



Containerize development and deployment | OBA Server

About Me:

Name: Akash Jaiswal
Github: [jaiakash \(Akash Jaiswal\) · GitHub](#)
Timezone: IST(GMT +5:30)
Project: Containerize development and deployment | Open Transit Software Foundation
Mentors: [Aaron Brethorst](#), Executive Director, OTSF (US/Pacific Time)
[Sean Crudden](#), Maintainer of TheTransitClock (GMT)
Project Size: 175 hours

Email: akashjaiswal3846@gmail.com
LinkedIn: <https://linkedin.com/in/akashjaiswal03>
Twitter: [Akash Jaiswal \(@a_kashhhhhh\) / X](#)
Discord: Akash Jaiswal#3828
Telegram: <https://t.me/johnAKJ>
University: National Institute of Technology, Tiruchirappalli, India
Location: Tiruchirappalli, Tamil Nadu, India
Resume: [Resume of Akash Jaiswal](#)

Abstract:

This proposal focuses on streamlining the development and deployment processes of the OneBusAway server. The core objective is to containerize the application using Docker, making development and deployment more efficient and flexible.

I will establish a robust **Docker image for the OneBusAway server**, enabling a smoother developer experience and simplifying server deployments for local testing and for production. This would make it easier for developers, testers and contributors like me to run the project and in turn, contribute to it. Additionally, the project will create clear guidelines for **deploying the containerized OneBusAway application to major cloud platforms** (e.g., AWS, GCP and Digital Ocean). This modernization effort will enhance the project's maintainability and promote wider adoption within the open-source transit community.

Goals:

1. Dockerization

- **Robust OneBusAway Image:** Build a well-structured Docker image encapsulating the OneBusAway server and its dependencies. Focus on image optimization, security, and clarity within the Dockerfile.
- **Development Workflow Integration:** Define how the Docker image seamlessly integrates with local development environments (e.g., mounting code volumes, environment variables, debugging support).
- **Image Testing:** Establish a suite of tests to validate the Docker image's functionality and ensure the correct behavior of the OneBusAway server within the containerized environment.

2. Cloud Deployment

- **Infrastructure as Code (IaC):** Utilize Terraform to codify the cloud infrastructure required to run the OneBusAway container(s). Target the providers specified (AWS, GCP, and Digital Ocean). Prioritize modularity and reusability in your Terraform configurations.
- **Orchestration Considerations:** If scaling requirements demand it, explore how a container orchestration tool like Kubernetes could be integrated into the deployment plan.
- **Deployment Pipelines (CI/CD):** Outline a strategy for automating the build, test, and deployment process using CI/CD tools. This fosters streamlined updates.

3. Comprehensive Documentation

- **Image Usage Guide:** Provide clear instructions on building the Docker image, running containers (locally and in the cloud), and interacting with the OneBusAway server within the container.
- **Cloud Deployment Walkthroughs:** Create step-by-step guides for deploying the OneBusAway container to each target cloud provider (AWS, GCP, Digital Ocean), covering network setup, security considerations, and any platform-specific nuances.

- **Best Practices:** Document recommended patterns for managing container updates, resource optimization, security configurations, and monitoring within the context of OneBusAway.

My background / Technical skills:

I am Akash Jaiswal, final-year student at NIT Trichy. I have done intern at **Oracle India as Application Developer** and was **GSoC 2022 contributor at CC Extractor**. I have done interns at various startups working as full stack developer and developer. I have experience in DevOps(Docker), AWS, Android Development (both native and flutter), Web Development (ReactJS, Flutter, NodesJS), C++, Java and Python. I am Technical Secretary at NIT Trichy, head the TeCOS, open source community of NIT Trichy, and core member of GDSC, NIT Trichy. I look to contribute to open source and in contact look out for challenging projects and startups to contribute.

Here are my socials -

Twitter - [Akash Jaiswal \(@a_kashhhhhh_\) / X](#)

Github - [jaiakash \(Akash Jaiswal\) · GitHub](#)

Linkedin - [Akash Jaiswal - National Institute of Technology, Tiruchirappalli | LinkedIn](#)

Bentoo - [Akash Jaiswal \(bento.me\)](#)

Here are some of my other contributions-

<https://github.com/jaiakash/amplification-service-1>

<https://github.com/jaiakash/alphaq-file-server>

[Delta Winter Of Code](#) website (a program similar to GSoC but by my college)

