ChaosConnect

Connect 4, But It's a Chaotic Massive Multiplayer

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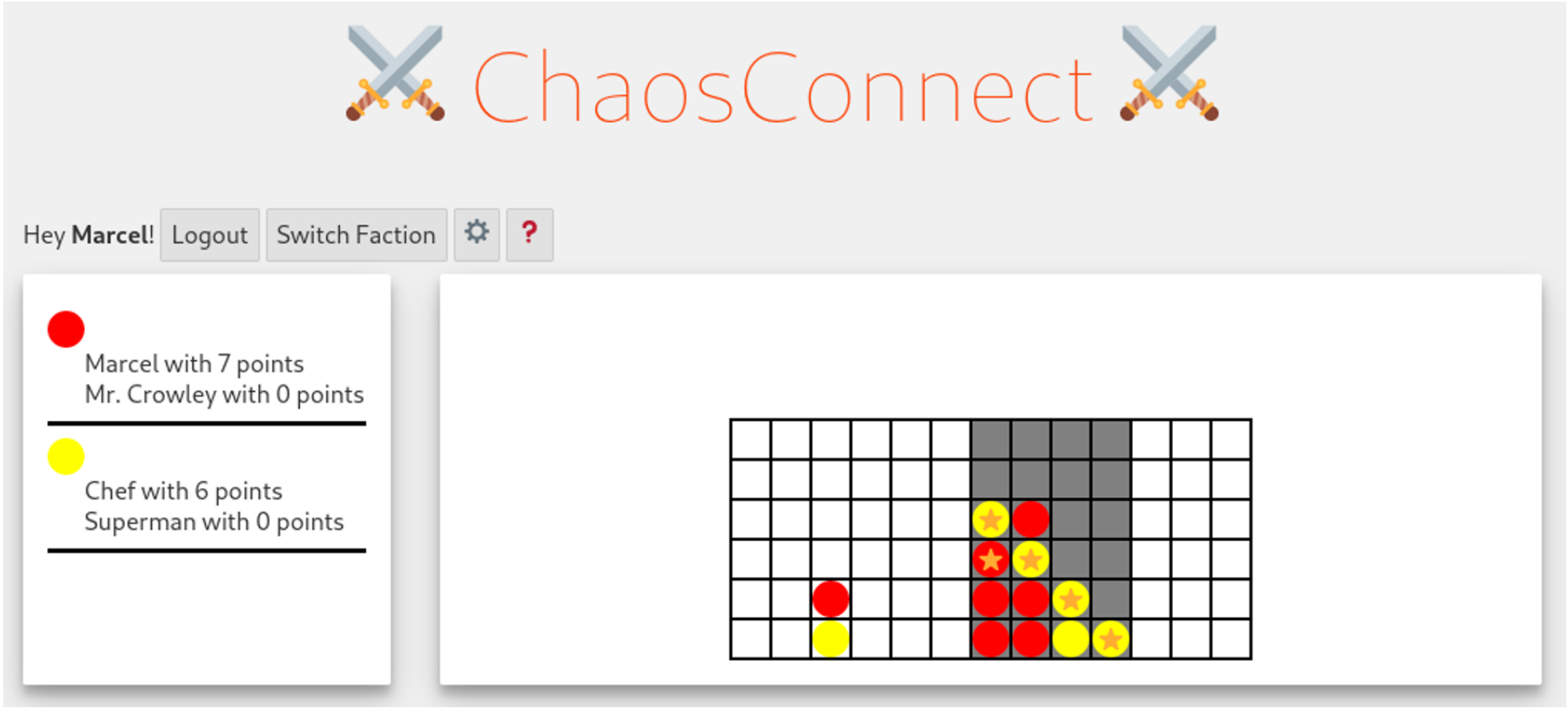
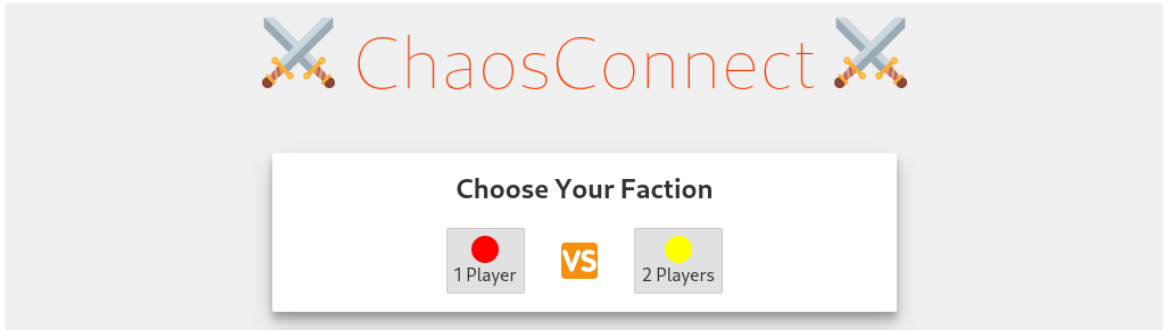
Distributed Connect4?

