

.NET ON KUBERNETES

THE GOOD,
THE BAD,
THE IMMUTABLE



CONTENTS

- Lowdown on Kubernetes
- State of dotnet
- Walking around EKS
- Gotchas
- Demo of the kubectl command line

LOWDOWN ON KUBERNETES

- Trendy for some reason
- Scalable
- Industry decoupling
- Any programming language
- Containerization is sizzling

CONTAINER ORCHESTRATION OR JENGA BLOCKS?



SERIOUSLY, WHAT'S SO COOL ABOUT KUBERNETES ANYWAYS?

- Cloud or on-prem agnostic-ity
- Developer habits
- The more things changes, the more things stay the same
- All major clouds provides K8s
- Very geeky
- Backed by a strong foundation: CNCF/LF
- The DevOps space is growing up and empowering for developers

STATE OF DOTNET



STATE OF DOTNET



Jeff Handley 🇺🇦 #StandWithUkraine @JeffHandley · Apr 22

Not go

43

.NET Developer Community

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320,000+

stars on GitHub

275,000+

followers on Twitter

350,000+

members on Meetup

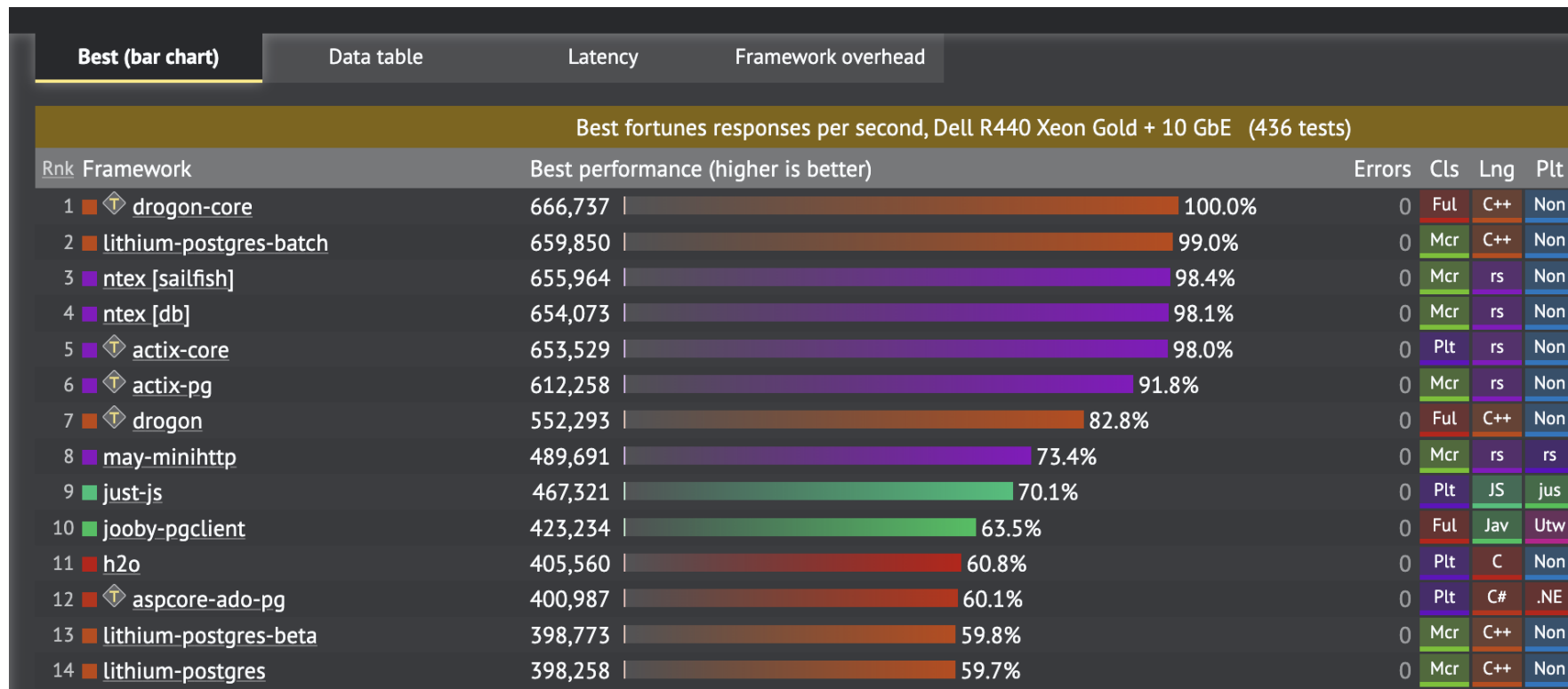
Get connected!

