BMS COLLEGE OF ENGINEERING

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

LAB CYCLE – AY2024-2025 [ODD]

Assignment Assessment -2

Post Date: 19th Nov 2024, 3 PM

Submit Date: 25th Nov 2024, 10 PM

COURSE: DevOps **SECTION: A, B, C & D**

COURSE CODE: 21IS7PEDVR **TOTAL CREDITS: 3 Marks**

Demonstrate a working solution on your laptop or on a lab system and share screenshots. Use any internet resources available (Google, GPT)

“TreasureBook”

Motivation

Imagine if **Facebook,** that manages complex web of friendships, likes and shares, wasn’t just for social connections but for an adventurous treasure hunt.

!! **Welcome** to **TreasureBook !!** where explorers connect treasures, hidden locations and mysterious trails on a dynamic, graph-based platform.

Congratulations! You’ve been hired by **TreasureBook**, a groundbreaking treasure hunt platform inspired by **Facebook**. TreasureBook connects treasures, maps and locations into a dynamic graph, enabling adventurers worldwide to collaborate and uncover hidden riches.

As a **DevOps Engineer**, **your mission, which you have no choice but to accept!** is to ensure that TreasureBook platform operates smoothly, scales dynamically and stays available—even during treasure hunt surges! With adventurers adding treasures and trails every second, your task is to deploy and manage TreasureBook's infrastructure using **Docker** and **Kubernetes**, all while implementing automation, scaling and monitoring strategies.

Mission

TreasureBook's graph-based system represents treasures, locations and their connections as nodes and edges. Your job is to:

1. Build and containerize the TreasureBook API, a, which manages this graph.
2. Deploy the API and its database (MongoDB) on a Kubernetes cluster.
3. Implement autoscaling for high traffic scenarios.
4. Monitor the system to ensure it performs well under load.
5. Simulate real-world traffic and analyze how the system scales.

TreasureBook and Facebook Analogy

TreasureBook uses a graph-based architecture, where nodes are treasures, maps, locations and edges are relationships like trails, hidden locations and map leads.

Reference: Facebook TOA Social Graph Architecture (Design): (Click Link) TAO: The power of the graph - Engineering at Meta

Analogy Table

Facebook (TAO)	TreasureBook	Example	Instructions
User	Treasure	Golden Crown	Create a POST /node endpoint with Type=Treasures to add treasures.
Page	Location	Cave of Wonders	Create a POST /node endpoint with Type=Location add locations.
Message	Map	Mystic Map	Create a POST /node endpoint with Type=Map to add maps.

Friendship	Trail	Trail connecting Forest of Secrets and Mystic Lake	Create a POST /edge endpoint with Type=Trail to add trails.
Likes	Hidden At	Golden Crown is hidden at Cave of Wonders	Create a POST /edge endpoint with Type=Hidden-At to map treasures to locations.
Comments	Leads To	Mystic Map leads to Cursed Diamond	Create a POST /edge endpoint with Type=Leads-to to link maps to treasures.

Deliverables and Deployment

- **Containerization**:
    - A Dockerfile for the API.
    - Instructions for building and running the container.
- **Write Kubernetes manifests for:**
    - **API Deployment with HPA and Service**.
        - Initial replicas: 3.
        - Autoscaling: Scale up to 10 pods when CPU usage exceeds 5%.
        - Resource requests: 100m CPU, 256Mi memory.
        - Resource limits: 200m CPU, 512Mi memory.
    - **MongoDB Deployment**: (for storing Treasure, Location, Map and so on)
        - Single replica for local setups.
    - **Services**: Use a NodePort or LoadBalancer to expose the API..
- **Performance Report**:
    - Traffic simulation results.
    - Observations on scaling and resource usage.