

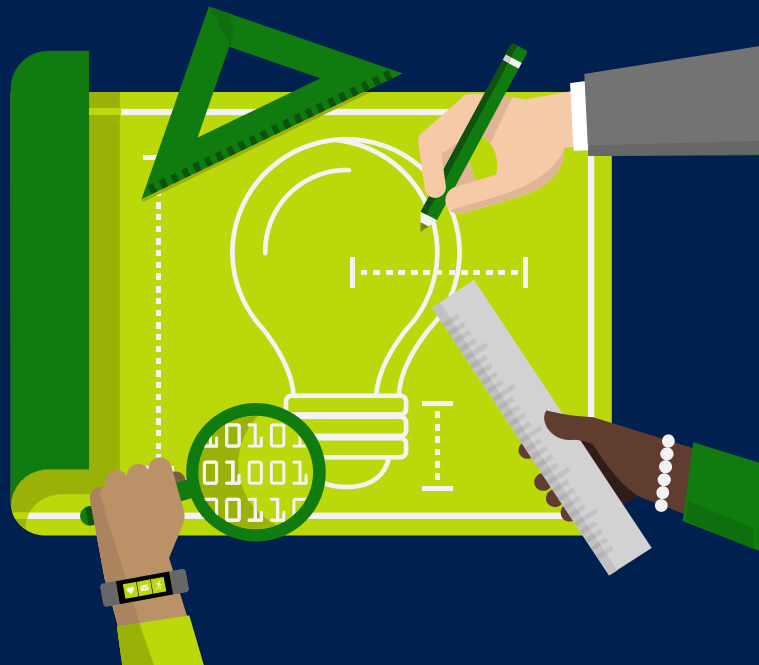


Lightning Talks

SREcon19 Dublin

How to achieve “100%" availability

igore@



Problem statement

We want to be able to explain in a simple, but effective way, that “100% availability” is **not** what we need nor want.

When Life Gives you Lemons, make a LaaS – Lemonade as a Service

- I know everybody craves lemonade all the time!
- So let's think big and offer it as a service
- Apply some principles of Cloud Services to it
- Skip some of the boring Business plan items and get to the core!



Mini Market Analysis

Competition

- As of today, nobody offers a 24/7 lemonade stand service
- We are creating a new demand and the market to satisfy this craving

Our studies show that 100% of the time:

- Customers want to have 100% organic fresh lemons
- Customers want to have their lemonade served in <60 seconds
- Customers want Lemonade with a temperature between 4° C and 5° C
- Customers want to buy Lemonade at any time and in any day
- Customers want a 0.4l serving size
- Customers are willing to pay up to € 2.50 for a cup of lemonade



Secret Lemonade Recipe (2.5 l)

- Juice of 1 kg organic lemons
- 250 g cane sugar
- 2 l water
- Ice cubes

Costs per Serving	Price per unit	Unit	2500ml juice	400 ml
Lemons	4.16	1	4.16	€ 0.67
Sugar	0.2	0.25	0.05	€ 0.01
Water	0.02	2	0.04	€ 0.01
Cups	0.1	1	-	€ 0.10
Total			4.25	**€ 0.79**

Other Costs

Monthly Costs

Item	cost per unit	Unit	cost per month
Electricity	250	1	€ 250.00
Permit	50	1	€ 50.00
Total			**€ 300.00**

CapE

x

Item	Cost per Unit	lifetime	cost per month
Juicing Machine	100	36	€ 2.78
Nice Stand	1000	36	€ 27.78
Ice Cube Machine	350	36	€ 9.72
Total	1450		**€ 40.28**



Break-even points

€ 1.13

- Stand can sell 1000 lemonades per day

Fix costs per month	Variable costs	1000	1
€ 340.28	€ 0.79	€ 1,130.28	**€ 1.13**

- I
- We sell for € 2.50, and our monthly profits are € 1,369.72!

We need to hire people!

€ 8.33

- An employee makes € 10 per hour.
- We need to hire multiple shifts to cover 24/7
- This adds 24h * €10 per day = €240 (€7200 per month)
- Our break-even point moves up to €8.33
- But customers won't pay that much... We are now making losses

We start our business!

€ 8.33

- There is a huge demand!
- People are forming lines at peak times to get our lemonade!!!!!
- But we are losing money!

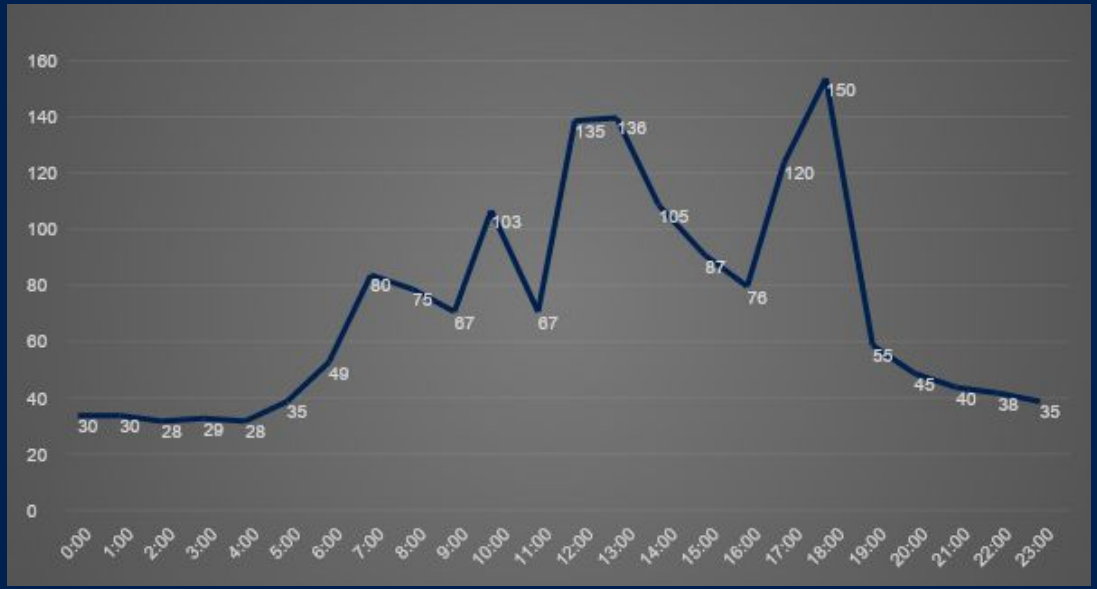


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Is huge demand a good problem to have?

€ 8.33

- We are missing our “Time to get Lemonade” target of < 60 secs at peak times
- We are hitting our stand capacity



Elastic-like scaling!

€ 5.33

- To reach capacity we need to operate:
- 3 stands at peak times (6 hours)
- 2 stands at normal times (6 hours)
- 1 stand for low times (12 hours)

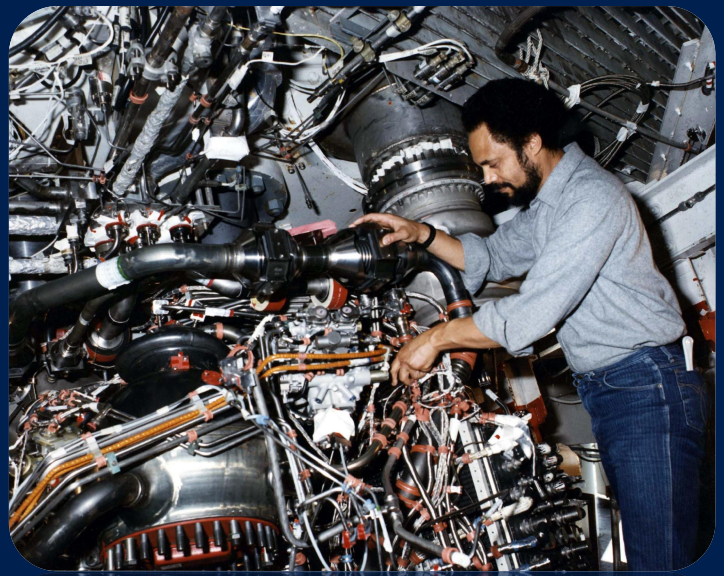
€ 1.12

- A fully automatic lemonade machine costs 25k and can serve up to 3000 servings per day
- We don't need a stand
- We don't need people to sell lemonade



HAL 3000
(Herman, the Automaton for Lemonades)

- HAL offers a no-headaches maintenance plan for “just” €500 per month, but we also need to overcome the downtime
- We need a spare HAL 3000 + maintenance plan
- We also need to account for when one machine is broken and one needs to be refilled with ingredients
- We go for n+2!

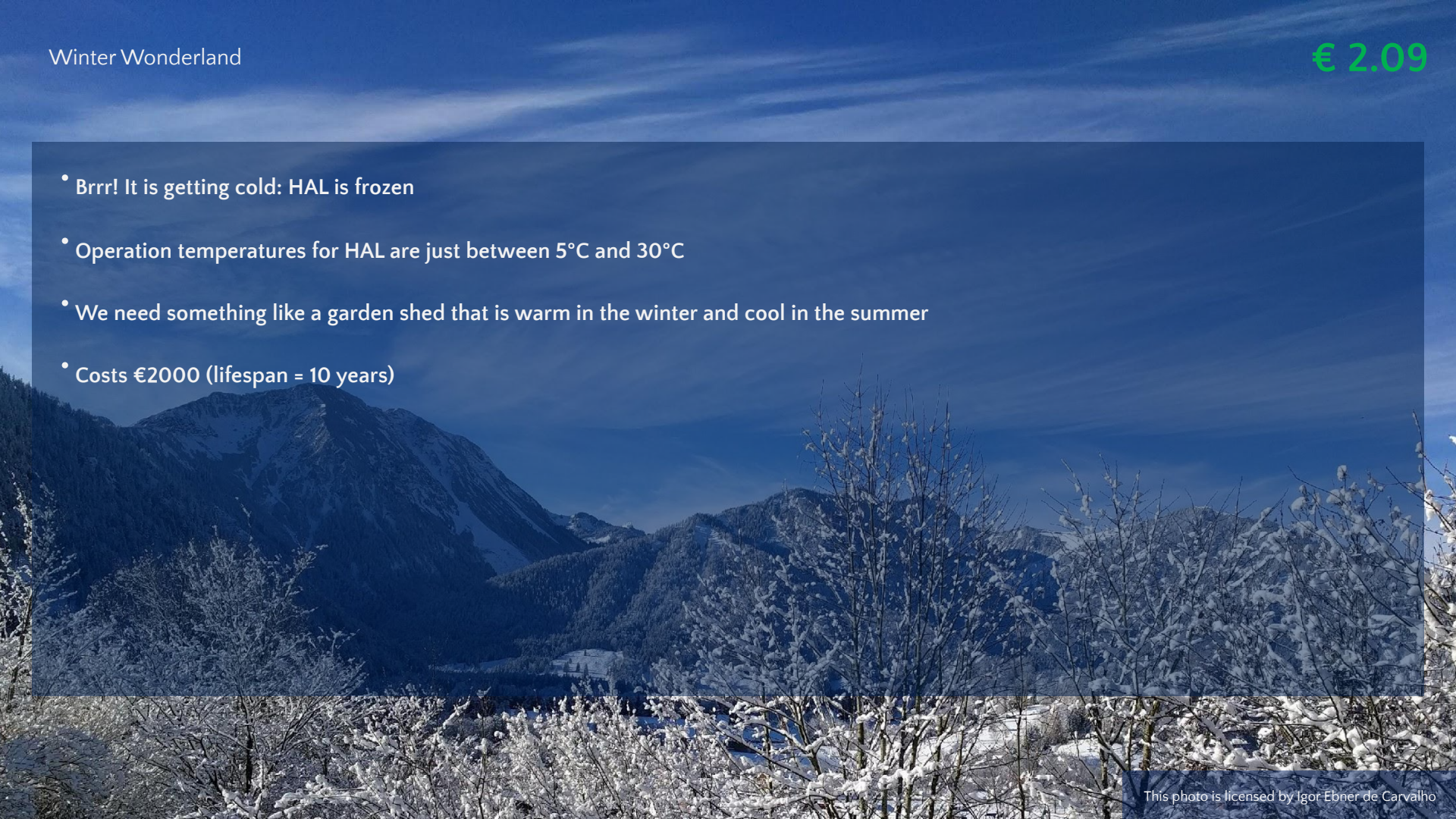


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Winter Wonderland

€ 2.09

- Brrr! It is getting cold: HAL is frozen
- Operation temperatures for HAL are just between 5°C and 30°C
- We need something like a garden shed that is warm in the winter and cool in the summer
- Costs €2000 (lifespan = 10 years)

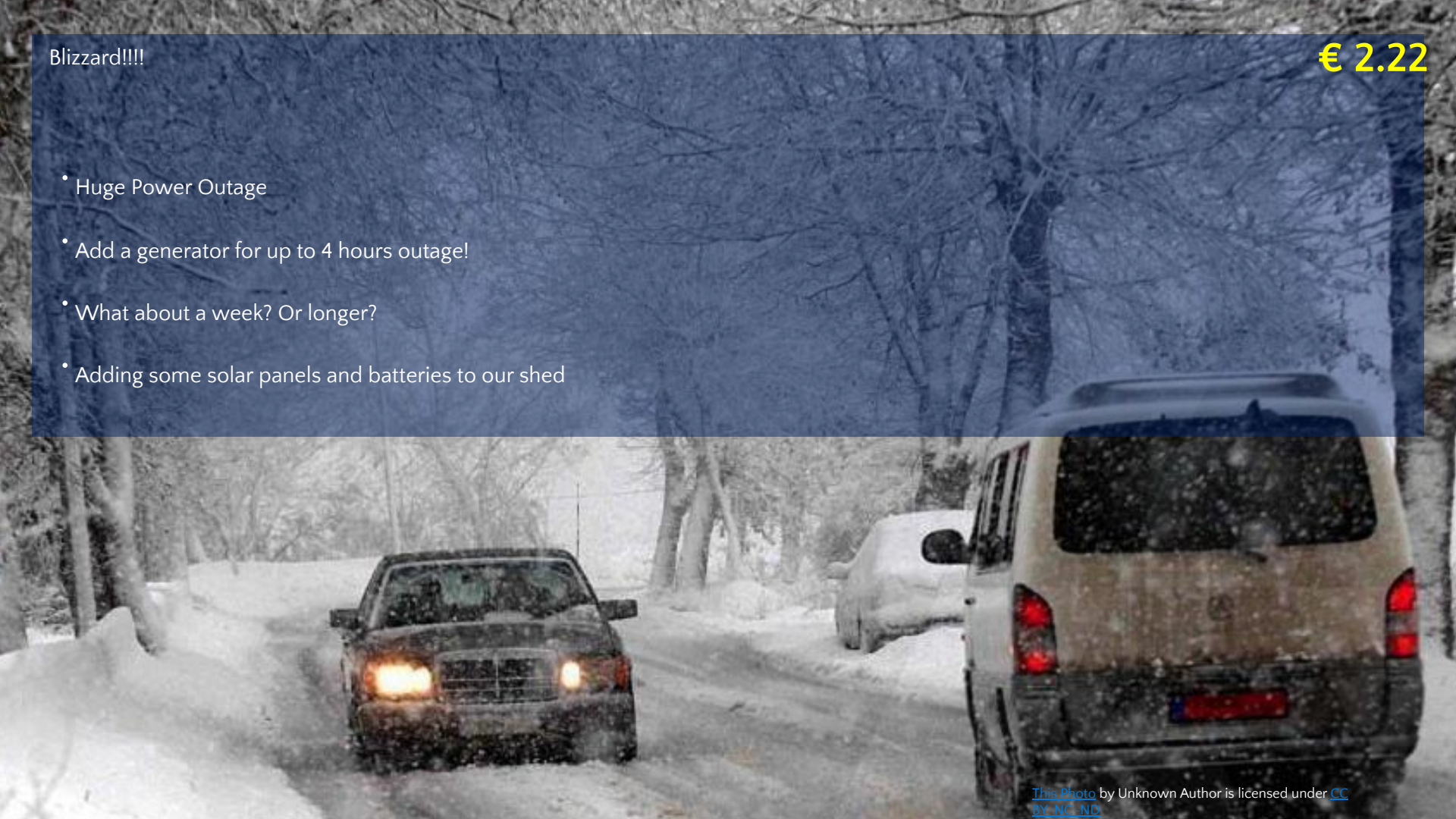


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Blizzard!!!!

€ 2.22

- Huge Power Outage
- Add a generator for up to 4 hours outage!
- What about a week? Or longer?
- Adding some solar panels and batteries to our shed



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Floods from the melting snow!

€ 2.43

- Due to the floods public water is unsuitable for consumption 😐
- We need a water purification system for €2500 (1Y depreciation)



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After the rain comes the sun again!

€ 2.45

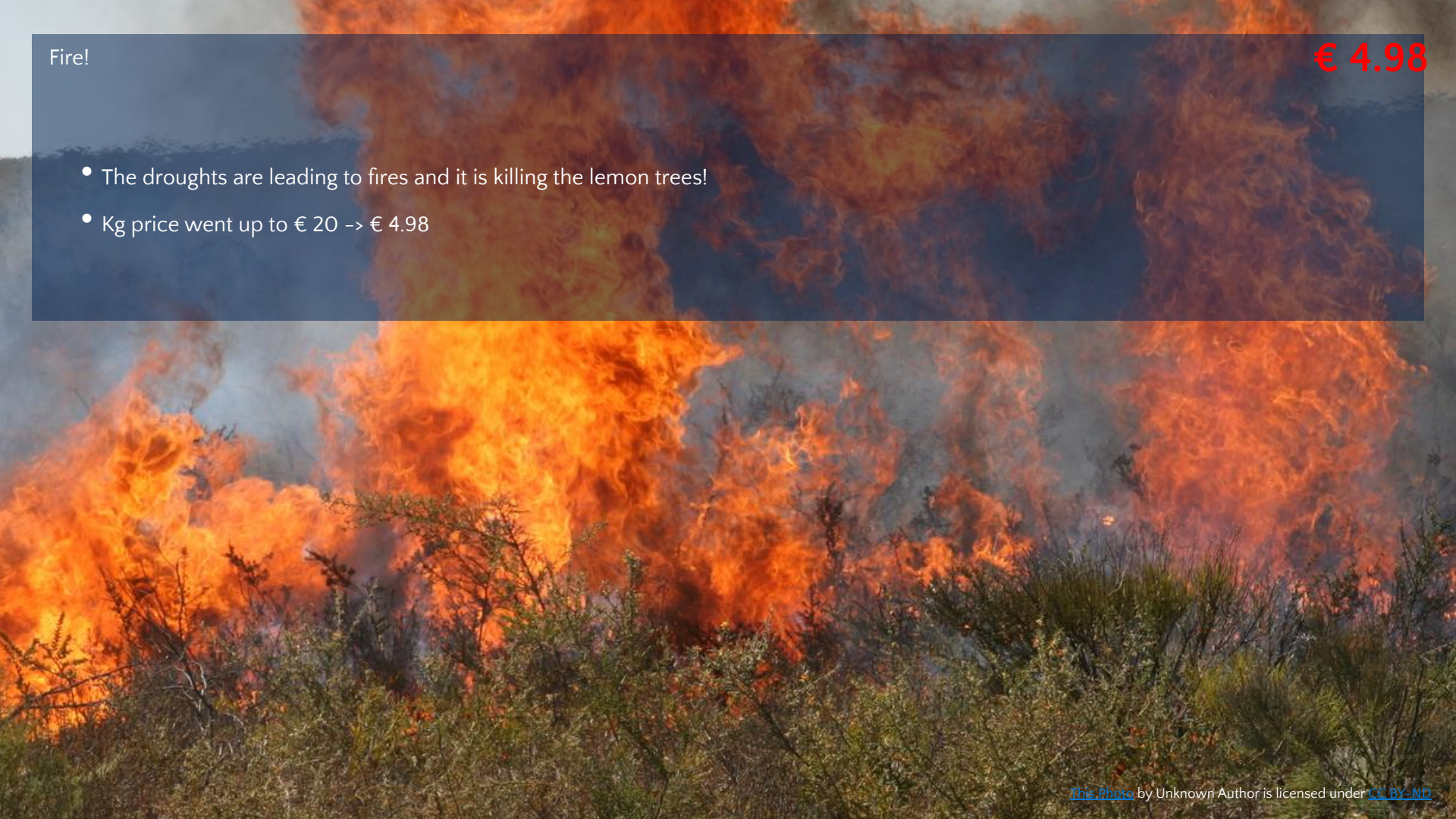
- There is a drought! No water is coming out of the tap!
- We need an alternative water supply
  - Mineral water shipments (€ 0.30 per liter) -> € 2.51
  - Building well (€5000, 15 year depreciation) -> € 2.45

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Fire!

€ 4.98

- The droughts are leading to fires and it is killing the lemon trees!
- Kg price went up to € 20 -> € 4.98



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What's the next disaster?

- Volcanos? Tornados? Earthquakes?
- How much more do we want to spend to sell lemonades for € 2.50?



How much availability/reliability do we need?