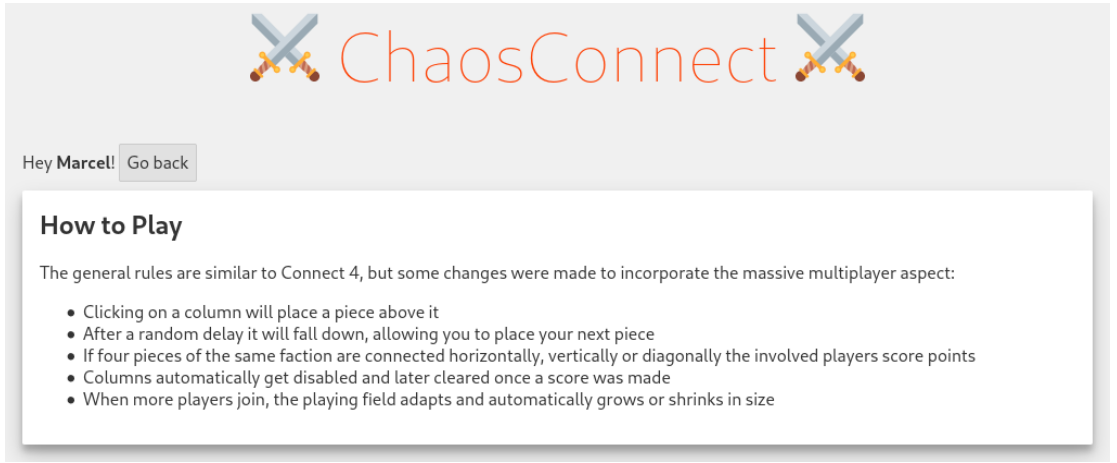
How More Than Two Players Can Play Connect Four

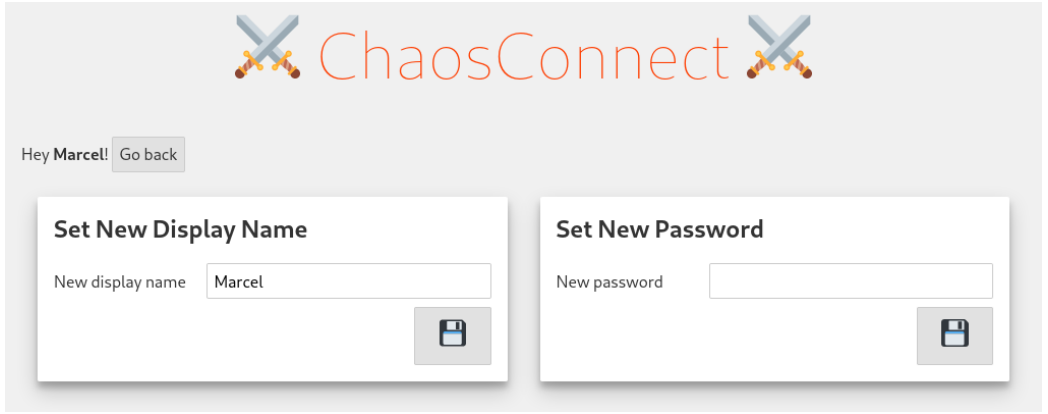
The Game


ChaosConnect
Hey Marcel!
Logout
Switch Faction
Marcel with 7 points
Mr. Crowley with 0 points
Chef with 6 points
Superman with 0 points

