

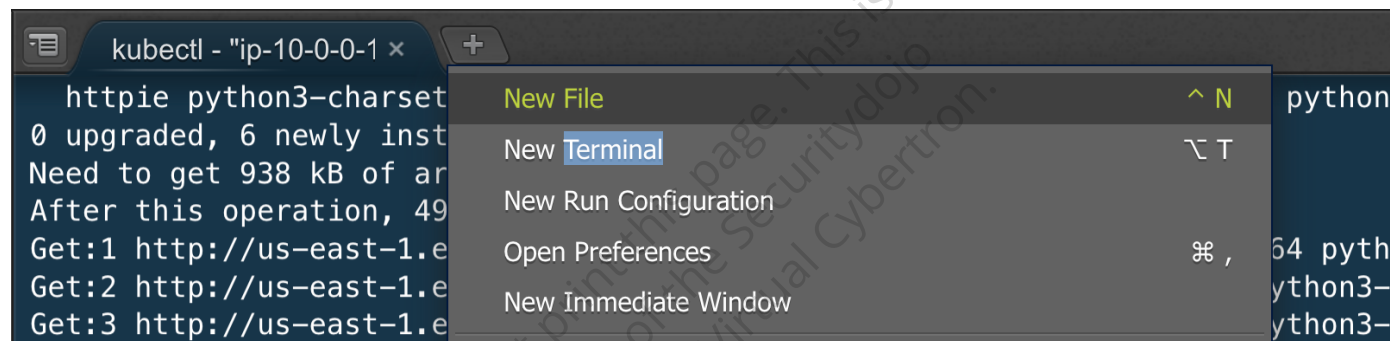
Lab: Host Network True

Host network true container breakout refers to a security vulnerability that occurs when a container is configured to run in the host network namespace, effectively sharing the same network stack as the host system.

Open New Terminal (Optional)

If current working directory is not `workspace/course`.

- Click on `+` icon, then select `new terminal` to open new terminal.



- Keep current working directory as `workspace/course`

```
cd course/4.5_container_breakout/hostnetwork
ls
```

```
root@ip-10-0-0-134:/home/ubuntu/ workspace# cd course/4.5_container_breakout/hostnetwork
root@ip-10-0-0-134:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# ls
hostnetwork-exec-pod.yaml  non-hostnetwork-exec-pod.yaml
root@ip-10-0-0-134:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
root@ip-10-0-0-134:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
```

- Compare both the yaml for the hostnetwork configuration.

```
cat hostnetwork-exec-pod.yaml
cat non-hostnetwork-exec-pod.yaml
```

```

root@ip-10-0-0-134:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# cat hostnetwork-exec-pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: hostnetwork-exec-pod
  labels:
    app: pentest
spec:
  hostNetwork: true
  containers:
  - name: hostnetwork-pod
    image: ubuntu
    command: [ "/bin/sh", "-c", "--" ]
    args: [ "while true; do sleep 30; done;" ]
#nodeName: k8s-control-plane-node # Force your pod to run on the control-plane node by uncommenting this line and changing to a control-plane node name

root@ip-10-0-0-134:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# cat non-hostnetwork-exec-pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: non-hostnetwork-exec-pod
  labels:
    app: pentest
spec:
  containers:
  - name: non-hostnetwork-pod
    image: ubuntu
    command: [ "/bin/sh", "-c", "--" ]
    args: [ "while true; do sleep 30; done;" ]
#nodeName: k8s-control-plane-node # Force your pod to run on the control-plane node by uncommenting this line and changing to a control-plane node name

root@ip-10-0-0-134:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# █

```

- Apply the `hostnetwork-exec-pod.yaml` to deploy the pod with `hostnetwork true` & also add the package for exploitation demo.

```

kubectll apply -f hostnetwork-exec-pod.yaml
sleep 5
kubectll exec -it hostnetwork-exec-pod -- sh -c "apt update && apt install
tcpdump net-tools -y"

```

```

root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectll apply -f hostnetwork-exec-pod.yaml
pod/hostnetwork-exec-pod created
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# sleep 1
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectll exec -it hostnetwork-exec-pod -- sh -c "apt update && apt install tcpdump net-tools -y"
Get:1 http://archive.ubuntu.com/ubuntu jammy InRelease [270 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
Get:8 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [17.5 MB]
Get:9 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1341 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1126 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [46.6 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1163 kB]
Get:13 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [919 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [49.4 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [1036 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [25.6 kB]
Get:17 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [41.2 kB]
Get:18 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [975 kB]
Fetched 27.0 MB in 2s (12.8 MB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
5 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  dbus libapparmor1 libdbus-1-3 libexpat1 libpcap0.8
Suggested packages:
  default-dbus-session-bus | dbus-session-bus apparmor
The following NEW packages will be installed:
  dbus libapparmor1 libdbus-1-3 libexpat1 libpcap0.8 net-tools tcpdump
0 upgraded, 7 newly installed, 0 to remove and 5 not upgraded.

