Kubernetes

Day 4

Lab 1

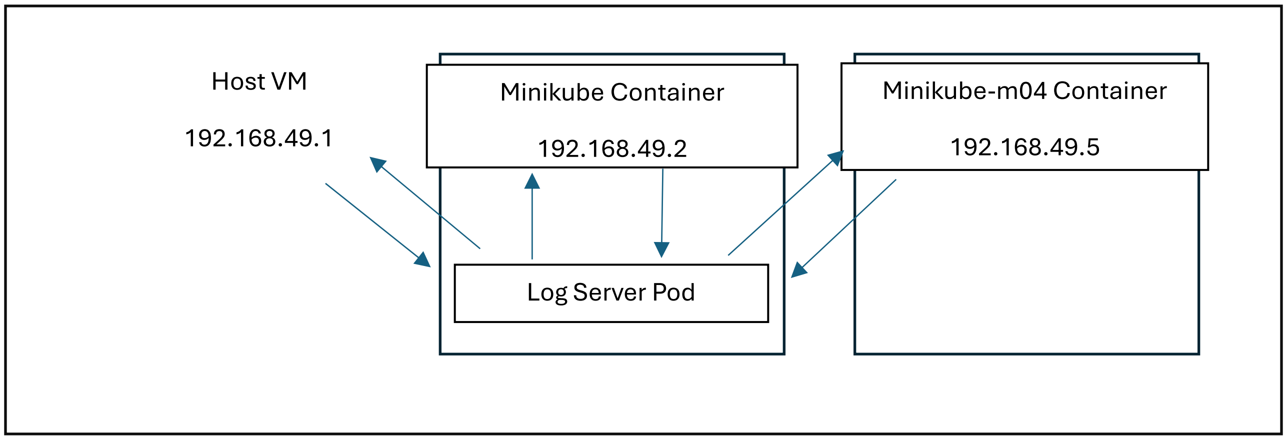
Scheduled Jobs/Cronjobs

Required:

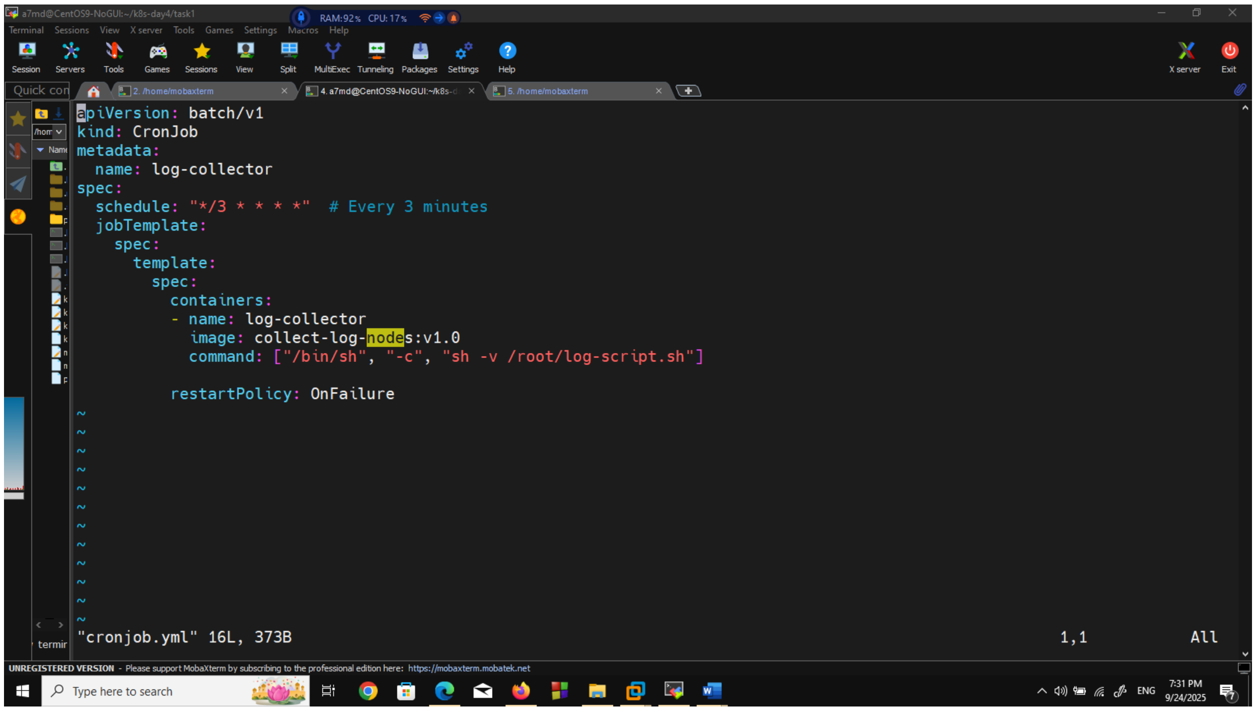
Schedule a Job/Cronjob the reads log files from a cluster's nodes and sends them to the host machine.

Solution:

Cluster's Infrastuctue:



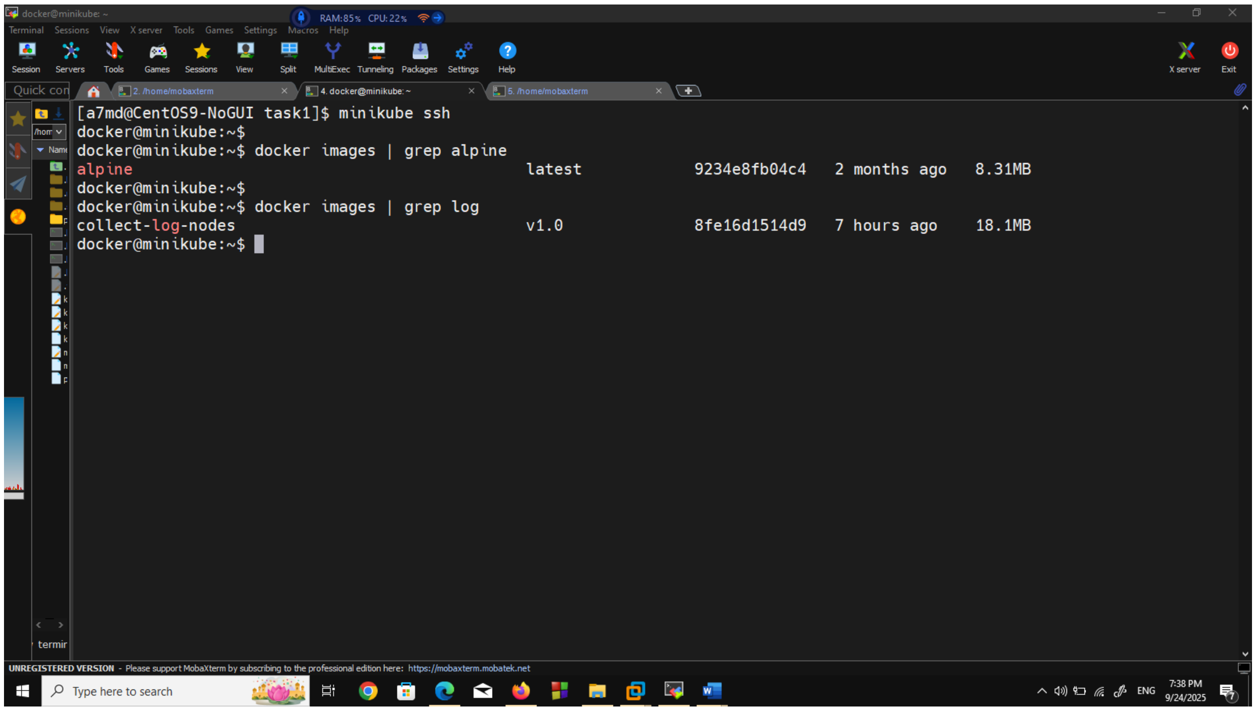
1- Created a cronjob .yml file that will be used to run a periodic job called "log-collector" for reading/collecting jobs every 3 minutes (short interval for testing purposes):



```
apiVersion: batch/v1
kind: CronJob
metadata:
  name: log-collector
spec:
  schedule: "*/3 * * * *"  # Every 3 minutes
  jobTemplate:
    spec:
      template:
        spec:
          containers:
          - name: log-collector
            image: collect-log-nodes:v1.0
            command: ["/bin/sh", "-c", "sh -v /root/log-script.sh"]

          restartPolicy: OnFailure
~
"cronjob.yml" 16L, 373B                                  1,1          All
```

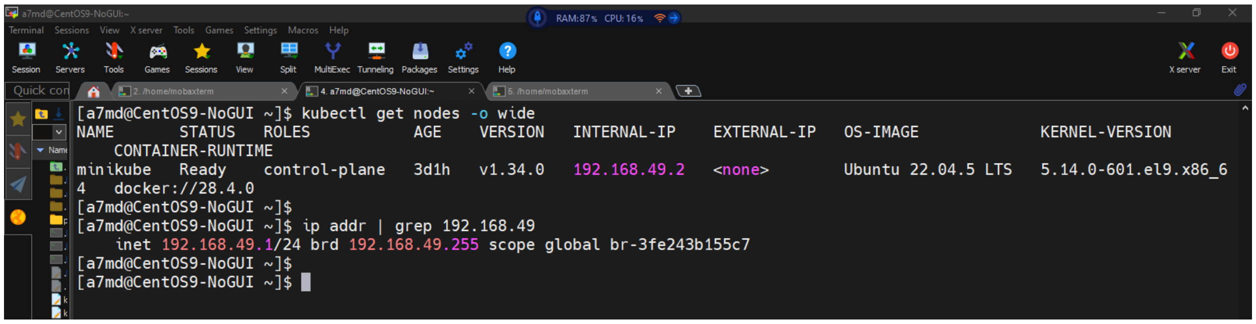
2- The "collect-log-nodes:v1.0" is a basic alpine image built by committing a running container that had openssh installed on it and is able to communicate with the nodes via ssh/scp in a password-less way by a generated shared public key.

This image is created by docker on the main minikube running container. It acts the log-collection server.



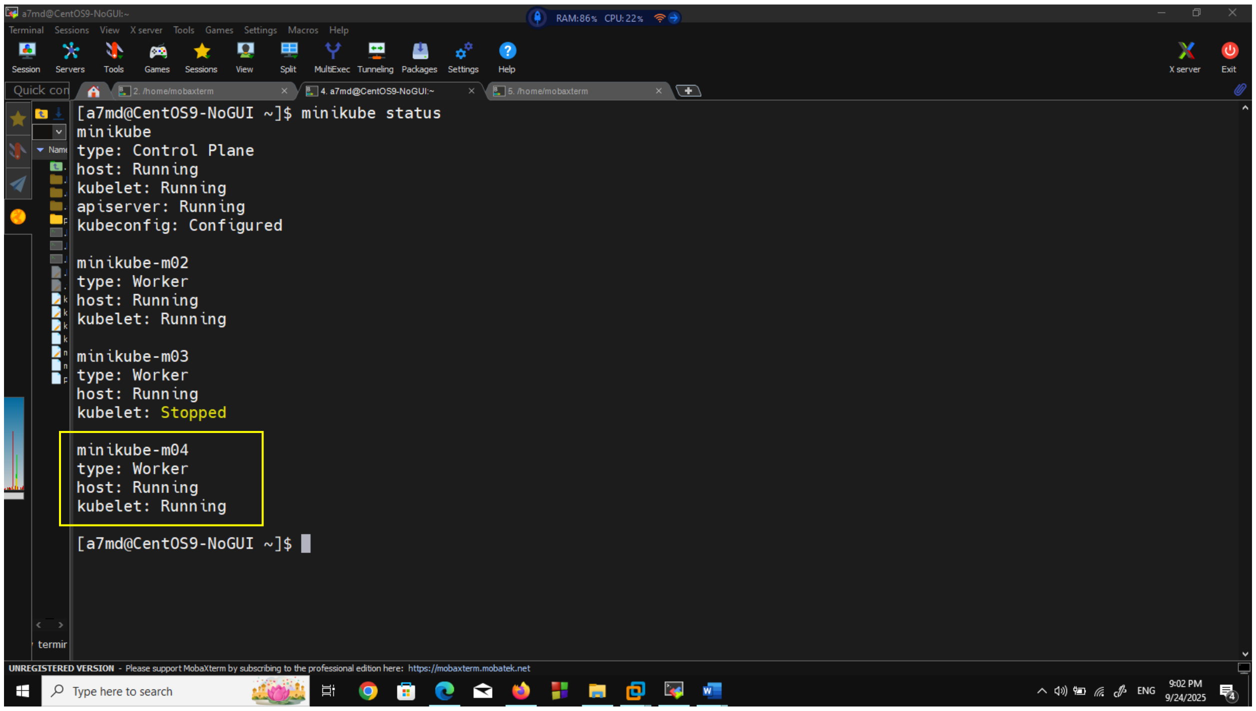
```
[a7md@CentOS9-NoGUI task1]$ minikube ssh
docker@minikube:~$
docker@minikube:~$ docker images | grep alpine
alpine                                                  latest            9234e8fb04c4   2 months ago   8.31MB
docker@minikube:~$
docker@minikube:~$ docker images | grep log
collect-log-nodes                                       v1.0              8fe16d1514d9   7 hours ago    18.1MB
docker@minikube:~$
```

Now, how to get the nodes IP addresses?

