Alex Hidalgo (@ahidalgosre)
Alex Lee (@ahl91)
Squarespace Site Reliability Engineering

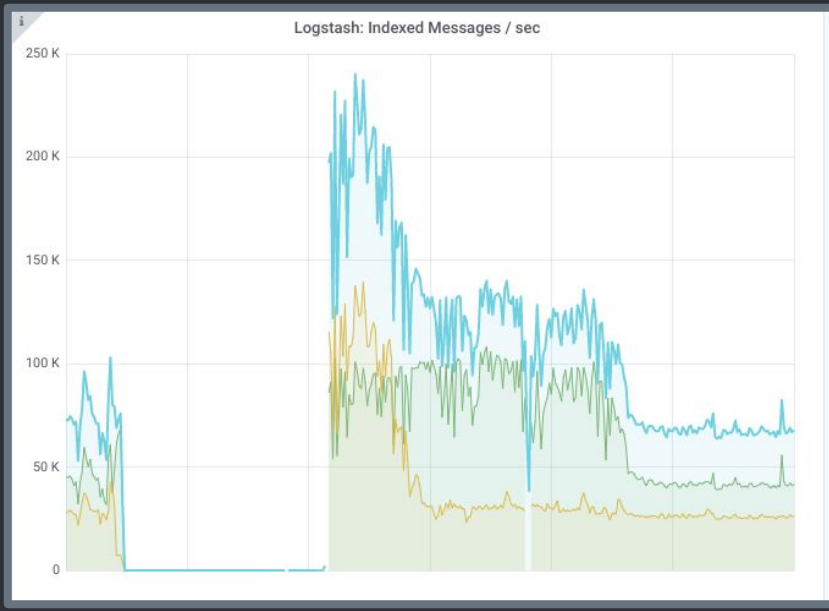
How to SRE When Everything is Already on Fire

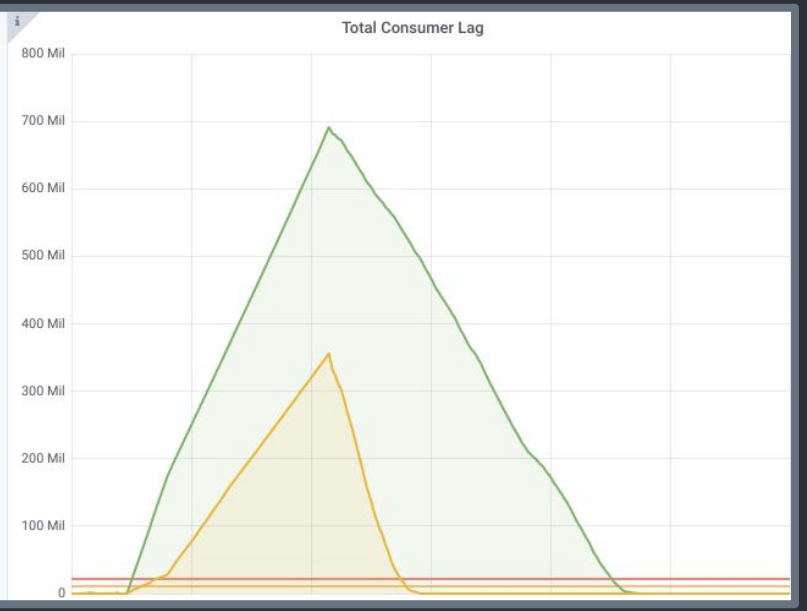
Tuesday, March 5th, 2019
20:00 ET

It is always darkest before the dawn

A PHENOMENAL EVENING

	1st Half	2nd Half	Final
VCU Rams	28	43	71
GMU Patriots	21	15	36


Logstash: Indexed Messages / sec
250 K
200 K
150 K
100 K
50 K
0


Total Consumer Lag
800 Mil
700 Mil
600 Mil
500 Mil
400 Mil
300 Mil
200 Mil
100 Mil
0

The same ignored problem that had been cropping up for weeks had returned.

Who are we?

Alex Hidalgo

@ahidalgosre

Squarespace Observability SRE

Alex Lee

@alee_sre

Service Reliability

85% ➔ 99.9%

None of this is new

NONE OF THIS IS NEW

Alarm Fatigue is studied

- Healthcare
- Mining
- Construction
- *NUCLEAR POWER INDUSTRY*

“A liar will not be believed, even when they speak the truth.” - Aesop

(Like 2600 years ago)

NONE OF THIS IS NEW (REDUX)

- Service reliability has been studied, too
  - Alert on what actually matters
  - Develop SLIs and SLOs
  - Increase your Observability
  - Improve tooling and automation
  - Trust proven paradigms
  - Conduct meaningful postmortems

CONTEXT

How we got here

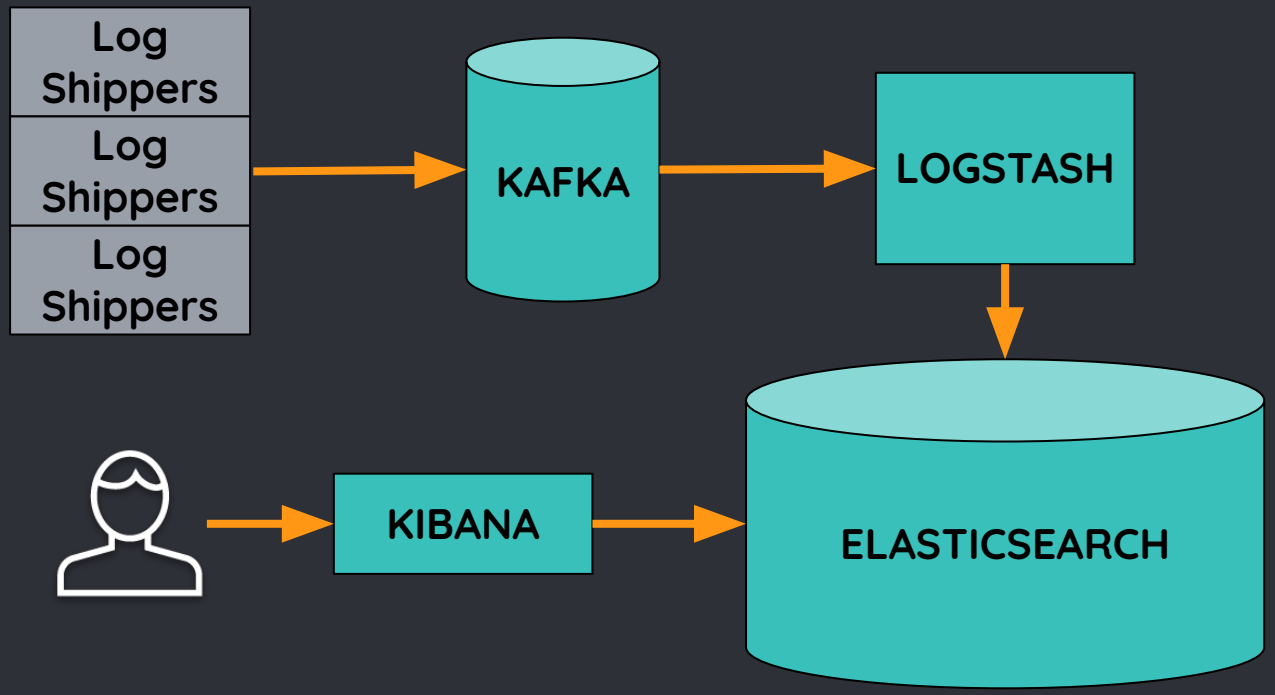
Spring 2015

The introduction of ELK

ELK @ SQUARESPACE

- Open-source log aggregation
- Scale observability platforms with growing Squarespace infrastructure
- Highest-trafficked service at Squarespace

