

Integrated Analysis of Data from Automated Instruments

**A case study in repurposing modern "DevOps"
tools for real-time science**

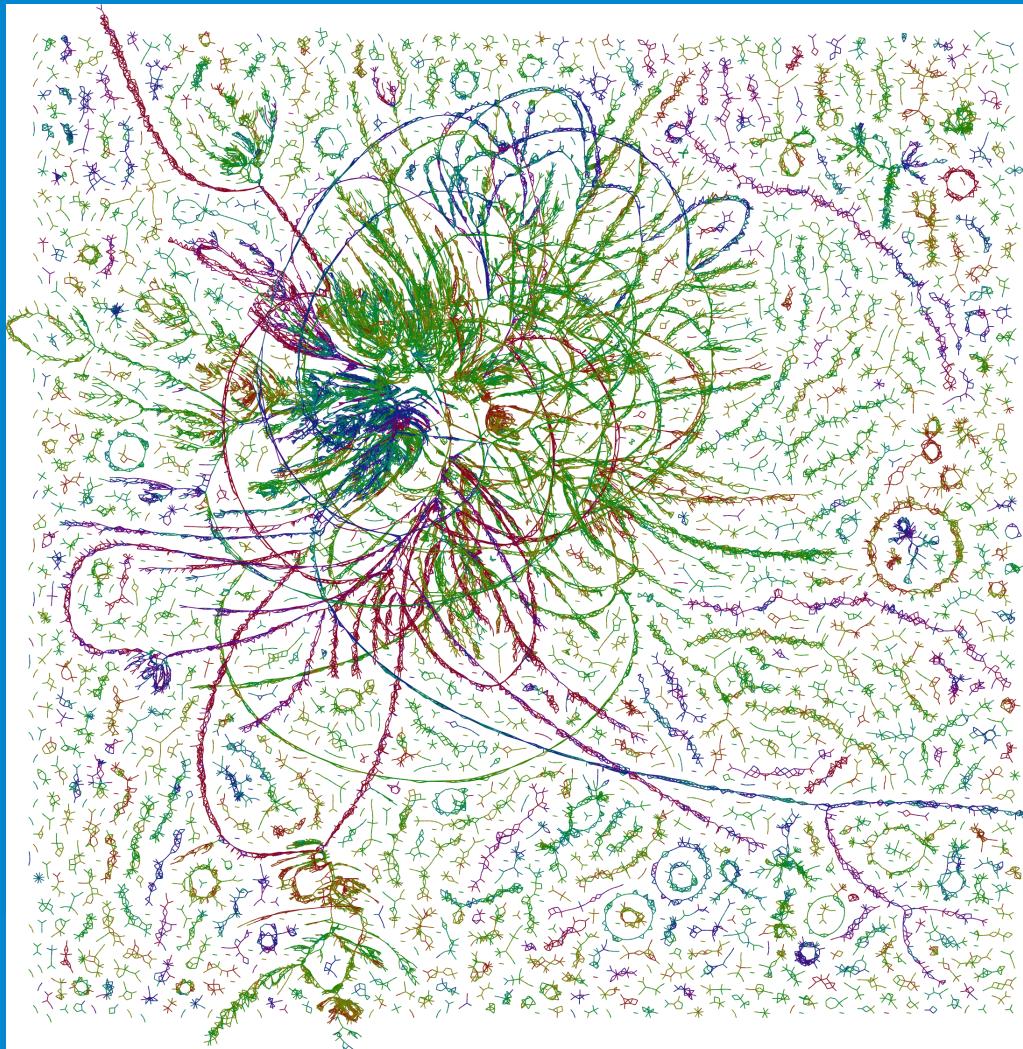
**Vaughn Iverson^{1 2}, Chris Berthiaume¹, Francois Ribalet¹,
Ginger Armbrust¹**

University of Washington

¹ School of Oceanography

² eScience Institute

A bit about me...