<https://github.com/appwrite/awesome-appwrite/pull/504>

https://github.com/fzyzcjy/flutter_rust_bridge/pull/1241

<https://github.com/crxjs/chrome-extension-tools/pull/675>

https://github.com/jaiakash/its_urgent/pull/8

<https://github.com/delta/nittfest-site/pull/1>

<https://github.com/osPrims/chatApp/pull/47>

CCExtractor Beacon - <https://github.com/CCExtractor/beacon/issues/160>

CCExtractor Beacon Backend - <https://github.com/CCExtractor/beacon-backend/issues/138>

KWOC 2021 - <https://kossiitkgp.org/public-files/KWoC/2021-Certificates/Student/jaiakash.pdf>

Hackerrank GHS - <https://github.com/interviewstreet/ghs/pull/5>

Ookla-Speedtest - <https://github.com/sinha-debojyoti/Ookla-Speedtest.net-Crawler/pull/104>

Codechef cards - https://github.com/jaiakash/Codechef_Cards

Timeline:

May 1 to May 26	Bonding period
May 27 to June 5	MILESTONE 1 - OneBusAway Server Local Setup and Containerization Planning
June 7 to June 27	MILESTONE 2 - Dockerise the module, setup DB and configure the network
June 28 to July 10	MILESTONE 3 - Adding docs for running the container
July 8 to July 12	Midterm Evaluation
July 13 to July 26	MILESTONE 4 - Infrastructure as Code (IaC) using Terraform on AWS and GCP
July 27 to August 5	MILESTONE 5 - [OPTIONAL] Kubernetes deployment
August 6 to August 18	MILESTONE 6 - Comprehensive Documentation and User Guides
August 19 to August 26	Final Evaluation

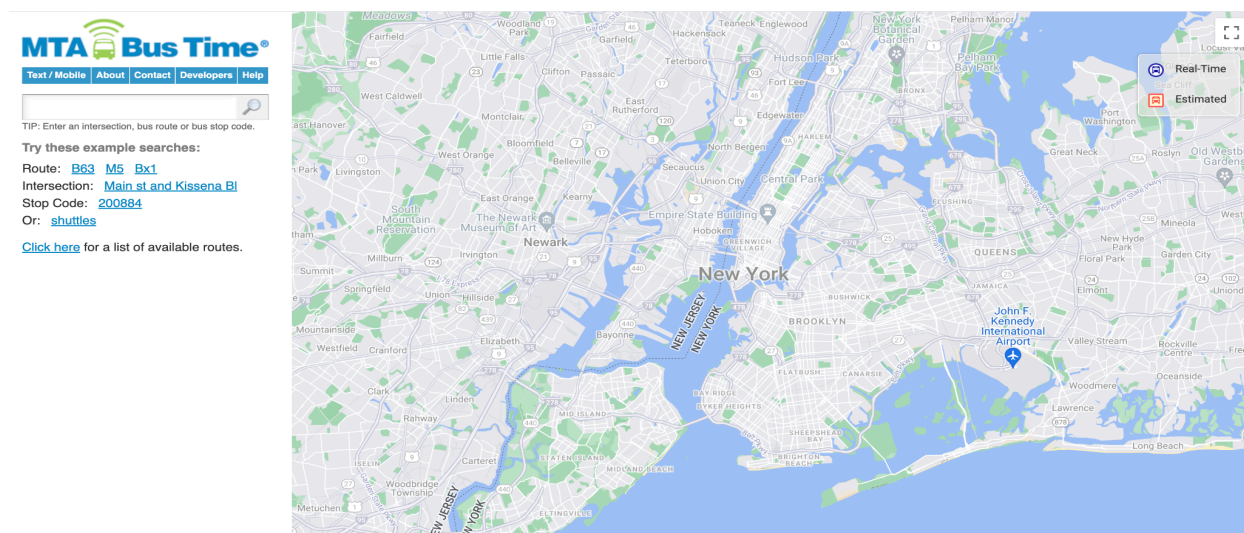
Implementation:

Implementation is divided into the following **Milestones** (all dates mentioned below are of 2024)

Bonding period (May 1 to May 26)
<ul style="list-style-type: none">Interact and engage with mentor/s (along with ice-breaker meet with mentors), and fellow selected contributors of OBA organisation for Google Summer of Code 2024.Although I have gone through the documentation once, re-review it to find any discrepancies as well as improvements in my proposed method of the dockerisation.Would go through the documentation of the project, learn about Terraform, Kubernetes, GCP, etc.Finalise deadlines and milestones with the mentor and modify if any need arises.Since OBA is a new org in GSoC, finalise the work, review, and documentation workflow in the organisation for new contributors.
MILESTONE 1 (May 27 to June 5) - OneBusAway Server Local Setup and Containerization Planning

