

Cloud Computing Assignment: Flask + MongoDB on Docker, Minikube, EKS with Monitoring & Alerts

Abstract

This report documents the complete lifecycle of deploying a Flask + MongoDB To-Do application using Docker, Kubernetes (Minikube and AWS EKS), implementing health probes, rolling updates, autoscaling, and setting up Prometheus-Alertmanager with Slack notification. The deployment journey, debugging steps, commands, and screenshots are provided.

Objectives

- Containerize a Flask + MongoDB app
- Run locally using Docker Compose
- Deploy on Minikube and AWS EKS
- Configure ReplicaSets, scaling, rolling updates
- Add liveness/readiness probes
- Implement HPA
- Setup Prometheus & Alertmanager
- Integrate Slack alerts
- Troubleshoot and validate reliability

Tech Stack

Docker, Docker Hub, Kubernetes, Minikube, AWS EKS, Flask, MongoDB, Prometheus, Alertmanager, Slack, BusyBox load-generator

Docker Containerization

Built Dockerfile & docker-compose to run Flask + MongoDB locally.

Verified CRUD in Mongo and UI in browser.

Pushed image to DockerHub.

Minikube Deployment

Deployed app to Minikube using YAML files:

Deployment, Service, Probes, HPA.

Verified pods, services, scaling, recovery.

AWS EKS Deployment

Provisioned EKS cluster, deployed app, accessed via LoadBalancer endpoint.

Scaling & ReplicaSets

Deleted pods & saw auto-healing.

Scaled replicas manually & using HPA.

Rolling Updates

Updated image tag → rolling replacement of pods verified.

Liveness & Readiness Probes

Configured HTTP GET probes, tested failure & restart behavior.

Prometheus & Alertmanager Setup

Installed kube-prometheus-stack.

Verified alert rules, port-forwarding for web UI.

Slack Integration

Created Secret + AlertmanagerConfig CRD.

Received actual alerts in Slack.

Troubleshooting Journey

Faced:

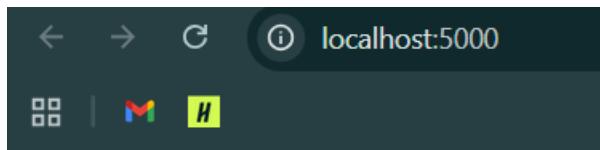
- ImagePullBackOff
- Metrics missing for HPA
- Probes failing
- Alertmanager config overridden by operator

Solved via pushing correct image, patching metrics-server, adjusting probe delays, and using AlertmanagerConfig CRD with secret.

Conclusion

We successfully containerized and deployed a distributed Flask + MongoDB system with resilience, observability, scaling, and alerting. The system auto-heals, scales based on CPU load, and sends Slack alerts for failures.

Screenshot 1 Docker Compose Build Output (Terminal)

