Welcome to

Experiences with a small on-premise Kubernetes setup

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Slides are available as PDF, kramse@Codeberg

kubernetes-on-premise.tex in the repo security-courses

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You are welcome to drop me an email

Run K8s Anywhere

Kubernetes is open source giving you the freedom to take advantage of on-premises, hybrid, or public cloud infrastructure, letting you effortlessly move workloads to where it matters to you.

To download Kubernetes, visit the download section.

Disclaimer:
Kubernetes is everywhere and can support many interesting use-cases for hosting services, while some feel it is overkill - decide for yourself.

This talk is based on my experience as a Unix, Internet and Security person with researching K8s over some years and setting up my own infrastructure with Kubernetes in a small production setup.

Use the fine manual at the main site: https://kubernetes.io/

On-premise migration can also be part of digital sovereignty and data independence

Goals for today

- Experiences running the setup for one more year now
- How do you bring up a bare-metal test-cluster using Kubeadm, I use two small VMs for all of it
- Cilium as the network plugin - and listing some things I noticed, like your setup may be correct, but the version of cilium can have a problem
- Keeping your cluster connected to the outside world with BGP, worked nicely
- Show a Kubernetes lab and run some tools
- Point you towards resources, so you can get started with Kubernetes more securely.Plan for a modern featureful reasonably secure K8s bare-metal install – works for me

The garden

I use this to run a small set of services based on Nginx as ingress controller, and Nginx serving applications (very boring static sites generated using Jekyll) you can see the result at: https://garden.kramse.org which also documents this setup

TL;DR My setup has now run for quite some time, and is very stable. Comparable to my OpenBSD web servers and also on par with public clouds. Runs inside the Adeo Datacenter https://adeodc.dk/

My Intentions

I suspect you want to work with Kubernetes, maybe you already do, but:

- You are responsible for all of it
- You don't have the resources, knowledge, time, etc. for getting to know it all
- You have to create an architecture, as well as implement it
- ... and monitor it, ... and secure it

My intention is to be your sparring partner today, list all the parts I think must be considered.

Target Audience

- Overall target audience: operators, and developers becoming operators – devops
- Maybe secdevops - security personnel that needs some scalable systems running on K8s - like myself
- People being told to setup a K8s cluster – for some app

Disclaimer: I am not an expert in EVERYTHING Kubernetes

I am not an EXPERT
– but I have read a lot and watched youtube videos. ☺

Kubernetes is such a big ecosystem

The list is long, and an incomplete list contains:

- Kubernetes core components – software written by the project RBAC etc.
- Kubernetes supported container technologies, docker etc.
- Kubernetes dependencies – etcd software used for storing data
- Operating systems – and that lies below, storage
- Kubernetes networking providers – multiple exist, which one to choose – like Cilium
- Monitoring solutions – logging solutions

and on top all the applications in and around Kubernetes – NGINX, PostgreSQL, ...

Kubernetes: Production-Grade Container Orchestration

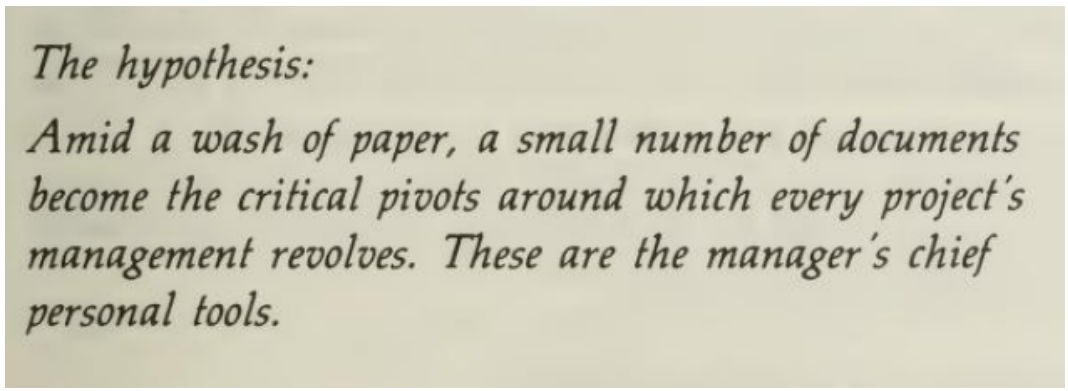
> Kubernetes, also known as K8s, is an open-source system for automating deployment, scaling, and management of containerized applications.
>
> It groups containers that make up an application into logical units for easy management and discovery. Kubernetes builds upon 15 years of experience of running production workloads at Google, combined with best-of-breed ideas and practices from the community.

