

# Casa 5GC v5.2.0 Installation

## Method of Procedure

### Create a 5gc-build-server VM

Flavor 4vCPU cores, 8G RAM, and 40GB disk with Ubuntu-18.04 image:



### Install Docker on Build Server

First, update the packages index and install the dependencies necessary to enable a new repository over HTTPS:

```
sudo apt update
```

```
sudo apt install apt-transport-https ca-certificates curl software-properties-common
```

Import the repository's GPG key using the following curl command:

```
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
```

Add the Docker APT repository to your system's software repository list by typing:

```
sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
```

Now that the Docker repository is enabled, update the apt package list and install the latest version of Docker CE (Community Edition) with:

```
sudo apt update
```

```
sudo apt install docker-ce
```

When the installation is completed the Docker service will start automatically. You can verify it by typing:

```
sudo systemctl status docker
```

```
docker -v
```

Executing the Docker Command Without Sudo

```
sudo usermod -aG docker $USER
```

Log out and log back in so that the group membership is refreshed.

To verify that Docker has been successfully installed and that you can run docker commands without prepending sudo, type the following command which will download a test image, run it in a container, print a “Hello from Docker” message and exit:

```
docker container run hello-world
```

## Clone a Local casa-5gc git Repository on Build Server

```
git config --global user.email "casa.5gc@casa-systems.com"
```

```
git config --list
```

```
user.email=casa.5gc@casa-systems.com
```

```
git clone http://65.202.54.7/deployments/casa-5gc.git (username: Casa_5GC, pwd: casacasa)
```

## Install and Run Rancher Container on Build Server

Run the following command to install Rancher container on the Docker:

```
docker run -d --restart=unless-stopped -p 80:80 -p 443:443 -v /home/ubuntu/.ssh:/container/certs -e SSL_CERT_DIR="/container/certs" --name rancher rancher/rancher:v2.4.5
```

Verify the Rancher container is up running:

```
docker ps
```

To access Rancher Web GUI using the IP address of Build server VM:

```
https://<build_sever_ip_address>
```

## Create Rancher Kubernetes Cluster for Casa 5GC (Examples)

For Casa 5GC cluster, the recommended flavors for each of mater and worker nodes are the following:

3 Master Nodes: 4 vCPU, 8GB RAM, 180GB vDisk for each master

3 Worker Nodes: 12 vCPU, 16GB RAM, 180GB vDisk for each worker

a. Required additional parameters for k8s cluster yaml file:

(1) Use kubernetes version v1.18.6:

```
kubernetes_version: v1.18.6-rancher1-1
```

(2) Set MTU 1400:

network:

```
mtu: '1400'
```

options:

```
flannel_backend_type: vxlan
```

```
plugin: calico
```

(3) Enable SCTP support:

kube-api:

```
always_pull_images: false
```

```
extra_args:
```

```
feature-gates: "SCTPSupport=true"
```

```
pod_security_policy: false
```

```
service_node_port_range: "30000-32767"
```

(4) Increase number of PODs per worker node, (needed for a single worker node cluster)

kubelet:


```
fail_swap_on: false
```

```
[...]
```

```
extra_args:
```


```
max-pods: '330'
```

b. Sample of k8s cluster configuration:



casa-k8s-cluster

ClusterNodesStorageProjectsNamespacesMembersTools



### Edit Cluster casa-k8s-cluster (Custom)

Cluster Name \*

casa-k8s-cluster

Add a Description

Member Roles

Control who has access to the cluster and what permission they have to change it.

Labels & Annotations

Configure labels and annotations for the cluster.

7 Configured

### Cluster Options

Edit as YAML

Expand All

Kubernetes Options

Customize the Kubernetes cluster options.

Kubernetes Version

v1.15.10-rancher1-1

When upgrading Kubernetes versions, please review the [Kubernetes release notes](#) for any breaking changes.

Network Provider

calico

Project Network Isolation

☐ Enabled

☒ Disabled

OS Plugin MTU Override

1400

Only applied if the value is not zero. When applied, the MTU value is explicitly configured for the chosen network provider (disabling auto-detection). The override must be calculated from the host's MTU minus the OS plugin's required overhead.