...and our lab



SeaFlow: "A census for the very small"

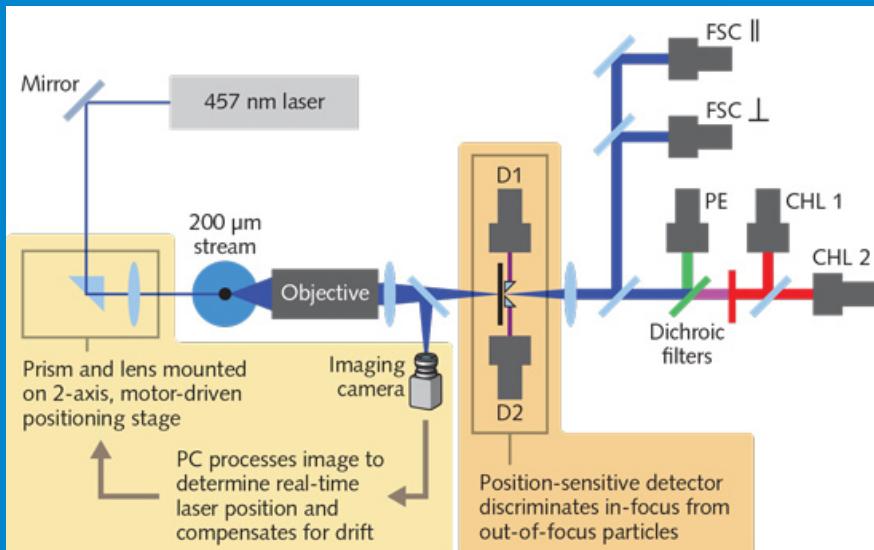
LIMNOLOGY
and
OCEANOGRAPHY: METHODS

Limnol. Oceanogr.: Methods 9, 2011, 466–477
© 2011, by the American Society of Limnology and Oceanography, Inc.

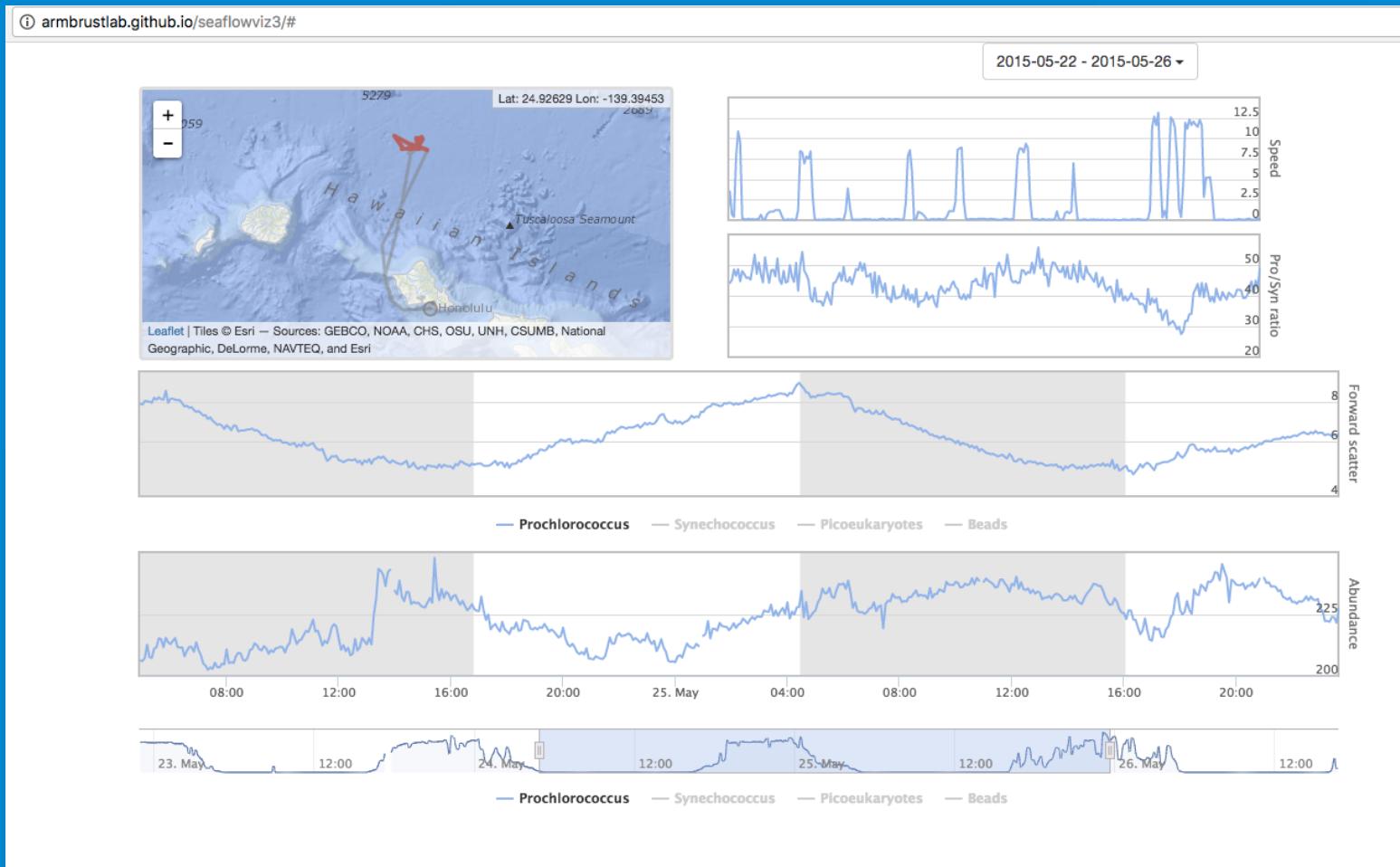
SeaFlow: A novel underway flow-cytometer for continuous observations of phytoplankton in the ocean