- As much as customers are willing to pay for
- As much as it makes sense without making the costs explode

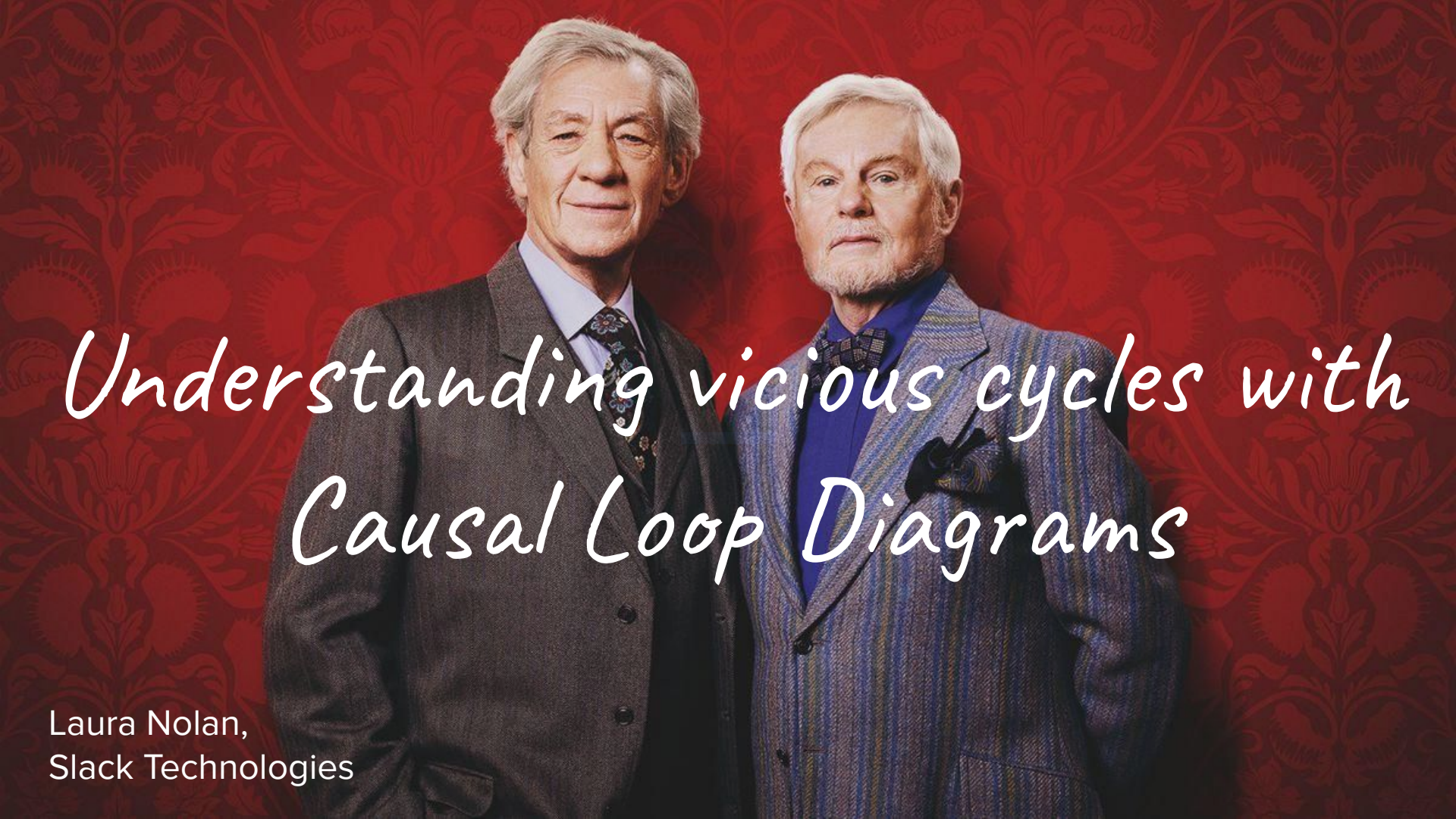






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Understanding vicious cycles with Causal Loop Diagrams

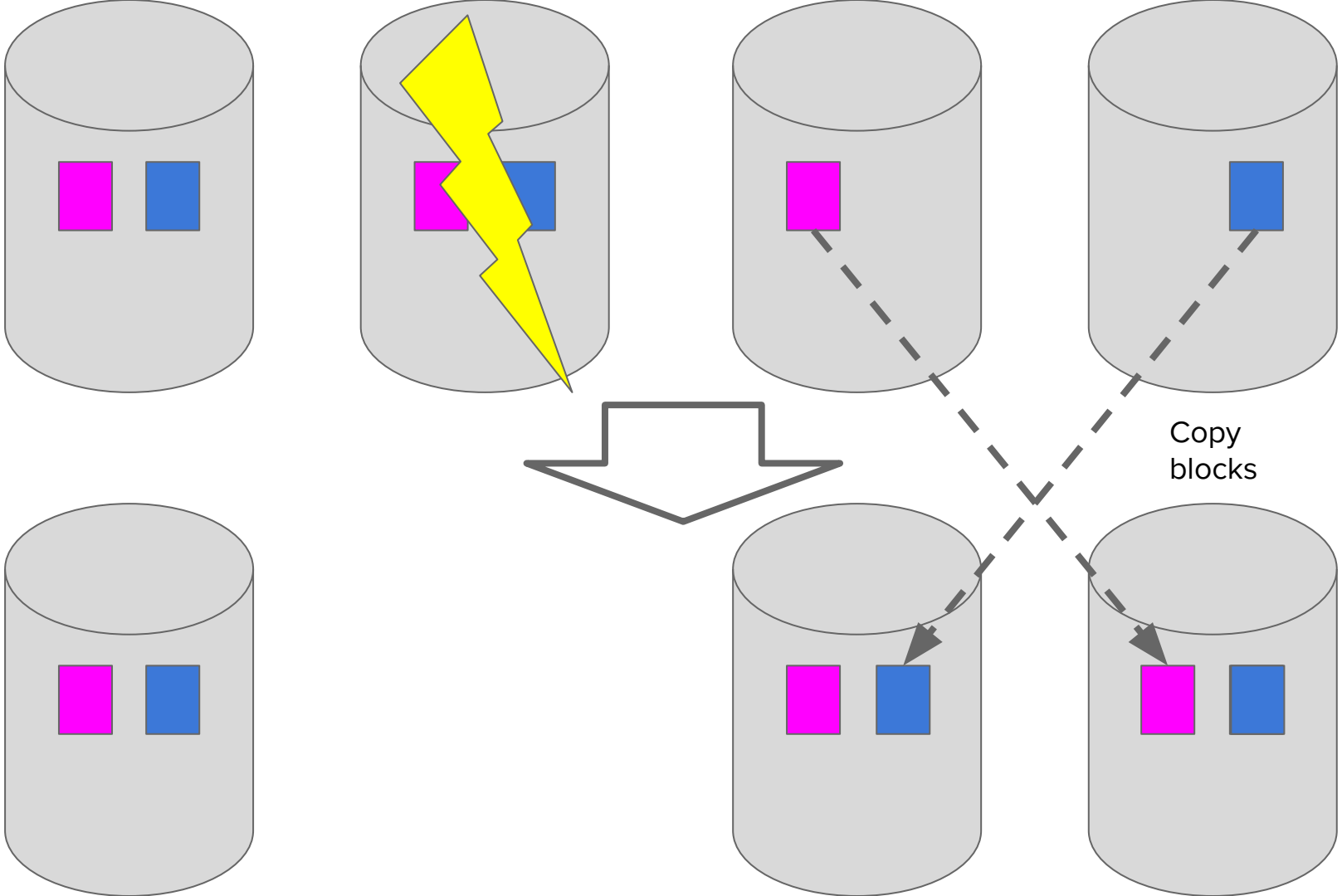
Laura Nolan,
Slack Technologies

My Little Distributed Filesystem

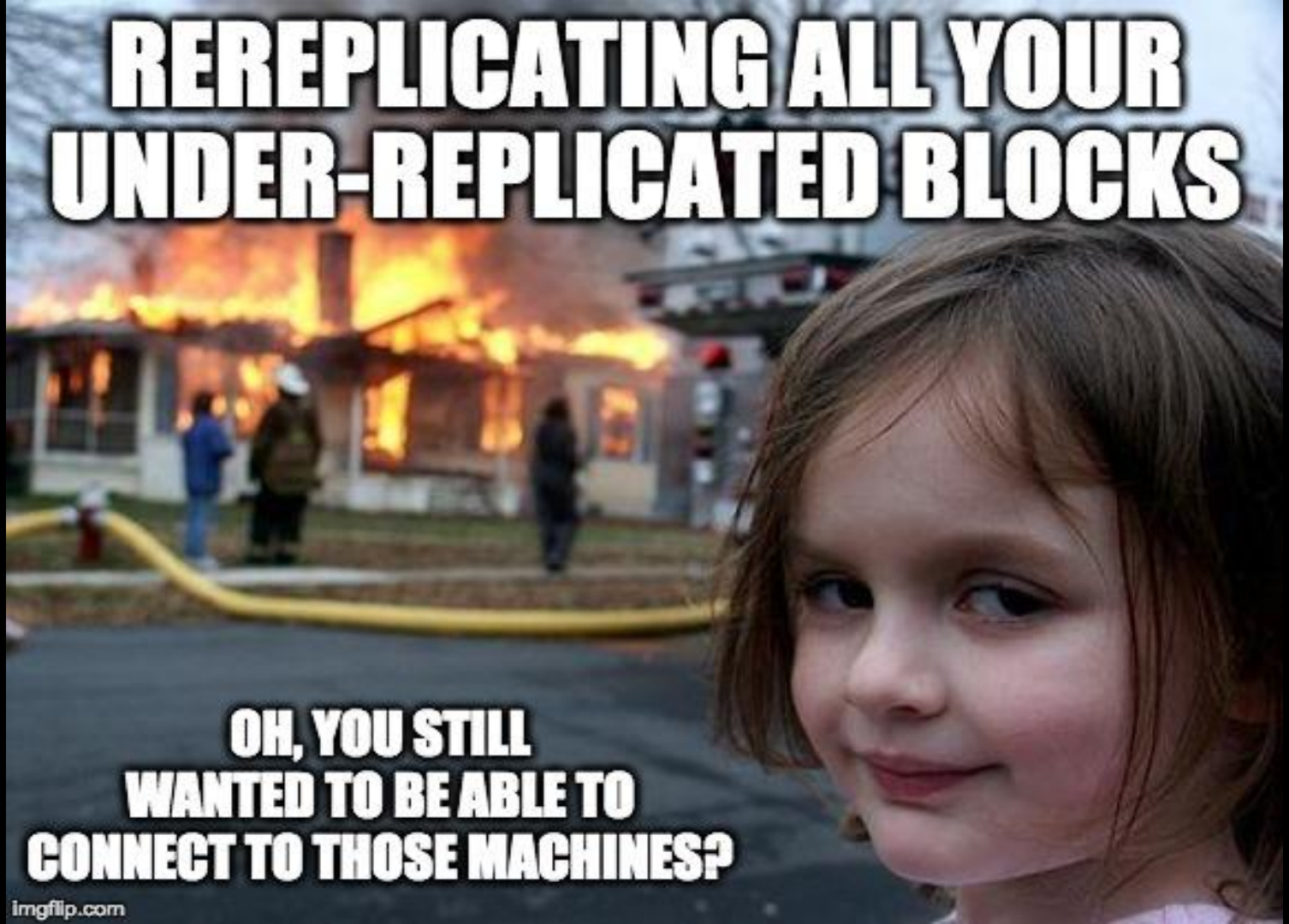
```
replicaChecker()
    while true {
        for each block in filesystem.GetAllBlocks() {
            if block.replicasHeartbeatedOK() < minReplicas {
                block.StartCopyNewReplica()
            }
        }
    }
}
```

My Little Distributed Filesystem

```
for each block in filesystem.GetAllBlocks() {
    if block.replicasHeartbeatedOK() < minReplicas {
        block.StartCopyNewReplica()
    }
}
```


Copy
blocks

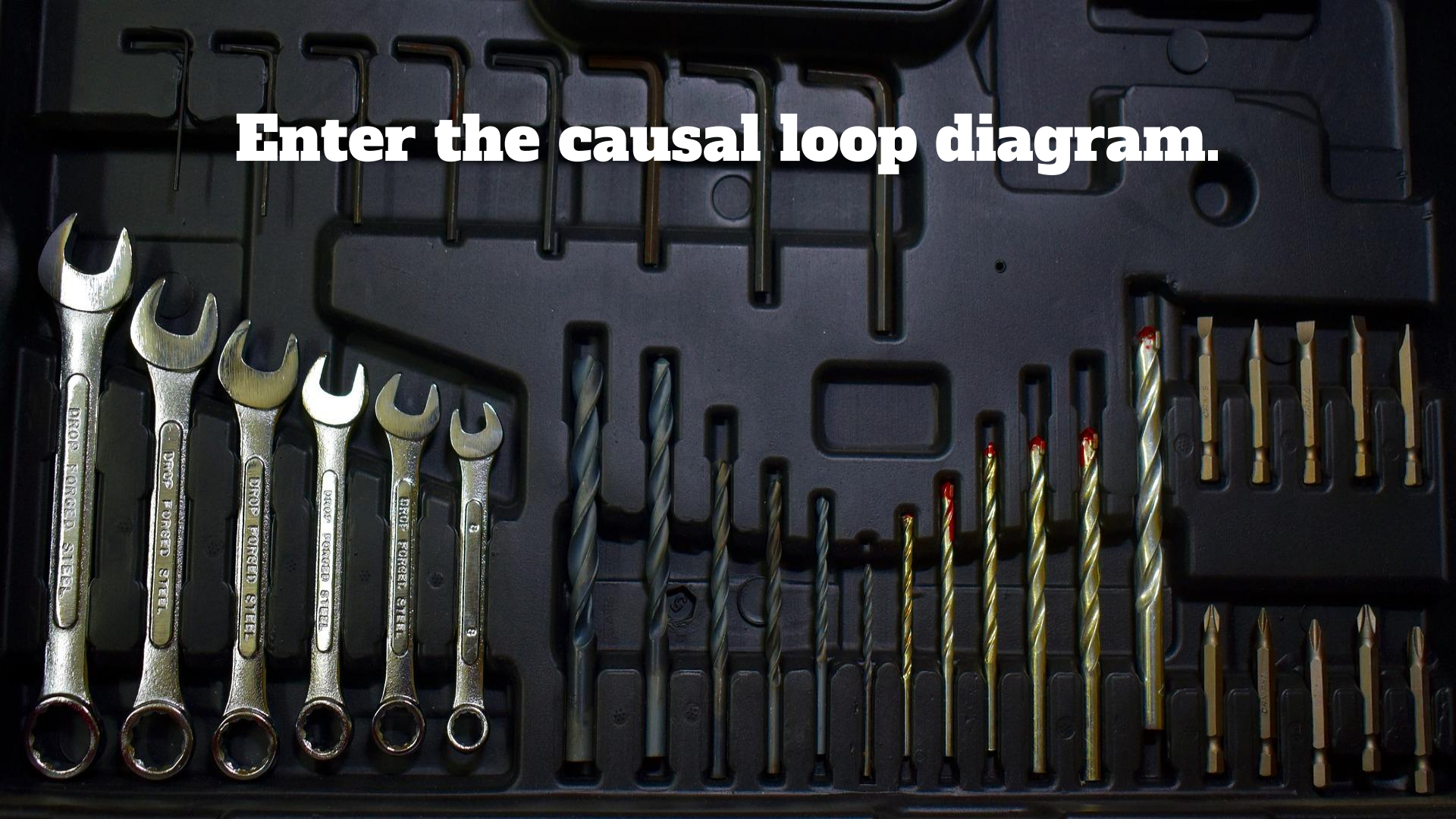


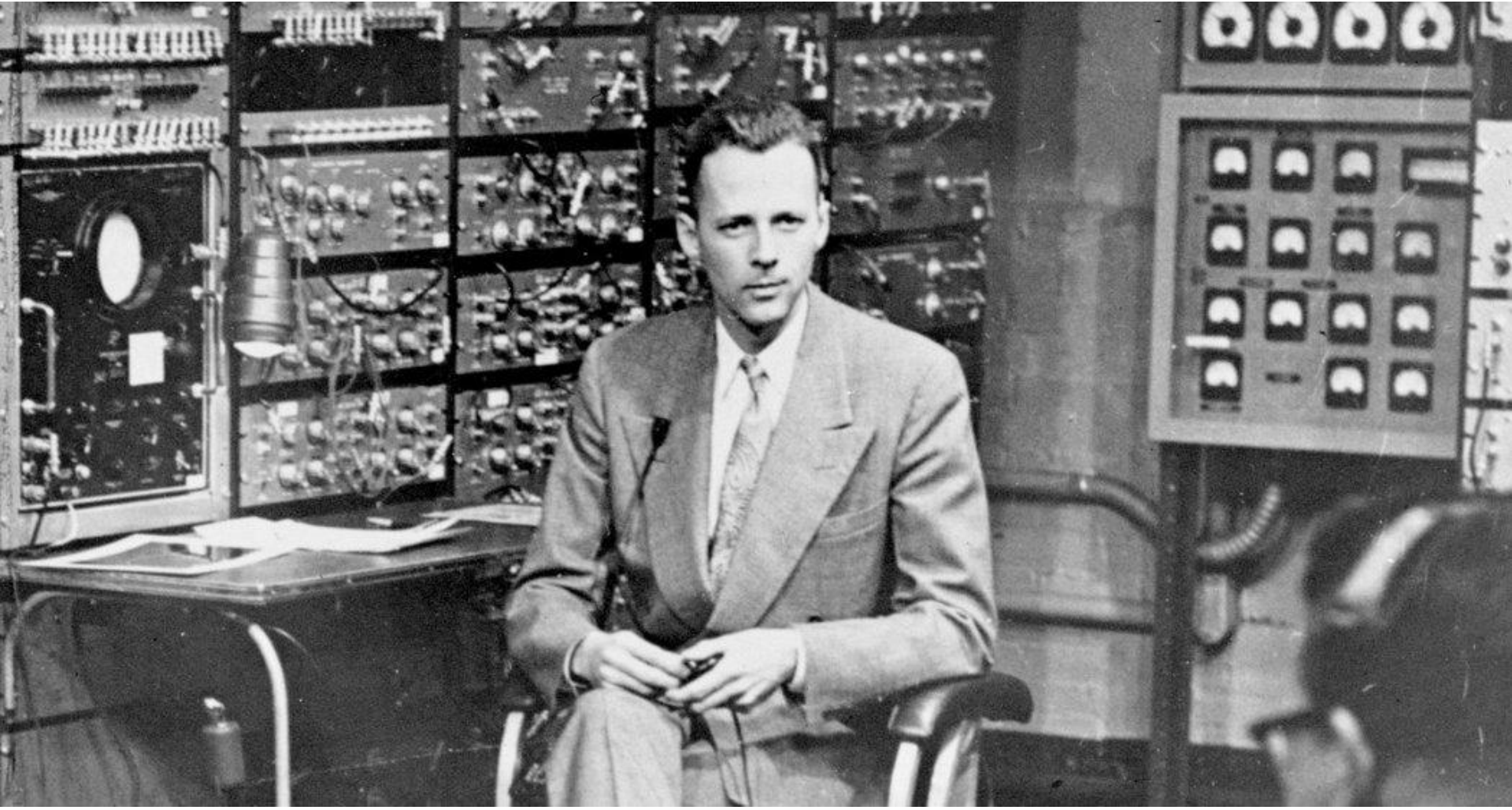

REREPLICATING ALL YOUR
UNDER-REPLICATED BLOCKS
OH, YOU STILL
WANTED TO BE ABLE TO
CONNECT TO THOSE MACHINES?
imgflip.com

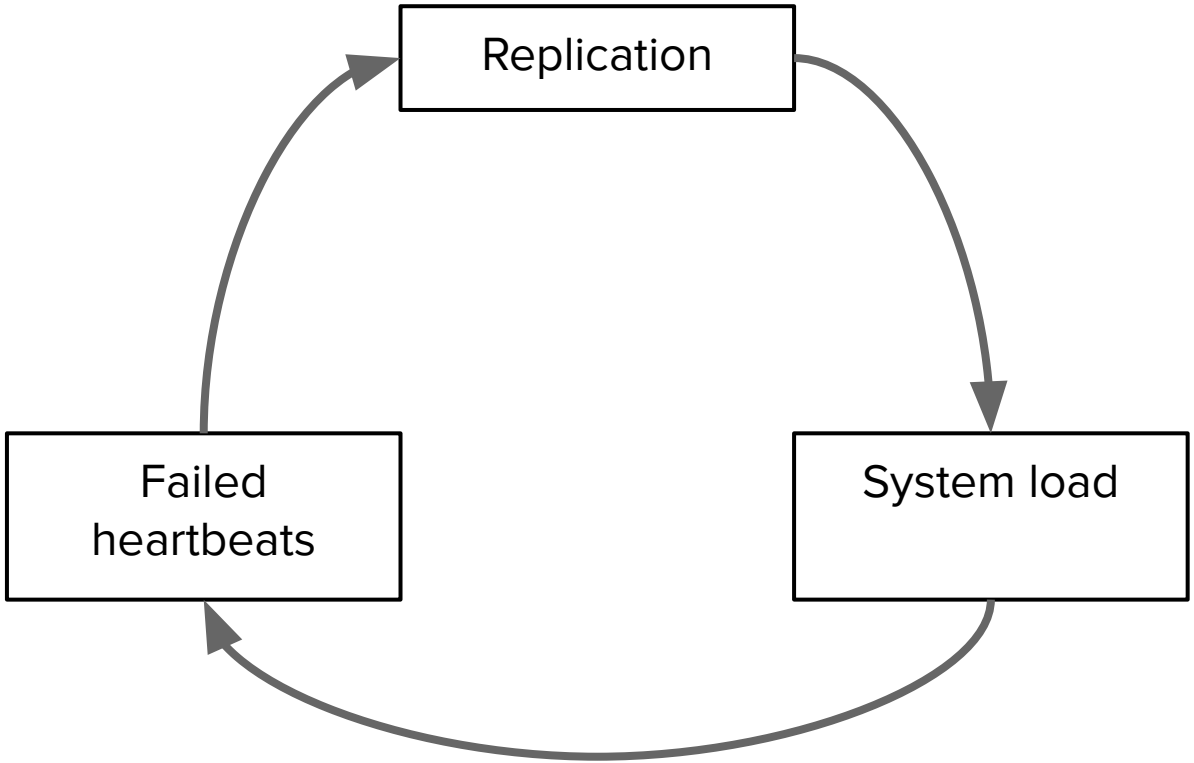
That's an example of a vicious cycle.

