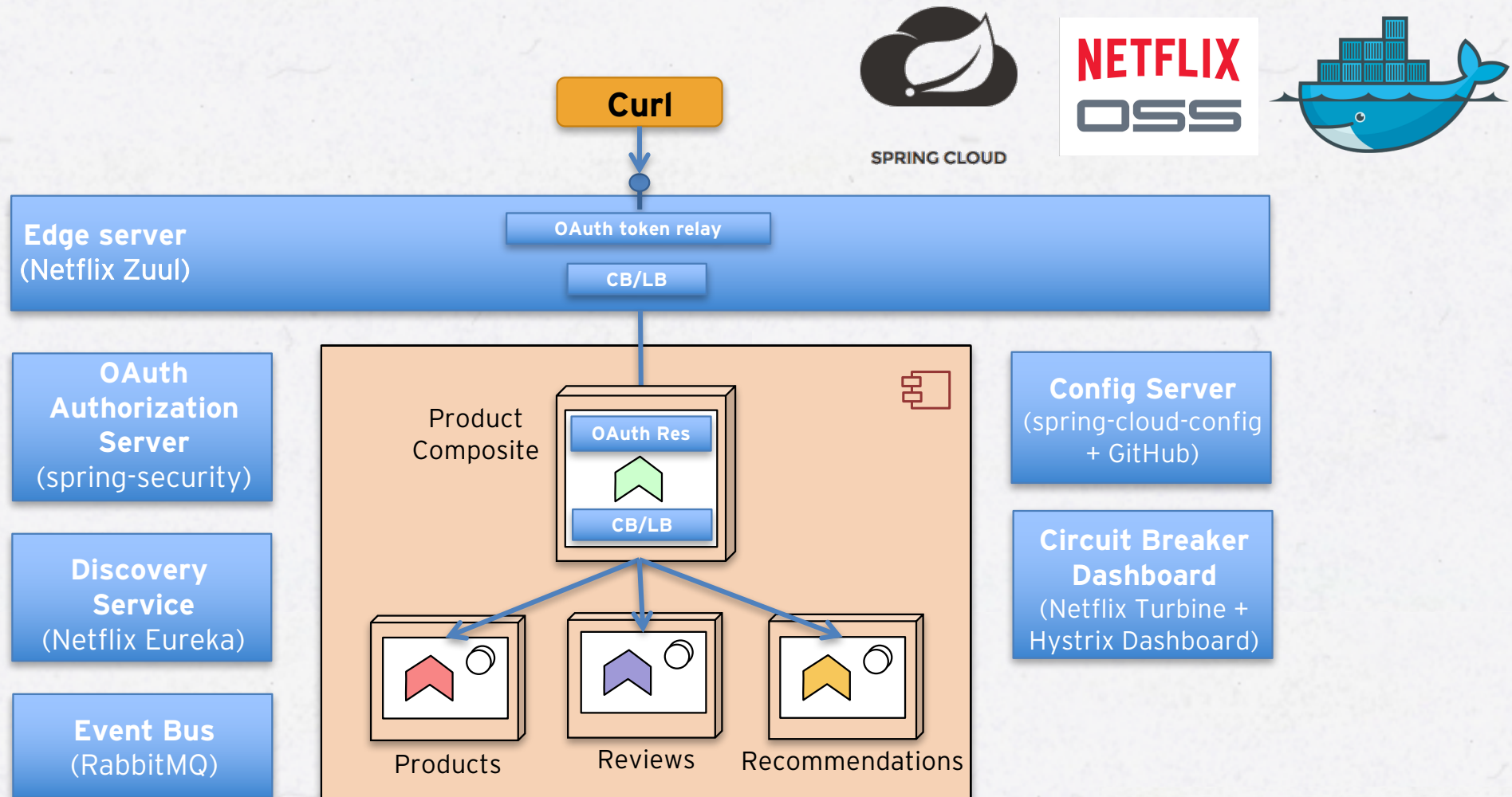


CADEC 2017 - EXPERIENCES FROM USING DISCOVERY SERVICES IN A MICROSERVICE LANDSCAPE

MAGNUS LARSSON

2017-01-25 | CALLISTAENTERPRISE.SE

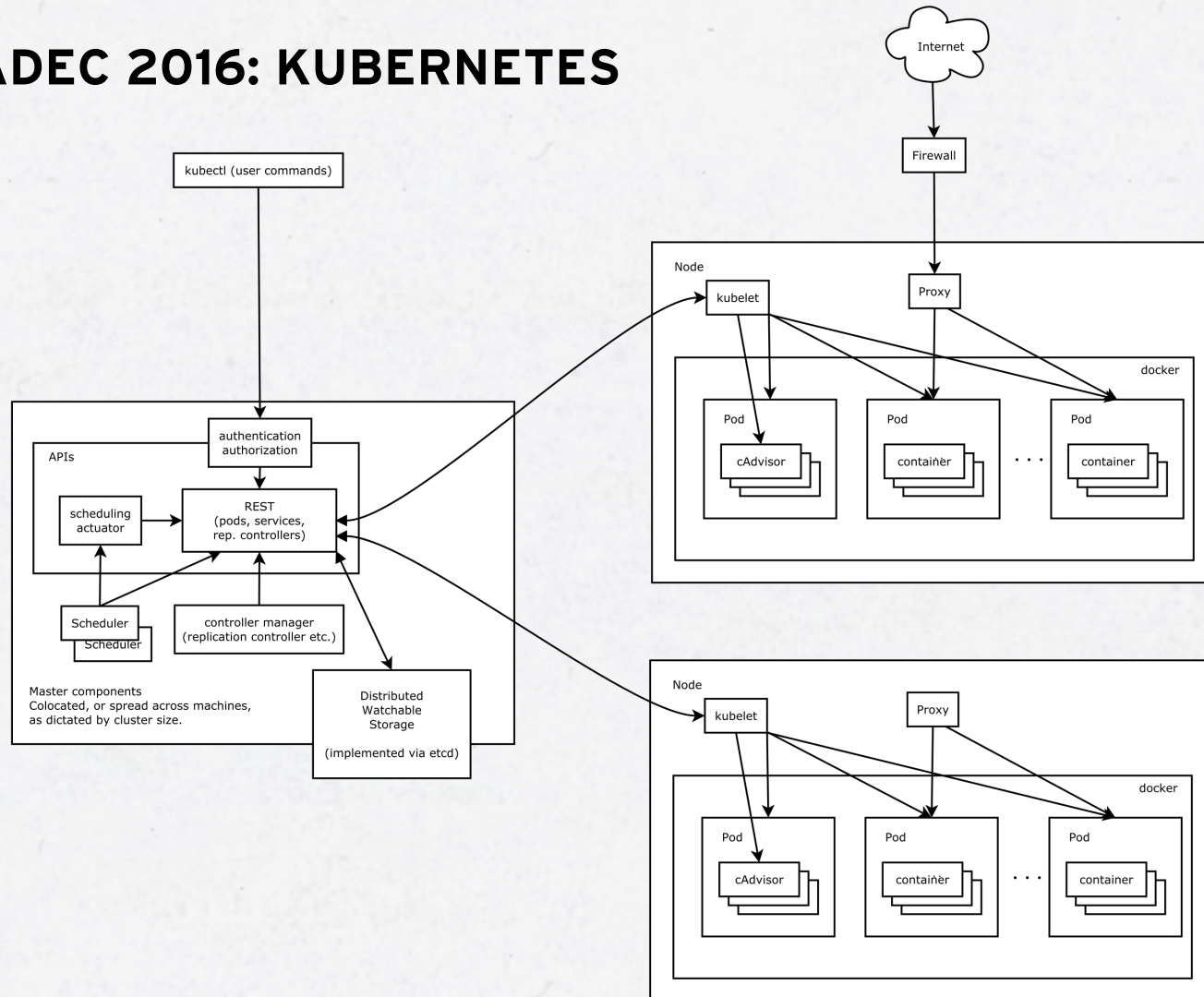
FROM CADEC 2016: MICROSERVICES WITH SPRING CLOUD AND NETFLIX OSS



FROM CADEC 2016: KUBERNETES



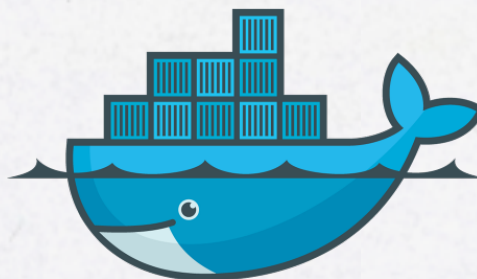
kubernetes



POST CADEC 2016 QUESTION IN MY HEAD



+



=




SPRING CLOUD

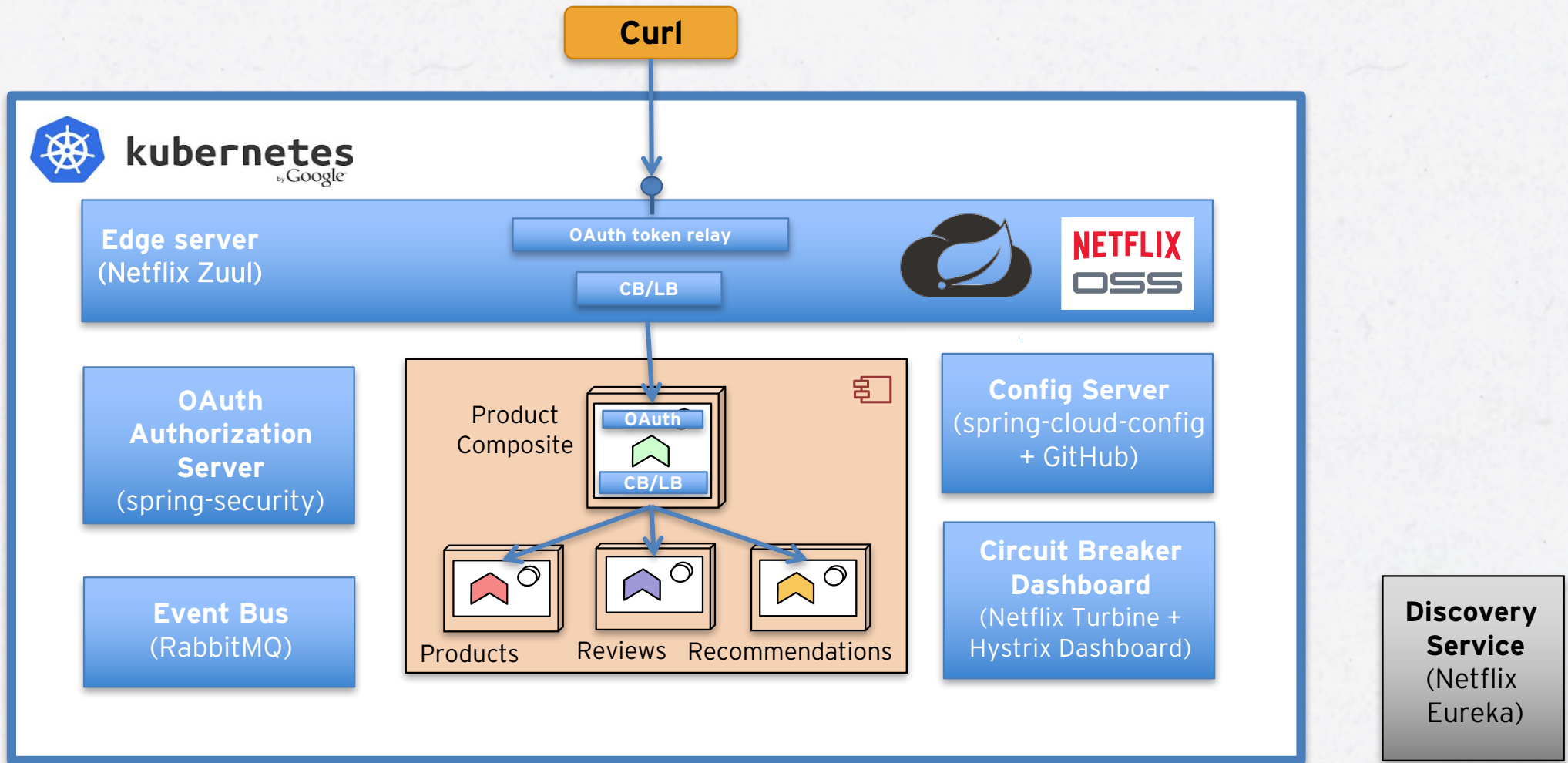


kubernetes

POST CADEC 2016 QUESTION IN MY HEAD

- Spring Cloud and Netflix OSS provides
 - Service discovery
 - Centralized configuration
 - Edge server
 - Circuit-breaker
 - OAuth based API security
 - Distributed tracing
 - Event-bus
 - ...
 - Kubernetes provides container orchestration capabilities
 - Cluster management
 - Declare a desired state
 - Service discovery
 - Self healing
 - Rolling upgrades
 - Automated scaling
 - ...
- 

SPRING CLOUD, NETFLIX OSS AND KUBERNETES



WHAT ABOUT OTHER CONTAINER ORCHESTRATION TOOLS?

- Docker Swarm mode (since v1.12)
- Amazon EC2 Container Services (ECS)
- Apache Mesos (DC/OS)
- Hashicorp Nomad

WHAT ABOUT MICROSERVICES WITHOUT CONTAINERS?

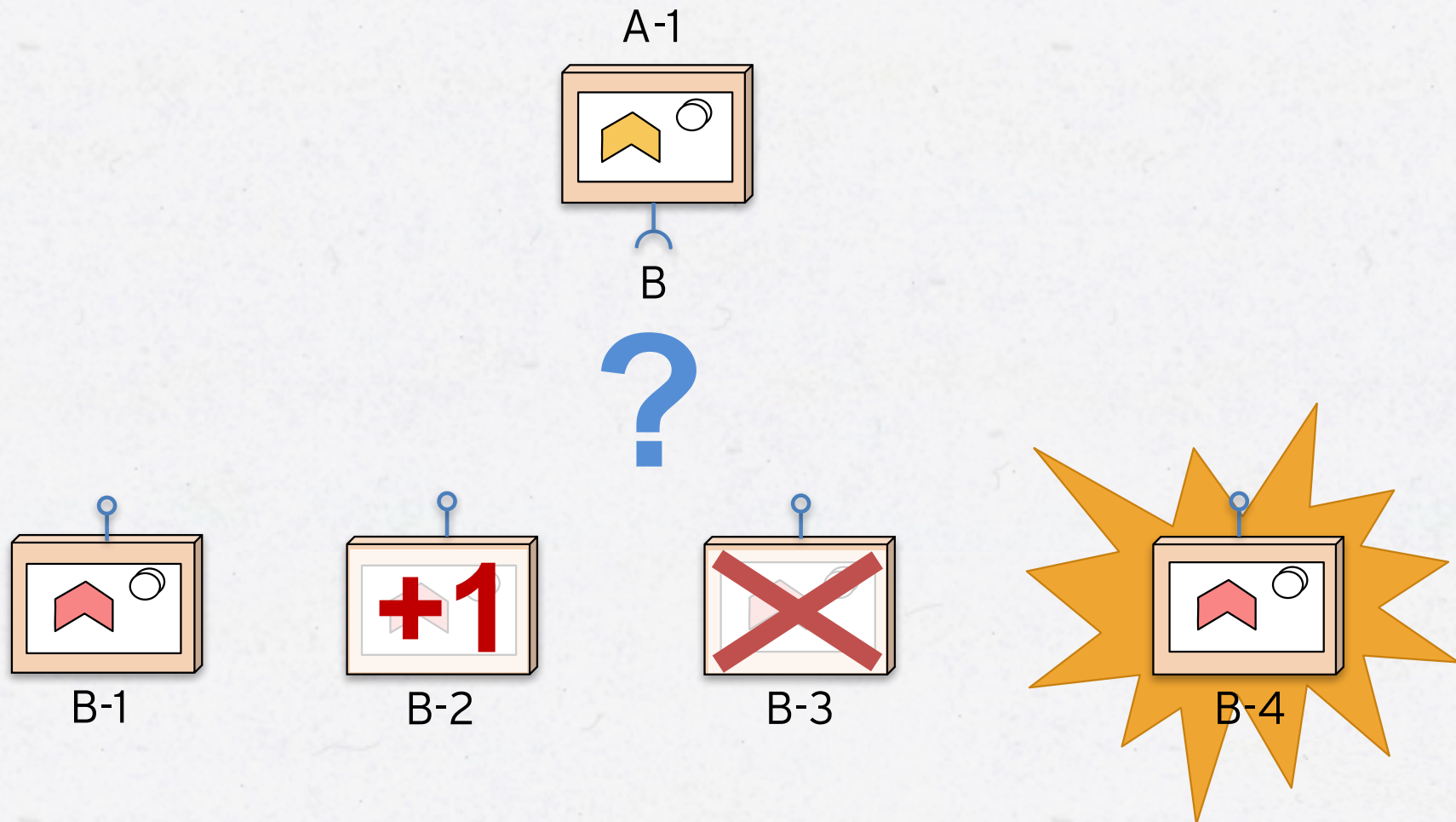
- Can we use Netflix Eureka as Service Discovery when containers are not used?

MY PERSONAL QUEST FOR 2016

- Write once, deploy “everywhere”?
 - Only allow configuration changes!
- Selected platforms (based on customer projects):
 - Without containers using *Netflix Eureka* as Service Discovery
 - Container orchestration tools (built in Service Discovery):
 - » *Kubernetes*
 - » *Docker Swarm mode*
 - » *Amazon ECS*
- **Main challenge**
 - How to write code that works with the various Service Discovery implementations?