Join millions of developers around the globe building apps with and contributing to .NET.

for C# and are removing it from C# 11. We may return to this area again at a later date.”

The people have spoken.

AND ITS FAST!



Source: <https://www.techempower.com/benchmarks/>



MY JOURNEY

HOW I FELL INTO
THIS SPACE...

THIS SLIDE
DESIGNED TO
GIVE ME SOME
CREDIBILITY ;-)



ROB KOCH



- Working at Slalom Build; prior S&P Global
- Principal Architect – Data Engineering
- Deaf, wife, 3 kids
- Running's my new passion – started mid-2018
- 25 years as developer: Microsoft Access, VB4/VB6, .NET, relational databases, big data, event-driven architecture.
- AWS Data Hero 2019
- @robcube



EEEEEEKS

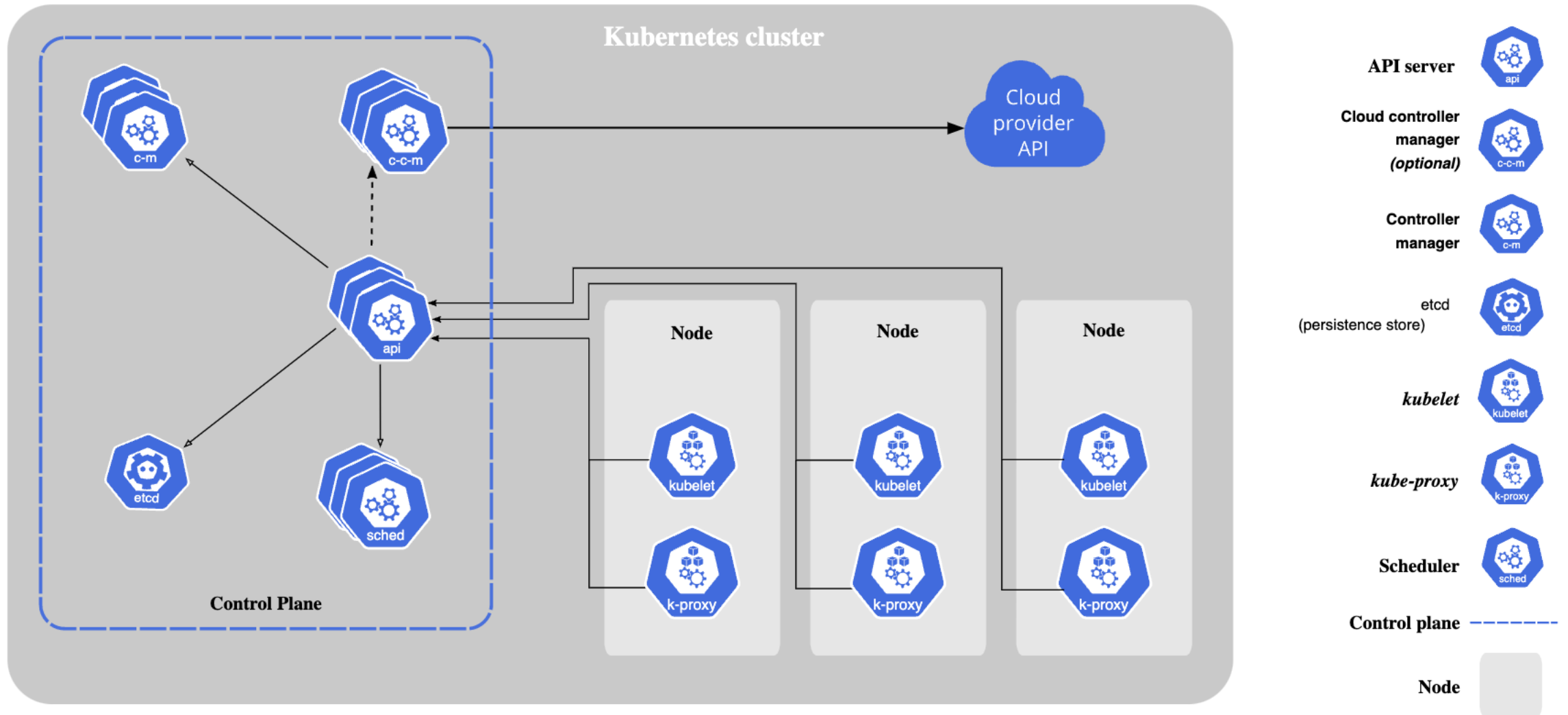


