

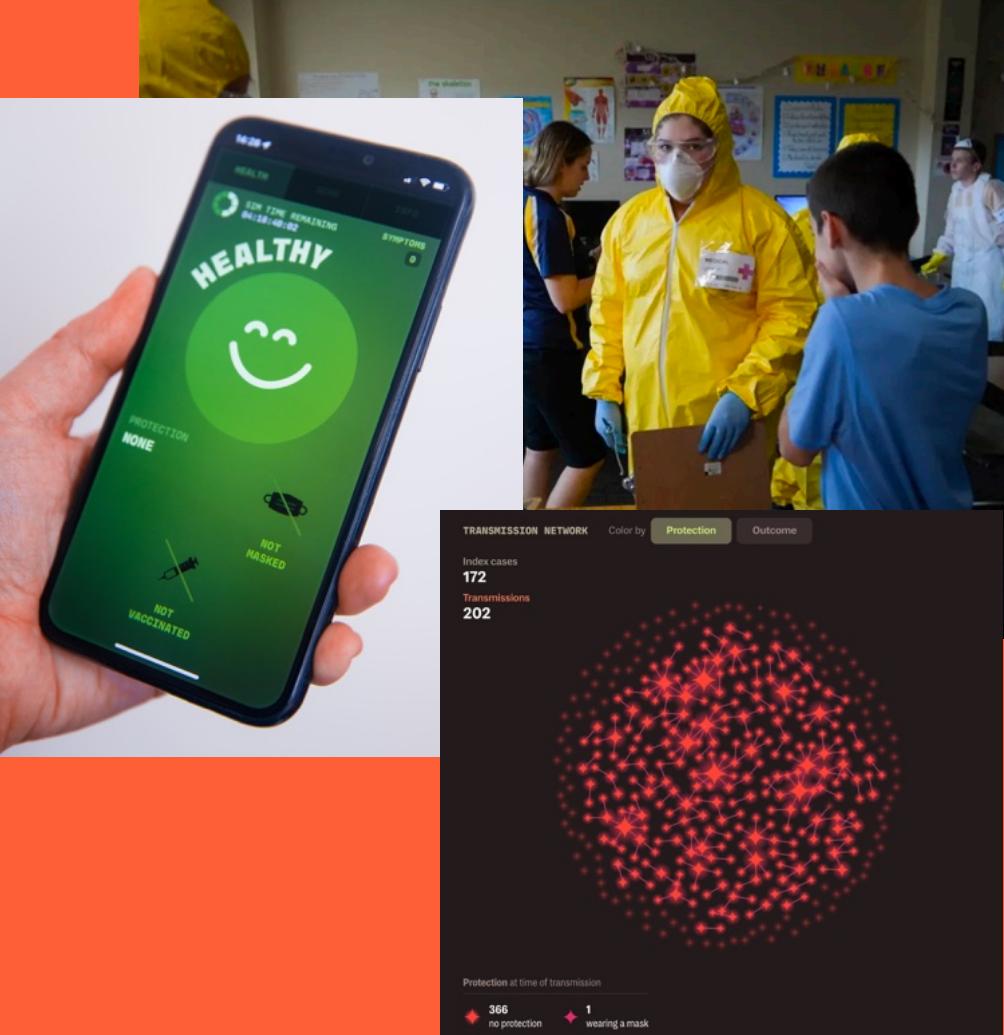
Visualising Pathogen Spread with LiveView

Kyle Oba | Fathom Information Design



A group photo of the Farbtron office on the patio

operation outbreak



A collage of Operation Outbreak images, including a mobile app screen, students in full protective gear, and an infection network visualization.

HEALTH

SCAN

INFO



SIM TIME REMAINING
01:22:33

HEALTHY



PROTECTION
PARTIAL

TIME LEFT TO EAT
05:30



NOT
MASKED



VACCINATED

HEALTH

SCAN

INFO



SIM TIME REMAINING
01:22:33

VERY
SICK



PROTECTION
PARTIAL

TIME LEFT TO EAT
05:30

SYMPOTMS

14



NOT
VACCINATED



MASKED

HEALTH

SCAN

INFO



SIM TIME REMAINING
01:22:33

SICK



PROTECTION
NONE

TIME LEFT TO EAT
05:30



NOT
MASKED

NOT
VACCINATED



[strained analogy]



