ZEVENET

Kube-Proxy Deep Dive

Kubernetes Sevilla - Octubre 2019

Let’s talk about…

Intro

Traditional load balancing

Networking in Docker

Networking challenges in Kubernetes

What’s next?

Demo

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Intro

Since 2010, from Zen Load Balancer to Zevenet developing highly available and scalable systems.

- 500 customers
- 60 countries
- 1600 downloads per month

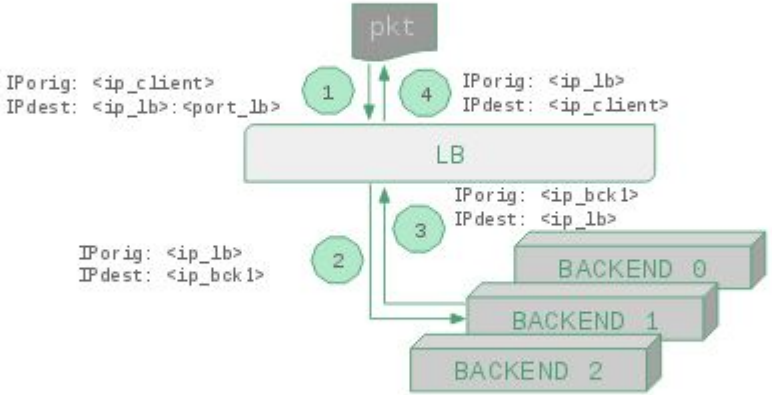
Traditional Load Balancing

Kernel Space

- Routing
- **sNAT**
- DSR

User Space

- Proxy
- DNS



Prerouting

Forward

Postrouting

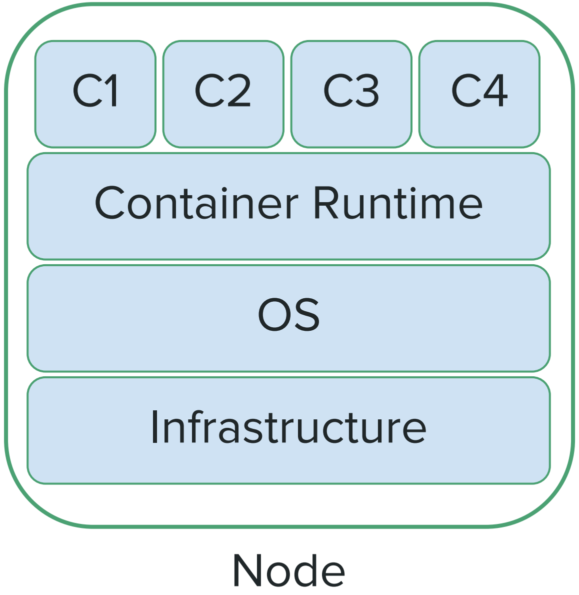
Networking in Docker

Low level networking layer

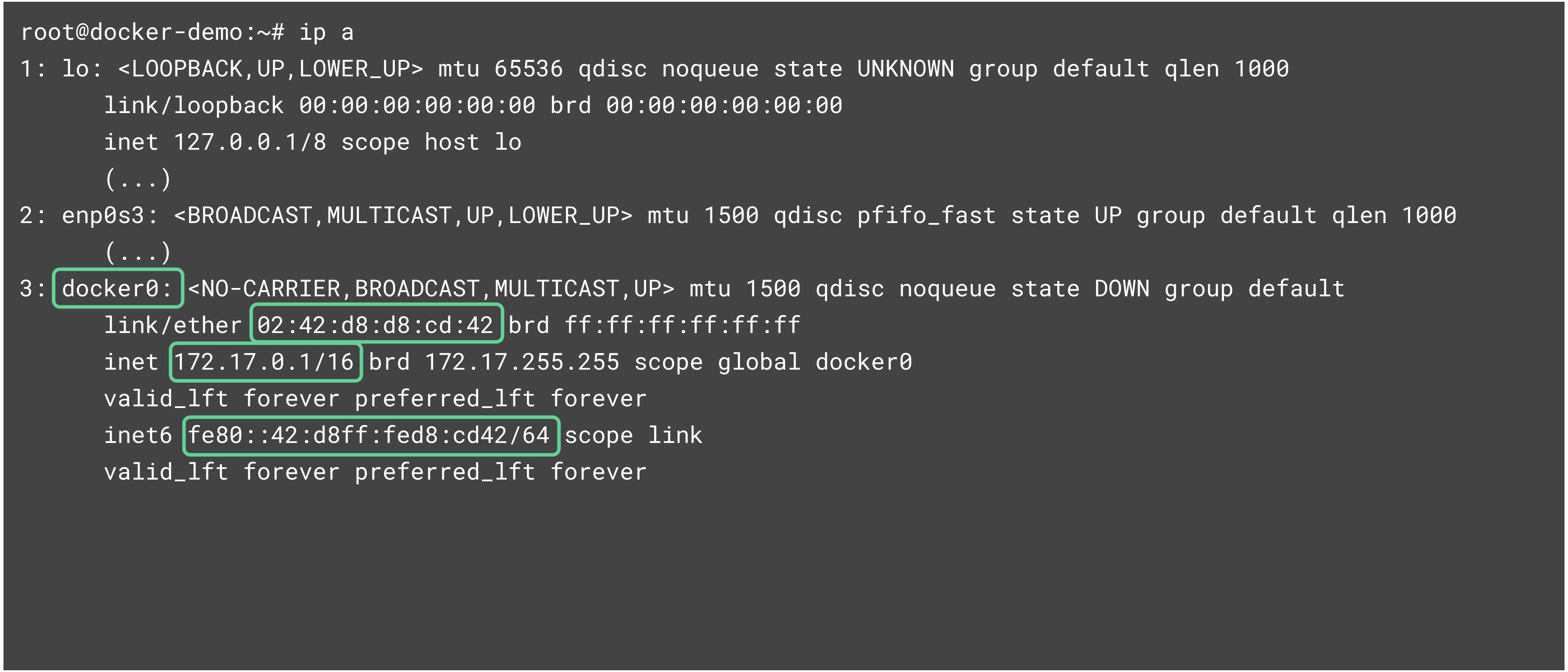
- IPVLAN, MACVLAN, routing, namespaces, iptables

Container networking layer

- Single-host bridge, multi-host, IP-per-container

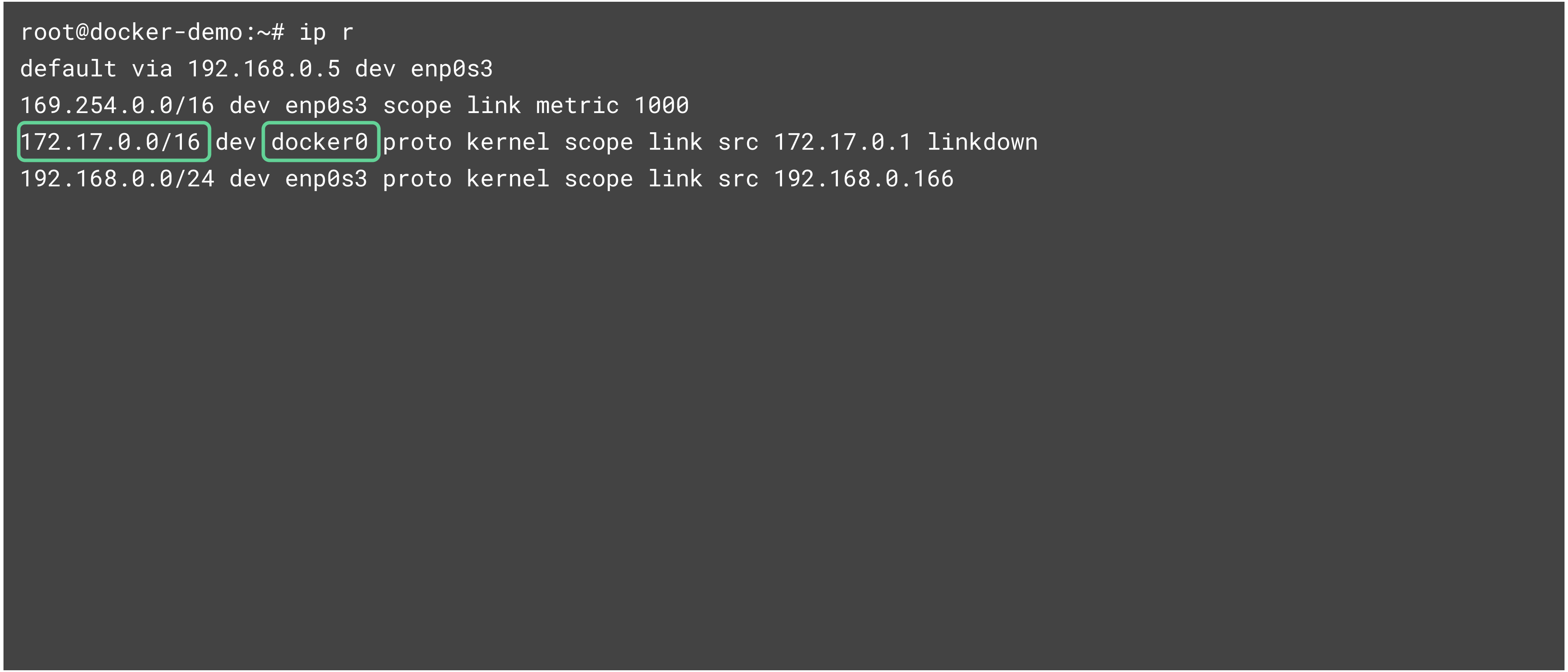


Networking in Docker



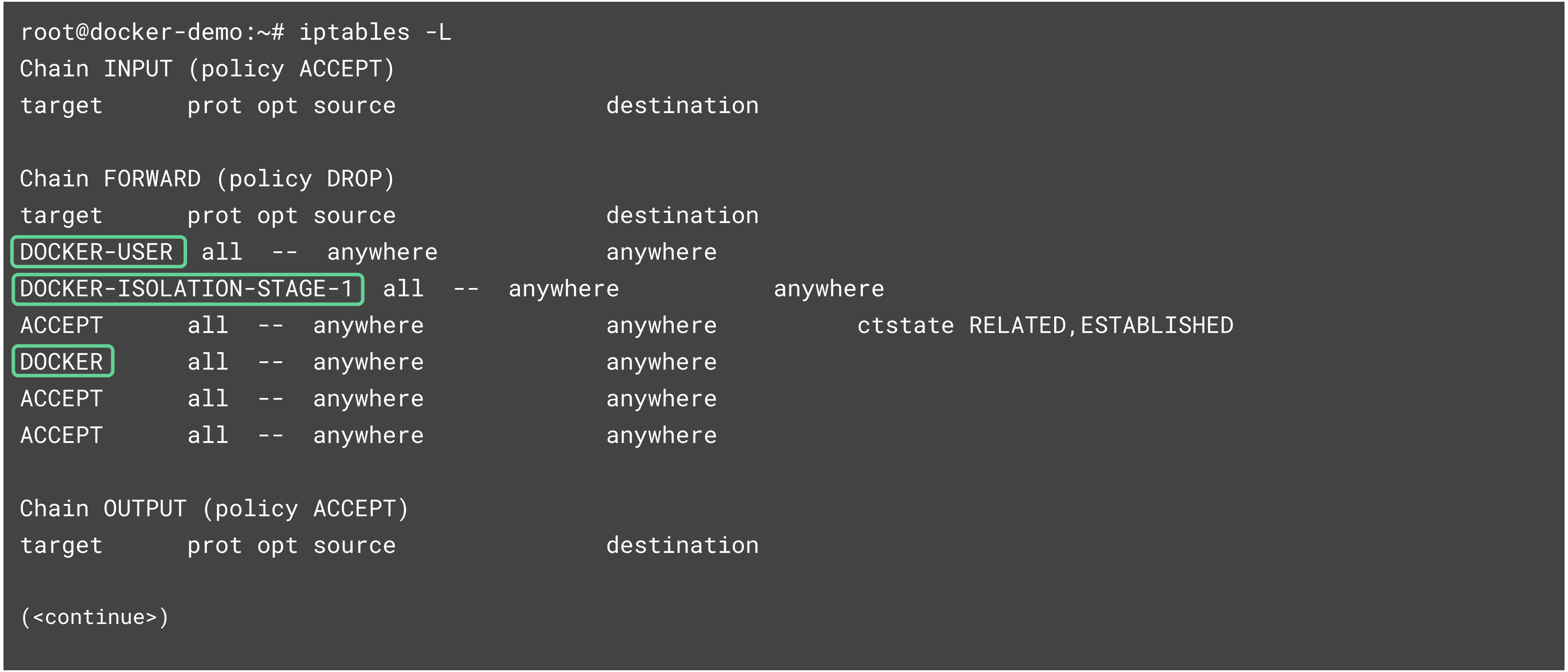
```
root@docker-demo:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
      link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
      inet 127.0.0.1/8 scope host lo
      (...)
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
      (...)
3: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
      link/ether 02:42:d8:d8:cd:42 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
      inet6 fe80::42:d8ff:fed8:cd42/64 scope link
      valid_lft forever preferred_lft forever
```

