



Scalable Application Architecture on AWS

Hrvoje Matić
Backend engineer, Productive

A stylized illustration of a blue octopus with white stripes on its tentacles. It is sitting at a desk, writing with an orange pen on a white notepad. A small orange laptop sits open on the desk next to the notepad. The background is a solid dark blue.

productie



Sales Pipeline



Resource
planning



Project
management



Time tracking



Profitability

**Productive is a tool for
running a profitable agency**

Infinium	All deals (320)			
	Contact made (4)	Proposal presented (10)	In negotiation	Final round
Search	The Big M landing page Metronet d.o.o. \$7.300 50% 2 min ago	The Big M landing page Metronet d.o.o. \$7.300 50% 2 min ago	Runners+ android app Metronet d.o.o. \$100.000 10% 2 min ago	Runners+ Backend de Metronet d.o.o. \$7.300 20%
Inbox	Online banking digital campaign Metronet d.o.o. \$10.000 90% 11 months ago	Online banking digital campaign Metronet d.o.o. \$10.000 90% 11 months ago	Runners+ Backend development Metronet d.o.o. \$7.300 20% 11 months ago	Homepage design Metronet d.o.o. \$10.000 50%
Tasks	Sound recognition Metronet d.o.o. \$10.000 100% 11 months ago		Homepage design Metronet d.o.o. \$10.000 50% 11 months ago	iOS mobile app phase Metronet d.o.o. \$3.500 10%
Time	iOS mobile app phase 2 Metronet d.o.o. \$5.000 15% 11 months ago		iOS mobile app phase 1 Metronet d.o.o. \$3.500 10% 11 months ago	
Projects			Custom API logistic Metronet d.o.o. \$1.280 20% 11 months ago	
Sales			Token response Metronet d.o.o. \$5.000 80% 11 months ago	
Contacts				
Billing				
Reports				
Timer				
Help				
Anthony Jennings				

Infinium

Search

Inbox

Tasks

Time

Projects

Sales

Contacts

Billing

Reports

Timer

Help

Anthony Jennings

Chase mobile banking

Open tasks Layout Columns Sort Filters Tasks Discussions Deals Activity +

APPI COMMENTS (10) +

96	Updated Orders Spec	feature_request	Filip Beć	7 day ago by Filip B.
9999	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.
96	Updated Orders Spec		Filip Beć	7 day ago by Filip B.
96	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.
9999	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.

DESIGN (4) +

96	Updated Orders Spec		Filip Beć	7 day ago by Filip B.
9999	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.
96	Updated Orders Spec		Filip Beć	7 day ago by Filip B.
9999	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.
96	Updated Orders Spec		Filip Beć	7 day ago by Filip B.
9999	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.
96	Updated Orders Spec		Filip Beć	7 day ago by Filip B.
96	New API Build Ready - Overview + Add/Edit Beneficiary Details		No assignee	1 day ago by Marinko B.
9999	New API Build Ready - Overview + Add/Edit Beneficiary Details		Filip Beć	1 day ago by Marinko B.

Infinium

< TODAY > Sep 21 - 27, 2015 ▾

04:30 Mon 24 Sep

--:-- Tue 24 Sep

--:-- Tue 24 Sep

--:-- Tue 24 Sep

--:-- Tue 24 Sep

04:30 Weekly total:

Tasks

Time

Select project

Service name

Time = 0h

START

Abanka abamobi 2h ► General/Internal work: Open hours ► General/Internal work: Food ►

TPE dev
TPE Development: Design Add notes to this time entry 00:30 ...

TPE dev
TPE Development: Design Add notes to this time entry 03:00 ► ...

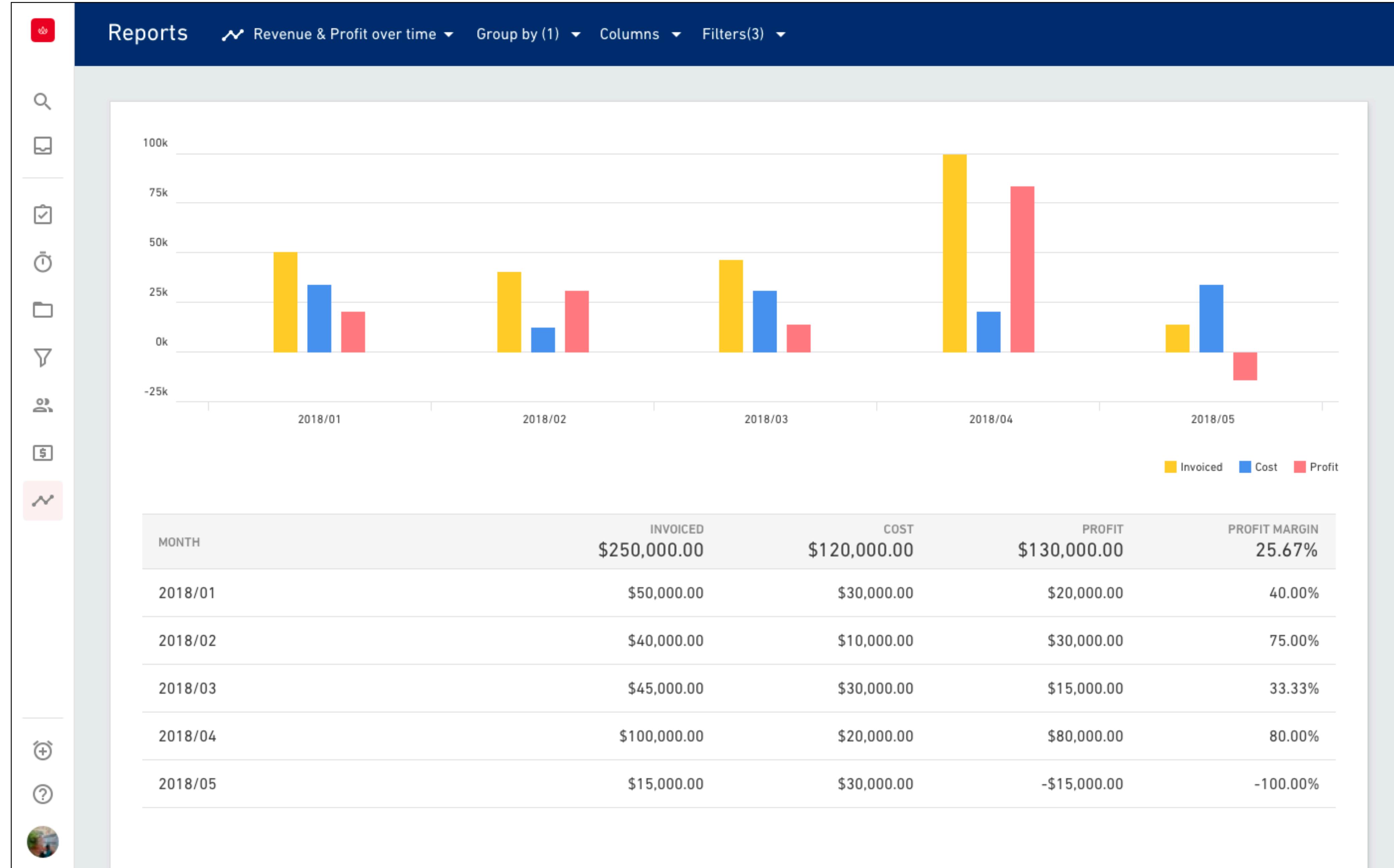
TPE Development: Design • audio component design
• flow
• best solution for this type of app 00:00 ► ...

Remote work Event No note added to this event All day

Timer

Help

Anthony Jennings



Microservices

Api (Rails)

App (Ember)

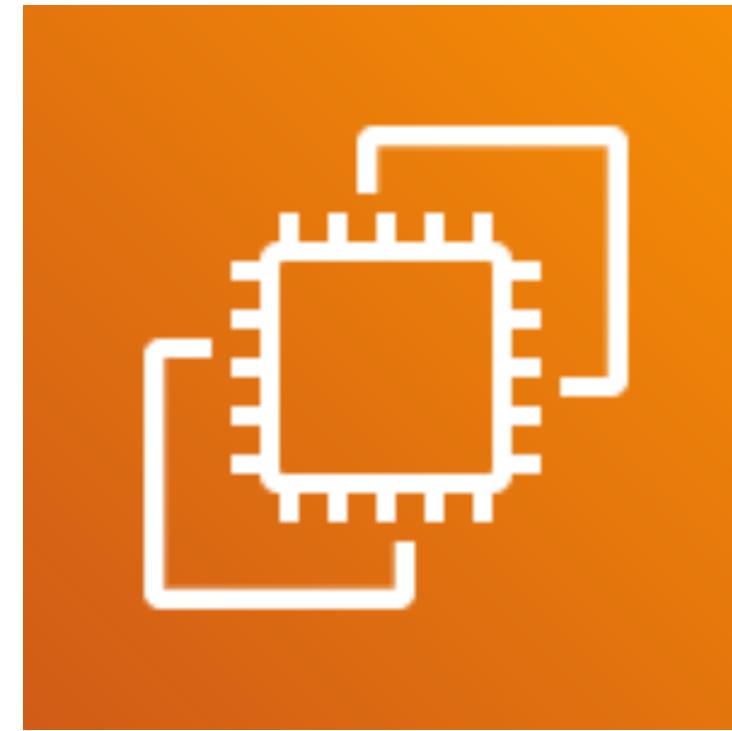
Mailer (Rails)

Export (Rails)

Realtime (Node.js)

Zip (Node.js)

