Arktos and Mizar Single Node Installation Guide

Date: 3 Jan 2022

Introduction

This document is intended for new users to install the Arktos platform with Mizar as the underlying network technology.

Installation Steps

- Prepare lab machine, the preferred OS is **Ubuntu 18.04**. If you are using AWS, the recommended instance size is `t2.2xlarge` and the storage size is `128GB` or more

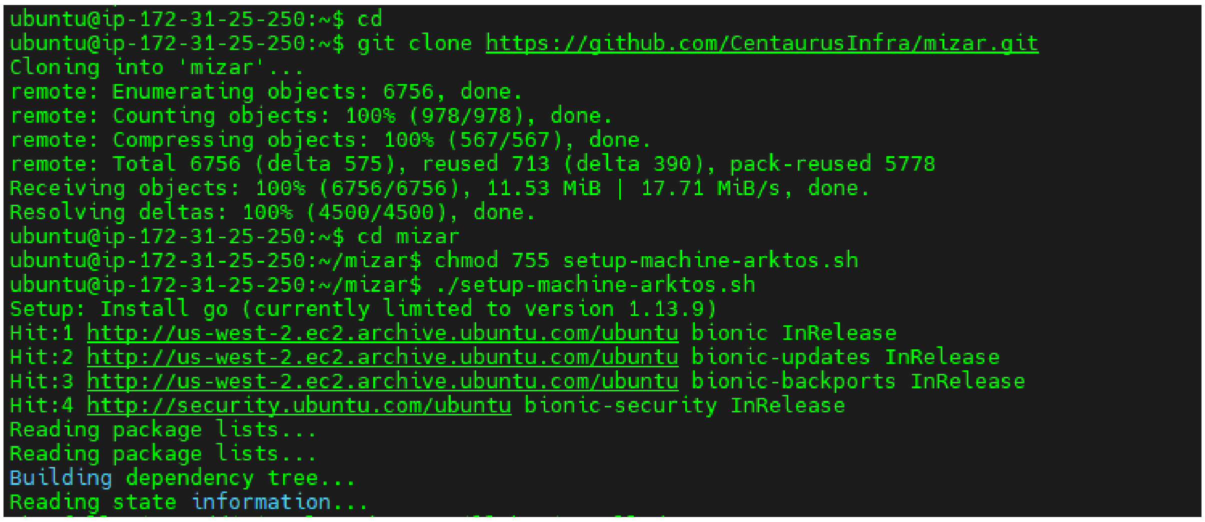
cd

git clone https://github.com/CentaurusInfra/mizar.git

cd mizar

chmod 755 setup-machine-arktos.sh

./setup-machine-arktos.sh

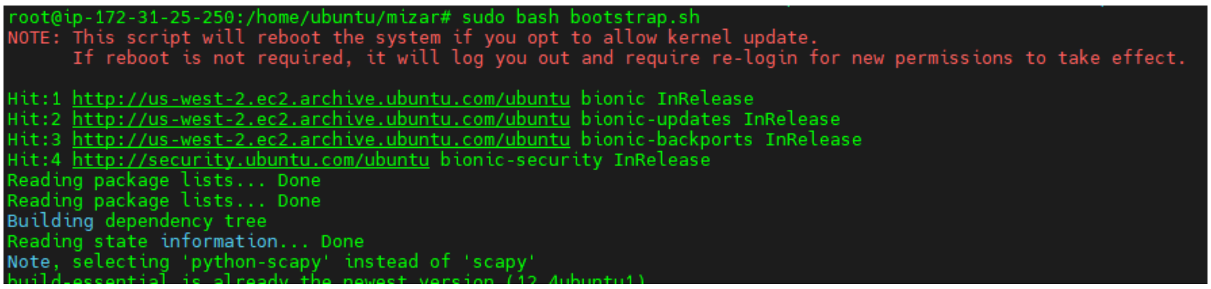


```
ubuntu@ip-172-31-25-250:~$ cd
ubuntu@ip-172-31-25-250:~$ git clone https://github.com/CentaurusInfra/mizar.git
Cloning into 'mizar'...
remote: Enumerating objects: 6756, done.
remote: Counting objects: 100% (978/978), done.
remote: Compressing objects: 100% (567/567), done.
remote: Total 6756 (delta 575), reused 713 (delta 390), pack-reused 5778
Receiving objects: 100% (6756/6756), 11.53 MiB | 17.71 MiB/s, done.
Resolving deltas: 100% (4500/4500), done.
ubuntu@ip-172-31-25-250:~$ cd mizar
ubuntu@ip-172-31-25-250:~/mizar$ chmod 755 setup-machine-arktos.sh
ubuntu@ip-172-31-25-250:~/mizar$ ./setup-machine-arktos.sh
Setup: Install go (currently limited to version 1.13.9)
Hit:1 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic-updates InRelease
Hit:3 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu bionic-security InRelease
Reading package lists...
Reading package lists...
Building dependency tree...
Reading state information...
```

