

Le Seigneur Des Conteneurs

Un atelier de migration vers Kubernetes et Traefik



<https://containous.github.io/slides>

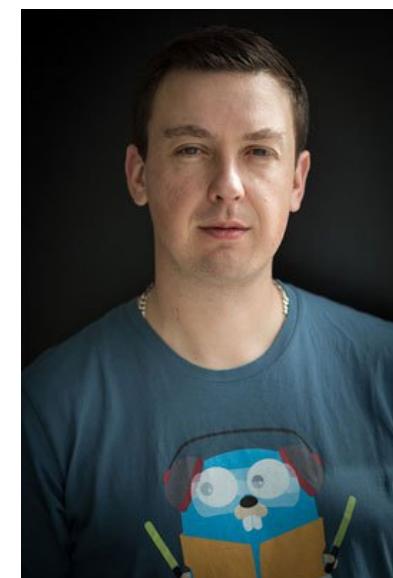
How To Use These Slides?

- **Browse the slides:** Use the arrows
 - Change chapter: Left/Right arrows
 - Next or previous slide: Top and bottom arrows
- **Overview of the slides:** keyboard's shortcut "o"
- **Speaker mode (and notes):** keyboard's shortcut "s"

Whoami 1/2

Nicolas Mengin

- DevOps & Code Craftsman @ Containous
- Blacksmith on Traefik
-  @nicomengin
-  nmengin



Whoami 2/2

Damien DUPORTAL

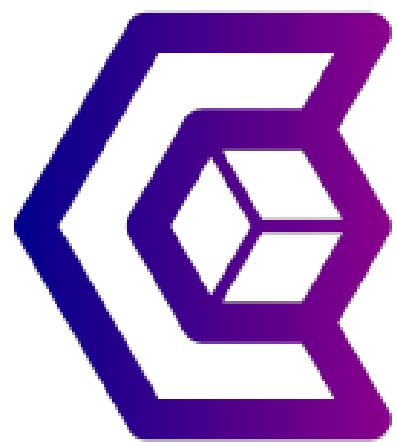
- Traefik's Developer  Advocate @ Containous
-  @DamienDuportal
-  dduortal



Containous

<https://containo.us>

- We Believe in Open Source
- We Deliver Traefik
- Commercial Support for Traefik
- 20 people, 90% tech



Once Upon A Time...

An Infrastructure War

- Docker as a standard
- Orchestrators: Docker Swarm, Rancher Caddle, Mesos Marathon, Kubernetes...
- The war lasted a couple of years...

One Orchestrator To Rule Them All

- **Kubernetes**
- Used by the competition
- Standard in the industry
- Powerful but not easy to master

Menu

The Hobbit House: Introduction to Traefik with Docker

Break

Saruman Tower: Migrate Traefik to Kubernetes

Break

The Castle: Migrate the infrastructure to Kubernetes

The Hobbit House



The Blacksmith

We want to host:

- Our web site
- Our own SCM Server,
- Our own Continuous Integration,
- and a "web" command line.

Preparation

- Step 1: Access the spreadsheet at <https://bit.ly/2Pdfe41>
- Step 2: Select a line and put your name to allocate the VM
- Step 3: no Step 3!

Infrastructure Setup

- An online shell to reach the lab infrastructure via SSH
- A public domain name `lab-XX.ddu-workshops-Y.com` for your stack
- A VM in the cloud, to run your "legacy" Dockerized applications
 - Connect to it from the WebCLI with `ssh 10.0.x.y`
- Docker and docker-compose installed on the "Docker" VM
- Create a directory named `~/01-docker` as working directory

DNS Setup

- Connect to the "Blue-Green Jenkins":
 - Link: [Blue-Green Jenkins](#)
 - Login with username `devoxx` and password `gandalf`
- Run the Job "change-dns"
 - Link: [Job "change-dns"](#)
 - Specify the `EXTERNAL_HOSTNAME` of your lab (`labxx.ddu-workshops-Y.com`)
 - Specify the `BACKEND_IP` of your Docker VM (`10.0.x.y`)

Reality Check

<http://lab-XX.ddu-workshops-Y.com/>

Bad Gateway

The external loadbalancer cannot reach our VM.

Lab 1



- Traefik
- Web Server
- CI Server
- SCM: A Gitea Git Server
- Web CLI
- SSL for everyone

Why Traefik?



Why, Mr Anderson?

Evolution Of Software Design



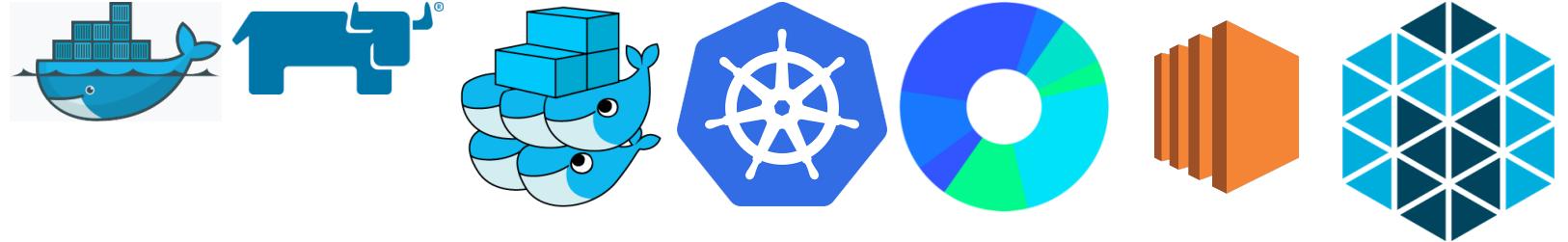
The Premise Of Microservices...



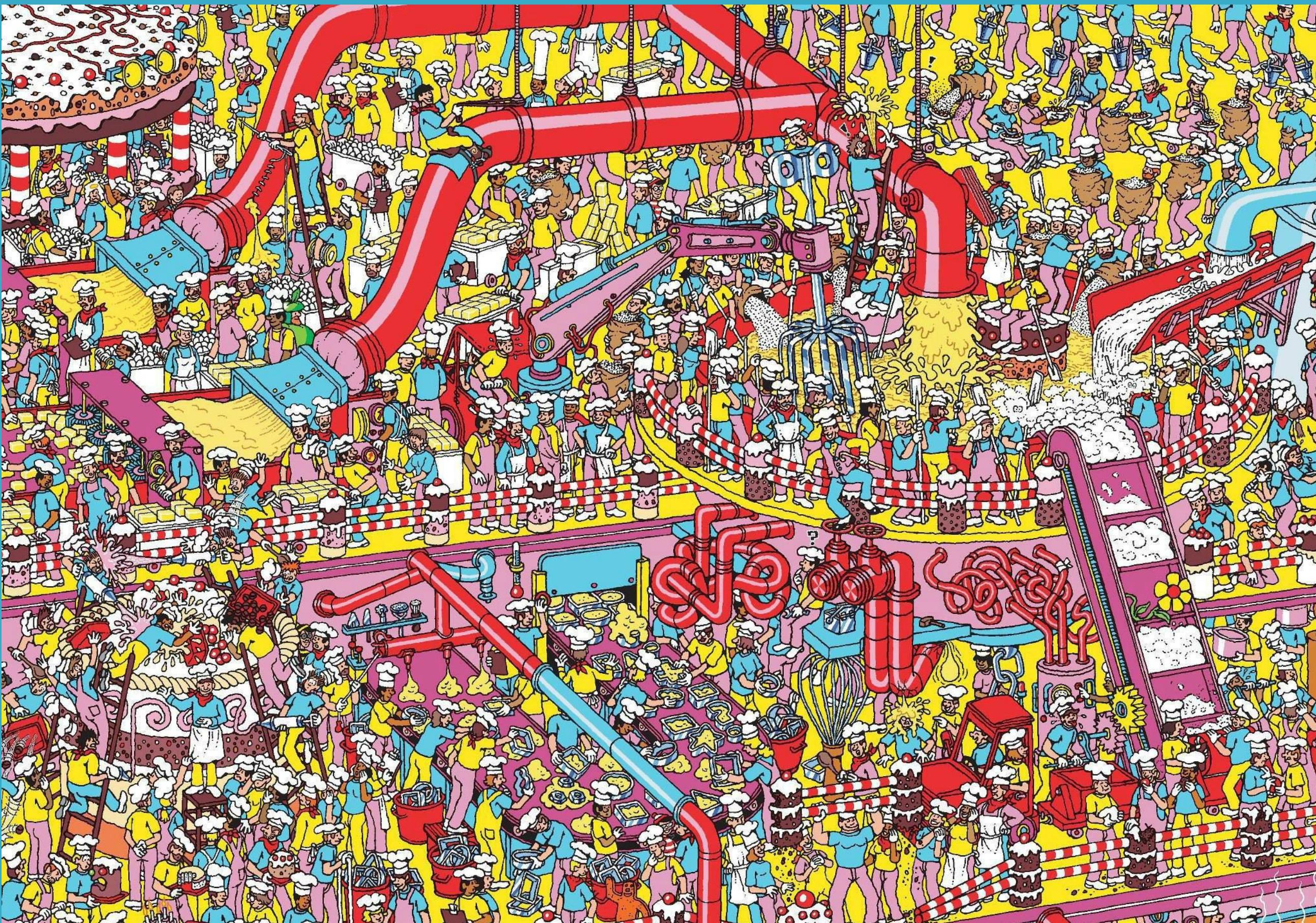
...And What Happens

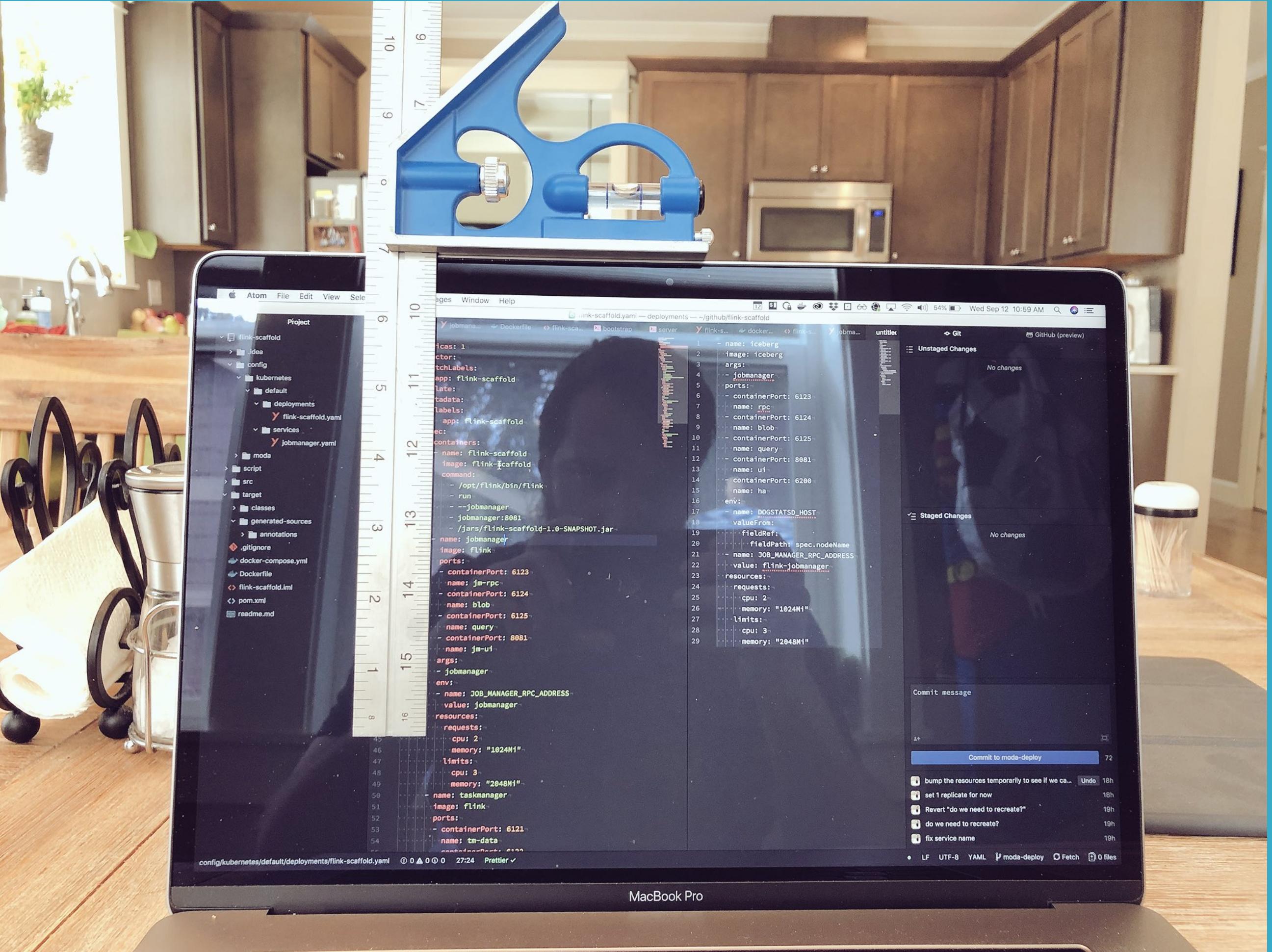


Tools Of The Trade



Where's My Service?





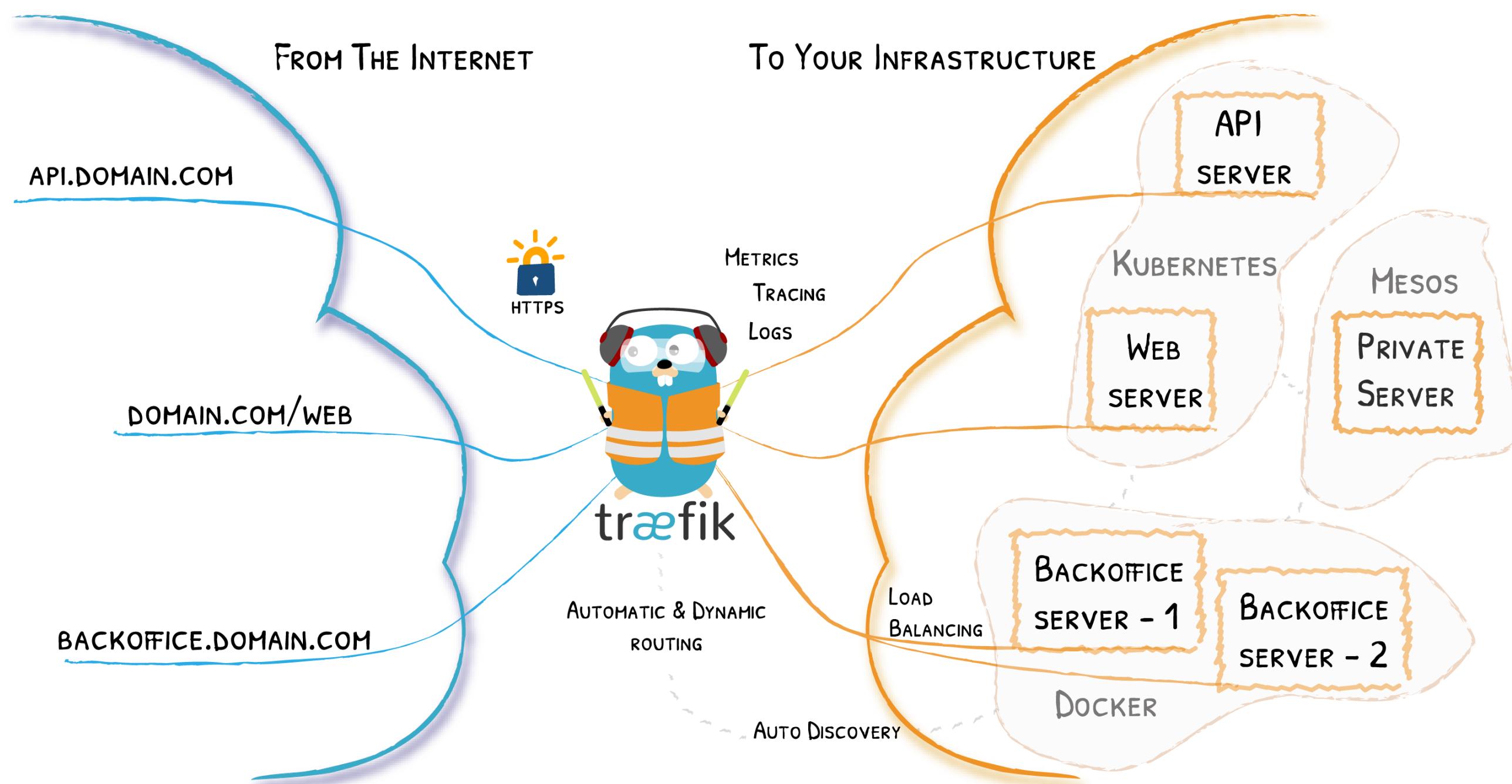
Source: <https://twitter.com/Caged/status/1039937162769096704>

What If I Told You?



