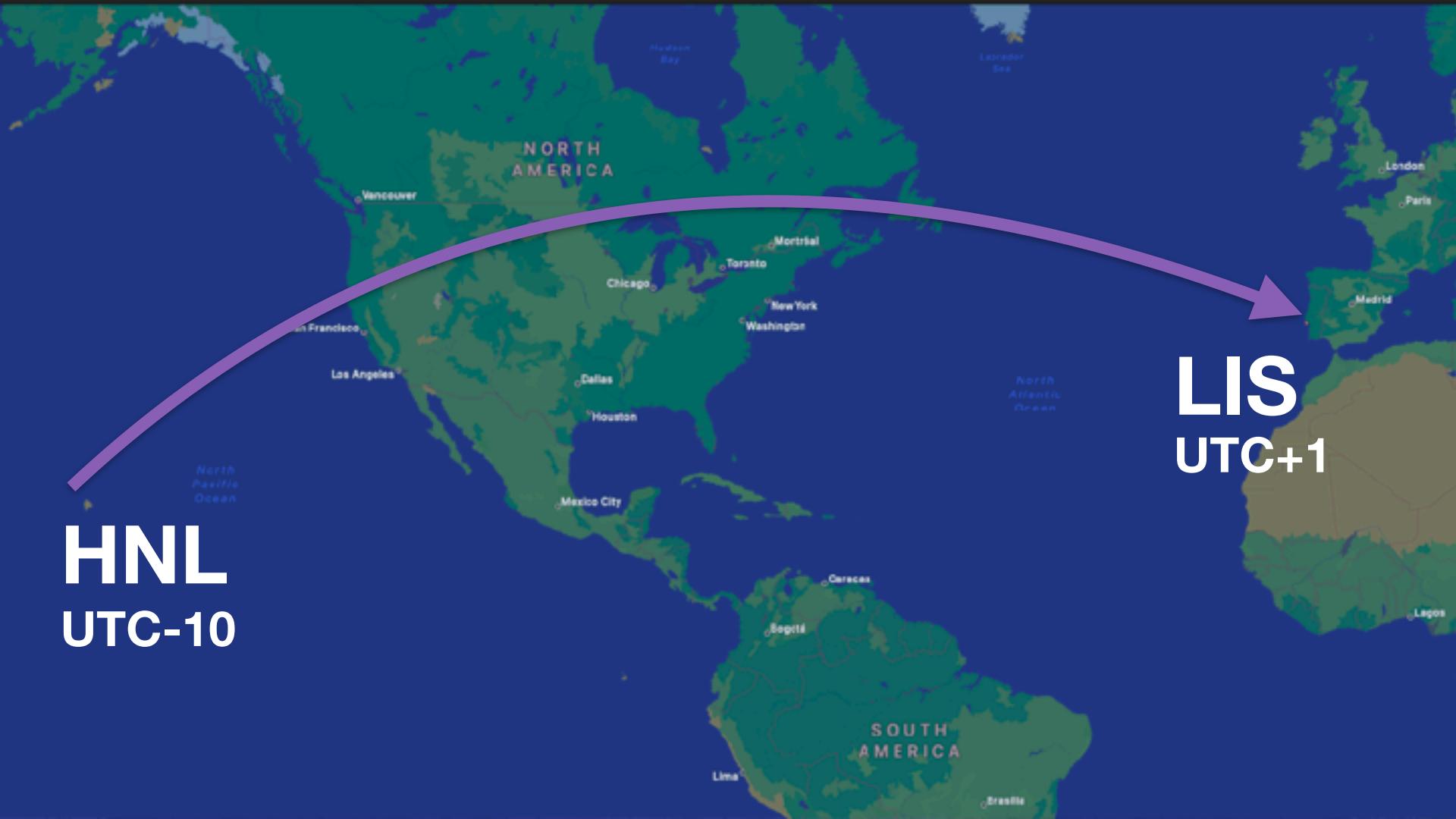


Visualising Pathogen Spread with LiveView

HNL
UTC-10



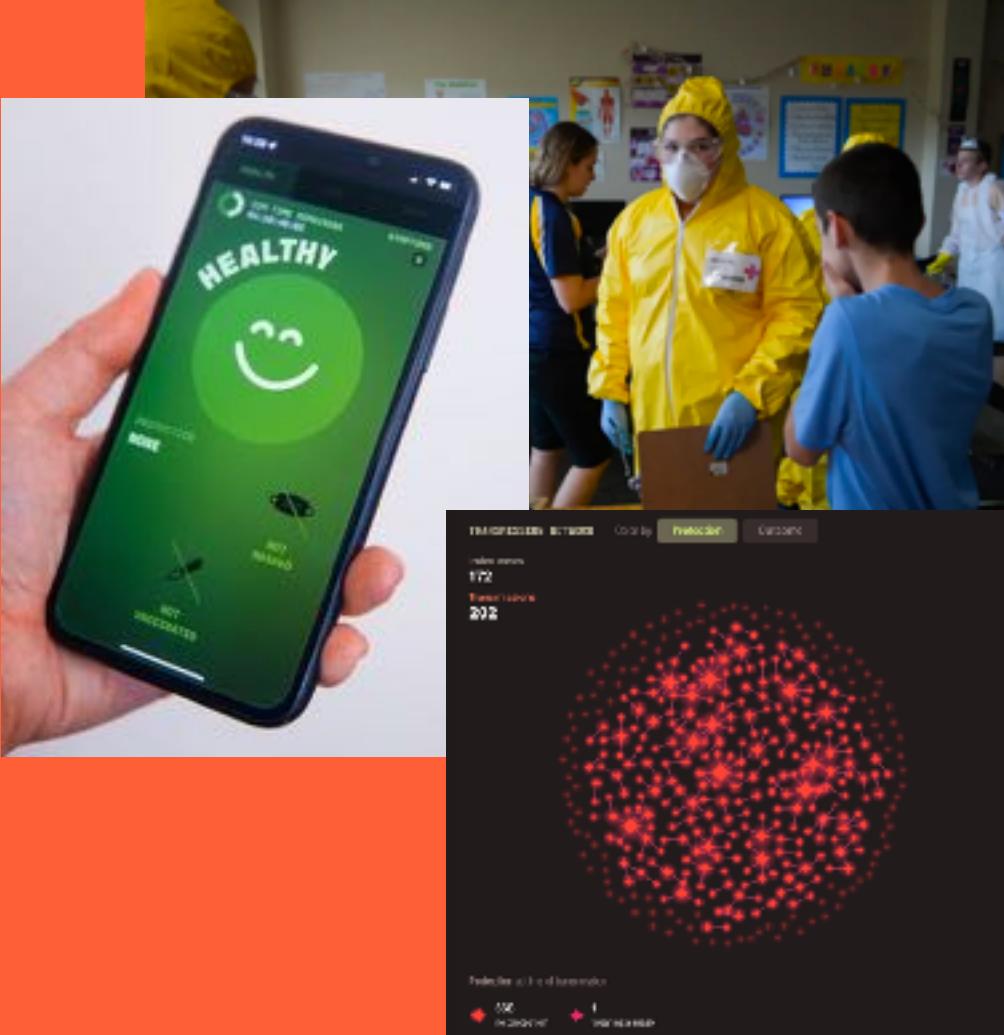
LIS
UTC+1



A group photo of the Farnion office on the patio

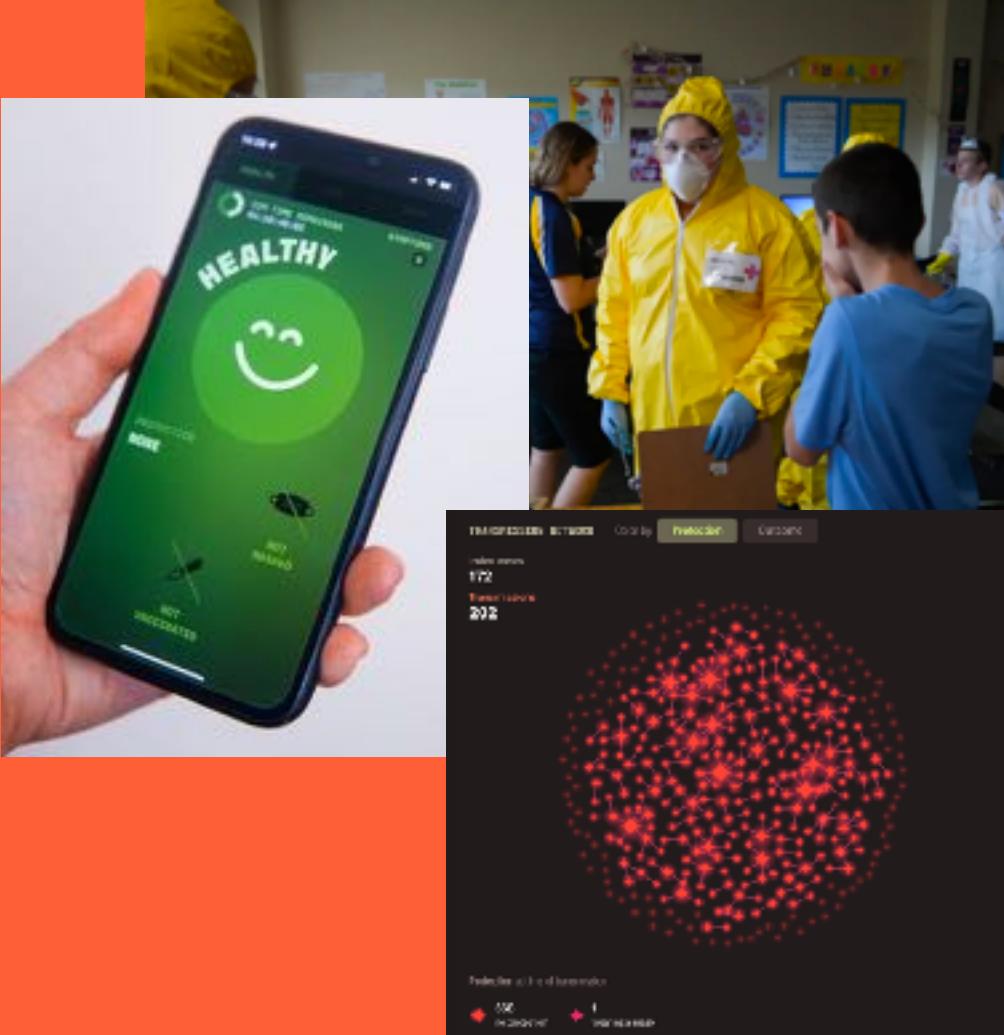
<https://operationoutbreak.org>

operation outbreak



<https://operationoutbreak.org>

operation outbreak





HEALTH

SCAN

INFO



SIM TIME REMAINING
01:22:33

HEALTHY

SYMPTOMS

0

PROTECTION
PARTIAL

TIME LEFT TO EAT
05:30



VACCINATED



NOT
MASKED

HEALTH

SCAN

INFO



SIM TIME REMAINING
01:22:33

VERY
SICK



SYMPTOMS

14

PROTECTION
PARTIAL

TIME LEFT TO EAT
05:30



MASKED



NOT
VACCINATED

HEALTH

SCAN

INFO



SIM TIME REMAINING
01:22:33

SICK



PROTECTION
NONE

TIME LEFT TO EAT
05:30



NOT
VACCINATED



NOT
MASKED

[please indulge me
this simple analogy]