The lab machine will be rebooted once the above script is completed, you will be automatically logged out of the lab machine.

- Log onto your lab machine, then run `bootstrap.sh` script from the Mizar project folder to bootstrap your lab machine.

- Once bootstrap is completed, you can then compile Mizar. Make sure to run these in `sudo` mode:

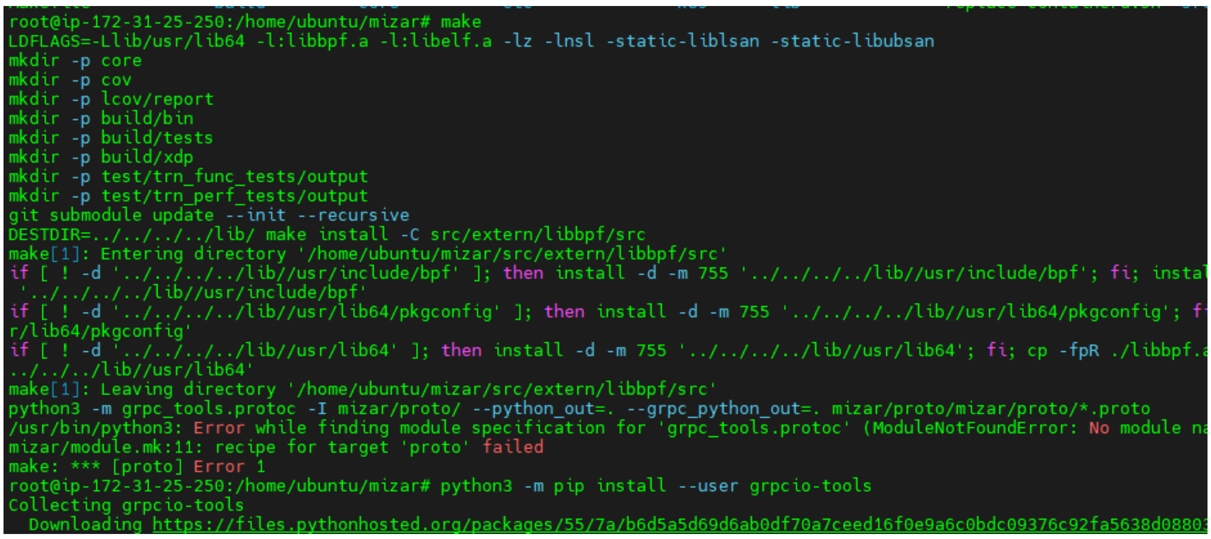


```
root@ip-172-31-25-250:/home/ubuntu/mizar# sudo bash bootstrap.sh
NOTE: This script will reboot the system if you opt to allow kernel update.
      If reboot is not required, it will log you out and require re-login for new permissions to take effect.

Hit:1 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic-updates InRelease
Hit:3 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu bionic-security InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'python-scapy' instead of 'scapy'
build-essential is already the newest version (12.4ubuntu1).
```

