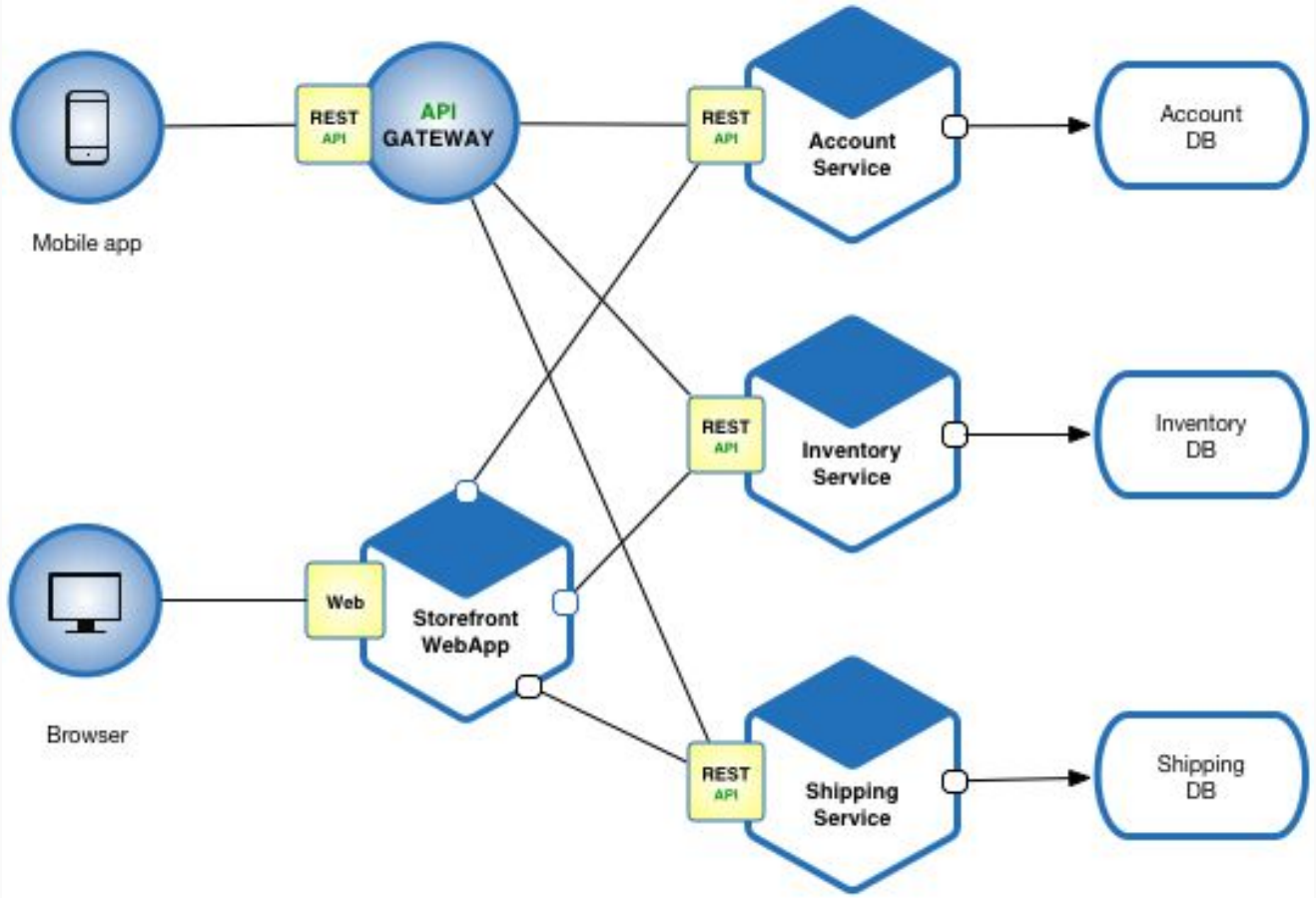
hammer.io

A tool for developing, maintaining, and monitoring Node.js microservices.