A video of spinner dolphins

Freediving



Freediving

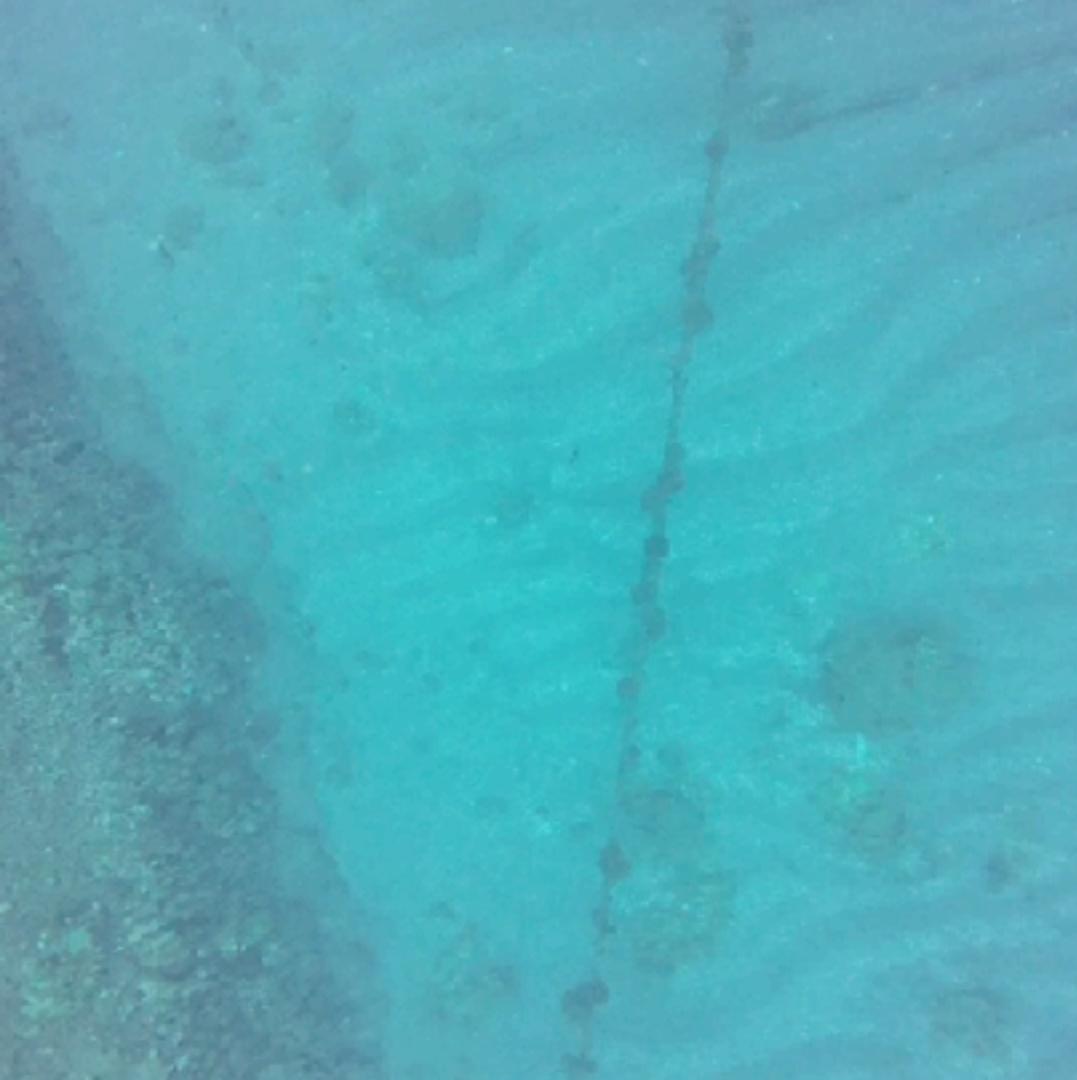


Phoenix



Freediving