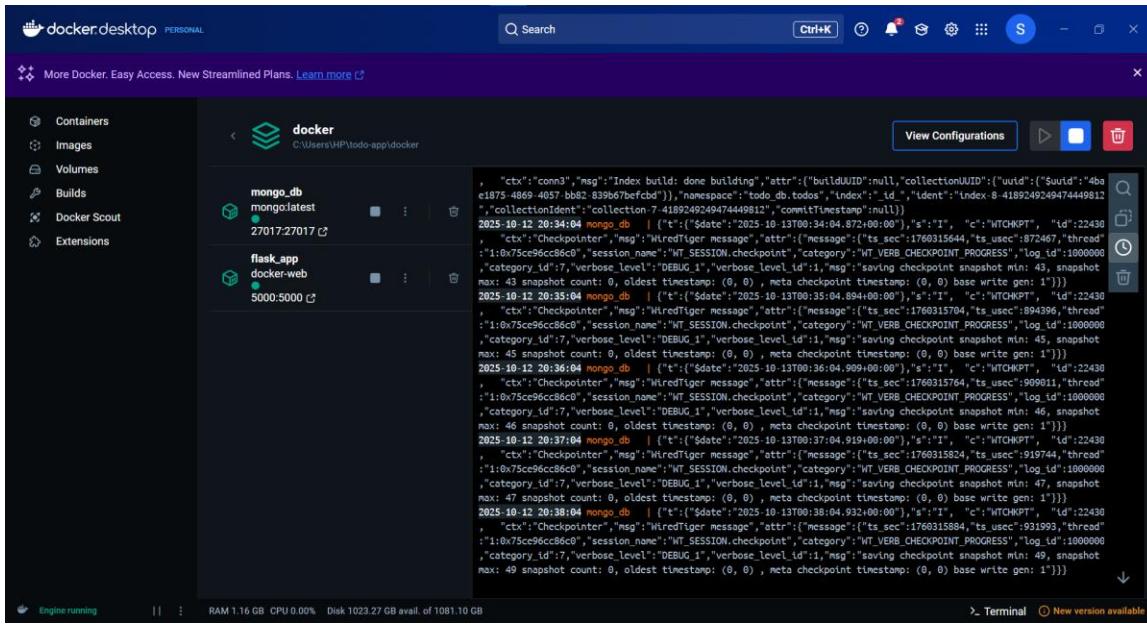


My To-Do List

New task

- #### • Do Laundry

Screenshot 2 Running Flask Web App (Browser) Local Host



Screenshot 3 Docker Desktop Container View


```
]
todo_db> db.todo.find().pretty()
{ acknowledged: true, deletedCount: 0 }
todo_db> db.todos.find().pretty()
[ acknowledged: true, deletedCount: 1 ]
  {
    _id: ObjectId('69065182edab9e42e5b34f78'), task: 'Prepare Dinner' ,
    {
      _id: ObjectId('690651c0edab9e42e5b34f79'),
      task: 'Review Docker Compose Setup'
    },
    {
      _id: ObjectId('690655af02ff684ed5ce5f47'),
      task: 'Complete Kubernetes Homework'
    }
]
todo_db> -
```



```
todo_db> db.todos.updateOne(
...  
...  
...  
...  
...
todo_db> db.todos.updateOne({ task: "hello" } , {$set: {task: "Review Docker Compose Setup"} })
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
todo_db> db.todos.find().pretty()
[
  { _id: ObjectId('68ec48de424b8222efd326e3'), task: 'Do Laundry' },
  { _id: ObjectId('69065182edab9e42e5b34f78'), task: 'Prepare Dinner' },
  {
    _id: ObjectId('690651c0edab9e42e5b34f79'),
    task: 'Review Docker Compose Setup'
  },
  {
    _id: ObjectId('690655af02ff684ed5ce5f47'),
    task: 'Complete Kubernetes Homework'
  }
]
todo_db> -
{ acknowledged: true, deletedCount: 0 }
```