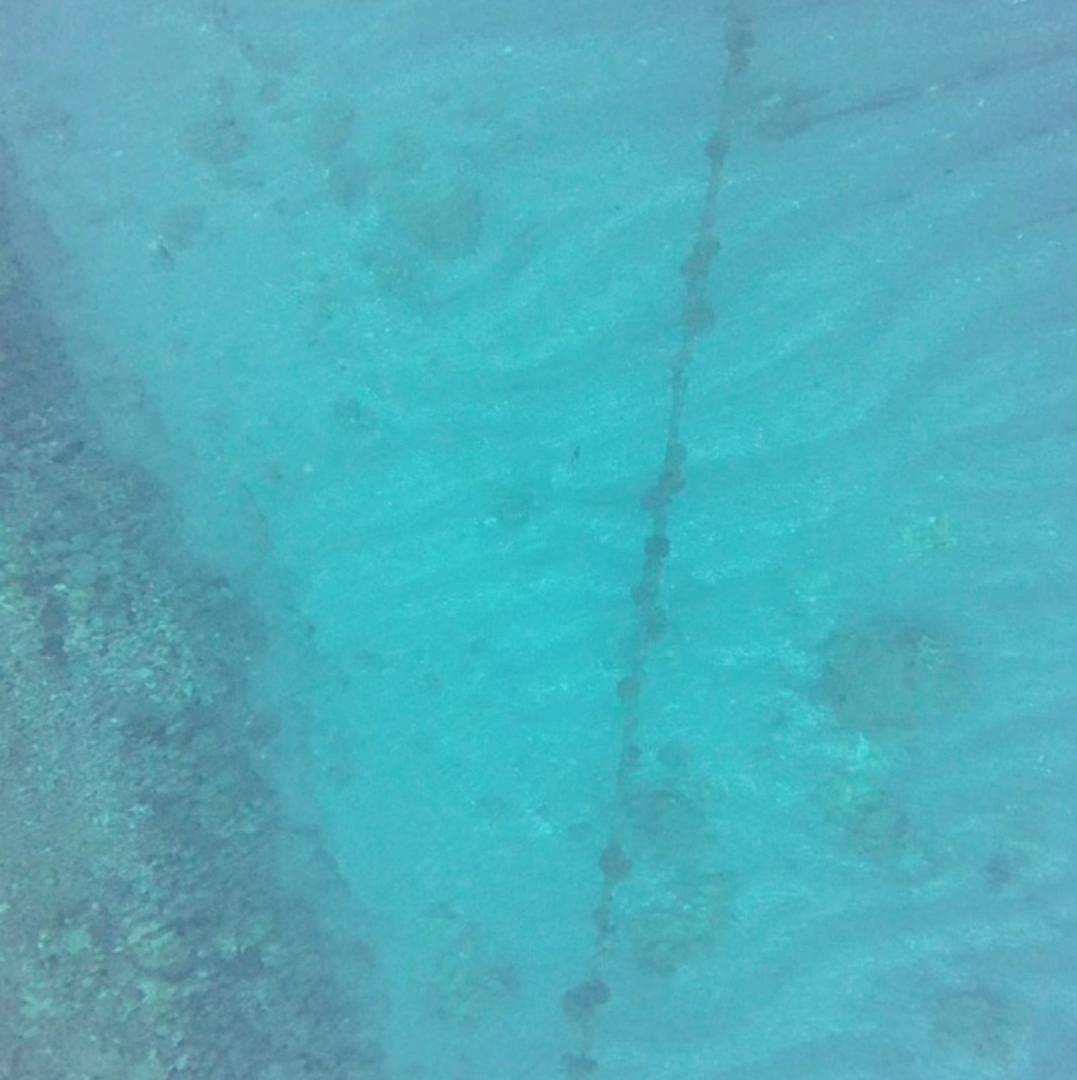
A video of spinner dolphins



A video of a green sea turtle which comes to investigate



A video of another curious green sea turtle