Tyr In Production:
https://www.npmjs.com/package/tyr-cli
Yggdrasil In Production:
http://hammer-io-test.ece.iastate.edu
Source Code:
https://github.com/hammer-io
Website
https://hammer-io.github.io

Erica Clark, Nathan De Graaf, Nathan Karasch, Jack Meyer, Nischay Venkatram Lotfi ben-Othmane

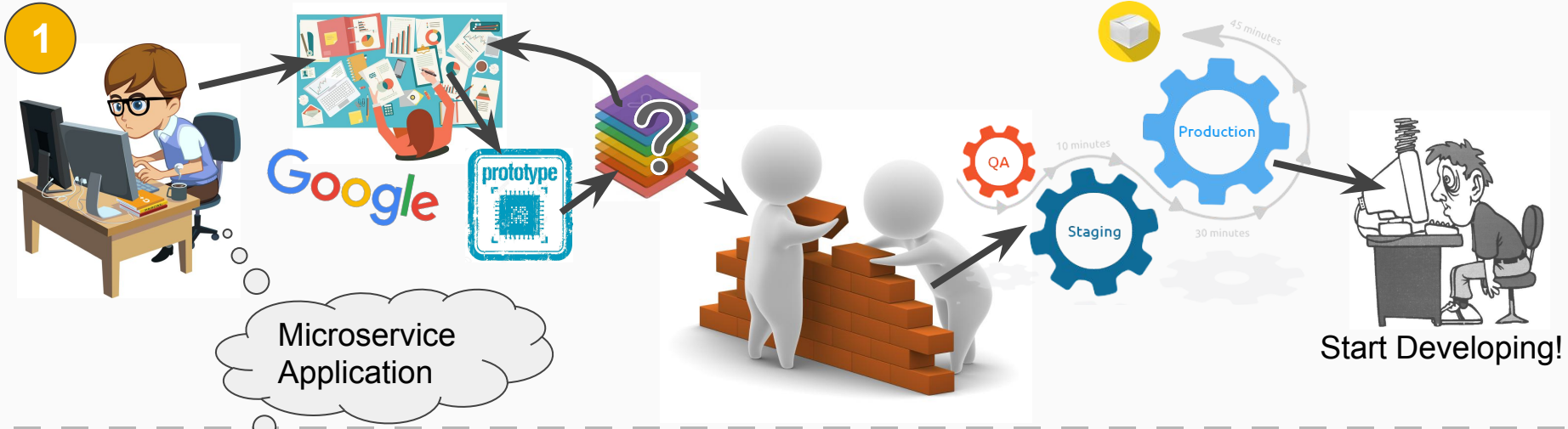
What are microservices?



What’s the problem?

- In order to deploy a set of microservices to the cloud reliably, a developer must go through a significant amount of work to establish the infrastructure and build an automated deployment process.
- Students or small startups with limited knowledge, resources, or time are faced with a significant barrier when beginning a microservices project.

The Tale of Two Coders



The Solution

1

Tyr

An automated DevOps process for Node.js applications

\+

2

Yggdrasil

An interface to monitor the health and status of deployed Tyr applications

\+

Skadi
A Node.js library which will sit in a user's project to collect statistics

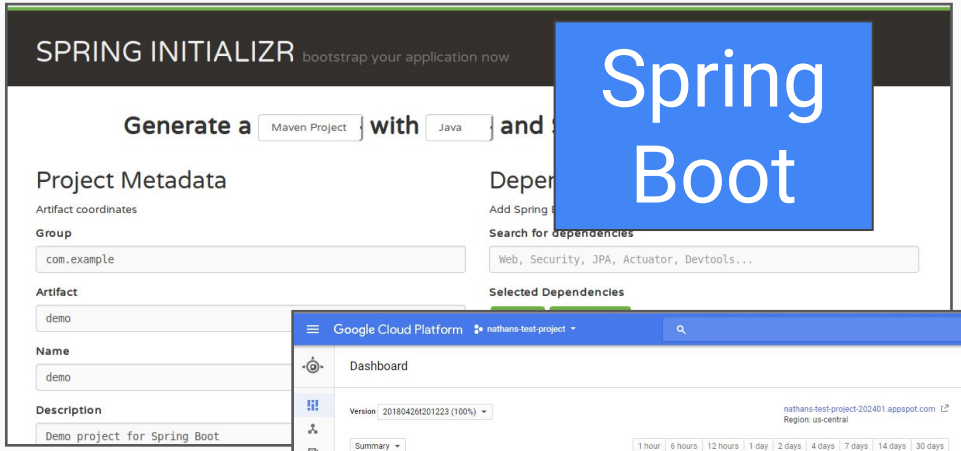
Koma
A microservice to accept statistics from skadi and send them to Firebase

