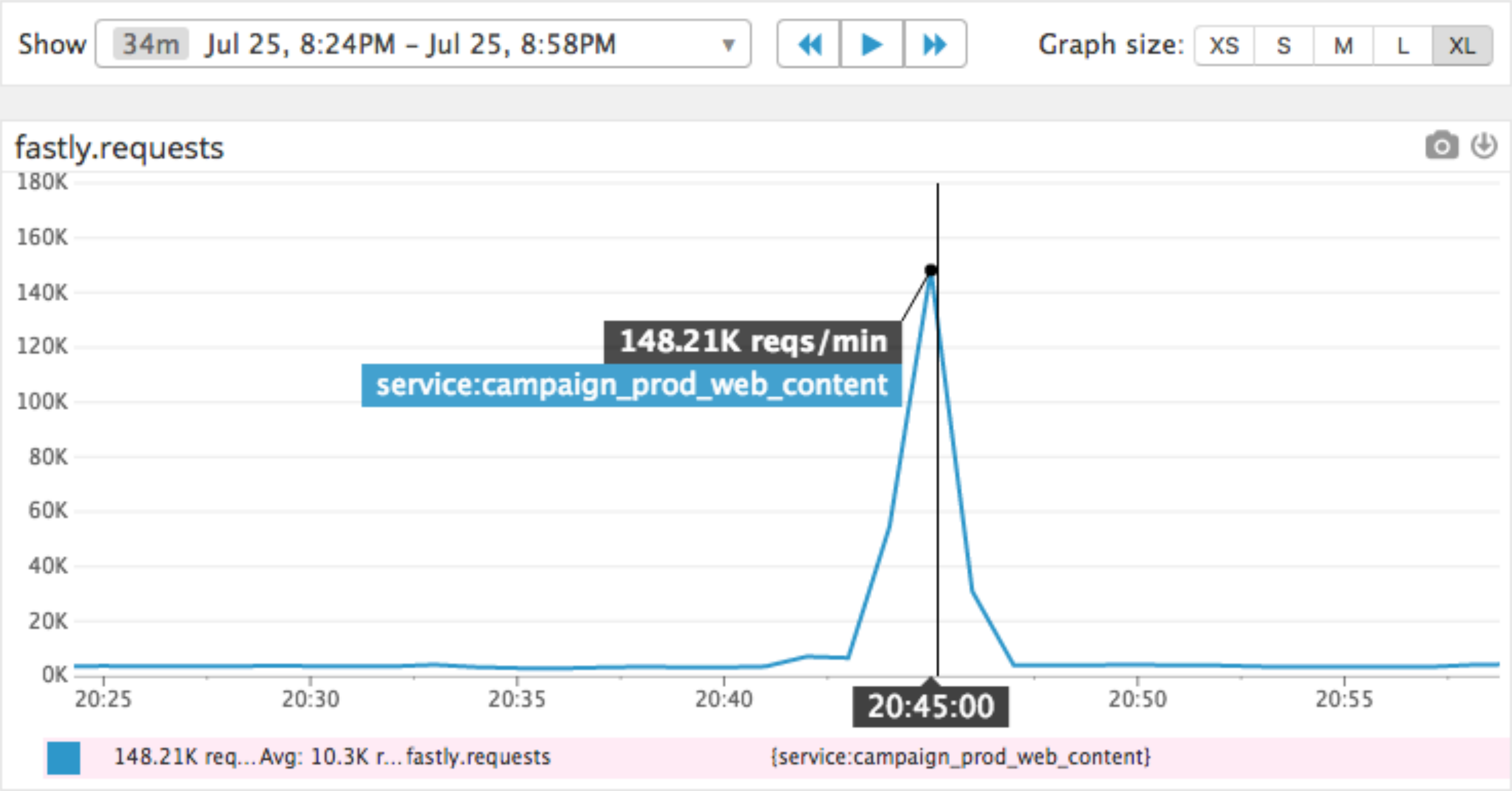
PRESIDENTIAL CAMPAIGNS & IMMUTABLE INFRASTRUCTURE