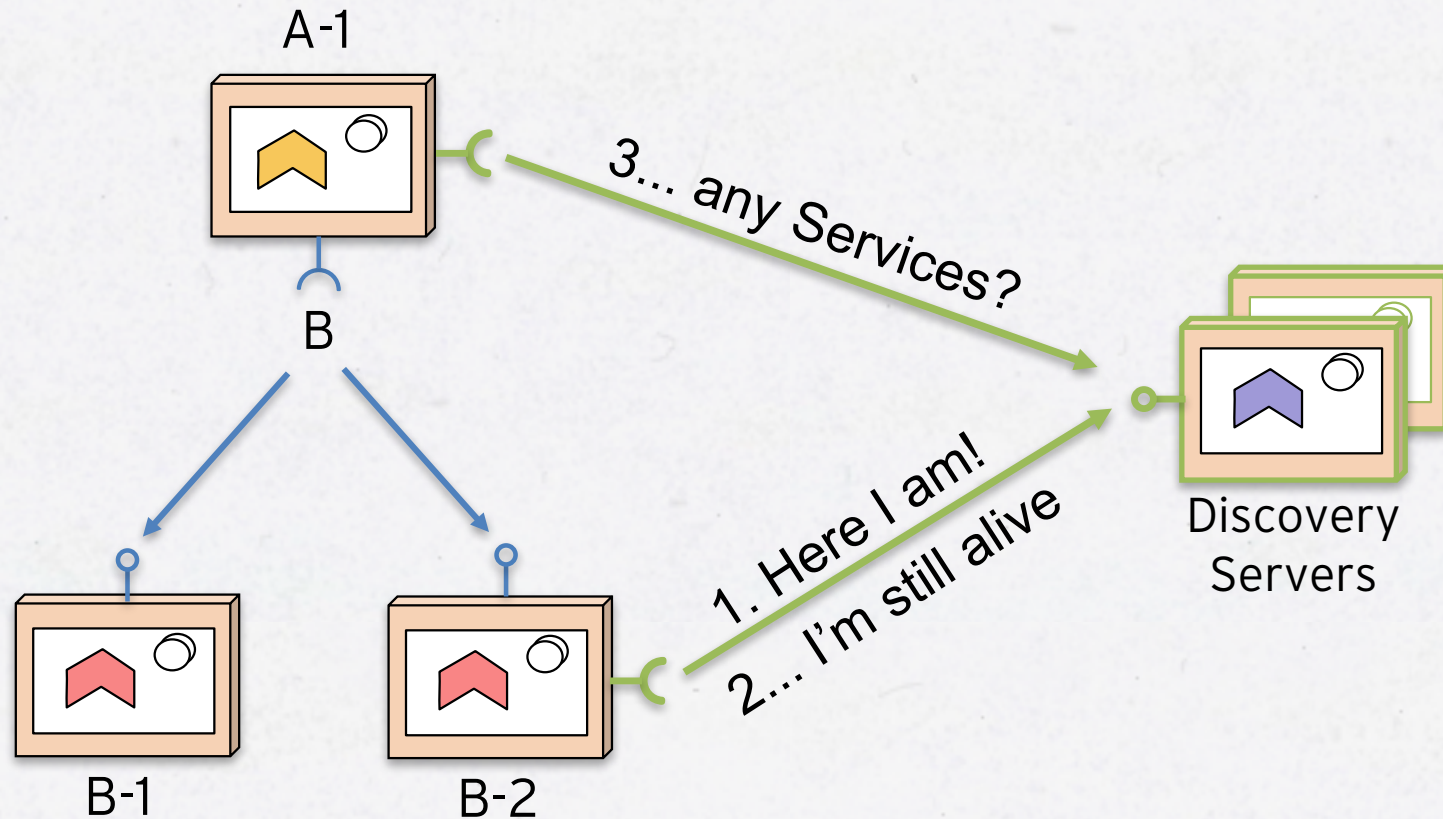
WHAT IS SERVICE DISCOVERY?

Keeping track of many small moving parts...



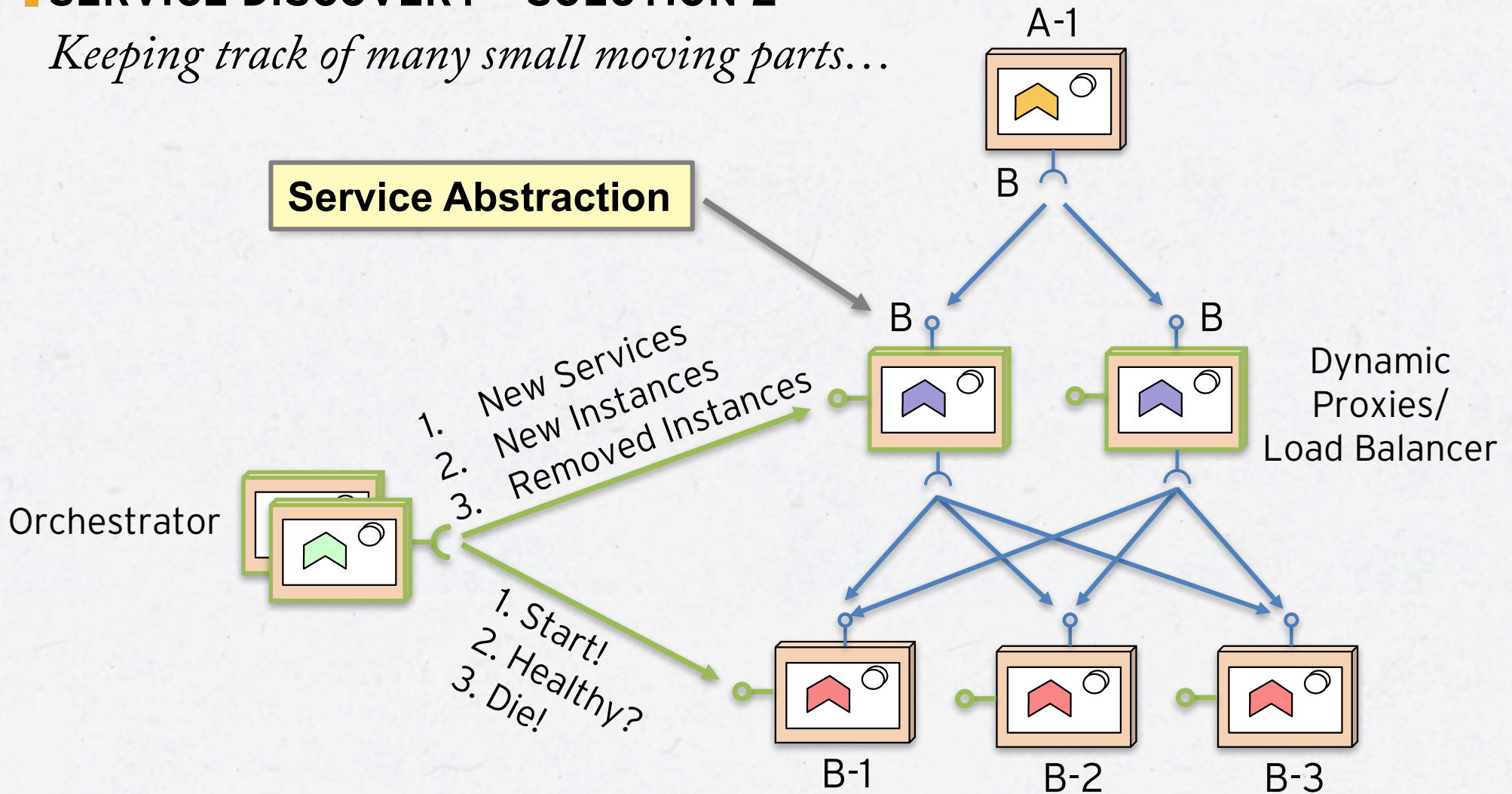
SERVICE DISCOVERY - SOLUTION 1

Keeping track of many small moving parts...



SERVICE DISCOVERY - SOLUTION 2

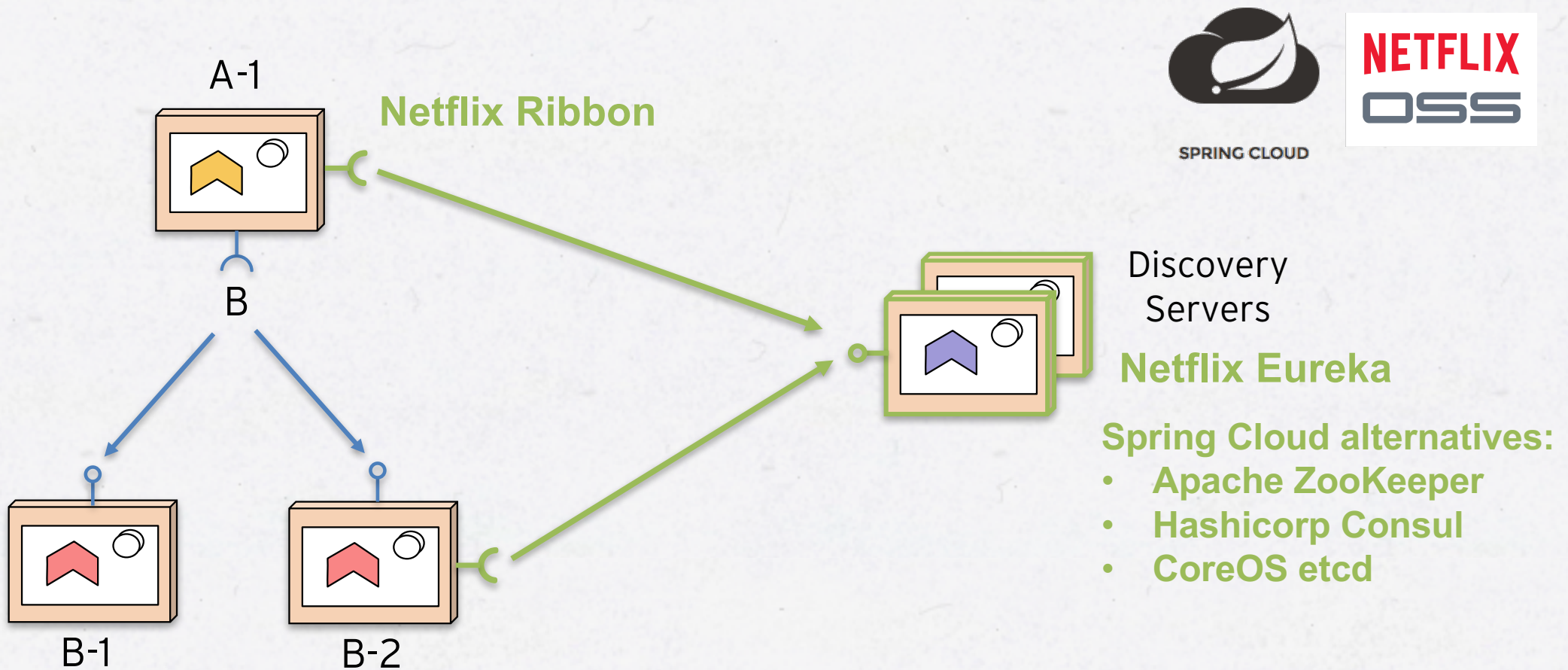
Keeping track of many small moving parts...