```

Not to get confused with `sleep` command, `sleep` commands helps the subsequent command to be completed before running next command.

- Apply the `non-hostnetwork-exec-pod.yaml` to deploy the pod with `hostnetwork not`

present in the yaml & also add the package for exploitation demo.

```
kubectl apply -f non-hostnetwork-exec-pod.yaml
sleep 5
kubectl exec -it non-hostnetwork-exec-pod -- sh -c "apt update && apt install
tcpdump net-tools -y"
```

```
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl apply -f non-hostnetwork-exec-pod.yaml
pod/non-hostnetwork-exec-pod created
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# sleep 1
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl exec -it non-hostnetwork-exec-pod -- sh -c "apt update && apt install tcpdump net-tools -y"

Get:1 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:2 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [919 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy InRelease [270 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [975 kB]
Get:5 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [41.2 kB]
Get:6 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [1036 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:8 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
Get:9 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
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Get:13 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1341 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1126 kB]
Get:15 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1163 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [46.6 kB]
Get:17 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [25.6 kB]
Get:18 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [49.4 kB]
Fetched 27.0 MB in 3s (8603 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
5 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  dbus libapparmor1 libdbus-1-3 libexpat1 libpcap0.8
Suggested packages:
  default-dbus-session-bus | dbus-session-bus apparmor
The following NEW packages will be installed:
  dbus libapparmor1 libdbus-1-3 libexpat1 libpcap0.8 net-tools tcpdump
```

Post exploitation

1. Validating the hostname & IP address for hostnetwork:true and hostnetwork not true

- Check the IP address within the range of the EC2 host & hostname is the node's hostname, which is due to hostnetwork: true.

```
echo "### For hostnetwork:true"
kubectl exec -it hostnetwork-exec-pod -- sh -c "ifconfig |grep -E 'inet' | grep
-v -E 'inet6' && hostname"
```

```
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# echo "### For hostnetwork:true"
### For hostnetwork:true
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl exec -it hostnetwork-exec-pod -- sh -c "ifconfig |grep -E 'inet' | grep -v -E 'inet6' && hostname"
inet 10.244.2.103 netmask 255.255.255.255 broadcast 0.0.0.0
inet 172.18.0.2 netmask 255.255.0.0 broadcast 172.18.255.255
inet 127.0.0.1 netmask 255.0.0.0
kind-worker2
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
```

- Check the IP address which is in the 10.x.x.x range within the pod network and hostname is the pod's name assigned in the YAML.

```
echo "### For hostnetwork not true"
kubectl exec -it non-hostnetwork-exec-pod -- sh -c "ifconfig |grep -E 'inet' |
grep -v -E 'inet6' && hostname"
```

```
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# echo "### For hostnetwork not true"
### For hostnetwork not true
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl exec -it non-hostnetwork-exec-pod -- sh -c "ifconfig |grep -E 'inet' | grep -v -E 'inet6' && hostname"
inet 10.244.2.84 netmask 255.255.255.255 broadcast 0.0.0.0
inet 127.0.0.1 netmask 255.0.0.0
non-hostnetwork-exec-pod
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
```

