

Platform Engineering Service

18.09.2023

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Overview

There are two parts to this take home exercise which is meant to challenge you on the aspects of the cloud infrastructure engineer role that you might encounter day to day.

The first part of the exercise is a programming exercise to write a small bespoke tool to perform some tasks.

The field of cloud computing is still very nascent and new. The ecosystem is still developing and there are many new tools that are not mature yet. Frequently, we might encounter some weird behaviour or bugs in the tools that we use. It is also common to encounter situations where there is no tool that performs exactly what we need, or the tool that we are using is missing certain features. Sometimes, it is possible to cobble together a myriad of tools to perform our tasks, but sometimes it's not.

It is therefore useful to be able to read and write code so that we can help to figure out where bugs or problems might have arisen from in the tools. We can then write detailed and useful bug reports for the maintainers to work on. If we have the time, we might even be able to write code ourselves and contribute to the open source community.

The second part of the exercise is to deploy the tool you have written in the first part to a production cloud environment.

The core part of the role is to run and maintain the cloud infrastructure and services and applications running on top of the infrastructure. It is important that the applications and services take advantage of the cloud environment as much as possible to provide the necessary performance and availability to fulfil business needs.

Goals

1. Please perform the tasks described in the next section.
2. Document instructions on how to execute and use your solution.
3. Think through the design and take note of the various decisions and tradeoffs that you make.
4. You will be asked questions during your interview for discussion.
5. Archive your solution and email them to the hiring manager.

Programming Task

Using a programming language of your choice, implement a long-running process that:

Accepts a csv file containing a list of up to 1000 urls with names at startup.

The process should pull all these urls every 10 minutes to check their HTTP status.

The process should also bind a local port, to provide a summary of monitoring status in the past hour in anysuitable format.

Containerise the application

A sample of the CSV file might include:

name, url

google, <https://www.google.com>

...

sph, <https://www.sph.com.sg>

Deployment Task

Provide a solution in the form of code using

Terraform

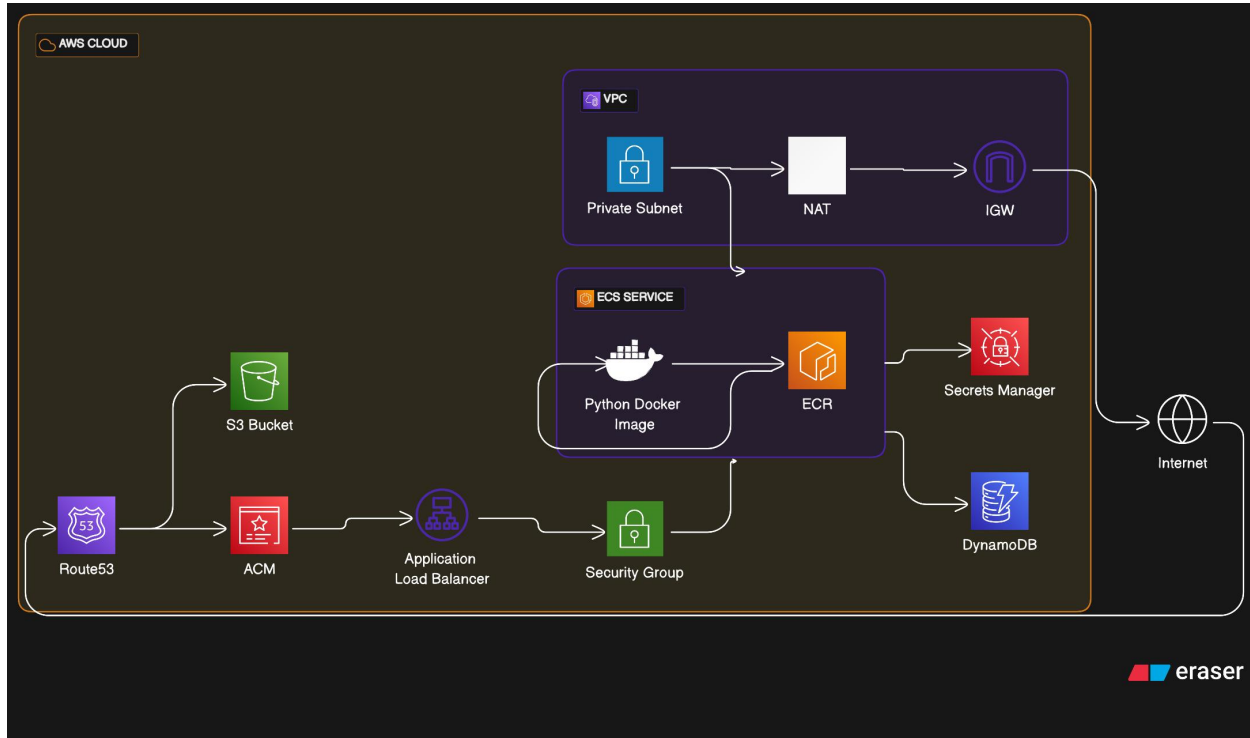
to deploy the containerised application you have written above to acloud provider of your choice.