TIMELINE, MAJOR IMPROVEMENTS DURING 2016...

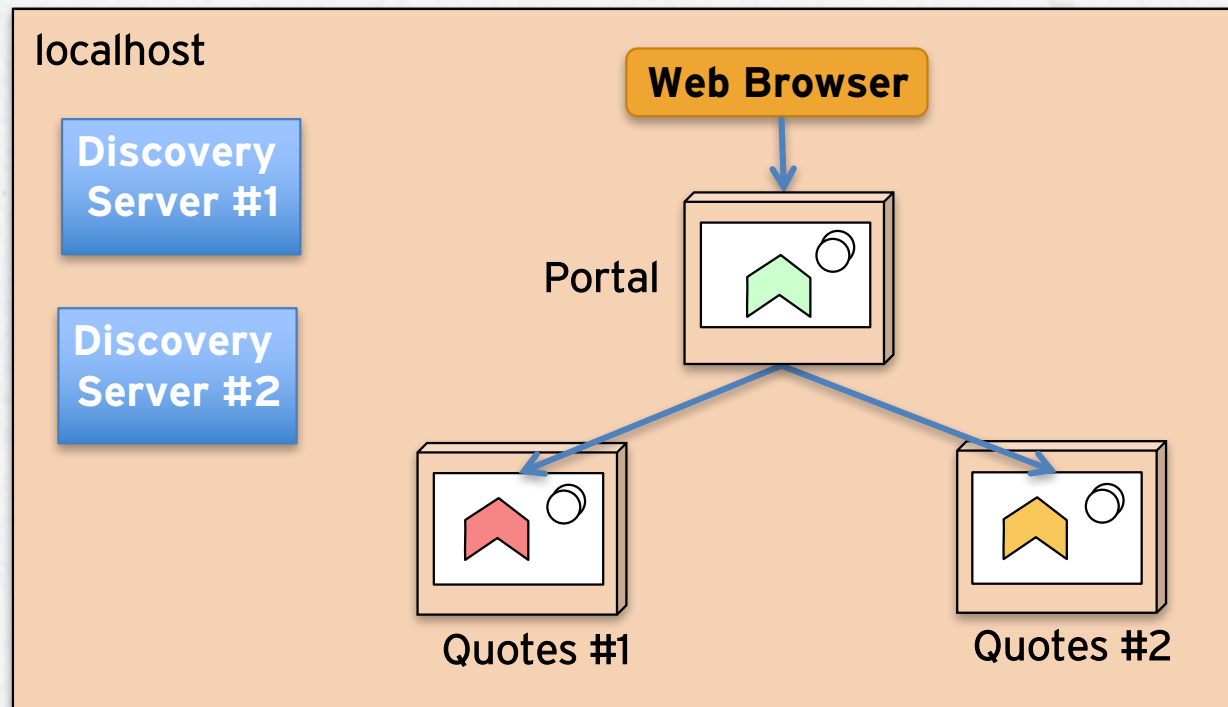
- **2016-01-27: Cadec 2016**
 - Can't find a common abstraction that works over Spring Cloud/Netflix OSS, Amazon ECS, Kubernetes and Docker Swarm!
- **2016-02-04: Docker 1.10**
 - Built in dynamic DNS server
- **2016-07-28: Docker 1.12**
 - Docker Swarm mode with a Service concept similar to Kubernetes
- **2016-08-11: Amazon Application Load Balancer**
 - Extends Amazon ELB to work with microservices in Amazon ECS
- **2017-01-25: Cadec 2017**
 - Looks better now, let's try it out!

EXAMPLE #1 - SPRING CLOUD AND NETFLIX OSS (NO CONTAINERS)



EXAMPLE #1 - SPRING CLOUD AND NETFLIX OSS (NO CONTAINERS)

DEMO



EXAMPLE #1 - SPRING CLOUD AND NETFLIX OSS (NO CONTAINERS)

DEMO

- Start up all 5 Java programs
 - Two discovery servers, one portal instance, two quote services
 - `termrc start`
- Open portal web app: localhost:9090
- Verify load balancing
- Kill one of the quotes instances...
- Start it again...

EXAMPLE #1 - SPRING CLOUD AND NETFLIX OSS (NO CONTAINERS)

Expected result:

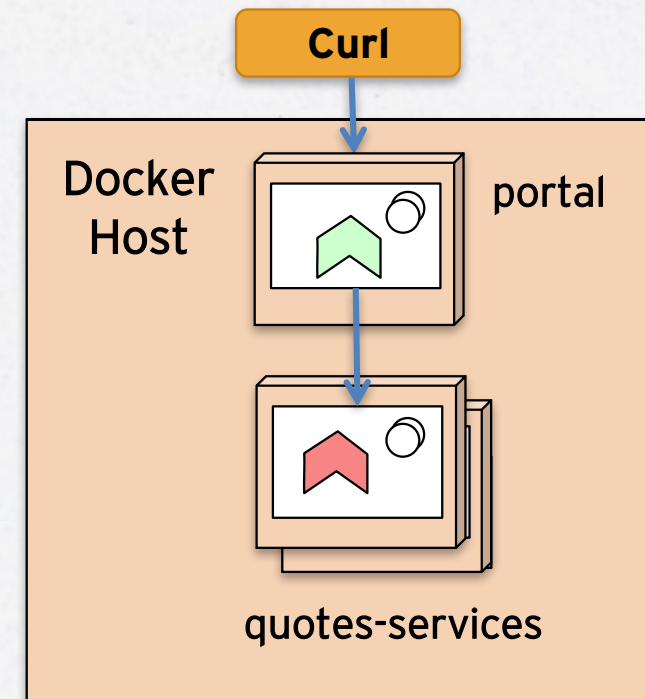
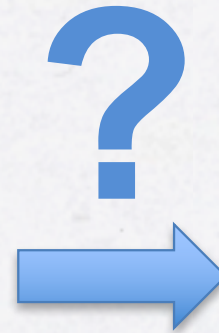
Timestamp	Response Time	Quote	IP Address
2017-01-03 14:16:31 743	355	You, too, Brutus?	Magnus-MBP.lan/192.168.1.198:8080
2017-01-03 14:16:30 736	349	Champagne should be cold, dry and free	Magnus-MBP.lan/192.168.1.198:8081
2017-01-03 14:16:29 719	332	You, too, Brutus?	Magnus-MBP.lan/192.168.1.198:8082
2017-01-03 14:16:28 726	340	To be or not to be	Magnus-MBP.lan/192.168.1.198:8080
2017-01-03 14:16:27 708	322	You, too, Brutus?	Magnus-MBP.lan/192.168.1.198:8081
2017-01-03 14:16:26 701	315	Champagne should be cold, dry and free	Magnus-MBP.lan/192.168.1.198:8082

EXAMPLE #2 - PLAIN CONTAINERS (NO ORCHESTRATION)?



- 2016-02-04: Docker 1.10 released
 - Docker gets a built in dynamic DNS server!
 - Plain Docker Compose sufficient?

```
version: '2'  
  
services:  
  
  quotes-service:  
    image: magnuslarsson/quotes:16  
  
  portal-service:  
    image: magnuslarsson/portal:17  
    ports:  
      - "9090:9090"
```



EXAMPLE #2 - PLAIN CONTAINERS (NO ORCHESTRATION)?

- Docker 1.10 with a built in DNS server!

```
docker-compose up
docker-compose scale quotes-service=2

docker-compose exec portal-service nslookup quotes-service
```

- Sample output

```
$ docker-compose exec portal-service nslookup quotes-service
Name:      quotes-service
Address 1: 172.19.0.3 dockercomposev2_quotes-service_1.dockercomposev2_default
Address 2: 172.19.0.4 dockercomposev2_quotes-service_2.dockercomposev2_default
```

EXAMPLE #2 - PLAIN CONTAINER ORCHESTRATION?

- [localhost:9090](#)

2017-01-02 17:26:28 801

2017-01-02 17:26:27 797

2017-01-02 17:26:26 800

2017-01-02 17:26:25 794

1. DNS client picks a IP address and sticks to that, i.e. no load balancing!
2. DNS clients cache responses from the DNS server
3. No readiness checks

a4dc9d5c6114/172.19.0.3 8080

a4dc9d5c6114/172.19.0.3 8080

a4dc9d5c6114/172.19.0.3 8080

a4dc9d5c6114/172.19.0.3 8080

EXAMPLE #2 - PLAIN CONTAINERS (NO ORCHESTRATION)?