Source: https://kubernetes.io/

Basics:

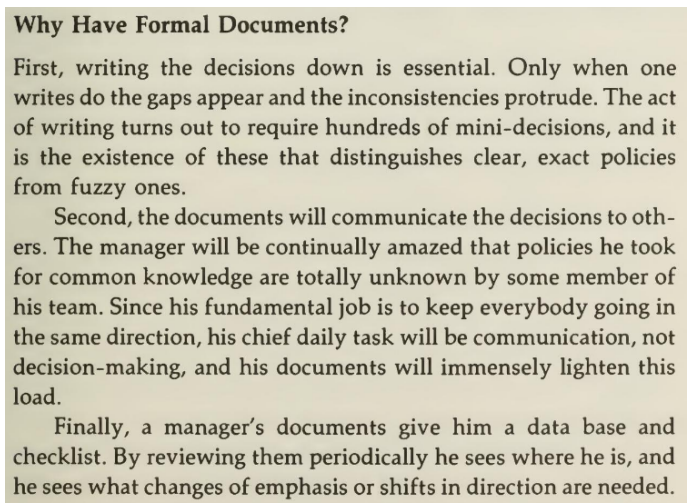
- I run two VMs for the K8s nodes – Debian 12
- Run NFS for storage – very easy to bind into the nodes
- Choose the Cilium for networking https://cilium.io/
- Cluster installed and maintained with Kubeadm https://kubernetes.io/docs/reference/setup-tools/kubeadm/

Document or it didn't happen



- Make sure to document!
- There are so many parts, so many decisions, soo many places thing can mess up
- Have a minimum of documentation – and the YAML files are not enough
- Hint: you can read the Mythical Man Month at https://archive.org/details/MythicalManMonth
- We also use decision records in my company:
  https://github.com/joelparkerhenderson/architecture-decision-record/
  https://github.com/joelparkerhenderson/decision-record/

Why Have Formal Documents



Why Have Formal Documents?

First, writing the decisions down is essential. Only when one writes do the gaps appear and the inconsistencies protrude. The act of writing turns out to require hundreds of mini-decisions, and it is the existence of these that distinguishes clear, exact policies from fuzzy ones.

Second, the documents will communicate the decisions to others. The manager will be continually amazed that policies he took for common knowledge are totally unknown by some member of his team. Since his fundamental job is to keep everybody going in the same direction, his chief daily task will be communication, not decision-making, and his documents will immensely lighten this load.

Finally, a manager's documents give him a data base and checklist. By reviewing them periodically he sees where he is, and he sees what changes of emphasis or shifts in direction are needed.

Source: *The Mythical Man-Month (Anniversary Edition)* by Frederick P. Brooks Jr.

- I use Git version control for my documentation purposes, some is in Zim Personal Wiki https://zim-wiki.org/
- I also use an IPAM https://spritelink.github.io/NIPAP/
- https://garden.kramse.org which also documents this setup

Adding administrators for people

```
kubeadm config print init-defaults > kubeadm.conf
kubeadm kubeconfig user --client-name=hlkadmin --config=kubeadm.conf > hlkadmin.conf
```

- I would recommend having multiple configs, even for yourself
- hlkadmin config used for administration
- hlkdeploy for deploying
- hlktester maybe even a testing user
- Read more about https://kubernetes.io/docs/reference/access-authn-authz/rbac/

RBAC, groups and namespaces

Kubernetes starts with three initial namespaces:

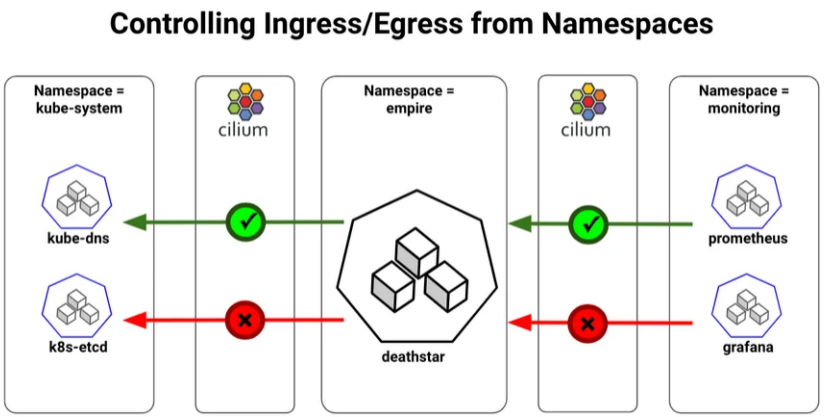
* default The default namespace for objects with no other namespace
* kube-system The namespace for objects created by the Kubernetes system
* kube-public This namespace is created automatically and is readable by all users (including those not authenticated).

Source: https://kubernetes.io/docs/tasks/administer-cluster/namespaces/

- I like namespaces, easy way to isolate stuff
- Allow for quotas – don't allow a test application to use all resources
- Easy network segregation – network policies
- Allows easy data isolation – who can access sensitive data
- I recommend groups, namespaces and roles for granting access – **do not grant permission to named users!**

Network parts

Lets move to networking and CNI plugin alternatives



- Container Network Interface (CNI) and Cloud Native Computing Foundation (CNCF) project https://github.com/containernetworking/cni
- Multiple options – popular and common ones Calico, Flannel, Weave and Cilium
- Cilium - I have followed Cilium for a while, so I choose that

Installing Cilium - part 1

```
hlk@cheese01:~/bin$ cat install-cilium.sh
#! /bin/sh
# Find releases with: cilium install --list-versions
cilium uninstall
echo waiting 15 seconds
sleep 15

API_SERVER_IP=::1
API_SERVER_PORT=6443

# May 27, 2025 this version was installed
#VERSION=1.16.3
# New version
#VERSION=1.17.4
# Not working with IPv6! Sounds like: https://github.com/cilium/cilium/issues/37817
# Reverted to 1.16, but newer version .10
VERSION=1.16.10
```

- As can be read, there has been problems along the way
- Ended up doing this complete uninstall and re-install, only a few minutes on my setup

Installing Cilium - part 2

```
# Gateway API CRDs
# Read on https://isovalent.com/blog/post/tutorial-getting-started-with-the-cilium-gateway-api/ it needs to be installed FIRST
kubectl apply -f https://github.com/kubernetes-sigs/gateway-api/releases/download/v1.2.0/standard-install.yaml
kubectl apply -f https://github.com/kubernetes-sigs/gateway-api/releases/download/v1.2.0/experimental-install.yaml

# Kubernetes was installed using these:
# So make sure to set the same!
NATIVE_CIDR=10.50.0.0/16
NATIVE_CIDR6="2a06:d380:9984:0::/96"

cilium install --version=$VERSION --helm-set ipam.mode=cluster-pool
--helm-set bgpControlPlane.enabled=true --helm-set k8s.requireIPv4PodCIDR=true --helm-set kube-proxy-replacement=strict
--helm-set prometheus.enabled=true          --helm-set operator.prometheus.enabled=true
--helm-set hubble.relay.enabled=true          --helm-set hubble.ui.enabled=true
--helm-set hubble.metrics.enabled="{dns,drop,tcp,flow,icmp,http}" --helm-set
--policy-audit-mode=true --helm-set hostFirewall.enabled=true  --helm-set devices='{enp1s0}'
--helm-set namespace=kube-system --helm-set ipv6.enabled=true --set enableIPv6Masquerade=false
--helm-set ipam.operator.clusterPoolIPv4PodCIDRList=$NATIVE_CIDR
--helm-set ipam.operator.clusterPoolIPv6PodCIDRList=$NATIVE_CIDR6
--helm-set ipam.operator.clusterPoolIPv4MaskSize=24 --helm-set ipam.operator.clusterPoolIPv6MaskSize=112
--helm-set bpf.masquerade=true --helm-set gatewayAPI.enabled=true
```

Installing Cilium - Finish up

We are missing the following lines from the install script, restart the thing:

```
#kubectl rollout restart daemonset -n kube-system cilium
kubectl -n kube-system rollout restart deployment/cilium-operator
```

Overall experience with cilium - great!

