Le Seigneur Des Conteneurs

Un atelier de migration vers Kubernetes et Traefik

https://containous.github.io/slides/devoxx-fr-2019

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

- Code Craftsman, Part Time DevOps @ Containous
- Traefik E If Blacksmith
- @nicomengin
- nmengin

Whoami 2/2

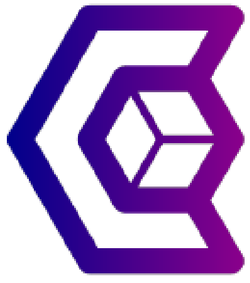
Damien DUPORTAL

- Traefik's Developer 🥑 Advocate @ Containous
- 🐦 @DamienDuportal
- dduportal

Containous

https://containo.us

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



Forge Content

- TODO: indicate the checklist
- ....
- ....

Once Upon A Time...

An Infrastruture War

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

One Orchestrator To Rule Them All

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

Agenda

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 Hobbit House

We want a server in AWS:

- to host our own SCM Server,
- and our own Continous Integration,
- and a static web site,
- and a "web" command line.

Infrastructure Setup

- An AWS VM with a public IP `35.178.178.237` and SSH access
- A domain name `lab01.demo.containous.cloud` pointing to `35.178.178.237`

```
$ dig +short lab01.demo.containous.cloud
35.178.178.237
```

- Docker and docker-compose for services

Reality Check

http://lab01.demo.containous.cloud/

This site can't be reached

refused to connect.

Search Google for

ERR_CONNECTION_REFUSED

Agenda

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

Why Traefik?

Why, Mr Anderson?

Evolution Of Software Design

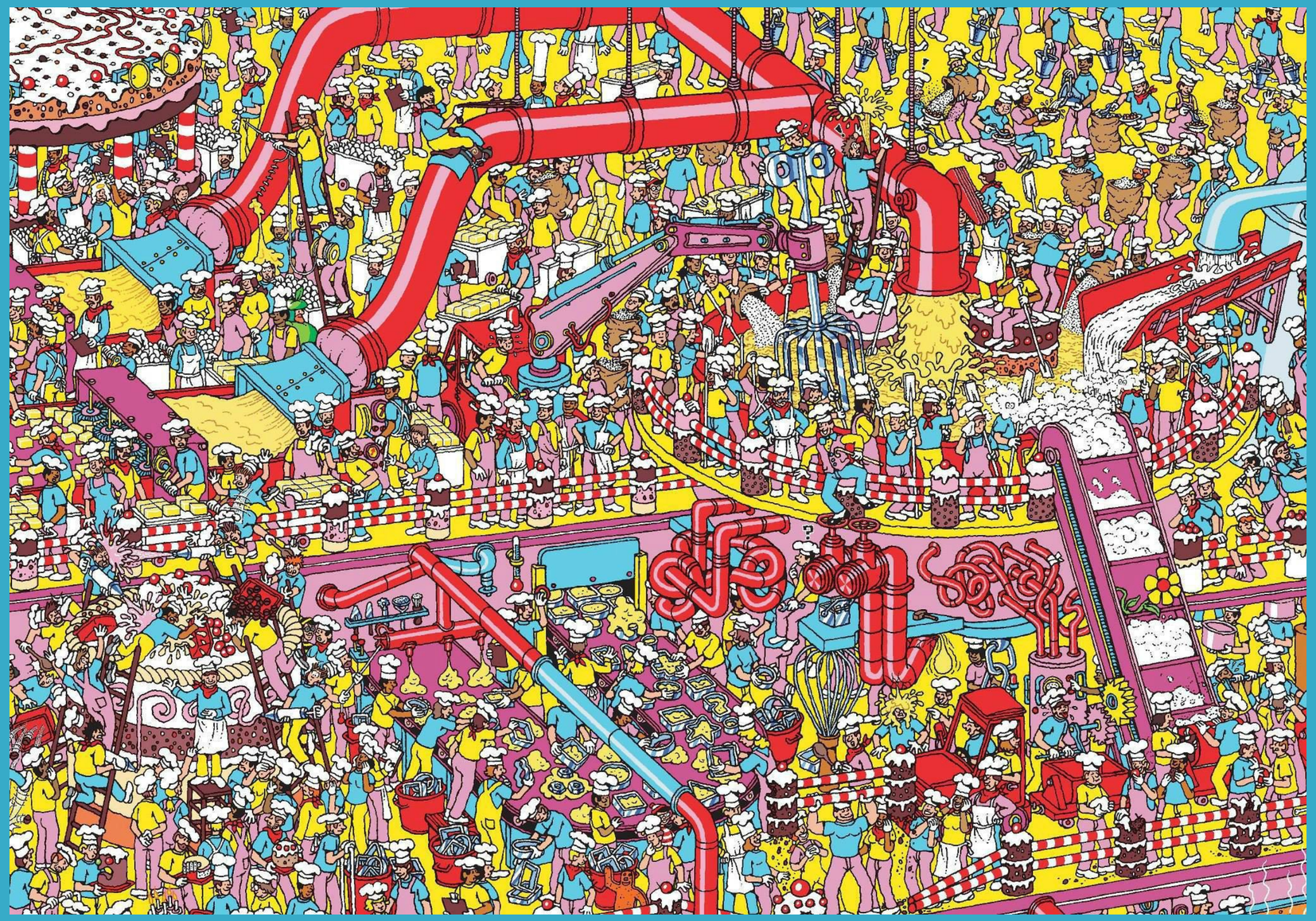
1990s and earlier	2000s	2010s
Coupling		
Pre-SOA (monolithic) Tight coupling	**Traditional SOA** Looser coupling	**Microservices** Decoupled