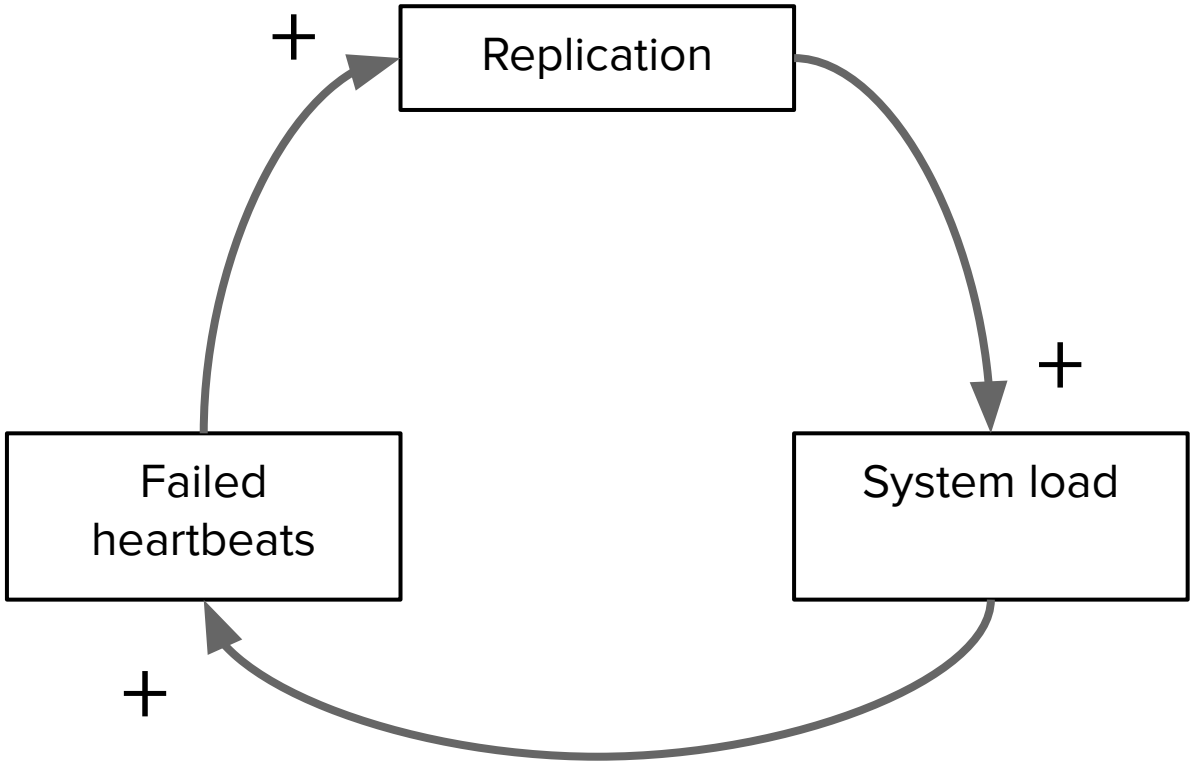


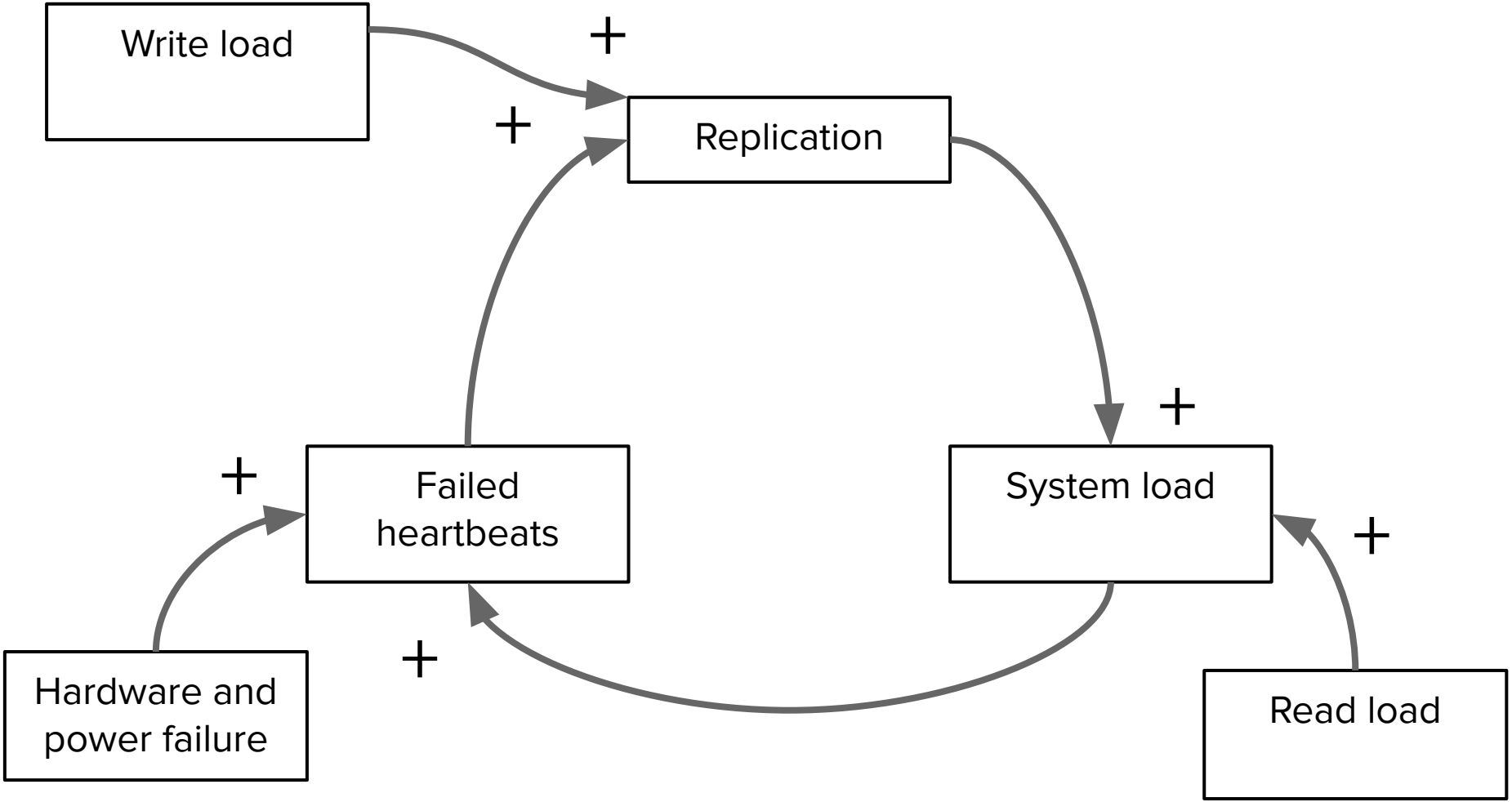
Enter the causal loop diagram.

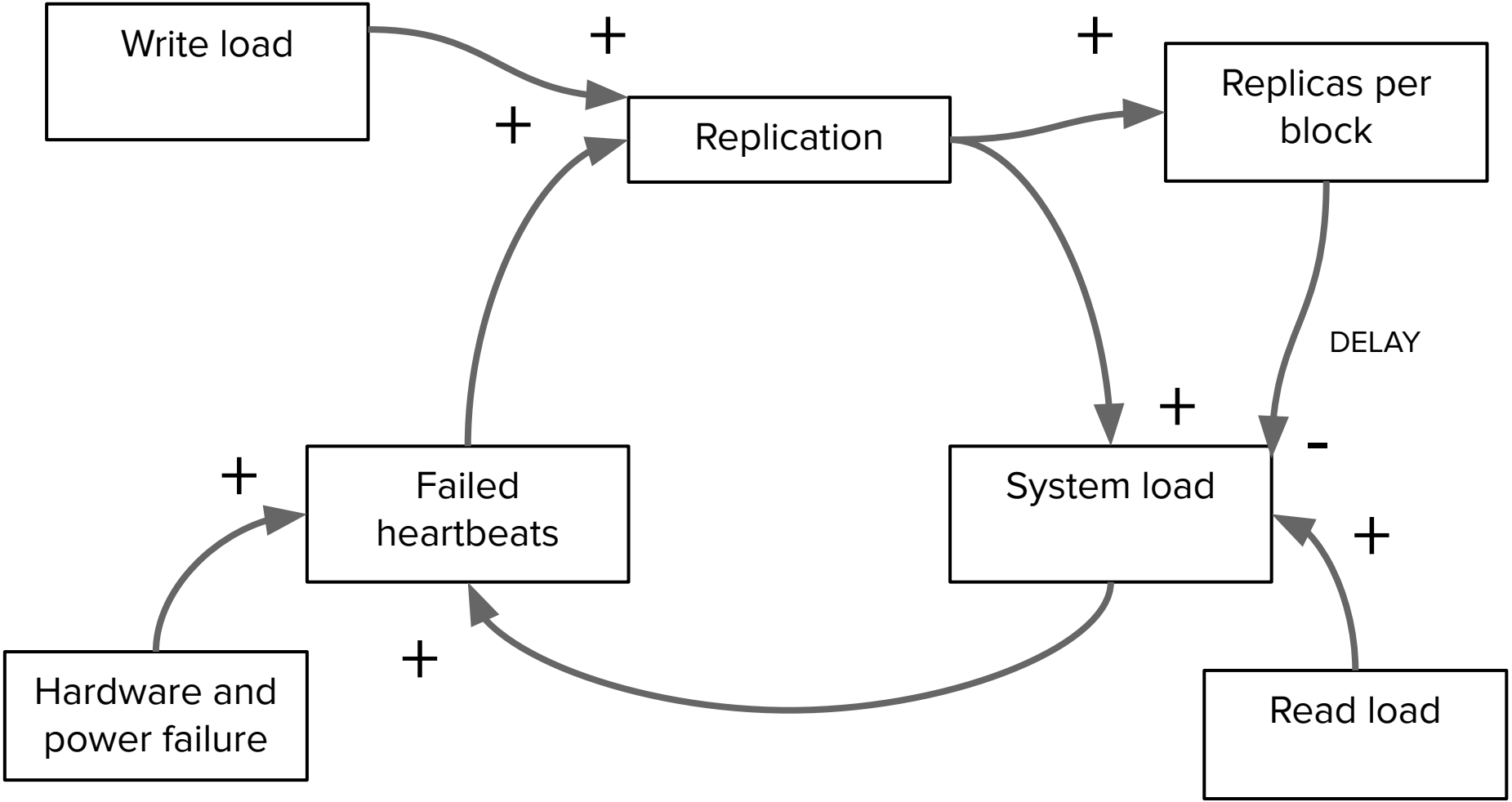


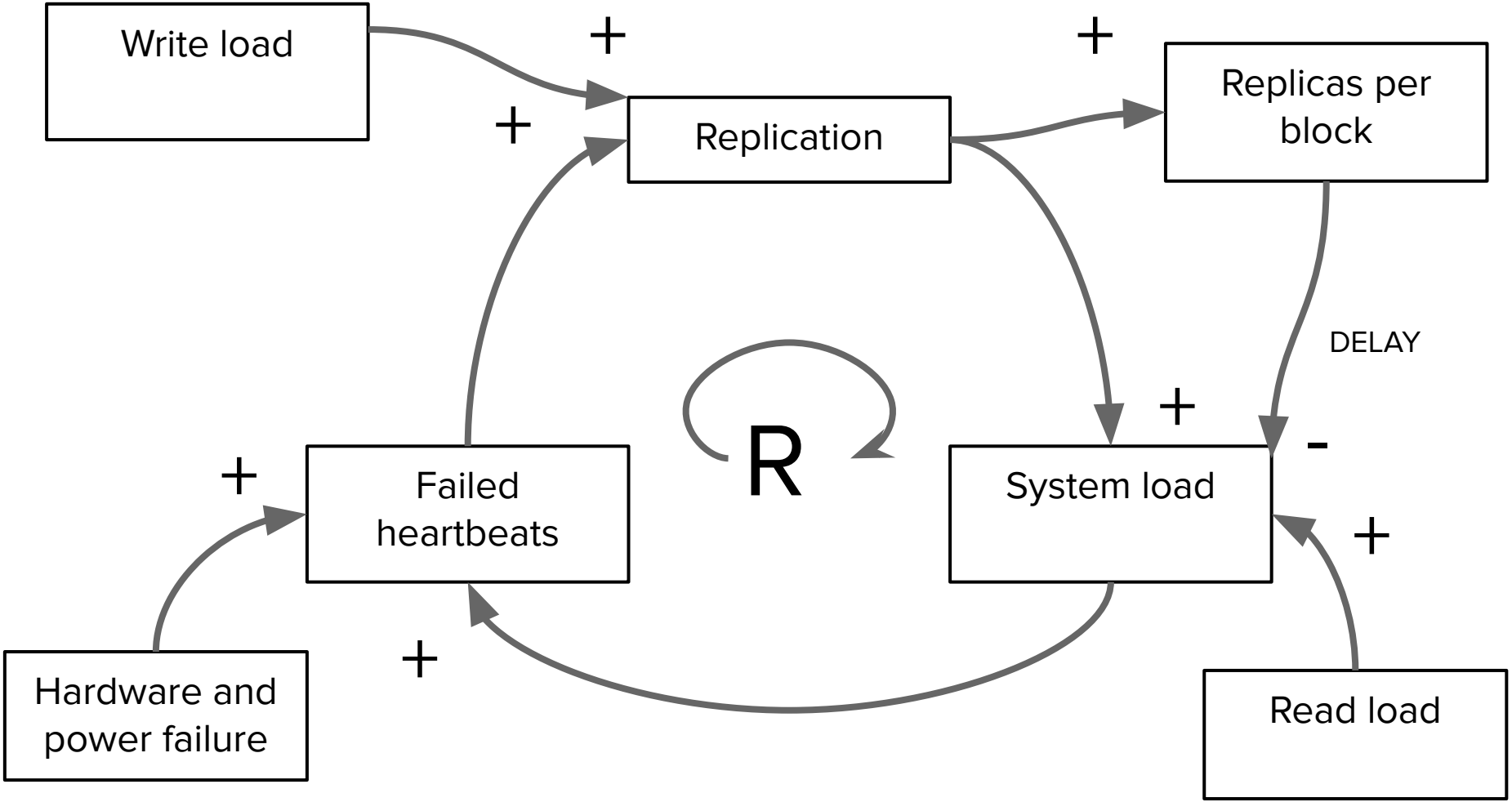


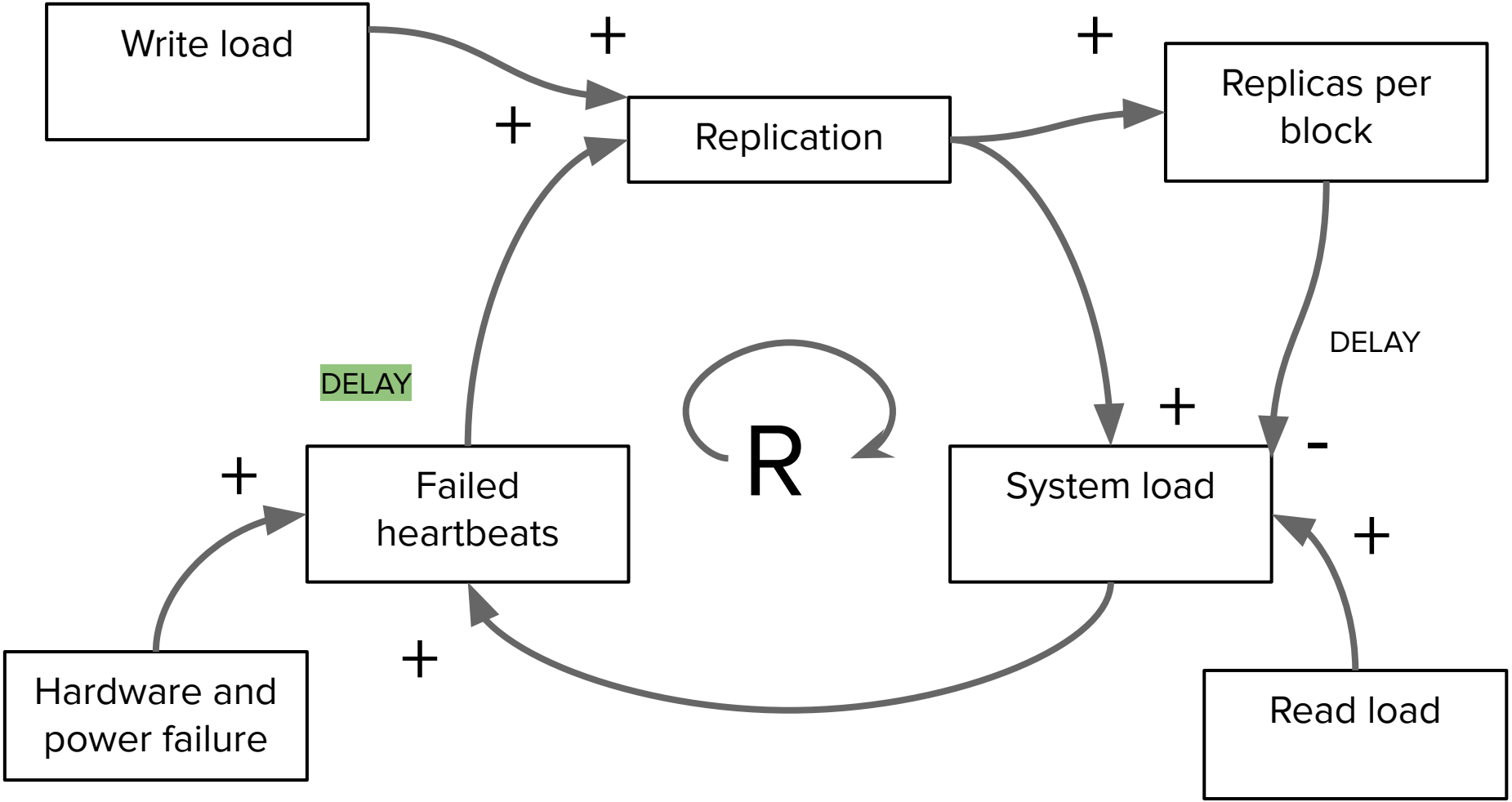

Replication
System load
Failed heartbeats

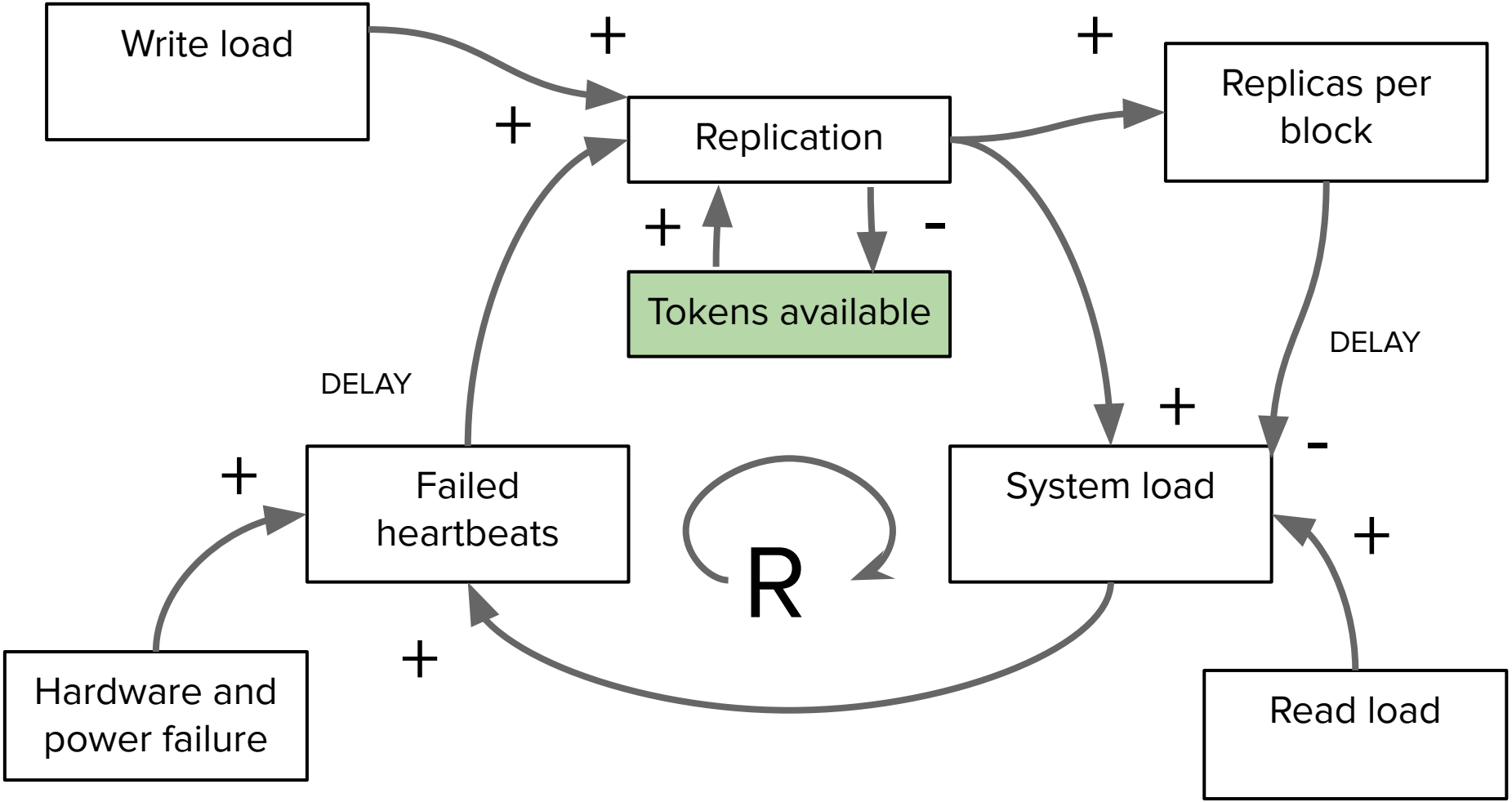

+
Replication
+
System load
+
Failed
heartbeats


Write load
+
+
Replication
+
System load
+
Failed
heartbeats
+
+
Hardware and
power failure
Read load


Write load
+
+
Replication
+
Replicas per block
DELAY
+
-
+
Failed heartbeats
System load
+
+
Hardware and power failure
Read load


Write load
+
+
Replicas per block
+
Replication
DELAY
R
+
-
+
Failed heartbeats
System load
+
+
Hardware and power failure
Read load


Write load
+
+
Replication
+
Replicas per block
DELAY
DELAY
R
+
-
+
Failed heartbeats
System load
+
+
Hardware and power failure
Read load


Write load
Replication
Replicas per block
Tokens available
DELAY
DELAY
Failed heartbeats
System load
R
Hardware and power failure
Read load
+
+
+
+
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+
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+
+

So, you want to be a wizard?



