern security standards.
App passwords are less secure than using up-to-date apps and services that use modern security standards. Before you create an app password, you should check to see if your app needs this in order to sign in.
Learn more
You don't have any app passwords.
To create a new app specific password, type a name for it below...
App name
Dexter
Create



Then I updated the GitLab SMTP information in the file **/etc/gitlab/gitlab.rb** as shown in the screenshot attached below.

```
[root@gitlab-server ~]# vim /etc/gitlab/gitlab.rb
```

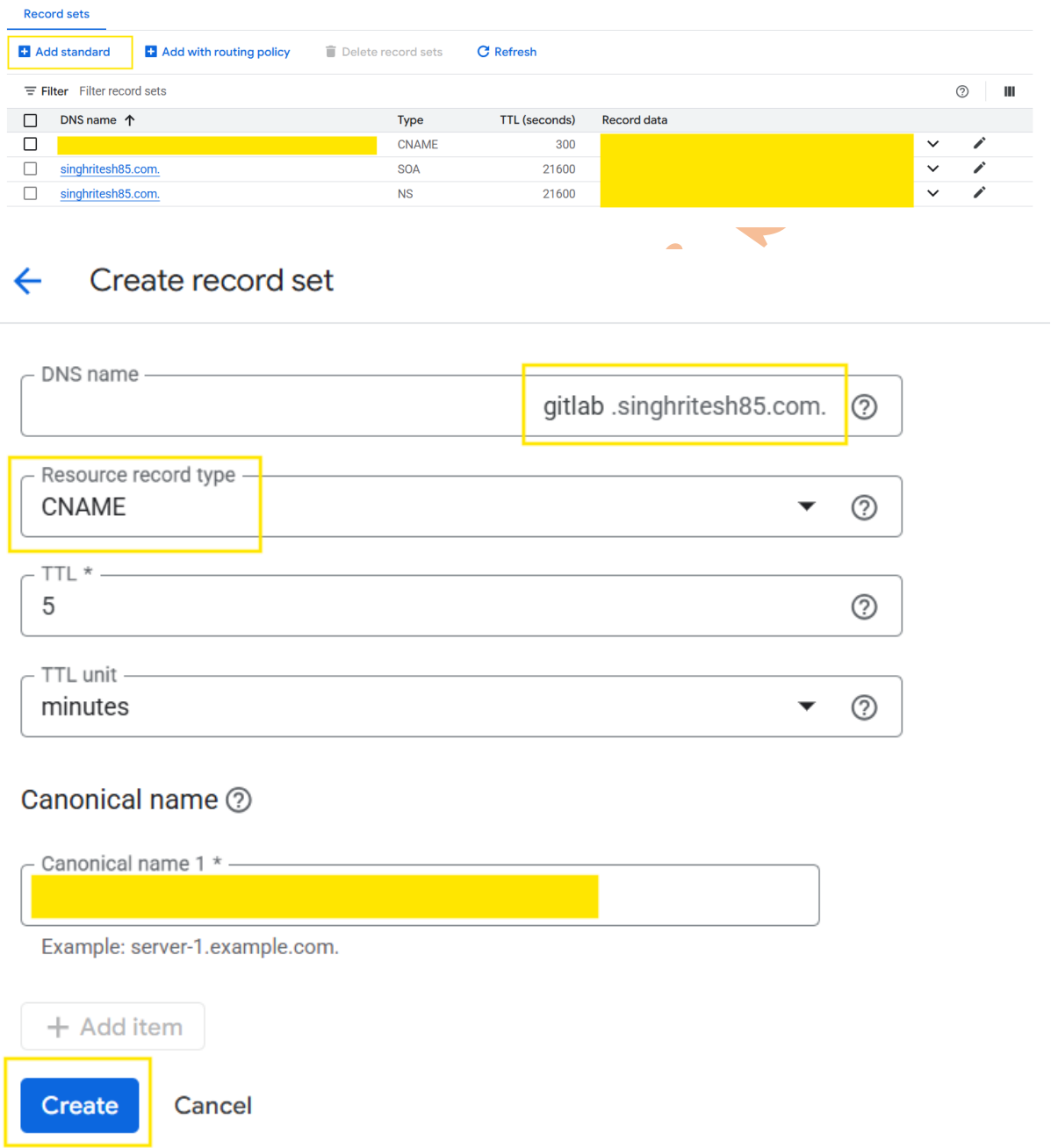
```
gitlab_rails['smtp_enable'] = true
gitlab_rails['smtp_address'] = "smtp.gmail.com"
gitlab_rails['smtp_port'] = 587
gitlab_rails['smtp_user_name'] = "[redacted]"
gitlab_rails['smtp_password'] = "[redacted]"
gitlab_rails['smtp_domain'] = "smtp.gmail.com"
gitlab_rails['smtp_authentication'] = "login"
gitlab_rails['smtp_enable_starttls_auto'] = true
gitlab_rails['smtp_tls'] = false

gitlab_rails['gitlab_email_from'] = '[redacted]'
gitlab_rails['gitlab_email_display_name'] = 'Dexter'
gitlab_rails['gitlab_email_reply_to'] = '[redacted]'
```

Finally, ran the command gitlab-ctl reconfigure as shown in the screenshot attached below.

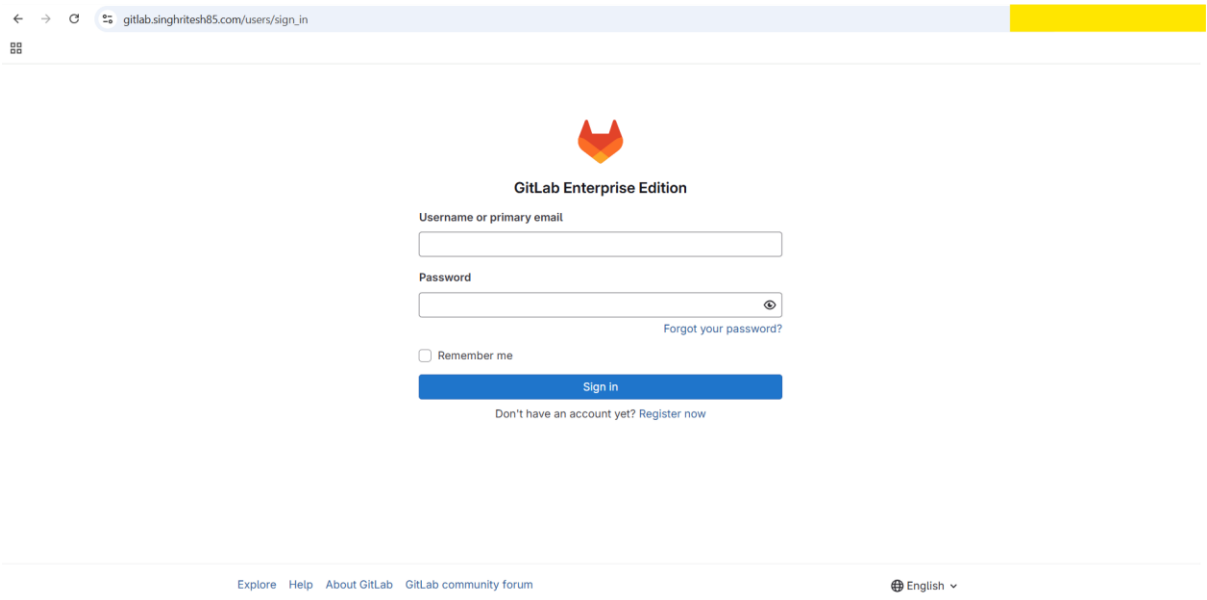
```
[root@gitlab-server ~]# gitlab-ctl reconfigure
```

```
Running handlers:
[2025                              ] INFO: Running report handlers
Running handlers complete
[2025                              ] INFO: Report handlers complete
Infra Phase complete, 0/871 resources updated in 19 seconds
gitlab Reconfigured!
```

Then I had created the Record Set of Type CNAME in GCP Cloud DNS using the DNS Name of the AWS Application LoadBalancer as shown in the screenshot attached below.

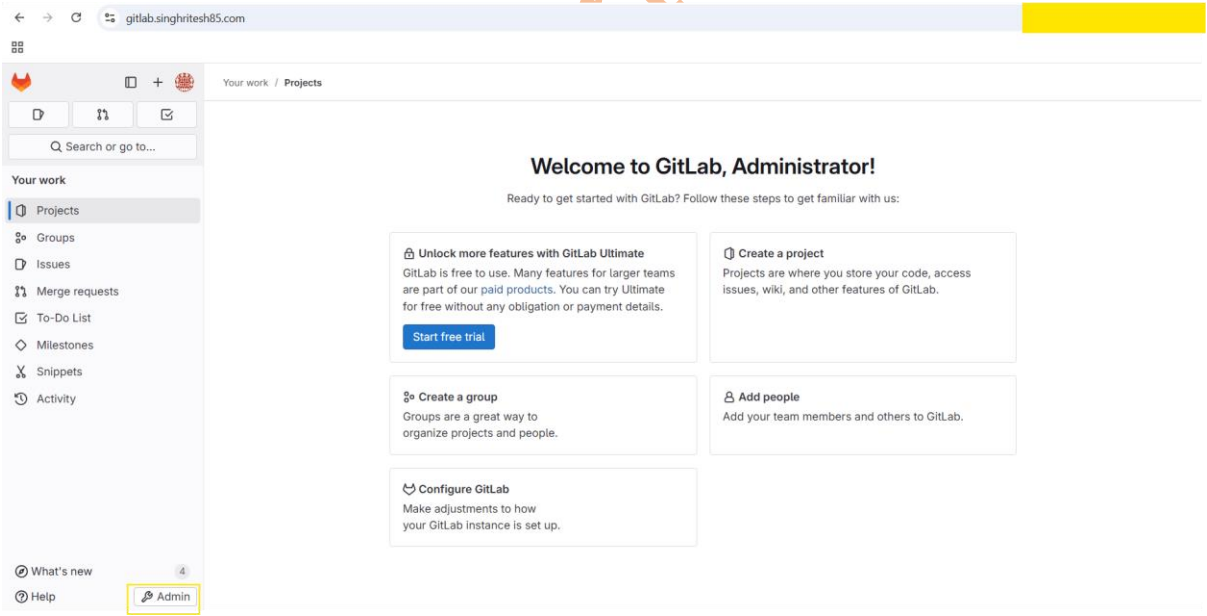


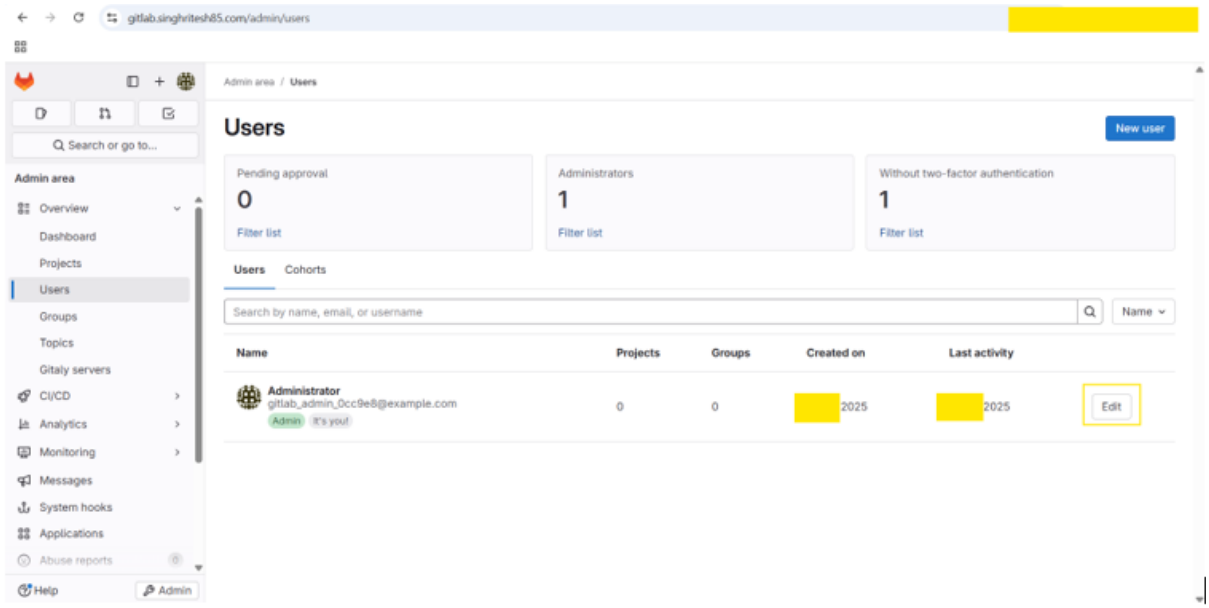
Finally, I was able to access the GitLab as shown in the screenshot attached below.

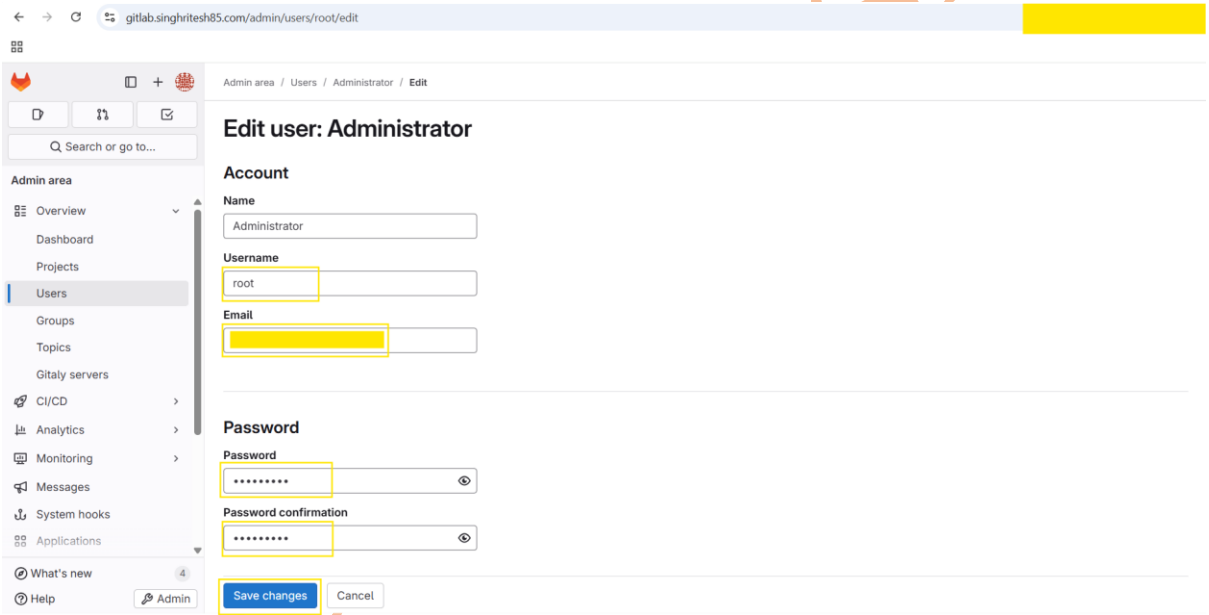


Now you can Login into the GitLab using the Root user credentials, remember the time when you configured GitLab the root user password had been generated and present in the file **/etc/gitlab/initial_root_password** which will be valid for next 24 hours So utilised it within 24 hours after its installation.

