Demystifying Docker, Kubernetes, Rancher, Portainer, containerization, CI/CD pipeline, microservices, etc.
I need to know why moving our app to the cloud didn't automatically solve all our problems.

You wouldn't let me re-architect the app to be cloud-native. Just put it in containers.

You can't solve a problem just by saying techy things. Kubernetes.
• **Buzzwords:** Docker, Kubernetes, Rancher, Portainer, containerization, CI/CD pipeline, microservices, etc.
  – Why should we care about these things?
  – How are they related to each other (if indeed they are related)?
Douglas Adams 3 rules of technology:

1. Anything that is in the world when you’re born is normal and ordinary and is just a natural part of the way the world works.

2. Anything that's invented between when you’re fifteen and thirty-five is new and exciting and revolutionary and you can probably get a career in it.

3. Anything invented after you're thirty-five is against the natural order of things.
Why I follow this stuff?

• I’m a UNIX sysadmin & developer

• The cloud native landscape feels natural & fun
  – UNIX philosophy → microservices
  – NIS & NFS → IaC & cloud
  – .cfg/.rc → .json/.yaml
  – Makefiles → Makefiles
  – UNIX → Linux (& BSD)
CI  CD (orchestrate, automate, IaC, EIEIO, etc.)
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devop
CI  CD (orchestrate, automate, IaC, EIEIO, etc.)

devop  SRE
CI    CD (orchestrate, automate, IaC, EIEIO, etc.)

devop

Gitops?

SRE
devsecops?
IT WORKS ON MY MACHINE

THEN WE'LL SHIP YOUR MACHINE

AND THAT IS HOW DOCKER WAS BORN
Containers and why are they good

- OS virtualization (=BSD jails)
  - namespace (restrict what container sees using syscalls)
  - cgroups (limits resources container uses)
  - chroot (sets / to the container image) – also /proc

- Liz Rice Containers from Scratch:
  - [https://www.youtube.com/watch?v=8fi7uSYlOdc](https://www.youtube.com/watch?v=8fi7uSYlOdc)

- Use underlying Linux kernel + container runtime
  - Except Hyper-V containers & LCOW which provide a separate kernel for each container
Containers and why are they good

• Easier to develop/evolve **microservices**
  – UNIX philosophy at work
  – Containers can be combined to create larger services
  – Containers can be scaled (unevenly too)
  – Just makes sense (comp sci is all about containers nowadays)
  – Can be used to add virtualized apps to an existing on-prem system or cloud VM

• Want to learn Docker?
  – Docker Desktop comes with great tutorial (macOS run a Linux VM, Windows uses WSL2)
  – Can also try: [https://labs.play-with-docker.com/](https://labs.play-with-docker.com/)
Containers and why are they good

• Container runtimes:
  – **LXC** (LXD is just LXC's REST tool) – sysadmins/proxmox
  – **Docker** = LXC + portable deployment (1 object with multiple containerized apps) + versioning + component/library reuse (index.docker.io)
  – **Podman** (daemonless Docker)
  – **CRI-O** (made for Kubernetes)
  – **containerd** (CRI-compliant)
Containers and why are they good

- **Kubernetes** natively supports CRI-O/containerd (Docker with a shim, but that is deprecated)
- Developers typically use Docker, Podman to create **OCI-compliant** container images that work on any container runtime (**cloud native**)

Run your crappy software inside a container and **BANG! It's cloud native!**
When it comes to orchestrators

THERE CAN BE ONLY ONE
Kubernetes/K8S

- Is **NOT** hard
- You must put on your dev mindset at first
  - Microservice scaling is a developer-first thing!
  - K8S provides a common API for implementing containers and managing resources (pods, deployments, services, etc.)
- Start small
  - Docker Desktop, minikube, kind, Rancher Desktop (k3s), microk8s
- Sweat equity
- Later, you must put on your sysadmin mindset
  - Networking, security, authentication, storage
Cloud Native: The Series

• 2011: **Jenkins** was king
  – Nothing was simple, and devops meant devops

• 2012: ???

• 2013: **Docker** is the new kid on the block

• 2014: New orchestrators
  – **Rancher** was the hot new startup (managed Docker containers)
  – Jenkins bought by Cloudbees and put on maintenance?
  – **Docker Swarm & K8S**
Cloud Native: The Series

• 2015: Things get formal
  – Docker starts Open Container Initiative (OCI) → containerd (OCI-compliant)
  – Cloud-native Computing Foundation (CNCF)
  – OpenShift gains traction after it adopts Docker & K8S
  – Microsoft announces Docker support in upcoming Server 2016/10 builds

• 2016: K8S ~ IBM PC of the cloud world
He broke up with me because I'm ugly.

Oh no, don't say that!

You're beautiful.

He broke up because you wouldn't shut up about Kubernetes.
• 2017: K8S Gold rush
  – People start making management & reporting tools (e.g. Portainer)
  – The big PaaS providers got in on it (hyperscalers)
  – Docker gets much more attention
  – Big push towards promoting container/microservice-focused development (start of evangelism)
Cloud Native: The Series

• 2018: Everyone and their mother pivots to support K8S (*Jenkins X, Rancher*)
  – Shift to the other areas of cloud native landscape (security, auth, storage, DBs, etc.)
  – Docker gets freakin’ huge (and stable)
  – Dev evangelism supreme (Kelsey Hightower)
  – Role separation: SRE vs devops
Cloud Native: The Series

• 2019: pick your area(s)
  – Make K8S easier? Manage K8S clusters?
  – Do K8S differently? Rancher K3S (edge)
  – Security must be worth $$ (saturated quickly)
  – GitHub ecosystem started to mature (including workflow)
  – Tooling is really really good (developer-driven)
Cloud Native: The Series

• 2020:
  – Developers know what they’re doing.
  – SREs make $150k US (we need to figure out a product that will reduce the # of them needed)
  – Gold rush: Make K8S cheaper to maintain
  – SuSE buys Rancher (to keep up with the Red Hats)

• 2021:
  – This infrastructure stuff is never gonna be easy. SREs are necessary. We’ve got to find our niche (pick something small that others aren’t doing and run with it).
  – Umm….. What’s your workflow like? Tell us and we’ll send you a free mug.
  – Docker Desktop isn’t free for big companies
How do I keep up with this stuff?

• Attend as many online events/presentations as you can
  – SuSEcon
  – Red Hat Summit
  – CloudNativeCon
  – AllDayDevops
  – and many more...

• HackerNews