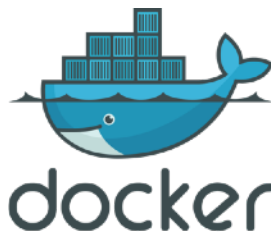# IPv6 on Container Plattforms

## Aarno Aukia

## VSHN AG

# About me

**Aarno Aukia**, CTO & Co-Founder @ VSHN

ETH → Google → Atrila → VSHN

@aarnoaukia   http://about.me/aarno

VSHN - The DevOps Company

Since 2014, currently 30 VSHNeers in Zürich, Switzerland

We help developers run web applications 24/7 in any cloud making both visitors happy with stability and developers happy with agility
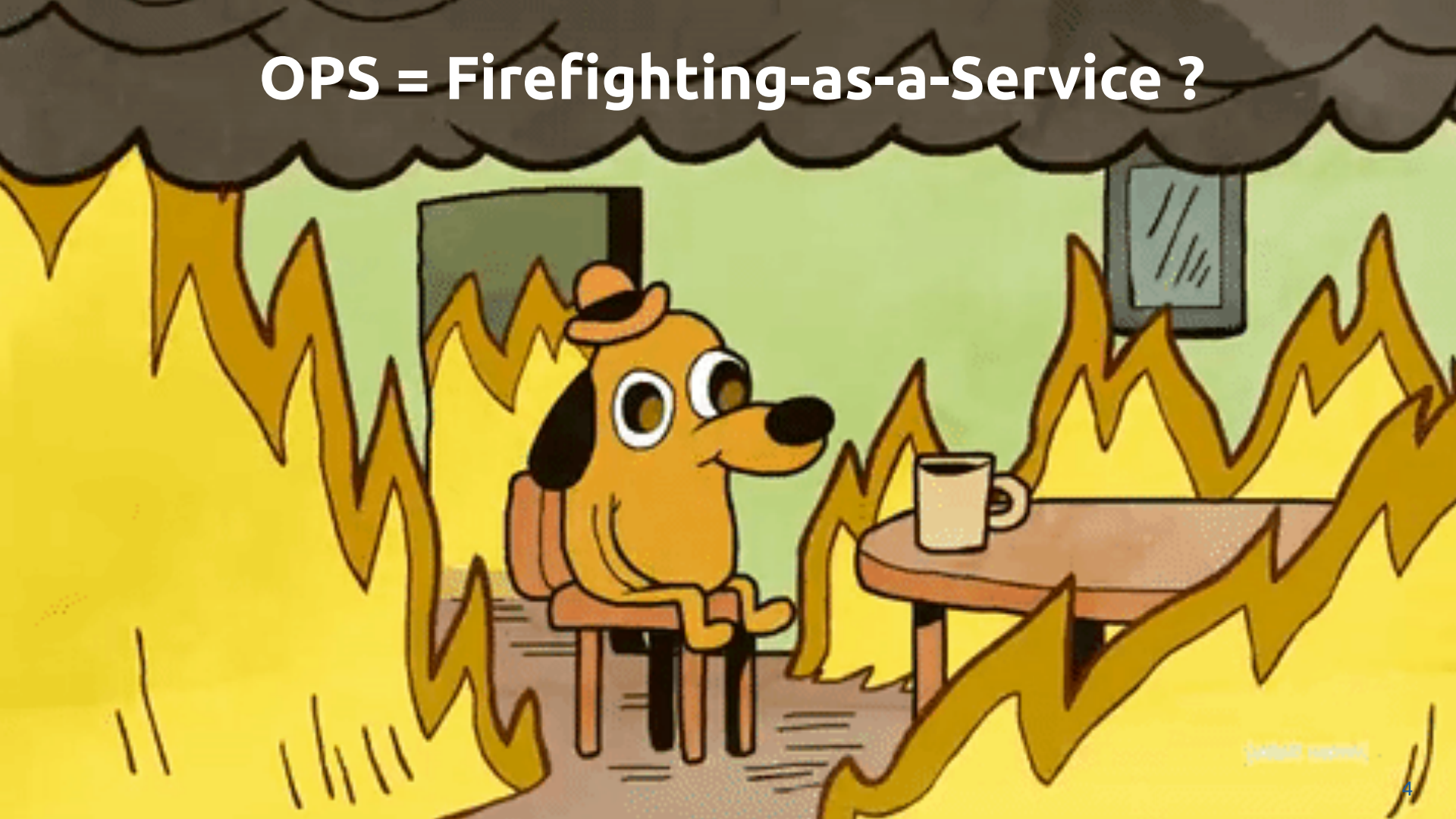
# Agenda