Your solution should include setting up the cloud provider account so that the applicationcan be deployed.

Technology Stack

- **Programming task - Python**
- **Infrastructure as code - Terraform(HCL)**
- **Cloud - AWS (ECS, ALB, Security Groups, Secrets, VPC, NAT, IGW, s3, DynamoDb, IAM, ACM, CloudWatch, Route53)**
- **Web app - Typescripts, Angular, Html5, CSS**

Target Architecture



How it works

ECS Service with FastAPI and Health Check

- **Environment:** AWS ECS with Fargate launch type, running within a private subnet.
- **Language:** The application is written in Python, using the FastAPI framework.
- **Task:** The ECS task is scheduled to run health check jobs on URLs every 10 minutes.
- **CSV File:** A CSV file containing the list of URLs is bundled within the Docker image.
- **Docker Image:** The Docker image containing the FastAPI application and the CSV file is hosted in a public Amazon ECR (Elastic Container Registry).

DynamoDB for Storing Summary

- **Database:** AWS DynamoDB is used to store the summary of health checks.
- **Data Model:** The table schema is designed to accommodate summary details like time, status, and status code count.

Summary APIs and ALB

- **APIs:** The ECS service exposes APIs that return health check summaries.
- **Load Balancer:** An AWS ALB distributes incoming API requests across ECS tasks.
- **Route 53:** Domain name resolution and routing are handled via AWS Route 53.
- **SSL:** SSL certificates are installed to secure the API requests and responses.

Angular App in S3

- **Static Site:** An Angular application is hosted in a public S3 bucket.
- **Functionality:** The app fetches health summary details via the secure APIs exposed by the ECS service.

Security Measures

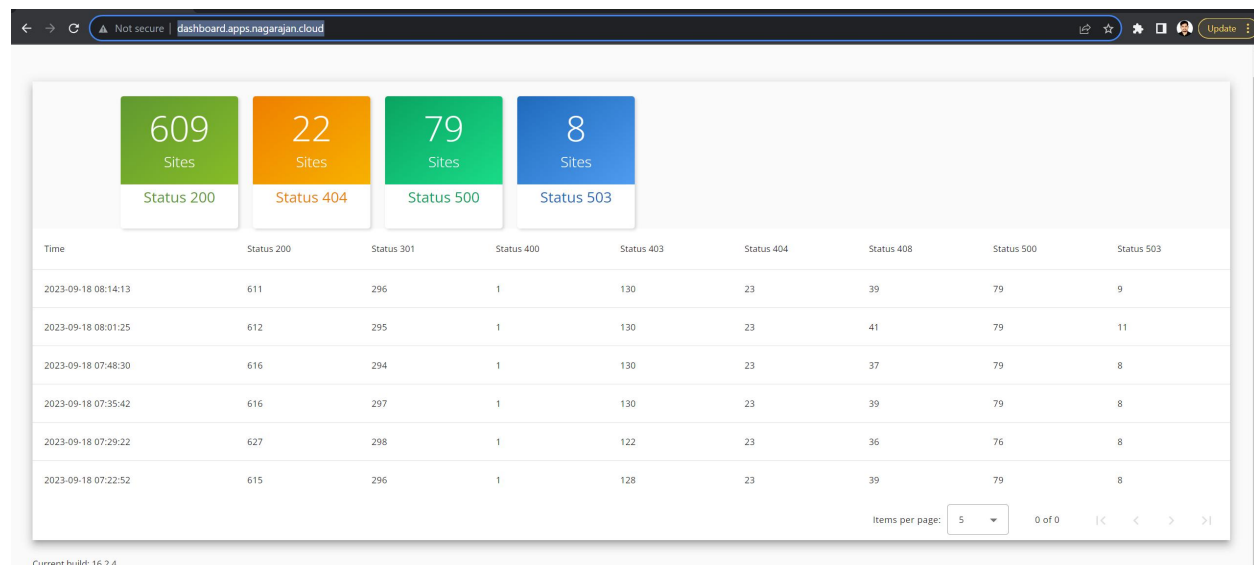
- **VPC and Private Subnet:** The ECS tasks are run within a VPC and a private subnet for added security.
- **SSL:** All traffic between the Angular app and the APIs are encrypted using SSL certificates.