That You Don't Have to Write This Configuration File...?

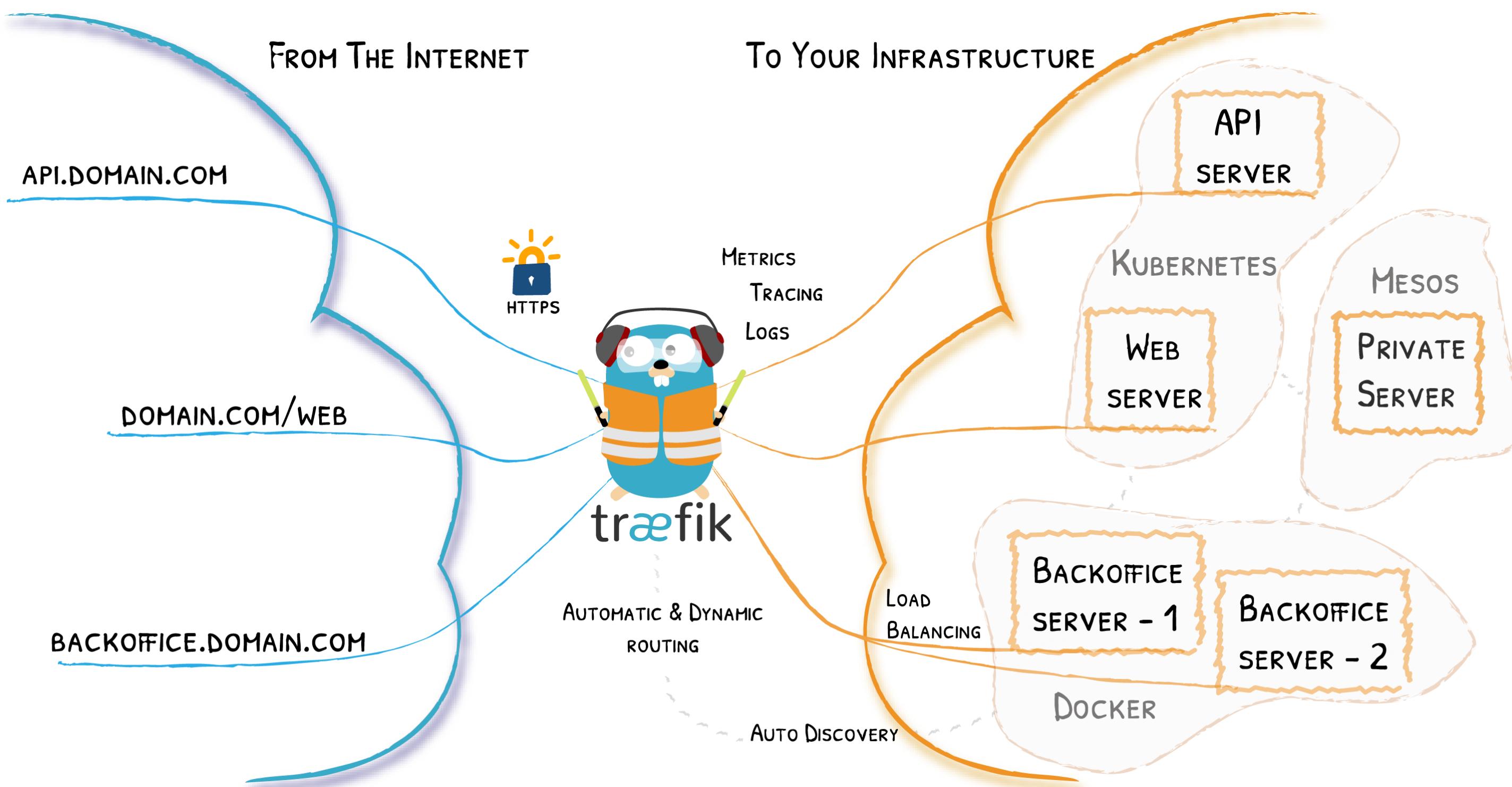
Here Comes Traefik!



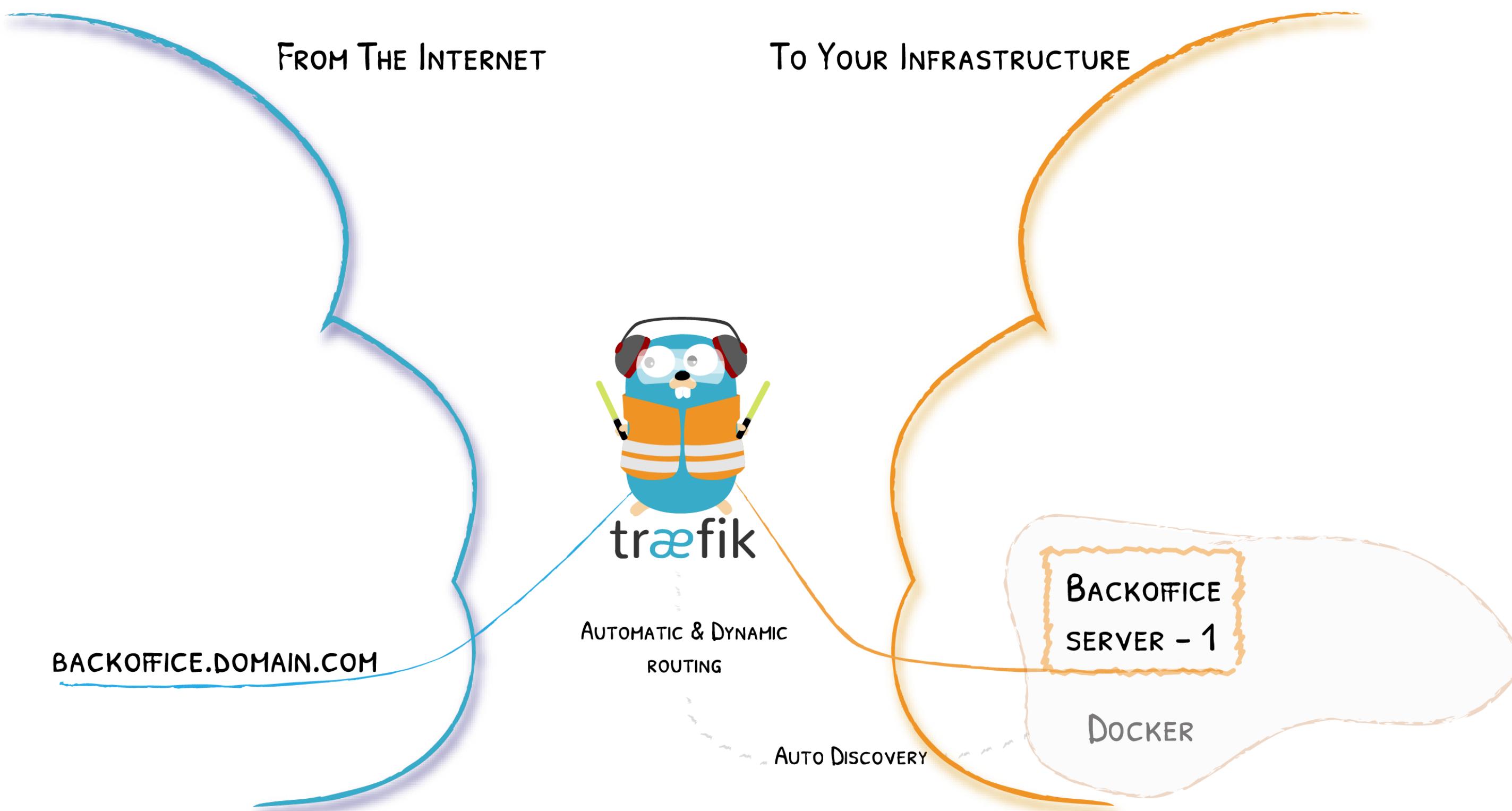
Traefik Project

-  <https://github.com/containous/traefik>
- MIT License
- Written in Go
- 21,000+ 
- 600M+ 
- 350+ 

Remember The Diagram?