Networking in Docker



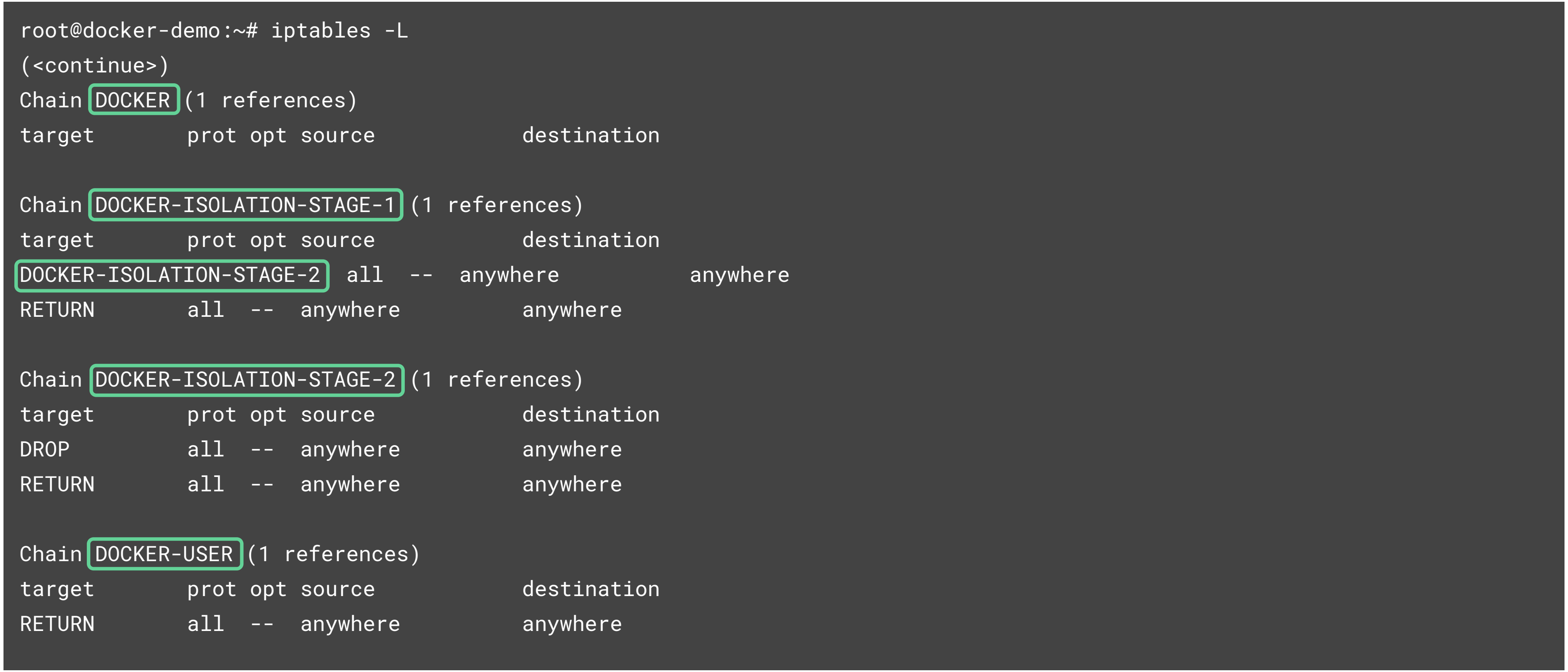
```
root@docker-demo:~# ip r
default via 192.168.0.5 dev enp0s3
169.254.0.0/16 dev enp0s3 scope link metric 1000
172.17.0.0/16 dev docker0 proto kernel scope link src 172.17.0.1 linkdown
192.168.0.0/24 dev enp0s3 proto kernel scope link src 192.168.0.166
```

Networking in Docker



```
root@docker-demo:~# iptables -L
Chain INPUT (policy ACCEPT)
target      prot opt source               destination

Chain FORWARD (policy DROP)
target      prot opt source               destination
DOCKER-USER  all  --  anywhere            anywhere
DOCKER-ISOLATION-STAGE-1  all  --  anywhere           anywhere
ACCEPT      all  --  anywhere             anywhere            ctstate RELATED,ESTABLISHED
DOCKER      all  --  anywhere             anywhere
ACCEPT      all  --  anywhere             anywhere
ACCEPT      all  --  anywhere             anywhere

Chain OUTPUT (policy ACCEPT)
target      prot opt source               destination

(<continue>)
```

Networking in Docker

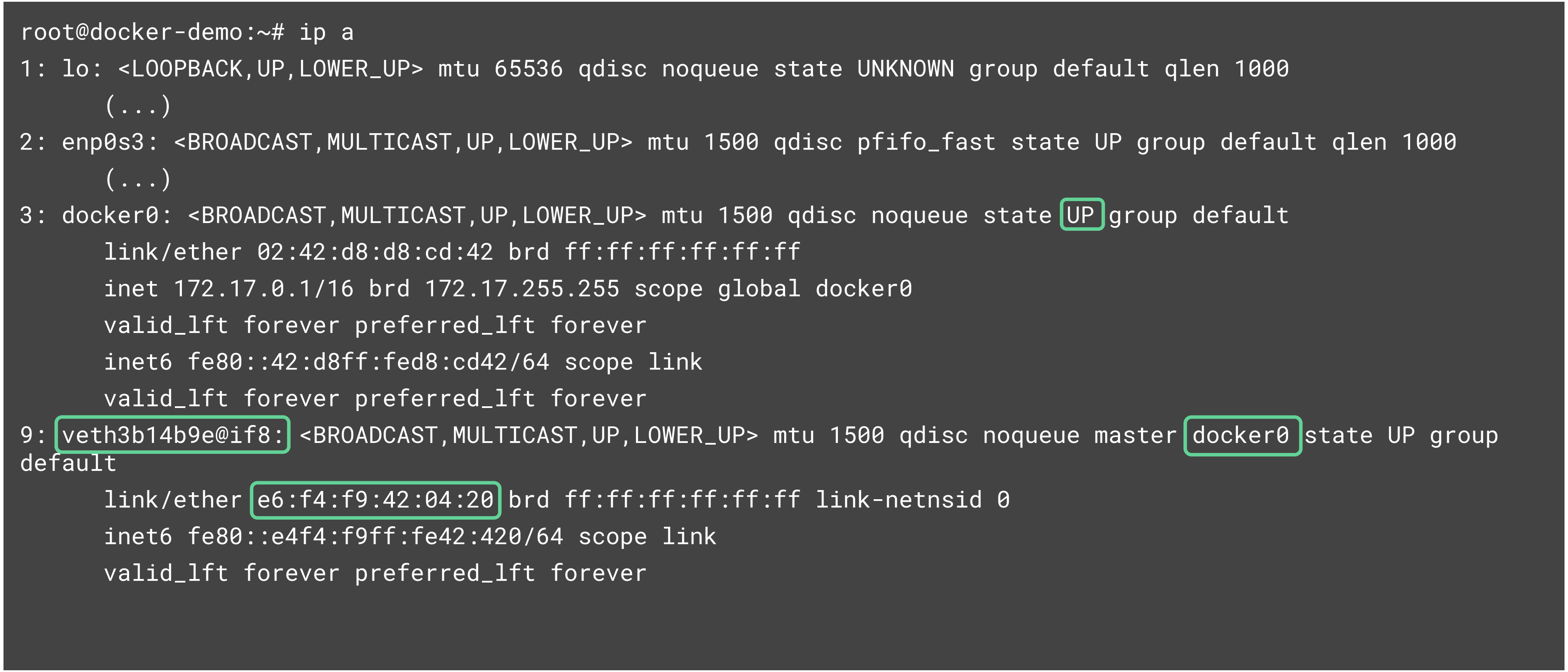


```
root@docker-demo:~# iptables -L
(<continue>)
Chain DOCKER (1 references)
target       prot opt source            destination

Chain DOCKER-ISOLATION-STAGE-1 (1 references)
target       prot opt source            destination
DOCKER-ISOLATION-STAGE-2  all  --  anywhere          anywhere
RETURN       all  --  anywhere          anywhere

Chain DOCKER-ISOLATION-STAGE-2 (1 references)
target       prot opt source            destination
DROP         all  --  anywhere          anywhere
RETURN       all  --  anywhere          anywhere

Chain DOCKER-USER (1 references)
target       prot opt source            destination
RETURN       all  --  anywhere          anywhere
```