- First things first, I'll set up my local dev environment with Java 11, MySQL 5.7, and Maven 3.5.4. I'll run the individual project, dive deep into the server architecture and figure out the key modules needed.
- Next up, I'll brainstorm the containerization of the server. I'll look at the current build process and sketch out a plan for the Dockerfiles for individual modules and docker-compose for the whole server.
- While taking care of env variables, runtime params, API keys and db creds. This i will make sure is hidden.
- Throughout the process, this is time I might require most feedback from my mentor. I'll share my findings, proposed containerization approach, and any architectural decisions I make. Their feedback will be valuable in refining the plan and ensuring it aligns with best practices.

MILESTONE 2 (June 7 to June 27) - Dockerise the module, setup DB and configure the network



- **Dockerize [onebusaway-admin-webapp](#) and [onebusaway-transit-data](#)**
 - Prerequisites: Java 11, MySQL 5.7
 - Set the base image to a suitable Java 11 image (e.g., openjdk:11)
 - Create a docker-compose.yml file to define the services and their dependencies
 - Configure the MySQL service in the docker-compose.yml file
 - Set up volume mounts for persistent data storage
 - Ensure onebusaway-admin-webapp's bundle services are accessible via /api/bundle/list
 - Verify onebusaway-transit-data-webapp can load the bundle and provide a data tier layer
- **Dockerize [onebusaway-api-webapp](#) and [onebusaway-enterprice-acta-webapp](#)**
 - Prerequisites: Java 11, Maven 3.5.4, MySQL 5.7
 - Set the base image to a suitable Java 11 and Maven image (e.g., maven:3.5.4-jdk-11)
 - Update the docker-compose.yml file to include the new services
 - Test the containerized modules:
 - Ensure onebusaway-enterprice-acta-webapp serves the branded UI for desktop and mobile web interfaces

- **Configure container DB and network and test the containerized system**

- Set up a Docker network to enable communication between the application containers and the database container
- Configure the Dockerfile to set up the onebusaway MySQL database and ensure it can be accessed by the application containers
- Perform end-to-end testing to ensure the system functions as expected
- Verify that the admin console can build and deploy bundles successfully
- Test the API endpoints to ensure they provide the expected responses
- Validate that the branded UI is accessible and functional

MILESTONE 3 (June 28 to July 10) - Adding docs for running the container

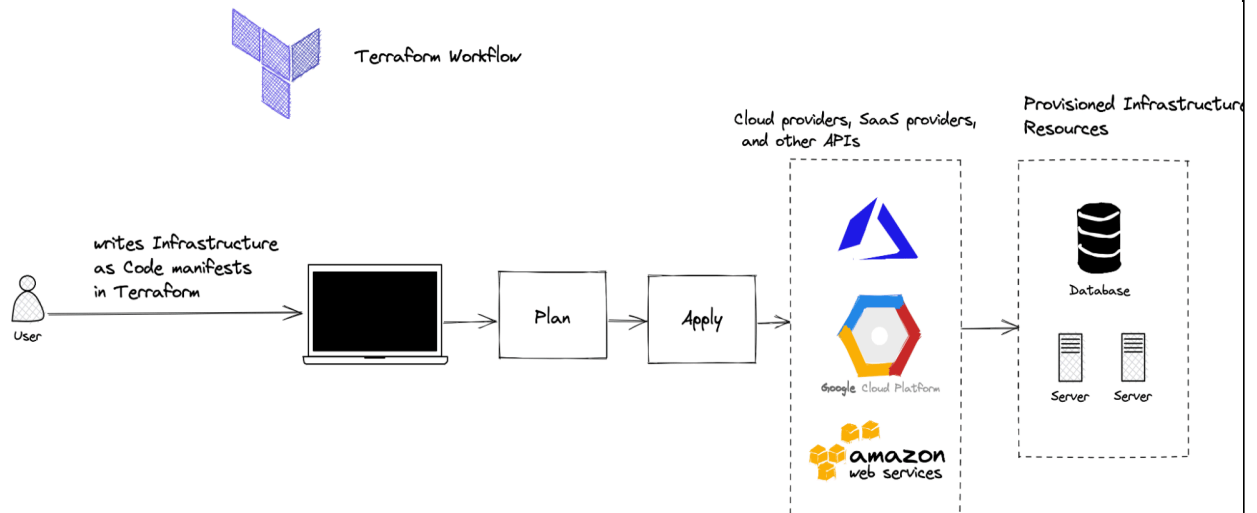
- Create detailed documentation on how to build and run the containerized OneBusAway system, including instructions on configuring the containers, setting up the database, and running the system
- Document the architecture and design decisions made during the containerization process.
- Provide guidelines for scaling and deploying the containerized system in production environments.
- Include screenshots, diagrams, and code snippets to enhance understanding.
- Share the initial draft of the documentation with the mentor for review.
- Iterate on the documentation based on the mentor's input to ensure it meets the project's standards.
- Include a roadmap or release notes section to communicate future enhancements and deprecations.

