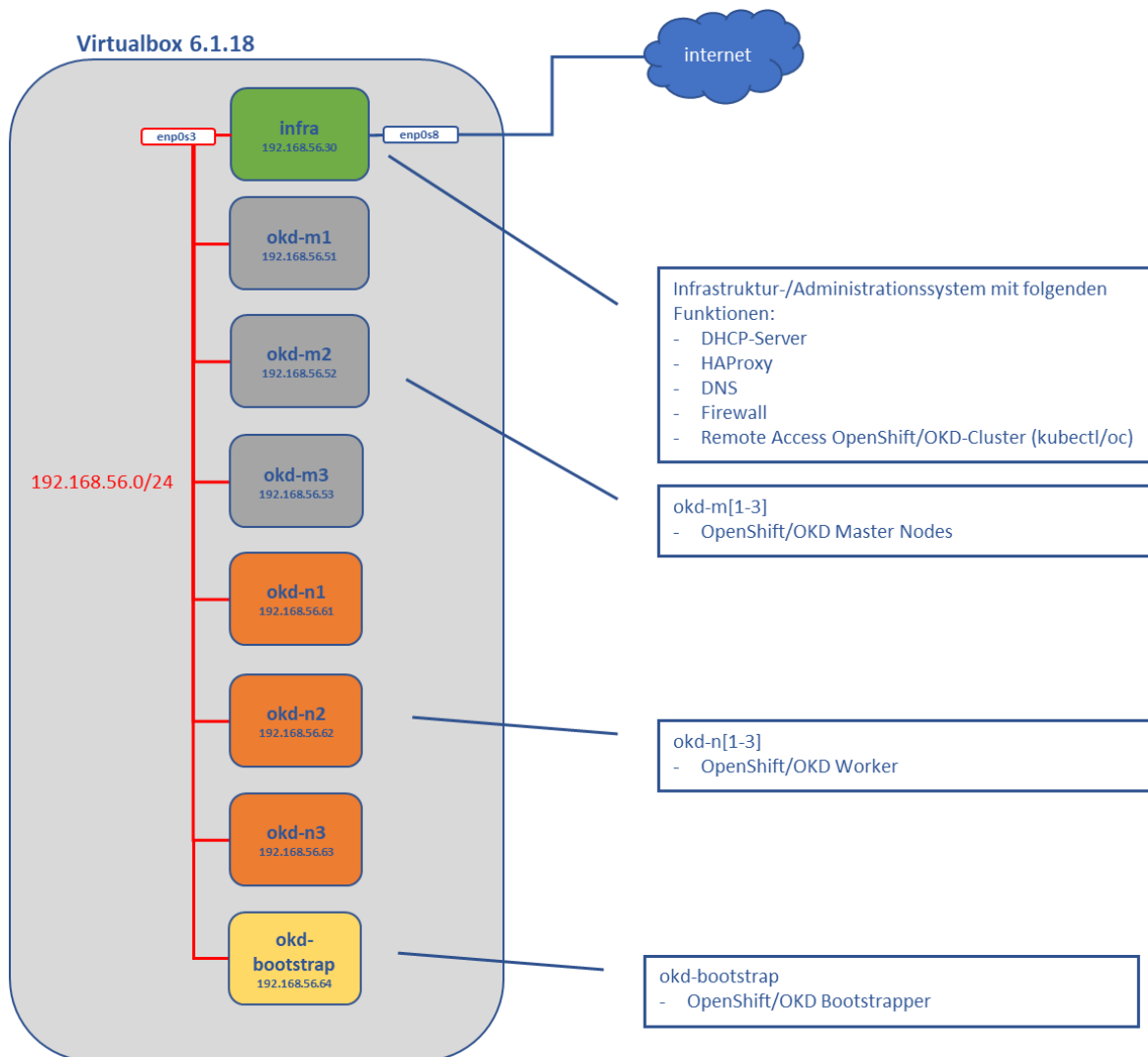


## Installation OKD 4.7.x

okd:

- <https://www.okd.io/>
- Installation ist beispielhaft für 8 Nodes
  - o 1 x Infra
  - o 1 x Bootstrap
  - o 3 x Master
  - o 3 x Worker
- Anzahl der Master/Worker kann individuell angepasst werden

## Architektur für UPI / OKD



## Dokumentation

Releaseinfo:

- <https://origin-release.apps.ci.l2s4.p1.openshiftapps.com/>

Installation:

- [https://docs.okd.io/latest/installing/installing\\_bare\\_metal/installing-bare-metal.html](https://docs.okd.io/latest/installing/installing_bare_metal/installing-bare-metal.html)

Requirements:

- [https://docs.okd.io/latest/installing/installing\\_bare\\_metal/installing-bare-metal.html#minimum-resource-requirements\\_installing-bare-metal](https://docs.okd.io/latest/installing/installing_bare_metal/installing-bare-metal.html#minimum-resource-requirements_installing-bare-metal)

Network Infrastruktur:

- [https://docs.okd.io/latest/installing/installing\\_bare\\_metal/installing-bare-metal.html#installation-network-user-infra\\_installing-bare-metal](https://docs.okd.io/latest/installing/installing_bare_metal/installing-bare-metal.html#installation-network-user-infra_installing-bare-metal)

## Virtualisierung

Virtualbox 6.1.x:

- <https://www.virtualbox.org/wiki/Downloads>

## Nodes

Hostname / FQDN	uname -a	CPU/MEM	Nutzung
infra / okd-infra.hs.local	CentOS 7.8	2/8	Administration
			DNS
			DHCP
			Firewall
			HaProxy
okd-m1 / okd-m1.lab.hs.local	CoreOS Fedora release 33	4/16	okd-Master
okd-m2 / okd-m2.lab.hs.local			
okd-m3 / okd-m3.lab.hs.local			
okd-n1 / okd-n1.lab.hs.local	CoreOS Fedora release 33	2/8	okd-Worker
okd-n2 / okd-n2.lab.hs.local			
okd-n3 / okd-n3.lab.hs.local			
okd-bootstrap / okd-bootstrap.lab.hs.local	CoreOS Fedora release 33	4/16	okd-Bootstrapper

## Download

Stable Fedora CoreOS für PXE der Master/Worker/Bootstrapper

- <https://getfedora.org/en/coreos?stream=stable>

CentOS 7.x/8.x für das Infrastruktursystem

- <https://www.centos.org/download/>

Installtools OKD:

- <https://github.com/openshift/okd/releases>

## Setup Infrastruktur-Node

ToDo's:

- Centos 7/8 VM als Infrastruktursystem
  - 2 Netzwerke
    - 192.168.56.0/24 -> Virtualbox HostOnly/Private
    - Public mit Zugang zum Internet -> Bridged
  - Setup Firewall/iptables/Masquerading
  - Setup Apache -> für Installation FCOS
  - Setup DHCP -> für Installation FCOS
    - Konfig im Anhang
  - Setup DNS -> für OKD4/OpenShift
    - Konfig im Anhang
  - Setup HAProxy -> für das LB zu den API-Endpoints
    - Konfig im Anhang
  - Setup NFS -> für PV's etc.
    - Konfig im Anhang
  - Setup PXE/TFTP -> für Installation FCOS
    - Konfig im Anhang
  - Setup chrony
- Installationvorbereitung

Im Weiteren als root@CentOS 7 (ginge auch als jeder andere User via sudo usw.)

- Konfig-Files für dhcp/haproxy usw. sind exemplarisch im Git Repo enthalten

```
# mkdir -p /data/okd4

# cd /data/okd4

# git clone https://github.com/git67/okd4.git ./local
```

Setup Firewall/IP-Forwarding/Masquerading:

- Kann ggf. feiner granuliert werden
  - o Further use ...
- enp0s3 -> 192.168.56.0/24
- enp0s8 -> www

```
# sysctl -w net.ipv4.ip_forward=1

# cd /data/okd4/local

# ./mk_fw.sh
```