Networking in Docker | IP-per-container

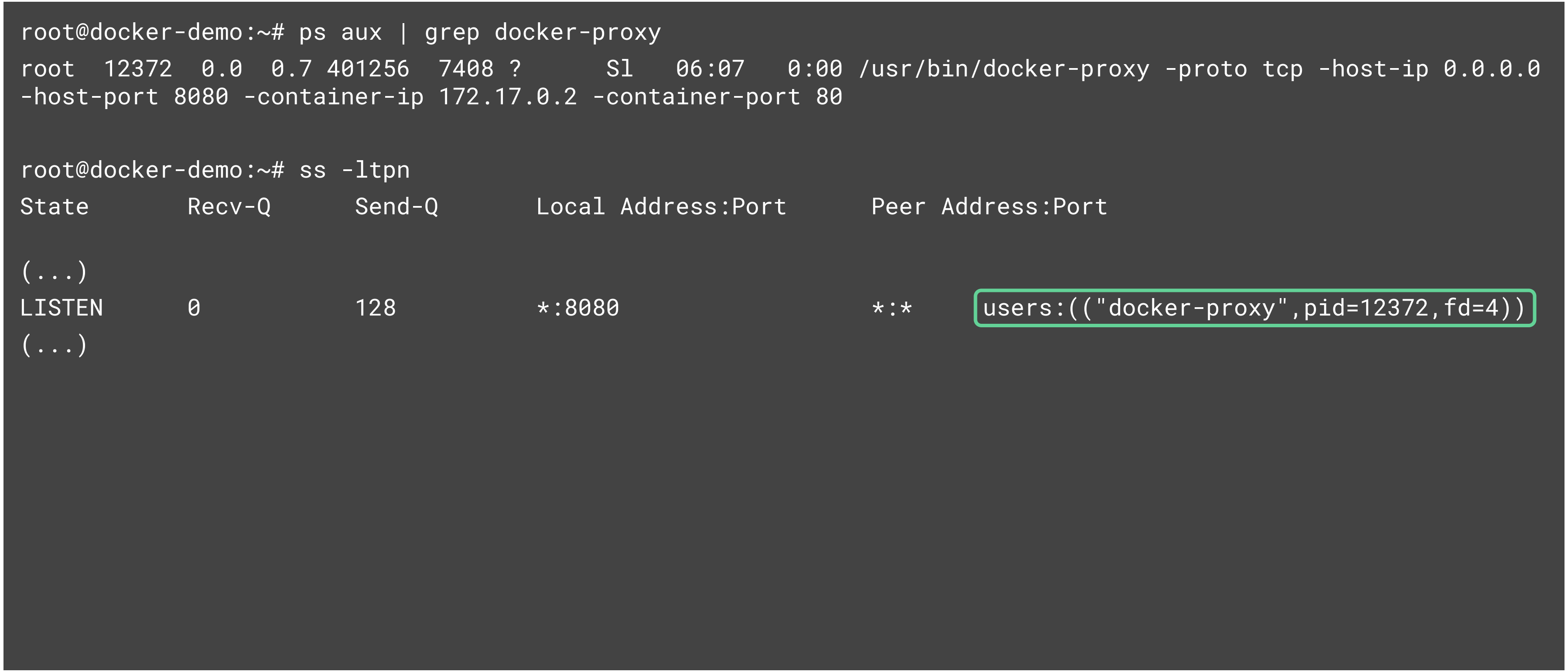
```
root@docker-demo:~# docker run -dit --name my-apache-app \
            -p 8080:80 -v "$PWD":/usr/local/apache2/htdocs/ httpd:2.4
```

Networking in Docker | IP-per-container



```
root@docker-demo:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
      (...)
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
      (...)
3: docker0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
      link/ether 02:42:d8:d8:cd:42 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
      inet6 fe80::42:d8ff:fed8:cd42/64 scope link
      valid_lft forever preferred_lft forever
9: veth3b14b9e@if8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master docker0 state UP group
default
      link/ether e6:f4:f9:42:04:20 brd ff:ff:ff:ff:ff:ff link-netnsid 0
      inet6 fe80::e4f4:f9ff:fe42:420/64 scope link
      valid_lft forever preferred_lft forever
```

Networking in Docker | IP-per-container

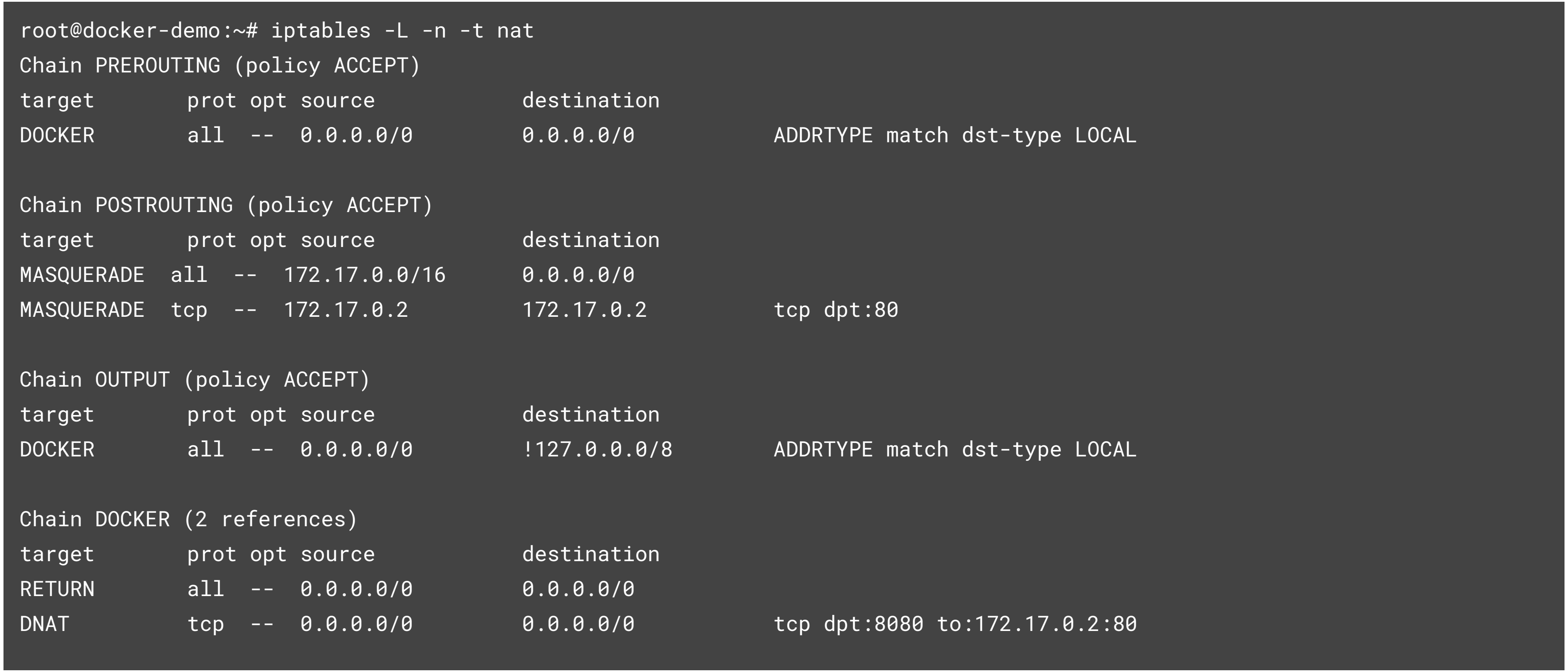


```
root@docker-demo:~# ps aux | grep docker-proxy
root  12372  0.0  0.7 401256  7408 ?      Sl   06:07   0:00 /usr/bin/docker-proxy -proto tcp -host-ip 0.0.0.0
-host-port 8080 -container-ip 172.17.0.2 -container-port 80


root@docker-demo:~# ss -ltpn
State       Recv-Q      Send-Q       Local Address:Port      Peer Address:Port

(...)
LISTEN      0           128          *:8080                  *:*     users:(("docker-proxy",pid=12372,fd=4))
(...)
```

Networking in Docker | IP-per-container

```
root@docker-demo:~# iptables -L
(...)

Chain DOCKER (1 references)
target      prot opt source               destination
ACCEPT      tcp  --  anywhere             172.17.0.2        tcp dpt:http

(...)
```

Networking in Docker | IP-per-container

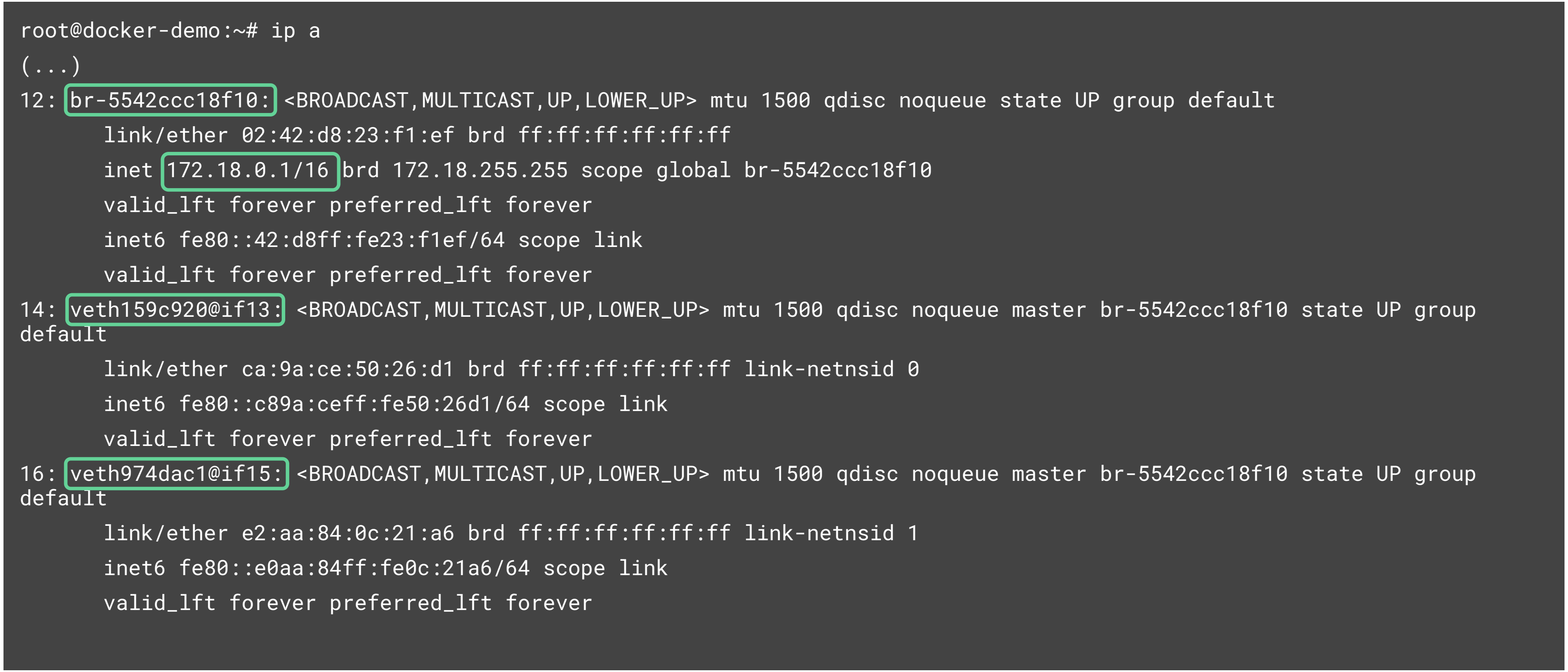


```
root@docker-demo:~# iptables -L -n -t nat
Chain PREROUTING (policy ACCEPT)
target       prot opt source            destination
DOCKER       all  --  0.0.0.0/0         0.0.0.0/0           ADDRTYPE match dst-type LOCAL

Chain POSTROUTING (policy ACCEPT)
target       prot opt source            destination
MASQUERADE  all  --  172.17.0.0/16      0.0.0.0/0
MASQUERADE  tcp  --  172.17.0.2         172.17.0.2          tcp dpt:80

Chain OUTPUT (policy ACCEPT)
target       prot opt source            destination
DOCKER       all  --  0.0.0.0/0         !127.0.0.0/8        ADDRTYPE match dst-type LOCAL

Chain DOCKER (2 references)
target       prot opt source            destination
RETURN       all  --  0.0.0.0/0         0.0.0.0/0
DNAT         tcp  --  0.0.0.0/0         0.0.0.0/0           tcp dpt:8080 to:172.17.0.2:80
```

Networking in Docker | Single-host-bridge

```
root@docker-demo:~# docker run -dit --name my-apache-app2 -p 8081:80 \
                     -v "$PWD":/usr/local/apache2/htdocs/ httpd:2.4
root@docker-demo:~# docker network create my-net
root@docker-demo:~# docker network connect my-net my-apache-app
root@docker-demo:~# docker network connect my-net my-apache-app2
```