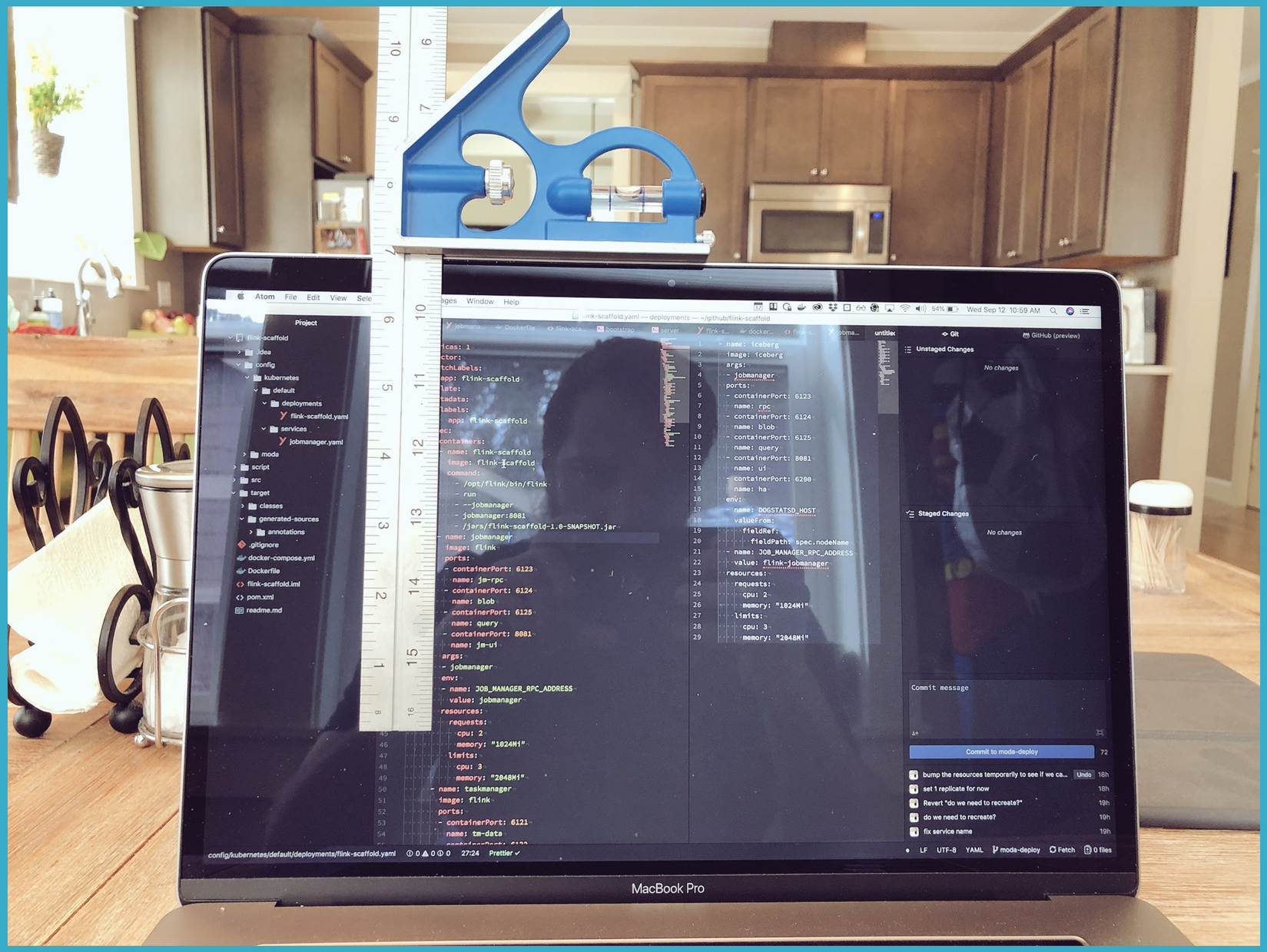
The Premise Of Microservices...

...And What Happens

Tools Of The Trade


Where's My Service?



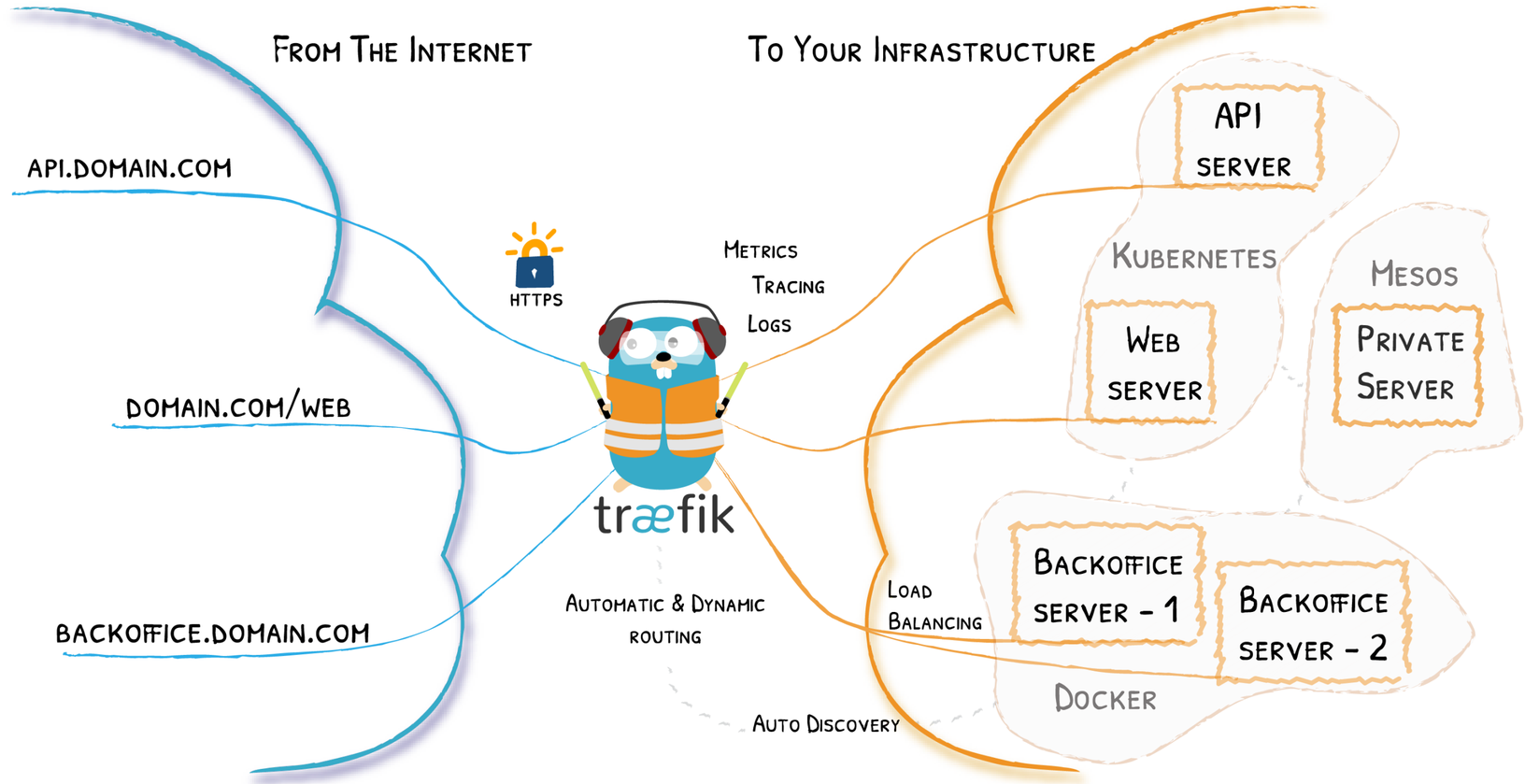


Source: https://twitter.com/Caged/status/1039937162769096704

What If I Told You?

