

Quick Installation Guide v0.2

Getting Ready

Get ready an Ubuntu VM with **at least 40GB of storage**.

Highly recommended to have a **clean snapshot of the VM** before proceeding with the installation.

Recommended to have **at least 8GB of RAM** and at least 4 cores.

Clone the GitHub project.

```
git clone https://github.com/hack-techv2/5G-playground
git clone git@github.com:hack-techv2/5G-playground.git
```

Installing the setup

Run the four installation scripts in the /scripts folder.

NOTE: Ensure the directories match the below commands. If not, please make the necessary changes.

```
chmod +x ./5G-playground/scripts/k8s-install.sh
chmod +x ./5G-playground/scripts/k8s-setup.sh
chmod +x ./5G-playground/scripts/ctfd-install.sh
chmod +x ./5G-playground/scripts/ctfd-setup.sh

### run the scripts from the same directory where the project is cloned
./5G-playground/scripts/k8s-install.sh
./5G-playground/scripts/k8s-setup.sh

./5G-playground/scripts/ctfd-install.sh
### wait until the ctfd-install has finished installing before running the ctfd-setup script!
./5G-playground/scripts/ctfd-setup.sh
```

NOTE: The ctfd-install script does NOT terminate. Read the output in the terminal to determine when the containers are up.

Should be able to see "ctfd-ctfd-1 | db is ready" message.

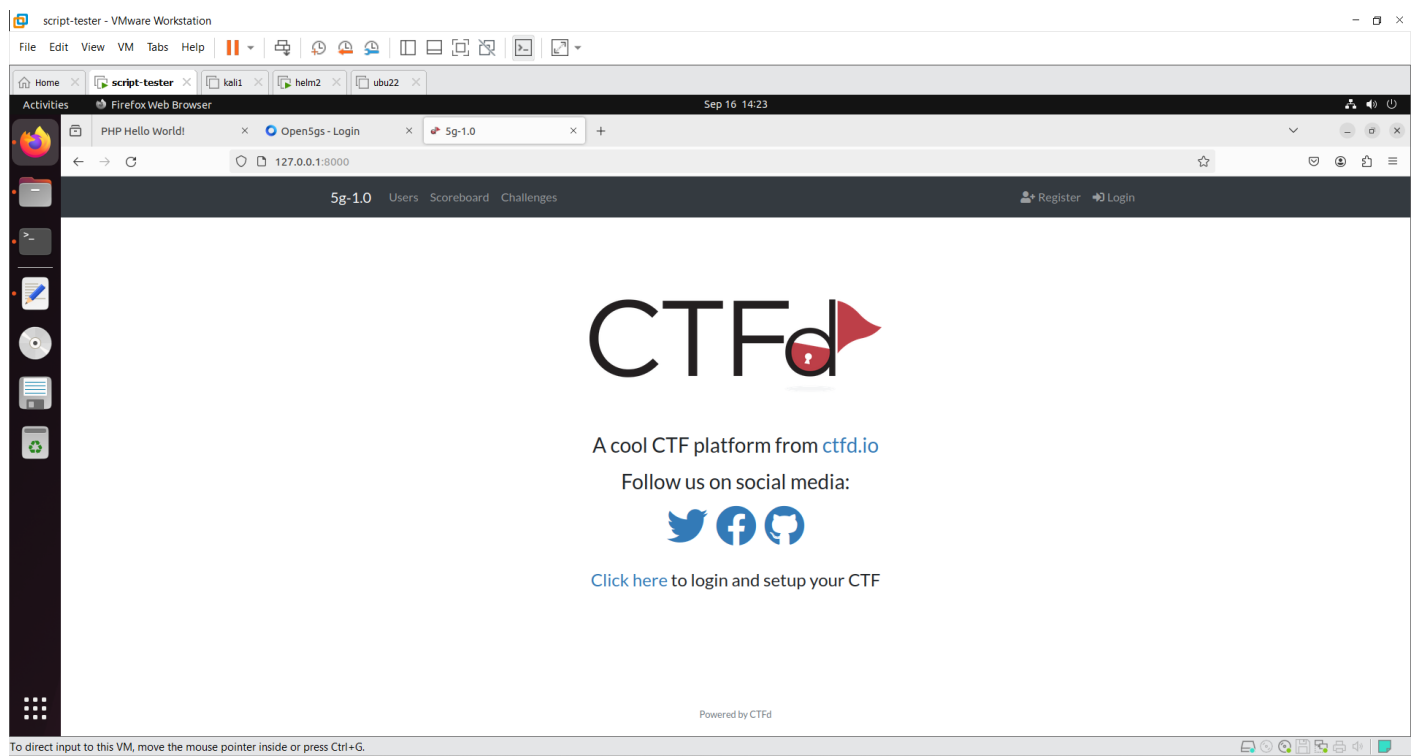
Access CTFd platform through a browser with <http://127.0.0.1:8000>