Or, how we learned to stop worrying and love the cloud

Michael E Fisher

JUNE 28, 2017

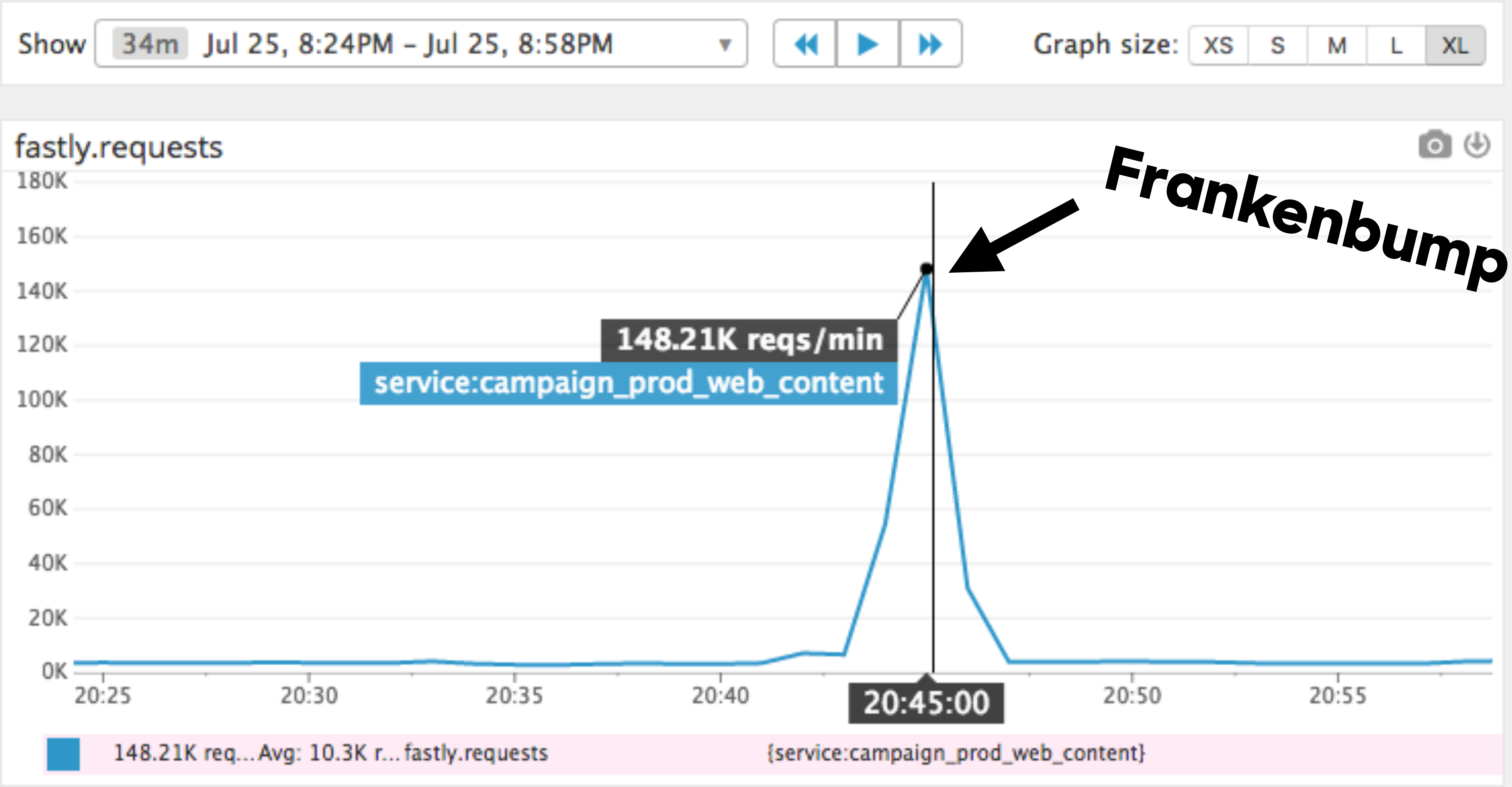


Show 34m Jul 25, 8:24PM – Jul 25, 8:58PM

Graph size: XS S M L XL

fastly.requests

🟦 148.21K req... Avg: 10.3K r... fastly.requests {service:campaign_prod_web_content}



Show 34m Jul 25, 8:24PM – Jul 25, 8:58PM

Graph size: XS S M L [✓ XL]

fastly.requests

🟦 148.21K req... Avg: 10.3K r... fastly.requests {service:campaign_prod_web_content}

Frankenbump

hello

BUT FIRST, HOW DID WE GET HERE?

Video: The story of us

Chip in today

$5 $15 $25 $100

Learn

About

Issues

Blog

Speeches

Support

Find my state

Volunteer

Shop

Jobs

Help from Home

Donate

Raise

Protect the vote

Vote Together

African Americans for Hillary

Latinos for Hillary

Asian Americans and Pacific Islanders for Hillary

Women for Hillary

Millennials for Hillary

Follow

Elements
Console
Sources
Network
Performance
Memory
Application
Security
Audits
Redux
React
8
Styles
Computed
Event Listeners
»
Filter
:hov
.cls
Console

```
<!DOCTYPE html>
<!--
    HHHHHH       →→HHHH
    HHHHHH       →→→→HH
    HHHHHH       →→→→→→→
    →→→→→→→→→→→→→→→→→→→→→→→      Git out the vote!
    →→→→→→→→→→→→→→→→→→→→→→→→→    Join the only 18 month, nationally televised hackathon.
    →→→→→→→→→→→→→→→→→→→→→→→      https://boards.greenhouse.io/hillaryforamerica
    HHHHHH       →→→→→→→
    HHHHHH       →→→→HH
    HHHHHH       →→HHHH
    -->
<html lang="en">
▸ <head>…</head>
▾ <body class="s-home s-chyron-enabled ">
    <div id="splash-page"></div>
```

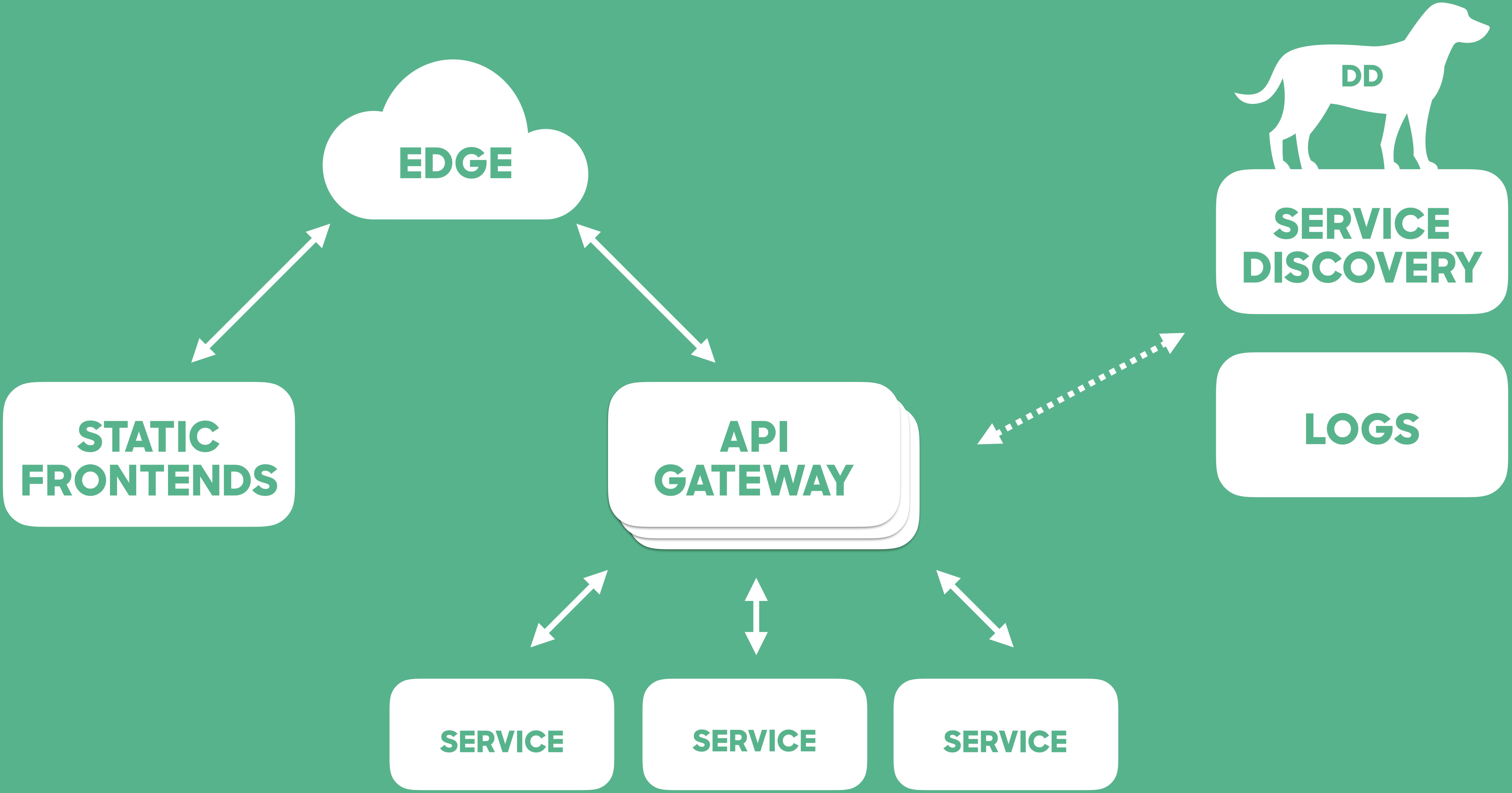
```
ml  body.s-home.s-chyron-enabled  main#main.o-wrap-page
```

```
element.style {
}
@media screen and (min-width: 840px)
.o-wrap-page {  global-57ef004….53789130.css:1
   margin-top: 90px;
}
.o-wrap-page {  global-57ef004….53789130.css:1
   ~~margin-top: 45px;~~
}
.o-wrap-page {  global-57ef004….53789130.css:1
   -webkit-box-flex: 1;
   ~~-webkit-flex: 1 1 auto;~~
```

Hillary

Vote for Hillary April 19
#ImWithHer
H New York

ONE
STO
PRING 2015


DD
EDGE
SERVICE DISCOVERY
STATIC FRONTENDS
API GATEWAY
LOGS
SERVICE
SERVICE
SERVICE

Application SLAs and Runbooks
File
Edit
View
Insert
Format
Data
Tools
Add-ons
Help
All changes saved in Drive
michaelfisher@hillaryclinton.com
Comments
Share
$
%
.0
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123
Arial
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A
Σ
fx

python, django, psql; darkroom -> continuum; Migration stack for db migrations.