In summary, this architecture offers a scalable, secure, and efficient solution for performing periodic health checks on URLs and exposing these summaries through an Angular app hosted on S3.

Live Demo

Please visit below url for live Demo (Angular app fetching health summary from live apis)

<http://dashboard.apps.nagarajan.cloud>



Api calls to ECS via LB

1. Latest websites health summary

<https://platform.apps.nagarajan.cloud/latest-summary>

```
← → ↺ platform.apps.nagarajan.cloud/latest-summary

{"200":609,"503":8,"403":129,"301":297,"404":22,"500":79,"408":47,"303":2,"406":37,"405":10,"302":66,"202":1,"429":3,"307":4,"308":3,"400":1,"412":1,"210":1,"410":1}
```

2. Last one hour health summary

<https://platform.apps.nagarajan.cloud/past-hour-summary>

```
← → ↺ platform.apps.nagarajan.cloud/past-hour-summary

[{"301":296,"503":9,"200":611,"403":130,"404":23,"500":79,"408":39,"406":37,"405":10,"303":2,"302":68,"202":1,"429":5,"307":4,"308":3,"400":1,"412":1,"210":1,"410":1,"time_stamp":"2023-09-18 08:14:13"}, {"301":295,"503":11,"200":612,"403":130,"404":23,"500":79,"408":41,"406":36,"405":10,"303":2,"302":64,"202":1,"429":6,"307":4,"308":3,"400":1,"412":1,"210":1,"410":1,"time_stamp":"2023-09-18 08:01:25"}, {"301":294,"503":8,"200":616,"403":130,"404":23,"500":79,"408":37,"406":35,"405":10,"303":2,"302":71,"202":1,"304":1,"307":4,"308":3,"400":1,"429":3,"412":1,"210":1,"410":1,"time_stamp":"2023-09-18 07:48:30"}, {"301":297,"503":8,"200":616,"403":130,"404":23,"500":79,"408":39,"406":35,"405":10,"303":2,"302":69,"202":1,"307":4,"308":3,"400":1,"412":1,"429":1,"410":1,"time_stamp":"2023-09-18 07:35:42"}, {"503":8,"403":122,"200":627,"301":298,"404":23,"500":76,"408":36,"406":35,"405":9,"302":72,"303":2,"202":1,"429":2,"308":3,"307":3,"400":1,"412":1,"210":1,"410":1,"time_stamp":"2023-09-18 07:29:22"}, {"301":296,"503":8,"200":615,"403":128,"404":23,"500":79,"408":39,"406":35,"405":10,"303":2,"302":69,"202":1,"429":5,"307":4,"308":3,"400":1,"412":1,"210":1,"410":1,"time_stamp":"2023-09-18 07:22:52"}]
```