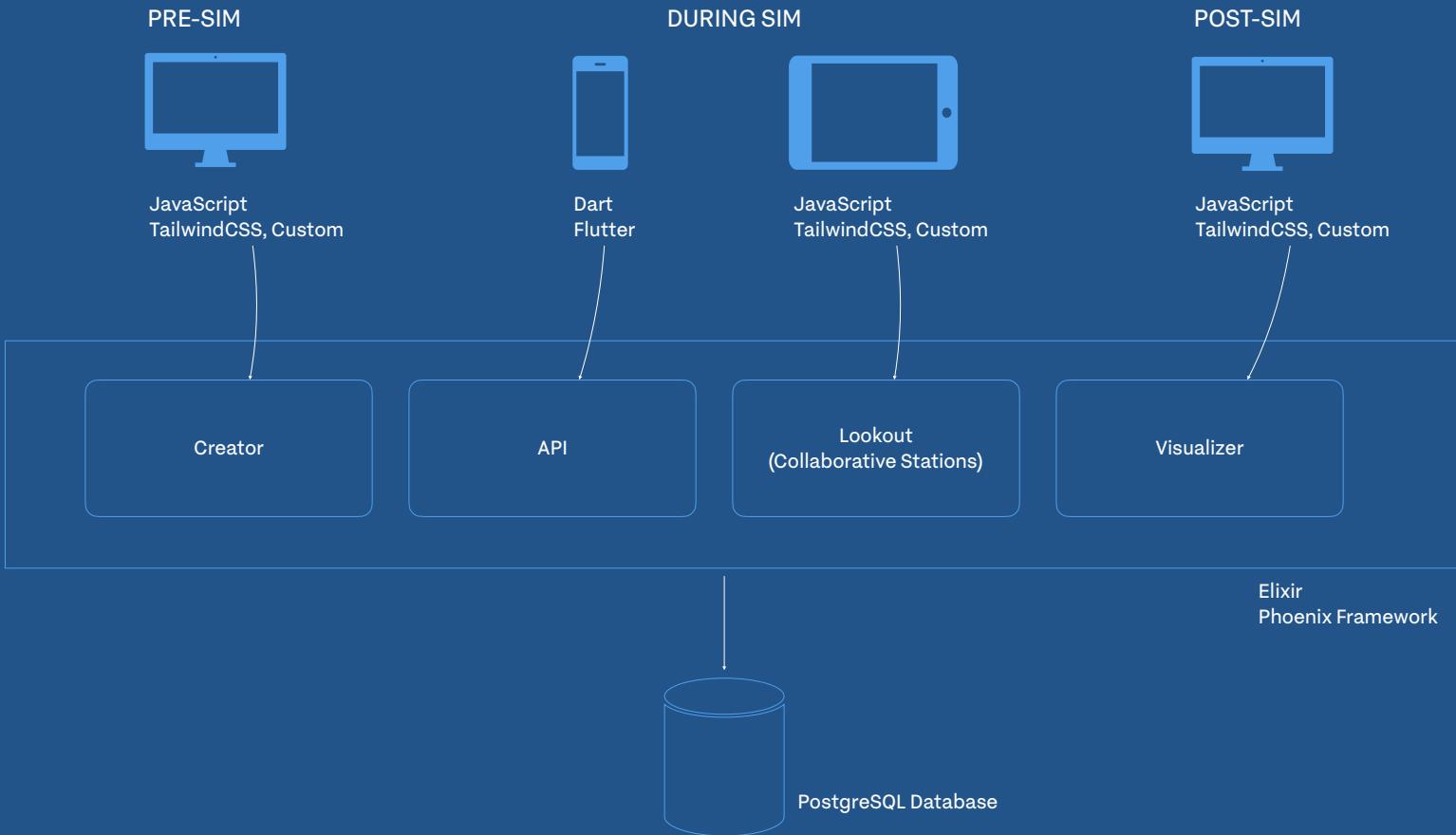




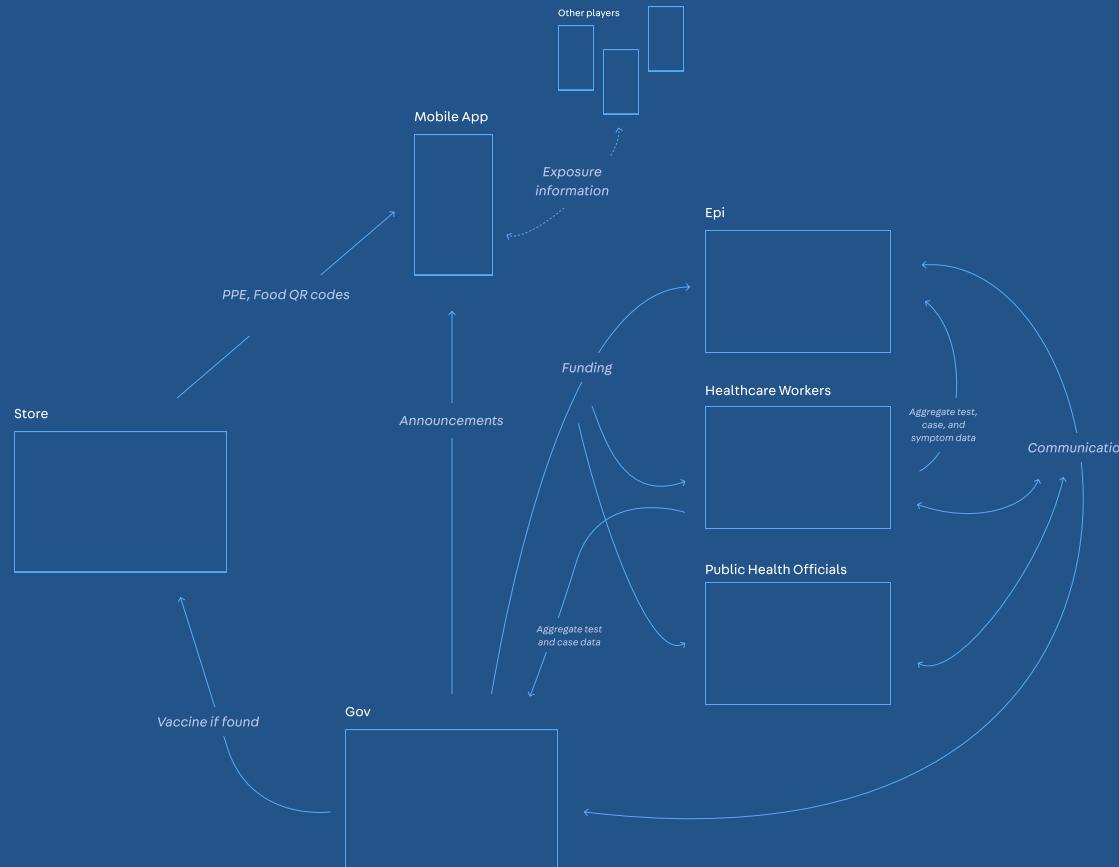
A dive video where a porcupinefish sits at the sandy bottom

