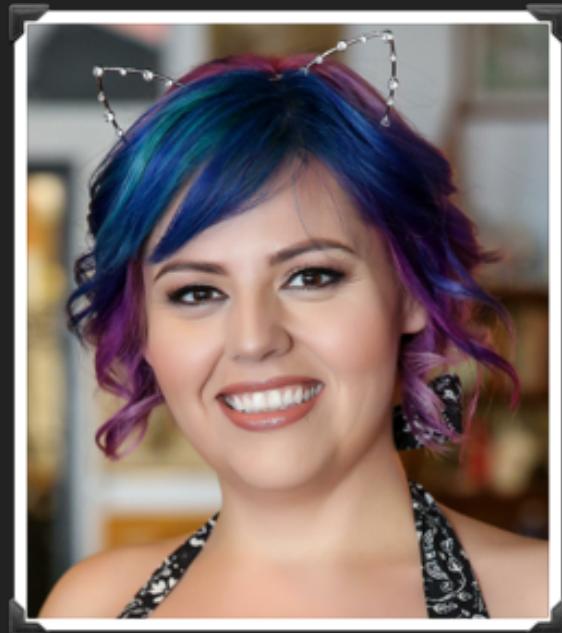


CONTAINERS:

NO, NOT YOUR MAMA'S TUPPERWARE.



ELL MARQUEZ

Technical Trainer
Rackspace Private Cloud Training
ell.marquez@rackspace.com

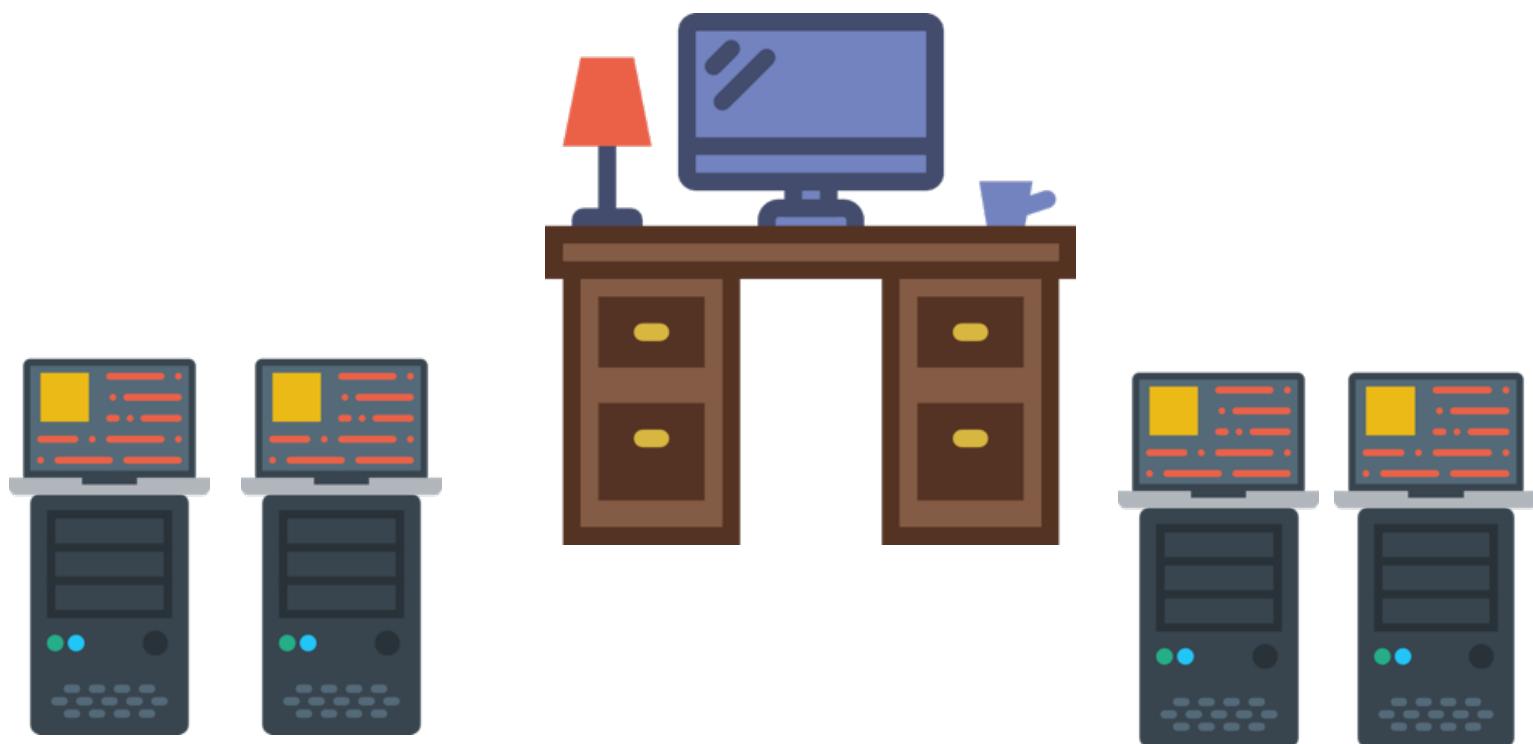
Agenda

Virtualization

Containerization

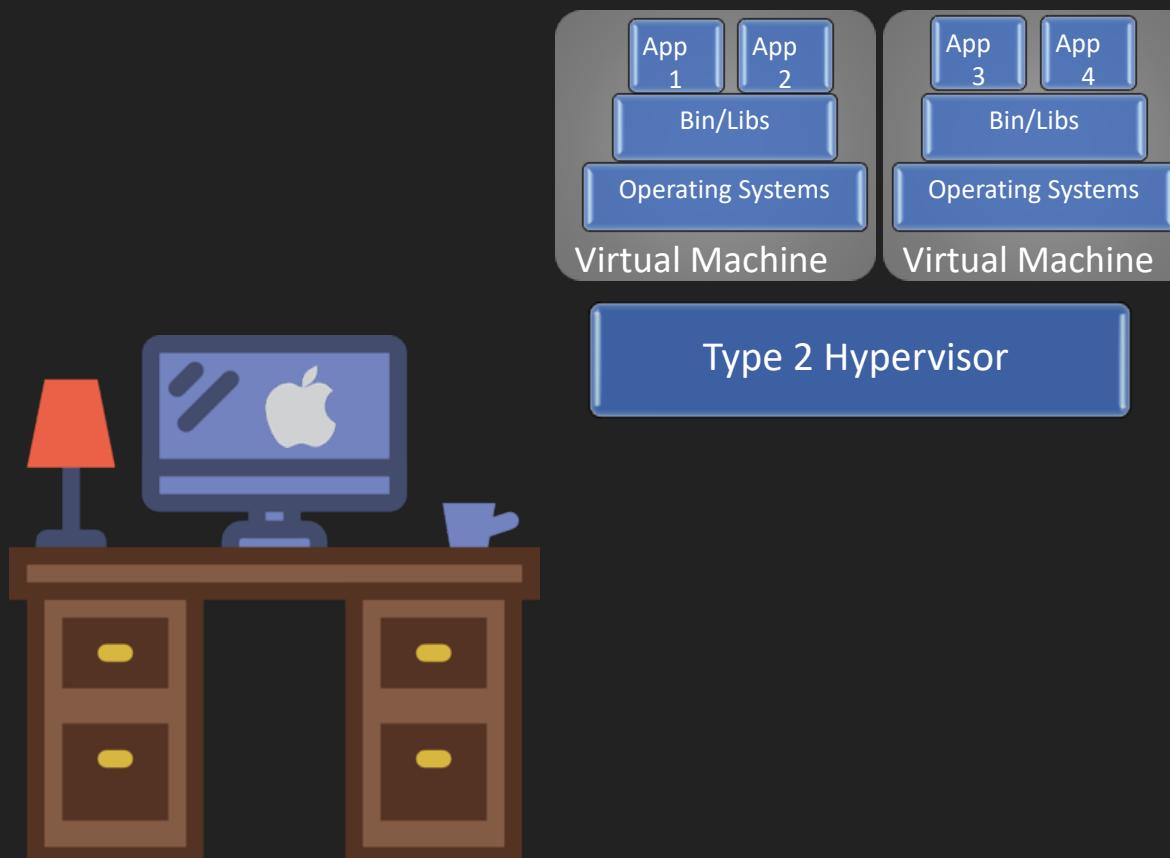
Docker

Kubernetes

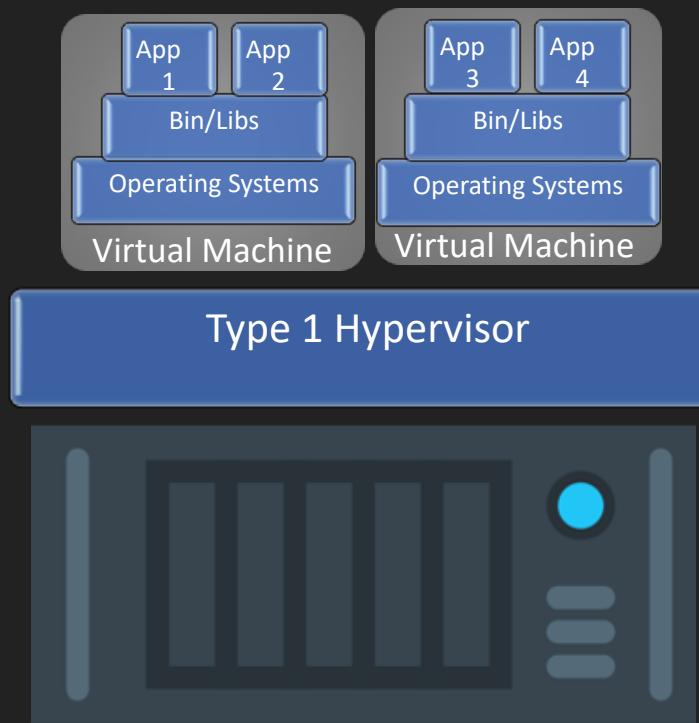


What is Virtualization?

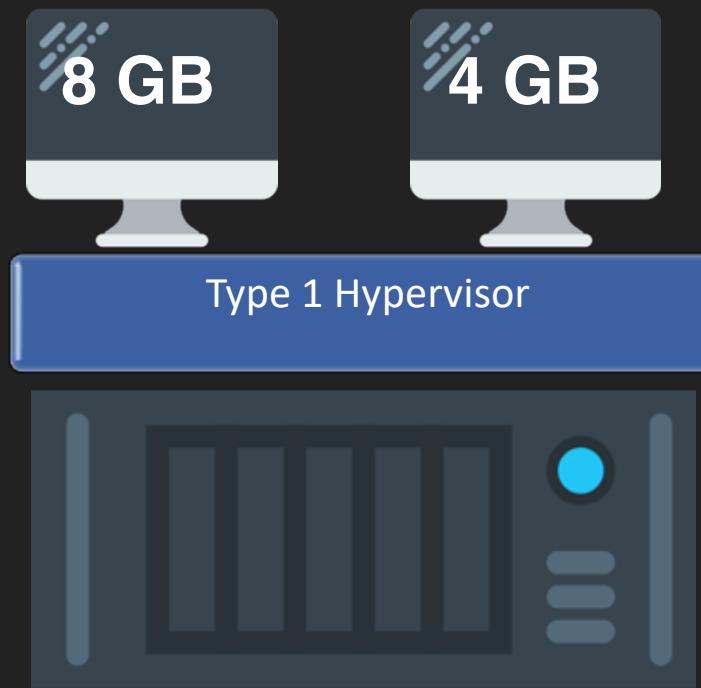
What is Virtualization?



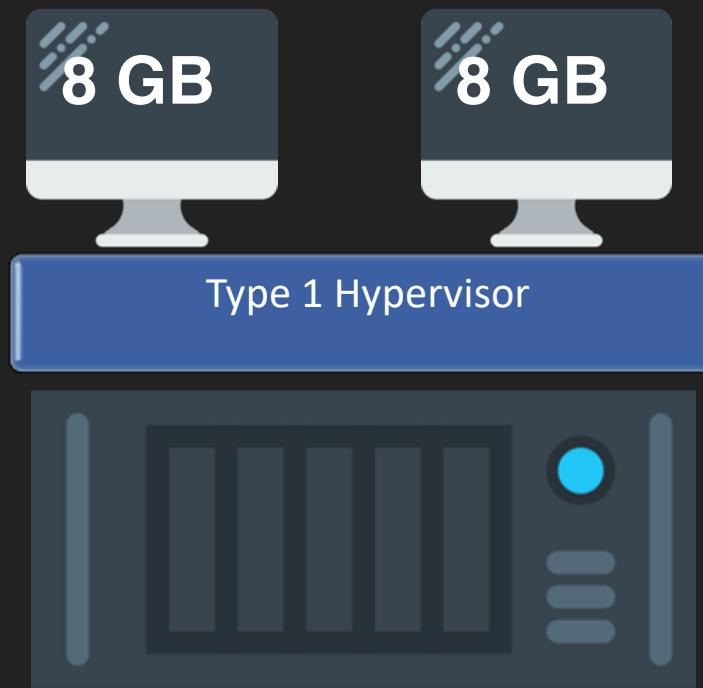
What is Virtualization?



What is Virtualization?

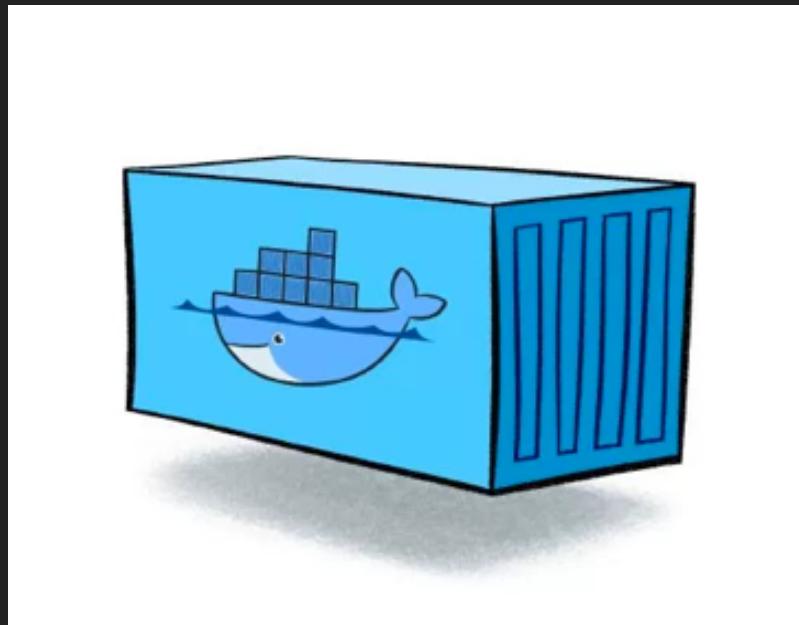


What is Virtualization?