3. All websites latest health

<https://platform.apps.nagarajan.cloud/websites-status>

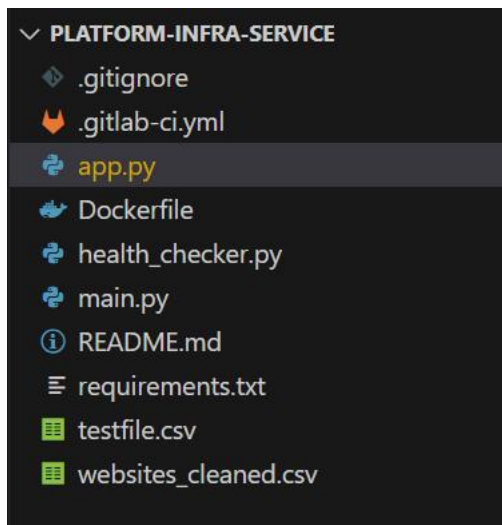
```
← → ↺ platform.apps.nagarajan.cloud/websites-status

{"www.trip.com":{"name":"www.trip.com","Category":"Travel","Status":200},"www.ebookers.com":{"name":"www.ebookers.com","Category":"Travel","Status":503},"www.orbitz.com":{"name":"www.orbitz.com","Category":"Travel","Status":503},"www.travelocity.com":{"name":"www.travelocity.com","Category":"Travel","Status":503},"book.priceline.com":{"name":"book.priceline.com","Category":"Travel","Status":403},"www.booking.com":{"name":"www.booking.com","Category":"Travel","Status":301},"www.monondo.in":{"name":"www.monondo.in","Category":"Travel","Status":200},"www.otel.com":{"name":"www.otel.com","Category":"Travel","Status":404},"travelsites.com":{"name":"travelsites.com","Category":"Travel","Status":200},"hoteltravelclub.com":{"name":"hoteltravelclub.com","Category":"Travel","Status":403},"www.marriott.com":{"name":"www.marriott.com","Category":"Travel","Status":503},"www.hoteltonight.com":{"name":"www.hoteltonight.com","Category":"Travel","Status":200},"in.lastminute.com":{"name":"in.lastminute.com","Category":"Travel","Status":403},"www.kayak.co.in":{"name":"www.kayak.co.in","Category":"Travel","Status":200},"www.ritzcarlton.com":{"name":"www.ritzcarlton.com","Category":"Travel","Status":301},"secretbay.de":{"name":"secretbay.de","Category":"Travel","Status":403},"www.rockhouse.com":{"name":"www.rockhouse.com","Category":"Social Networking and Messaging","Status":200},"www.onthebeach.co.uk":{"name":"www.onthebeach.co.uk","Category":"Travel","Status":200},"www.twinfarms.com":{"name":"www.twinfarms.com","Category":"Travel","Status":403},"www.airbnb.co.in":{"name":"www.airbnb.co.in","Category":"Travel","Status":200},"www.sunsetkeycottages.com":{"name":"www.sunsetkeycottages.com","Category":"Travel","Status":301},"dreamworldtravel.co.uk":{"name":"dreamworldtravel.co.uk","Category":"Travel","Status":500},"www.capallahotels.com":{"name":"www.capallahotels.com","Category":"Travel","Status":301},"westin.marriott.com":{"name":"westin.marriott.com","Category":"Travel","Status":403},"www.milstonehotel.com":{"name":"www.milstonehotel.com","Category":"Travel","Status":303},"nhi.com":{"name":"nhi.com","Category":"Travel","Status":200},"www.shiptoshoretraveltd.com":{"name":"www.shiptoshoretraveltd.com","Category":"Travel","Status":200},"fogoislandinn.ca":{"name":"fogoislandinn.ca","Category":"Travel","Status":200},"www.peru-travels.com":{"name":"www.peru-travels.com","Category":"Travel","Status":200},"www.totallyspain.com":{"name":"www.totallyspain.com","Category":"Travel","Status":200},"www.oceanotravel.com":{"name":"www.oceanotravel.com","Category":"Travel","Status":301},"www.aisadventures.com":{"name":"www.aisadventures.com","Category":"Travel","Status":200},"njswafaris.com":{"name":"njswafaris.com","Category":"Travel","Status":200},"essentialdownunder.com":{"name":"essentialdownunder.com","Category":"Travel","Status":301},"www.hotwire.com":{"name":"www.hotwire.com","Category":"Travel","Status":200},"www.viceroyhotelsandresorts.com":{"name":"www.viceroyhotelsandresorts.com","Category":"Travel","Status":200},"northblockhotel.com":{"name":"northblockhotel.com","Category":"Travel","Status":301},"www.wyndhamhotels.com":{"name":"www.wyndhamhotels.com","Category":"Travel","Status":200},"www.ethioustour.com":{"name":"www.ethioustour.com","Category":"Travel","Status":500},"www.nbttravel.com":{"name":"www.nbttravel.com","Category":"Travel","Status":403},"islanddreamsworldtravel.com":{"name":"islanddreamsworldtravel.com","Category":"Travel","Status":403},"agavetravelcreative.com":{"name":"agavetravelcreative.com","Category":"Travel","Status":404},"www.turana.com":{"name":"www.turana.com","Category":"Travel","Status":200},"tierrahotels.com":{"name":"tierrahotels.com","Category":"Travel","Status":403},"www.spicejet.com":{"name":"www.spicejet.com","Category":"Travel","Status":200},"inaxperience.com":{"name":"inaxperience.com","Category":"Travel","Status":200},"novotal.accor.com":{"name":"novotal.accor.com","Category":"Travel","Status":301},"www.megacabs.com":{"name":"www.megacabs.com","Category":"Travel","Status":200},"www.pueblononito.com":{"name":"www.pueblononito.com","Category":"Travel","Status":200},"www.montriresort-bangkok.com":{"name":"www.montriresort-bangkok.com","Category":"Travel","Status":200},"www.nepalspiritualtrekking.com":{"name":"www.nepalspiritualtrekking.com","Category":"Travel","Status":200},"www.costcotravel.com":{"name":"www.costcotravel.com","Category":"Travel","Status":403},"www.dwestontravel.com":{"name":"www.dwestontravel.com","Category":"Travel","Status":403},"www.andbeyond.com":{"name":"www.andbeyond.com","Category":"Travel","Status":200},"www.hotelamparo.com":{"name":"www.hotelamparo.com","Category":"Travel","Status":408},"www.olacabs.com":{"name":"www.olacabs.com","Category":"Travel","Status":200}}
```