Midterm Evaluation (July 8 to July 12)

- Share the progress so far with the mentor, do any improvements or changes if required.
- Get feedback from mentor, regarding the scaling and quality of the project required at the organisation.
- Submit the midterm report at the GSoC website.

MILESTONE 4 (July 13 to July 26) - Infrastructure as Code (IaC) using Terraform on AWS and GCP

- Use **Terraform** to automate the deployment of the project.
- Define AWS resources in Terraform configuration files, use modules for reusability, and configure variables for customization
- Write Terraform code to provision AWS infrastructure, test and apply configuration, and verify successful deployment on AWS



[Source](#)

- Define GCP resources in Terraform configuration files, use modules for reusability, and configure variables for customization
- I found a excellent blog on same topic:
<https://www.pluralsight.com/resources/blog/cloud/how-to-use-github-actions-to-automate-terraform>
- Write Terraform code to provision GCP infrastructure, test and apply configuration, and verify successful deployment on GCP
- Since i dont know much about Render, if time permits i will try to automate the deployment on Render as well.

```

provider "aws" {
  region = "us-east-1"
}

# Create EC2 instance for the admin webapp
resource "aws_instance" "admin_webapp" {
  ami           = "ami-0d5eff06f840c45e0" # Amazon Linux 2 AMI
  instance_type = "t2.micro"
  key_name      = "your-key-pair-name"

  vpc_security_group_ids = [aws_security_group.admin_sg.id]

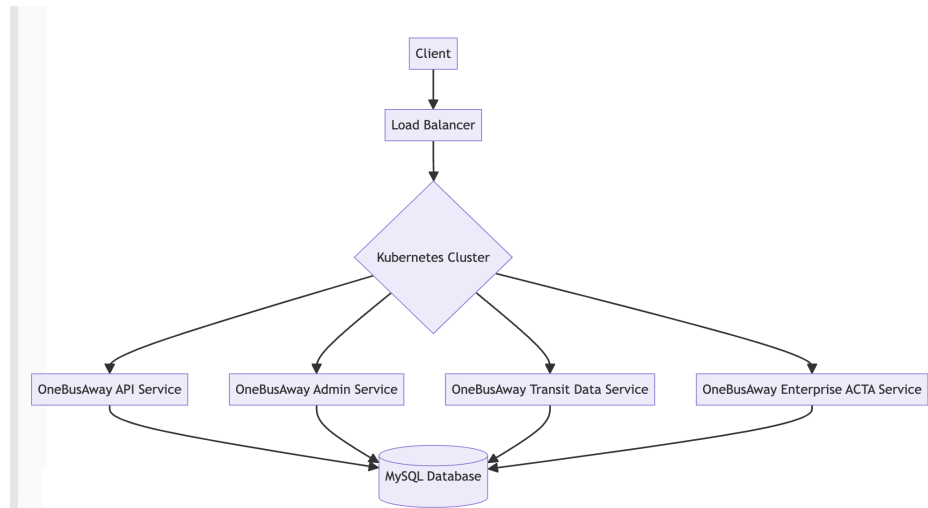
  user_data = <<EOF
    #!/bin/bash
    sudo yum update -y
    sudo yum install -y git maven java-11-openjdk-devel mysql
    mkdir ~/src
    cd ~/src
    git clone https://github.com/OneBusAway/onebusaway-application-modules.git
    cd onebusaway-application-modules
    mvn clean install
    mkdir ~/tomcat
    cd ~/tomcat
    wget https://www.apache.org/dist/tomcat/tomcat-8/v8.5.75/bin/apache-tomcat-8.5.75.zip
    unzip apache-tomcat-8.5.75.zip
    cd apache-tomcat-8.5.75/webapps
    cp ~/src/onebusaway-application-modules/onebusaway-admin-webapp/target/onebusaway-admin-webapp.war
ROOTT.war
    cd ../conf
    sed -i 's!port="8080"!port="9999"!g;s!port="8005"!port="8115"! server.xml
    sed -i 's!<Context>!<Parameter name="file.bundle.bucketName" value="/var/lib/oba/bundles/builder"
override="false" /><Parameter name="admin.instanceId" value="localhost" override="false" /><Parameter
name="admin.port" value="9999" override="false" /><Parameter name="admin.context" value="api" override="false" />
</Context>!' context.xml
    cd ../lib
    wget https://repo1.maven.org/maven2/javax/mail/mail/1.4/mail-1.4.jar
    mkdir /var/lib/oba
    cp /path/to/config.json /var/lib/oba/config.json
    cd ../bin
    chmod 755 catalina.sh
    ./catalina.sh run
  EOF

  tags = {
    Name = "OneBusAway Admin Webapp"
  }
}

