Indian Institute of Technology Jodhpur

Fundamentals of Distributed Systems

Assignment – 1

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Smart Grid Load Balancing System

Project Overview

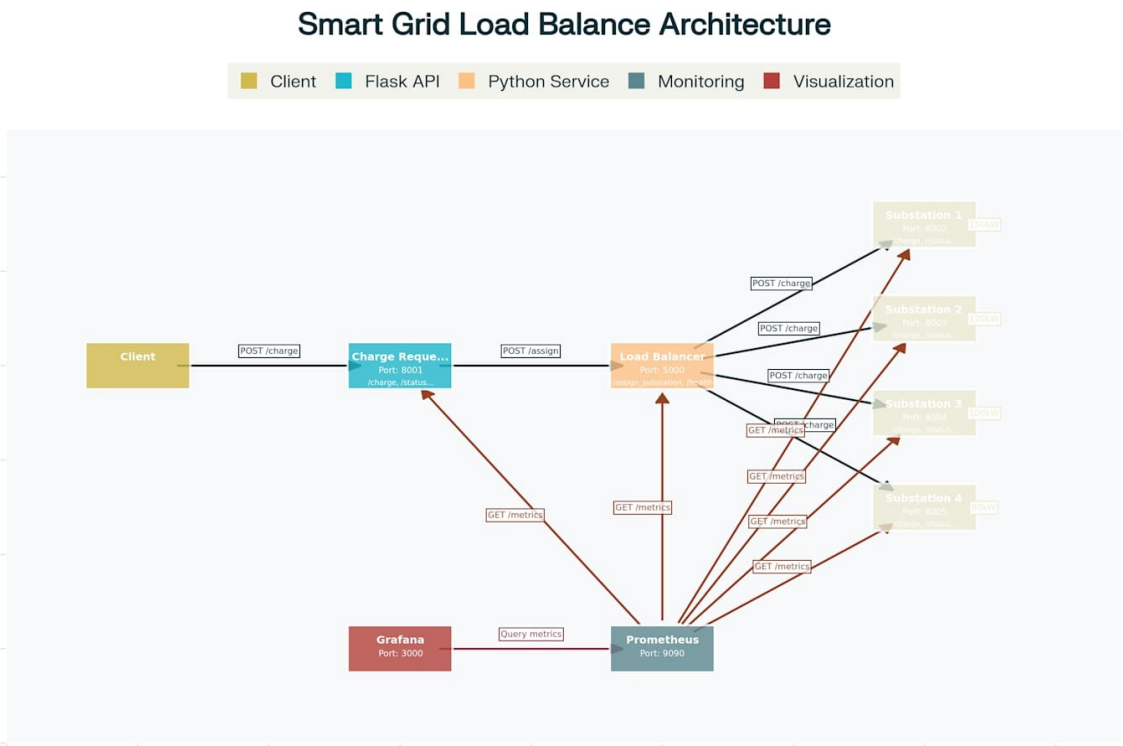
The Smart Grid Load Balancing system is a microservices-based application that dynamically distributes Electric Vehicle (EV) charging requests across multiple substations based on their real-time load. The system uses the least-loaded algorithm to ensure optimal resource utilization and prevent overloading.

Architecture

Core Components:

- Charge Request Service - Public API endpoint for EV charging requests
- Load Balancer - Core service that implements dynamic load balancing logic
- Substation Services - Multiple instances simulating charging substations
- Monitoring Stack - Prometheus and Grafana for metrics and visualization
- Load Tester - Tool to simulate rush hour traffic

Diagram:

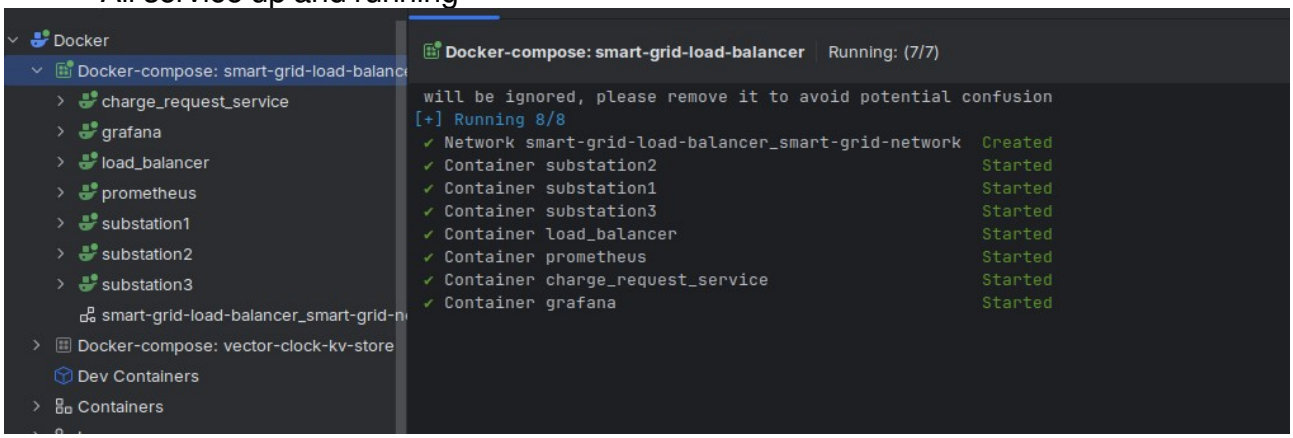


Demo

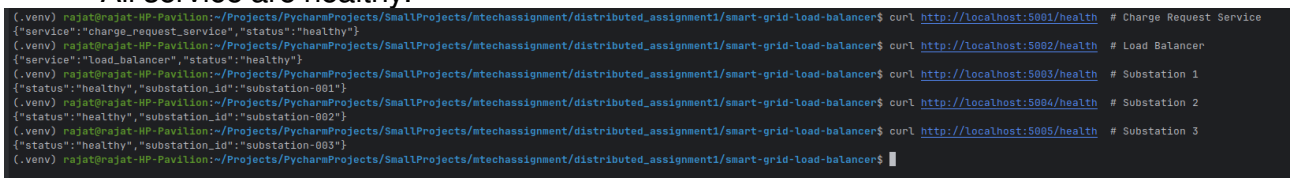
URL: https://drive.google.com/file/d/1GXEvhFVE7O44Kubcq7G-kyoe8ZeDDg1U/
Git URL: https://github.com/RajatPanda/smart-grid-load-balancer