Networking in Docker | Single-host-bridge



```
root@docker-demo:~# ip a
(...)
12: br-5542ccc18f10: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
      link/ether 02:42:d8:23:f1:ef brd ff:ff:ff:ff:ff:ff
      inet 172.18.0.1/16 brd 172.18.255.255 scope global br-5542ccc18f10
      valid_lft forever preferred_lft forever
      inet6 fe80::42:d8ff:fe23:f1ef/64 scope link
      valid_lft forever preferred_lft forever
14: veth159c920@if13: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master br-5542ccc18f10 state UP group
default
      link/ether ca:9a:ce:50:26:d1 brd ff:ff:ff:ff:ff:ff link-netnsid 0
      inet6 fe80::c89a:ceff:fe50:26d1/64 scope link
      valid_lft forever preferred_lft forever
16: veth974dac1@if15: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master br-5542ccc18f10 state UP group
default
      link/ether e2:aa:84:0c:21:a6 brd ff:ff:ff:ff:ff:ff link-netnsid 1
      inet6 fe80::e0aa:84ff:fe0c:21a6/64 scope link
      valid_lft forever preferred_lft forever
```

Networking in containers

Summary

- Private IP network addresses and NATing to outside
- Virtual Interfaces with own MAC address
- Kernel space NATing to forward traffic to containerized services
- User space docker-proxy for layer 7 purposes (not always required)
- Namespaces per container
- Resolves IP-per-container, single-host (bridge) and multi-host (overlay) modes
- DIY load balancing & clustering

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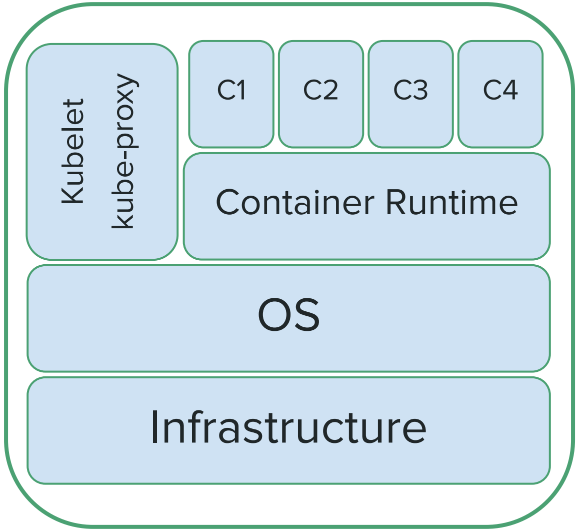
Networking challenges in Kubernetes

Resolve:

- Container orchestration layer
- Clustering
- Service discovery
- Load Balancing
- Automation



Node

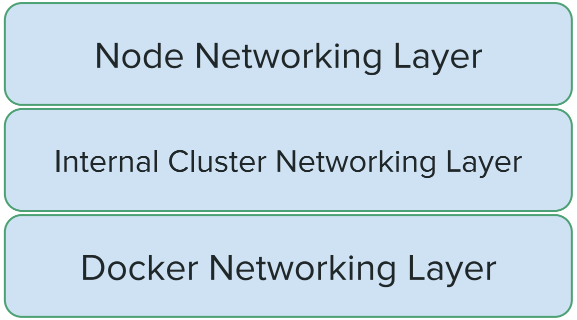
Networking challenges in Kubernetes

Minikube

- Kubernetes in 1 node

Cluster Architecture

- Several masters
- Several nodes



Node Networking Layer

Internal Cluster Networking Layer

Docker Networking Layer

Networking challenges in Kubernetes

Components:

Master Components

- kube-apiserver
- etcd
- kube-scheduler
- kube-controller-manager
- cloud-controller-manager

Node Components

- kubelet
- **kube-proxy**
- container runtime

Addons

- dns
- web ui
- container resource monitoring
- cluster logging

Networking challenges in Kubernetes

kube-proxy in charge of

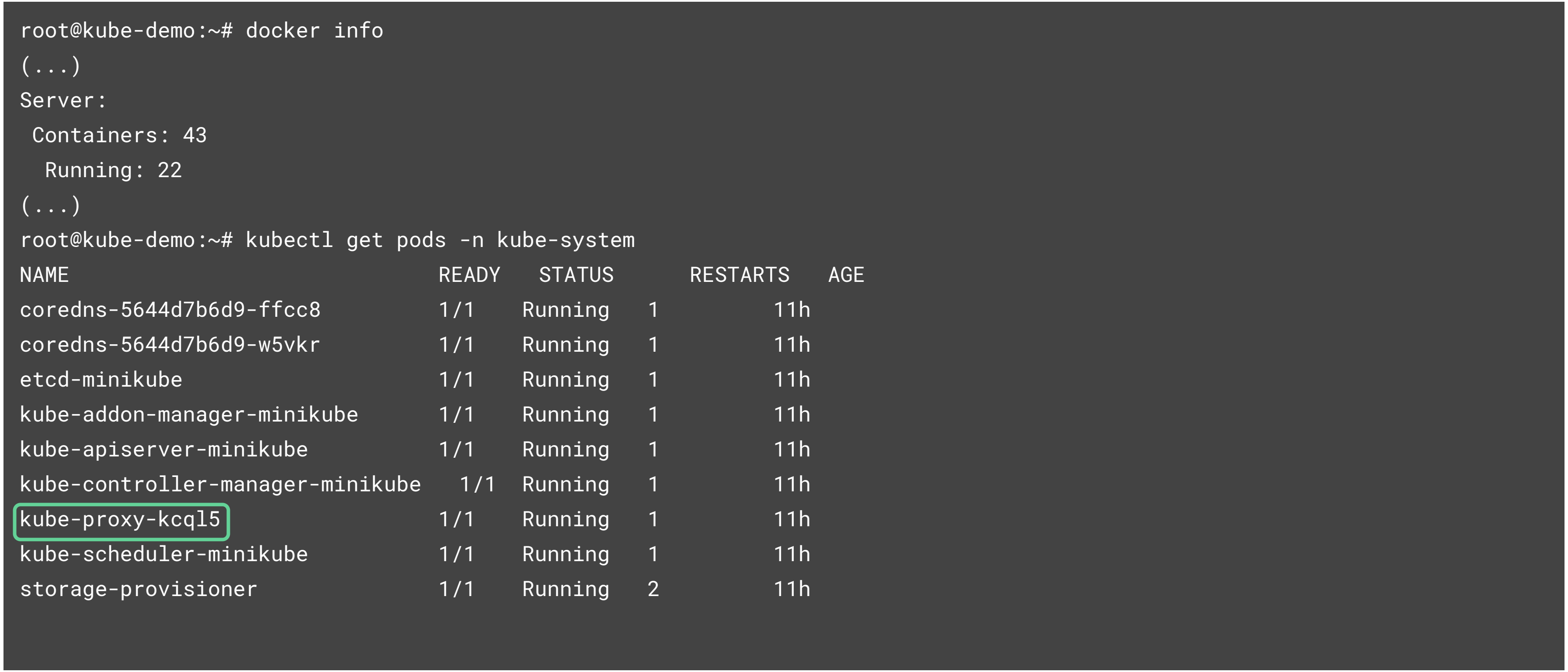
- Allow the communication to the pods from inside or outside the cluster
- Forward the traffic
- Services load balance: different working modes
- Ensure the users network session: connection tracking and persistence
- Access filtering to the services: iptables

Networking challenges in Kubernetes

kube-proxy --proxy-mode <ProxyMode>

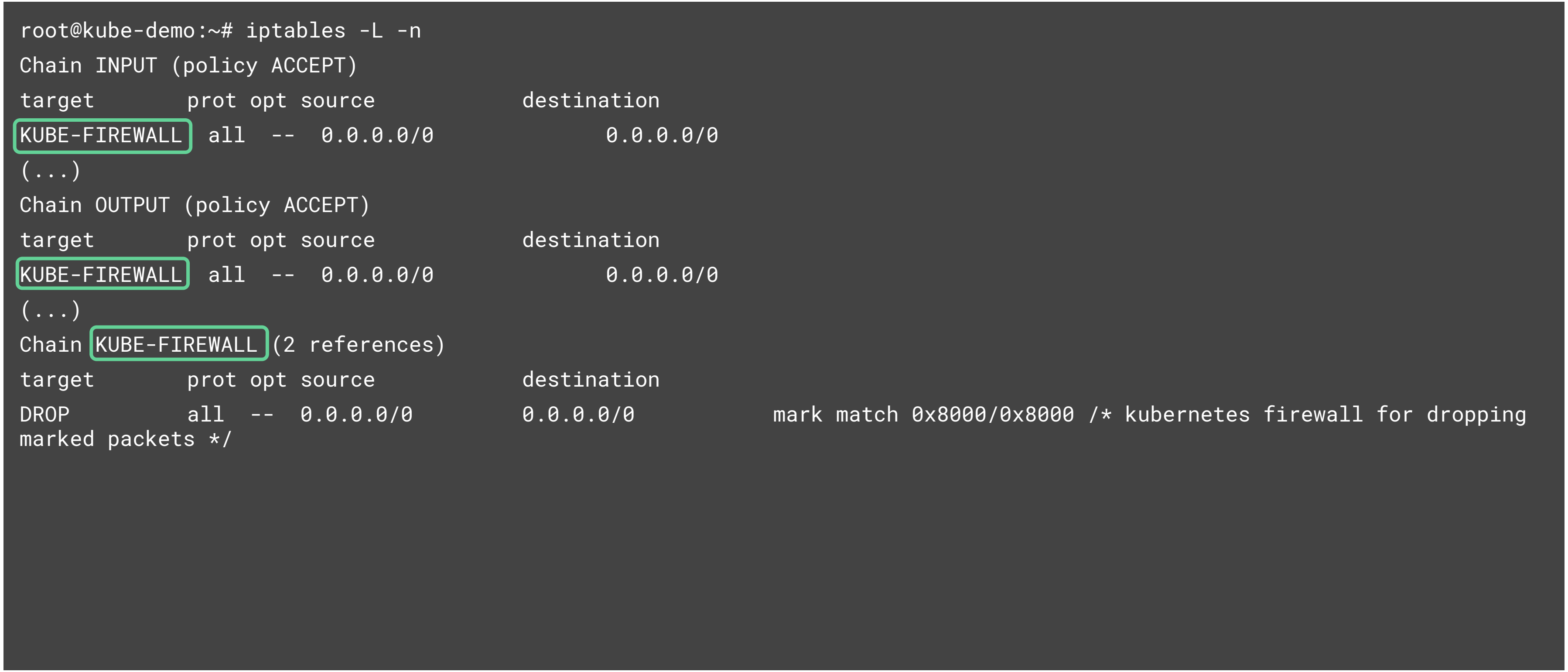
- userspace
  - old and unused
- iptables (default)
  - NAT load balancing, filtering, equal cost & round-robin
  - Based on sequential rules with a complexity of O(n)
- Ipvs
  - NAT & DSR load balancing, more advanced schedulers
  - Kernel process with complexity of O(1), relies on iptables for certain cases