Endor
The server of Yggdrasil and the brains of the operation

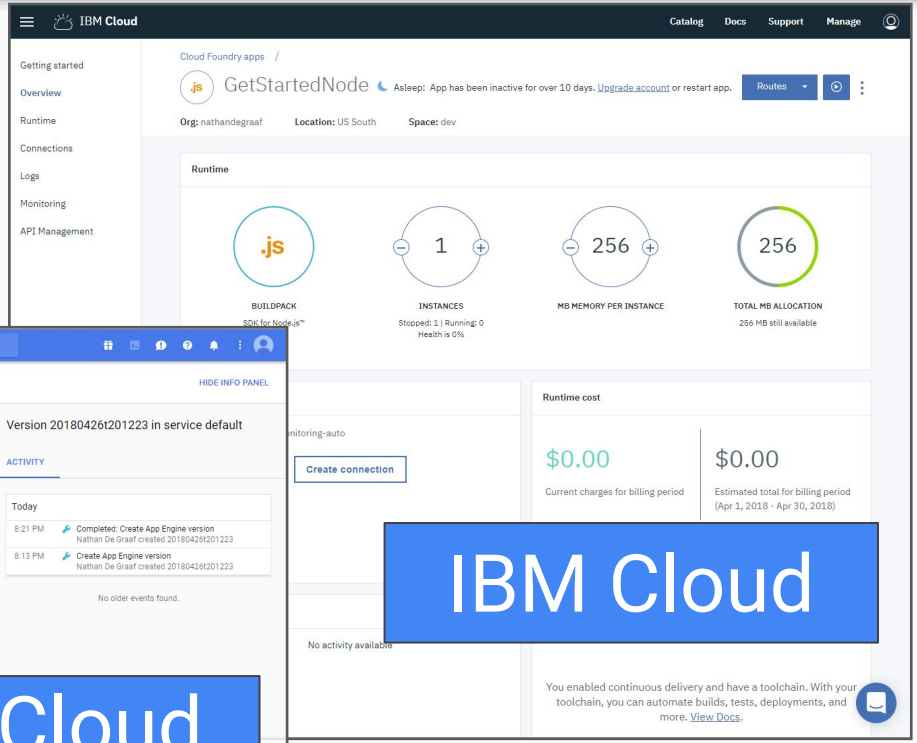
Definitions

- DevOps - the unification between software development and software operations. This typically involves improving and monitoring different aspects of creating software including: coding, testing, and deploying.
- Continuous Integration - The practice of continually ‘shipping’ code that has just been written by immediately testing and deploying it.
- TravisCI - A continuous integration tool hooked up to GitHub.
- Heroku - A cloud platform to deploy apps. It has a free tier so it is perfect for students.