Screenshots

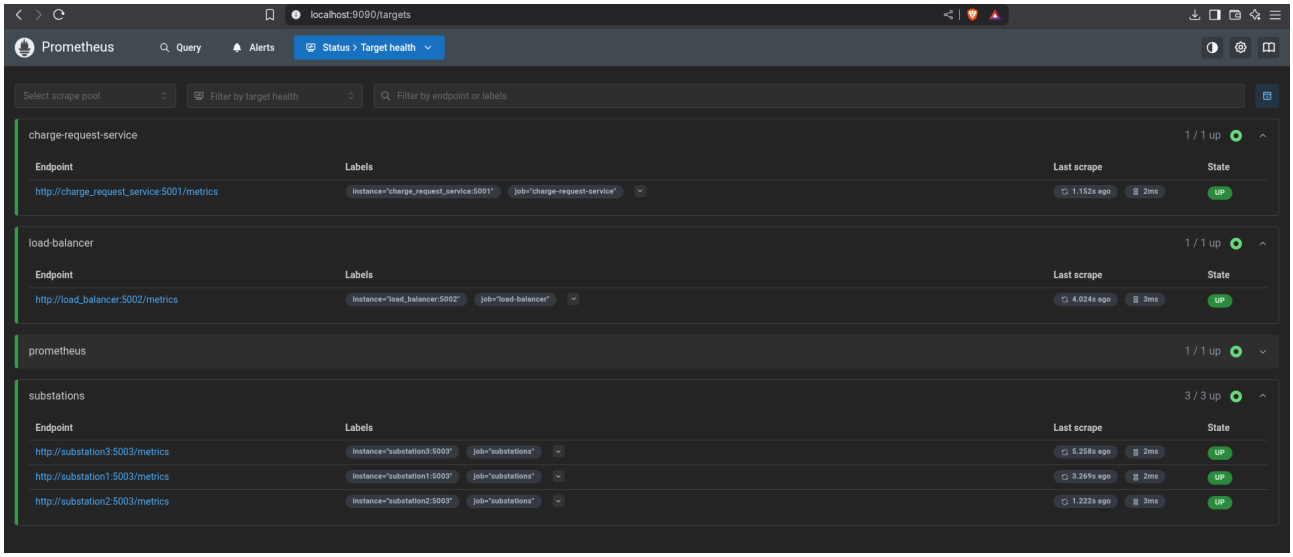
- All service up and running



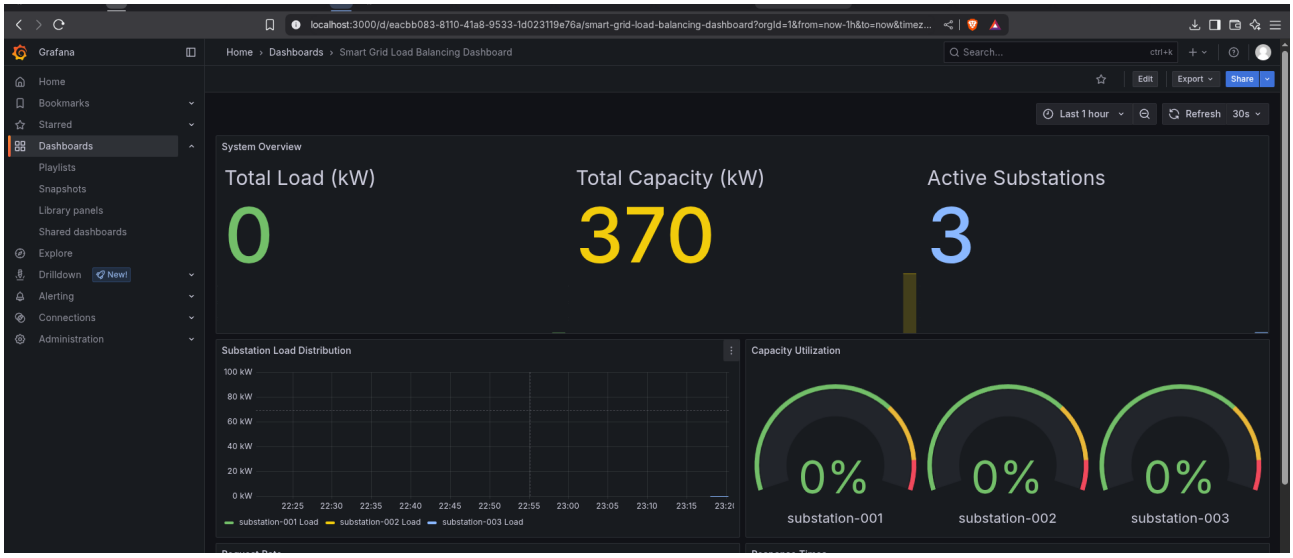
- All service are healthy:



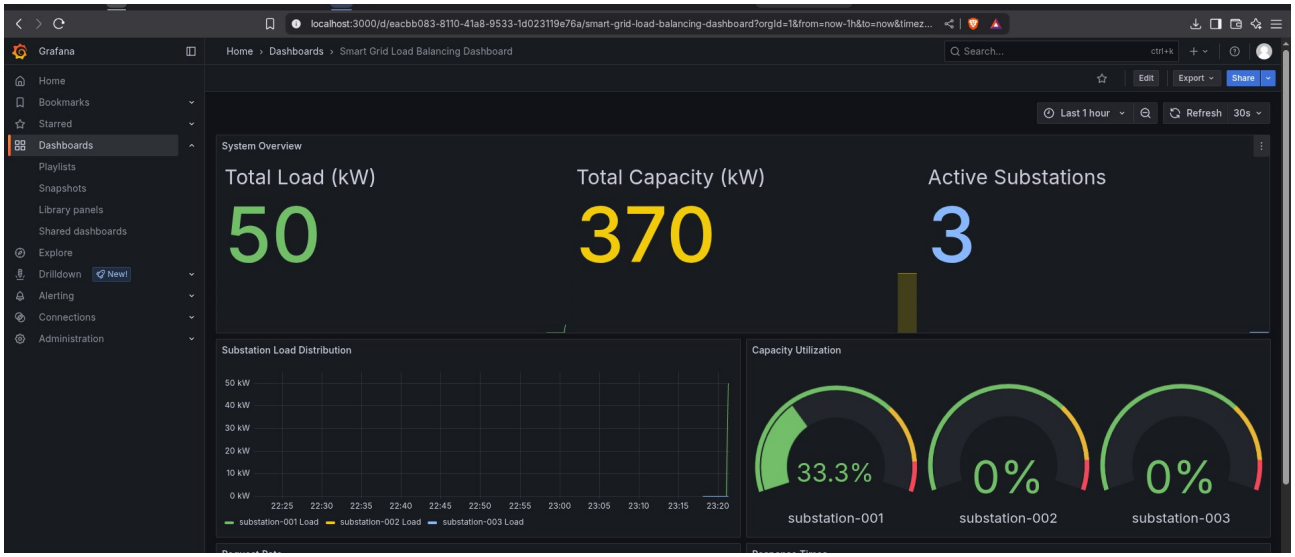
- Prometheus:



- Grafana



- 1st Charge request



- 4th charge request to go to least load