THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

# Automating Deployment:

# Node.js REST API CI/CD Pipeline on AWS EC2

# with GitHub Actions

This document provides a comprehensive guide to setting up a complete CI/CD pipeline for deploying a Node.js REST API on an AWS EC2 instance using GitHub Actions. It covers every step, from configuring the AWS environment to automating build, test, and deployment processes.

Key highlights include:

- **EC2 Instance Setup**: Installing and configuring the necessary tools, such as Node.js, npm, and Git, on the AWS EC2 instance.
- **GitHub Actions Workflow**: Writing reusable and efficient workflows to automate the testing, building, and deployment stages of the Node.js application.
- **Environment Variables Management**: Ensuring secure handling of sensitive information like AWS credentials and instance details.
- **Seamless Integration**: Demonstrating how GitHub Actions integrate with AWS to streamline the deployment process.
- **Error Handling and Debugging**: Best practices for monitoring and resolving potential issues during deployment.

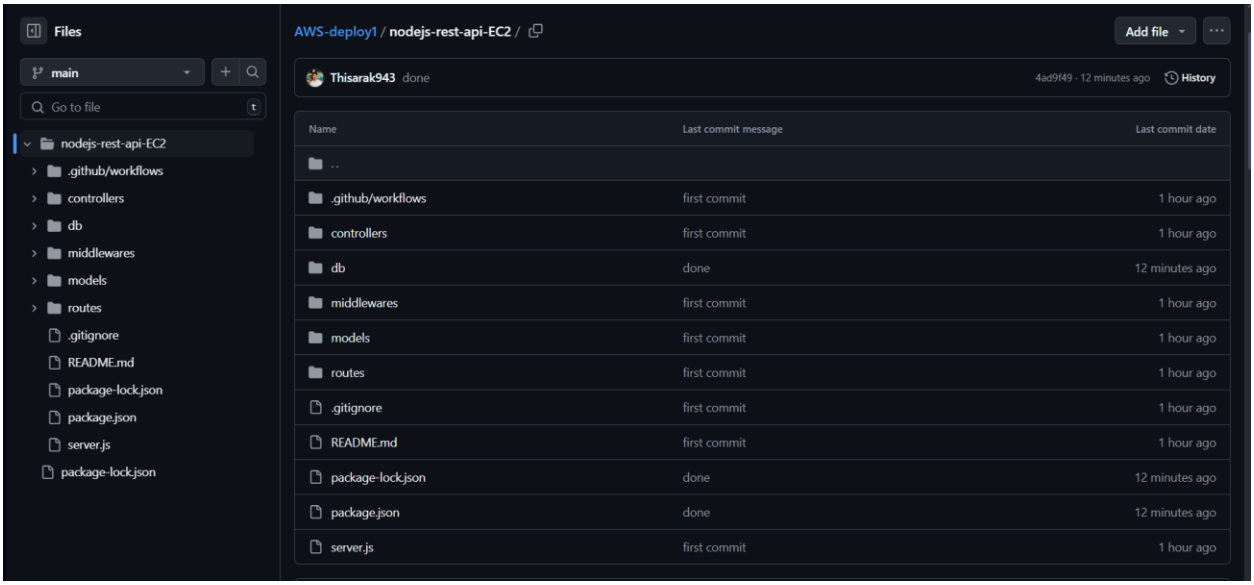
This guide is tailored for those seeking to understand the practical implementation of DevOps practices, focusing on continuous integration and delivery workflows for modern cloud environments.