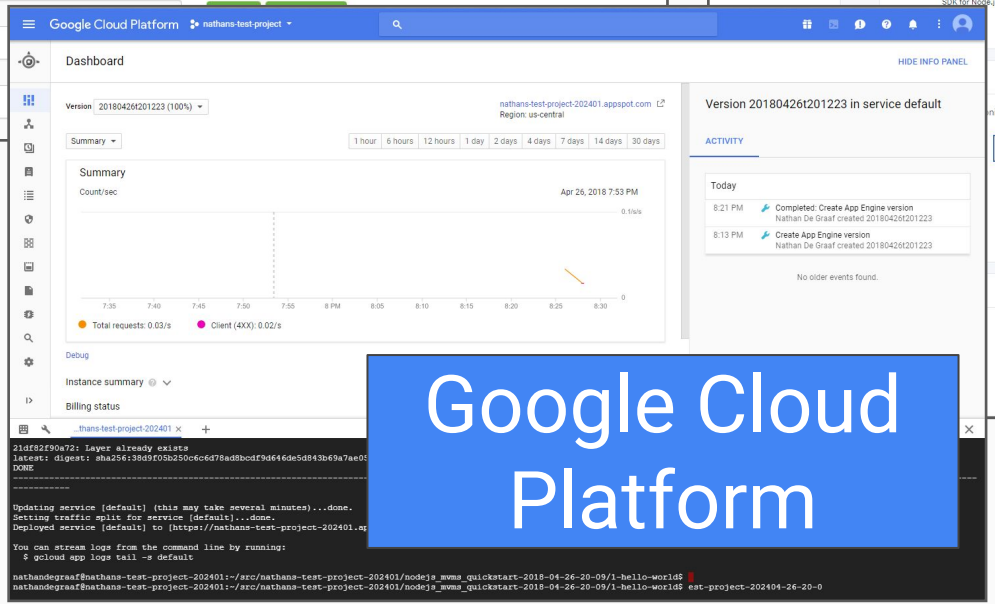
What else is out there?



Spring Boot



IBM Cloud



Google Cloud Platform

Functional Requirements / Deliverables

Tyr: Automated DevOps

- Create a new Node.js application
- Build configuration files for services such as source control, continuous integration, deployment, etc.
- Generate and provide project files
- Automate delivery of code from source control all the way to cloud hosting provider

Yggdrasil: Monitoring Platform

- Use Tyr to provide functionality to create new projects
- Integrate with third party services
- Create and manage users and teams
- Manage project issues, builds, and deployment
- View project statistics, reports, and analytics

Non-Functional Requirements

- Usability
  - A clean, consistent look and feel throughout the product, which is usable by those with limited understanding of DevOps and services being utilized
- Supportability
  - The system will support Node.Js version 8.x> on Unix-based systems
- Modifiability
  - Ability to quickly add new features and tool support
- Security
  - Secure handling of user information

Development Process

- Agile
- Feature Branch → Pull Request → Code Review Workflow
- Code Coverage and Linting
- Continuous Integration
- “Never break the build”