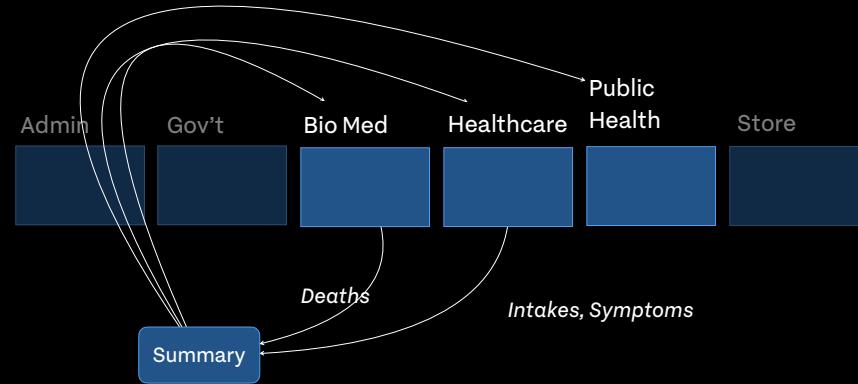
- What worked
- What didn't work
- What we did to fix it

- What worked



Data flow during simulation





Healthcare overview and case intake screens, and a diagram of message passing between stations

Lookout Healthcare

OVERVIEW CASE INTAKE SUMMARY

Case Intake

Patient name: Alpha Romeo

Symptoms: Select all that apply

Fever	Chills	Cough	Loss of smell and taste	Fatigue	Malaise	Mysitis	Diarrhea	Stomach
Vomiting	Sore throat	Headache	Rhinorrhea	Dyspnea	Pneumonia	Delirium	Haemoptysis	
Acute respiratory distress syndrome			Kidney failure	Disseminated intravascular coagulation			Tongue spots	
Skin rash	Penile	Encephalitis	Bleeding	Skin bumps	Skin abscess	Internal infection	Abdominal pain	
Jaundice	Liver failure	Multiple organ failure						

Diagnostic test:

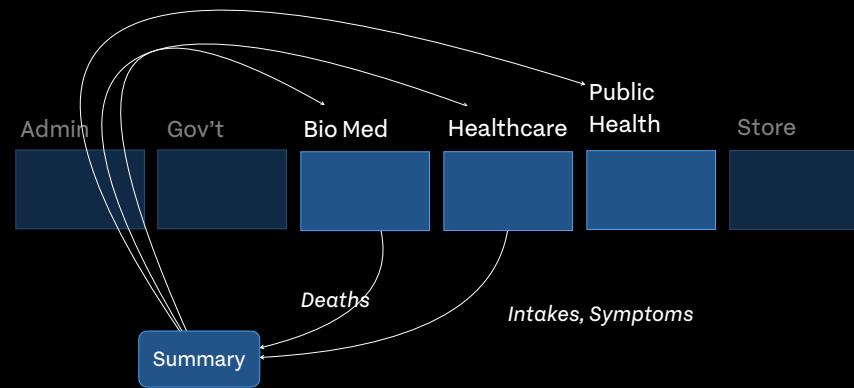
Select result: Positive

Your patient is positive for the pathogen. Advise them to visit Public Health to report contacts.