Networking challenges in Kubernetes



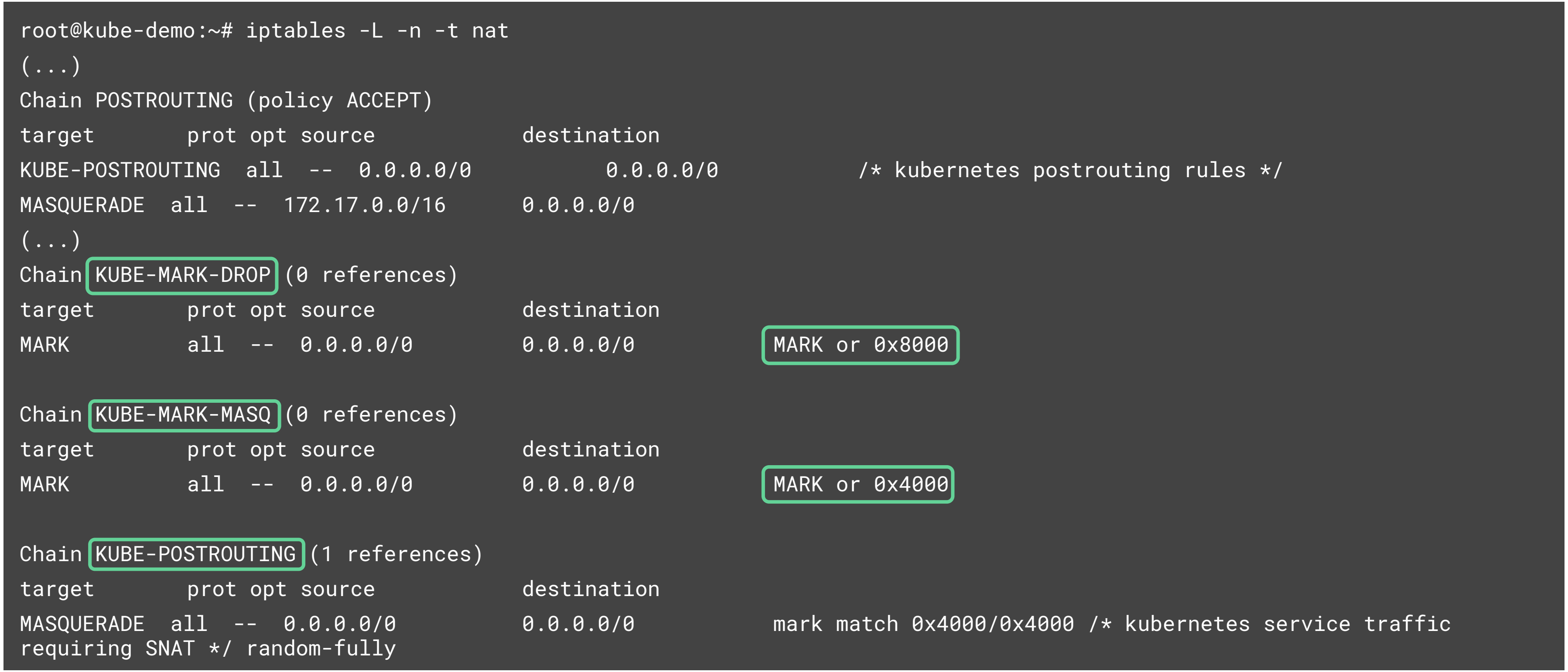
```
root@kube-demo:~# docker info
(...)
Server:
 Containers: 43
  Running: 22
(...)
root@kube-demo:~# kubectl get pods -n kube-system
NAME                             READY   STATUS      RESTARTS   AGE
coredns-5644d7b6d9-ffcc8         1/1    Running   1         11h
coredns-5644d7b6d9-w5vkr         1/1    Running   1         11h
etcd-minikube                    1/1    Running   1         11h
kube-addon-manager-minikube      1/1    Running   1         11h
kube-apiserver-minikube          1/1    Running   1         11h
kube-controller-manager-minikube   1/1  Running   1         11h
kube-proxy-kcql5                 1/1    Running   1         11h
kube-scheduler-minikube          1/1    Running   1         11h
storage-provisioner              1/1    Running   2         11h
```

Networking challenges in Kubernetes



```
root@kube-demo:~# iptables -L -n
Chain INPUT (policy ACCEPT)
target       prot opt source            destination
KUBE-FIREWALL  all  --  0.0.0.0/0             0.0.0.0/0
(...)
Chain OUTPUT (policy ACCEPT)
target       prot opt source            destination
KUBE-FIREWALL  all  --  0.0.0.0/0             0.0.0.0/0
(...)
Chain KUBE-FIREWALL (2 references)
target       prot opt source            destination
DROP         all  --  0.0.0.0/0         0.0.0.0/0           mark match 0x8000/0x8000 /* kubernetes firewall for dropping
marked packets */
```

Networking challenges in Kubernetes



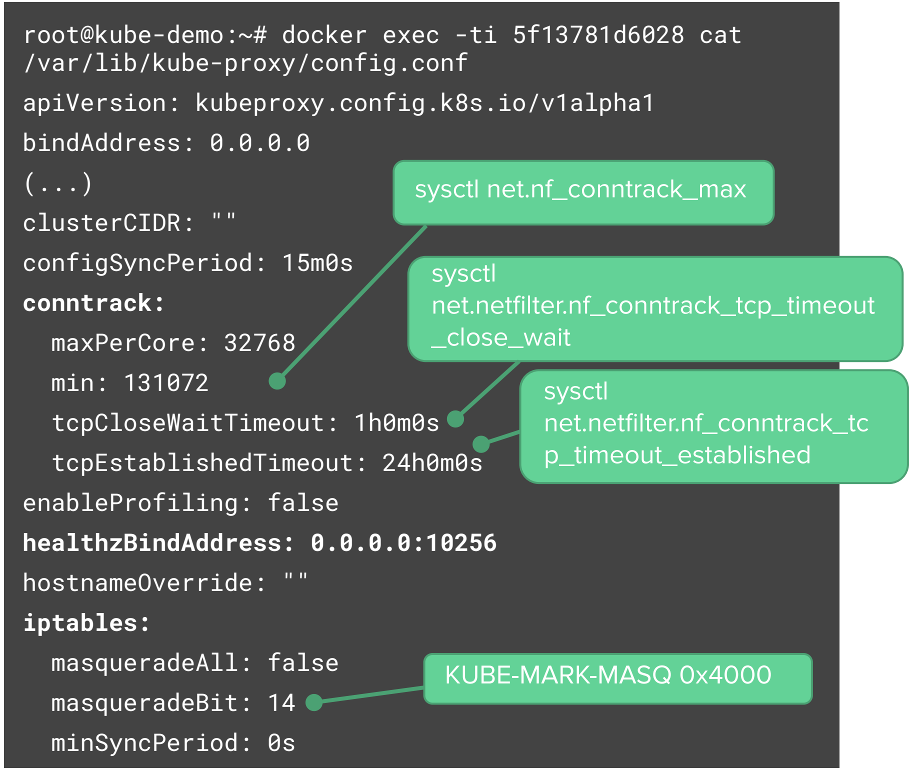
```
root@kube-demo:~# iptables -L -n -t nat
(...)
Chain POSTROUTING (policy ACCEPT)
target       prot opt source            destination
KUBE-POSTROUTING  all  --  0.0.0.0/0           0.0.0.0/0           /* kubernetes postrouting rules */
MASQUERADE  all  --  172.17.0.0/16      0.0.0.0/0
(...)
Chain KUBE-MARK-DROP (0 references)
target       prot opt source            destination
MARK         all  --  0.0.0.0/0         0.0.0.0/0           MARK or 0x8000

Chain KUBE-MARK-MASQ (0 references)
target       prot opt source            destination
MARK         all  --  0.0.0.0/0         0.0.0.0/0           MARK or 0x4000

Chain KUBE-POSTROUTING (1 references)
target       prot opt source            destination
MASQUERADE  all  --  0.0.0.0/0          0.0.0.0/0           mark match 0x4000/0x4000 /* kubernetes service traffic
requiring SNAT */ random-fully
```

Networking challenges in Kubernetes

```
root@kube-demo:~# docker exec -ti 5f13781d6028 cat
/var/lib/kube-proxy/config.conf
apiVersion: kubeproxy.config.k8s.io/v1alpha1
bindAddress: 0.0.0.0
(...)
clusterCIDR: ""
configSyncPeriod: 15m0s
conntrack:
  maxPerCore: 32768
  min: 131072
  tcpCloseWaitTimeout: 1h0m0s
  tcpEstablishedTimeout: 24h0m0s
enableProfiling: false
healthzBindAddress: 0.0.0.0:10256
hostnameOverride: ""
iptables:
  masqueradeAll: false
  masqueradeBit: 14
  minSyncPeriod: 0s
```

```
  syncPeriod: 30s
ipvs:
  excludeCIDRs: null
  minSyncPeriod: 0s
  scheduler: ""
  strictARP: false
  syncPeriod: 30s
kind: KubeProxyConfiguration
metricsBindAddress: 127.0.0.1:10249
mode: ""
nodePortAddresses: null
oomScoreAdj: -999
portRange: ""
udpIdleTimeout: 250ms
winkernel:
  enableDSR: false
  networkName: ""
```

Networking challenges in Kubernetes



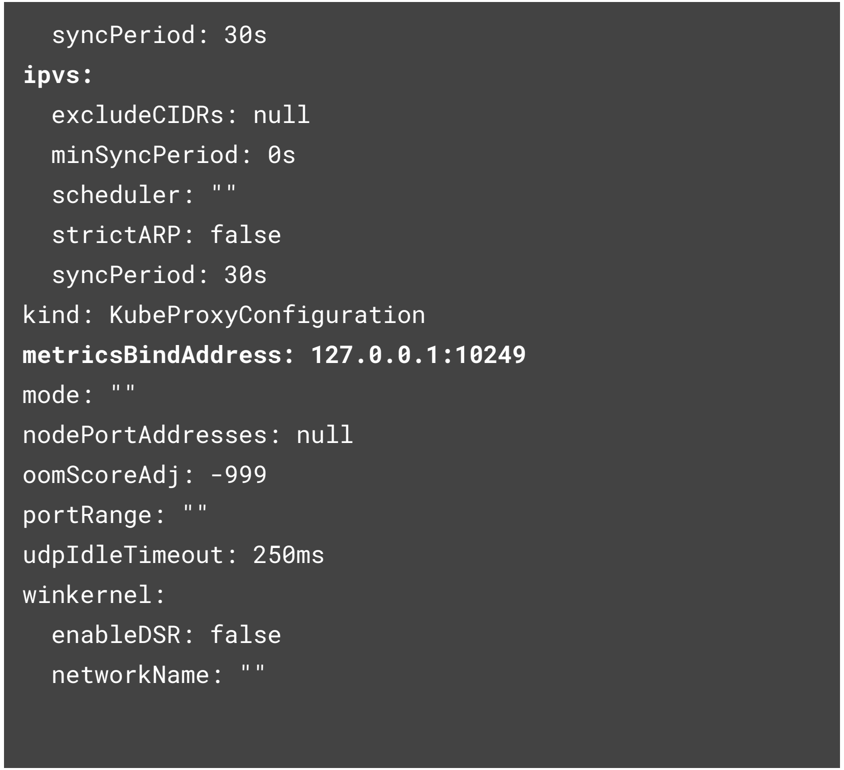
```
root@kube-demo:~# docker exec -ti 5f13781d6028 cat
/var/lib/kube-proxy/config.conf
apiVersion: kubeproxy.config.k8s.io/v1alpha1
bindAddress: 0.0.0.0
(...)
clusterCIDR: ""
configSyncPeriod: 15m0s
conntrack:
  maxPerCore: 32768
  min: 131072
  tcpCloseWaitTimeout: 1h0m0s
  tcpEstablishedTimeout: 24h0m0s
enableProfiling: false
healthzBindAddress: 0.0.0.0:10256
hostnameOverride: ""
iptables:
  masqueradeAll: false
  masqueradeBit: 14
  minSyncPeriod: 0s
```