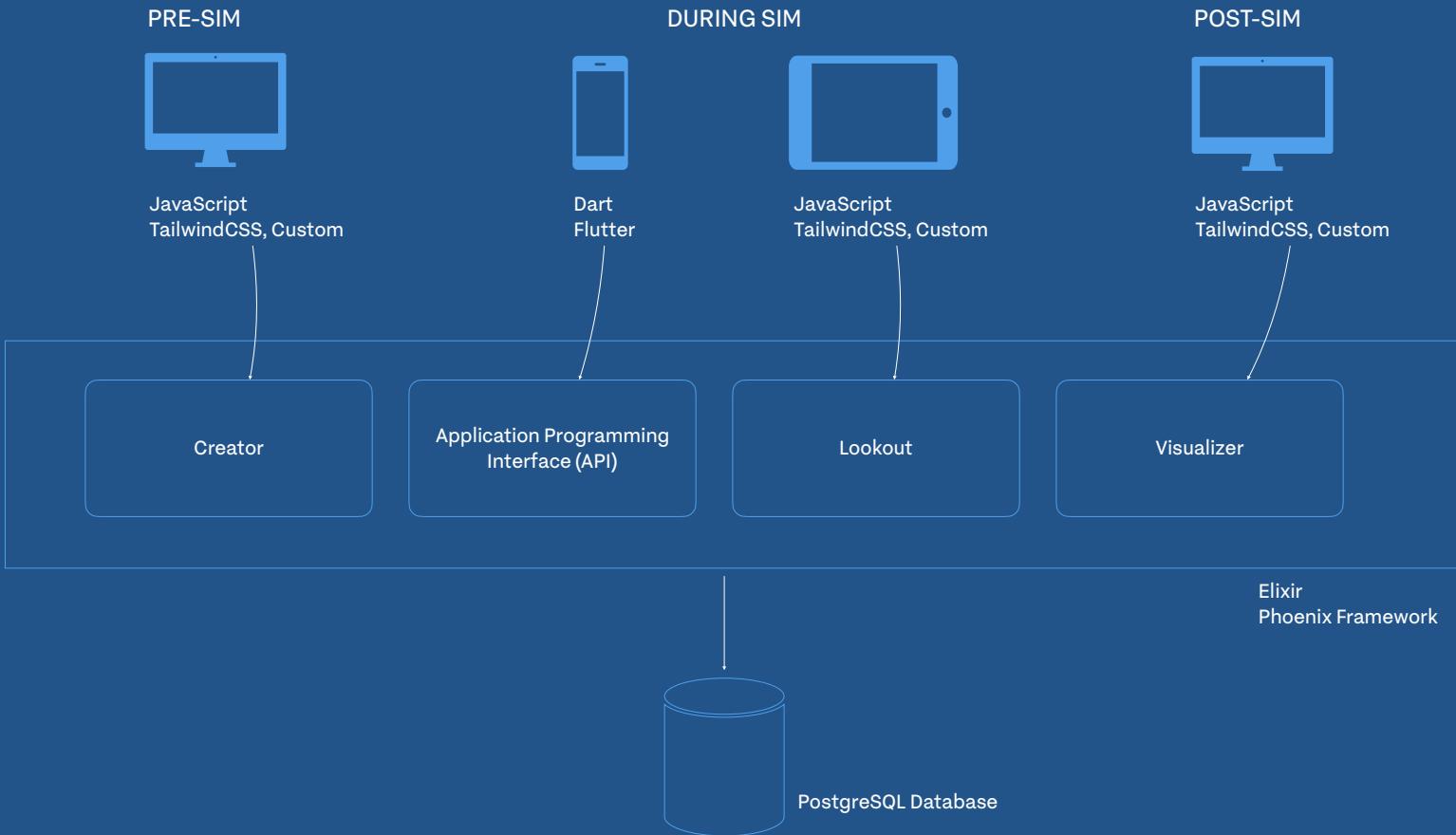
A dive video where a porcupinefish sits at the sandy bottom



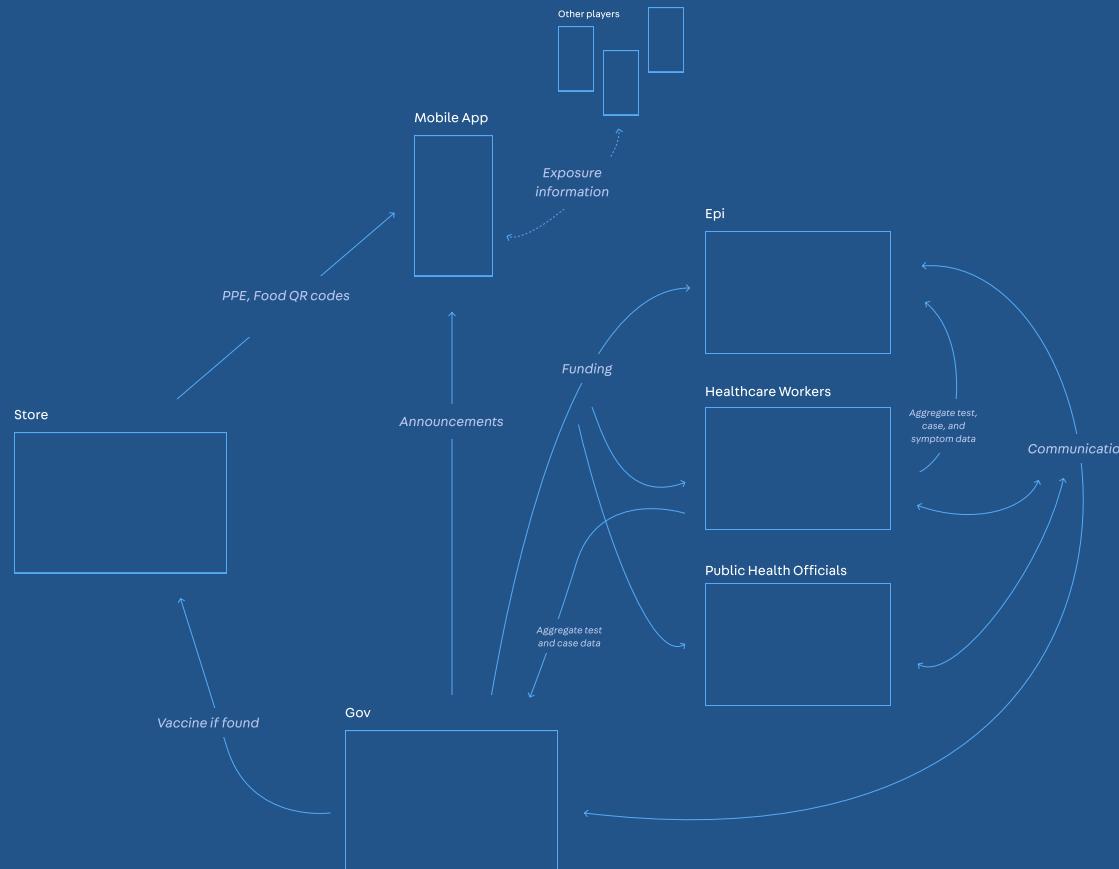
A video of three monk seals swimming together