Cloud Provider

ⓘ If your cloud provider is not listed, please use the Custom option.

none

## Install kubectl to Manage 5GC Kubernetes Cluster

Ubuntu procedure of installing Kubectl:

```
curl -LO https://storage.googleapis.com/kubernetes-release/release/v1.18.6/bin/linux/amd64/kubectl
```

```
chmod +x ./kubectl
```

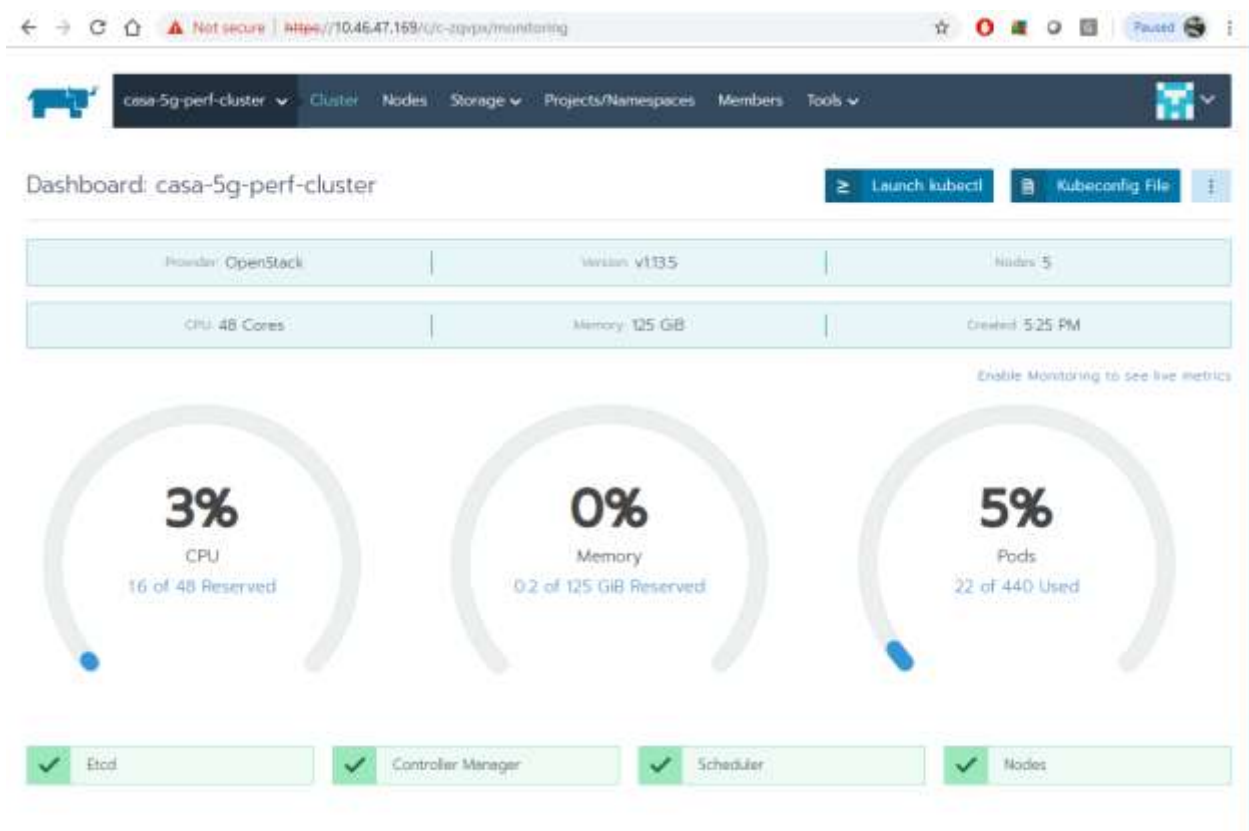
```
sudo mv ./kubectl /usr/local/bin/kubectl
```

```
kubectl cluster-info
```

```
touch ~/.kube/config
```

```
export KUBECONFIG=/home/ubuntu/.kube/config
```