sysctl net.nf_conntrack_max

sysctl net.netfilter.nf_conntrack_tcp_timeout_close_wait

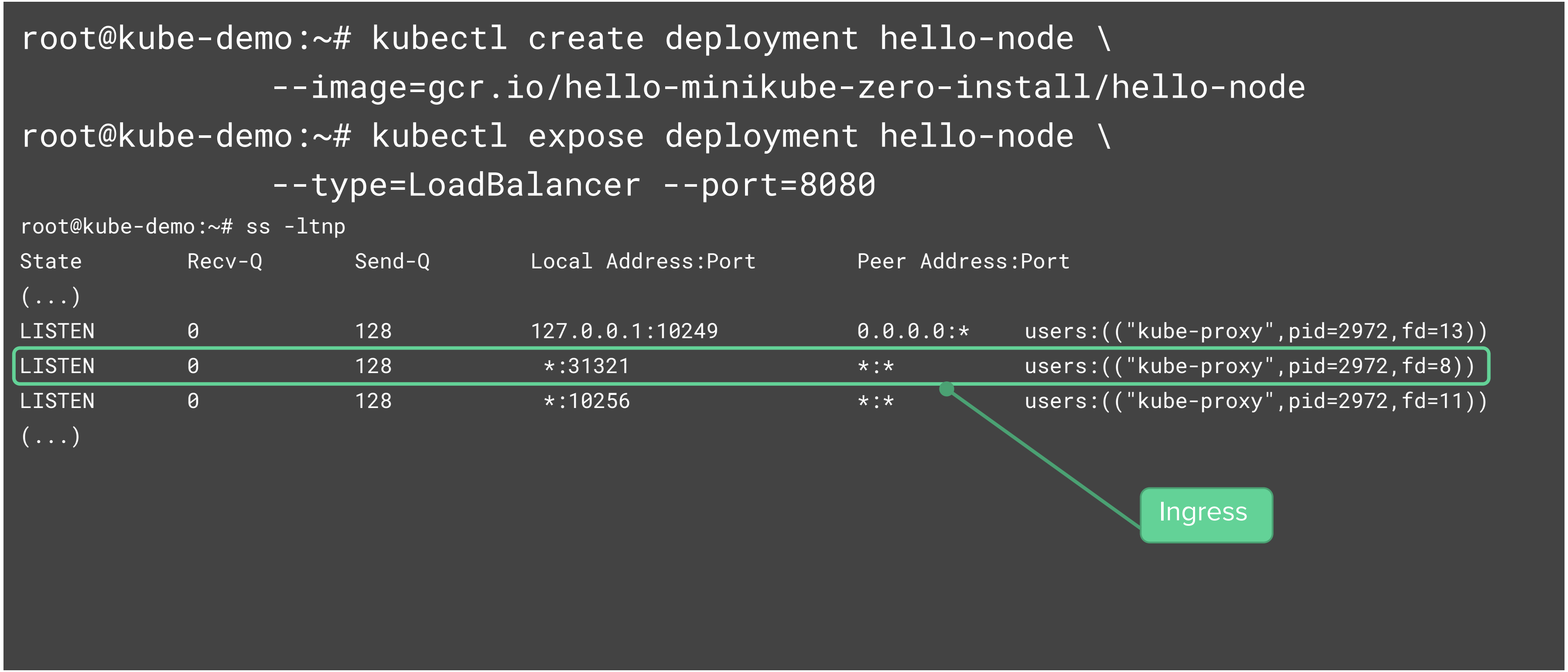
sysctl net.netfilter.nf_conntrack_tcp_timeout_established

KUBE-MARK-MASQ 0x4000



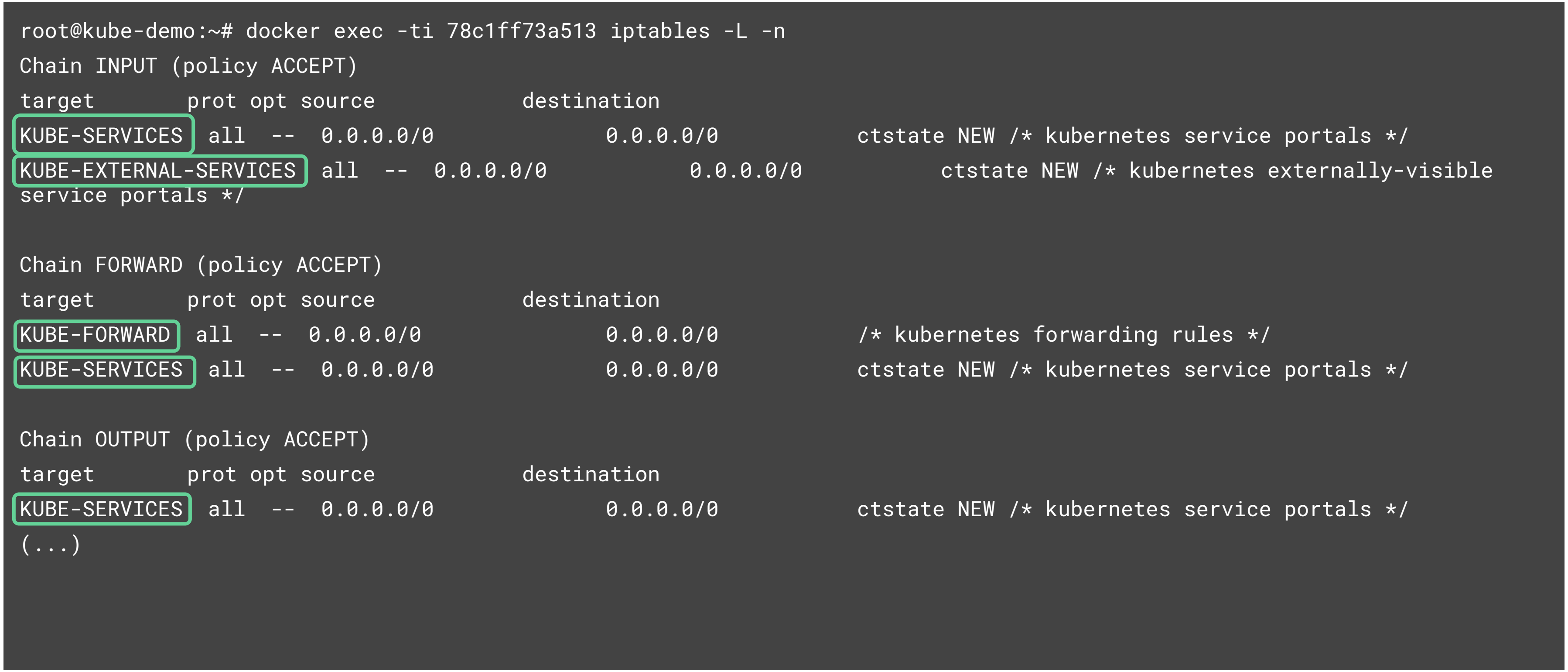
```
  syncPeriod: 30s
ipvs:
  excludeCIDRs: null
  minSyncPeriod: 0s
  scheduler: ""
  strictARP: false
  syncPeriod: 30s
kind: KubeProxyConfiguration
metricsBindAddress: 127.0.0.1:10249
mode: ""
nodePortAddresses: null
oomScoreAdj: -999
portRange: ""
udpIdleTimeout: 250ms
winkernel:
  enableDSR: false
  networkName: ""
```

Networking challenges in Kubernetes



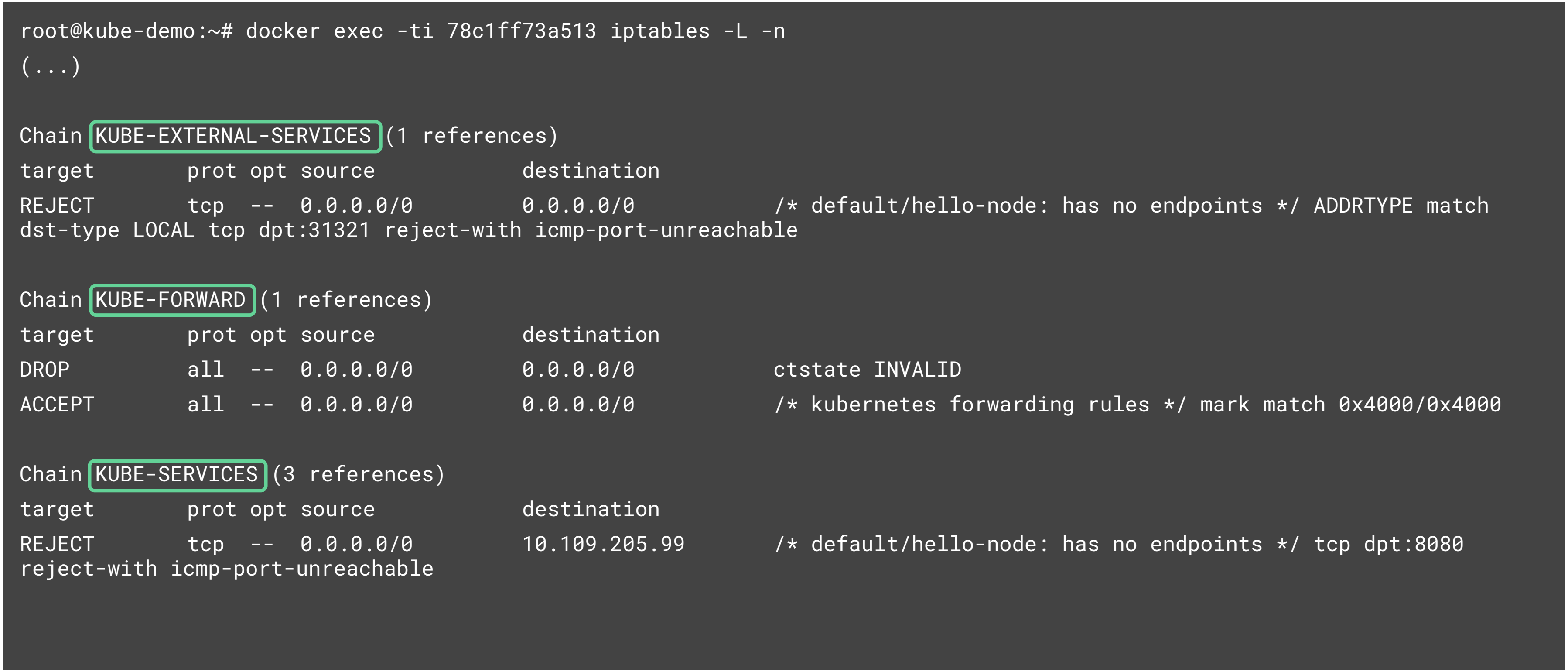
```
root@kube-demo:~# kubectl create deployment hello-node \
                    --image=gcr.io/hello-minikube-zero-install/hello-node
root@kube-demo:~# kubectl expose deployment hello-node \
                    --type=LoadBalancer --port=8080
root@kube-demo:~# ss -ltnp
State         Recv-Q       Send-Q       Local Address:Port        Peer Address:Port
(...)
LISTEN        0            128          127.0.0.1:10249           0.0.0.0:*     users:(("kube-proxy",pid=2972,fd=13))
LISTEN        0            128           *:31321                  *:*           users:(("kube-proxy",pid=2972,fd=8))
LISTEN        0            128           *:10256                  *:*           users:(("kube-proxy",pid=2972,fd=11))
(...)
```