THISARA KANDAGE

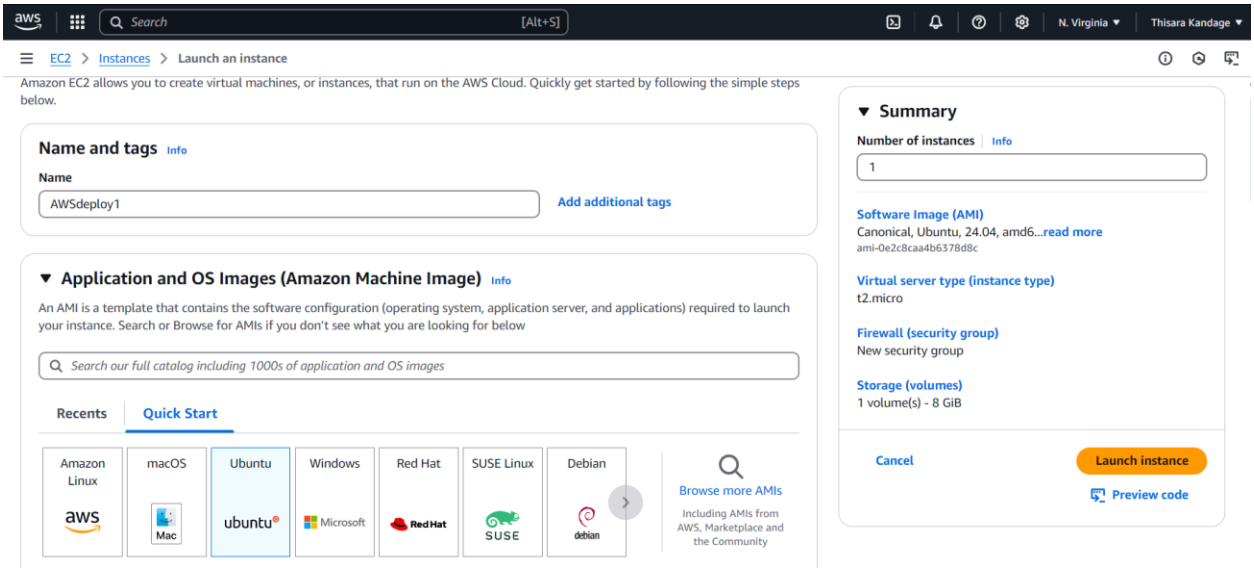
UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