Screenshots



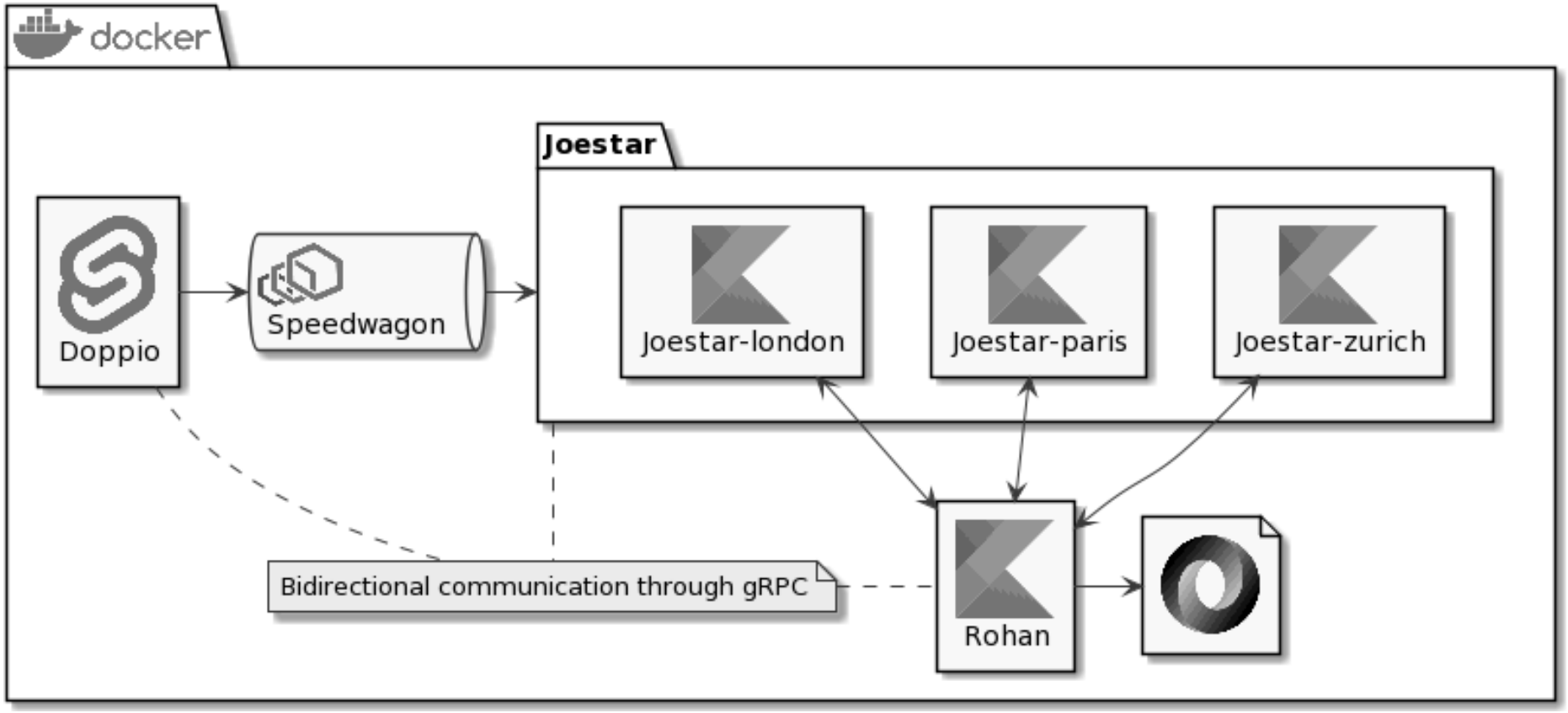




Software Architecture

How It's Built

Big Picture


docker
Joestar
Doppio
Speedwagon
Joestar-london
Joestar-paris
Joestar-zurich
Bidirectional communication through gRPC
Rohan

Components

Name	Role	Description
Doppio	Frontend	**Svelte**-based web client
Speedwagon	Load balancer	**envoy**-based load balancing reverse proxy
Joestar	Scaling backend	**Micronaut** server for user authentication and caching
Rohan	Central backend	**Micronaut** server for central storage and processing of the game and its users

The service names are all a reference to the popular anime JoJo's Bizarre Adventure.