Setup Apache:

```
# yum install httpd -y

# sudo sed -i 's/Listen 80/Listen 8080/' /etc/httpd/conf/httpd.conf

# mkdir -p /var/www/html/okd4/
# chown -R apache: /var/www/html/
# chmod -R 755 /var/www/html/
# setsebool -P httpd_read_user_content 1

# systemctl enable httpd
# systemctl start --now httpd
```

Setup DNS:

- IP/Domain anpassen falls gewünscht
  - o Achtung, taucht auch in der OpenShift Installations Konfig auf !!
    - install-config.yaml

```
# yum install bind bind-utils -y

# vi /etc/named.conf (siehe Anhang)
...

# vi /var/named/hs.local.db (siehe Anhang)
...

# vi /var/named/192.168.56 (siehe Anhang)
...

# vi /etc/resolv.conf
...

# systemctl enable named
# systemctl start --now named
```

### Setup DHCP:

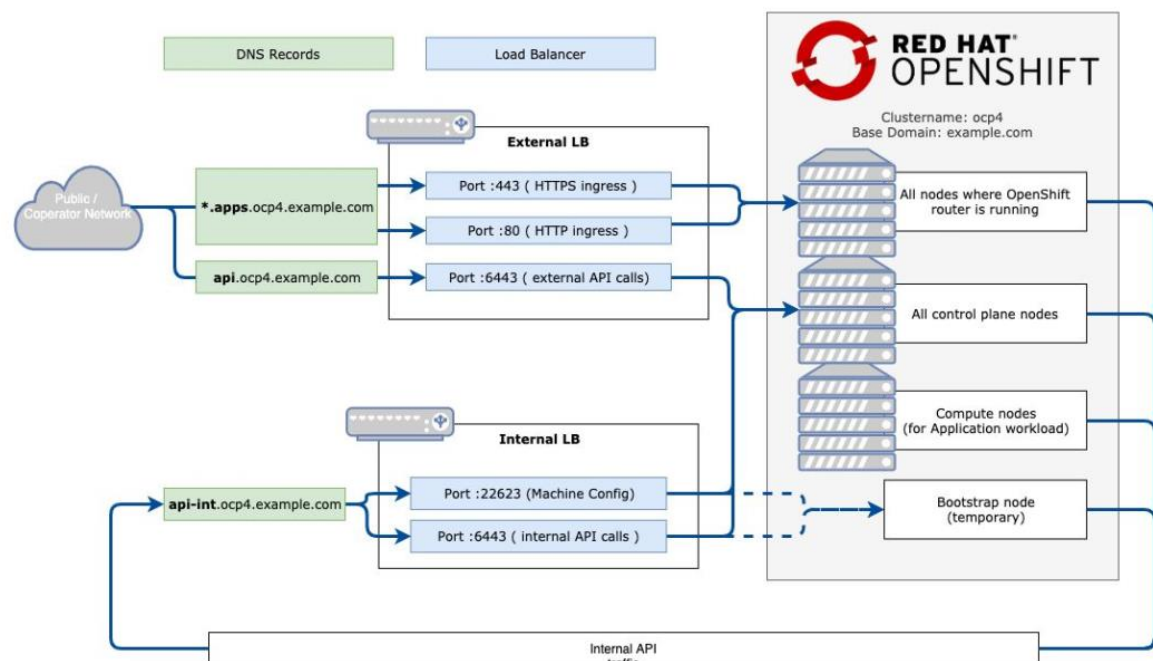
- MAC-Adressen usw. anpassen ...
- Falls DNS angepasst worden ist, hier auch nacharbeiten ...

```
# yum install dhcp -y

# vi /etc/dhcp/dhcpd.conf (siehe Anhang)
...

# systemctl enable dhcpd
# systemctl start --now dhcpd
```

### Setup HAProxy:



- Falls DNS angepasst worden ist, hier auch nacharbeiten ...

```
# yum install haproxy -y

# vi /etc/haproxy/haproxy.cfg (siehe Anhang)
...

# setsebool -P haproxy_connect_any 1
# systemctl enable haproxy
# systemctl start --now haproxy
```

