

EECS6432: Containerized Orchestration of IoT Lighting Systems

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Abstract

We have implemented a dockerized, automatically load-balancing IoT system and associated web-infrastructure for a networked smart-lighting system. Our system can be applied to public spaces with shared resources, potentially containing individual actors with competing goals - all while working to balance a global setpoint that best satisfies the goals of all independent actors in the system.

Created with horizontal scalability in mind, our software architecture is well-suited towards rapid expansion of both users and resources. Our embedded IoT devices are connected to our GraphQL API through a Kafka pub-sub system, ensuring easy scalability. Our various interaction methods (voice, web app, EEG Reader) connect through our Pub-Sub architecture where appropriate, which connects them to our orchestrated containerized server architecture. Our PID based load-balancer ensures that there are enough server resources available and that the requests coming from each available endpoint are satisfied as much as possible in the face of possibly competing goals.

of 10-15%).

As IoT technology has only recently emerged as a powerful force in the technology space, there are many situations that are in a suboptimal state. We attempt to address one such situation through the application architecture presented here.

1. Introduction

Public spaces with adaptive smart technologies present interesting problems regarding the satisfiability of concurrent requests for shared resources. We explore this problem in the context of a smart lighting system in a space such as a university library or public co-working space. Prior to the introduction of smart technologies, users might be limited to working in a globally lit environment, or a locally lit environment that did not effectively consider the preferences of those around them, or of the energy usage policy of the building or organization.

Our system enables authenticated and authorized users to make luminance-level requests about the local lighting level. Our system balances this request with the requests of spatially co-located individuals who have made prior requests. These requests can either be trivially compatible with each other (e.g co-located users making similar requests) or be incompatible (brightness preferences outside