- I have tried both release candidates, production releases and had few problems
- It is quite easy to install cilium with the script, try a new / newer version
- It starts up quickly, and fails equally fast – where you can read why it didn't start
- My initial rules for Cilium has been very stable - including as the host firewall too!
  https://docs.cilium.io/en/latest/security/host-firewall/
- I find it cleaner to use Cilium for all network policies, ignoring IPtables
- You need only a few CiliumClusterwideNetworkPolicy resources defined for the cluster to work, and then you can allow Secure Shell from only a few places
- Note: While booting there might be a very short time where Cilium is starting, where packets are allowed YMMV

Worst when learning something new, trust yourself! You read the damn manual, but it didn't work - it might be a bug!

Document what you did, what it did

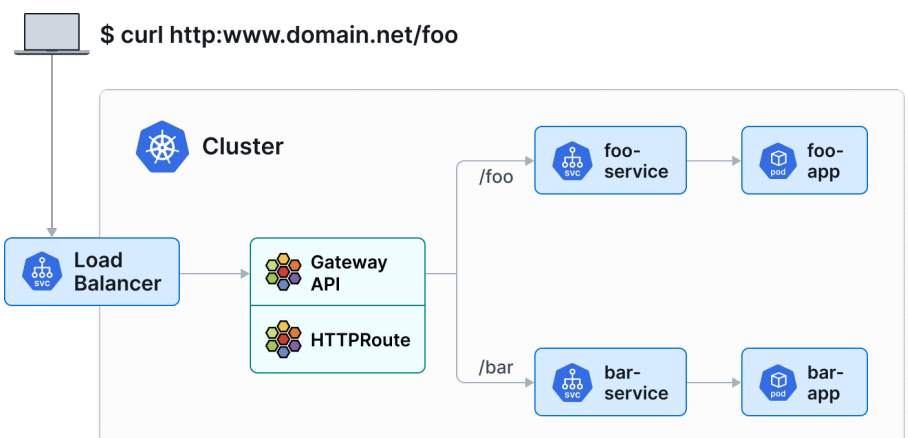
Initially I started out with much fewer options for cilium:

```
cilium install --version=1.13.0-rc4 \
               --helm-set ipam.mode=kubernetes --helm-set tunnel=disabled \
               --helm-set ipv4NativeRoutingCIDR="10.0.0.0/8" --helm-set bgpControlPlane.enabled=true \
               --helm-set k8s.requireIPv4PodCIDR=true --helm-set kube-proxy-replacement=strict
  Using Cilium version 1.13.0-rc4
 Auto-detected cluster name: kubernetes
 Auto-detected datapath mode: tunnel
 Auto-detected kube-proxy has not been installed
  Cilium will fully replace all functionalities of kube-proxy
  helm template --namespace kube-system cilium cilium/cilium --version 1.13.0-rc4 --set bgpControlPlane.enabled=true,
cluster.id=0,cluster.name=kubernetes,encryption.nodeEncryption=false,ipam.mode=kubernetes,
ipv4NativeRoutingCIDR=10.0.0.0/8,k8s.requireIPv4PodCIDR=true,k8sServiceHost=10.137.0.26,
k8sServicePort=6443,kube-proxyreplacement=strict,kubeProxyReplacement=strict,operator.replicas=1,
serviceAccounts.cilium.name=cilium,serviceAccounts.operator.name=cilium-operator,tunnel=disabled
...
 Waiting for Cilium to be installed and ready...
 Cilium was successfully installed! Run 'cilium status' to view installation health
```

Cilium Gateway and TLS

Initially I had started with NGINX Ingress and Cilium, quite simple in the cloud world.

Along the way I found out there is a new thing called Gateway API
https://kubernetes.io/docs/concepts/services-networking/gateway/



Source: https://cilium.io/use-cases/gateway-api/

Gateway API in real life

```yaml
---
apiVersion: gateway.networking.k8s.io/v1beta1
kind: Gateway
metadata:
  name: garden-gateway
  namespace: webservices
  annotations:
    cert-manager.io/cluster-issuer: "letsencrypt-prod"
spec:
  gatewayClassName: cilium
  infrastructure:
    annotations:
      io.cilium/lb-ipam-ips: 185.129.62.180, 2a06:d380:0:9985::1
# Not in 1.16.3 yet
#  addresses:
#  - type: IPAddress
#    value: 185.129.62.177
```

- I run my DNS seperate from K8s, so I allocate static IPs externally and add them here
- Also again note that some feature was not in the version I used originally etc.