	A	B	C	D	E
1		**What is it? Give us two sentences on your service.**	**What's your stack? How does it get deployed?**	**How do I find it?**	**How does it go down?**
45	DNC Service Proxy	Used to be called polling-lookup. Proxies requests to a variety of DNC apis. Much more important when polling places are open starting in August.	Nginx config deployed via continuum	https://github.com/hillaryclinton/dnc-service-proxy	DNS cache can go stale, and DNC can shit the bed.
46	LBJ (not in prod)				
47					
48					
49	**Organizing**				
50	bundler	Tool to help fundraisers manage the people who fundraise for them.	TODO(kdavis)		
51	hoverboard	Service for generating walk packets and storing data from volunteers that use walk packets.	Django backend (continuum), normal megaphone FE		VanProxy is the major dependency
52	blacktie	Allows users to create and manage ticketed events and free, grassroots events	HTML, CSS, JS. Deployed via Travis to S3	hillaryclinton.com/events	Fastly or S3 problems, bad JS/CSS/HTML pushed
53	megaphone chrome extension	A chrome extension that interfaces with VAN and allows Field Organizers to create and sync events from VAN to GW. Will expand for hoverboard and email.	The Chrome extension itself is published to the Chrome Web Store via Travis. The web app loaded by the extension is deployed to S3. Both are HTML&CSS&JS	Extension: https://chrome.google.com/webstore/detail/hfa-events-van/egihiifclcddeledndlcepglcbfdgcfi - Must have VAN login to use. Shows up here: https://www.votebuilder.com/EventList.aspx - Web app: hillaryclinton.com/van-events	Fastly or S3 problems, bad JS/CSS/HTML in web app or Chrome Extension
54	vanproxy	A proxy service for van soap and rest apis	flask app, travis/darkroom/continuum, no db	www.hillaryclinton.com/api/vanproxy, vanproxy.hillaryclinton.com	Probably van api problems, or problems with concurrent open external request threads. Possibly bad push or loss of end-user permissions in the claw.
55	events-app	backend rest api for all things events. events and rsvps/orders	python, django, psql; darkroom -> continuum; Migration stack for db migrations.	admin: https://events-external.prod.hillaryclinton.com/admin/ api: /api/events	historically, only when the-claw has problems. Possibly a bad push or unexpected load (db or server). Could also have issues if hamm goes. Uses all three Hamms.
56	events sync to GW	reads event data from van and writes it to gw via events-app apis	flask app, docker, airflow	airflow admin	Either database breaks. (trying to remove vertica from pipeline). Airflow goes down.
57	email-templates-prod	Just a bunch of email temlates for pizza planet	Jinja based email templates	https://github.com/HillaryClinton/email-templates-prod	Bad template logic

60 elections

80 tech staff

100 immutable backends

150 serverless frontends

577 days

2,500 max QPS

82,759,676 votes

Chaos, right?
Immutable to the rescue.

Immutable as a handshake

```
==> amazon-ebs: Launching a source AWS instance...
==> amazon-ebs: Waiting for instance to become ready...
==> amazon-ebs: Connecting to the instance via SSH...
==> amazon-ebs: Stopping the source instance...
==> amazon-ebs: Waiting for the instance to stop...
==> amazon-ebs: Creating the AMI: packer-example 1371856345
==> amazon-ebs: AMI: ami-19601070
==> amazon-ebs: Waiting for AMI to become ready...
==> amazon-ebs: Terminating the source AWS instance...
==> amazon-ebs: Deleting temporary security group...
==> amazon-ebs: Deleting temporary keypair...
==> amazon-ebs: Build finished.

==> Builds finished. The artifacts of successful builds are:
--> amazon-ebs: AMIs were created:

us-east-1: ami-19601070


root@really-important-production-instance:~# service nginx restart
```

Easy:

- Build tooling
- Deployment
- Resiliency

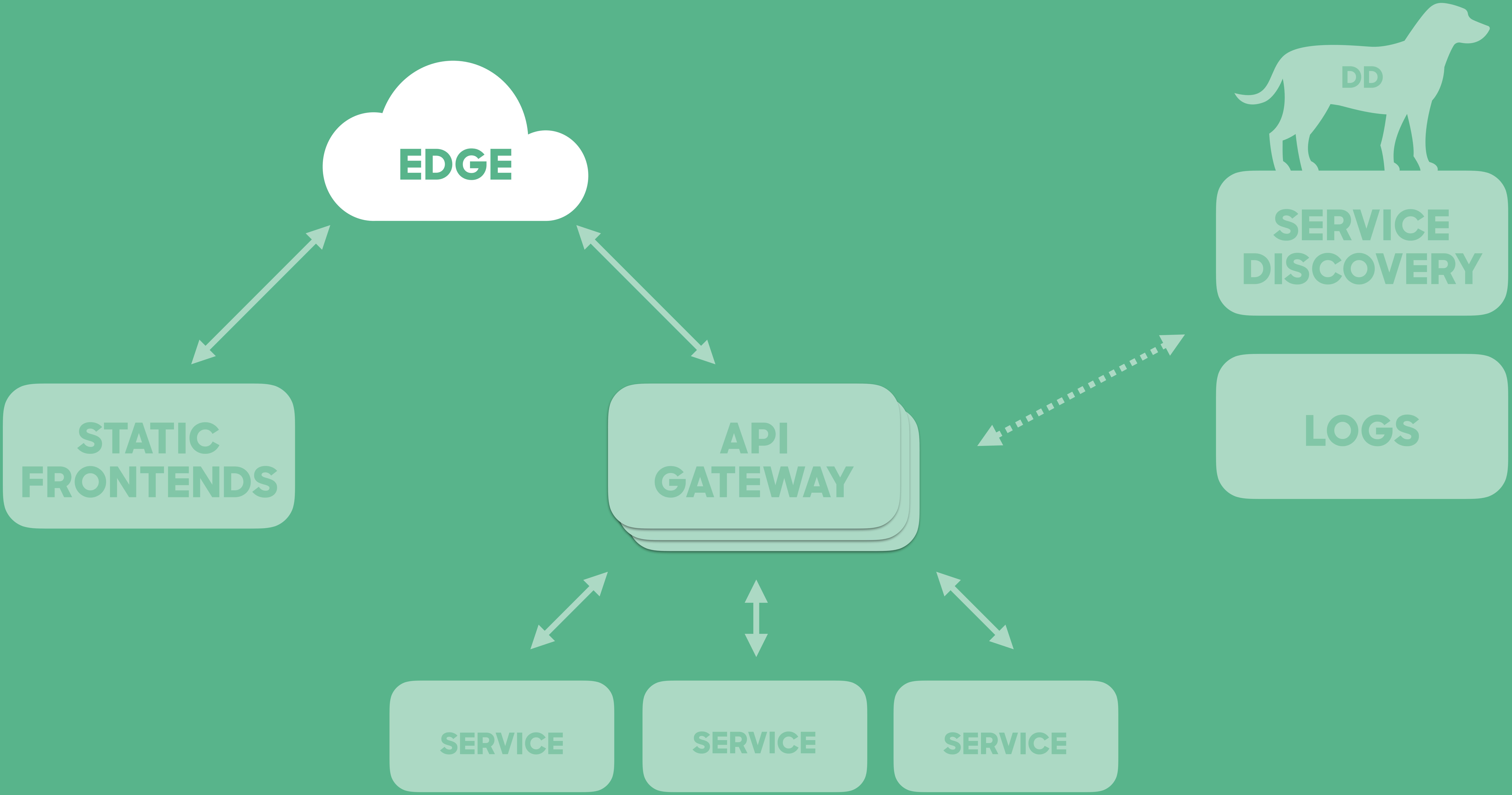
Hard:

- Making it work for everything
- Getting everyone on board

BUILD TOOLS

- Travis CI
- Packer
- Continuum
- Ansible

Let's focus in on our edge.


EDGE
STATIC FRONTENDS
API GATEWAY
DD
SERVICE DISCOVERY
LOGS
SERVICE
SERVICE
SERVICE

Everyone is coming for you.

Scriptkiddies and DDoS

Confusion as a defense strategy

```
sub vcl_recv {
  if (table.lookup(edge_settings, "non_us_ban", "disabled") ==
"enabled") {if (geoip.country_code != "US") {
        error 503;
    }
  }


 if (client.ip ~ cc_blacklist && req.url.path == "/api/hamm/
donations" && req.request == "POST") {
    if (randombool(1, 2)) {
      error 201;
    } else {
      error 402;
    }
  }
```

Just ban them

```
if (table.lookup(THEWALL, client.ip) &&
!req.http.Fastly-FF) {
    error 819 "Bad Taco.";
  }

 if (req.http.user-agent ~ "^WordPress") {
   error 819 {"Forbidden &#x1f32e;"};
 }
```

819 Forbidden 🌮
Secure
https://www.hillaryclinton.com

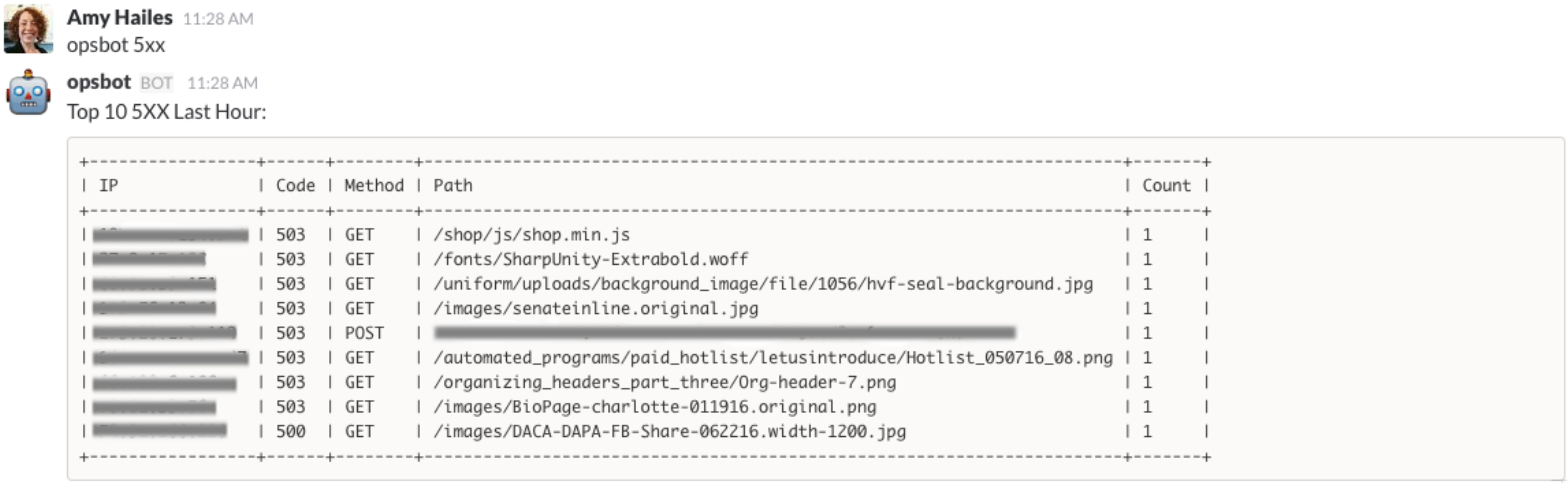
Error 819 Forbidden 🌮

Forbidden 🌮

Guru Mediation:

Details: cache-ams4147-AMS 1498431069 1062421900

Varnish cache server



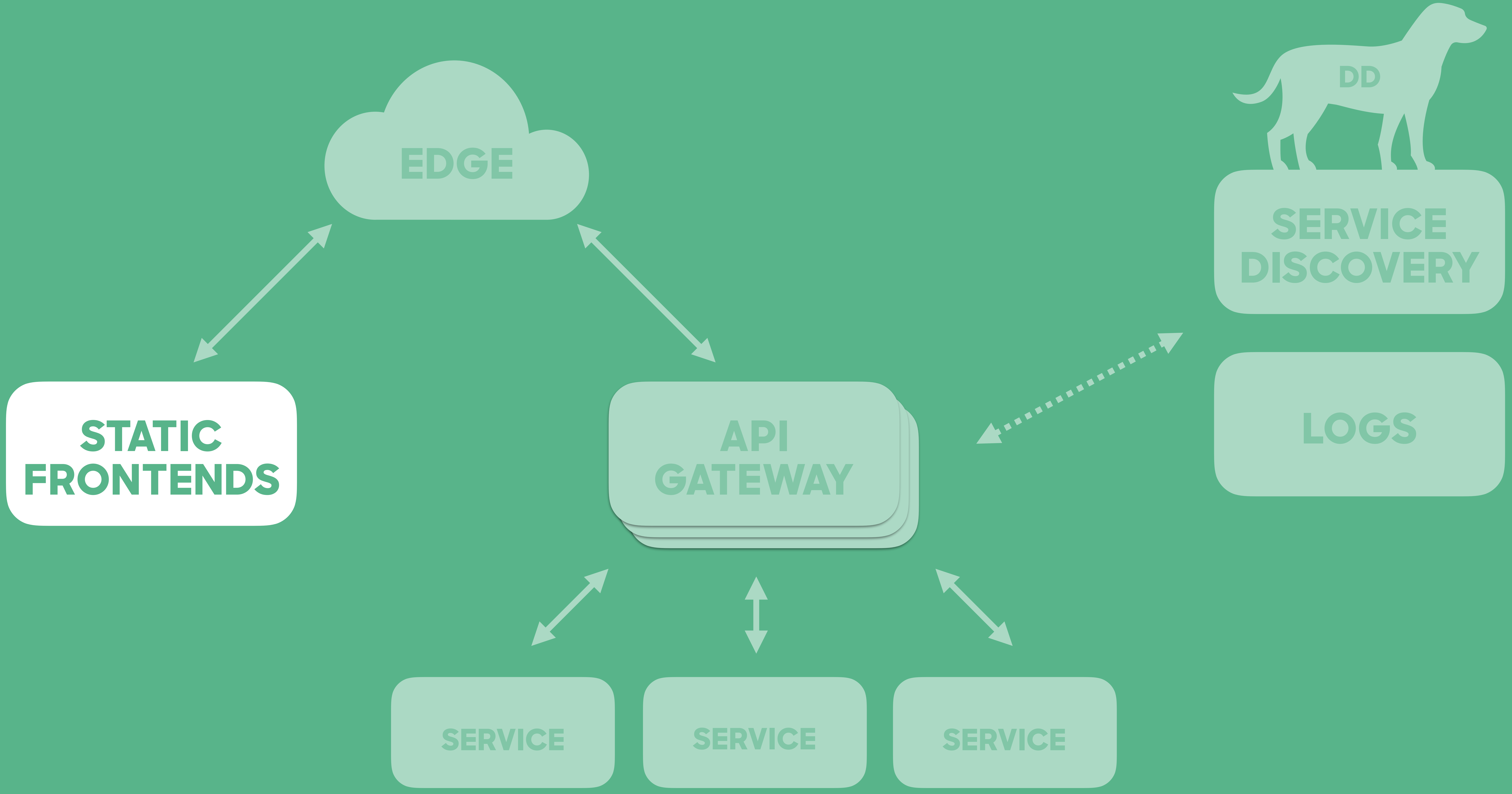
Amy Hailes 11:28 AM

opsbot 5xx

opsbot BOT 11:28 AM

Top 10 5XX Last Hour:

```
+-----------------+------+--------+-------------------------------------------------------------------------+-------+
| IP              | Code | Method | Path                                                                    | Count |
+-----------------+------+--------+-------------------------------------------------------------------------+-------+
| [redacted]      | 503  | GET    | /shop/js/shop.min.js                                                    | 1     |
| [redacted]      | 503  | GET    | /fonts/SharpUnity-Extrabold.woff                                        | 1     |
| [redacted]      | 503  | GET    | /uniform/uploads/background_image/file/1056/hvf-seal-background.jpg     | 1     |
| [redacted]      | 503  | GET    | /images/senateinline.original.jpg                                       | 1     |
| [redacted]      | 503  | POST   | [redacted]                                                              | 1     |
| [redacted]      | 503  | GET    | /automated_programs/paid_hotlist/letusintroduce/Hotlist_050716_08.png   | 1     |
| [redacted]      | 503  | GET    | /organizing_headers_part_three/Org-header-7.png                         | 1     |
| [redacted]      | 503  | GET    | /images/BioPage-charlotte-011916.original.png                           | 1     |
| [redacted]      | 500  | GET    | /images/DACA-DAPA-FB-Share-062216.width-1200.jpg                        | 1     |
+-----------------+------+--------+-------------------------------------------------------------------------+-------+
```