ELK @ SQUARESPACE



August 2018

An unhealthy stack

1

ALERT ON WHAT MATTERS

Put your users first

DEVELOP MEANINGFUL SLOs

INCREASE YOUR OBSERVABILITY

IMPROVE YOUR ENVIRONMENT

TRUST PROVEN PARADIGMS

CONDUCT MEANINGFUL POSTMORTEMS

OLD ALERTS

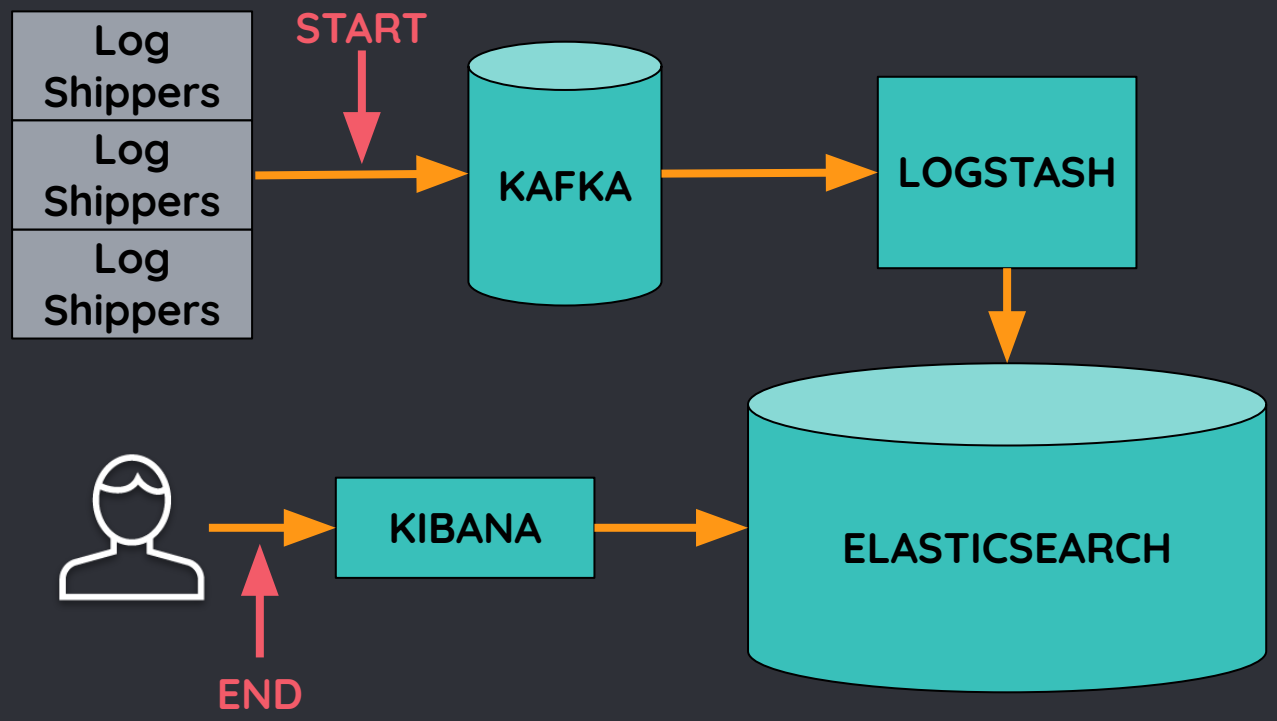
- Logstash process
- Logstash-to-Kafka connection
- Logstash-to-Elasticsearch connection
- Logstash-to-Elasticsearch throughput
- Elasticsearch process
- Elasticsearch “cluster block”

- Noisy
- Only “known-unknowns”
- Not user-focused

Alert on what matters.
Put your users first.

“My logs are delayed. Is ELK having issues?”

ELK @ SQUARESPACE



NEW ALERT, SINGULAR

SLI

$$\frac{\text{Kafka lag (msg)}}{\text{Logstash rate (msg/s)}} = \text{End-to-end Latency (s)}$$

“My logs are delayed. Is ELK having issues?”

“Yes, logs are delayed by ~5 minutes.”

ALERT ON WHAT MATTERS

2

DEVELOP MEANINGFUL SLOs

Don’t try to be perfect

INCREASE YOUR OBSERVABILITY

IMPROVE YOUR ENVIRONMENT

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CONDUCT MEANINGFUL POSTMORTEMS

SERVICE RELIABILITY PRINCIPLES

1. Reliability is the most important feature of your service.
2. Your users determine what reliable means.
3. Nothing works all the time, so don’t aim for it.

THE RELIABILITY STACK

SLI

SERVICE LEVEL INDICATORS

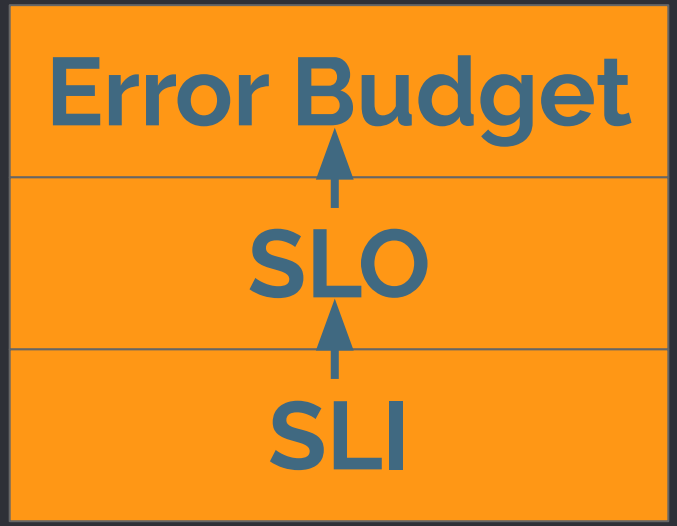
- A metric used to define how a service is operating
- Most often a ratio of good events over total events
- Measures how your service is doing from user's perspective

THE RELIABILITY STACK

SERVICE LEVEL OBJECTIVES

- A target percentage informed by an SLI
- Often with a threshold involved
- Nothing is ever 100% reliable, so an SLO lets you pick a reasonable number

THE RELIABILITY STACK



ERROR BUDGETS

- Calculating how well your SLO has performed over a period of time
- An SLO implies acceptable levels of errors or problems
- For example, 99.9% available also means “we’re gonna have 43 bad minutes every 30 days.”

ERROR BUDGETS ARE AWESOME

Surplus Error Budget? → Do what you want!

Out of Error Budget? → Focus on reliability.

Tuesday, March 5th, 2019
20:00 ET

Yet another incident begins

Tuesday, March 5th, 2019
20:36 ET

Error budget exhaustion declared

Monday, March 4th, 2019
16:29 ET

SLO was defined

“A logline will be processed on average within 5 minutes 99% of the time.”

99% target =

1% = 7h 18m 17s

bad time/30 days

Jon Thornton
Mar 5, 2019

This sounds like a great v1 SLO

Tanya Reilly
Mar 5, 2019

+1!