The CTFd platform should be accessible through other VMs with [http://\[IP\]:8000](http://[IP]:8000)

Admin account is admin:admin

Username: admin

Password: admin



Wait for 5-10 min after the installation process has completed for the open5GS setup to be fully functional.

Check everything is working

Check that pods are running using

```
microk8s kubectl get pods -n your-namespace
microk8s kubectl get services -n your-namespace
```

```
microk8s kubectl get endpoints -A
```

Check that the network is fully functional:

```
microk8s kubectl -n your-namespace exec -ti deployment/my-ueransim-gnb-ues -- /bin/bash
### inside pod
ip a
ping -I uesimtun0 1.1.1.1
### ip should have interface uesimtun0
### should be able to have WAN connectivity
```

Example of working setup for microk8s:

```
ubu22@ubu22-virtual-machine:~$ microk8s kubectl get pods -n your-namespace
NAME                                READY   STATUS    RESTARTS   AGE
my-open5gs-amf-77f7b4899d-674cn     1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-ausf-b8ff6d66c-87cfr     1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-bsf-7694df579f-chjvd     1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-mongodb-5f994b846-zc6bz  1/1     Running   0           4h13m
my-open5gs-nrf-6578bc7949-cm5nz     1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-nssf-5d86cddd96-6qwnf    1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-pcf-6f6c76c4c8-mgtlw     1/1     Running   8 (4h8m ago)   4h13m
my-open5gs-populate-f7cc975f5-7h5hh 1/1     Running   0           4h13m
my-open5gs-scp-95b6d4d98-zk9d9      1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-smf-5f9dbf7576-82klt     1/1     Running   3 (4h9m ago)   4h13m
my-open5gs-udm-59d8d4df6f-7mcr4     1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-udr-67dcfc89cb-5hb6t     1/1     Running   7 (4h8m ago)   4h13m
my-open5gs-upf-7f8458d8f4-7t7hq     1/1     Running   1 (4h10m ago)  4h13m
my-open5gs-webui-8449b7684d-rvl7q   1/1     Running   0           4h13m
my-ueransim-gnb-577879ff5d-xttgf    1/1     Running   3 (4h9m ago)   4h13m
my-ueransim-gnb-ues-664c849cc6-q4vp8 1/1     Running   2 (4h9m ago)   4h13m
phpfpm-nginx-deployment-6f68865f65-lrv6 2/2     Running   0           4h8m
```