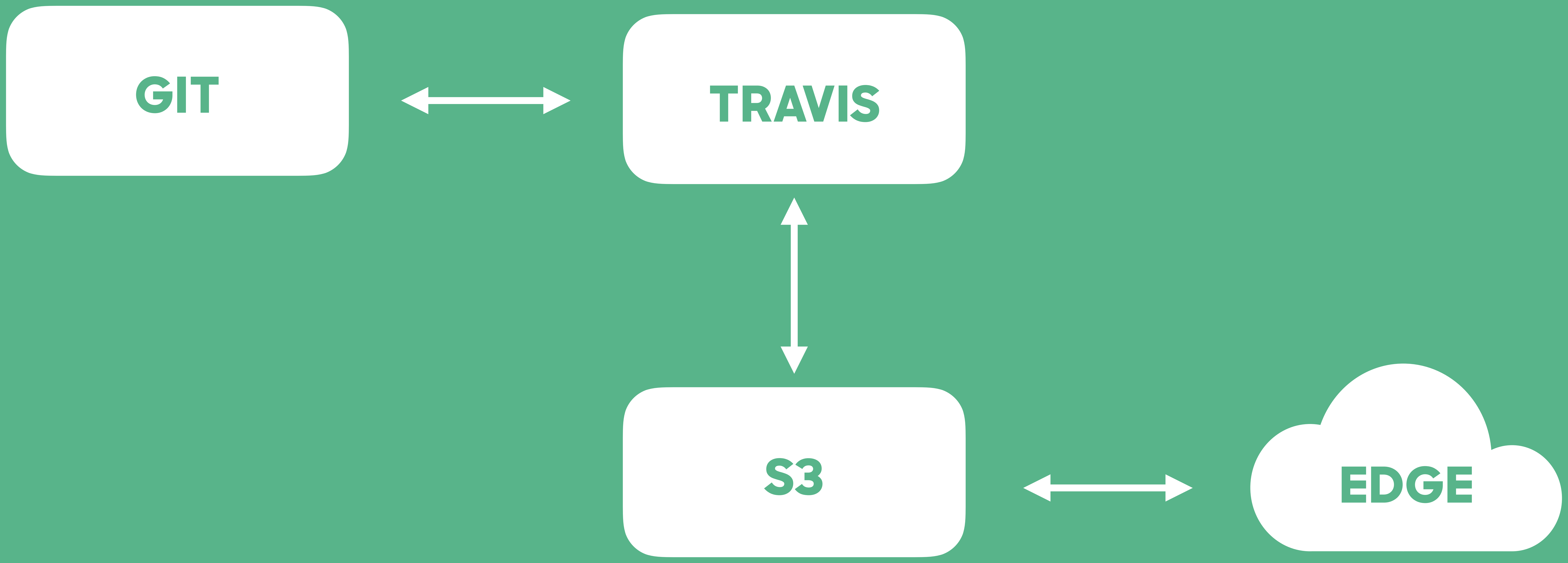

EDGE
DD
SERVICE DISCOVERY
STATIC FRONTENDS
API GATEWAY
LOGS
SERVICE
SERVICE
SERVICE

Onesie

hillaryclinton.com/*calls* → *onesie-web.s3-aws-us-east-1.amazonaws.com/calls*

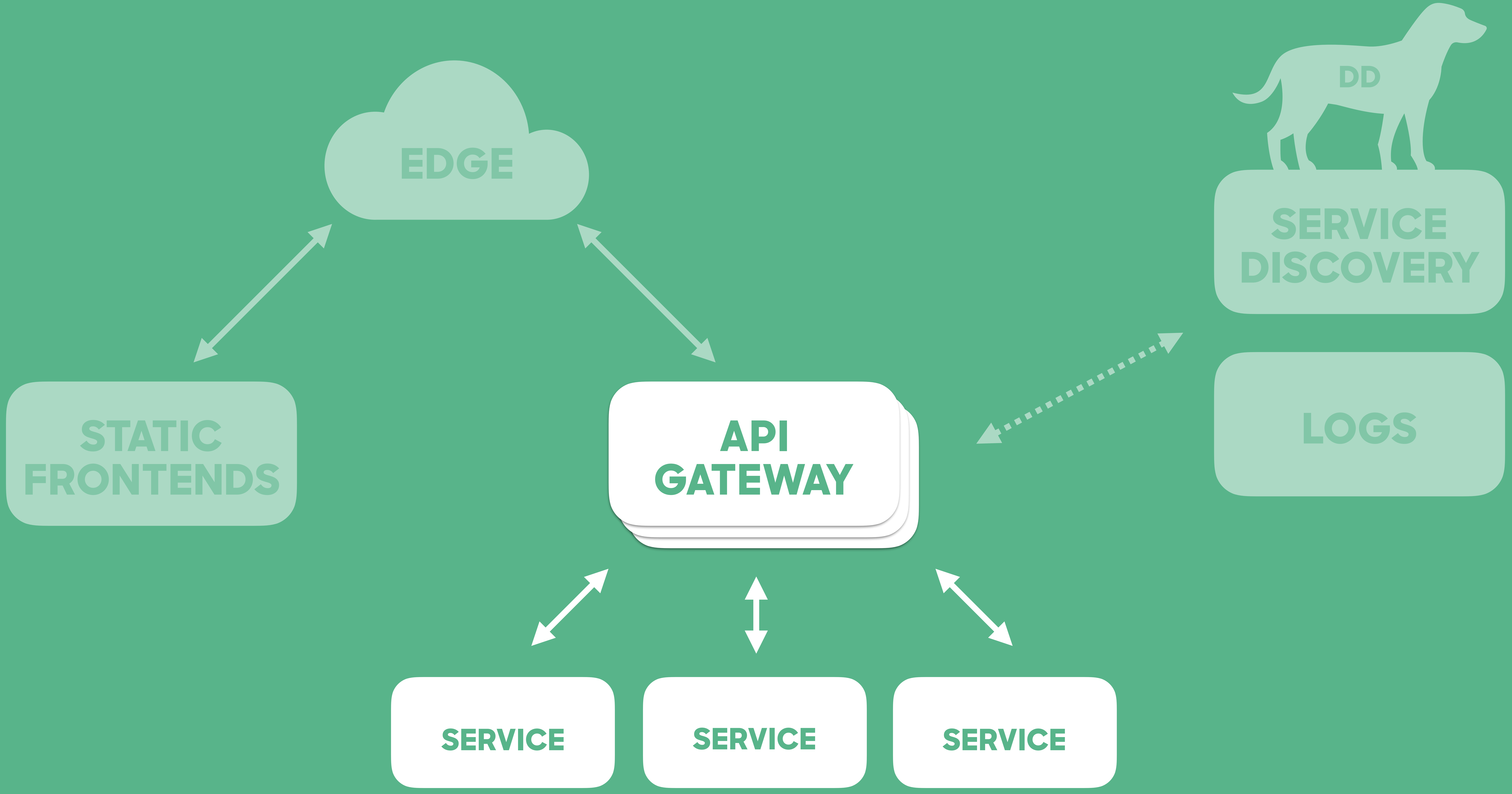
- Caching
- Paths and query params
- Regional failover

Onesie



Let's assume the remaining traffic are legitimate folks making API calls.

And they really, *really* want to go to Philadelphia.


EDGE
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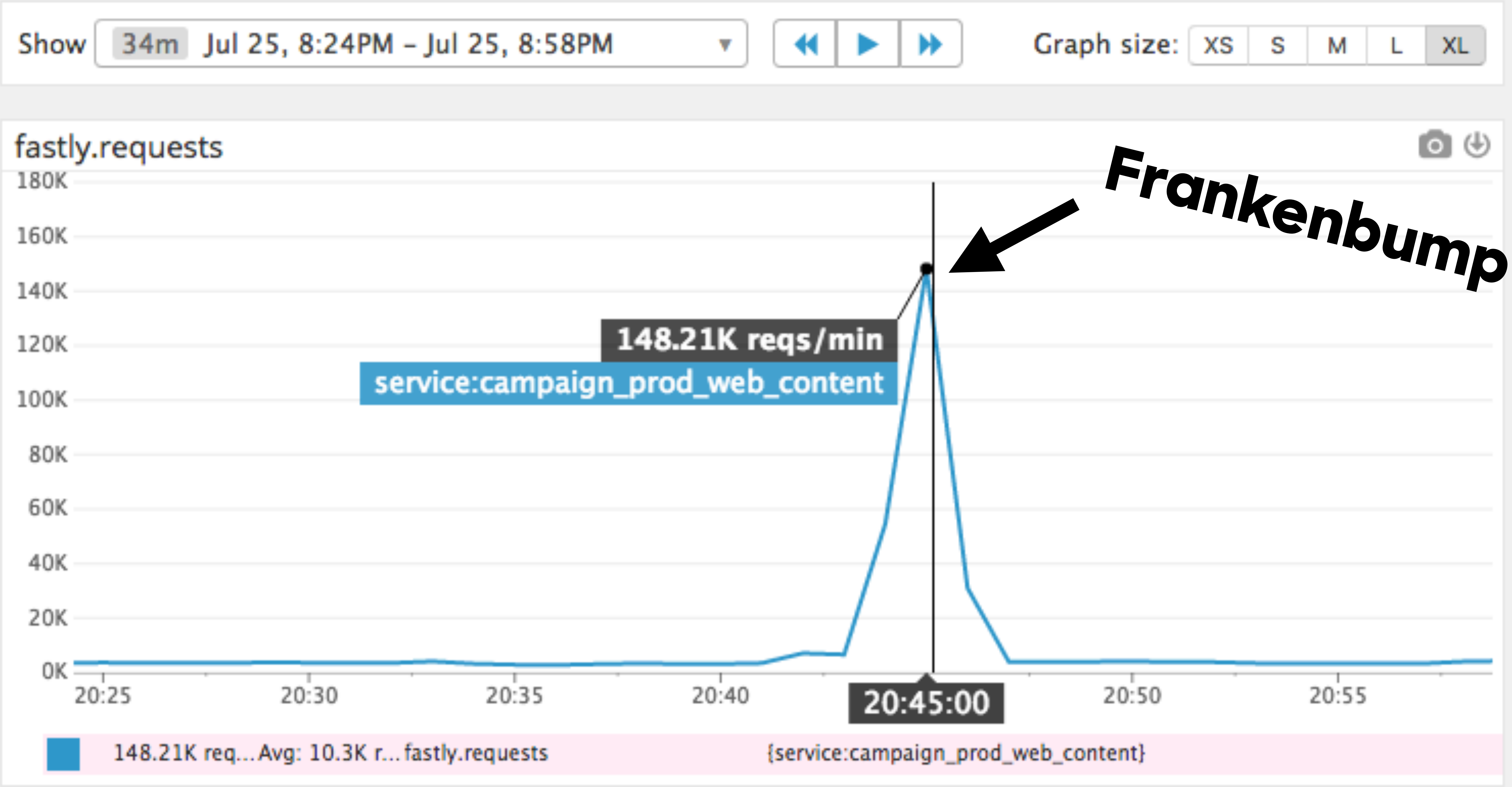
STATIC FRONTENDS
API GATEWAY
LOGS
SERVICE
SERVICE
SERVICE