Let's Simplify



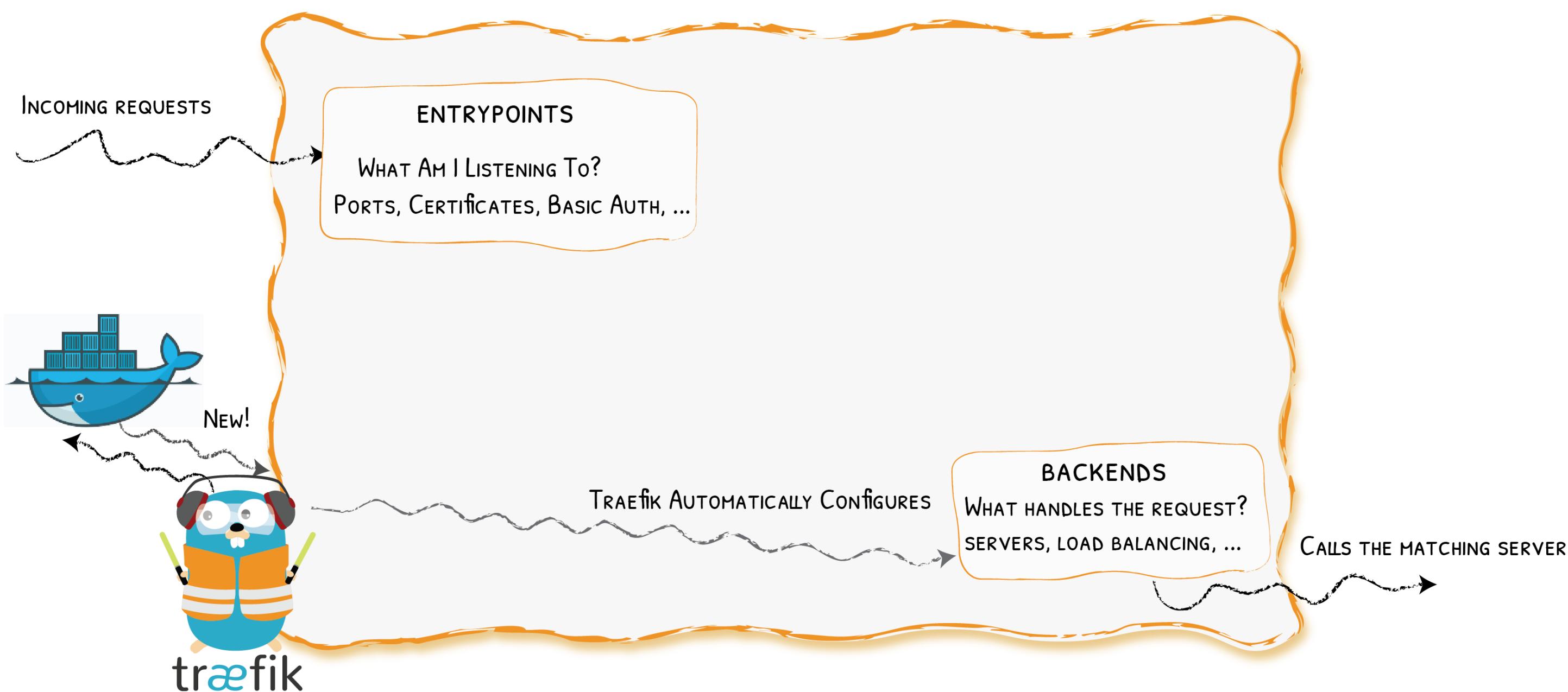
Providers



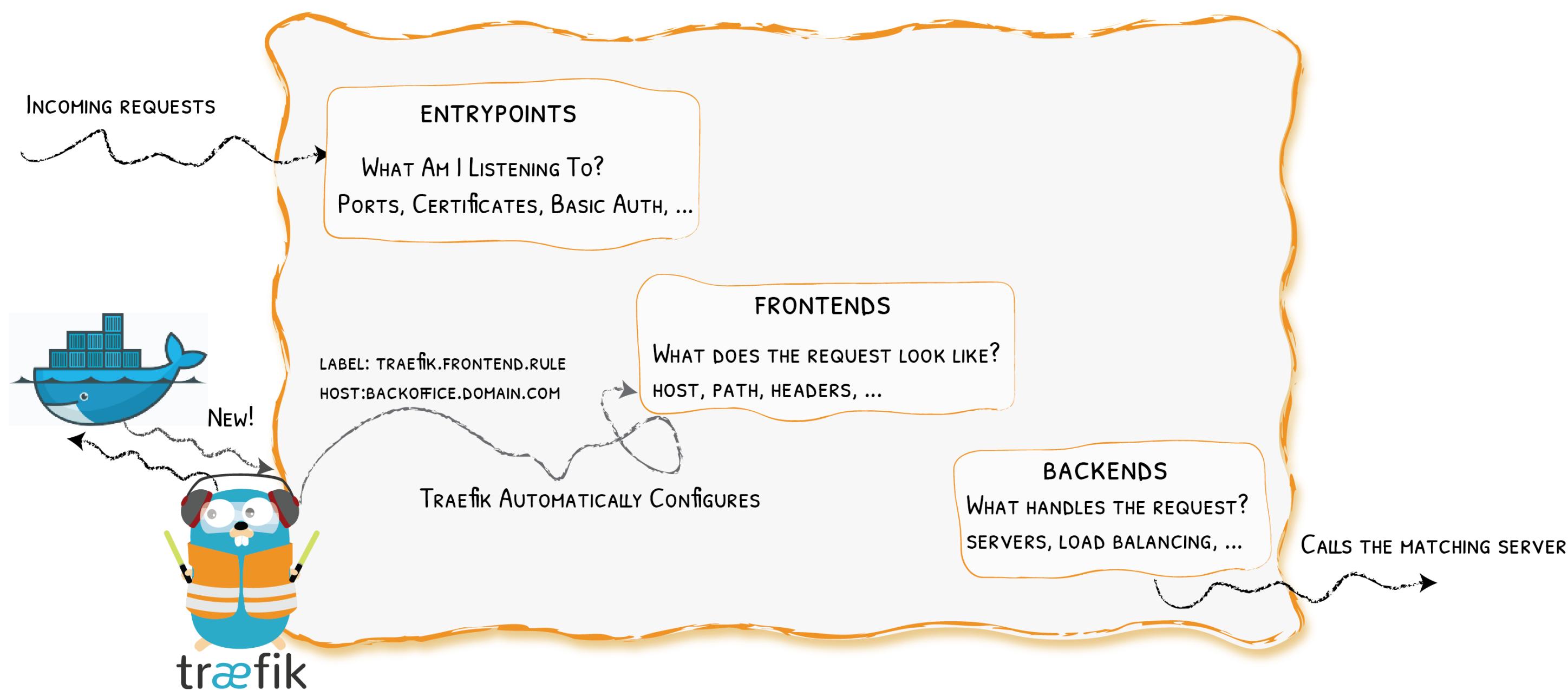
Entrypoints



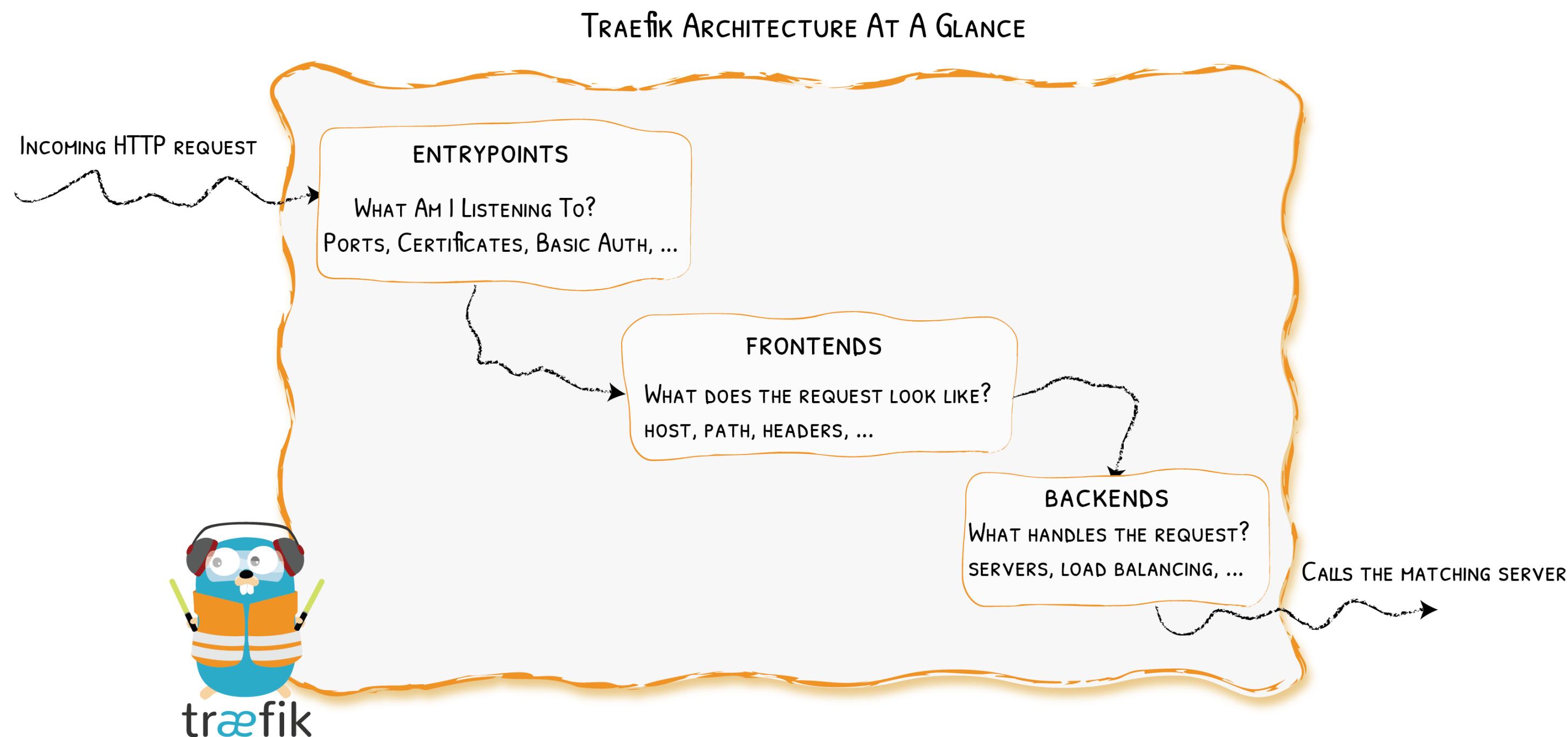
Backends



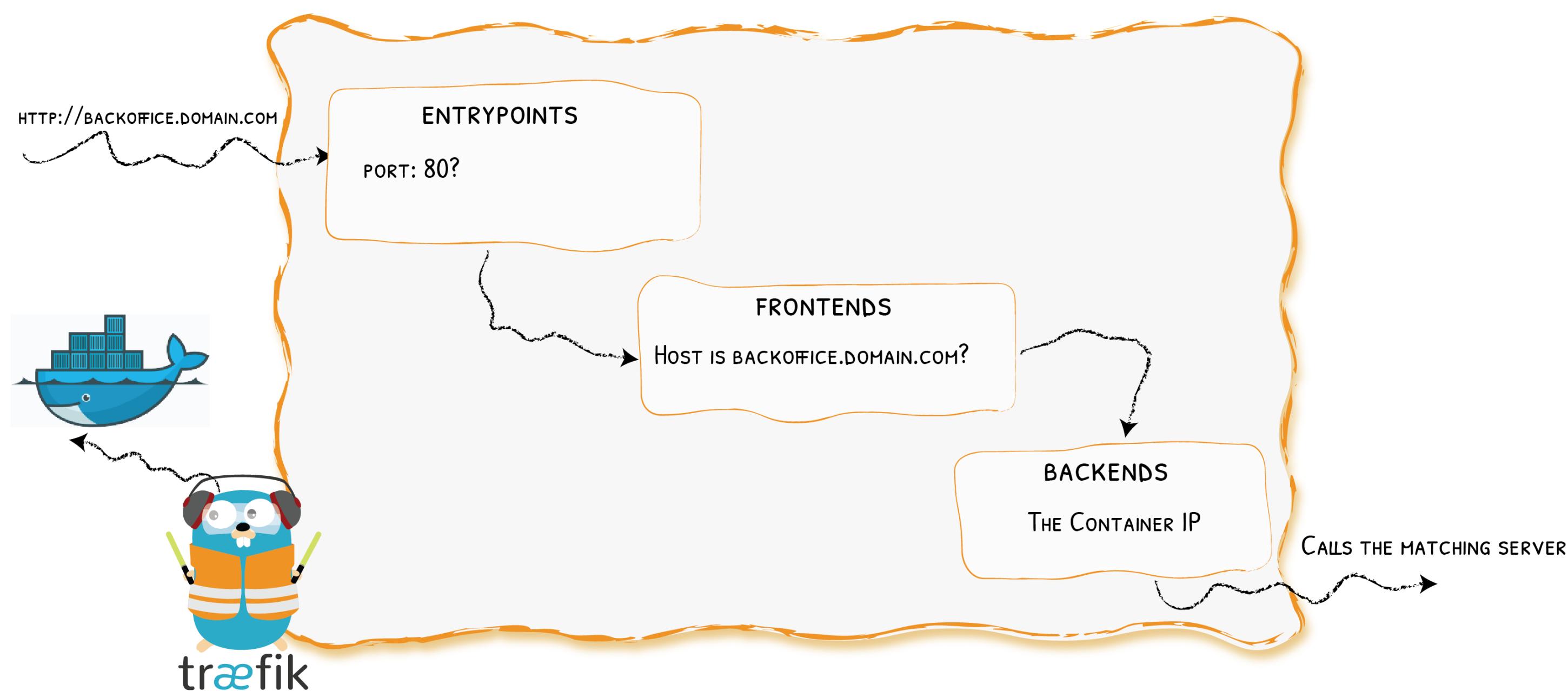
Frontends



At A Glance



In Practice



Let's Go

Traefik Setup

- Step 1: Compose file in /home/devoxx/01-docker/docker-compose.yml:

```
version: '2.4'

services:
  edge:
    image: traefik:1.7.10
    command:
      - "--docker.domain=lab-XX.ddu-workshops-Y.com"
    ports:
      - "80:80"
      - "443:443"
    volumes:
      # To communicate with the Docker Engine
      - /var/run/docker.sock:/var/run/docker.sock
```

- Step 2: Start the stack:

```
docker-compose up -d
```

Reality Check

<http://lab-XX.ddu-workshops-Y.com/>



It's good: we have an HTTP answer!

Lab 1



- Traefik
- **Web Server**
- CI Server
- SCM: A Gitea Git Server
- Web CLI
- SSL for everyone

Goal

We want to host a static webserver behind Traefik.

Problem

How to tell Traefik to route requests to the web server?

```
http://lab-XX.ddu-workshops-Y.com/index.html
-> Traefik
-> http://<Webserver Private IP>/index.html
```

The Web Server Setup

- Step 1: web server in Compose. Check the labels:

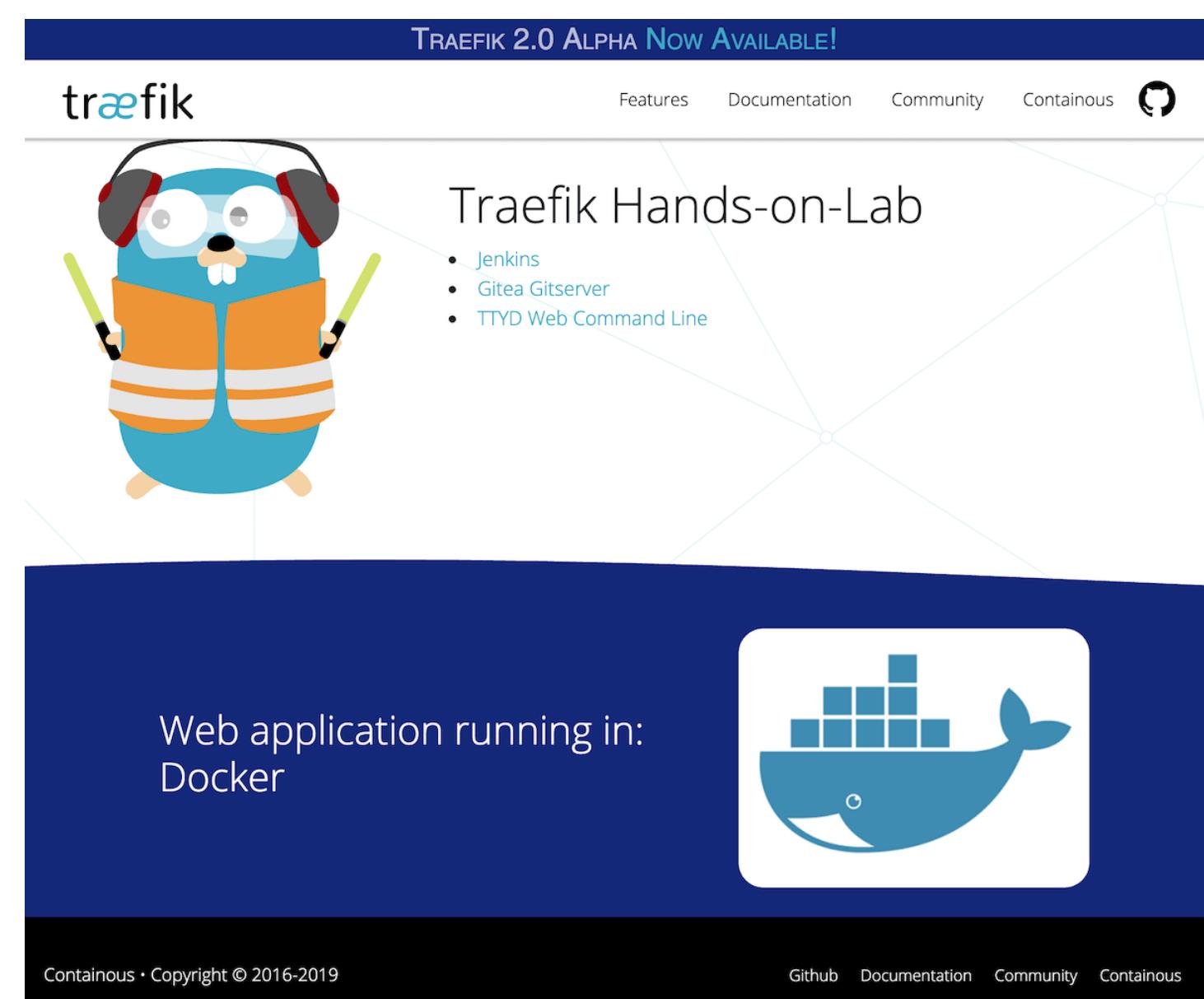
```
web:  
  image: nmengin/web:devoxx-v1  
  labels:  
    - "traefik.frontend.rule=PathPrefix:/"
```

- Step 2: Start the Web Server:

```
docker-compose up -d web
```

Reality Check

<http://lab-XX.ddu-workshops-Y.com/>



It's good: we have a web page!

Lab 1



- Traefik
- Web Server
- **CI Server**
- SCM: A Gitea Git Server
- Web CLI
- SSL for everyone

Goal

- We want to host our own automation system for Continuous Integration
 - Let's use Jenkins

Challenge 1/3

- **Problem:** Jenkins exposes 2 ports: 8080 and 50000. How to let Traefik know to only use 8080?
- **Solution:** Select the port with the label `traefik.port`.

```
- "traefik.port=8080"
```

Challenge 2/3

- **Problem:** How to let Traefik know when to send requests to the Jenkins backend instead of the webserver?

```
http://lab-XX.ddu-workshops-Y.com/jenkins/configuration  
  -> Traefik  
  -> http://<Jenkins Private IP>:8080/jenkins/configuration
```

- **Solution:** Change the frontend rule to use PathPrefix.

```
- "traefik.frontend.rule=PathPrefix:/jenkins"
```

Challenge 3/3

- **Problem:** How to tell Jenkins to accept requests under /jenkins?
- **Solution:** Use the Jenkins flag --prefix=/jenkins with the variable JENKINS_OPTS.

```
environment:  
  - JENKINS_OPTS=--prefix=/jenkins
```

Jenkins Setup

- Step 1: Edit Compose file:

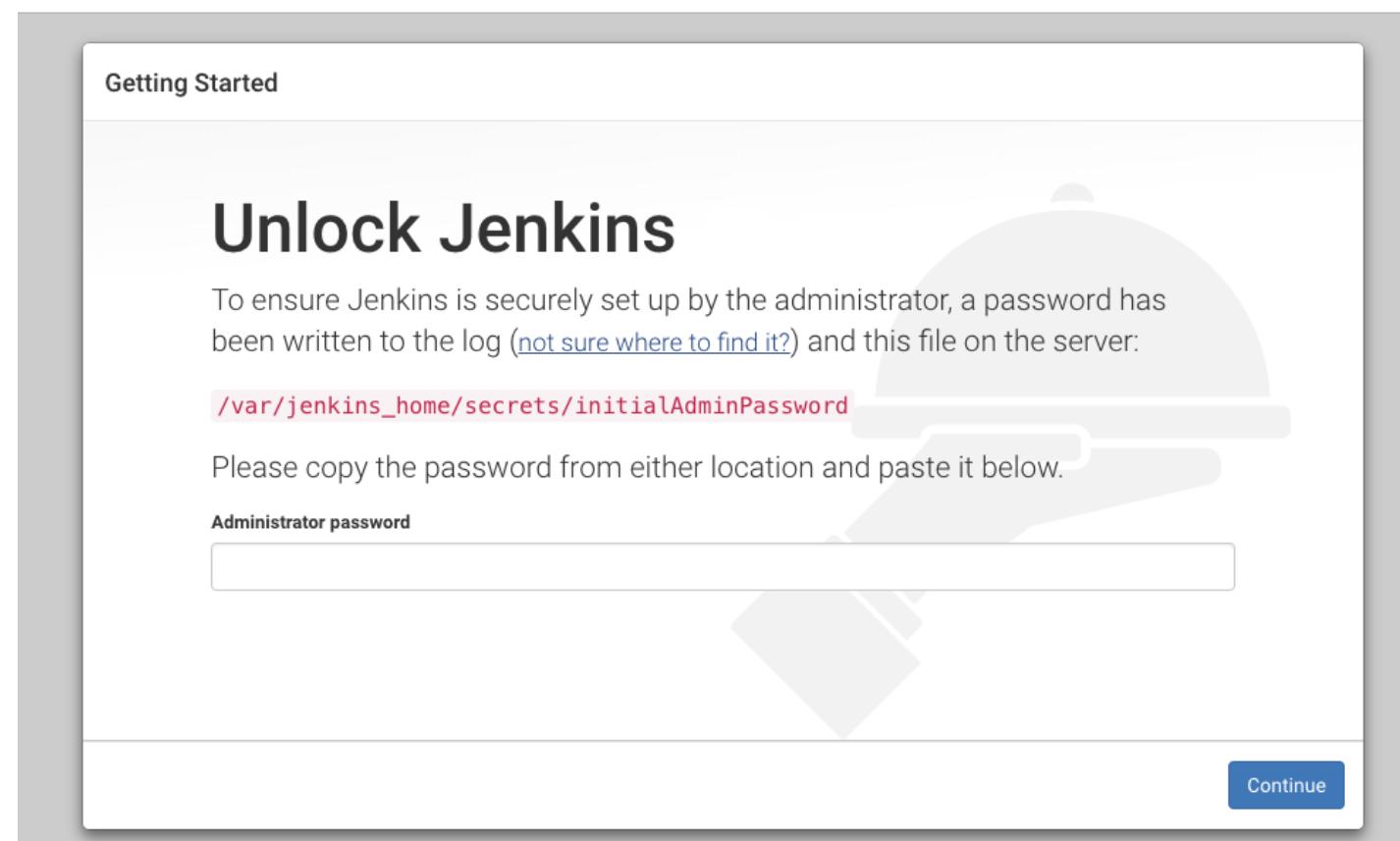
```
jenkins:  
  image: jenkins/jenkins:2.164.2-alpine  
  expose:  
    - 8080  
    - 50000  
  environment:  
    - JENKINS_OPTS=--prefix=/jenkins  
  labels:  
    - "traefik.port=8080"  
    - "traefik.frontend.rule=PathPrefix:/jenkins"
```

- Step 2: start the service:

```
docker-compose up -d jenkins
```

Reality Check

<http://lab-XX.ddu-workshops-Y.com/jenkins>



It's good: we can setup Jenkins!

Lab 1



- Traefik
- Web Server
- CI Server
- **SCM: A Gitea Git Server**
- Web CLI
- SSL for everyone

Goal

- We want to host our own git server
 - Let's use Gitea, a painless self-hosted Git service.

Challenge

- **Problem:**

- Gitea only serves requests under /:
- How to remove the prefix /gitserver?

```
http://lab-XX.ddu-workshops-Y.com/gitserver/index.html  
  -> Traefik  
    -> http://<Gitea private IP>:3000/index.html
```

- **Solution:** Use the Traefik Frontend Rule PathPrefixStrip.

```
- "traefik.frontend.rule=PathPrefixStrip:/gitserver"
```

Gitea Setup

- Step 1: Edit Compose file:

```
gitserver:  
  image: gitea/gitea:latest  
  expose:  
    - "3000"  
    - "22"  
  environment:  
    - ROOT_URL=/gitserver  
  labels:  
    - "traefik.port=3000"  
    - "traefik.frontend.rule=PathPrefixStrip:/gitserver"
```

- Step 2: Create the service:

```
docker-compose up -d gitserver
```

Reality Check

<http://lab-XX.ddu-workshops-Y.com/gitserver>



Gitea: Git with a cup of tea

A painless, self-hosted Git service

It's good: we can setup Gitea!

Lab 1



- Traefik
- Web Server
- CI Server
- SCM: A Gitea Git Server
- **Web CLI**
- SSL for everyone

Goal

- We want to host our own Web Command Line.
 - Let's use TTYD, Share your terminal over the web.

Challenge

- **Problem:** TTYD requires Websockets.
- **Solution:** It's not even a problem with Traefik!

Easy Peasy!

- Step 1: Edit Compose file:

```
ttyd:  
  image: ts10922/ttyd:1.4.2-alpine  
  labels:  
    - "traefik.frontend.rule=PathPrefixStrip:/ttyd"
```

- Step 2: Create the service:

```
docker-compose up -d ttyd
```

Reality Check

<http://lab-XX.ddu-workshops-Y.com/ttyd>



It's good: we have our own "web CLI" in a web browser!

Lab 1



- Traefik
- Web Server
- CI Server
- SCM: A Gitea Git Server
- Web CLI
- **SSL for everyone**

Goals

- Use HTTPS instead of HTTP
- Do NOT care about certificates and renewal
- Use a TOML configuration file



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

It uses the "ACME" protocol to verify that you control a given domain name and to issue a certificate.

Problem 1/3

- **Problem:** How to tell Traefik to listen on port 443 for HTTPS requests?
- **Solution:**
 - Create a new entrypoint
 - Add it to the default entrypoints list

```
# TOML sample
defaultEntryPoints = ["http", "https"]

[entryPoints]
  [entryPoints.https]
    address = ":443"
    [entryPoints.https.tls]
```

Problem 2/3

- **Problem:** How to tell Traefik to use Let's Encrypt for HTTPS?
- **Solution:**
 - Configure the ACME/Let's Encrypt provider:

```
# TOML sample
[acme]
email = "noreply@lab.org"
storage = "/acme/acme.json"
entryPoint = "https"
# caServer = "https://acme-staging-v02.api.letsencrypt.org/directory"

[acme.tlsChallenge]

[[acme.domains]]
main = "lab-XX.ddu-workshops-Y.com"
```

Problem 3/3

- **Problem:**
 - Traefik detects itself as a docker container with a port
 - It tries to request a 2nd certificate for edge.lab-XX.ddu-workshops-Y.com.
- **Solution:** Exclude Traefik's container with the label traefik.enable=false.

Traefik Setup 1/2

- Step 1: Create the configuration file `traefik.toml`:

```
defaultEntryPoints = ["http", "https"]

[entryPoints]
  [entryPoints.https]
    address = ":443"
    [entryPoints.https.tls]
  [entryPoints.http]
    address = ":80"

[acme]
email = "noreply@lab.org"
storage = "/acme/acme.json"
entryPoint = "https"
# caServer = "https://acme-staging-v02.api.letsencrypt.org/directory"

[acme.tlsChallenge]

[ [acme.domains] ]
main = "lab-XX.ddu-workshops-Y.com"

[docker]
domain = "lab-XX.ddu-workshops-Y.com"
watch = true
```

Traefik Setup 2/2

- Step 2: Adapt the Compose file:

```
edge:  
  image: traefik:1.7.10  
  labels: # Replace "command" by labels  
    - "traefik.enable=false"  
  ports:  
    - "80:80"  
    - "443:443"  
  volumes:  
    - /var/run/docker.sock:/var/run/docker.sock  
    # Add the TOML configuration file in the root directory  
    - ./traefik.toml:/traefik.toml  
    # We declare the folder "/acme" as a data volume  
    - /acme
```

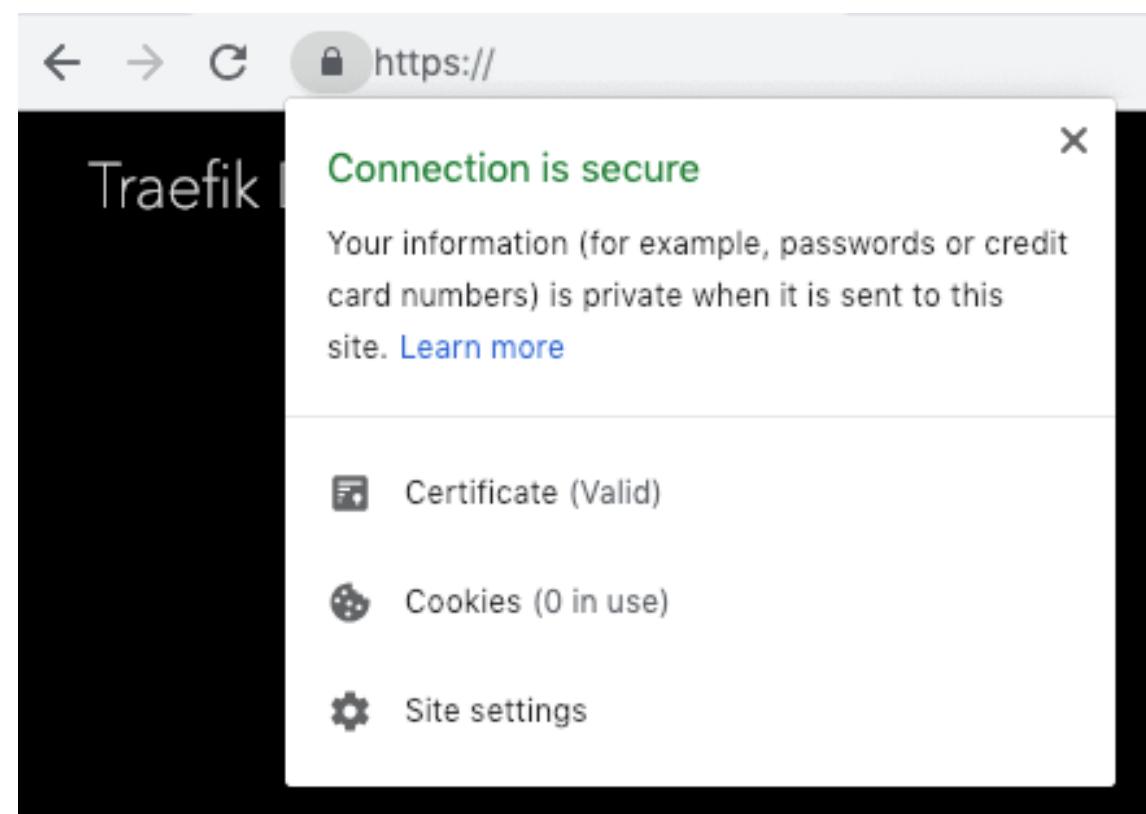
- Step 3: Update the edge service:

```
docker-compose up -d edge
```

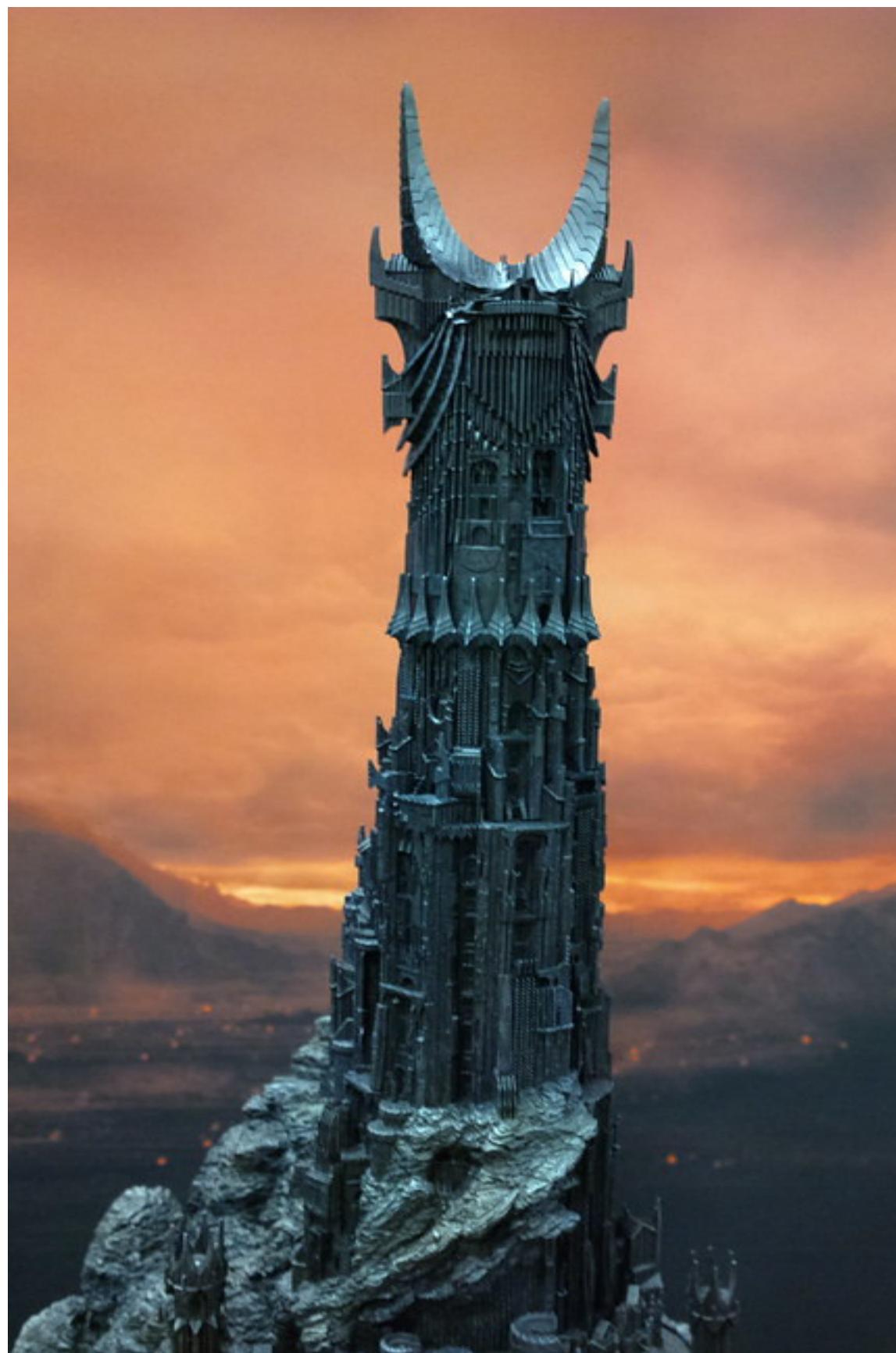
Reality Check

Wait a few seconds (time to get the certificate from Let's Encrypt) and reload the main page:

<https://lab-XX.ddu-workshops-Y.com>



Saruman Tower: Migrate Traefik To Kubernetes



Saruman Tower

We want to begin the migration of our services from the our VM to a Kubernetes cluster:

- keep the Docker services
- migrate Traefik to Kubernetes
- migrate the Let's Encrypt certificates
- access to the Docker services through Traefik in Kubernetes

Infrastructure Setup

- A Kubernetes cluster (k3s) on a 2nd VM
 - Get the IP on the spreadsheet (column "Kube IP (10.0.n.p)")
 - Connect to the VM with the webshell: `ssh 10.0.n.p`
- `kubectl` and `helm` installed on the client machines
- Create a directory named `~/02-k8s-traefik` as working directory

Kubernetes CheatSheet

- Kubernetes Official Documentation:
 - <https://kubernetes.io/docs/home/>
- kubectl cheat sheet:
 - <https://kubernetes.io/docs/reference/kubectl/cheatsheet/>
- Get status of an object:

```
# Use the -o yaml for full readable description
kubectl get --namespace=devoxx <object type> <object name> (-o yaml)
```
- An error after a kubectl apply? Do a proper kubectl delete

Lab 2



- Traefik
- Web Server
- CI Server
- SCM: A Gitea Git Server
- Web CLI

North-South Connection In Kubernetes

Internet



[Ingress]