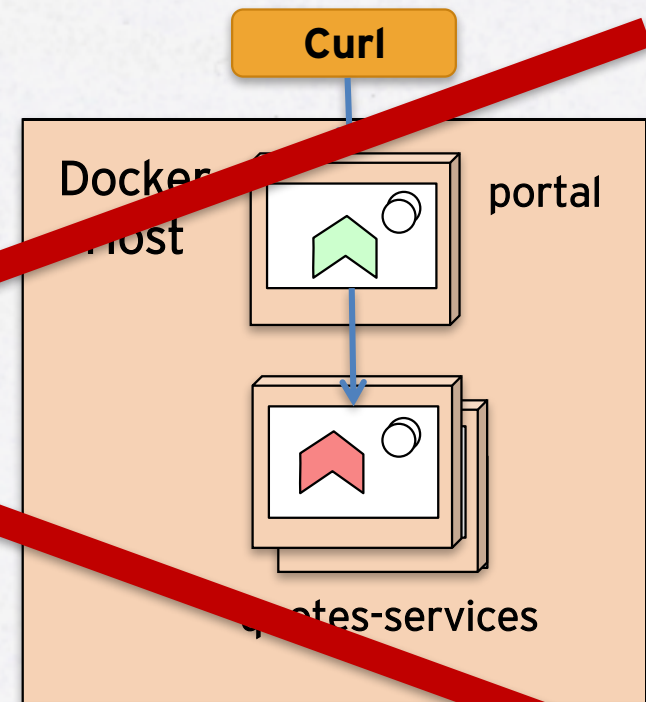
- 2016-02-04: Docker 1.10 released
 - Docker gets a built in DNS server!

```
version: '2'

services:

  quotes-service:
    image: magnuslarsson/quotes:16

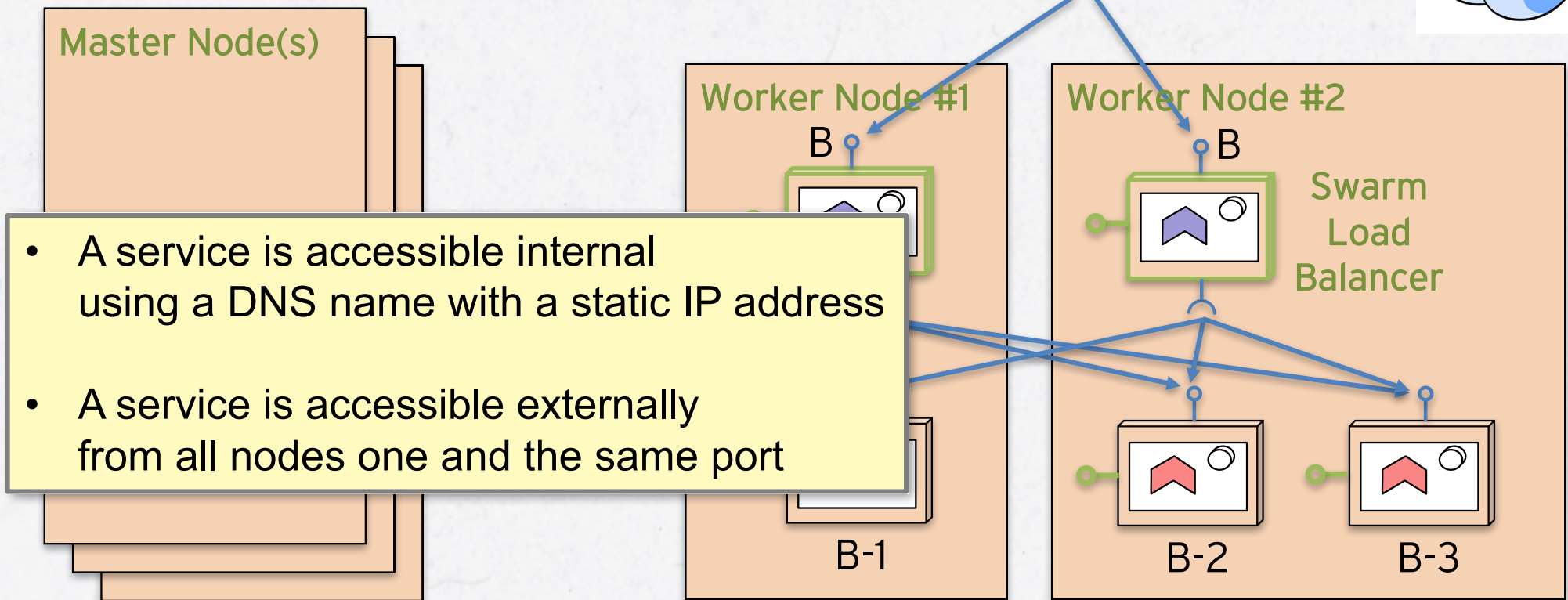
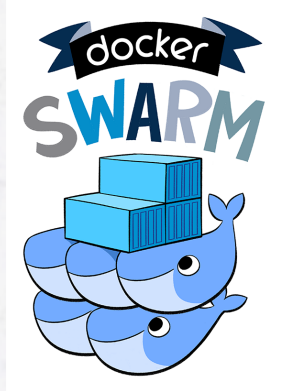
  portal-service:
    image: magnuslarsson/portal:16
    ports:
      - "9090:9090"
```



EXAMPLE #3: DOCKER SWARM MODE

Docker Services and Routing Mesh

- 2016-07-28: Docker 1.12 released

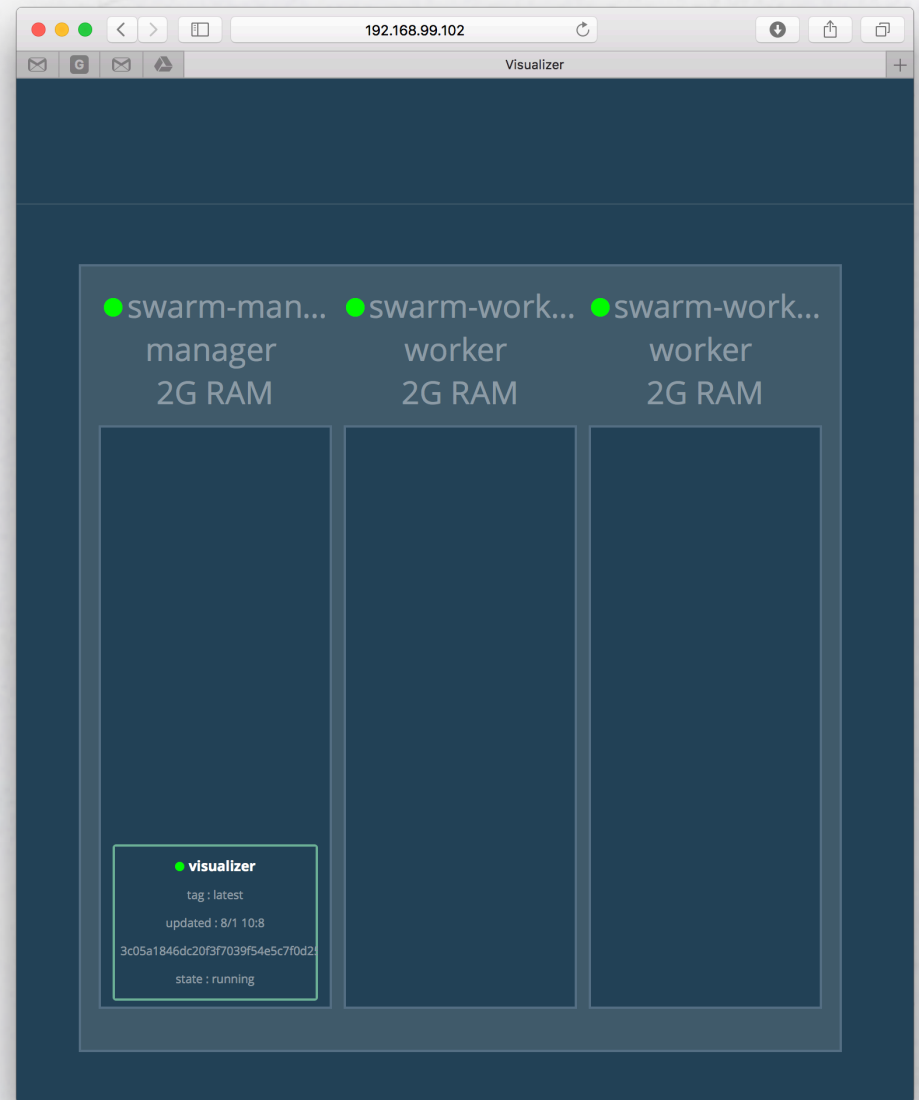


EXAMPLE #3: DOCKER SWARM MODE

DEMO

- 3 node cluster
(local VirtualBox nodes)

```
$ docker swarm init ...  
$ docker swarm join ...  
$ docker swarm join ...  
  
$ docker service create \  
  --name=viz \  
  --publish=8000:8080 \  
  manomarks/visualizer
```



EXAMPLE #3: DOCKER SWARM MODE

- Deploy quotes and portal

```
$ docker network create \
  --driver overlay my_network
```

```
$ docker service create \
  --name quotes-service \
  --replicas 3 \
  --network my_network \
  magnuslarsson/quotes:16 \
```

```
$ docker service create \
  --name portal \
  --publish 9090:9090 \
  --replicas 1 \
  --network my_network \
  magnuslarsson/portal:17
```



EXAMPLE #3: DOCKER SWARM MODE

1. Start portal
2. Kill quote container
3. Kill node with quote containers



EXAMPLE #4: KUBERNETES

DEMO

- Setup a Kubernetes Cluster in Google Cloud
- Let Kubernetes auto configure Google Cloud Load Balancer
- Let's try auto scaling!
 - Both pods (e.g. containers) and nodes
- Put some load on the cluster and see if we can get new pods and new nodes started up...