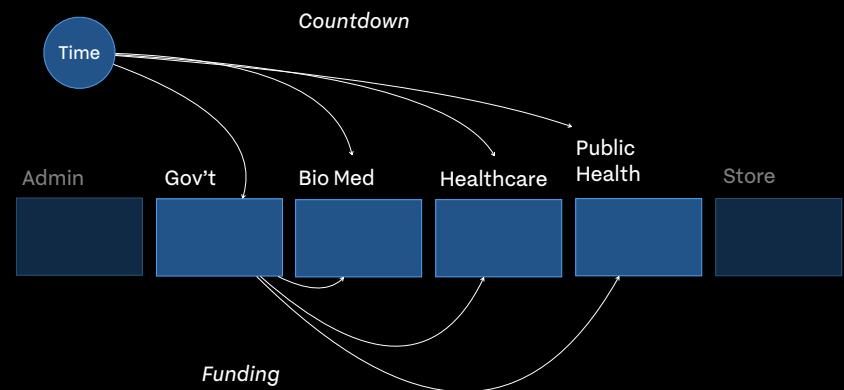
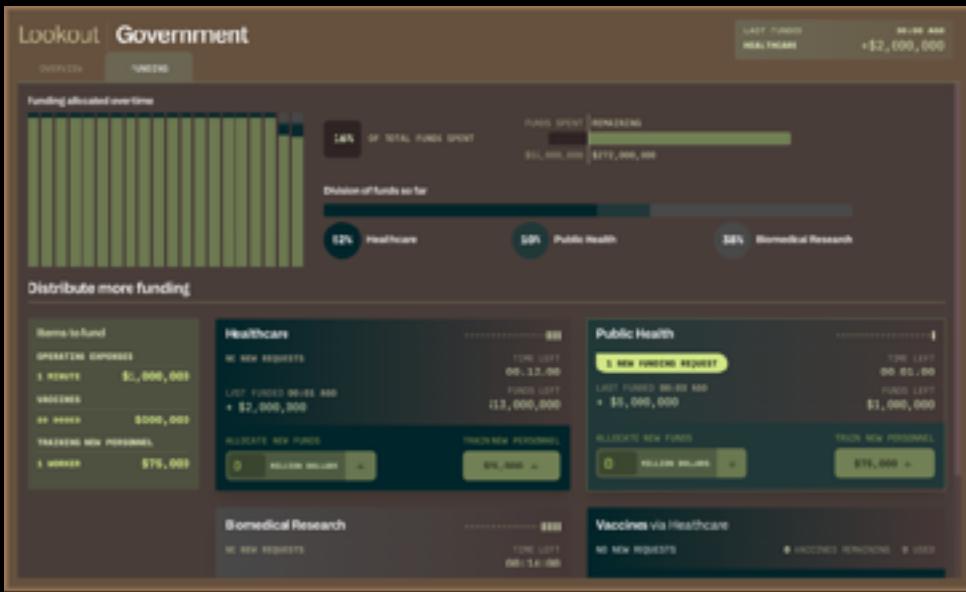
Prescription?

Yes No

Write your patient a prescription for medicine. Get them to bring the prescription to the store to buy medicine.



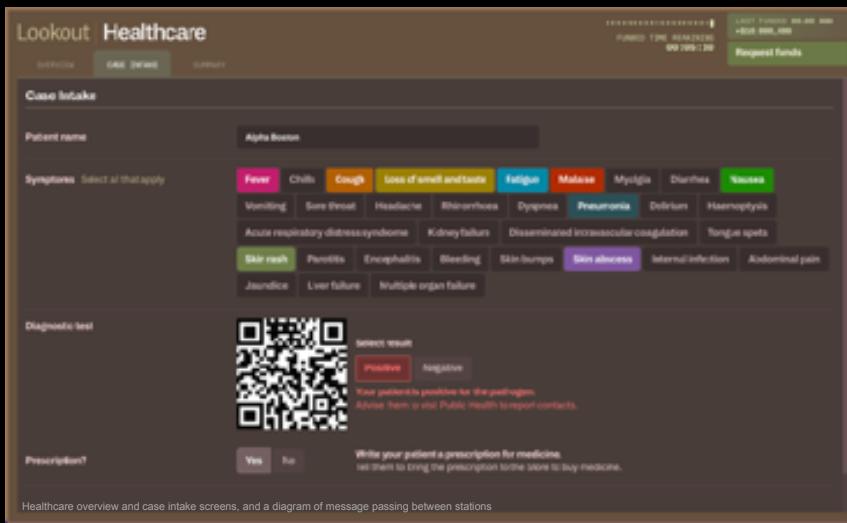
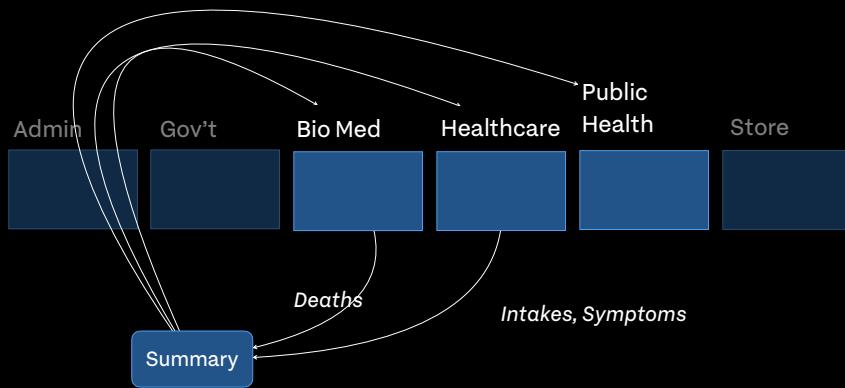
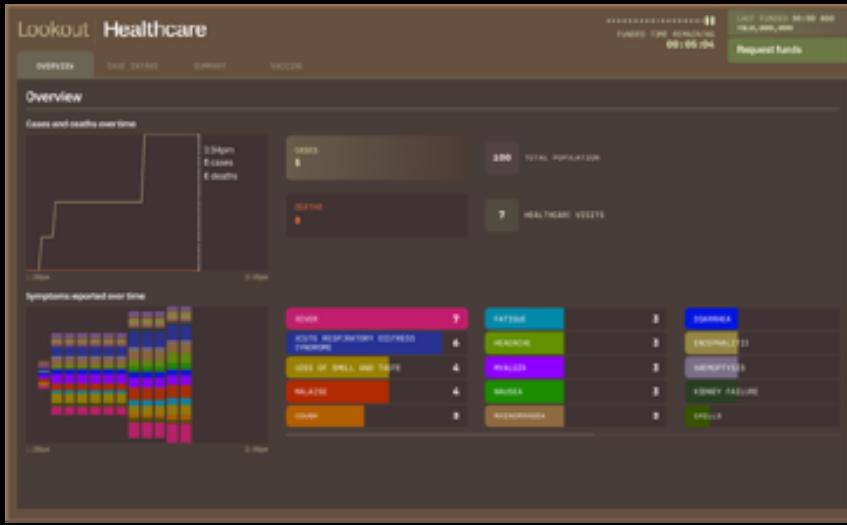
Healthcare overview and case intake screens, and a diagram of message passing between stations