With no remaining error budget, we gave ourselves permission to go all-in

ALERT ON WHAT MATTERS

DEVELOP MEANINGFUL SLOs

3

INCREASE YOUR OBSERVABILITY

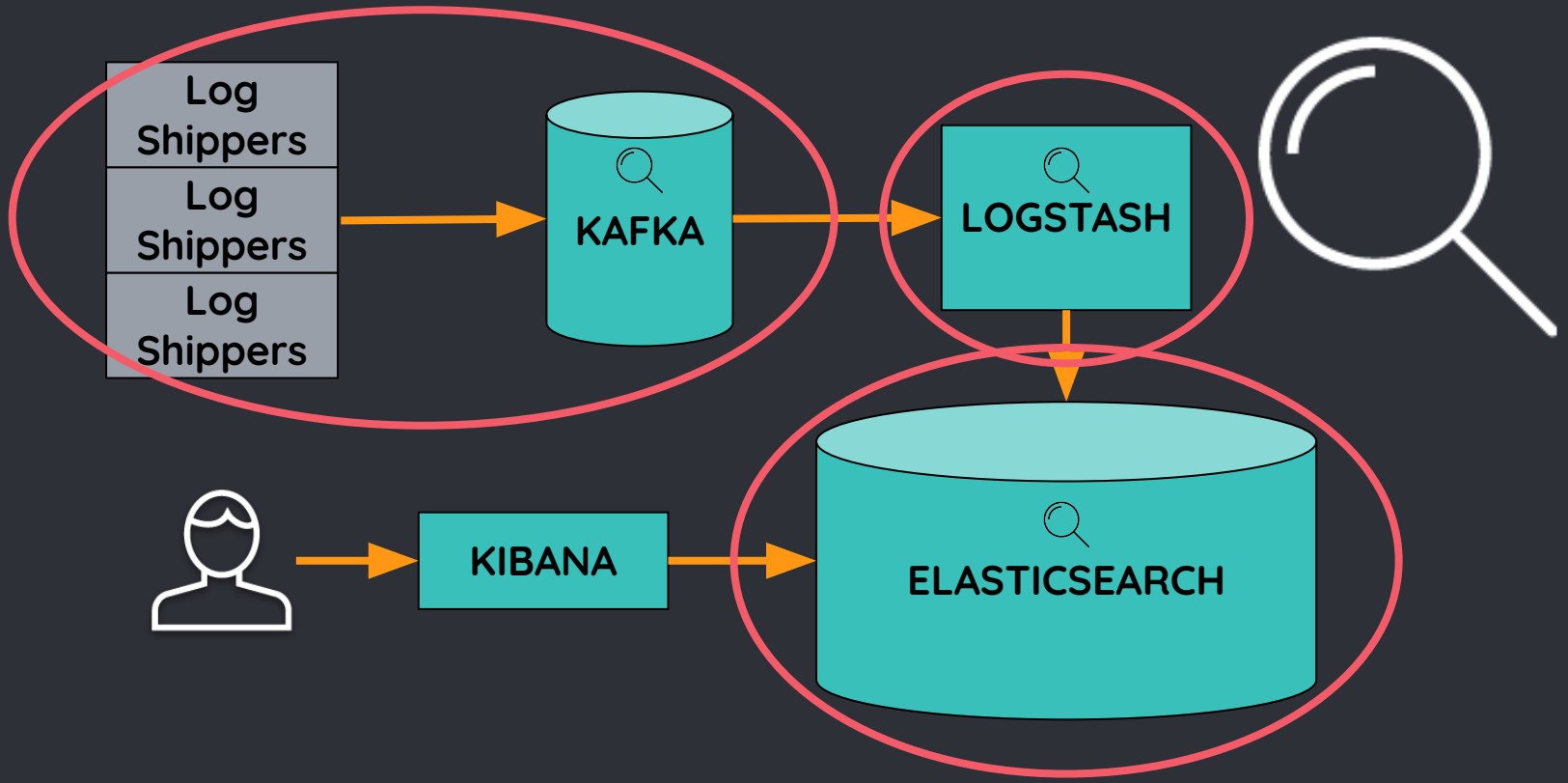
You need to know what is happening to fix it

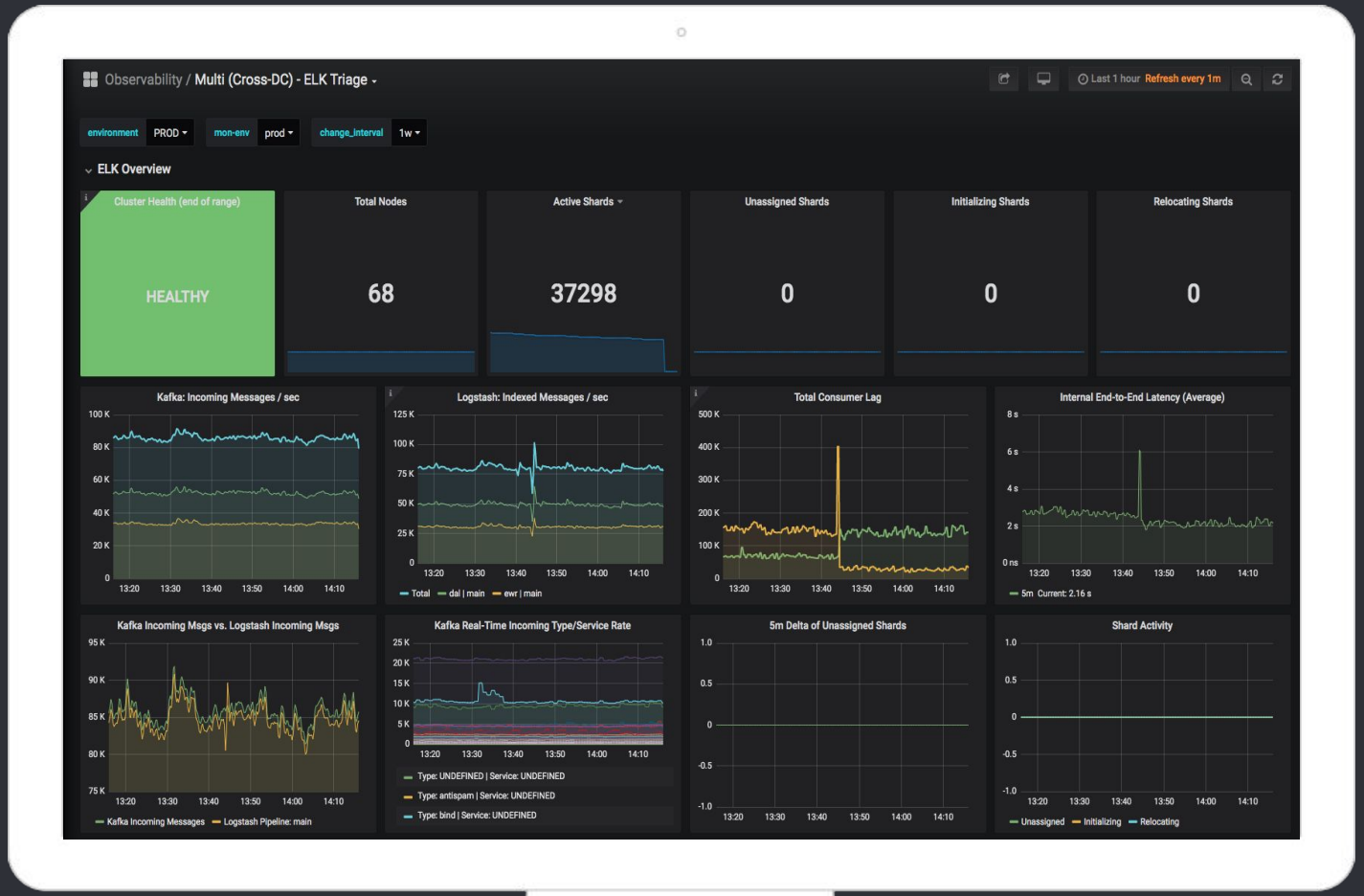
IMPROVE YOUR ENVIRONMENT

TRUST PROVEN PARADIGMS

CONDUCT MEANINGFUL POSTMORTEMS

ELK @ SQUARESPACE




Observability / Multi (Cross-DC) - ELK Triage
Last 1 hour
Refresh every 1m
environment
PROD
mon-env
prod
change_interval
1w
ELK Overview
Cluster Health (end of range)
HEALTHY
Total Nodes
68
Active Shards
37298
Unassigned Shards
0
Initializing Shards
0
Relocating Shards
0
Kafka: Incoming Messages / sec
Logstash: Indexed Messages / sec
Total
dal | main
ewr | main
Total Consumer Lag
Internal End-to-End Latency (Average)
5m Current: 2.16 s
Kafka Incoming Msgs vs. Logstash Incoming Msgs
Kafka Incoming Messages
Logstash Pipeline: main
Kafka Real-Time Incoming Type/Service Rate
Type: UNDEFINED | Service: UNDEFINED
Type: antispam | Service: UNDEFINED
Type: bind | Service: UNDEFINED
5m Delta of Unassigned Shards
Shard Activity
Unassigned
Initializing
Relocating