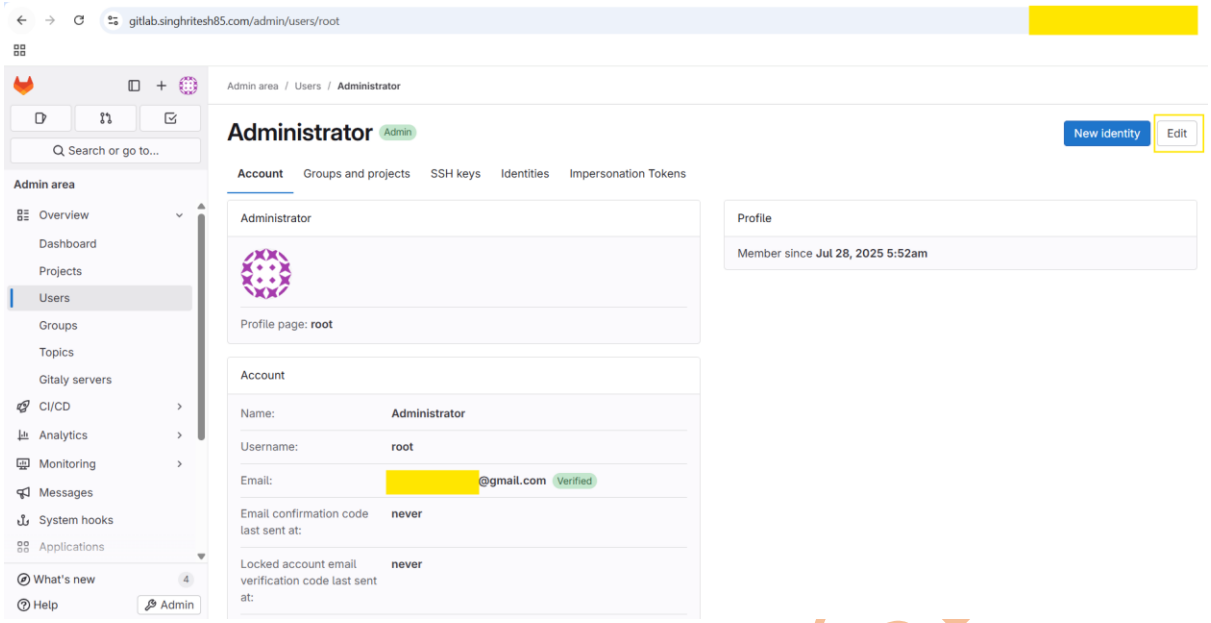
After Login change the administrator username, password, and email for that go to the admin area and edit the Administrator user as shown in the screenshot attached below.

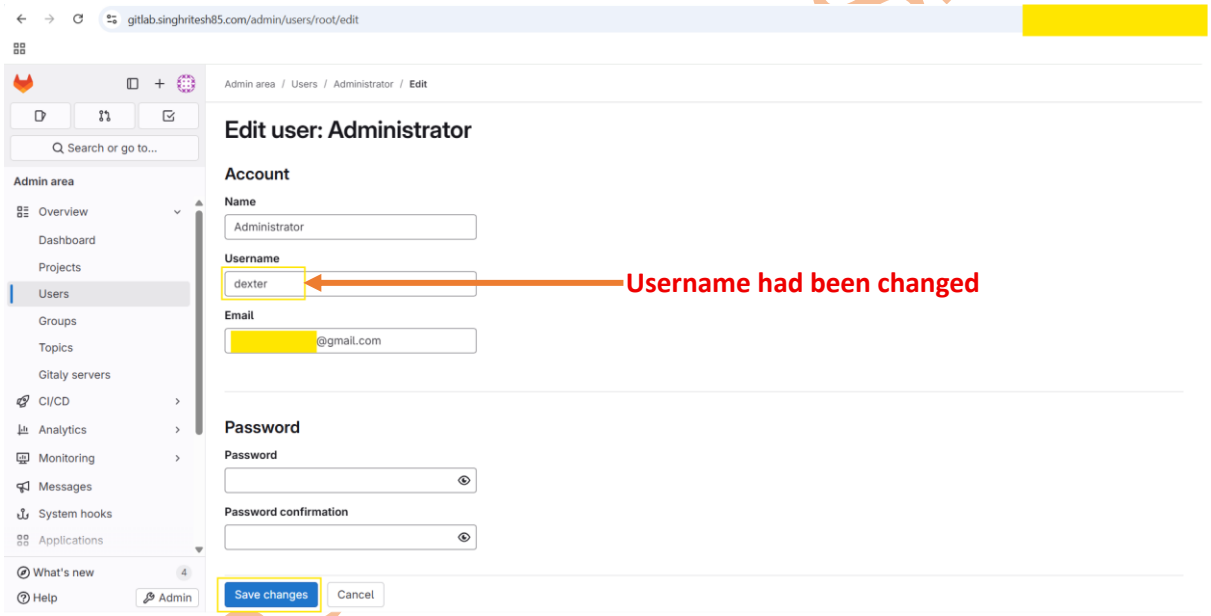


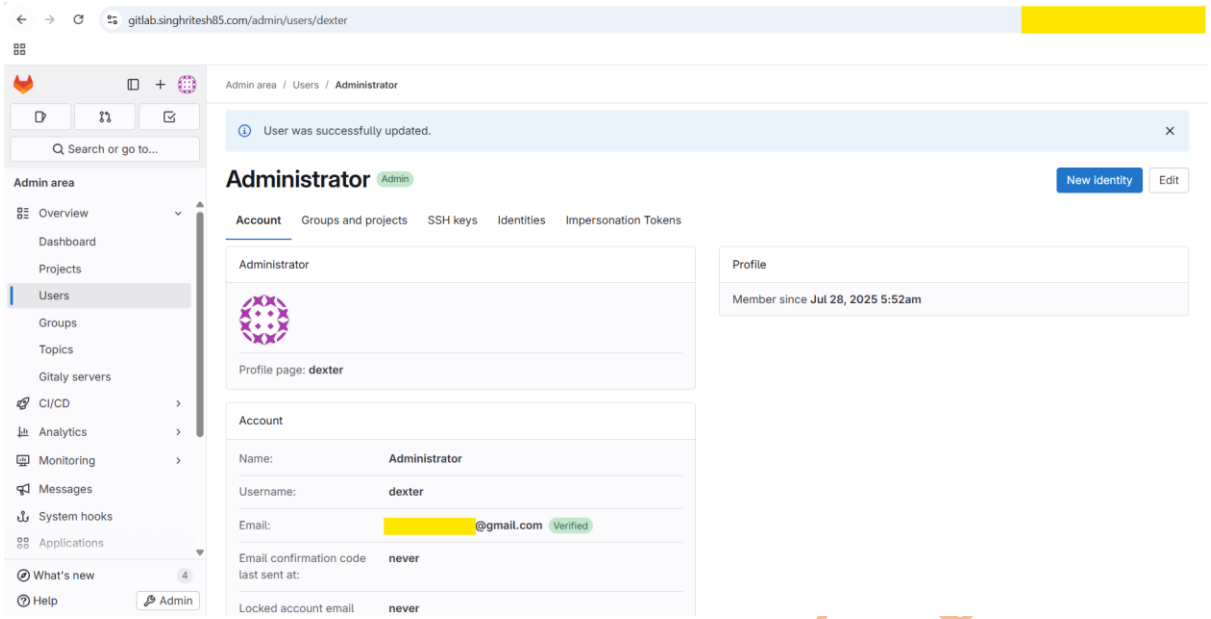




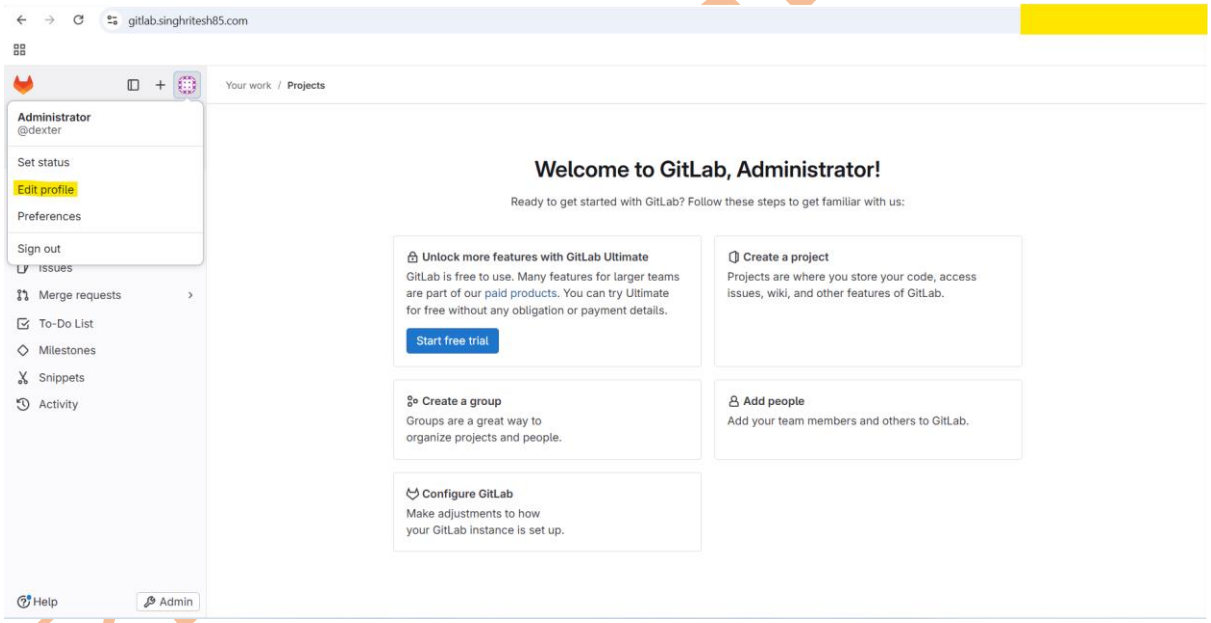
Then it will ask to sign-in again using the new credentials and a password change notification will come to your email Id as shown in the screenshot attached below.

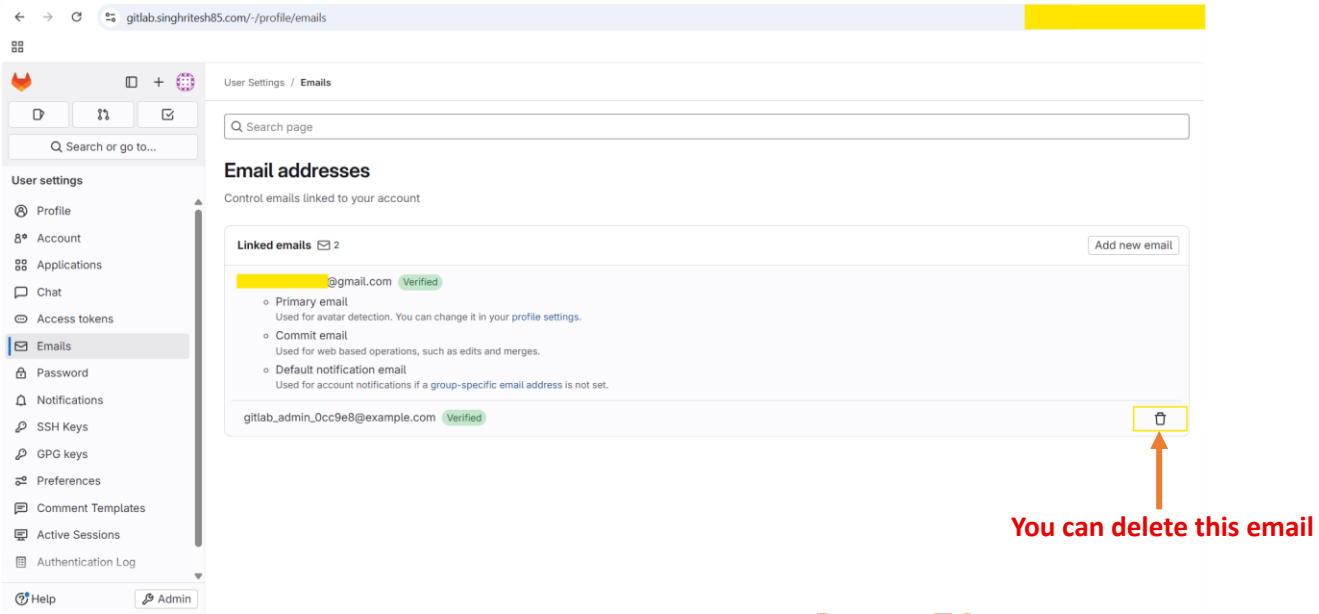

gitlab.singhritesh85.com/admin/users/root
Admin area / Users / Administrator
Administrator
Admin
New identity
Edit
Account
Groups and projects
SSH keys
Identities
Impersonation Tokens
Profile
Member since Jul 28, 2025 5:52am
Profile page: root
Name: Administrator
Username: root
Email: @gmail.com
Verified
Email confirmation code last sent at: never
Locked account email verification code last sent at: never


gitlab.singhritesh85.com/admin/users/root/edit
Admin area / Users / Administrator / Edit
Edit user: Administrator
Account
Name
Administrator
Username
dexter
Username had been changed
Email
@gmail.com
Password
Password
Password confirmation
Save changes
Cancel

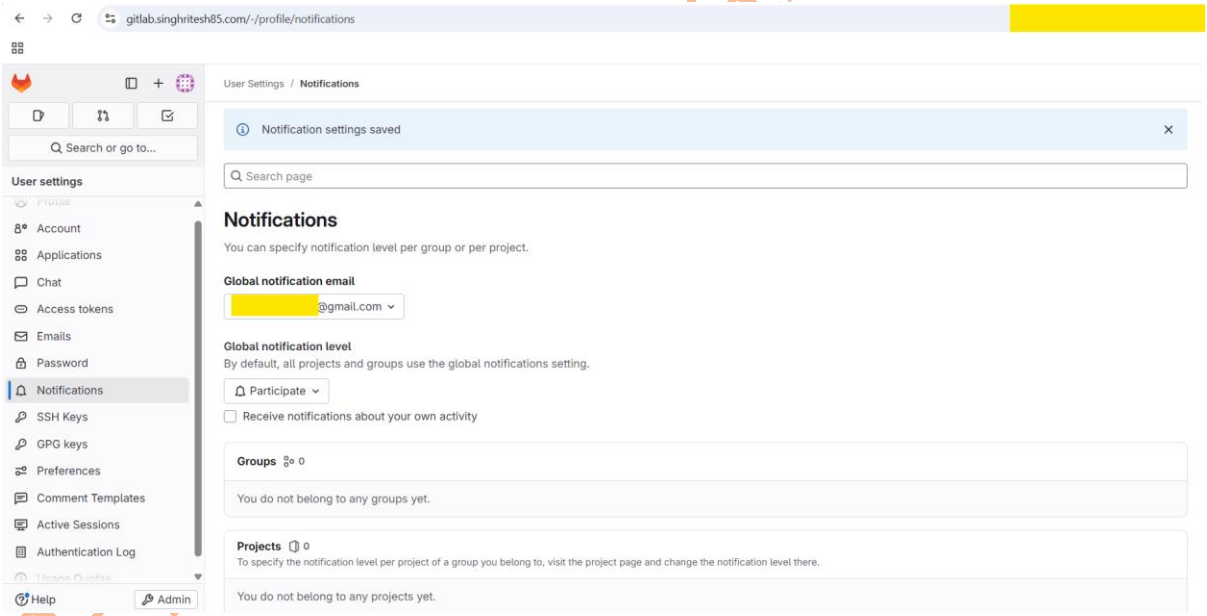


Now if you sign-in again then you need to provide the new credentials. Go to the Administrator profile and check the same from in email and notification as shown in the screenshot attached below.