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

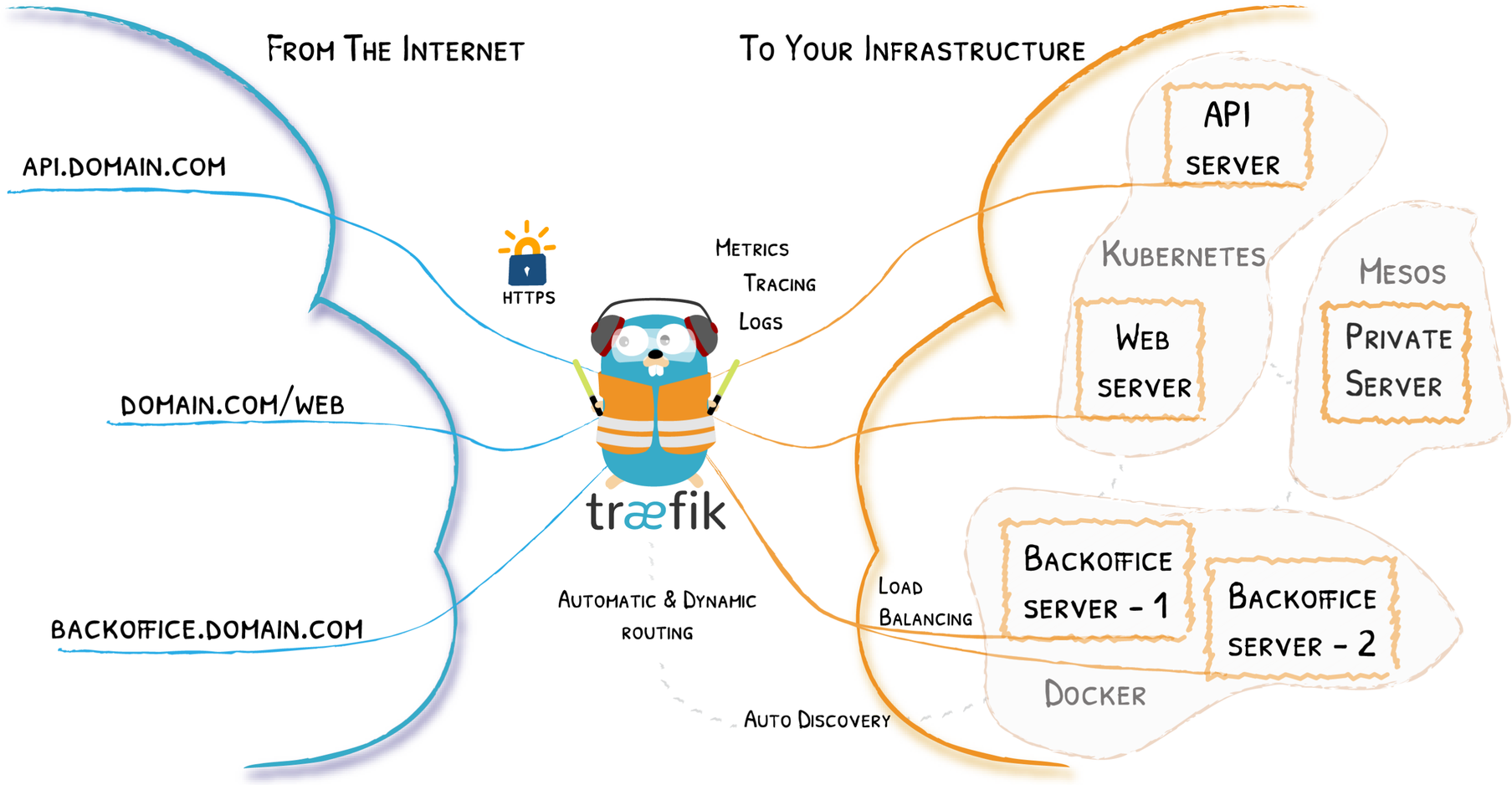
Here Comes Traefik!