Technical Stack

Backend

NodeJS, MySQL, Sequelize

Frontend

React, Redux, Webpack, Babel

Testing

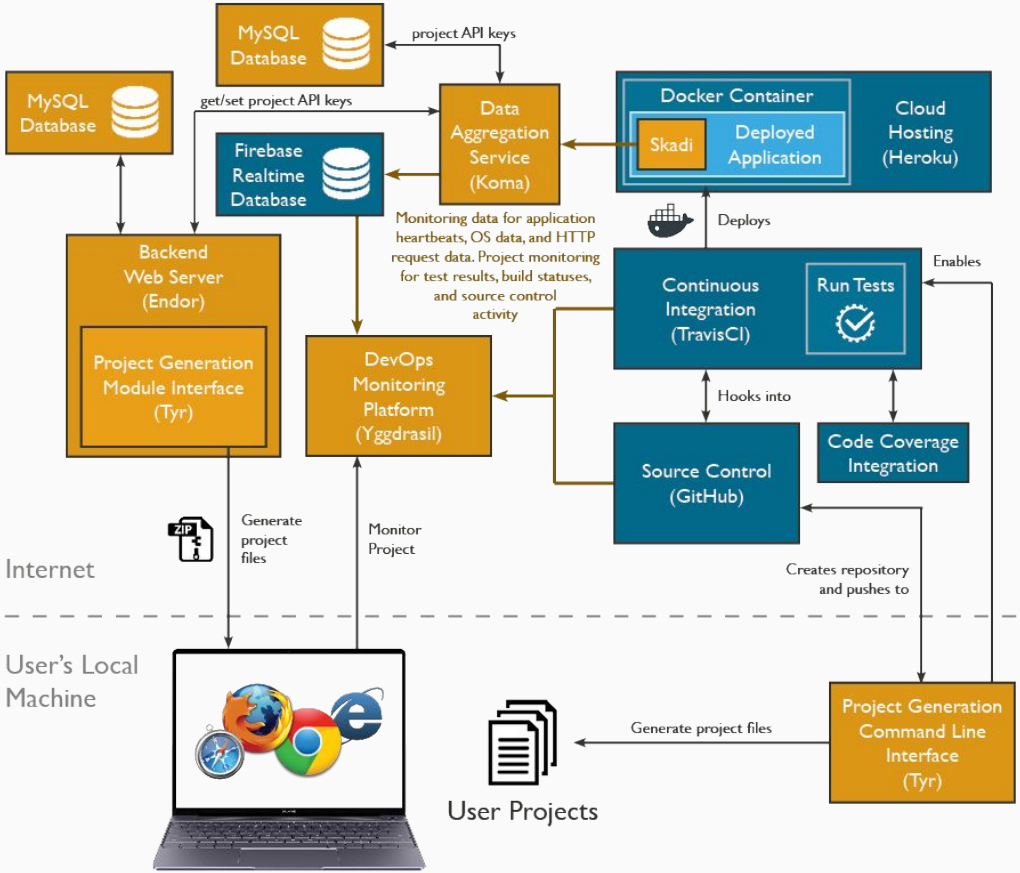
Mocha, Chai

Tools

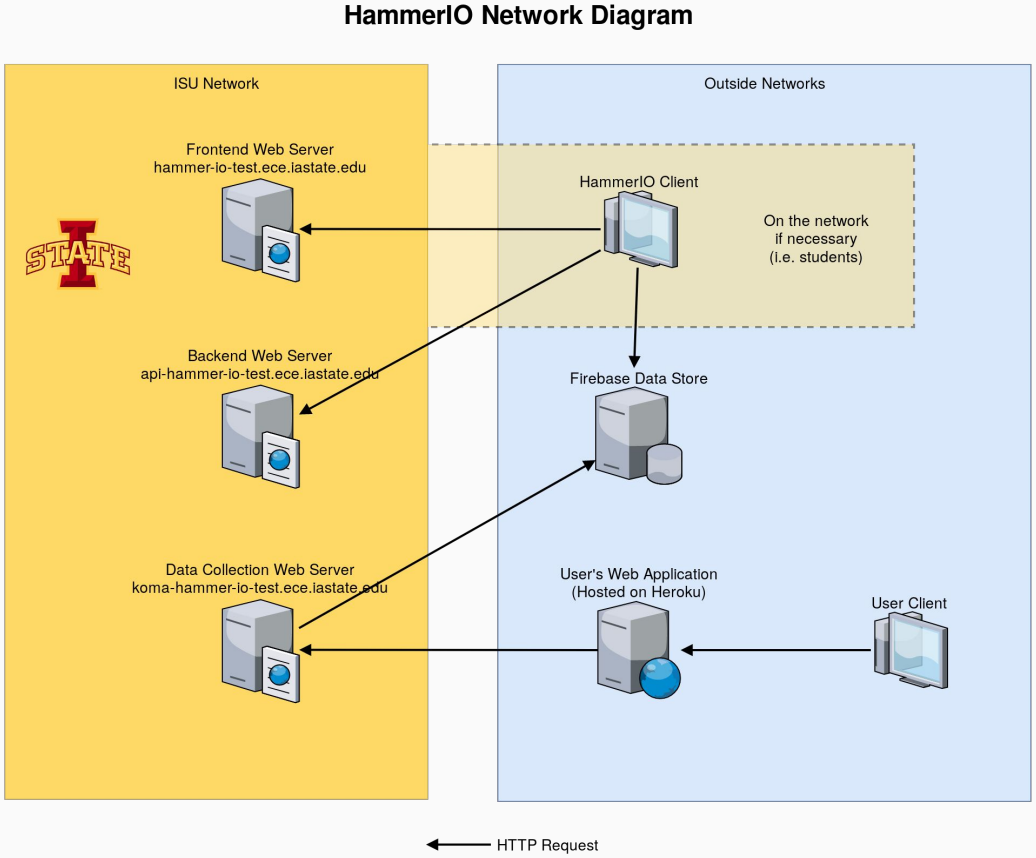
Github, Travis, Docker, ESlint

System Design

System Block Diagram



Network Diagram



Skadi

What is it?