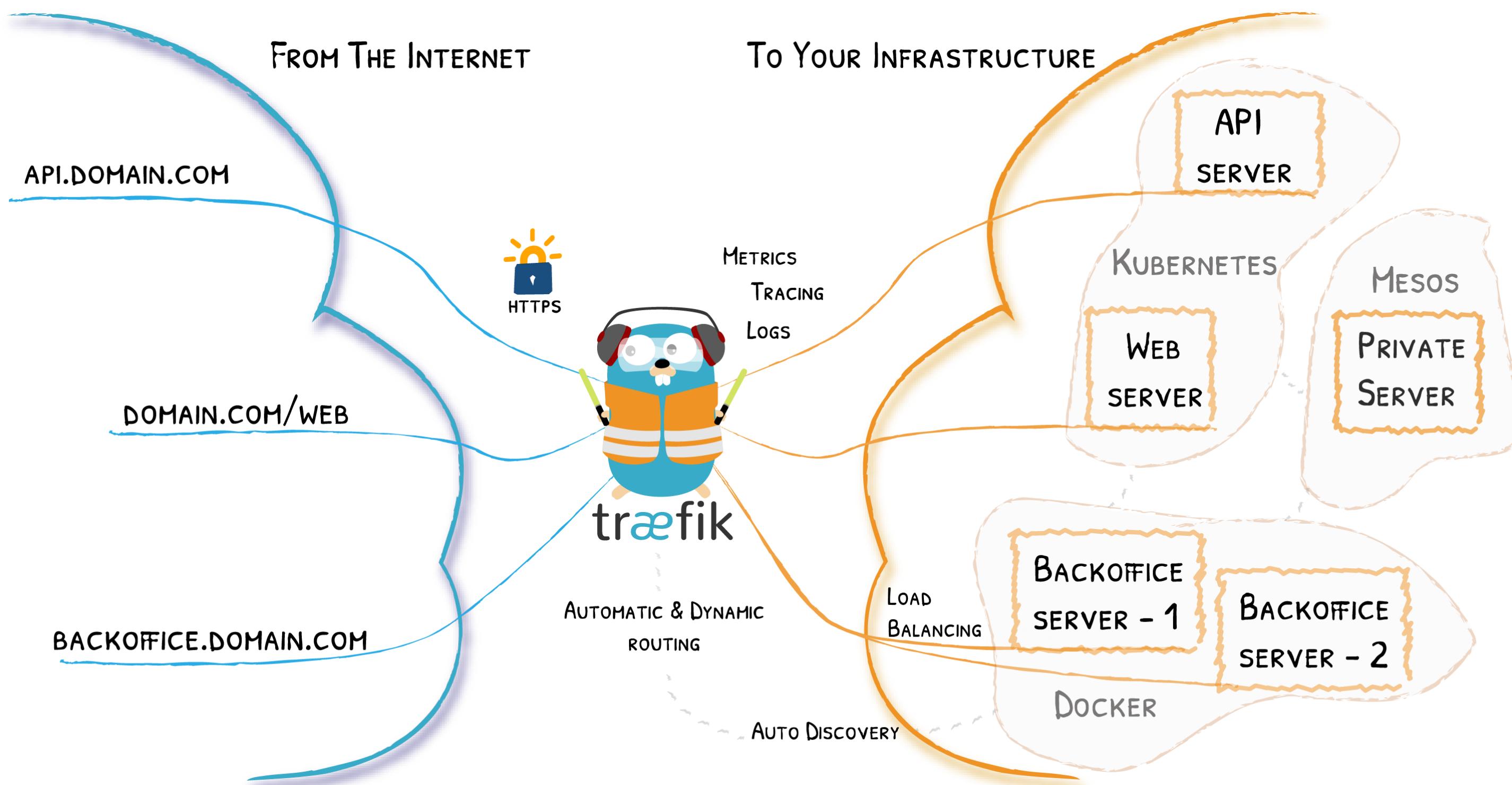
--|-----|--

[Services]

--|-----|--

[Pods]

Remember The Diagram?



In Kubernetes

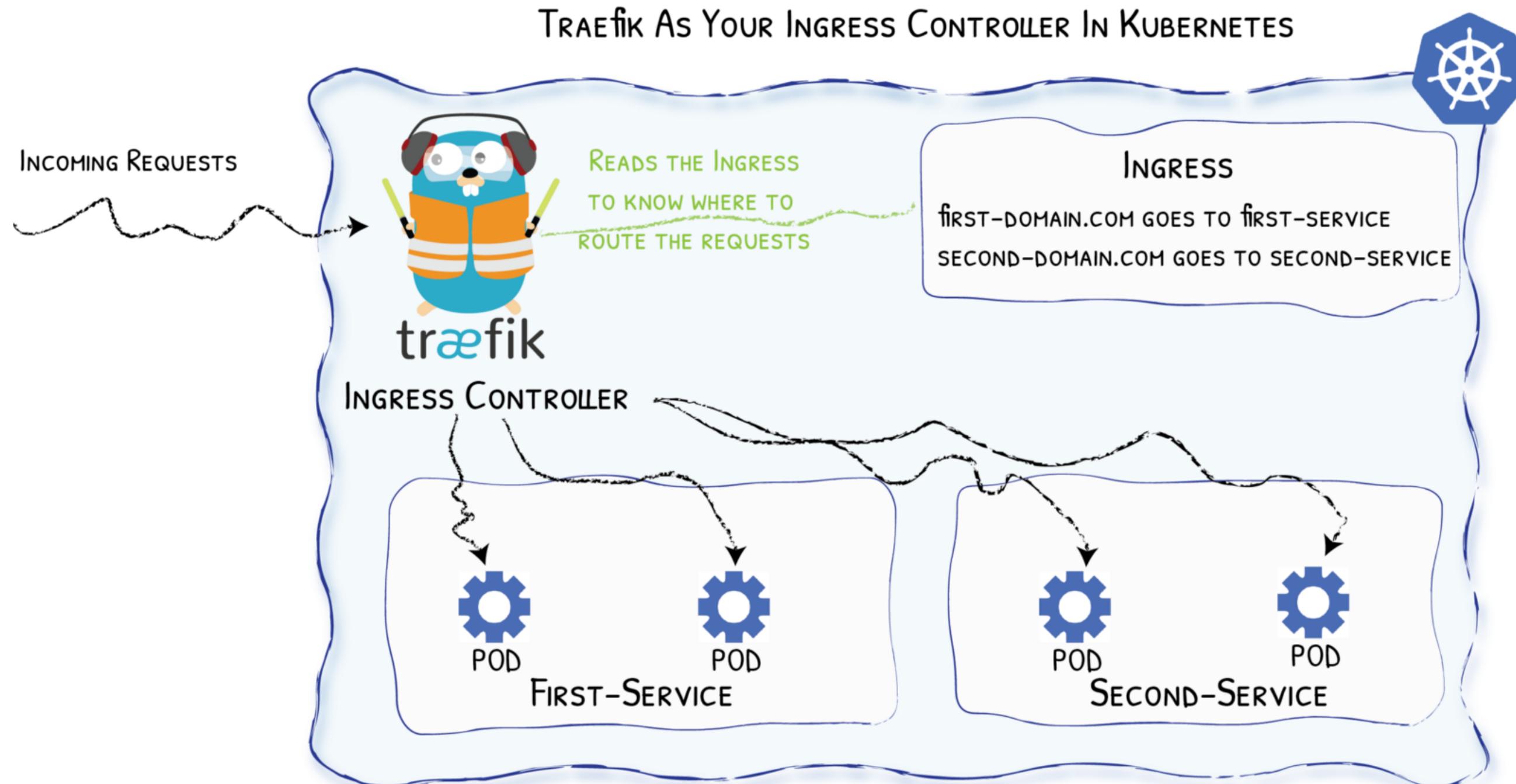


Diagram from <https://medium.com/@geraldcroes>

Let's Go

- Let's start by migrating the Let's Encrypt Certificates
- Then, we install Traefik as Ingress Controller

Goal

- We want to use our generated Let's Encrypt certificates.
 - We do not want to exceed the ACME Rate Limits..

Retrieve Certificates From Docker

- Step 1: From the "Legacy" (Docker) VM:

```
# Get Traefik Container ID
TRAEFIK_CONTAINER_ID=$(docker ps | grep traefik | grep edge | awk '{print $1}'")"

# Generate a file "certs.b64" in the user home
docker run --rm --volumes-from="${TRAEFIK_CONTAINER_ID}" -t \
    alpine cat /acme/acme.json | base64 > ~/certs.b64
```

- Step 2: From the "bastion", copy the certificates to the new VM

```
ssh 10.0.x.y cat certs.b64 | ssh 10.0.n.p "cat > certs.b64"
```

Import Certificates Into Kubernetes

- On the "Kube" VM, we'll create a pod with a PVC ("Persistent Volume Claim").
- Then, using this pod, we'll populate the persistent volume with the acme.json data.
- After that, we'll be able to install the Traefik Ingress configured to use this PVC.

Prepare PVC In Kubernetes

- Step 1: Create the PVC ("Persistent Volume Claim") manifest file acme-pvc.yml:

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: acme-data-pvc
  namespace: devoxx
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: local-path
  resources:
    requests:
      storage: 200Mi
```

- Step 2: create namespace and PVC:

```
kubectl create namespace devoxx
kubectl apply -f acme-pvc.yml
```

Prepare The "Acme-Loader" Deployment

- Step 1: Create the manifest file acme-deploy.yml:

```
apiVersion: v1
kind: Pod
metadata:
  name: acme-loader
  namespace: devoxx
spec:
  containers:
  - name: acme-loader
    image: traefik:alpine
    imagePullPolicy: IfNotPresent
    volumeMounts:
    - name: acme
      mountPath: /acme
  volumes:
  - name: acme
    persistentVolumeClaim:
      claimName: acme-data-pvc
```

- Step 2: create the deployment:

```
kubectl apply -f acme-deploy.yml
```

Load ACME Data In Kubernetes

- Step 1: Wait for the pod and pvc to be created:

```
# Expecting the pod "acme-loader" to be in state "Running"  
watch kubectl get pod,pv,pvc --namespace=devoxx  
# Then hit CTRL-C
```

- Step 2: Decode ACME data and copy it:

```
base64 --decode certs.b64 > ~/acme.json  
chmod 0600 ~/acme.json  
kubectl --namespace=devoxx cp ~/acme.json acme-loader:/acme/  
kubectl exec --namespace=devoxx acme-loader -- ls -l /acme  
# the file "acme.json" MUST be in 600 (-rw-----)
```

- Step 3: Remove the "acme-loader" deployment:

```
kubectl delete -f acme-deploy.yml
```

Install Traefik Ingress

Create A values.yaml File

- Step 1: Add rights on namespace:

```
# Allow creating the needed Role and Service Account
rbac:
  enabled: true
```

- Step 2: Set SSL EntryPoint with redirection:

```
ssl:
  enabled: true
  enforced: true
```

- Step 3: Add Let's Encrypt:

```
acme:
  enabled: true
  email: noreply@lab.org
  onHostRule: true
  #staging: true
  challengeType: tls-alpn-01
  persistence:
    enabled: true
    existingClaim: acme-data-pvc
```

Deploy Traefik

```
helm install stable/traefik \  
--name traefik-devoxx \  
--namespace devoxx \  
--set imageTag=1.7.10 \  
--values values.yml
```

Access To Traefik

- Step 1: Run the command:

```
kubectl --namespace=devoxx get services
```

- Step 2: Once the column EXTERNAL-IP show an IP in 172..., then the LoadBalancer can be reached at your VM's IP address:

```
# Launch a curl command from the Kube VM
curl -v 10.0.n.p
# 302 Found -> https://10.0.n.p
```

Reality Check

It's good: we have an answer: HTTP/302 redirect to https!

Lab 2



- Traefik
- **Web Server**
- CI Server
- SCM: A Gitea Git Server
- Web CLI

Goal

We want access to the webserver hosted in Docker through Traefik in Kubernetes.

Challenge 1/2

Problem: How to tell to Traefik to route requests to the web server which is not deployed in Kubernetes?

```
https://lab-XX.ddu-workshops-Y.com/index.html
-> Traefik Kubernetes
-> Traefik Docker
-> https://<Webserver Private IP>/index.html
```

Headless Service

Solution: Define a service linked to an external address in ~/02-k8s-traefik/web.yml.

```
---
apiVersion: v1
kind: Service
metadata:
  name: web-service
  namespace: devoxx
  labels:
    guilde: web
spec:
  ports:
    # Define the port to contact on the external Host
    # Here contact Traefik defined in lab1
    - port: 80
      name: traefik-http
    # Indicate to Kubernetes that the service will redirect
    # to a backend which is not managed in the Kubernets network
  type: ExternalName
  # IP of the VM in the lab1
  externalName: 10.0.x.y
```

Challenge 2/2

Problem: How to detect the HTTPS requests to catch?

Ingress Rule

Solution: Define a rule to catch all the incoming requests for the PathPrefix: / in ~/02-k8s-traefik/web.yml.

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: web-ingress
  namespace: devoxx
  labels:
    guilde: web
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.passHostHeader: "false"
    traefik.frontend.rule.type: PathPrefix
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /
        backend:
          serviceName: web-service
          servicePort: traefik-http
```

Apply The Configuration

- Step 1: Apply the Kubernetes manifest:

```
kubectl apply -f ~/02-k8s-traefik/web.yml
```

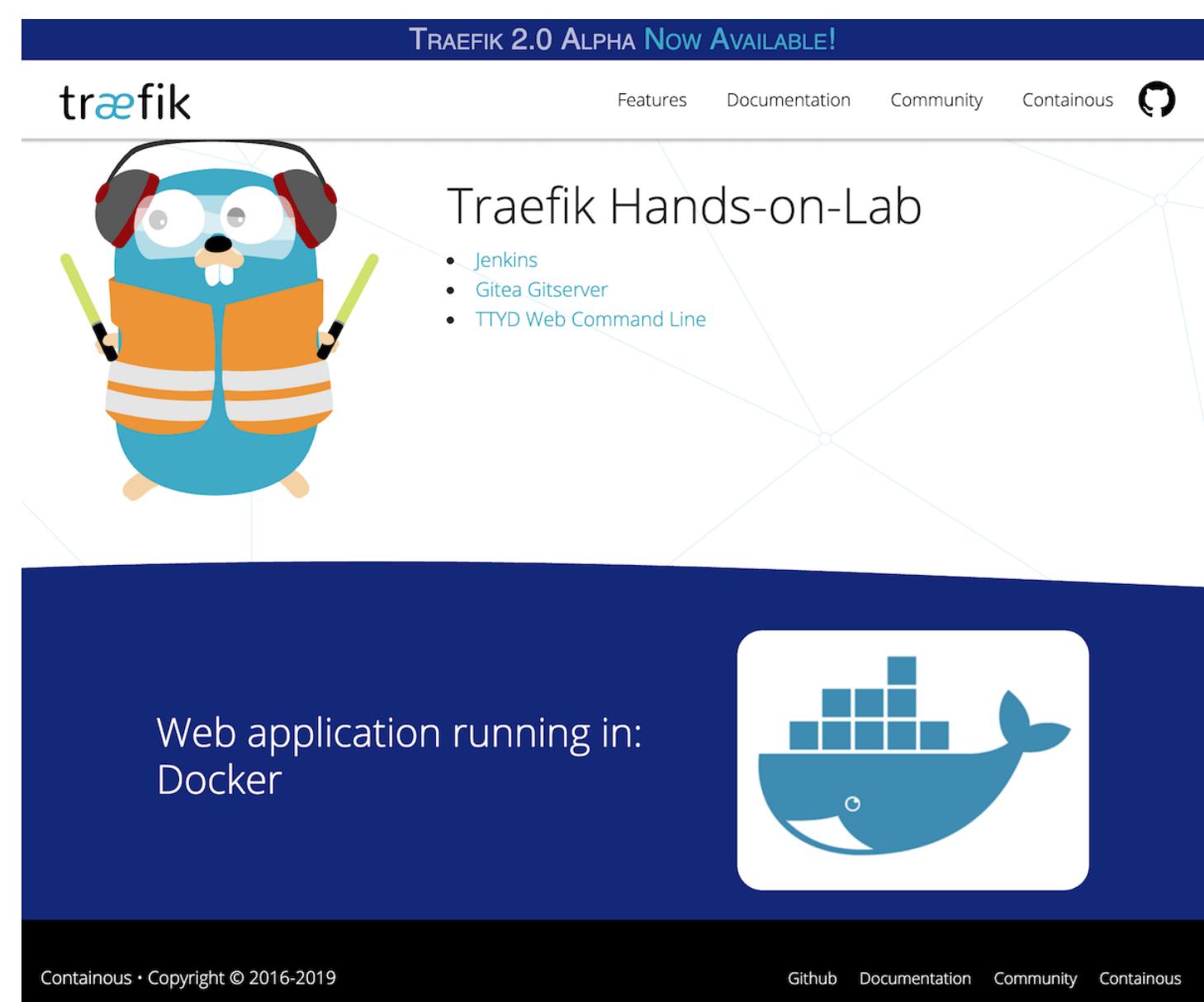
- Step 2: Verify locally:

```
curl -v -sSL 10.0.n.p -H "Host: lab-XX.ddu-workshops-Y.com" > /dev/null
# ...
# HTTP/2 200
# ...
```

- Step 3: Use the Blue-Green Jenkins job to switch:
 - Your domain name (labXX.ddu-workshops-Y.com)
 - To this VM_IP (10.0.n.p)

Reality Check

<https://lab-XX.ddu-workshops-Y.com/>



It's good: we have a web page!