- About Aarno/VSHN.ch
- From Ops to DevOps
- From configuration management to containers
- Container orchestration/Kubernetes
- Kubernetes Distributions
- Kubernetes as a Service: APPUiO.ch
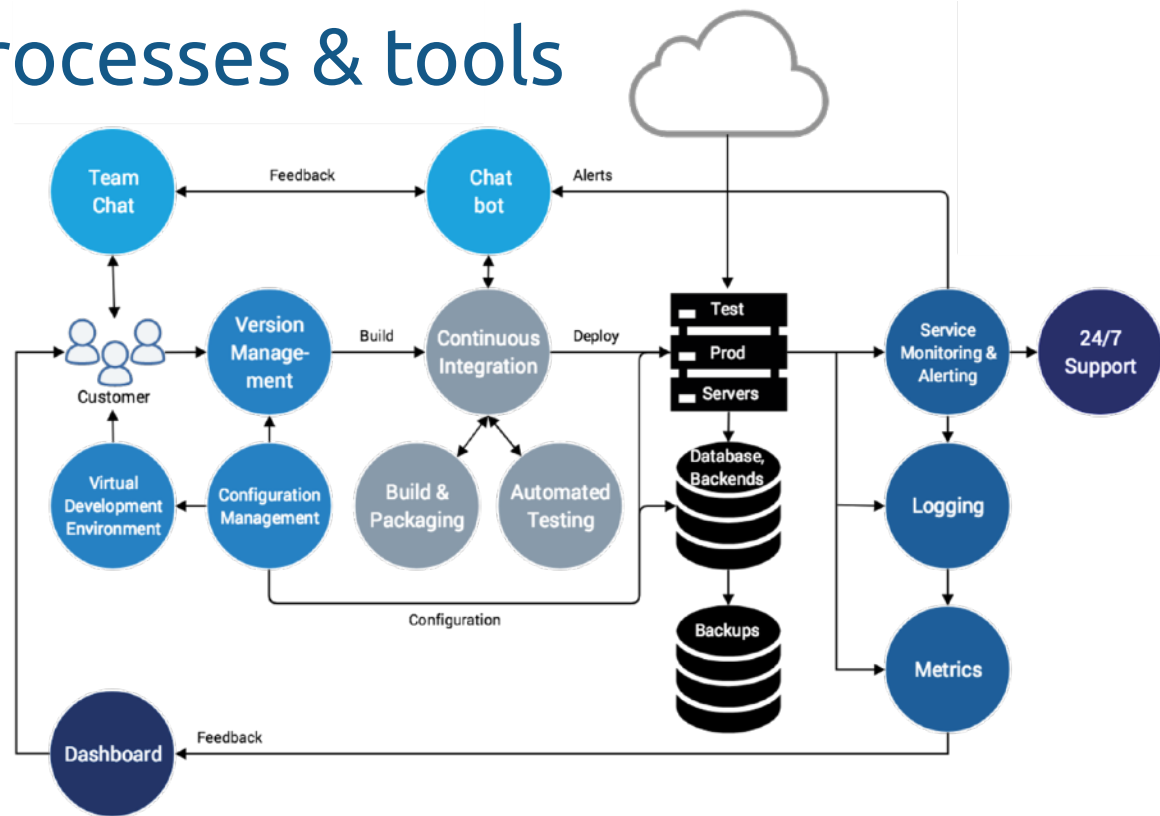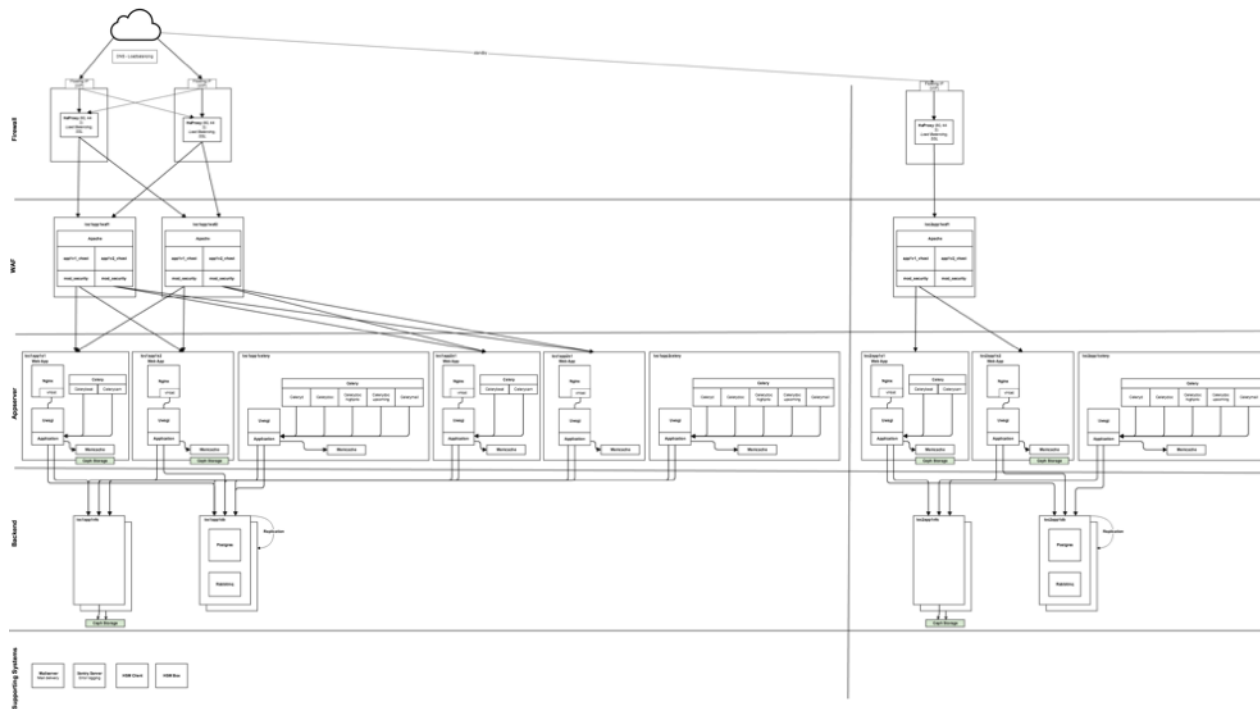- Cloud Native Computing
- Demo