EXAMPLE #4: KUBERNETES

- Setup cluster on Google Cloud with auto scaling of nodes

```
$ export KUBE_GCE_ZONE=europe-west1-b  
$ export NODE_SIZE=n1-standard-1  
$ export KUBE_ENABLE_CLUSTER_AUTOSCALER=true  
$ export KUBE_AUTOSCALER_MIN_NODES=1  
$ export KUBE_AUTOSCALER_MAX_NODES=5  
  
$ kube-up.sh
```

EXAMPLE #4: KUBERNETES

- Deploy quotes and portal using service type *LoadBalancer*

```
$ kubectl run quotes --image=magnuslarsson/quotes:16 --port=8080
$ kubectl expose deployment quotes --type=LoadBalancer --name quotes-service

$ kubectl run portal --image=magnuslarsson/portal:17 --port=9090
$ kubectl expose deployment portal --type=LoadBalancer --name portal-service
```

- Enable auto scaling of quote pods

```
$ kubectl autoscale deployment quotes --cpu-percent=50 --min=1 --max=10
```

EXAMPLE #4: KUBERNETES

- Services

```
$ kubectl get svc
```

NAME	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
portal-service	10.0.94.30	146.148.16.15	9090/TCP	3d
quotes-service	10.0.17.114	23.251.139.163	8080/TCP	3d

- Pods

```
$ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
portal-329106472-6qw13	1/1	Running	0	3d
quotes-4111254610-x7ng5	1/1	Running	0	3d

- Nodes

```
$ kubectl get nodes
```

NAME	STATUS	AGE
kubernetes-master	Ready,SchedulingDisabled	3d
kubernetes-minion-group-clbp	Ready	3d

EXAMPLE #4: KUBERNETES

- Put some load using the portal and wait for a while...

```
$ kubectl get hpa
NAME          REFERENCE          TARGET    CURRENT    MINPODS    MAXPODS    AGE
quotes       Deployment/quotes  50%      433%      1          10         3m
```

- Any new pods?

```
$ kubectl get pods
NAME                                READY    STATUS    RESTARTS    AGE
quotes-4029858897-2nsm6             1/1     Running   0           2m
quotes-4029858897-5xn93             1/1     Running   0           17m
quotes-4029858897-82vdc             1/1     Running   0           6m
quotes-4029858897-d5ctp             1/1     Running   0           6m
quotes-4029858897-s6sl4             0/1     Pending   0           2m
quotes-4029858897-t7sbj             1/1     Running   0           6m
quotes-4029858897-w8crj             0/1     Pending   0           2m
quotes-4029858897-xm68g            1/1     Running   0           2m
```

EXAMPLE #4: KUBERNETES

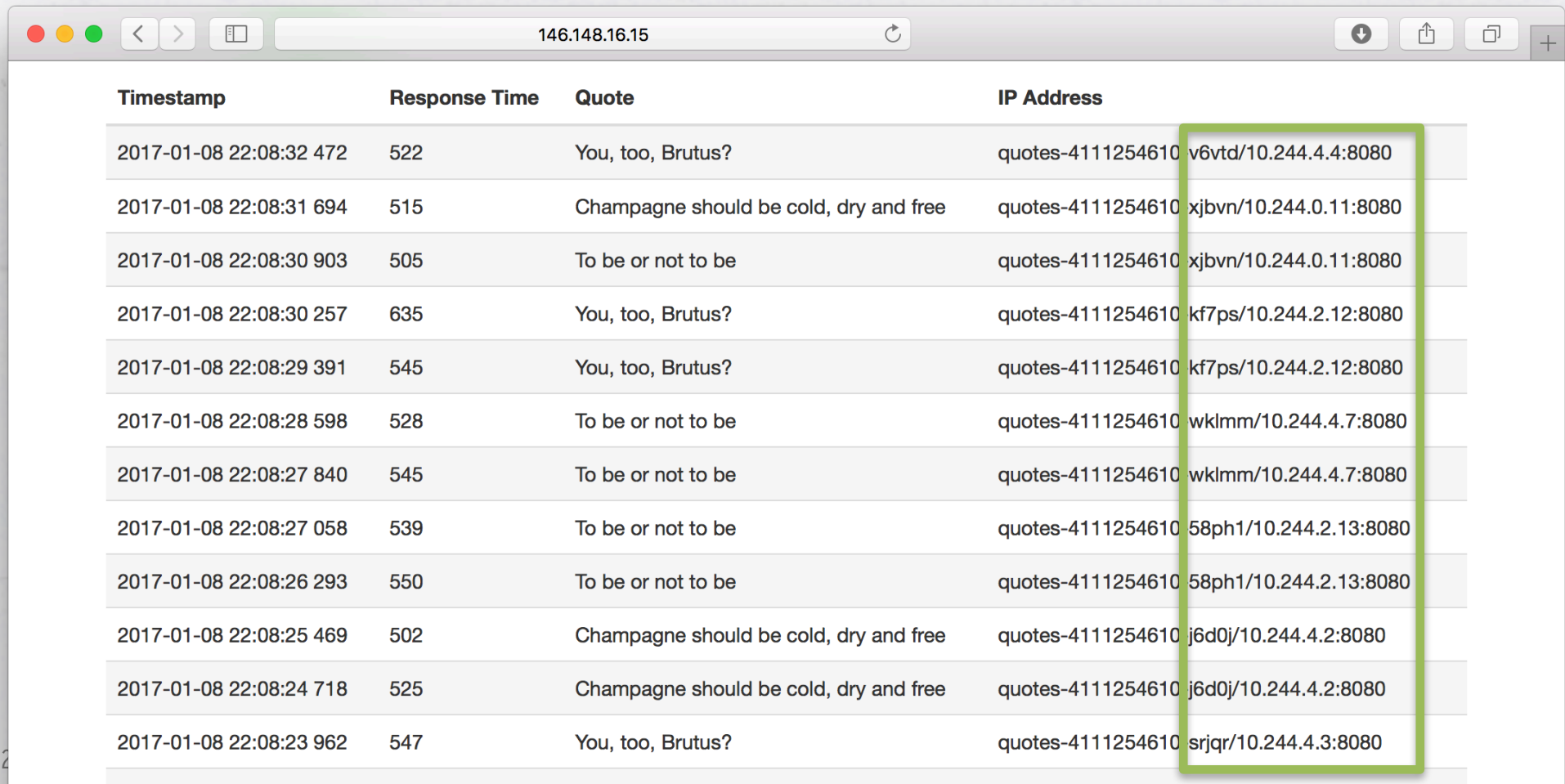
- Any new nodes?

