

# Clustering Docker on AWS with Amazon ECR & ECS

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Docker Grenoble, 13/01/2016 Docker Lyon, 14/01/2016 Docker Nantes, 18/01/2016 Docker Rennes, 01/03/2016



# The problem

Given a certain amount of processing power and memory,

how can we best manage an arbitrary number of apps running in Docker containers?

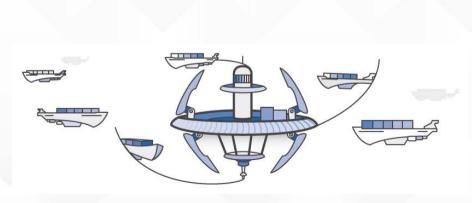


http://tidalseven.com



# Requirements for modern cluster orchestration

Distributed state management
Scalable scheduling
Built-in high availability



#### **Amazon EC2 Container Service (ECS)**

Launched in 04/2015

https://aws.amazon.com/ecs/

No additional charge ©

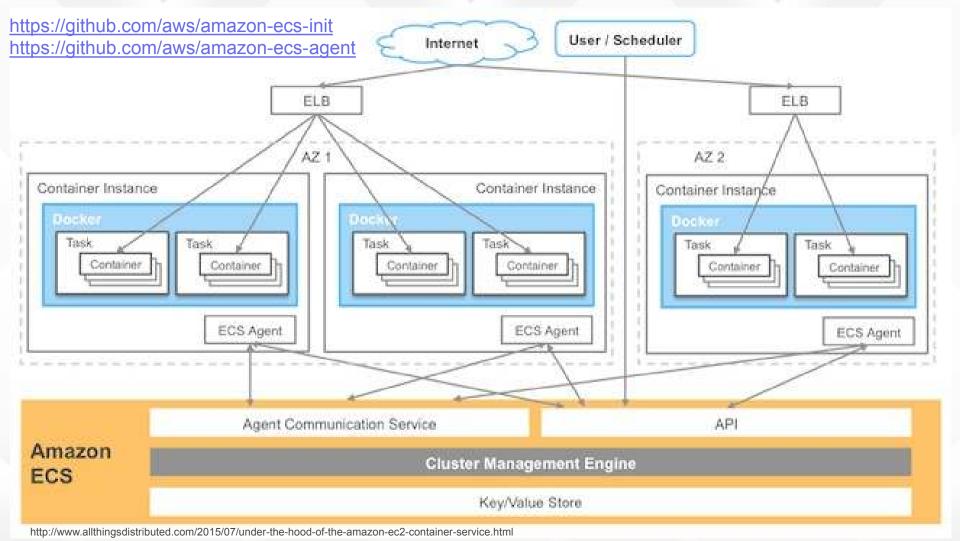
#### **Amazon EC2 Container Registry (ECR)**

Launched in 12/2015

https://aws.amazon.com/ecr/

Free tier: 500MB / month for a year \$0.10 / GB / month + outgoing traffic





### Case study: Coursera

https://www.youtube.com/watch?v=a45J6xAGUvA

#### What Else Did We Look At?

#### Home-grown Tech



MESOS



- Tried, but proved to be unreliable
- Powerful, but hard to
- productionize
- Difficult to handle coordination and synchronization
- Needs developers with experience

- Designed for GCE first
- Not a managed service, higher Ops load

"Amazon ECS enabled Coursera to focus on releasing new software rather than spending time managing clusters" Frank Chen, Software Engineer