Jarred E Swalwell, Francois Ribalet, E. Virginia Armbrust*

School of Oceanography, University of Washington, Box 357940, Seattle, Washington, 98195, USA

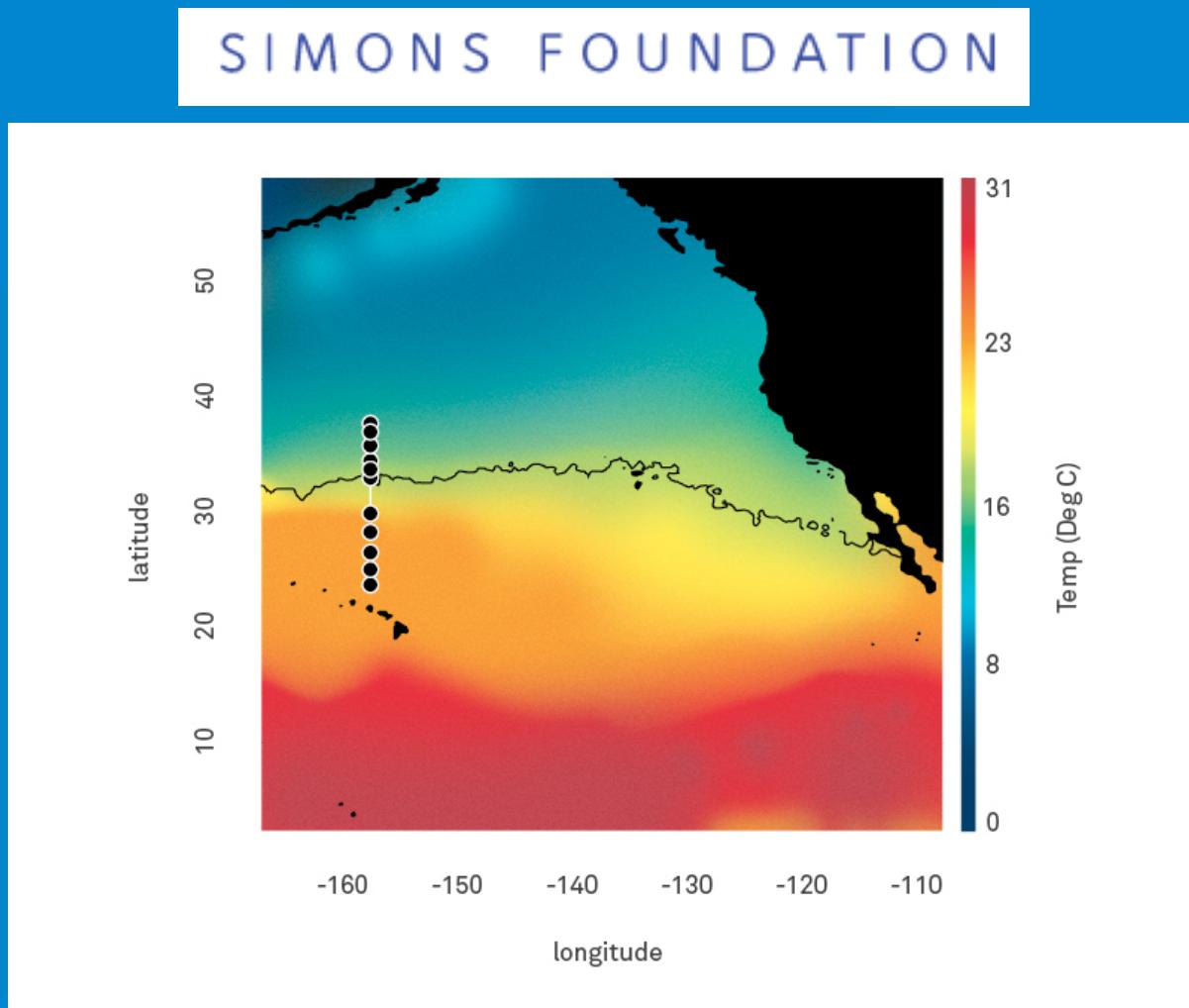


Realtime Integrated Monitoring



<http://armbrustlab.github.io/seaflowviz3>

Gradients Cruise



Gradients Cruise

Now with
MOAR
automated
instruments!



