BCSE399J (Summer Industrial Internship)
Type of Intern: Industry

CLOUD BACKEND INTERNSHIP AT EMOTORAD

Internship Completed at:
EMotorad, Ground Floor, North Block, Smartworks, Vaishnavi Tech Park, Sy. No. 16/1 and 17/2, Bellandur Gate, Sarjapur Main Road, Ambalipura, Bengaluru, Karnataka, 560102
www.emotorad.com, rishika.sinha@emotorad.com
Duration: 131 days : 07-Aug-2023 to 15-Dec-2023

by

Abhinav Dinesh Srivatsa
21BDS0340

Completion Certificate

WWW.EMOTORAD.COM

EMOTORAD

Date: 23-02-2024

Name: Mr. Abhinav Srivatsa

To whomsoever it may concern

This is to certify that **Mr. Abhinav Srivatsa** has been associated with EMotorad as a **Cloud Backend Intern** for the period from **07-08-2023** to **15-12-2023**.

During his tenure he has carried out his duties responsibly.

We highly appreciate all the contributions he has made in favor of the organization, and we wish him good luck in his future endeavors.

Yours Sincerely,

For INKODOP TECHNOLOGIES PVT LTD.

SINCERELY
FOR EMOTORAD,

Kunal Gupta
CEO

CEO and Co-Founder

Introduction

About EMotorad

- EMotorad is a pioneering company in the electric mobility industry, specialising in electric bicycles (e-bikes) and other electric vehicles
- Affordable bicycles with a focus on “movements of fun”
- Known for its innovative approach to sustainable transportation and its commitment to reducing carbon emissions
- EMotorad's mission is to promote green transportation through electric vehicles

Introduction

About My Role at EMotorad

- Headed the design and implementation of backend architecture for real-time ingestion of electric bike data
- Hosted and maintained MQTT brokers
- Designed stateful Apache Flink applications to perform map, reduce and filter operations for realtime data aggregation and processing with Cassandra, Redis and Kafka as a sink
- Designed, programmed and maintained Go REST microservices to serve dashboards and the EMotorad companion app.
- Interviewed applications for full time employees and interns