OPS = Firefighting-as-a-Service ?

# DevOps
## people, processes & tools

# Customer project
## with Python, Celery, Postgres

# Challenges

- Scaling (virtual/cloud) servers takes minutes to hours, occasional manual intervention needed
- configuration management on server-level, not on project/deployment-level
- dependencies in separate GIT, separate coordination of versions & backends needed
- adding new services is complex, affects multiple components, lots of moving parts & risk
- managing service dependencies at runtime
- scaling up is OK, scaling down is difficult

# wishful thinking...

- Solving the build-ship-run workflow, integrated in CI/CD, DevOps and self-service-portal
- Isolation between environments, projects, services and customers/tenants
- solves software operations processes: hitless deployment, scaling, monitoring, backups, logs, metrics, etc
- Open standards: 100% open source software
- No vendor lock-in, cloud-native not cloud-only, working on any infrastructure
- extensible using APIs

# Docker

- Container runtime
- Tools for container image management
- Dockerfile describes application environment, can be built automatically and lightweight
- Packages application code, appserver, plugins, modules, libraries down to libc
- enforces 12 factor app patterns

    – https://vshn.ch/blog/docker/
    – https://github.com/docker/docker-ce/blob/master/components.conf

# 12 Factor App Patterns

- https://12factor.net/
- Use **declarative formats** for setup automation
- Have a **clean, portable contract** with the underlying operating system
- Are suitable for **deployment** on **modern cloud platforms**, obviating the need for servers and systems administration;
- **Minimize divergence** between development and production, enabling continuous deployment for maximum agility;
- And can **scale up** without significant changes to tooling, architecture, or development practices.

# IPv6 in Docker

- Implemented since January 2015
- Add --ipv6 to docker daemon command line flags
- -> add {"ipv6": true, "fixed-cidr-v6": "2001:db8:1::/64"} in /etc/docker/daemon.json
- sets up dual-stack bridge-device, routes & ip-forwarding

```
docker run -it alpine ash -c "ip -6 addr show dev eth0; ip -6 route show"
```

- https://docs.docker.com/v17.09/engine/userguide/networking/default_network/ipv6/