Lab 2



- Traefik
- Web Server
- CI Server
- SCM: A Gitea Git Server
- Web CLI

Goal

We want access to the CI hosted in Docker through Traefik in
Kubernetes

Challenge 1/2

Problem: How to tell to Traefik to route requests to the CI which is not deployed in Kubernetes?

```
https://lab-XX.ddu-workshops-Y.com/jenkins
-> Traefik Kubernetes
-> Traefik Docker
-> https://<Jenkins Private IP>/jenkins
```

Headless Service

Solution: Use (once again) a service linked to an external address in `~/02-k8s-traefik/ci.yml`.

```
---
apiVersion: v1
kind: Service
metadata:
  name: jenkins-service
  namespace: devoxx
  labels:
    guilde: ci
spec:
  ports:
  - port: 80
    name: traefik-http
  type: ExternalName
  externalName: 10.0.x.y
```

Challenge 2/2

Problem: How to detect the HTTPS requests to catch?

Ingress Rule

Solution: Define a rule to catch all the incoming requests for the PathPrefix: /jenkins in ~/02-k8s-traefik/ci.yml.

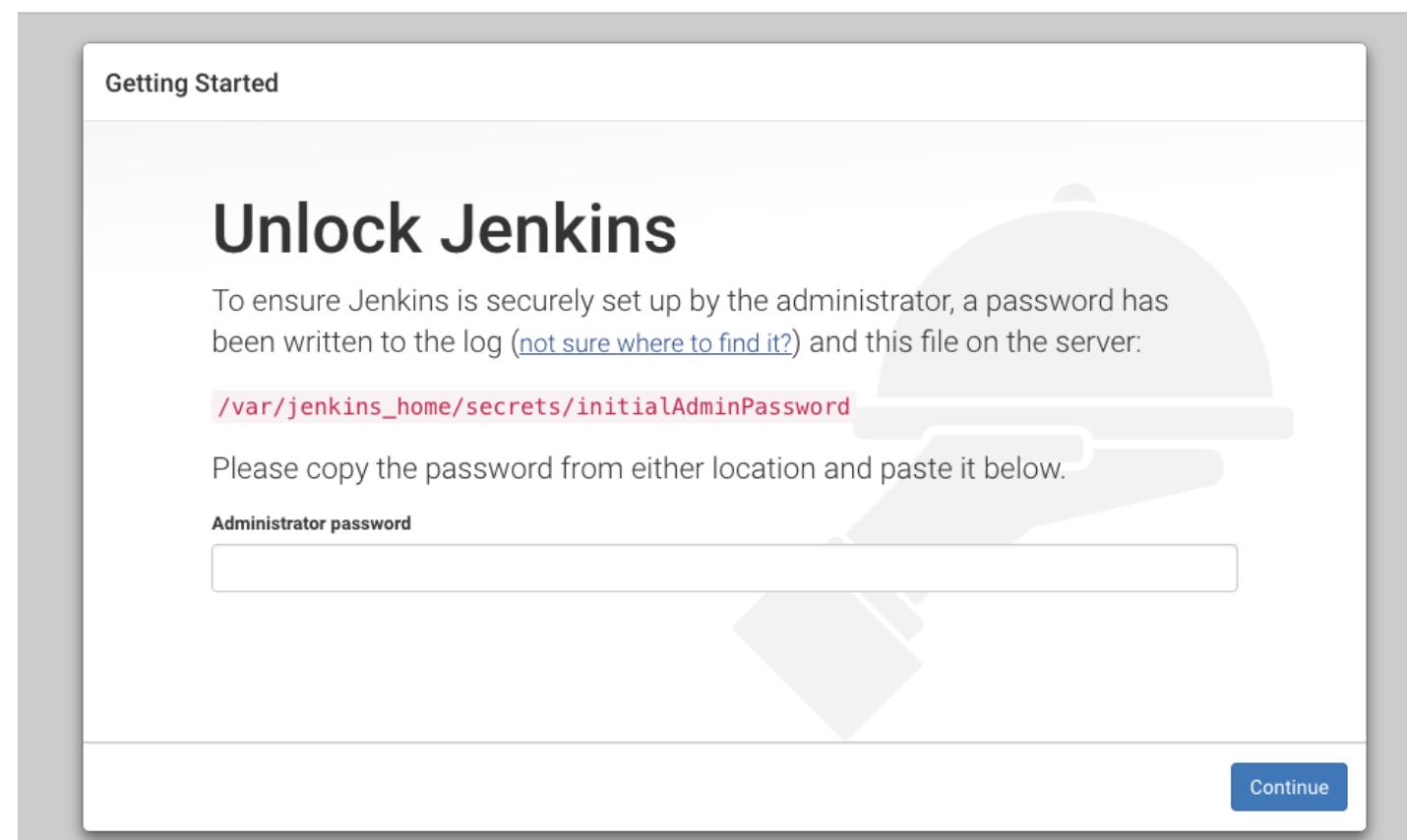
```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: jenkins-ingress
  namespace: devoxx
  labels:
    guilde: ci
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.passHostHeader: "false"
    traefik.frontend.rule.type: PathPrefix
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /jenkins
        backend:
          serviceName: jenkins-service
          servicePort: traefik-http
```

Apply The Configuration

```
kubectl apply -f ~/02-k8s-traefik/ci.yml
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/jenkins>



It's good: we still can setup Jenkins!

Lab 2



- Traefik
- Web Server
- CI Server
- **SCM: A Gitea Git Server**
- Web CLI

Goal

We want access to the Git server hosted in Docker through Traefik in Kubernetes.

Challenge 1/2

- Problem:
 - Gitea only serves requests under /
 - Traefik in Docker already removes the prefix /gitserver

```
http://lab-XX.ddu-workshops-Y.com/gitserver/index.html
-> Traefik Kubernetes
-> Traefik Docker
-> http://<Gitea private IP>:3000/index.html
```

Use A PathPrefix Rule

Solution: Do not remove the prefix (Thanks Captain Obvious!) in the ingress rule in `~/02-k8s-traefik/gitea.yml`.

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: gitea-ingress
  namespace: devoxx
  labels:
    guilde: git
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.passHostHeader: "false"
    # Only Path Prefix to let the other Traefik Strip it
    traefik.frontend.rule.type: PathPrefix
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /gitserver
        backend:
          serviceName: gitea-server
          servicePort: traefik-http
```

Challenge 2/2

Problem: How to tell to Traefik to route requests to the SCM which is not deployed in Kubernetes?

Headless Service

Solution: Use (once again again) a service linked to an external address in ~/02-k8s-traefik/gitea.yaml.

```
---
apiVersion: v1
kind: Service
metadata:
  name: gitea-server
  namespace: devoxx
  labels:
    guilde: git
spec:
  ports:
  - port: 80
    name: traefik-http
  type: ExternalName
  externalName: 10.0.x.y
```

Apply The Configuration

```
kubectl apply -f ~/02-k8s-traefik/gitea.yml
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/gitserver>



Gitea: Git with a cup of tea

A painless, self-hosted Git service

It's good: Gitea is still available!

Lab 2



- Traefik
- Web Server
- CI Server
- SCM: A Gitea Git Server
- **Web CLI**

Goal

We want to access to TTYD deployed in Docker through Traefik in Kubernetes.

Challenges

- **Problem 1:** How to tell to Traefik to route requests to TTYD which is not deployed in Kubernetes?

```
https://lab-XX.ddu-workshops-Y.com/ttyd
  -> Traefik Kubernetes
  -> Traefik Docker
  -> https://<WebCLI Private IP>/
```

- **Problem 2:** How to detect the HTTPS requests to catch ?

Solution 1

- Use a Headless Service in ~/02-k8s-traefik/ttyd.yml:

```
---  
apiVersion: v1  
kind: Service  
metadata:  
  name: ttyd-service  
  namespace: devoxx  
  labels:  
    guilde: console  
spec:  
  ports:  
  - port: 80  
    name: traefik-http  
  type: ExternalName  
  externalName: 10.0.x.y
```

Solution 2

- Ingress Rule with PathPrefix: /ttyd in ~/02-k8s-traefik/ttyd.yml:

```
---  
apiVersion: extensions/v1beta1  
kind: Ingress  
metadata:  
  name: ttyd-ingress  
  namespace: devoxx  
  annotations:  
    kubernetes.io/ingress.class: 'traefik'  
    traefik.frontend.passHostHeader: "false"  
    traefik.frontend.rule.type: PathPrefix  
spec:  
  rules:  
  - host: lab-XX.ddu-workshops-Y.com  
    http:  
      paths:  
      - path: /ttyd  
        backend:  
          serviceName: ttyd-service  
          servicePort: traefik-http
```

Apply The Configuration

```
kubectl apply -f ~/02-k8s-traefik/ttyd.yml
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/ttyd>



It's good: we can continue to develop in a web browser!

The Castle



The Castle

We want to terminate the migration of our services to the Kubernetes cluster.

Infrastructure Setup

- Same VM as the Lab 2 (ssh 10.0.n.p from the webshell)
- kubectl and helm installed on the client machines
- Create a directory named ~/03-k8s-apps as working directory

Lab 3

- CI Server
- SCM: A Gitea Git Server
- Web CLI
- Web Server



Goal

We want to host the CI in Kubernetes and access it through Traefik

Challenge 1/3

Problem: How to host the CI in Kubernetes?

Deployment Object

Solution: Declare it as a Deployment object in `~/03-k8s-apps/ci.yaml`.

```
---
kind: Deployment
apiVersion: extensions/v1beta1
metadata:
  name: jenkins-full-deployment
  namespace: devoxx
spec:
  replicas: 1
  template:
    metadata:
      labels:
        guilde: ci
        faction: jenkins
    spec:
      containers:
        - name: jenkins-full-container
          image: jenkins/jenkins:2.164.2-alpine
          imagePullPolicy: IfNotPresent
          env:
            - name: JENKINS_OPTS
              value: "--prefix=/jenkins"
```

Challenge 2/2

Problem: How to access to the CI?

```
https://lab-XX.ddu-workshops-Y.com/jenkins  
-> Traefik  
-> https://<Jenkins Private IP>/jenkins
```

Service

Solution: Adding a service in `~/03-k8s-apps/ci.yml`.

```
---
apiVersion: v1
kind: Service
metadata:
  name: jenkins-full-service
  namespace: devoxx
  labels:
    guilde: ci
spec:
  type: ClusterIP
  ports:
    - port: 8080
      name: jenkins-http
    - port: 50000
      name: jenkins-agent
  selector:
    guilde: ci
    faction: jenkins
```

Ingress Rule

Solution: Adding an Ingress Rule in ~/03-k8s-apps/ci.yml.

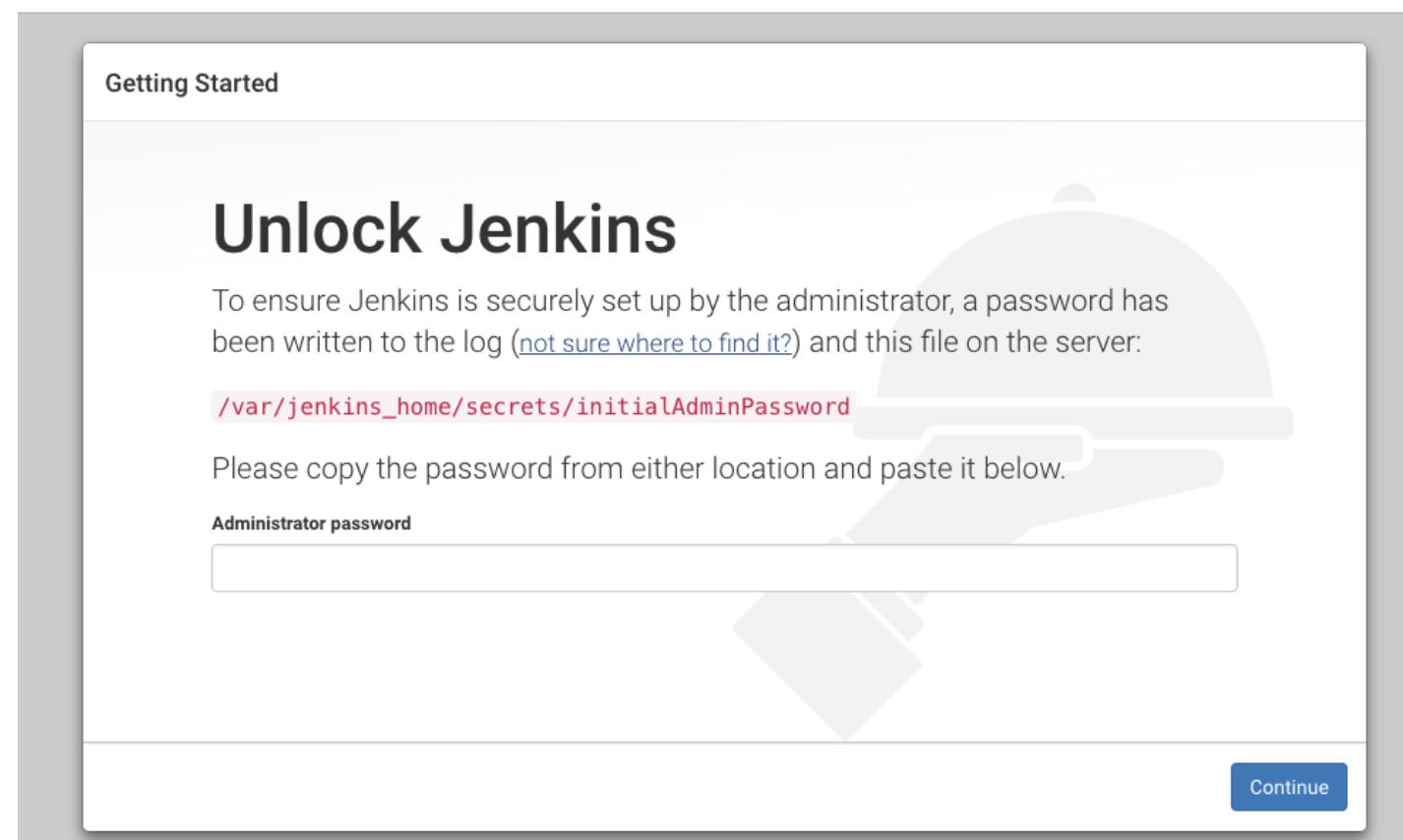
```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: jenkins-full-ingress
  namespace: devoxx
  labels:
    guilde: ci
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.rule.type: PathPrefix
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /jenkins
        backend:
          serviceName: jenkins-full-service
          servicePort: jenkins-http
```

Apply The Configuration

```
# Add the new objects
kubectl apply -f ~/03-k8s-apps/ci.yml
# Delete the headless service and its ingress rule (blue-green)
kubectl delete -f ~/02-k8s-traefik/ci.yml
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/jenkins>



It's good: we can setup Jenkins in Kubernetes!

Lab 3



- CI Server
- **SCM: A Gitea Git Server**
- Web CLI
- Web Server

Goal

We want to host the Git server in Kubernetes and access it through Traefik.

Challenges

- Problem 1:
 - How to host the Git server in Kubernetes?
- Problem 2:
 - Gitea only serves requests under /
 - Traefik in Docker already removes the prefix /gitserver

```
http://lab-XX.ddu-workshops-Y.com/gitserver/index.html
-> Traefik
  -> http://<Gitea private IP>:3000/index.html
```

Deployment Object

Solution: Declare it as a Deployment object in ~/03-k8s-apps/gitea.yaml.