Retrieve Kubeconfig file from Rancher kubernetes cluster and copy it into ~/.kube/config:



```
apiVersion: v1
kind: Config
clusters:
- name: "casa-5g-perf-cluster"
  cluster:
    server: "https://10.46.47.169/k8s/clusters/c-zqvpX"
    certificate-authority-data: "LS0tLS1CRUdJTiBDRVJUSUZJQ0FURSB0tLS0tCk1JSUM3akNDQV
    WRhZ0F3SUJBZ01CQURBTk1na3Foa2lH0XcwQkFRc0ZBREFTTVjJd0VBWURWUUVFLRXdsMGFHVXQKY\
    21GdVkyZ3hFakFRQmd0VkJBTVRDV05oZEhSc1pTMWpZVEFlRncweE9UQTfNakV4TXpFNU1qZGFgd\
    zB5T1RBMQpNVGd4TXpFNU1qZGFNQ2d4RwpBUUJnTlZCQW9UQ1hSb1pTMX1ZVzVqYURFU01CQUdBM\
    VVFQXhNS1kyRjBkr3hsCkxXTmhNSU1CSWpBTk1na3Foa2lH0XcwQkFRRUZBQU9DQVE4QU1JSUJDZ\
    0tDQVFFQThzcXFYZVYVYnFjaHl3VjUKYTVGZHd6VytQOE9GMVJVNBHbzTmwxbThyM1YvR1UweJNUV\
    25Mek9TRDNhUTfQwJrmNDNOQ1FGaEc1Z0FaQXZtaQowew5h0HRxNkh1SmsrRGFoUzc5Z1dndkQ4c\
    014UXMrdm5XSKNYeDhQOHFEYm5xUGFha2VUVk1qOUFtamdKawFLCndmVksrZ3dLZm1lTHp0aVFid\
    TAY0StSZVN2ZE5NNGxtSzBFSWZwMhp5aUUzOGw0ZG1qVWVmdGVEWtNYZlNIWGoKdn1PRHpLbz1rU\
    XJQSn1KcwZuUEV2dW8zNmFmcEpyT3h1UTFMd2JQMzN5dEkWk2Y3MnN1aU8yWDdRVHU3NmIzcgoYT\
    ERmM1prL0hkMjZpYjY5K3NvdWlkbbHhLdDlHN05jcnpnNWhnYUeYUWNIYjc5ekRWN3VEckFveUJRS\
    W03b3N1CkxwaGNWU1EQVFBQm95TXdJVEFPQmd0OVkhROEJBZjhFQkFNQ0F0UXdEd1lEV1IwVEFRS\
    C9CQV3QXdfQi96QU4KQmdrcWhraUc5dzBCQVfzRkFBT0NBUEVBMi8zZW5FakxxRnJmOXZJSzVjM\
    TftSnF3M2VXT0dET1hjQzhKMlF2eAo5cTRKWER4RjA5Umx0NWRVNF1JdkpOUJ50TcrbExKZU1WN\
    XJXMVvtWw5ZVMI3MDZjbjBmSnA5MDQ5cmZjRVdHcm1lRwXNOFNxewU4YzRiRm5DVFdWRDBldG04W\
    jYzY2Z0a0VnNXkrZS9kdXpEcWnQajNWyU12Rj1xYTI3NDhUYVgKNVE2TVg3TjJ5ZGdJM2hnTTF0Q\
    m44amM2dm9LTldLWldEd0p5Uko0MHJU0EU2ZDE5Z0hvDFZwOD1oR0lwQXN3MwpGVtUwcjVPN0ZUc\
    UV0SGsvNjJVNmp1Y3JQbVYyZEFzYlF2eUht3Fzc2FTMFA4c11DUHRIKzdRSXZqdH1kRGdpCkdGS\