2. Validating the network sniffing via tcpdump for hostnetwork:true and hostnetwork not true.

- Validate the **tcpdump** able to sniff the traffic from other nodes via pod with hostnetwork:true.

```
kubectl get nodes -owide
echo "### For hostnetwork:true"
kubectl exec -it hostnetwork-exec-pod -- sh -c "tcpdump -ni eth0" |head -20
```

```
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl get nodes -owide
NAME                STATUS    ROLES    AGE   VERSION   INTERNAL-IP   EXTERNAL-IP   OS-IMAGE             KERNEL-VERSION        CONTAINER-RUNTIME
kind-control-plane   Ready     control-plane  4h44m   v1.25.3   172.18.0.3    <none>         Ubuntu 22.04.1 LTS   5.15.0-1028-aws       containerd://1.6.9
kind-worker          Ready     <none>      4h44m   v1.25.3   172.18.0.4    <none>         Ubuntu 22.04.1 LTS   5.15.0-1028-aws       containerd://1.6.9
kind-worker2        Ready     <none>      4h44m   v1.25.3   172.18.0.2    <none>         Ubuntu 22.04.1 LTS   5.15.0-1028-aws       containerd://1.6.9
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# echo "### For hostnetwork:true"
### For hostnetwork:true
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl exec -it hostnetwork-exec-pod -- sh -c "tcpdump -ni eth0" |head -20
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
21:23:51.562332 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 1855616877:1855617068, ack 4269677581, win 501, options [nop,nop,TS val 3844564678 ecr 1527396354], length 191
21:23:51.609349 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [.], ack 191, win 501, options [nop,nop,TS val 1527396442 ecr 3844564678], length 0
21:23:51.661711 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 191:552, ack 1, win 501, options [nop,nop,TS val 3844564777 ecr 1527396442], length 361
21:23:51.661789 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [.], ack 552, win 501, options [nop,nop,TS val 1527396494 ecr 3844564777], length 0
21:23:51.695052 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [P.], seq 1:27, ack 552, win 501, options [nop,nop,TS val 1527396528 ecr 3844564777], length 26
21:23:51.695090 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [P.], seq 27:52, ack 552, win 501, options [nop,nop,TS val 1527396528 ecr 3844564777], length 26
21:23:51.695106 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [P.], seq 53:76, ack 552, win 501, options [nop,nop,TS val 1527396528 ecr 3844564777], length 23
21:23:51.695150 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [.], ack 76, win 501, options [nop,nop,TS val 3844564811 ecr 1527396528], length 0
21:23:51.695627 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 552:582, ack 76, win 501, options [nop,nop,TS val 3844564811 ecr 1527396528], length 30
21:23:51.695664 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 582:606, ack 76, win 501, options [nop,nop,TS val 3844564811 ecr 1527396528], length 24
21:23:51.695713 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [.], ack 606, win 501, options [nop,nop,TS val 1527396528 ecr 3844564811], length 0
21:23:51.765868 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 606:1103, ack 76, win 501, options [nop,nop,TS val 3844564882 ecr 1527396528], length 497
21:23:51.765933 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 1103:2068, ack 76, win 501, options [nop,nop,TS val 3844564882 ecr 1527396528], length 965
21:23:51.765972 IP 172.18.0.3.59668 > 172.18.0.2.10250: Flags [.], ack 2068, win 501, options [nop,nop,TS val 1527396599 ecr 3844564882], length 0
21:23:51.838067 IP6 fc00:f853:cdd:e793::3.6443 > fc00:f853:cdd:e793::2.44334: Flags [P.], seq 42533302:42533401, ack 213343989, win 7741, options [nop,nop,TS val 3148811543 ecr 2119096373], length 99
21:23:51.838109 IP6 fc00:f853:cdd:e793::2.44334 > fc00:f853:cdd:e793::3.6443: Flags [.], ack 99, win 2681, options [nop,nop,TS val 2119096702 ecr 3148811543], length 0
21:23:51.869756 IP 172.18.0.2.10250 > 172.18.0.3.59668: Flags [P.], seq 2068:2943, ack 76, win 501, options [nop,nop,TS val 3844564985 ecr 1527396599], length 875
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
```

- Validate the **tcpdump** unable to sniff the traffic from other nodes via pod with hostnetwork not true.

```
echo "### For hostnetwork not true"
kubectl exec -it non-hostnetwork-exec-pod -- sh -c "tcpdump -ni eth0 | head -5"
```

```
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# echo "### For hostnetwork not true"
### For hostnetwork not true
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl exec -it non-hostnetwork-exec-pod -- sh -c "tcpdump -ni eth0"|head -5
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
```

- Hit **ctrl+c** to exit the tcpdump.

Cleanup

- Run the `kubectl delete` command to remove the pods running.

```
kubectl delete -f non-hostnetwork-exec-pod.yaml
```

```
kubectl delete -f hostnetwork-exec-pod.yaml
```

Wait for the pods to be deleted.

```
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl delete -f non-hostnetwork-exec-pod.yaml
pod "non-hostnetwork-exec-pod" deleted

root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork# kubectl delete -f hostnetwork-exec-pod.yaml
pod "hostnetwork-exec-pod" deleted
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
root@ip-10-0-0-211:/home/ubuntu/ workspace/course/4.5_container_breakout/hostnetwork#
```

Note: The Container Breakout Labs featured in this course are developed by [Bishop Fox](#). We would like to extend our gratitude and give full credit to their team for their excellent work.

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