

21BDS0340 Abhinav Dinesh Srivatsa - CLOUD BACKEND INTERNSHIP AT EMOTORAD

8/7/2023	Monday	First day, I talked to the tech team in Bangalore to figure out the needs for a cloud backend and the goals they expect to fulfill with me.
8/8/2023	Tuesday	I got concrete goals after a discussion with the embedded team head and the project manager. The goals consist of three parts: a data stream to capture the electric bicycles data and store it, to serve the data to analytics users and to serve as an over the air software updater for the electric bikes
8/9/2023	Wednesday	I created a flow chart including the services as a mock for the team to view and give feedback on. The flow chart consisted of the three services discussed in the previous day.
8/10/2023	Thursday	I continued working on the flow chart to give my team a better understanding of what services I was going to implement. It consisted of web sockets to a kafka queue to storing the data into a MongoDB database.
8/11/2023	Friday	I completed the flow chart and sent it to the head of the tech team in Bangalore, in the meantime I researched about Docker and deployed a small prototype I had worked on in AWS Elastic Container Service.

8/12/2023 Saturday

8/13/2023 Sunday

8/14/2023 Monday I worked on deploying my services using AWS Elastic Kubernetes Service using images from the Elastic Container Registry. I learned how to assign load balancers, private networks and deploy my Nodejs services.

8/15/2023 Tuesday I completed the flow chart and sent it to the head of the tech team in Bangalore, I got feedback to add in more images instead of just listing services as rectangles and to compile the scattered diagrams into one.

8/16/2023 Wednesday I obtained a tutorial to create microservices in Go, Working with Microservices in Go (Golang) by Trevor Sawler. This taught me the basics for inter service communication, internet communication and deploying Go services with Docker and Kubernetes.

8/17/2023 Thursday I reached out to various MQTT (HiveMQ and EMQX) brokers to find a good fit for our needs, and arranged meetings for the coming week. I also researched how to deploy Kafka using AWS Managed Service for Apache Kafka and AWS Redshift for my data warehousing.

8/18/2023	Friday	I got in touch with a ScyllaDB expert to find out why I want to use their solution instead of MongoDB. I required high write speeds, and a Cassandra wrapper fit my needs. I also deployed an MQTT broker for me to test my Go service connections and simulate a bike passing data.
8/19/2023	Saturday	
8/20/2023	Sunday	
8/21/2023	Monday	I had the meeting with EMQX, they showed us their services and had a presentation prepared for connected IoT devices over the internet. We discussed pricing and resource scalability. The rest of the day was spent discussing whether they were a viable option for us to consider partnering with.
8/22/2023	Tuesday	I explored various cloud backend case studies from other companies and learned how I can build my own from scratch but better.
8/23/2023	Wednesday	I explored deploying Docker containers for Apache Kafka, EMQX MQTT brokers and my services to create a cluster I can scale and deploy to AWS. I also had a meeting with another MQTT broker cloud service - HiveMQ.

8/24/2023	Thursday	I deployed ScyllaDB containers to my cluster and spent the entire day fine tuning and debugging it to fit my needs.
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8/25/2023	Friday	I went to the second location - Vaishnavi Tech Park to take interviews on a panel of three. I participated in all interviews and headed the cloud and backend based questions and discussions. We shortlisted one Kotlin developer and one cloud infrastructure deployment engineer.
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8/26/2023	Saturday	
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8/27/2023	Sunday	
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8/28/2023	Monday	I researched about various data lakes like Snowflake, Firebolt.io and AWS Redshift further. I met a company that offered services to analytics services for motorbikes and speed monitoring. I then had a meeting to narrow down questions asked in our recruitment tests to make them more insightful as interviewers.
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8/29/2023	Tuesday	Created flow chart for the backend services including. Took interview for a potential member interested in cloud backend engineering. Had meeting with iotreeminds to potentially handle our front end development. Registered for meeting with firebolt.io data warehouse.
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8/30/2023	Wednesday	I had an interview with a potential cloud backend engineer. I also explored monitoring metrics and logging services like Prometheus and Grafana to integrate with my Kubernetes cluster in the deployment stage.
8/31/2023	Thursday	I worked on creating a prototype to capture the motor speed via a mobile app and send to the cloud to store and view as a graph. The pipeline works as expected. I then hosted one of the two services on AWS.
9/1/2023	Friday	I completed hosting the motor speed servers on AWS and they work as expected. I then had a discussion with a senior executive to plan the migration of a service to in house, I scetched out a software pipeline to serve and aggregate data at scale for us to implement.
9/2/2023	Saturday	
9/3/2023	Sunday	
9/4/2023	Monday	I made the software pipeline better, to store data in a more efficient and less memory intensive way. I scetched out the relational models (entity relationship diagrams) for all the objects involved in the system.