Gradients 2.0

Integrate all the things!
IT will be Great! Build **IT**!

Gradients 2.0

Integrate all the things!
IT will be Great! Build **IT**!

Uh, what is "IT" exactly, again?

Gradients 2.0

Integrate all the things!
IT will be Great! Build **IT**!

Uh, what is "IT" exactly, again?

Oh, you know, that great thing you did for SeaFlow...
... but with **MOAR** Instruments!
Shouldn't be too hard, right? When will **IT** be done?

Gradients 2.0

Integrate all the things!
IT will be Great! Build **IT**!

Uh, what is "IT" exactly, again?

Oh, you know, that great thing you did for SeaFlow...
... but with **MOAR** Instruments!
Shouldn't be too hard, right? When will **IT** be done?

*Um... No. That's not how this works.
We're going to need agree on the requirements first.*

Gradients 2.0

Integrate all the things!
IT will be Great! Build **IT**!

Uh, what is "IT" exactly, again?

Oh, you know, that great thing you did for SeaFlow...
... but with **MOAR** Instruments!
Shouldn't be too hard, right? When will **IT** be done?

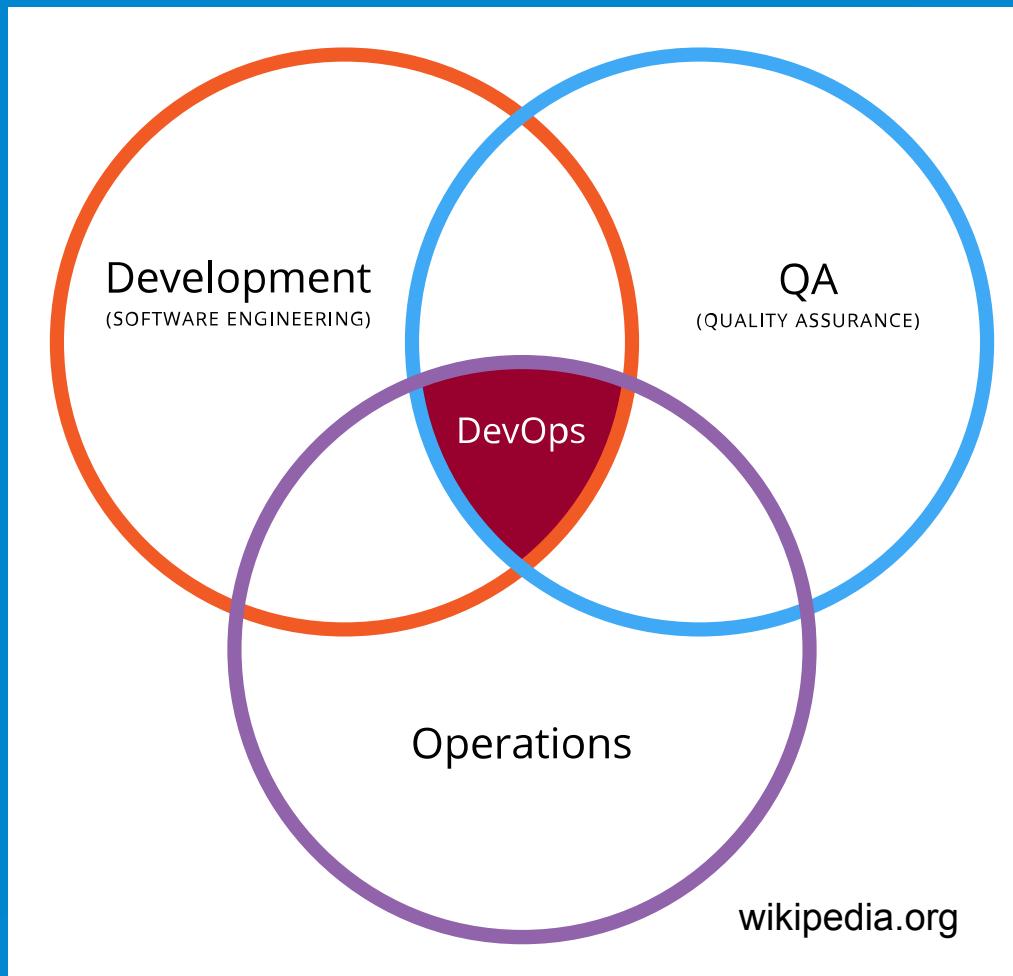
*Um... No. That's not how this works.
We're going to need agree on the requirements first.*

Huh? How do we do that?