## Created a GitHub repository



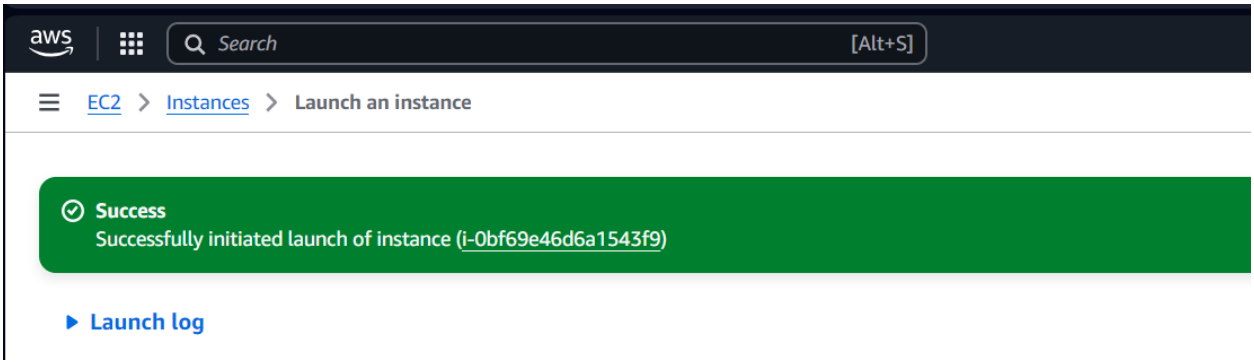

## Create AWS EC2 instance with Ubuntu



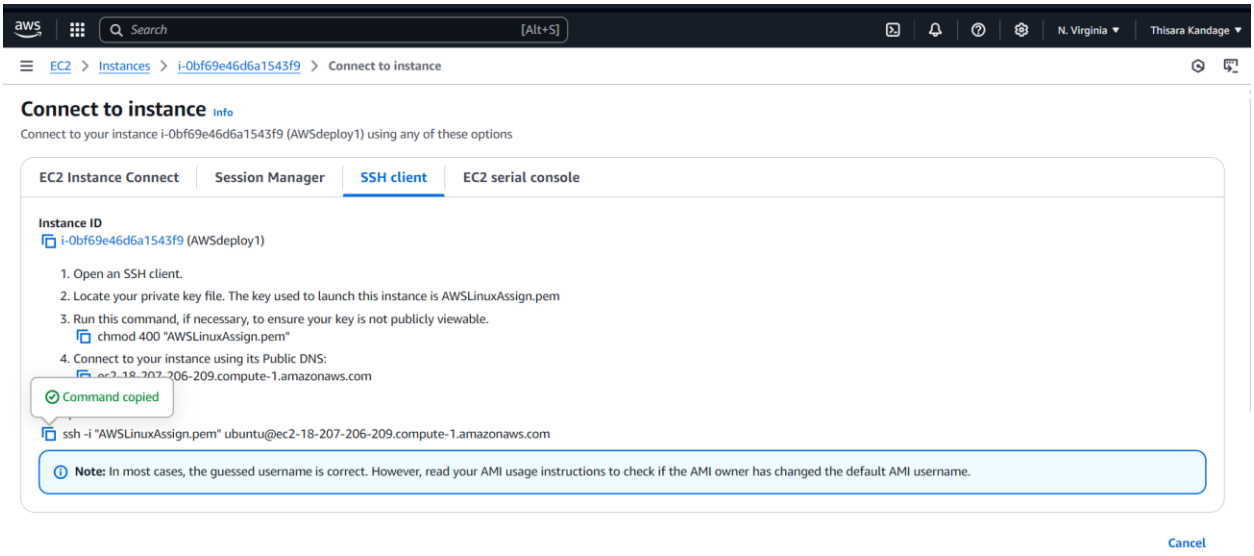
THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website


## Connect via SSH



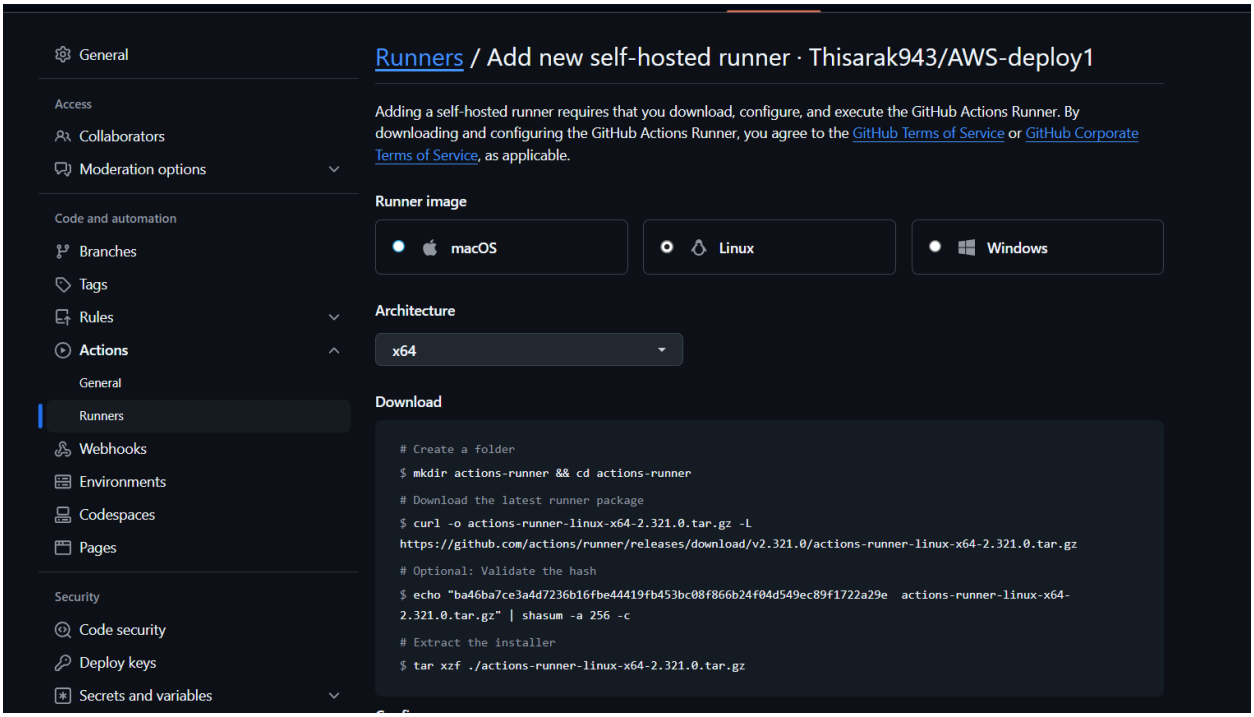
THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website


```
PS C:\Users\Thisara K\Downloads\LinuxTest> ssh -i "AWSLinuxAssign.pem" ubuntu@ec2-18-207-206-209.compute-1.amazonaws.com
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1018-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

 System information as of Sun Dec 29 07:50:18 UTC 2024

  System load:  0.0               Processes:             105
  Usage of /:   24.6% of 6.71GB   Users logged in:       0
  Memory usage: 20%               IPv4 address for enX0: 172.31.92.212
  Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status


The list of available updates is more than a week old.
To check for new updates run: sudo apt update


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

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-92-212:~$
```