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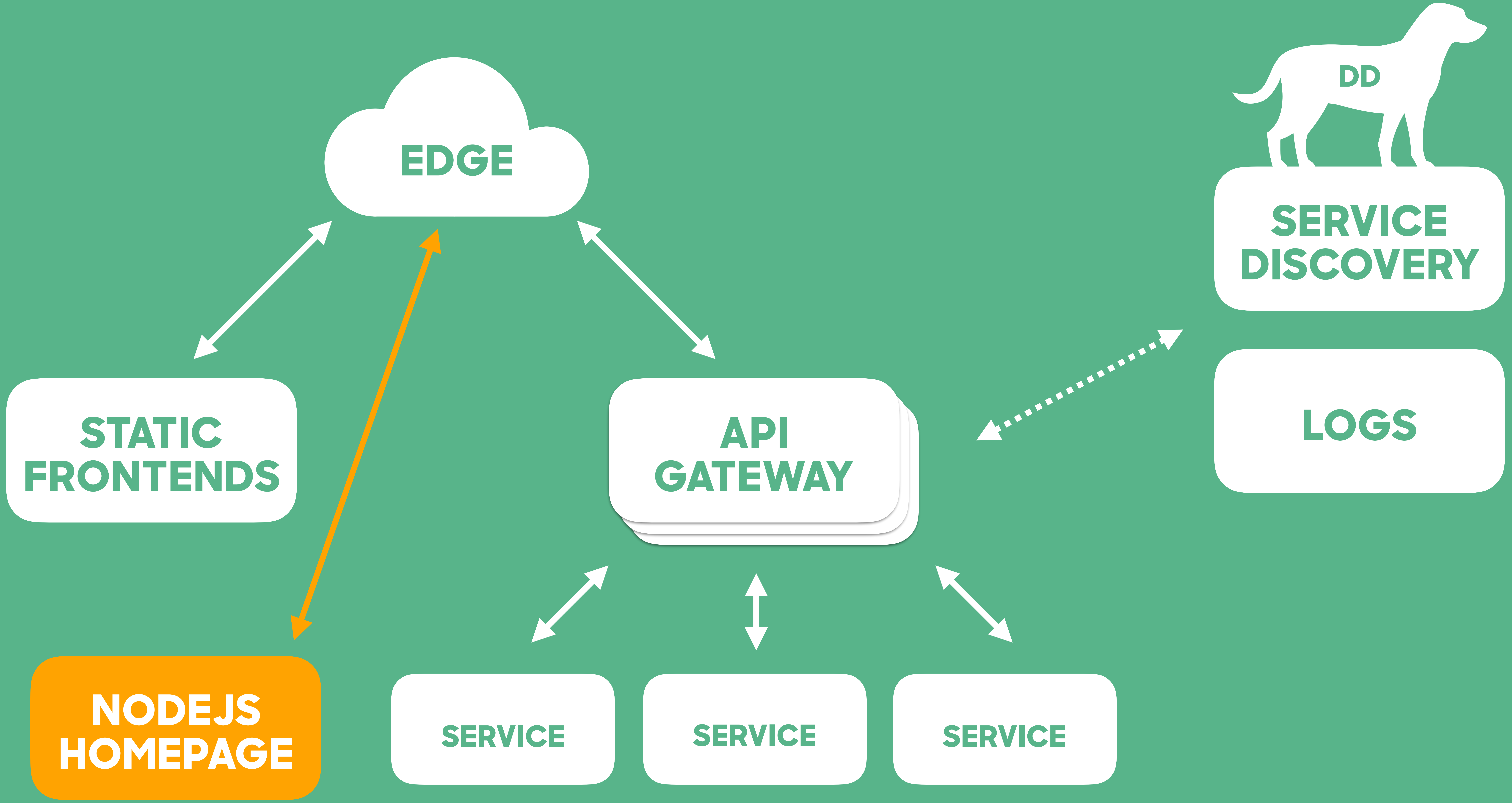
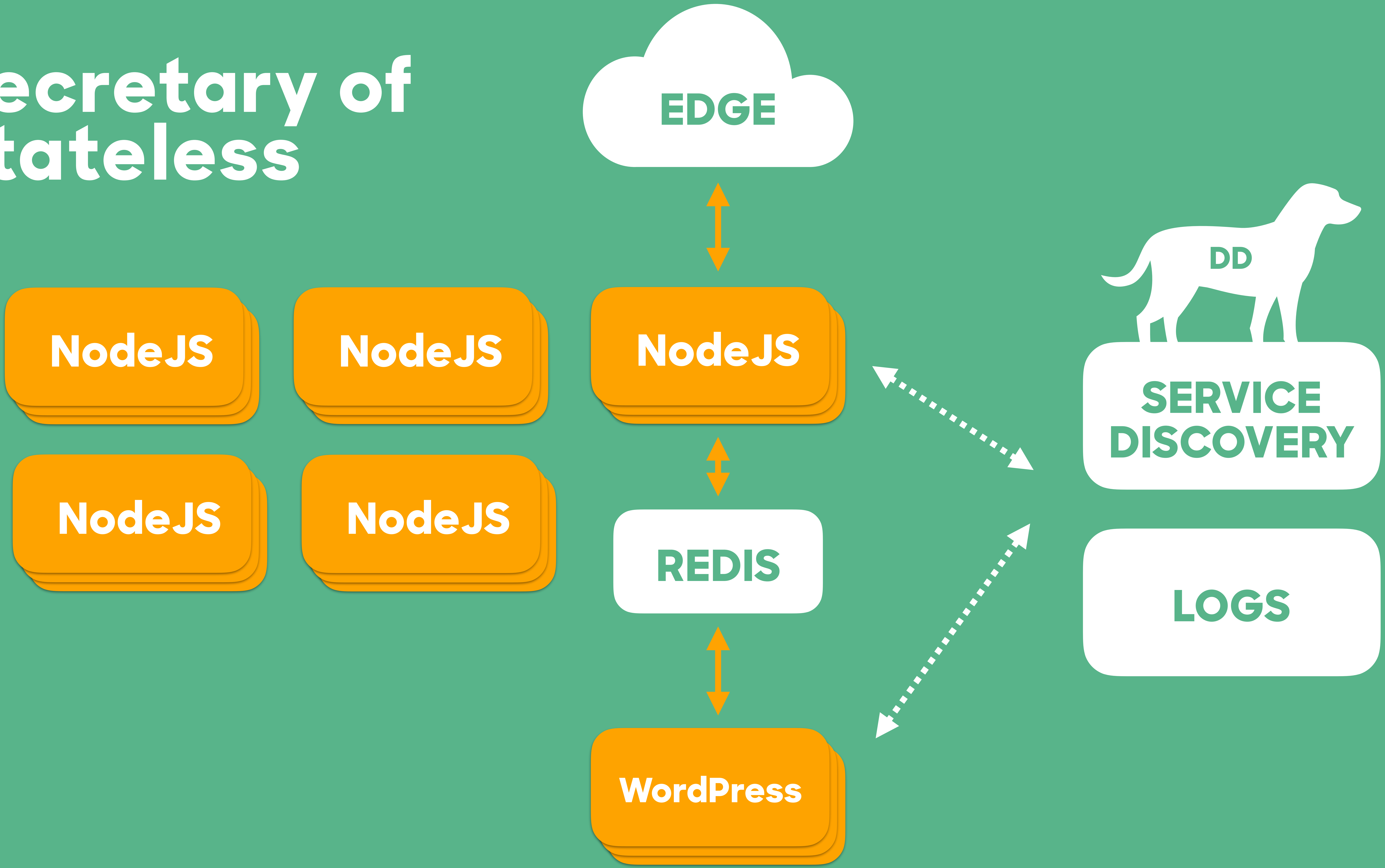
Frankenbump