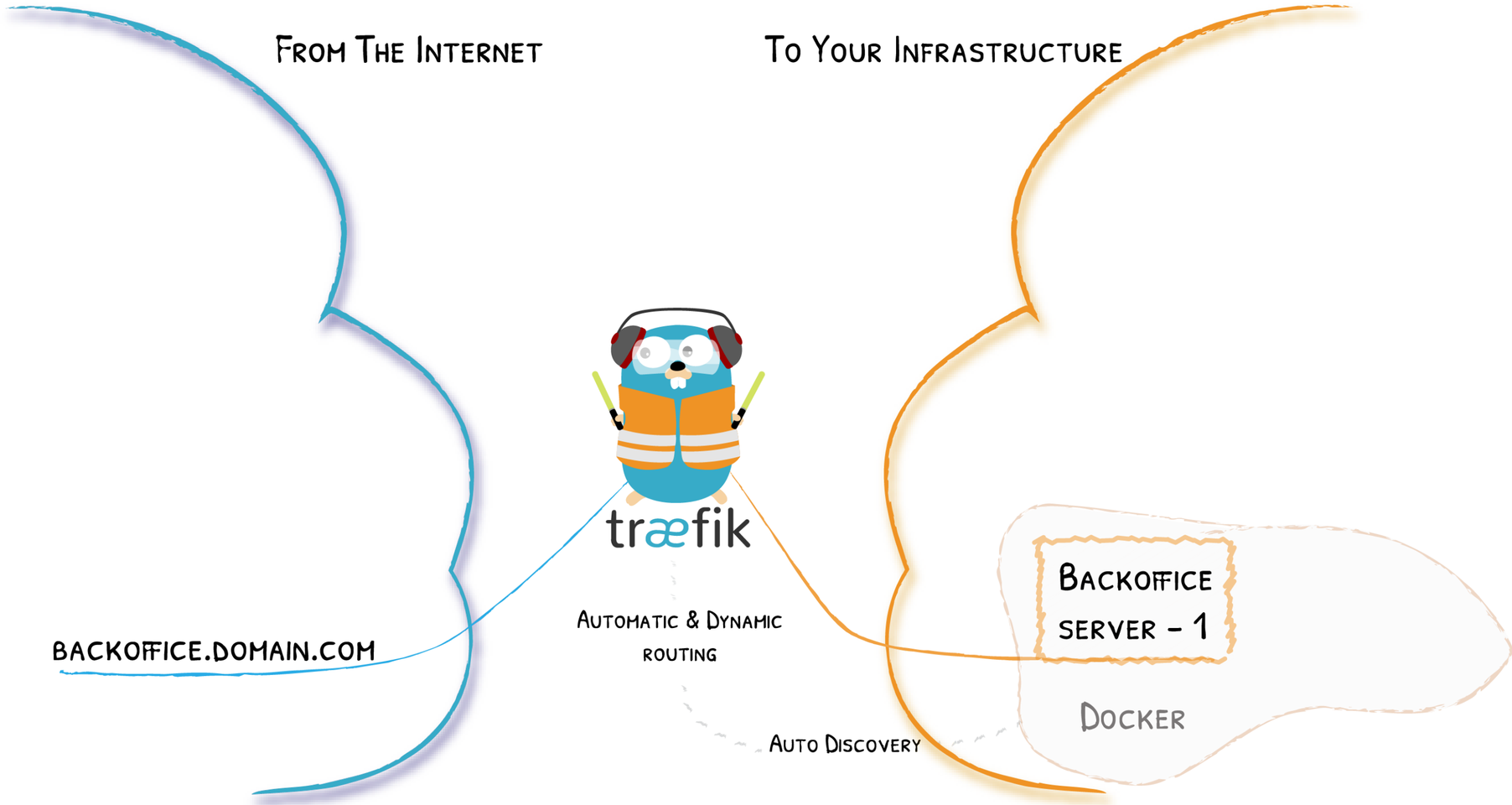
Traefik Project

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

Remember The Diagram?