9/5/2023	Tuesday	I aggregated proper pricing for all the services I want to use in the software pipeline. I presented my document to my superior and received feedback to better the diagrams to explain the pipeline.
9/6/2023	Wednesday	I started working on my prototype of the document, which I had submitted this morning for a proper review. I created a pipeline to get data and am working on a service to push the data into a write heavy database.
9/7/2023	Thursday	I finished pushing the data into an AWS Keyspaces database, which is a Cassandra service. I created an API server to fetch and serve this data to users requesting it. I started working on warehousing my data in AWS Redshift.
9/8/2023	Friday	I continued working on the prototype. I created the service to push data into the data warehouse, and created a service to pull the data into excel and csv files
9/9/2023	Saturday	
9/10/2023	Sunday	

9/11/2023	Monday	We had our first meeting today to confirm the roadmap to create the official applicatio for our average user to use. I had to make notes for services to implement in the backend.
9/12/2023	Tuesday	I completed the full prototype, by adding in an authentication service and an OTA update service. All these prototypes were now available to make the official project.
9/13/2023	Wednesday	I was informed of scrapping the migration project due to reason that we were not in charge of, we had another meeting today covering the aspects to implement in the fifth and sixth releases
9/14/2023	Thursday	I worked on settting up my own MQTT broker on AWS EKS, I completed the full PoC on my local machine and am working on implementing the service with SSL/TLS over public servers. We completed the meetings until release 8 today
9/15/2023	Friday	I met with an experienced backend developer and got feedback for my data ingestion architecture. I started implementing Apache Flink jobs to ingest data from MQTT and push to Kafka
9/16/2023	Saturday	

9/17/2023 Sunday

9/18/2023 Monday

9/19/2023 Tuesday I worked on creating the services required for the front end to utilise to serve the app. At the moment, I completed the operator service. This service is meant to authorise the app to use the APIs I make.

9/20/2023 Wednesday I started working on the backend API and implemented GraphQL, a library to substitute REST API for better standards.

9/21/2023 Thursday I found this tool called SQLC and used it to generate all my models in Go for me. This tool enabled me to standardise my database models and generates functions for me to utilise.

9/22/2023 Friday I implemented tokens with PASETO. These tokens enable me to authorise and authenticate users based on tokens they provide me to verify their sessions.



9/23/2023 Saturday

9/24/2023 Sunday

9/25/2023 Monday I implemented the authentication server on the cloud, this server will handle all events and requests related to users, bikes and authentication.

9/26/2023 Tuesday I realised that GraphQL is not a viable option and migrated all my code to RESTful APIs. I had realised this massive speed difference when I ran cloud and local test to compare latencies, REST went to perform as fast as 9x in some tests.

9/27/2023 Wednesday I finished migrating the GraphQL requests all to REST API and deployed them for my front end team to utilise, I spent the rest of the day working on documentation for the front end to view.

9/28/2023 Thursday I had a discussion with my supervisor and realised that my architecture would not be good to scale, so I planned to refactor my services to have a broker that can speak to multiple services and act as a middle man between clients and the services.

9/29/2023	Friday	I finished implementing all the basic necessary APIs that the front end team required to perform authentication, token management and user bike detail updation. I plan to complete the real time server data next.
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9/30/2023	Saturday	
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10/1/2023	Sunday	
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10/2/2023	Monday	I added the real time server to fetch the latest data from each bike. The API is ready to use for the front end team. The server works with AWS Keyspaces, a serverless platform for Apache Cassandra
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10/3/2023	Tuesday	I created analytics server to push data into an analytics warehouse, Clickhouse in my case for data aggregation. I added the Clickhouse server to my Kubernetes cluster with a simple deployment.
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10/4/2023	Wednesday	I added the data aggregation statement to my analytics server to poll data per trip. The data schema has now been updated for bikes to send data when the trip has ended.
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10/5/2023	Thursday	My Clickhouse server wasn't easily scalable, so I implemented the servers with a Helm chart. I modified the values to accommodate my needs to store data.
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10/6/2023	Friday	I spent the full day compiling a detailed document of everything I had implemented in the backend. I then presented it to my supervisor.
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10/7/2023	Saturday	
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10/8/2023	Sunday	
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10/9/2023	Monday	I worked on creating maps from the input latitudes and longitudes I was getting as input from MQTT. This compilation to a JPEG image would happen after the ride ends. I have completed my PoC using the open source OpenStreetMap APIs.
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10/10/2023	Tuesday	I completed implementing my PoC to the production build. The map will be generated everytime a trip is marked as finished.
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10/11/2023	Wednesday	I added AWS S3 to store the map images. I also created APIs to access trips and telemetry. An API for viewing maps is also created.
10/12/2023	Thursday	I created a server to aggregate data to serve as benchmarks, like calories and distance driven. This aggregation happens every start of the week and calculates for all users.
10/13/2023	Friday	I took 3 interviews for MERN developers. I proceeded with one of the candidates to move forward on hiring.
10/14/2023	Saturday	
10/15/2023	Sunday	
10/16/2023	Monday	The aggregation task was scrapped for not being of much clarity. After a long discussion, we decided to move again to doing the cron job once every week and the recalculate old data at a later period.