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

- What worked



Data flow during simulation





Lookout Healthcare

OVERVIEW CASE INTAKE SUMMARY

LAST FUNDED 09:00 AM
+\$10,000,000

FUNDED TIME REMAINING:
00:05:10

Request funds

Case Intake

Patient name Alpha Boston

Symptoms Select all that apply

Fever Chills Cough Loss of smell and taste Fatigue Malaise Myalgia Diarrhea Nausea

Vomiting Sore throat Headache Rhinorrhoea Dyspnea Pneumonia Delirium Haemoptysis

Acute respiratory distress syndrome Kidney failure Disseminated intravascular coagulation Tongue spots

Skin rash Parotitis Encephalitis Bleeding Skin bumps Skin abscess Internal infection Abdominal pain

Jaundice Liver failure Multiple organ failure

Diagnostic test

Selected result

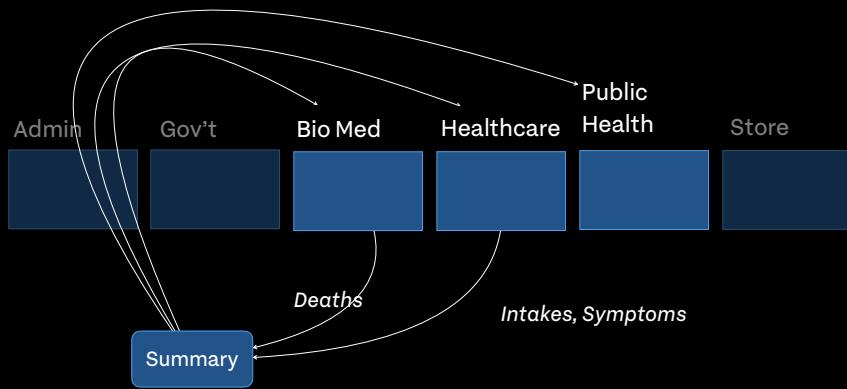
Positive Negative

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

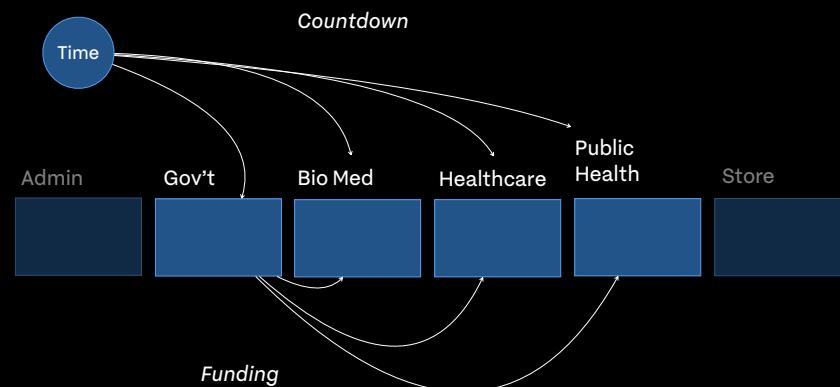
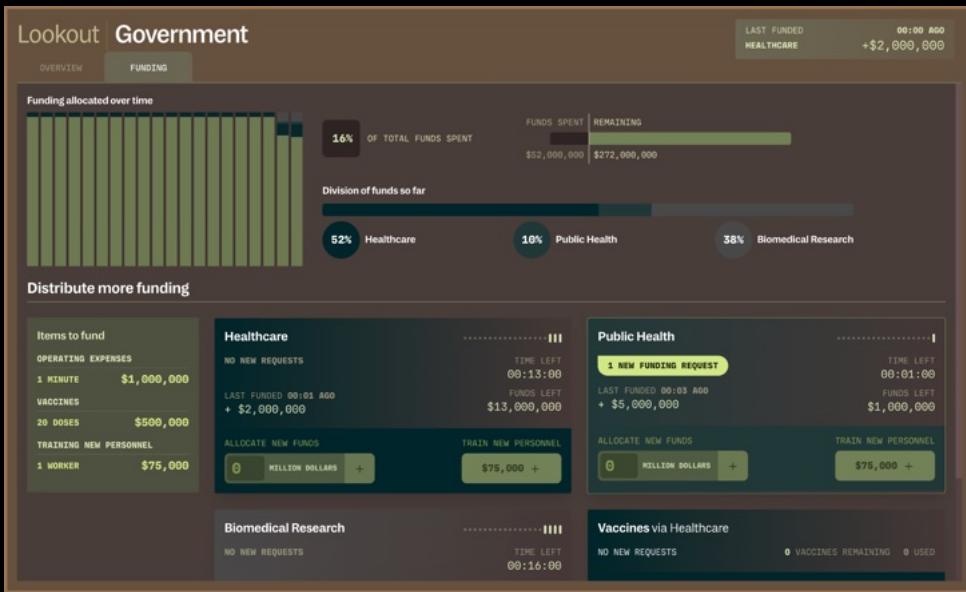
Prescription?

Yes No

Write your patient a prescription for medicine.
Tell them to bring the prescription to the Store to buy medicine.