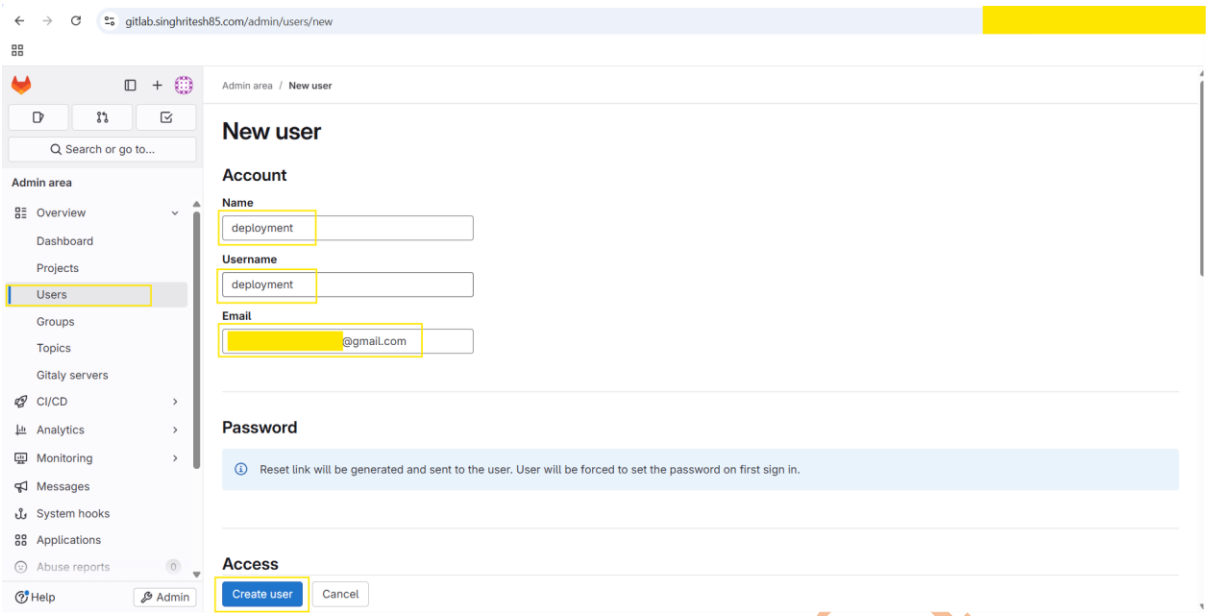


Now go to notification and update with your newly added email as shown in the screenshot attached below.

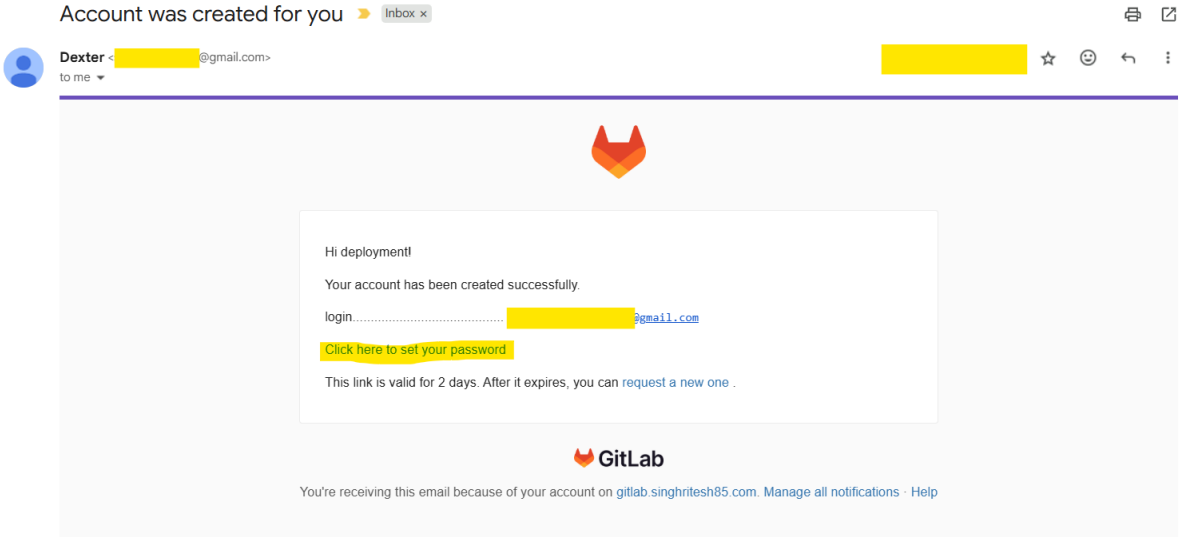


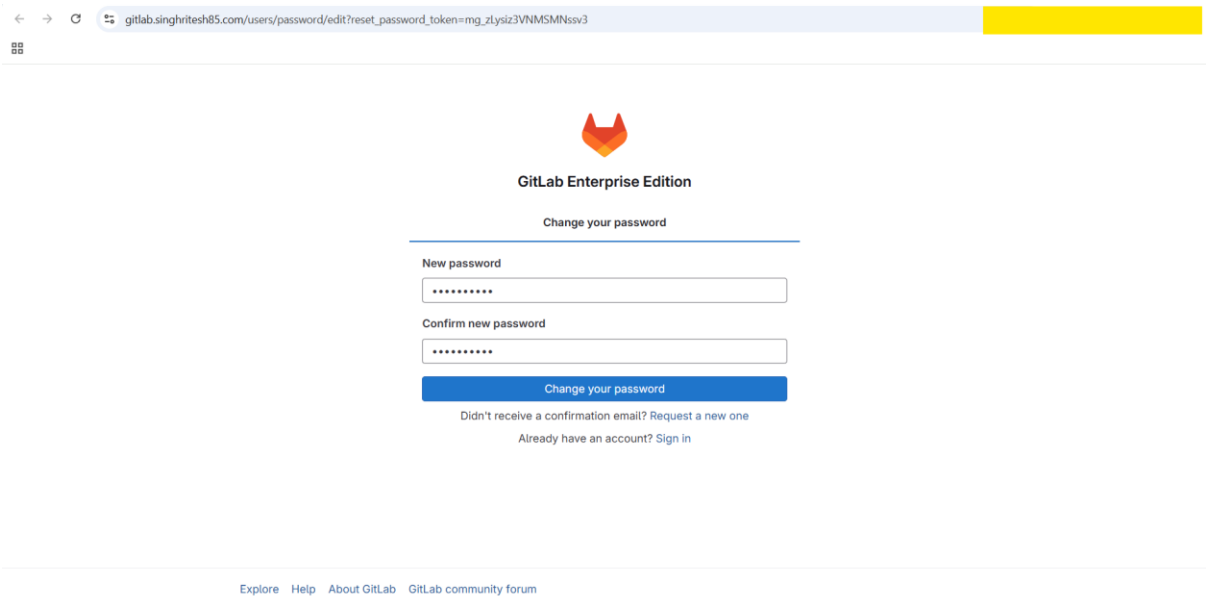
Now, the username, password and email of the Administrator was updated as shown in the screenshot attached below.

Then I had created a user named as **deployment** (regular user) which I only use in CI/CD operation. To achieve the same, I went to Admin area > Users > New User as shown in the screenshot attached below.



Now newly created user will login into his/her email ID and will reset the password as shown the screenshot attached below





Now run the terraform script to create the GCP GitLab-Runner (on GCP VM-Instance), Instance-template, Instance-Group with Autoscaling, SonarQube Server (on EC2 Instance) and Nexus Server (on EC2 Instance).

terraform init -------> initializes a working directory containing configuration files and installs plugins for required providers.

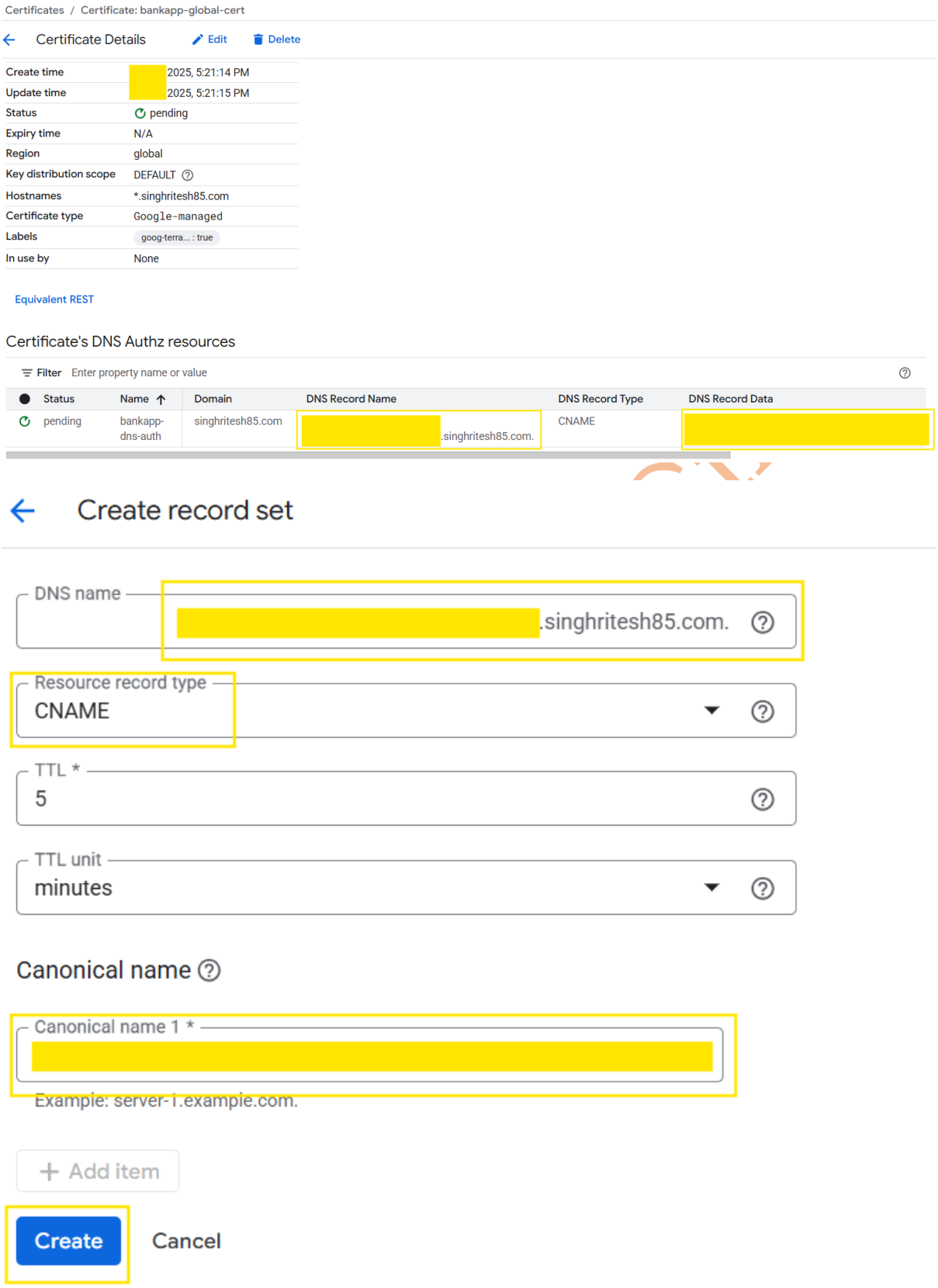
terraform validate --------> verify that terraform configuration file is correct or not

terraform plan ---------> Check which resources are going to be created.

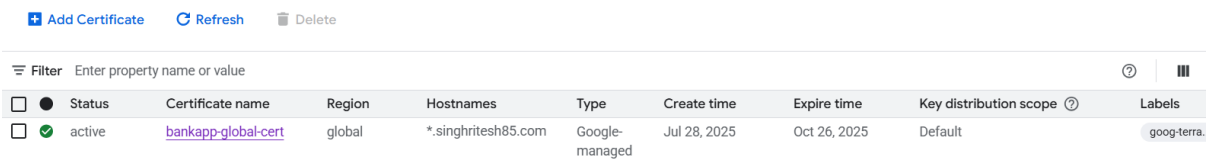
Then you can run the command **terraform apply -auto-approve** -----> Finally, Create the resources.

```
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [19m00s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [19m10s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [19m20s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [19m30s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [19m40s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [19m50s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [20m00s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [20m10s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [20m20s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [20m30s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [20m40s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [20m50s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [21m00s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [21m10s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [21m20s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Still creating... [21m30s elapsed]
module.autoscale_alb.google_sql_database_instance.db_instance: Creation complete after 21m31s [id=bankapp-private-dbinstance-       ]
module.autoscale_alb.google_sql_database.dexter_dbschema: Creating...
module.autoscale_alb.google_sql_user.db_users: Creating...
module.autoscale_alb.google_sql_database.dexter_dbschema: Creation complete after 0s [id=projects/                    /instances/bankapp-private-dbinstance-
    /databases/bankappdb]
module.autoscale_alb.google_sql_user.db_users: Creation complete after 1s [id=dbadmin/%/bankapp-private-dbinstance-       ]

Apply complete! Resources: 96 added, 0 changed, 0 destroyed.

Outputs:

gcp_instance_template_vm_instance_autoscale_alb_mysql_gitlab_vm_instance_private_and_static_ip_gcp_alb_static_ip = {
  "db_connection_name" = "                    :us-central1:bankapp-private-dbinstance-       "
  "db_instance_name" = "bankapp-private-dbinstance-       "
  "db_instance_private_ip_address" = "10.       "
  "gcp_alb_static_ip" = "34.       "
  "gitlab_runner_vm_instance_private_ip_address" = "172.       "
  "gitlab_runner_vm_instance_public_ip_address" = "34.       "
  "instance_template_id" = "projects/                    /global/instanceTemplates/bankapp-tempate"
  "instance_template_name" = "bankapp-tempate"
  "instance_template_self_link" = "https://www.googleapis.com/compute/v1/projects/                    /global/instanceTemplates/bankapp-tempate"
}
```

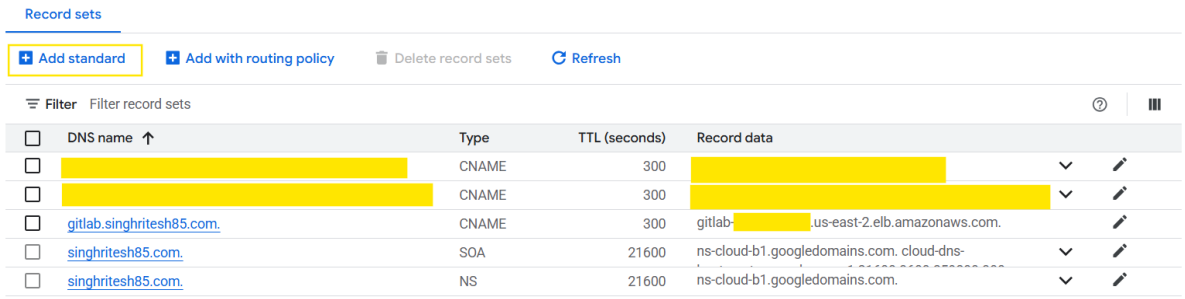
After creation of GCP and AWS Resources you need to validate the SSL Certificate in GCP Cloud DNS, to do so I created a Record-Set of Type CNAME as shown in the screenshot attached below.