Containerization



chroot
1978/1982

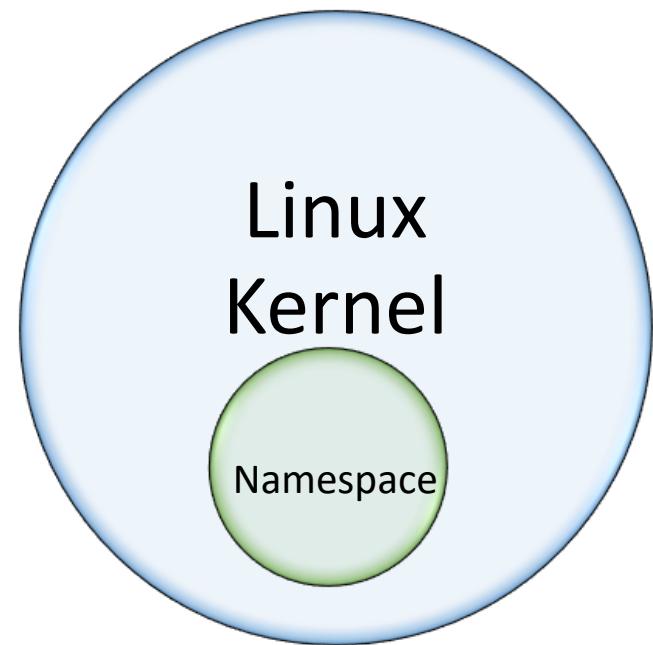
Jail
2000

**Process
Containers**
2006

NameSpaces
Present



- Similar to a Type 2 Hypervisor
- Restricts the resource process has to on the host

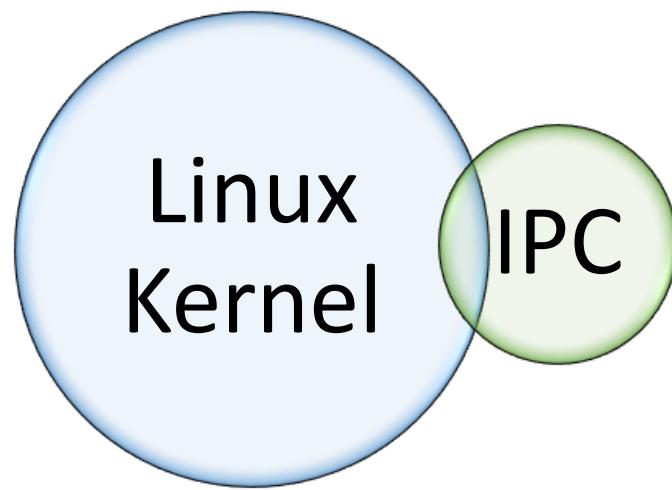


What is a Process?

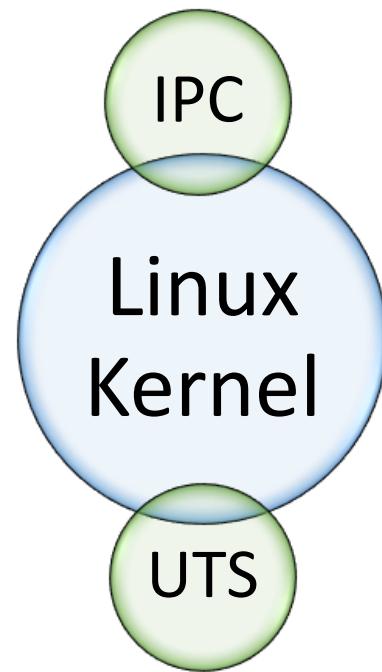
What is a Process?

- Set of instructions for computer to perform.
- Linux is multiprocessing.
- Namespaces allow for separation of processes from the global environment.

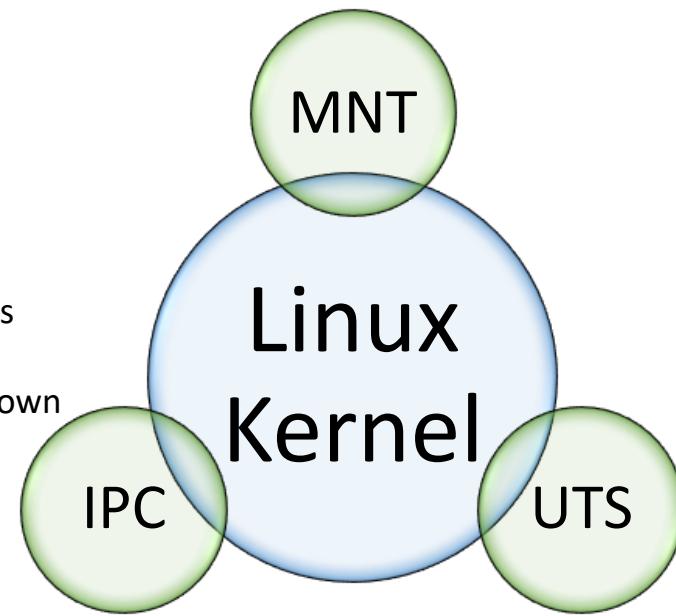
- Multi process data exchange
- Separate message queue for each namespace



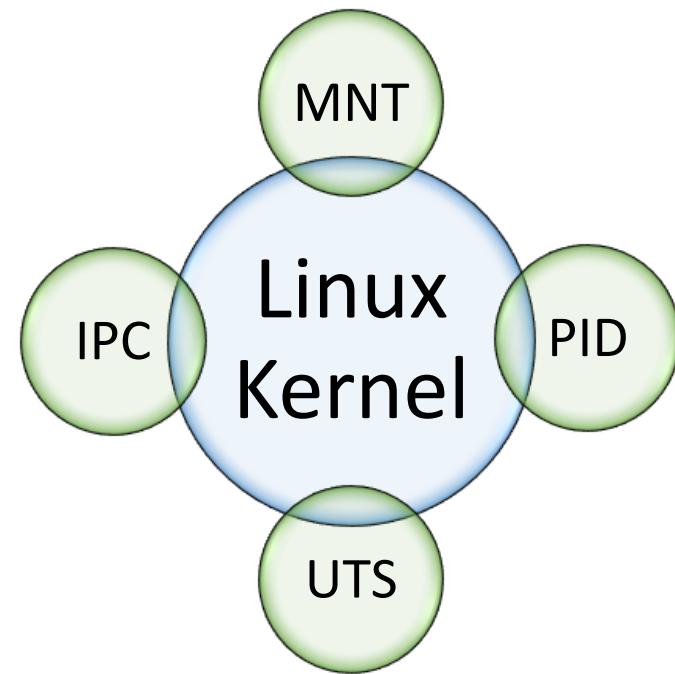
- Allowed for isolation of hostnames
- Hostnames could be unique identifiers.



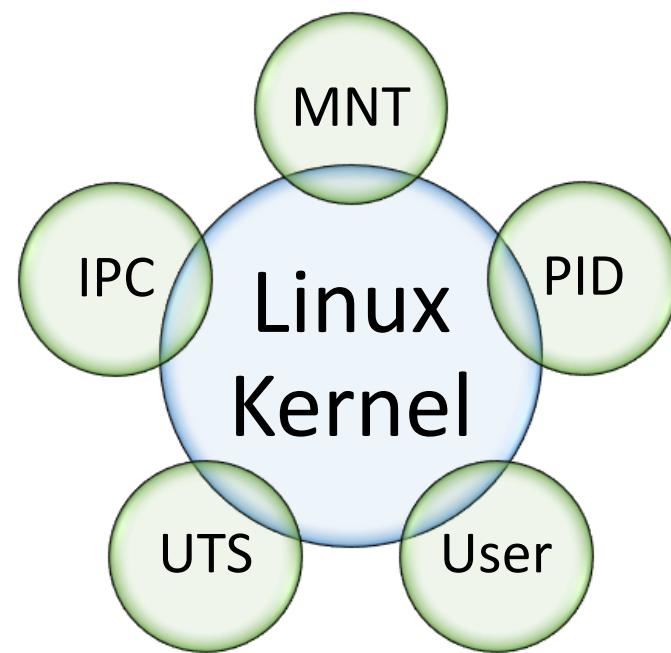
- Controls filesystem mount points
- Each Namespace could have its own root file system



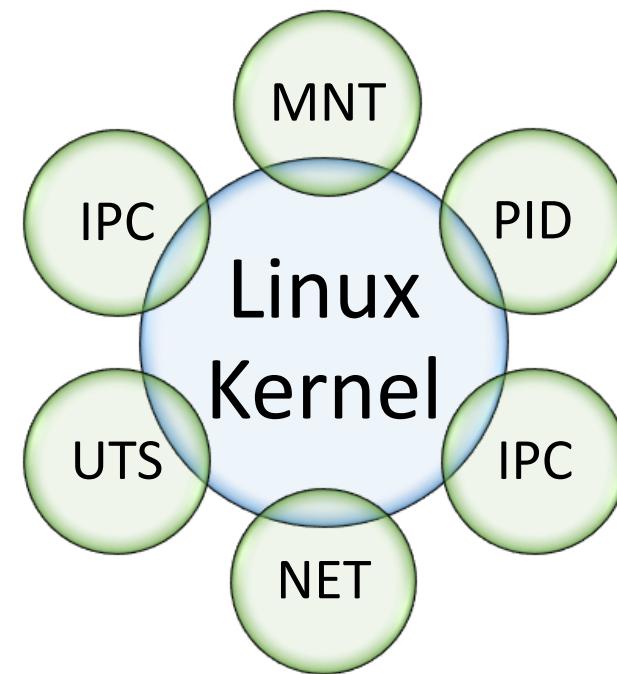
- Isolation of Process ID numbers
- Suspend and move possesses



- Allowed for Root access to container but not to host.



- Each container has a copy of its own network stack.
- Network Devices can belong to exactly 1 Network namespace.



ell@ellsamplebox:~\$ █

```
e11@e11samplebox:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
f2b-sshd   tcp  --  anywhere        anywhere         multiport dports ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination

Chain f2b-sshd (1 references)
target     prot opt source          destination
RETURN    all  --  anywhere        anywhere
```

```
e11@e11samplebox:~$
```

```
[ell@ellsamplebox:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
f2b-sshd   tcp  --  anywhere        anywhere          multiport dports ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination

Chain f2b-sshd (1 references)
target     prot opt source          destination
RETURN    all  --  anywhere        anywhere
[ell@ellsamplebox:~$ sudo ip netns add sample
[ell@ellsamplebox:~$ sudo ip netns list
sample
ell@ellsamplebox:~$ ]
```

```
[ell@ellsamplebox:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
f2b-sshd   tcp  --  anywhere        anywhere          multiport dports ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination

Chain f2b-sshd (1 references)
target     prot opt source          destination
RETURN    all  --  anywhere        anywhere
[ell@ellsamplebox:~$ sudo ip netns add sample
[ell@ellsamplebox:~$ sudo ip netns list
sample
[ell@ellsamplebox:~$ sudo cd /var/run/net
netns/  network/
[ell@ellsamplebox:~$ sudo ls -lha /var/run/netns
total 0
drwxr-xr-x  2 root root  60 Apr  9 22:28 .
drwxr-xr-x 26 root root 1020 Apr  9 22:28 ..
-r--r--r--  1 root root  0 Apr  9 22:28 sample
ell@ellsamplebox:~$ █
```

```
[ell@ellsamplebox:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
f2b-sshd   tcp  --  anywhere        anywhere          multiport dports ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination

Chain f2b-sshd (1 references)
target     prot opt source          destination
RETURN    all  --  anywhere        anywhere
[ell@ellsamplebox:~$ sudo ip netns add sample
[ell@ellsamplebox:~$ sudo ip netns list
sample
[ell@ellsamplebox:~$ sudo cd /var/run/net
netns/
network/
[ell@ellsamplebox:~$ sudo ls -lha /var/run/netns
total 0
drwxr-xr-x  2 root root  60 Apr  9 22:28 .
drwxr-xr-x 26 root root 1020 Apr  9 22:28 ..
-r--r--r--  1 root root   0 Apr  9 22:28 sample
[ell@ellsamplebox:~$ sudo ip netns exec sample bash
root@ellsamplebox:~#
```

```
f2b-sshd  tcp  --  anywhere            anywhere          multiport dports ssh
Chain FORWARD (policy ACCEPT)
target    prot opt source               destination
Chain OUTPUT (policy ACCEPT)
target    prot opt source               destination
Chain f2b-sshd (1 references)
target    prot opt source               destination
RETURN   all  --  anywhere            anywhere
[ell@ellsamplebox:~$ sudo ip netns add sample
[ell@ellsamplebox:~$ sudo ip netns list
sample
[ell@ellsamplebox:~$ sudo cd /var/run/net
netns/  network/
[ell@ellsamplebox:~$ sudo ls -lha /var/run/netns
total 0
drwxr-xr-x  2 root root  60 Apr  9 22:28 .
drwxr-xr-x 26 root root 1020 Apr  9 22:28 ..
-r--r--r--  1 root root  0 Apr  9 22:28 sample
[ell@ellsamplebox:~$ sudo ip netns exec sample bash
[root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target    prot opt source               destination
Chain FORWARD (policy ACCEPT)
target    prot opt source               destination
Chain OUTPUT (policy ACCEPT)
target    prot opt source               destination
[root@ellsamplebox:~# ]
```

```
Chain OUTPUT (policy ACCEPT)
target    prot opt source          destination

Chain f2b-sshd (1 references)
target    prot opt source          destination
RETURN   all  --  anywhere        anywhere
ell@ellsamplebox:~$ sudo ip netns add sample
ell@ellsamplebox:~$ sudo ip netns list
sample
ell@ellsamplebox:~$ sudo cd /var/run/net
netns/   network/
ell@ellsamplebox:~$ sudo ls -lha /var/run/netns
total 0
drwxr-xr-x  2 root root  60 Apr  9 22:28 .
drwxr-xr-x 26 root root 1020 Apr  9 22:28 ..
-r--r--r--  1 root root   0 Apr  9 22:28 sample
ell@ellsamplebox:~$ sudo ip netns exec sample bash
root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target    prot opt source          destination

Chain FORWARD (policy ACCEPT)
target    prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target    prot opt source          destination
root@ellsamplebox:~# ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
root@ellsamplebox:~#
```

```
[ell@ellsamplebox:~$ sudo ip netns add sample
[ell@ellsamplebox:~$ sudo ip netns list
sample
[ell@ellsamplebox:~$ sudo cd /var/run/net
netns/  network/
[ell@ellsamplebox:~$ sudo ls -lha /var/run/netns
total 0
drwxr-xr-x  2 root root   60 Apr  9 22:28 .
drwxr-xr-x 26 root root 1020 Apr  9 22:28 ..
-r--r--r--  1 root root    0 Apr  9 22:28 sample
[ell@ellsamplebox:~$ sudo ip netns exec sample bash
[root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target      prot opt source          destination
Chain FORWARD (policy ACCEPT)
target      prot opt source          destination
Chain OUTPUT (policy ACCEPT)
target      prot opt source          destination
[root@ellsamplebox:~# ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
[root@ellsamplebox:~# ip link set dev lo up
[root@ellsamplebox:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    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
root@ellsamplebox:~# ]
```