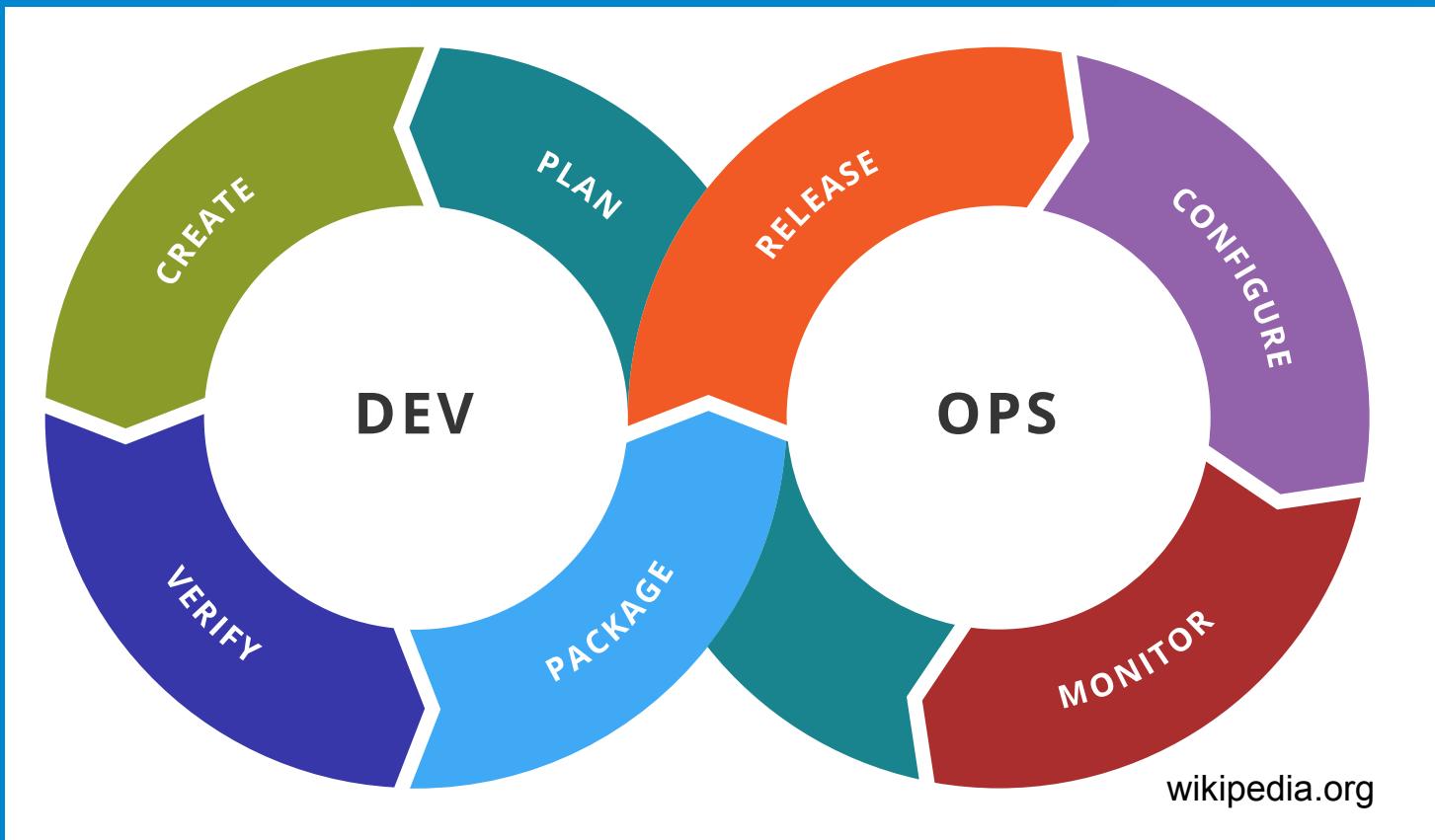
Gradients 2.0 Requirements Summarized:

- Capture as much data as possible, as it's generated
 - From both instruments and experiential results
- Enable simple, realtime interactive plotting
 - Customizable on the fly by scientists
- Tolerate certain hardware and network failures
 - Within defined limits
- Same capabilities available on ship and shore
 - But, lower resolution data on shore

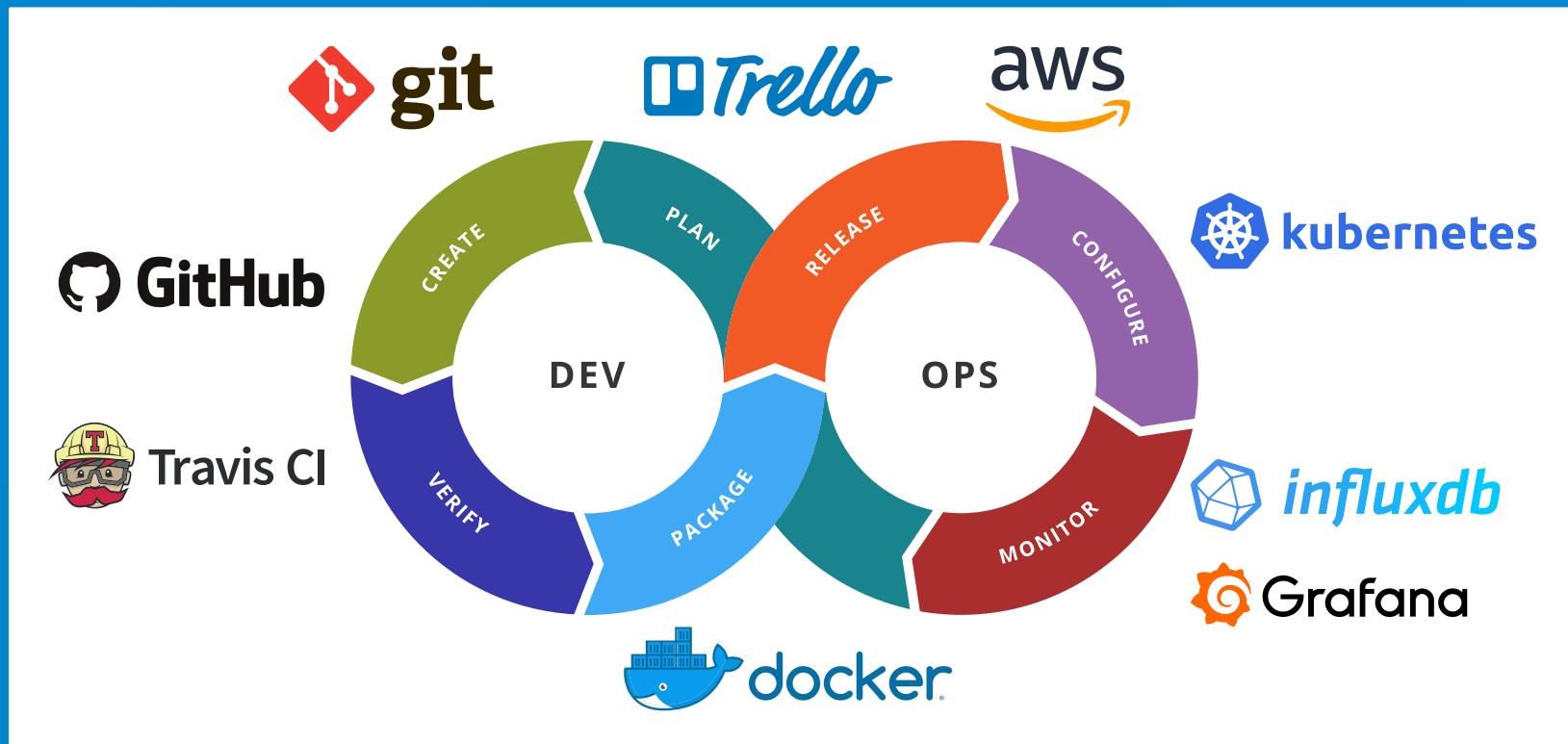
DevOps



DevOps



DevOps



SciOps? *(not PsyOps!)*

Or perhaps: *ResearchOps*

Monitoring tools

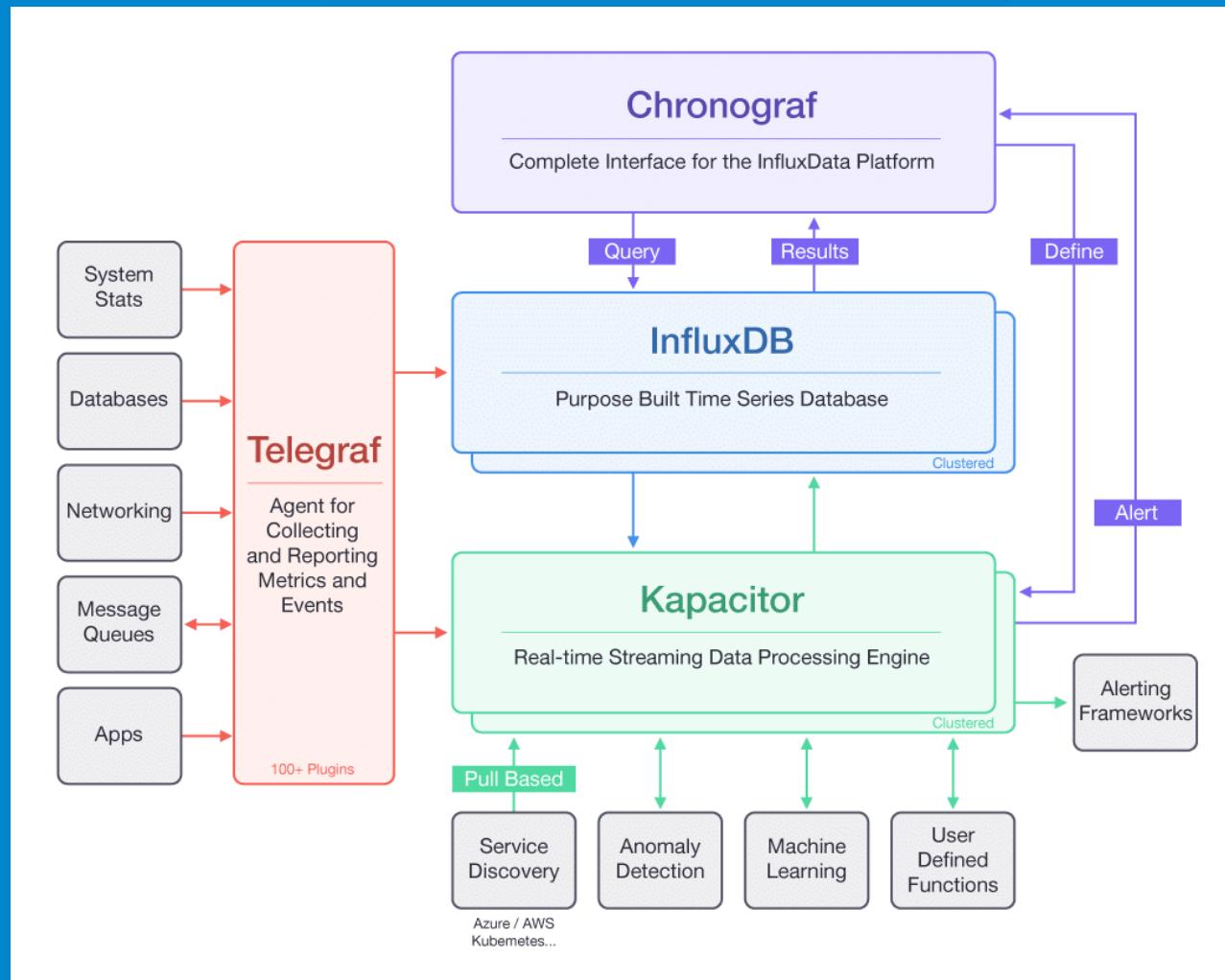


Popular "stacks" of OSS monitoring tools:

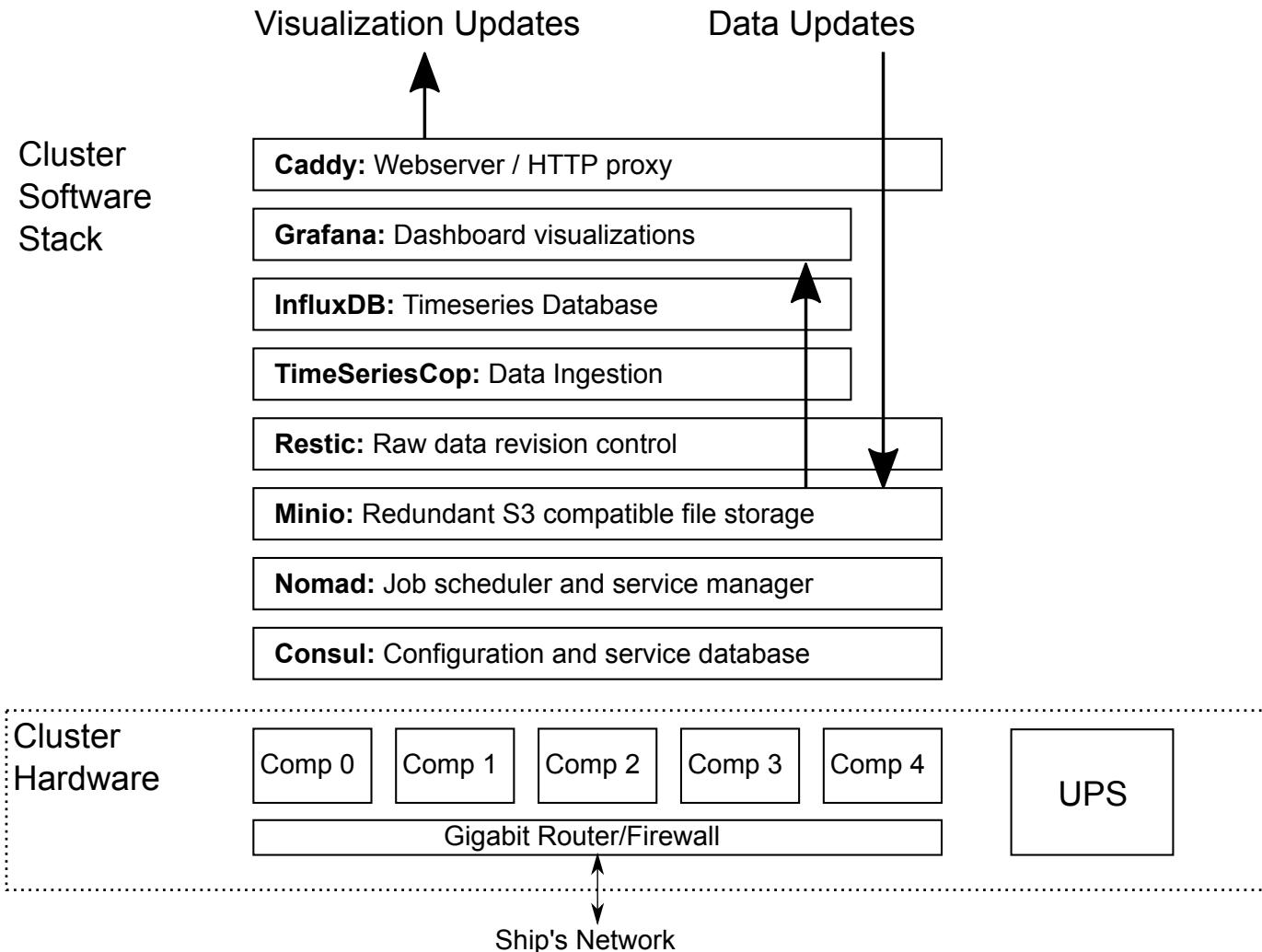
- "**ELK**": Elasticsearch, Logstash, Kibana
- "**TICK**": Telegraf, InfluxDB, Chronograf, Kapacitor

Also popular: Prometheus, Graphite, Grafana

What are all of these things?



Architecture



Monitoring tools



Popular "stacks" of OSS monitoring tools:

- "**ELK**": Elasticsearch, Logstash, Kibana
- "**TICK**": Telegraf, InfluxDB, Chronograf, Kapacitor

Also popular: Prometheus, Graphite, Grafana

InfluxDB

- Open Source DB Optimized for timeseries data
- Simplified table structure:
 - Metrics
 - Measurements
 - Tags
- Familiar "SQL-like" query language
 - Features simplifying time-based calculations

Grafana

- Complete Open Source Dashboard Server
 - Visualization "Panels" are all plug-ins
 - Supports a wide variety of DB backends
 - Most mature and flexible choice
- We added:
 - XY plot plugin
 - Map plugin (based on leaflet) and tile server
- Create/edit/share dashboards without coding
 - (maybe a bit of InfluxQL...)

What did we learn?

- Repurposing delivered functionality and polish
- When people see the value, they will put data in
- Integrated realtime data aided in making decisions



Demo / Resources

Gradients Dashboard: <https://gradientscruise.com>

Grafana Playground: <http://play.grafana.org>

InfluxDB: <http://influxdata.com>

Restic: <https://restic.net>

Minio: <https://minio.io>

Consul/Nomad: <https://www.hashicorp.com>

This talk: <https://github.com/vsivsi/COHWpres>

Thanks!