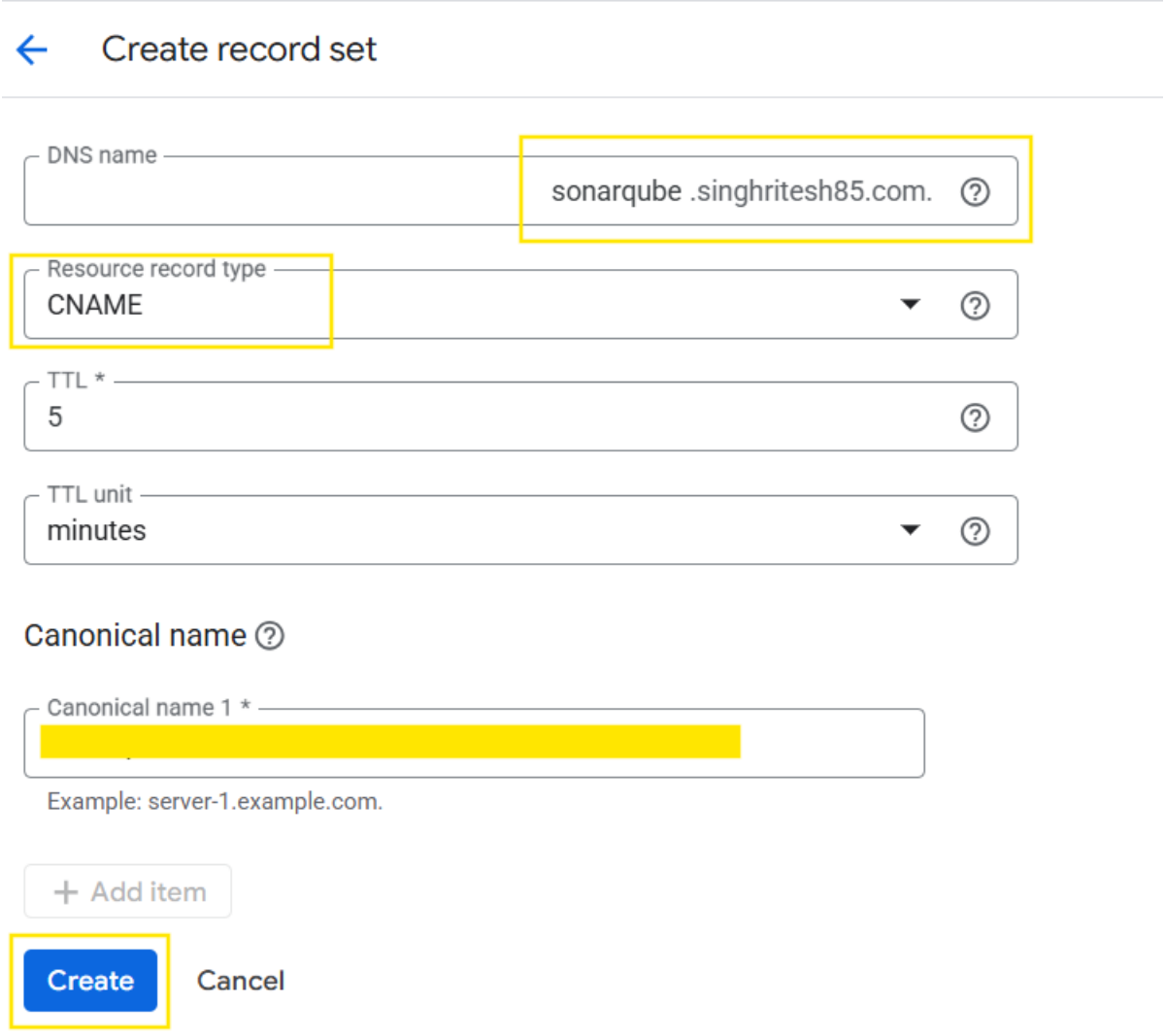


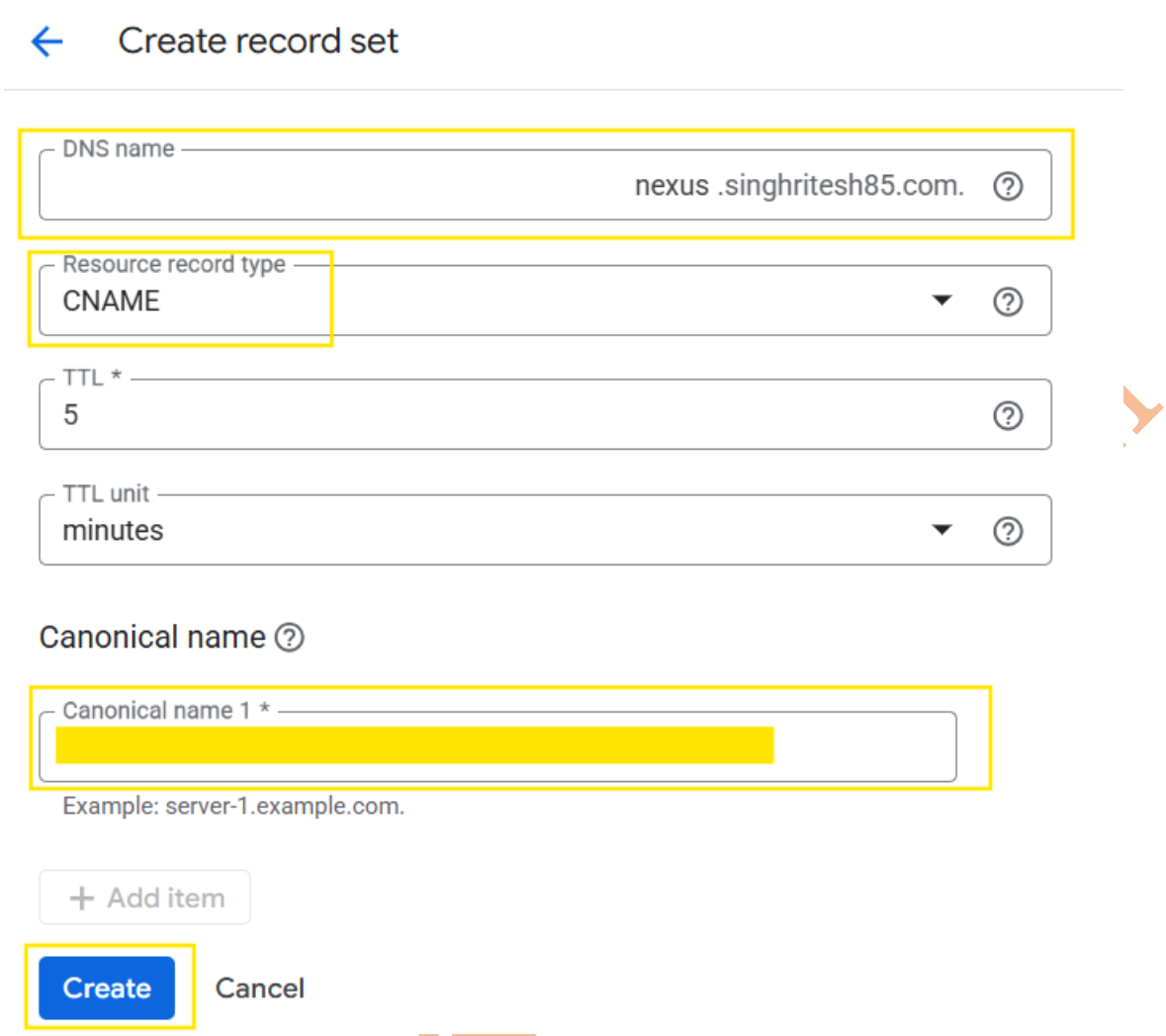
Check after 10-15 minutes the GCP SSL certificate gets validated.



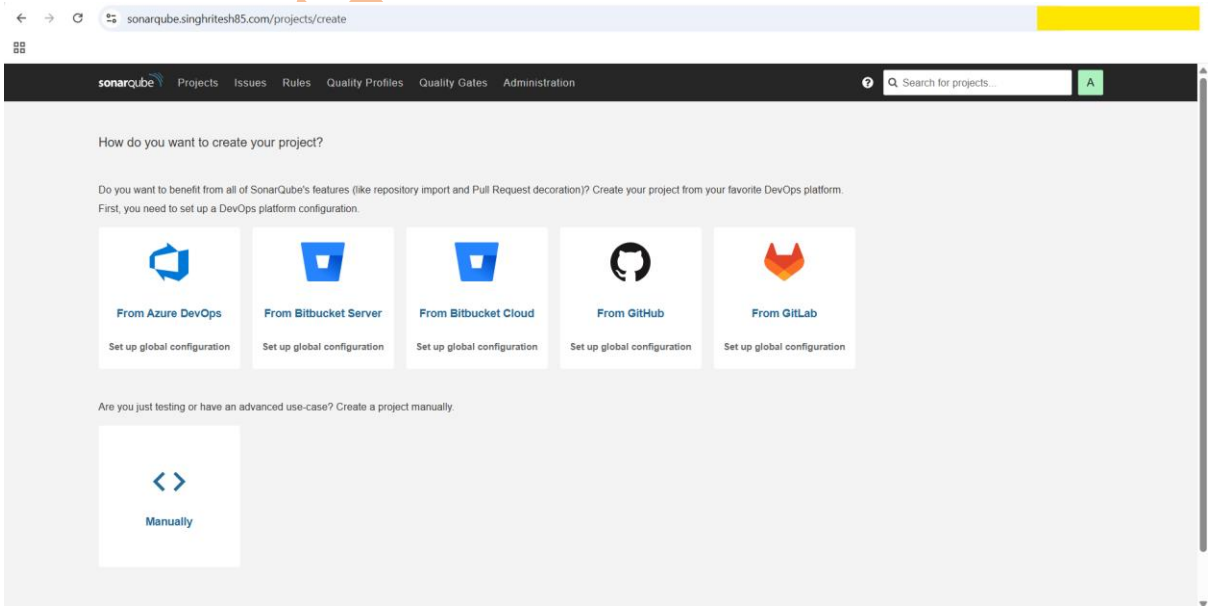
I create the URL for SonarQube and Nexus Server by doing the entry of DNS Name of the LoadBalancer sonarqube and nexus in the GCP Cloud DNS to create the Record Set of Type CNAME as shown in the screenshot attached below.

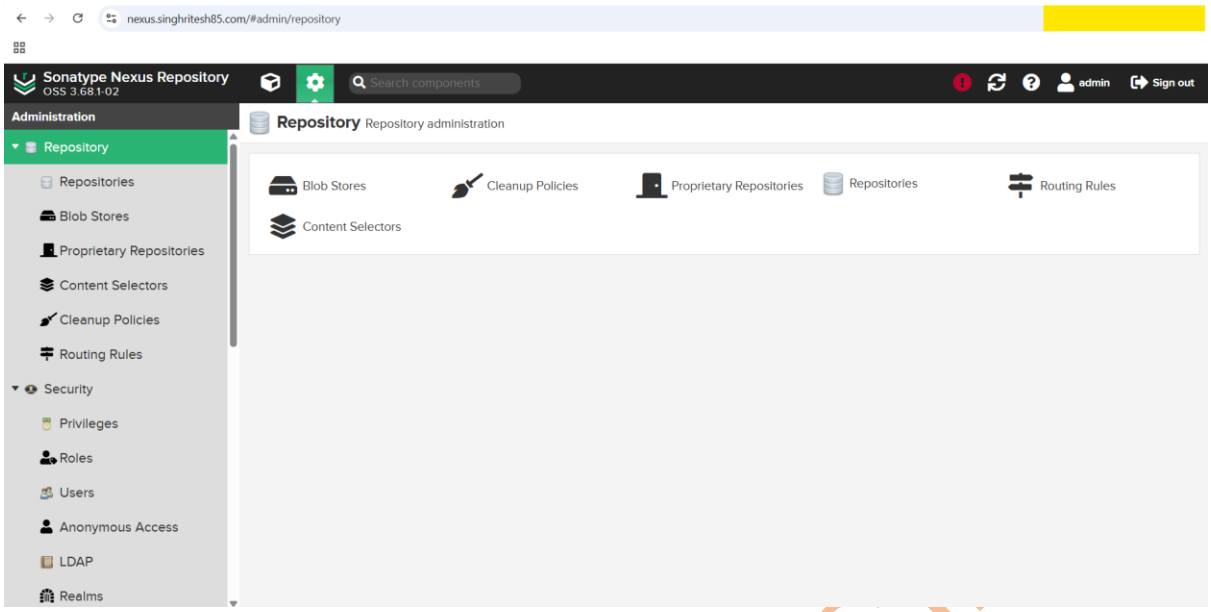




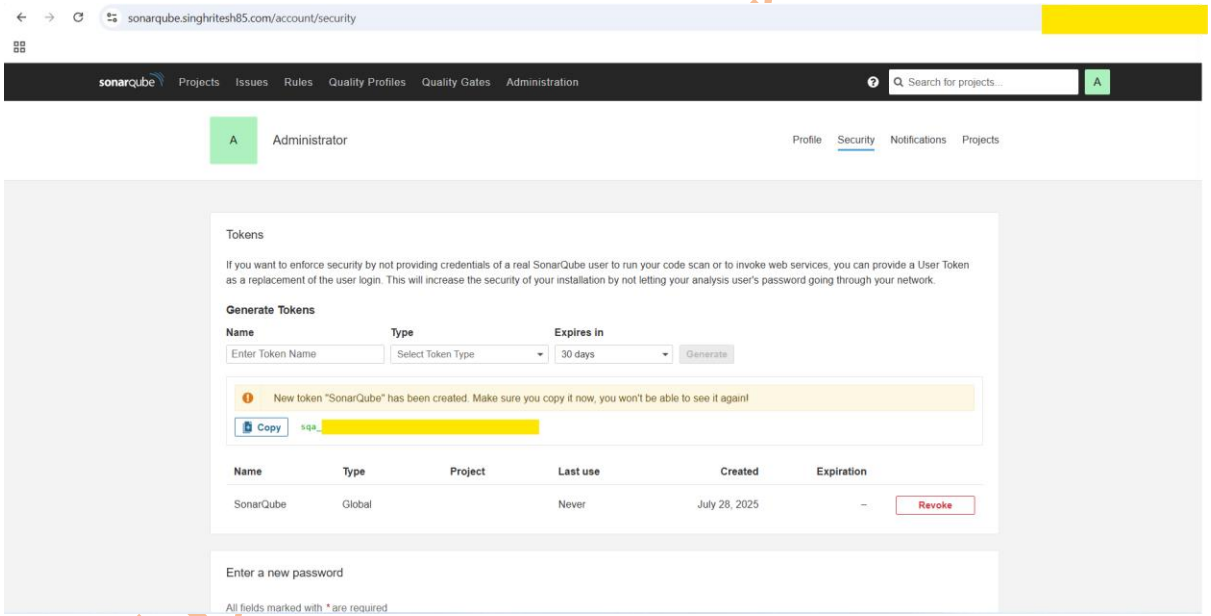


Finally, I was able to access SonarQube and Nexus as shown in the screenshot attached below.