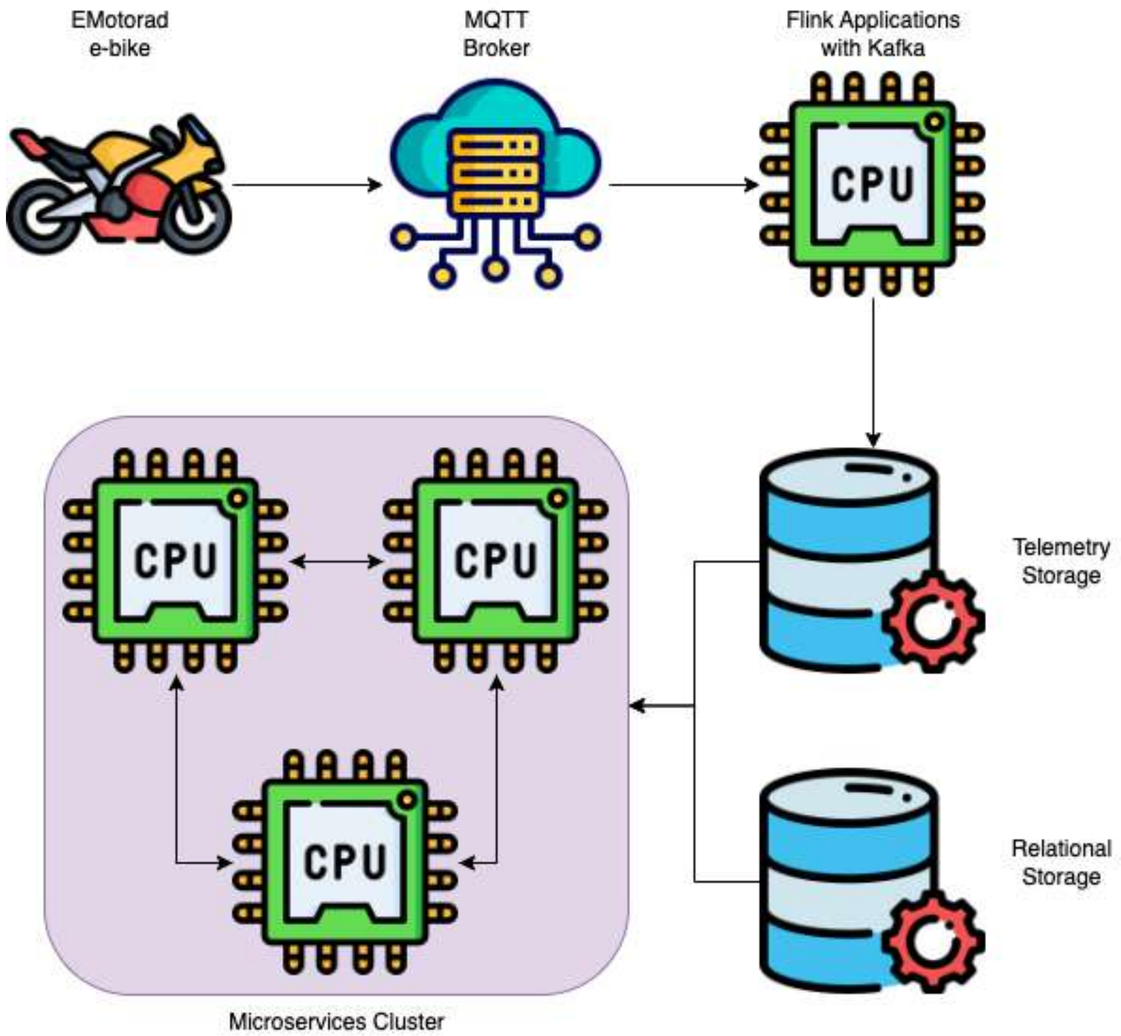
Aim, objective, and motivation

- **Aim:** To design and implement a scalable backend architecture that could efficiently process real-time data from electric bikes, enabling key functionalities for EMotorad's electric mobility ecosystem

- **Objective:** Develop robust data processing pipelines using Apache Flink, create Go-based REST microservices for dashboards and companion apps, and ensure seamless deployment using AWS and Kubernetes

- **Motivation:** Contribute to the advancement of electric mobility, gain hands-on experience with cutting-edge technologies, and make a meaningful impact through innovative backend solutions leveraging data from the electric bicycles