MongoDB CRUD Operations

```
C:\Users\HP\Todo-App>kubectl get pods -n kube-system
NAME          READY   STATUS    RESTARTS   AGE
coredns-66bc5c9577-9sqkc   1/1    Running   0          3m15s
etcd-minikube      1/1    Running   0          3m19s
kube-apiserver-minikube  1/1    Running   0          3m19s
kube-controller-manager-minikube  1/1    Running   0          3m19s
kube-proxy-vv4zx       1/1    Running   0          3m15s
kube-scheduler-minikube  1/1    Running   0          3m19s
metrics-server-85b7d694d7-wcbjj  1/1    Running   0          106s
storage-provisioner     1/1    Running   0          3m16s

C:\Users\HP\Todo-App>kubectl apply -f k8s\
deployment.apps/flask-todo-deployment created
horizontalpodautoscaler.autoscaling/flask-hpa created
deployment.apps/mongo-deployment created
service/mongo created
deployment.apps/flask-todo-deployment-probed created
deployment.apps/flask-todo-deployment-rolling created
service/flask-todo-service created

C:\Users\HP\Todo-App>kubectl get deploy,pod,svc,hpa -o wide
NAME                                READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES   SELECTOR
deployment.apps/flask-todo-deployment 0/2    2           0          10s   flask-todo   sharayu1418/flask-todo:latest   app=flask-todo
deployment.apps/flask-todo-deployment-probed 0/2    2           0          9s    flask-app   sharayu1418/flask-todo:latest   app=flask-app
deployment.apps/flask-todo-deployment-rolling 0/2    2           0          9s    flask-app   sharayu1418/flask-todo:latest   app=flask-app-rolling
deployment.apps/mongo-deployment       0/1    1           0          10s   mongo        mongo:latest   app=mongo

NAME          READY   STATUS    RESTARTS   AGE   IP           NODE   NOMINATED-NODE   READINESS GATES
pod/flask-todo-deployment-5dd8b766bf-f9g87  0/1   ContainerCreating   0          10s   <none>      minikube   <none>   <none>
pod/flask-todo-deployment-5dd8b766bf-gnrhd  0/1   ContainerCreating   0          10s   <none>      minikube   <none>   <none>
pod/flask-todo-deployment-probed-5dc48f4696-4hnnb 0/1   ContainerCreating   0          9s    <none>      minikube   <none>   <none>
pod/flask-todo-deployment-probed-5dc48f4696-wc7kd 0/1   ContainerCreating   0          9s    <none>      minikube   <none>   <none>
pod/flask-todo-deployment-rolling-68b88db89f-8k742 0/1   ContainerCreating   0          9s    <none>      minikube   <none>   <none>
pod/flask-todo-deployment-rolling-68b88db89f-kspch 0/1   ContainerCreating   0          9s    <none>      minikube   <none>   <none>
pod/mongo-deployment-7bcb56ff4f-sf76h       0/1   ContainerCreating   0          9s    <none>      minikube   <none>   <none>

NAME          TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE   SELECTOR
service/flask-todo-service LoadBalancer  10.99.195.193  <pending>   80:30215/TCP  9s   app=flask-todo
service/mongo ClusterIP   10.98.115.89   <none>        27017/TCP   9s   app=mongo

NAME          REFERENCE   TARGETS   MINPODS   MAXPODS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/flask-hpa Deployment/flask-todo-deployment   cpu: <unknown>/50%  2          5          0          10s

C:\Users\HP\Todo-App>

C:\Users\HP\Todo-App>kubectl apply -f k8s/flask-deployment.yaml
deployment.apps/flask-todo-deployment configured
service/flask-todo-service configured

C:\Users\HP\Todo-App>kubectl rollout restart deployment flask-todo-deployment
deployment.apps/flask-todo-deployment restarted

C:\Users\HP\Todo-App>kubectl get pods -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE
flask-todo-deployment-56958c979-m599x  1/1    Running   0          3s    192.168.19.210 ip-192-168-31-248.ec2.i
internal <none>      <none>
flask-todo-deployment-6965dfb477-zxttk  1/1    Terminating   0          14m   192.168.21.197 ip-192-168-31-248.ec2.i
internal <none>      <none>
mongo-deployment-5659576dc8-242l1j     1/1    Running   0          14m   192.168.5.205 ip-192-168-31-248.ec2.i
internal <none>      <none>

C:\Users\HP\Todo-App>kubectl get pods -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE
flask-todo-deployment-56958c979-m599x  1/1    Running   0          6m54s  192.168.19.210 ip-192-168-31-248.ec2.inte
rnal <none>      <none>
mongo-deployment-5659576dc8-242l1j     1/1    Running   0          21m   192.168.5.205 ip-192-168-31-248.ec2.inte
rnal <none>      <none>
```

```
C:\ Command Prompt
mongo-deployment-7bcb56ff4f-sf76h      1/1     Running   0          22m
C:\Users\HP\todo-app>kubectl describe deployment flask-todo-deployment | find "Image"
    Image:           sharayu1418/flask-todo:latest
C:\Users\HP\todo-app>kubectl set image deployment/flask-todo-deployment flask-container=sharayu1418/flask-todo:v2
error: unable to find container named "flask-container"
C:\Users\HP\todo-app>kubectl describe deployment flask-todo-deployment | find "Container"
    Containers:
C:\Users\HP\todo-app>kubectl get deployment flask-todo-deployment -o yaml | find "name:"
    name: flask-todo-deployment
        name: flask-todo
C:\Users\HP\todo-app>kubectl set image deployment/flask-todo-deployment flask-todo=sharayu1418/flask-todo:v2
deployment.apps/flask-todo-deployment image updated
C:\Users\HP\todo-app>kubectl rollout status deployment/flask-todo-deployment
deployment "flask-todo-deployment" successfully rolled out
C:\Users\HP\todo-app>kubectl rollout history deployment/flask-todo-deployment
deployment.apps/flask-todo-deployment
REVISION  CHANGE-CAUSE
1          <none>
2          <none>

C:\Users\HP\todo-app>kubectl get pods -o wide
NAME                  READY   STATUS    RESTARTS   AGE      IP           NODE   NOMINATED-NODE   READINESS   GATES
flask-todo-deployment-b68874b6d-j2lh9   1/1     Running   0          2m2s   10.244.0.15   minikube   <none>       <none>
flask-todo-deployment-b68874b6d-vnpmh   1/1     Running   0          2m6s   10.244.0.14   minikube   <none>       <none>
flask-todo-deployment-probed-5dc48f4696-4hnrb  1/1     Running   0          29m    10.244.0.10   minikube   <none>       <none>
flask-todo-deployment-probed-5dc48f4696-wc7kd  1/1     Running   1 (28m ago) 29m    10.244.0.9    minikube   <none>       <none>
flask-todo-deployment-rolling-68b88db89f-8k742  1/1     Running   0          29m    10.244.0.8    minikube   <none>       <none>
flask-todo-deployment-rolling-68b88db89f-kspch  1/1     Running   0          29m    10.244.0.4    minikube   <none>       <none>
flask-todo-rc-gkz5m                      1/1     Running   0          7m56s   10.244.0.13   minikube   <none>       <none>