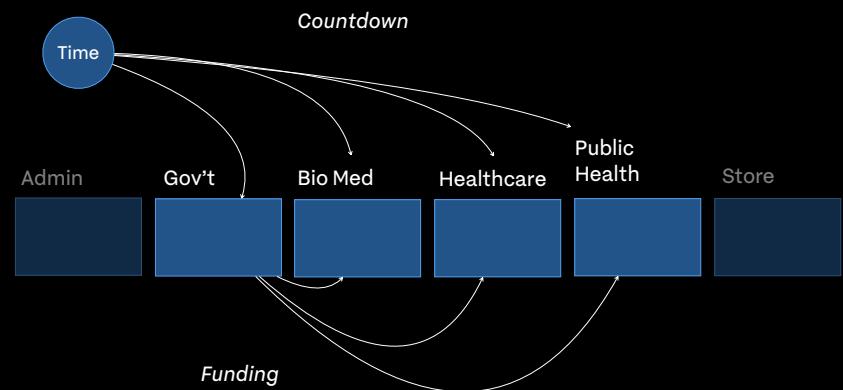
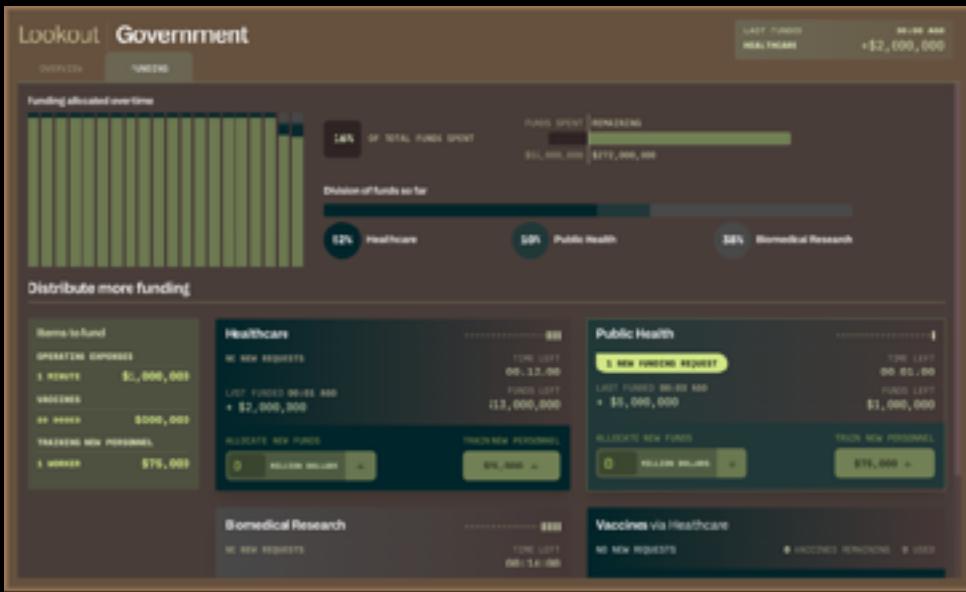


The government station's screen and a diagram of how funds and timers pass messages to the other stations

- What worked

Phoenix's abstractions over
soft real-time messaging





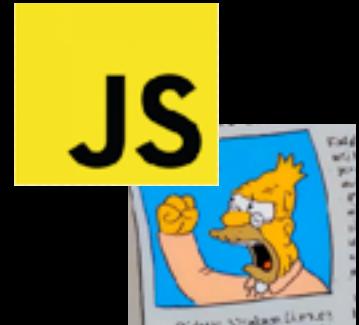
The government station's screen and a diagram of how funds and timers pass messages to the other stations

- **What worked**

Building LiveViews during
the iterative design process,
and throwing the bad ones

- What worked

JS Client Hooks to
handle boilerplate UI
lifecycle code



- What worked

TailwindCSS & LiveView
Components for FREE!

- What worked

Using Phoenix to build a
FAST API

- What didn't work



- **What didn't work**

Sending large amounts of data to LiveViews over websockets is slow and uses a lot of server memory

3 Interacting at 8:00 am on
2/22/2023

191
total participants

88
HEALTHY

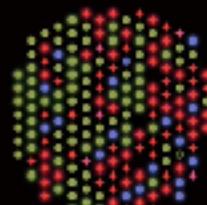
82
INFECTED

21
RECOVERED

0
DECEASED

IRI not currently interacting.