ALERT ON WHAT MATTERS

DEVELOP MEANINGFUL SLOs

INCREASE YOUR OBSERVABILITY

4

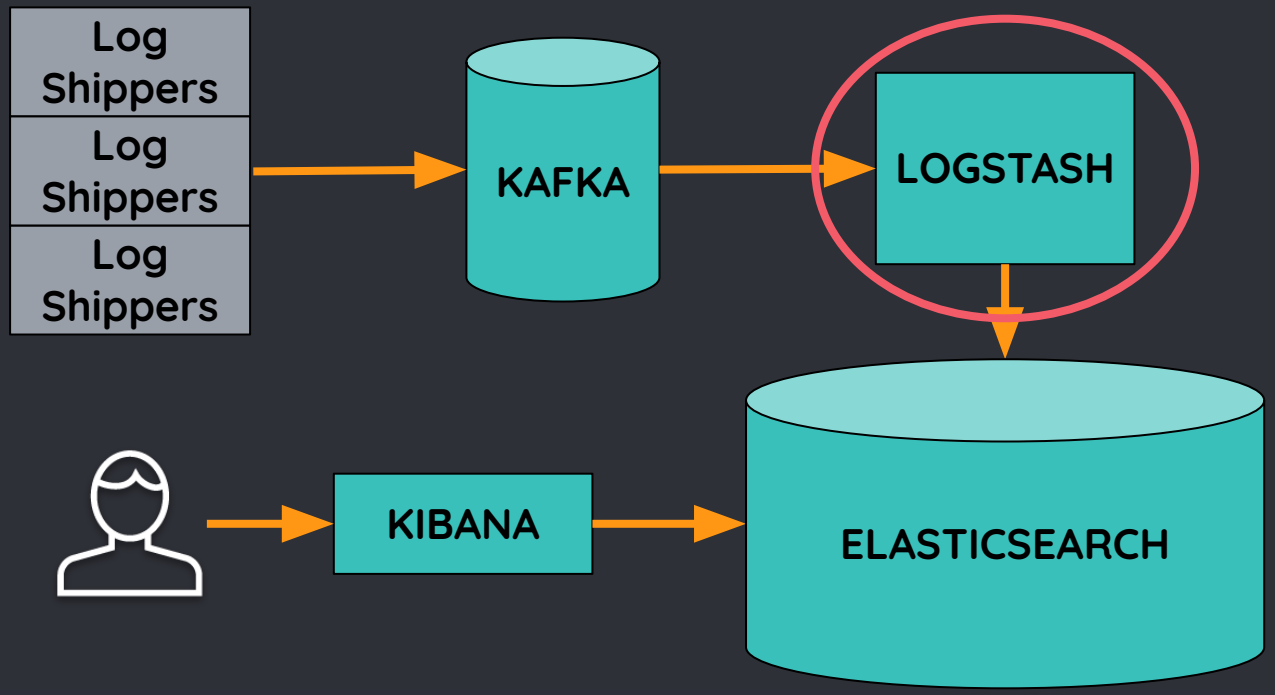
IMPROVE YOUR ENVIRONMENT

Tooling and automation are your friends

TRUST PROVEN PARADIGMS

CONDUCT MEANINGFUL POSTMORTEMS

ELK @ SQUARESPACE



ELK @ SQUARESPACE

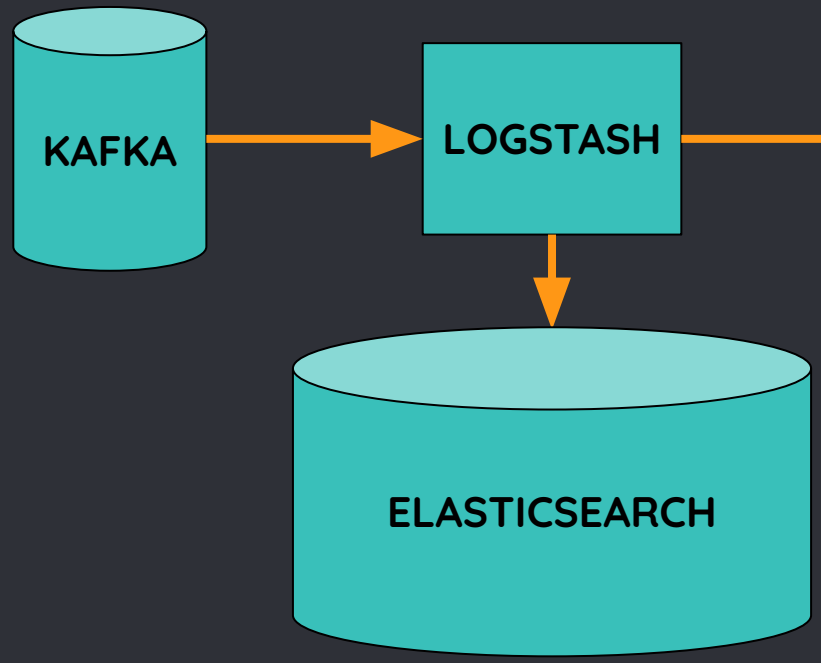
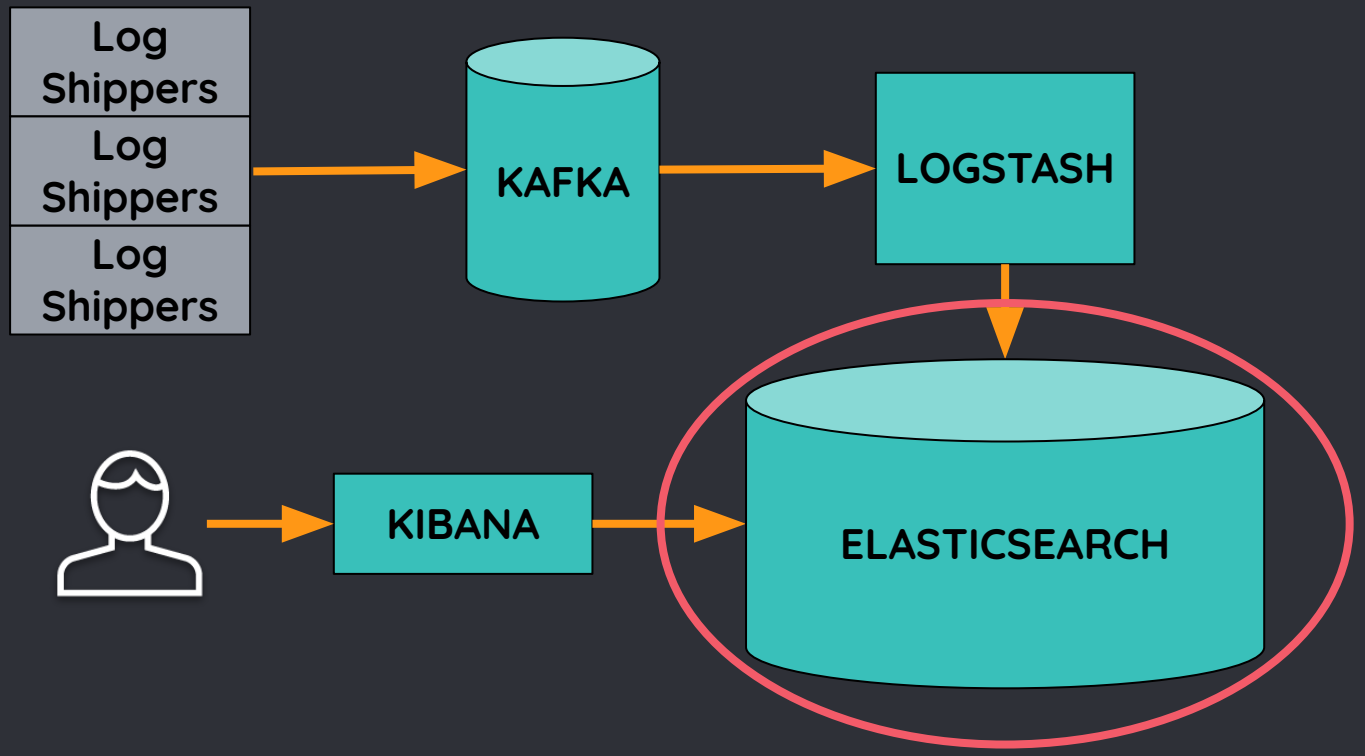