flask-todo-rc-ws94w                      1/1     Running   0          11m    10.244.0.11   minikube   <none>       <none>
mongo-deployment-7bcb56ff4f-sf76h      1/1     Running   0          29m    10.244.0.5    minikube   <none>       <none>

C:\Users\HP\todo-app>
```

```
Command Prompt
C:\Users\HP\todo-app>

C:\Users\HP\todo-app>kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87   1/1     Running   0          22m
flask-todo-deployment-5ddb8766bf-ghrhd   1/1     Running   0          22m
flask-todo-deployment-probed-5dc48f4696-4hnmb 1/1     Running   0          22m
flask-todo-deployment-probed-5dc48f4696-wc7kd 1/1     Running   1 (21m ago) 22m
flask-todo-deployment-rolling-68b88db89f-8k742 1/1     Running   0          22m
flask-todo-deployment-rolling-68b88db89f-kspch 1/1     Running   0          22m
flask-todo-rc-gkz5m                   1/1     Running   0          58s
flask-todo-rc-ws94w                   1/1     Running   0          4m53s
mongo-deployment-7bcb56ff4f-sf76h       1/1     Running   0          22m

C:\Users\HP\todo-app>kubectl describe deployment flask-todo-deployment | find "Image"
  Image:           sharayu1418/flask-todo:latest

C:\Users\HP\todo-app>kubectl set image deployment/flask-todo-deployment flask-container=sharayu1418/flask-todo:v2
error: unable to find container named "flask-container"

C:\Users\HP\todo-app>kubectl describe deployment flask-todo-deployment | find "Container"
  Containers:

C:\Users\HP\todo-app>kubectl get deployment flask-todo-deployment -o yaml | find "name:"
  name: flask-todo-deployment
  name: flask-todo

C:\Users\HP\todo-app>kubectl set image deployment/flask-todo-deployment flask-todo=sharayu1418/flask-todo:v2
deployment.apps/flask-todo-deployment image updated

C:\Users\HP\todo-app>kubectl rollout status deployment/flask-todo-deployment
deployment "flask-todo-deployment" successfully rolled out

C:\Users\HP\todo-app>kubectl rollout history deployment/flask-todo-deployment
deployment.apps/flask-todo-deployment
REVISION  CHANGE-CAUSE
1        <none>
2        <none>

C:\Users\HP\todo-app>
```

```
Command Prompt
flask-todo-deployment-probed-5dc48f4696-4hnnb 1/1 Running 0 17m
flask-todo-deployment-probed-5dc48f4696-wc7kd 1/1 Running 1 (16m ago) 17m
flask-todo-deployment-rolling-68b88db89f-8k742 1/1 Running 0 17m
flask-todo-deployment-rolling-68b88db89f-kspch 1/1 Running 0 17m
flask-todo-rc-jk6wx 0/1 Pending 0 0s
flask-todo-rc-ws94w 0/1 Pending 0 1s
mongo-deployment-7bcb56ff4f-sf76h 1/1 Running 0 17m

C:\Users\HP\todo-app>kubectl get rc
NAME      DESIRED   CURRENT   READY   AGE
flask-todo-rc  2        2        2      30s

C:\Users\HP\todo-app>kubectl get pods
NAME                                     READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87  1/1    Running   0          18m
flask-todo-deployment-5ddb8766bf-ghrhd  1/1    Running   0          18m
flask-todo-deployment-probed-5dc48f4696-4hnnb 1/1    Running   0          18m
flask-todo-deployment-probed-5dc48f4696-wc7kd 1/1    Running   1 (16m ago) 18m
flask-todo-deployment-rolling-68b88db89f-8k742 1/1    Running   0          18m
flask-todo-deployment-rolling-68b88db89f-kspch 1/1    Running   0          18m
flask-todo-rc-jk6wx 1/1    Running   0          30s
flask-todo-rc-ws94w 1/1    Running   0          31s
mongo-deployment-7bcb56ff4f-sf76h 1/1    Running   0          18m

C:\Users\HP\todo-app>kubectl get rc
NAME      DESIRED   CURRENT   READY   AGE
flask-todo-rc  2        2        2      2m56s

C:\Users\HP\todo-app>kubectl get pods
NAME                                     READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87  1/1    Running   0          20m
flask-todo-deployment-5ddb8766bf-ghrhd  1/1    Running   0          20m
flask-todo-deployment-probed-5dc48f4696-4hnnb 1/1    Running   0          20m
flask-todo-deployment-probed-5dc48f4696-wc7kd 1/1    Running   1 (19m ago) 20m
flask-todo-deployment-rolling-68b88db89f-8k742 1/1    Running   0          20m
flask-todo-deployment-rolling-68b88db89f-kspch 1/1    Running   0          20m
flask-todo-rc-jk6wx 1/1    Running   0          2m55s
flask-todo-rc-ws94w 1/1    Running   0          2m56s
mongo-deployment-7bcb56ff4f-sf76h 1/1    Running   0          20m

C:\Users\HP\todo-app>
```

```

C:\ Command Prompt

C:\Users\HP\todo-app>kubectl get rc
NAME      DESIRED   CURRENT   READY   AGE
flask-todo-rc   2         2         2     2m56s

C:\Users\HP\todo-app>kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87   1/1     Running   0          20m
flask-todo-deployment-5ddb8766bf-ghrhd   1/1     Running   0          20m
flask-todo-deployment-probed-5dc48f4696-4hnrb   1/1     Running   0          20m
flask-todo-deployment-probed-5dc48f4696-wc7kd   1/1     Running   1 (19m ago)   20m
flask-todo-deployment-rolling-68b88db89f-8k742   1/1     Running   0          20m
flask-todo-deployment-rolling-68b88db89f-kspch   1/1     Running   0          20m
flask-todo-rc-jk6wx   1/1     Running   0          2m55s
flask-todo-rc-ws94w   1/1     Running   0          2m56s
mongo-deployment-7bcb56ff4f-sf76h   1/1     Running   0          20m

C:\Users\HP\todo-app>kubectl delete pod flask-todo-rc-jk6wx
pod "flask-todo-rc-jk6wx" deleted

C:\Users\HP\todo-app>kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87   1/1     Running   0          22m
flask-todo-deployment-5ddb8766bf-ghrhd   1/1     Running   0          22m
flask-todo-deployment-probed-5dc48f4696-4hnrb   1/1     Running   0          22m
flask-todo-deployment-probed-5dc48f4696-wc7kd   1/1     Running   1 (20m ago)   22m
flask-todo-deployment-rolling-68b88db89f-8k742   1/1     Running   0          22m
flask-todo-deployment-rolling-68b88db89f-kspch   1/1     Running   0          22m
flask-todo-rc-gkz5m   1/1     Running   0          33s
flask-todo-rc-ws94w   1/1     Running   0          4m28s
mongo-deployment-7bcb56ff4f-sf76h   1/1     Running   0          22m

C:\Users\HP\todo-app>

C:\Users\HP\todo-app>kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87   1/1     Running   0          22m
flask-todo-deployment-5ddb8766bf-ghrhd   1/1     Running   0          22m
flask-todo-deployment-probed-5dc48f4696-4hnrb   1/1     Running   0          22m
flask-todo-deployment-probed-5dc48f4696-wc7kd   1/1     Running   1 (21m ago)   22m
flask-todo-deployment-rolling-68b88db89f-8k742   1/1     Running   0          22m
flask-todo-deployment-rolling-68b88db89f-kspch   1/1     Running   0          22m
flask-todo-rc-gkz5m   1/1     Running   0          58s
flask-todo-rc-ws94w   1/1     Running   0          4m53s
mongo-deployment-7bcb56ff4f-sf76h   1/1     Running   0          22m

C:\Users\HP\todo-app>_