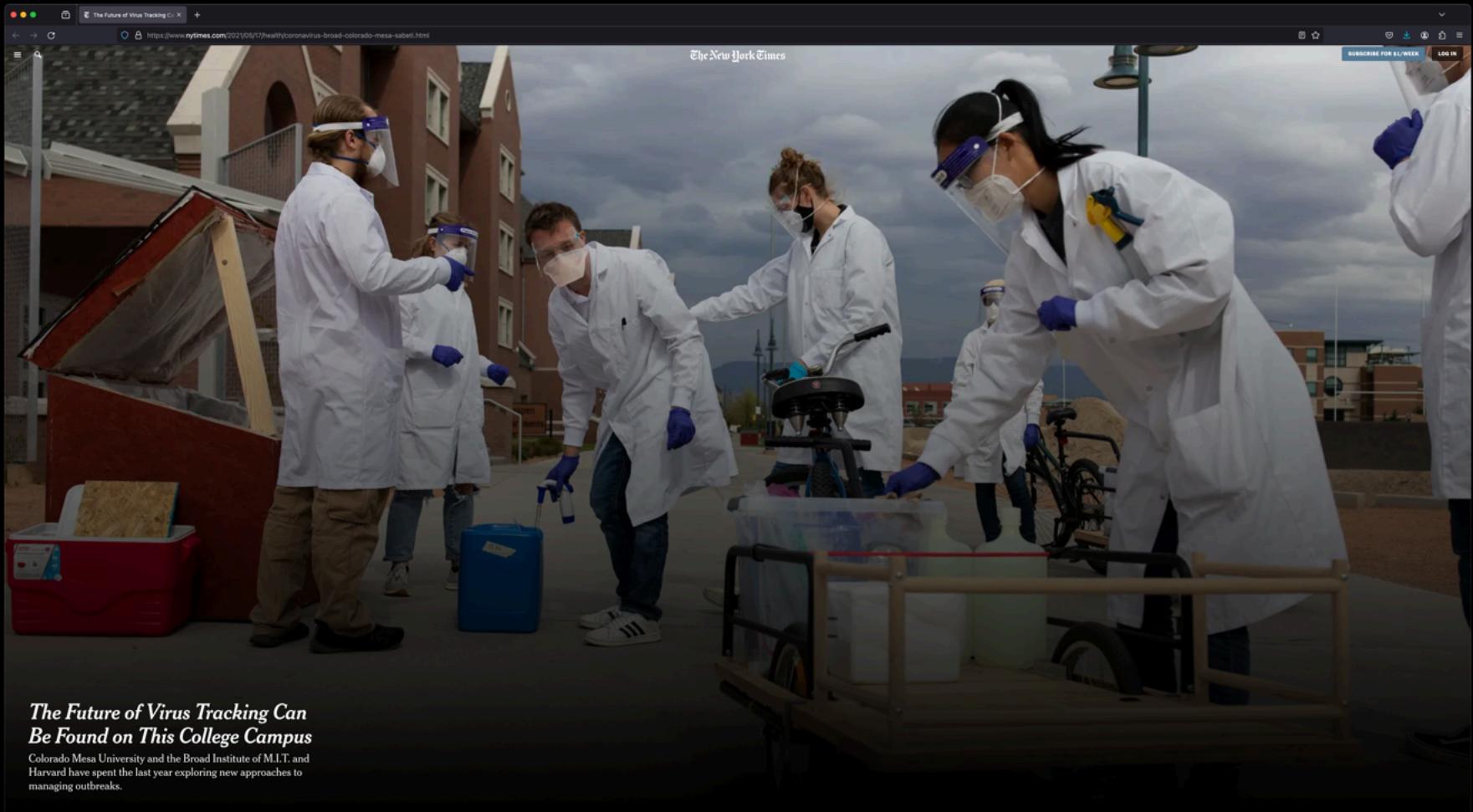


Healthcare overview and case intake screens, and a diagram of message passing between stations





Screens for the real Lookout application showing live real world data, next to the simulation's Lookout screen to show similarities



The Future of Virus Tracking Can Be Found on This College Campus

Colorado Mesa University and the Broad Institute of M.I.T. and Harvard have spent the last year exploring new approaches to managing outbreaks.

The New York Times