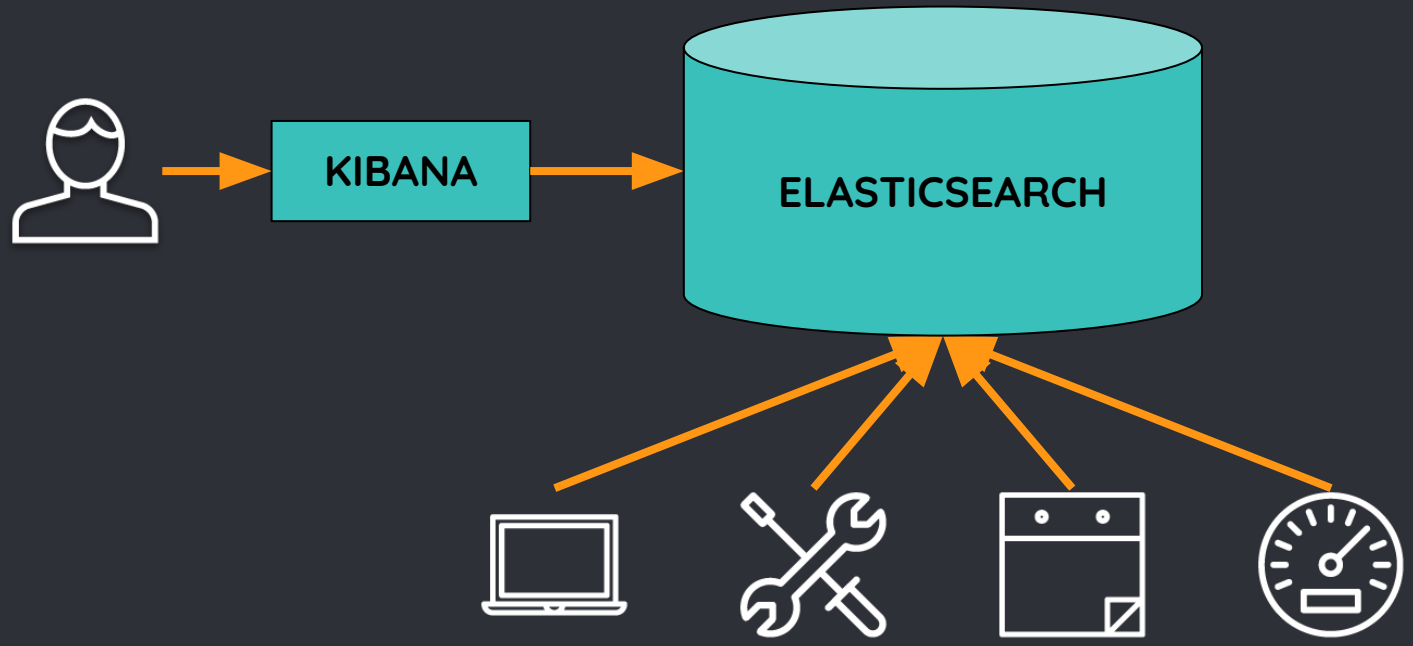
Photo of a black hole

NASA, April 2019

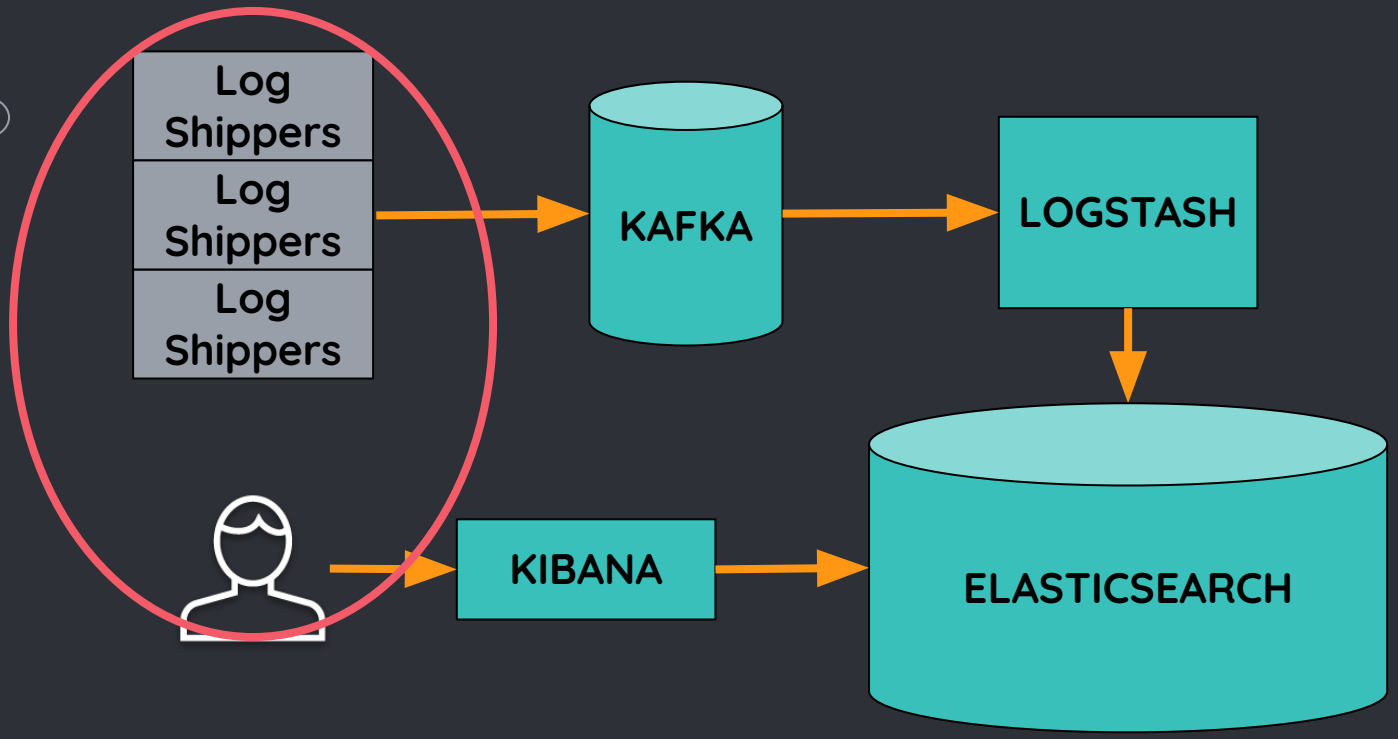
ELK @ SQUARESPACE



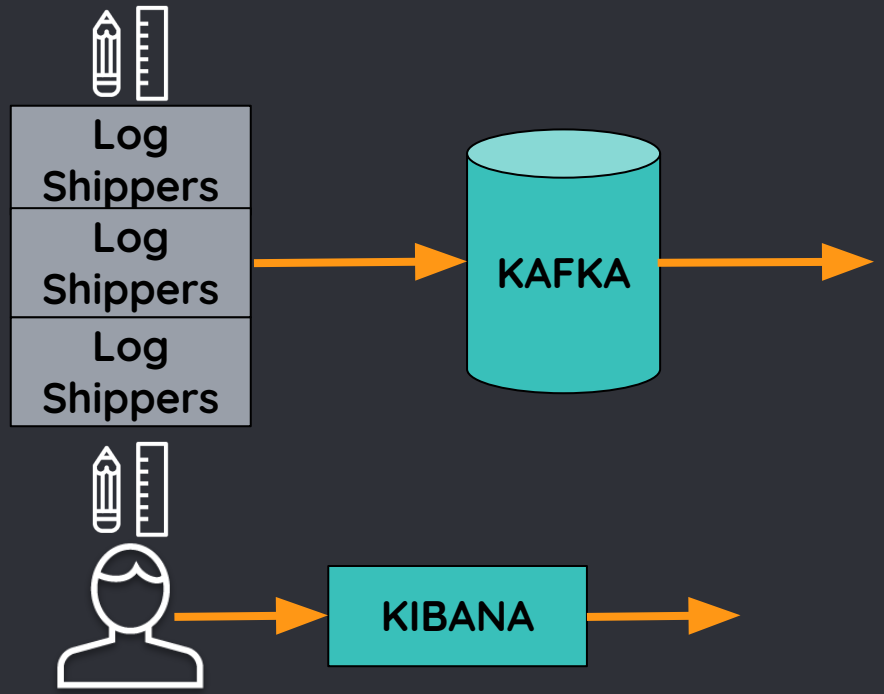
ELK @ SQUARESPACE



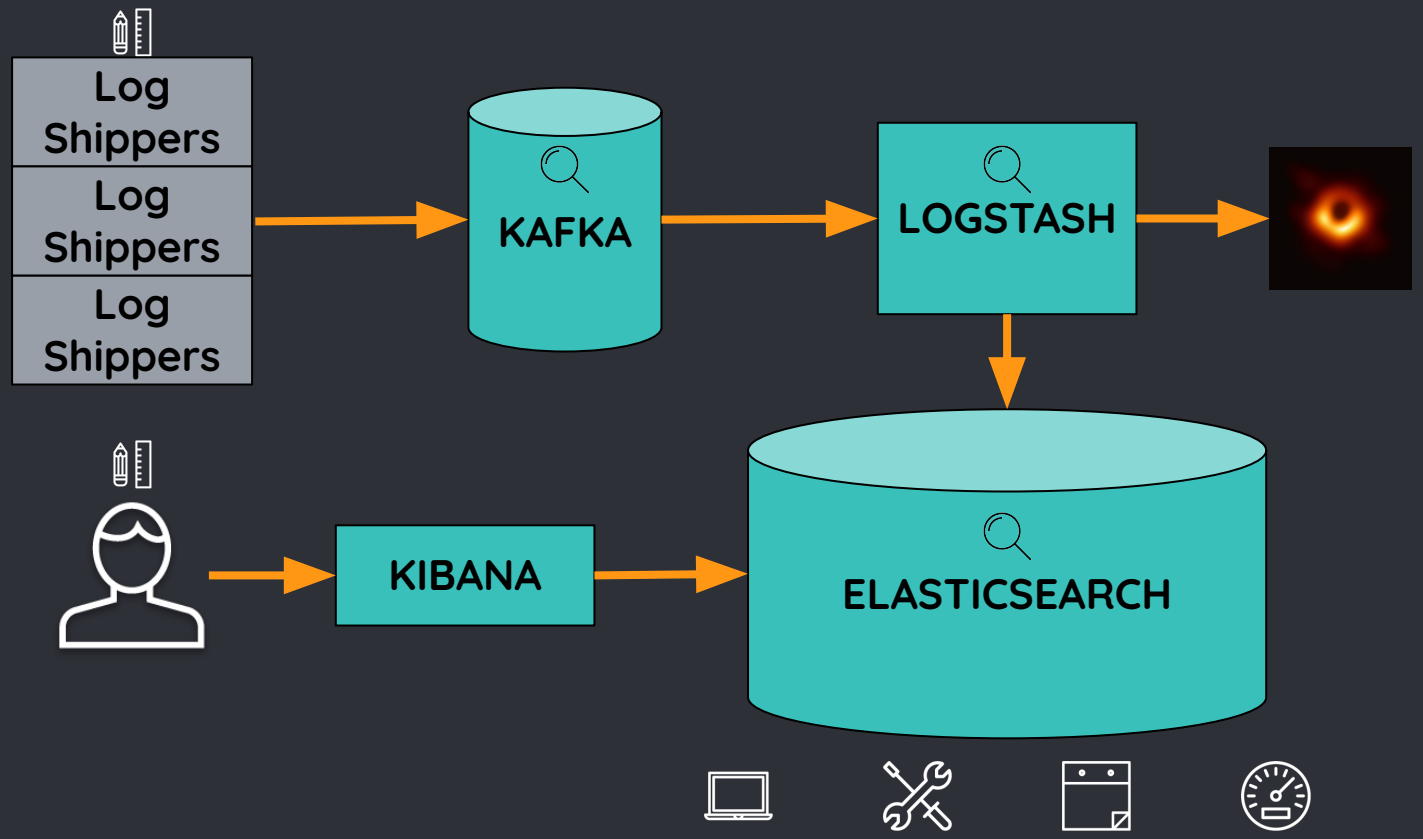
ELK @ SQUARESPACE



ELK @ SQUARESPACE



ELK @ SQUARESPACE



ALERT ON WHAT MATTERS

DEVELOP MEANINGFUL SLOs

INCREASE YOUR OBSERVABILITY

IMPROVE YOUR ENVIRONMENT

5

TRUST PROVEN PARADIGMS

We can learn from those that came before us

CONDUCT MEANINGFUL POSTMORTEMS