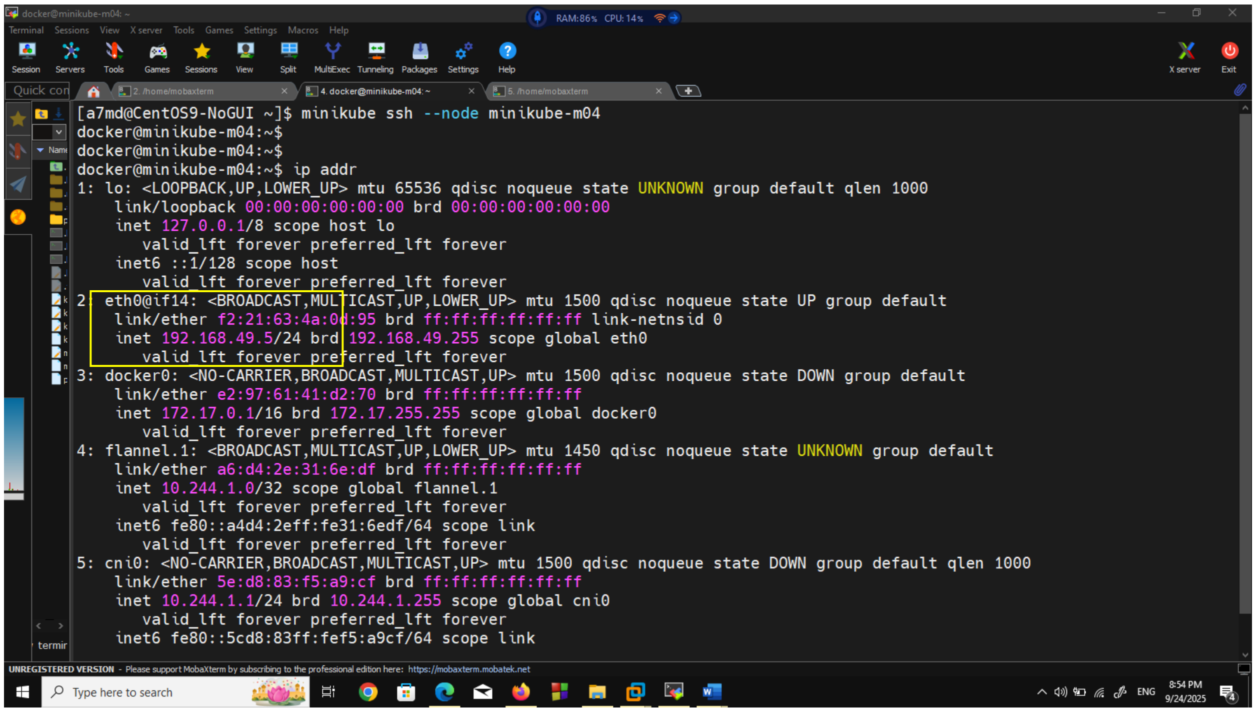


```
[a7md@CentOS9-NoGUI ~]$ kubectl get nodes -o wide
NAME       STATUS   ROLES           AGE    VERSION   INTERNAL-IP    EXTERNAL-IP   OS-IMAGE             KERNEL-VERSION
     CONTAINER-RUNTIME
minikube   Ready    control-plane   3d1h   v1.34.0   192.168.49.2   <none>        Ubuntu 22.04.5 LTS   5.14.0-601.el9.x86_6
4    docker://28.4.0
[a7md@CentOS9-NoGUI ~]$
[a7md@CentOS9-NoGUI ~]$ ip addr | grep 192.168.49
     inet 192.168.49.1/24 brd 192.168.49.255 scope global br-3fe243b155c7
[a7md@CentOS9-NoGUI ~]$
[a7md@CentOS9-NoGUI ~]$
```

The “minikube-m04” was deleted before this document was written, but we still can see it’s still running via “minikube status” command on the host.

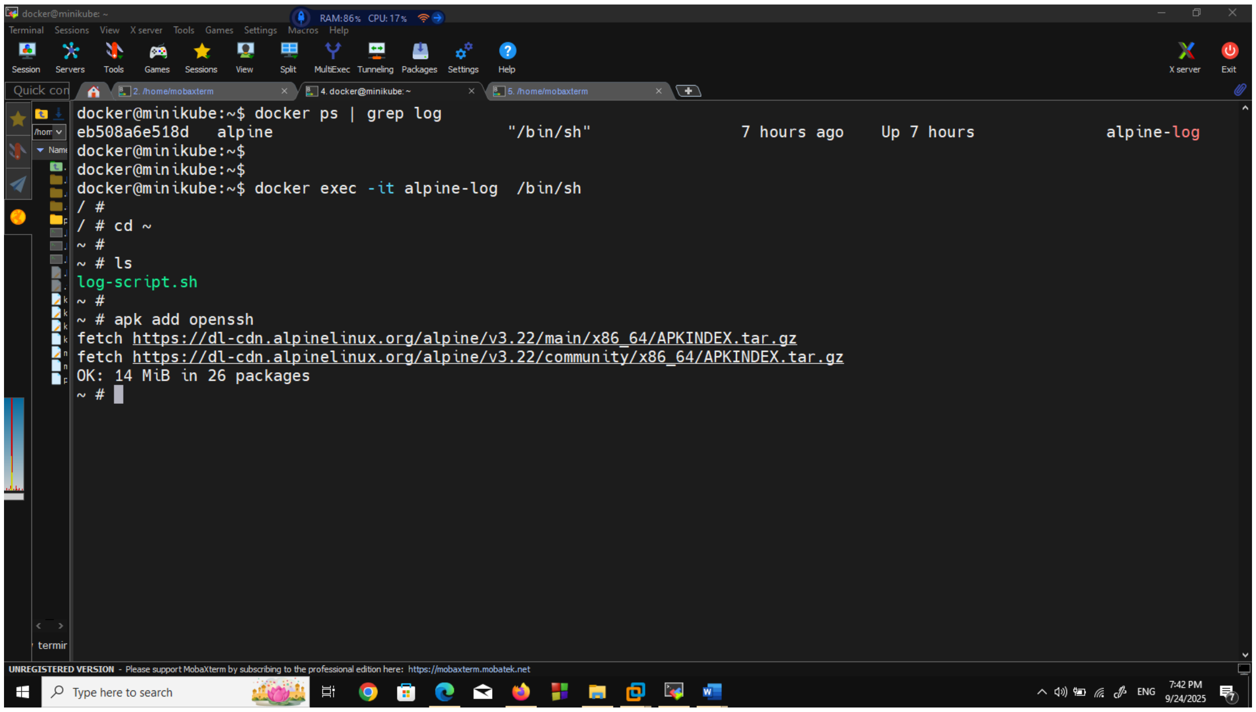


```
[a7md@CentOS9-NoGUI ~]$ minikube status
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured

minikube-m02
type: Worker
host: Running
kubelet: Running

minikube-m03
type: Worker
host: Running
kubelet: Stopped

minikube-m04
type: Worker
host: Running
kubelet: Running

[a7md@CentOS9-NoGUI ~]$
```