Amazon
EKS

WALK AROUND
ELASTIC
KUBERNETES
SERVICE



CUSTOMARY DIAGRAM



LET'S TAKE A
LOOK AT MY
EKS SETUP



SETTING ALIAS K='KUBECTL'

- My favorite kubectl trick:
- Setting alias k='kubectl', depending on your shell setup will be different.

- I'm using Oh My ZSH:

```
$ echo $ZSH_CUSTOM
```

```
/Users/robko/.oh-my-zsh/custom
```

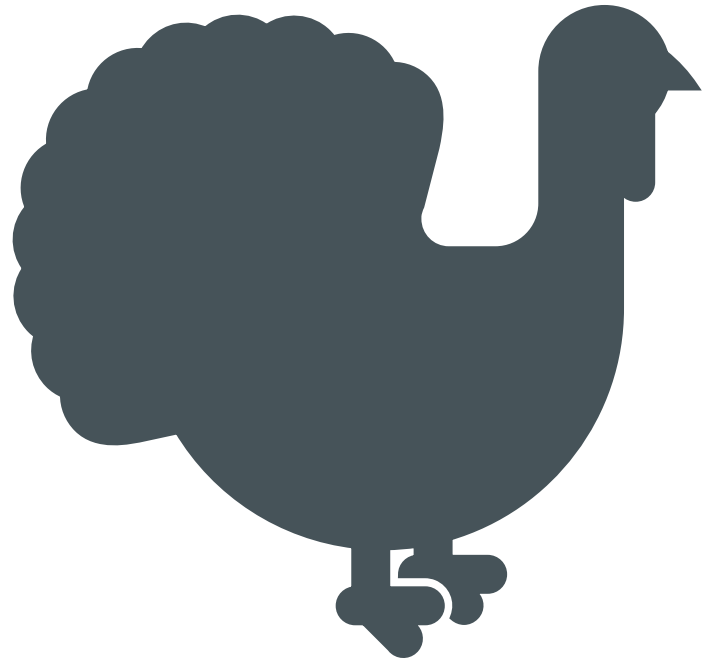
```
$ cd $ZSH_CUSTOM
```

```
$ echo "alias k='kubectl'" > alias.zsh
```

To trigger the alias:

```
$ source ~/.zshrc
```

WHAT ARE THE GOTCHAS?



- Visual Studio Docker support
- Which Linux flavor?
- Subnet tagging
- IAM Role generation
- Apple Mac M1
- Public-facing URL/ports
- Debug containers
- Load testing

Play-With-Kubernetes (main)