### Setup NFS-Server:

- /nfs/data
  - o OpenShift erwartet für das Registry-PV 100GB, das wird nicht(!) überprüft, also ginge auch weniger 😊

```
# yum install -y nfs-utils
# systemctl enable nfs-server rpcbind

# mkdir -p /nfs/data1/vol /nfs/data1/registry
# chmod -R 777 /nfs
# chown -R nobody:nobody /nfs

# vi /etc/exports
/nfs/data1/vol
192.168.56.0/24(rw,sync,no_root_squash,no_all_squash,no_wdelay)
/nfs/data1/registry
192.168.56.0/24(rw,sync,no_root_squash,no_all_squash,no_wdelay)

# setsebool -P nfs_export_all_rw 1
# systemctl start --now nfs-server rpcbind
```

### Setup TFTP/PXE:

```
# yum install -y syslinux tftp-server

# mkdir /var/lib/tftpboot/pxelinux.cfg /var/lib/tftpboot/okd4

# setsebool -P tftp_anon_write 1

# systemctl enable tftp
# systemctl start --now tftp
```

### Setup chrony:

- Standard ...

### Vorbereitung der Installation:

- Falls noch nicht passiert ...

```
# mkdir -p /data/okd4
# cd /data/okd4
# git clone https://github.com/git67/okd4.git ./local
# cd ./local
```

### Installations-Konfig:

- [https://docs.okd.io/latest/installing/installing\\_bare\\_metal/installing-bare-metal.html#installation-bare-metal-config-yaml](https://docs.okd.io/latest/installing/installing_bare_metal/installing-bare-metal.html#installation-bare-metal-config-yaml)
- Benötigt:
  - o Public SSH-Key für die Nodes
    - ~/.ssh/id\_rsa.pub (z.b.)
  - o Pull Secret
    - <https://cloud.redhat.com/openshift/install/pull-secret>
    - Oder der „Fake“
      - {"auths":{"fake":{"auth": "bar"}}

```
# cd /data/okd4/local
# cp install-config.yaml2edit install-config.yaml
# vi install-config.yaml
apiVersion: v1
baseDomain: hs.local
metadata:
  name: lab
compute:
- hyperthreading: Enabled
  name: worker
  replicas: 0
controlPlane:
  hyperthreading: Enabled
  name: master
  replicas: 3
networking:
  clusterNetwork:
  - cidr: 10.128.0.0/14
    hostPrefix: 23
  networkType: OVNKubernetes
  serviceNetwork:
  - 172.30.0.0/16
platform:
  none: {}
fips: false
pullSecret: 'HIER das PULL Secret eintragen'
sshKey: 'HIER den PUBLIC SSH-Key eintragen'
```

#### Download und Installation OpenShift-Installer/-Client und Download und Vorbereitung FCOS:

- Download und Installation OpenShift-Installer/-Client
- Download und Vorbereitung FCOS
- Erstellung Installations-Manifests
- Anpassung Konfig, das App-Pods nicht auf die Master deployed werden
- Erstellung Ignition-Files
- Sicherung initiale Auth's
  - o Initiales Passwort kubeadmin
  - o Initiales CA
    - export KUBECONFIG=/data/okd4/install/auth/kubeconfig
- Vorbereitung Webserver für FCOS-Installation:

```
# cd /data/okd4/local  
  
# ./mk_inst.sh
```

#### Vorbereitung FCOS-Installation:

- 7 Files
  - o 1 Bootstrap
  - o 3 Master
  - o 3 Worker
- Pro Node 1 File
  - o Siehe Files in /data/okd4/local
    - 01-bootstrap
    - 01-master
    - 01-worker
  - o 01-<mac adresse dash separiert>
    - Z.b. 01-08-00-27-0e-8b-0d
- Pro Node jeweils das „richtige“ Ignition File“ eintragen
  - o Bootstrap -> bootstrap.ign
  - o Master -> master.ign
  - o Worker -> worker.ign
- Im Folgenden ein Beispiel für den Bootstrap-Node