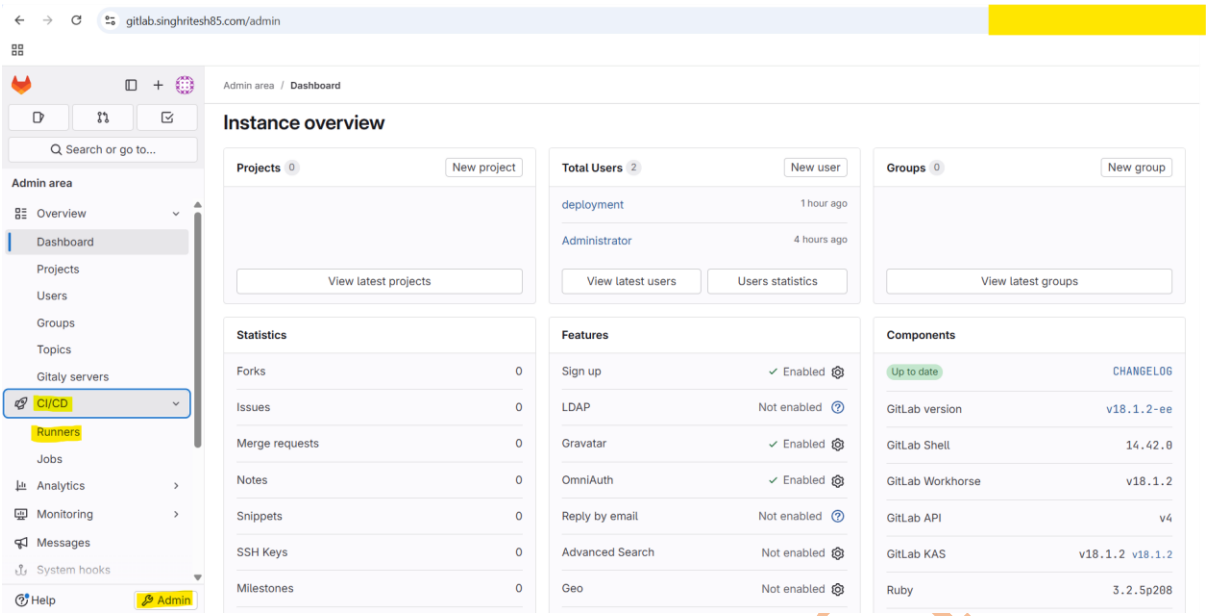




In Nexus I created two Repositories with the name of **maven-snapshot** and **maven-release** and in SonarQube I generated the Token as shown in the screenshot attached below.



I added the GitLab Runner to the GitLab Server as shown in the screenshot attached below. Go to Admin area > CI/CD > Runners > Create Instance runner as shown in the screenshot attached below.

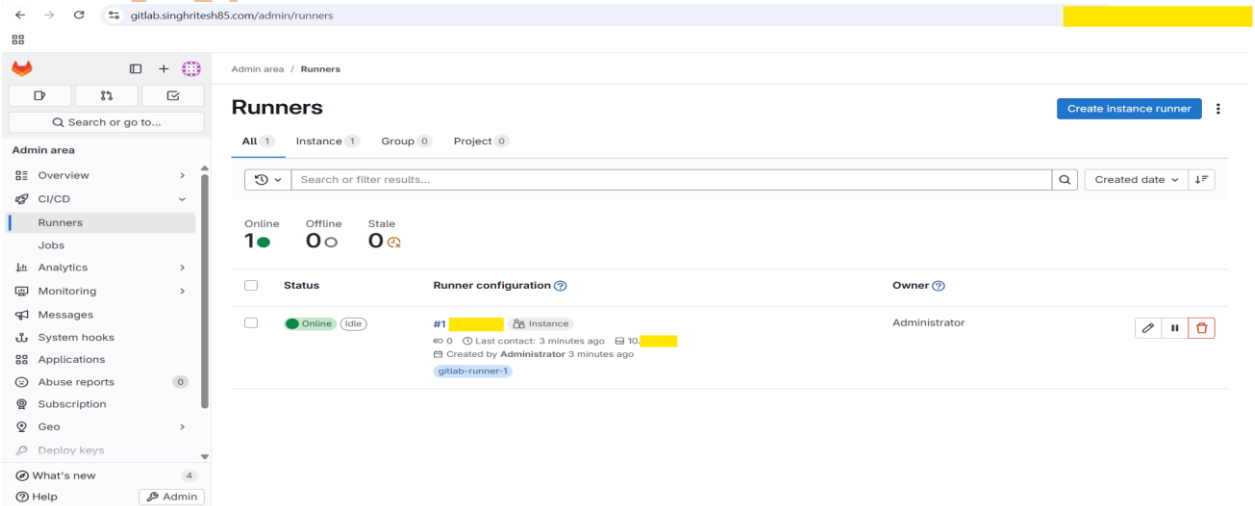


In the Tags provide **gitlab-runner-1** as the tag name and then click on create runner and select Operating System as Linux then go to your gitlab-runner instance and run the command **gitlab-runner register** to register the gitlab-runner with the gitlab server and subsequently provide the GitLab URL and Runner Authentication Token as shown in the screenshot attached below. Then you can check the status of gitlab-runner using the command **gitlab-runner status**.

```
[root@bankapp-gitlab-runner ~]# gitlab-runner register
Runtime platform                                    arch=amd64 os=linux pid=[redacted] revision=[redacted] version=18.2.0
Running in system-mode.

Enter the GitLab instance URL (for example, https://gitlab.com/):
https://gitlab.singhritesh85.com/
Enter the registration token:
[redacted]
Verifying runner... is valid                        correlation_id=[redacted] runner=[redacted]
Enter a name for the runner. This is stored only in the local config.toml file:
[bankapp-gitlab-runner]: gitlab-runner-1
Enter an executor: shell, ssh, parallels, docker, docker-windows, docker+machine, docker-autoscaler, custom, virtualbox, kubernetes, instance:
shell
Runner registered successfully. Feel free to start it, but if it's running already the config should be automatically reloaded!

Configuration (with the authentication token) was saved in "/etc/gitlab-runner/config.toml"
```

```
[root@bankapp-gitlab-runner ~]# gitlab-runner status
Runtime platform                                    arch=amd64 os=linux pid=[redacted] revision=[redacted] version=18.2.0
gitlab-runner: Service is running
```

Then click on view Runner and you will find Runner is in Online state as shown in the screenshot attached below.



You can enable two-factor authentication (2FA) for all users to login into GitLab for that please refer the project present in GitHub Repo https://github.com/singhritesh85/DevOps-Project-BankApp-CICD-using-GitLab-GCP-and-AWS.git.

Before proceeding further make sure clone_url should be added on GitLab-Runner in the file **/etc/gitlab-runner/config.toml** as shown in the screenshot attached below.

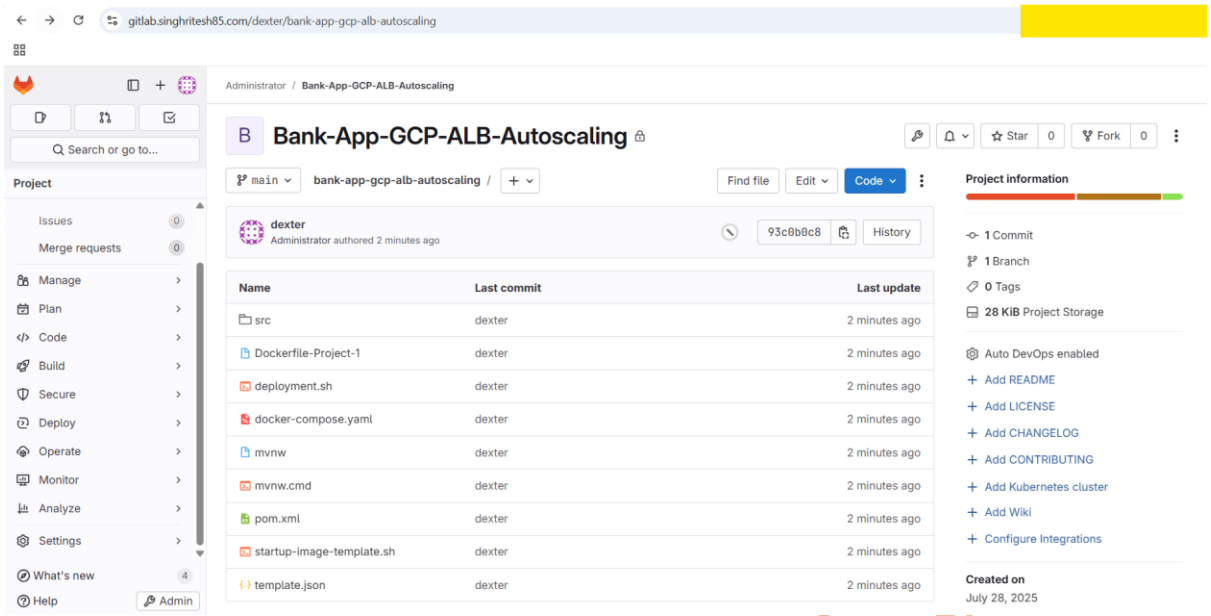
```
[root@bankapp-gitlab-runner ~]# vim /etc/gitlab-runner/config.toml
```

```
concurrent = 1
check_interval = 0
connection_max_age = "15m0s"
shutdown_timeout = 0

[session_server]
  session_timeout = 1800

[[runners]]
  name = "gitlab-runner-1"
  url = "https://gitlab.singhritesh85.com/"
  clone_url = "https://gitlab.singhritesh85.com/"
  id = 1
  token = "                                                                    "
  token_obtained_at = 2025
  token_expires_at = 0001-01-01T00:00:00Z
  executor = "shell"
  [runners.cache]
    MaxUploadedArchiveSize = 0
    [runners.cache.s3]
    [runners.cache.gcs]
    [runners.cache.azure]
```

Then I created two Repositories in Sonatype Nexus named as **maven-snapshot** and **maven-release**.

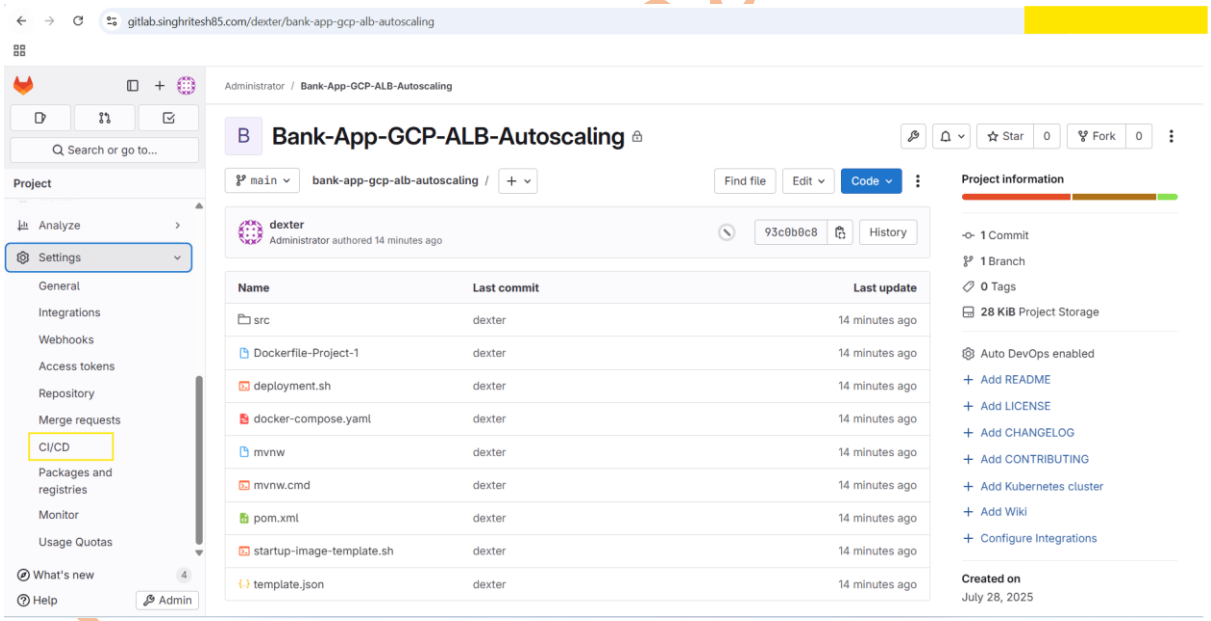
maven-snapshot	hosted	maven2	default	Online	copy			›
maven-release	hosted	maven2	default	Online	copy			›

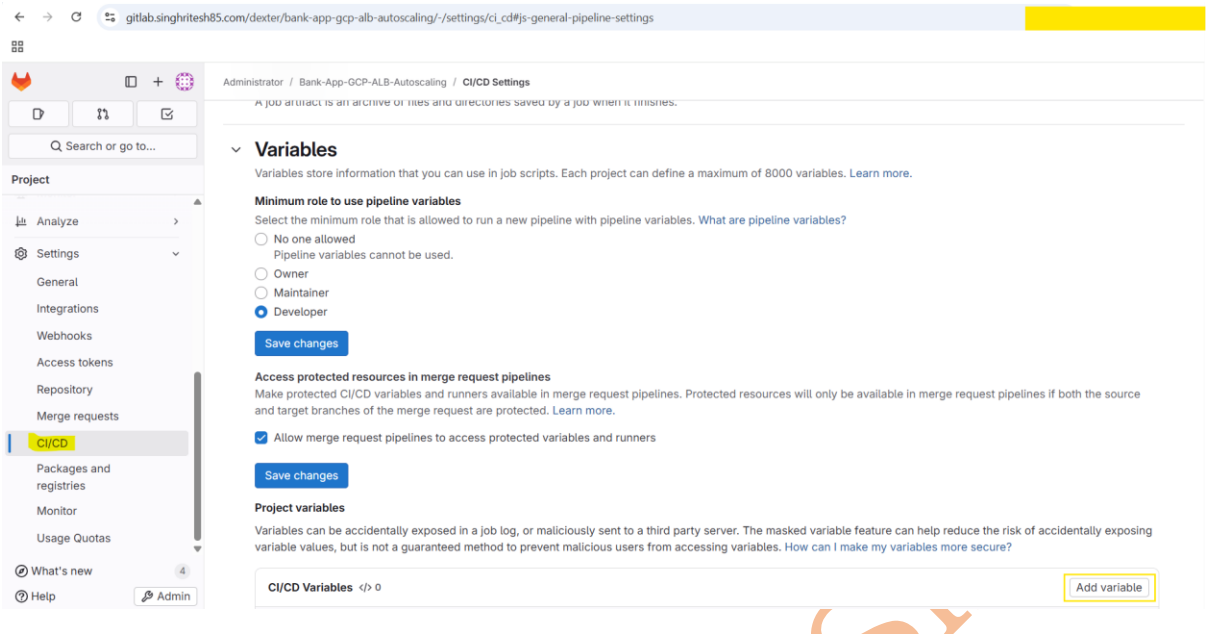
For this project the source Code was present in the GitLab Repo as shown in the screenshot attached below. But for your reference I kept it along with **.gitlab-ci.yml** file in GitHub Repo https://github.com/singhritesh85/Bank-App-GCP-ALB-Autoscaling.git.