Solution Items

.gitignore

Dockerfile

docker-compose

.dockerignore

docker-compose.yml

docker-compose.override

Play-With-Kubernetes

Connected Services

Dependencies – 1 update

Controllers

StockController.cs

WeatherForecastControll

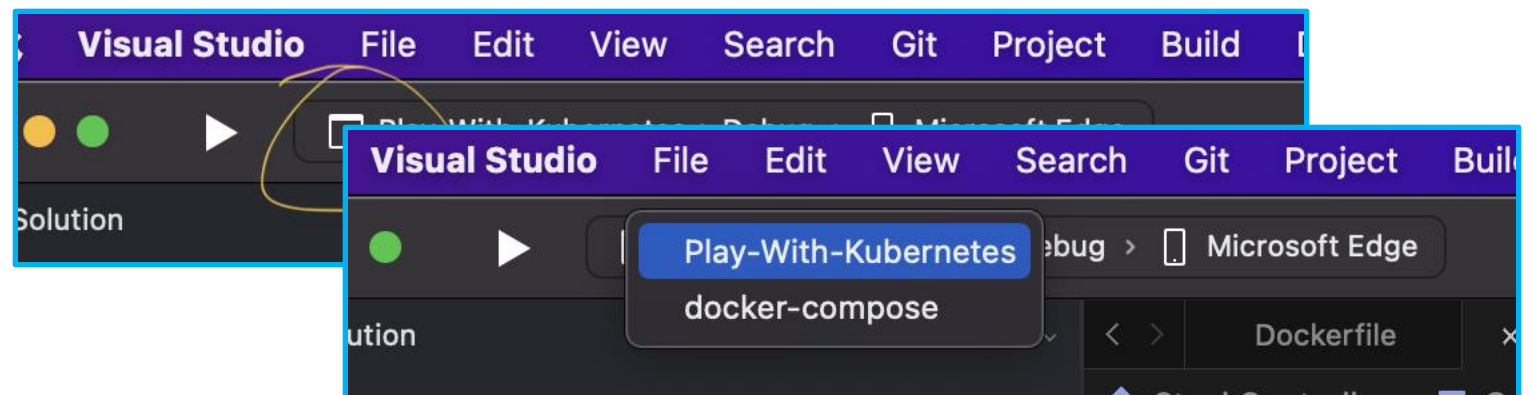
VISUAL STUDIO DOCKER SUPPORT

- docker-compose
- docker-compose-override

You're almost always going to end up always combining the two so what gives?

- Otherwise, very pleasantly surprised with the ease of using containers with VS Preview for Mac.

Look! You can select whether you want to run as a container:



LINUX FLAVOR



alpine
Linux

VPC SUBNET TAGGING

- At least two subnets in different Availability Zones. The AWS load balancer controller chooses one subnet from each Availability Zone. When multiple tagged subnets are found in an Availability Zone, the controller chooses the subnet whose subnet ID comes first lexicographically. Each subnet must have at least eight available IP addresses.

If you're using multiple security groups attached to worker node, exactly one security group must be tagged as follows. Replace `cluster-name` with your cluster name.

- **Key** – `kubernetes.io/cluster/cluster-name`
- **Value** – `shared` or `owned`

Source: <https://docs.aws.amazon.com/eks/latest/userguide/alb-ingress.html>

IAM ROLE BINDING

- So many roles, so little time!
- Hot tip: creating containers using eksctl which uses CloudFormation is best/easiest

eksctl

AWS Management Console

AWS CLI

Prerequisite

Version 0.94.0 or later of the `eksctl` command line tool installed on your computer or `eksctl`, see [Installing eksctl](#).

Create an Amazon EKS IPv4 cluster with the Amazon EKS latest Kubernetes version in your region. If you create an IPv6 cluster, you must deploy your cluster using a config file. For an example, see [Deploying an Amazon EKS IPv6 cluster](#). For the `example-values` file, replace `1.22` with any supported Kubernetes version. It must start with an alphanumeric character (case-sensitive) and hyphens. It must be 1-128 characters.

APPLE M1 CHIP

- The M1 is ARM-based
- Linux is Intel/AMD-based
- So what do we doooooo?

CRASHLOOPBACKOFF

\$ kubectl get all

NAME	READY	STATUS	RESTARTS	AGE
pod/dotnetapi-6ddf74d84f-whfkh	0/1	CrashLoopBackOff	10	28m

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
service/dotnetapi	LoadBalancer	10.100.89.251	a58787613f9364bdfa464566c617f99e-999086863.us-west-2.elb.amazonaws.com	80:31115/TCP	45m
service/kubernetes	ClusterIP	10.100.0.1	<none>	443/TCP	12h

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
deployment.apps/dotnetapi	0/1	1	0	45m

NAME	DESIRED	CURRENT	READY	AGE
replicaset.apps/dotnetapi-6ddf74d84f	1	1	0	45m

FINDING LOGS

```
$ kubectl logs dotnet-deployment-5d6c655fc4-lvkq7
```

```
standard_init_linux.go:228: exec user process caused "exec format error"
```

Tells me that the exec format is not right.