OLD ARCHITECTURE



EC2 T2.XLARGE



PHUSION PASSENGER

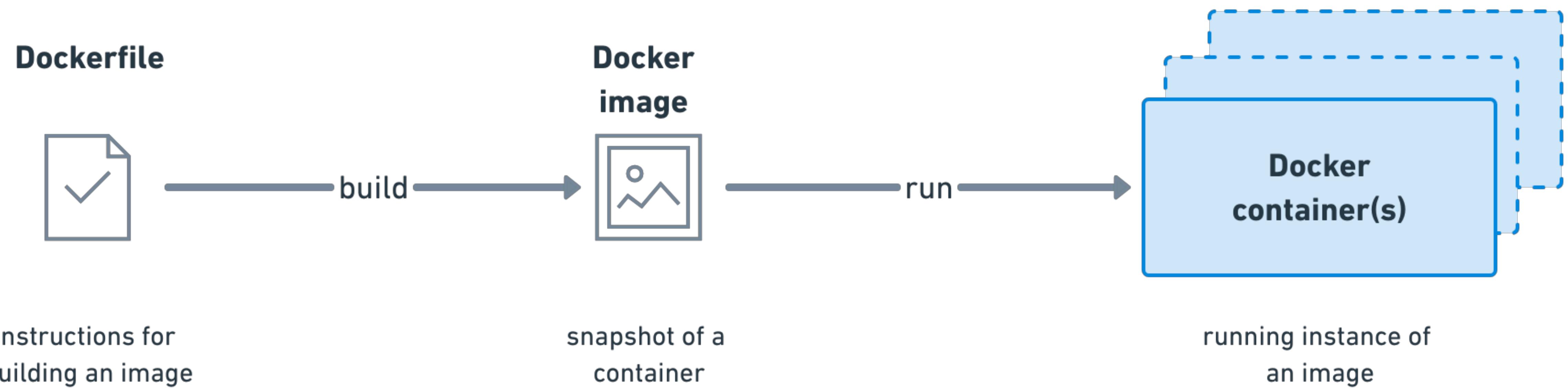
NGINX

OUR GOALS:

- 1. Scalability**
- 2. Isolation**
- 3. Stability**
- 4. Consistency**
- 5. Ability to easily introduce new services
or environments**



docker





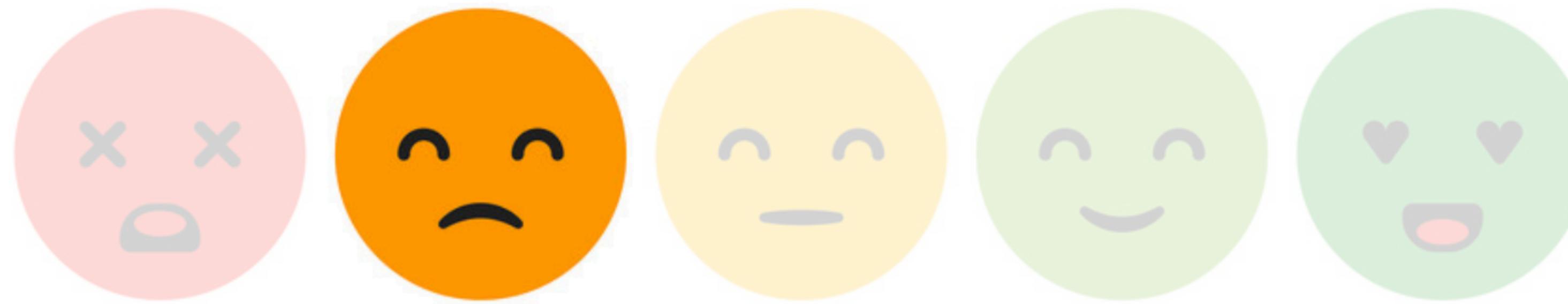
```
1 FROM ruby:VERSION
2
3 ENV APP_HOME /api
4
5 RUN apt-get update -qq && \
6     apt-get install -y build-essential mysql-client \
7     libsqlclient-dev nodejs sudo
8
9 RUN mkdir -p $APP_HOME && mkdir $APP_HOME/log
10
11 WORKDIR $APP_HOME
12
13 COPY Gemfile Gemfile
14 COPY Gemfile.lock Gemfile.lock
15 RUN bundle install
16
17 COPY . .
```



STATELESS

IMMUTABLE

DEVELOPMENT ENVIRONMENT IN DOCKER



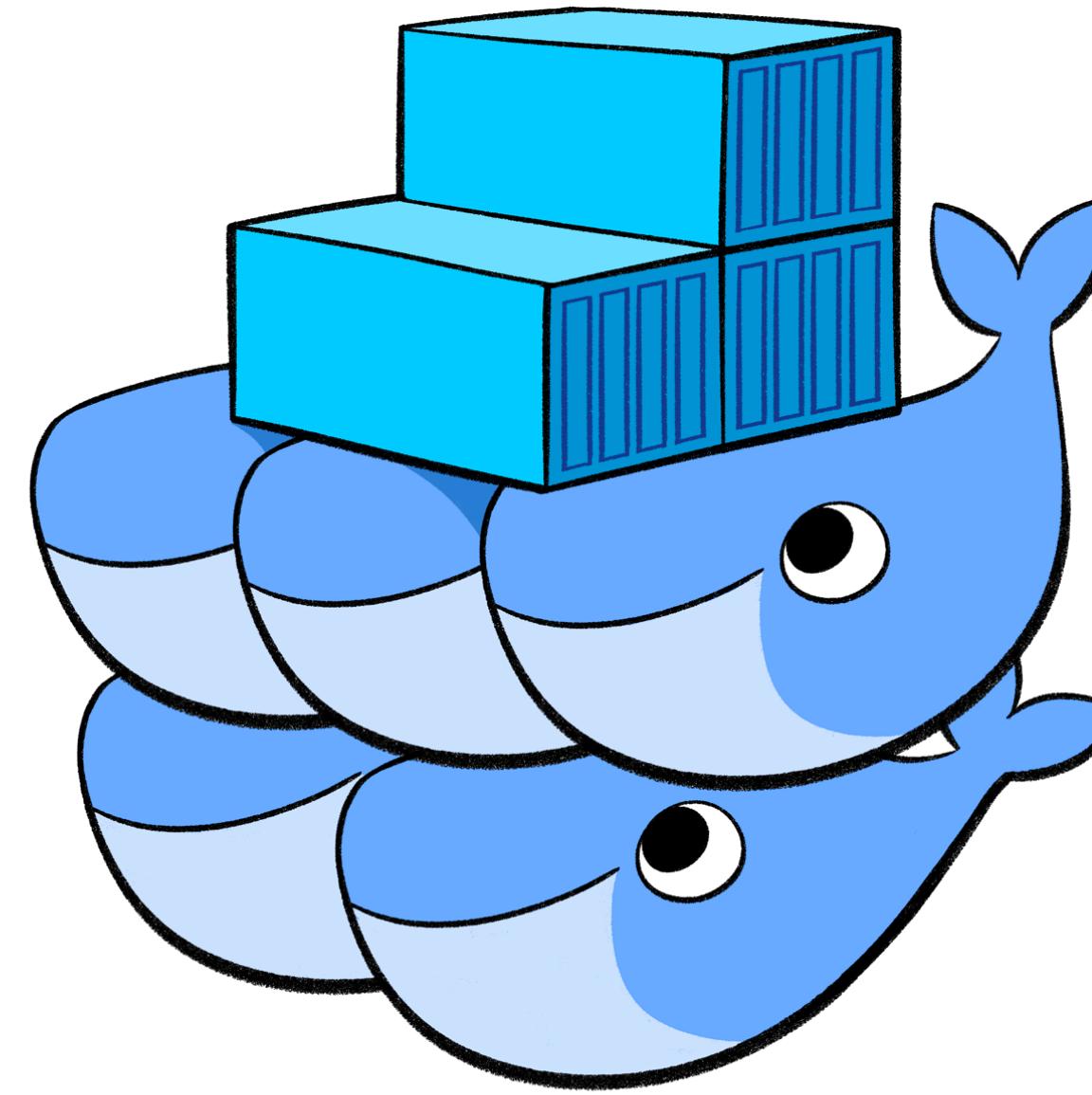


aws **ECS**





KUBERNETES



DOCKER SWARM

WHY NOT?

Dockerfile



Docker image



Elastic container registry (ECR)



Elastic container service (ECS)

ECS LAYERS

TASK DEFINITION



```
1 {
2   "executionRoleArn": "arn:aws:iam::012345678910:role/ecsTaskExecutionRole",
3   "family": "SERVICE",
4   "containerDefinitions": [
5     {
6       "name": "SERVICE",
7       "image": "ECR_ACCOUNT/REPO:BUILD",
8       "portMappings": [
9         {
10           "hostPort": 0,
11           "protocol": "tcp",
12           "containerPort": 80
13         }
14       ],
15       "logConfiguration": {
16         "logDriver": "awslogs",
17         "options": {
18           "awslogs-group": "/ecs/SERVICE",
19           "awslogs-region": "AWS_REGION",
20           "awslogs-stream-prefix": "ecs"
21         }
22       },
23     ]
24   ]
25 }
```

ECS LAYERS

TASK DEFINITION

TASK

SERVICE

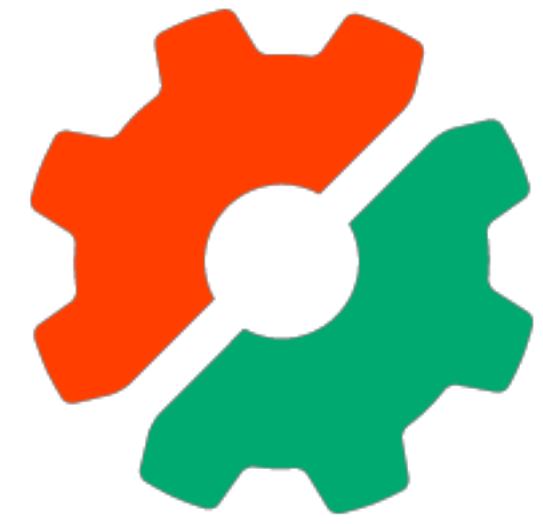
DEPLOYMENT

```
❯ build_push_image.sh  
❯ deploy_api.sh  
❯ deploy_worker.sh  
❯ ecr_login.sh  
{..} env.json  
❯ prepare_test_db.sh  
❯ pull_image.sh  
❯ run_migrations.sh  
❯ run_test_booster.sh  
❯ run_tests.sh  
❯ start_api.sh  
❯ start_migrations.sh  
❯ start_worker.sh  
{..} task-definition-migrations-template.json  
{..} task-definition-template.json  
{..} task-definition-worker-template.json
```