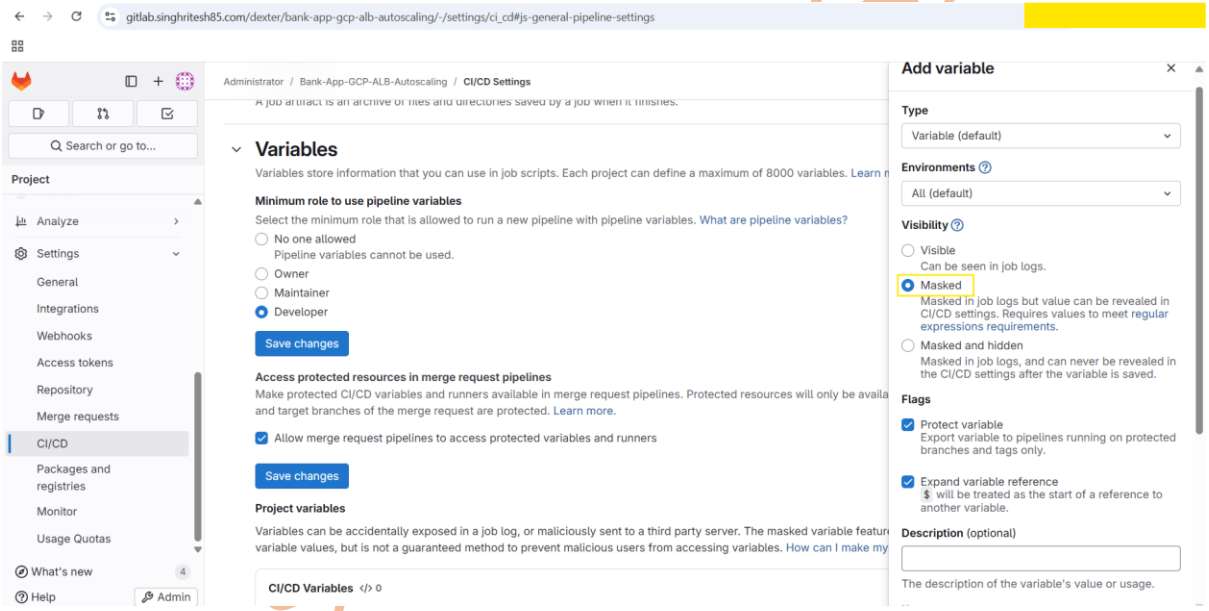


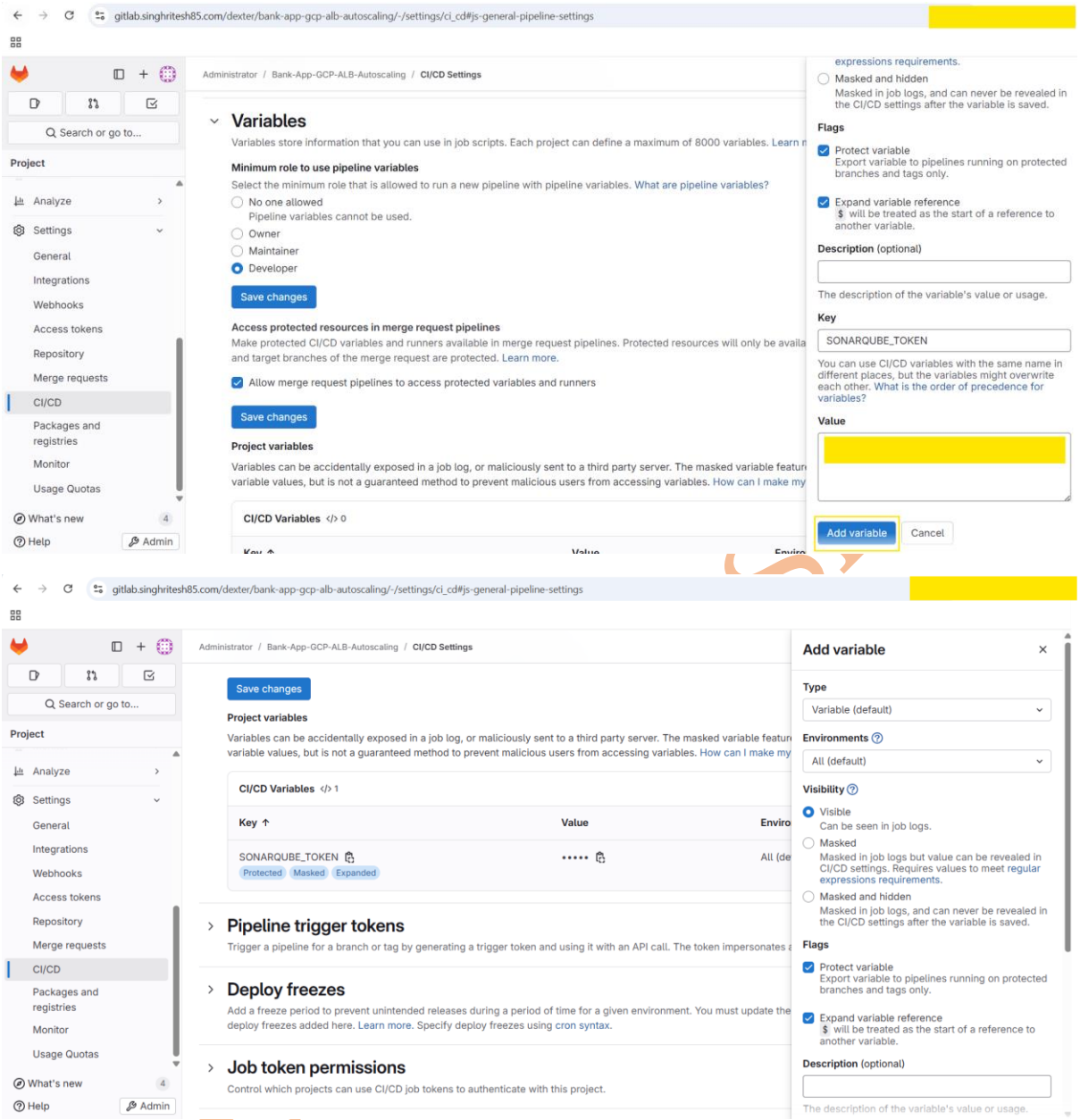
Before creating the GitLab CI/CD pipeline, I created variables which will be used during execution of CI/CD pipeline as shown in the screenshot attached below.

Go to **GitLab > GitLab Project/Repo > Settings > CI/CD > Variables** and Add new variables as shown in the screenshot attached below.

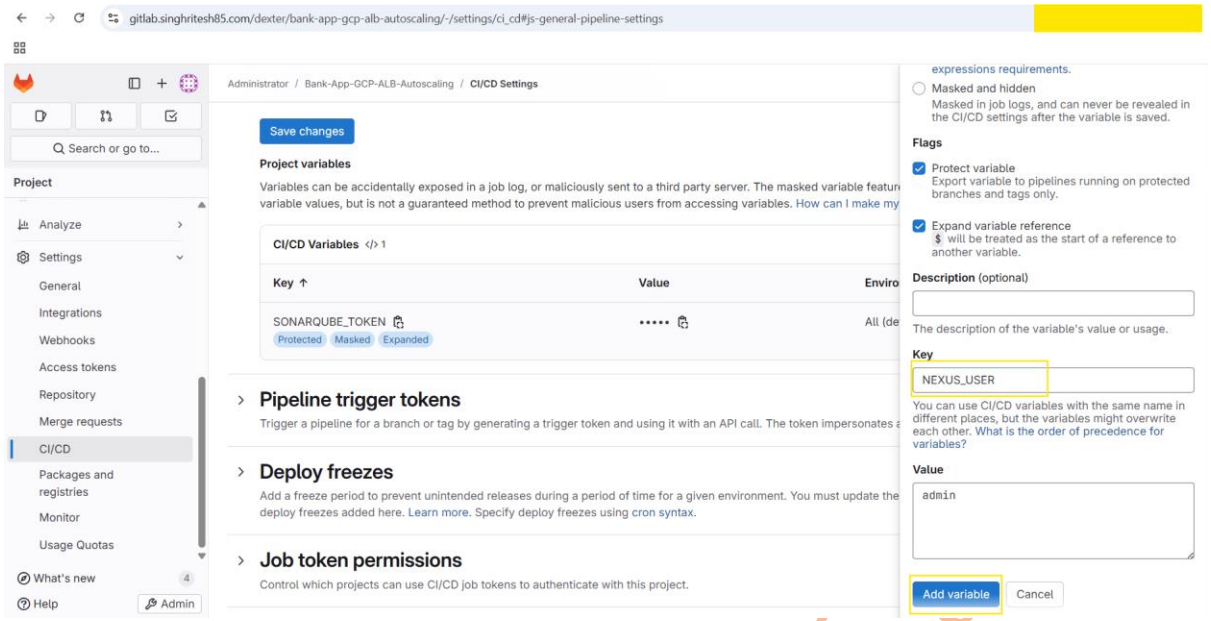


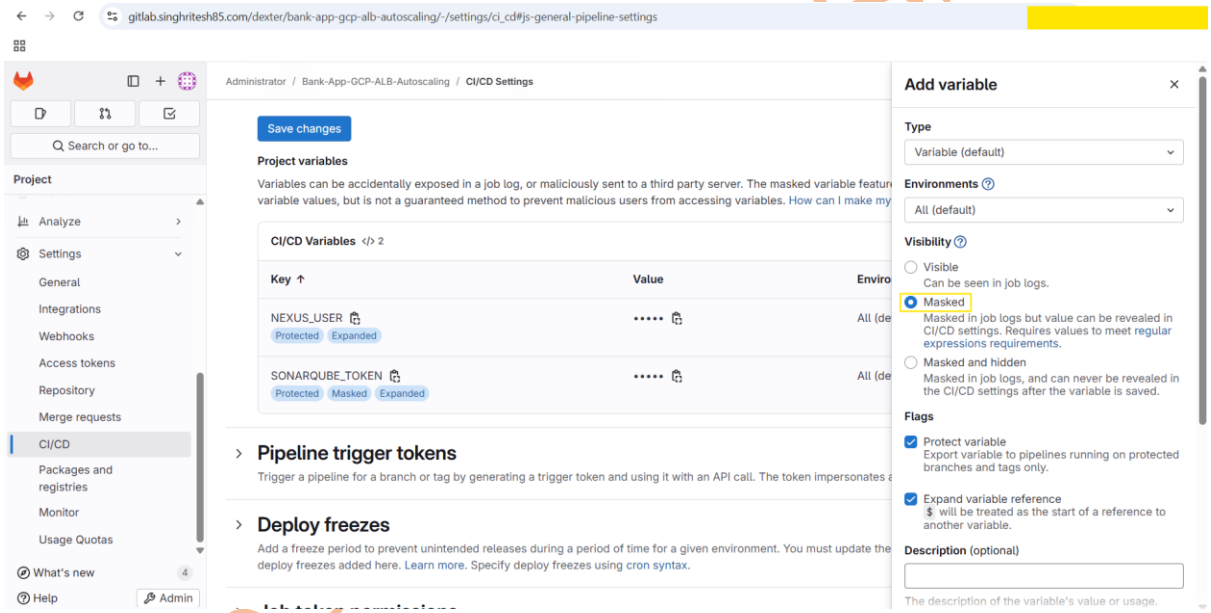

gitlab.singhritesh85.com/dexter/bank-app-gcp-alb-autoscaling/-/settings/ci_cd#js-general-pipeline-settings
Administrator / Bank-App-GCP-ALB-Autoscaling / CI/CD Settings
Search or go to...
Project
Analyze
Settings
General
Integrations
Webhooks
Access tokens
Repository
Merge requests
CI/CD
Packages and registries
Monitor
Usage Quotas
What's new
Help
Admin
Variables
Variables store information that you can use in job scripts. Each project can define a maximum of 8000 variables. Learn more.
Minimum role to use pipeline variables
Select the minimum role that is allowed to run a new pipeline with pipeline variables. What are pipeline variables?
No one allowed
Pipeline variables cannot be used.
Owner
Maintainer
Developer
Save changes
Access protected resources in merge request pipelines
Make protected CI/CD variables and runners available in merge request pipelines. Protected resources will only be available in merge request pipelines if both the source and target branches of the merge request are protected. Learn more.
Allow merge request pipelines to access protected variables and runners
Save changes
Project variables
Variables can be accidentally exposed in a job log, or maliciously sent to a third party server. The masked variable feature can help reduce the risk of accidentally exposing variable values, but is not a guaranteed method to prevent malicious users from accessing variables. How can I make my variables more secure?
CI/CD Variables 0
Add variable