root@ellsamplebox:~#

```
root@ellsamplebox:~# ping 127.0.0.1
PING 127.0.0.1 (127.0.0.1) 56(84) bytes of data.
64 bytes from 127.0.0.1: icmp_seq=1 ttl=64 time=0.066 ms
64 bytes from 127.0.0.1: icmp_seq=2 ttl=64 time=0.021 ms
64 bytes from 127.0.0.1: icmp_seq=3 ttl=64 time=0.042 ms
64 bytes from 127.0.0.1: icmp_seq=4 ttl=64 time=0.044 ms
c64 bytes from 127.0.0.1: icmp_seq=5 ttl=64 time=0.017 ms
64 bytes from 127.0.0.1: icmp_seq=6 ttl=64 time=0.032 ms
^C
--- 127.0.0.1 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5000ms
rtt min/avg/max/mdev = 0.017/0.037/0.066/0.016 ms
root@ellsamplebox:~# █
```

```
[root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
Chain FORWARD (policy ACCEPT)
target     prot opt source          destination
Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination
[root@ellsamplebox:~# ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
[root@ellsamplebox:~# ip link set dev lo up
[root@ellsamplebox:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    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
[root@ellsamplebox:~# iptables -A INPUT -p tcp --dport 2022 -j ACCEPT
[root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
ACCEPT     tcp  --  anywhere         anywhere        tcp dpt:2022

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination
[root@ellsamplebox:~# ]
```

```
target      prot opt source          destination
Chain FORWARD (policy ACCEPT)
target      prot opt source          destination
Chain OUTPUT (policy ACCEPT)
target      prot opt source          destination
root@ellsamplebox:~# ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
root@ellsamplebox:~# ip link set dev lo up
root@ellsamplebox:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    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
root@ellsamplebox:~# iptables -A INPUT -p tcp --dport 2022 -j ACCEPT
root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target      prot opt source          destination
ACCEPT     tcp   --  anywhere          anywhere          tcp dpt:2022

Chain FORWARD (policy ACCEPT)
target      prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target      prot opt source          destination
root@ellsamplebox:~# exit
exit
ell@ellsamplebox:~$ iptables -L
```

```
Chain OUTPUT (policy ACCEPT)
target    prot opt source          destination
[ell@ellsamplebox:~# ip a
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
[ell@ellsamplebox:~# ip link set dev lo up
[ell@ellsamplebox:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    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
[ell@ellsamplebox:~# iptables -A INPUT -p tcp -m tcp --dport 2022 -j ACCEPT
[ell@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target    prot opt source          destination
ACCEPT    tcp   --  anywhere           anywhere          tcp  dpt:2022

Chain FORWARD (policy ACCEPT)
target    prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target    prot opt source          destination
[ell@ellsamplebox:~# exit
exit
[ell@ellsamplebox:~$ iptables -L
Command 'iptables' is available in '/sbin/iptables'
The command could not be located because '/sbin' is not included in the PATH environment variable.
This is most likely caused by the lack of administrative privileges associated with your user account.
iptables: command not found
ell@ellsamplebox:~$
```

```
[root@ellsamplebox:~# iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
ACCEPT     tcp  --  anywhere        anywhere         tcp dpt:2022

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination
[root@ellsamplebox:~# exit
exit
[ell@ellsamplebox:~$ iptables -L
Command 'iptables' is available in '/sbin/iptables'
The command could not be located because '/sbin' is not included in the PATH environment variable.
This is most likely caused by the lack of administrative privileges associated with your user account.
iptables: command not found
[ell@ellsamplebox:~$ sudo iptables -L
[[sudo] password for ell:
Sorry, try again.
[[sudo] password for ell:
Chain INPUT (policy ACCEPT)
target     prot opt source          destination
f2b-sshd   tcp  --  anywhere        anywhere         multiport dports ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source          destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source          destination

Chain f2b-sshd (1 references)
target     prot opt source          destination
RETURN    all  --  anywhere        anywhere
ell@ellsamplebox:~$
```

```

Chain INPUT (policy ACCEPT)
target     prot opt source               destination
f2b-sshd   tcp  --  anywhere             anywhere            multiport dports ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination

Chain f2b-sshd (1 references)
target     prot opt source               destination
RETURN    all  --  anywhere             anywhere

[ell@ellsamplebox:~$ cd /proc/
[ell@ellsamplebox:/proc$ ls
 1  1436  158   25  27138  37   488  68      cmdline      kallsyms    net          timer_stats
 10 1462  15806  26  27335  38   5    7      consoles     kcore        pagetypeinfo  tty
 11 15    15807  26055 27366  39   55   74      cpuinfo      keys         partitions  uptime
 12 1517  159   262   27892  3918  56   758     crypto       key-users   sched_debug  version
 13 152   1591  26278  28   402   57   76      devices      kmsg        schedstat   version_signature
 1341 1523  16   26280  29   435   58   762     diskstats   kpagecgroun scsi        vmallocinfo
 1344 1524  160  26281  294   444   587  8      dma         kpagecount  self        vmstat
 1350 153   161  26286  29872  450   59   831     driver      kpageflags  slabinfo   xen
 1352 154   17   26370  3     463   60   833     execdomains loadavg    softirqs    zoneinfo
 1371 15473  18   26401  31   467   61   88      fb          locks       stat
 1373 15475  19   26448  32   468   62   89      filesystems mdstat    swaps
 1379 15476  2   26687  33   4683  63   9       fs          meminfo    sys
 1386 155   20   27   349   471   64   acpi     interrupts  misc      sysrq-trigger
 1411 15532  22   27090  355   472   65   buddyinfo iomem     modules   sysvipc
 1426 156   23   27121  356   473   66   bus      ioports    mounts   thread-self
 1427 157   24   27137  36   474   67   cgroups  irq       mtrr     timer_list

[ell@ellsamplebox:/proc$
```

```

        target prot opt source          destination
RETURN all -- anywhere
anywhere

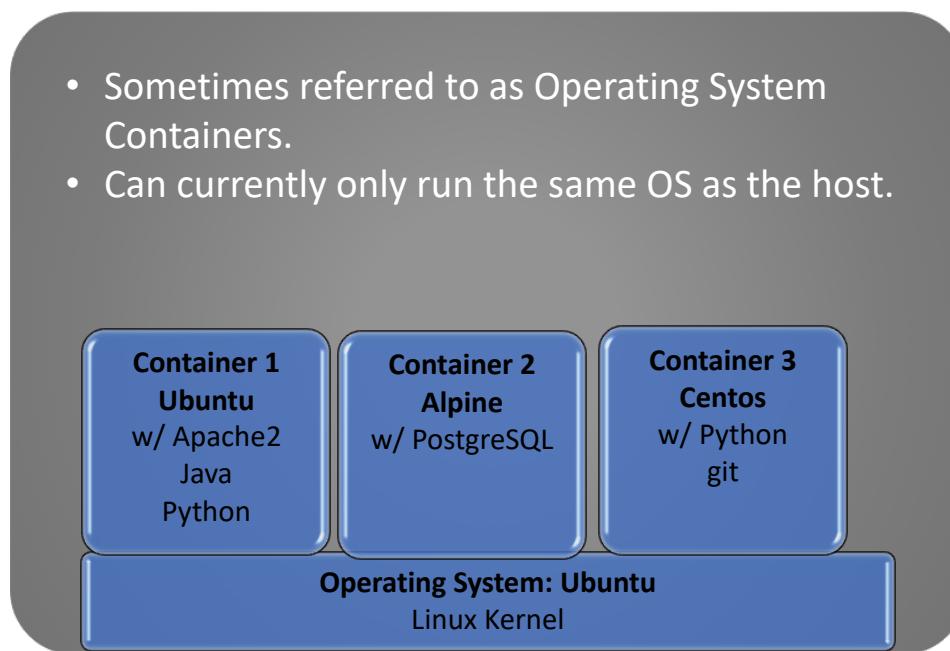
ell@ellsamplebox:~$ cd /proc/
ell@ellsamplebox:/proc$ ls
1   1436  158   25   27138  37   488  68      cmdline      kallsyms    net          timer_stats
10  1462  15806  26   27335  38   5    7       consoles     kcore        pagetypeinfo  tty
11  15     15807  26055  27366  39   55   74      cpuinfo      keys         partitions  uptime
12  1517  159   262   27892  3918  56   758     crypto       key-users   sched_debug  version
13  152   1591  26278  28    402   57   76      devices     kmsg        schedstat   version_signature
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1344 1524  160   26281  294   444   587  8       dma         kpagecount  self          vmstat
1350 153   161   26286  29872  450   59   831     driver      kpageflags  slabinfo   xen
1352 154   17    26370  3     463   60   833     execdomains loadavg     softirqs   zoneinfo
1371 15473 18    26401  31    467   61   88      fb          locks       stat
1373 15475 19    26448  32    468   62   89      filesystems mdstat     swaps
1379 15476 2     26687  33    4683  63   9       fs          meminfo    sys
1386 155   20    27    349   471   64   acpi      interrupts  misc
1411 15532 22    27090  355   472   65   buddyinfo iomem      modules
1426 156   23    27121  356   473   66   bus       ioports    mounts
1427 157   24    27137  36    474   67   cgroups   irq       mtrr
                                         timer_list

ell@ellsamplebox:/proc$ cd self
ell@ellsamplebox:/proc/self$ ls
attr      cmdline      environ  io      mem      ns          pagemap    schedstat  stat      timers
autogroup comm        exe      limits  mountinfo numa_maps  personality sessionid statm  uid_map
auxv      coredump_filter fd      loginuid mounts  oom_adj    projid_map setgroups status wchan
cgroup    cpuset      fdinfo   map_files mountstats oom_score root      smaps
clear_refs cwd        gid_map  maps    net      oom_score_adj sched    stack
task

ell@ellsamplebox:/proc/self$ cd ns
ell@ellsamplebox:/proc/self/ns$ ls
cgroup  ipc  mnt  net  pid  user  uts
ell@ellsamplebox:/proc/self/ns$
```

Machine Containers

- Sometimes referred to as Operating System Containers.
- Can currently only run the same OS as the host.



trainer@rackspace:~\$ █

```
trainer@rackspace:~$ sudo lxc list
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+
trainer@rackspace:~$ █
```

```
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+
trainer@rackspace-training:~$ sudo lxc launch ubuntu:16.04 ubuntu-container
Creating ubuntu-container
Starting ubuntu-container
trainer@rackspace-training:~$ █
```

```
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+
trainer@rackspace-training:~$ sudo lxc launch ubuntu:16.04 ubuntu-container
Creating ubuntu-container
Starting ubuntu-container
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+-----+-----+
|      NAME      | STATE | IPV4 |          IPV6          | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
| ubuntu-container | RUNNING |      | fdf2:82e5:d36b:f591:216:3eff:fe3e:a154 (eth0) | PERSISTENT | 0      |
+-----+-----+-----+-----+-----+-----+
trainer@rackspace-training:~$ █
```

```
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+
trainer@rackspace-training:~$ sudo lxc launch ubuntu:16.04 ubuntu-container
Creating ubuntu-container
Starting ubuntu-container
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+-----+-----+
|      NAME      | STATE | IPV4 |          IPV6          | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
| ubuntu-container | RUNNING |      | fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0) | PERSISTENT | 0      |
+-----+-----+-----+-----+-----+-----+
trainer@rackspace-training:~$ cat /etc/issue
Ubuntu 16.04.3 LTS \n \l

trainer@rackspace-training:~$ █
```

```
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+
trainer@rackspace-training:~$ sudo lxc launch ubuntu:16.04 ubuntu-container
Creating ubuntu-container
Starting ubuntu-container
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+-----+-----+
|      NAME      | STATE | IPV4 |          IPV6          | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
| ubuntu-container | RUNNING |      | fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0) | PERSISTENT | 0      |
+-----+-----+-----+-----+-----+-----+
trainer@rackspace-training:~$ cat /etc/issue
Ubuntu 16.04.3 LTS \n \l

trainer@rackspace-training:~$ sudo lxc launch images:alpine/3.5 alpine-container
Creating alpine-container
Starting alpine-container
trainer@rackspace-training:~$ 
```

```
Creating ubuntu-container
```

```
Starting ubuntu-container
```

```
trainer@rackspace-training:~$ sudo lxc list
```