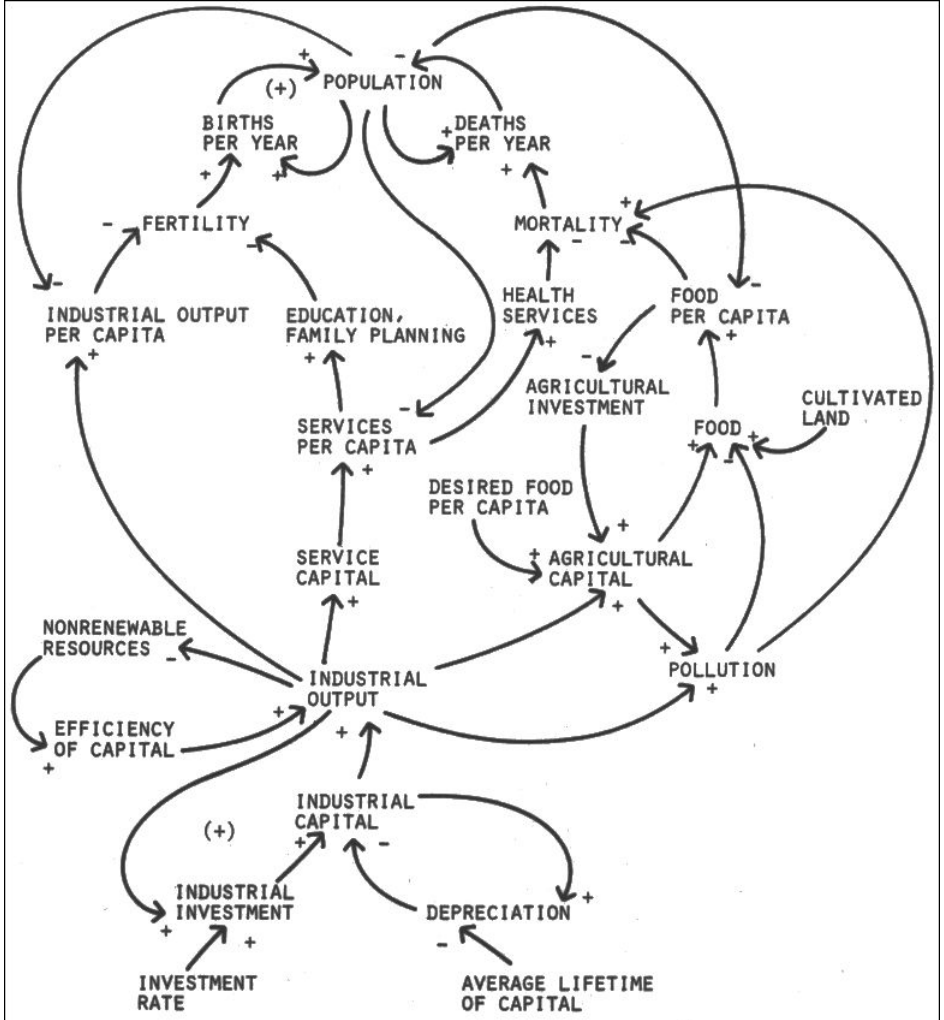
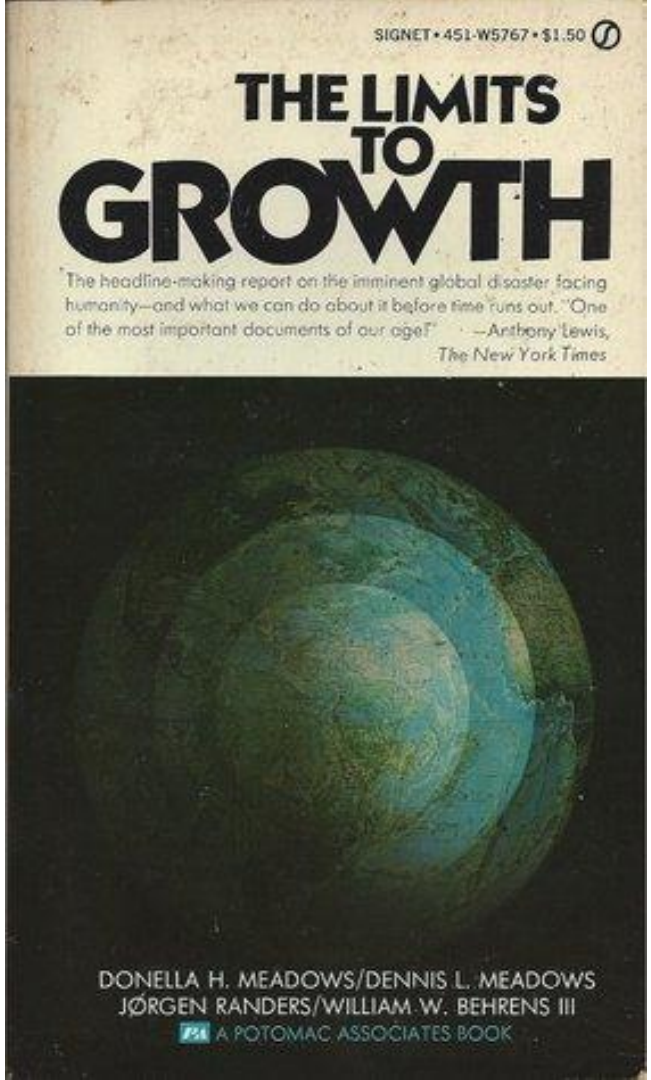
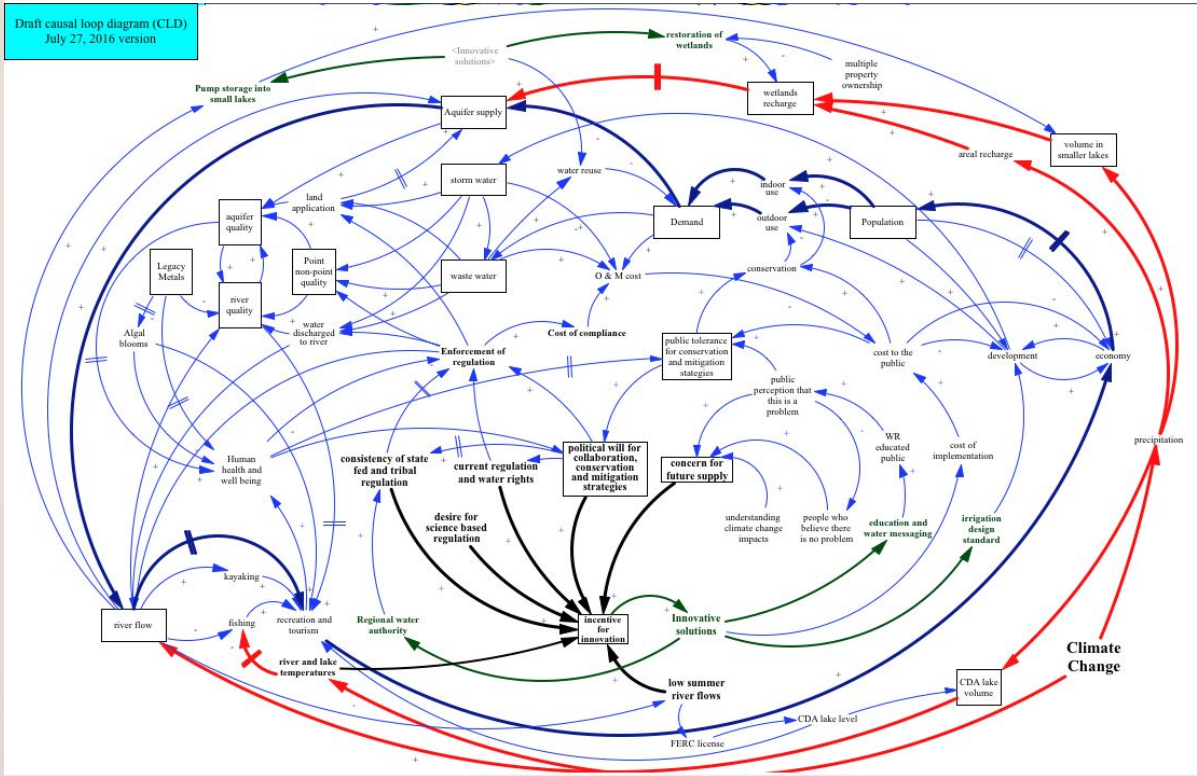


Figure 1-3 Causal-loop diagram of several important feedback loops in World3





Draft causal loop diagram (CLD)
July 27, 2016 version




@lauralifts on Twitter.
Slack is hiring!
Find me in the hallway.





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SREcon19 Dublin



Flame Graphs

A meeting point between developers and SRE

Doron Sekler & Amir Langer



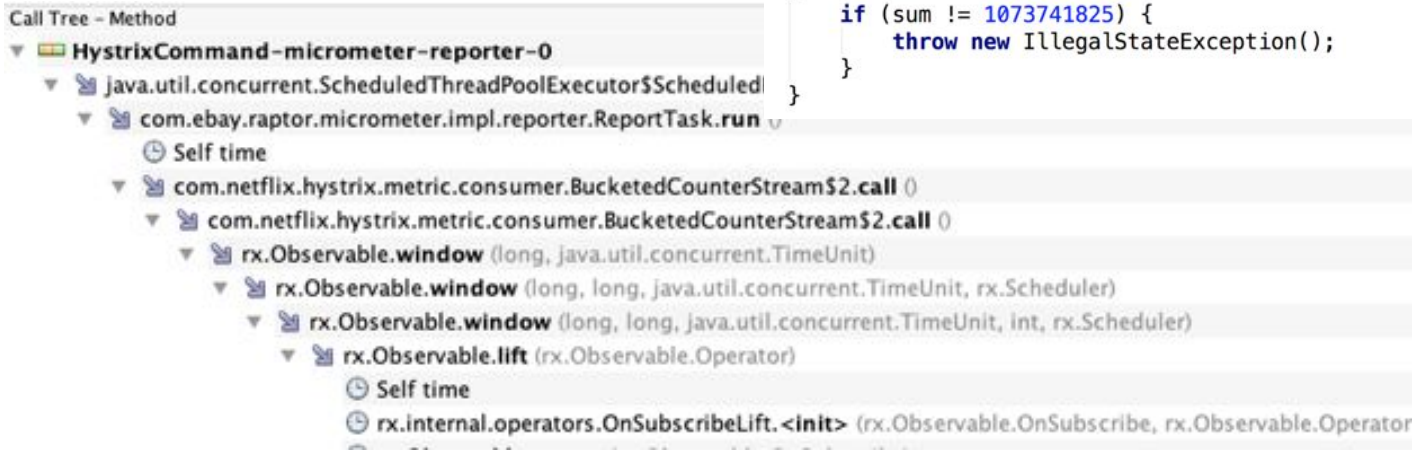
I’m a developer

And as such I know my code. I also test it.

So before it reaches production I am pretty certain it is perfect.

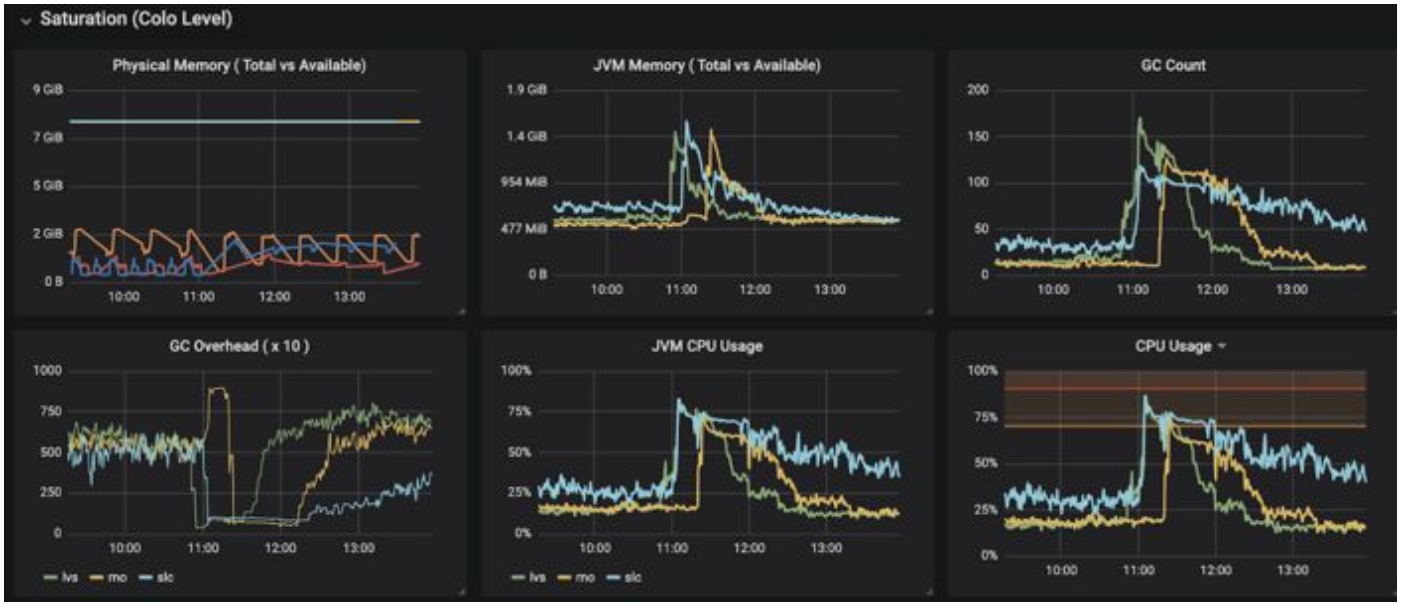
```
public void findTheSafepoint()
{
    int sum = 0;
    for (int i = 0; i < Integer.MAX_VALUE; i++)
    {
        sum += i;
    }
    cheapMethod(sum);
}

private void cheapMethod(final int sum)
{
    if (sum != 1073741825) {
        throw new IllegalStateException();
    }
}
```



I’m an SRE

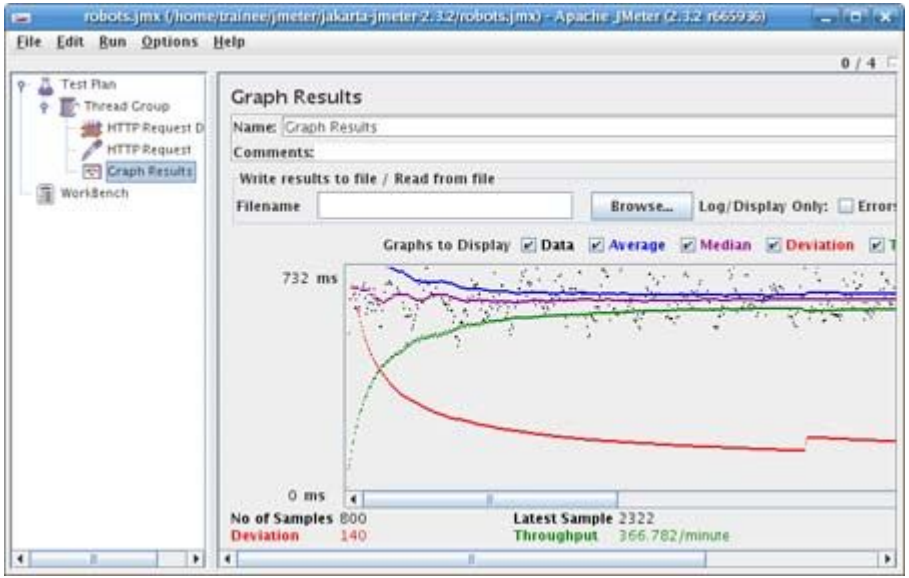
I am responsible for reliability, availability and **performance** of production services. I triage performance problems and can see that we have a performance issue.



But

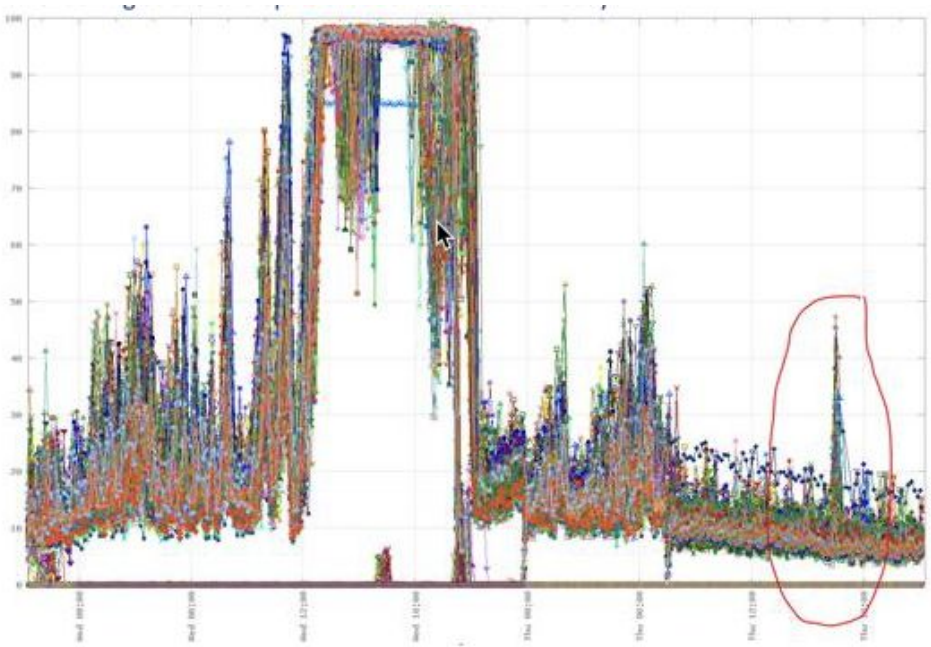
Look at the results of my performance tests. I can prove to you that whatever you're seeing is not my service.

Have you checked the network latency?



My metrics

Suggest it is not the network latency. It’s your service that can’t cope in production for whatever reason.



Sigh...

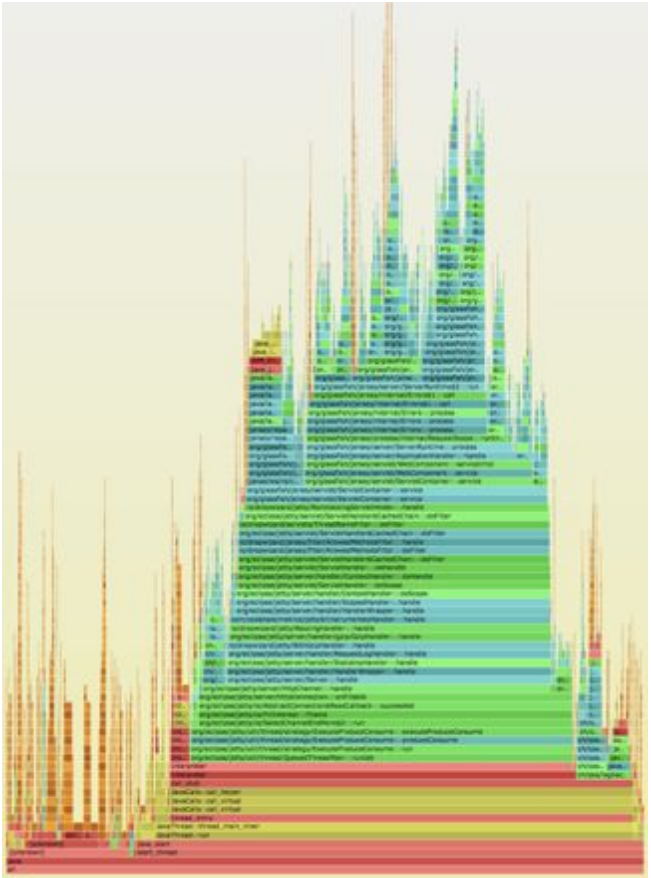
At eBay we have various production metrics that developers never encounter in their environments. They also approach us SREs with a production issue but do not know (or reveal) why is it happening.



...

To solve performance issues both SREs and developers need to see the **same view**.

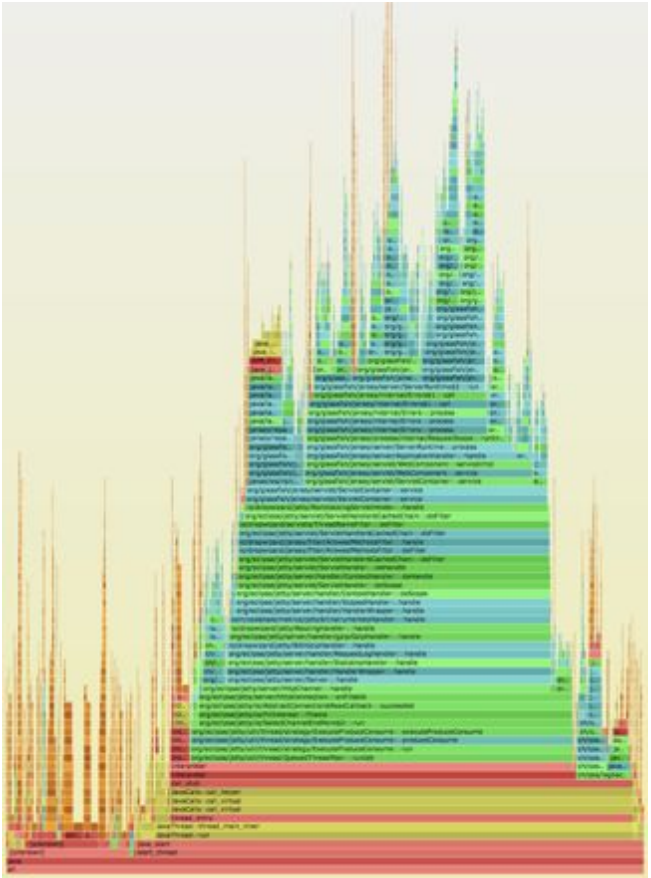
This view needs to be both **global** and also be able to drill down to the **single line of code** that's at the heart of the problem.



Flamegraphs

Are a visualization of profiled software, allowing the most frequent code-paths to be identified quickly and accurately.

It shows the results of sampling profiling, on CPU, memory allocation... any data that has a code path associated with it.



