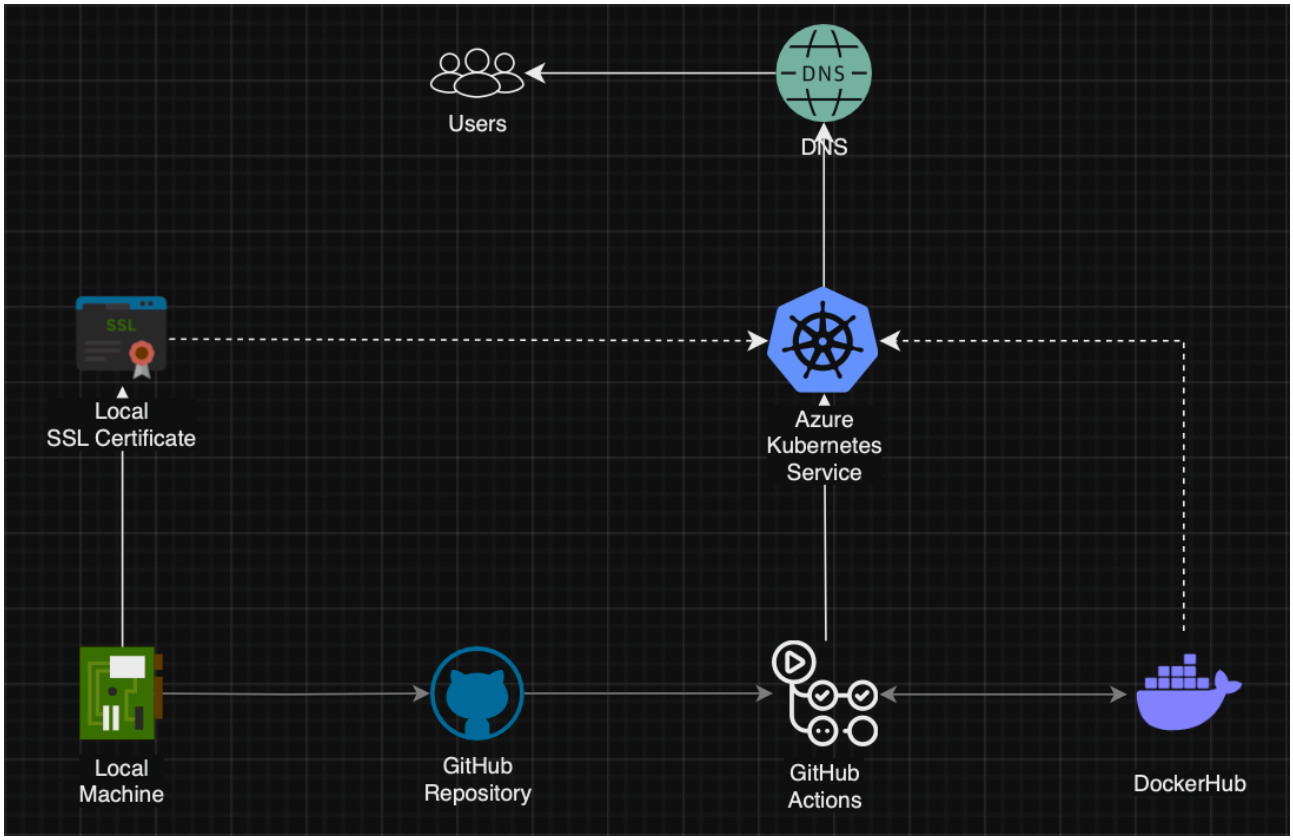
Assignment result

1. A detailed design document outlining the solution architecture.

Link: fastApiAssignment

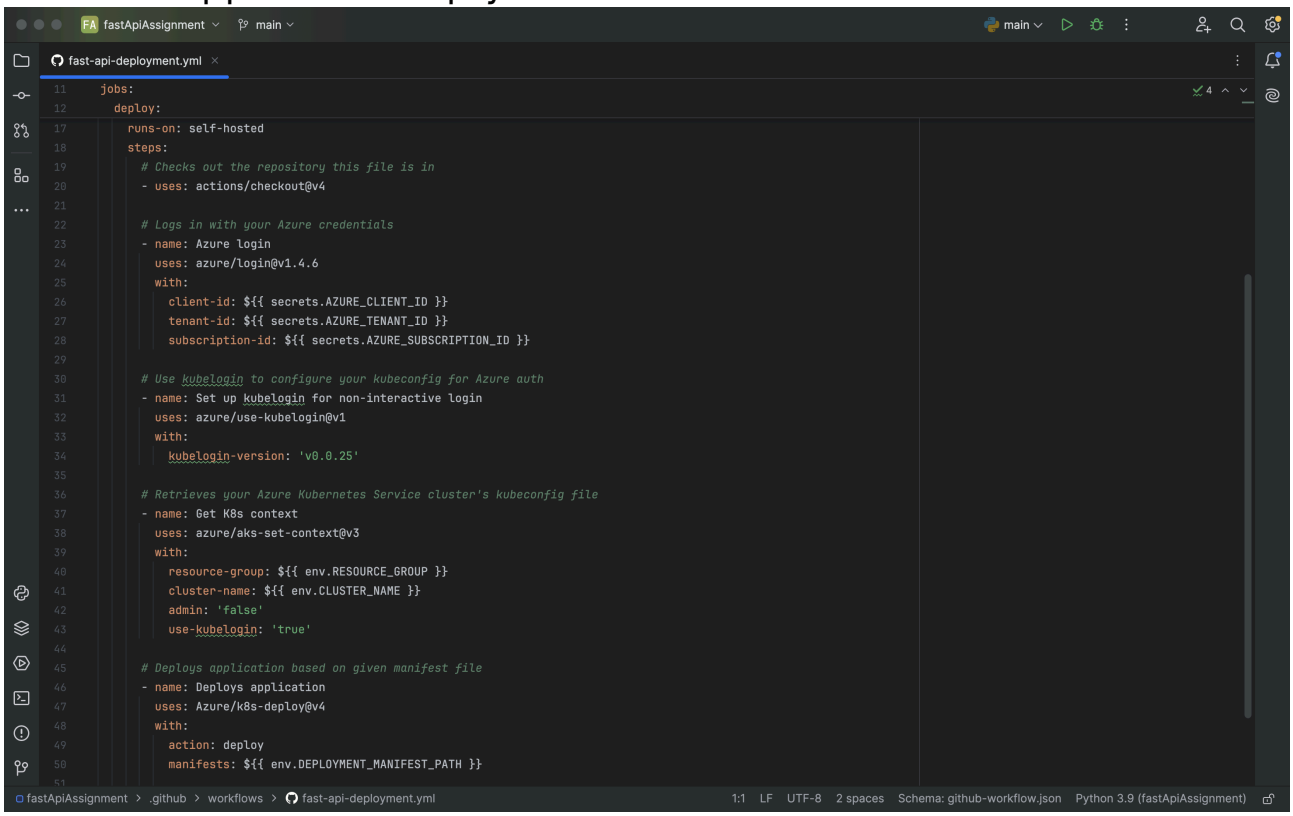
Architecture:



2. A GitHub Actions workflow file that automates the deployment process.

Link: fast-api-deployment

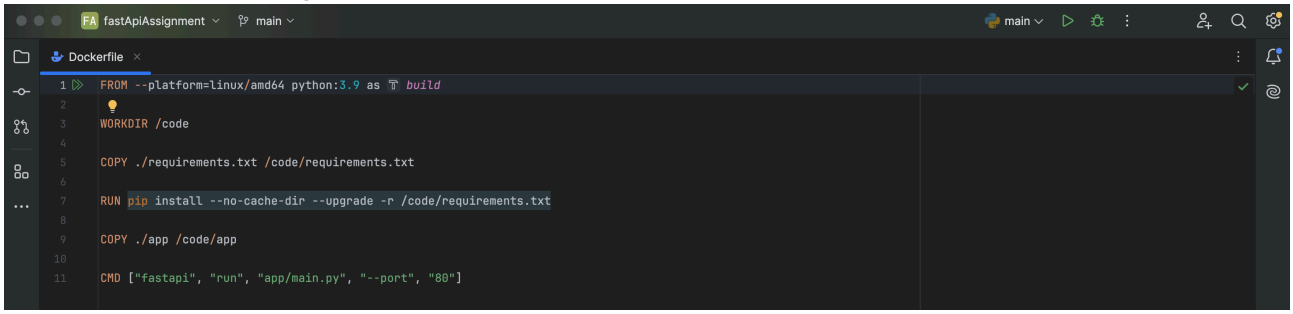
GitHub Actions pipeline for AKS deployment:



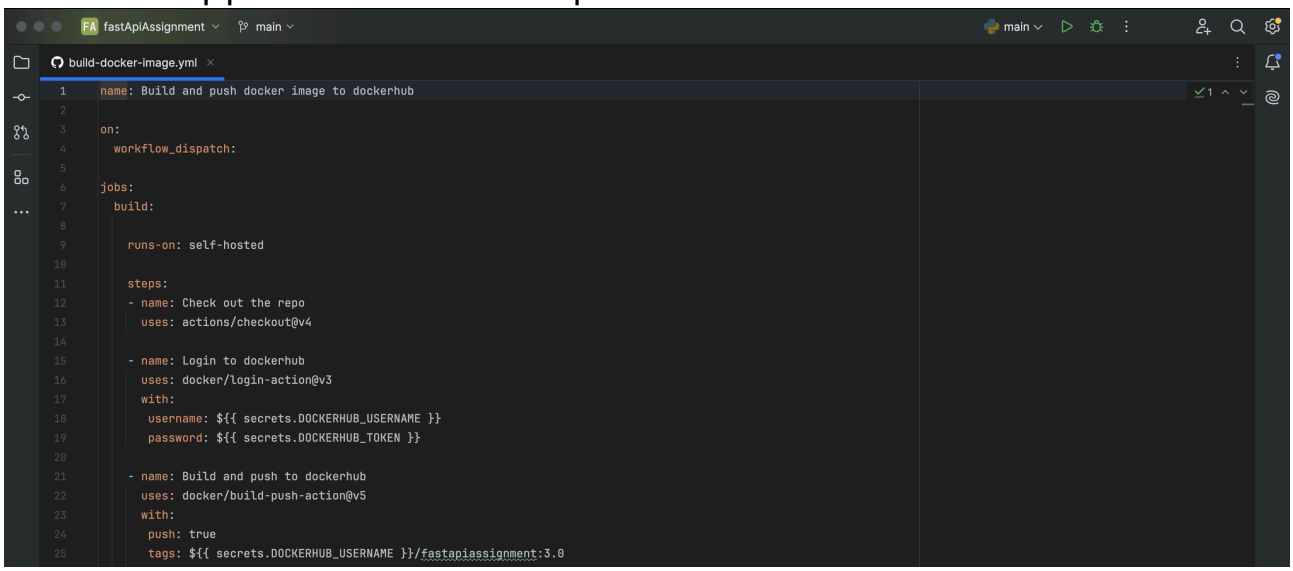
3. A Dockerfile that packages the web application.