    zU3U2NFd0NRB2p3V3BPaDFzVzd1cXR5e1F0VG95TnNaMXJKQVJxUFZBcm9PQ0tLS0tLUVORCBDR\
    VJUSUZJQ0FURSB0tLS0t"
- name: "casa-5g-perf-cluster-k8s-master1"
  cluster:
    server: "https://10.46.47.172:6443"
    certificate-authority-data: "LS0tLS1CRUdJTiBDRVJUSUZJQ0FURSB0tLS0tCk1JSUN3akNDQV
    WFxZ0F3SUJBZ01CQURBTk1na3Foa2lH0XcwQkFRc0ZBREFTTVjBd0RnWURWUUVFERXdkcmRXSmwKT\
    FdOaE1CNfHeVEU1TURVeU1USXhNamd5TTFvWERUSTVNRfV4T0RJeE1qZ3lNMW93RWpFUU1BNEdBm\
    VVFQXhNSAphM1ZpwlMxa1lUQ0NBUE013RFFZSKtvWklodmNOQVFFQkJRQURnZ0VQURDQ0FRb0NnZ\
    0VCQU56UmlnMmtsMmxRCKM2ekVqTG11enRDc0Z6Ri9lMUxodWpqV1V4eUgydnovKytldk1ickhhR\
    1FoU1FkZXBMQVdiWG02ZGV1TkZ0SjYKVUk5L2dzL1BqYzB0dHZZcXRjeTNEKzFCTko3cytCOWMyU"
```

```
zFjQjh0YnB1e1hGd2hTznF5UmN2Z1lDS3p5cm5vMgowZDI3RHc0U3ZrTUFzbHZDdlRCVTlnWmdVd\
G1VQzF4dXBWZnkyREdxc1NqTTdEZfVmwMfYM2JiQWE4M1k2MDRpCnNvdK5mT0ptYmwyUi9tR0N2S\
EM0LzhYckNjNzBkTGExL1VRSz1Qa2JCVE5GNFV1WE5UUE5GTEhzMVhVWGJCdEcKRHE5azB5cTRaW\
TZRRTF6VGV2QUFsQU5QYk03L01CN28zWko2V2I5YXQxb2V4NFFJWjd2REU1RUVFUE1HOGNERgo1b\
HVEYm1YMnhTMENBd0VBQWFNak1DRXdEZ1lEV1IwUEFRSC9CQVFEQWdLa01B0EdBMVVkRXdfQI93U\
UZNUQ1CCKfMOHdEUUV1KS29aSWh2Y05BUUVMQ1FBRGdnRUJBQVlwSVp6UU5qWEdjN1kyUFp1Z0xsa\
UYyQ3VXQTFyQm93NEsKUKRqZzErV0xmTnBLMW1ZTXZXTmhDZ3hJMTJ6NjBwSTlKRUGvZmU5ZGxVb\
TVCQU1vSnBEM3M3dTZ4VEhQNKyNpYnNXZn1VdHdJRUNwODUrdkhHTXhub2FuSHZHcVRBUEV1S\
Ed4bXVDM21FbU1VZkxMbG1zQ2tyd1Rjdk9jTVNECjc3b1I1RUVESFp2NjQvZ1hwSTB3T2tPaHBpY\
1ZPUXp3UFhPNDRHbWZ3RDFrK0hhRG94VXk2cDBMSnozYXVnQmgKc0Fyb2NVcFVKVUo4K1dFaytiW\
VU1eElwNy9ScFZrbW9pd1FGbkNnMk84bGtESVdSK3crS3RrbkVKdmoyZHo3MAphSUG4azVqZWdMc\
XhFdX1tSTf4TTZpcGtHd1Jlby9uSElZZEUwcV4UfN3d1hYUhd4V0k9Ci0tLS0tRU5EIEENFU1RJR\
k1DQVRFLS0tLS0K"
```