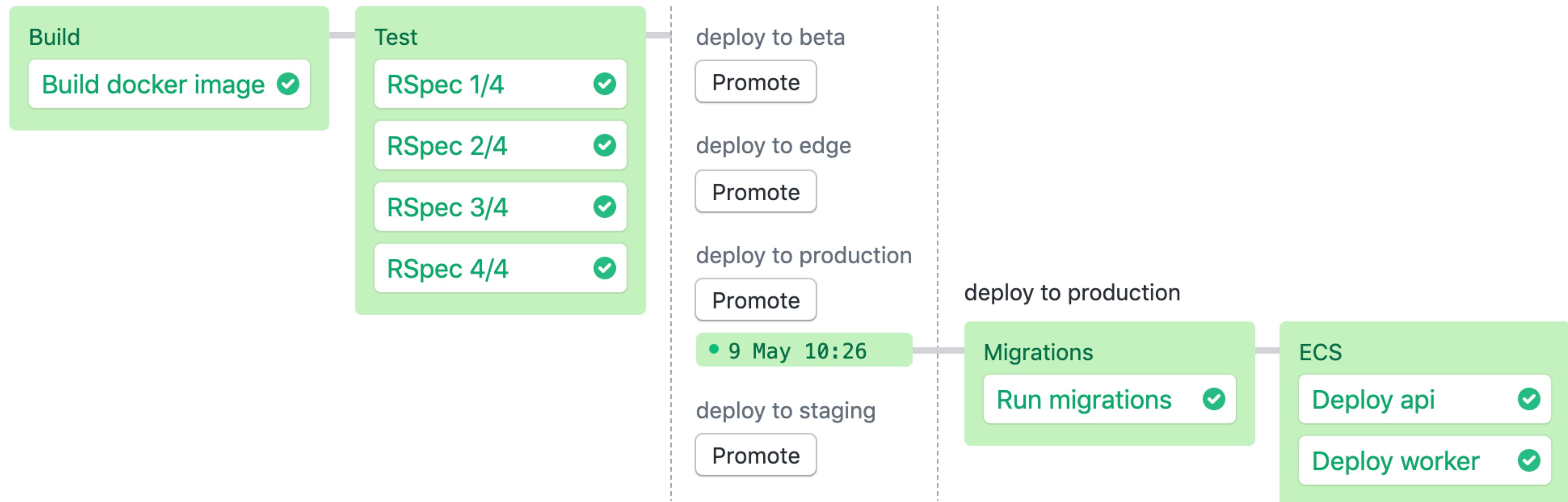


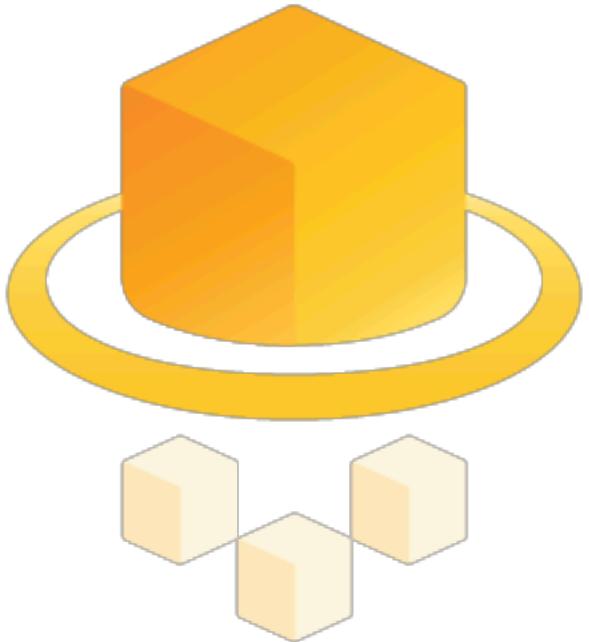
```
1 aws ecr get-login --region eu-west-1 --no-include-email
2
3
4
5
6
7
8

9
10
11
12
13
14
```



SEMAPHORE

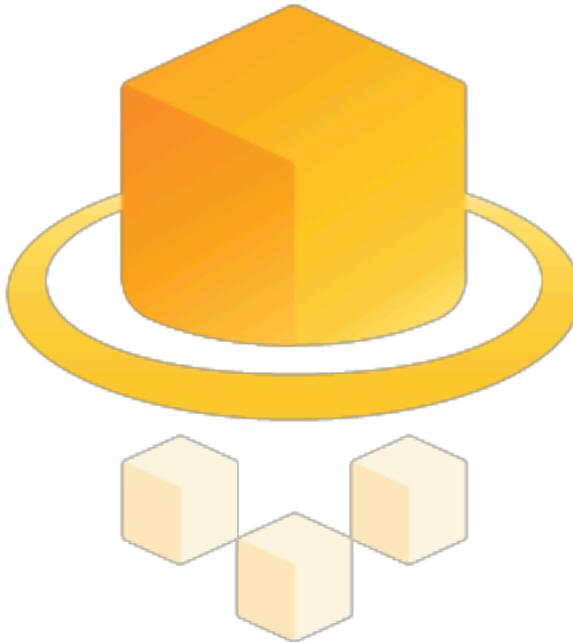




AWS Fargate

PROS:

- **Containers become fundamental compute primitives**
- **You don't have to manage EC2 instances, Amazon does it for you**

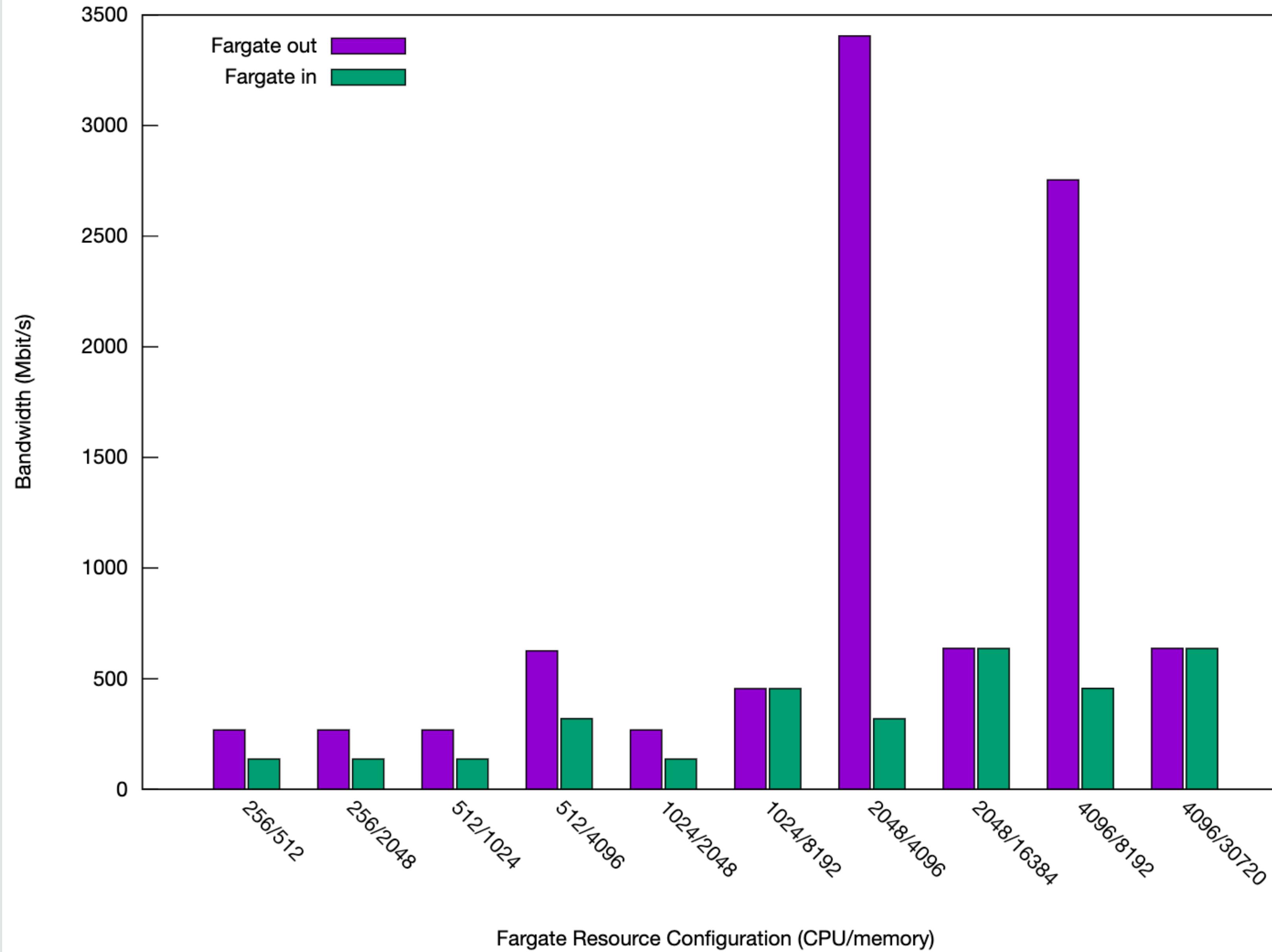


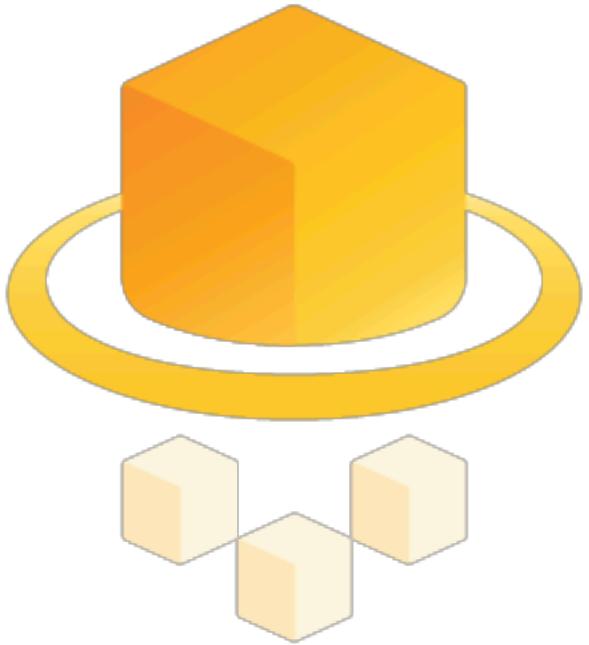
AWS Fargate

CONS:

- **Pricing**
- **No ability to SSH into containers**
- **Network performance issues**

AWS Fargate Network Performance



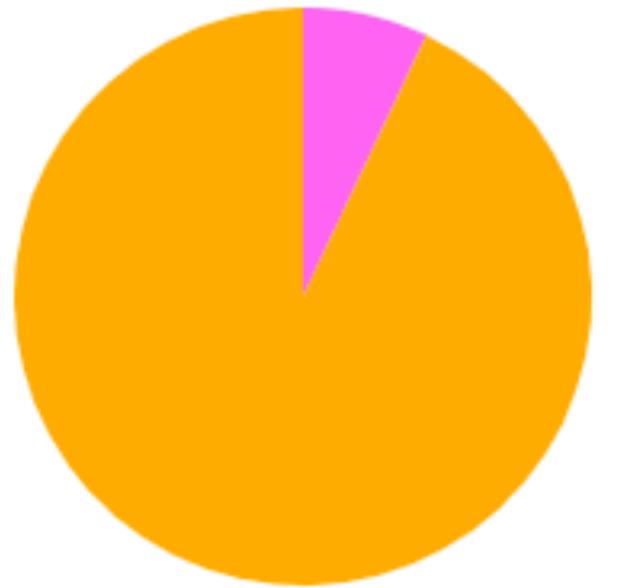


AWS Fargate

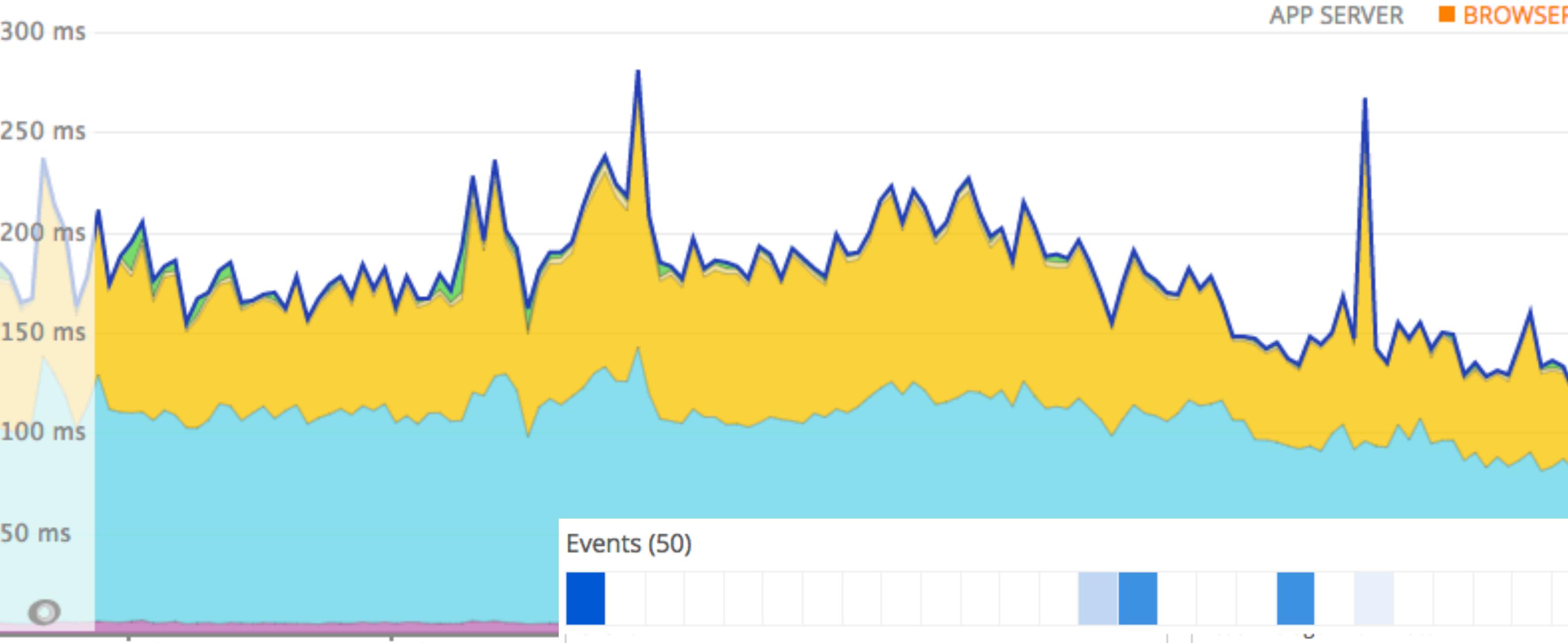
USECASES:

- **Background jobs**
- **One time tasks (eg. database migrations)**
- **Applications with lower workloads**