cd ~/mizar

sudo su

make

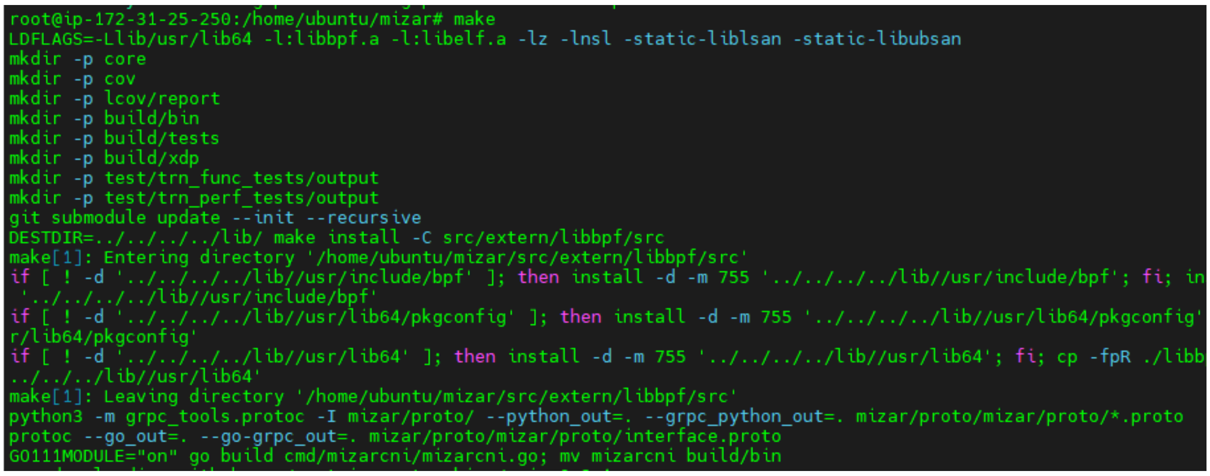


```
root@ip-172-31-25-250:/home/ubuntu/mizar# make
LDFLAGS=-Llib/usr/lib64 -l:libbpf.a -l:libelf.a -lz -lnsl -static-liblsan -static-libubsan
mkdir -p core
mkdir -p cov
mkdir -p lcov/report
mkdir -p build/bin
mkdir -p build/tests
mkdir -p build/xdp
mkdir -p test/trn_func_tests/output
mkdir -p test/trn_perf_tests/output
git submodule update --init --recursive
DESTDIR=../../../../lib/ make install -C src/extern/libbpf/src
make[1]: Entering directory '/home/ubuntu/mizar/src/extern/libbpf/src'
if [ ! -d '../../../../lib//usr/include/bpf' ]; then install -d -m 755 '../../../../lib//usr/include/bpf'; fi; instal
 '../../../../lib//usr/include/bpf'
if [ ! -d '../../../../lib//usr/lib64/pkgconfig' ]; then install -d -m 755 '../../../../lib//usr/lib64/pkgconfig'; f
r/lib64/pkgconfig'
if [ ! -d '../../../../lib//usr/lib64' ]; then install -d -m 755 '../../../../lib//usr/lib64'; fi; cp -fpR ./libbpf.a
../../../lib//usr/lib64'
make[1]: Leaving directory '/home/ubuntu/mizar/src/extern/libbpf/src'
python3 -m grpc_tools.protoc -I mizar/proto/ --python_out=. --grpc_python_out=. mizar/proto/mizar/proto/*.proto
/usr/bin/python3: Error while finding module specification for 'grpc_tools.protoc' (ModuleNotFoundError: No module na
mizar/module.mk:11: recipe for target 'proto' failed
make: *** [proto] Error 1
root@ip-172-31-25-250:/home/ubuntu/mizar# python3 -m pip install --user grpcio-tools
Collecting grpcio-tools
  Downloading https://files.pythonhosted.org/packages/55/7a/b6d5a5d69d6ab0df70a7ceed16f0e9a6c0bdc09376c92fa5638d08803
```

Install grpcio tools:

python3 -m pip install --user grpcio-tools

make



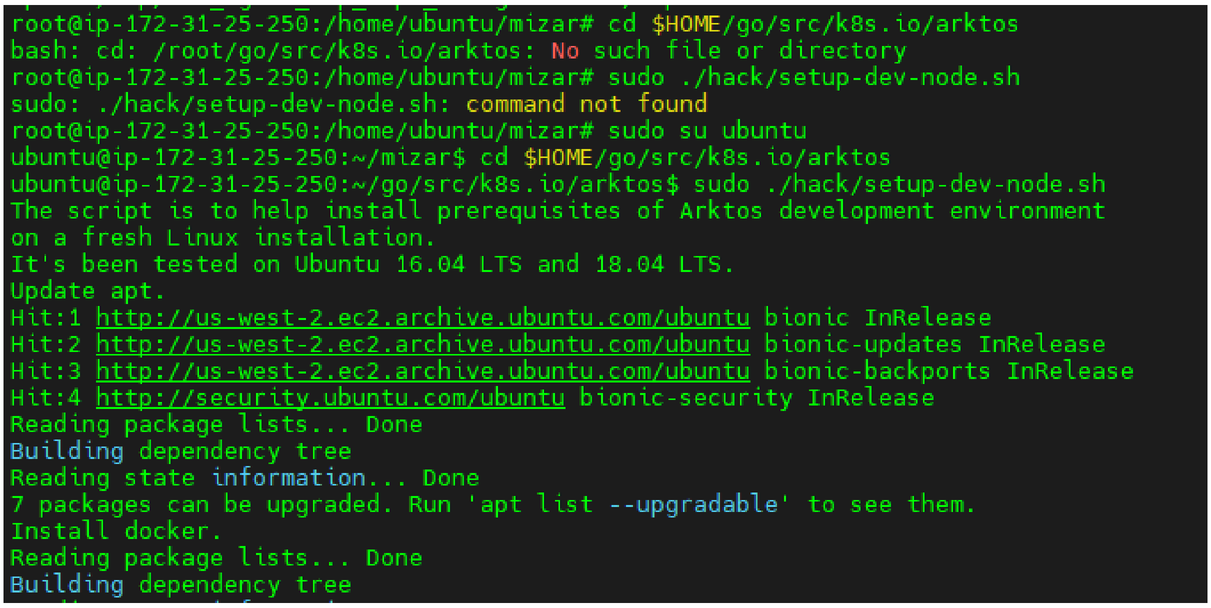
```
root@ip-172-31-25-250:/home/ubuntu/mizar# make
LDFLAGS=-Llib/usr/lib64 -l:libbpf.a -l:libelf.a -lz -lnsl -static-liblsan -static-libubsan
mkdir -p core
mkdir -p cov
mkdir -p lcov/report
mkdir -p build/bin
mkdir -p build/tests
mkdir -p build/xdp
mkdir -p test/trn_func_tests/output
mkdir -p test/trn_perf_tests/output
git submodule update --init --recursive
DESTDIR=../../../../lib/ make install -C src/extern/libbpf/src
make[1]: Entering directory '/home/ubuntu/mizar/src/extern/libbpf/src'
if [ ! -d '../../../../lib//usr/include/bpf' ]; then install -d -m 755 '../../../../lib//usr/include/bpf'; fi; in
 '../../../../lib//usr/include/bpf'
if [ ! -d '../../../../lib//usr/lib64/pkgconfig' ]; then install -d -m 755 '../../../../lib//usr/lib64/pkgconfig'
r/lib64/pkgconfig'
if [ ! -d '../../../../lib//usr/lib64' ]; then install -d -m 755 '../../../../lib//usr/lib64'; fi; cp -fpR ./libb
../../../lib//usr/lib64'
make[1]: Leaving directory '/home/ubuntu/mizar/src/extern/libbpf/src'
python3 -m grpc_tools.protoc -I mizar/proto/ --python_out=. --grpc_python_out=. mizar/proto/mizar/proto/*.proto
protoc --go_out=. --go-grpc_out=. mizar/proto/mizar/proto/interface.proto
GO111MODULE="on" go build cmd/mizarcni/mizarcni.go; mv mizarcni build/bin
```

Build arktos-network-controller (as it is not part of arktos-up.sh yet)