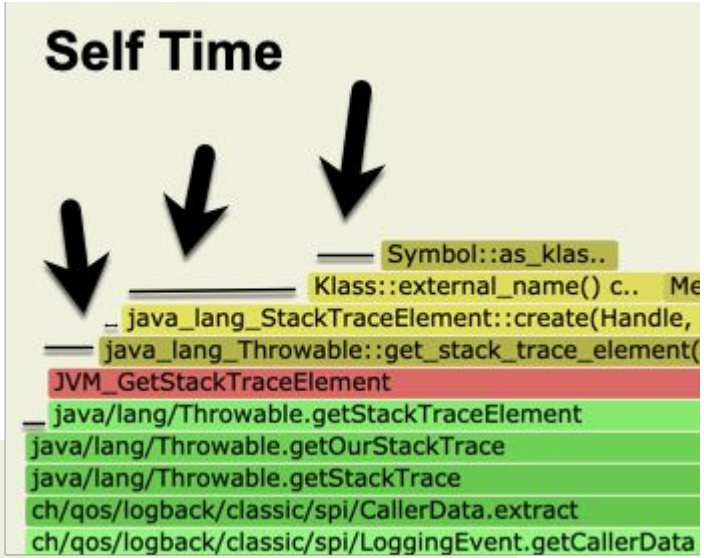
In a single image

We can see all the code paths as flames. The total time of each frame is its width,

The self time is the delta between the frames (a.k.a. its edge).

We can see how we arrived to the frame and where do we go from it.



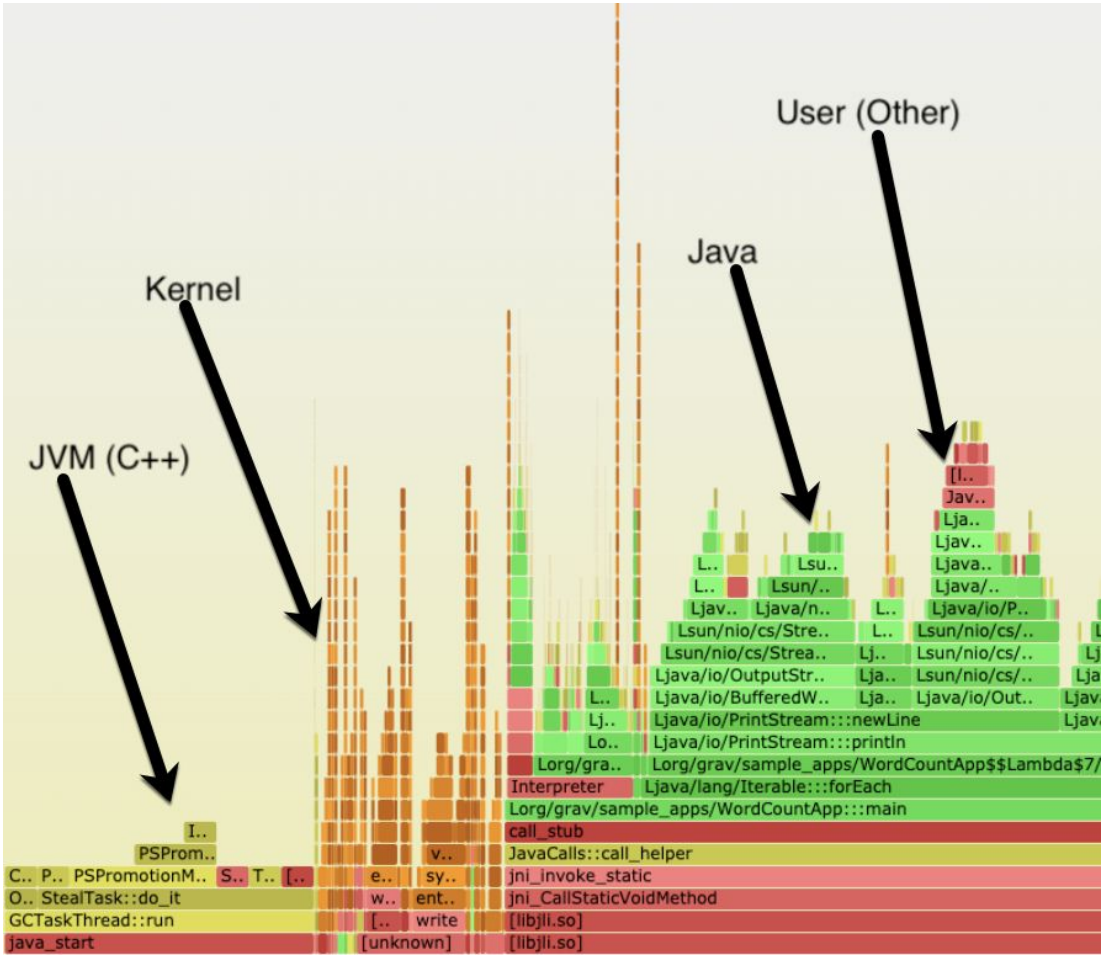


Colour

scheme shows us the type of code in that frame.

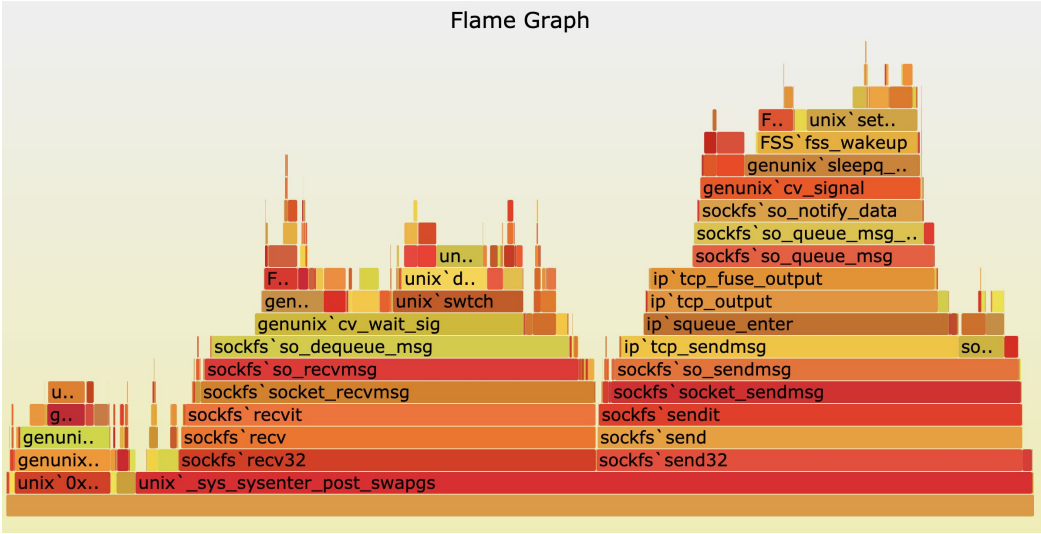
In this example **green** is java code, **yellow** is JVM C++ code, **orange** is kernel code, **red** is the rest of JVM code.

Other types of processes have their own colour schemes.



Our experience

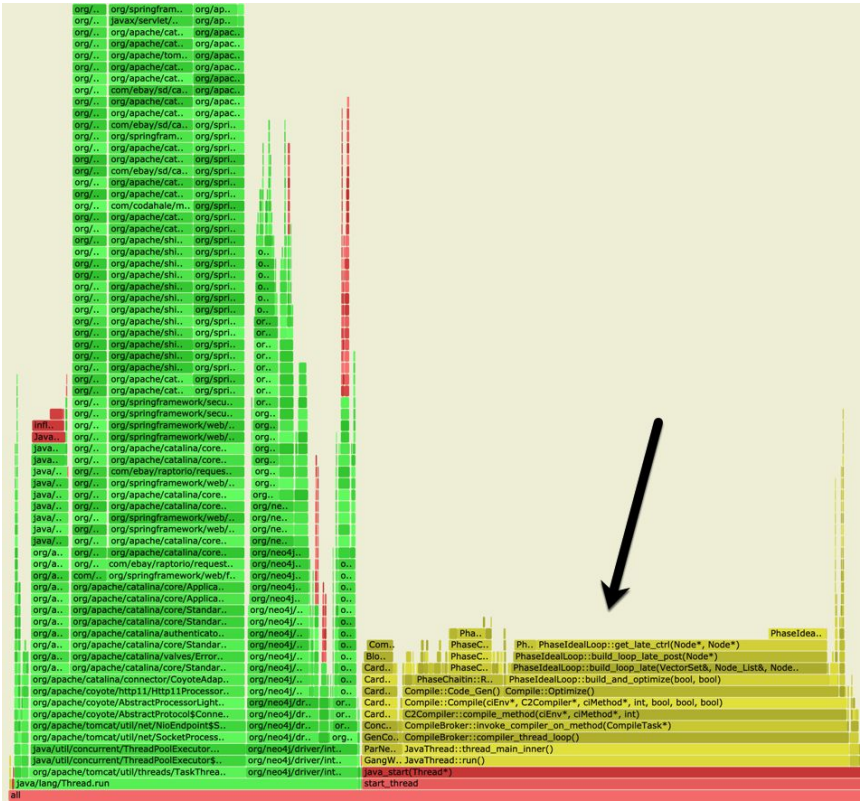
shows that using flamegraphs is a good common ground that allows both SRE and developers to cooperate, reason about and solve production performance problems.



Real life examples

In this Java process it only took a quick look to deduce we have a serious GC problem.

Unlike other visualizations, Flamegraph can show everything that happens on the CPU in this process and it is obvious half of the CPU time is spent on garbage collection.



Real life examples

And after JVM GC tunning we can see the difference.



Real life examples

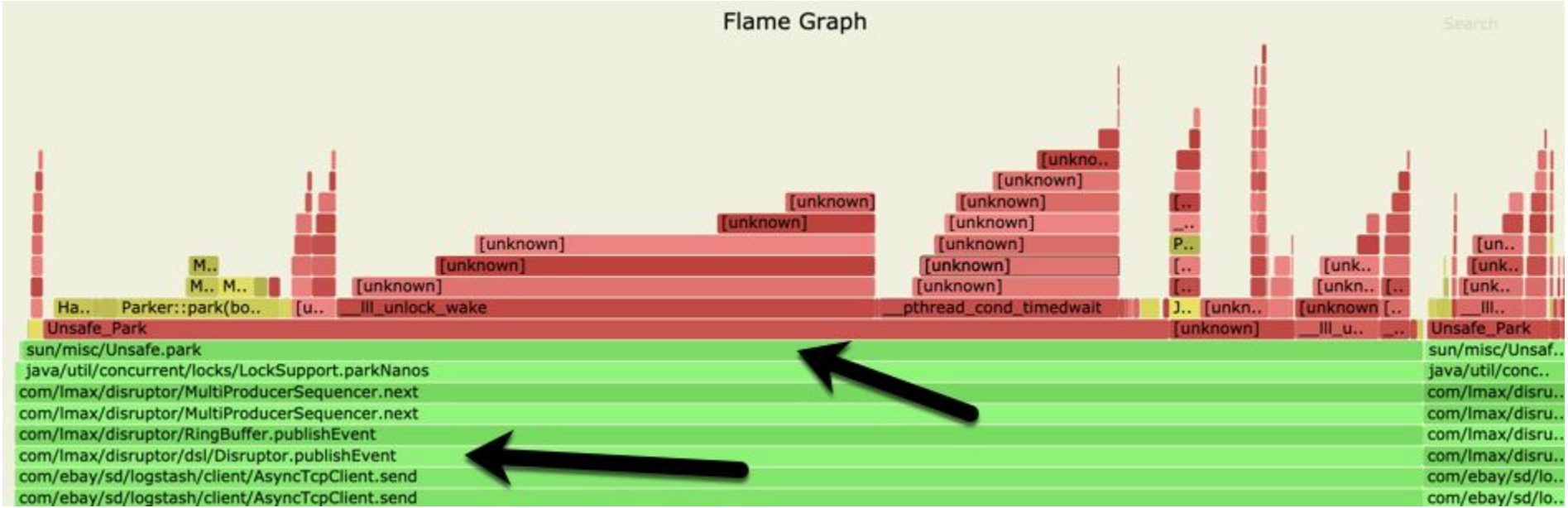
Here we could prove to developers that production data meant the process worked much harder than anticipated on queries to an embedded Solr index.

You can dig into the code paths by searching a regex and the results are painted here in purple.



Real life examples

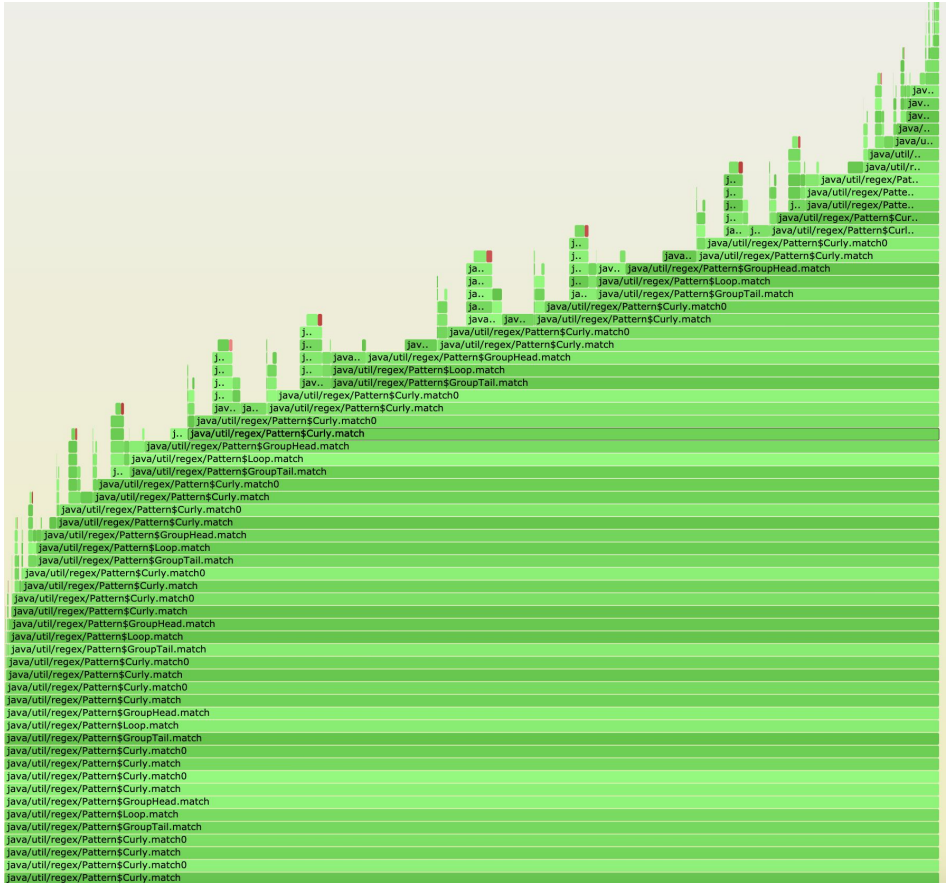
In this service we noticed that most CPU time was spent doing Unsafe.park i.e. parking the thread.
It came from an open source ring buffer library (Disruptor).
This behaviour indicated that the internal ring buffer was full most of the time and the publisher had to wait for it to drain


Flame Graph
Search
[unkno..
[unknown]
[unknown]
[unknown]

Real life examples

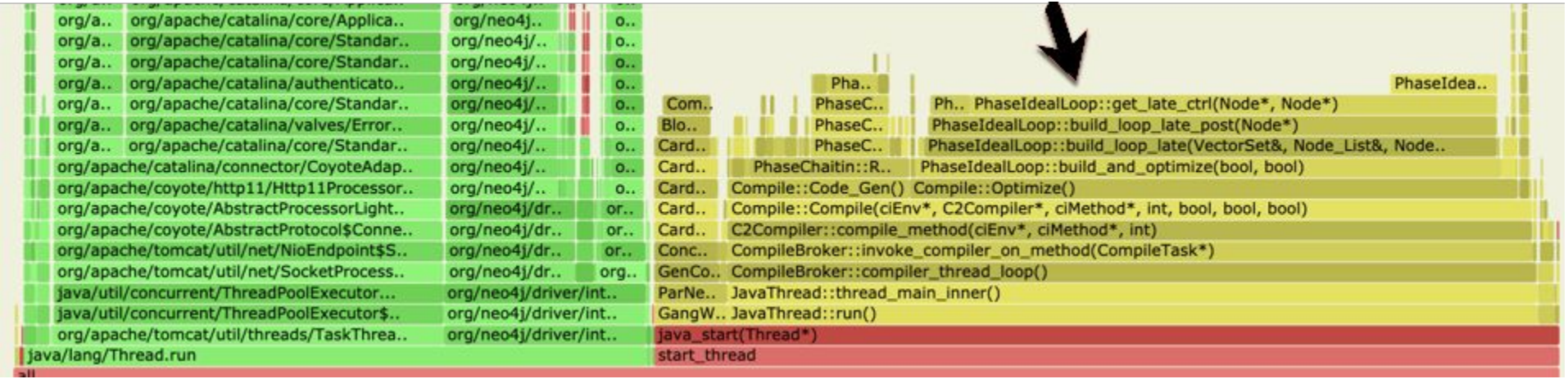
Flamegraphs also tells us a lot about how the code runs even if we're not familiar with it beforehand.

Here's a picture of recursion.



Real life examples

We can also see the effects of the JIT compiler on a service startup by seeing how much CPU is used by the JVM compiler threads



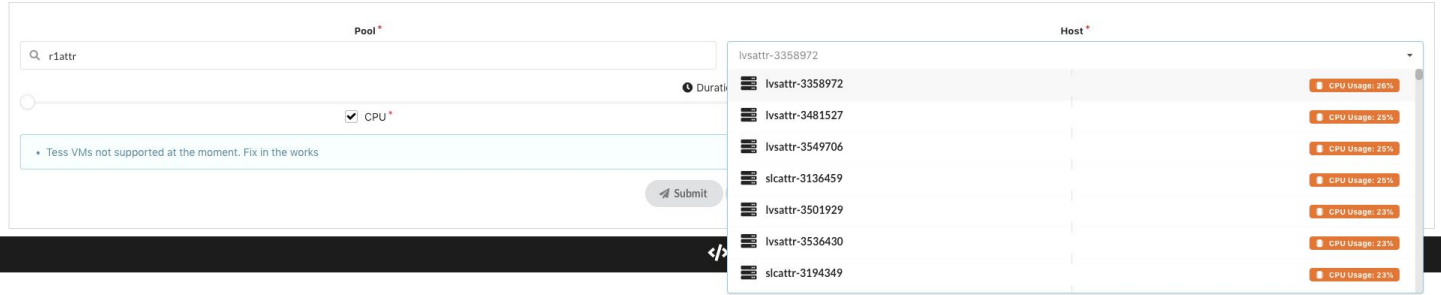
Automation and Streamlining

We built a project that allows everyone, SRE and developers to generate on-demand Flamegraphs from any production host.

We're currently working on

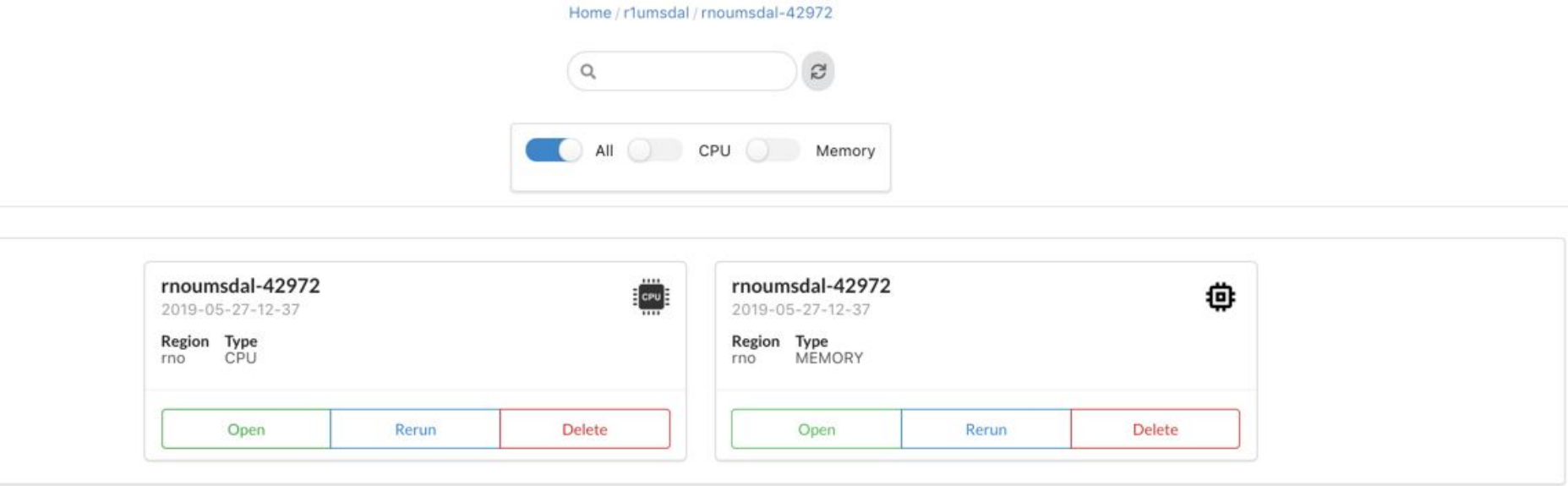
- having a constant stream of flamegraphs (and their visualization).
- Proactive, alert based profiling

We're also in the process of open-sourcing this tool.



Automation and Streamlining

All snapshots are stored, aggregated and can be searched / browsed by both developers and SREs and can be used as the starting point to analysis / discussion



Thank you



Amir Langer | Doron Sekler

alanger@ebay.com | dsekler@ebay.com

http://www.brendangregg.com/flamegraphs.html





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Smart and Effective Way to Reduce Distributed Tracing Overhead

SMART ?

EFFECTIVE ?

EH !?

Is tracing already not present in any form ?

Is tracing already not present in any form ?

Why is this of importance to SRE based teams or any team as a matter of fact ?

Why is this of importance to SRE based teams or any team as a matter of fact ?

Present day solutions

Present day solutions

Drawbacks

Drawbacks



Or as they say, every failure is a success in making.. :)

Comic courtesy - Dilbert.com

Problems ?? Solution..

- Overview

Problems ?? Solution..

- Overview

Problems ?? Solution..

- Smartness of the solution

Problems ?? Solution..

- Smartness of the solution

Problems ?? Solution..

- Effectiveness

Problems ?? Solution..

- Effectiveness


TECHNOLOGY ACHIEVEMENT
UNLOCKED!


THANK
YOU!

For discussing more please reach out to me,

@ susobhitpanigrahi@gmail.com





Lightning Talks

SREcon19 Dublin

In Recent News...