```
$ kubectl get nodes
```

NAME	STATUS	AGE
kubernetes-master	Ready,SchedulingDisabled	21m
kubernetes-minion-group-4ptj	Ready	22m
kubernetes-minion-group-l6kv	NotReady	6s
kubernetes-minion-group-xq6d	Ready	18m

EXAMPLE #4: KUBERNETES

- Portal uses new pods!

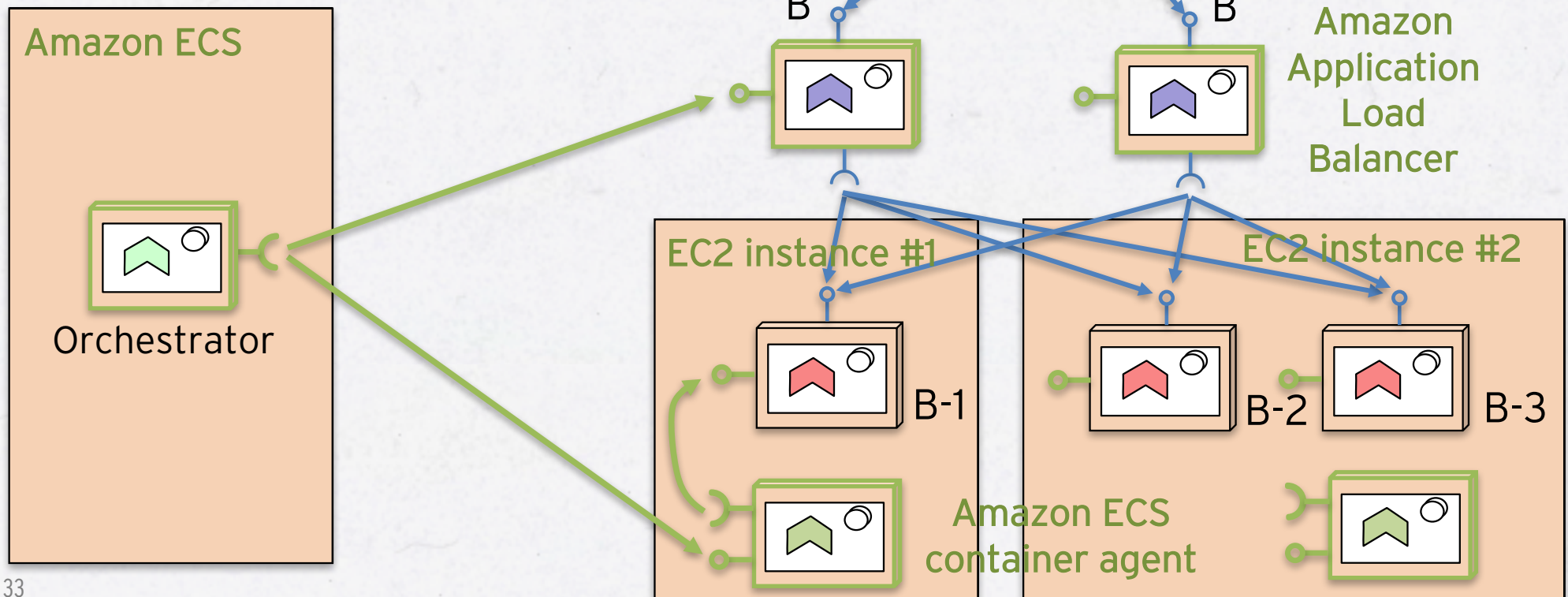


Timestamp	Response Time	Quote	IP Address
2017-01-08 22:08:32 472	522	You, too, Brutus?	quotes-4111254610-v6vtd/10.244.4.4:8080
2017-01-08 22:08:31 694	515	Champagne should be cold, dry and free	quotes-4111254610-xjbvn/10.244.0.11:8080
2017-01-08 22:08:30 903	505	To be or not to be	quotes-4111254610-xjbvn/10.244.0.11:8080
2017-01-08 22:08:30 257	635	You, too, Brutus?	quotes-4111254610-kf7ps/10.244.2.12:8080
2017-01-08 22:08:29 391	545	You, too, Brutus?	quotes-4111254610-kf7ps/10.244.2.12:8080
2017-01-08 22:08:28 598	528	To be or not to be	quotes-4111254610-wklmm/10.244.4.7:8080
2017-01-08 22:08:27 840	545	To be or not to be	quotes-4111254610-wklmm/10.244.4.7:8080
2017-01-08 22:08:27 058	539	To be or not to be	quotes-4111254610-58ph1/10.244.2.13:8080
2017-01-08 22:08:26 293	550	To be or not to be	quotes-4111254610-58ph1/10.244.2.13:8080
2017-01-08 22:08:25 469	502	Champagne should be cold, dry and free	quotes-4111254610-j6d0j/10.244.4.2:8080
2017-01-08 22:08:24 718	525	Champagne should be cold, dry and free	quotes-4111254610-j6d0j/10.244.4.2:8080
2017-01-08 22:08:23 962	547	You, too, Brutus?	quotes-4111254610-srjqr/10.244.4.3:8080

EXAMPLE #5: AMAZON ECS

ECS = EC2 Container Services

- **2016-08-11:** Amazon Application Load Balancer
 - Extend Amazon ELB to support ECS



EXAMPLE #5: AMAZON ECS

DEMO

- Setup a Amazon ECS Cluster with Application Load Balancer
- Let's try auto scaling!
 - Both pods (e.g. containers) and nodes
- Put some load on the cluster and see if we can get new tasks and new nodes started up...

AMAZON ECS CLUSTER

The screenshot displays the Amazon ECS console interface. The browser address bar shows 'eu-west-1.console.aws.amazon.com'. The navigation bar includes 'Services', 'Resource Groups', and user information 'LARSSON MAGNUS' in the 'Ireland' region. The left sidebar shows 'Amazon ECS' with sub-items 'Clusters', 'Task Definitions', and 'Repositories'. The main content area is titled 'Clusters > ecs-ml-cluster' and shows the cluster name 'Cluster : ecs-ml-cluster' with a 'Delete Cluster' button. Below this, the cluster status is 'ACTIVE', with 2 registered container instances, 0 pending tasks, and 2 running tasks. A tabbed interface shows 'Services' selected, displaying a table of services. The table has columns for 'Service Name', 'Status', 'Task Definiti...', 'Desired tasks', and 'Running tasks'. Two services are listed: 'quotes-service' and 'portal-service', both with an 'ACTIVE' status and 1 running task. The footer contains 'Feedback', 'English', copyright information '© 2008 - 2017, Amazon Web Services, Inc. or its affiliates. All rights reserved.', 'Privacy Policy', and 'Terms of Use'.

eu-west-1.console.aws.amazon.com

Services Resource Groups LARSSON MAGNUS Ireland Support

Amazon ECS
Clusters
Task Definitions
Repositories

Clusters > ecs-ml-cluster

Cluster : ecs-ml-cluster Delete Cluster

Get a detailed view of the resources on your cluster.

Status **ACTIVE**

Registered container instances 2

Pending tasks count 0

Running tasks count 2

Services Tasks ECS Instances Metrics

Create Update Delete Last updated on January 11, 2017 9:55:53 PM (0m ago) ↺ ?

Filter in this page < Viewing 1-2 Services >

<input type="checkbox"/>	Service Name	Status	Task Definiti...	Desired tasks	Running tasks
<input type="checkbox"/>	quotes-service	ACTIVE	ecscompose-...	1	1
<input type="checkbox"/>	portal-service	ACTIVE	ecscompose-...	1	1

Feedback English © 2008 - 2017, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use

AMAZON APPLICATION LOAD BALANCER WITH PATH BASED ROUTING

The screenshot shows the AWS Management Console interface for an Amazon Application Load Balancer (ALB). The browser address bar indicates the URL is `eu-west-1.console.aws.amazon.com`. The console header shows the user is logged in as 'LARSSON MAGNUS' in the 'Ireland' region. The left-hand navigation pane is expanded to 'LOAD BALANCING' > 'Load Balancers'. The main content area shows the 'Create Load Balancer' button and an 'Actions' dropdown. Below this is a table of load balancers with a search filter. The table shows one load balancer named 'ML-ALB' with a state of 'active', VPC ID 'vpc-e0e8b984', and availability zones 'eu-west-1a, eu-west-1b'. Below the table, there is a section for 'Rules' with an 'Add rule' button and a 'Reorder rules' button. A text block explains that rules are evaluated in priority order. Below this is a table of routing rules.

Name	DNS name	State	VPC ID	Availability Zones	Type
ML-ALB	ML-ALB-1373732302.eu-we...	active	vpc-e0e8b984	eu-west-1a, eu-west-1b	application

Rules are evaluated in priority order, from the lowest value to the highest value. When the path pattern for a rule is met, traffic is routed to the target group. Other

Add rule **Reorder rules**

Path pattern	Target group name	Priority	Rule ARN
/api-other	API	1	arn...ee88dc55447d3b3a
/api/quote*	quotes-service	2	arn...56b3478dc71e6e68
/	portal-service	3	arn...28452f25692b436d
/styles/*	portal-service	4	arn...d345d3ee0c4f054e
/scripts/*	portal-service	5	arn...c43484f508ad93c8

AMAZON EC2 INSTANCE (NODES) AUTO SCALING

The screenshot displays the AWS Management Console interface for an Auto Scaling Group. The browser address bar shows 'eu-west-1.console.aws.amazon.com'. The navigation bar includes 'Services', 'Resource Groups', and user information 'LARSSON MAGNUS' in 'Ireland'. The left sidebar lists navigation options such as 'EC2 Dashboard', 'Events', 'Tags', 'Reports', 'Limits', 'INSTANCES', 'IMAGES', 'ELASTIC BLOCK STORE', and 'NETWORK & SECURITY'. The main content area shows the 'Create Auto Scaling group' button and 'Actions' dropdown. Below this is a search filter for 'Filter Auto Scaling groups...' and a pagination indicator '1 to 1 of 1 Auto Scaling Groups'. The specific Auto Scaling Group is identified as 'amazon-ecs-cli-setup-ecs-ml-cluster-EcsInstanceAsg-JTS0P23QTKO9'. A tabbed interface allows switching between 'Details', 'Activity History' (selected), 'Scaling Policies', 'Instances', 'Monitoring', 'Notifications', 'Tags', and 'Scheduled Actions'. The 'Activity History' tab shows a search filter 'Filter scaling history...' and a pagination indicator '1 to 25 of 194 History Items'. A table lists the activity history items with columns for Status, Description, Start Time, and End Time.