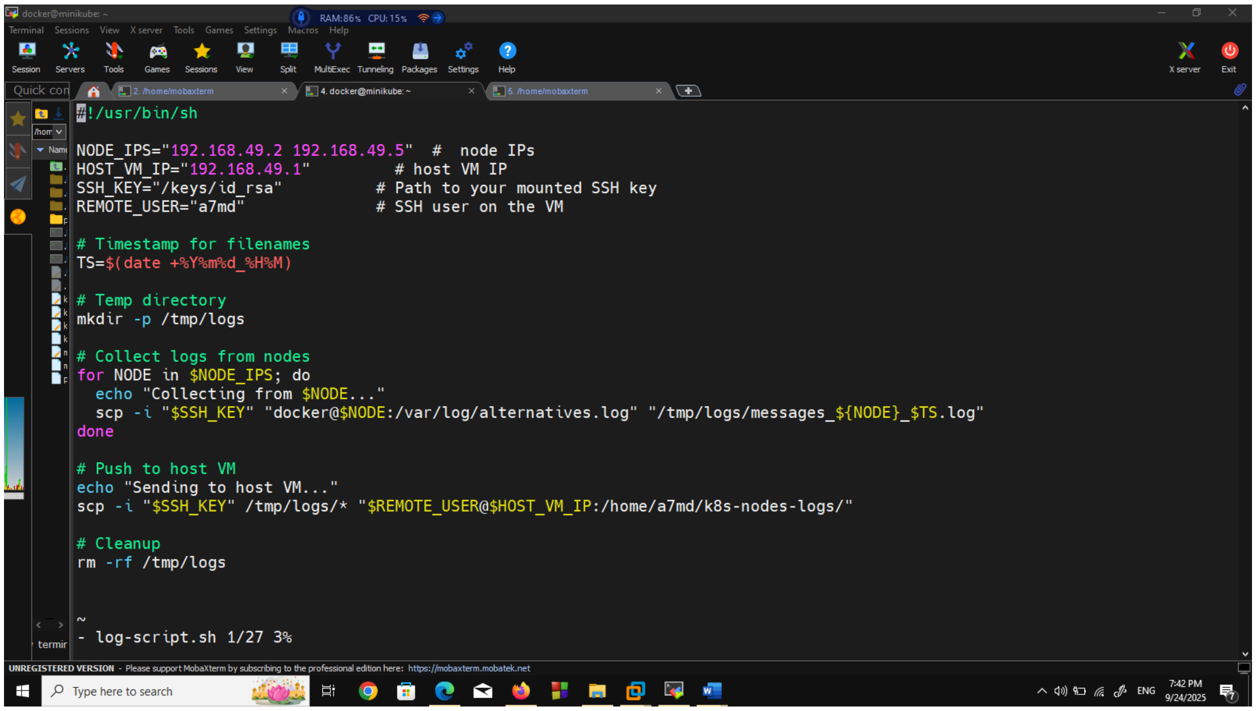
```
[a7md@CentOS9-NoGUI ~]$ minikube ssh --node minikube-m04
docker@minikube-m04:~$
docker@minikube-m04:~$
docker@minikube-m04:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0@if14: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
    link/ether f2:21:63:4a:0d:95 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.49.5/24 brd 192.168.49.255 scope global eth0
       valid_lft forever preferred_lft forever
3: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether e2:97:61:41:d2:70 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
       valid_lft forever preferred_lft forever
4: flannel.1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue state UNKNOWN group default
    link/ether a6:d4:2e:31:6e:df brd ff:ff:ff:ff:ff:ff
    inet 10.244.1.0/32 scope global flannel.1
       valid_lft forever preferred_lft forever
    inet6 fe80::a4d4:2eff:fe31:6edf/64 scope link
       valid_lft forever preferred_lft forever
5: cni0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default qlen 1000
    link/ether 5e:d8:83:f5:a9:cf brd ff:ff:ff:ff:ff:ff
    inet 10.244.1.1/24 brd 10.244.1.255 scope global cni0
       valid_lft forever preferred_lft forever
    inet6 fe80::5cd8:83ff:fef5:a9cf/64 scope link
```

3- Let’s see what was added on the container to be committed to a new image



```
docker@minikube:~$ docker ps | grep log
eb508a6e518d   alpine                    "/bin/sh"                7 hours ago     Up 7 hours                alpine-log
docker@minikube:~$
docker@minikube:~$
docker@minikube:~$ docker exec -it alpine-log  /bin/sh
/ #
/ # cd ~
~ #
~ # ls
log-script.sh
~ #
~ # apk add openssh
fetch https://dl-cdn.alpinelinux.org/alpine/v3.22/main/x86_64/APKINDEX.tar.gz
fetch https://dl-cdn.alpinelinux.org/alpine/v3.22/community/x86_64/APKINDEX.tar.gz
OK: 14 MiB in 26 packages
~ #
```