Source Code Structure

1. Health check task service python code

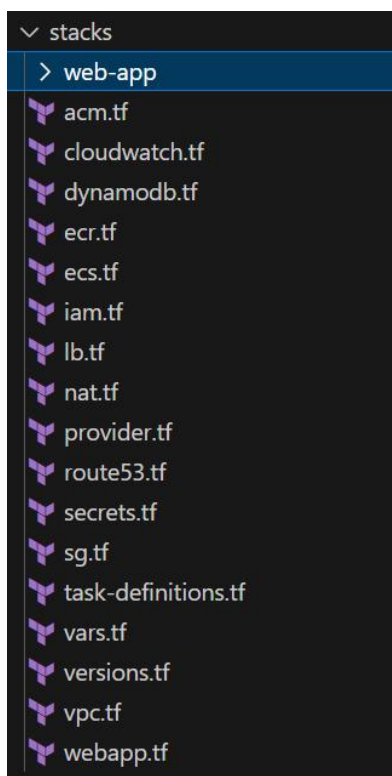
<https://github.com/nagarajyadava/platform-infra-service>



- Use main.py for testing in local
- Gitlab ci for making docker image using gitlab
- app.py for fastApi controller

2. Infrastructre As Code

<https://github.com/nagarajyadava/platform-infra-iac>



How to deploy it?

- Create a IAM user with below access

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "PlatformEngAccess",
      "Effect": "Allow",
      "Action": [
        "s3:*", "cloudwatch:*", "elasticloadbalancing:*", "acm:*", "ec2:*", "route53:*", "route53domains:*", "dynamodb:*",
        "ecr-public:*", "secretsmanager:*", "ecs:*", "ecr:*"
      ],
      "Resource": "*"
    }
  ]
}
```

- 'aws configure' with above user's access key and id
- cd stacks
- Before deploying this iac please change below domain names to your domain names in stacks/var.tf