## Create Self Hosted Runner on GitHub



THISARA KANDAGE

UNDERGRADUATE - SLIIT

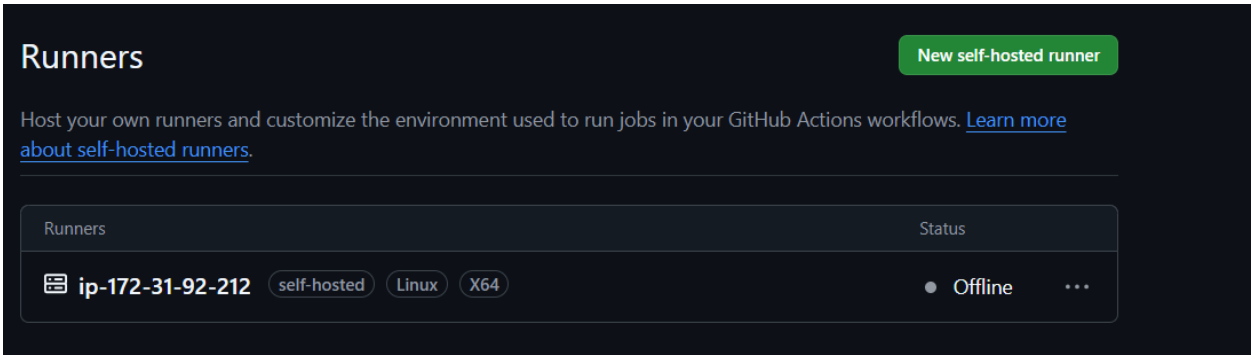
E-mail LinkedIn GitHub Website

## Download Part

```
ubuntu@ip-172-31-92-212:~$ mkdir actions-runner && cd actions-runner
ubuntu@ip-172-31-92-212:~/actions-runner$ curl -o actions-runner-linux-x64-2.321.0.tar.gz -L https://github.com/actions/runner/releases/download/v2.321.0/actions-runner
-linux-x64-2.321.0.tar.gz
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0
100  113M  100  113M    0     0  82.4M      0  0:00:01  0:00:01 --:--:--  111M
ubuntu@ip-172-31-92-212:~/actions-runner$ echo "ba46ba7ce3a4d7236b16fbe44419fb453bc08f866b24f04d549ec89f1722a29e  actions-runner-linux-x64-2.321.0.tar.gz" | shasum -a 2
56 -c
actions-runner-linux-x64-2.321.0.tar.gz: OK
ubuntu@ip-172-31-92-212:~/actions-runner$ tar xzf ./actions-runner-linux-x64-2.321.0.tar.gz
ubuntu@ip-172-31-92-212:~/actions-runner$
```

## Configuration part

```
ubuntu@ip-172-31-92-212:~/actions-runner$ ./config.sh --url https://github.com/Thisarak943/AWS-deploy1 --token BGDYHC4SSFMBQVPLKDL2RGDHOEG2O

--------------------------------------------------------------------------------
|        ____ _ _   _   _       _          _     _                            |
|       / ___(_) |_| | | |_   _| |__      / \   ___| |_(_) ___  _ __  ___      |
|       | |  _| | __| |_| | | | | '_ \    / _ \ / __| __| |/ _ \| '_ \/ __|     |
|       | |_| | | |_|  _  | |_| | |_) |  / ___ \ (__| |_| | (_) | | | \__ \     |
|        \____|_|\__|_| |_|\__,_|_.__/  /_/   \_\___|\__|_|\___/|_| |_|___/     |
|                                                                              |
|                       Self-hosted runner registration                        |
|                                                                              |
--------------------------------------------------------------------------------

# Authentication


√ Connected to GitHub

# Runner Registration

Enter the name of the runner group to add this runner to: [press Enter for Default]

Enter the name of runner: [press Enter for ip-172-31-92-212]

This runner will have the following labels: 'self-hosted', 'Linux', 'X64'
Enter any additional labels (ex. label-1,label-2): [press Enter to skip]

√ Runner successfully added
√ Runner connection is good
```