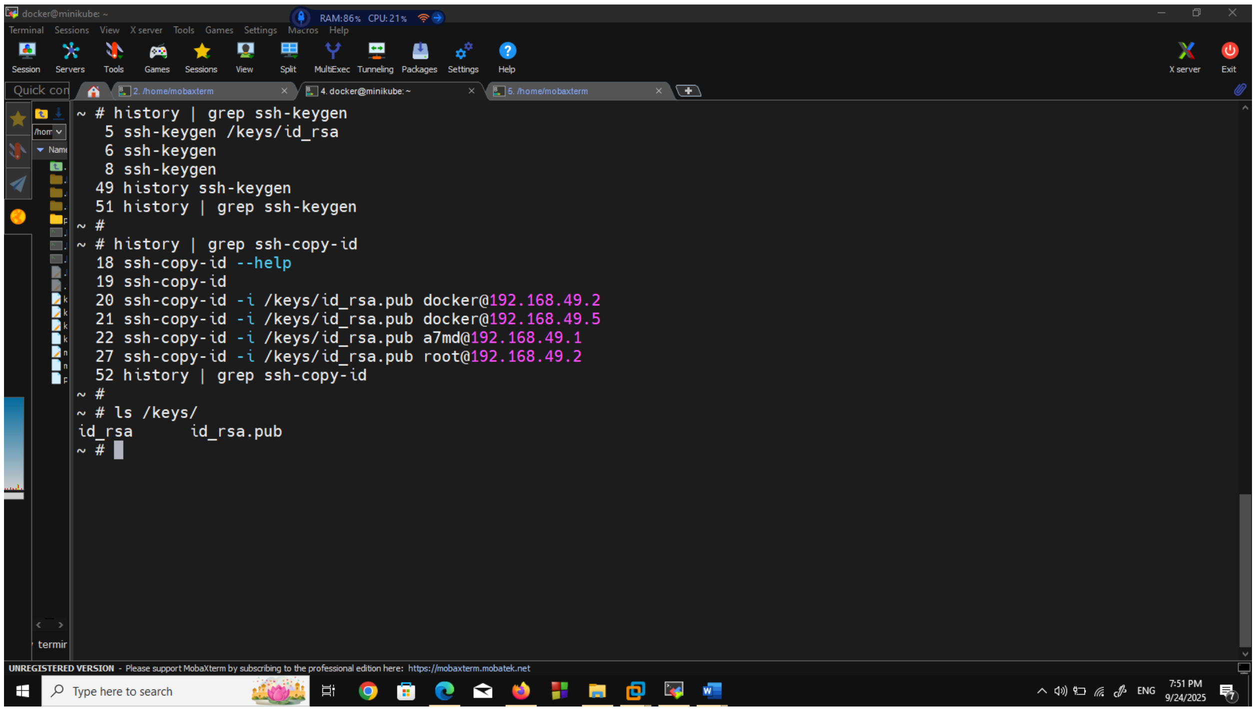
Figure 1: Installing OpenSSH



```
#!/usr/bin/sh

NODE_IPS="192.168.49.2 192.168.49.5"  #  node IPs
HOST_VM_IP="192.168.49.1"          # host VM IP
SSH_KEY="/keys/id_rsa"           # Path to your mounted SSH key
REMOTE_USER="a7md"               # SSH user on the VM

# Timestamp for filenames
TS=$(date +%Y%m%d_%H%M)

# Temp directory
mkdir -p /tmp/logs

# Collect logs from nodes
for NODE in $NODE_IPS; do
  echo "Collecting from $NODE..."
  scp -i "$SSH_KEY" "docker@$NODE:/var/log/alternatives.log" "/tmp/logs/messages_${NODE}_$TS.log"
done

# Push to host VM
echo "Sending to host VM..."
scp -i "$SSH_KEY" /tmp/logs/* "$REMOTE_USER@$HOST_VM_IP:/home/a7md/k8s-nodes-logs/"

# Cleanup
rm -rf /tmp/logs


~
- log-script.sh 1/27 3%
```

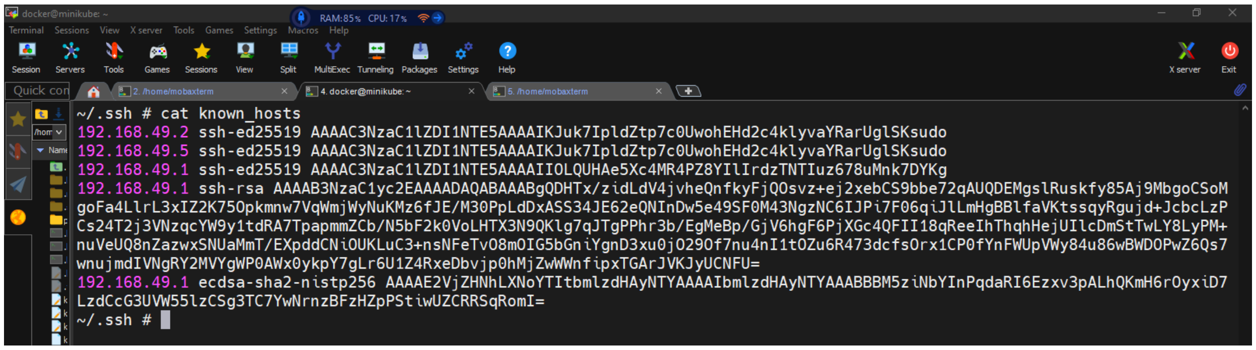
Figure 2: Adding log-collection script

The log-collection script copies a certain file with read permissions on the node containers, to a file uniquely named after the node IP and time stamp it was copied at.



```
~ # history | grep ssh-keygen
    5 ssh-keygen /keys/id_rsa
    6 ssh-keygen
    8 ssh-keygen
   49 history ssh-keygen
   51 history | grep ssh-keygen
~ #
~ # history | grep ssh-copy-id
   18 ssh-copy-id --help
   19 ssh-copy-id
   20 ssh-copy-id -i /keys/id_rsa.pub docker@192.168.49.2
   21 ssh-copy-id -i /keys/id_rsa.pub docker@192.168.49.5
   22 ssh-copy-id -i /keys/id_rsa.pub a7md@192.168.49.1
   27 ssh-copy-id -i /keys/id_rsa.pub root@192.168.49.2
   52 history | grep ssh-copy-id
~ #
~ # ls /keys/
id_rsa      id_rsa.pub
~ #
```