The tech industry is hurtling towards adopting known processes instead of continuing to invent our own.

THIS RELIABILITY STUFF ISN'T NEW

- Engineers have been working on reliability for as long as humans have been building stuff
- Statisticians have been analyzing data for centuries
- Emergency responders have been focused on response for just as long

THE INCIDENT COMMAND SYSTEM

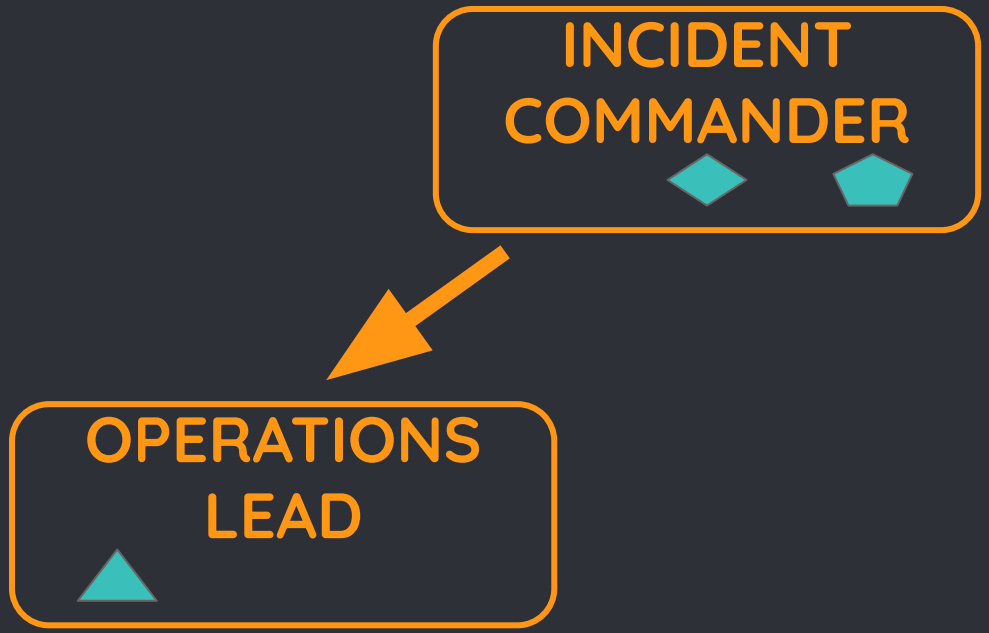
- Formalized in 1968 by Fire Chiefs in Phoenix, Arizona
- They had resolved to streamline and improve response
- Based upon serious research and data