NAME	STATE	IPV4	IPV6	TYPE	SNAPSHOTS
ubuntu-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0)	PERSISTENT	0

```
trainer@rackspace-training:~$ cat /etc/issue
```

```
Ubuntu 16.04.3 LTS \n \l
```

```
trainer@rackspace-training:~$ sudo lxc launch images:alpine/3.5 alpine-container
```

```
Creating alpine-container
```

```
Starting alpine-container
```

```
trainer@rackspace-training:~$ sudo lxc list
```

NAME	STATE	IPV4	IPV6	TYPE	SNAPS
alpine-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feb6:3bf2 (eth0)	PERSISTENT	0
ubuntu-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0)	PERSISTENT	0

```
trainer@rackspace-training:~$ █
```

```
Starting ubuntu-container
```

```
trainer@rackspace-training:~$ sudo lxc list
```

	NAME	STATE	IPV4	IPV6		TYPE	SNAPSHOTS
	ubuntu-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0)		PERSISTENT	0

```
trainer@rackspace-training:~$ cat /etc/issue
```

```
Ubuntu 16.04.3 LTS \n \l
```

```
trainer@rackspace-training:~$ sudo lxc launch images:alpine/3.5 alpine-container
```

```
Creating alpine-container
```

```
Starting alpine-container
```

```
trainer@rackspace-training:~$ sudo lxc list
```

	NAME	STATE	IPV4	IPV6		TYPE	SNAPS
	HOTS						
	alpine-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feb6:3bf2 (eth0)		PERSISTENT	0
	ubuntu-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0)		PERSISTENT	0

```
trainer@rackspace-training:~$ sudo lxc exec alpine-container -- ash
```

```
~ #
```

NAME	STATE	IPV4	IPV6	TYPE	SNAPSHOTS
ubuntu-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0)	PERSISTENT	0

```
trainer@rackspace-training:~$ cat /etc/issue
Ubuntu 16.04.3 LTS \n \l
```

```
trainer@rackspace-training:~$ sudo lxc launch images:alpine/3.5 alpine-container
```

```
Creating alpine-container
Starting alpine-container
```

```
trainer@rackspace-training:~$ sudo lxc list
```

NAME	STATE	IPV4	IPV6	TYPE	SNAPS
HOTS					
alpine-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feb6:3bf2 (eth0)	PERSISTENT	0
ubuntu-container	RUNNING		fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0)	PERSISTENT	0

```
trainer@rackspace-training:~$ sudo lxc exec alpine-container -- ash
```

```
~ # whoami
root
~ #
```

```
| ubuntu-container | RUNNING |      | fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0) | PERSISTENT | 0      |
+-----+-----+-----+-----+-----+-----+
trainer@rackspace-training:~$ cat /etc/issue
Ubuntu 16.04.3 LTS \n \l

trainer@rackspace-training:~$ sudo lxc launch images:alpine/3.5 alpine-container
Creating alpine-container
Starting alpine-container
trainer@rackspace-training:~$ sudo lxc list
+-----+-----+-----+-----+-----+-----+
|       NAME      | STATE   | IPV4            |          IPV6           |      TYPE     | SNAPS
HOTS  |
+-----+-----+-----+-----+-----+-----+
| alpine-container | RUNNING | 10.49.185.39 (eth0) | fdf2:82e5:d36b:f591:216:3eff:feb6:3bf2 (eth0) | PERSISTENT | 0
|
+-----+-----+-----+-----+-----+-----+
| ubuntu-container | RUNNING |          | fdf2:82e5:d36b:f591:216:3eff:feec:b066 (eth0) | PERSISTENT | 0
|
+-----+-----+-----+-----+-----+-----+
|       |
trainer@rackspace-training:~$ sudo lxc exec alpine-container -- ash
~ # whoami
root
~ # cat /etc/issue
Welcome to Alpine Linux 3.5
Kernel \r on an \m (\l)

~ #
```

Application Containers

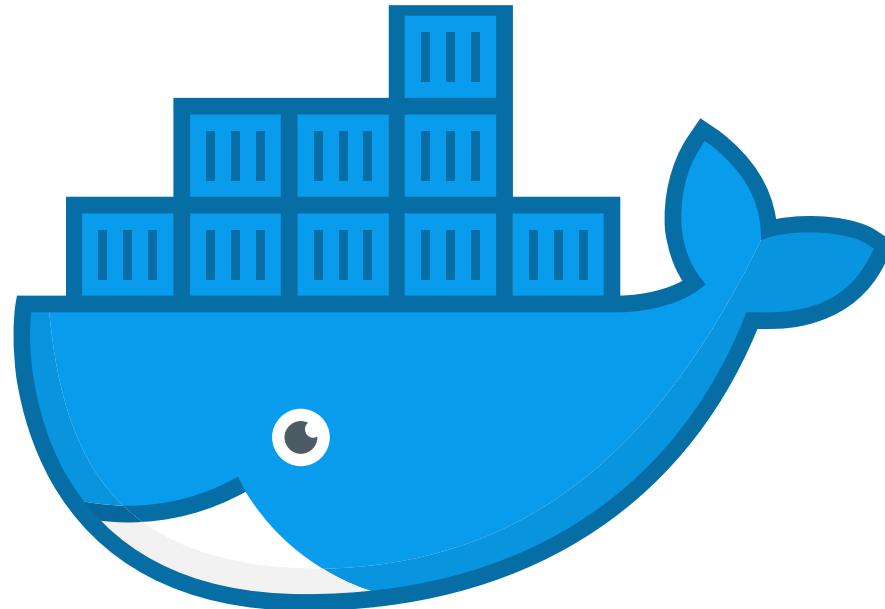
- Process container
- Allows for provisioning of stand alone environment for application or single process.