Networking challenges in Kubernetes



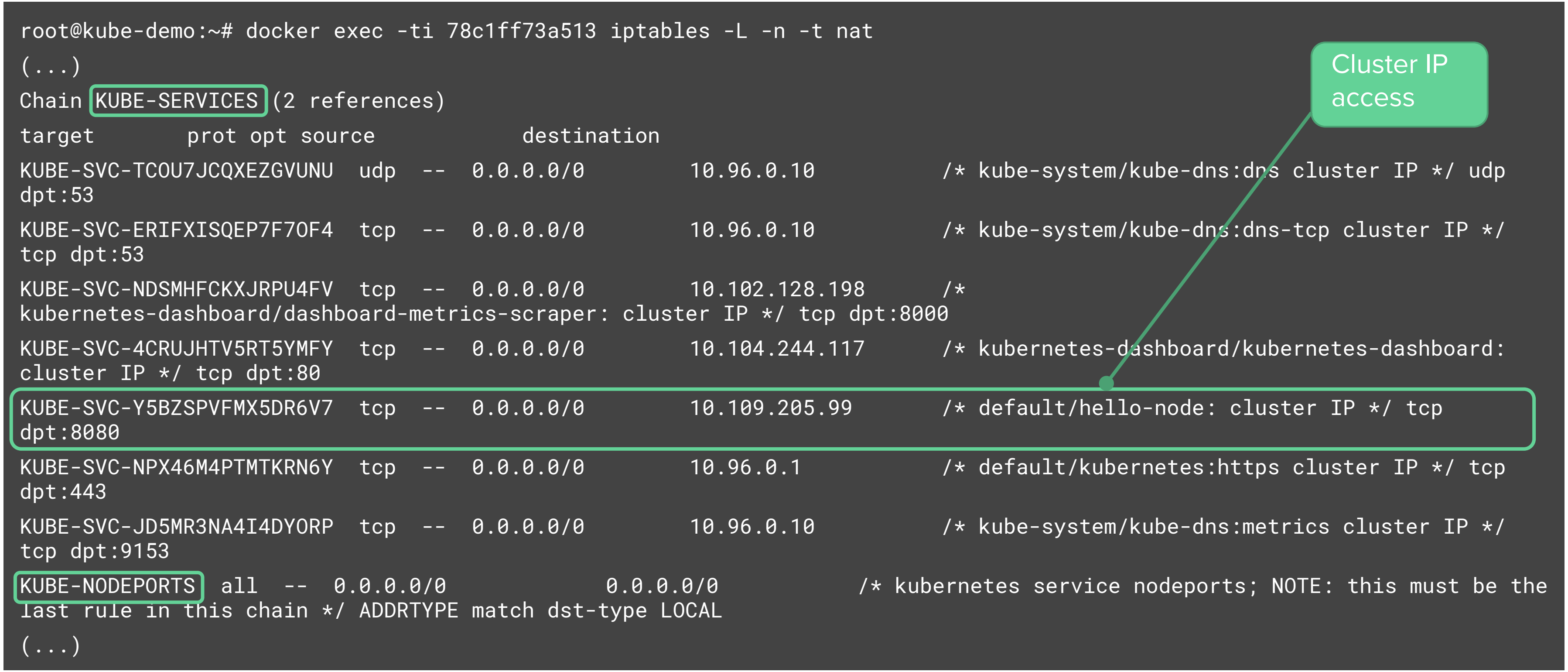
```
root@kube-demo:~# docker exec -ti 78c1ff73a513 iptables -L -n
Chain INPUT (policy ACCEPT)
target       prot opt source               destination
KUBE-SERVICES  all  --  0.0.0.0/0            0.0.0.0/0          ctstate NEW /* kubernetes service portals */
KUBE-EXTERNAL-SERVICES  all  --  0.0.0.0/0            0.0.0.0/0          ctstate NEW /* kubernetes externally-visible
service portals */

Chain FORWARD (policy ACCEPT)
target       prot opt source               destination
KUBE-FORWARD  all  --  0.0.0.0/0            0.0.0.0/0          /* kubernetes forwarding rules */
KUBE-SERVICES  all  --  0.0.0.0/0            0.0.0.0/0          ctstate NEW /* kubernetes service portals */

Chain OUTPUT (policy ACCEPT)
target       prot opt source               destination
KUBE-SERVICES  all  --  0.0.0.0/0            0.0.0.0/0          ctstate NEW /* kubernetes service portals */
(...)
```

Networking challenges in Kubernetes



```
root@kube-demo:~# docker exec -ti 78c1ff73a513 iptables -L -n
(...)

Chain KUBE-EXTERNAL-SERVICES (1 references)
target       prot opt source            destination
REJECT       tcp  --  0.0.0.0/0         0.0.0.0/0           /* default/hello-node: has no endpoints */ ADDRTYPE match
dst-type LOCAL tcp dpt:31321 reject-with icmp-port-unreachable

Chain KUBE-FORWARD (1 references)
target       prot opt source            destination
DROP         all  --  0.0.0.0/0         0.0.0.0/0           ctstate INVALID
ACCEPT       all  --  0.0.0.0/0         0.0.0.0/0           /* kubernetes forwarding rules */ mark match 0x4000/0x4000

Chain KUBE-SERVICES (3 references)
target       prot opt source            destination
REJECT       tcp  --  0.0.0.0/0         10.109.205.99       /* default/hello-node: has no endpoints */ tcp dpt:8080
reject-with icmp-port-unreachable
```

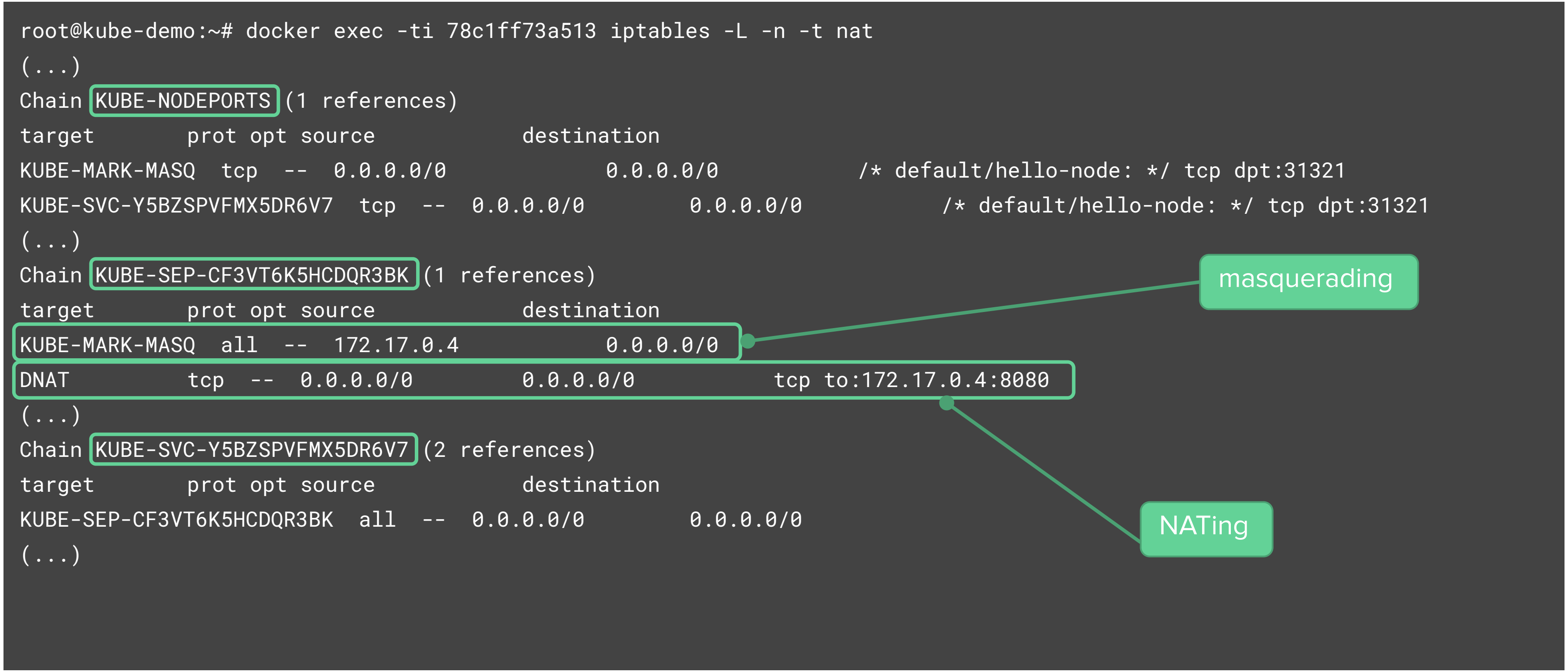
Networking challenges in Kubernetes



```
root@kube-demo:~# docker exec -ti 78c1ff73a513 iptables -L -n -t nat
(...)
Chain KUBE-SERVICES (2 references)
target       prot opt source            destination
KUBE-SVC-TCOU7JCQXEZGVUNU  udp  --  0.0.0.0/0        10.96.0.10          /* kube-system/kube-dns:dns cluster IP */ udp
dpt:53
KUBE-SVC-ERIFXISQEP7F7OF4  tcp  --  0.0.0.0/0        10.96.0.10          /* kube-system/kube-dns:dns-tcp cluster IP */
tcp dpt:53
KUBE-SVC-NDSMHFCKXJRPU4FV  tcp  --  0.0.0.0/0        10.102.128.198      /*
kubernetes-dashboard/dashboard-metrics-scraper: cluster IP */ tcp dpt:8000
KUBE-SVC-4CRUJHTV5RT5YMFY  tcp  --  0.0.0.0/0        10.104.244.117      /* kubernetes-dashboard/kubernetes-dashboard:
cluster IP */ tcp dpt:80
KUBE-SVC-Y5BZSPVFMX5DR6V7  tcp  --  0.0.0.0/0        10.109.205.99       /* default/hello-node: cluster IP */ tcp
dpt:8080
KUBE-SVC-NPX46M4PTMTKRN6Y  tcp  --  0.0.0.0/0        10.96.0.1           /* default/kubernetes:https cluster IP */ tcp
dpt:443
KUBE-SVC-JD5MR3NA4I4DYORP  tcp  --  0.0.0.0/0        10.96.0.10          /* kube-system/kube-dns:metrics cluster IP */
tcp dpt:9153
KUBE-NODEPORTS  all  --  0.0.0.0/0            0.0.0.0/0          /* kubernetes service nodeports; NOTE: this must be the
last rule in this chain */ ADDRTYPE match dst-type LOCAL
(...)
```