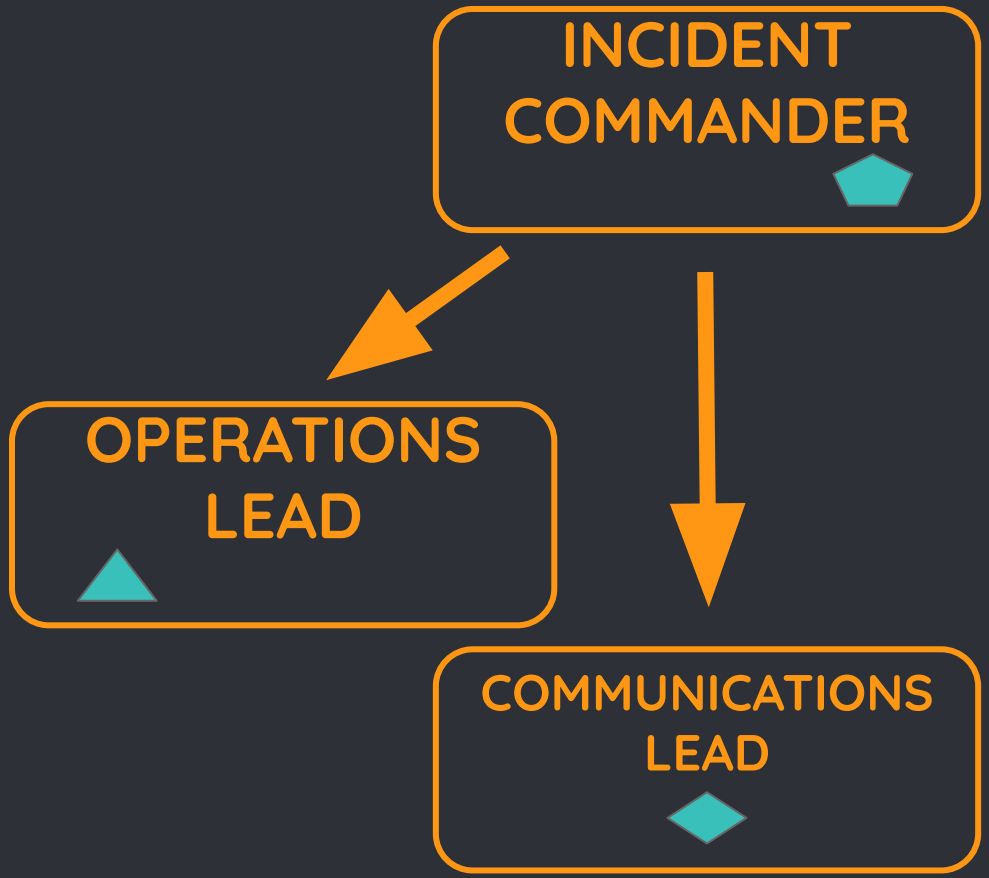
PROBLEMS THE ICS ADDRESSES

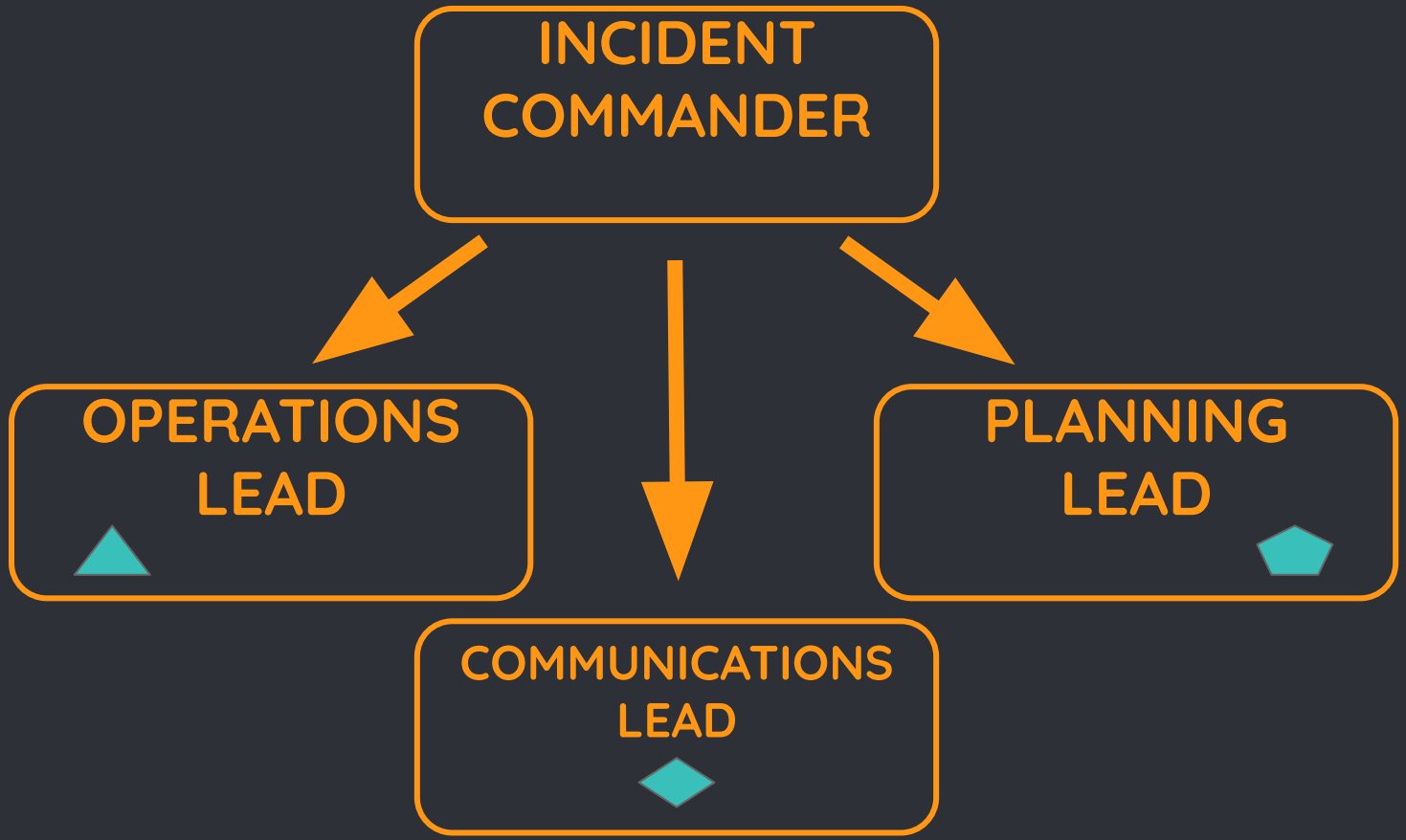
- Lack of accountability
- Poor communications
- No established hierarchy
- Too much freelancing