10/17/2023	Tuesday	I worked on implementing the new aggregation tasks and deploying a newer cron job that stores data more accurately now.
10/18/2023	Wednesday	I created a service to serve the data I was aggregating with cron jobs for statistics to compare to the universe and for analytical purposes.
10/19/2023	Thursday	I interviewed another MERN stack developer who seemed to be a good fit and who was interested in backend development, we proceeded to move forward to hiring him as he could join immediately.
10/20/2023	Friday	We realised that we were storing too many map images on AWS S3, so we decided to store only the last map, and generate any old maps on the spot. This proved more difficult as generating a map on demand was slow and memory taxing.
10/21/2023	Saturday	
10/22/2023	Sunday	

10/23/2023	Monday	I joined a knowledge transfer program for the website and the services related to it, today we went over the basics of all the third party integrations and how the website is hosted on DigitalOcean.
10/24/2023	Tuesday	I implemented the on demand map generation, this map can now be requested by providing a trip identification number, which is generated separately. An API now exists to fetch an old map with OpenStreetMaps.
10/25/2023	Wednesday	I started working on a feature to see a users previous weekly, monthly and yearly data. This data uses the aggregation data, maps and live data.
10/26/2023	Thursday	I finished the API I started working on for serving time based data, the API is now ready to be used by the frontend. I also completed minor APIs for latest trip, and fetching all trips a user has been on.
10/27/2023	Friday	I had interviews the full day to recruit a potential software developer 1 role. I did not find anyone who seemed interested in working and learning the tech we used, or who had prior experience with a lot of the technology.
10/28/2023	Saturday	

10/29/2023 Sunday

10/30/2023 Monday The knowledge transfer sessions officially got over, I started pooling all the resources like third party integrations and code repositories in one place for easy access.

10/31/2023 Tuesday All the repositories were now consolidated, I gave access to people who are now going to be replacing the old web developer. This enables easy version control and handover for future users.

11/1/2023 Wednesday All the credentials, except one, were now pooled into one spreadsheet for my supervisor and everybody who needs to know about a specific credential can now access this sheet.

11/2/2023 Thursday I started working on a feature called engineering mode, this feature allows for users to interactively modify and set their preferences for bike speed, pedal assist, etc. I completed half the APIs.

11/3/2023 Friday I finished working on all the APIs for engineering modes, I went over the product requirements document a second time to verify my code was correct. I then proceeded to deploy this service on the Kubernetes cluster.

11/4/2023 Saturday

11/5/2023 Sunday

11/6/2023 Monday Today we shifted to a new office, we did Puja for the new opening and the rest of day was spent in looking through the new workspace and meeting the new interns that joined us then.

11/7/2023 Tuesday I officially started my knowledge transfer of all cloud and backend resources to the other cloud intern who had joined a while back. We started by going over the authentication process and how tokens are managed for single sign on.

11/8/2023 Wednesday Today's knowledge transfer session went over RabbitMQ, and how I am using asynchronous message queues to decouple direct dependencies between services. I then proceeded to show how to write the code for event emitters and consumers.

11/9/2023 Thursday I worked on putting together a simple server for the Flutter front end team to use for APIs. The service lists 20 map routes, and a user can like them, and this will be saved. I put together a simple RDS services along with running the service in ECS, this service is now deployed and working.



11/10/2023	Friday	I was sick today, I did not go to work.
11/11/2023	Saturday	
11/12/2023	Sunday	
11/13/2023	Monday	I started writing unit tests, as I realised my code was not going to be very understandable without them. I finished writing tests for 3 out of my 10 services. I also improved my Makefile to smooth out the deployment process.
11/14/2023	Tuesday	I wrote tests for another 4 of the 10. I completed the maps generation using the go-static-maps package. I started researching ways for Emotorad to host their own tile provider.
11/15/2023	Wednesday	I researched Docker containers like Overv OpenStreetMap tiles and a reverse geocoding container called Nominatim. I presented these services to higher ups to get ideas of whether we should implement them ourselves.