SUBSCRIBE FOR \$1/WEEK

LOG IN

- What worked

Phoenix's abstractions over
soft real-time messaging



Lookout Healthcare

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Selected result

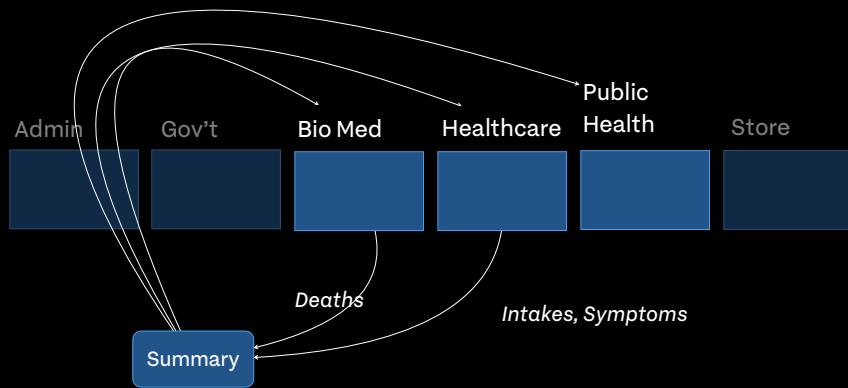
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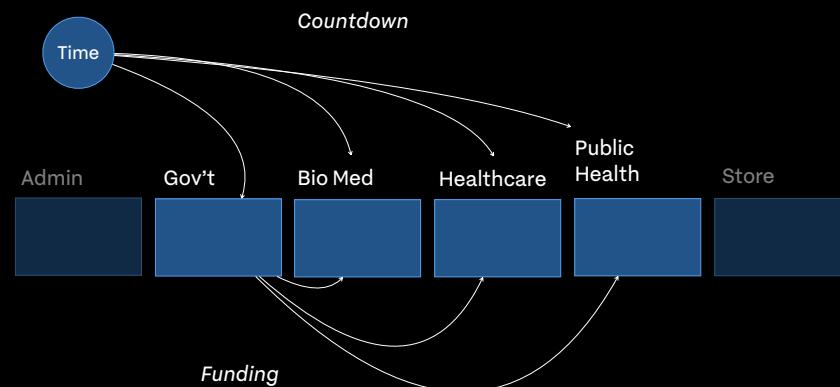
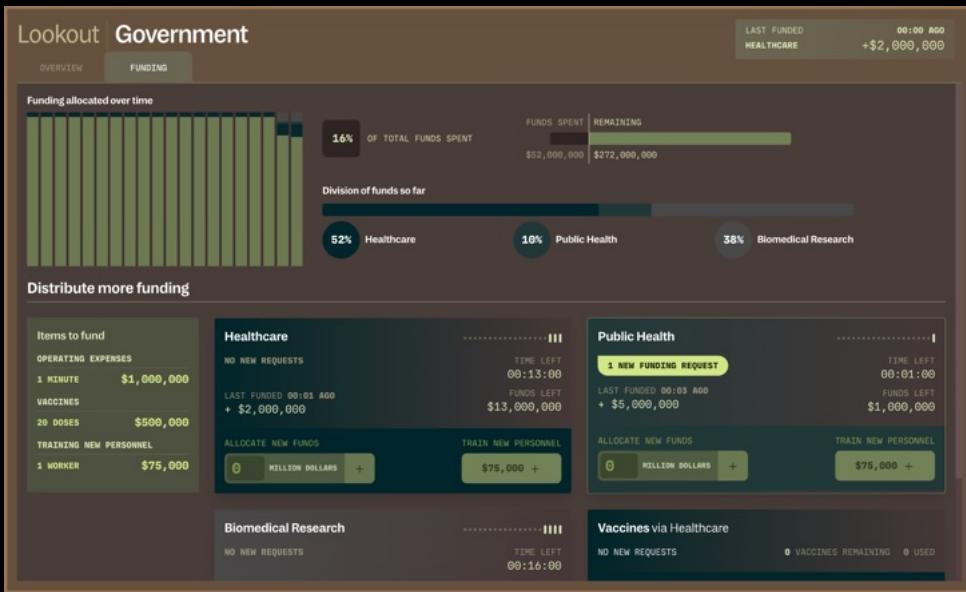
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Healthcare overview and case intake screens, and a diagram of message passing between stations