Status	Description	Start Time	End Time
Successful	Launching a new EC2 instance: i-00e02e5f4593a63f7	2017 January 10 17:47:32 UTC+1	2017 January 10 17:48:05 UTC+1
Successful	Terminating EC2 instance: i-0e3f6b9e0fc421a06	2017 January 10 17:40:16 UTC+1	2017 January 10 17:41:44 UTC+1
Successful	Terminating EC2 instance: i-059c68981807a33c1	2017 January 10 17:34:05 UTC+1	2017 January 10 17:34:48 UTC+1
Successful	Launching a new EC2 instance: i-072bdb91fd87a6295	2017 January 10 17:27:54 UTC+1	2017 January 10 17:28:27 UTC+1
Successful	Launching a new EC2 instance: i-059c68981807a33c1	2017 January 10 17:21:42 UTC+1	2017 January 10 17:22:15 UTC+1
Successful	Terminating EC2 instance: i-0a4ec6c798f7c42d3	2017 January 10 17:14:57 UTC+1	2017 January 10 17:16:21 UTC+1
Successful	Launching a new EC2 instance: i-0e3f6b9e0fc421a06	2017 January 10 17:08:47 UTC+1	2017 January 10 17:09:20 UTC+1
Successful	Terminating EC2 instance: i-04efccc28e8333cc0	2017 January 10 17:02:02 UTC+1	2017 January 10 17:03:06 UTC+1
Successful	Terminating EC2 instance: i-0408e1a9eccb68588	2017 January 10 16:55:19 UTC+1	2017 January 10 16:56:44 UTC+1

AMAZON ECS TASKS (CONTAINERS) AUTO SCALING

The screenshot displays the Amazon ECS console interface. The breadcrumb navigation shows 'Clusters > ecs-ml-cluster > Service: quotes-service'. The main heading is 'Service : quotes-service', with 'Update' and 'Delete' buttons. Below this, there are tabs for 'Tasks', 'Events', 'Deployments', 'Auto Scaling', and 'Metrics'. The 'Auto Scaling' tab is active, showing the following configuration:

- Minimum tasks:** 1
- Maximum tasks:** 10
- add-new-instance-medium-cpu-policy:** CPUUtilization > 25
For alarm: [add-new-instance-medium-cpu-alarm](#)
Take the action:
Add 1 tasks when $25 \leq \text{CPUUtilization}$
- remove-one-quote-service-isntance-on-low-cpu:** CPUUtilization < 10
For alarm: [low-cpu-usage](#)
Take the action:
Remove 1 tasks when $10 \geq \text{CPUUtilization}$
- add-new-quote-service-on-high-cpu:** CPUUtilization > 50
For alarm: [cpu-over-50-pct](#)
Take the action:
Add 1 tasks when $50 \leq \text{CPUUtilization}$

The footer of the console includes 'Feedback', 'English', and copyright information: '© 2008 - 2017, Amazon Web Services, Inc. or its affiliates. All rights reserved.' along with links for 'Privacy Policy' and 'Terms of Use'.

NEW ECC TASKS (CONTAINERS) AUTO CREATED UNDER LOAD

eu-west-1.console.aws.amazon.com

Translate Brf HH2 devOps OAuth microservices wso2 AZ ATG ML misc

Amazon EC2 Container Service EC2 Management Console Amazon EC2 Container Service CloudWatch Management Con... aws Add 1 tasks when 50 <= C...

Services Resource Groups

LARSSON MAGNUS Ireland Support

Amazon ECS
Clusters
Task Definitions
Repositories

Clusters > ecs-ml-cluster > Service: quotes-service

Service : quotes-service

Update Delete

Tasks Events Deployments Auto Scaling Metrics

Last updated on December 30, 2016 6:50:24 PM (0m ago) Refresh Help

Filter in this page Task status: Running Stopped < Viewing 1-4 Tasks > Results per page 50

Task	Task Definition	Group	Last status	Desired status
70b2129e-e807-4aa5-9...	ecscompose-quotes:4	service:quotes-service	RUNNING	RUNNING
9c11a714-f1c7-449d-bf...	ecscompose-quotes:4	service:quotes-service	RUNNING	RUNNING
abb8dd1f-ed33-44b8-8...	ecscompose-quotes:4	service:quotes-service	RUNNING	RUNNING
c11173dc-b1a4-4b75-b...	ecscompose-quotes:4	service:quotes-service	RUNNING	RUNNING

NEW EC2 INSTANCES (NODES) AUTO CREATED UNDER LOAD

The screenshot shows the AWS Management Console for the 'ecs-ml-cluster'. The cluster status is 'ACTIVE'. It has 3 registered container instances, 0 pending tasks, and 6 running tasks. The 'ECS Instances' tab is selected, showing a table of container instances with their corresponding EC2 instances.

Cluster : ecs-ml-cluster Delete Cluster

Status **ACTIVE**

Registered container instances 3

Pending tasks count 0

Running tasks count 6

Services | Tasks | **ECS Instances** | Metrics

Add additional ECS Instances using [Auto Scaling](#) or [Amazon EC2](#).

Actions Last updated on December 30, 2016 6:48:22 PM (1m ago)

Filter in this page Viewing 1-3 Container Instances Results per page 50

<input type="checkbox"/>	Container Instance	EC2 Instance	Ava...	Age...	Sta...	Runnin...	CP...	Me...	Ag...	Doc...
<input type="checkbox"/>	02b57a7f-d428-4a83-9020-673c7f0...	i-0af716542d429a706	eu-...	true	ACT...	2	1024	233	1.12.2	1.11.2
<input type="checkbox"/>	590b1437-2474-4843-bcb2-9c491fe...	i-06866a3850ec68541	eu-...	true	ACT...	2	1024	233	1.12.2	1.11.2
<input type="checkbox"/>	5dc9d72f-92a1-4b5b-ae68-b41ab8...	i-039a42f21204dcbe9	eu-...	true	ACT...	2	1024	233	1.12.2	1.11.2

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EXAMPLE #5: AMAZON ECS

- Portal uses new tasks!

The screenshot shows a web browser window with the URL `ml-alb-1373732302.eu-west-1.elb.amazonaws.com`. The page title is "Quotes Portal".

Controls include:

- Request interval, ms:** A slider ranging from 1 to 3000, currently set at 853.
- Strength:** A dropdown menu set to 13.
- Waiting requests:** A counter showing 0.

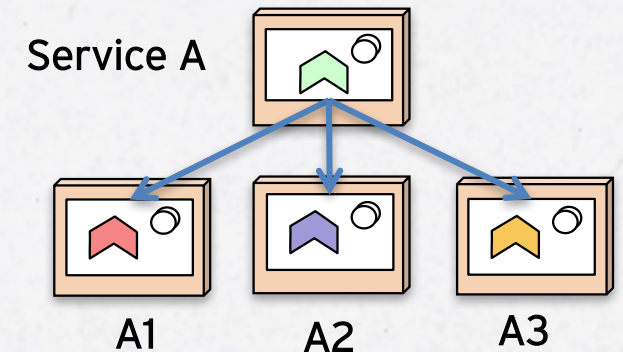
Buttons for "One Request" and "Start" are visible.

A table displays request logs with the following columns: Timestamp, Response Time, Quote, and IP Address. The IP Address column is highlighted with a green box, showing alternating values: `d33a567bf867/ 72.17.0.3:8080` and `e8b40d1ca860/ 72.17.0.3:8080`.

Timestamp	Response Time	Quote	IP Address
2017-01-12 11:11:40 359	981	Champagne should be cold, dry and free	d33a567bf867/ 72.17.0.3:8080
2017-01-12 11:11:39 701	1176	To be or not to be	e8b40d1ca860/ 72.17.0.3:8080
2017-01-12 11:11:38 875	1204	You, too, Brutus?	976b1dc9a926/ 72.17.0.2:8080
2017-01-12 11:11:37 791	973	You, too, Brutus?	d33a567bf867/ 72.17.0.3:8080
2017-01-12 11:11:37 112	1148	To be or not to be	e8b40d1ca860/ 72.17.0.3:8080
2017-01-12 11:11:36 256	1146	You, too, Brutus?	976b1dc9a926/ 72.17.0.2:8080
2017-01-12 11:11:35 236	979	To be or not to be	d33a567bf867/ 72.17.0.3:8080
2017-01-12 11:11:34 549	1146	Champagne should be cold, dry and free	e8b40d1ca860/ 72.17.0.3:8080

PROGRAMMING MODEL

- I used Java and Spring Cloud...
 - Can be accomplished using any language
- Orchestration tools (Swarm, Kubernetes, ECS) expose an abstraction of a service on top of the actual containers
- Spring Cloud provides a similar abstraction on top of Netflix Eureka and Netflix Ribbon
- Spring Boot provides a customizable Health API for liveness and readiness probes



SOME CODE FRAGMENTS...