Container 1
Java

Container2
Apache2

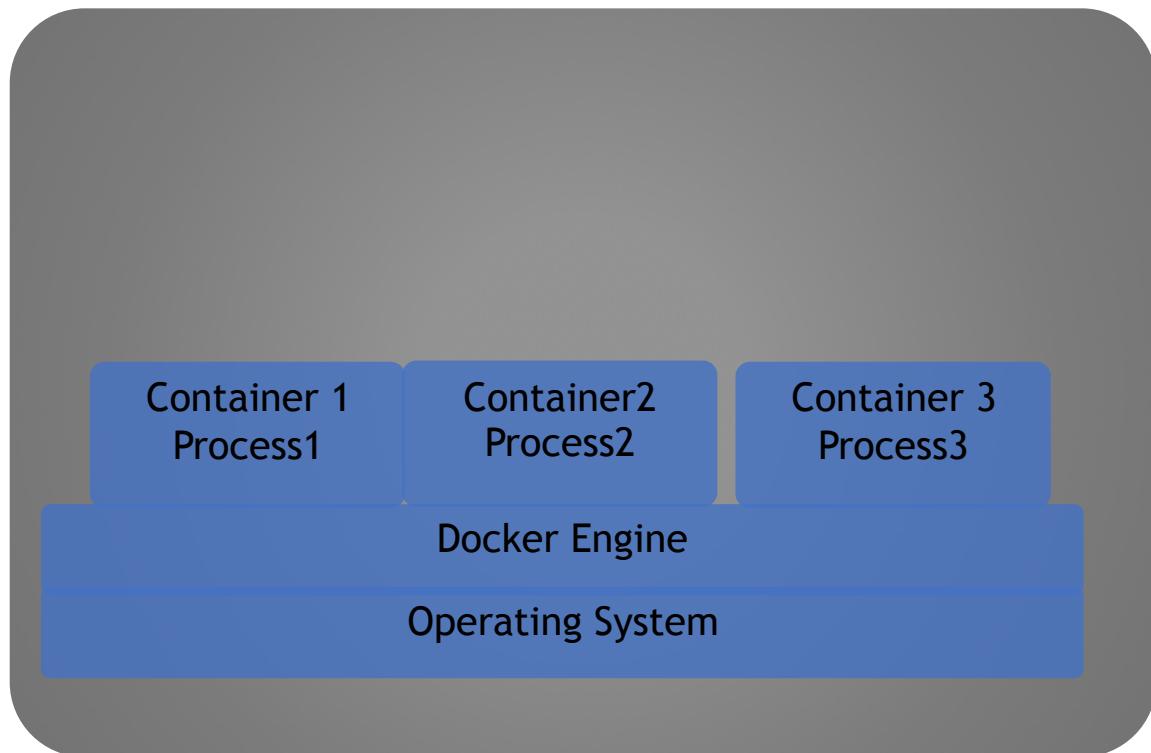
Container 3
MySQL

Operating System

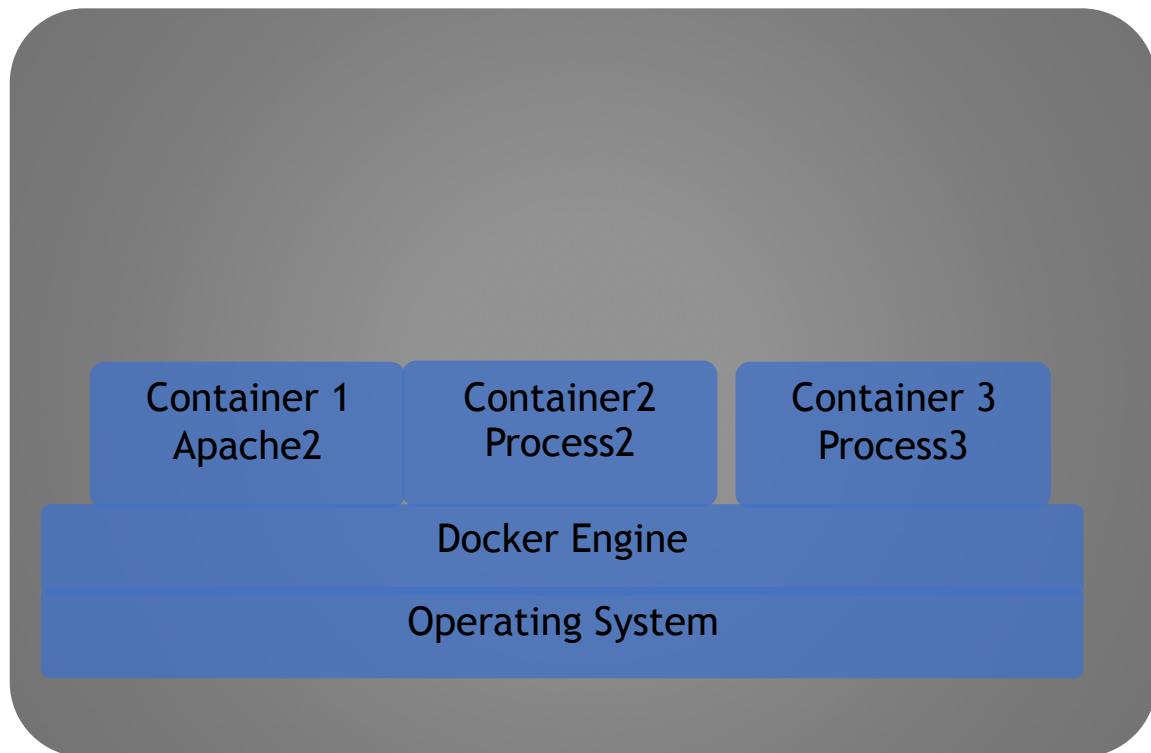


docker

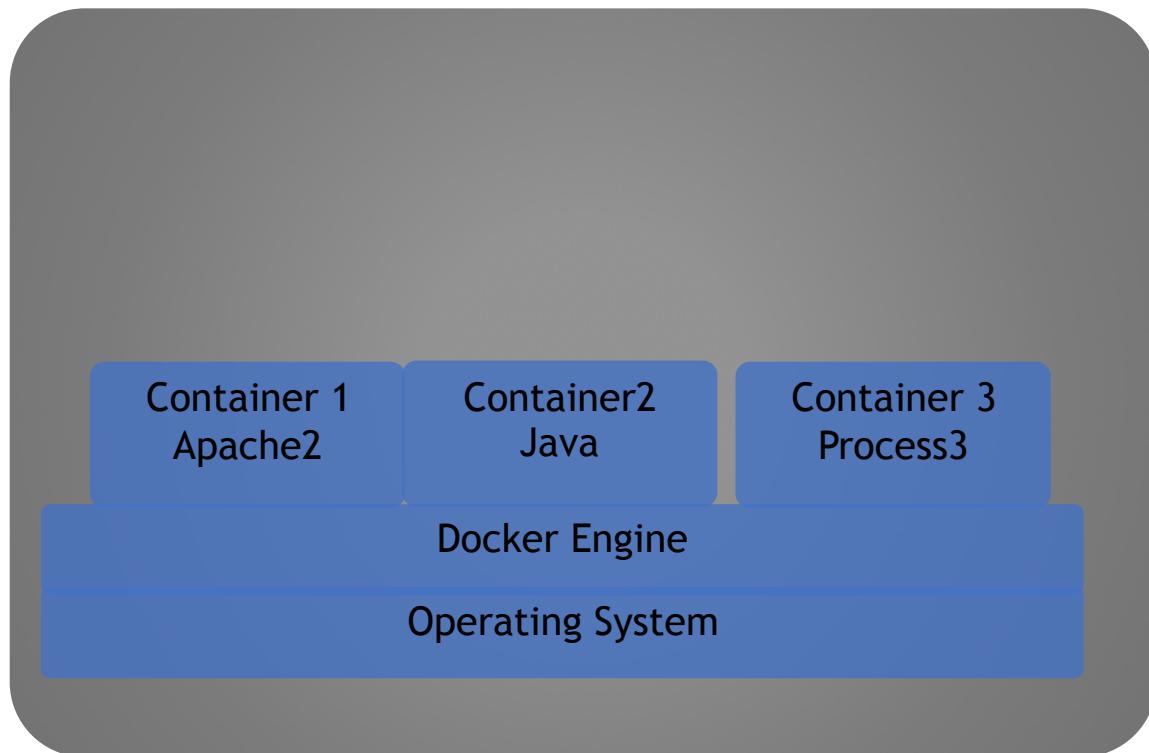
Application Containers



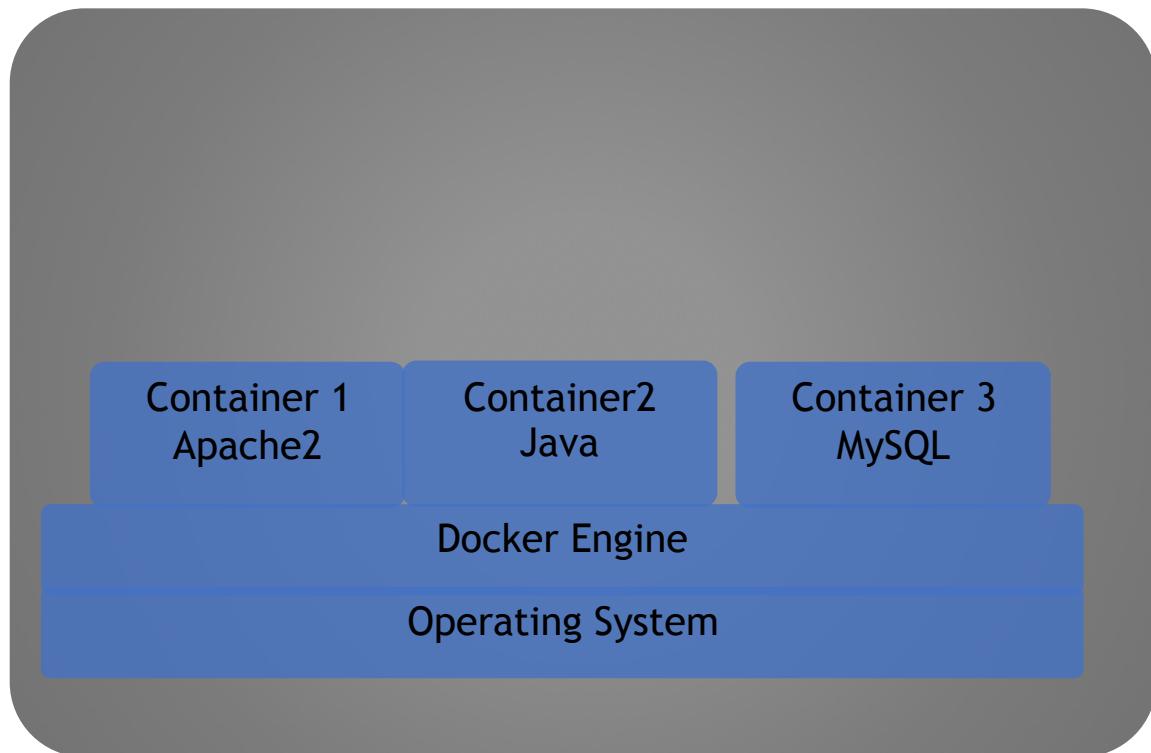
Application Containers



Application Containers



Application Containers



Machine Container

Httpd
MySQL
PHP

Nginx
PostgreSQL

Git
Python

Container 1
Ubuntu

Container 2
Centos

Container 3
Alpine

Operating System :Ubuntu
Linux Kernel

Application Container

Container
1
PHP

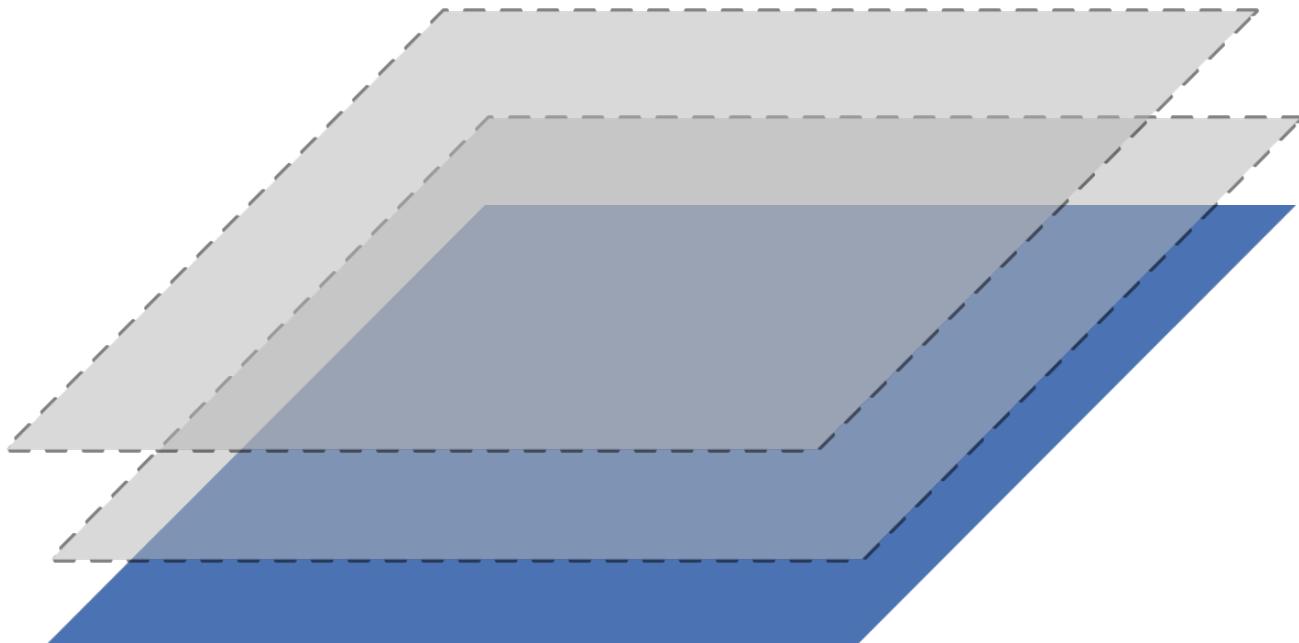
Container2
Apache2

Container
3
MySQL

Docker Engine

Operating System

Docker Image

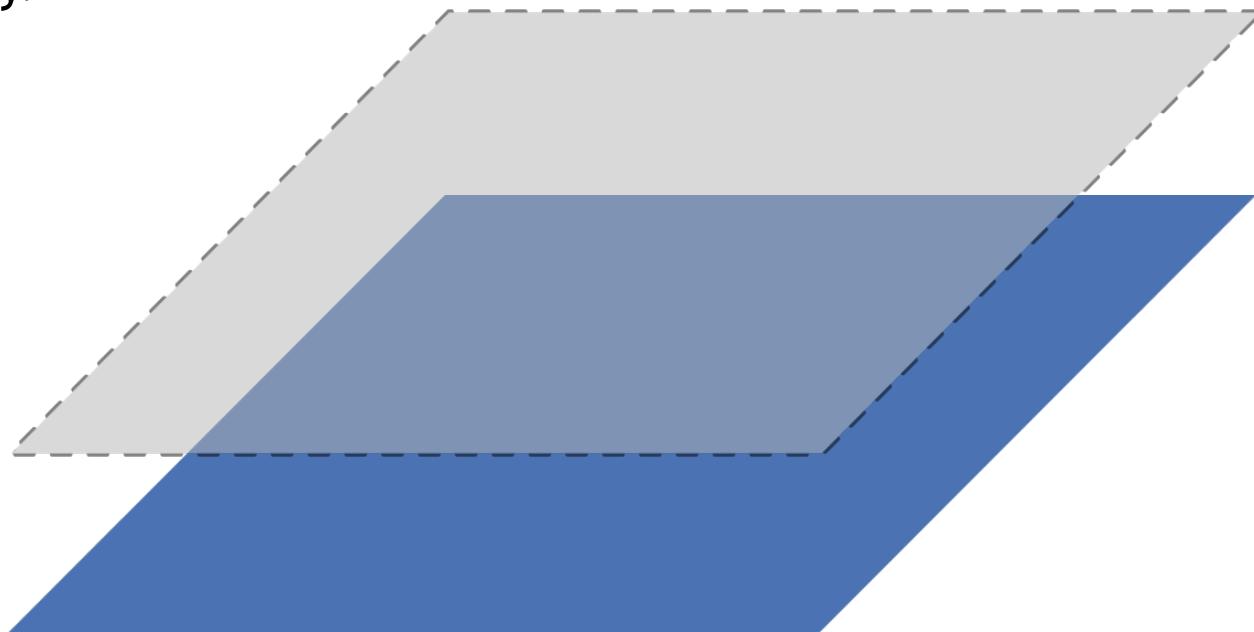


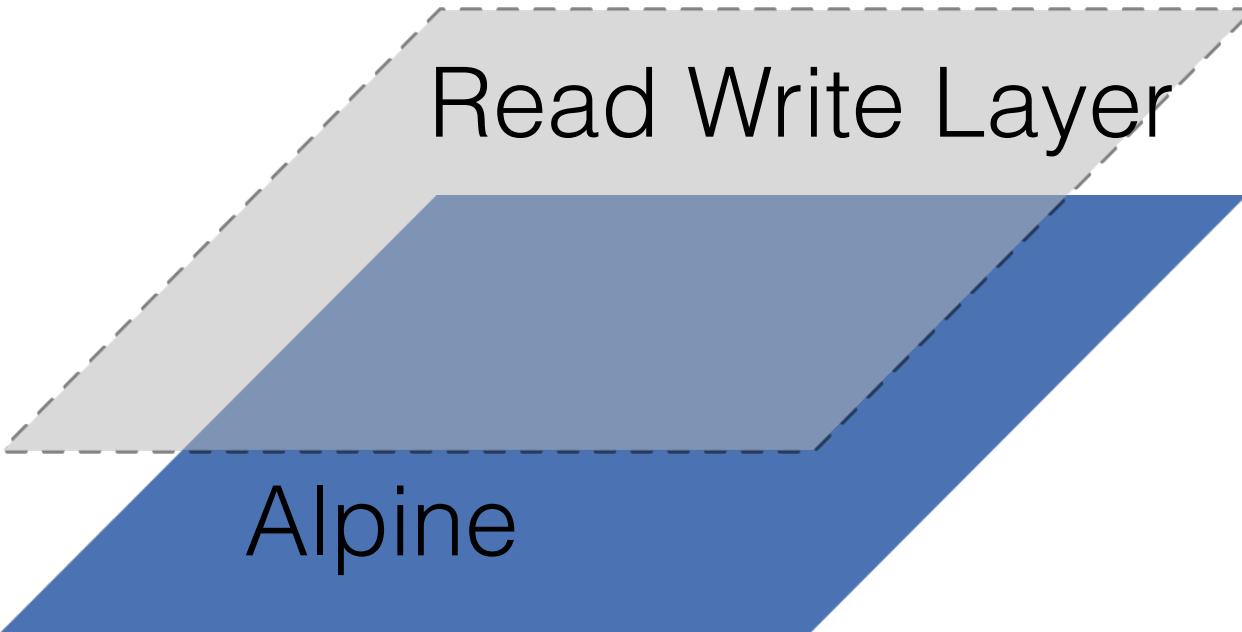
Base Image



Read Write Layer

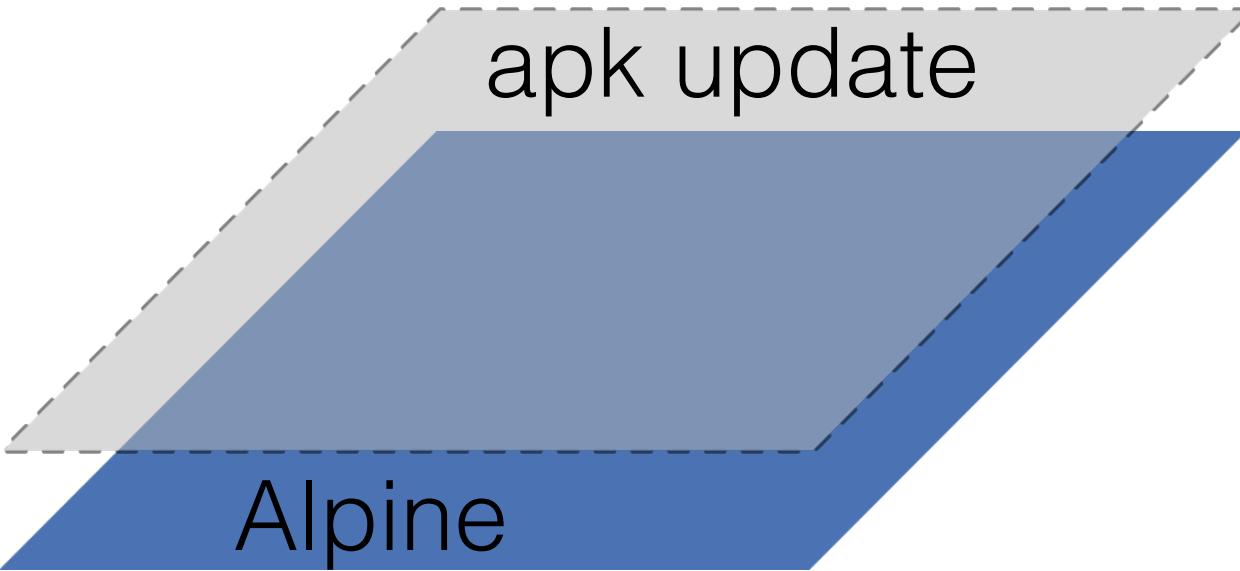
- Makes use of Copy on Write strategy.