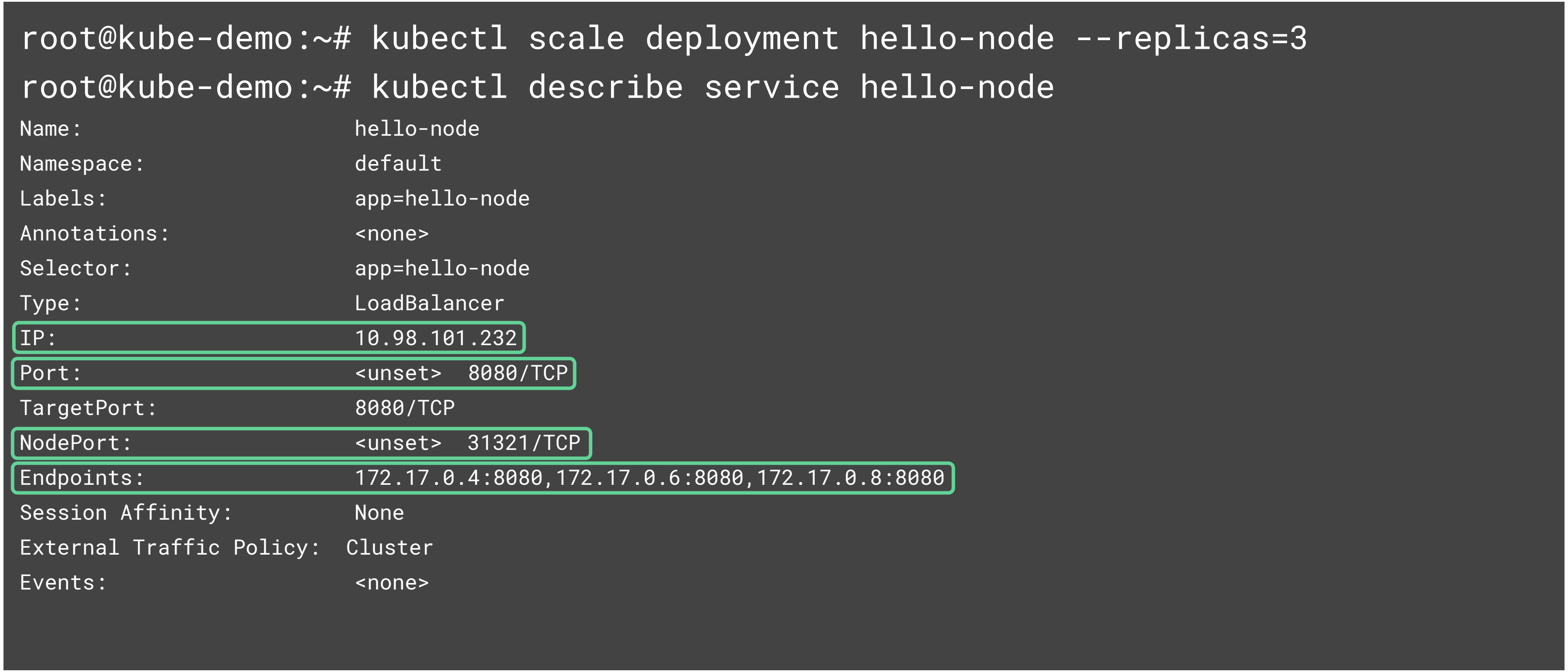
Cluster IP access

Networking challenges in Kubernetes



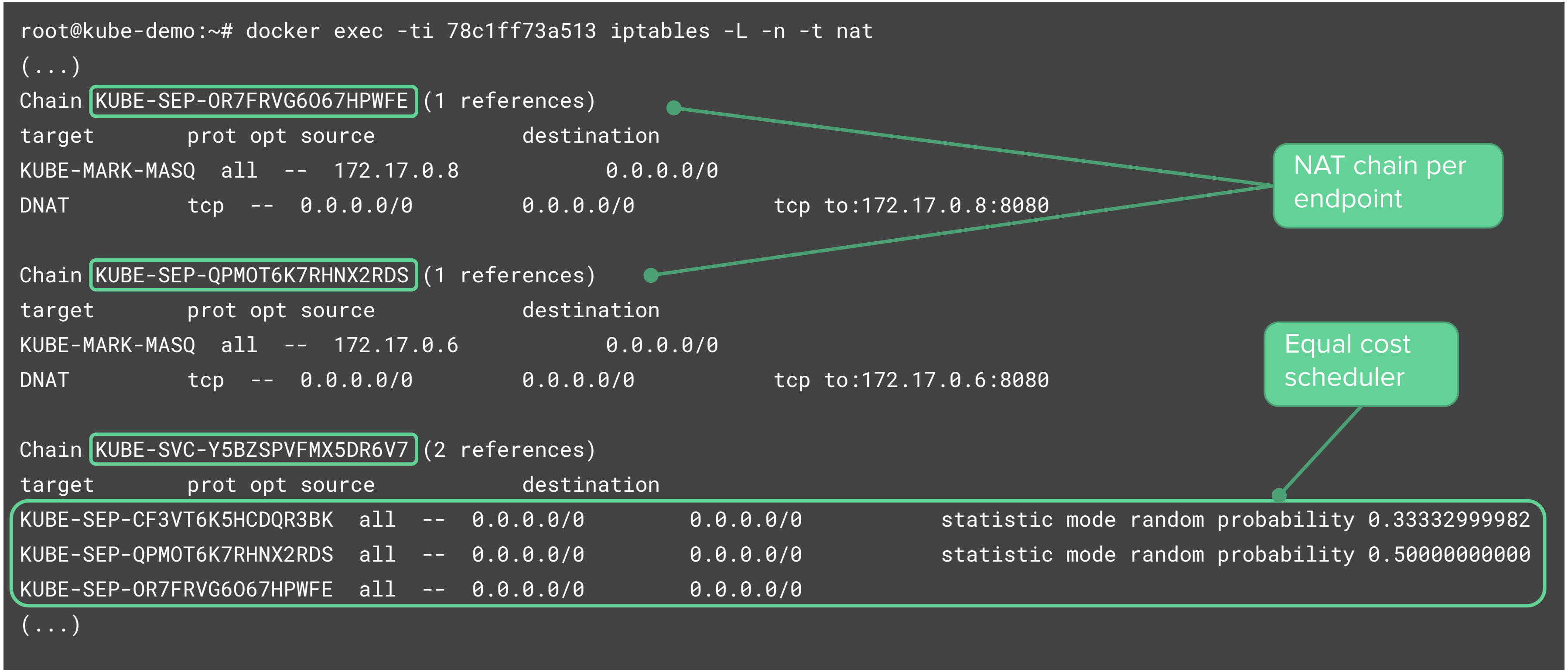
```
root@kube-demo:~# docker exec -ti 78c1ff73a513 iptables -L -n -t nat
(...)
Chain KUBE-NODEPORTS (1 references)
target       prot opt source            destination
KUBE-MARK-MASQ  tcp  --  0.0.0.0/0            0.0.0.0/0           /* default/hello-node: */ tcp dpt:31321
KUBE-SVC-Y5BZSPVFMX5DR6V7  tcp  --  0.0.0.0/0        0.0.0.0/0           /* default/hello-node: */ tcp dpt:31321
(...)
Chain KUBE-SEP-CF3VT6K5HCDQR3BK (1 references)
target       prot opt source            destination
KUBE-MARK-MASQ  all  --  172.17.0.4           0.0.0.0/0
DNAT         tcp  --  0.0.0.0/0         0.0.0.0/0           tcp to:172.17.0.4:8080
(...)
Chain KUBE-SVC-Y5BZSPVFMX5DR6V7 (2 references)
target       prot opt source            destination
KUBE-SEP-CF3VT6K5HCDQR3BK  all  --  0.0.0.0/0        0.0.0.0/0
(...)
```

Networking challenges in Kubernetes



```
root@kube-demo:~# kubectl scale deployment hello-node --replicas=3
root@kube-demo:~# kubectl describe service hello-node
Name:                      hello-node
Namespace:                 default
Labels:                    app=hello-node
Annotations:               <none>
Selector:                  app=hello-node
Type:                      LoadBalancer
IP:                        10.98.101.232
Port:                      <unset>  8080/TCP
TargetPort:                8080/TCP
NodePort:                  <unset>  31321/TCP
Endpoints:                 172.17.0.4:8080,172.17.0.6:8080,172.17.0.8:8080
Session Affinity:          None
External Traffic Policy:  Cluster
Events:                    <none>
```

Networking challenges in Kubernetes



```
root@kube-demo:~# docker exec -ti 78c1ff73a513 iptables -L -n -t nat
(...)
Chain KUBE-SEP-OR7FRVG6O67HPWFE (1 references)
target       prot opt source            destination
KUBE-MARK-MASQ  all  --  172.17.0.8           0.0.0.0/0
DNAT         tcp  --  0.0.0.0/0         0.0.0.0/0           tcp to:172.17.0.8:8080

Chain KUBE-SEP-QPMOT6K7RHNX2RDS (1 references)
target       prot opt source            destination
KUBE-MARK-MASQ  all  --  172.17.0.6           0.0.0.0/0
DNAT         tcp  --  0.0.0.0/0         0.0.0.0/0           tcp to:172.17.0.6:8080

Chain KUBE-SVC-Y5BZSPVFMX5DR6V7 (2 references)
target       prot opt source            destination
KUBE-SEP-CF3VT6K5HCDQR3BK  all  --  0.0.0.0/0        0.0.0.0/0           statistic mode random probability 0.33332999982
KUBE-SEP-QPMOT6K7RHNX2RDS  all  --  0.0.0.0/0        0.0.0.0/0           statistic mode random probability 0.50000000000
KUBE-SEP-OR7FRVG6O67HPWFE  all  --  0.0.0.0/0        0.0.0.0/0
(...)
```

NAT chain per endpoint

Equal cost scheduler

Networking challenges in Kubernetes

Summary

- Plane IP addresses
- Service identified by IP + port
- Dedicated Cluster IP per service
- Dedicated Node Port for service exposure
- Connection tracking, Iptables and proxy for traffic forwarding
- Resolves Clustering and scaling

What's next?

Yet, a lot of kube-proxy corner cases:

- Improve performance and reduce complexity of rules: 4*endpoints
- Support of IPv6 and dual stack
- Load balancing based on mixed protocols or IP only
- Load balance of other protocols FTP, SIP, RDP, SMTP, SYSLOG, LDAP, etc.
- Support of transparent proxy
- Traffic limits per service or endpoints, etc.
- Configurable session persistence
- Better integration with security policies
- Stateful connection tracking replication
- Use of network acceleration techniques

What’s next?

nftlb, the new Zevenet L4 core, based in nftables

https://github.com/zevenet/nftlb

Kubernetes nftlb integration prototype

https://github.com/zevenet/kube-nftlb

Demo

```
root@kube-demo:~# git clone https://github.com/zevenet/kube-nftlb
root@kube-demo:~# ./kube-nftlb/debian_tools_installer.sh
root@kube-demo:~# go get -u github.com/zevenet/kube-nftlb/...
root@kube-demo:~# cd ~/go/src/github.com/zevenet/kube-nftlb/
root@kube-demo:~# kubectl apply -f yaml/give_internet_access_to_pods.yaml
root@kube-demo:~# kubectl apply -f yaml/authentication_system_level_from_pod.yaml
root@kube-demo:~# sh build.sh
root@kube-demo:~# kubectl delete daemonsets -n kube-system kube-proxy
root@kube-demo:~# kubectl apply -f yaml/create_nftlb_as_daemonset.yaml
root@kube-demo:~# kubectl create deployment hello-node \
                           --image=gcr.io/hello-minikube-zero-install/hello-node
root@kube-demo:~# kubectl expose deployment hello-node --type=LoadBalancer --port=8080
root@kube-demo:~# kubectl scale deployment hello-node --replicas=3
root@kube-demo:~# kubectl edit service hello-node
root@kube-demo:~# kubectl delete service hello-node
root@kube-demo:~# kubectl delete deployment hello-node
```

ZEVENET

Happy load balancing!

Zevenet careers
https://www.zevenet.com/careers/