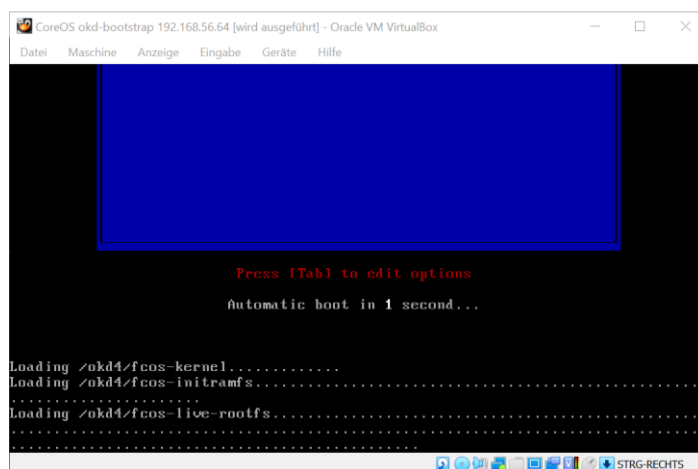
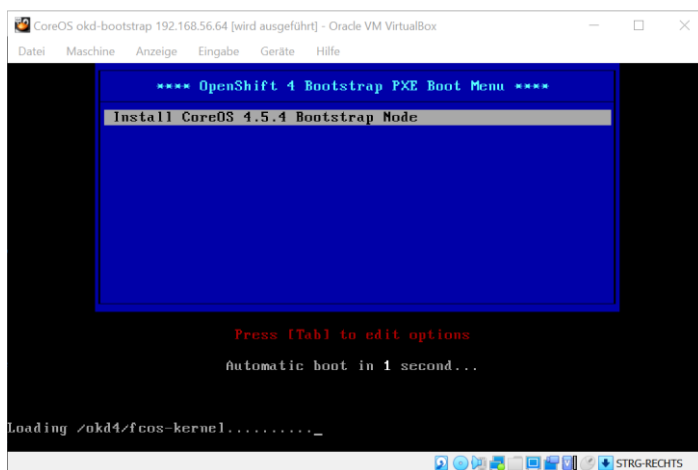
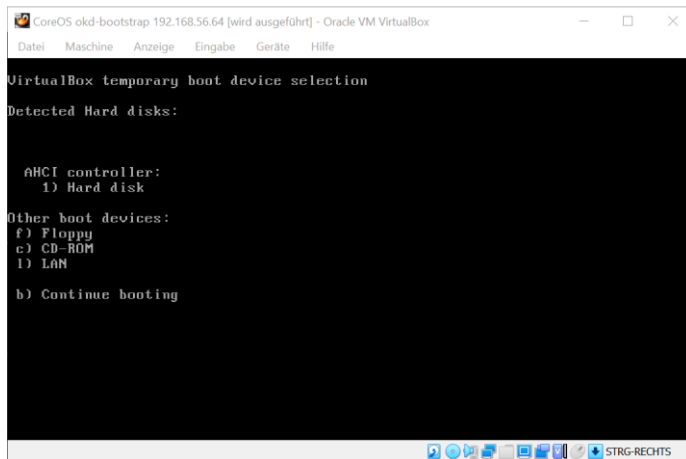
```
# cd /var/lib/tftpboot/pxelinux.cfg/  
  
# vi 01-<mac bootstrap>  
default menu.c32  
prompt 0  
timeout 50  
menu title **** OpenShift 4 Bootstrap PXE Boot Menu ****  
  
label Install CoreOS 4.5.4 Bootstrap Node  
kernel /okd4/fcos-kernel  
append ip=dhcp rd.neednet=1 coreos.inst.install_dev=sda coreos.inst=yes  
coreos.inst.image_url=http://192.168.56.30:8080/okd4/fcos.raw.xz  
coreos.inst.ignition_url=http://192.168.56.30:8080/okd4/bootstrap.ign  
initrd=/okd4/fcos-initramfs,/okd4/fcos-live-rootfs  
  
# vi ...
```



## Setup OKD

Virtualbox:

- Einschalten Bootstrap-Node
  - o F12
    - Netzwerkboot
- System installiert automatisch und startet neu



Installation tracken:

```
# cd /data/okd4

# openshift-install --dir=install/ wait-for bootstrap-complete --log-level=debug
```