Figure 3: Copy a generated RSA Public key for SCP protocol

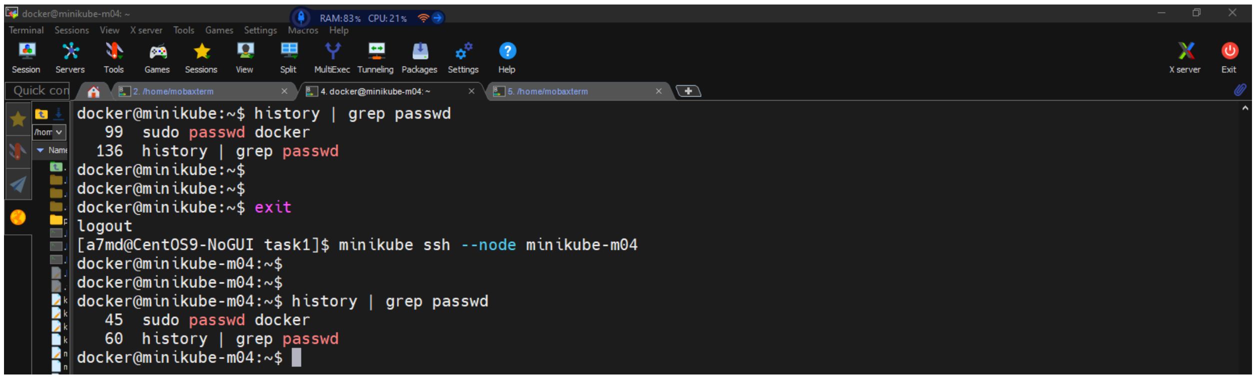


```
~/.ssh # cat known_hosts
192.168.49.2 ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIKJuk7IpldZtp7c0UwohEHd2c4klyvaYRarUglSKsudo
192.168.49.5 ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIKJuk7IpldZtp7c0UwohEHd2c4klyvaYRarUglSKsudo
192.168.49.1 ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIIOLQUHAe5Xc4MR4PZ8YIlIrdzTNTIuz678uMnk7DYKg
192.168.49.1 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABgQDHTx/zidLdV4jvheQnfkyFjQOsvz+ej2xebCS9bbe72qAUQDEMgslRuskfy85Aj9MbgoCSoM
goFa4LlrL3xIZ2K75Opkmnw7VqWmjWyNuKMz6fJE/M30PpLdDxASS34JE62eQNInDw5e49SF0M43NgzNC6IJPi7F06qiJlLmHgBBlfaVKtssqyRgujd+JcbcLzP
Cs24T2j3VNzqcYW9y1tdRA7TpapmmZCb/N5bF2k0VoLHTX3N9QKlg7qJTgPPhr3b/EgMeBp/GjV6hgF6PjXGc4QFII18qReeIhThqhHejUIlcDmStTwLY8LyPM+
nuVeUQ8nZazwxSNUaMmT/EXpddCNiOUKLuC3+nsNFeTvO8mOIG5bGniYgnD3xu0jO29Of7nu4nI1tOZu6R473dcfsOrx1CP0fYnFWUpVWy84u86wBWDOPwZ6Qs7
wnujmdIVNgRY2MVYgWP0AWx0ykpY7gLr6U1Z4RxeDbvjp0hMjZwWWnfipxTGArJVKJyUCNFU=
192.168.49.1 ecdsa-sha2-nistp256 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHAyNTYAAABBBM5ziNbYInPqdaRI6Ezxv3pALhQKmH6rOyxiD7
LzdCcG3UVW55lzCSg3TC7YwNrnzBFzHZpPStiwUZCRRSqRomI=
~/.ssh #
```

This is a mandatory step before running the script in order to get it working in a password-less way.

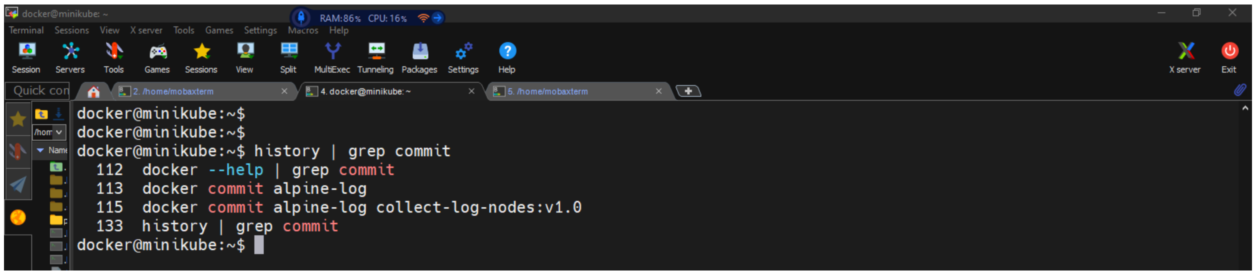
This operation required the passwords of the "docker" users on the two nodes

"minikube" and "minikube-m04", which was changed via "sudo passwd docker" command, which seemed like that they were "sudoer" users, hopefully.



```
docker@minikube:~$ history | grep passwd
   99  sudo passwd docker
  136  history | grep passwd
docker@minikube:~$
docker@minikube:~$
docker@minikube:~$ exit
logout
[a7md@CentOS9-NoGUI task1]$ minikube ssh --node minikube-m04
docker@minikube-m04:~$
docker@minikube-m04:~$
docker@minikube-m04:~$ history | grep passwd
   45  sudo passwd docker
   60  history | grep passwd
docker@minikube-m04:~$
```

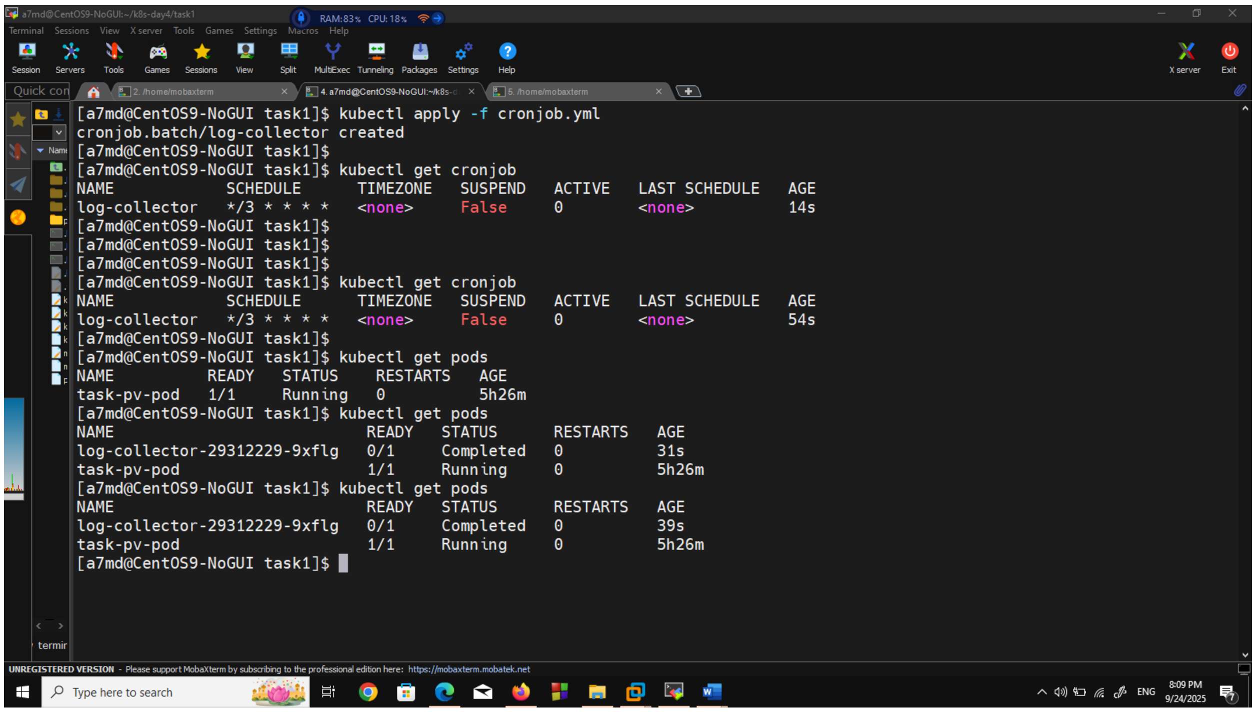
Figure 4: Changing the 'docker" user 's password on both the minikube container



```
docker@minikube:~$
docker@minikube:~$
docker@minikube:~$ history | grep commit
  112  docker --help | grep commit
  113  docker commit alpine-log
  115  docker commit alpine-log collect-log-nodes:v1.0
  133  history | grep commit
docker@minikube:~$
```