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

- What worked

Churning out LiveViews during
the iterative design process

- What worked

TailwindCSS & LiveView
Components for FREE!

- What worked

Using Phoenix to build a
FAST API

- **What didn't work**

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

- What we did to fix it

Switch from LiveView
websockets to file downloads

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

191
total participants

88
HEALTHY

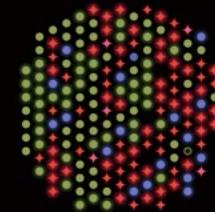
82
INFECTED

21
RECOVERED

0
DECEASED

188 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



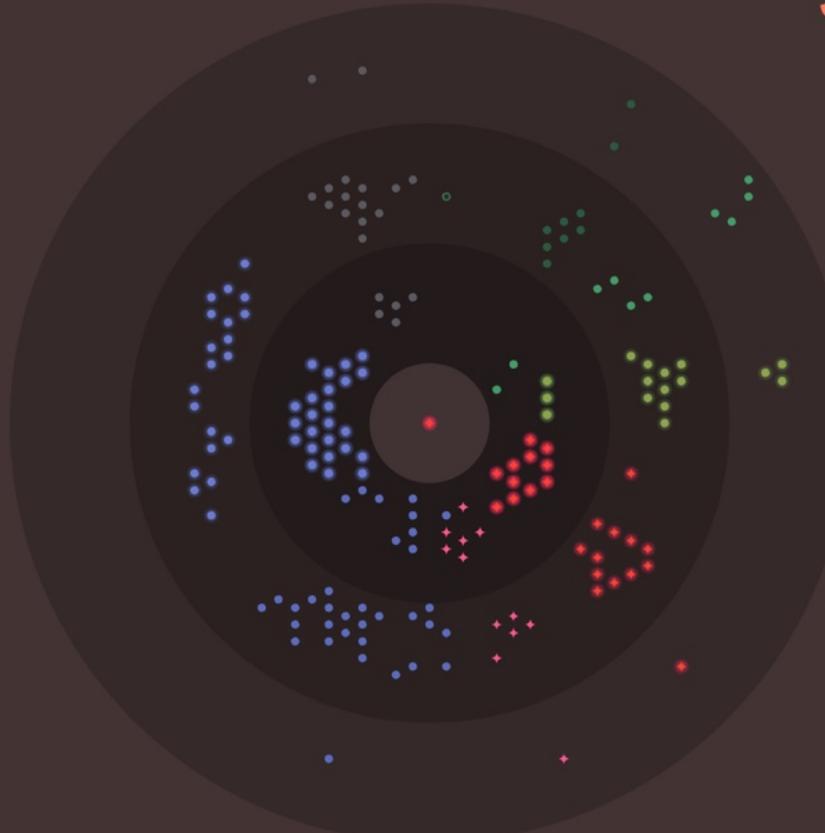
Infected 30% of the time



CONTACT NETWORK

55 direct contacts
infected

190 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

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	Infected	0	225
--------	----------	---	-----