Link: Dockerfile

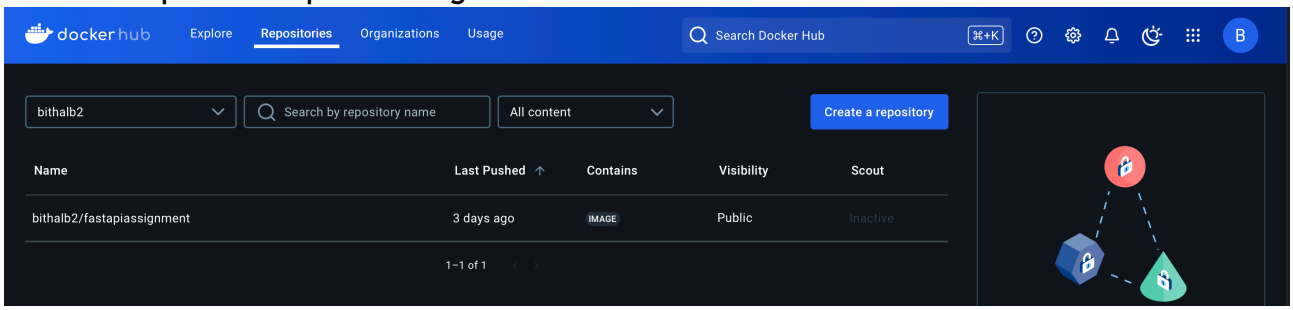
Dockerfile for build image:



GitHub Actions pipeline for docker build and push to docker hub:



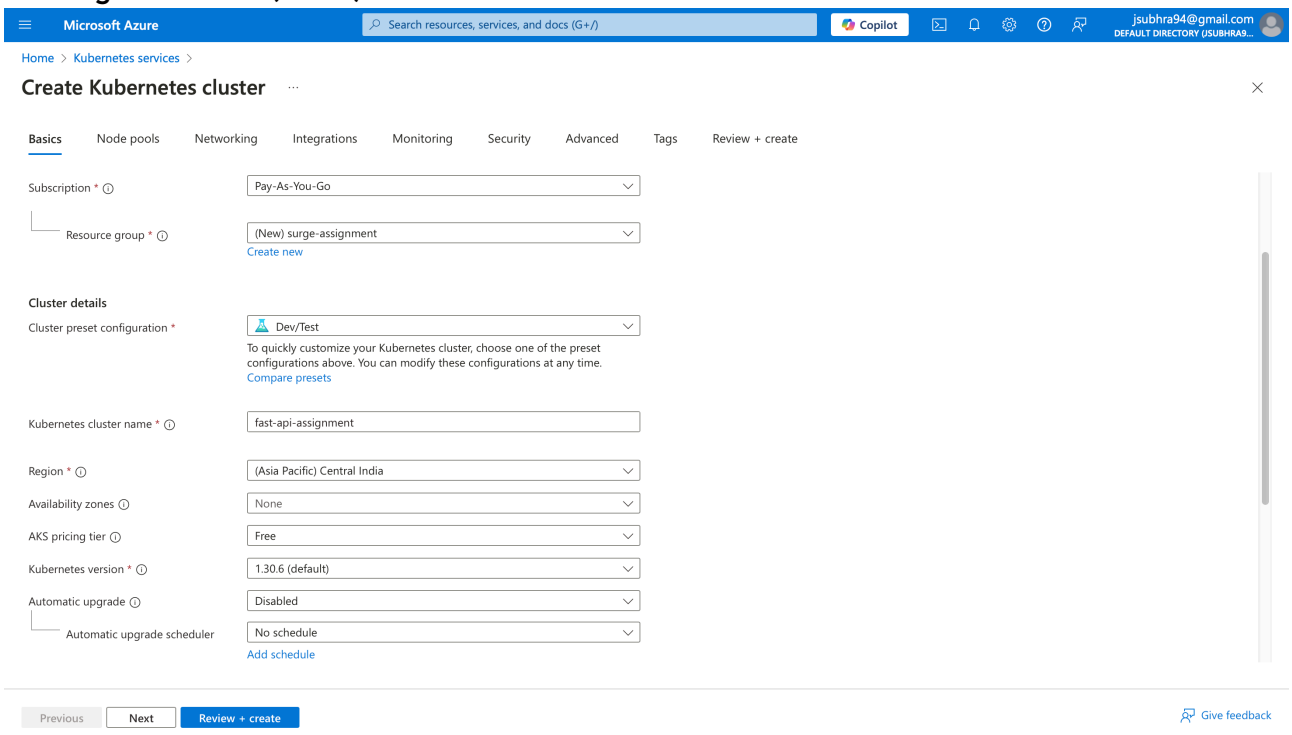
Docker Hub portal with pushed image:



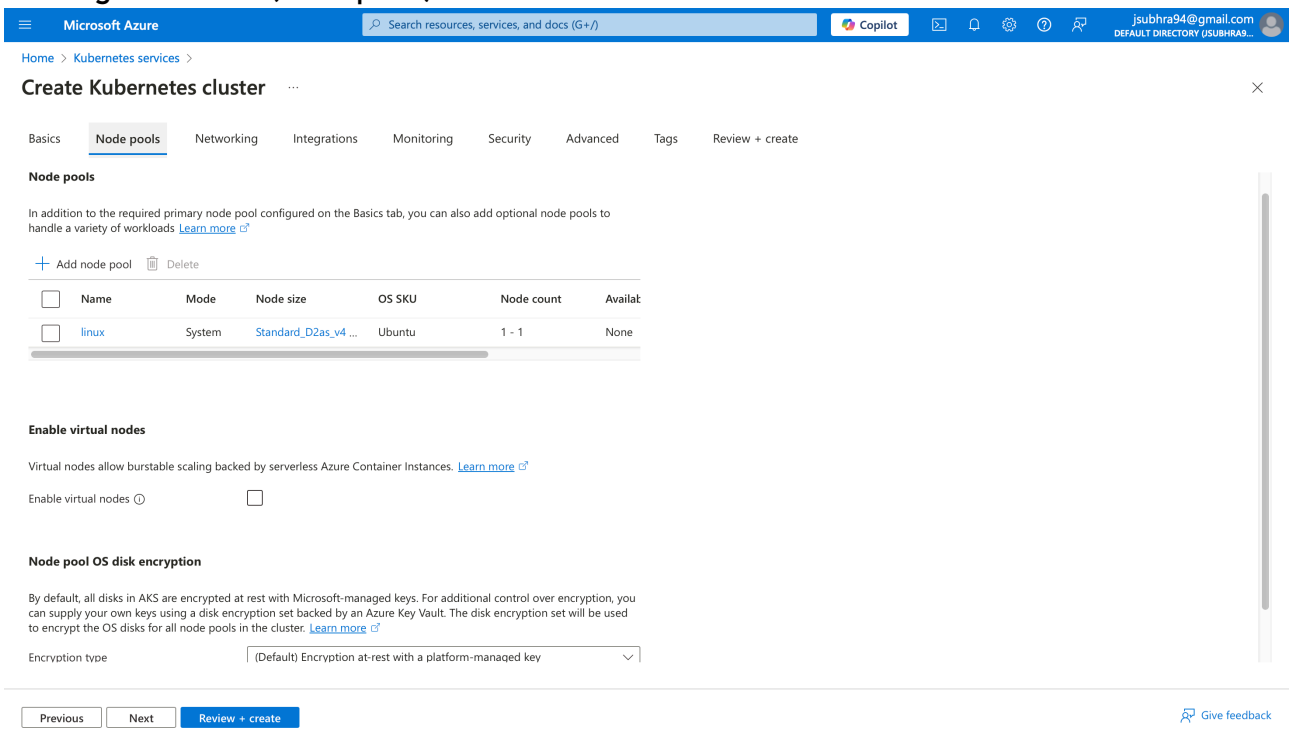
4. An AKS cluster configuration file that deploys the web application.

Link: deployment

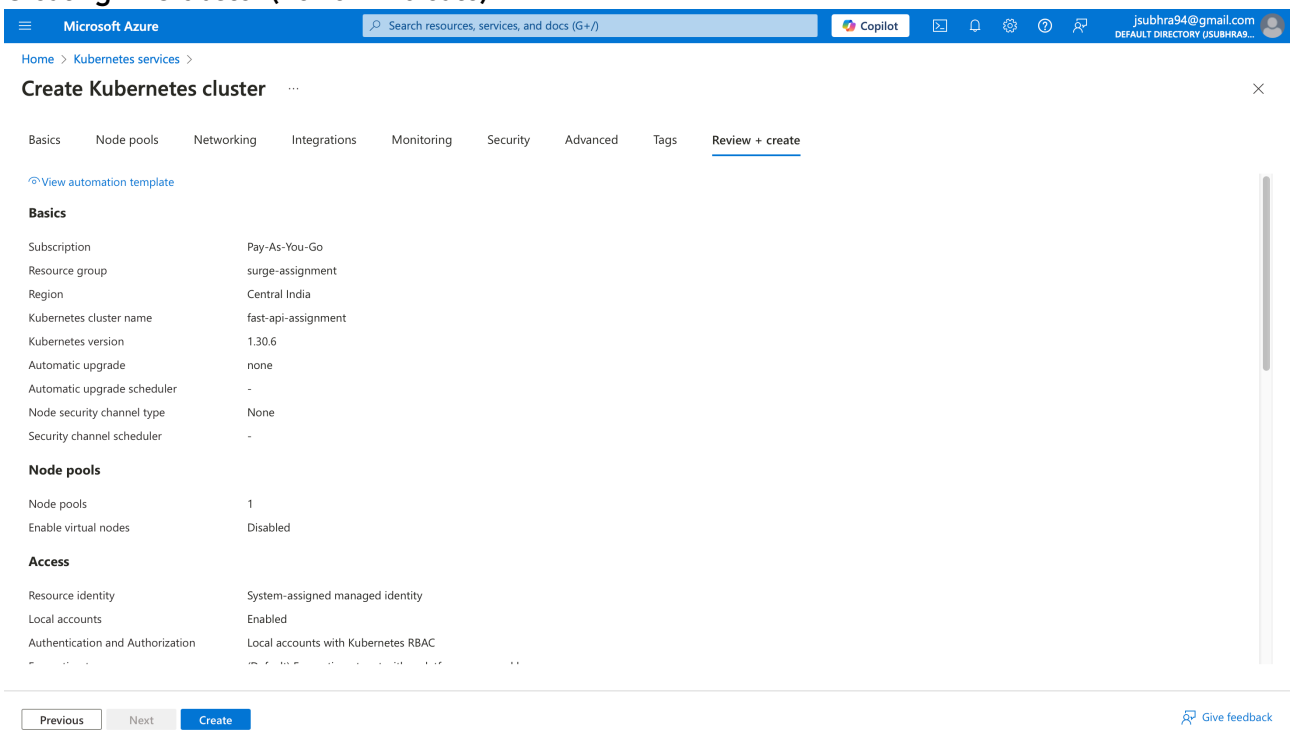
Creating AKS cluster (Basics):