Your solution: do a firmware update





Your hardware is still mostly software

Handling Firmwares in your fleet

Yannick Brosseau

2019.10.05

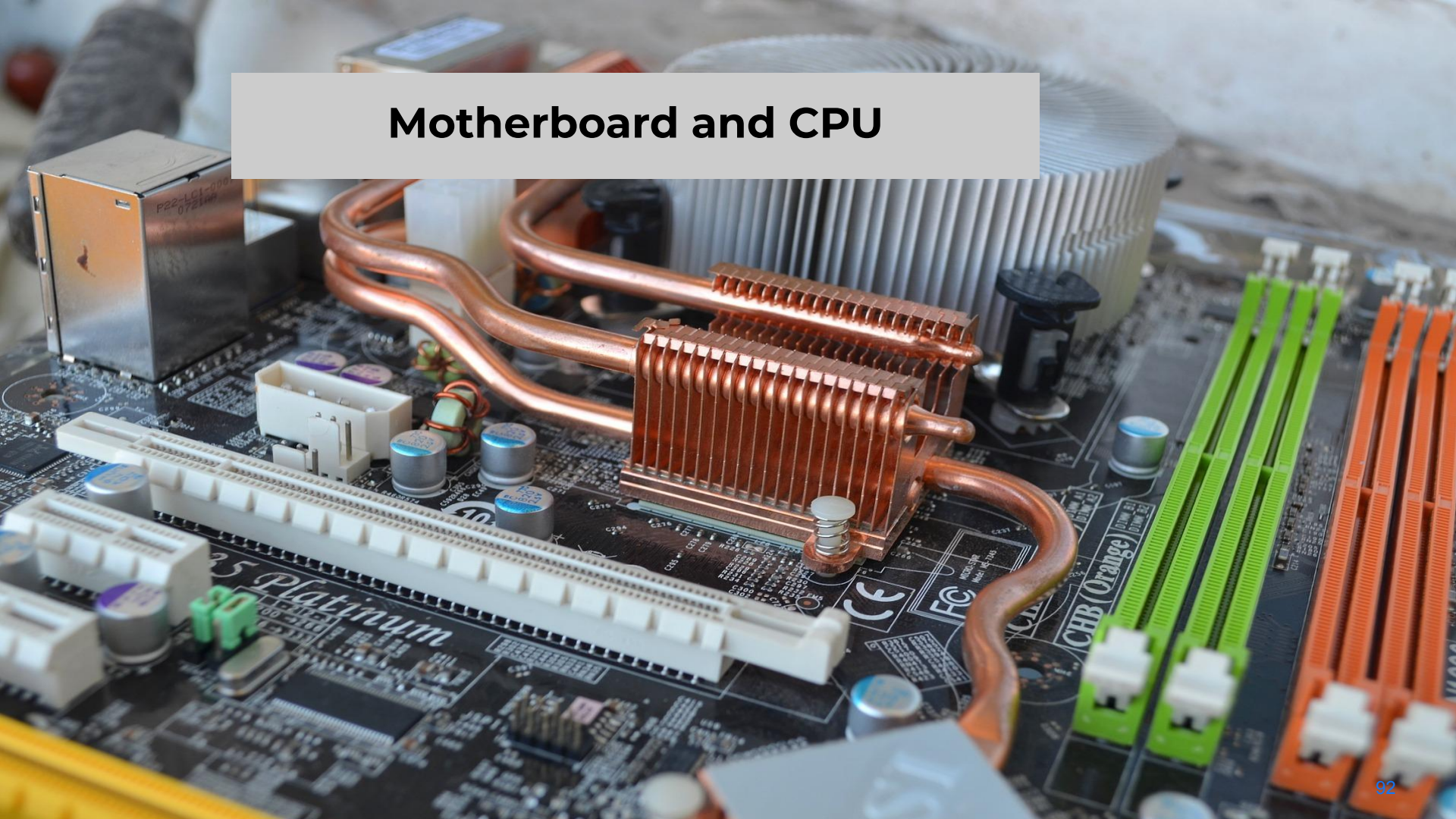

You are deploying fast and frequently already...

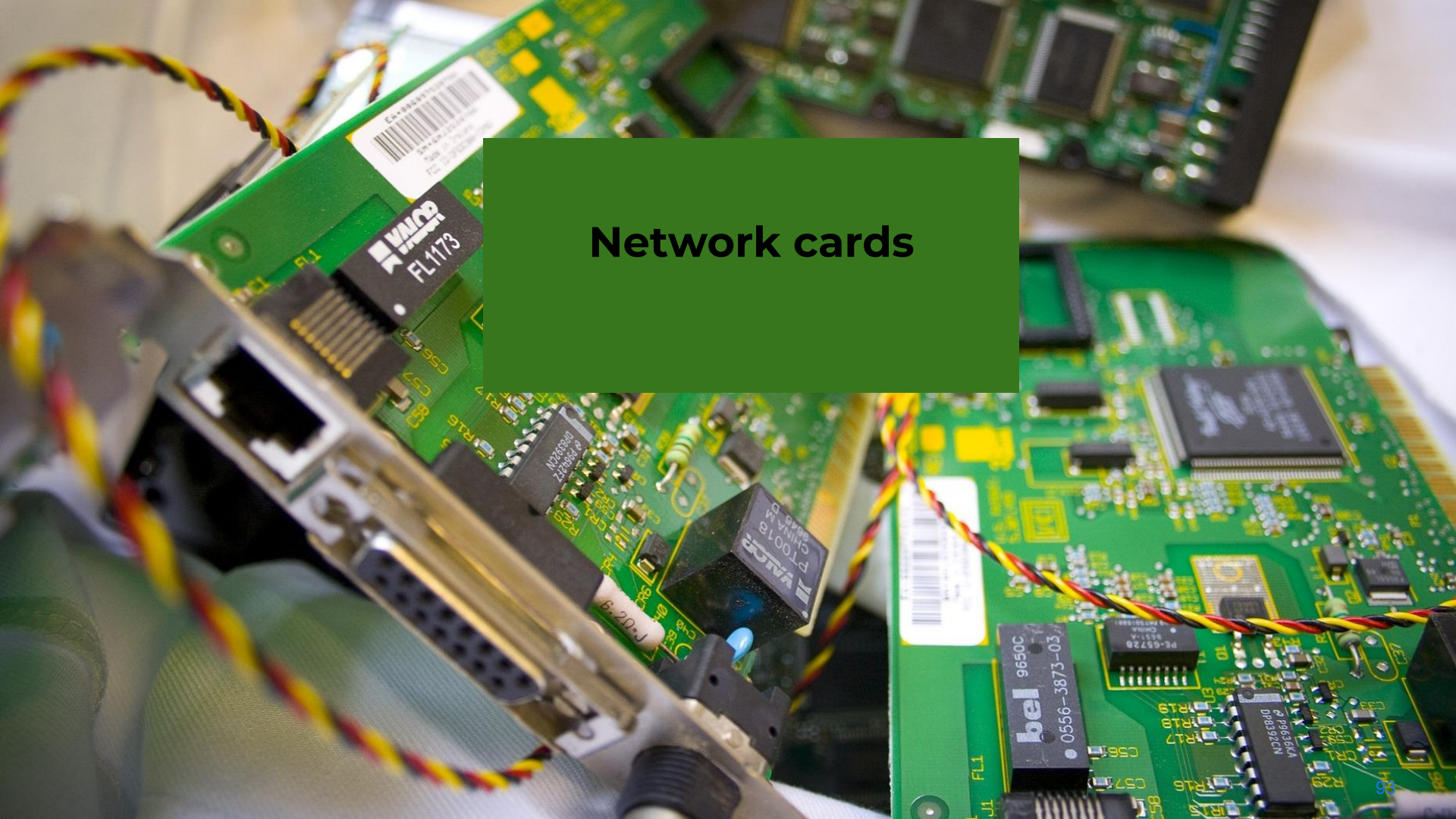

... but have
you thought
of firmwares ?

You need actual hardware



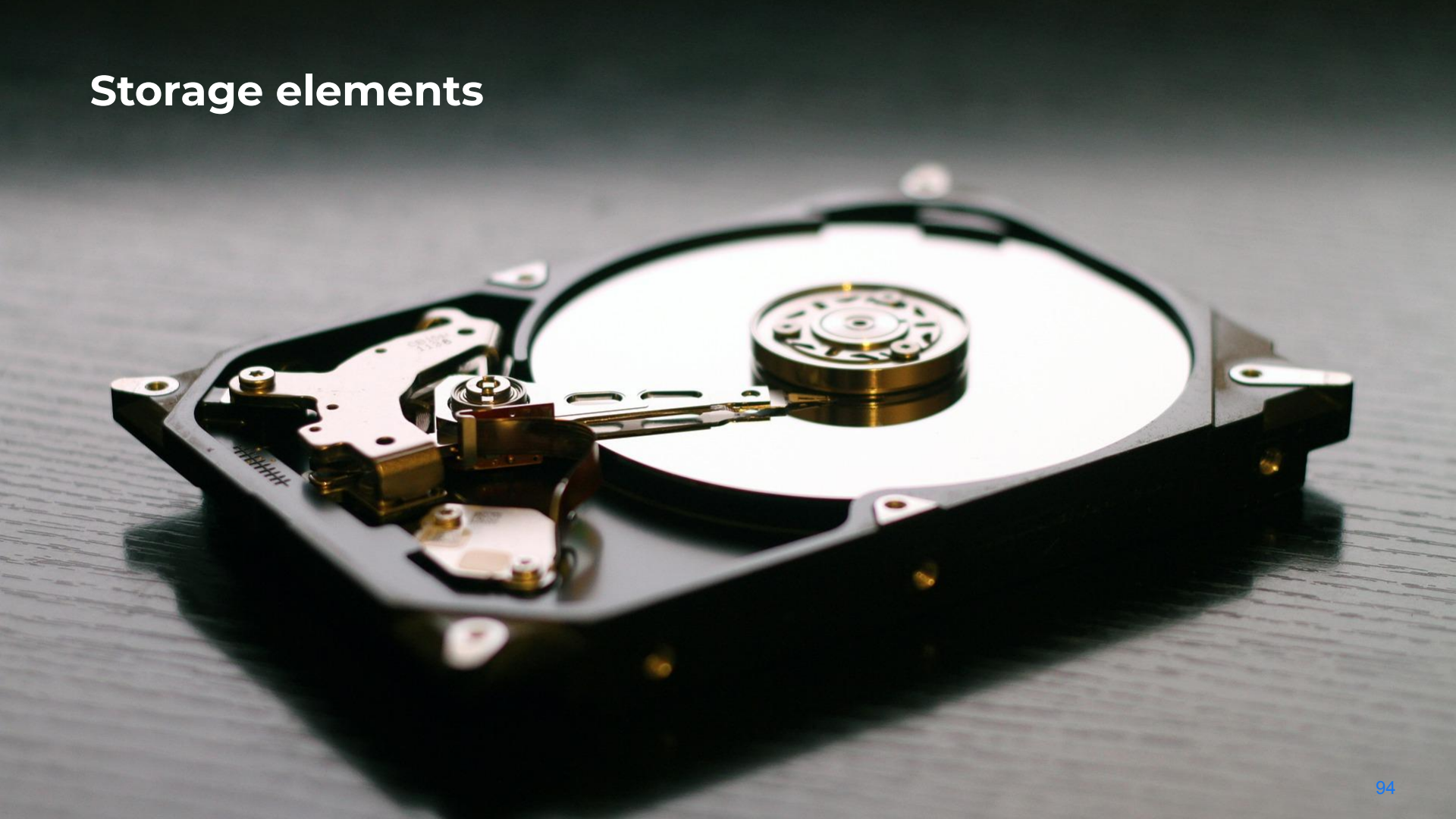
Motherboard and CPU





Network cards

Storage elements



And many more!

**(Network switches,
Back up devices,
Power supply, UPS,
etc)**







Why should you care ?



Security issues


Stability and performance

New features



How do we handle firmware ?

Packaging

One format for all





Versions database

Testing





Deployment

Open source firmware











Open System Firmware





Lightning Talks

SREcon19 Dublin

Issuance controls for SSL/TLS certificates

James Renken
(he/him)
SRE @ Let's Encrypt

Let’s Encrypt

Let’s Encrypt is a free, automated, and open Certificate Authority.

You can request certificates using the Automated Certificate Management Environment (ACME) protocol, RFC 8555.

Why control certificate issuance?

Operations & policy

Ensure that private keys are stored only in approved, secure ways.

Track certificate inventory for renewal, revocation, etc.

Meet compliance and audit requirements.

Why control certificate issuance?

Operations & policy

Ensure that private keys are stored only in approved, secure ways.

Track certificate inventory for renewal, revocation, etc.

Meet compliance and audit requirements.

Transport security

An attacker with a valid certificate could intercept traffic, and impersonate your service, with a Monster in the Middle attack.

This would defeat the purpose of Transport Layer Security.

Certificate types

Let’s Encrypt issues only **Domain Validated (DV)** certificates:

CN / SAN = enigma.gchq.dev

~~O = Government Digital Service~~

~~L = London~~

~~ST = Greater London~~

~~C = GB~~

Domain validation methods

“Confirming the Applicant's control over the FQDN by confirming...via HTTP/HTTPS over an Authorized Port...[t]he presence of the Request Token or Random Value contained in the content of a file.”

“Confirming the Applicant's control over the FQDN by confirming the presence of a Random Value or Request Token for either in a DNS CNAME, TXT or CAA record...”

(CA/Browser Forum Baseline Requirements, v1.6.6, §§ 3.2.2.4.6-7)

Certificate Authority Authorization (CAA)

RFC 6844

```
$ORIGIN gchq.dev.

.    IN    CAA    0    issue    "letsencrypt.org"
```

CA relationship

“You now have a Certificate Management agreement with us. We won’t sign any certificate for gchq.dev until your registered contacts have approved the request.”

CAA Record Extensions

RFC-to-be 8647

```
$ORIGIN gchq.dev.

.    IN    CAA    0    issue    "letsencrypt.org;
accounturi=https://acme-v02.api.letsencrypt.org/acme/acct/4
2056462"
```

CAA Record Extensions

RFC-to-be 8647

```
$ORIGIN gchq.dev.

.    IN    CAA    0    issue    "letsencrypt.org;
validationmethods=dns-01"
```

CA relationship

“You now have ~~a Certificate Management agreement with us~~ a CAA record in DNS.”

DNS: it’s not great

CAA records’ control is only as good as DNS’ integrity.

DNS responses usually aren’t authenticated.

BGP hijacking

Paths to Bob:

CA→Alice→Charlie→Max→Bob

CA→Alice→**Mallory**→“Bob”

Shortest path wins!

Improving DNS' integrity

Network presence & ops

Use authoritative DNS servers that are:

- Well-connected worldwide
- Announced as small prefixes (/24)
- Protected with RPKI
- Actively monitored and defended

Improving DNS' integrity

Network presence & ops

Use authoritative DNS servers that are:

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- Protected with RPKI
- Actively monitored and defended

Authenticated responses

Use DNSSEC.

When properly deployed, DNSSEC authenticates the presence/lack and content of DNS records.

It is a lovely morning on the Internet, and DNSSEC is a horrible goose.



Both prevention & monitoring

CAA record controls are great, they’re getting better, and you can improve their integrity—but not perfect it.

Monitor the Internet for unexpected certificates.

Certificate Transparency

RFC 6962

There are public, verifiable logs of most SSL/TLS certificates.

Google Chrome does not trust unlogged certificates, so the vast majority of CAs submit their certs.

Your SSL/TLS clients can do the same by validating Signed Certificate Timestamps (SCTs).

CT monitoring resources

- Facebook for Developers
- Hardenize
- Report URI
- SSLMate Cert Spotter

Or build your own with resources from certificate-transparency.org.

Thanks!

@jrenken





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Application and Network Service Mesh
Brennen Smith



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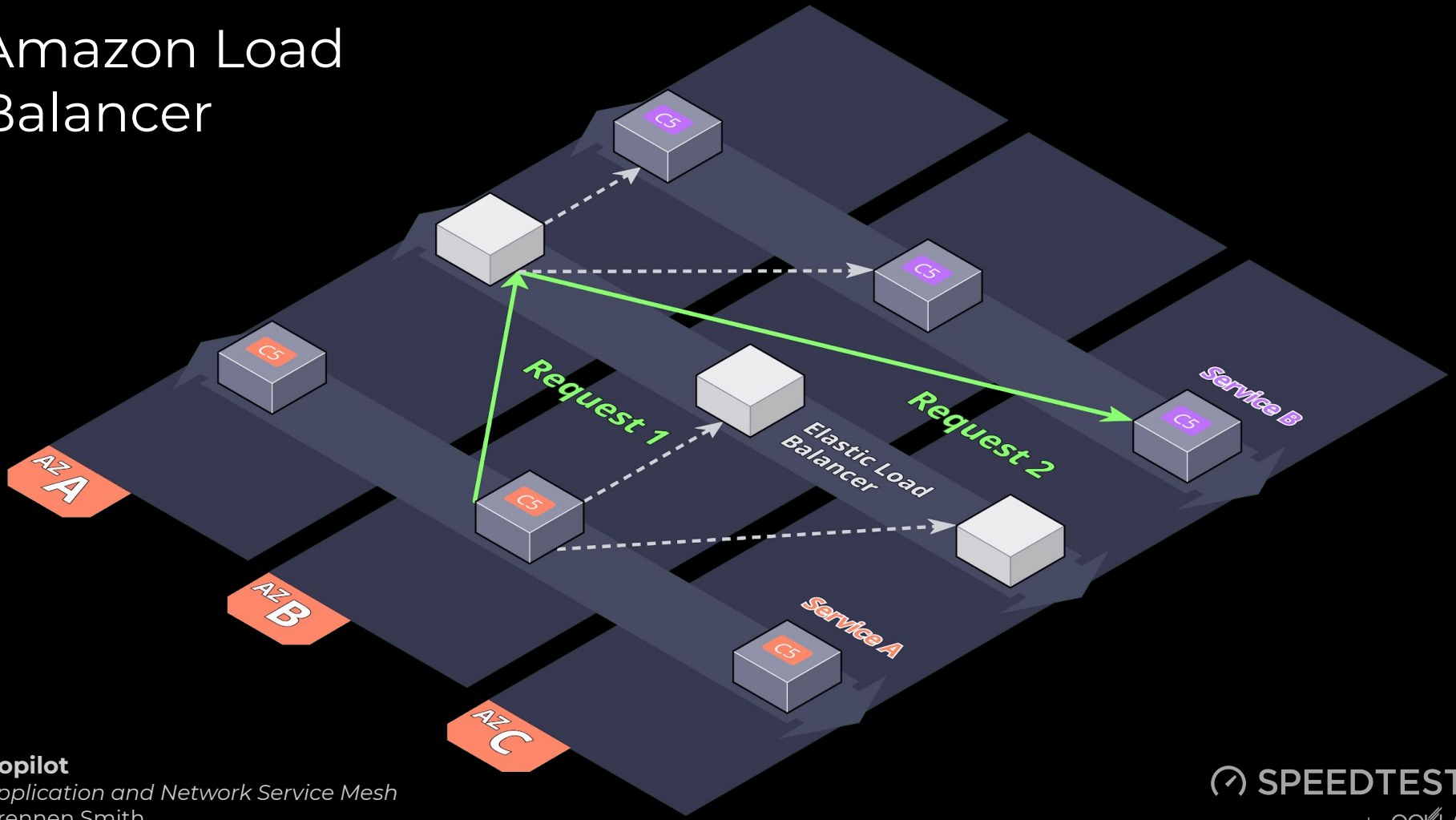


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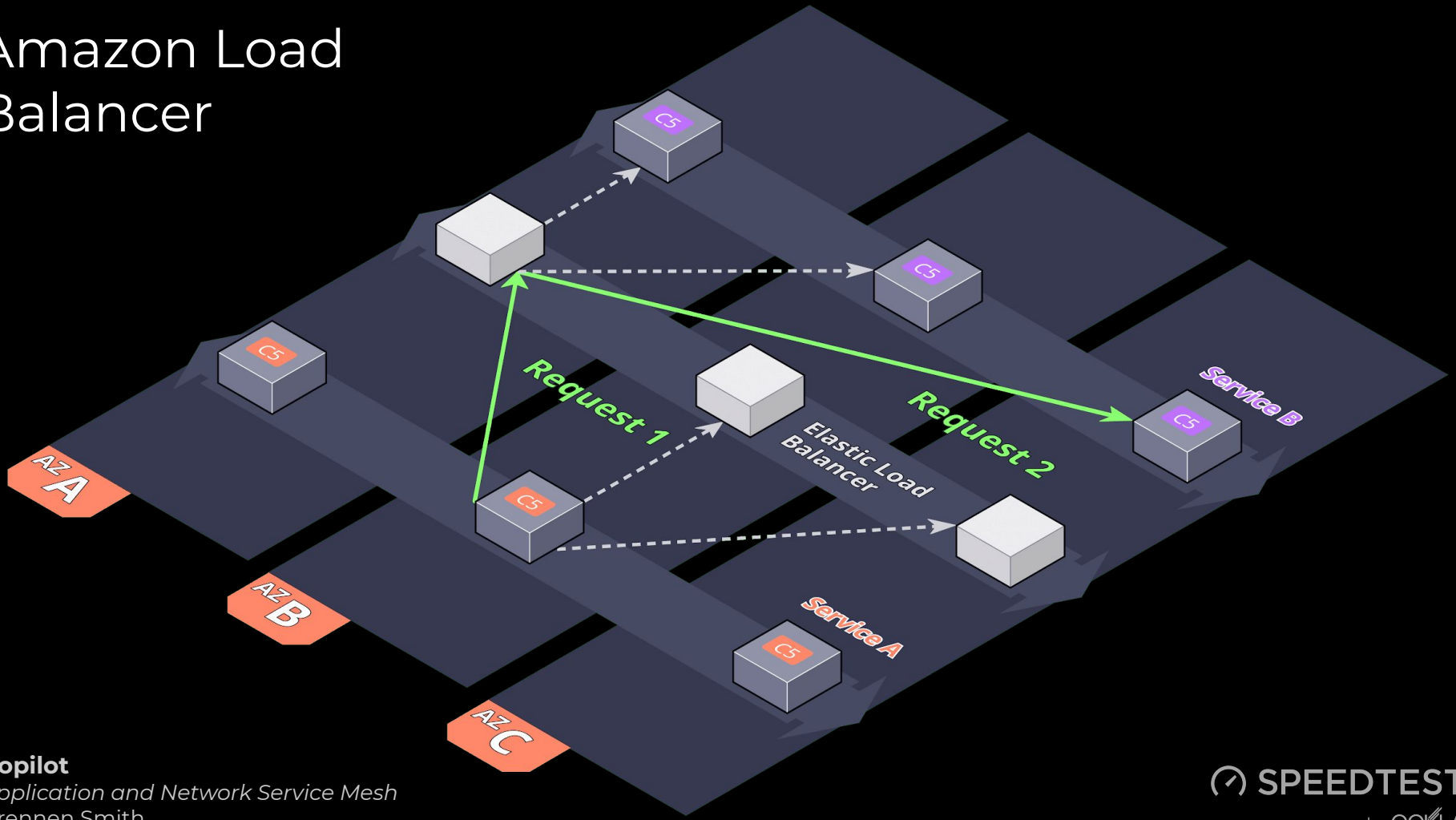
Amazon Load Balancer