TRANSMISSION NETWORK

Color by

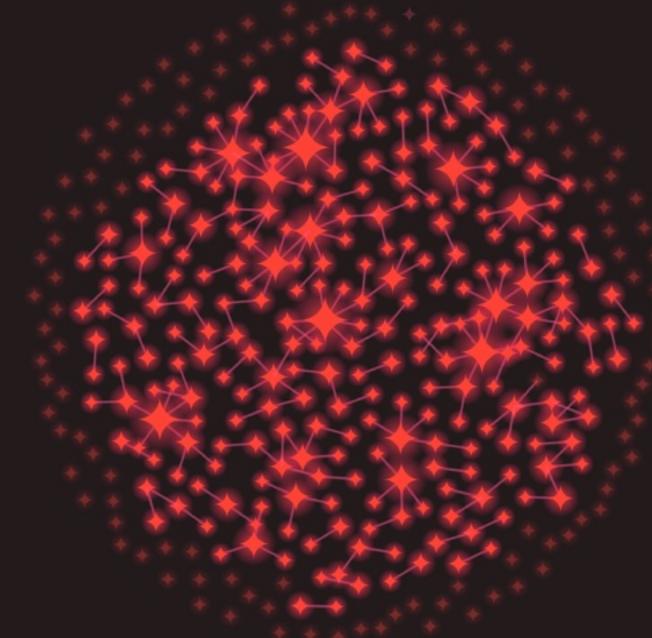
Protection

Outcome

Index cases

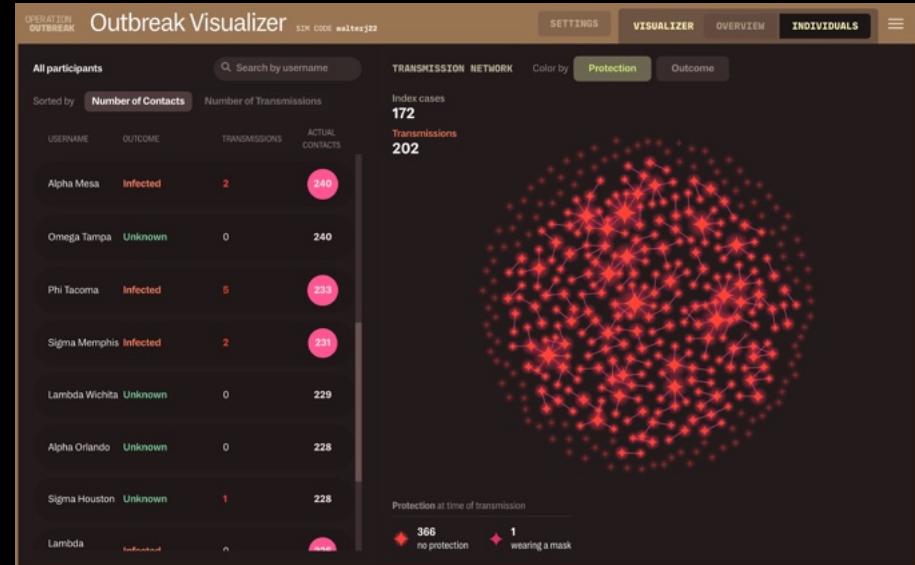
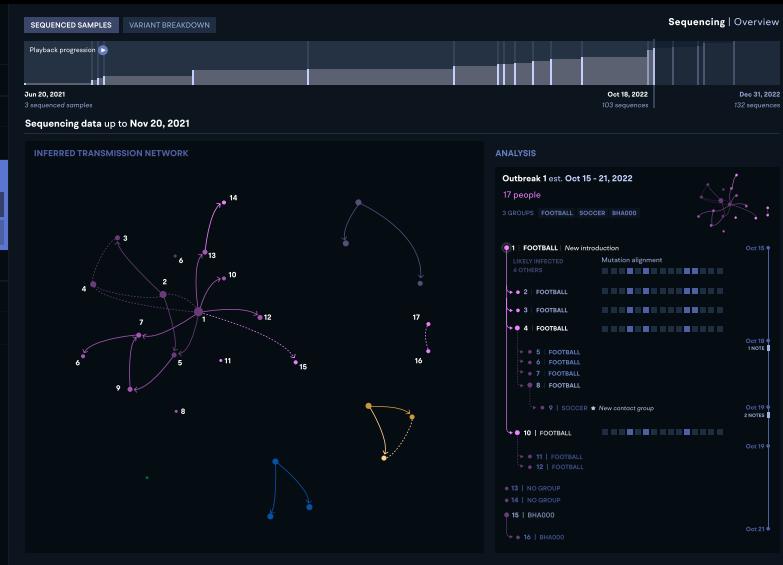
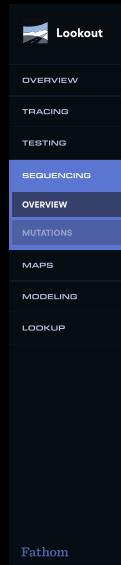
172

Transmissions

202

Protection at time of transmission

 366
no protection 1
wearing a mask



- What didn't work

- **What didn't work**

Distributed systems are hard.

They can be confusing and difficult
to debug.

- What we did to fix it

Use a simple Phoenix monolith

- What didn't work

- What we did to fix it

Name everything with structs



Thank you!