# From container to production?
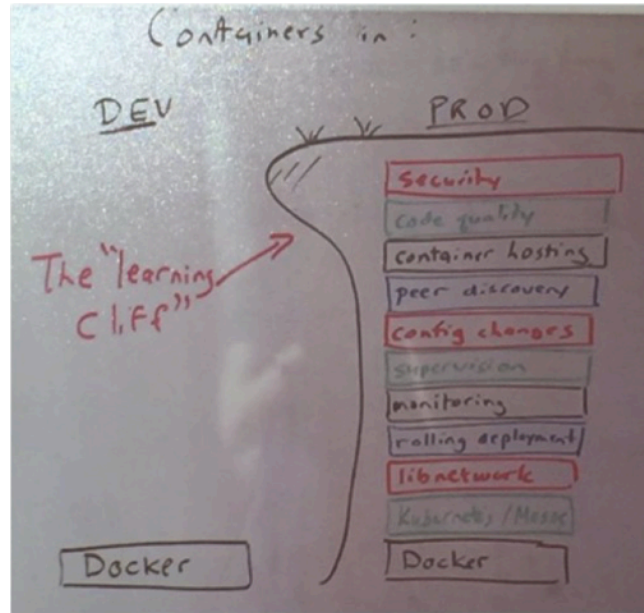


Michael Ducy
@mfdii

Containers in Dev vs Prod
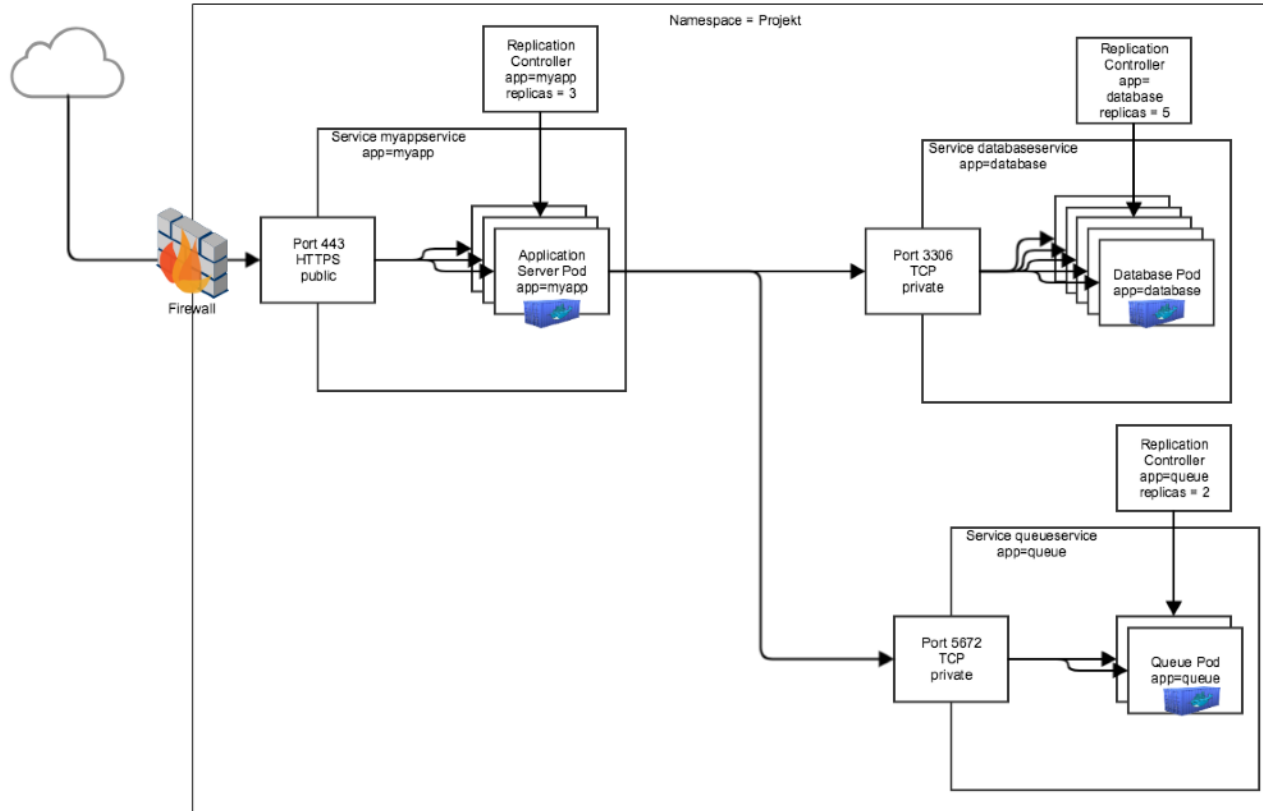10:27 PM - 10 Feb 2016
1,624    1,357