Gateway API listeners

```
  listeners:
    - name: http-garden
      protocol: HTTP
      port: 80
      hostname: garden.kramse.org
      allowedRoutes:
        namespaces:
          from: All
... more port 80 listeners
    - name: https-garden
      protocol: HTTPS
      port: 443
      hostname: garden.kramse.org
      tls:
        mode: Terminate
        certificateRefs:
        - kind: Secret
          name: garden-tls
      allowedRoutes:
        namespaces:
          from: All
```

Gateway API HTTProute with TLS

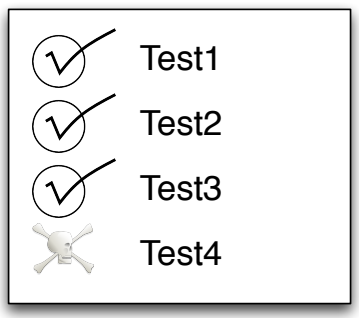
```yaml
apiVersion: gateway.networking.k8s.io/v1beta1
kind: HTTPRoute
metadata:
  name: http-app-tls
  namespace: webservices
spec:
  parentRefs:
  - name: garden-gateway
    namespace: webservices
  hostnames:
  - "garden.kramse.org"
  rules:
  - matches:
    - path:
        type: PathPrefix
        value: /
  - backendRefs:
    - name: nginx-garden
      port: 80
```

- End result is very easy to follow, connects things

Cilium and other CLI tools

- Many tools are executed via `kubectl`
- Others have their own command: kubeadm, crictl
- This can be very confusing, and again – document which tools you use!
- Having a **jump host with updated tools installed** might help – helps me!

Checking your Kubernetes deployment



- It can actually be hard to check your Kubernetes installation
- Especially networking in detail
- I would recommend spending a little time investigating Maximum Transmission Unit (MTU) https://en.wikipedia.org/wiki/Maximum_transmission_unit
- Your devices – switches and network cards can probably also offload some features to hardware
- Advanced users could dive deeper into *BPF and XDP Reference Guide* https://docs.cilium.io/en/latest/bpf/

Testing Connectivity

Cilium has a very nice built-in connectivity test:

```
root@k8s-1:~# cilium connectivity test
   Monitor aggregation detected, will skip some flow validation steps
  [kubernetes] Creating namespace cilium-test for connectivity check...
  [kubernetes] Deploying echo-same-node service...
  [kubernetes] Deploying DNS test server configmap...
  [kubernetes] Deploying same-node deployment...
  [kubernetes] Deploying client deployment...
  [kubernetes] Deploying client2 deployment...
  [kubernetes] Deploying echo-other-node service...
  [kubernetes] Deploying other-node deployment...
  [kubernetes] Waiting for deployments [client client2 echo-same-node] to become ready...
  [kubernetes] Waiting for deployments [echo-other-node] to become ready...
...
  All 31 tests (232 actions) successful, 0 tests skipped, 0 scenarios skipped.
root@k8s-1:~#
```

External IPs

Jumping directly in, I am running on bare metal. Getting external access into K8s is a bit hard. I decided to use Cilium, BGP, and IP pools

pool-zencurity.yaml:

```yaml
---
apiVersion: "cilium.io/v2alpha1"
kind: CiliumLoadBalancerIPPool
metadata:
  name: "pool"
spec:
  cidrs:
  - cidr: "185.129.62.144/28"
  - cidr: "2a06:d380:0:85::0/64"
```

- https://docs.cilium.io/en/latest/network/lb-ipam/
- I run a LIR (Local Internet Registry) with network AS57860 which have these addresses
- This part has been running flawlessly, no more comments - nice!