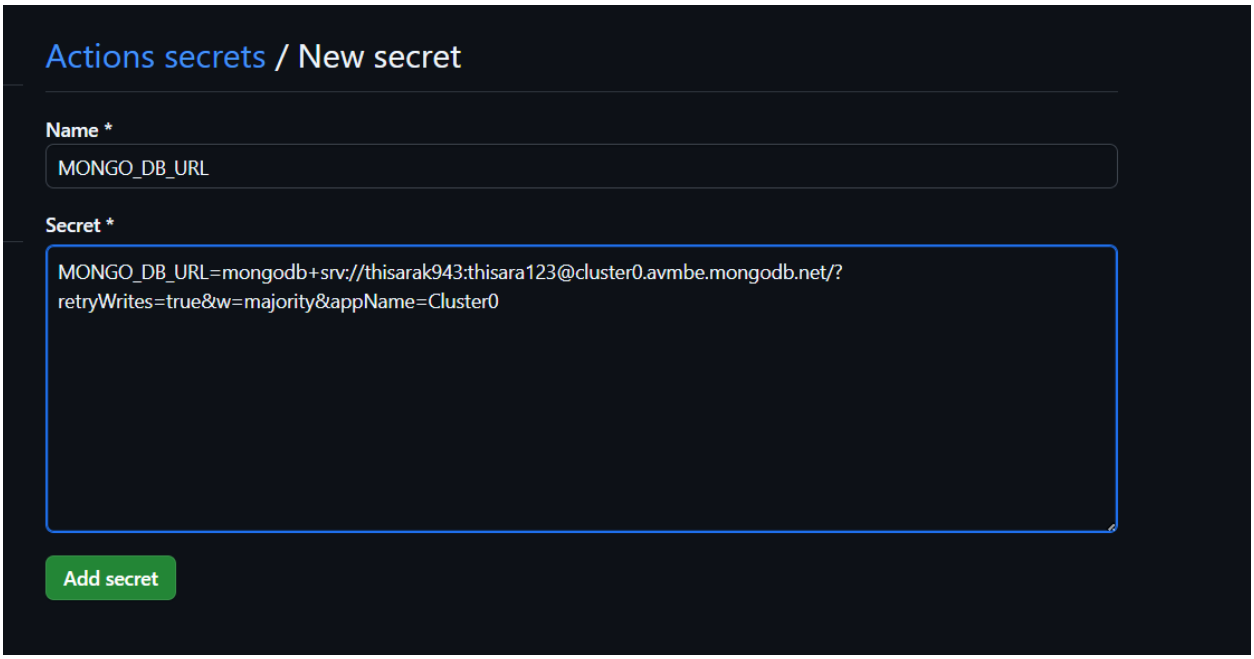


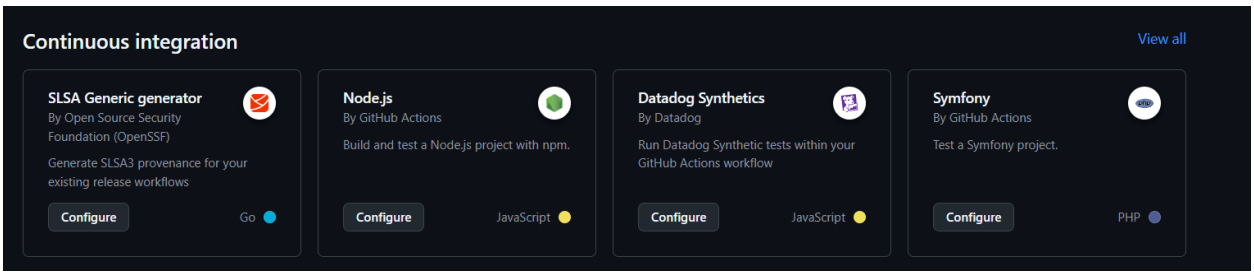
THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