# Kubernetes

Container Orchestrator

- How many container instances should be running per service?
- On which IP/port/server are they running on?
- Service discovery
- What happens if a container/server goes away?
- scaling, load balancing, rolling deployments, persistent storage etc

# Kubernetes Architecture Example

# Kubernetes IPv6

- can currently only handle 1 IP-address per container/service internally
- that address can be IPv6 since Kubernetes 1.9 (December 2017)
  -> IPv4-only or IPv6-only
- More than 1 address (=dual-stack) -> scheduled for K8s 1.11 -> 1.12
- Ingress load balancers have been dual stack for longer, but are not part of Kubernetes

- Howto IPv6-Kubernetes: https://github.com/leblancd/kube-v6
- Scripts: https://github.com/leblancd/kube-in-the-box

# Kubernetes Distributions

Software distributions:

- Redhat OpenShift

- Rancher

- Canonical

- Docker Datacenter Enterprise

- IBM cloud private

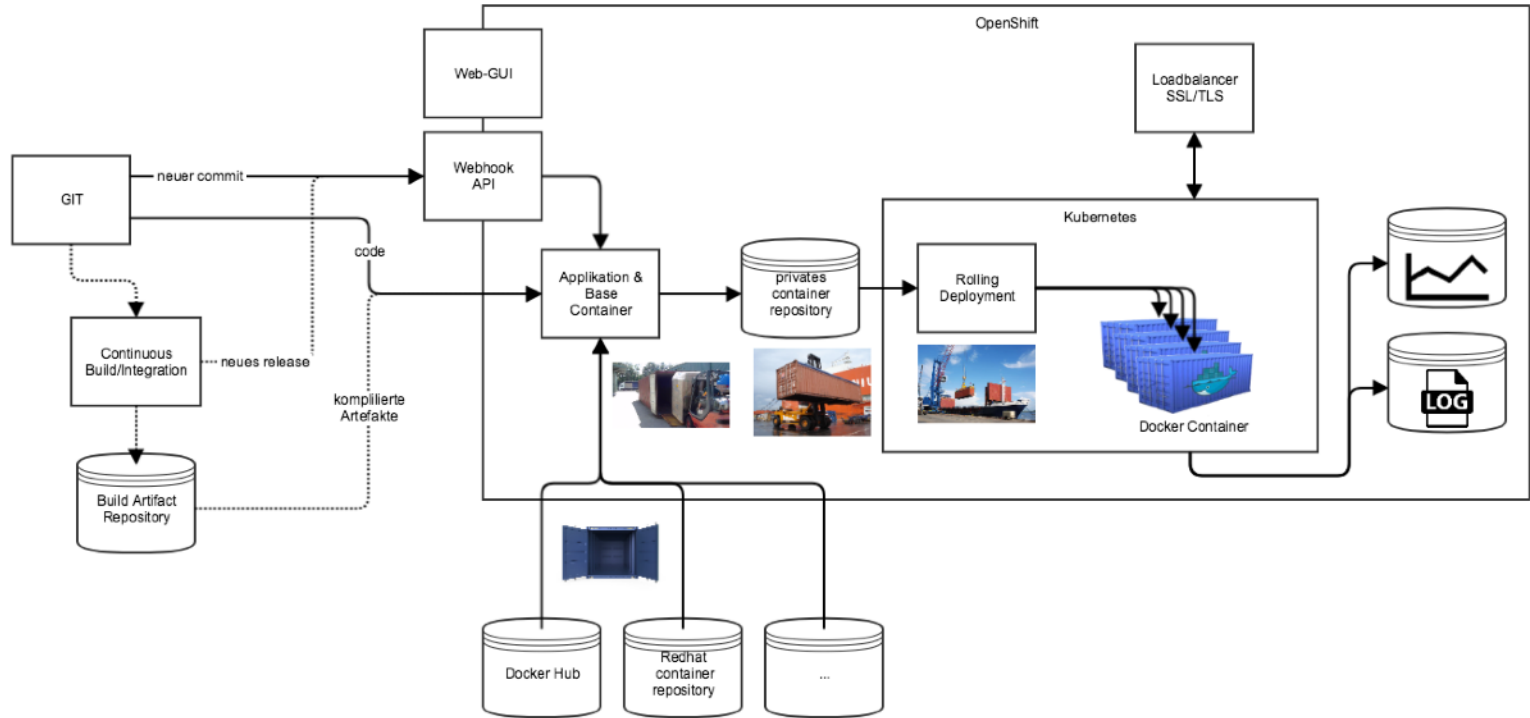- CoreOS Tectonic (aquired -> will be merged into OpenShift)