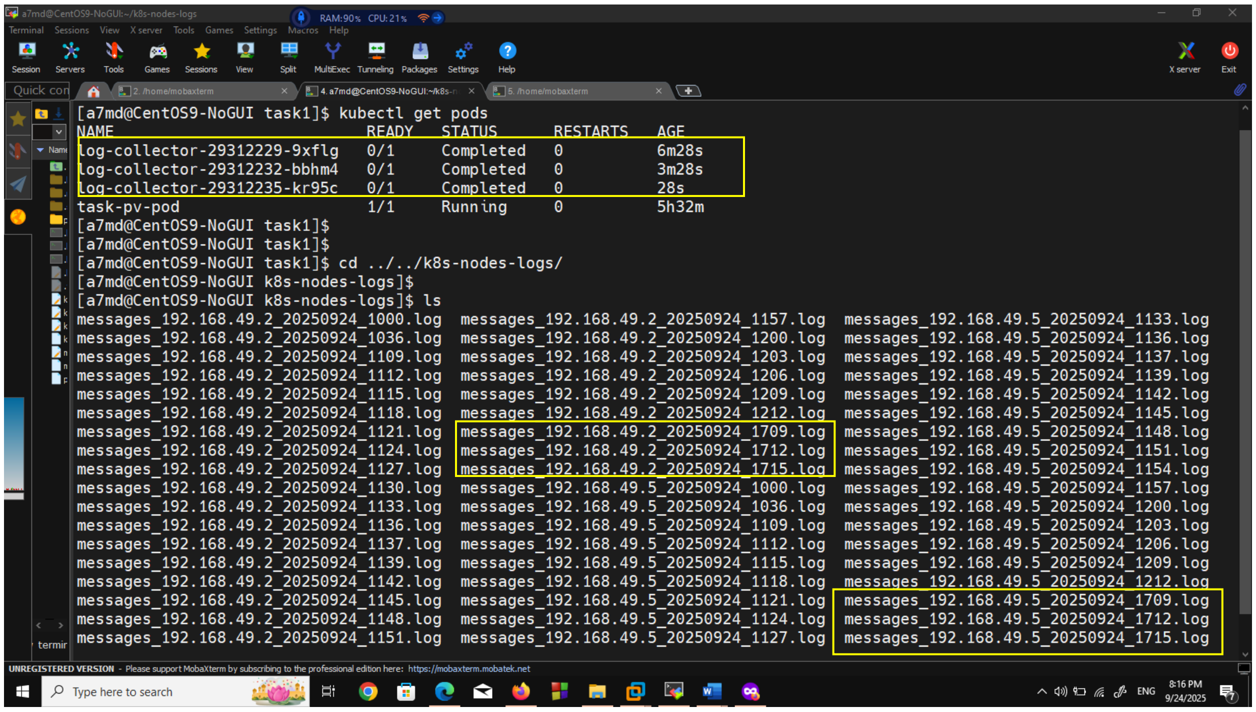
Figure 5: Committing the container at this state to an image used by the pod created by the cronjob

4- Starting the cronjob:



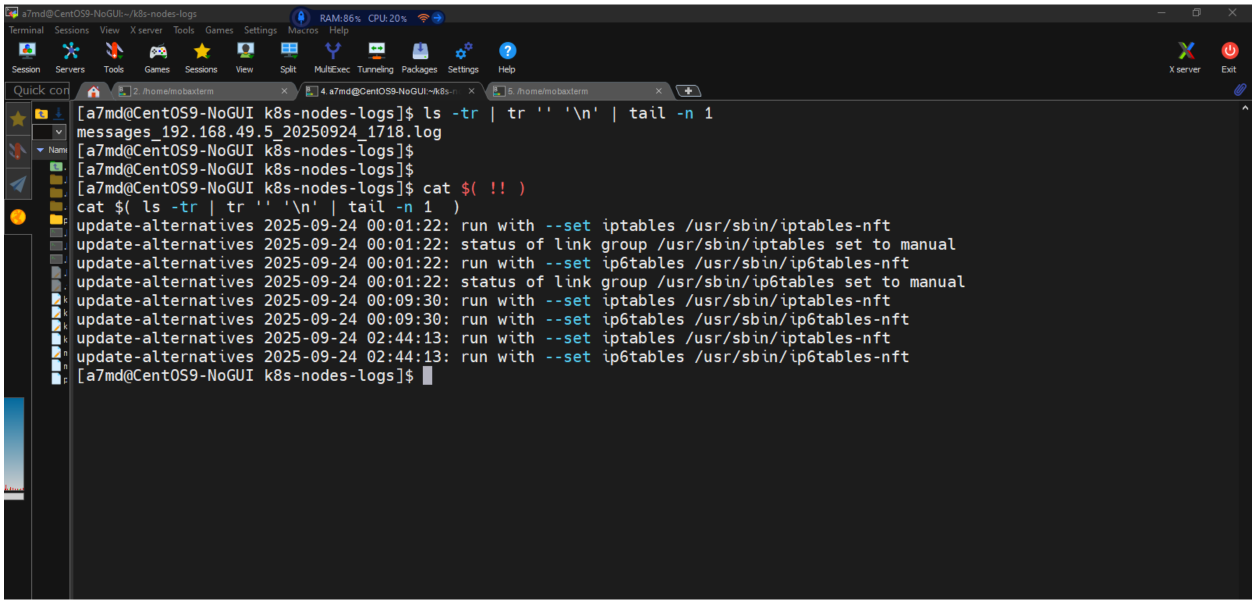
```
[a7md@CentOS9-NoGUI task1]$ kubectl apply -f cronjob.yml
cronjob.batch/log-collector created
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$ kubectl get cronjob
NAME            SCHEDULE      TIMEZONE   SUSPEND   ACTIVE   LAST SCHEDULE   AGE
log-collector   */3 * * * *   <none>     False     0        <none>          14s
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$ kubectl get cronjob
NAME            SCHEDULE      TIMEZONE   SUSPEND   ACTIVE   LAST SCHEDULE   AGE
log-collector   */3 * * * *   <none>     False     0        <none>          54s
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
task-pv-pod   1/1     Running   0          5h26m
[a7md@CentOS9-NoGUI task1]$ kubectl get pods
NAME                           READY   STATUS      RESTARTS   AGE
log-collector-29312229-9xflg   0/1     Completed   0          31s
task-pv-pod                    1/1     Running     0          5h26m
[a7md@CentOS9-NoGUI task1]$ kubectl get pods
NAME                           READY   STATUS      RESTARTS   AGE
log-collector-29312229-9xflg   0/1     Completed   0          39s
task-pv-pod                    1/1     Running     0          5h26m
[a7md@CentOS9-NoGUI task1]$
```