Why This Architecture?

- Requirement For Horizontal Scaling => Joestar
- Single Source of Truth For Game Update => Rohan
- As Few Services as Possible => No Database

- The Simplest Effective Architecture

Technologies & Frameworks

Using Bleeding Edge In Production

Communication

Requirements

- Strictly Typed
- Real Time Updates
- Web to Server
- Server to Server
- Open Source

- Protobuf
- Streaming
- gRPC-web
- Micronaut gRPC
- Cloud Native

Doppio

- Frontend Needs To Display The Game State
- No Need For Complex Forms Or Logic
- We Decided On Svelte
  - Simple And Modern Web Framework
  - Supports TypeScript
  - Built In State Management

Speedwagon

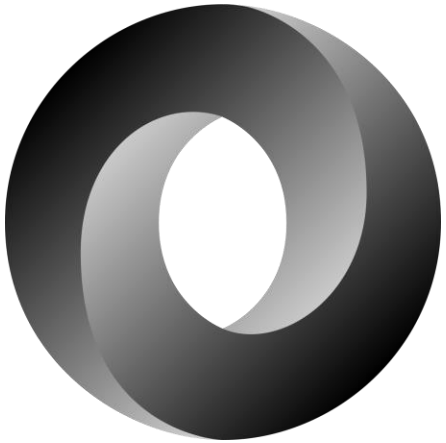
- Ideally Native Docker Support
- Needs To Support Load Balancing
- Needs To Support gRPC
- We Decided on envoy
  - Support gRPC-web
  - Sample Config Available