users:

- name: "user-2k8nf"

user:

token: "kubecfg-user-2k8nf.c-  
zqvpX:l97vszmwXsfxf8f77ttz4zbbk7cpdcxt62zms2fgjq82j5mnrkgz"

contexts:

- name: "casa-5g-perf-cluster"

context:

user: "user-2k8nf"

cluster: "casa-5g-perf-cluster"

- name: "casa-5g-perf-cluster-k8s-master1"

context:

user: "user-2k8nf"

cluster: "casa-5g-perf-cluster-k8s-master1"

current-context: "casa-5g-perf-cluster"

## kubect1 get pods --all-namespaces

NAMESPACE	NAME	READY	STATUS	RESTARTS	AGE
cattle-system	cattle-cluster-agent-657cbb48d9-65rlr	1/1	Running	0	22m
cattle-system	cattle-node-agent-kqdf5	1/1	Running	0	21m
cattle-system	cattle-node-agent-m8f7p	1/1	Running	0	21m
cattle-system	cattle-node-agent-pf4kl	1/1	Running	0	21m
cattle-system	cattle-node-agent-pxlsw	1/1	Running	0	20m
cattle-system	cattle-node-agent-rhjvm	1/1	Running	0	22m
cattle-system	kube-api-auth-85rdp	1/1	Running	0	21m
cattle-system	kube-api-auth-b7zjx	1/1	Running	0	21m

cattle-system	kube-api-auth-dfxlk	1/1	Running	0	20m
cattle-system	kube-api-auth-jm6dd	1/1	Running	0	22m
cattle-system	kube-api-auth-q4qwp	1/1	Running	0	21m
ingress-nginx	default-http-backend-78fccfc5d9-hgxkk	1/1	Running	0	22m
ingress-nginx	nginx-ingress-controller-59gpt	1/1	Running	0	21m
ingress-nginx	nginx-ingress-controller-jt26p	1/1	Running	0	21m
ingress-nginx	nginx-ingress-controller-r7gdb	1/1	Running	0	21m
ingress-nginx	nginx-ingress-controller-rvr5q	1/1	Running	0	20m
kube-system	calico-node-62cmn	1/1	Running	0	21m
kube-system	calico-node-djt2s	1/1	Running	0	22m
kube-system	calico-node-hcrxs	1/1	Running	0	21m
kube-system	calico-node-j6tmj	1/1	Running	0	21m
kube-system	calico-node-vklvf	1/1	Running	0	21m
kube-system	kube-dns-58bd5b8dd7-8n9xt	3/3	Running	0	20m
kube-system	kube-dns-58bd5b8dd7-qgbfd	3/3	Running	0	22m
kube-system	kube-dns-autoscaler-77bc5fd84-tl68c	1/1	Running	0	22m
kube-system	metrics-server-58bd5dd8d7-qz9qp	1/1	Running	0	22m
kube-system	rke-ingress-controller-deploy-job-dbk19	0/1	Completed	0	22m
kube-system	rke-kube-dns-addon-deploy-job-mm4d	0/1	Completed	0	22m
kube-system	rke-metrics-addon-deploy-job-x2b6j	0/1	Completed	0	22m
kube-system	rke-network-plugin-deploy-job-t2phq	0/1	Completed	0	22m

## Option #1: Deploy Casa 5GC using AWS Registry (External Deployments)

### Install AWS Client

```
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
```

```
sudo apt install unzip
```

```
unzip awscliv2.zip
```

```
sudo ./aws/install
```

### Configure AWS for Access

Note that please contact Casa support for obtaining your AWS account.

```
aws configure
```

```
AWS Access Key ID [None]: *****
```

```
AWS Secret Access Key [None]: *****
```

```
Default region name [None]: us-east-2
```

```
Default output format [None]:
```



## Docker Login

To log into Docker, enter the following:

```
aws ecr get-login-password --region us-east-2 | docker login --username AWS --password-stdin  
228078468156.dkr.ecr.us-east-2.amazonaws.com
```

## Create Image Pulling Secret

```
kubectl -n default delete secret regcred
```

```
kubectl -n default create secret generic regcred --from-  
file=.dockerconfigjson=/home/ubuntu/.docker/config.json --type=kubernetes.io/dockerconfigjson
```

```
kubectl -n default patch serviceaccount default -p '{"imagePullSecrets":[{"name":"regcred"}]}'
```

## Install and Uninstall Casa Axyom 5GC Platform

To install Casa Axyom 5GC platform, enter the following:

```
export KUBECONFIG=/home/ubuntu/.kube/config
```

```
cd /home/ubuntu/casa-5gc/install_v5.2.0
```

```
axyomctl install --platform --release 5.2.0 --storage --storage-provisioner
```