Quick values for host



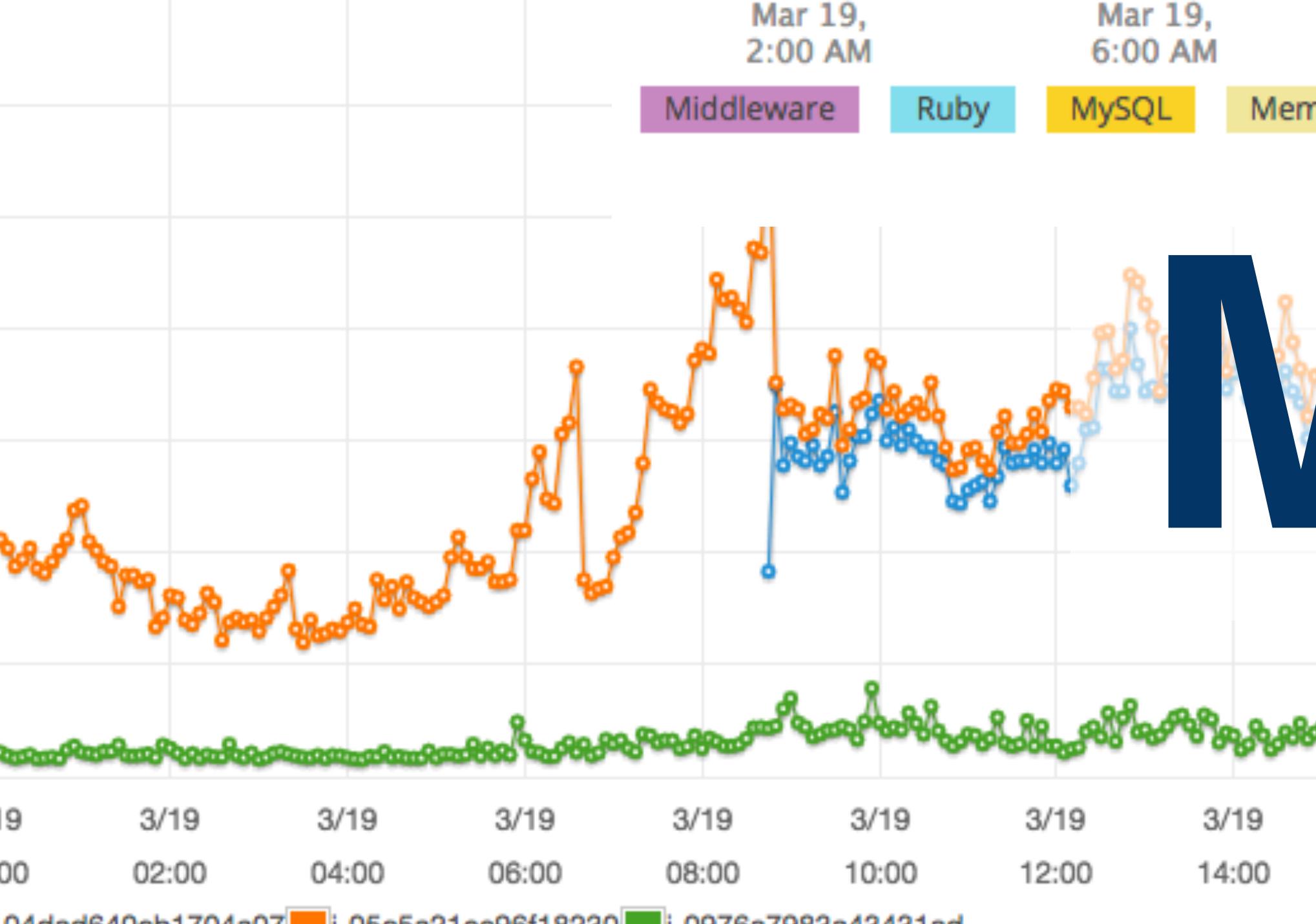
Web transactions time ▾



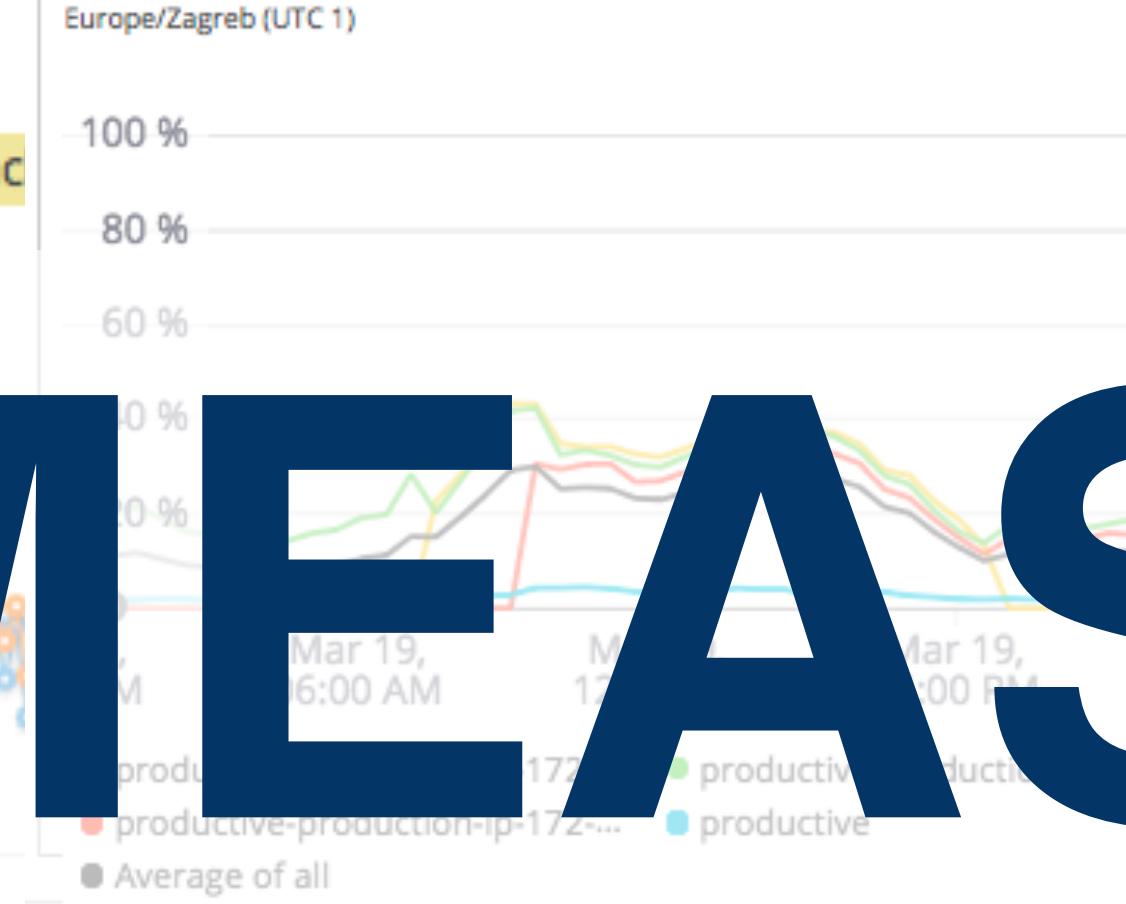
Watch Monitoring Detail

Utilization (Percent)

St

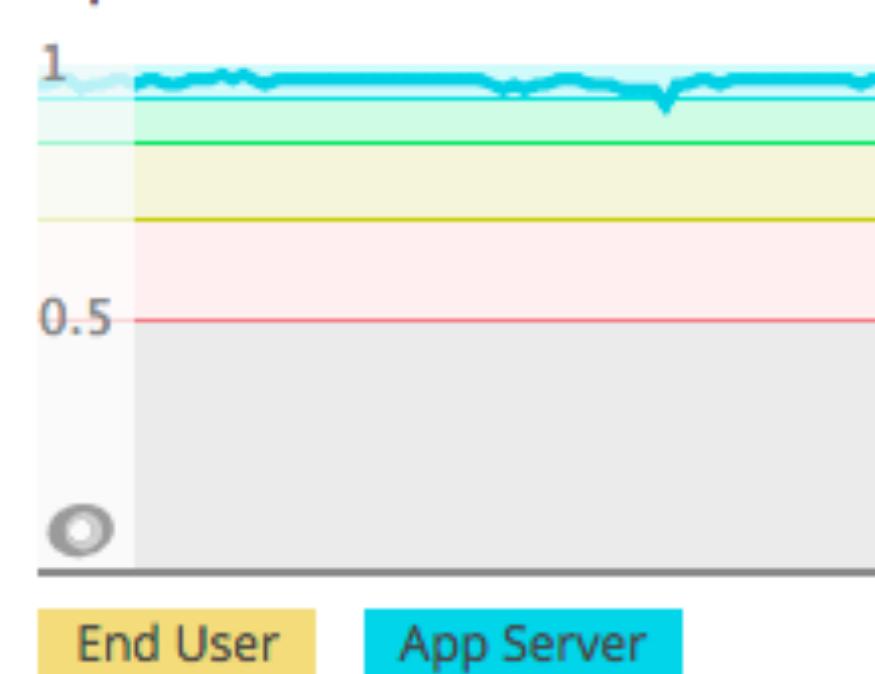


Events (50)



VIEW	HOST	HEALTH	CPU %	LOAD AVERAGE ONE MINUTE	MEMORY USED %	APPLICATION
●	productive-production-ip-172-31-17-	0 0	32%	0.73	59%	1 applic
●	productive-production-ip-172-31-14-	0 0	25%	0.57	62%	1 applic
●	productive-production-ip-172-31-25-	0 0	24%	0.52	61%	—

Apdex score ?



Throughput

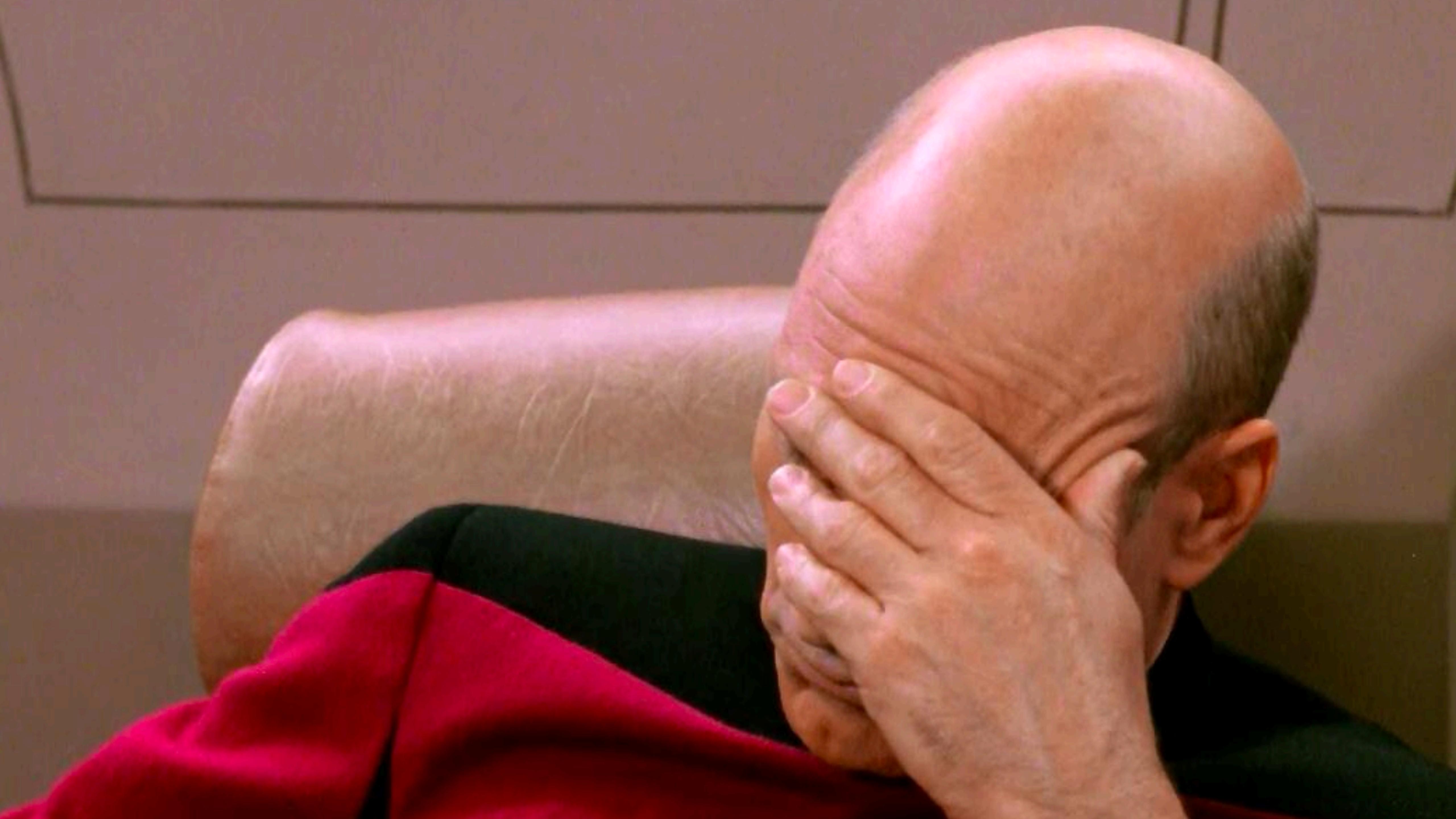


MEASURE:

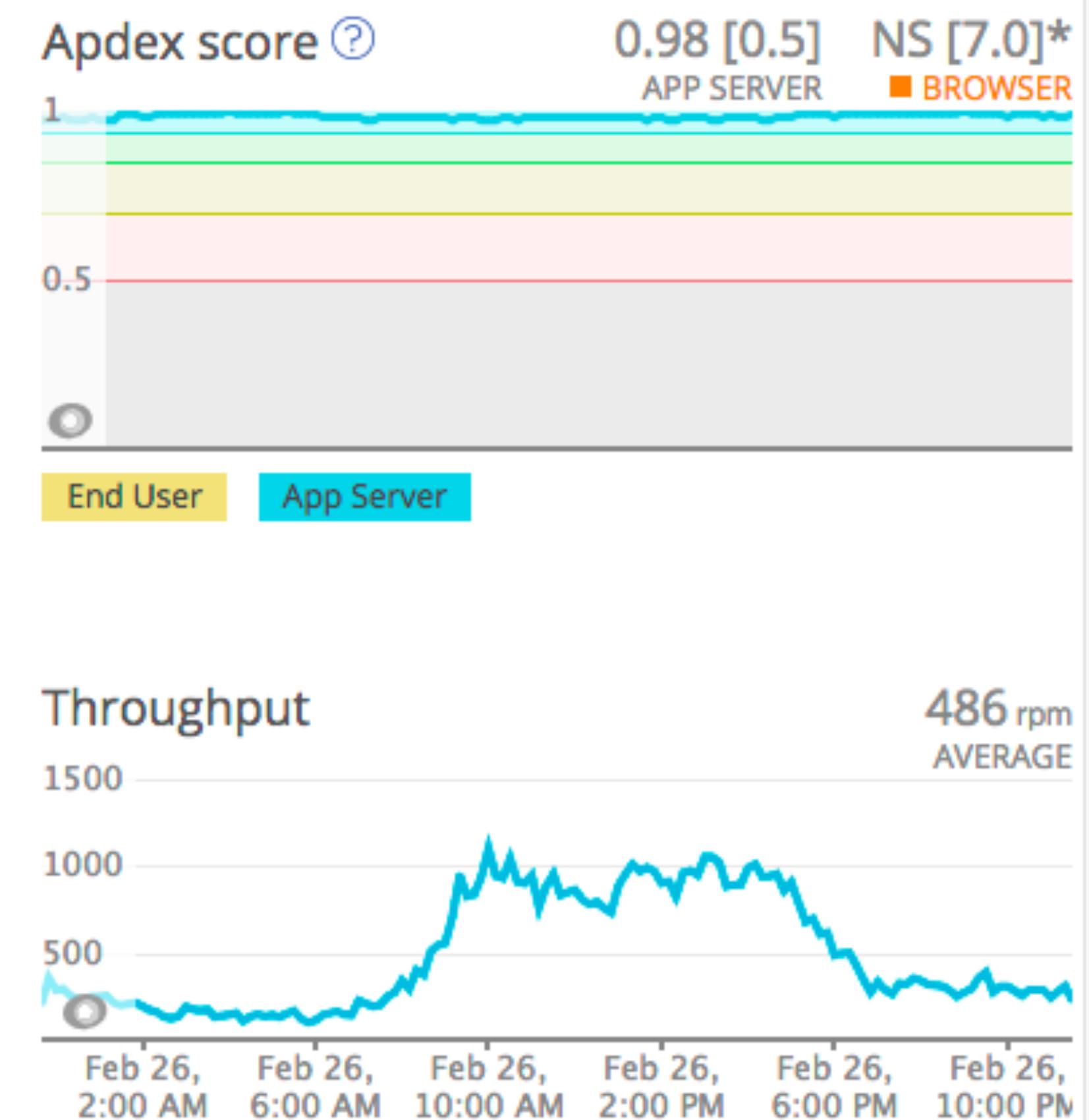
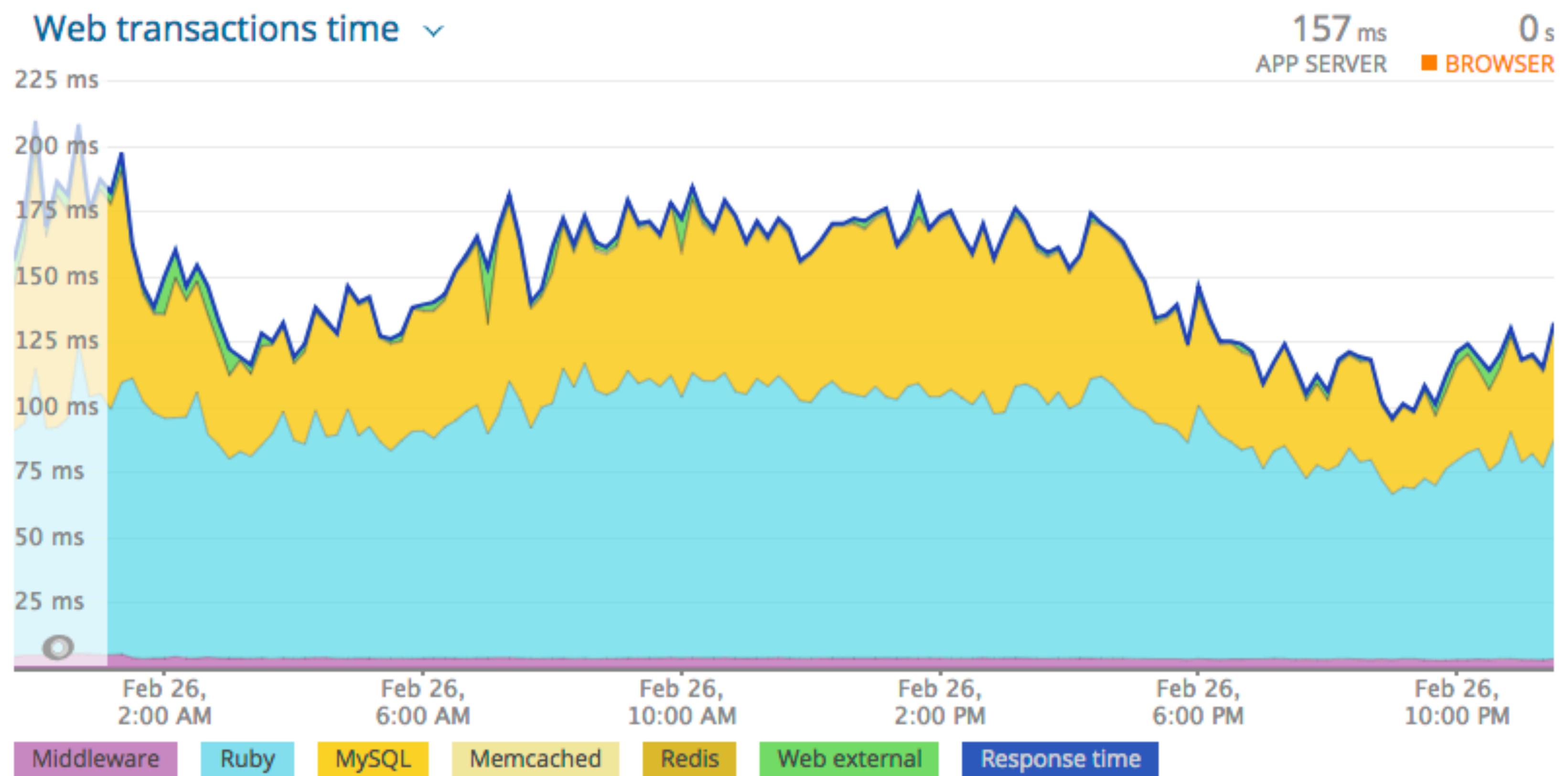
- Skip artificial load testing
- Routing part of traffic to new architecture:
api & api-beta

TOOLS:

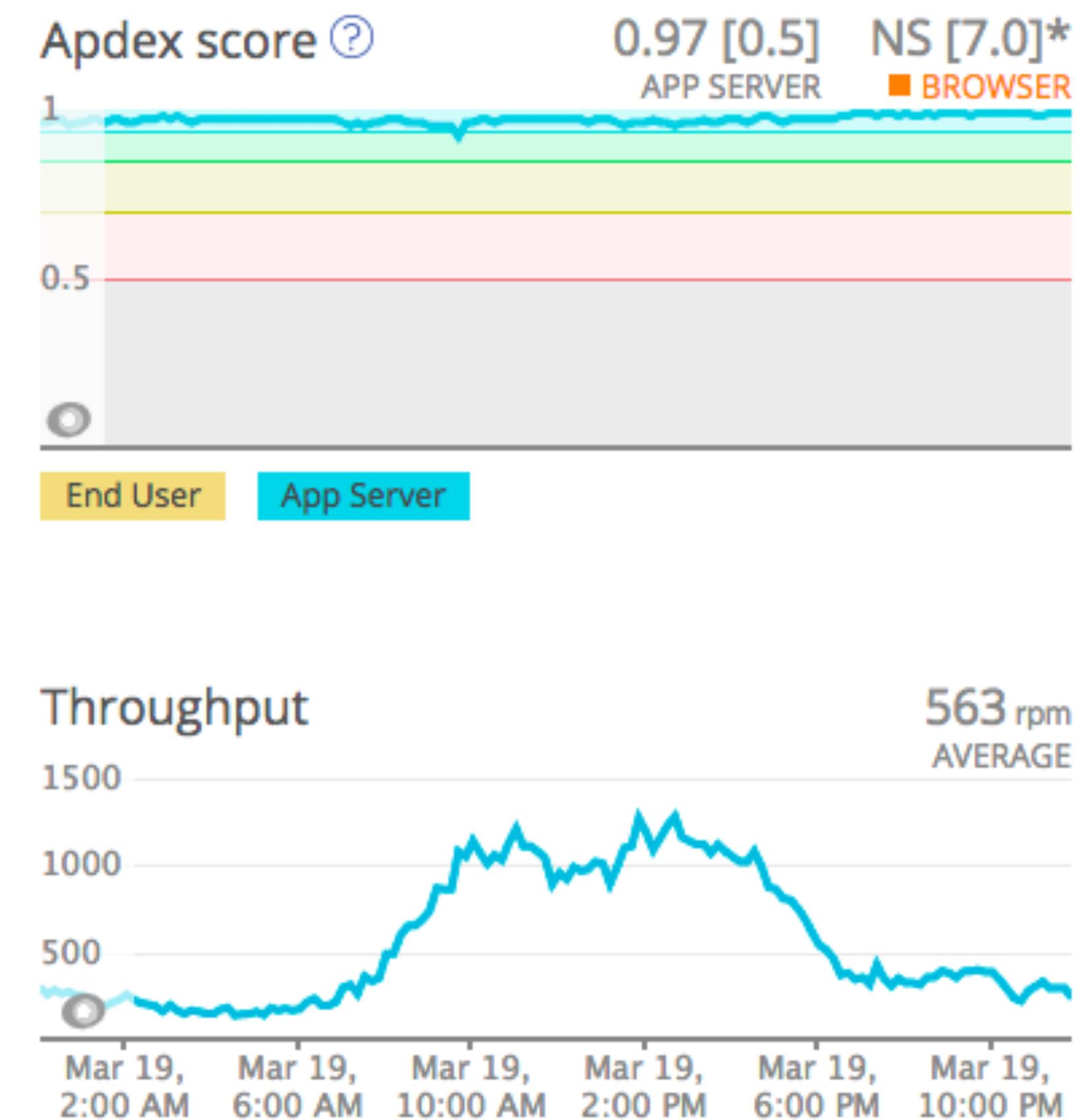
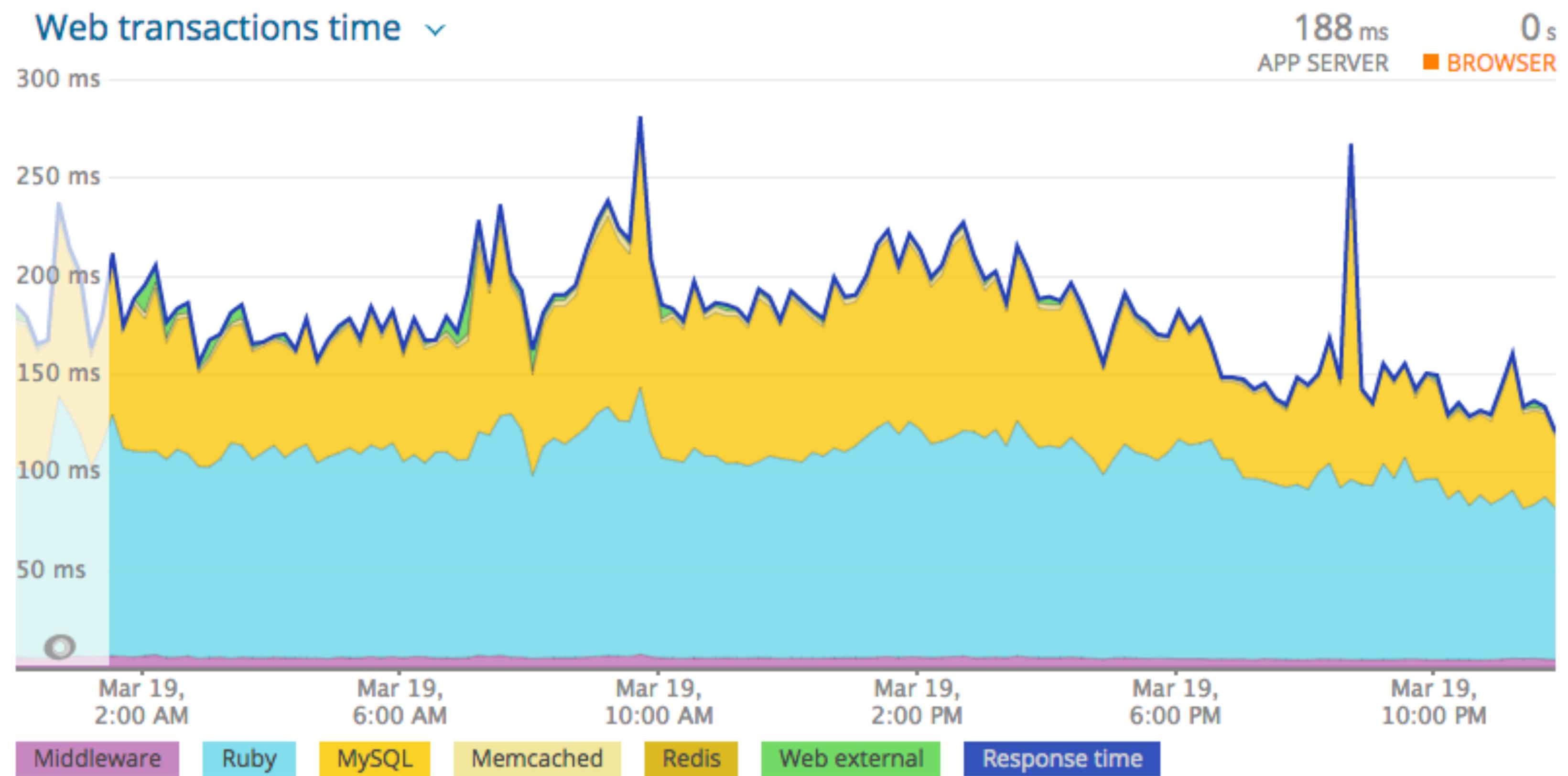
- 1. New Relic**
- 2. Cloudwatch**
- 3. Graylog**
- 4. ScoutAPM**
- 5. Grafana (for Redis and Memcached)**



EC2



ECS



20-30% overhead

OTHER USEFUL SERVICES:



**SECRETS
MANAGER**



**CLOUDWATCH
EVENTS**

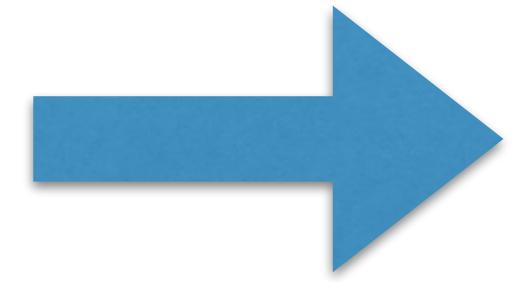


LAMBDA@EDGE

SECRETS:



HASHICORP
VAULT



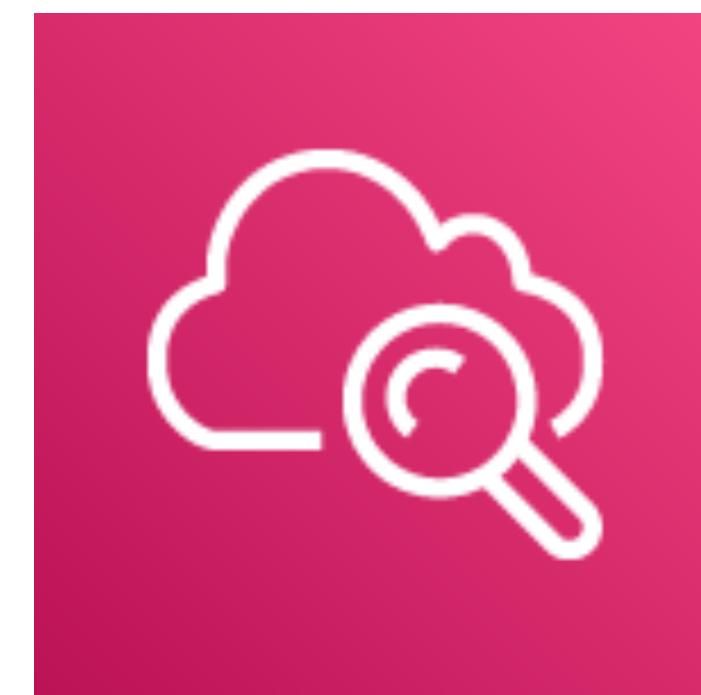
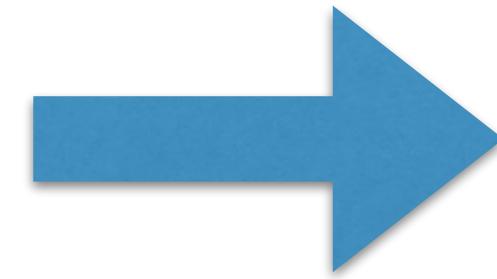
SECRETS
MANAGER



github.com/hmatic/secrets_manager

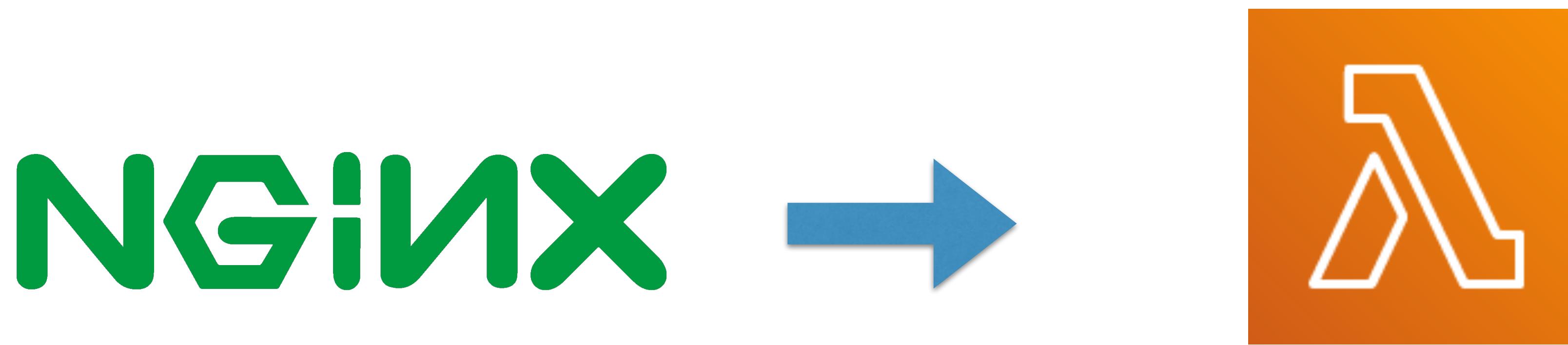
JOB SCHEDULING:

CRON



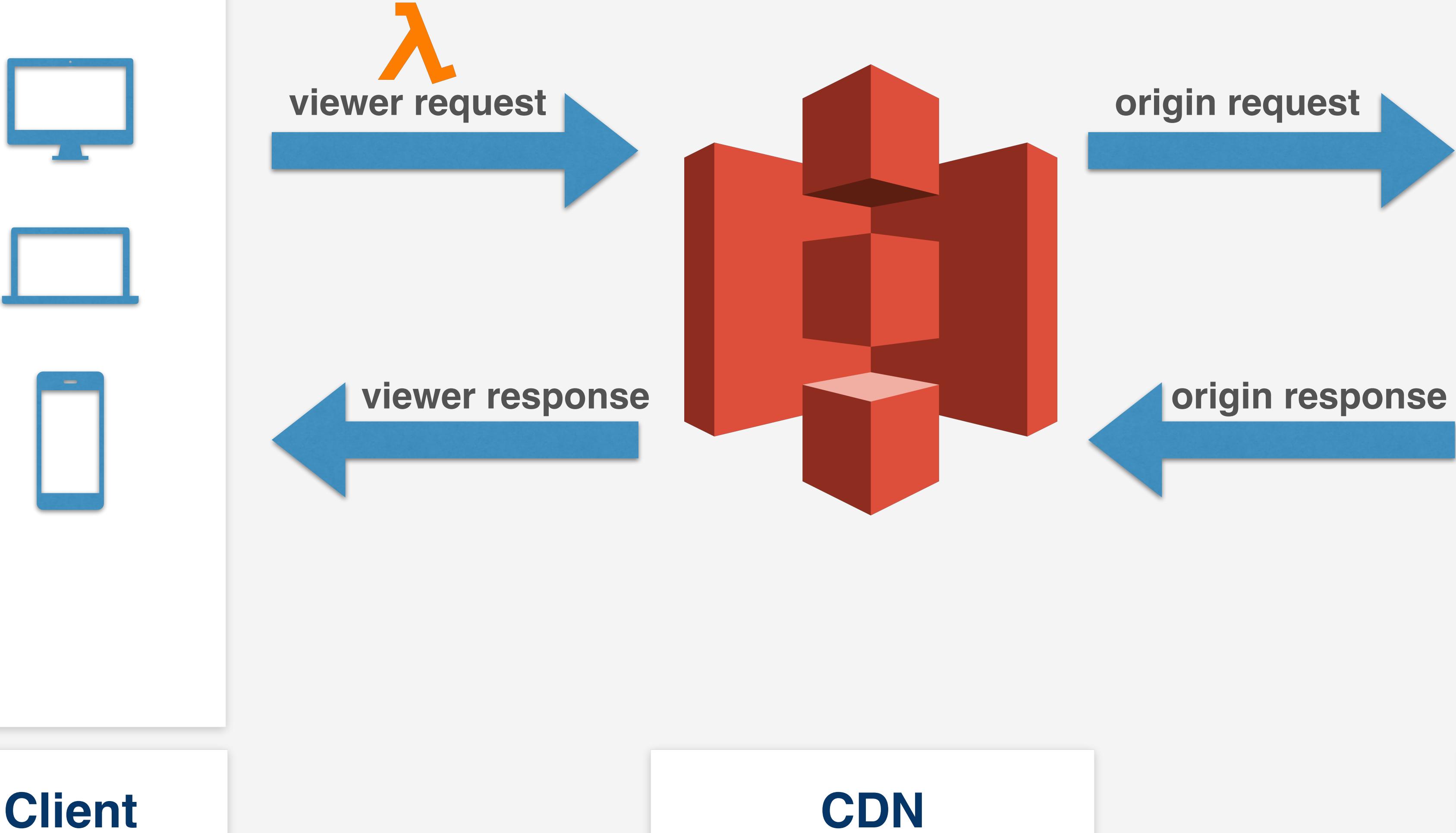
CLOUDWATCH
EVENTS

APP ROUTING:



LAMBDA@EDGE

AWS LAMBDA@EDGE

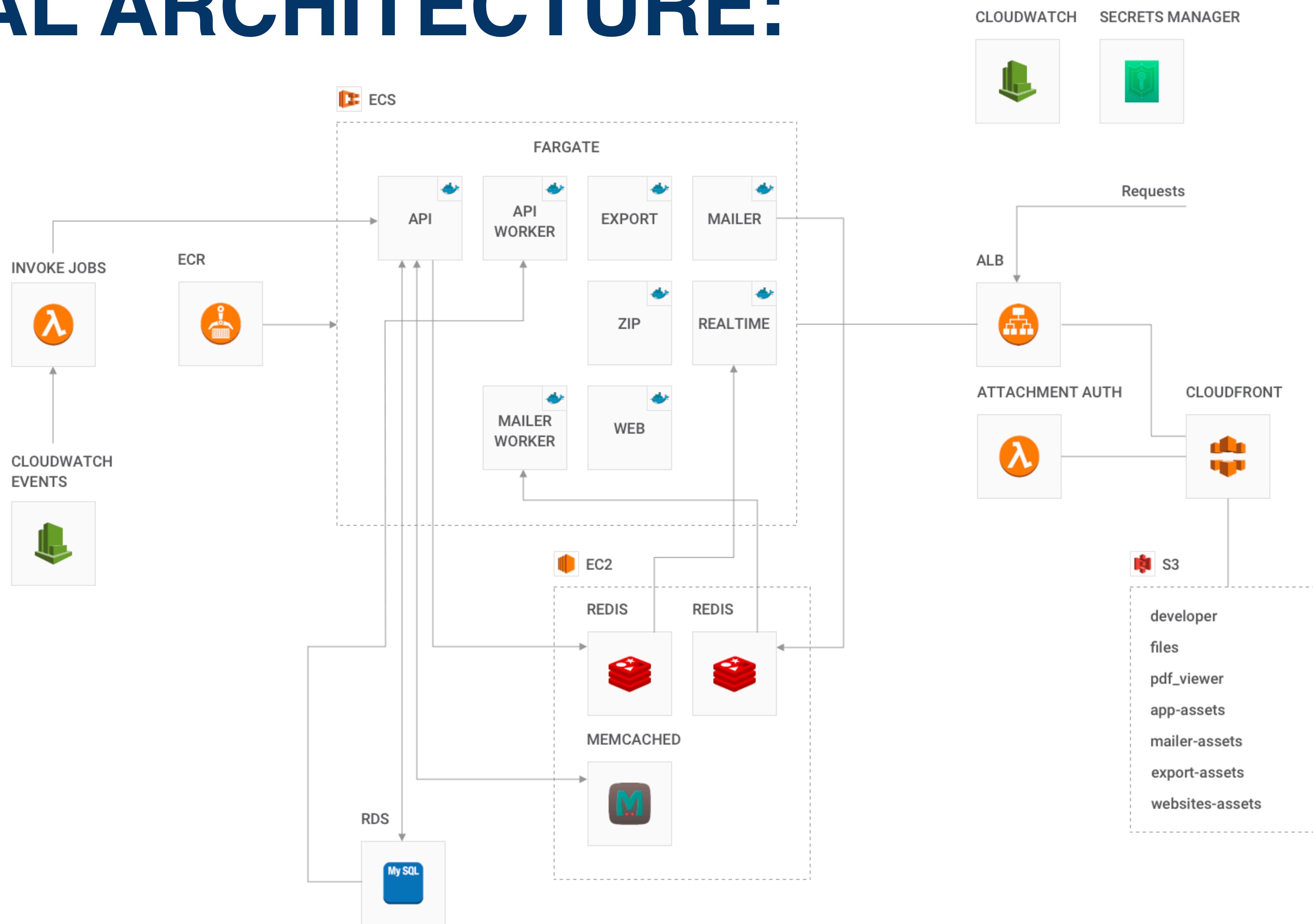


Client

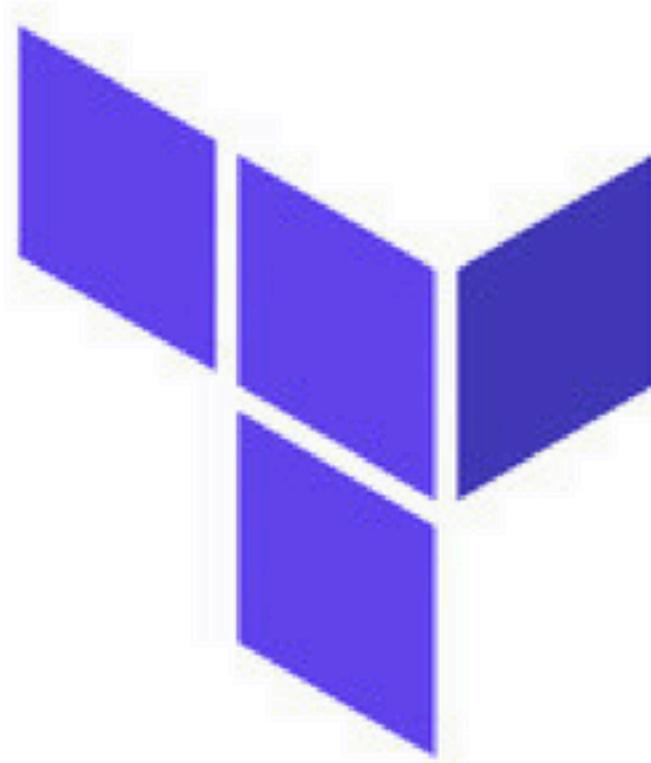
CDN

Origin

FINAL ARCHITECTURE:



IN FUTURE:



HashiCorp
Terraform



Questions?

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Thank you!

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