Warten bis Setup des Bootstrap-Node abgeschlossen ist:

```
...
DEBUG OpenShift Installer 4.7.0-0.okd-2021-02-25-144700
DEBUG Built from commit a005bb9eddc97e4cac2cdf4436fe2d524cc75e
INFO Waiting up to 20m0s for the Kubernetes API at
https://api.lab.hs.local:6443...
INFO API v1.20.0-1046+5fbfd197c16d3c-dirty up
INFO Waiting up to 30m0s for bootstrapping to complete...

DEBUG OpenShift Installer 4.7.0-0.okd-2021-02-25-144700
DEBUG Built from commit a005bb9eddc97e4cac2cdf4436fe2d524cc75e
INFO Waiting up to 20m0s for the Kubernetes API at
https://api.lab.hs.local:6443...
INFO API v1.20.0-1046+5fbfd197c16d3c-dirty up
...
```

## Jetzt die restlichen Nodes (Master/Worker) via Netboot anstarten

Warten bis Setup des Bootstrap-Node abgeschlossen ist:

```
...
INFO Waiting up to 30m0s for bootstrapping to complete...
DEBUG Bootstrap status: complete
INFO It is now safe to remove the bootstrap resources
INFO Time elapsed: 0s
...
```

Jetzt den Bootstrap-Node in /etc/haproxy auskommentieren:

```
# sed '/okd-bootstrap/s/^/#/' /etc/haproxy/haproxy.cfg  
  
#systemctl reload haproxy
```

Erster Login:

```
# export KUBECONFIG=/data/okd4/local/auth/kubeconfig  
  
# oc get nodes
```

CSR's freigeben:

```
# oc get csr -ojson | jq -r '.items[] | select(.status == {} ) |  
.metadata.name' | xargs oc adm certificate approve  
  
# oc get nodes
```

Weitere Schritte:

- Authentications Provider (htpasswd, ldap, ...) einrichten
  - o User anlegen
- Project Templates anlegen
  - o Quotas etc.
- PV für Registry anlegen
  - o Siehe NFS-Server ...

## /etc/dhcp/dhcpd.conf:

```
ddns-update-style none;
default-lease-time 600;
max-lease-time 7200;
deny unknown-clients;
option domain-search "hs.local, lab.hs.local";
option domain-name-servers 192.168.56.30;
authoritative;
log-facility local7;

subnet 192.168.56.0 netmask 255.255.255.0 {
    option subnet-mask 255.255.255.0;
    option domain-search "hs.local lab.hs.local";
    option domain-name-servers 192.168.56.30;
    option routers 192.168.56.30;
    get-lease-hostnames true;
    use-host-decl-names true;
    default-lease-time 600;
    max-lease-time 7200;
    filename "pxelinux.0";
    next-server 192.168.56.30;
}

host okd-bootstrap {
    option host-name "okd-bootstrap.lab.hs.local";
    fixed-address 192.168.56.64;
    hardware ethernet 08:00:27:36:5B:BE;
}

host okd-m1 {
    option host-name "okd-m1.lab.hs.local";
    fixed-address 192.168.56.51;
    hardware ethernet 08:00:27:BE:3D:8B;
}

host okd-m2 {
    option host-name "okd-m2.lab.hs.local";
    fixed-address 192.168.56.52;
    hardware ethernet 08:00:27:C4:91:C6;
}

host okd-m3 {
    option host-name "okd-m3.lab.hs.local";
    fixed-address 192.168.56.53;
    hardware ethernet 08:00:27:0E:8B:0D;
}

host okd-n1 {
    option host-name "okd-n1.lab.hs.local";
    fixed-address 192.168.56.61;
    hardware ethernet 08:00:27:B8:3B:48;
}

host okd-n2 {
    option host-name "okd-n2.lab.hs.local";
    fixed-address 192.168.56.62;
    hardware ethernet 08:00:27:D0:C9:B3;
}

host okd-n3 {
    option host-name "okd-n3.lab.hs.local";
    fixed-address 192.168.56.63;
    hardware ethernet 08:00:27:FB:0F:54;
}
```