Result in my setup

```
hlk@cheese01:~$ k get gateway -A
NAMESPACE     NAME              CLASS    ADDRESS           PROGRAMMED   AGE
webservices   garden-gateway    cilium   185.129.62.180    True         228d
hlk@cheese01:~$ k get svc -A
NAMESPACE      NAME                            TYPE           CLUSTER-IP      EXTERNAL-IP                                PORT(S)
cert-manager   cert-manager                    ClusterIP      10.96.2.250     <none>                                     9402/TCP
cert-manager   cert-manager-cainjector         ClusterIP      10.96.14.165    <none>                                     9402/TCP
cert-manager   cert-manager-webhook            ClusterIP      10.96.214.76    <none>                                     443/TCP,9402/TCP
default        kubernetes                      ClusterIP      10.96.0.1       <none>                                     443/TCP
kube-system    cilium-envoy                    ClusterIP      None            <none>                                     9964/TCP
kube-system    kube-dns                        ClusterIP      10.96.0.10      <none>                                     53/UDP,53/TCP,9153/
webservices    cilium-gateway-garden-gateway   LoadBalancer   10.96.85.230    185.129.62.180,2a06:d380:0:9985::1         80:30137/TCP,443:32
webservices    nginx-files-kramse              LoadBalancer   10.96.234.56    185.129.62.176,2a06:d380:0:9985::2         80:30854/TCP,443:31
webservices    nginx-garden                    LoadBalancer   10.96.49.30     185.129.62.179,2a06:d380:0:9985::          80:31498/TCP,443:31
webservices    nginx-library-kramse            LoadBalancer   10.96.44.145    185.129.62.177,2a06:d380:0:9985::3         80:30420/TCP,443:30
```

Shortened quite a bit, but hopefully you can see there is an overview of things

Monitoring and updating – upgrades

Since Kubernetes is a complex system, I recommend making an initial deployment plan which is longer than a release cycle of Kubernetes. Currently new releases are coming out rapidly, so a 3-4 month plan should suffice.
Main goal is to try upgrading the cluster *before* you have production running!

https://kubernetes.io/releases/

You need to upgrade all parts, so remember which parts you use:

- Firmwares and supporting systems, routers, switches, server control, storage, ...
- Operating systems
- Kubernetes core components
- Cilium upgrade and various other plugins

I have upgraded multiple times using this method. Most upgrades have been unremarkable, good!

Performing upgrades: Cilium

When rolling out an upgrade with Kubernetes, Kubernetes will first terminate the pod followed by pulling the new image version and then finally spin up the new image. In order to reduce the downtime of the agent and to prevent ErrImagePull errors during upgrade, the pre-flight check pre-pulls the new image version.

```
root@gouda01:~# cilium upgrade
  Auto-detected datapath mode: tunnel
  Upgrading cilium-operator to version quay.io/cilium/operator-generic:v1.12.5...
  Upgrading cilium to version quay.io/cilium/cilium:v1.12.5...
  Waiting for Cilium to be upgraded...
```

- Cilium recommend a pre-flight check – pulls images beforehand etc: https://docs.cilium.io/en/current/operations/upgrade/
- A good example of how to prepare upgrades

Performing upgrades: CRI-O and K8s

Basically I follow the instructions from:
https://kubernetes.io/docs/tasks/administer-cluster/kubeadm/kubeadm-upgrade/

Example in mid May 2025, and 1.33 came out recently. I upgraded from 1.31 over 1.32 to 1.33, without problems

The process was for each upgrade

- Update repositories
- Upgrade kubeadm from say 1.32 which you are running to 1.33 which is the version you want
- Run `kubeadm upgrade plan` to check a few things
- Perform upgrade on controller to the version you want, like kubeadm upgrade apply v1.33.1
- Upgrade software, CRI-O container, kubectl and kubelet etc. just regular apt update/upgrade
- Do a reboot, controlled, chaotic, whatever :-D