cd $HOME/go/src/k8s.io/arktos

sudo ./hack/setup-dev-node.sh

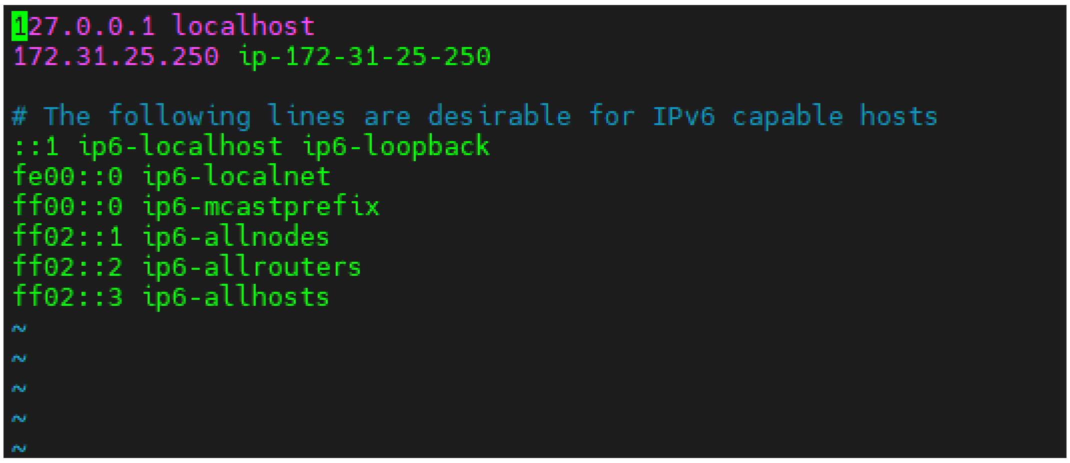
make all WHAT=cmd/arktos-network-controller



```
root@ip-172-31-25-250:/home/ubuntu/mizar# cd $HOME/go/src/k8s.io/arktos
bash: cd: /root/go/src/k8s.io/arktos: No such file or directory
root@ip-172-31-25-250:/home/ubuntu/mizar# sudo ./hack/setup-dev-node.sh
sudo: ./hack/setup-dev-node.sh: command not found
root@ip-172-31-25-250:/home/ubuntu/mizar# sudo su ubuntu
ubuntu@ip-172-31-25-250:~/mizar$ cd $HOME/go/src/k8s.io/arktos
ubuntu@ip-172-31-25-250:~/go/src/k8s.io/arktos$ sudo ./hack/setup-dev-node.sh
The script is to help install prerequisites of Arktos development environment
on a fresh Linux installation.
It's been tested on Ubuntu 16.04 LTS and 18.04 LTS.
Update apt.
Hit:1 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic-updates InRelease
Hit:3 http://us-west-2.ec2.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu bionic-security InRelease
Reading package lists... Done
Building dependency tree
Reading state information... Done
7 packages can be upgraded. Run 'apt list --upgradable' to see them.
Install docker.
Reading package lists... Done
Building dependency tree
```

Also, please ensure the hostname and its ip address in /etc/hosts. For instance, if the hostname is ip-172-31-25-250, ip address is 172.31.25.250:

```
127.0.0.1 localhost
172.31.25.250  ip-172-31-25-250
```

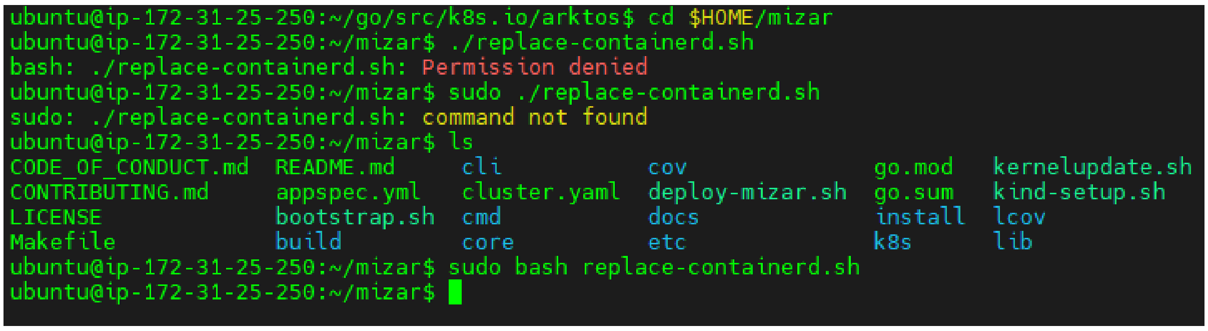


```
127.0.0.1 localhost
172.31.25.250 ip-172-31-25-250

# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
ff02::3 ip6-allhosts
~
~
~
~
~
```