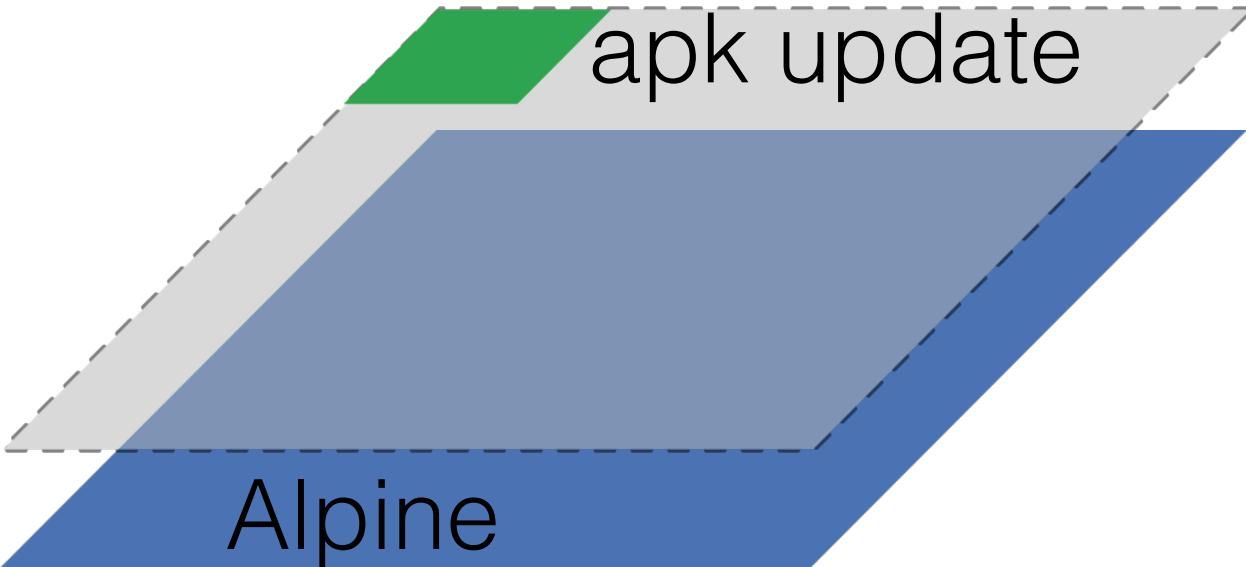
Read Write Layer

Alpine



apk update

Alpine



apk update

Alpine

The Docker Store

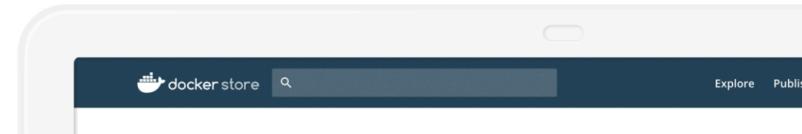
Find Trusted and Enterprise Ready Containers, Plugins, and Docker Editions

  Search for great content (e.g. mysql) Docker EE Docker CE Containers Plugins

GET DOCKER

Get started with Docker

Docker is the world's leading software container platform available for



Docker File

```
From alpine:latest  
Run apk update  
Run apk add htop
```

```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
    --> 3fd9065eaf02
Step 2/3 : RUN apk update
    --> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
    --> 66dbbe8efa76
Removing intermediate container 1eca023ad8b5
Step 3/3 : RUN apk add htop
    --> Running in 68e8164e970e
(1/4) Installing ncurses-terminfo-base (6.0_p20171125-r0)
(2/4) Installing ncurses-terminfo (6.0_p20171125-r0)
(3/4) Installing ncurses-libs (6.0_p20171125-r0)
(4/4) Installing htop (2.0.2-r0)
Executing busybox-1.27.2-r7.trigger
OK: 12 MiB in 15 packages
    --> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$ █
```

```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
    --> 3fd9065eaf02
Step 2/3 : RUN apk update
    --> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
    --> 66dbbe8efa76
Removing intermediate container 1eca023ad8b5
Step 3/3 : RUN apk add htop
    --> Running in 68e8164e970e
(1/4) Installing ncurses-terminfo-base (6.0_p20171125-r0)
(2/4) Installing ncurses-terminfo (6.0_p20171125-r0)
(3/4) Installing ncurses-libs (6.0_p20171125-r0)
(4/4) Installing htop (2.0.2-r0)
Executing busybox-1.27.2-r7.trigger
OK: 12 MiB in 15 packages
    --> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$
```

```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
--> 3fd9065eaf02
Step 2/3 : RUN apk update
--> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
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Removing intermediate container 1eca023ad8b5
Step 3/3 : RUN apk add htop
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(1/4) Installing ncurses-terminfo-base (6.0_p20171125-r0)
(2/4) Installing ncurses-terminfo (6.0_p20171125-r0)
(3/4) Installing ncurses-libs (6.0_p20171125-r0)
(4/4) Installing htop (2.0.2-r0)
Executing busybox-1.27.2-r7.trigger
OK: 12 MiB in 15 packages
--> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$
```

```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
--> 3fd9065eaf02
Step 2/3 : RUN apk update
--> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
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Removing intermediate container 1eca023ad8b5
Step 3/3 : RUN apk add htop
--> Running in 68e8164e970e
(1/4) Installing ncurses-terminfo-base (6.0_p20171125-r0)
(2/4) Installing ncurses-terminfo (6.0_p20171125-r0)
(3/4) Installing ncurses-libs (6.0_p20171125-r0)
(4/4) Installing htop (2.0.2-r0)
Executing busybox-1.27.2-r7.trigger
OK: 12 MiB in 15 packages
--> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$ █
```

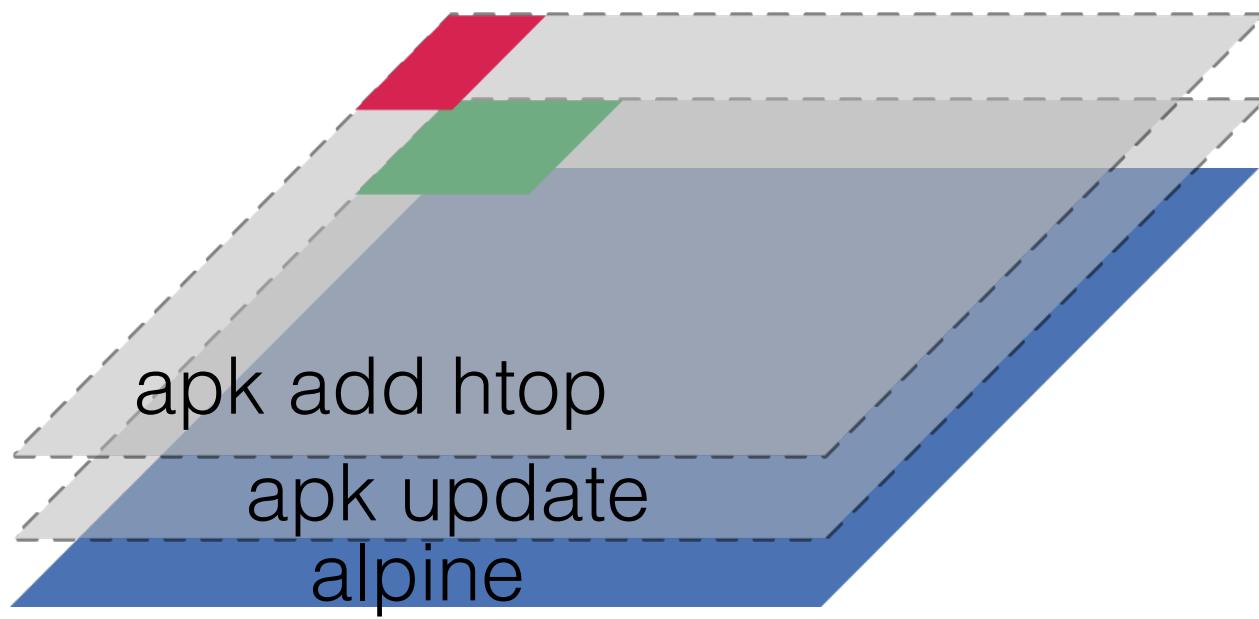
```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
    --> 3fd9065eaf02
Step 2/3 : RUN apk update
    --> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
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Executing busybox-1.27.2-r7.trigger
OK: 12 MiB in 15 packages
    --> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$
```

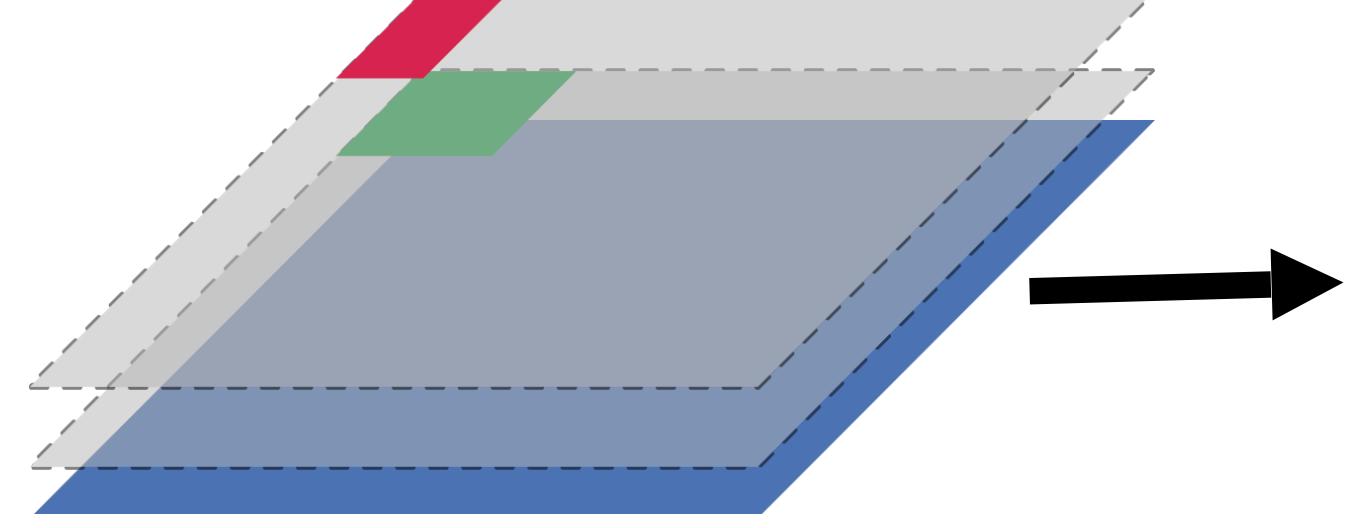
```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
--> 3fd9065eaf02
Step 2/3 : RUN apk update
--> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
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Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$ █
```

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trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
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v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
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    --> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace:~$
```

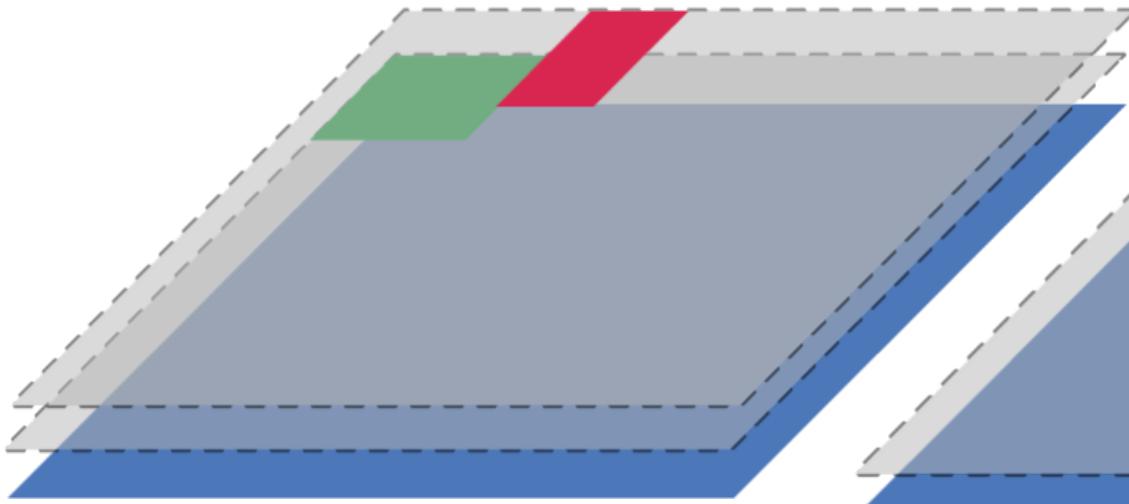
```
trainer@rackspace:~$ sudo docker build .
Sending build context to Docker daemon 22.02 kB
Step 1/3 : FROM alpine:latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
Status: Downloaded newer image for alpine:latest
    --> 3fd9065eaf02
Step 2/3 : RUN apk update
    --> Running in 1eca023ad8b5
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
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```

```
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ff3a5c916c92: Pull complete
Digest: sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c0
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v3.7.0-63-g2bfbc724f [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.0-66-g3a4ccadc0d [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9045 distinct packages available
--> 66dbbe8efa76
Removing intermediate container 1eca023ad8b5
Step 3/3 : RUN apk add htop
--> Running in 68e8164e970e
(1/4) Installing ncurses-terminfo-base (6.0_p20171125-r0)
(2/4) Installing ncurses-terminfo (6.0_p20171125-r0)
(3/4) Installing ncurses-libs (6.0_p20171125-r0)
(4/4) Installing htop (2.0.2-r0)
Executing busybox-1.27.2-r7.trigger
OK: 12 MiB in 15 packages
--> d91489a54832
Removing intermediate container 68e8164e970e
Successfully built d91489a54832
trainer@rackspace-training:~$ sudo docker images
REPOSITORY          TAG           IMAGE ID            CREATED             SIZE
<none>              <none>        d91489a54832      18 minutes ago     8.09 MB
alpine               latest        3fd9065eaf02      4 weeks ago       4.15 MB
trainer@rackspace-training:~$ █
```