kubeadm upgrade plan

```
# kubeadm upgrade plan
[preflight] Running pre-flight checks.
[upgrade/config] Reading configuration from the "kubeadm-config" ConfigMap in namespace "kube-system"...
[upgrade/config] Use 'kubeadm init phase upload-config --config your-config-file' to re-upload it.
W0525 20:44:37.362442  833945 configset.go:78] Warning: No kubeproxy.config.k8s.io/v1alpha1 config is loaded.
Continuing without it: configmaps "kube-proxy" not found
[upgrade] Running cluster health checks
[upgrade] Fetching available versions to upgrade to
[upgrade/versions] Cluster version: 1.32.5
[upgrade/versions] kubeadm version: v1.33.1
[upgrade/versions] Target version: v1.33.1
[upgrade/versions] Latest version in the v1.32 series: v1.32.5

W0525 20:44:44.068842  833945 configset.go:78] Warning: No kubeproxy.config.k8s.io/v1alpha1 config is loaded.
Continuing without it: configmaps "kube-proxy" not found
Components that must be upgraded manually after you have upgraded the control plane with 'kubeadm upgrade apply':
COMPONENT   NODE       CURRENT   TARGET
kubelet     cheese01   v1.32.5   v1.33.1
kubelet     cheese02   v1.32.5   v1.33.1
```

continued

```
Upgrade to the latest stable version:

COMPONENT                 NODE       CURRENT    TARGET
kube-apiserver            cheese01   v1.32.5    v1.33.1
kube-controller-manager   cheese01   v1.32.5    v1.33.1
kube-scheduler            cheese01   v1.32.5    v1.33.1
kube-proxy                           1.32.5     v1.33.1
CoreDNS                              v1.11.3    v1.12.0
etcd                      cheese01   3.5.16-0   3.5.21-0

You can now apply the upgrade by executing the following command:

        kubeadm upgrade apply v1.33.1
```

Then after running the apply:

```
[upgrade] SUCCESS! A control plane node of your cluster was upgraded to "v1.33.1".
```

Logs from my upgrade can be seen at https://garden.kramse.org/kubernetes-upgrade.html

Package installation: Kubernetes and CRI-O repositories

Then following the instructions from the packaging README.md:
https://github.com/cri-o/packaging/blob/main/README.md

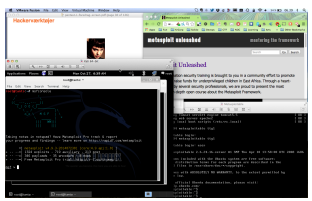
```
KUBERNETES_VERSION=v1.33
CRIO_VERSION=v1.33

curl -fsSL https://pkgs.k8s.io/core:/stable:/$KUBERNETES_VERSION/deb/Release.key |
  gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg

echo "deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg]
https://pkgs.k8s.io/core:/stable:/$KUBERNETES_VERSION/deb/ /" |
  tee /etc/apt/sources.list.d/kubernetes.list

echo "and CRI-O"
curl -fsSL https://download.opensuse.org/repositories/isv:/cri-o:/stable:/$CRIO_VERSION/deb/Release.key |
      gpg --dearmor -o /etc/apt/keyrings/cri-o-apt-keyring.gpg

echo "deb [signed-by=/etc/apt/keyrings/cri-o-apt-keyring.gpg]
https://download.opensuse.org/repositories/isv:/cri-o:/stable:/$CRIO_VERSION/deb/ /" |
  tee /etc/apt/sources.list.d/cri-o.list
```

The software upgrade

```
#  apt upgrade
  Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  cri-o cri-tools kubectl kubelet
4 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 66.5 MB of archives.
After this operation, 13.2 MB of additional disk space will be used.
Get:1 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.33/deb  cri-tools 1.33.0-1.1 [17.3 MB]
Get:2 https://ftp.gwdg.de/pub/opensuse/repositories/isv%3A/cri-o%3A/stable%3A/v1.33/deb  cri-o 1.33.0-2.1 [21.6 MB]
Get:3 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.33/deb  kubectl 1.33.1-1.1 [11.7 MB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.33/deb  kubelet 1.33.1-1.1 [15.9 MB]
Fetched 66.5 MB in 1s (76.9 MB/s)
...
```

- I have had very little trouble with the CRI-O and K8s software installation and maintainance

Kubernetes lab setup – proof of concept



- Hardware: any modern PC with modern CPU and virtualisation
  Don't forget to enable it in the BIOS
- Software: your favourite Linux distribution, I choose Debian
- Container software: pick CRI-O
- Smallest Kubernetes: Minikube - I run this on Debian
- Production deployment probably would use better tools like 🔧 `Kubeadm`
- Cilium for the networking part took some setup, quite a lot! Afterwards has been very easy
- Switching from NGINX Ingress to Gateway API with Cilium was well documented, even though a new feature