Let's Simplify



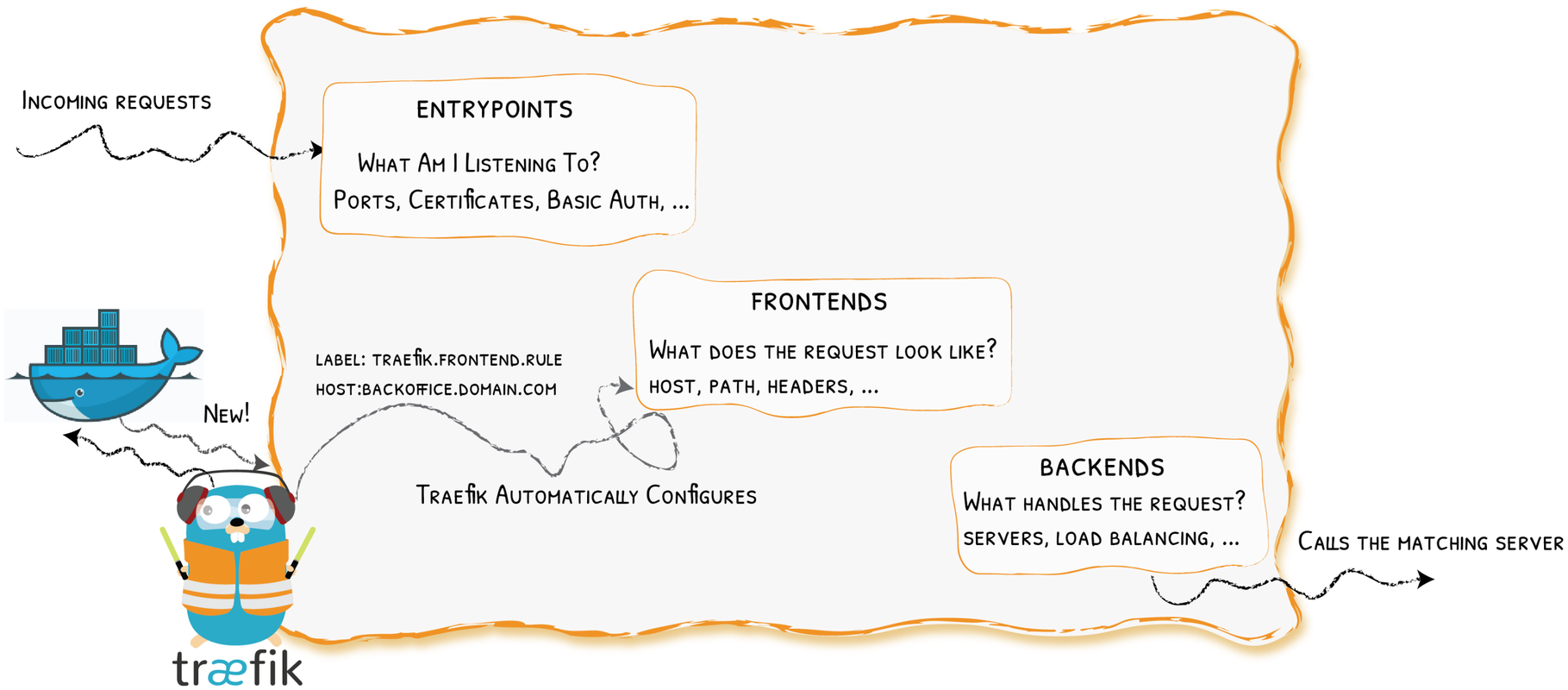
Providers

Entrypoints

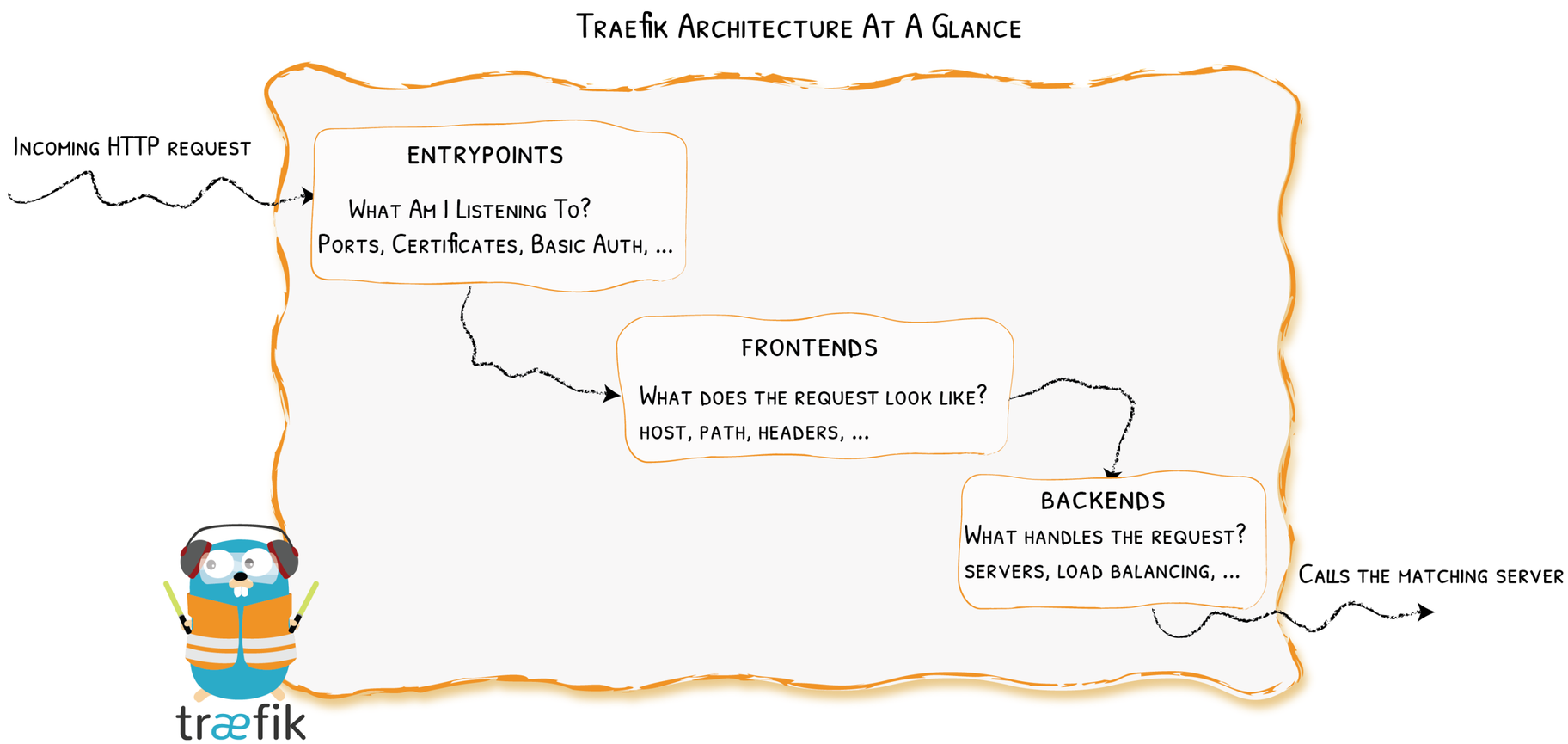
Backends


Incoming requests
ENTRYPOINTS
What Am I Listening To?
Ports, Certificates, Basic Auth, ...
New!
Traefik Automatically Configures
BACKENDS
What handles the request?
servers, load balancing, ...
Calls the matching server
træfik

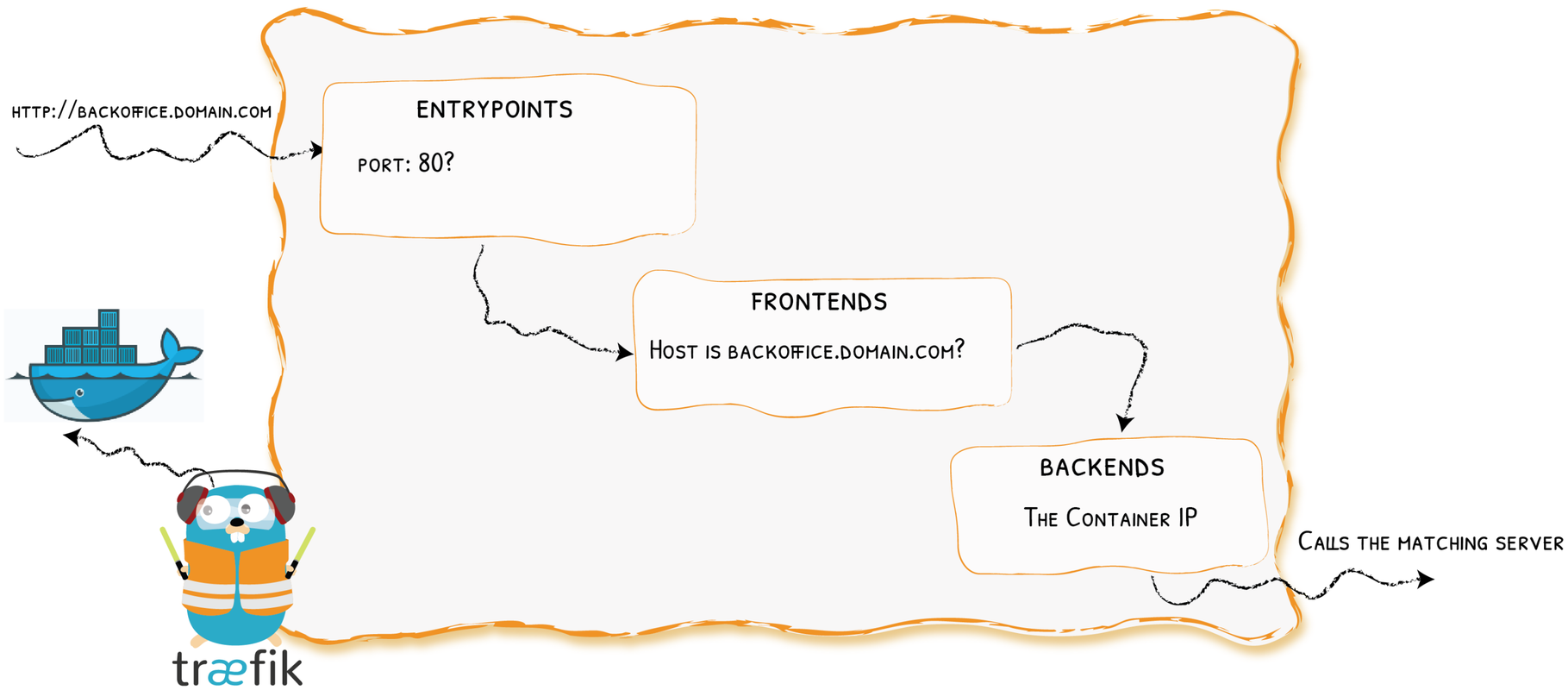
Frontends


Incoming requests
ENTRYPOINTS
What Am I Listening To?
Ports, Certificates, Basic Auth, ...
FRONTENDS
What does the request look like?
host, path, headers, ...
BACKENDS
What handles the request?
servers, load balancing, ...
Calls the matching server
label: traefik.frontend.rule
host:backoffice.domain.com
Traefik Automatically Configures
New!
træfik