Replace the Arktos containerd:

cd $HOME/mizar

sudo bash replace-containerd.sh

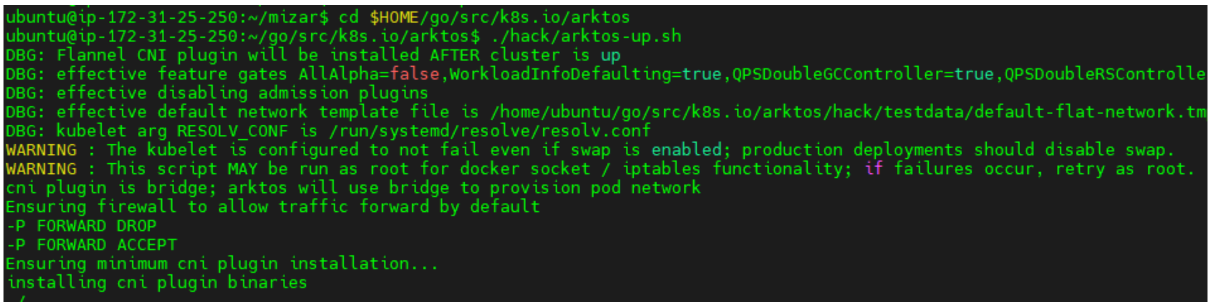


```
ubuntu@ip-172-31-25-250:~/go/src/k8s.io/arktos$ cd $HOME/mizar
ubuntu@ip-172-31-25-250:~/mizar$ ./replace-containerd.sh
bash: ./replace-containerd.sh: Permission denied
ubuntu@ip-172-31-25-250:~/mizar$ sudo ./replace-containerd.sh
sudo: ./replace-containerd.sh: command not found
ubuntu@ip-172-31-25-250:~/mizar$ ls
CODE_OF_CONDUCT.md   README.md     cli           cov              go.mod    kernelupdate.sh
CONTRIBUTING.md      appspec.yml   cluster.yaml  deploy-mizar.sh  go.sum    kind-setup.sh
LICENSE              bootstrap.sh  cmd           docs             install   lcov
Makefile             build         core          etc              k8s       lib
ubuntu@ip-172-31-25-250:~/mizar$ sudo bash replace-containerd.sh
ubuntu@ip-172-31-25-250:~/mizar$ 
```

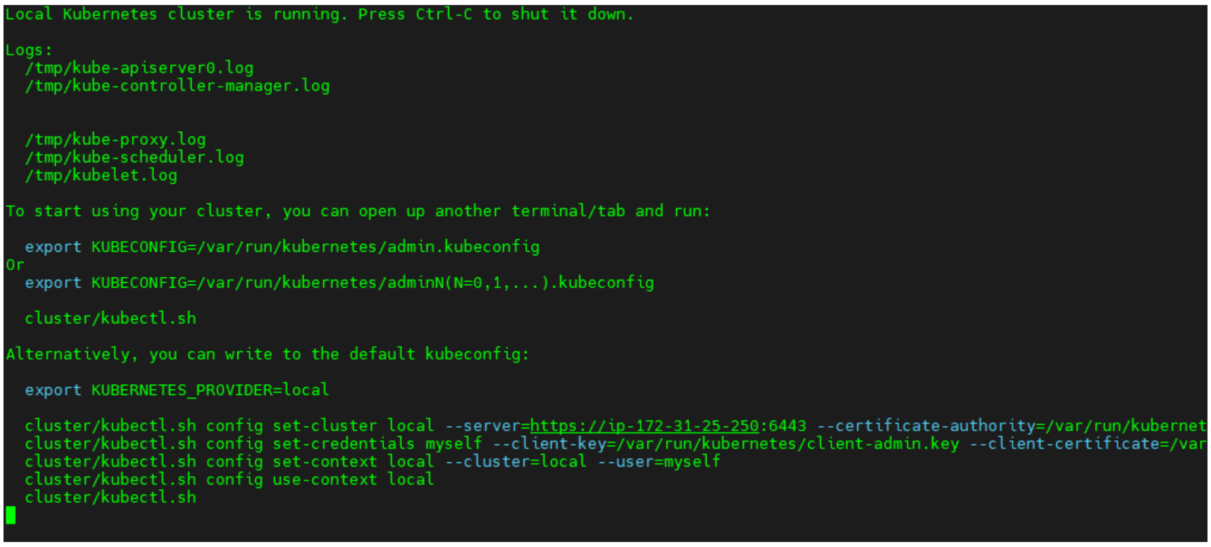
Before deploying Mizar, you will need first start up Arktos API server:

cd $HOME/go/src/k8s.io/arktos

./hack/arktos-up.sh



```
ubuntu@ip-172-31-25-250:~/mizar$ cd $HOME/go/src/k8s.io/arktos
ubuntu@ip-172-31-25-250:~/go/src/k8s.io/arktos$ ./hack/arktos-up.sh
DBG: Flannel CNI plugin will be installed AFTER cluster is up
DBG: effective feature gates AllAlpha=false,WorkloadInfoDefaulting=true,QPSDoubleGCController=true,QPSDoubleRSControlle
DBG: effective disabling admission plugins
DBG: effective default network template file is /home/ubuntu/go/src/k8s.io/arktos/hack/testdata/default-flat-network.tm
DBG: kubelet arg RESOLV_CONF is /run/systemd/resolve/resolv.conf
WARNING : The kubelet is configured to not fail even if swap is enabled; production deployments should disable swap.
WARNING : This script MAY be run as root for docker socket / iptables functionality; if failures occur, retry as root.
cni plugin is bridge; arktos will use bridge to provision pod network
Ensuring firewall to allow traffic forward by default
-P FORWARD DROP
-P FORWARD ACCEPT
Ensuring minimum cni plugin installation...
installing cni plugin binaries
```

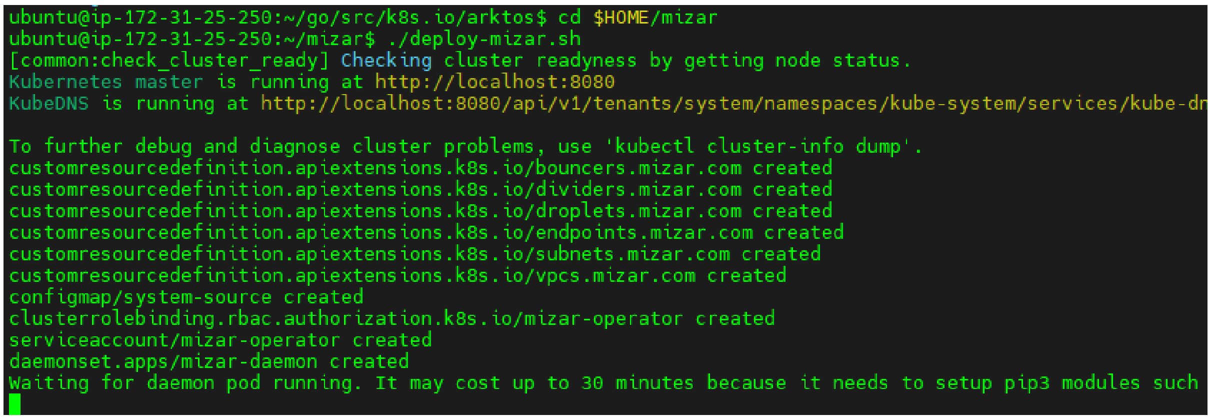


```
Local Kubernetes cluster is running. Press Ctrl-C to shut it down.

Logs:
  /tmp/kube-apiserver0.log
  /tmp/kube-controller-manager.log


  /tmp/kube-proxy.log
  /tmp/kube-scheduler.log
  /tmp/kubelet.log

To start using your cluster, you can open up another terminal/tab and run:

  export KUBECONFIG=/var/run/kubernetes/admin.kubeconfig
Or
  export KUBECONFIG=/var/run/kubernetes/adminN(N=0,1,...).kubeconfig

  cluster/kubectl.sh

Alternatively, you can write to the default kubeconfig:

  export KUBERNETES_PROVIDER=local

  cluster/kubectl.sh config set-cluster local --server=https://ip-172-31-25-250:6443 --certificate-authority=/var/run/kubernet
  cluster/kubectl.sh config set-credentials myself --client-key=/var/run/kubernetes/client-admin.key --client-certificate=/var
  cluster/kubectl.sh config set-context local --cluster=local --user=myself
  cluster/kubectl.sh config use-context local
  cluster/kubectl.sh
```