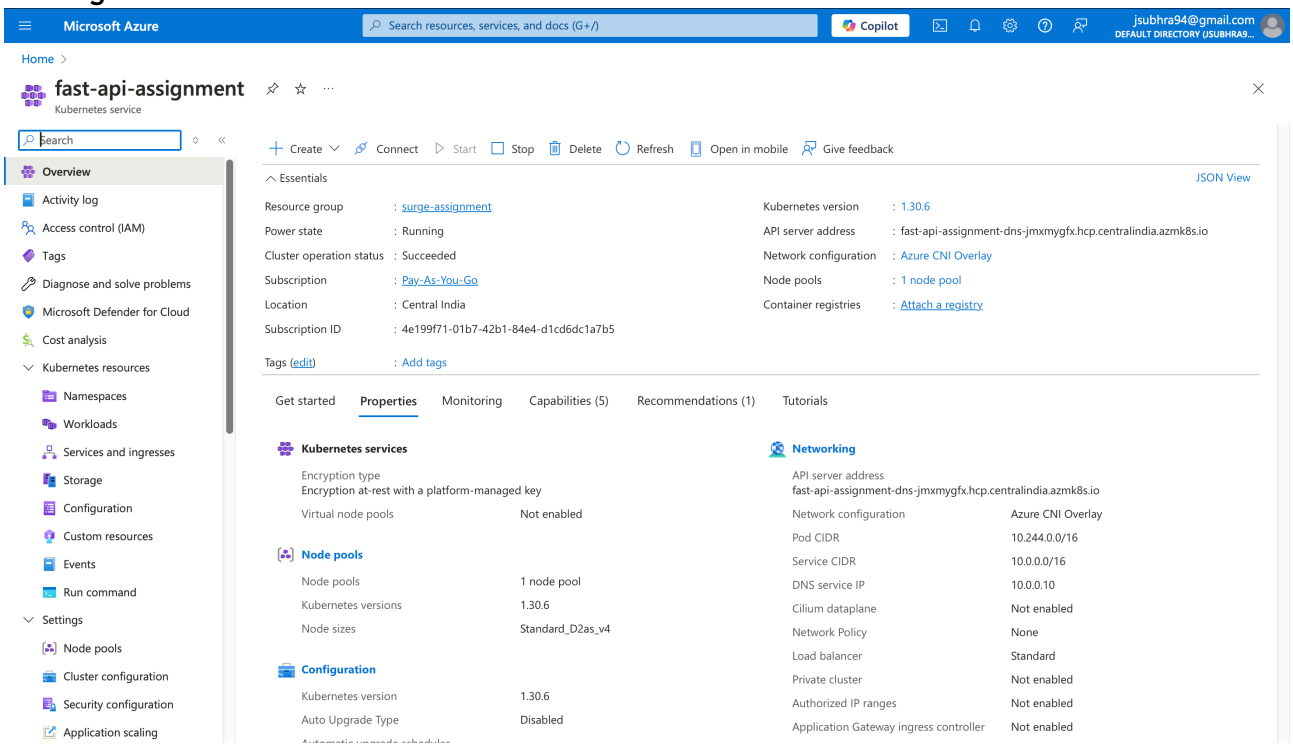
Creating AKS cluster (Node pools):



Creating AKS cluster (Review + create):



Running AKS cluster:



Self signed SSL certificate creation and added to Kubernetes TLS secret:

```
subhraprakashjena@Mac certificate % openssl req -x509 -newkey rsa:4096 -keyout key.pem -out cert.pem -sha256 -days 3650 -nodes
[illegible]
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:IN
State or Province Name (full name) [Some-State]:ODI
Locality Name (eg, city) []:BHU
Organization Name (eg, company) [Internet Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:surgeapi.duckdns.org
Email Address []:jsubhra94@gmail.com
subhraprakashjena@Mac certificate % ls -ltr
total 16
-rw-------  1 subhraprakashjena  staff  3268 Dec 26 07:29 key.pem
-rw-r--r--  1 subhraprakashjena  staff  2143 Dec 26 07:30 cert.pem
```

```
subhraprakashjena@Mac certificate % kubectl create secret tls fastapi-tls-secret --cert=cert.pem --key=key.pem
secret/fastapi-tls-secret created
```

Kubernetes deployment:

deployment.yml

```yaml
# Deployment
apiVersion: apps/v1
kind: Deployment
metadata:
  name: fastapi-deployment
  labels:
    app: fastapi
spec:
  replicas: 1
  selector:
    matchLabels:
      app: fastapi
  template:
    metadata:
      labels:
        app: fastapi
    spec:
      containers:
      - name: fastapi
        image: bithalb2/fastapiassignment:3.0
        ports:
        - containerPort: 80
```

Kubernetes service:

deployment.yml

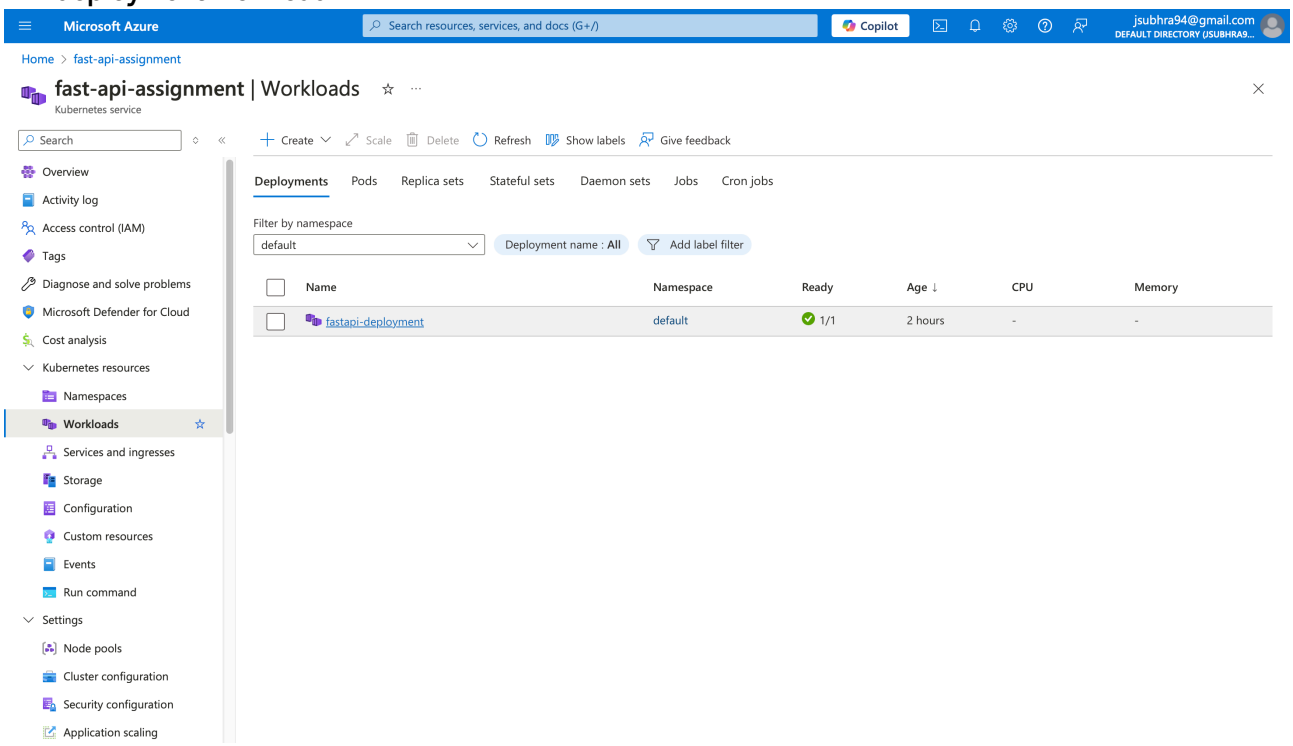
```yaml
# Service
apiVersion: v1
kind: Service
metadata:
  name: fastapi-service
  labels:
    app: fastapi
spec:
  selector:
    app: fastapi
  ports:
  - name: https
    protocol: TCP
    port: 80
    targetPort: 80
```

Kubernetes ingress:

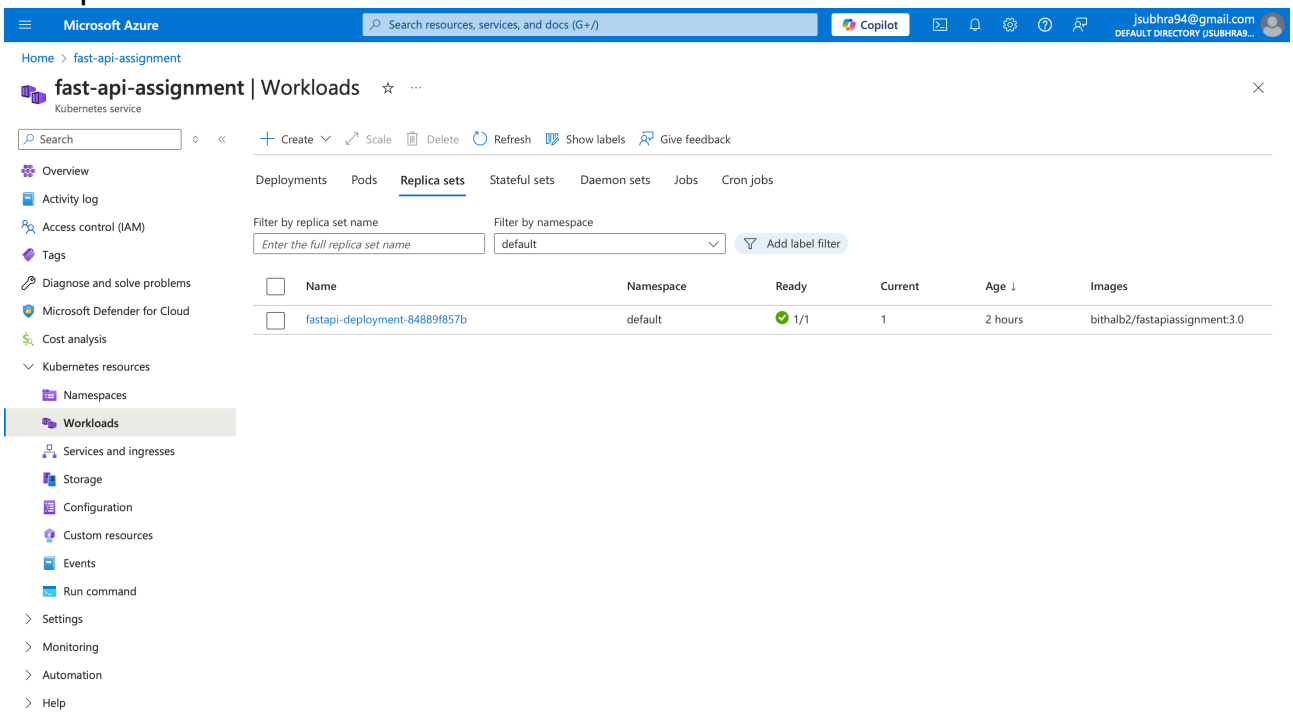
deployment.yml

```yaml
# Ingress
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: fastapi-ingress
  labels:
    app: fastapi
  annotations:
    kubernetes.io/ingress.class: nginx
    nginx.ingress.kubernetes.io/ssl-redirect: "false"
    nginx.ingress.kubernetes.io/use-regex: "true"
spec:
  ingressClassName: nginx
  tls:
    - hosts:
        - surgeapi.duckdns.org
      secretName: fastapi-tls-secret
  rules:
    - host: surgeapi.duckdns.org
      http:
        paths:
          - path: /
            pathType: Prefix
            backend:
              service:
                name: fastapi-service
                port:
                  number: 80
```

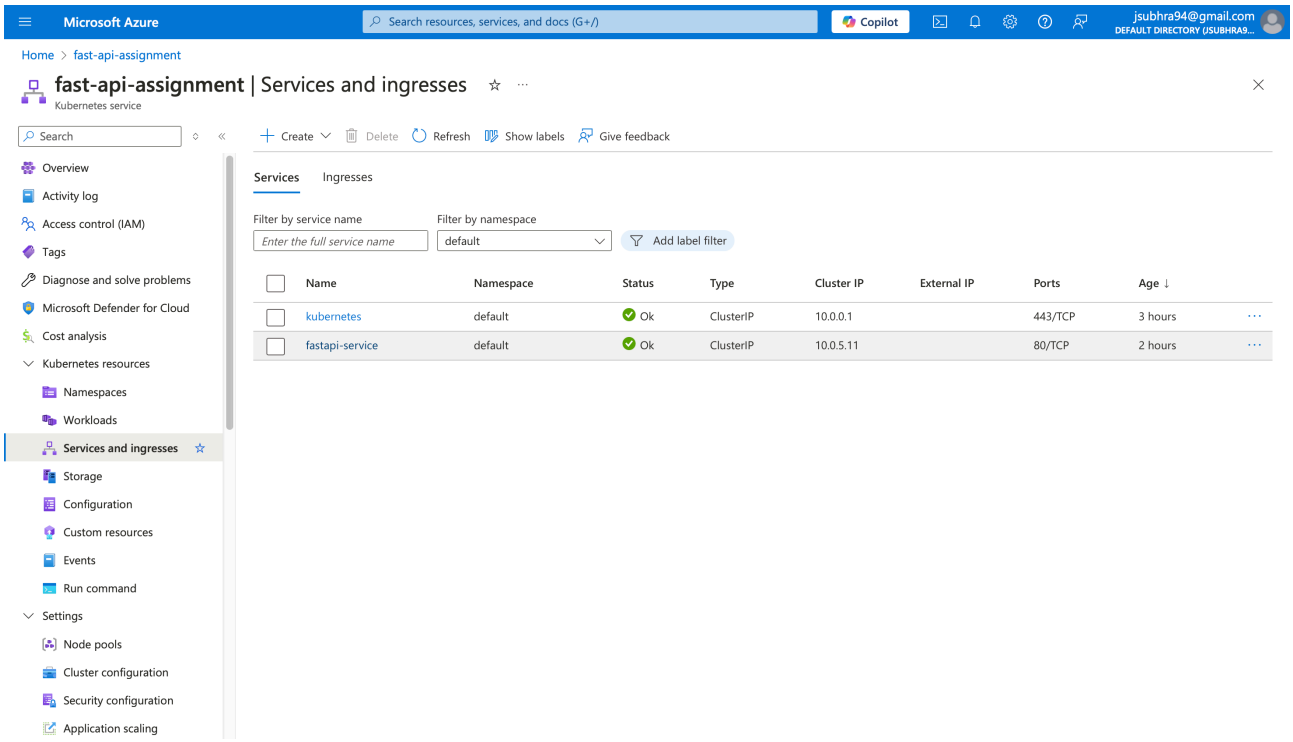
API deployment workload:



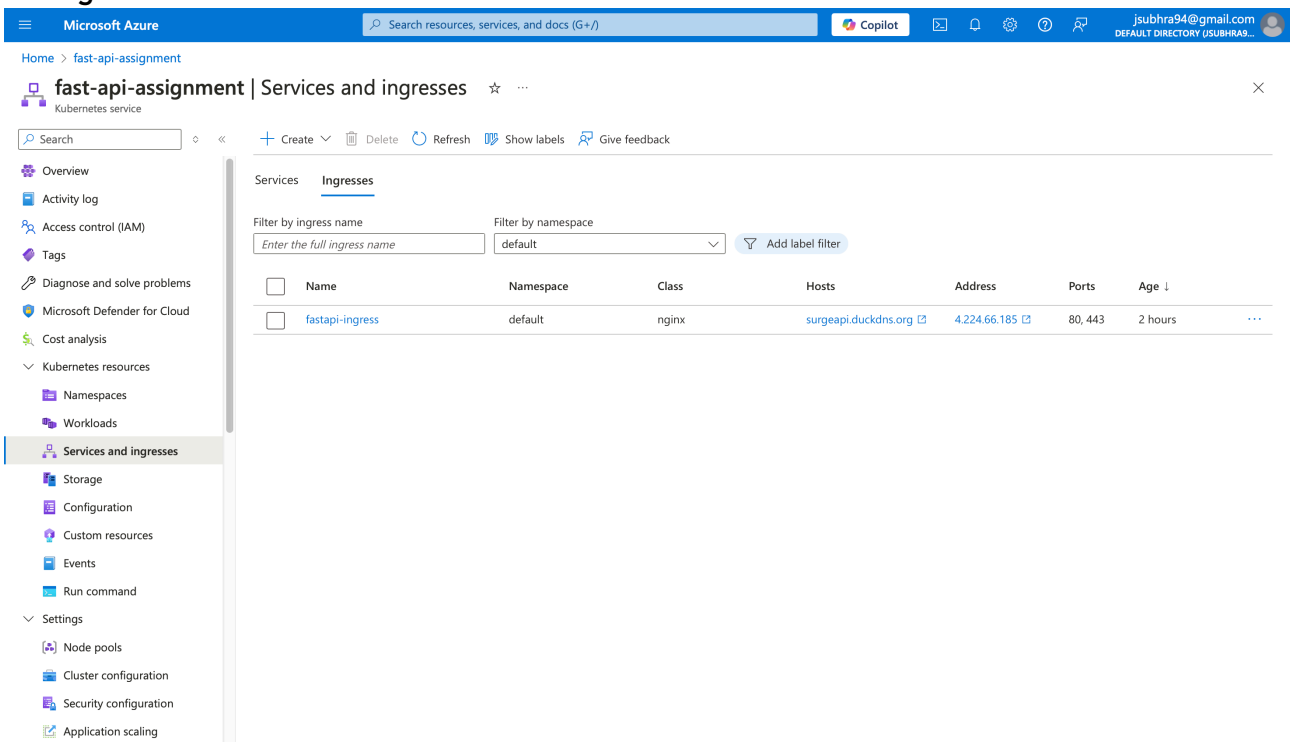
API replica sets workload:



API service workload:

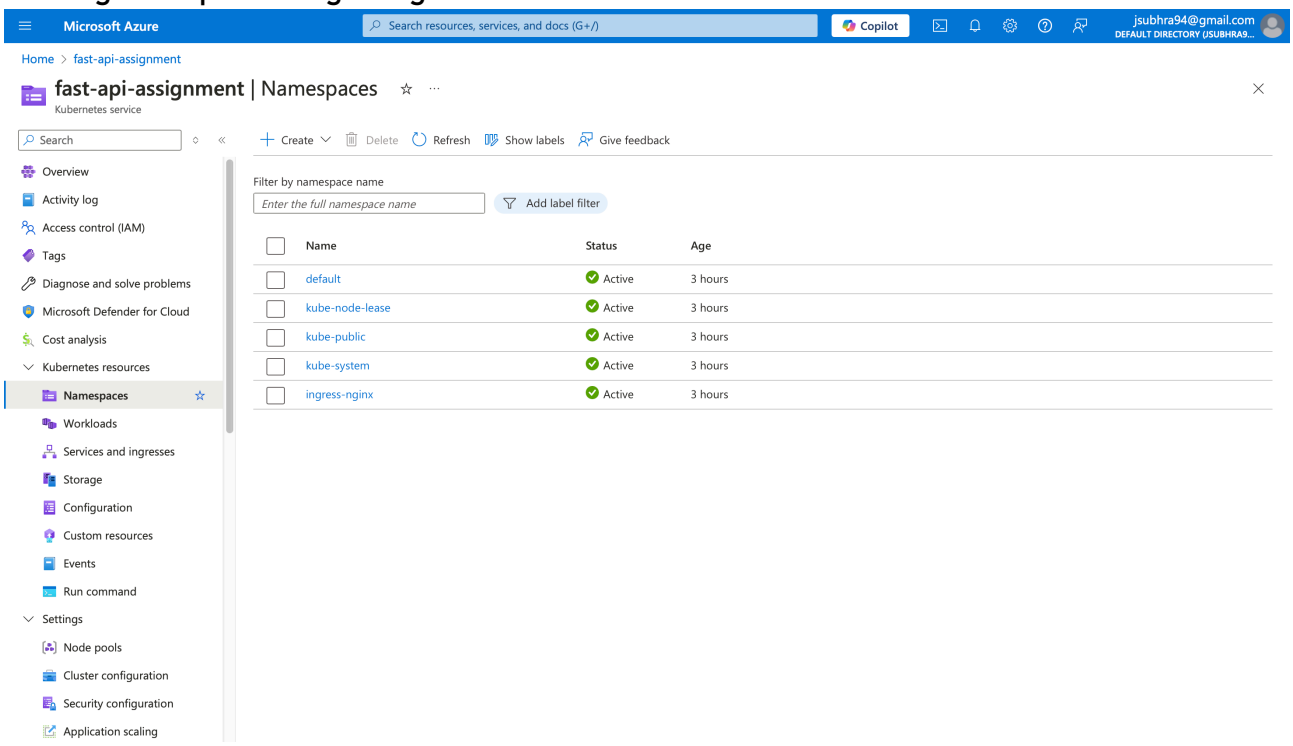


API ingress workload:

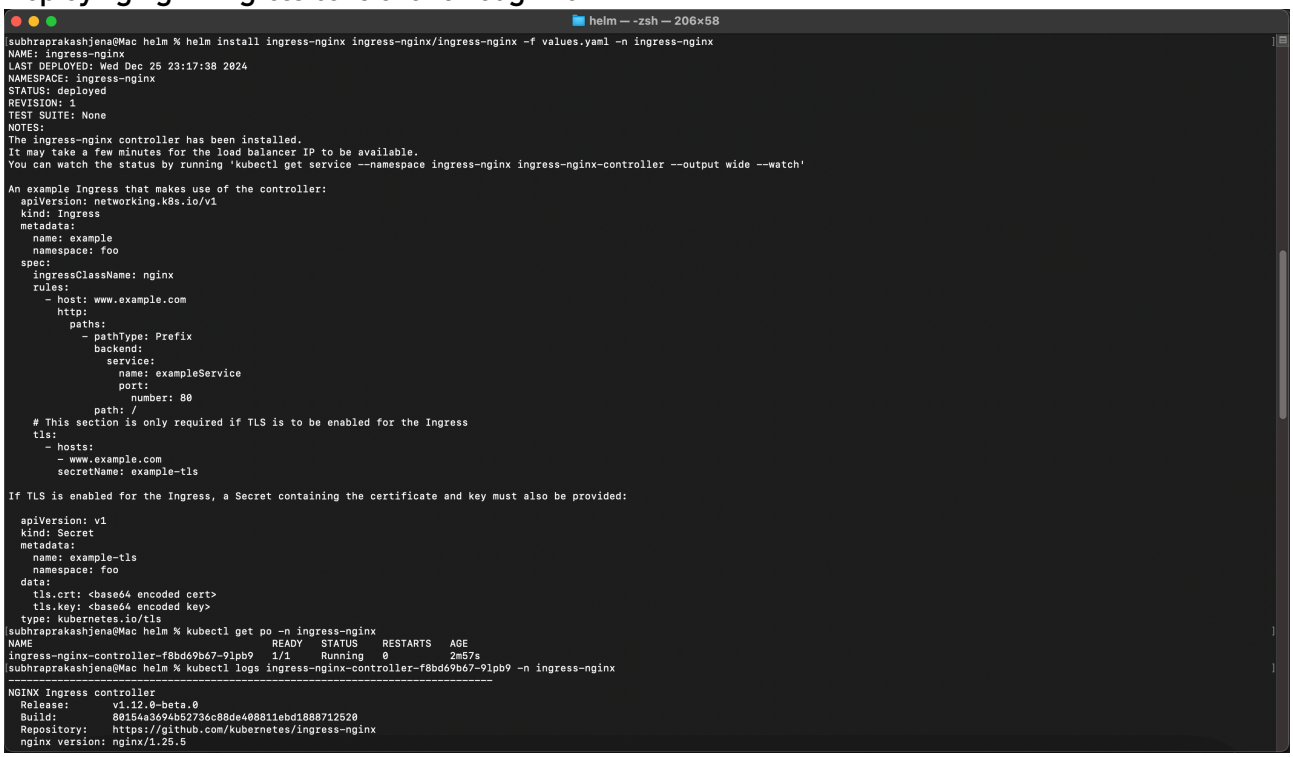


5. An ingress controller configuration file that exposes the web application to the internet using HTTPS.

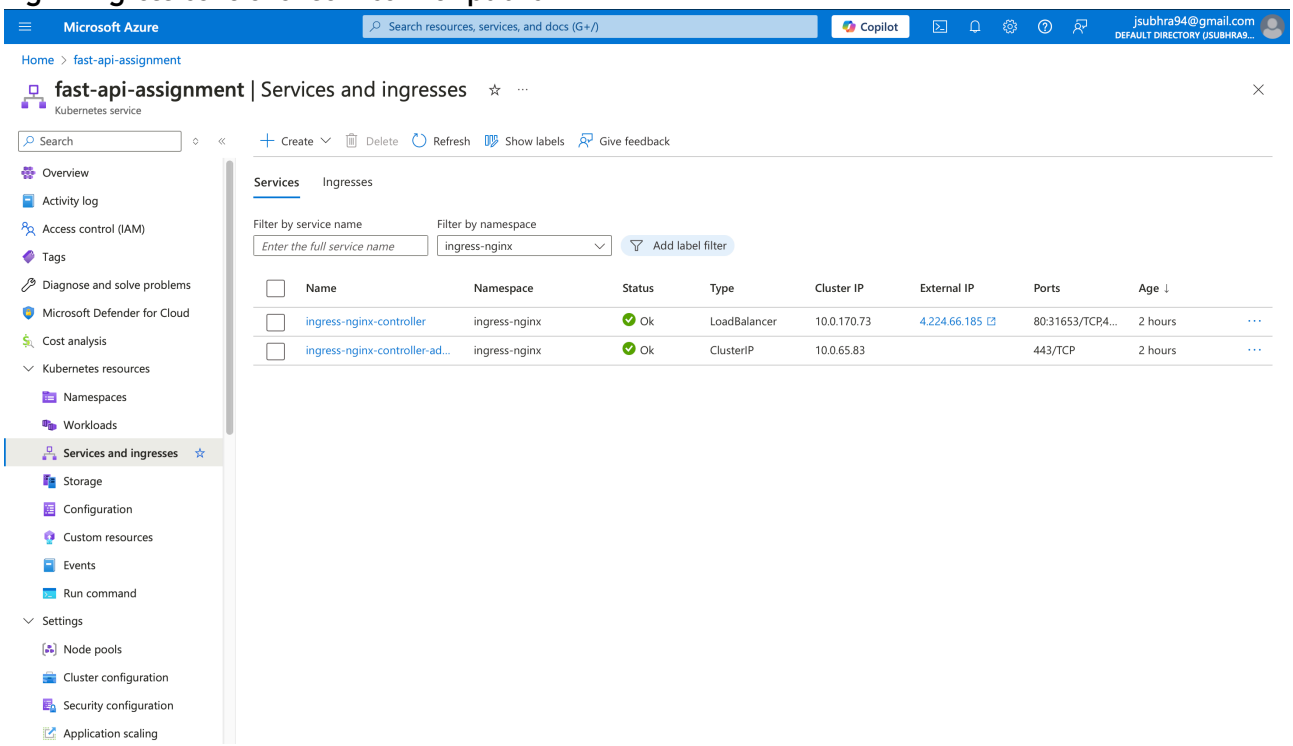
Creating namespace for nginx ingress controller:



Deploying nginx ingress controller through helm:



Nginx ingress controller service with public IP:



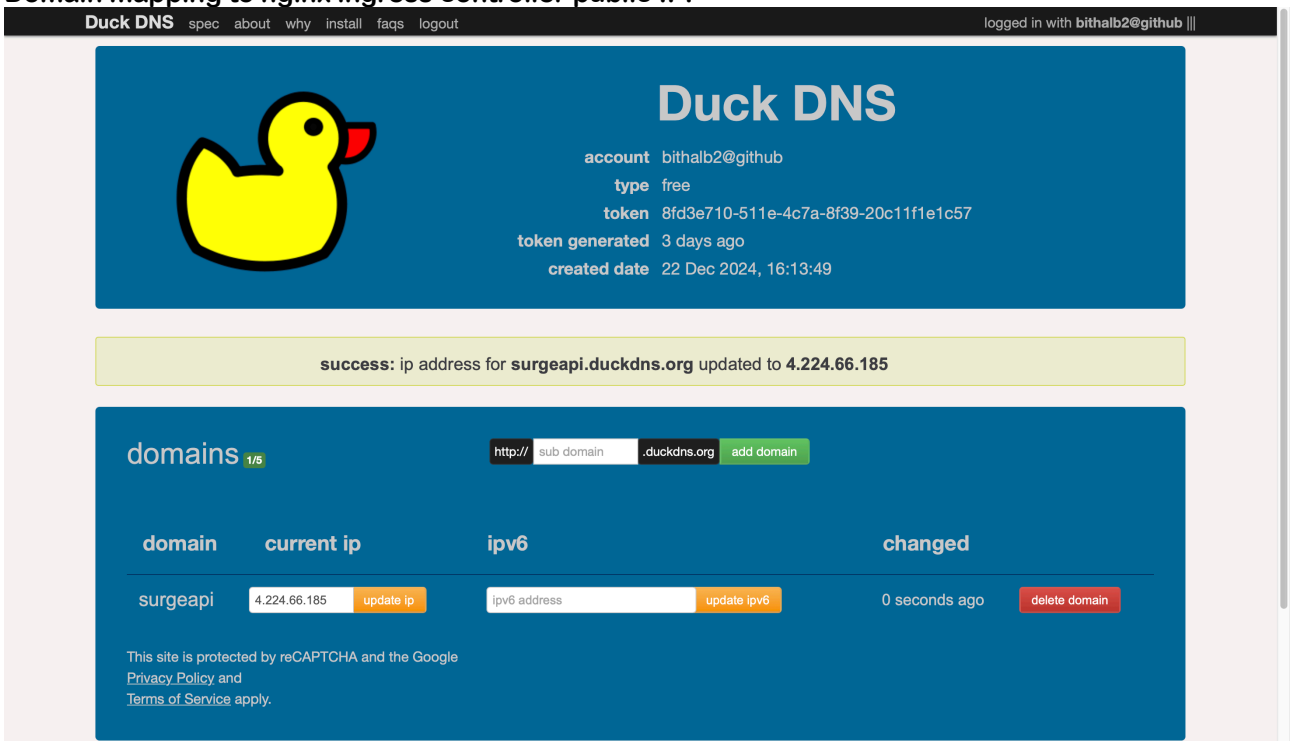
Nginx ingress controller discovering and routing request to the API ingress:

```
subhraprakashjena@Mac helm % kubectl get po -n ingress-nginx
NAME                                   READY   STATUS    RESTARTS   AGE
ingress-nginx-controller-f8bd69b67-9lpb9   1/1     Running   0          146m
subhraprakashjena@Mac helm % kubectl get svc -n ingress-nginx
NAME                                 TYPE           CLUSTER-IP    EXTERNAL-IP    PORT(S)                      AGE
ingress-nginx-controller             LoadBalancer   10.0.170.73   4.224.66.185   80:31653/TCP,443:30746/TCP   146m
ingress-nginx-controller-admission   ClusterIP      10.0.65.83    <none>         443/TCP                      146m
subhraprakashjena@Mac helm % kubectl get deploy -n ingress-nginx
NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
ingress-nginx-controller   1/1     1            1           146m
subhraprakashjena@Mac helm % kubectl logs ingress-nginx-controller-f8bd69b67-9lpb9 -n ingress-nginx
-------------------------------------------------------------------------------
NGINX Ingress controller
  Release:       v1.12.0-beta.0
  Build:         80154a3694b52736c88de408811ebd1888712520
  Repository:    https://github.com/kubernetes/ingress-nginx
  nginx version: nginx/1.25.5

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

W1225 17:47:51.036461       7 client_config.go:659] Neither --kubeconfig nor --master was specified.  Using the inClusterConfig.  This might not work.
I1225 17:47:51.036670       7 main.go:205] "Creating API client" host="https://10.0.0.1:443"
I1225 17:47:51.057523       7 main.go:248] "Running in Kubernetes cluster" major="1" minor="30" git="v1.30.6" state="clean" commit="00f20d443ba0cbc485d6ce36a7d3f9a9c4e8ed7a" platform="linux/amd64"
I1225 17:47:51.202870       7 main.go:101] "SSL fake certificate created" file="/etc/ingress-controller/ssl/default-fake-certificate.pem"
I1225 17:47:51.231242       7 ssl.go:535] "loading tls certificate" path="/usr/local/certificates/cert" key="/usr/local/certificates/key"
I1225 17:47:51.246508       7 nginx.go:271] "Starting NGINX Ingress controller"
I1225 17:47:51.262234       7 event.go:377] Event(v1.ObjectReference{Kind:"ConfigMap", Namespace:"ingress-nginx", Name:"ingress-nginx-controller", UID:"c5e7a0d8-32c1-4537-bd37-e0f62094d03f", APIVersion:"v1"
, ResourceVersion:"18381", FieldPath:""}): type: 'Normal' reason: 'CREATE' ConfigMap ingress-nginx/ingress-nginx-controller
I1225 17:47:52.351458       7 store.go:440] "Found valid IngressClass" ingress="default/hello-app" ingressclass="nginx"
I1225 17:47:52.351817       7 event.go:377] Event(v1.ObjectReference{Kind:"Ingress", Namespace:"default", Name:"hello-app", UID:"f74049b2-6770-4d3e-9858-7240ca89346a", APIVersion:"networking.k8s.io/v1", Res
ourceVersion:"18159", FieldPath:""}): type: 'Normal' reason: 'Sync' Scheduled for sync
I1225 17:47:52.447812       7 nginx.go:317] "Starting NGINX process"
I1225 17:47:52.447983       7 leaderelection.go:254] attempting to acquire leader lease ingress-nginx/ingress-nginx-leader...
I1225 17:47:52.452148       7 nginx.go:337] "Starting validation webhook" address=":8443" certPath="/usr/local/certificates/cert" keyPath="/usr/local/certificates/key"
I1225 17:47:52.452351       7 controller.go:196] "Configuration changes detected, backend reload required"
I1225 17:47:52.468450       7 status.go:85] "New leader elected" identity="ingress-nginx-controller-f8bd69b67-5mggg"
I1225 17:47:52.489447       7 controller.go:216] "Backend successfully reloaded"
I1225 17:47:52.489677       7 controller.go:227] "Initial sync, sleeping for 1 second"
I1225 17:47:52.490137       7 event.go:377] Event(v1.ObjectReference{Kind:"Pod", Namespace:"ingress-nginx", Name:"ingress-nginx-controller-f8bd69b67-9lpb9", UID:"fc18f2c6-9eeb-42db-a867-aae544d9cf7a", APIVe
rsion:"v1", ResourceVersion:"18413", FieldPath:""}): type: 'Normal' reason: 'RELOAD' NGINX reload triggered due to a change in configuration
I1225 17:48:30.669797       7 leaderelection.go:268] successfully acquired lease ingress-nginx/ingress-nginx-leader
I1225 17:48:30.670156       7 status.go:85] "New leader elected" identity="ingress-nginx-controller-f8bd69b67-9lpb9"
I1225 17:48:30.678072       7 status.go:304] "updating Ingress status" namespace="default" ingress="hello-app" currentValue=null newValue=[{"ip":"4.224.66.185"}]
I1225 17:48:30.684084       7 event.go:377] Event(v1.ObjectReference{Kind:"Ingress", Namespace:"default", Name:"hello-app", UID:"f74049b2-6770-4d3e-9858-7240ca89346a", APIVersion:"networking.k8s.io/v1", Res
ourceVersion:"18633", FieldPath:""}): type: 'Normal' reason: 'Sync' Scheduled for sync
I1225 17:49:00.886270       7 controller.go:196] "Configuration changes detected, backend reload required"
I1225 17:49:00.921539       7 controller.go:216] "Backend successfully reloaded"
I1225 17:49:00.922408       7 event.go:377] Event(v1.ObjectReference{Kind:"Pod", Namespace:"ingress-nginx", Name:"ingress-nginx-controller-f8bd69b67-9lpb9", UID:"fc18f2c6-9eeb-42db-a867-aae544d9cf7a", APIVe
rsion:"v1", ResourceVersion:"18413", FieldPath:""}): type: 'Normal' reason: 'RELOAD' NGINX reload triggered due to a change in configuration
W1225 17:49:43.517461       7 controller.go:1215] Service "default/hello-app-service" does not have any active Endpoint.
I1225 17:49:43.548213       7 main.go:107] "successfully validated configuration, accepting" ingress="default/hello-app"
I1225 17:49:43.554022       7 store.go:440] "Found valid IngressClass" ingress="default/hello-app" ingressclass="nginx"
I1225 17:49:43.554548       7 event.go:377] Event(v1.ObjectReference{Kind:"Ingress", Namespace:"default", Name:"hello-app", UID:"3d4be40e-613f-455e-84bf-c94fe001f22f", APIVersion:"networking.k8s.io/v1", Res
ourceVersion:"18968", FieldPath:""}): type: 'Normal' reason: 'Sync' Scheduled for sync
I1225 17:49:46.407615       7 controller.go:196] "Configuration changes detected, backend reload required"
I1225 17:49:46.445452       7 controller.go:216] "Backend successfully reloaded"
I1225 17:49:46.466095       7 event.go:377] Event(v1.ObjectReference{Kind:"Pod", Namespace:"ingress-nginx", Name:"ingress-nginx-controller-f8bd69b67-9lpb9", UID:"fc18f2c6-9eeb-42db-a867-aae544d9cf7a", APIVe
rsion:"v1", ResourceVersion:"18413", FieldPath:""}): type: 'Normal' reason: 'RELOAD' NGINX reload triggered due to a change in configuration
I1225 17:50:30.686517       7 status.go:304] "updating Ingress status" namespace="default" ingress="hello-app" currentValue=null newValue=[{"ip":"4.224.66.185"}]
I1225 17:50:30.692477       7 event.go:377] Event(v1.ObjectReference{Kind:"Ingress", Namespace:"default", Name:"hello-app", UID:"3d4be40e-613f-455e-84bf-c94fe001f22f", APIVersion:"networking.k8s.io/v1", Res
ourceVersion:"19174", FieldPath:""}): type: 'Normal' reason: 'Sync' Scheduled for sync
122.171.16.29 - - [25/Dec/2024:18:09:57 +0000] "GET / HTTP/1.1" 400 650 "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/131.0.0.0 Safari/537.36 Edg/131.0.0.0" 44
5 0.000 [] [] - - - - caa70523efe13630e14756207707e3d0
122.171.16.29 - - [25/Dec/2024:18:09:57 +0000] "GET /favicon.ico HTTP/1.1" 400 650 "http://4.224.66.185:443/" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/131.0.0
.0 Safari/537.36 Edg/131.0.0.0" 390 0.000 [] [] - - - - be649de80ba6b107448029eeeca3c651
```