## /etc/named.conf:

```
//
// named.conf
//
// Provided by Red Hat bind package to configure the ISC BIND named(8) DNS
// server as a caching only nameserver (as a localhost DNS resolver only).
//
// See /usr/share/doc/bind*/sample/ for example named configuration files.
//
// See the BIND Administrator's Reference Manual (ARM) for details about the
// configuration located in /usr/share/doc/bind-{version}/Bv9ARM.html

options {
    listen-on port 53 { 127.0.0.1; 192.168.56.30; };
    listen-on-v6 port 53 { ::1; };
    directory      "/var/named";
    dump-file       "/var/named/data/cache_dump.db";
    statistics-file "/var/named/data/named_stats.txt";
    memstatistics-file "/var/named/data/named_mem_stats.txt";
    recursing-file  "/var/named/data/named.recursing";
    secroots-file   "/var/named/data/named.secroots";
    allow-query     { localhost; 192.168.56.0/24; };

    /*
     * - If you are building an AUTHORITATIVE DNS server, do NOT enable recursion.
     * - If you are building a RECURSIVE (caching) DNS server, you need to enable
     *   recursion.
     * - If your recursive DNS server has a public IP address, you MUST enable access
     *   control to limit queries to your legitimate users. Failing to do so will
     *   cause your server to become part of large scale DNS amplification
     *   attacks. Implementing BCP38 within your network would greatly
     *   reduce such attack surface
     */
    recursion yes;

    dnssec-enable yes;
    dnssec-validation yes;

    /* Path to ISC DLV key */
    bindkeys-file "/etc/named.root.key";

    managed-keys-directory "/var/named/dynamic";

    pid-file "/run/named/named.pid";
    session-keyfile "/run/named/session.key";
    forwarders {
        8.8.8.8;
        8.8.4.4;
    };
};

logging {
    channel default_debug {
        file "data/named.run";
        severity dynamic;
    };
};

zone "." IN {
    type hint;
    file "named.ca";
};

zone "hs.local" IN {
    type master;

    file "/var/named/hs.local.db";

    allow-update { none; };
};

zone "56.168.192.in-addr.arpa" IN {
    type master;

    file "/var/named/192.168.56.db";

    allow-update { none; };
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";
```

## /var/named/hs.local.db:

```
$TTL      604800
@         IN      SOA      okd-infra.hs.local. admin.hs.local. (
                        1      ; Serial
                        604800 ; Refresh
                        86400  ; Retry
                        241964 ; Expire
                        604800 ; Negative Cache TTL
)

; name servers - NS records
IN      NS      okd-infra

; name servers - A records
okd-infra.hs.local.      IN      A      192.168.56.30

; OpenShift Container Platform Cluster - A records
okd-bootstrap.lab.hs.local.      IN      A      192.168.56.64
okd-m1.lab.hs.local.      IN      A      192.168.56.51
okd-m2.lab.hs.local.      IN      A      192.168.56.52
okd-m3.lab.hs.local.      IN      A      192.168.56.53
okd-n1.lab.hs.local.      IN      A      192.168.56.61
okd-n2.lab.hs.local.      IN      A      192.168.56.62
okd-n3.lab.hs.local.      IN      A      192.168.56.63

; OpenShift internal cluster IPs - A records
api.lab.hs.local.      IN      A      192.168.56.30
api-int.lab.hs.local.      IN      A      192.168.56.30
*.apps.lab.hs.local.      IN      A      192.168.56.30
etcd-0.lab.hs.local.      IN      A      192.168.56.61
etcd-1.lab.hs.local.      IN      A      192.168.56.62
etcd-2.lab.hs.local.      IN      A      192.168.56.63
console-openshift-console.apps.lab.hs.local.      IN      A      192.168.56.30
oauth-openshift.apps.lab.hs.local.      IN      A      192.168.56.30

; OpenShift internal cluster IPs - SRV records
_etcd-server-ssl._tcp.lab.hs.local.      86400      IN      SRV      0      10      2380      etcd-0.lab
_etcd-server-ssl._tcp.lab.hs.local.      86400      IN      SRV      0      10      2380      etcd-1.lab
_etcd-server-ssl._tcp.lab.hs.local.      86400      IN      SRV      0      10      2380      etcd-2.lab
```