At A Glance


Traefik Architecture At A Glance
Incoming HTTP request
ENTRYPOINTS
What Am I Listening To?
Ports, Certificates, Basic Auth, ...
FRONTENDS
What does the request look like?
host, path, headers, ...
BACKENDS
What handles the request?
servers, load balancing, ...
Calls the matching server
træfik

In Practice


HTTP://BACKOFFICE.DOMAIN.COM
ENTRYPOINTS
PORT: 80?
FRONTENDS
HOST IS BACKOFFICE.DOMAIN.COM?
BACKENDS
THE CONTAINER IP
CALLS THE MATCHING SERVER
træfik

Let's Go

Traefik Setup

- Step 1: Compose file in `/home/ubuntu/lab-docker-k8s/01-docker/docker-compose.yml`:

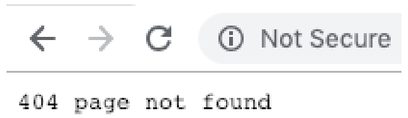
```
version: '2.4'

services:
  edge:
    image: traefik:1.7.10
    command:
      - "--docker.domain=lab01.demo.containous.cloud"
    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://lab01.demo.containous.cloud/



It’s good: we have an HTTP answer!

Agenda

- 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://lab01.demo.containous.cloud/index.html
  -> Traefik
    -> http://<Webserver Private IP>/index.html
```

The Web Server Setup

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

```
web:
  build: ./web/
  labels:
    - "traefik.frontend.rule=Path:/"
```

- Step 2: Start the Web Server:

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

Reality Check

http://lab01.demo.containous.cloud/

It’s good: we have a web page!

Agenda

- 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://lab01.demo.containous.cloud/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:2.150.3-alpine
  expose:
    - 8080
    - 50000
  environment:
    - JENKINS_OPTS=--prefix=/jenkins
  labels:
    - "traefik.port=8080"
    - "traefik.frontend.rule=PathPrefix:/jenkins"
```

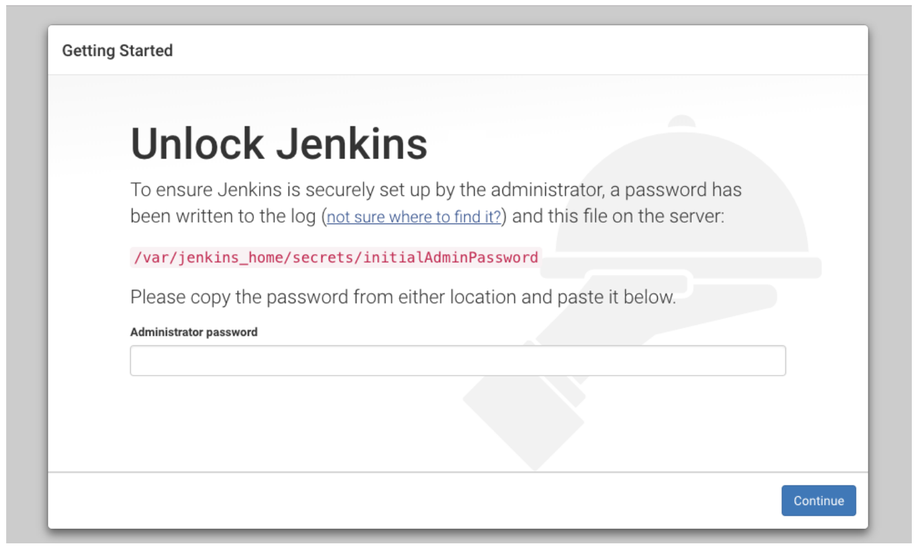
- Step 2: update the service

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

Reality Check

Click on the "Jenkins" link:

http://lab01.demo.containous.cloud/jenkins



It’s good: we can setup Jenkins!

Agenda

- 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-domain}/gitserver/index.html
  -> Traefik
    -> http://<Gitea private IP>:3000/index.html
```

- **Solution:**
  - Use the Traefik's 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

Try the "Gitea Git server" link:

http://lab01.demo.containous.cloud/gitserver

Gitea: Git with a cup of tea

A painless, self-hosted Git service

It’s good: we can setup Gitea!

Agenda

- 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: tsl0922/ttyd
  labels:
    - "traefik.frontend.rule=PathPrefixStrip:/ttyd"
```

- Step 2: create the service

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

Reality Check

Try the "TTYD Web Command Line" link:

http://lab01.demo.containous.cloud/ttyd

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

Agenda

- 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
- Redirect any incoming HTTP request to HTTPS:

```
http://lab01.demo.containous.cloud/
  -> https://lab01.demo.containous.cloud/
```

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 you a certificate.

Problem 1/4

- **Problem:**
  - How to tell Traefik to listen on port `443` for HTTPS requests?
- **Solution:**
  - Create a new entrypoint with the flag `--entrypoints`,
  - Set it as a default entrypoint with `--defaultentrypoints`:

```
- "--entryPoints=Name:https Address::443 TLS"
- "--defaultEntryPoints=https,http"
```

Problem 2/4

- **Problem:**
  - How to tell Traefik to redirect request from http to https?
- **Solution:**
  - Configure the new entrypoint `http` with the flag `--entrypoints`:

```
- "--entryPoints=Name:http Address::80" # Redirect.EntryPoint:https"
```

Problem 3/4

- **Problem:**
  - How to tell Traefik to use Let's Encrypt for HTTPS?
- **Solution:**
  - Configure the ACME/Let's Encrypt provider with the flags – `–acme.*`:

```
- "--acme.entryPoint=https"          # Uses LE certificates on the entrypoint "https" .
- "--acme.email=damien@containo.us" # Specifies the contact email for the certificates.
- "--acme.storage=acme.json"         # Stores certificates in the file "acme.storage".
- "--acme.tlsChallenge=true"         # Uses TLS Challenge.
- "--acme.onHostRule=true"           # Get cert's domain names from frontend rules.
```

Problem 4/4

- **Problem:**
  - Traefik detects itself as a docker container with a port, and tries to request a 2nd certificate for `edge.lab01.demo.containous.cloud`
- **Solution:**
  - Exclude Traefik's container with the label `traefik.enable=false`

Traefik Setup

- Step 1: Adapt Compose file:

```
    command:
      - "--entryPoints=Name:http Address::80" # Redirect.EntryPoint:https"
      - "--entryPoints=Name:https Address::443 TLS"
      - "--defaultEntryPoints=https,http"
      - "--acme.entryPoint=https"          # Uses LE certificates on the entrypoint "https" .
      - "--acme.email=damien@containo.us" # Specifies the contact email for the certificates.
      - "--acme.storage=acme.json"         # Stores certificates in the file "acme.storage".
      - "--acme.tlsChallenge=true"         # Uses TLS Challenge.
      - "--acme.onHostRule=true"           # Get cert's domain names from frontend rules.
      - "--docker.domain=lab01.demo.containous.cloud"
    labels:
      - "traefik.enable=false"
```

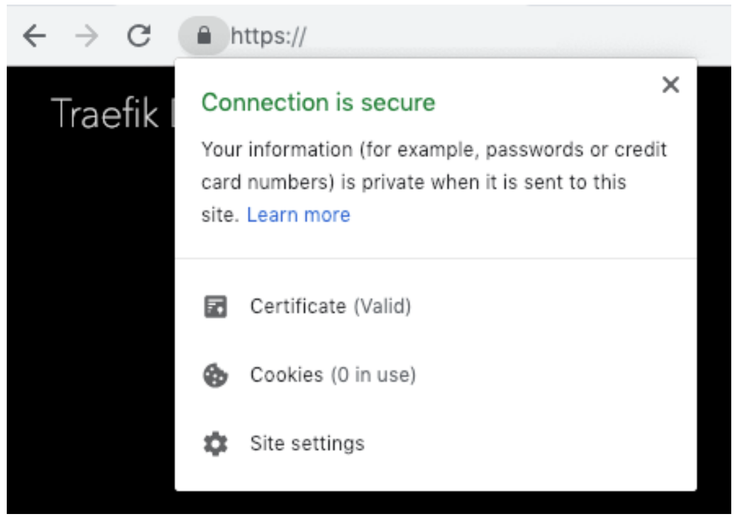
- Step 2: Update the `edge` service

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

Reality Check

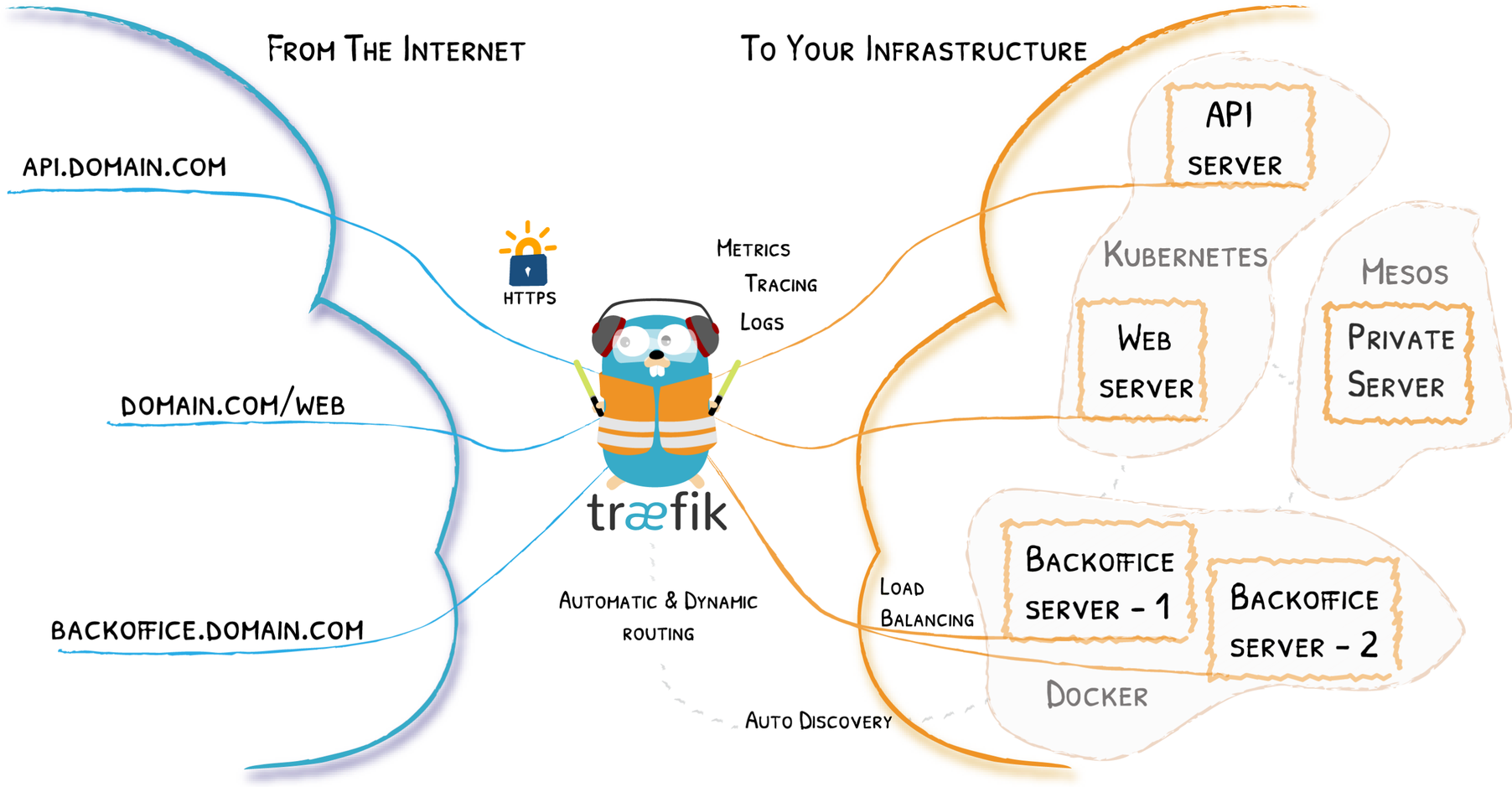
- Wait a few seconds (time to get the certificate from Let's Encrypt) and reload the main page:

https://lab01.demo.containous.cloud



Lab 2 Traefik & Kubernetes

Remember The Diagram?



In Kubernetes

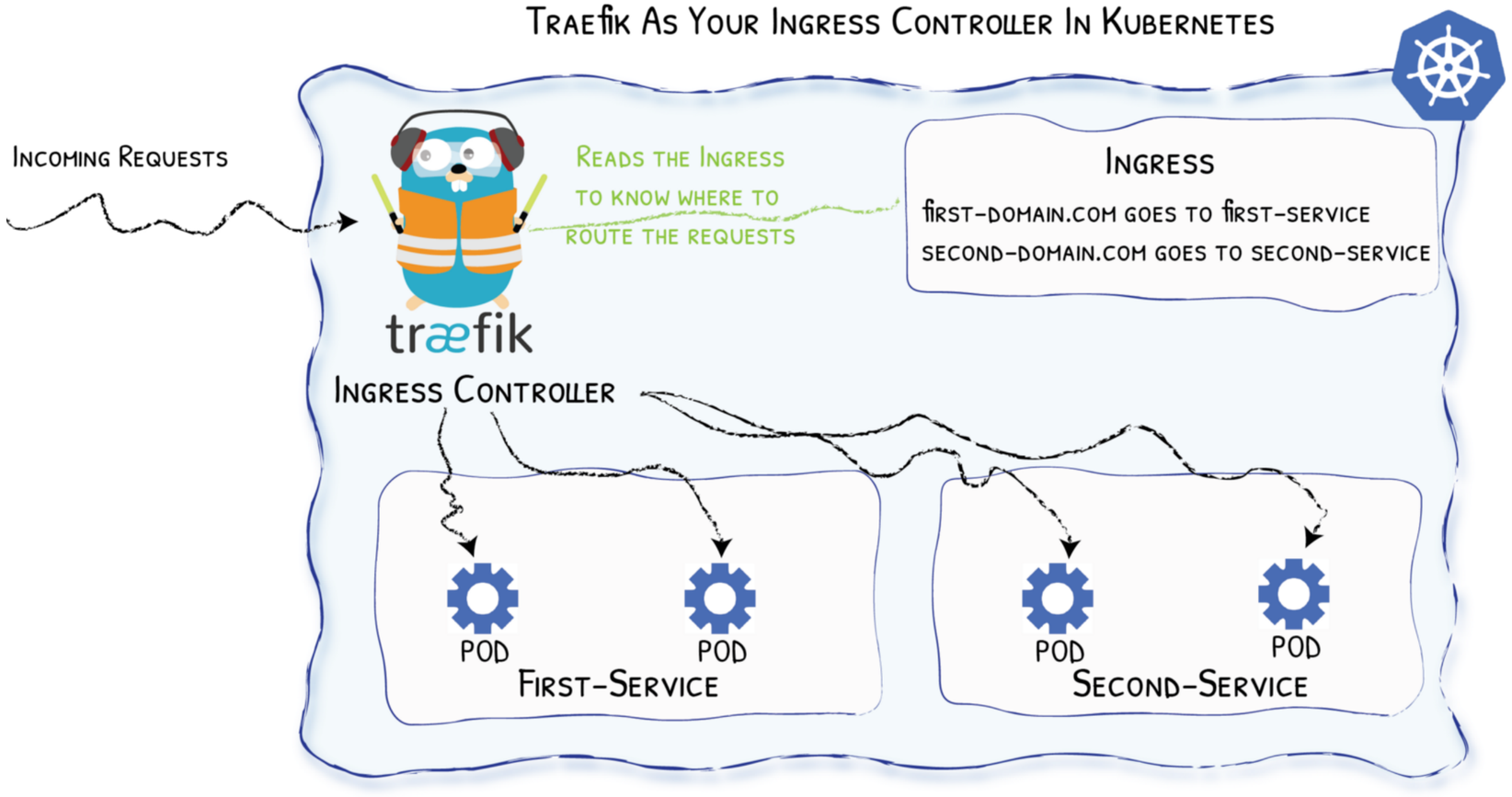


Diagram from https://medium.com/@geraldcroes

Let's Go

The House

The House

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

- keep the Docker services
- migrate Traefik to Kubernetes
- access to the Docker services through Traefik in Kubernetes

Infrastructure Setup

- A Google Cloud GKE server with a public IP `35.178.178.237` and SSH access
- A domain name `lab01.demo.containous.cloud` pointing to `35.178.178.237`