11/16/2023	Thursday	I took interviews today for multiple potential full time backend lead employees. One profile stood out, which I reported to the HR team and the hiring team.
11/17/2023	Friday	I again took interviews today, one profile stood out again, which was reported. I spent the second half of my day discussing release 2 features that needed to be implemented.
11/18/2023	Saturday	
11/19/2023	Sunday	
11/20/2023	Monday	The backend team wiped the old repository and created a new one due to Git keeping track of executables, making the .git files extremely large. We started a new repository.
11/21/2023	Tuesday	I worked on APIs for users to create goals. The features was for users to create health goals and track them, similar to other health apps.

11/22/2023	Wednesday	I worked on APIs for users to view their goals and modify their already created goals. The team discussed this feature further as a lot of loopholes like multiple goals and points being earned.
11/23/2023	Thursday	I worked on Firebase cloud functions to trigger sending personalised push notifications to users. I used technology like Firestore, Messaging and Functions to achieve this.
11/24/2023	Friday	I created a microservice to trigger Firebase push notifications, this service can take requests from other services to trigger notifications. I also worked on updating the Flink jobs to serialise JSON entries better in Kafka.
11/25/2023	Saturday	
11/26/2023	Sunday	
11/27/2023	Monday	I worked on generating maps from trip data that was entered in ClickHouse. I worked on creating generic derialisers for each protobuf packet received in Kafka in Flink.

11/28/2023	Tuesday	I worked on generating Go code by giving ClickHouse schemas, this would make any tasks that changed the ClickHouse tables much easier. The code would read an SQL file and generate native Go code. I automated this for future use.
11/29/2023	Wednesday	I worked on creating a service that would keep track of any notifications that needed to be sent to users on a monthly basis. I achieved deploying this using a cronjob in kubernetes. This service would talk to the notification handler microservice I created earlier.
11/30/2023	Thursday	I changed the storage class of my ClickHouse cluster on Kubernetes to use AWS EFS, an elastic file store, which scales as more data comes in. I also changed the monthly cronjob to add concurrency to improve run times.
12/1/2023	Friday	I worked on creating a robust MQTT client to test my Flink jobs and data depositing in ClickHouse. I tested sending all the different types of protobuf packets. I also enabled users to store profile pictures on AWS S3, and added this to the profile microservice.
12/2/2023	Saturday	
12/3/2023	Sunday	

12/4/2023	Monday	I debugged an error that we were facing for the profile service. This bug kept killing the microservice in Kubernetes, the error being an out of memory error. I increased the amount of RAM given to the service. I then realised that this was due to the profile picture being loaded into memory before being served.
12/5/2023	Tuesday	I was ill today and did not go to the office.
12/6/2023	Wednesday	I removed AWS EFS from the deployment due to massive charges. I switched back to using AWS EBS, the network storage with EC2. I configured the weekly cronjob to aggregate data better from ClickHouse and Postgres.
12/7/2023	Thursday	I changed some requirements that were misrepresented in the requirements documents. This comprised of seven changes spanning 5 microservices.
12/8/2023	Friday	I created a distributed logger microservice to handle all logs from all the Kubernetes pods. I wanted to consolidate all my logs in one place so I can read them easily and take better actions. I used Kafka for this and deployed it.
12/9/2023	Saturday	

12/10/2023 Sunday

12/11/2023 Monday I updated the microservices to know about the logger and set the services to check if the logger existed before pushing logs. I also changed the token middlewares in my microservices to not depend on a service, but rather be globally initialised.

12/12/2023 Tuesday I wrote a microservice to keep track of all map related components. This will be used for saved locations, saving home and work locations and marking saved routes. I developed APIs to create, get and update the location latitudes and longitudes.

12/13/2023 Wednesday I changed some requirements that were misrepresented in the requirements documents. This comprised of three changes spanning 2 microservices. I also worked on adding Nominatim to the deployment, which would help with the map components reverse geocoding.

12/14/2023 Thursday I spent my time today going through interview, where there were two promising candidates. The rest of the day was spent on changing the profile picture API handler to compress the image on receiving.

12/15/2023 Friday I had mistakenly committed the binaries of the cronjobs, which I cleaned up in the repository. I updated the logger service to have a better output with more details of a log with its pod.