```

Kubernetes Deployment

```

C:\ Command Prompt - kubectl get hpa -w
  etcd-docker-desktop      1/1   Running  2 (109m ago)  19d
  kube-apiserver-docker-desktop 1/1   Running  2 (109m ago)  19d
  kube-controller-manager-docker-desktop 1/1   Running  2 (109m ago)  19d
  kube-proxy-tgjzb          1/1   Running  2 (109m ago)  19d
  kube-scheduler-docker-desktop 1/1   Running  17 (109m ago)  19d
  metrics-server-7bc64b58bf-fh8q 1/1   Running  0          119s
  storage-provisioner        1/1   Running  21 (108m ago)  19d
  vpknkit-controller         1/1   Running  2 (109m ago)  19d

C:\Users\HP>kubectl top pods
NAME                               CPU(cores)   MEMORY(bytes)
flask-todo-deployment-bb84554c4-6vq97    201m        26Mi
Flask-todo-deployment-bb84554c4-fxqvv     194m        26Mi
flask-todo-deployment-probed-8676f848d-6p5v9 3m          26Mi
Flask-todo-deployment-probed-8676f848d-b8lrq 3m          26Mi
flask-todo-deployment-rolling-b46bb64c5-mpz74 2m          46Mi
Flask-todo-deployment-rolling-b46bb64c5-vkvgq 1m          25Mi
load-generator                      450m        2Mi
mongo-deployment-6c475888d7-mhgfx       85m         295Mi

C:\Users\HP>kubectl get hpa -w
NAME      REFERENCE      TARGETS      MINPODS   MAXPODS   REPLICAS   AGE
Flask-todo-deployment  Deployment/flask-todo-deployment  cpu: <unknown>/50%  2          5          2          13m

C:\Users\HP>kubectl get pods -n kube-system
NAME      READY   STATUS    RESTARTS   AGE
coredns-55cb58b774-dmhzyv    1/1   Running  2 (109m ago)  19d
coredns-55cb58b774-x64dr     1/1   Running  2 (109m ago)  19d
etcd-docker-desktop          1/1   Running  2 (109m ago)  19d
kube-apiserver-docker-desktop 1/1   Running  2 (109m ago)  19d
kube-controller-manager-docker-desktop 1/1   Running  2 (109m ago)  19d
kube-proxy-tgjzb             1/1   Running  2 (109m ago)  19d
kube-scheduler-docker-desktop 1/1   Running  17 (109m ago)  19d
metrics-server-7bc64b58bf-fh8q 1/1   Running  0          119s
storage-provisioner          1/1   Running  21 (108m ago)  19d
vpknkit-controller           1/1   Running  2 (109m ago)  19d

C:\Users\HP>kubectl top pods
NAME                               CPU(cores)   MEMORY(bytes)
flask-todo-deployment-bb84554c4-6vq97    201m        26Mi
Flask-todo-deployment-bb84554c4-fxqvv     194m        26Mi
flask-todo-deployment-probed-8676f848d-6p5v9 3m          26Mi
Flask-todo-deployment-probed-8676f848d-b8lrq 3m          26Mi
flask-todo-deployment-rolling-b46bb64c5-mpz74 2m          46Mi
Flask-todo-deployment-rolling-b46bb64c5-vkvgq 1m          25Mi
load-generator                      450m        2Mi
mongo-deployment-6c475888d7-mhgfx       85m         295Mi

C:\Users\HP>kubectl get hpa -w
NAME      REFERENCE      TARGETS      MINPODS   MAXPODS   REPLICAS   AGE
Flask-todo-deployment  Deployment/flask-todo-deployment  cpu: <unknown>/50%  2          5          2          13m

