SIT323/SIT737- Cloud Native Application Development

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9.1P: Adding a database to your application

GitHub Link: https://github.com/AndyWanng/sit323-737-2024-t1-prac9p.git

Deployment Guide for Kubernetes Cluster: Task Calculator Application

Introduction

This Kubernetes configuration encompasses the deployment of a multi-component application which includes a frontend server, an authentication server, a calculator server, and a MongoDB database. This setup ensures that all components are deployed in a secure and scalable fashion within a Kubernetes environment.

Components Overview

1. **Secrets:**
    - **jwt-secret:** Manages the JWT secret key for authentication services.
    - **mongo-secret:** Stores MongoDB credentials for database access.
2. **Deployments:**
    - **auth-server-deployment:** Handles user authentication and JWT management.
    - **calculator-server-deployment:** Provides APIs for calculator functionalities.
    - **frontend-server-deployment:** Serves the user interface.
    - **mongo:** MongoDB database deployment for data storage.
3. **Services:**

- Expose application components within the Kubernetes cluster.

4. **Persistent Volumes:**
    - Ensure data persistence for MongoDB with a PersistentVolumeClaim.
5. **Ingress:**
    - Routes external traffic to the services based on configured paths.

Deployment Guide

Prerequisites:

- A Kubernetes cluster is up and running.
- kubectl is configured to interact with your cluster.
- Docker images for the application components are available in a registry.

Deployment Steps:

1. **Prepare Your Configuration Files:**
    - Ensure all your Kubernetes YAML configurations are stored in one directory. This typically includes your deployments, services, secrets, persistent volume claims, and ingress configurations.
2. **Deploy the Entire Configuration:**
    - Navigate to the directory where your Kubernetes configuration files are located.
    - Use the following command to apply all configurations at once:

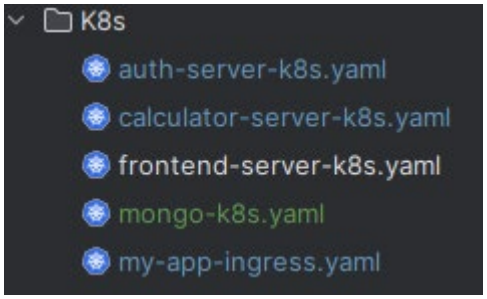
      kubectl apply -f .
3. **Check Deployment Status**:
    - Verify that all pods are running correctly:
      kubectl get pods
    - Check the status of your services to ensure they are properly set up:
      kubectl get services
    - Inspect the stateful sets, particularly for MongoDB:
      kubectl get statefulsets
4. **Monitor Resource Usage and Logs:**
    - Monitor the resource usage:
      kubectl top pod
    - Tail the logs of a specific pod if needed:

kubectl logs -f <pod-name>

5. **Access the Application:**
    - If using an ingress controller, access your application via the URLs configured in the ingress rules.
    - Otherwise, you might need to use port-forwarding or external IPs based on your service configurations to access your application.

Screenshots:

K8s files:



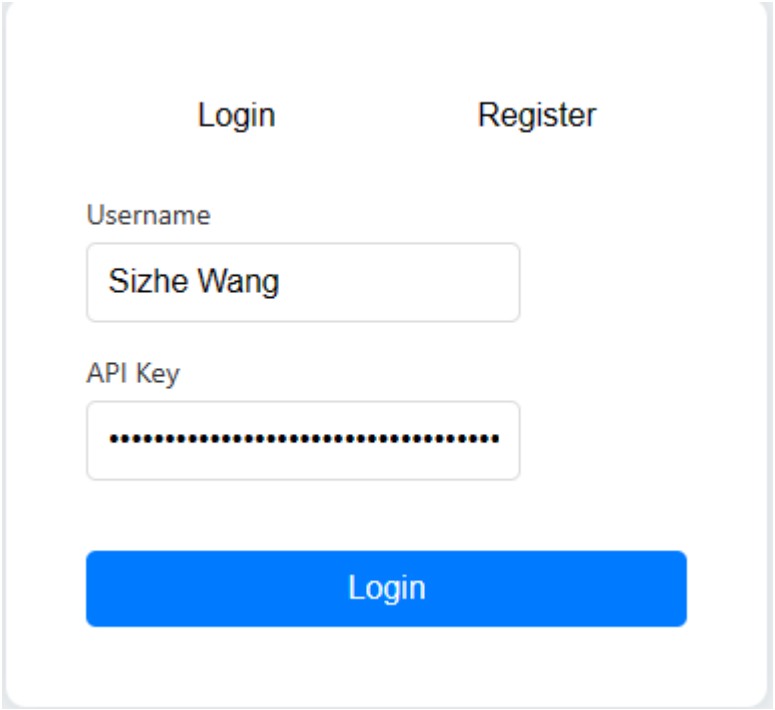
Pods, services, deployments and statefulsets monitoring:

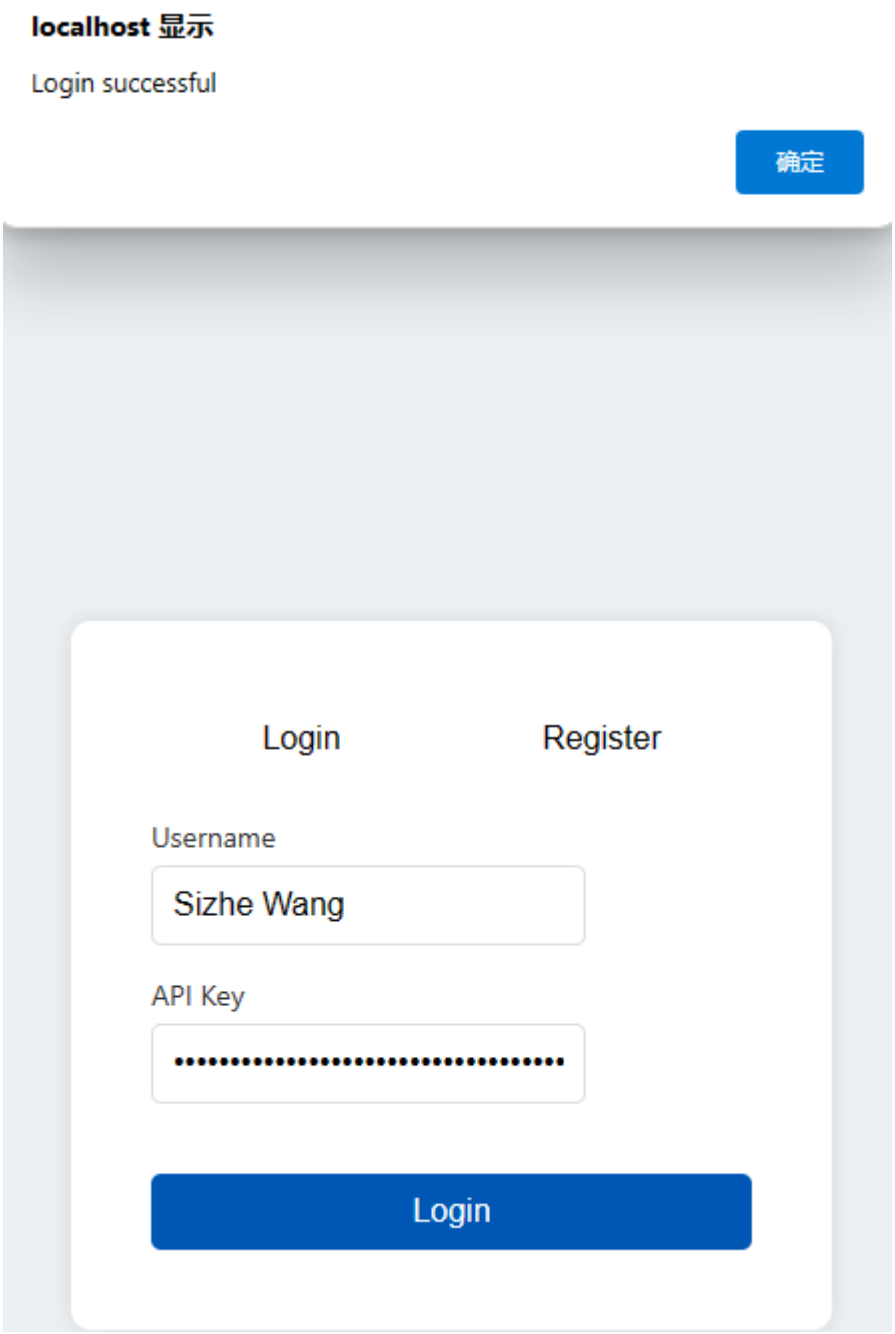
```
PS C:\Users\22396\WebstormProjects\task-calculator-K8s\k8s> kubectl get all
NAME                                             READY   STATUS    RESTARTS   AGE
pod/auth-server-deployment-dd77d6855-zpfx7       1/1     Running   0          3d10h
pod/calculator-server-deployment-6dfc86687-cxwn5 1/1     Running   0          3d10h
pod/frontend-server-deployment-5c474c7c8d-mrpvj  1/1     Running   0          3d10h
pod/mongo-0                                      1/1     Running   0          14m

NAME                      TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
service/auth-server       NodePort    10.98.72.249    <none>        3001:30257/TCP   3d10h
service/calculator-server NodePort    10.109.70.114   <none>        3002:30439/TCP   3d10h
service/frontend-server   ClusterIP   10.111.75.1     <none>        3000/TCP         3d10h
service/kubernetes        ClusterIP   10.96.0.1       <none>        443/TCP          3d10h
service/mongo             ClusterIP   10.107.157.99   <none>        27017/TCP        3d10h

NAME                                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/auth-server-deployment     1/1     1            1           3d10h
deployment.apps/calculator-server-deployment 1/1   1            1           3d10h
deployment.apps/frontend-server-deployment 1/1     1            1           3d10h

NAME                                                DESIRED   CURRENT   READY   AGE
replicaset.apps/auth-server-deployment-dd77d6855    1         1         1       3d10h
replicaset.apps/calculator-server-deployment-6dfc86687 1      1         1       3d10h
replicaset.apps/frontend-server-deployment-5c474c7c8d  1      1         1       3d10h

NAME                     READY   AGE
statefulset.apps/mongo   1/1     33m
PS C:\Users\22396\WebstormProjects\task-calculator-K8s\k8s>
```