# Add new Repository Secret



THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

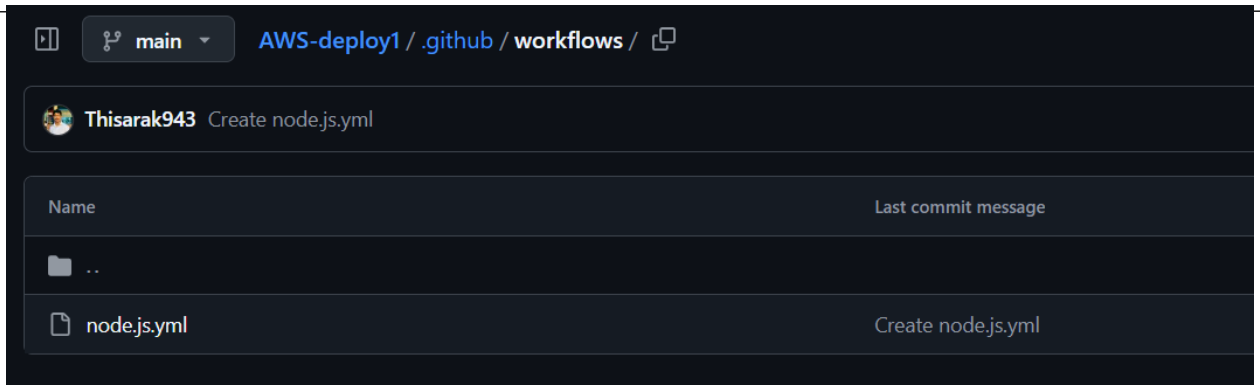
## Node.js.yml File

```
name: Node.js CI/CD

on:
  push:
    branches: [ "main" ]

jobs:
  build:
    runs-on: self-hosted
    strategy:
      matrix:
        node-version: [20.x]
        # See supported Node.js release schedule at https://nodejs.org/en/about/releases/
    steps:
    - uses: actions/checkout@v3
    - name: Use Node.js ${{ matrix.node-version }}
      uses: actions/setup-node@v3
      with:
        node-version: ${{ matrix.node-version }}
        cache: 'npm'
    - run: npm ci
    - run: |
        touch .env
        echo "${{ secrets.MONGO_DB_URL }}" > .env
    - run: pm2 restart BackendAPI
```