```
$ dig +short lab01.demo.containous.cloud
35.178.178.237
```

- Kubernetes and Helm to deploy the infrastructure

Reality Check

http://lab01.demo.containous.cloud/

This site can’t be reached

refused to connect.

Search Google for

ERR_CONNECTION_REFUSED

Agenda

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

Traefik Setup

- Step 1: Install Helm

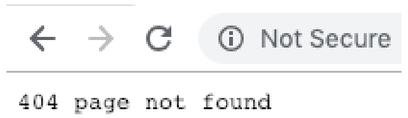
```
curl https://raw.githubusercontent.com/kubernetes/helm/master/scripts/get | bash
# add a service account within a namespace to segregate tiller
kubectl --namespace kube-system create sa tiller
# create a cluster role binding for tiller
kubectl create clusterrolebinding tiller \
    --clusterrole cluster-admin \
    --serviceaccount=kube-system:tiller
# initialized helm within the tiller service account
helm init --service-account tiller
# updates the repos for Helm repo integration
helm repo update
```

- Step 2: Deploy Traefik

```
helm install stable/traefik \
 --name traefik-devoxx \
 --namespace devoxx \
 --set rbac.enabled=true \
 --set service.annotations."cloud\.google\.com/load-balancer-type"=Internal \
 --set imageTag=1.7.10
helm ls
```

Reality Check

http://lab01.demo.containous.cloud/



It’s good: we have an HTTP answer!

Agenda

- 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://lab01.demo.containous.cloud/index.html
  -> Traefik
    -> http://<Webserver Private IP>/index.html
```

The Web Server Setup

- Step 1: Declare a Headless Service

```yaml
---
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: 18.196.121.238
```

- Step 2: Declare the Ingress Rule

```
---
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: web-ingress
  namespace: devoxx
  labels:
    guilde: web
  annotations:
    kubernetes.io/ingress.class: 'traefik'
    # Indicate to Traefik to not set the original Host
    # as a Host Header to allow the redirection
    traefik.frontend.passHostHeader: "false"
    traefik.frontend.rule.type: PathPrefix
spec:
  rules:
  - host:
    http:
      paths:
      - path: /
        backend:
          serviceName: web-service
          servicePort: traefik-http
```

- Step 3: Apply the configuration

```
kubectl apply -f ./web/svc-ingress.yml
```

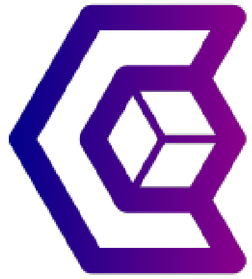
Reality Check

http://lab01.demo.containous.cloud/

It’s good: we have a web page!


We Have
Stickers!
træfik

We Are Hiring!



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

Thank You!

@nicomengin nmengin

@DamienDuportal dduportal

- Slides (HTML): https://containous.github.io/slides/devoxx-fr-2019
- Slides (PDF): https://containous.github.io/slides/devoxx-fr-2019/slides.pdf
- Source on : https://github.com/containous/slides/tree/devoxx-fr-2019