Example of functional open5Gs setup:

```

ubuntu22@ubuntu22-virtual-machine:~$ microk8s kubectl -n your-namespace exec -ti deployment/my-ueransim-gnb-ues -- /bin/bash
root@my-ueransim-gnb-ues-664c849cc6-q4vp8:/# ip a
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
3: eth0@if39: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue state UP group default
    link/ether 92:3b:d6:61:12:cf brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 10.1.61.225/32 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::903b:d6ff:fe61:12cf/64 scope link
        valid_lft forever preferred_lft forever
4: uesimtun0: <POINTOPOINT,PROMISC,NOTRAILERS,UP,LOWER_UP> mtu 1400 qdisc fq_codel state UNKNOWN group default qlen 500
    link/none
    inet 10.45.0.2/32 scope global uesimtun0
        valid_lft forever preferred_lft forever
    inet6 fe80::bc2f:aaad:e377:40f/64 scope link stable-privacy
        valid_lft forever preferred_lft forever
root@my-ueransim-gnb-ues-664c849cc6-q4vp8:/# ping -I uesimtun0 singtel.com
PING singtel.com.localdomain (45.60.35.24) from 10.45.0.2 uesimtun0: 56(84) bytes of data.
64 bytes from 45.60.35.24 (45.60.35.24): icmp_seq=1 ttl=126 time=14.9 ms
64 bytes from 45.60.35.24 (45.60.35.24): icmp_seq=2 ttl=126 time=16.5 ms
^C
--- singtel.com.localdomain ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 14.930/15.719/16.509/0.789 ms
root@my-ueransim-gnb-ues-664c849cc6-q4vp8:/# ping -I uesimtun0 singtel.com
PING singtel.com.localdomain (45.60.33.24) from 10.45.0.2 uesimtun0: 56(84) bytes of data.
64 bytes from 45.60.33.24 (45.60.33.24): icmp_seq=1 ttl=126 time=44.1 ms
64 bytes from 45.60.33.24 (45.60.33.24): icmp_seq=2 ttl=126 time=46.5 ms
64 bytes from 45.60.33.24 (45.60.33.24): icmp_seq=3 ttl=126 time=45.6 ms
^C
--- singtel.com.localdomain ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 44.096/45.402/46.542/1.005 ms
root@my-ueransim-gnb-ues-664c849cc6-q4vp8:/# exit
exit

```

After setting up the infrastructure, prepare another Kali VM as the "attacking machine". Ensure connectivity between the Kali and Ubuntu VM.

Troubleshooting

Try upgrading the Helm deployments

```

### if having issues with 5G network
microk8s helm upgrade my-open5gs $(pwd)/5G-playground/open5gs-2.2.3/open5gs --namespace your-namespace --values $(pwd)/5G-playground/helms/5gSA-values.yaml

### wait for at least 5 min before running the script for upgrading the GNB

### the open5gs takes time to setup
microk8s helm upgrade my-ueransim-gnb $(pwd)/5G-playground/ueransim-gnb-0.2.6/ueransim-gnb --namespace your-namespace --values $(pwd)/5G-playground/helms/my-gnb-ues-values.yaml

### if having issues with web server
microk8s helm upgrade phpfpn-nginx-release $(pwd)/5G-playground/phpfpn-nginx-chart --namespace your-namespace

```

Uninstalling and reinstalling the deployments may work as a last resort

```

### uninstall helm charts, when done OR if errors cannot be fixed, uninstall and reinstall
microk8s helm uninstall -n your-namespace phpfpn-nginx-release
microk8s helm uninstall -n your-namespace my-ueransim-gnb
microk8s helm uninstall -n your-namespace my-open5gs
### WAIT for a few minutes before reinstalling the helm charts to ensure proper clean up by
microk8s
### if not, prepare for a lot of issues to appear

microk8s helm install my-open5gs $(pwd)/5G-playground/open5gs-2.2.3/open5gs --namespace your-
namespace --values $(pwd)/5G-playground/helms/5gSA-values.yaml
sleep 10s ### best to wait at least 5 minutes before running next command
microk8s helm install my-ueransim-gnb $(pwd)/5G-playground/ueransim-gnb-0.2.6/ueransim-gnb --
namespace your-namespace --values $(pwd)/5G-playground/helms/my-gnb-ues-values.yaml
microk8s helm install phpfpn-nginx-release $(pwd)/5G-playground/phpfpn-nginx-chart --namespace
your-namespace

```

Other Errors

1. If faced with the below error, simply run `newgrp microk8s` on the command line.

Insufficient permissions to access MicroK8s.

You can either try again with sudo or add the user ubu22 to the 'microk8s' group:

```

sudo usermod -a -G microk8s ubu22
sudo chown -R ubu22 ~/.kube

```

After this, reload the user groups either via a reboot or by running 'newgrp microk8s'.

2. When running `microk8s kubectl get pods -n your-namespace` and faced with the below, the 5G network should not be affected.

my-open5gs-populate-f7cc975f5-lh92b	0/1	Unknown	0	20m
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