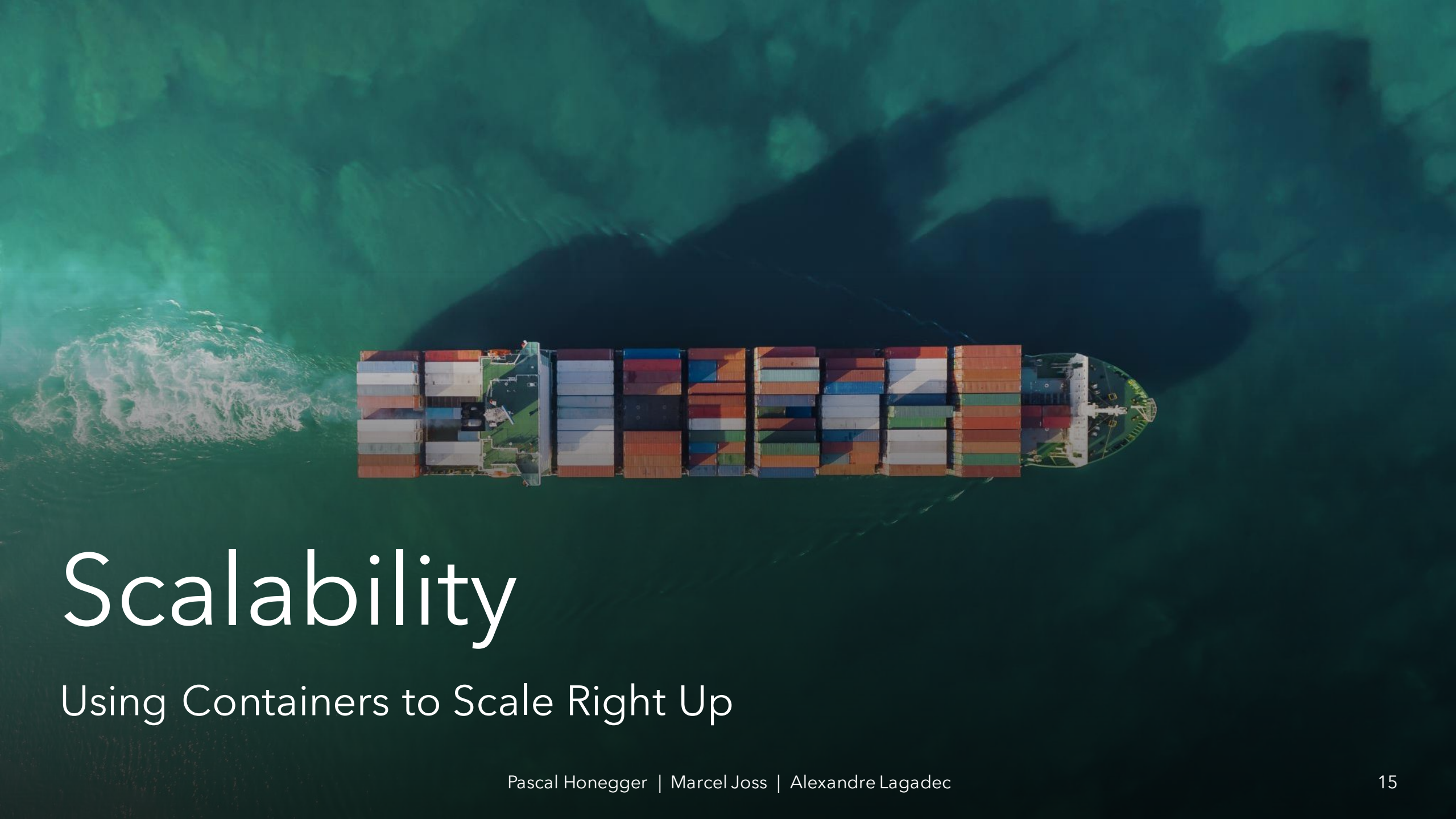
Joestar & Rohan

- Needs To Support gRPC Client & Server
- As Little Overhead as Possible
- We Decided on Micronaut & Kotlin
  - Modern Web Framework
  - Supports All Requirements Out of the Box
  - Easy To Use, Test And Deploy

Persistent Storage

- Rohan Holds Users And Their Scores In Memory
- Regularly Written To a JSON Document
- Serialized Using *Kotlinx.Serialization*
  - Very Fast And Extensible
  - Format Could Easily Be Changed If Desired
- Keep It Simple, Stupid





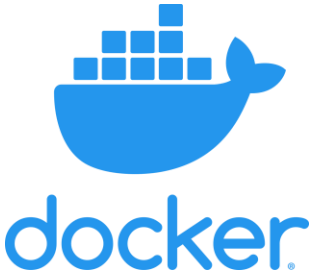
Scalability

Using Containers to Scale Right Up

Speedwagon: **envoy** Reverse Proxy

- Single Entry Point For API Requests
- We Configured **envoy** To Use Round-Robin Load Balancing
- Only Consider Servers Which Fulfill a Readiness Check
  - A Starting Joestar Isn't Ready
  - A Joestar Without a Valid Rohan Connection Isn't Ready

Docker



- Every Service Is Dockerized
- Mostly Used For Production or Code Generation
- All Docker Images Are Optimized For File Size
- Our Images Implement Docker Healthchecks
- Minimal Configuration Required To Start Your Own Instance

Security

Signed JSON Web Tokens Ensure Secure Operation

Password Hashing

- Password Hash Stored In JSON File
- Only For Registered Users
- We Chose Argon2
  - State of The Art - Won 2015 Password Hashing Competition
  - Simple Java API Available
  - Insanely Secure

Symmetric JWT

- We Couldn't Use The Micronaut-Security Package
  - gRPC Support Still Work In Progress
- Offical gRPC Authentication Relies on Google As JWT Provider
  - We Didn't Want To Have a Vendor Lock-In
- Simple Do-It-Yourself Solution
  - Joestar Signs And Verifies JWT With Symmetric Secret
  - Doppio Sends Secret In Authorization Header

Hosting

From GitHub To Cloud

Cloud Provider
Linode

We Chose Linode as a Cloud Provider Because They Provide Fair Pricing And a Free Initial Credit

Continuous Integration & Delivery

- Every Push Runs GitHub Actions
  - Compile & Test All Components
  - Build Docker Container
- Publish Images on GitHub Release
  - Follows Semantic Versioning (e.g. cc-rohan:1.0.1, cc-doppio:1)
  - Publicly Available
- Latest Version Automatically Installed on Linode

Let's Play!

https://chaos.honegger.dev/

Questions?

For Details See https://github.com/PascalHonegger/ChaosConnect