```
---
kind: Deployment
apiVersion: extensions/v1beta1
metadata:
  name: gitea-full-deployment
  namespace: devoxx
spec:
  replicas: 1
  template:
    metadata:
      labels:
        guilde: git
        faction: server
    spec:
      containers:
        - name: gitea-full-container
          image: gitea/gitea:latest
          imagePullPolicy: IfNotPresent
          env:
            - name: ROOT_URL
              value: "/gitserver"
```

Service

Solution: Adding a service in ~/03-k8s-apps/gitea.yml.

```
---
apiVersion: v1
kind: Service
metadata:
  name: gitea-full-server
  namespace: devoxx
  labels:
    guilde: git
spec:
  type: ClusterIP
  ports:
    - port: 3000
      name: gitea-http
    - port: 22
      name: gitea-ssh
  selector:
    guilde: git
    faction: server
```

Ingress Rule

Solution: Adding an Ingress Rule in ~/03-k8s-apps/gitea.yml.

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: gitea-full-ingress
  namespace: devoxx
  labels:
    guilde: git
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.rule.type: PathPrefixStrip
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /gitserver
        backend:
          serviceName: gitea-full-server
          servicePort: gitea-http
```

Apply The Configuration

```
# Add the new objects
kubectl apply -f ~/03-k8s-apps/gitea.yml
# Delete the headless service and its ingress rule (blue-green)
kubectl delete -f ~/02-k8s-traefik/gitea.yml
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/gitserver>



Gitea: Git with a cup of tea

A painless, self-hosted Git service

It's good: we can setup Gitea in Kubernetes!

Lab 3



- CI Server
- SCM: A Gitea Git Server
- **Web CLI**
- Web Server

Goal

We want to host TTYD in Kubernetes and access it through Traefik.

Challenges

- **Problem 1:** How to host the TTYD in Kubernetes?
- **Problem 2:** How to access to TTYD?

```
http://lab-XX.ddu-workshops-Y.com/ttyd/  
-> Traefik  
-> http://<WebCLI private IP>/
```

Deployment Object

Solution: Declare it as a Deployment object in ~/03-k8s-apps/ttyd.yml.

```
---
kind: Deployment
apiVersion: extensions/v1beta1
metadata:
  name: ttyd-full-deployment
  namespace: devoxx
spec:
  replicas: 1
  template:
    metadata:
      labels:
        guilde: console
        faction: tty
    spec:
      containers:
        - name: ttyd-full-container
          image: ts10922/ttyd:1.4.2-alpine
          imagePullPolicy: IfNotPresent
```

Service

Solution: Adding a service in ~/03-k8s-apps/ttyd.yml.

```
---
apiVersion: v1
kind: Service
metadata:
  name: ttyd-full-service
  namespace: devoxx
  labels:
    guilde: console
spec:
  type: ClusterIP
  ports:
    - port: 7681
      name: ttyd-ws
  selector:
    guilde: console
    faction: tty
```

Ingress Rule

Solution: Adding an Ingress Rule in ~/03-k8s-apps/ttyd.yml.

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: ttyd-full-ingress
  namespace: devoxx
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.rule.type: PathPrefixStrip
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /ttyd
        backend:
          serviceName: ttyd-full-service
          servicePort: ttyd-ws
```

Apply The Configuration

```
# Add the new objects
kubectl apply -f ~/03-k8s-apps/ttyd.yml
# Delete the headless service and its ingress rule (blue-green)
kubectl delete -f ~/02-k8s-traefik/ttyd.yml
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/ttyd>



It's good: we have our own "Dev Box" in a web browser hosted in Kubernetes!

Lab 3



- CI Server
- SCM: A Gitea Git Server
- Web CLI
- **Web Server**

Goal

We want to host the webserver in Kubernetes and access it through Traefik.

Challenges

- **Problem 1:** How to host the web server in Kubernetes?
- **Problem 2:** How to access to the web server?

```
http://lab-XX.ddu-workshops-Y.com/index.html
-> Traefik
-> http://<Webserver Private IP>/index.html
```

Deployment Object

Solution: Declare it as a Deployment object in ~/03-k8s-apps/web.yml.

```
---
kind: Deployment
apiVersion: extensions/v1beta1
metadata:
  name: web-full-deployment
  namespace: devoxx
spec:
  replicas: 1
  template:
    metadata:
      labels:
        guilde: web
        faction: server
    spec:
      containers:
        - name: web-full-container
          image: nmengin/web:devoxx-v1
          imagePullPolicy: IfNotPresent
```

Service

Solution: Adding a service in `~/03-k8s-apps/web.yml`.

```
---
apiVersion: v1
kind: Service
metadata:
  name: web-full-service
  namespace: devoxx
  labels:
    guilde: web
spec:
  type: ClusterIP
  ports:
    - port: 80
      name: web-http
  selector:
    guilde: web
    faction: server
```

Ingress Rule

Solution: Adding an Ingress Rule in `~/03-k8s-apps/web.yml`.

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: web-full-ingress
  namespace: devoxx
  labels:
    guilde: web
  annotations:
    kubernetes.io/ingress.class: 'traefik'
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /
        backend:
          serviceName: web-full-service
          servicePort: web-http
```

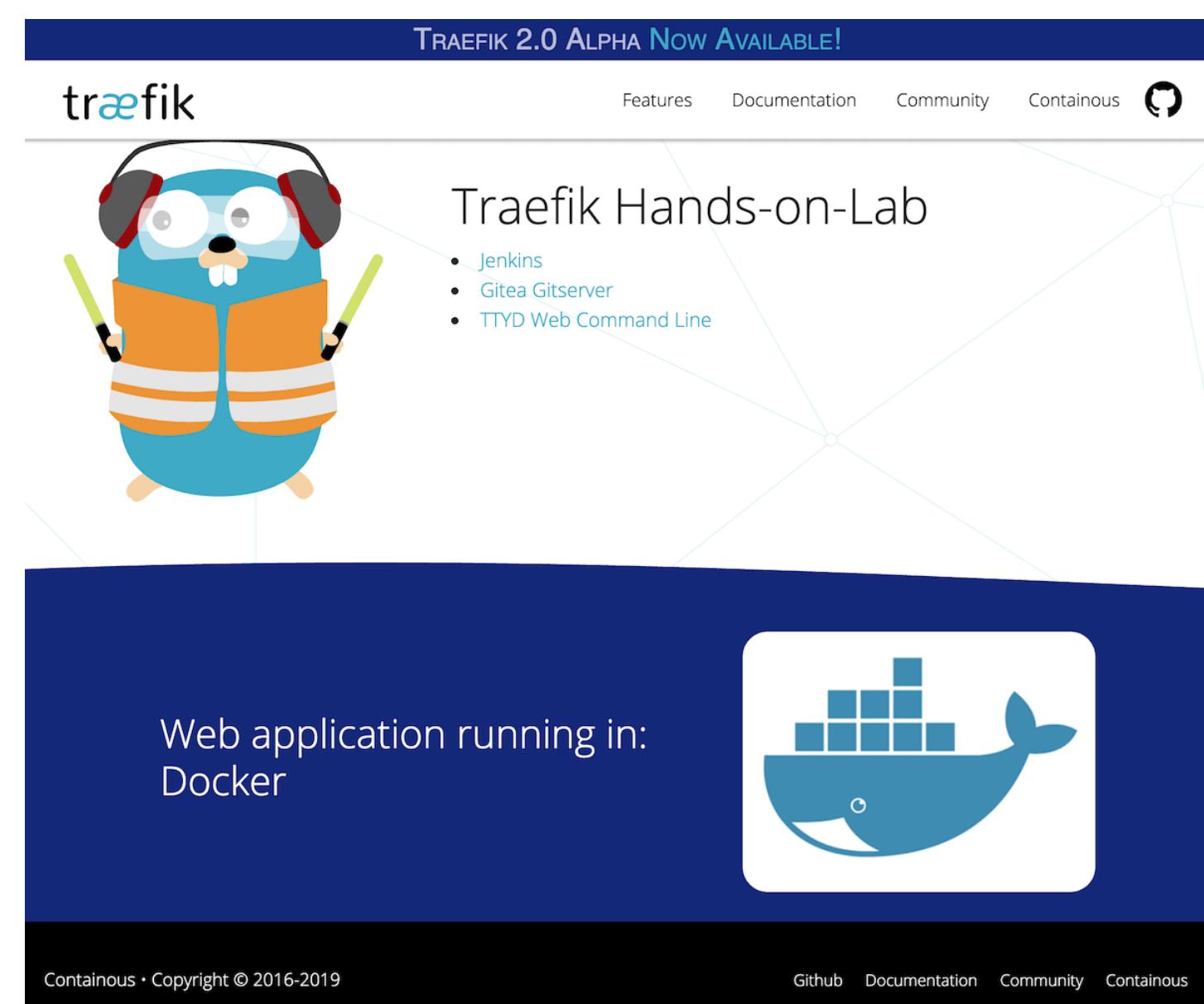
Apply The Configuration

```
# Add the new objects
kubectl apply -f ~/03-k8s-apps/web.yml
# Delete the headless service and its ingress rule (blue-green)
kubectl delete -f ~/02-k8s-traefik/web.yml
```

Reality Check

Reality Check

<http://lab-XX.ddu-workshops-Y.com/>



It's good: we have a web page in Kubernetes!

Extra Ball

Goal

- We want to deploy a new version of the webserver:
 - hosted in Kubernetes and accessed through Traefik
 - continue to access to the old version for the main part of the traffic

Challenge 1/3

Problem: How to host the new version of the webserver in Kubernetes?

Deployment Object

Solution: Declare it as a Deployment object in `~/03-k8s-apps/web-v2.yaml`.

```
kind: Deployment
apiVersion: extensions/v1beta1
metadata:
  name: web-full-v2-deployment
  namespace: devoxx
spec:
  replicas: 1
  template:
    metadata:
      labels:
        guilde: web
        faction: server-v2
    spec:
      containers:
        - name: web-full-v2-container
          image: nmengin/web:devoxx-v2
          imagePullPolicy: IfNotPresent
```

Challenge 2/2

Problem: How to access to both the old and new version at the same time with a traffic repartition?

```
https://lab-XX.ddu-workshops-Y.com/  
-> Traefik Kubernetes  
-> 80% of traffic V1:  
  -> https://<Webserver Docker Private IP>/  
-> 20% of traffic V2:  
  -> https://<Webserver kubernetes Private IP>/
```

Follow The Yellow Bird!

Solution: Use the Traffic splitting feature in Traefik.

```
traefik.ingress.kubernetes.io/service-weights: |
  web-full-service: 80%
  web-full-v2-service: 20%
```

Ingress Rule

Solution: In `~/03-k8s-apps/web-v2.yml`.