- An npm library which collects information from a user's application such as Operating System Data, HTTP Request/Response Data, and sends Heartbeats

How did we build it?

- Uses Node.js OS package and sends information on a timer
- HTTP Request/Response Data collected in an express middleware
- Heartbeats is sent on a timer
- Requires API key to Koma to authenticate the project

Why did we build it?

- To collect the information needed to build out the monitoring framework

Koma

What is it?

- A microservice to aggregate data from Skadi and store it in realtime

How did we build it?

- It is a Node.js server, built with Express to create a Web API
- Stores project credentials (API Key and Project ID) in a MySQL database
- Stores data from Skadi in a Firebase database to be consumed later

Why did we build it?

- To aggregate and store data from Skadi
- Be able to scale the system separate from Endor
- Be able to collect data, even if Endor goes down

Tyr

What is it?

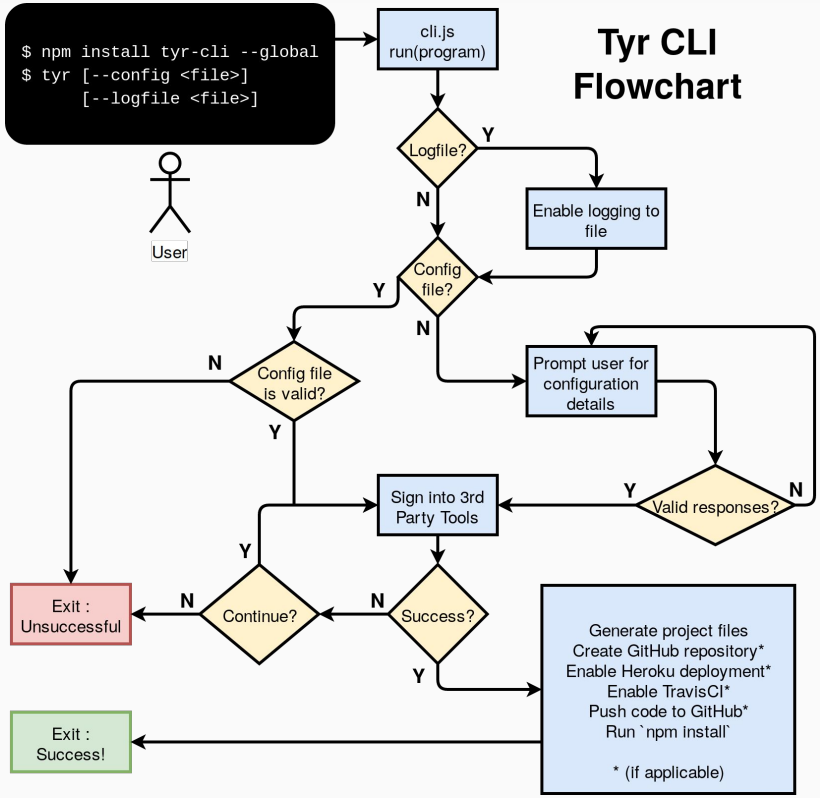
- A library and CLI that sets up a deployment pipeline and Node.js project template

How did we build it?

- Used independent components to separate functionality and make it simple to add additional tool support

Why did we build it?

- To allow the project generator functionality to be used as a CLI or a library



Endor

What is it?

- Backend of Yggdrasil who coordinates project creation using Tyr and setting up the projects in Koma

How did we build it?