Deploy Mizar. Open a new terminal window, and run:

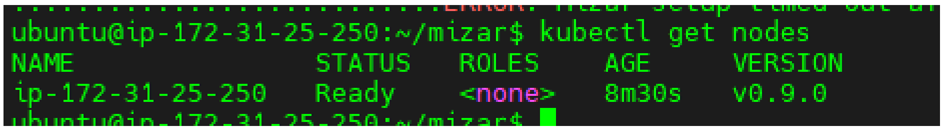
cd $HOME/mizar

./deploy-mizar.sh



```
ubuntu@ip-172-31-25-250:~/go/src/k8s.io/arktos$ cd $HOME/mizar
ubuntu@ip-172-31-25-250:~/mizar$ ./deploy-mizar.sh
[common:check_cluster_ready] Checking cluster readyness by getting node status.
Kubernetes master is running at http://localhost:8080
KubeDNS is running at http://localhost:8080/api/v1/tenants/system/namespaces/kube-system/services/kube-dr

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
customresourcedefinition.apiextensions.k8s.io/bouncers.mizar.com created
customresourcedefinition.apiextensions.k8s.io/dividers.mizar.com created
customresourcedefinition.apiextensions.k8s.io/droplets.mizar.com created
customresourcedefinition.apiextensions.k8s.io/endpoints.mizar.com created
customresourcedefinition.apiextensions.k8s.io/subnets.mizar.com created
customresourcedefinition.apiextensions.k8s.io/vpcs.mizar.com created
configmap/system-source created
clusterrolebinding.rbac.authorization.k8s.io/mizar-operator created
serviceaccount/mizar-operator created
daemonset.apps/mizar-daemon created
Waiting for daemon pod running. It may cost up to 30 minutes because it needs to setup pip3 modules such
```

Once your arktos server and Mizar are running. To verify, you can open a new terminal and run `kubectl get nodes`, you should see a node running with the name starts with "IP" followed by the private IP address of your lab machine.



```
ubuntu@ip-172-31-25-250:~/mizar$ kubectl get nodes
NAME                STATUS    ROLES     AGE      VERSION
ip-172-31-25-250    Ready     <none>    8m30s    v0.9.0
```

You also want make sure the default kubernetes bridge network configuration file is deleted:

sudo ls /etc/cni/net.d

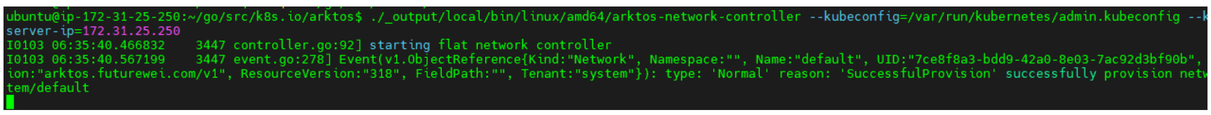
sudo rm /etc/cni/net.d/bridge.conf

Start Arktos network controller. From a new terminal window, run:

cd $HOME/go/src/k8s.io/arktos

./_output/local/bin/linux/amd64/arktos-network-controller --kubeconfig=/var/run/kubernetes/admin.kubeconfig --kube-apiserver-ip=xxx.xxx.xxx.xxx

where the `kube-apiserver-ip` is your lab machine's **private ip address**



```
ubuntu@ip-172-31-25-250:~/go/src/k8s.io/arktos$ ./_output/local/bin/linux/amd64/arktos-network-controller --kubeconfig=/var/run/kubernetes/admin.kubeconfig --k
server-ip=172.31.25.250
I0103 06:35:40.466832    3447 controller.go:92] starting flat network controller
I0103 06:35:40.567199    3447 event.go:278] Event(v1.ObjectReference{Kind:"Network", Namespace:"", Name:"default", UID:"7ce8f8a3-bdd9-42a0-8e03-7ac92d3bf90b",
ion:"arktos.futurewei.com/v1", ResourceVersion:"318", FieldPath:"", Tenant:"system"}): type: 'Normal' reason: 'SuccessfulProvision' successfully provision netw
tem/default
```