```

```
cmd Command Prompt - kubectl get hpa -w
microsoft Windows [Version 10.0.19045.6456]
c) Microsoft Corporation. All rights reserved.

:\Users\HP>kubectl top pods
NAME                               CPU(cores)   MEMORY(bytes)
flask-todo-deployment-bb84554c4-6vg97    197m        26Mi
flask-todo-deployment-bb84554c4-fxawv     194m        26Mi
flask-todo-deployment-probed-8676f848d-6p5v9    2m          26Mi
flask-todo-deployment-probed-8676f848d-b8lrq     2m          26Mi
flask-todo-deployment-rolling-b46bb64c5-mpz74    1m          46Mi
flask-todo-deployment-rolling-b46bb64c5-vkvgq     1m          25Mi
load-generator                      450m        2Mi
mongo-deployment-6c475888d7-mhgfx       83m        306Mi

:\Users\HP>kubectl get hpa -w
NAME      REFERENCE      TARGETS      MINPODS   MAXPODS   REPLICAS   AGE
flask-hpa  Deployment/flask-todo-deployment  cpu: <unknown>/50%  2          5          2          27m
flask-hpa  Deployment/flask-todo-deployment  cpu: <unknown>/50%  2          5          2          27m

cmd Command Prompt - kubectl get hpa -w
microsoft Windows [Version 10.0.19045.6456]
c) Microsoft Corporation. All rights reserved.

:\Users\HP>kubectl get hpa -w
NAME      REFERENCE      TARGETS      MINPODS   MAXPODS   REPLICAS   AGE
flask-hpa  Deployment/flask-todo-deployment  cpu: <unknown>/50%  2          5          2          21m

C:\Users\HP\(todo-app>)kubectl patch deployment metrics-server -n kube-system --type=json -p "[{\\"op\\":\"add\", \"path\": \"/spec/template/spec/containers/0/args/-\", \"value\": \"--kubelet-insecure-tls\"}]"
deployment.apps/metrics-server patched

C:\Users\HP\(todo-app>)kubectl get deployment metrics-server -n kube-system
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
metrics-server   0/1     1           0          92s

C:\Users\HP\(todo-app>)kubectl get deployment metrics-server -n kube-system
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
metrics-server   1/1     1           1          3m19s

C:\Users\HP\(todo-app>)kubectl get hpa
NAME      REFERENCE      TARGETS      MINPODS   MAXPODS   REPLICAS   AGE
flask-hpa  Deployment/flask-todo-deployment  cpu: <unknown>/50%  2          5          2          12m

C:\Users\HP\(todo-app>_
```

```

C:\ Command Prompt
C:\Users\HP\todo-app>helm install prometheus prometheus-community/kube-prometheus-stack -n monitoring --create-namespace
'helm' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\HP\todo-app>helm repo add prometheus-community https://prometheus-community.github.io/helm-charts
"prometheus-community" has been added to your repositories

C:\Users\HP\todo-app>helm repo update
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "prometheus-community" chart repository
Update Complete. Happy Helm-ing!

C:\Users\HP\todo-app>helm install prometheus prometheus-community/kube-prometheus-stack -n monitoring --create-namespace
NAME: prometheus
LAST DEPLOYED: Sat Nov  1 21:36:48 2025
NAMESPACE: monitoring
STATUS: deployed
REVISION: 1
NOTES:
kube-prometheus-stack has been installed. Check its status by running:
  kubectl --namespace monitoring get pods -l "release=prometheus"

Get Grafana 'admin' user password by running:
  kubectl --namespace monitoring get secrets prometheus-grafana -o jsonpath=".data.admin-password" | base64 -d ; echo

Access Grafana local instance:
  export POD_NAME=$(kubectl --namespace monitoring get pod -l "app.kubernetes.io/name=grafana,app.kubernetes.io/instance=prometheus" -oname)
  kubectl --namespace monitoring port-forward $POD_NAME 3000

Get your grafana admin user password by running:
  kubectl get secret --namespace monitoring -l app.kubernetes.io/component=admin-secret -o jsonpath=".items[0].data.admin-password" | base64 --decode ; echo

Visit https://github.com/prometheus-operator/kube-prometheus for instructions on how to create & configure Alertmanager and Prometheus instances using the Operator.

C:\Users\HP\todo-app>kubectl get pods -n monitoring
NAME                               READY   STATUS    RESTARTS   AGE
alertmanager-prometheus-kube-prometheus-alertmanager-0   2/2     Running   0          44s
prometheus-grafana-dfb544fd7-26vvl   3/3     Running   0          48s
prometheus-kube-prometheus-operator-697656cb68-kgslw   1/1     Running   0          48s
prometheus-kube-state-metrics-7c5fb9d798-9t4cc   1/1     Running   0          48s
prometheus-prometheus-kube-prometheus-0   2/2     Running   0          43s
prometheus-prometheus-node-exporter-vssdf   1/1     Running   0          48s

C:\Users\HP\todo-app>

C:\Users\HP\todo-app>kubectl get svc
NAME           TYPE      CLUSTER-IP      EXTERNAL-IP
  PORT(S)        AGE
flask-todo-service LoadBalancer   10.100.36.182 acbcfedde25a84543a87a778a0c4ba96-1133005992.us-east-1.elb.amazonaws.com 80:30604/TCP 23m
kubernetes      ClusterIP   10.100.0.1    <none>
mongo          ClusterIP   10.100.222.37 <none>
      27017/TCP 16m

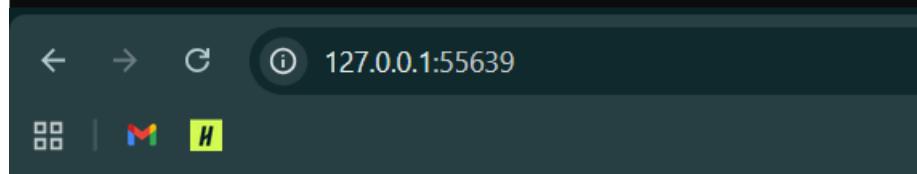
C:\Users\HP\todo-app>