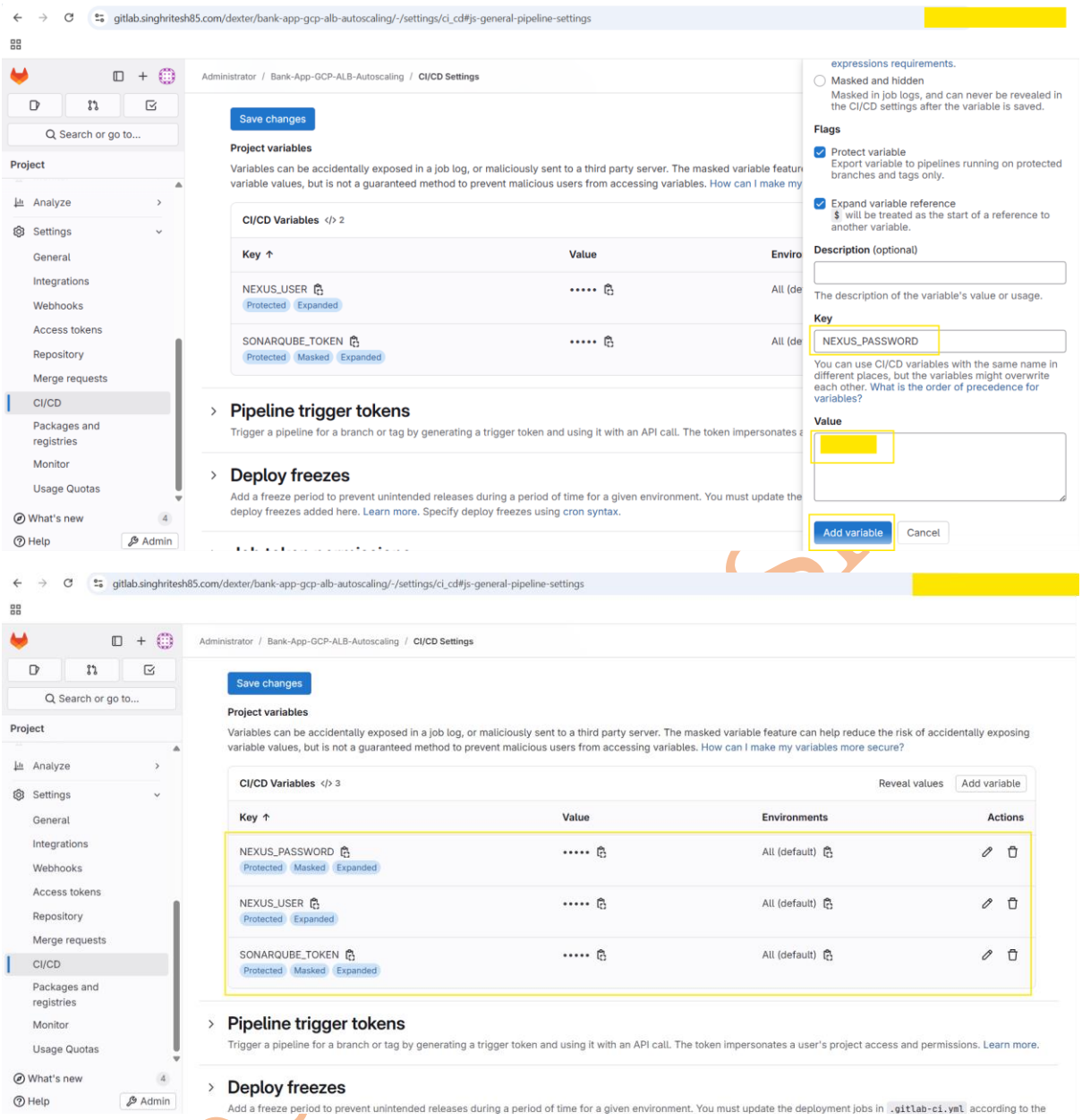

gitlab.singhritesh85.com/dexter/bank-app-gcp-alb-autoscaling/-/settings/ci_cd#js-general-pipeline-settings
Administrator / Bank-App-GCP-ALB-Autoscaling / CI/CD Settings
Variables
Minimum role to use pipeline variables
Save changes
Access protected resources in merge request pipelines
Allow merge request pipelines to access protected variables and runners
Save changes
Project variables
CI/CD Variables 0
Add variable
Type
Variable (default)
Environments
All (default)
Visibility
Visible
Can be seen in job logs.
Masked
Masked in job logs but value can be revealed in CI/CD settings. Requires values to meet regular expressions requirements.
Masked and hidden
Masked in job logs, and can never be revealed in the CI/CD settings after the variable is saved.
Flags
Protect variable
Export variable to pipelines running on protected branches and tags only.
Expand variable reference
$ will be treated as the start of a reference to another variable.
Description (optional)
The description of the variable's value or usage.


gitlab.singhritesh85.com/dexter/bank-app-gcp-alb-autoscaling/-/settings/ci_cd#js-general-pipeline-settings
Administrator / Bank-App-GCP-ALB-Autoscaling / CI/CD Settings
Search or go to...
Project
Analyze
Settings
General
Integrations
Webhooks
Access tokens
Repository
Merge requests
CI/CD
Packages and registries
Monitor
Usage Quotas
What's new
Help
Admin
Variables
Variables store information that you can use in job scripts. Each project can define a maximum of 8000 variables.
Minimum role to use pipeline variables
Select the minimum role that is allowed to run a new pipeline with pipeline variables. What are pipeline variables?
No one allowed
Pipeline variables cannot be used.
Owner
Maintainer
Developer
Save changes
Access protected resources in merge request pipelines
Make protected CI/CD variables and runners available in merge request pipelines. Protected resources will only be availa
and target branches of the merge request are protected. Learn more.
Allow merge request pipelines to access protected variables and runners
Save changes
Project variables
Variables can be accidentally exposed in a job log, or maliciously sent to a third party server. The masked variable featur
variable values, but is not a guaranteed method to prevent malicious users from accessing variables. How can I make my
CI/CD Variables 0
expressions requirements.
Masked and hidden
Masked in job logs, and can never be revealed in the CI/CD settings after the variable is saved.
Flags
Protect variable
Export variable to pipelines running on protected branches and tags only.
Expand variable reference
$ will be treated as the start of a reference to another variable.
Description (optional)
The description of the variable's value or usage.
Key
SONARQUBE_TOKEN
You can use CI/CD variables with the same name in different places, but the variables might overwrite each other. What is the order of precedence for variables?
Value
Add variable
Cancel

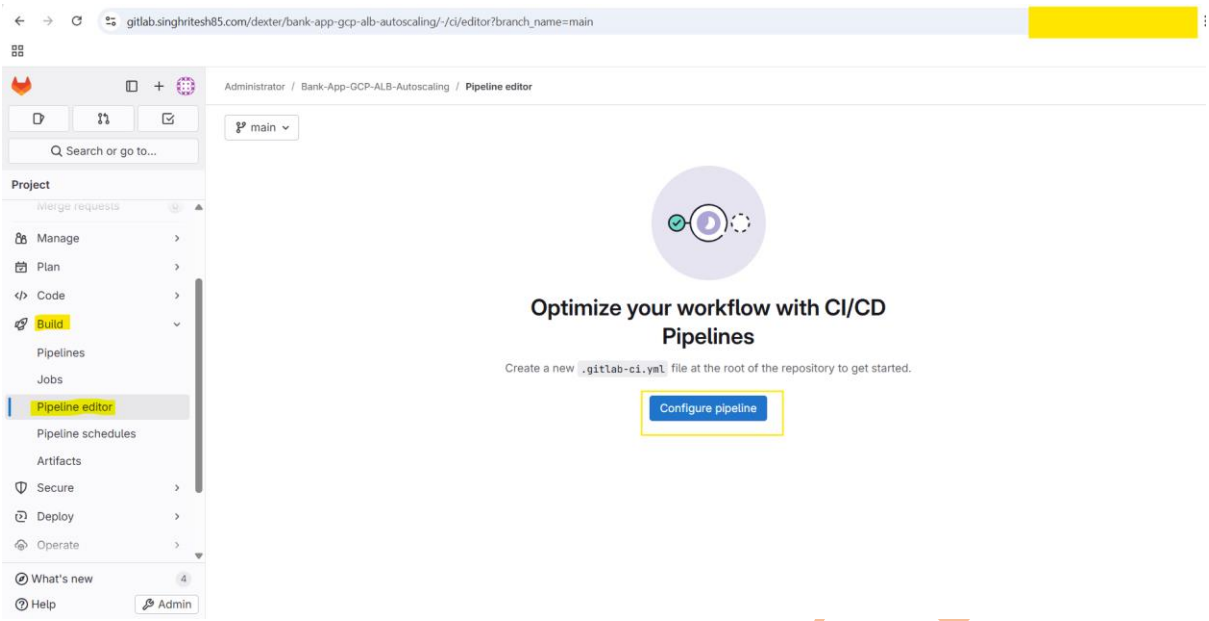
gitlab.singhritesh85.com/dexter/bank-app-gcp-alb-autoscaling/-/settings/ci_cd#js-general-pipeline-settings
Administrator / Bank-App-GCP-ALB-Autoscaling / CI/CD Settings
Search or go to...
Project
Analyze
Settings
General
Integrations
Webhooks
Access tokens
Repository
Merge requests
CI/CD
Packages and registries
Monitor
Usage Quotas
What's new
Help
Admin
Save changes
Project variables
Variables can be accidentally exposed in a job log, or maliciously sent to a third party server. The masked variable featur
variable values, but is not a guaranteed method to prevent malicious users from accessing variables. How can I make my
CI/CD Variables 1
Key
Value
Enviro
SONARQUBE_TOKEN
Protected
Masked
Expanded
All (de
Pipeline trigger tokens
Trigger a pipeline for a branch or tag by generating a trigger token and using it with an API call. The token impersonates
Deploy freezes
Add a freeze period to prevent unintended releases during a period of time for a given environment. You must update the
deploy freezes added here. Learn more. Specify deploy freezes using cron syntax.
Job token permissions
Control which projects can use CI/CD job tokens to authenticate with this project.
Add variable
Type
Variable (default)
Environments
All (default)
Visibility
Visible
Can be seen in job logs.
Masked
Masked in job logs but value can be revealed in CI/CD settings. Requires values to meet regular expressions requirements.
Masked and hidden
Masked in job logs, and can never be revealed in the CI/CD settings after the variable is saved.
Flags
Protect variable
Export variable to pipelines running on protected branches and tags only.
Expand variable reference
$ will be treated as the start of a reference to another variable.
Description (optional)
The description of the variable's value or usage.

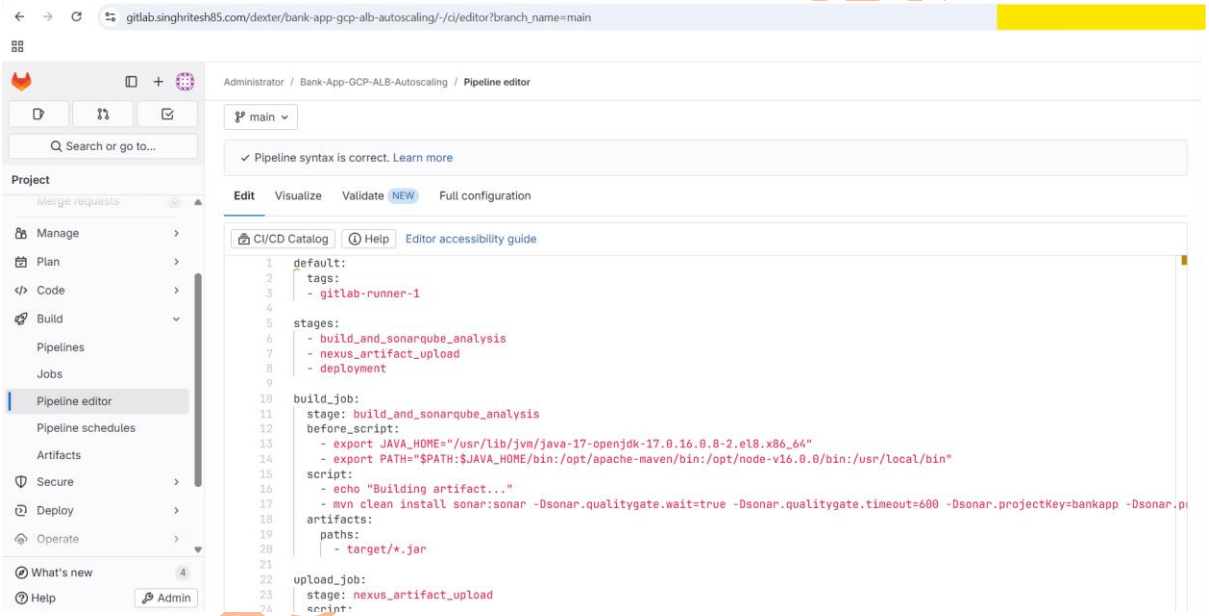

gitlab.singhritesh85.com/dexter/bank-app-gcp-alb-autoscaling/-/settings/ci_cd#js-general-pipeline-settings
Administrator / Bank-App-GCP-ALB-Autoscaling / CI/CD Settings
Save changes
Project variables
CI/CD Variables 1
Key
Value
SONARQUBE_TOKEN
Protected Masked Expanded
Pipeline trigger tokens
Deploy freezes
Job token permissions
Masked and hidden
Flags
Protect variable
Expand variable reference
Description (optional)
Key
NEXUS_USER
Value
admin
Add variable
Cancel


gitlab.singhritesh85.com/dexter/bank-app-gcp-alb-autoscaling/-/settings/ci_cd#js-general-pipeline-settings
Administrator / Bank-App-GCP-ALB-Autoscaling / CI/CD Settings
Save changes
Project variables
CI/CD Variables 2
Key
Value
NEXUS_USER
Protected Expanded
SONARQUBE_TOKEN
Protected Masked Expanded
Pipeline trigger tokens
Deploy freezes
Add variable
Type
Variable (default)
Environments
All (default)
Visibility
Visible
Masked
Masked and hidden
Flags
Protect variable
Expand variable reference
Description (optional)



Now create the GitLab CI/CD Pipeline, go to your GitLab Project/GitLab Repo > Build > Pipeline editor and provide/write the **.gitlab-ci.yml** file as shown in the screenshot





Using this GitLab-CI/CD Pipeline (through .gitlab-ci.yml file) what I am trying to achieve is as mentioned below: -

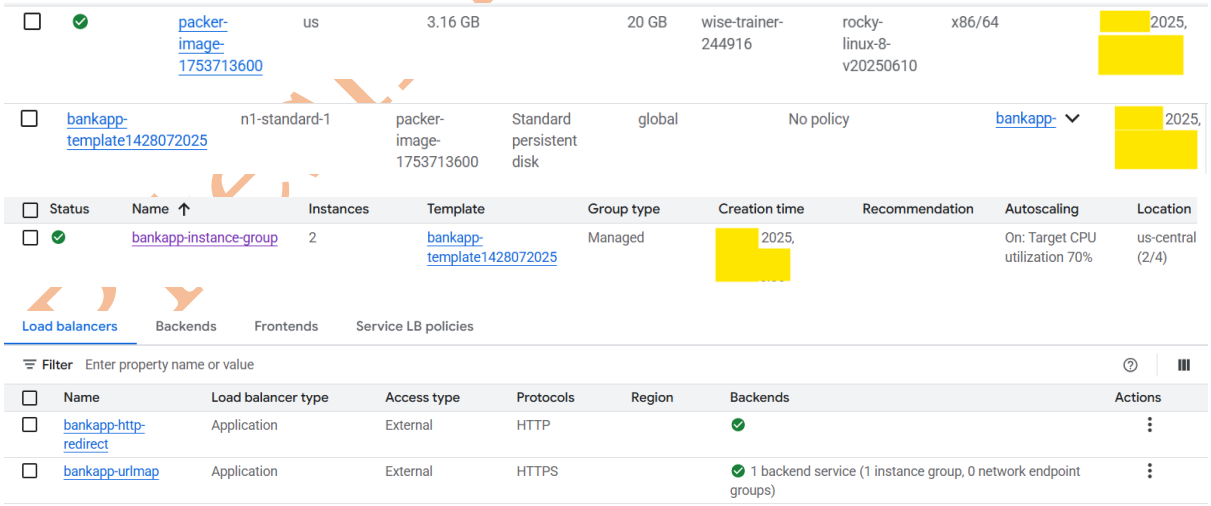
There are three stages in this CI/CD Pipeline.