- Node.js using the Express framework
- Used an MVC pattern to organize the server

Why did we build it?

- To store project information
- To coordinate between Tyr, Koma, and Yggdrasil

Yggdrasil

What is it?

- Web application with -
  - project creation and management
  - Monitoring
  - user account management

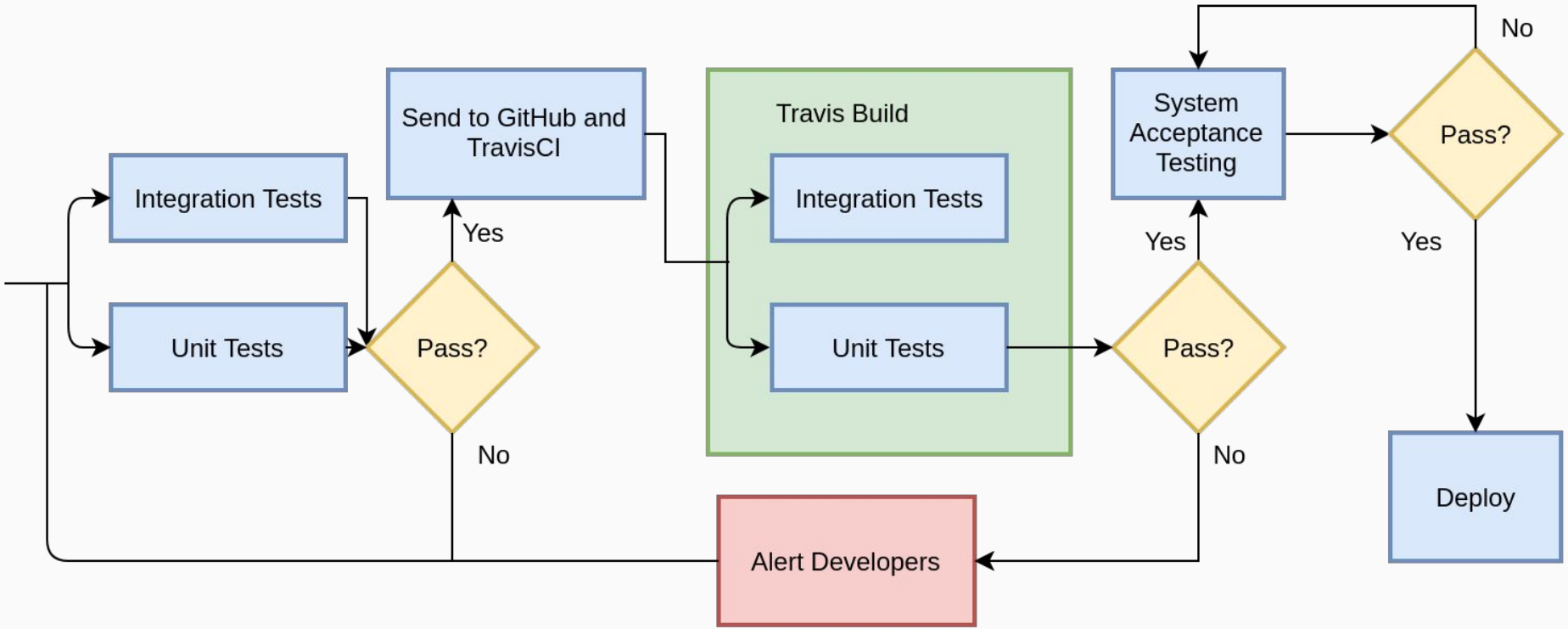
How did we build it?

- React for rendering UI
- Redux for managing state(data) of the frontend app
- Endor REST API
- Connects to third party apps for OAuth2
- Firebase SDK
- Deployed using Docker

How are we testing it?