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SPEEDTEST by OOKLA

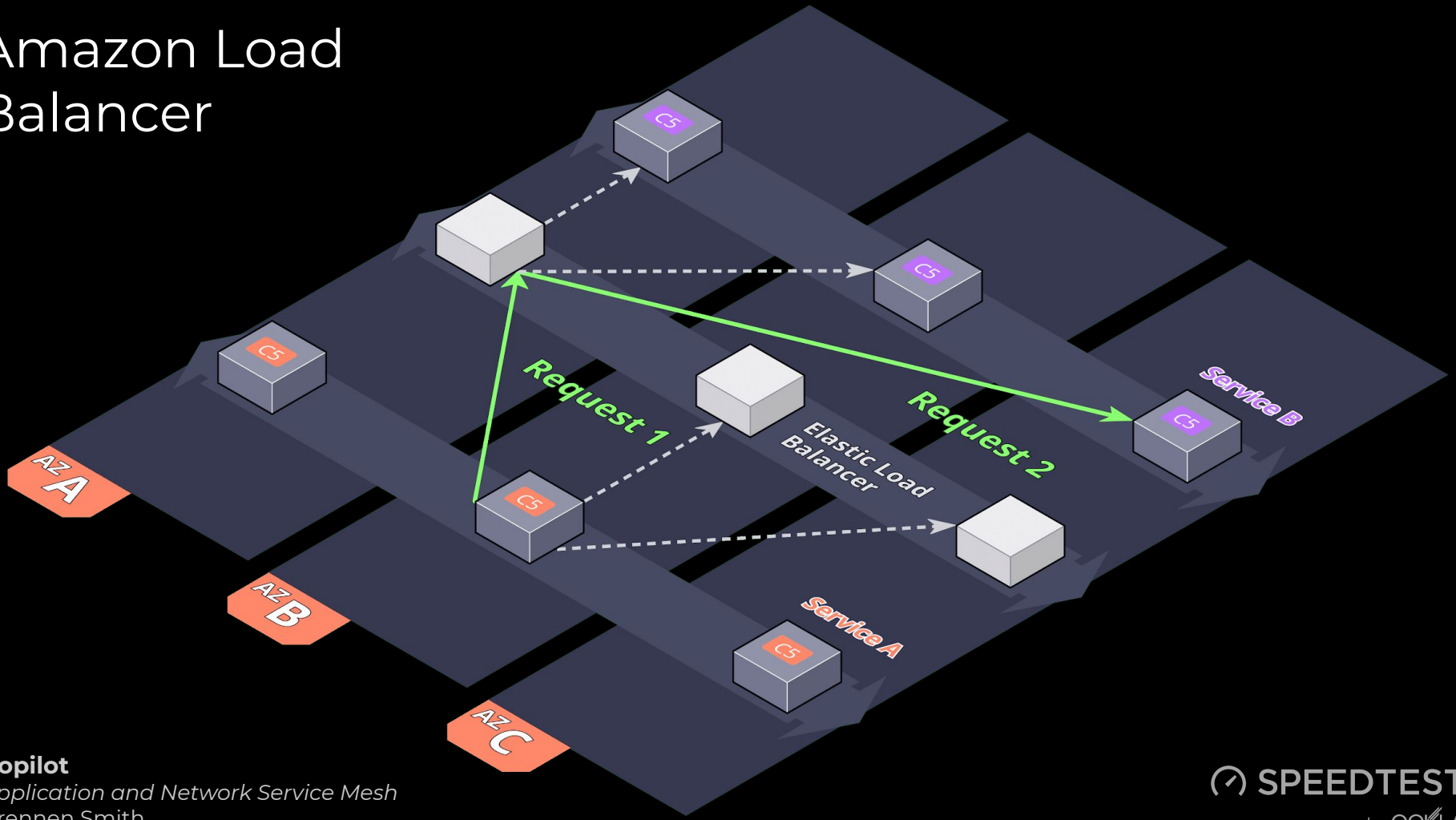
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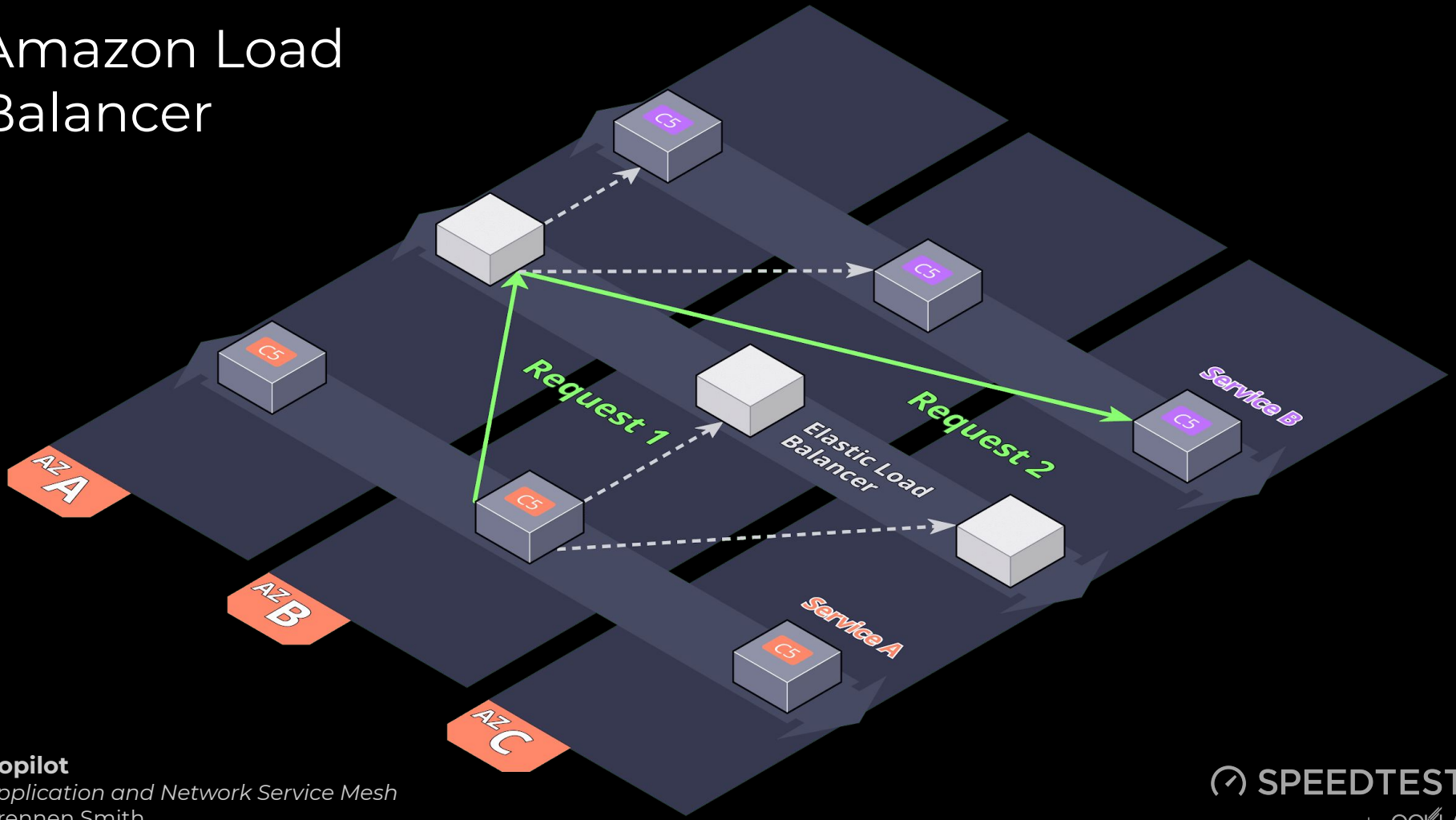
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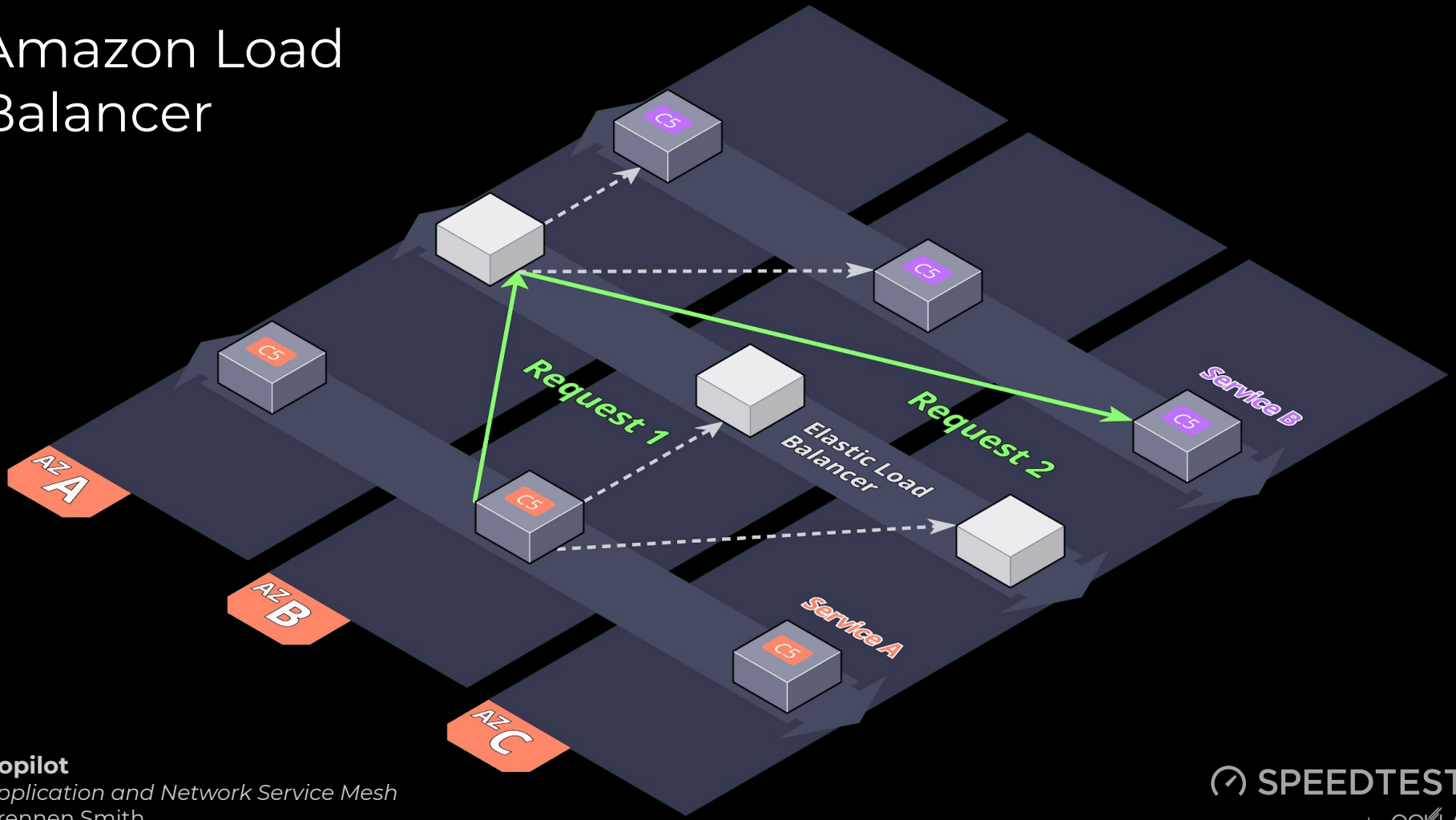
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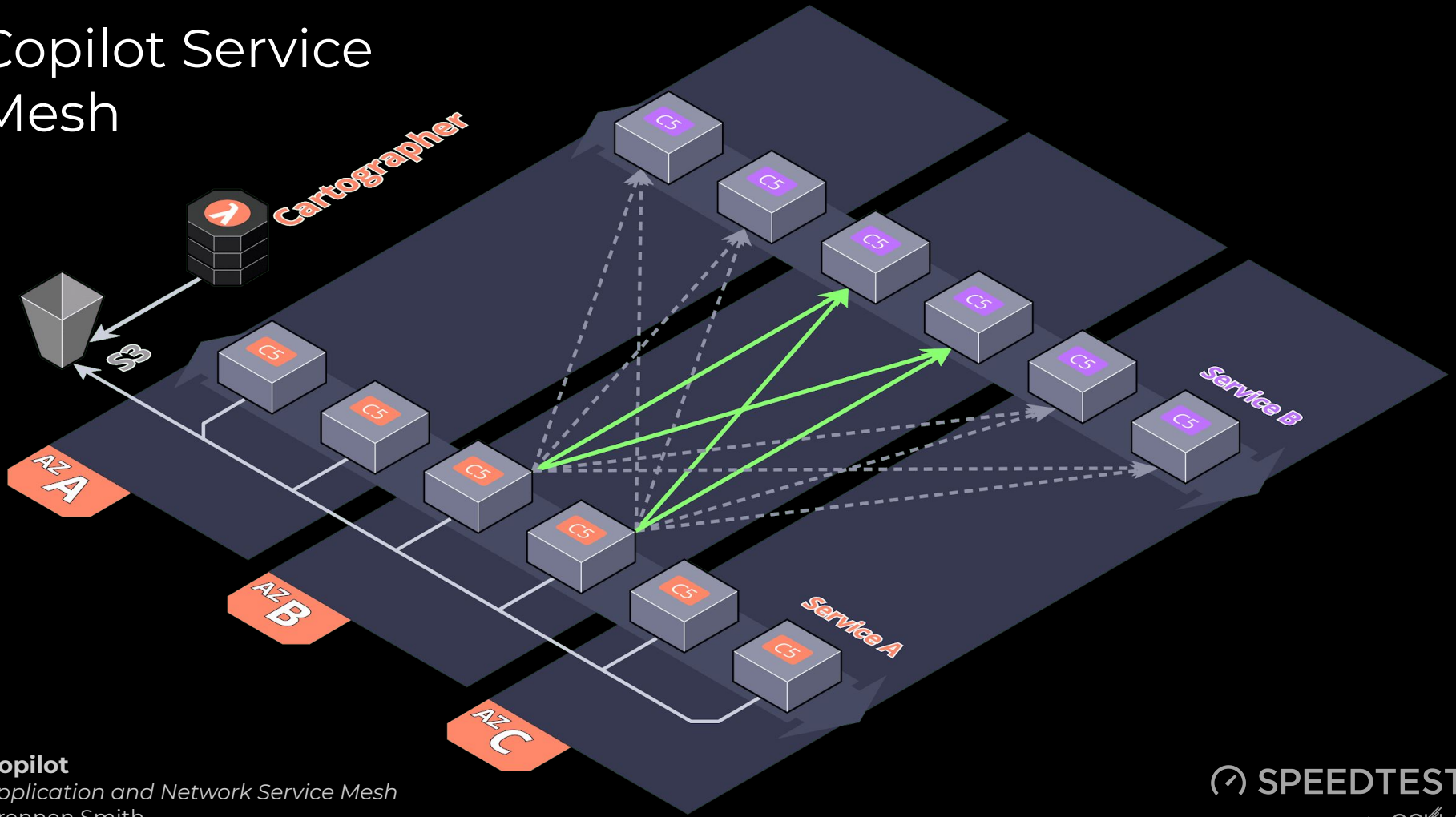
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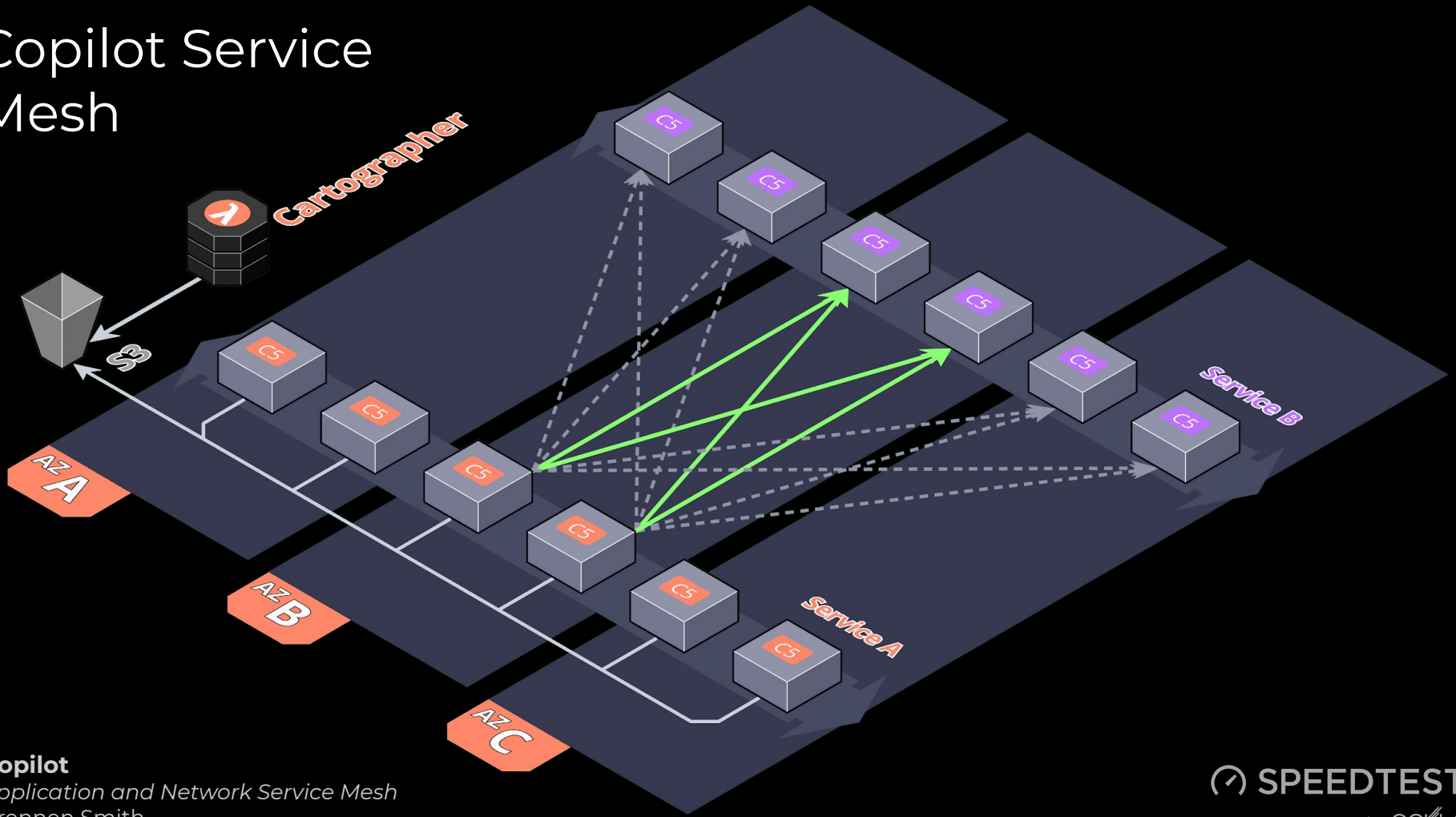
Copilot Service Mesh