### Case study: Meteor

https://www.youtube.com/watch?v=xlc3WT6kAVw

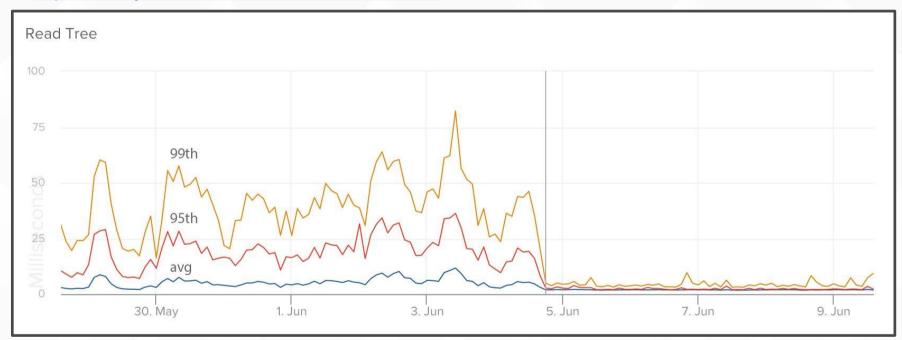
#### **ECS** container management

- Lots of exciting options here: ECS, Kubernetes, Marathon, ...
- Service argument is compelling. Same case we make for Galaxy to our customers.
- Integration with other parts of AWS saves us time and code.
   Example: services automatically register containers with Elastic Load Balancing (ELB).
- Support for multiple Availability Zones.
- Bottom line: ECS got us to market faster than the alternatives.

"Can we scale the amount of compute resources necessary to run all our customers' apps? Can we scale the mechanics of coordinating all those pieces? Using AWS, we can answer 'yes' to both" - Matt DeBergalis, Cofounder & VP Product

# Case study: Remind

https://www.youtube.com/watch?v=8zbbQkszP04



"Moving to Amazon ECS significantly improved our service performance"

Jason Fischl, VP of Engineering



# DEMO #1

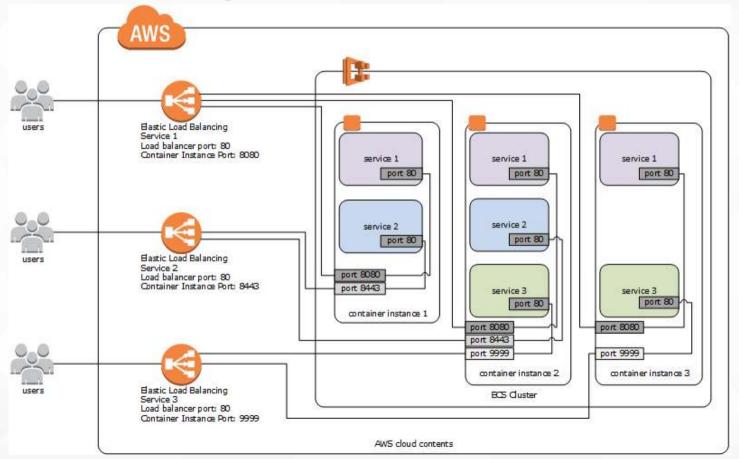
Demo gods, I'm your humble servant, please be good to me

Using the 'aws' and 'ecs-cli' command lines:
Create and scale an Amazon ECS cluster
Pull an image from an Amazon ECR registry
Run, scale and load-balance a simple PHP app

... and look at EC2 Instances, Security Groups, Auto-Scaling Groups,
Elastic Load Balancers and Cloud Formation



# Load balancing services on fixed ports





# Micro-services: it gets worse ©

Micro-services run in an ever-moving production environment: continuous deployment, multiple versions running in parallel, servers coming and going, etc.

- Can micro-services be deployed and scaled independently?
- Can multiple copies of a micro-service run on the same server?
- Can micro-services register their name & port automatically?
- Can micro-services discover each other?
- Can traffic be load-balanced across multiple copies of a micro-service?