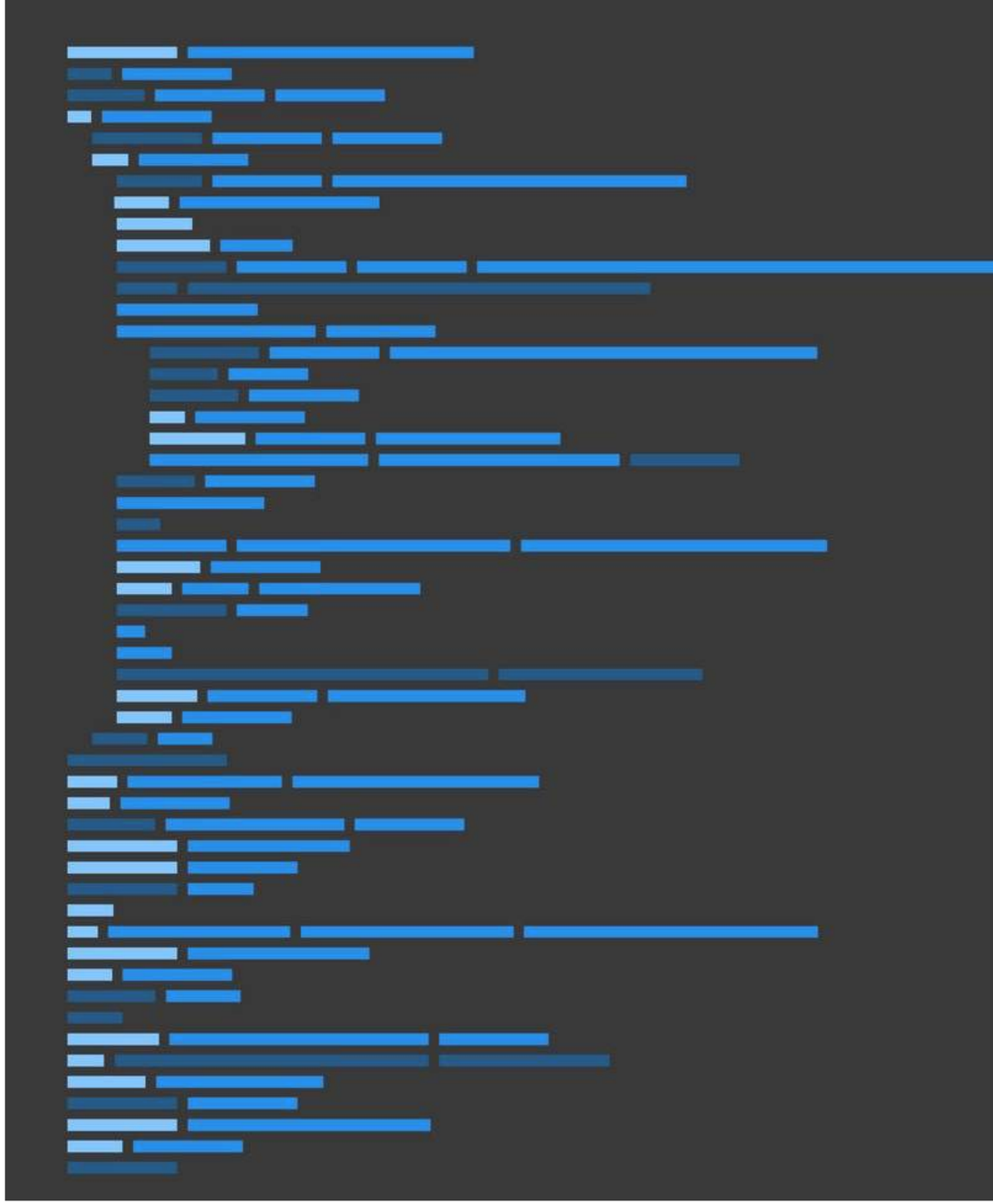
Simplified Architecture



Skills Acquired

Programming Languages

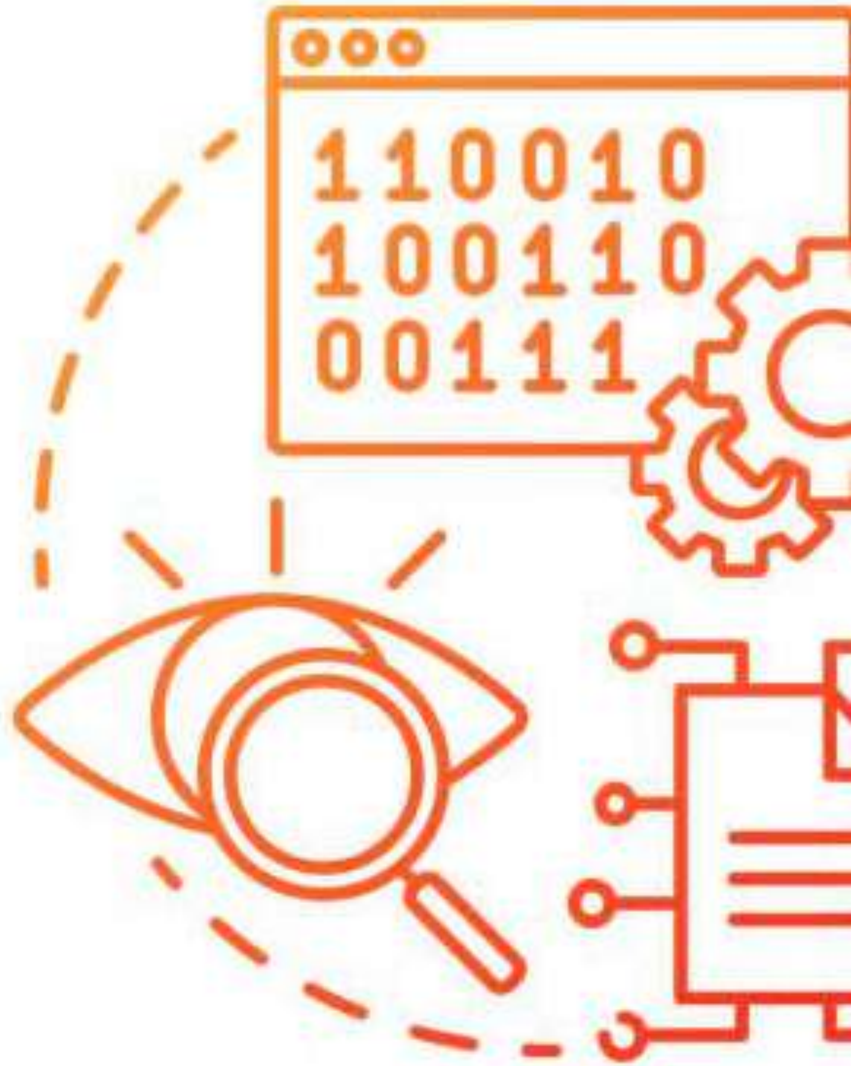
- Deepened my understanding of Java and JavaScript and learned a new language - Go
- Used Java to Flink jobs, JavaScript for Firebase Cloud Functions and Go for all deployed microservices
- Code examples: JavaScript, Java, Go



Skills Acquired

Containerisation and Orchestration

- Experienced with Docker for containerisation, including creating and managing containers for consistent development environments
- Skilled in deploying and orchestrating multi-container applications using Docker Compose and Kubernetes, with knowledge of core components, Helm charts, and AWS EKS