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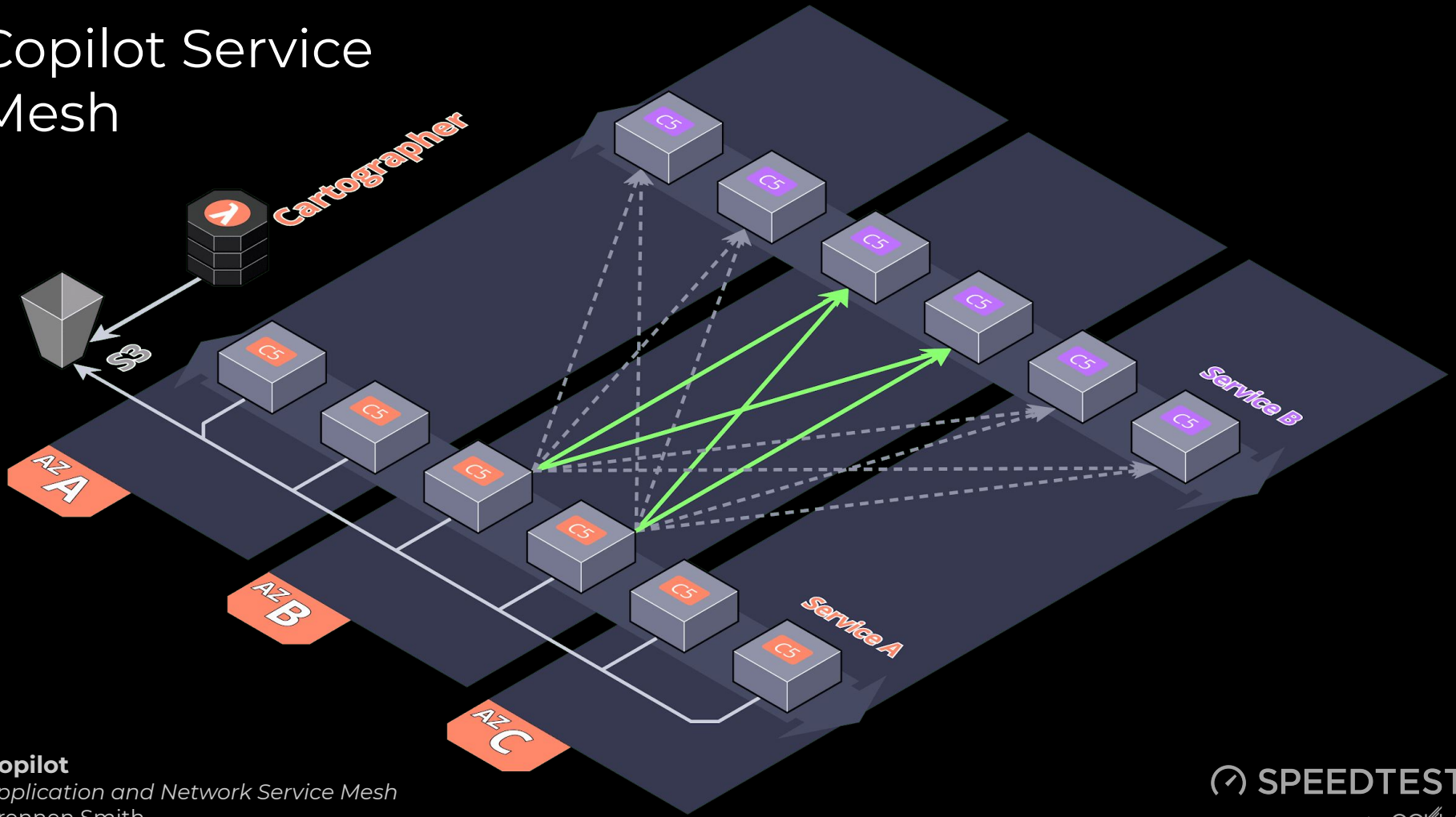
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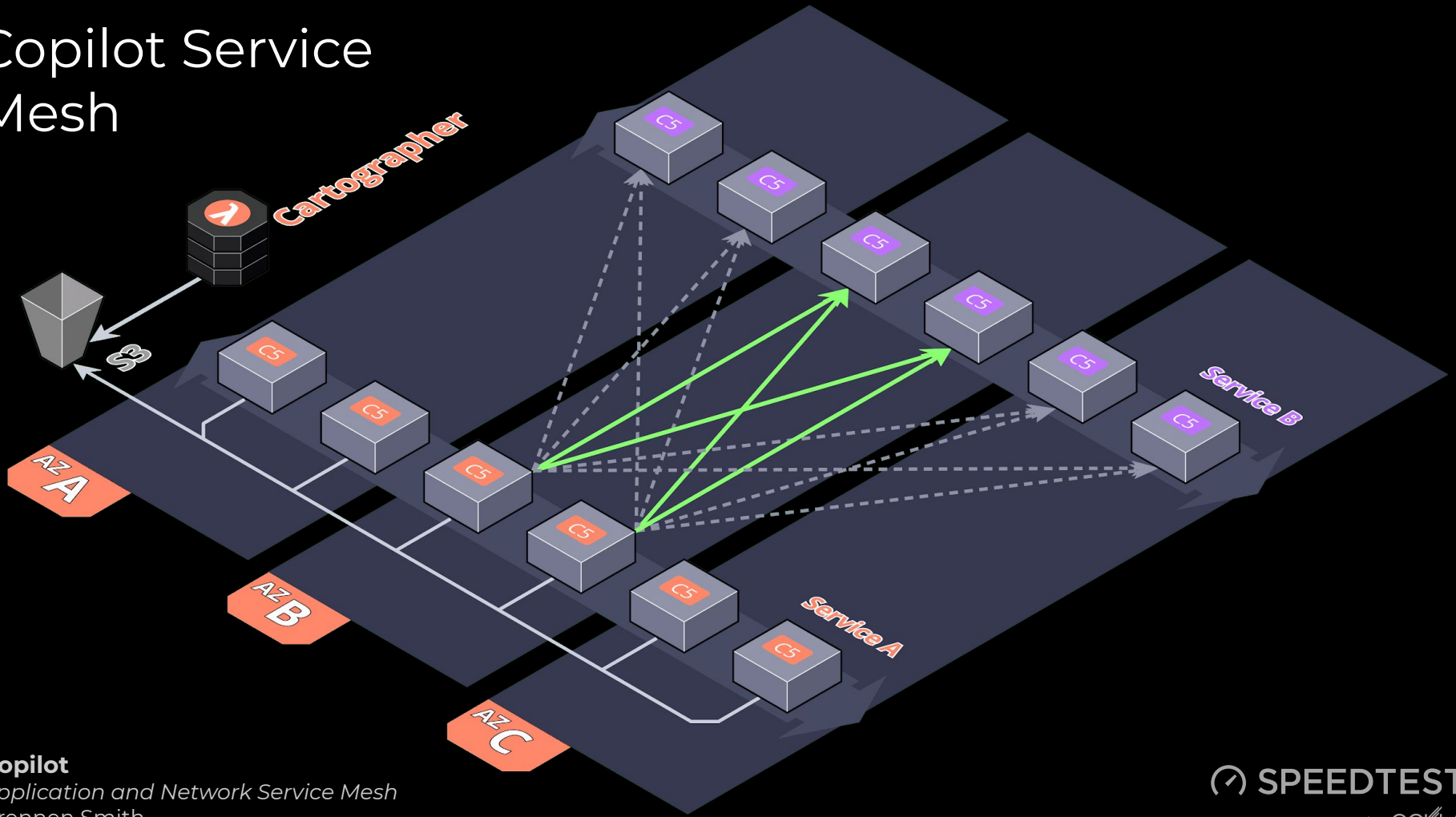
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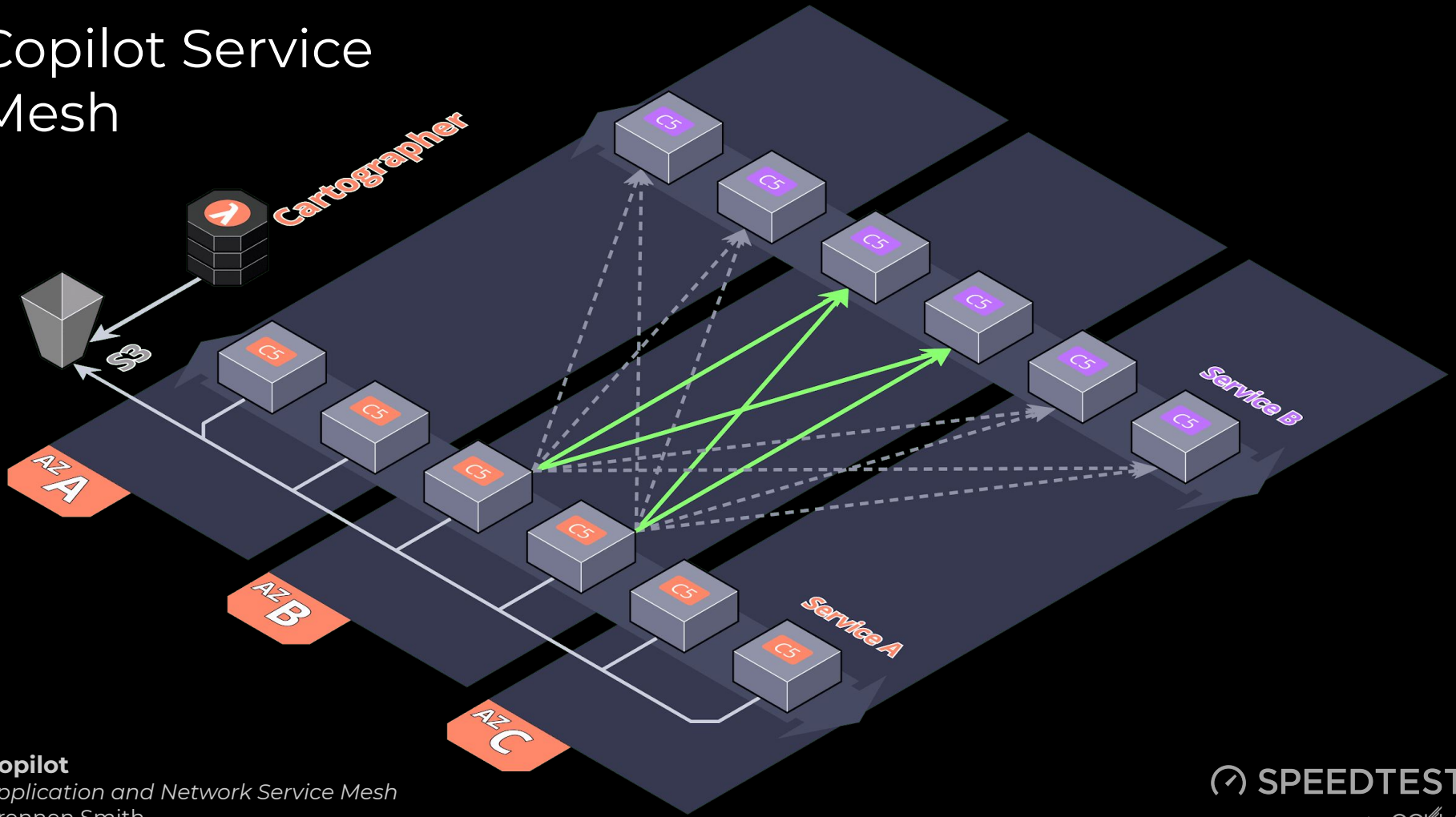
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Avg. Global Timings: Frontdoor Service → STNET Servers API



AWS Application Load Balancer

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AWS Application Load Balancer

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SPEEDTEST by OOKLA

```
{
  "next_steps": {
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Lightning Talks

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How Shopify Launched the Welcome Back Returnship Program

Jane Maguire, Engineering Recruitment Lead
@jane_maguire

5:00

shopify

We’re not just an ecommerce software, Shopify is the best ecommerce platform that has everything you need to sell online, on social media or in person.

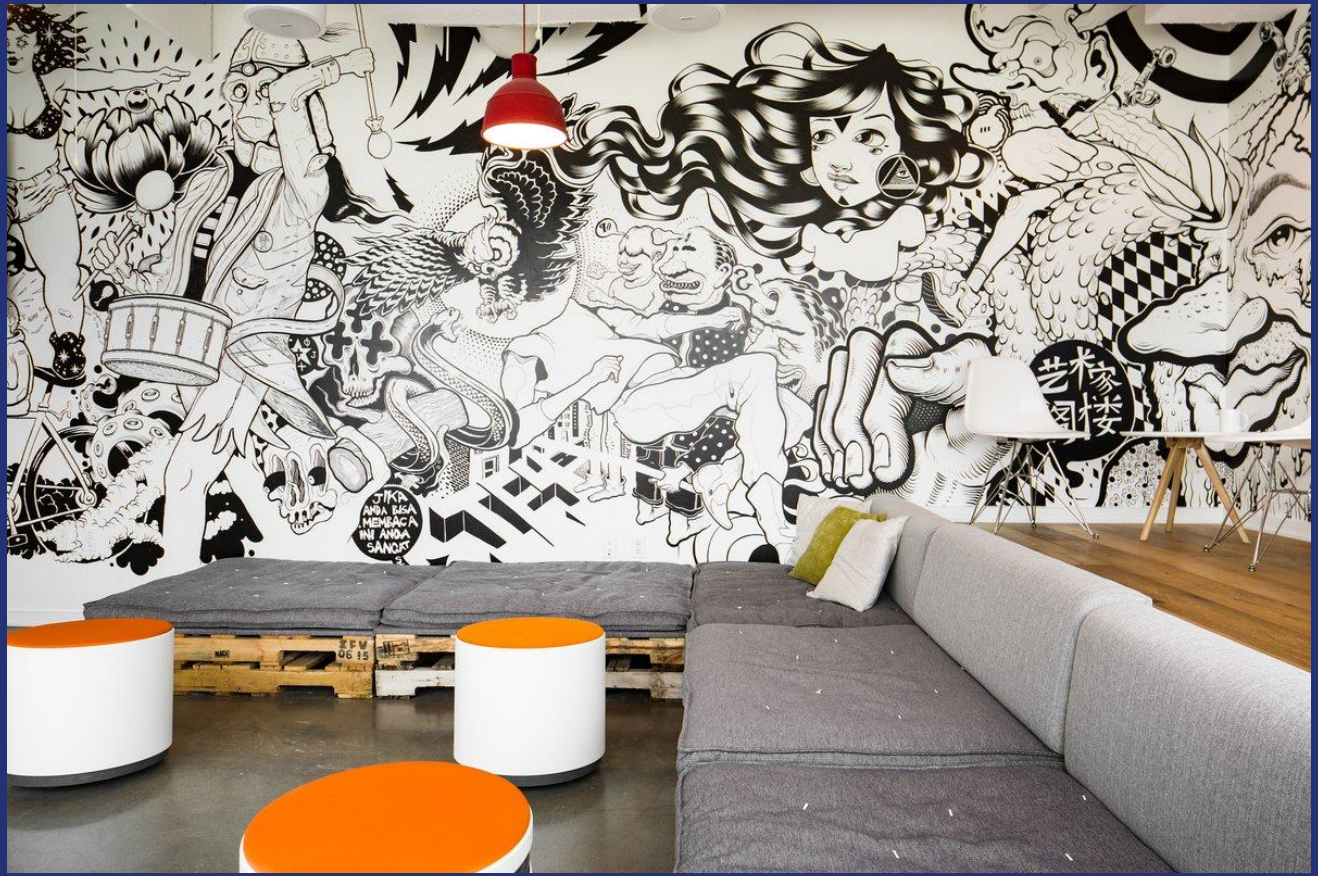

shopify
3M

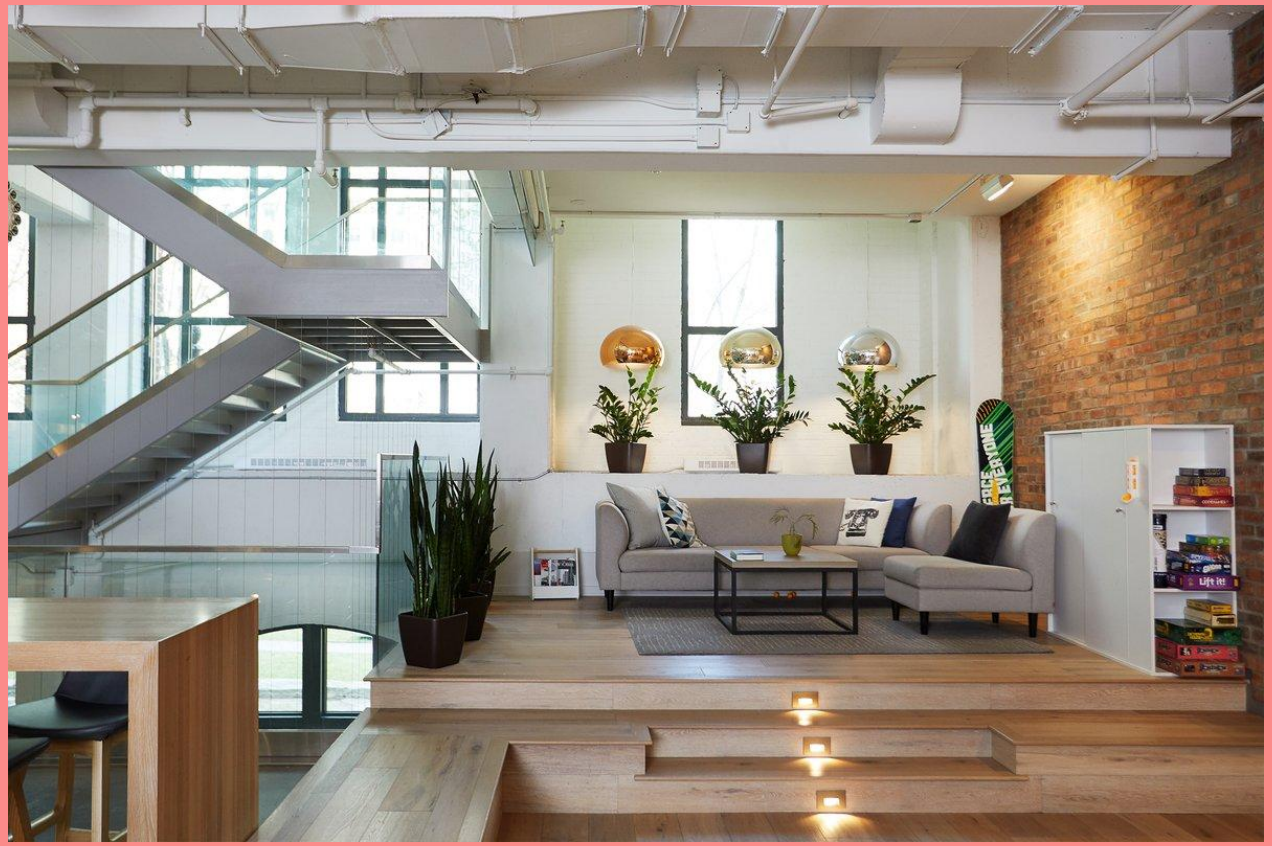


4:15



4:00


JIKA
ANDA BISA
MEMBACA
INI ANDA
SANGAT



3:30




WELCOME TO
THE
SF UNITE
VIEWING PART
BUILD YOUR OWN
WAFFLE BAR
MOCKMOSAS
& MIMOSAS
COFFEE
HELP YOURSELF

3:00



2:45

We’re halfway through! 😂😂

2:30



2:15



2:00



1:45





1:15



1:00



0:45



0:30



0:15

Thanks!

shopify





Lightning Talks

SREcon19 Dublin

Pivotal

Managing On-Call Atrophy

Version 1
September 2019

5:00

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What is On-Call Atrophy

When you don’t exercise your On-Call muscles



What is On-Call Atrophy

When you don’t exercise your On-Call muscles

- Low call out rate - Google call this Operational Underload



What is On-Call Atrophy

When you don’t exercise your On-Call muscles

- Low call out rate - Google call this Operational Underload
- Wide product base\legacy product base



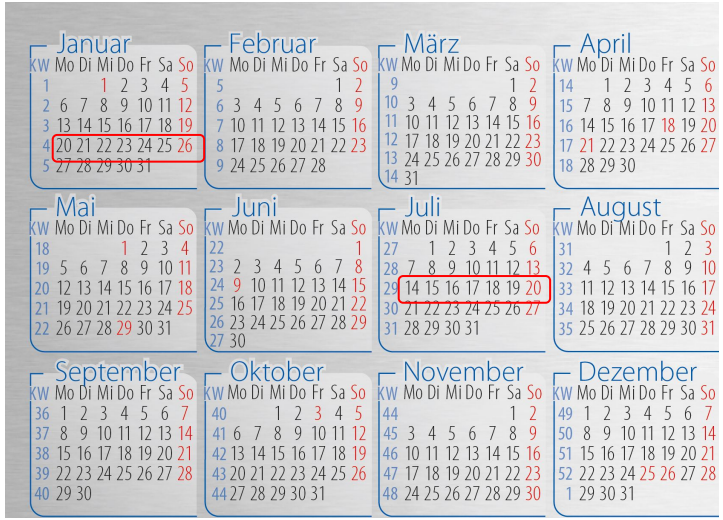
Pivotal

4:15

What is On-Call Atrophy

When you don't exercise your On-Call muscles

- Low call out rate - Google call this Operational Underload
- Wide product base\legacy product base
- Infrequent rotations - loss of touch



Wait, What!!

You're saying "It's bad NOT being paged"



Wait, What!!

You're saying "It's bad NOT being paged"

- No system ever is 100% reliable and probably shouldn't be

100%

Wait, What!!

You're saying "It's bad NOT being paged"

- No system ever is 100% reliable and probably shouldn't be

99.9%

Wait, What!!

You’re saying “It’s bad NOT being paged”

- No system ever is 100% reliable and probably shouldn’t be
- Emotional safety and comfort



3:00

Wait, What!!

You're saying "It's bad NOT being paged"

- No system ever is 100% reliable and probably shouldn't be
- Emotional safety and comfort
- Be prepared for now



2:45*

Wait, What!!

You're saying "It's bad NOT being paged"

- No system ever is 100% reliable and probably shouldn't be
- Emotional safety and comfort
- Be prepared for now



You did WHAT!!
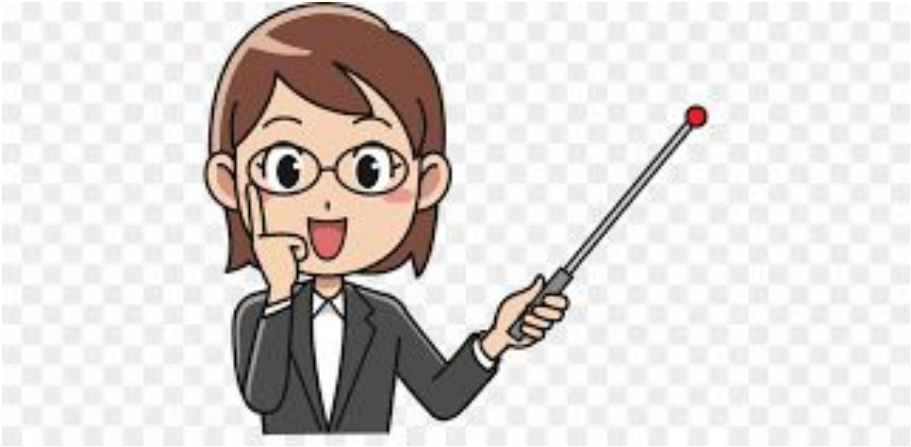
Don’t tell me you did something Dumb like paging On-Call at Random?



You did WHAT!!

Don’t tell me you did something Dumb like paging On-Call at Random?

- Opt in approach and strict rules



You did WHAT!!

Don’t tell me you did something Dumb like paging On-Call at Random?

- Opt in approach and strict rules
- Set of comprehensive drills



1:45*

You did WHAT!!

Don’t tell me you did something Dumb like paging On-Call at Random?

- Opt in approach and strict rules
- Set of comprehensive drills



You did WHAT!!

Don’t tell me you did something Dumb like paging On-Call at Random?

- Opt in approach and strict rules
- Set of comprehensive drills
- What have we found out
  - Out of date software
  - Ipv6 and Google firewalls
  - People like it! (People are strange!)



Obligatory War Story

So this one time at band camp.....



Obligatory War Story

So this one time at band camp.....







Who the hell was that?

So I am....

- James Wynne
- Pivotal CloudOps R&D
- You can drop me a mail at jwynne@pivotal.io
- Or come up to me afterwards and ask me anything (within a very narrow scope!)



Transforming How The World ~~Builds~~ Operates Software

0:15

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Slide karaoke

for the brave
and fearless





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