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: web-full-v2-ingress
  namespace: devoxx
  labels:
    guilde: web
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    traefik.frontend.passHostHeader: "false"
    traefik.frontend.rule.type: PathPrefix
    traefik.ingress.kubernetes.io/service-weights: |
      web-full-service: 80%
      web-full-v2-service: 20%
spec:
  rules:
  - host: lab-XX.ddu-workshops-Y.com
    http:
      paths:
      - path: /
        backend:
          serviceName: web-full-v2-service
          servicePort: web-http
      - path: /
        backend:
          serviceName: web-full-service
          servicePort: web-http
```

Service

Solution: In `~/03-k8s-apps/web-v2.yaml`.

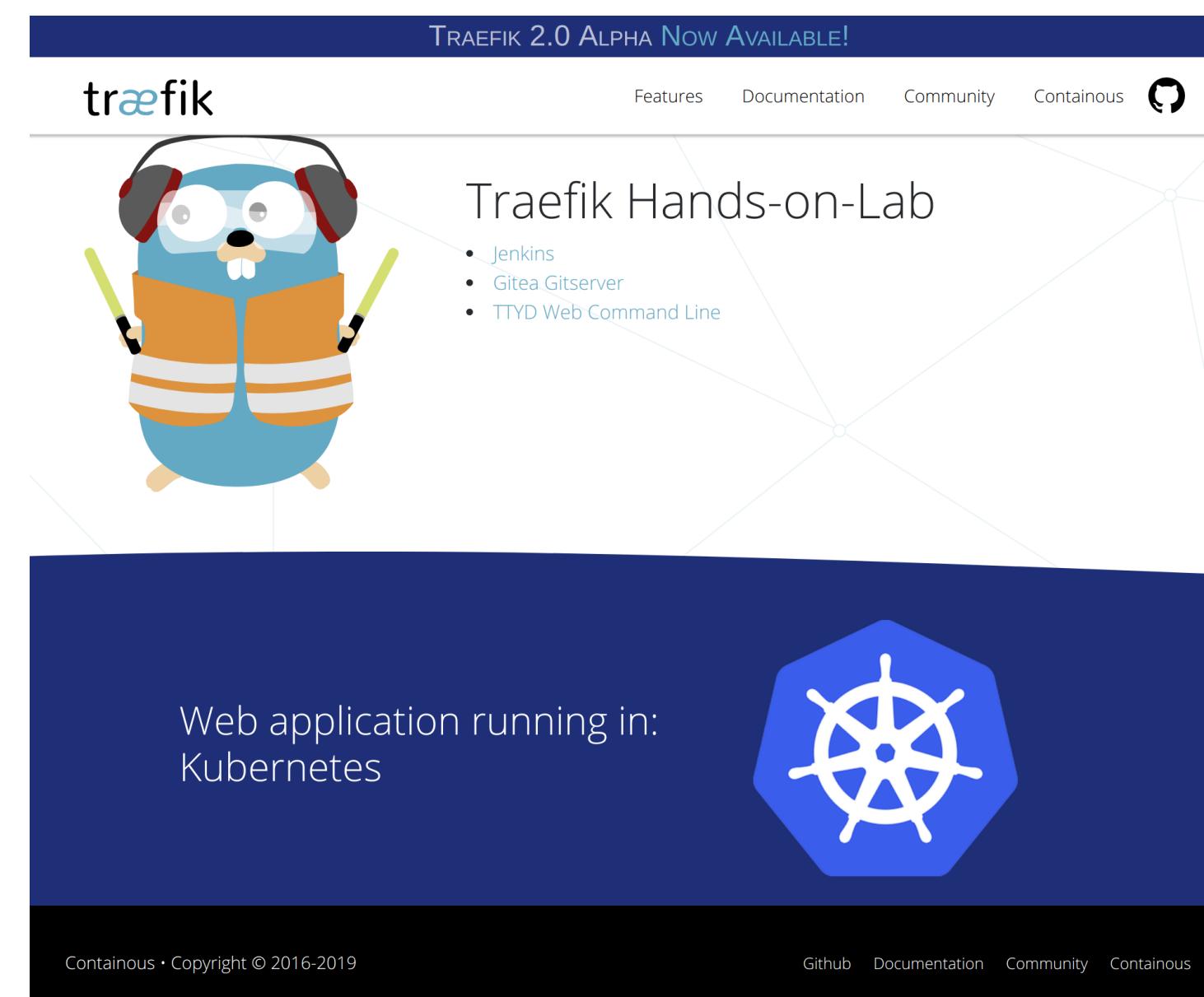
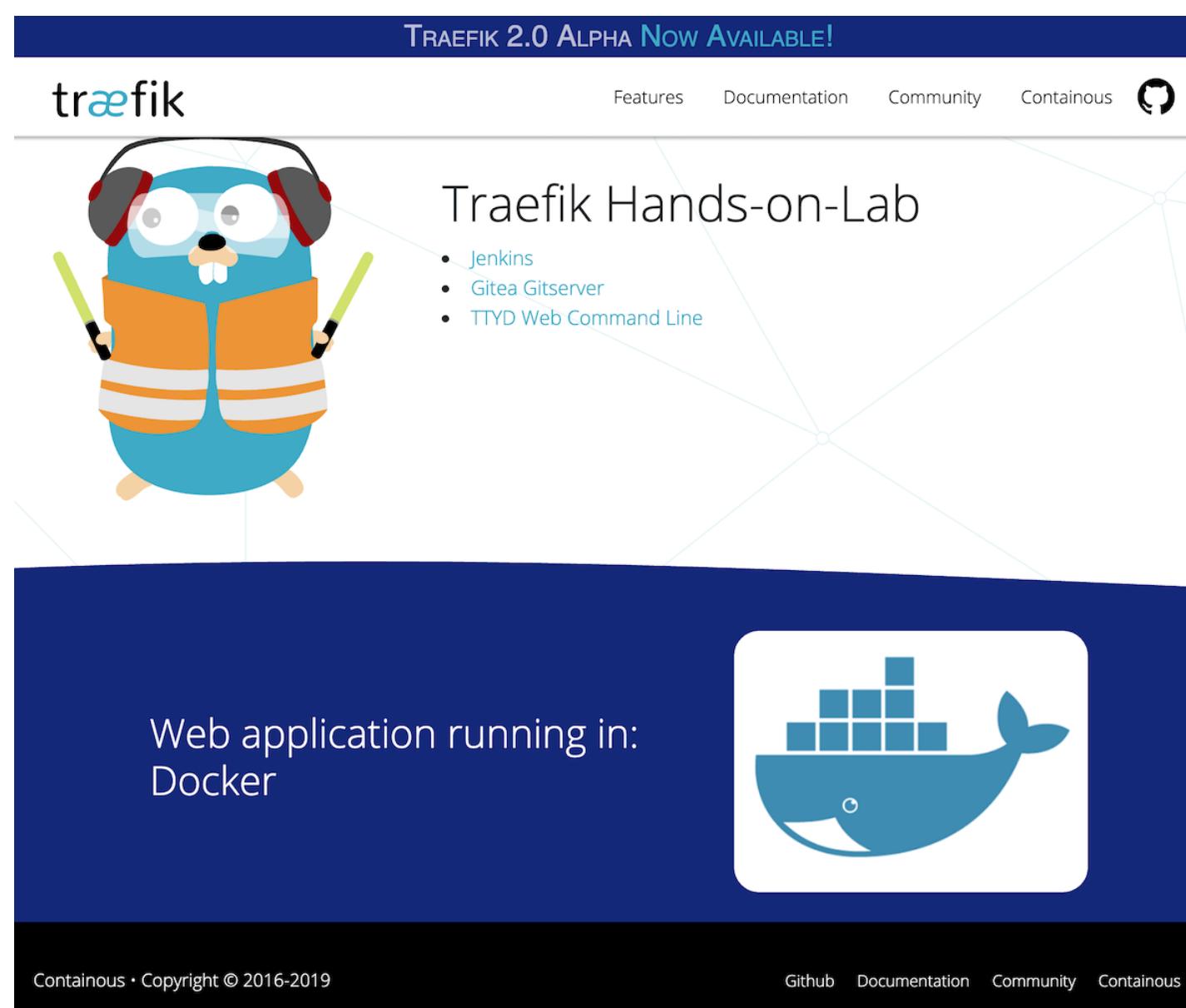
```
---
apiVersion: v1
kind: Service
metadata:
  name: web-full-v2-service
  namespace: devoxx
  labels:
    guilde: web
spec:
  type: ClusterIP
  ports:
    - port: 80
      name: web-http
  selector:
    guilde: web
    faction: server-v2
```

Apply The Configuration

```
# Add the new objects
kubectl apply -f ~/03-k8s-apps/web-v2.yml
# Delete only the old ingress rule: the service will be reachable from the new one
kubectl --namespace devoxx delete ingress web-full-ingress
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/>



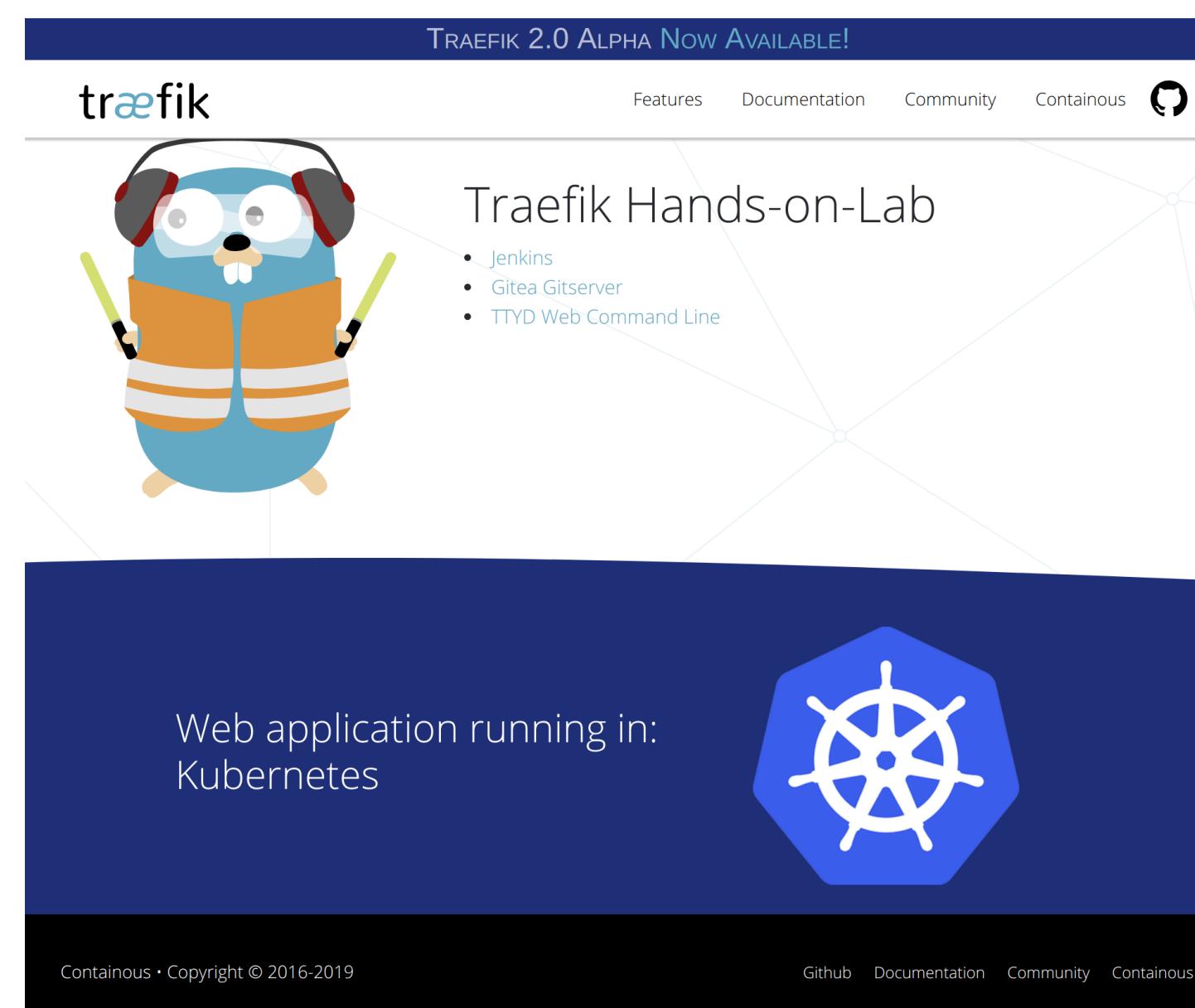
It's good: when reloading, the 2 versions of the web page are shown!

Switch All Traffic To The New Version

```
# Edit the ingress
kubectl --namespace devoxx edit ingress web-full-v2-ingress
#####
# Delete the following lines
  traefik.frontend.passHostHeader: "false"
  traefik.frontend.rule.type: PathPrefix
  traefik.ingress.kubernetes.io/service-weights: |
    web-full-service: 80%
    web-full-v2-service: 20%
...
  - path: /
    backend:
      serviceName: web-full-service
      servicePort: web-http
# Exit and save
###
```

Reality Check

<https://lab-XX.ddu-workshops-Y.com/>



It's good: we only have the new version of the web page!

We Did Not Talk About...

BACK toTRAEFIK 2.8

PART →

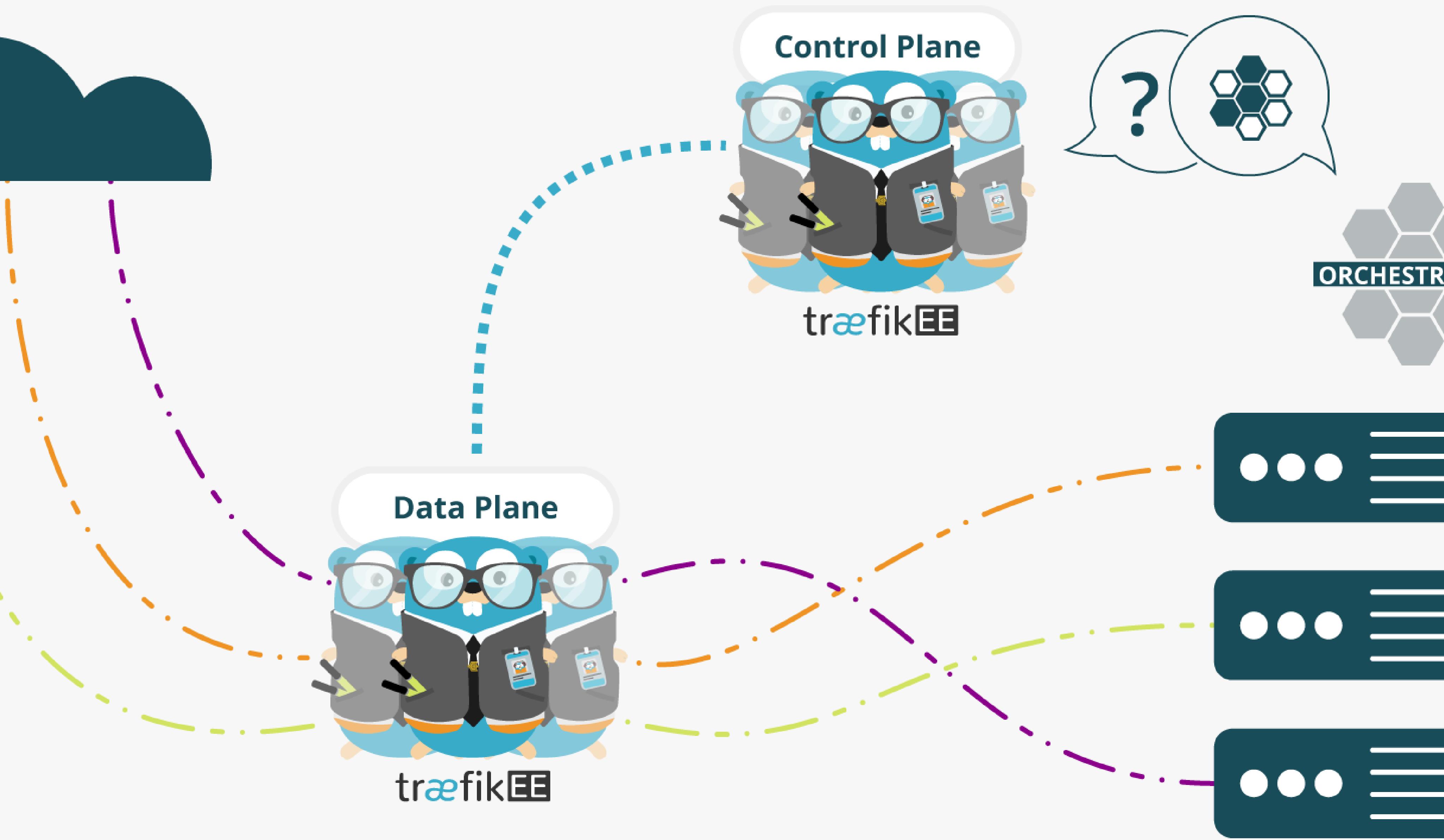


Traefik V2

- Used during all the workshop 😢
- Alpha version since March
- Main features:
 - Revamped Documentation & Clarified Concepts
 - Expressive Routing Rule Syntax
 - Middlewares
 - TCP Support! 🥰
 - Kubernetes "CRD"
- Learn More

INTERNET

TO YOUR INFRA

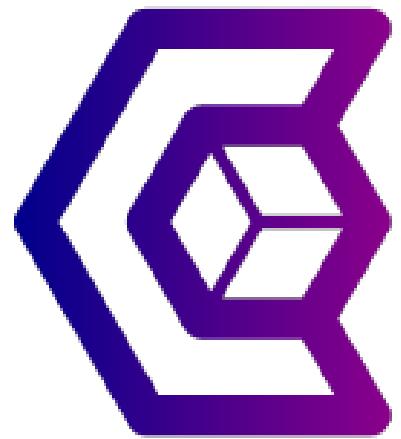


Traefik Enterprise Edition

- Highly Available Traefik 
- Split responsibilities 
 - Control Plane
 - Data Plane
- Let's Encrypt Distributed Support 
- Smooth Operations with the `traefikeectl` CLI
- 1.0.0 GA since... Today! 
- Documentation



We Are Hiring!

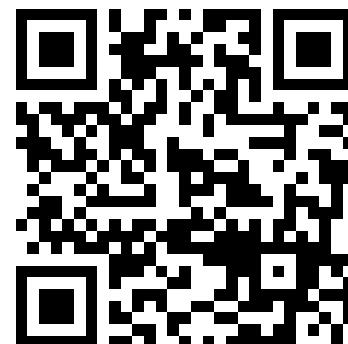


```
docker run -it containous/jobs
```

Thank You!

 @nicomengin  nmengin

 @DamienDuportal  dduportal



- Slides (HTML): <https://containous.github.io/slides>
- Slides (PDF): <https://containous.github.io/slides/slides.pdf>
- Source on : <https://github.com/containous/slides>