THISARA KANDAGE

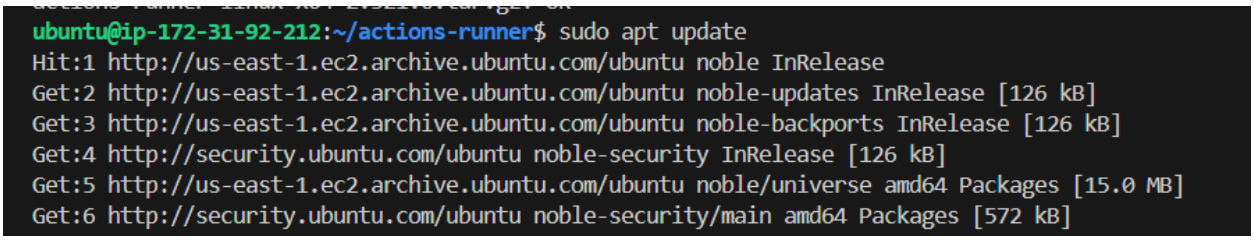
UNDERGRADUATE - SLIIT

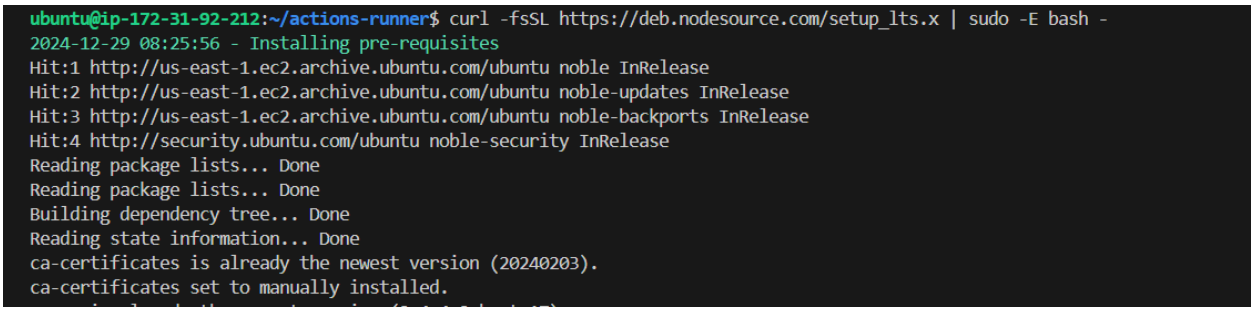
E-mail LinkedIn GitHub Website




## Environmental Setup in Ubuntu

## Ensure Node.js and Nginx are installed on my Ubuntu instance.



THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

```
ubuntu@ip-172-31-92-212:~/actions-runner$ sudo apt-get install -y nodejs nginx
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  nginx-common
Suggested packages:
  fcgiwrap nginx-doc ssl-cert
The following NEW packages will be installed:
  nginx nginx-common nodejs
0 upgraded, 3 newly installed, 0 to remove and 55 not upgraded.
Need to get 36.7 MB of archives.
```

```
ubuntu@ip-172-31-92-212:~/actions-runner$ node -v
v22.12.0
ubuntu@ip-172-31-92-212:~/actions-runner$ npm -v
10.9.0
ubuntu@ip-172-31-92-212:~/actions-runner$
```

THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

## Setting Up PM2(for 24*7 Availability)

```
v22.12.0
ubuntu@ip-172-31-92-212:~/actions-runner$ npm -v
10.9.0
ubuntu@ip-172-31-92-212:~/actions-runner$ sudo npm i -g pm2

added 137 packages in 8s

13 packages are looking for funding
  run `npm fund` for details
npm notice
npm notice New major version of npm available! 10.9.0 -> 11.0.0
npm notice Changelog: https://github.com/npm/cli/releases/tag/v11.0.0
npm notice To update run: npm install -g npm@11.0.0
npm notice
ubuntu@ip-172-31-92-212:~/actions-runner$ pm2

                        -------------

__/\\\\\\\\\\\\\____/\\\\____________/\\\\____/\\\\\\\\\_____
 _\/\\\/////////\\\_\/\\\\\\________/\\\\\\__/\\\///////\\\___
  _\/\\\_______\/\\\_\/\\\//\\\____/\\\//\\\_\///______\//\\\__
   _\/\\\\\\\\\\\\\/__\/\\\\///\\\/\\\/_\/\\\___________/\\\/___
    _\/\\\/////////____\/\\\__\///\\\/___\/\\\________/\\\//_____
     _\/\\\_____________\/\\\____\///_____\/\\\_____/\\\//________
      _\/\\\_____________\/\\\_____________\/\\\___/\\\/___________
       _\/\\\_____________\/\\\_____________\/\\\__/\\\\\\\\\\\\\\\_
        _\///______________\///______________\///__\///////////////__
```

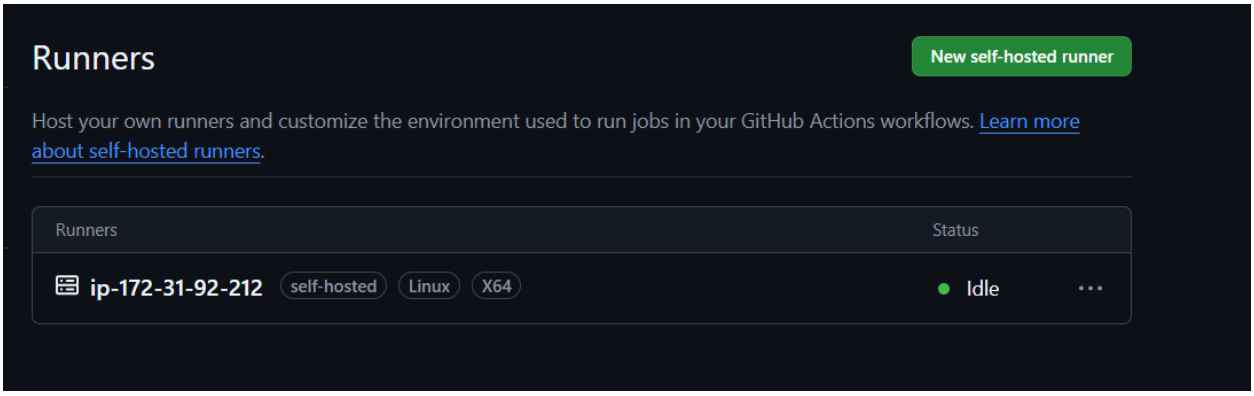
THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