Note that you can also obtain axyomctl binary from Casa artifactory registry as:

```
wget -cO- https://artifactory.casa-  
systems.com:443/artifactory/axyom/cli/0.11.2/axyomctl_0.11.2_Linux_x86_64 > axyomctl
```

```
chmod +x axyomctl
```

To uninstall Axyom resources:

```
axyomctl uninstall
```

To uninstall Axyom resources AND the 5G Platform:

```
axyomctl uninstall --platform
```

## Verify Casa Axyom 5GC Platform

After installing Casa Axyom 5GC platform successfully, you should have the following containers up running:

**kubectl get pod -A**

NAMESPACE	NAME	READY	STATUS	RESTARTS	AGE
axyom-system	axyom-controller-manager-6f964dd454-jxfdf	2/2	Running	0	127m
axyom-system	axyom-dashboard-54c8c47c9d-cczf8	1/1	Running	0	127m
axyom	etcd-0	1/1	Running	0	127m
axyom	mgmt-85c6586dd6-gcjzc	1/1	Running	0	127m
cattle-system	cattle-cluster-agent-6c98bcfddf-dwbsz	1/1	Running	3	7h39m
cattle-system	cattle-node-agent-crkwk	1/1	Running	3	7h39m
cattle-system	kube-api-auth-8hw7c	1/1	Running	3	7h39m
cert-manager	cert-manager-7747db9d88-jg94k	1/1	Running	0	128m
cert-manager	cert-manager-cainjector-87c85c6ff-gts9l	1/1	Running	0	128m
cert-manager	cert-manager-webhook-64dc9fff44-8jttx	1/1	Running	0	128m
elastic-system	elastic-operator-0	1/1	Running	0	129m
infrastructure	alertmanager-main-0	2/2	Running	0	128m
infrastructure	alertmanager-main-1	2/2	Running	0	128m
infrastructure	alertmanager-main-2	2/2	Running	0	128m
infrastructure	es-es-default-0	1/1	Running	0	129m
infrastructure	es-es-default-1	1/1	Running	0	129m
infrastructure	es-es-default-2	1/1	Running	0	129m
infrastructure	es-kb-5cb549cbcd-jxr6b	1/1	Running	0	129m
infrastructure	etcd-etcd-operator-etcd-backup-operator-55b65bdbcc-w9vcw	1/1	Running	0	127m
infrastructure	etcd-etcd-operator-etcd-operator-64bb89498c-tdjbp	1/1	Running	0	127m
infrastructure	etcd-etcd-operator-etcd-restore-operator-6545c49ff5-kqkc4	1/1	Running	0	127m
infrastructure	flb-fluent-bit-bhqcg	1/1	Running	0	129m
infrastructure	grafana-64589b5777-9r7x2	1/1	Running	0	129m
infrastructure	jaeger-collector-8467c99867-w28tc	1/1	Running	3	128m
infrastructure	jaeger-query-9bb6b75b9-gkc99	2/2	Running	2	128m
infrastructure	kube-state-metrics-bdb8874fd-fh4bs	3/3	Running	0	129m
infrastructure	node-exporter-kxb5q	2/2	Running	0	129m
infrastructure	prometheus-adapter-7f9dfdb9c-jc7wt	1/1	Running	0	129m
infrastructure	prometheus-k8s-0	3/3	Running	1	128m
infrastructure	prometheus-k8s-1	3/3	Running	1	128m