```
variable "AWS_REGION" {
  default = "ap-southeast-1"
}

variable "MAIN_HOST" {
  default = "apps.nagarajan.cloud"
}

variable "ACM_DOMAIN" {
  default = "/*.apps.nagarajan.cloud"
}

variable "ALB_DOMAIN" {
  default = "platform.apps.nagarajan.cloud"
}

variable "WEB_APP_DOMAIN" {
  default = "dashboard.apps.nagarajan.cloud"
}
```

- terraform init
- terraform plan
- terraform apply
- Now all stacks will be created in above aws account
- Note: Web-app folder have angular app dist files.

VPC > Your VPCs > vpc-05f3a3e4867be7020

vpc-05f3a3e4867be7020 / main

Actions

DetailsInfo

VPC ID

vpc-05f3a3e4867be7020

Tenancy

Default

Default VPC

No

Network Address Usage metrics

Disabled

State

Available

DHCP option set

dopt-0e26920745b2c8600

IPv4 CIDR

10.0.0.0/16

Route 53 Resolver DNS Firewall rule groups

-

DNS hostnames

Enabled

Main route table

rtb-037c186e7d56244ce

IPv6 pool

-

Owner ID

581508631401

DNS resolution

Enabled

Main network ACL

acl-099ee131ebefc1d5f

IPv6 CIDR (Network border group)

-

Resource mapNew

CIDRs

Flow logs

Tags

Resource mapInfo

VPCShow details

Your AWS virtual network

main

Subnets(6)

Subnets within this VPC

ap-southeast-1a

main-public-1

main-private-1

ap-southeast-1b

main-public-2

main-private-2

ap-southeast-1c

main-public-3

main-private-3

Route tables(3)

Route network traffic to resources

rtb-037c186e7d56244ce

main-private-1

main-public-1

Network connections(2)

Connections to other networks

main

nat-03ce306385a541fbb

Was the resource map helpful today?

Give us feedback as often as possible. We are improving continually.

EC2 > Load balancers

Load balancers(1/1)

Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

Filter by property or value

platform-alb

platform-alb-2134408633...

Active

vpc-05f3a3e4867be7020

2 Availability Zones

application

September 17, 2023, 17:10 (UTC+08:00)

Route 53 > Hosted zones

Hosted zones(1)

Automatic mode is the current search behavior optimized for best filter results. To change modes go to settings.

Filter records by property or value

Hosted zone name

Type

Create...

Record ...

Descrip...

apps.nagarajan.cloud

Public

Route 53

6

Managed ...

Security Groups(3)Info

Filter security groups

lb-sg

sg-063b592fafa2faf11

lb-sg

vpc-05f3a3e4867be7020

security group for load...

-

sg-00e969dae628183af

default

vpc-05f3a3e4867be7020

default VPC security gr...

ecs-service-sg

sg-06d62824db91094bf

ecs-service-sg

vpc-05f3a3e4867be7020

security group for ecs

Amazon Elastic Container Service > Clusters > fargate-cluster > Services > platform_eng_service > Tasks

platform_eng_service

Update serviceDelete service

Health and metricsTasksLogsDeploymentsEventsConfigurationNetworkingTags

Tasks (1/1)

Filter tasks by property or valueRunning tasksAll launch types

| Task | Last status | Desired st... | Task defi... | Revision | Health sta... | Started at | Container instan... | Launch type | CPU | Me |
|-----------|-------------|---------------|---------------|----------|---------------|-------------|---------------------|-------------|---------|-----|
| 9cd000... | Running | Running | platform-e... | 16 | Healthy | 6 hours ago | - | FARGATE | .5 vCPU | 1 C |

Amazon S3 > Buckets > dashboard.apps.nagarajan.cloud

dashboard.apps.nagarajan.cloud

Publicly accessible

ObjectsPropertiesPermissionsMetricsManagementAccess Points

Objects (6)

Objects are the fundamental entities stored in Amazon S3. You can use [Amazon S3 inventory](#) to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#)