Skills Acquired

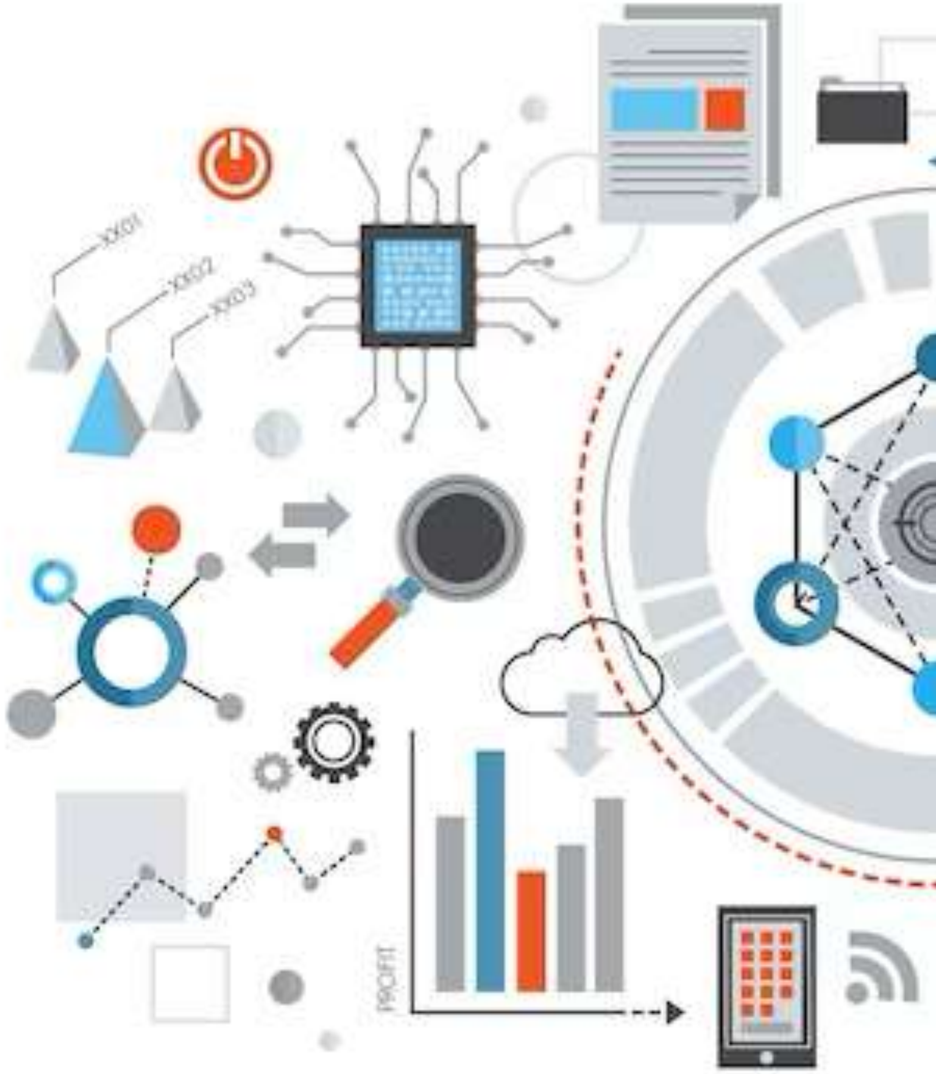
Cloud Services and Infrastructure

- Extensive experience with Amazon Web Services (AWS), including services like Amazon RDS, Elastic Load Balancers, ECR, EKS, MemoryDB for Redis, Keyspaces for Cassandra, S3, and Amazon MSK
- Competent in configuring and optimising cloud infrastructure, demonstrating the ability to deploy scalable applications in a cloud environment

Skills Acquired

Data Processing and Stream Handling

- Expertise in Apache Flink, using it for real-time data processing and stream applications, including MQTT bridging and Protobuf deserialisation
- Efficient storage and retrieval of data in AWS S3, with practical experience in orchestrating complex data workflows



Skills Acquired

Backend Development and Microservices

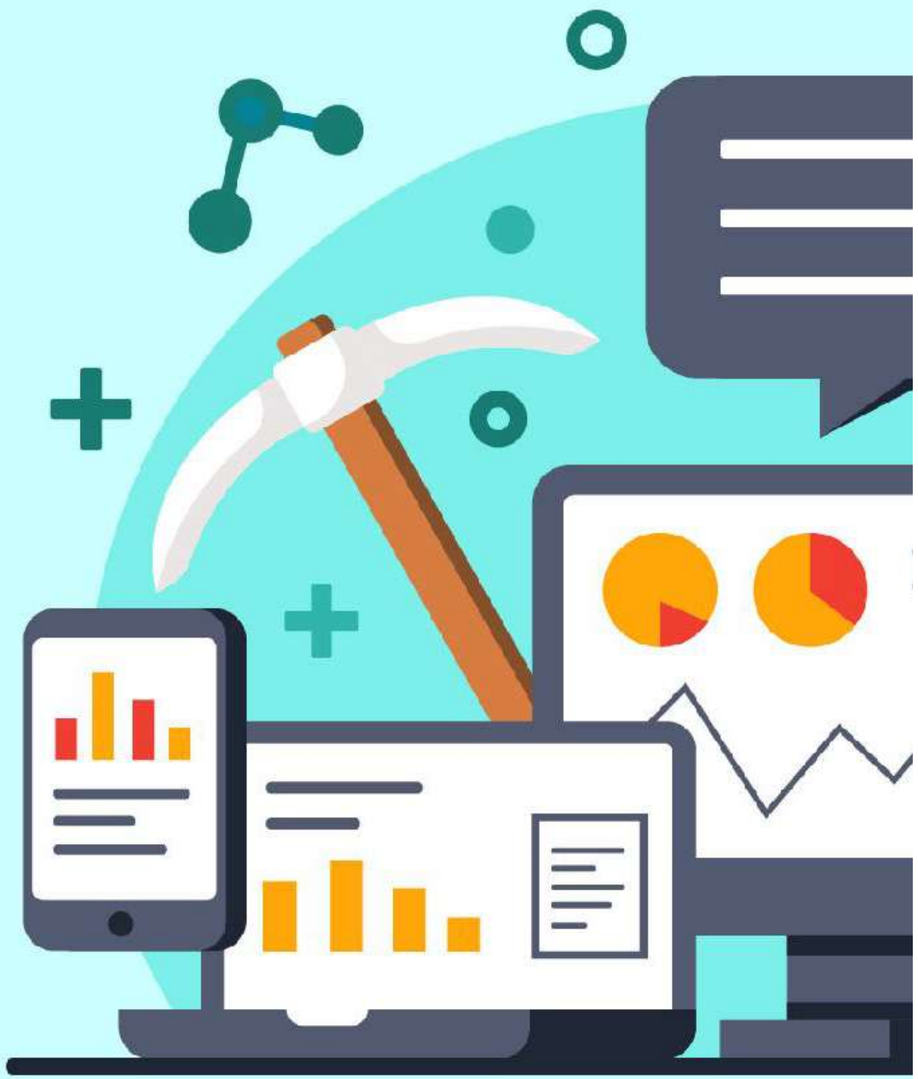
- Designed and implemented Go-based REST microservices to support EMotorad's Companion App, with a focus on secure authentication, real-time communication, and data retrieval