Conclusion Kubernetes on-premise

- It is hard getting started, took me a lot of YAML ☺
- Dont be discouraged – just learn some Linux, Debian, K8s, Cilium, BGP, NFS, YAML, NGINX, Git, Ruby, Jekyll and you are almost done
- Start out using something you know already. like I used Debian for the OS
- Trust yourself
- Multiple books have checklist – depending on your interests, some for developers, some for ops
- Example: Hacking Kubernetes chapter 10. has good advice too, including a small checklist for On-Premises Environments links on p249 to Build K8s Bare-metal cluster with external access
  https://medium.com/swlh/on-premise-kubernetes-clusters-b36660ca6914
  https://www.datapacket.com/blog/build-kubernetes-cluster
  https://medium.com/@apiotrowski312/bare-metal-kubernetes-with-helm-rook-ingress-prometheus-grafana-6a74857cc74

Questions?

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You are always welcome to send me questions later via email

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Materials – where to start

- This presentation – slides for today, start here
- *Kubernetes: Up and Running*, 3rd Edition, Brendan Burns, Joe Beda, Kelsey Hightower, August 2022
  Introduces containers and Kubernetes, books in 3rd ed also has been fixed and updated
- *Container Security*, (CS) Liz Rice, O'Reilly, Apr 2020
  A classic text about containers and a must read for everyone
- *Networking and Kubernetes: A Layered Approach*, James Strong, Vallery Lancey, O'Reilly, 2021
  K8s uses a lot of intricate networking – great for understanding this more
- *Learn Kubernetes Security* (LKS), Kaizhe Huang , Pranjal Jumde, Packt, July 2020
  This is a very complete and detailed view at K8s security, covering many many parts
- Advanced security practioners will enjoy security focused books like:
  Hacking Kubernetes: Threat-Driven Analysis and Defense, Andrew Martin, Michael Hausenblas, O'Reilly, October 2021
- *Kubernetes Best Practices: Blueprints for Building Successful Applications on Kubernetes*, Brendan Burns, Eddie Villalba, Dave Strebel and Lachlan Evenson, O'Reilly 2020

Books and educational materials

We could keep recommending books, articles, papers and official documentation. These are examples, and even if some details are changed, may be good to read

- *Kubernetes Security and Observability* Brendan Creane, Amit Gupta Mastering Kubernetes, **Third Edition**, Gigi Sayfan, Packt 2020
- *kubectl: Command-Line Kubernetes in a Nutshell*, Rimantas Mocevicius, Packt, 2020
- *The Kubernetes Workshop*,Zachary Arnold, Sahil Dua, Wei Huang, Faisal Masood, Melony Qin, and Mohammed Abu Taleb, Packt, 2020
- *Kubernetes A Complete DevOps Cookbook*, Murat Karslioglu, Packt, 2020
- *Cloud Native with Kubernetes*, Alexander Raul, Packt, 2020
- *Kubernetes and Docker – An Enterprise Guide*, Scott Surovich, Marc Boorshtein, Packt, 2020
- *Kubernetes in Production Best Practices: Build and manage highly available production-ready Kubernetes clusters*, Aly Saleh, Murat Karslioglu, Packt 2021

These are the ones I selected for *my Kubernetes education* some via a Humble Ultimate Devops bundle

Linux and Internet Resources

Let's face it, K8s is Unix, so basic Linux and Internet Security resources help too:

- *The Linux Command Line: A Complete Introduction*, 2nd Edition
  by William Shotts, internet edition https://sourceforge.net/projects/linuxcommand
- *Defensive Security Handbook: Best Practices for Securing Infrastructure*, Lee Brotherston, Amanda Berlin ISBN: 978-1-491-96038-7 284 pages
- *Web Application Security*, Andrew Hoffman, 2020, ISBN: 9781492053118
- *Practical Packet Analysis, Using Wireshark to Solve Real-World Network Problems* by Chris Sanders, 3rd ed, ISBN: 978-1-59327-802-1

I teach using these books and others! Diploma in IT-security at KEA (until 2025)
https://zencurity.gitbook.io/