## /var/named/192.168.56.db:

```
$TTL      604800
@         IN      SOA      okd-infra.hs.local. admin.hs.local. (
                        6      ; Serial
                        604800 ; Refresh
                        86400  ; Retry
                        2419200 ; Expire
                        604800 ; Negative Cache TTL
)

; name servers - NS records
IN      NS      okd-infra.hs.local.

; name servers - PTR records
30      IN      PTR      okd-infra.hs.local.

; OpenShift Container Platform Cluster - PTR records
64      IN      PTR      okd-bootstrap.lab.hs.local.
51      IN      PTR      okd-m1.lab.hs.local.
52      IN      PTR      okd-m2.lab.hs.local.
53      IN      PTR      okd-m3.lab.hs.local.
61      IN      PTR      okd-n1.lab.hs.local.
62      IN      PTR      okd-n2.lab.hs.local.
63      IN      PTR      okd-n3.lab.hs.local.
30      IN      PTR      api.lab.hs.local.
30      IN      PTR      api-int.lab.hs.local.
30      IN      PTR      console-openshift-console.apps.lab.hs.local.
```

## /etc/haproxy/haproxy.cfg:

```
# Global settings
#-----
global
    maxconn      20000
    log          /dev/log local0 info
    chroot       /var/lib/haproxy
    pidfile      /var/run/haproxy.pid
    user         haproxy
    group        haproxy
    daemon

    # turn on stats unix socket
    stats socket /var/lib/haproxy/stats

#-----
# common defaults that all the 'listen' and 'backend' sections will
# use if not designated in their block
#-----
defaults
    mode                http
    log                 global
    option               httplog
    option               dontlognull
    option http-server-close
    option forwardfor    except 127.0.0.0/8
    option               redispatch
    retries              3
    timeout http-request 10s
    timeout queue        1m
    timeout connect      10s
    timeout client       300s
    timeout server       300s
    timeout http-keep-alive 10s
    timeout check        10s
    maxconn              20000

listen stats
    bind :9000
    mode http
    stats enable
    stats uri /

frontend okd4_k8s_api_fe
    bind :6443
    default_backend okd4_k8s_api_be
    mode tcp
    option tcplog

backend okd4_k8s_api_be
    balance source
    mode tcp
    server      okd-bootstrap.lab.hs.local 192.168.56.64:6443 check
    server      okd-m1.lab.hs.local 192.168.56.51:6443 check
    server      okd-m2.lab.hs.local 192.168.56.52:6443 check
    server      okd-m3.lab.hs.local 192.168.56.53:6443 check

frontend okd4_machine_config_server_fe
    bind :22623
    default_backend okd4_machine_config_server_be
    mode tcp
    option tcplog

backend okd4_machine_config_server_be
    balance source
    mode tcp
    server      okd-bootstrap.lab.hs.local 192.168.56.64:22623 check
    server      okd-m1.lab.hs.local 192.168.56.51:22623 check
    server      okd-m2.lab.hs.local 192.168.56.52:22623 check
    server      okd-m3.lab.hs.local 192.168.56.53:22623 check

frontend okd4_http_ingress_traffic_fe
    bind :80
    default_backend okd4_http_ingress_traffic_be
    mode tcp
    option tcplog

backend okd4_http_ingress_traffic_be
    balance source
    mode tcp
    server      okd-n1.lab.hs.local 192.168.56.61:80 check
    server      okd-n2.lab.hs.local 192.168.56.62:80 check
    server      okd-n3.lab.hs.local 192.168.56.63:80 check

frontend okd4_https_ingress_traffic_fe
    bind *:443
    default_backend okd4_https_ingress_traffic_be
    mode tcp
    option tcplog

backend okd4_https_ingress_traffic_be
    balance source
    mode tcp
    server      okd-n1.lab.hs.local 192.168.56.61:443 check
    server      okd-n2.lab.hs.local 192.168.56.62:443 check
    server      okd-n3.lab.hs.local 192.168.56.63:443 check
```