About that infrastructure diagram…

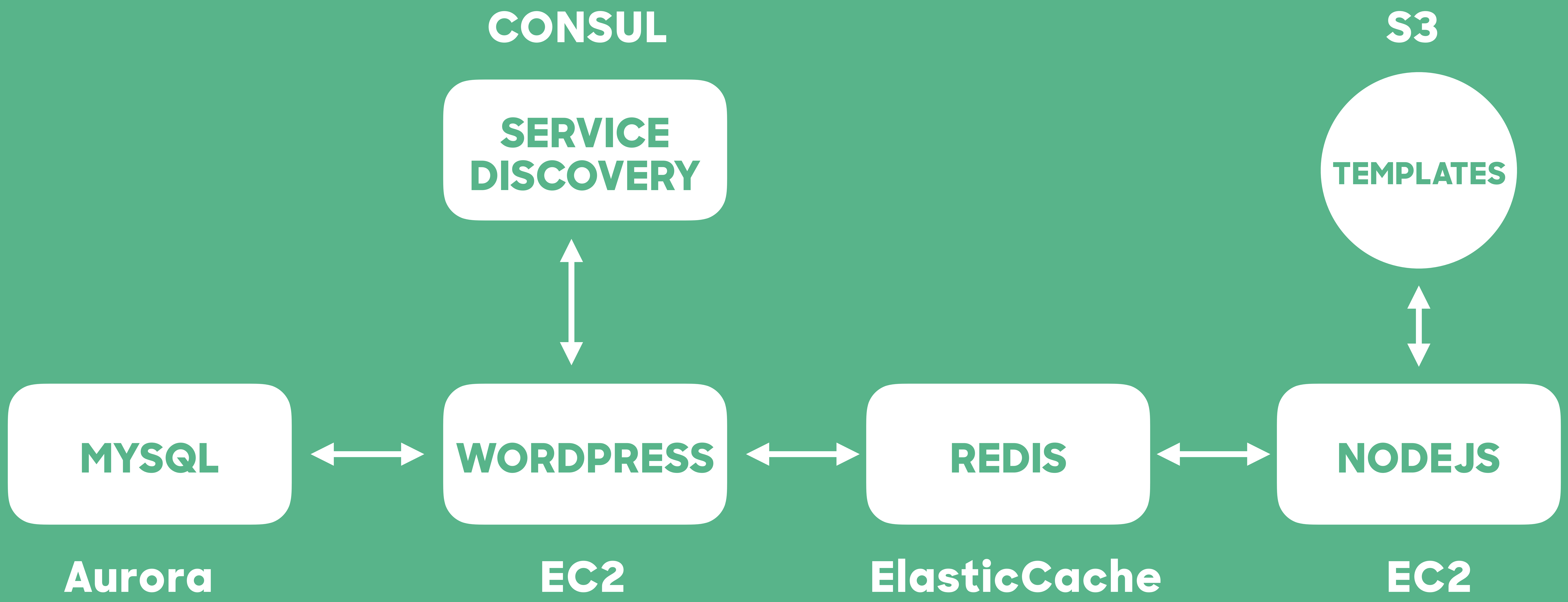

DD
EDGE
SERVICE DISCOVERY
STATIC FRONTENDS
API GATEWAY
LOGS
NODEJS HOMEPAGE
SERVICE
SERVICE
SERVICE

Secretary of Stateless



Biggest problem to solve:

What's the state of your state?


CONSUL
SERVICE DISCOVERY
S3
TEMPLATES
MYSQL
WORDPRESS
REDIS
NODEJS
Aurora
EC2
ElasticCache
EC2

Biggest problem to solve:

What's the state of your state?

Abuse S3, Consul, and ELB health checks to find out.

```
export default function(servers, dog = new DD) {
  return async (ctx) => {
    let path = '/health';

    // only run template version checks on the ELB version of the health check
    if (ctx.url === '/health-elb') {
      try {
        const templateRelease = await getCurrentTemplateRelease();
        path = `/health?templateRelease=${templateRelease}`;
      } catch (err) {
        // For the initial release consul will be empty, so if the consul check errors with a 404
        // there's nothing wrong, just continue on with the normal health check
        if (err.status === 404) {
          log.warn('Skipping templateRelease health check since consul is empty');
        } else {
          dog.increment('sos-template-deploy.consul-error', 1);
          log.error({err}, 'Error reading data from consul');
        }
      }
    }

    try {
      await runHealthChecks(servers, path);
    } catch (err) {
      const message = 'Health check failed';
      log.error({err}, `${message} : ${err.message}`);
      ctx.throw(message);
    }
    ctx.status = 200;
  };
```

Takeaways

- Immutable infrastructure was key to our technical success
- We moved quickly but were resilient against failure (most of the time)
- It takes more effort to apply immutable to everything you're doing, but it's worth it
- Ultimately, developers like the handshake between SRE and dev

Takeaways

- On a presidential campaign, innovation is a necessity, and there aren't any hard and fast rules in tech
- It's difficult to imagine where infrastructure tech will be in four years, but the next campaigns will be leveraging the most exciting stuff out there

Takeaways

- You can build cool shit and work in public service