After some time:



```
[a7md@CentOS9-NoGUI task1]$ kubectl get pods
NAME                           READY   STATUS      RESTARTS   AGE
log-collector-29312229-9xflg   0/1     Completed   0          6m28s
log-collector-29312232-bbhm4   0/1     Completed   0          3m28s
log-collector-29312235-kr95c   0/1     Completed   0          28s
task-pv-pod                    1/1     Running     0          5h32m
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$
[a7md@CentOS9-NoGUI task1]$ cd ../../k8s-nodes-logs/
[a7md@CentOS9-NoGUI k8s-nodes-logs]$
[a7md@CentOS9-NoGUI k8s-nodes-logs]$ ls
messages_192.168.49.2_20250924_1000.log  messages_192.168.49.2_20250924_1157.log  messages_192.168.49.5_20250924_1133.log
messages_192.168.49.2_20250924_1036.log  messages_192.168.49.2_20250924_1200.log  messages_192.168.49.5_20250924_1136.log
messages_192.168.49.2_20250924_1109.log  messages_192.168.49.2_20250924_1203.log  messages_192.168.49.5_20250924_1137.log
messages_192.168.49.2_20250924_1112.log  messages_192.168.49.2_20250924_1206.log  messages_192.168.49.5_20250924_1139.log
messages_192.168.49.2_20250924_1115.log  messages_192.168.49.2_20250924_1209.log  messages_192.168.49.5_20250924_1142.log
messages_192.168.49.2_20250924_1118.log  messages_192.168.49.2_20250924_1212.log  messages_192.168.49.5_20250924_1145.log
messages_192.168.49.2_20250924_1121.log  messages_192.168.49.2_20250924_1709.log  messages_192.168.49.5_20250924_1148.log
messages_192.168.49.2_20250924_1124.log  messages_192.168.49.2_20250924_1712.log  messages_192.168.49.5_20250924_1151.log
messages_192.168.49.2_20250924_1127.log  messages_192.168.49.2_20250924_1715.log  messages_192.168.49.5_20250924_1154.log
messages_192.168.49.2_20250924_1130.log  messages_192.168.49.5_20250924_1000.log  messages_192.168.49.5_20250924_1157.log
messages_192.168.49.2_20250924_1133.log  messages_192.168.49.5_20250924_1036.log  messages_192.168.49.5_20250924_1200.log
messages_192.168.49.2_20250924_1136.log  messages_192.168.49.5_20250924_1109.log  messages_192.168.49.5_20250924_1203.log
messages_192.168.49.2_20250924_1137.log  messages_192.168.49.5_20250924_1112.log  messages_192.168.49.5_20250924_1206.log
messages_192.168.49.2_20250924_1139.log  messages_192.168.49.5_20250924_1115.log  messages_192.168.49.5_20250924_1209.log
messages_192.168.49.2_20250924_1142.log  messages_192.168.49.5_20250924_1118.log  messages_192.168.49.5_20250924_1212.log
messages_192.168.49.2_20250924_1145.log  messages_192.168.49.5_20250924_1121.log  messages_192.168.49.5_20250924_1709.log
messages_192.168.49.2_20250924_1148.log  messages_192.168.49.5_20250924_1124.log  messages_192.168.49.5_20250924_1712.log
messages_192.168.49.2_20250924_1151.log  messages_192.168.49.5_20250924_1127.log  messages_192.168.49.5_20250924_1715.log
```

We can see the last three recently copied log files from each node, by the 3 pods marked as Completed.



```
[a7md@CentOS9-NoGUI k8s-nodes-logs]$ ls -tr | tr '' '\n' | tail -n 1
messages_192.168.49.5_20250924_1718.log
[a7md@CentOS9-NoGUI k8s-nodes-logs]$
[a7md@CentOS9-NoGUI k8s-nodes-logs]$
[a7md@CentOS9-NoGUI k8s-nodes-logs]$ cat $( !! )
cat $( ls -tr | tr '' '\n' | tail -n 1  )
update-alternatives 2025-09-24 00:01:22: run with --set iptables /usr/sbin/iptables-nft
update-alternatives 2025-09-24 00:01:22: status of link group /usr/sbin/iptables set to manual
update-alternatives 2025-09-24 00:01:22: run with --set ip6tables /usr/sbin/ip6tables-nft
update-alternatives 2025-09-24 00:01:22: status of link group /usr/sbin/ip6tables set to manual
update-alternatives 2025-09-24 00:09:30: run with --set iptables /usr/sbin/iptables-nft
update-alternatives 2025-09-24 00:09:30: run with --set ip6tables /usr/sbin/ip6tables-nft
update-alternatives 2025-09-24 02:44:13: run with --set iptables /usr/sbin/iptables-nft
update-alternatives 2025-09-24 02:44:13: run with --set ip6tables /usr/sbin/ip6tables-nft
[a7md@CentOS9-NoGUI k8s-nodes-logs]$
```

Figure 6: Looking at the last-received log file