Copy S3 URICopy URLDownloadOpenDeleteActionsCreate folderUpload

Find objects by prefix

| | Name | Type | Last modified | Size | Storage class |
|--|-------------------------------|------|--|----------|---------------|
| | 3rdpartylicenses.txt | txt | September 18, 2023, 20:28:50 (UTC+08:00) | 14.8 KB | Standard |
| | index.html | html | September 18, 2023, 20:28:50 (UTC+08:00) | 23.2 KB | Standard |
| | main.5e740b3d29e05264.js | js | September 18, 2023, 20:28:50 (UTC+08:00) | 514.6 KB | Standard |
| | polyfills.1b25fe0f25728a0c.js | js | September 18, 2023, 20:28:50 (UTC+08:00) | 33.0 KB | Standard |
| | runtime.629acb5bf0090e27.js | js | September 18, 2023, 20:28:50 (UTC+08:00) | 900.0 B | Standard |
| | styles.3be8e26b6cb3697a.css | css | September 18, 2023, 20:28:50 (UTC+08:00) | 80.5 KB | Standard |

AWS Certificate Manager > Certificates

Certificates (1)

DeleteManage expiry eventsImportRequest

| Certificate ID | Domain name | Type | Status | In use | Renewal eligibility | Key algorithm |
|--------------------------------------|------------------------|---------------|--------|--------|---------------------|---------------|
| 01ecf75c-df9b-4464-bd61-c0b5e35a2d67 | *.apps.nagarajan.cloud | Amazon Issued | Issued | Yes | Eligible | RSA 2048 |

Amazon ECR > Repositories > platform_eng

platform_eng

View public listingView push commands

Images (1)

Search artifacts

| Image tag | Artifact type | Pushed at | Size (MB) | Image URI | Digest |
|-----------|---------------|---------------------------------------|-----------|-----------|--|
| 14 | Image | September 18, 2023, 17:06:40 (UTC+08) | 392.89 | Copy URI | sha256:ecf6b762011b9a8148a90641ae37c7... |

DynamoDB > Explore Items > platform-eng

platform-eng Autopreview View table details

Tables (2)

Any tag key
Any tag value
Find tables by table name

german-phonenos
platform-eng

Scan or query items

☒ Scan ☐ Query

Select a table or index: Table - platform-eng
Select attribute projection: All attributes

Filters

Run Reset

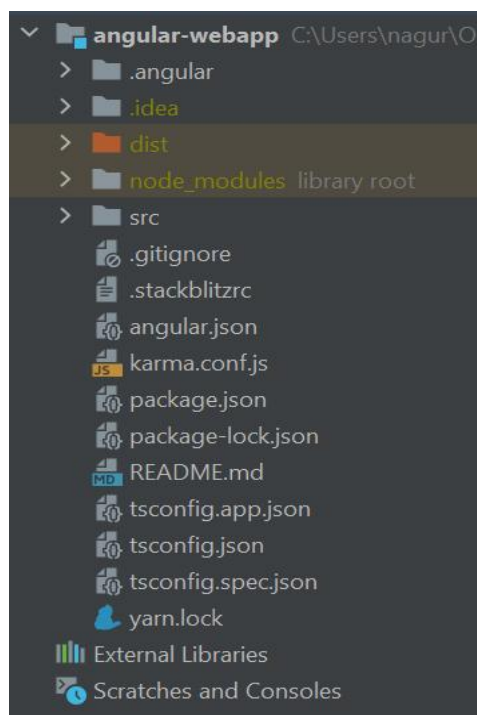
Completed. Read capacity units consumed: 2


Items returned (6) Actions Create item

| id (Number) | summary |
|---------------|--|
| 1695022162452 | (*503": 8, "403": 122, "200": 627, "301": 298, "404": 23, "500": 76, "408": 36, "406": 35, "405": 9, "302": 72, "303": 2, "202": 1, "429": 2, "308": ... |
| 1695021772279 | (*301": 296, "503": 8, "200": 615, "403": 128, "404": 23, "500": 79, "408": 39, "406": 35, "405": 10, "303": 2, "302": 69, "202": 1, "429": 5, "307": ... |
| 1695023310501 | (*301": 294, "503": 8, "200": 616, "403": 130, "404": 23, "500": 79, "408": 37, "406": 35, "405": 10, "303": 2, "302": 71, "202": 1, "504": 1, "307": ... |
| 1695024853218 | (*301": 296, "503": 9, "200": 611, "403": 130, "404": 23, "500": 79, "408": 39, "406": 37, "405": 10, "303": 2, "302": 68, "202": 1, "429": 5, "307": ... |
| 1695024085249 | (*301": 295, "503": 11, "200": 612, "403": 130, "404": 23, "500": 79, "408": 41, "406": 36, "405": 10, "303": 2, "302": 64, "202": 1, "429": 6, "307": ... |
| 1695022542159 | (*301": 297, "503": 8, "200": 616, "403": 130, "404": 23, "500": 79, "408": 39, "406": 35, "405": 10, "303": 2, "302": 69, "202": 1, "307": 4, "308": ... |

3. Angular web app

<https://github.com/nagarajyadava/angular-webapp>



- 
- npm install
 - npm update
 - 'ng build' to generate dist files
 - Copy dist files into iac-code/stacks/web-app to deploy