Interacting using mongosh

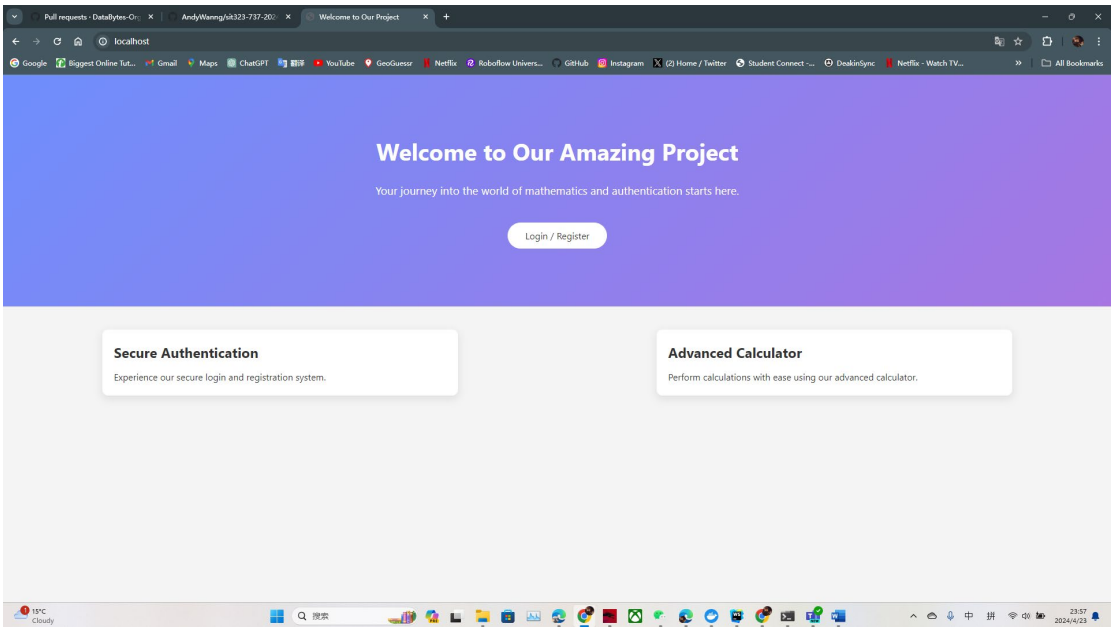
```
------
   The server generated these startup warnings when booting
   2024-05-09T13:33:39.958+00:00: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
   2024-05-09T13:33:41.366+00:00: /sys/kernel/mm/transparent_hugepage/enabled is 'always'. We suggest setting it to 'never' in this binary version
   2024-05-09T13:33:41.366+00:00: vm.max_map_count is too low
------

test> show dbs
admin   100.00 KiB
auth     40.00 KiB
config  108.00 KiB
local    72.00 KiB
test> use auth
switched to db auth
auth> show collections
users
auth> db.users.find().pretty()
[
  {
    _id: ObjectId('663cccede0b96ec226b29188'),
    username: 'Sizhe Wang',
    apiKey: 'efb29325c6b375b3a2a7d547f130d5f9566c8b83'
  }
]
auth>
```

Using the data from mongo to login:




localhost 显示
Login successful
确定
Login
Register
Username
Sizhe Wang
API Key
Login

Web pages:


Welcome to Our Amazing Project
Your journey into the world of mathematics and authentication starts here.
Login / Register
Secure Authentication
Experience our secure login and registration system.
Advanced Calculator
Perform calculations with ease using our advanced calculator.