## Start the Runners

```
ubuntu@ip-172-31-92-212:~/actions-runner$ sudo ./svc.sh install
Creating launch runner in /etc/systemd/system/actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service
Run as user: ubuntu
Run as uid: 1000
gid: 1000
Created symlink /etc/systemd/system/multi-user.target.wants/actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service → /etc/systemd/system/actions.runner.Thisara
k943-AWS-deploy1.ip-172-31-92-212.service.
ubuntu@ip-172-31-92-212:~/actions-runner$ sudo ./svc.sh start

/etc/systemd/system/actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service
● actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service - GitHub Actions Runner (Thisarak943-AWS-deploy1.ip-172-31-92-212)
     Loaded: loaded (/etc/systemd/system/actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service; enabled; preset: enabled)
     Active: active (running) since Sun 2024-12-29 08:34:36 UTC; 14ms ago
   Main PID: 2794 (runsvc.sh)
      Tasks: 1 (limit: 1130)
     Memory: 236.0K (peak: 756.0K)
        CPU: 3ms
     CGroup: /system.slice/actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service
             ├─2794 /bin/bash /home/ubuntu/actions-runner/runsvc.sh
             └─2796 cat .path

Dec 29 08:34:36 ip-172-31-92-212 systemd[1]: Started actions.runner.Thisarak943-AWS-deploy1.ip-172-31-92-212.service - GitHub Actions Runner (Thisarak943-A…-31-92-212).
Dec 29 08:34:36 ip-172-31-92-212 runsvc.sh[2794]: .path=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
Hint: Some lines were ellipsized, use -l to show in full.
ubuntu@ip-172-31-92-212:~/actions-runner$
```



THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

## PM2 logs in terminal

```
/home/ubuntu/.pm2/logs/server-out.log last 15 lines:
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | Server is running on port: 8000
0|server   | MongoDB connection established
```

## Creating Nginx reverse proxy

```
  GNU nano 7.2                                    /etc/nginx/sites-available/default *
        #       fastcgi_pass 127.0.0.1:9000;
        #}

        # deny access to .htaccess files, if Apache's document root
        # concurs with nginx's one
        #
        #location ~ /\.ht {
        #       deny all;
        #}
}


# Virtual Host configuration for example.com
#
# You can move that to a different file under sites-available/ and symlink that
# to sites-enabled/ to enable it.
#
#server {
#       listen 80;
#       listen [::]:80;
#
#       server_name example.com;
  GNU nano 7.2                                    /etc/nginx/sites-available/default *
#       location / {
#               try_files $uri $uri/ =404;
#       }
#}
ocation /api {
  rewrite ^\/api\/(.*)$ /api/$1 break;
  proxy_pass http://localhost:5000;
  proxy_set_header Host $host;
  proxy_set_header X-Real-IP $remote_addr;
  proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
}
```

THISARA KANDAGE

UNDERGRADUATE - SLIIT

E-mail LinkedIn GitHub Website

# Conclusion

1. **Challenges Faced:**
    - Configuring the AWS EC2 instance for deployments, including setting up security groups and SSH access.
    - Managing AWS credentials securely within the CI/CD pipeline.
    - Debugging GitHub Actions workflows due to misconfigurations in YAML files and incorrect environment variables.
2. **Solutions Implemented:**
    - Researched AWS documentation to properly configure EC2 instances.
    - Used GitHub Secrets to securely store and manage sensitive information.
    - Analyzed GitHub Actions logs and applied systematic debugging to resolve pipeline issues.
3. **Key Learnings:**
    - Gained practical knowledge of cloud infrastructure setup and management.
    - Improved understanding of CI/CD processes, automation, and workflow optimization.
    - Developed skills in securing pipelines and handling environment variables.
4. **Impact on Knowledge:**
    - Enhanced technical proficiency in deploying scalable and reliable applications.
    - Strengthened problem-solving abilities and confidence in tackling DevOps challenges.
    - Acquired hands-on experience with tools and practices critical to modern DevOps workflows.