Services:

- EKS, AKS, GKE

- APPUiO.ch

See also https://thenewstack.io/find-perfect-kubernetes-distribution/

# OpenShift Architecture

# APPUiO - Swiss Container Platform

- Product from VSHN.ch
- Managed Docker, Kubernetes, OpenShift
- Shared clusters in Switzerland on cloudscale.ch, exoscale.ch or Swisscom
- Shared clusters worldwide on AWS, Azure
- Private clusters on any infrastructure and on-premises
- Free monthly half-day training/workshops: https://appuio.ch/techlabs.html

- Starting at CHF 40/month

# APPUiO Architecture
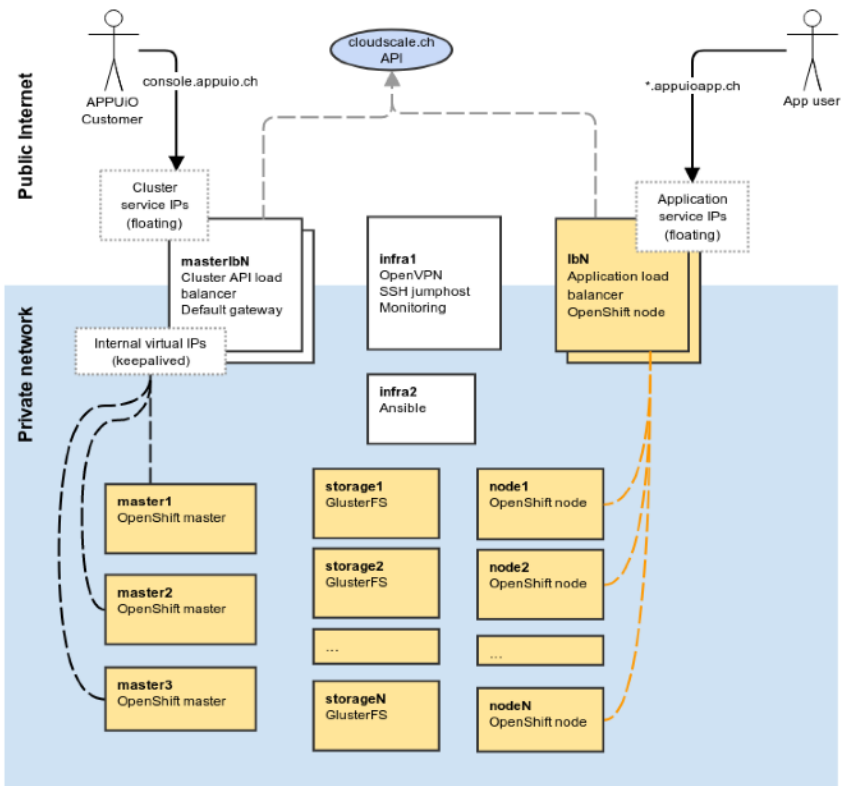
# OpenShift IPv6

- No internal dualstack/IPv6 due to missing feature in upstream Kubernetes
- Default HTTP(s)-Loadbalancer supports dualstack-IPv6 since Release 3.6 (August 2017)
- IPv6-IP-Failover added in Release 3.7 (November 2017)
- But broken (IPv6 address math seems to be hard)
- Supposedly fixed in Release 3.9 (March 2018, there was no 3.8)
- But broken (produces invalid VRRP config) -> thus not deployed on APPUiO.ch :(
- Fixed in 3.9 errata release, live at https:// swissipv6council.appuiolab.ch/

# Cloud Native Computing meetup

**Next Event**

22. November 2018 from 18:30 Uhr

https://www.meetup.com/Cloud-Native-Computing-Switzerland

**Please volunteer for Sponsoring & Talks**

https://cnc-meetup.ch

# Examples & Demo

- PHP example: https://github.com/arska/phpinfo
- Python example: https://github.com/arska/flask-helloworld
- Java/Spring example: https://github.com/appuio/springdemo

# Thanks!

**Would you like to work with IPv6 and Kubernetes?**

https://vshn.ch/jobs/docker-kubernetes/