```

MILESTONE 5 (July 27 to August 5) - [OPTIONAL] Kubernetes deployment

- Test the load of the deployed instance.
- If it requires scaling, i will explore container orchestration tool like Kubernetes and how it could be integrated into the deployment plan
- Deploy CI/CD pipeline for building, testing and deploying build on repo, we can use tools like Github Action (preferred), Jenkins, etc.



MILESTONE 6 (August 6 to August 18) - Comprehensive Documentation and User Guides

- Create a detailed, step-by-step guide for setting up and running the OneBusAway server in a local testing environment using the containerized setup including prerequisites, installation instructions, configuration steps, and troubleshooting tips.
- Develop comprehensive guides for deploying the OneBusAway server on AWS and GCP using Terraform.
- Include diagrams or architecture visuals to illustrate the deployment setup.
- Explain how developers can extend or customize the OneBusAway server to meet specific requirements.
- Document the process for updating and maintaining the containerized OneBusAway server.
- Include a roadmap or release notes section to communicate future enhancements and deprecations.
- Iterate and refine the documentation based on user feedback to ensure it meets the needs of the target audience.
- Collaborate with the mentor and project stakeholders to finalize the documentation.

Run the project by docker

Original location: <https://github.com/onebusaway/onebusaway-docker>

Last updated: April 2024

Welcome to OneBusAway!

OneBusAway Application modules are a suite of modules that assist in providing Customer Information Systems (CIS) features for fixed route Service. As an open-source project, it pairs nicely with [TheTransitClock](#) and [OpenTripPlanner](#) to bring transit features to your agency.

To make the deployment and usage of OneBusAway easier, we have containerized the application using Docker. Running OneBusAway via Docker simplifies the setup process and ensures a consistent environment across different systems. With Docker, you can quickly get OneBusAway up and running without worrying about dependencies and compatibility issues.

To run OneBusAway using Docker, follow these steps:

1. Install Docker on your system by following the official Docker documentation for your operating system.
2. Clone the OneBusAway repository from GitHub:

```
git clone https://github.com/OneBusAway/onebusaway-application-modules.git
```

3. Navigate to the cloned repository directory:

```
cd onebusaway-application-modules
```

4. Build the Docker image using the provided Dockerfile:

```
docker build -t onebusaway .
```

5. Once the image is built, you can run the OneBusAway container:

Final Evaluation (August 19 to August 26)

- Share the progress so far with the mentor, make any improvements or changes if required.
- Prepare WIP and future enhancement doc for future contributors.
- Submit the final report at the GSoC website.

Commitments:

During the initial coding period, which coincides with the final semester and graduation of my bachelor's degree, I will have ample free time to dedicate to the project. Starting from June 15th, 2024, I will be joining Oracle India as a full-time employee. However, based on my past experience, I am confident in my ability to effectively manage my full-time job alongside my open-source contributions.

Moreover, the initial month of my job will involve training in technologies such as Java, Spring Boot, React, MySQL, and Oracle DB. These skills are not only beneficial for my professional growth but also directly relevant to this project, enabling me to apply the knowledge gained from the training to enhance the project's implementation.

Apart from my job, I have no other significant commitments at the moment. I am committed to maintaining clear and consistent communication with my mentor throughout the project. To account for any potential setbacks or delays, I have incorporated buffer periods for each milestone. These buffer periods will allow me to address any backlog and ensure that the project stays on track.

Weekly Commitment: I will dedicate 20-25 hours per week to the project, ensuring consistent progress and timely completion of milestones.