```

Metrics Server & Autoscaling (HPA)

```
C:\Users\HP\todo-app>kubectl get svc
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP
flask-todo-service LoadBalancer  10.100.36.182 acbcfedde25a84543a87a778a0c4ba96-1133005992.us-east-1.elb.amazonaws.com  80:30604/TCP  23m
kubernetes     ClusterIP  10.100.0.1    <none>
mongo          ClusterIP  10.100.222.37 <none>
                27017/TCP  16m

C:\Users\HP\todo-app>
```



My To-Do List

- Do Laundry
- Prepare Dinner

```
C:\Administrator: Command Prompt - minikube service flask-todo-service -n cc-hw2 --url
C:\Windows\system32>move .\minikube-windows-amd64.exe C:\Windows\System32\minikube.exe
The system cannot find the file specified.

C:\Windows\system32>cd C:\Users\HP\todo-app

C:\Users\HP\todo-app>move .\minikube-windows-amd64.exe C:\Windows\System32\minikube.exe
1 file(s) moved.

C:\Users\HP\todo-app>minikube status
* Profile "minikube" not found. Run "minikube profile list" to view all profiles.
  To start a cluster, run: "minikube start"

C:\Users\HP\todo-app>minikube start --driver=docker --cpus=4 --memory=4096
* minikube v1.37.0 on Microsoft Windows 10 Home 10.0.19045.6456 Build 19045.6456
* Using the docker driver based on user configuration

X Exiting due to MK_USAGE: Docker Desktop has only 3796MB memory but you specified 4096MB

C:\Users\HP\todo-app>minikube start --driver=docker --cpus=4 --memory=3000
* minikube v1.37.0 on Microsoft Windows 10 Home 10.0.19045.6456 Build 19045.6456
* Using the docker driver based on user configuration
* Using Docker Desktop driver with root privileges
* Starting "minikube" primary control-plane node in "minikube" cluster
* Pulling base image v0.0.48 ...
* Downloading Kubernetes v1.34.0 preload ...
  > gcr.io/k8s-minikube/kicbase...: 488.52 MiB / 488.52 MiB 100.00% 13.65 M
  > preloaded-images-k8s-v18-v1...: 337.07 MiB / 337.07 MiB 100.00% 6.86 Mi
* Creating docker container (CPUs=4, Memory=3000MiB) ...
! Failing to connect to https://registry.k8s.io/ from inside the minikube container
* To pull new external images, you may need to configure a proxy: https://minikube.sigs.k8s.io/docs/reference/networking/proxy/
* Preparing Kubernetes v1.34.0 on Docker 28.4.0 ...
* Configuring bridge CNI (Container Networking Interface) ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass

! C:\Program Files\Docker\Dockers\resources\bin\kubectl.exe is version 1.30.5, which may have incompatibilities with Kubernetes 1.34.0.
- Want kubectl v1.34.0? Try 'minikube kubectl -- get pods -A'
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default

C:\Users\HP\todo-app>minikube status
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubecfg: Configured
```