- Leveraged Redis and PostgreSQL for backend data management, enabling efficient and scalable microservices architecture

Knowledge Acquired

New Technologies and Frameworks

- **Go Programming Language**: Learned advanced features of Go, including its concurrency model with goroutines and channels, allowing efficient handling of real-time tasks
- **Apache Flink**: Gained hands-on experience with this stream processing framework, using it to process real-time data from electric bikes, and apply map, reduce, and filter operations
- **Docker and Kubernetes**: Explored containerization with Docker, creating consistent environments, and used Kubernetes for orchestrating multi-container applications, enhancing scalability and maintainability
- **Amazon Web Services (AWS)**: Developed skills in various AWS services, including S3, RDS, ECR, EKS, and MSK, gaining insights into cloud-based deployment and infrastructure management



Knowledge Acquired

Real-Time Problems Encountered

- **Data Ingestion Challenges**: Addressed issues with real-time data ingestion from electric bikes, ensuring reliability and consistency in MQTT-based communication
- **Concurrency Management**: Dealt with concurrency-related problems in backend microservices, resolving race conditions and ensuring efficient task execution
- **Stream Processing Optimisation**: Identified bottlenecks in stream processing and optimised Apache Flink applications to ensure smooth data flow and timely processing

Knowledge Acquired

Analysis-Based Knowledge

- **Data Analysis and Reporting**: Developed skills in analysing large datasets, extracting insights, and generating reports. Utilised Presto for querying and analysing data stored in AWS S3
- **Performance Monitoring and Optimisation**: Gained experience in monitoring backend services and optimising their performance, ensuring low latency and high availability
- **User Behaviour Insights**: Analysed real-time data to understand user behaviour and preferences, providing valuable insights for product improvement and personalised services

Conclusion

- My time at EMotorad provided valuable hands-on experience in backend development, data processing, and cloud-based technologies. I applied my academic knowledge to real-world projects
- I designed backend architecture for real-time data ingestion, implemented microservices, and worked with technologies like Apache Flink, Docker, and AWS, significantly improving EMotorad's infrastructure.
- I mastered new technologies and frameworks, solving problems related to data ingestion, concurrency, and scalability. This experience strengthened my backend and cloud expertise.
- The internship confirmed my interest in backend development and cloud technologies, providing a solid foundation for my career and giving me the skills to tackle complex technical challenges.