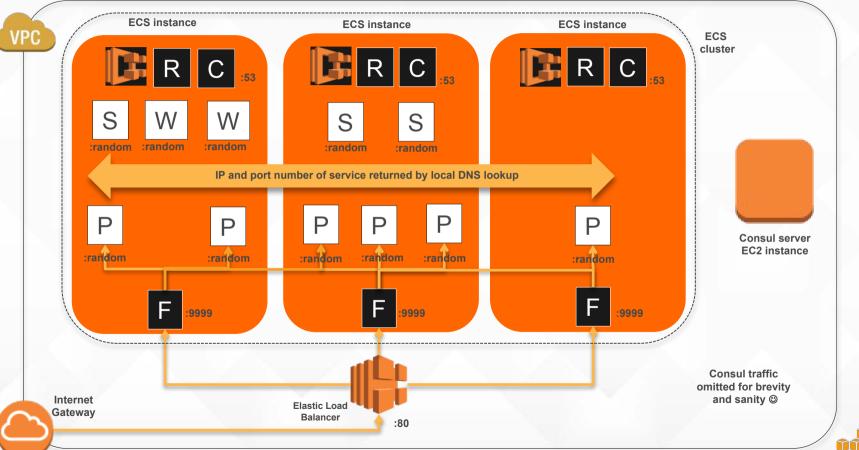


#### Yes we can!

- Can micro-services be deployed and scaled independently?
   Micro-service = Docker image + task definition + service definition
- Can multiple copies of a micro-service run on the same server?
   Let Docker assign a <u>random</u> port
- Can micro-services register name & port automatically?
   Use Registrator to inspect containers and register them in Consul
- Can micro-services discover each other?
   Use local Consul agent for DNS lookups
- Can traffic be load-balanced across multiple copies of a micro-service?
   User-facing service: ELB (80) → Fabio (fixed port) → service (random port)
   Internal service: DNS lookup (53) → service (random port)



# Load balancing services on random ports



ECS agent



Registrator

Consul agent

Fabio



Р

Stock

S

Weather





# DEMO #2

Demo gods, I know I'm pushing it, but please don't let me down now

Run an application built from 3 micro-services (*portal*, *stock*, *weather*) running on random ports

Use a combination of ELB, Fabio and Consul (DNS lookups) for load-balancing

Scale & break stuff, see what happens ©



# Thank you. Let's keep in touch!

@aws\_actus @julsimon
facebook.com/groups/AWSFrance/

AWS User Groups in Paris, Lyon, Nantes, Lille & Rennes (meetup.com)







March 16



March 23-24



April 6-7 (Lyon)



April 20-22



April 25



AWS Summit May 31st



# BONUS SLIDES



# **Using Amazon ECS**

https://docs.aws.amazon.com/fr fr/AmazonECS/latest/developerguide/ECS GetStarted.html

AWS Console

https://console.aws.amazon.com/ecs/

AWS CLI

https://github.com/aws/aws-cli

https://github.com/awslabs/aws-shell NEW!

AWS SDK (Java, .NET, Node.js, PHP, Python, Ruby, Go, C++) https://github.com/aws/aws-sdk-\*

Amazon ECS CLI<a href="https://github.com/aws/amazon-ecs-cli">https://github.com/aws/amazon-ecs-cli</a>

https://www.youtube.com/watch?v=MMr78xAiZpQ



#### **Amazon ECS resources**

#### Building demos #1 & #2

https://docs.aws.amazon.com/fr fr/AmazonECS/latest/developerguide/docker-basics.html

https://github.com/awslabs/ecs-demo-php-simple-app

https://aws.amazon.com/blogs/compute/service-discovery-via-consul-with-amazon-ecs/

https://github.com/awslabs/service-discovery-ecs-consul

https://www.consul.io/ - https://github.com/gliderlabs/registrator - https://github.com/eBay/fabio

#### Tech articles by Werner Vogels, CTO of Amazon

http://www.allthingsdistributed.com/2014/11/amazon-ec2-container-service.html

http://www.allthingsdistributed.com/2015/04/state-management-and-scheduling-with-ecs.html

http://www.allthingsdistributed.com/2015/07/under-the-hood-of-the-amazon-ec2-container-service.html