infrastructure	prometheus-operator-574fd8ccd9-mmcz7	2/2	Running	0	129m
infrastructure	redis-redis-operator-5876f76659-f2n2b	1/1	Running	0	129m
ingress-nginx	default-http-backend-598b7d7dbd-7s7xx	1/1	Running	3	7h39m
ingress-nginx	nginx-ingress-controller-9gps7	1/1	Running	3	7h39m
istio-system	flagger-745bb588c5-bvztr	1/1	Running	0	127m
istio-system	grafana-d4d7bdd6-th4gx	1/1	Running	0	128m
istio-system	istio-citadel-7f5dd5b7cf-4x9sc	1/1	Running	0	128m
istio-system	istio-citadel-7f5dd5b7cf-nmbsv	1/1	Running	0	128m
istio-system	istio-galley-5f58c64987-2hj9x	1/1	Running	0	128m
istio-system	istio-galley-5f58c64987-85kqj	1/1	Running	0	128m
istio-system	istio-ingressgateway-7d4db586fc-6dm9g	1/1	Running	0	128m
istio-system	istio-ingressgateway-7d4db586fc-6w17b	1/1	Running	0	128m
istio-system	istio-init-crd-10-1.4.9-xsqmh	0/1	Completed	0	128m
istio-system	istio-init-crd-11-1.4.9-jxfpm	0/1	Completed	0	128m
istio-system	istio-init-crd-14-1.4.9-dz4xj	0/1	Completed	0	128m
istio-system	istio-pilot-7bb9f66878-72cgr	2/2	Running	2	128m
istio-system	istio-pilot-7bb9f66878-vrvvx	2/2	Running	0	128m
istio-system	istio-policy-5598697668-5htxh	2/2	Running	0	128m
istio-system	istio-policy-5598697668-mkgs	2/2	Running	1	128m
istio-system	istio-sidecar-injector-7c7884fbdd-7pdfx	1/1	Running	0	128m
istio-system	istio-sidecar-injector-7c7884fbdd-pgswd	1/1	Running	0	128m
istio-system	istio-telemetry-6bb9994b59-9gn2s	2/2	Running	2	128m
istio-system	istio-telemetry-6bb9994b59-jzwc8	2/2	Running	0	128m
istio-system	kiali-5c86d94d8b-ngv74	1/1	Running	0	128m
istio-system	prometheus-7748955775-2jj9r	1/1	Running	0	128m
kube-system	calico-kube-controllers-7fbc6b86cc-tn9xk	1/1	Running	3	7h39m
kube-system	calico-node-vb5km	1/1	Running	3	7h39m
kube-system	coredns-849545576b-rrzfd	1/1	Running	3	7h39m
kube-system	coredns-autoscaler-84bf756579-gxppb	1/1	Running	3	7h21m
kube-system	metrics-server-697746ff48-jbg2x	1/1	Running	3	7h39m
kube-system	rke-coredns-addon-deploy-job-fj146	0/1	Completed	0	7h21m
kube-system	rke-ingress-controller-deploy-job-jgzsk	0/1	Completed	0	7h39m
kube-system	rke-metrics-addon-deploy-job-tdd8n	0/1	Completed	0	7h39m
kube-system	rke-network-plugin-deploy-job-v8589	0/1	Completed	0	7h39m
local-path-storage	local-path-storage-local-path-provisioner-57f7cc7fbb-n7xht	1/1	Running	0	129m
observability	jaeger-operator-78f757cdc8-xctps	1/1	Running	0	128m
test	flagger-loadtester-dfff84d9d-zsxjz	1/1	Running	0	127m