Google-fu got me to this:

<https://stackoverflow.com/a/70614305/73382>

Problem solved, moving on...

Need to go through a few things:

- Install aws-load-balancer-controller, you can find it in EKS docs
- Got error when checking logs after it shows 0/2
 - "error": "WebIdentityErr: failed to retrieve credentials\ncaused by: AccessDenied: Not authorized to perform sts:AssumeRoleWithWebIdentity\n\tstatus"
- Because I started creating EKS cluster using AWS Management Console and then backed out and used eksctl instead.
- Took a look at the service

```
$ kubectl get svc
```

- Look for address under EXTERNAL-PORT(S)

```
$ kubectl get svc
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-PORT(S)	AGE
dotnet-service	LoadBalancer	10.100.44.103	a233fhuw83bdsfsu3rbyd3dd-1527972464.us-west-2.elb.amazonaws.com	8080:32535/TCP 8h
kubernetes	ClusterIP	10.100.0.1	<none>	443

```
/TCP 28h
```

PUBLIC FACING
URLS

DEBUG CONTAINERS

Easy peasy:

- Shell into dotnet containers:

```
$ kubectl exec -it dotnetapi-58b44cb8bf-955rd /bin/sh
```

- Shell into other containers to see traffic

```
$ kubectl run -i --tty --rm debug --image=busybox --restart=Never -- sh
```


LOAD TESTING

- This is fun to see containers scale.
- Takes about 5 minutes to scale down
- To scale up, it varies by CPU/memory and using “hpa” (horizontal pod autoscaler)

```
$ kubectl autoscale deployment dotnet-deployment --cpu-percent=20 --min=1 --max=10
```

When you autoscale, you can lower the % as low as you want to see pods scale.

- Another terminal window and use curl:

```
$ for ((i=1;i<=100;i++)); do curl -X 'GET' 'http://hdf737h347rfh43h7hdf437fh77hf43f54-62704582.us-west-2.elb.amazonaws.com:8080/Stock?page=1&pageSize=200000'; done
```

This'll cause pods to crank up the CPU cycles quick!

- Add sleep 0.5 as an example, maybe 5... it's some work playing with scaling.

```
$ for ((i=1;i<=100;i++)); do curl -X 'GET' 'http://hdf737h347rfh43h7hdf437fh77hf43f54-62704582.us-west-2.elb.amazonaws.com:8080/Stock?page=1&pageSize=200000'; sleep 0.5; done
```

- Tweak the hpa as much as you want to

```
$ kubectl edit hpa dotnet-deployment
```

DOTNET CODE TIME!

Some of the trials and tribulations I had when working with it
Kick the tires out of the Dockerfile
How to start building containers and getting it up to AWS

.NET



DEMO – WRAPPING UP – Q&A

- Open source community
- Dotnet community
- AWS Community
- Stack Overflow
- Google & Bing search
- S&P Global for giving me the Kubernetes bug
- Slalom Build for letting me give this talk
- Sign language interpreters! 🙋

THANK YOU!

LINK LIBRARY

- <https://docs.aws.amazon.com/eks/latest/userguide/create-cluster.html>
- <https://www.youtube.com/watch?v=ZOROT9yMp44>
- <https://medium.com/@pczarkowski/kubernetes-tip-run-an-interactive-pod-d701766a12>
- <https://docs.aws.amazon.com/eks/latest/userguide/alb-ingress.html>
- <http://localhost:8001/api/v1/namespaces/kubernetes-dashboard/services/https:kubernetes-dashboard:/proxy/>
- <https://medium.com/bi3-technologies/deploy-dockerized-asp-net-core-web-api-on-aws-eks-fargate-94a64357d0e1>
- <https://dev.to/christianzink/how-to-build-an-asp-net-core-kubernetes-microservices-architecture-with-angular-on-local-docker-desktop-using-ingress-395n>
- <https://stackoverflow.com/questions/42494853/standard-init-linux-go178-exec-user-process-caused-exec-format-error>
- <https://generatedata.com/generator>