#### Amazon ECS video @ AWS re:Invent 2015

Amazon ECS: Distributed Applications at Scale <a href="https://www.youtube.com/watch?v=eun8CqGqdk8">https://www.youtube.com/watch?v=eun8CqGqdk8</a>

Turbocharge Your Deployment Pipeline with Containers <a href="https://www.youtube.com/watch?v=o4w8opVCI-Q">https://www.youtube.com/watch?v=o4w8opVCI-Q</a>

From Local Docker Development to Production Deployments <a href="https://www.youtube.com/watch?v=7CZFpHUPqXw">https://www.youtube.com/watch?v=7CZFpHUPqXw</a>



# Managing Amazon ECR repositories

\$ aws ecr create-repository --repository-name REPO\_NAME --region us-east-1

\$ aws ecr describe-repositories -- region us-east-1

\$ aws ecr delete-repository --repository-name REPO\_NAME --region us-east-1



# Managing Docker images with ECR

\$ aws ecr get-login -- region us-east-1

<run docker login command provided as output>

\$ docker build -t REPO\_NAME .

\$ docker tag REPO\_NAME:latest ACCOUNT\_ID.dkr.ecr.us-east-1.amazonaws.com/REPO\_NAME:latest

\$ docker push ACCOUNT\_ID.dkr.ecr.us-east-1.amazonaws.com REPO NAME:latest



# Creating, scaling and deleting an ECS cluster

- \$ ecs-cli **configure** -c CLUSTER\_NAME -r eu-west-1 \$ ecs-cli **up** --keypair *KEY\_PAIR\_ID* --capability-iam --size 1 --instance-type t2.micro
- \$ ecs-cli **scale** --size 3 --capability-iam
- \$ ecs-cli ps
- \$ ecs-cli down CLUSTER\_NAME --force

#### Reminder:

- 'ecs-cli up' launches a CloudFormation template
- By default, the cluster is created in a new VPC
- By default, only port 80 is open on ECS instances
- See 'ecs-cli up –help' for advanced networking options



#### **Basic ECS commands**

- \$ aws ecs list-clusters
- \$ aws ecs describe-clusters --cluster CLUSTER\_NAME
- \$ aws ecs list-container-instances --cluster CLUSTER\_NAME
- \$ aws ecs **describe-container-instances** --cluster CLUSTER\_NAME --container-instances *ECS\_INSTANCE\_ID*



# **Updating the Amazon ECS agent**

\$ aws ecs update-container-agent --cluster CLUSTER\_NAME --container-instance ECS\_INSTANCE\_ID

#### #!/bin/bash

done

for i in `aws ecs list-container-instances --cluster CLUSTER\_NAME | grep arn | cut -b 64-99` do aws ecs update-container-agent --cluster CLUSTER\_NAME--container-instance \$i



### Allowing SSH access on an ECS cluster

- \$ aws ecs **describe-container-instances** --cluster CLUSTER\_NAME --container-instances *ECS\_INSTANCE\_ID* --query 'containerInstances[\*].ec2InstanceId'
- \$ aws ec2 **describe-instances** --instance-ids *EC2\_INSTANCE\_ID* --query "Reservations[\*].Instances[\*].SecurityGroups[\*].GroupId"
- \$ aws ec2 authorize-security-group-ingress --group-id SECURITY\_GROUP\_ID --protocol tcp --port 22 --cidr 0.0.0.0/0



#### **Amazon ECS metadata**

Log into the ECS instance

#### **Instance information**

\$ curl http://localhost:51678/v1/metadata

#### Task information

\$ curl http://localhost:51678/v1/tasks



# Creating and scaling an Amazon ECS service

Write a docker-compose.yml file

\$ ecs-cli compose service start

\$ ecs-cli compose service up

\$ ecs-cli compose service **scale** 3



# Stopping and deleting an Amazon ECS service

\$ ecs-cli compose service stop

\$ ecs-cli compose service delete