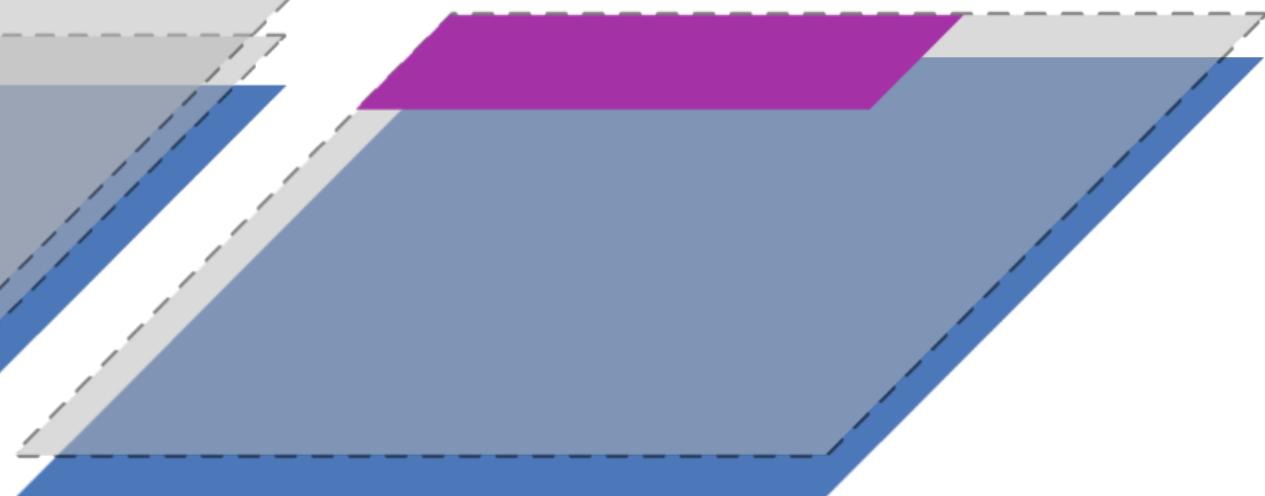




**Run apk update
Run apk add htop**



**Run apk update && apk add htop &&
apk add bash**



```
trainer@rackspace:~$ sudo docker images
REPOSITORY      TAG          IMAGE ID      CREATED       SIZE
alpine          bash         24565039698a  4 days ago   9.66 MB
<none>          <none>       d91489a54832  4 days ago   8.09 MB
alpine          latest        3fd9065eaf02  4 weeks ago  4.15 MB
trainer@rackspace:~$
```

```
trainer@rackspace:~$ sudo docker images
REPOSITORY          TAG        IMAGE ID      CREATED       SIZE
alpine              bash        24565039698a  4 days ago   9.66 MB
<none>              <none>     d91489a54832  4 days ago   8.09 MB
alpine              latest      3fd9065eaf02  4 weeks ago  4.15 MB
trainer@rackspace:~$ sudo docker run □
```

```
trainer@rackspace:~$ sudo docker images
REPOSITORY      TAG          IMAGE ID      CREATED       SIZE
alpine          bash         24565039698a  4 days ago   9.66 MB
<none>          <none>       d91489a54832  4 days ago   8.09 MB
alpine          latest        3fd9065eaf02  4 weeks ago  4.15 MB
trainer@rackspace:~$ sudo docker run docker/whalesay
```

```
trainer@rackspace:~$ sudo docker images
REPOSITORY      TAG          IMAGE ID      CREATED       SIZE
alpine          bash         24565039698a  4 days ago   9.66 MB
<none>          <none>       d91489a54832  4 days ago   8.09 MB
alpine          latest        3fd9065eaf02  4 weeks ago  4.15 MB
trainer@rackspace:~$ sudo docker run docker/whalesay cowsay "Hello World!"
```

```
trainer@rackspace:~$ sudo docker images
REPOSITORY          TAG        IMAGE ID      CREATED       SIZE
alpine              bash        24565039698a    4 days ago   9.66 MB
<none>              <none>     d91489a54832    4 days ago   8.09 MB
alpine              latest      3fd9065eaf02    4 weeks ago  4.15 MB
trainer@rackspace:~$ sudo docker run docker/whalesay cowsay "Hello World!"
Unable to find image 'docker/whalesay:latest' locally
latest: Pulling from docker/whalesay
e190868d63f8: Pull complete
909cd34c6fd7: Pull complete
0b9bfabab7c1: Pull complete
a3ed95caeb02: Pull complete
00bf65475aba: Pull complete
c57b6bcc83e3: Pull complete
8978f6879e2f: Pull complete
8eed3712d2cf: Pull complete
Digest: sha256:178598e51a26abbc958b8a2e48825c90bc22e641de3d31e18aaf55f3258ba93b
Status: Downloaded newer image for docker/whalesay:latest
```

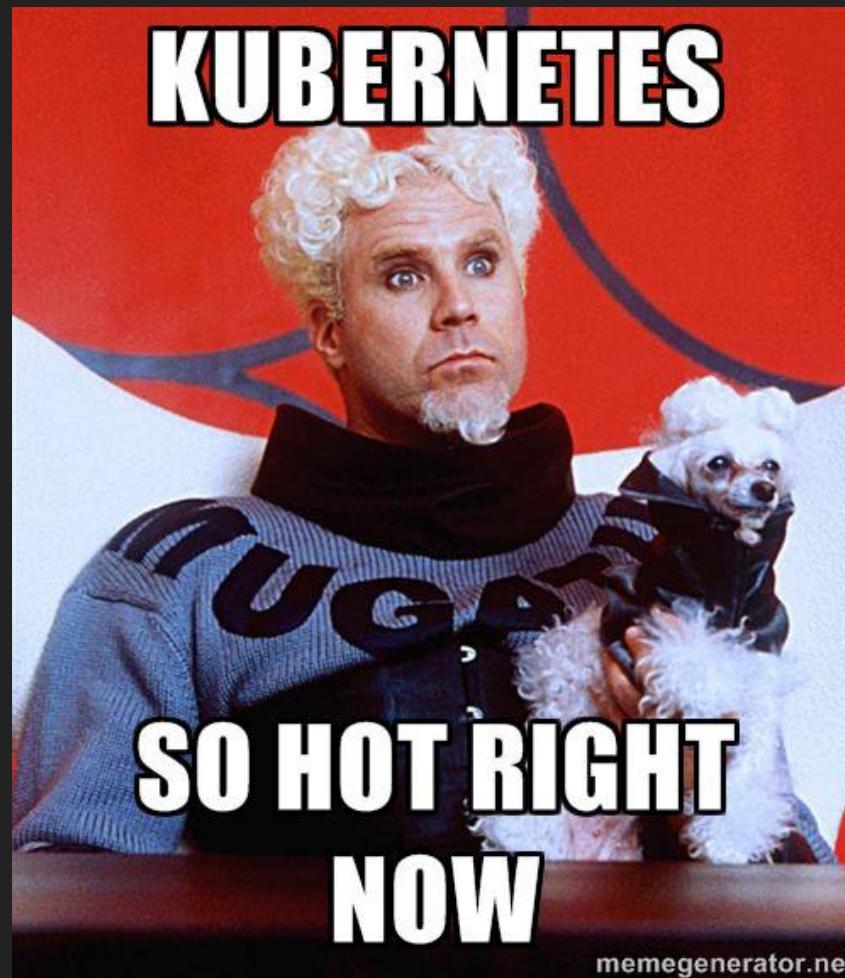
```
<none>          <none>          d91489a54832        4 days ago      8.09 MB
alpine          latest           3fd9065eaf02        4 weeks ago     4.15 MB
trainer@rackspace:~$ sudo docker run docker/whalesay cowsay "Hello World!"
Unable to find image 'docker/whalesay:latest' locally
latest: Pulling from docker/whalesay
e190868d63f8: Pull complete
909cd34c6fd7: Pull complete
0b9bfabab7c1: Pull complete
a3ed95caeb02: Pull complete
00bf65475aba: Pull complete
c57b6bcc83e3: Pull complete
8978f6879e2f: Pull complete
8eed3712d2cf: Pull complete
Digest: sha256:178598e51a26abbc958b8a2e48825c90bc22e641de3d31e18aaf55f3258ba93b
Status: Downloaded newer image for docker/whalesay:latest
```

```
-----  
< Hello World! >
```



```
trainer@rackspace:~$ █
```

Why do I need Kubernetes?



Application



Application



Questions?



@ell_o_punk

This slide is where we ended due to time. If we have enough interest, I can present the k8s 101 portion but have chosen to include it here so that anyone who wants to can review the command line portions.

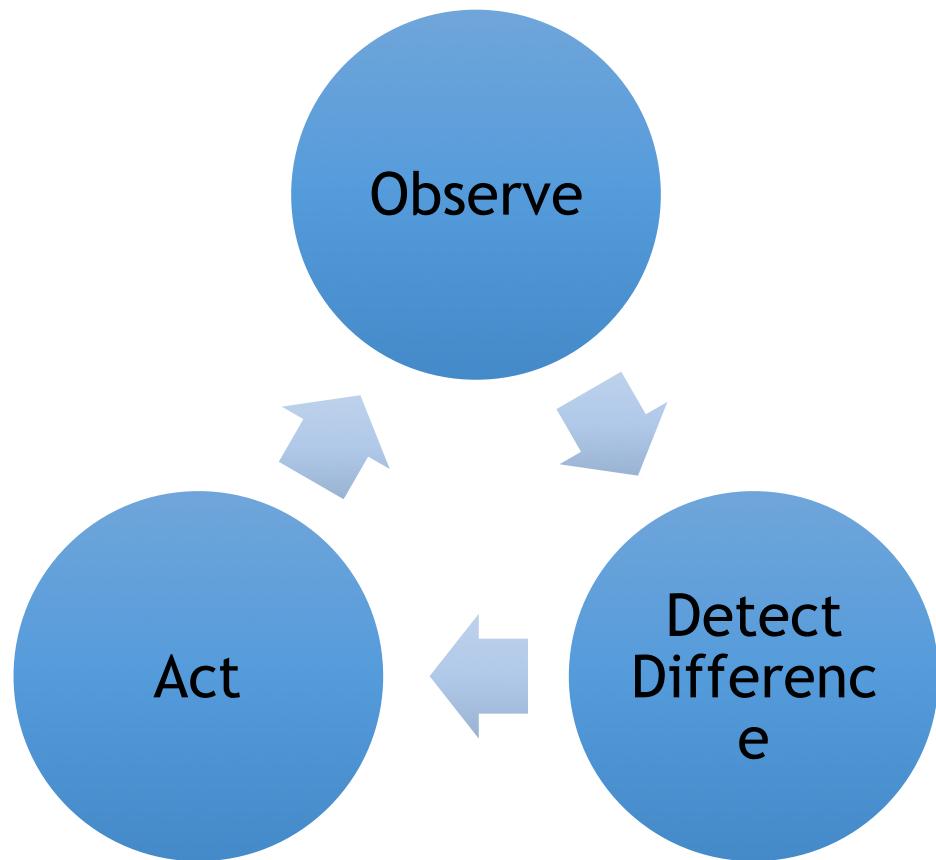
Application



Application

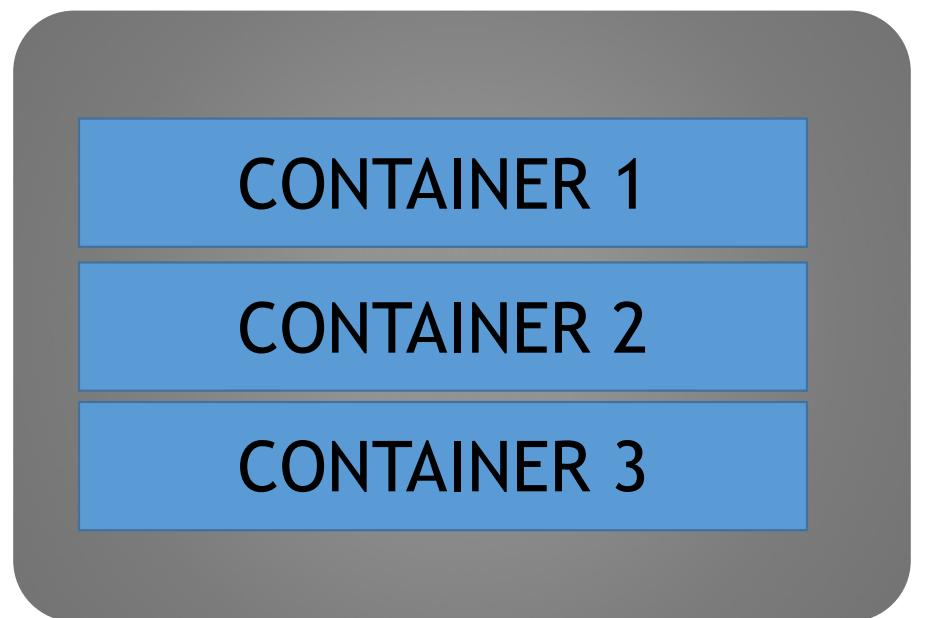


Desired State vs Observed State



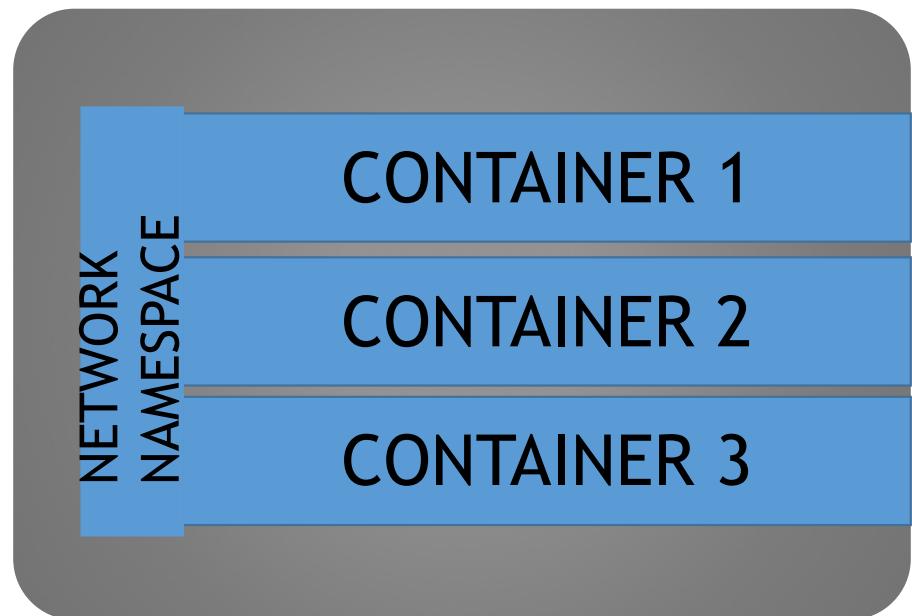
Pods

- Base unit of deployment
- Groups or Single container running under a single service.