8:00 am
Wednesday, February 22
0 NEW INFECTIONS



Participant Phi Washington

FINAL OUTCOME • Infected

PERFORMANCE
COMPARED TO PEERS

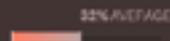
60 direct contacts



Masked 66% of the time



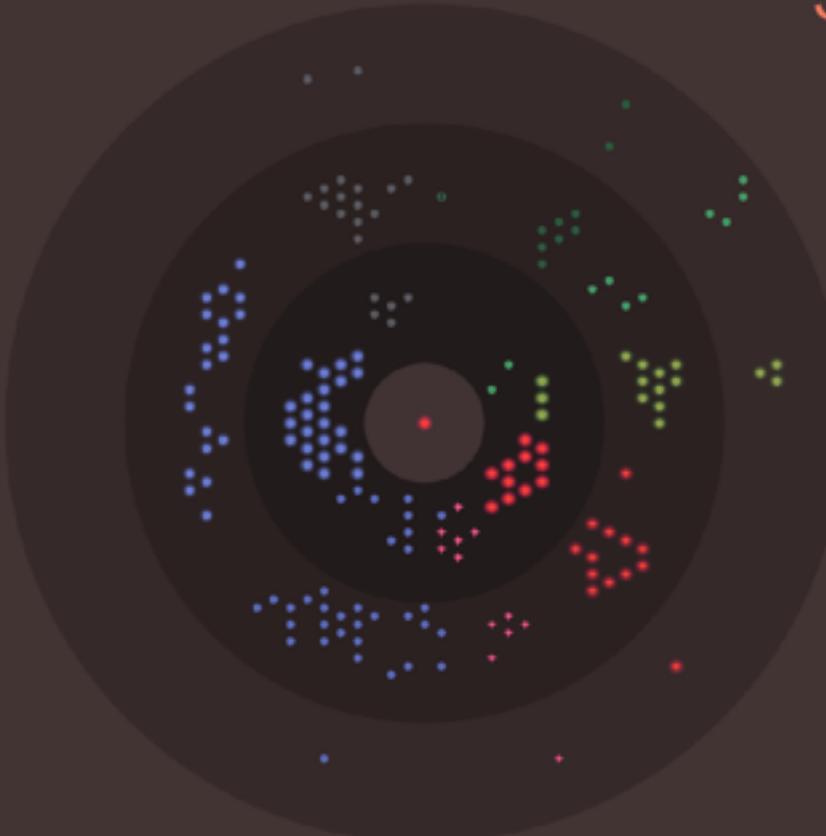
Vaccinated 0% of the time



Infected 30% of the time



CONTACT NETWORK

55 direct contacts
infected190 infected contacts
in entire network

Likelihood of infection

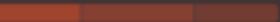
with immediate contacts only



immediate + 2nd-degree contacts



immediate, 2nd and 3rd-degree contacts



All participants

Search by username

Sorted by

Number of Contacts

Number of Transmissions

TRANSMISSION NETWORK

Color by

Protection

Outcome

Index cases

172

Transmissions

202

USERNAME OUTCOME TRANSMISSIONS ACTUAL CONTACTS

Alpha Mesa Infected 2 240

Omega Tampa Unknown 0 240

Phi Tacoma Infected 5 233

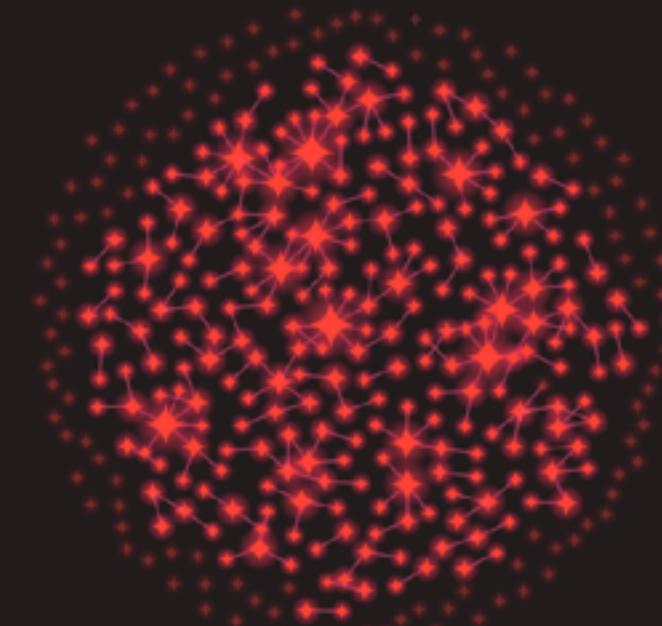
Sigma Memphis Infected 2 231

Lambda Wichita Unknown 0 229

Alpha Orlando Unknown 0 228

Sigma Houston Unknown 1 228

Lambda Unknown 0 228



Protection at time of transmission

◆ 366 no protection

◆ 1 wearing a mask

- What we did to fix it

- **What we did to fix it**

Switch from LiveView
websockets to file downloads
(w/ cache tags, temp files)

- What didn't work

Distributed systems can be complicated.

They can be confusing and difficult to debug.

- What we did to fix it

We leaned on a simple
Phoenix monolith

- What we did to fix it

Name everything with structs

Name everything with structs

```
1 defmodule LandOfOo.Health.PopStats do
2   defstruct [
3     :num_participants,
4     :num_pos_cases: 0, :cases_pct: 0,
5     :num_deaths: 0, :deaths_pct: 0,
6     :num_visits: 0,
7     :num_quarantined: 0,
8     :num_vaccinated: 0,
9     :positive_intakes: [],
10    :death_counts: []
11  ]
12 end
```



A video of another curious green sea turtle

Thank you!