Minikube Deployment

```

Administrator: Command Prompt - minikube service flask-todo-service -n cc-hw2 --url
deployment.apps/flask-todo-deployment-probed created
deployment.apps/flask-todo-deployment-rolling created
service/flask-todo-service created

C:\Users\HP\todo-app>kubectl get deploy,po,svc,hpa -o wide
NAME                                     READY   UP-TO-DATE   AVAILABLE   AGE    CONTAINERS   IMAGES                               SELECTOR
deployment.apps/flask-todo-deployment     0/2     2           0           10s   flask-todo   sharayu1418/flask-todo:latest   app=flask-todo
deployment.apps/flask-todo-deployment-probed 0/2     2           0           9s    flask-app   sharayu1418/flask-todo:latest   app=flask-app
deployment.apps/flask-todo-deployment-rolling 0/2     2           0           9s    flask-app   sharayu1418/flask-todo:latest   app=flask-app-rolling
deployment.apps/mongo-deployment          0/1     1           0           10s   mongo       mongo:latest                app=mongo

NAME                           READY   STATUS    RESTARTS   AGE    IP        NODE   NOMINATED NODE   READINESS GATES
pod/flask-todo-deployment-5ddb8766bf-f9g87 0/1   ContainerCreating 0  10s   <none>   minikube   <none>   <none>
pod/flask-todo-deployment-5ddb8766bf-ghrhd 0/1   ContainerCreating 0  10s   <none>   minikube   <none>   <none>
pod/flask-todo-deployment-probed-5dc48f4696-4hnnb 0/1   ContainerCreating 0  9s    <none>   minikube   <none>   <none>
pod/flask-todo-deployment-probed-5dc48f4696-wc7kd 0/1   ContainerCreating 0  9s    <none>   minikube   <none>   <none>
pod/flask-todo-deployment-rolling-68b88bd89f-8k742 0/1   ContainerCreating 0  9s    <none>   minikube   <none>   <none>
pod/flask-todo-deployment-rolling-68b88bd89f-kspch 0/1   ContainerCreating 0  9s    <none>   minikube   <none>   <none>
pod/mongo-deployment-7bc56ff4f-sf76h 0/1   ContainerCreating 0  9s    <none>   minikube   <none>   <none>

NAME          TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE    SELECTOR
service/mongo ClusterIP  10.99.195.193 <pending>   80:30215/TCP 9s    app=mongo
service/mongo ClusterIP  10.98.115.89  <none>        27017/TCP  9s    app=mongo

NAME          REFERENCE   TARGETS   MINPODS   MAXPODS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/flask-hpa   Deployment/flask-todo-deployment   cpu: <unknown>/50% 2          5          0          10s

C:\Users\HP\todo-app>kubectl get pods
NAME                           READY   STATUS    RESTARTS   AGE
flask-todo-deployment-5ddb8766bf-f9g87 1/1   Running  0  2m6s
flask-todo-deployment-5ddb8766bf-ghrhd 1/1   Running  0  2m6s
flask-todo-deployment-probed-5dc48f4696-4hnnb 1/1   Running  0  2m5s
flask-todo-deployment-probed-5dc48f4696-wc7kd 1/1   Running  1 (21s ago) 2m5s
flask-todo-deployment-rolling-68b88bd89f-8k742 1/1   Running  0  2m5s
flask-todo-deployment-rolling-68b88bd89f-kspch 1/1   Running  0  2m5s
mongo-deployment-7bc56ff4f-sf76h 1/1   Running  0  2m5s

C:\Users\HP\todo-app>minikube service flask-todo-service --url
X Exiting due to SVC_NOT_FOUND: Service 'flask-todo-service' was not found in 'default' namespace.
You may select another namespace by using 'minikube service flask-todo-service -n <namespace>'. Or list out all the services using 'minikube service list'

C:\Users\HP\todo-app>minikube service flask-todo-service -n cc-hw2 --url
http://127.0.0.1:55639
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.




The screenshot shows two windows side-by-side. On the left is a Slack workspace for 'Big Data | CS-GY 651...'. It displays a message from 'Sharayu Rasal' about integrating Prometheus alerts, followed by messages from 'prometheus-alerts' indicating test alerts. The sidebar shows a list of team members and various workspace settings. On the right is a Notion canvas titled 'To-do list'. The canvas includes a 'To-do list' section with a note: 'This is your space. We've added a few things to help get you started, but feel free to use this canvas however you'd like.' Below it is a 'This week' section with two items: 'Update your profile photo so your team knows it's you' and 'Stay in loop by customizing your'. At the bottom of the Notion window are buttons for 'To-do list', 'Explore all templates', 'Use Blank Canvas', and 'Use Template'.


```

```
Command Prompt
flask-todo:
  Container ID: docker://644ef41d955d6a47aa6559b4f46ac8e9633e19bf19c03f704241a0fcf69de866
  Image: sharayu1418/flask-todo:v2
  Image ID: docker-pullable://sharayu1418/flask-todo@sha256:60d10548a384eaf7b0492bf9346c39a8c24c69676089c08b0e8c896017b7c42e
  Port: 5000/TCP
  Host Port: 0/TCP
  State: Running
    Started: Sat, 01 Nov 2025 17:24:45 -0400
  Ready: True
  Restart Count: 0
  Liveness: http-get http://:5000/health delay=15s timeout=1s period=10s #success=1 #failure=3
  Readiness: http-get http://:5000/ delay=5s timeout=1s period=5s #success=1 #failure=3
  Environment: <none>
  Mounts:
    /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-kjlbc (ro)
Conditions:
  Type          Status
  PodReadyToStartContainers  True
  Initialized   True
  Ready         True
  ContainersReady  True
  PodScheduled  True
Volumes:
  kube-api-access-kjlbc:
    Type:        Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName:      kube-root-ca.crt
    ConfigMapOptional:  <nil>
    DownwardAPI:       true
  QoS Class:  BestEffort
  Node-Selectors: <none>
  Tolerations:   node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                 node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type  Reason  Age   From            Message
  ----  -----  --   ----            -----
  Normal Scheduled  57s   default-scheduler  Successfully assigned cc-hw2/flask-todo-deployment-probed-6bb55d88db-57d2t to minikube
  Normal Pulled   56s   kubelet         Container image "sharayu1418/flask-todo:v2" already present on machine
  Normal Created   56s   kubelet         Created container: flask-todo
  Normal Started   55s   kubelet         Started container flask-todo
  Warning Unhealthy 17s  (x3 over 37s)  kubelet   Liveness probe failed: HTTP probe failed with statuscode: 404
  Normal Killing   17s   kubelet         Container flask-todo failed liveness probe, will be restarted
C:\Users\HP\todo-app>
```

Monitoring and Alerts