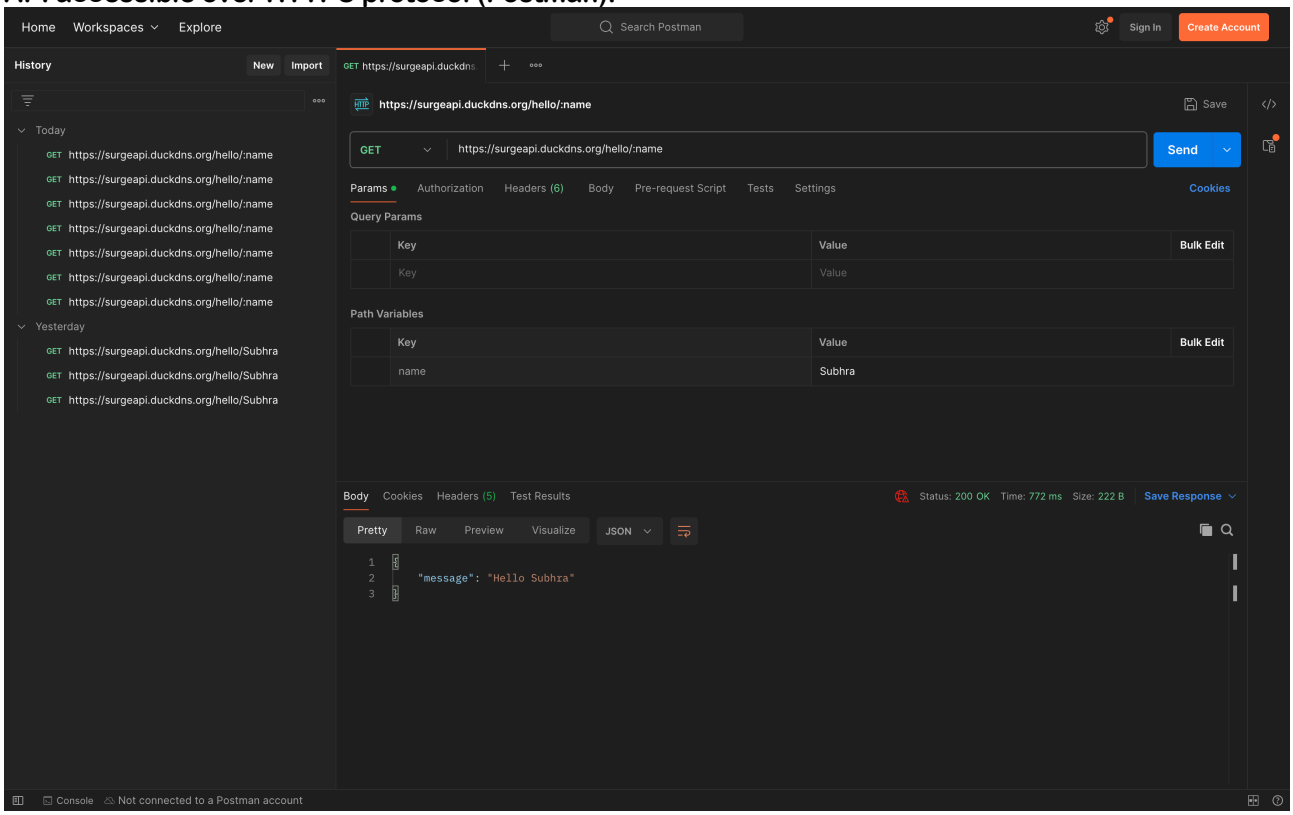
Nginx ingress controller discovering and routing request to the API ingress:

```
I1225 18:22:10.291890       7 controller.go:196] "Configuration changes detected, backend reload required"
I1225 18:22:10.321547       7 controller.go:216] "Backend successfully reloaded"
I1225 18:22:10.322528       7 event.go:377] Event(v1.ObjectReference{Kind:"Pod", Namespace:"ingress-nginx", Name:"ingress-nginx-controller-f8bd69b67-9lpb9", UID:"fc18f2c6-9eeb-42db-a867-aae544d9cf7a", APIVersion:"v1", ResourceVersion:"18413", FieldPath:""}): type: 'Normal' reason: 'RELOAD' NGINX reload triggered due to a change in configuration
W1225 18:22:24.529608       7 controller.go:1215] Service "default/fastapi-service" does not have any active Endpoint.
W1225 18:22:24.529815       7 controller.go:1437] Error getting SSL certificate "default/fastapi-tls-secret": local SSL certificate default/fastapi-tls-secret was not found. Using default certificate
I1225 18:22:24.551044       7 main.go:107] "successfully validated configuration, accepting" ingress="default/fastapi-ingress"
I1225 18:22:24.557541       7 store.go:440] "Found valid IngressClass" ingress="default/fastapi-ingress" ingressclass="nginx"
I1225 18:22:24.557708       7 event.go:377] Event(v1.ObjectReference{Kind:"Ingress", Namespace:"default", Name:"fastapi-ingress", UID:"f8e6d296-2954-41f4-aa26-0b79a72aa1e2", APIVersion:"networking.k8s.io/v1", ResourceVersion:"26895", FieldPath:""}): type: 'Normal' reason: 'Sync' Scheduled for sync
W1225 18:22:24.557976       7 backend_ssl.go:47] Error obtaining X.509 certificate: no object matching key "default/fastapi-tls-secret" in local store
W1225 18:22:27.714671       7 controller.go:1437] Error getting SSL certificate "default/fastapi-tls-secret": local SSL certificate default/fastapi-tls-secret was not found. Using default certificate
I1225 18:22:27.714722       7 controller.go:196] "Configuration changes detected, backend reload required"
I1225 18:22:27.752152       7 controller.go:216] "Backend successfully reloaded"
I1225 18:22:27.752708       7 event.go:377] Event(v1.ObjectReference{Kind:"Pod", Namespace:"ingress-nginx", Name:"ingress-nginx-controller-f8bd69b67-9lpb9", UID:"fc18f2c6-9eeb-42db-a867-aae544d9cf7a", APIVersion:"v1", ResourceVersion:"18413", FieldPath:""}): type: 'Normal' reason: 'RELOAD' NGINX reload triggered due to a change in configuration
I1225 18:22:30.681818       7 status.go:304] "updating Ingress status" namespace="default" ingress="fastapi-ingress" currentValue=null newValue=[{"ip":"4.224.66.185"}]
W1225 18:22:30.687655       7 backend_ssl.go:47] Error obtaining X.509 certificate: no object matching key "default/fastapi-tls-secret" in local store
I1225 18:22:30.687758       7 event.go:377] Event(v1.ObjectReference{Kind:"Ingress", Namespace:"default", Name:"fastapi-ingress", UID:"f8e6d296-2954-41f4-aa26-0b79a72aa1e2", APIVersion:"networking.k8s.io/v1", ResourceVersion:"26931", FieldPath:""}): type: 'Normal' reason: 'Sync' Scheduled for sync
W1225 18:22:31.048221       7 controller.go:1437] Error getting SSL certificate "default/fastapi-tls-secret": local SSL certificate default/fastapi-tls-secret was not found. Using default certificate
W1225 18:22:34.381960       7 controller.go:1437] Error getting SSL certificate "default/fastapi-tls-secret": local SSL certificate default/fastapi-tls-secret was not found. Using default certificate
152.59.154.110 - - [25/Dec/2024:18:26:27 +0000] "GET / HTTP/1.1" 200 25 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/18.2 Safari/605.1.15" 399 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 25 0.002 200 04972a9cc6af922633134710d2e17a47
152.59.154.110 - - [25/Dec/2024:18:26:39 +0000] "GET / HTTP/1.1" 200 25 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/18.2 Safari/605.1.15" 399 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 25 0.002 200 87e6f40ebf0845306a9bc8069015e9b6
152.59.154.110 - - [25/Dec/2024:18:26:43 +0000] "GET /hello/Subhra HTTP/1.1" 200 26 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/18.2 Safari/605.1.15" 411 0.012 [default-fastapi-service-80] [] 10.244.0.149:80 26 0.012 200 2db718006f113b06765e3d736c8f2207
152.59.154.110 - - [25/Dec/2024:18:27:00 +0000] "GET /hello/Subhra HTTP/2.0" 200 26 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/18.2 Safari/605.1.15" 277 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 26 0.002 200 12a8e1e435275a8e4c2d96a3263134ba
152.59.154.110 - - [25/Dec/2024:18:27:00 +0000] "GET /favicon.ico HTTP/2.0" 404 22 "https://surgeapi.duckdns.org/hello/Subhra" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/18.2 Safari/605.1.15" 88 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 22 0.002 404 94926ad637c26a39f6174d8f98dae389
152.59.154.110 - - [25/Dec/2024:18:29:29 +0000] "GET /apple-touch-icon-precomposed.png HTTP/2.0" 404 22 "-" "com.apple.WebKit.Networking/20620.1.16.11.8 Network/4277.60.255 macOS/15.2" 157 0.003 [default-fastapi-service-80] [] 10.244.0.149:80 22 0.003 404 9022a27fcb85bbb7b7647e1436285ded
152.59.154.110 - - [25/Dec/2024:18:29:29 +0000] "GET /apple-touch-icon.png HTTP/2.0" 404 22 "-" "com.apple.WebKit.Networking/20620.1.16.11.8 Network/4277.60.255 macOS/15.2" 25 0.004 [default-fastapi-service-80] [] 10.244.0.149:80 22 0.001 404 08b4b30af9dab370a9ccd11828355f72
152.59.154.110 - - [25/Dec/2024:18:29:29 +0000] "GET /favicon.ico HTTP/2.0" 404 22 "-" "com.apple.WebKit.Networking/20620.1.16.11.8 Network/4277.60.255 macOS/15.2" 19 0.001 [default-fastapi-service-80] [] 10.244.0.149:80 22 0.001 404 90922564ca1319682b56cf1e00d4157a
152.59.154.110 - - [25/Dec/2024:18:29:38 +0000] "GET /hello/Subhra HTTP/1.1" 200 26 "-" "PostmanRuntime/7.39.0" 219 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 26 0.002 200 8f88e4b201b03b434f4cfdc563bc83ba
152.59.154.110 - - [25/Dec/2024:18:29:45 +0000] "GET /hello/Subhra HTTP/1.1" 200 26 "-" "PostmanRuntime/7.39.0" 219 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 26 0.002 200 e69fe83c4fdd0a1b557f9573a6aa1de3
152.59.154.110 - - [25/Dec/2024:18:30:05 +0000] "GET /hello/Subhra HTTP/1.1" 200 26 "-" "PostmanRuntime/7.39.0" 219 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 26 0.002 200 57012ffdae155b6be2bb3e3683e79859
152.59.154.110 - - [25/Dec/2024:18:30:13 +0000] "GET /hello/Santosh HTTP/1.1" 200 27 "-" "PostmanRuntime/7.39.0" 220 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 27 0.002 200 0161276ae4da6053e61538f819246aa7
I1225 18:31:24.275402       7 store.go:611] "Secret was added and it is used in ingress annotations. Parsing" secret="default/fastapi-tls-secret"
I1225 18:31:24.276092       7 backend_ssl.go:67] "Adding secret to local store" name="default/fastapi-tls-secret"
W1225 18:31:24.276211       7 controller.go:1451] Unexpected error validating SSL certificate "default/fastapi-tls-secret" for server "surgeapi.duckdns.org": x509: certificate relies on legacy Common Name field, use SANs instead
W1225 18:31:24.276231       7 controller.go:1452] Validating certificate against DNS names. This will be deprecated in a future version
152.59.154.110 - - [25/Dec/2024:18:31:40 +0000] "GET /hello/Subhra HTTP/2.0" 200 26 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/18.2 Safari/605.1.15" 277 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 26 0.002 200 1ee12ffb75741402139508880890f81c2
152.59.154.110 - - [25/Dec/2024:18:31:44 +0000] "GET /hello/Santosh HTTP/1.1" 200 27 "-" "PostmanRuntime/7.39.0" 220 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 27 0.002 200 c905cc05c97f88ede8f9e0f677a8392a
152.59.154.110 - - [25/Dec/2024:18:33:11 +0000] "GET /hello/Santosh HTTP/1.1" 200 27 "-" "PostmanRuntime/7.39.0" 220 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 27 0.002 200 d4b01a1676c68e1916591aa8191d34c8
152.59.154.110 - - [25/Dec/2024:18:33:12 +0000] "GET /hello/Santosh HTTP/1.1" 200 27 "-" "PostmanRuntime/7.39.0" 220 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 27 0.002 200 7e6e32b1a1618d3e9132fc4e012a17eb
152.59.154.110 - - [25/Dec/2024:18:34:57 +0000] "GET /hello/Santosh HTTP/1.1" 200 27 "-" "PostmanRuntime/7.39.0" 220 0.002 [default-fastapi-service-80] [] 10.244.0.149:80 27 0.002 200 4d93204c9660f099ad3b645771a783b6
52.167.144.55 - - [25/Dec/2024:18:47:02 +0000] "GET /robots.txt HTTP/1.1" 400 650 "-" "Mozilla/5.0 AppleWebKit/537.36 (KHTML, like Gecko; compatible; bingbot/2.0; +http://www.bing.com/bingbot.htm) Chrome/116.0.1938.76 Safari/537.36" 354 0.000 [] [] - - - - be36ca6d05d3d5b23b15b6b5ac2c9319
157.55.39.63 - - [25/Dec/2024:18:47:07 +0000] "GET / HTTP/1.1" 400 650 "-" "Mozilla/5.0 AppleWebKit/537.36 (KHTML, like Gecko; compatible; bingbot/2.0; +http://www.bing.com/bingbot.htm) Chrome/116.0.1938.76 Safari/537.36" 277 0.000 [] [] - - - - 3369294d380b3912e9ec94511d86e884
```