## Deploy Casa 5G Core Network Functions

Following the steps below, to deploy Casa 5G Core network functions under “default” namespace:

- 1) Invoke commands below to deploy 5G core network functions on the cluster  
`cd ~/casa-5gc/install_v5.2.0/deployments`

**kubectl apply -k casa-aws**

- 2) Invoke commands below to undeploy 5G core network functions on the cluster  
`cd ~/casa-5gc/install_v5.2.0/deployments`

**kubectl delete -k casa-aws**

## Verify Casa 5G Core Network Functions Running on the Cluster

**kubectl get pods**

NAME	READY	STATUS	RESTARTS	AGE
amfl-dnsmgr-5678f7db4-q655v	2/2	Running	0	69m
amfl-gtpmgr-d8c555ddc-dbjmh	2/2	Running	1	69m
amfl-n2mgr-84d54fdb49-j9ddc	3/3	Running	1	69m
amfl-nrf-agent-c8b64c5fb-cx69j	3/3	Running	0	69m
amfl-overloadmgr-56bb9768d8-sr4wr	2/2	Running	1	69m
amfl-sctpmgr-0-9dff4d47-pp5f6	3/3	Running	0	69m
amfl-uemgr-f96695fb8-tr6fx	3/3	Running	1	69m
nrfl-nrf-574bb8b794-8dhvb	3/3	Running	0	69m
nrfl-nrf-bootstrapping-86d6d697c4-7lksm	2/2	Running	0	69m
nrfl-nrf-timer-54d7768b68-kzhxt	2/2	Running	1	69m
nssf1-nrf-agent-64874c8f44-gg4p7	2/2	Running	0	69m
nssf1-nrf-timer-647455f6c4-zm6lg	2/2	Running	0	69m
nssf1-nssf-7fd6f7d77c-t2wch	2/2	Running	0	69m
rediscluster-amfl-redis-7scx8	1/1	Running	0	69m
rediscluster-amfl-redis-f67cc	1/1	Running	0	69m
rediscluster-nrfl-redis-jdg6m	1/1	Running	0	69m
rediscluster-nrfl-redis-nbltg	1/1	Running	0	69m
rediscluster-nssf1-redis-qns6k	1/1	Running	0	69m
rediscluster-nssf1-redis-r2q6k	1/1	Running	0	69m
rediscluster-smfl-redis-gxj6j	1/1	Running	0	69m
rediscluster-smfl-redis-q57c9	1/1	Running	0	69m
smfl-n4-77f55d644d-97tn5	3/3	Running	0	69m
smfl-nrf-agent-d8f8d68f6-lmtmh	3/3	Running	0	69m
smfl-smfsm-7c59c5b847-scch5	3/3	Running	0	69m
smfl-upfmgr-5b97fb84f8-8qdzq	3/3	Running	0	69m
ubuntu-jump-box	1/1	Running	0	69m

## Verify Casa 5G Core Network Functions NRF Registrations

```
../scripts/nrf_query.sh
nflInstanceId      nfType  nfStatus
ef6c1652-f80e-48f0-8482-ab959ba8a20d REGISTERED AMF
166354f3-6b41-46dc-ad6f-5988b0656d3b REGISTERED NSSF
74edb23d-c8fd-4e3f-814f-33eac5e17425 REGISTERED SMF
```

## Option #2: Deploy Casa SGC using Artifactory Registry (Internal Deployments)

Note that you can also obtain axyomctl binary from Casa artifactory registry as:

```
wget -cO- https://artifactory.casa-systems.com:443/artifactory/axyom/cli/0.11.2/axyomctl_0.11.2_Linux_x86_64 > axyomctl  
chmod +x axyomctl
```

**Most of procedures for Option #1 apply except of the following:**

(A) Add insecure registry entry into the file `/etc/docker/daemon.json` on each of worker nodes as:

```
{  
  "registry-mirrors": ["https://mirror.gcr.io"],  
  "insecure-registries" : ["artifactory.casa-systems.com", "0.0.0.0"]  
}
```

Then restart docker as:

```
sudo systemctl restart docker
```

(B) Using `--registry` option to specify artifactory image registry:

```
./axyomctl install --platform --registry artifactory.casa-systems.com --release 5.2.0 --storage --storage-provisioner
```

(C) Using `deployments/casa-labs` configurations for deploying Casa 5G Network Functions

1) Invoke commands below to deploy 5G core network functions on the cluster

```
cd ~/casa-5gc/install_v5.2.0/deployments
```

```
kubectl apply -k casa-labs
```

or (in case the validation failed)

```
kubectl apply -k casa-labs --validate=false
```

2) Invoke commands below to undeploy 5G core network functions on the cluster

```
cd ~/casa-5gc/install_v5.2.0/deployments
```

```
kubectl delete -k casa-labs
```

## Appendix A: UPF Image

<https://casasystems.sharepoint.com/pm/SitePages/Home.aspx?RootFolder=%2Fpm%2FPM%20Company%20Share%2FCorporate%20SE%2FCasa%205G%20Core%20HowTo%2FImage%20Files&FolderCTID=0x012000FE5A8A8A0E09974983F9955E144D5E29&View=%7B808F1552%2DD599%2D4A4D%2DB309%2D6343C8116C66%7D>