COMP4651 Project Proposal

Scalable Serverless Backend for IoT Systems

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Background

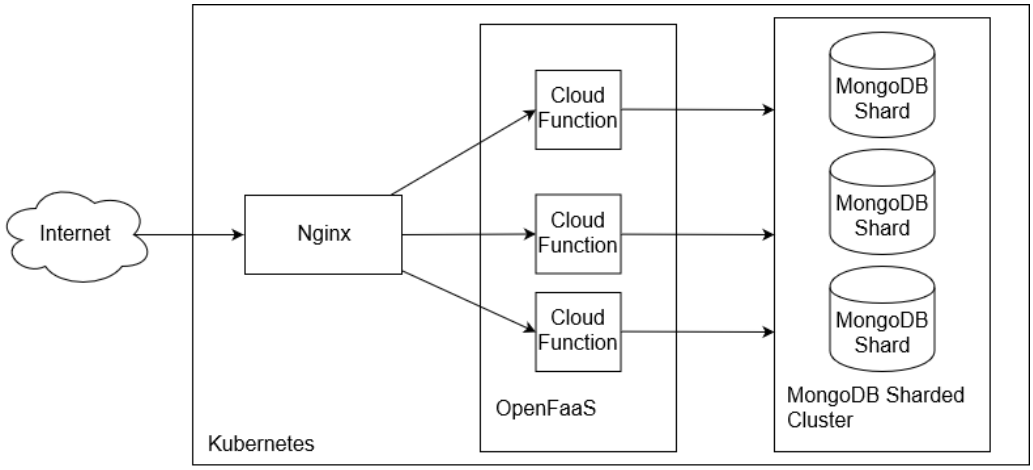
As both of our FYPs (Smart Home Security and Smart Car Park) make use of IoT devices, we would like to build a serverless backend to support them. In particular, APIs are to be provided for IoT devices to upload data and for client apps to retrieve those records. Moreover, database change hooks are to be implemented for automation scripting. Consider that both of our projects will support large amount of IoT devices or serve many users, while system availability is critical to the safety or operation of the home or car park, load-balancing and fault-tolerance must be achieved by high scalability with this backend.

To address these challenges, we propose a serverless backend based on open-source software and managed by kubernetes. This would allow cloud vendor independence while providing the scalability and flexibility required for our FYPs.

Implementation

We plan to use the following software / frameworks:

1. Amazon Elastic Kubernetes Service (EKS) for hosting
2. Kubernetes for container orchestration
3. Nginx-ingress for ingress control
4. OpenFaaS for cloud function
5. MongoDB for data storage



Plan

- By 16 Nov:
  - Set up project repo and kubernetes yaml
  - Implement cloud functions as API for IoT devices and client apps
  - Design MongoDB schema and implement request helpers
- By 30 Nov:
  - Set up scaling for OpenFaaS and MongoDB
  - Deploy kubernetes stack to AWS

Challenges

1. How to set up kubernetes with clustering
2. How to scale cloud function workers and MongoDB cluster
3. How to host the stack on Amazon EKS