```
@SpringBootApplication
public class PortalApplication {

    @Bean
    public RestTemplate restTemplate() {
        return new RestTemplate();
    }
}
```

1. Integrate with Netflix Eureka
2. Wrap Netflix Ribbon
3. Abstract service name resolved by Netflix Ribbon using the configuration

```
@RestController
public class PortalController {

    @Inject RestTemplate restTemplate;

    Quote quote = restTemplate.getForObject("http://quotes-service/" + ..., Quote.class);
}
```

SOME CONFIGURATION...

Default usage in Docker with Orchestration tools like Swarm, K8S, ECS/ALB

spring.cloud.discovery.enabled: false

ribbon.eureka.enabled: false

quotes-service.ribbon.listOfServers: quotes-service:8080

For usage with Amazon ECS/ALB

spring.profiles: aws-ecs

quotes-service.ribbon.listOfServers: ML-ALB-1373732302.eu-west-1.elb.amazonaws.com

For usage with Eureka outside of Docker

spring.profiles: eureka

spring.cloud.discovery.enabled: true

ribbon.eureka.enabled: true

eureka.client.serviceUrl:

defaultZone: http://localhost:8761/eureka/,http://localhost:8762/eureka/

IF YOU WANT TO LEARN MORE...

- Blog series – Building microservices:
<http://callistaenterprise.se/blogg/teknik/2015/05/20/blog-series-building-microservices/>
- Workshop in developing microservices
 - Build a set of collaborating microservices from ground up using Spring Boot, Spring Cloud, Netflix OSS and Docker.
 - [Jfokus – 2017-02-06](#)
 - [jDays – 2017-03-09](#)

SUMMARY

- Mission accomplished, worked to write once and deployed on:
 - Without containers using *Netflix Eureka* as Service Discovery
 - Container orchestration tools (with built in Service Discovery):
 - » *Kubernetes*
 - » *Docker Swarm mode*
 - » *Amazon ECS*
- Only differs in configuration
- Platform specific features (e.g. cloud auto scaling) can be used
- Prevents vendor lock in
- Can be accomplished using any language, not only Java