1. In **build_and_sonarqube_analysis** stage performed SonarQube Analysis and Build the code using Maven.
2. In **nexus_artifact_upload** stage Upload the Artifacts to Nexus Artifactory.
3. In **deployment** stage I created the GCP Image using Hashicorp Packer in this Image I copied the **.jar** file using file provisioner then using this Image, GCP Image-template had been created then with this new image-template the existed Managed Image-Group (MIG) was updated and I also enabled the auto-healing in GCP MIG. In the newly created VM-Instances I deployed the **.jar** file using the systemctl command and started it from boot-time as shown in the screenshot attached below. The Linux service to deploy the **.jar** file had been created using bootstrap script **startup-image-template.sh** present in the GitHub Repo https://github.com/singhritesh85/Bank-App-GCP-ALB-Autoscaling.git.

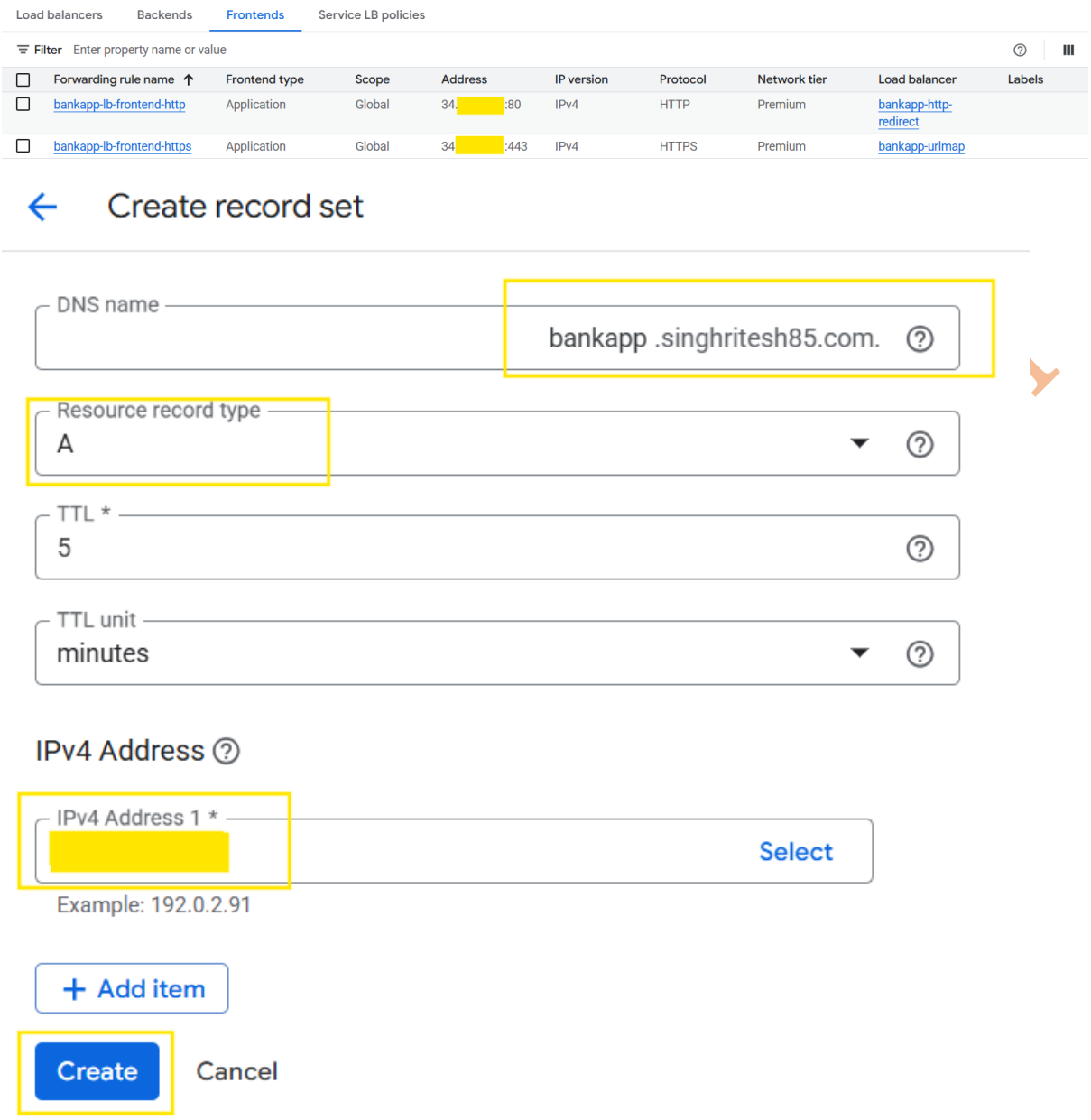
```
cat > /opt/bankapp-shell-script.sh <<BANKAPP
#!/bin/bash

BANKAPP=`ps -ef|grep "java -jar /opt/bankapp/bankapp.jar"|grep -v "color=auto"|awk '{print $2}'`
echo $BANKAPP
kill -9 $BANKAPP
nohup java -jar /opt/bankapp/bankapp.jar >/dev/null 2>&1 &
BANKAPP

chmod +x /opt/bankapp-shell-script.sh
cp /opt/bankapp-shell-script.sh /usr/local/bin/
```

```
cat > /etc/systemd/system/bankapp.service <<END_FOR_SCRIPT
[Unit]
Description=bankapp service
After=network.target

[Service]
Type=forking
Environment="PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/usr/lib/jvm/java-17-openjdk-17.0.16.0.8-2.el8.x86_64/bin"
ExecStart=/usr/local/bin/bankapp-shell-script.sh start
User=root
Restart=on-failure

[Install]
WantedBy=multi-user.target
END_FOR_SCRIPT

systemctl daemon-reload
systemctl enable bankapp
systemctl start bankapp
systemctl status bankapp
```

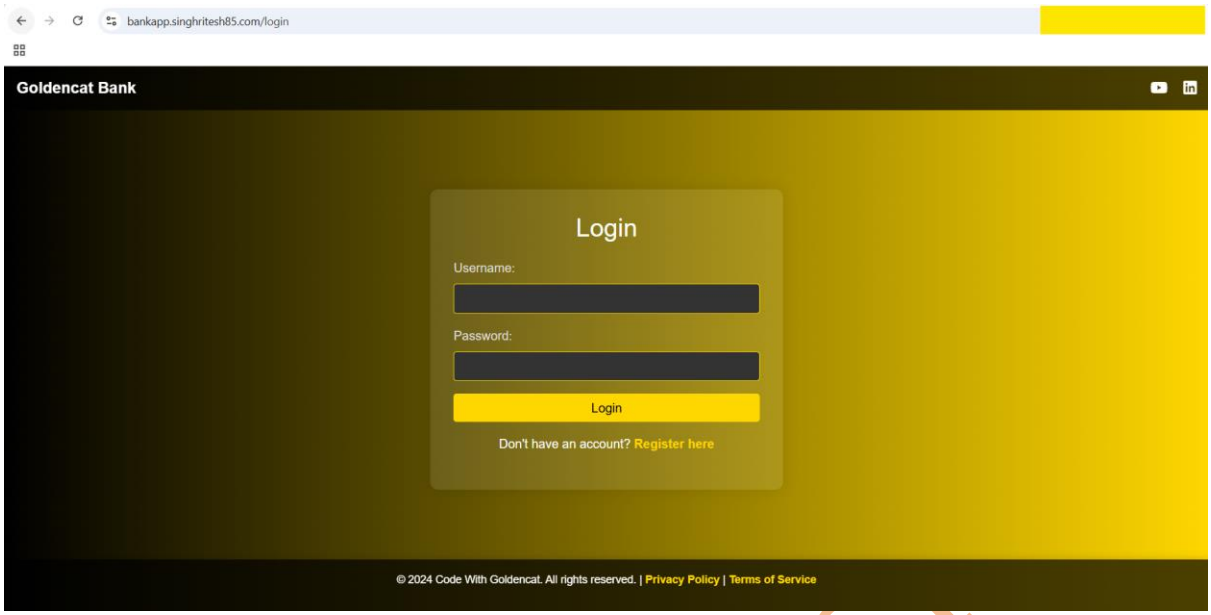
Below screenshots shows GCP Image, Instance-Template, Instance-Group and LoadBalancer.

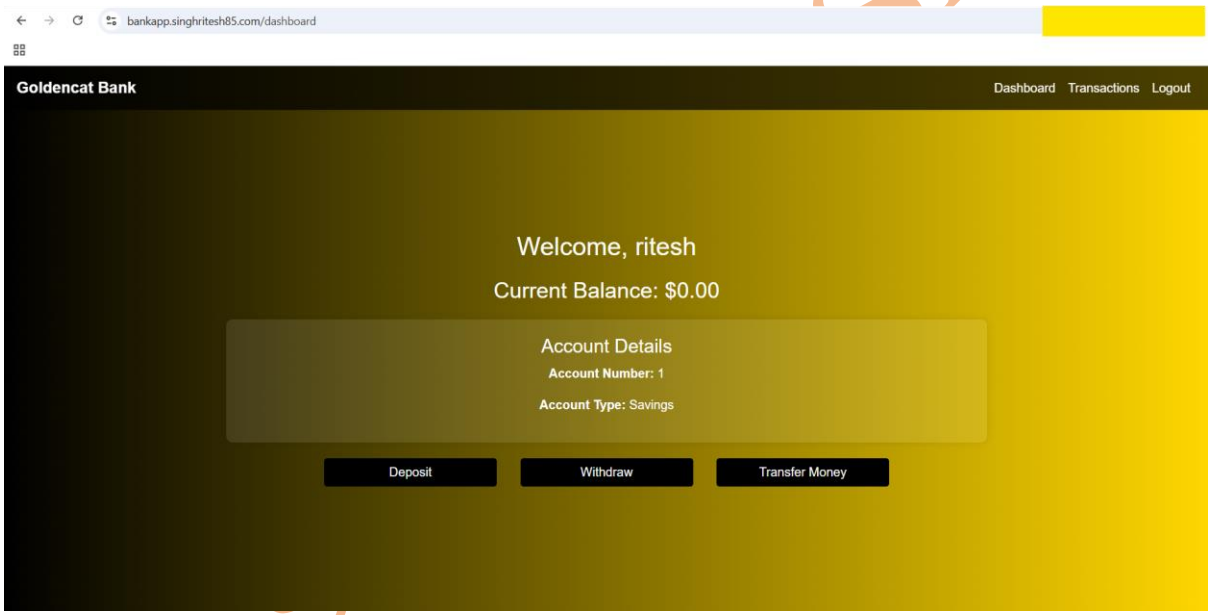


I had created a Record-Set of A-Type in GCP Cloud DNS with GCP Application LoadBalancer Static IP as shown in the screenshot attached below.



Finally, I was able to access the Bank Application using the URL as shown in the screenshot attached below.

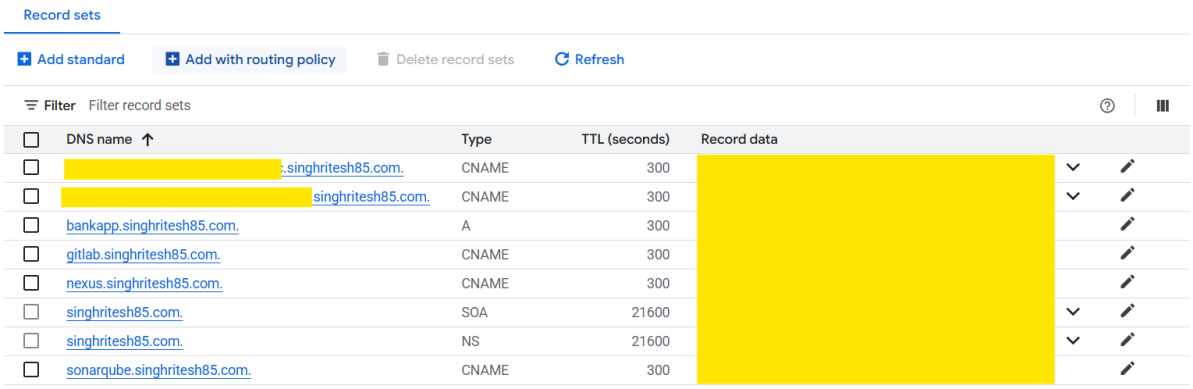

bankapp.singhritesh85.com/login
Goldencat Bank
Login
Username:
Password:
Login
Don't have an account? Register here
© 2024 Code With Goldencat. All rights reserved. | Privacy Policy | Terms of Service


bankapp.singhritesh85.com/dashboard
Goldencat Bank
Dashboard
Transactions
Logout
Welcome, ritesh
Current Balance: $0.00
Account Details
Account Number: 1
Account Type: Savings
Deposit
Withdraw
Transfer Money

```
[root@                    # mysql -h 10.      -u dbadmin --password
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 5444
Server version: 8.0.41-google (Google)

Copyright (c) 2000, 2025, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| bankappdb          |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.02 sec)

mysql> use bankappdb;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
```

```
mysql> show tables;
+--------------------+
| Tables_in_bankappdb |
+--------------------+
| account            |
| transaction        |
+--------------------+
2 rows in set (0.01 sec)

mysql> select * from account;
+----+---------+--------------------------------------------------------------+----------+
| id | balance | password                                                     | username |
+----+---------+--------------------------------------------------------------+----------+
|  1 |    0.00 |                                                              | ritesh   |
+----+---------+--------------------------------------------------------------+----------+
1 row in set (0.01 sec)
```

The entry for Cloud DNS Zone for Record Sets is as shown in the screenshot attached below.



Source Code: https://github.com/singhritesh85/Bank-App-GCP-ALB-Autoscaling.git

GitHub Repo: https://github.com/singhritesh85/DevOps-Project-BankApp-GCP-ALB-Autoscaling.git

Terraform Script: https://github.com/singhritesh85/DevOps-Project-BankApp-GCP-ALB-Autoscaling.git

References: https://github.com/Goldencat98/Bank-App.git