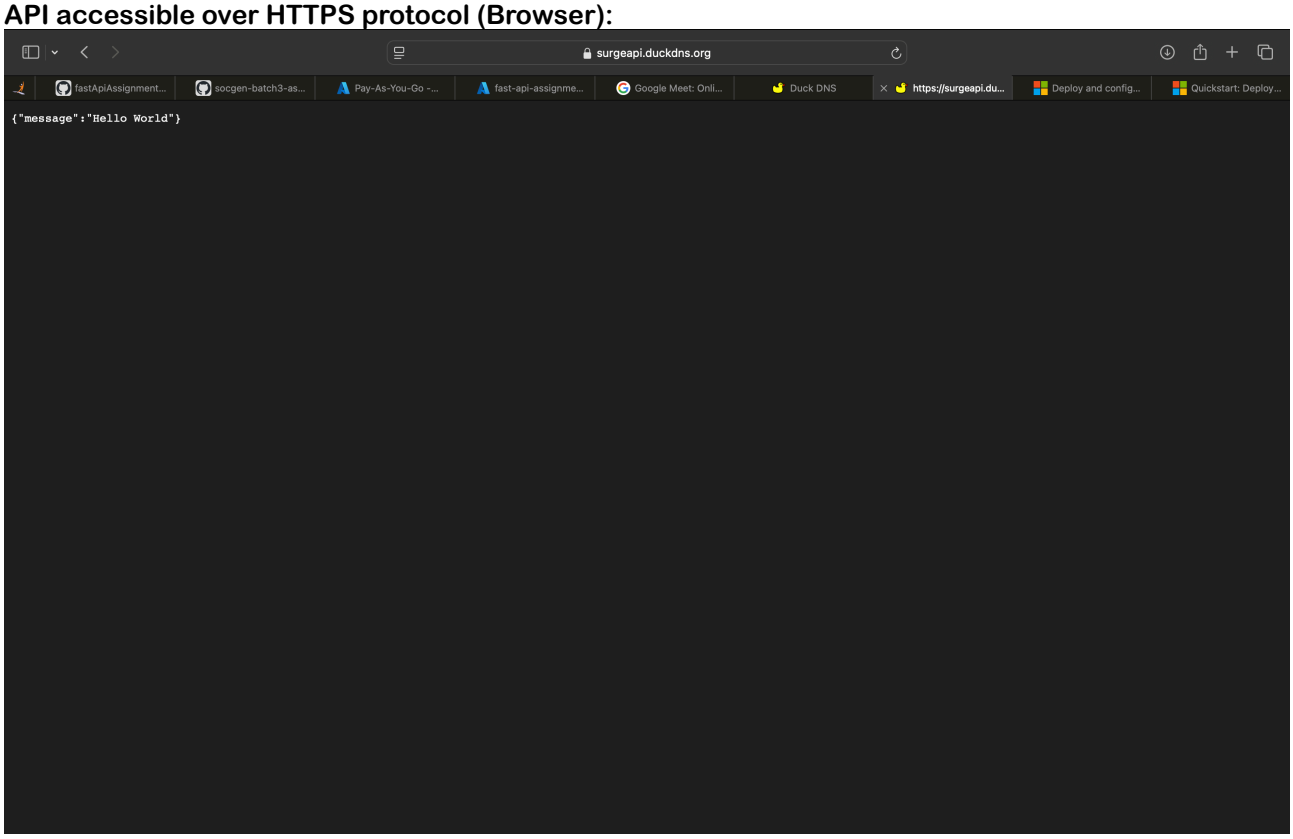
Domain mapping to nginx ingress controller public IP:



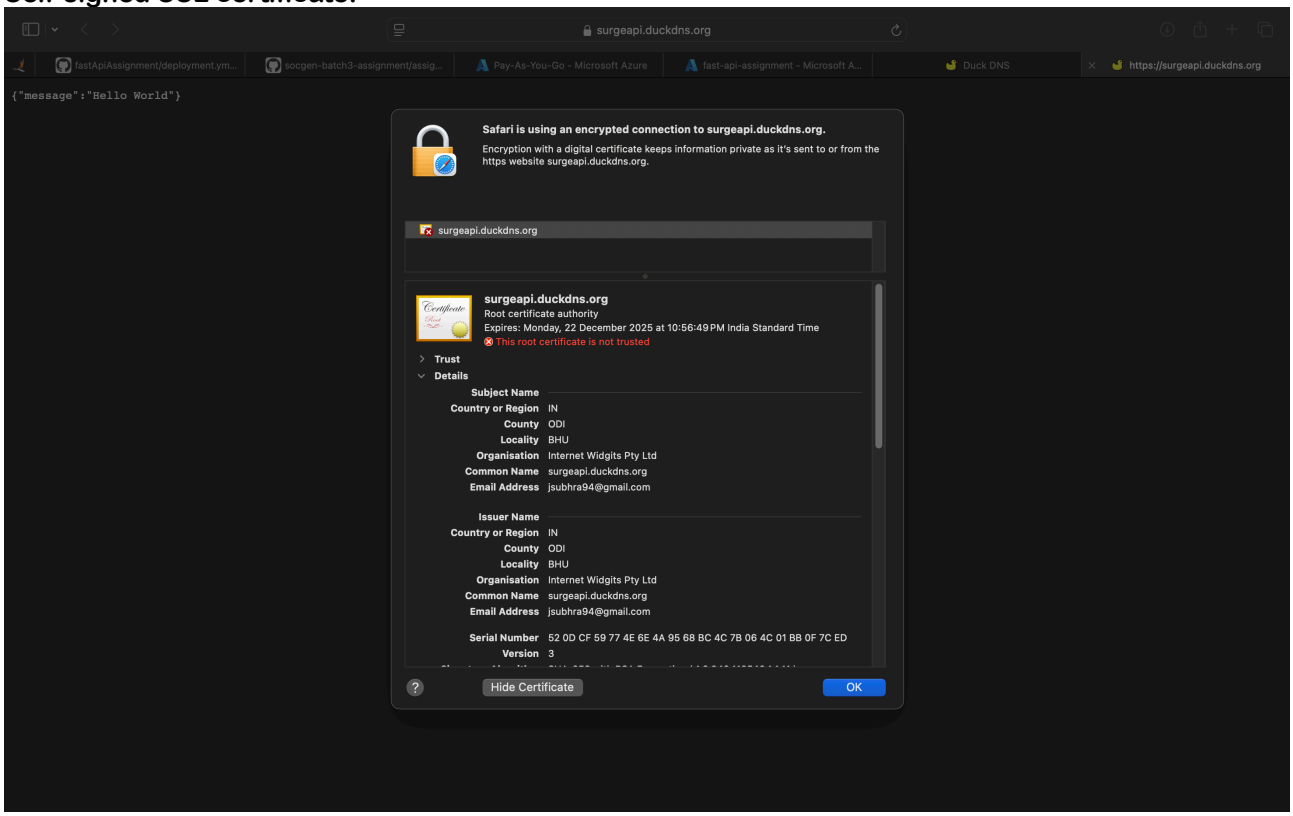
API accessible over HTTPS protocol (Postman):



API accessible over HTTPS protocol (Browser):



Self signed SSL certificate:



6. A report that summarises the solution and its benefits.

- Source code for the web application build locally and pushed to a GitHub repository.
- Web application is packaged through GitHub actions pipeline as a Docker image and stored in a Docker Hub registry.
- Securing the web application done by obtained a local SSL certificate and private key.
- Application deployed to Azure Kubernetes Service to make it scalable and high available.
- To remove manual error and improve efficiency, automated application deployment (CICD) done through GitHub Actions.