- Unit Testing with Mocha
- Integration testing with Mocha and Chai
- Run tests in deployment pipeline
- Manual Testing for System and Acceptance Testing

Test Plan

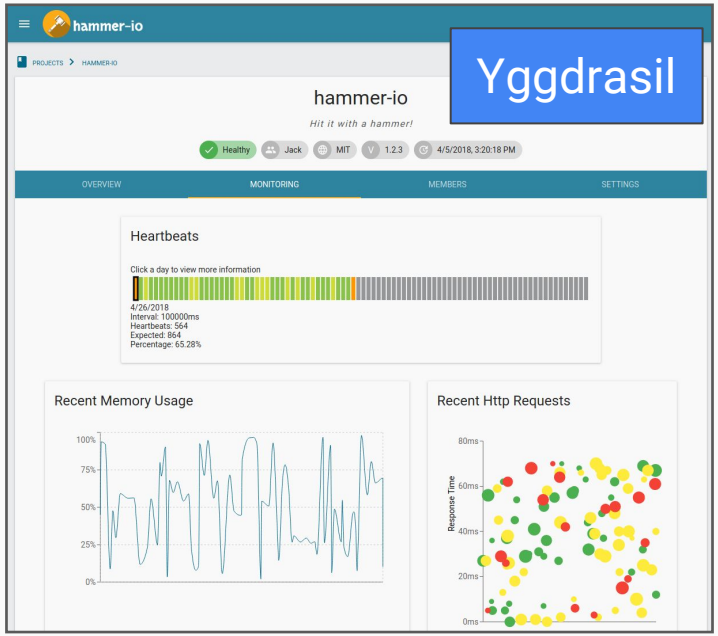

Integration Tests
Unit Tests
Pass?
Yes
No
Send to GitHub and TravisCI
Travis Build
Integration Tests
Unit Tests
Pass?
Yes
No
System Acceptance Testing
Pass?
No
Yes
Deploy
Alert Developers

Closing Material

Challenges

- Novelty
  - Lots of competition in the market
- Third-party services
  - Dealing with external APIs
- Code quality
  - Project needs to be picked up by another team

State of the Project



- Tyr-CLI and Skadi published to NPM
- Endor, Koma, and Yggdrasil deployed to Iowa State's servers and available for use
- Overall has functionality to:
  - Generate a project
  - Set up a deployment pipeline
  - Provide monitoring tools
- Ready for many features and improvements in the future...

Future Work

- Project Management Suite
  - A typical project management suite with stories and story boards, plus:
    - Ability to track commits per issue
    - Ability to track code coverage, test results, and code quality per issue
    - Ability to link tests and issues
    - Functionality to predict the likeliness of that issue becoming a bug
- Deployment and tools
  - Deploy to any server
  - Track releases and ability to rollback
  - More tooling support (Db, ORM, CI, etc)
- More Data Monitoring Functionality
  - Notifications if services go down
  - Downloadable error and log reports
  - Record response time by URL
  - View test result history for builds
- Microservice Template Generator
  - Create a Domain Specific Language to specify endpoints for a microservice in the express framework
  - Generate API Code, Documentation, and client code
  - Automatically generate sanitizers and validators for API endpoints

Lessons Learned

- Spending time on design is important and will save time later
- Importance of code readability, documentation, and testing for increasing a project's maintainability
- Importance of having a consistent and unintrusive development process

The Team

Erica Clark
Data Analytics Lead
Website/Content Management
Yggdrasil Backend Security

Jack Meyer
Communications
Software Architecture
Test Lead

Nathan De Graaf
React Designer
Status Reports
Yggdrasil Frontend Design

Nischay Venkatram
UI Lead
Node.js SME
Yggdrasil Frontend Architecture

Nathan Karasch
Project Management
Technical Writing
Website Design & Maintenance

Dr. Lotfi Ben-Othmane
Client
Faculty Advisor

hammer.io

A tool for developing, maintaining, and monitoring Node.js microservices.

Tyr In Production:
https://www.npmjs.com/package/tyr-cli
Yggdrasil In Production:
http://hammer-io-test.ece.iastate.edu
Source Code:
https://github.com/hammer-io
Website
https://hammer-io.github.io

Erica Clark, Nathan De Graaf, Nathan Karasch, Jack Meyer, Nischay Venkatram Lotfi ben-Othmane