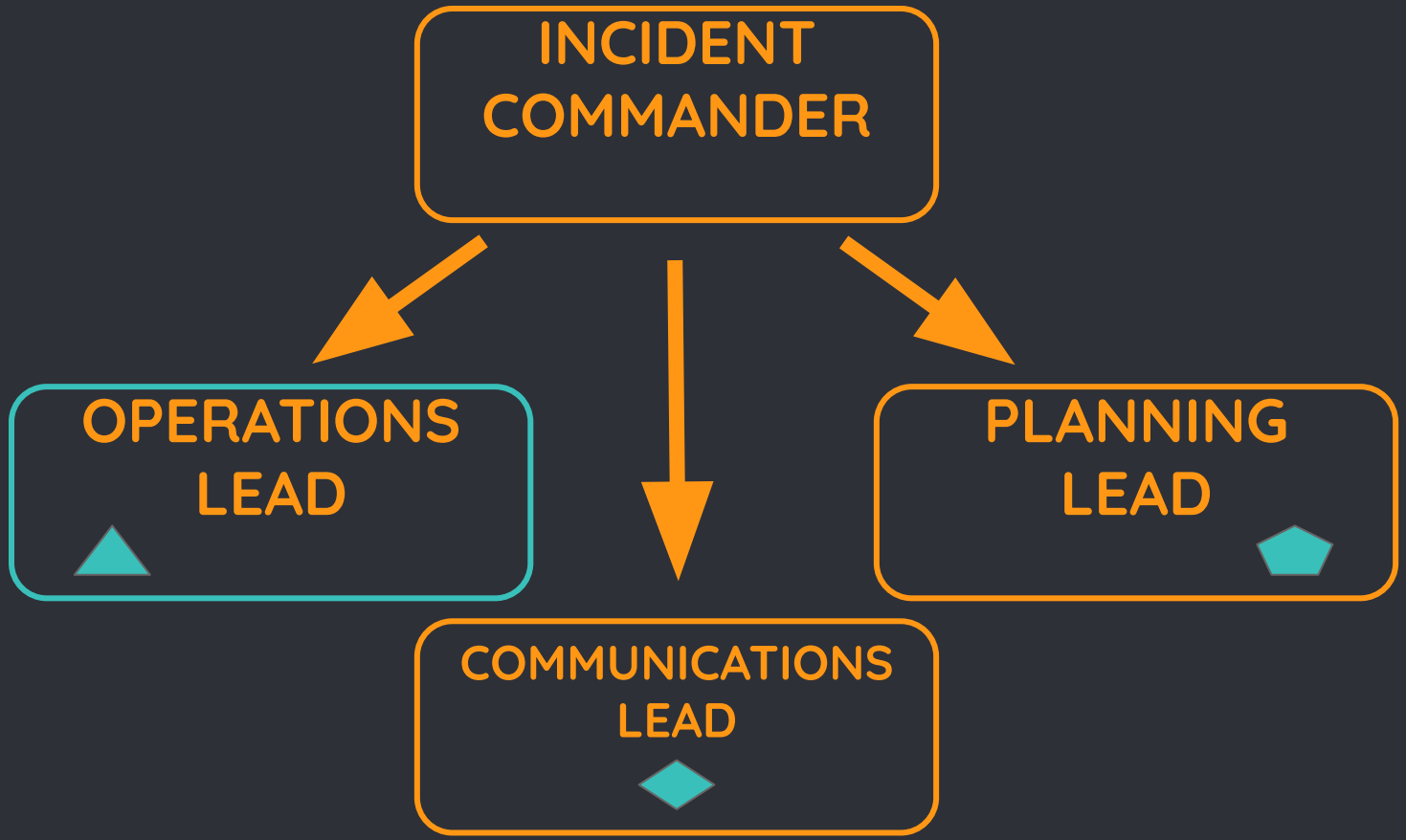
Delegation of Duties

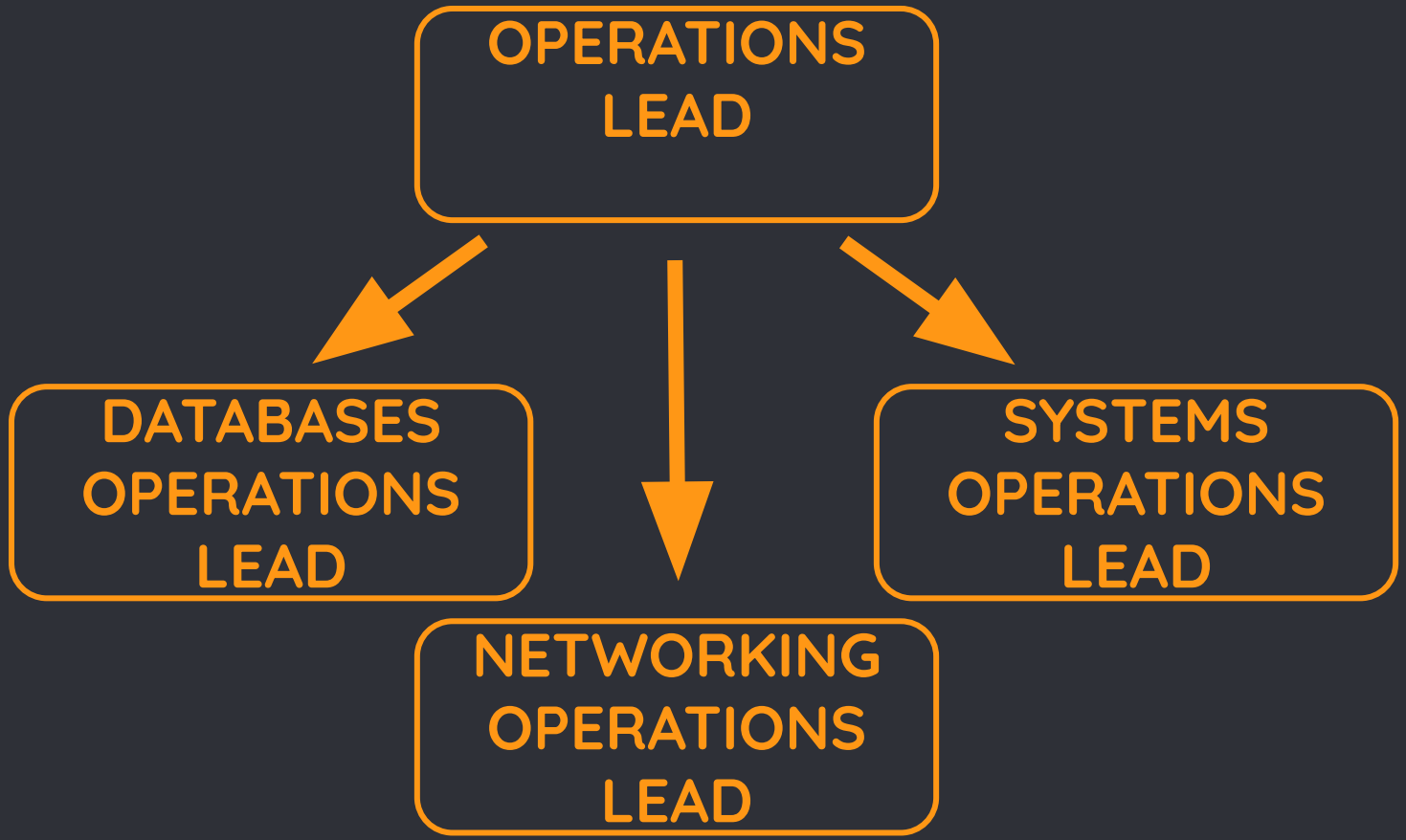
INCIDENT COMMANDER


INCIDENT COMMANDER
OPERATIONS LEAD


INCIDENT COMMANDER
OPERATIONS LEAD
COMMUNICATIONS LEAD


INCIDENT COMMANDER
OPERATIONS LEAD
PLANNING LEAD
COMMUNICATIONS LEAD


INCIDENT COMMANDER
OPERATIONS LEAD
PLANNING LEAD
COMMUNICATIONS LEAD


OPERATIONS LEAD
DATABASES OPERATIONS LEAD
NETWORKING OPERATIONS LEAD
SYSTEMS OPERATIONS LEAD

Handing Off

INCIDENT COMMANDER 1

INCIDENT COMMANDER 2

INCIDENT COMMANDER 1

INCIDENT COMMANDER 2

INCIDENT COMMANDER 2

INCIDENT COMMANDER 1

INCIDENT COMMANDER 2

A ticking time bomb was getting ready to explode...

Thursday, March 21st, 2019
20:00 ET

We’re better working together

TIMELINE OF A 37-HOUR INCIDENT

- 2019-03-21 20:00 ET - Consumer lag starts increasing
- 20:05 ET - Node with too many new shards identified
- 20:10 ET - Ran `cancel_future` command to move shards
- 2019-03-22 00:30 ET - Disengaged while the cluster recovers
- 01:00 ET - `precreate_indices` script runs
- 01:00-06:30 ET - Indexing slump as shards are moved
- 08:05 ET - Allocation set to `primaries`
- 08:10 ET - An apparently stuck node is restarted
- 08:48 ET - Translog heap changed from 512MB to 2GB
- 10:00 ET - All logstash nodes are restarted
- 13:02 ET - Identified new erroring logs to filter out
- 14:18 ET - Incident Commander hands off and goes to bed

TIMELINE OF A 37-HOUR INCIDENT

- Probably tried changing something about the indexers
- Maybe tried to move more shards around
- Let's try restarting the load balancers, or something?
- **HANDOFF**
- **HANDOFF**
- **HANDOFF**
- **HANDOFF**
- 2019-03-23 - 09:23 ET - **ALL CLEAR**

When your back is against the wall your perspective changes.

Sunday, March 24th, 2019 Afternoon

A beautiful day

SEE THE FOREST FOR THE TREES

- The problem was clearly shard related
- But, what if it wasn't the new shards...
- What if it was the **total** number of shards?

Google, “How many shards should I have in my Elasticsearch cluster?”

18 SEPTEMBER 2017 ENGINEERING

EN ES PT CN KR JP FR DE

How many shards should I have in my Elasticsearch cluster?

By Christian Dahlqvist

Share

elastic.co/blog/how-many-shards-should-i-have-in-my-elasticsearch-cluster

“

“A node with a 30GB heap should therefore have a maximum of 600 shards, but the further below this limit you can keep it the better.”

elastic.co/blog/how-many-shards-should-i-have-in-my-elasticsearch-cluster

$$600 < 2200$$

THE UNSHARDENING

ALERT ON WHAT MATTERS

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INCREASE YOUR OBSERVABILITY

IMPROVE YOUR ENVIRONMENT

TRUST PROVEN PARADIGMS

6

CONDUCT MEANINGFUL POSTMORTEMS

Learn from your own past

“A postmortem is an argument for change.”

- Nida Farrukh, Monitorama 2019

KEY COMPONENTS

Data Collection

DATA COLLECTION

1. Impact Assessment
   - User-focused
2. Timeline
   - Started, Detected, Engaged, Mitigated
3. Contributing Factors
   - Root cause fallacy

KEY COMPONENTS

Data Collection

↓

Lessons Learned

LESSONS LEARNED

- What went well?
- What went poorly?
- Where did we get lucky?

KEY COMPONENTS

Data Collection

↓

Lessons Learned

↓

Repair Items

REPAIR ITEMS

Incident Response

- Timeline analysis
- TT Detect
- TT Engage
- TT Mitigate

System

- Preventative / Mitigative
- “Why do we even X?”

Diversity of backgrounds and expertise is key!

April 23, 2019

Recording this chapter of ELK

Postmortem Report: 2019 State of ELK

Squarespace Engineering | Operational Excellence

Incident Date: 2019-01 to 2019-04-04
COE Jira Ticket: COE-730, COE-753, COE-774, COE-790
Authors: Alex Lee
Contributors: Mike Du Russel, Hannan Butt, Alex Conway, Weitao Jiang, Alex Hidalgo

Customer Impact

Over a period of several months, Squarespace engineers could not reliably depend on ELK.

April 29, 2019

The End

... Or is it?

7

ITERATE OVER EVERYTHING

Again and again and again...

You can make good be great.

PROGRESS IS INCREMENTAL

Things we continued to do for a while:

- Everything!

Things we continue to do until this day:

- Everything!

Friday, May 10th, 2019
15:30 ET

SLO target improved

OLD:

"A logline will be processed on average within 5 minutes 99% of the time."

NEW:

*"A logline will be processed on average within **2** minutes **99.9%** of the time."*

Alex Hidalgo
3:30 PM May 10

We are updating this to 99.9% processed within an average of 2 minutes.

Jon Thornton
5:19 PM May 10

:dogeintesifies:

CONCLUSIONS

ALERT ON WHAT MATTERS

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ITERATE OVER EVERYTHING

Again and again and again...

It’s always darkest before the dawn

“You’re going to be amazing.”

Thank you!

Alex Hidalgo - @ahidalgosre
Alex Lee - @ahl91

Shout Outs:

Squarespace Engineering

https://engineering.squarespace.com

Slidesgala.com