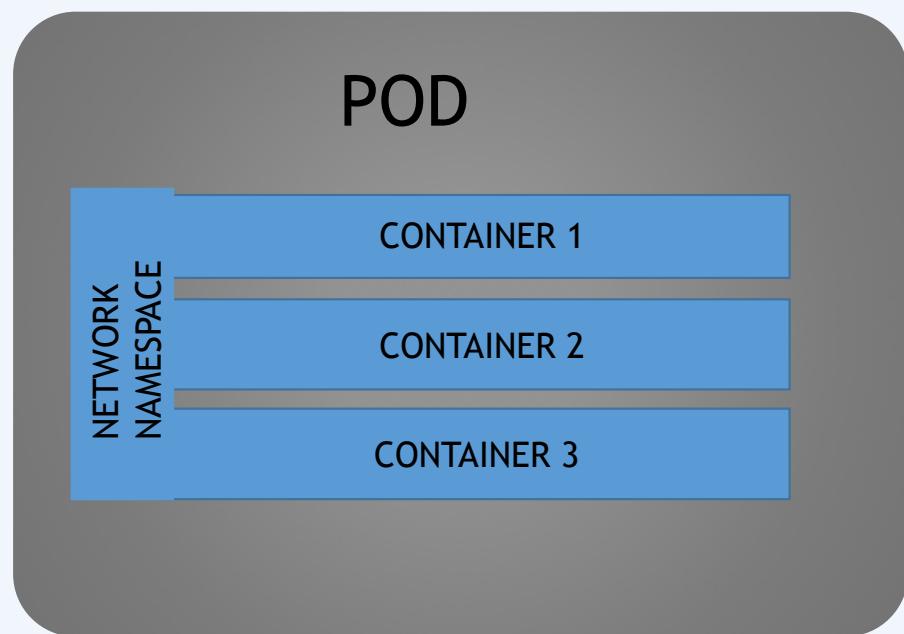
Pods

- Shared IP
- Local host communication
- Shared Namespaces
- Base unit of replication



- Physical or virtual machine
- Previously minion node
- Work in a cluster
- Little user interaction

Worker Node



- Collection of process running on a single node.
- Only one master but you can have followers.
- Master takes commands from administrator and schedules tasks.

Master Node

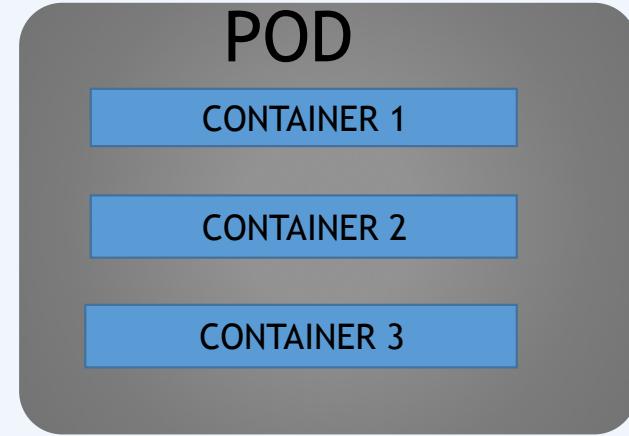


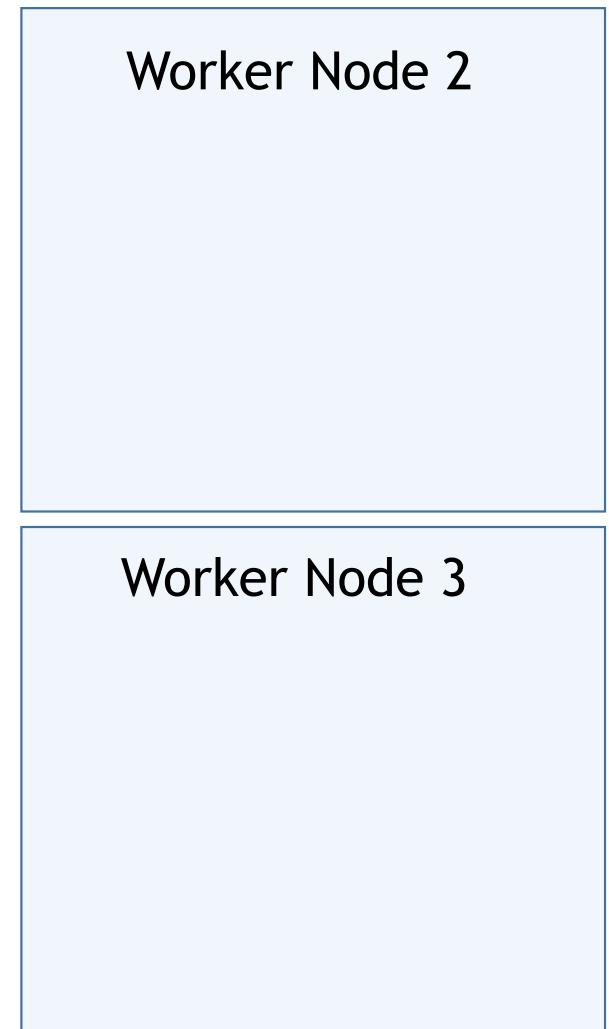
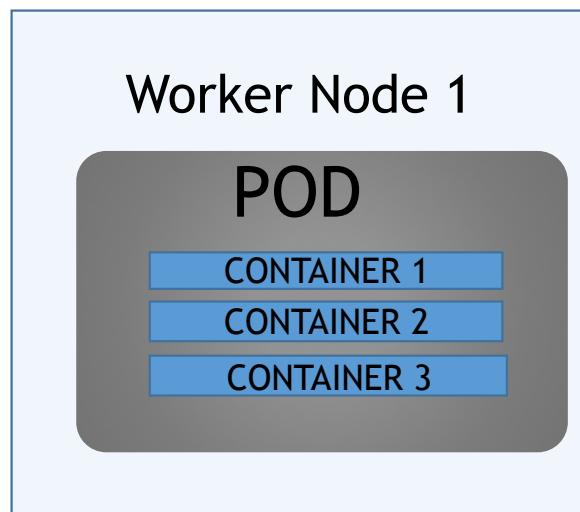
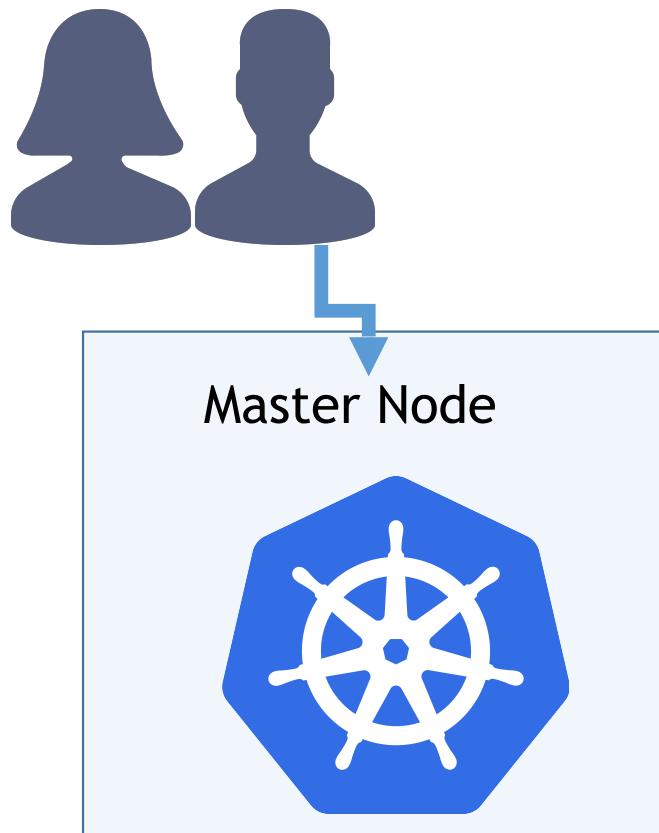
Let's pull it all together.

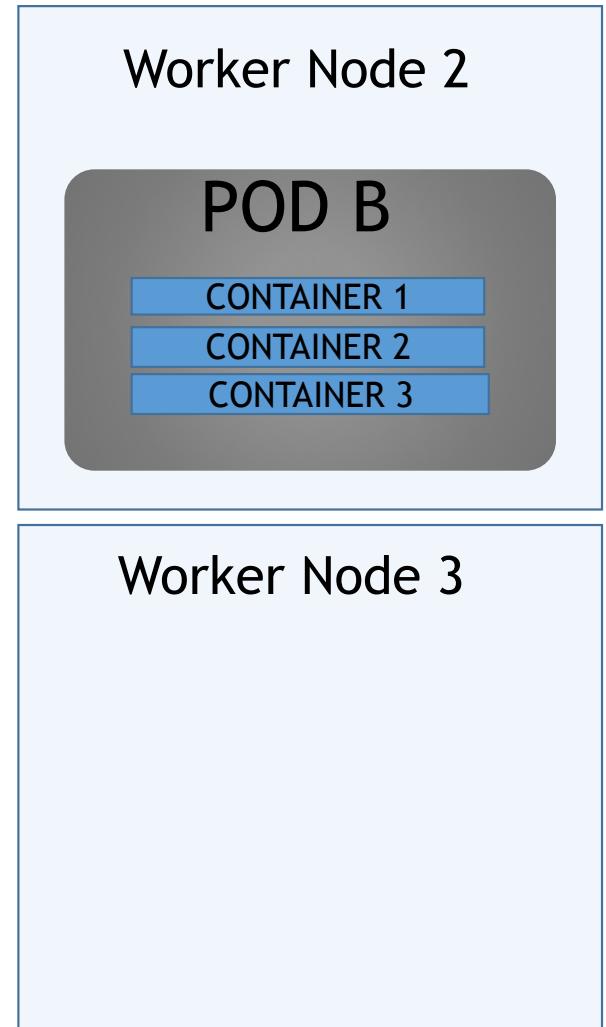
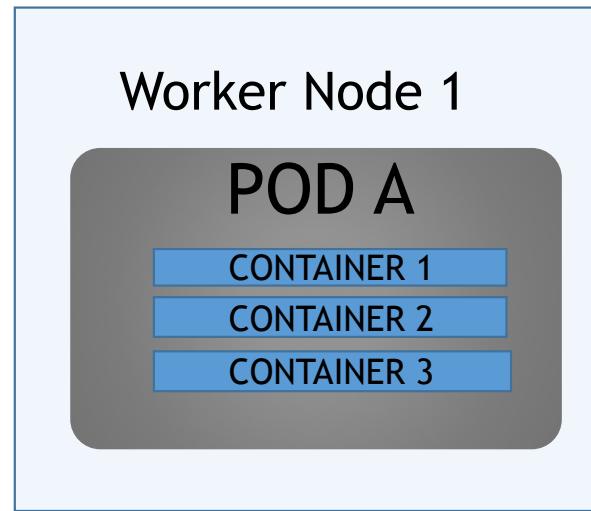
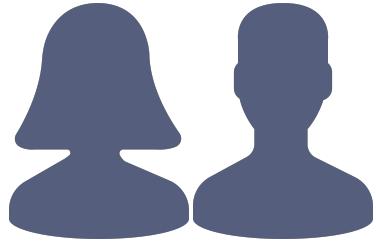
Master Node

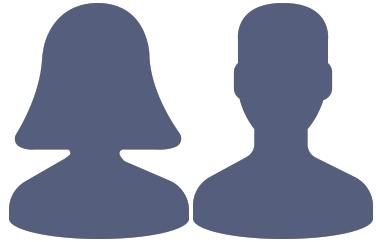


Worker Node









Master Node



Worker Node 1

POD A

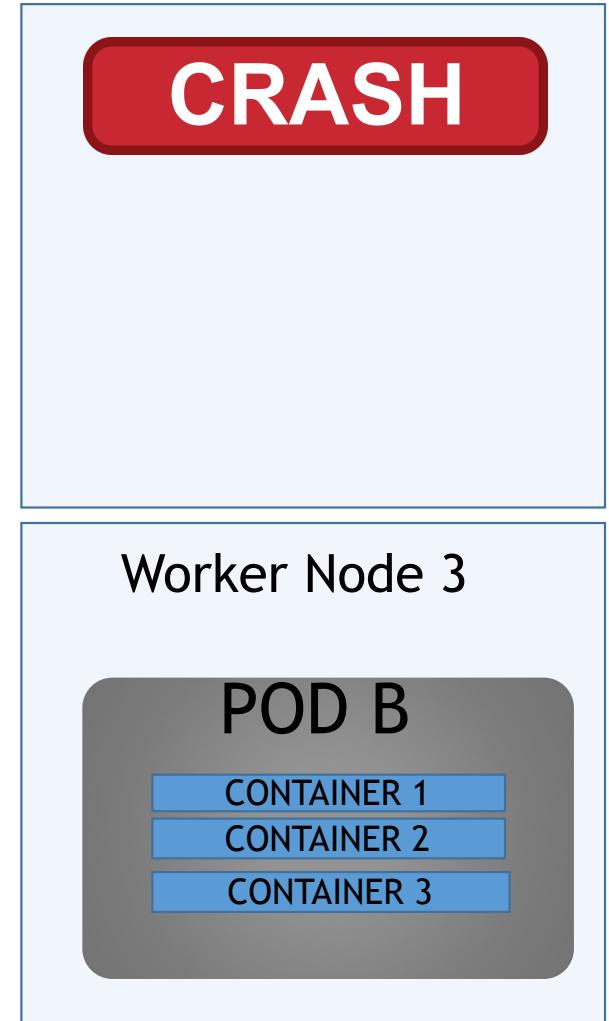
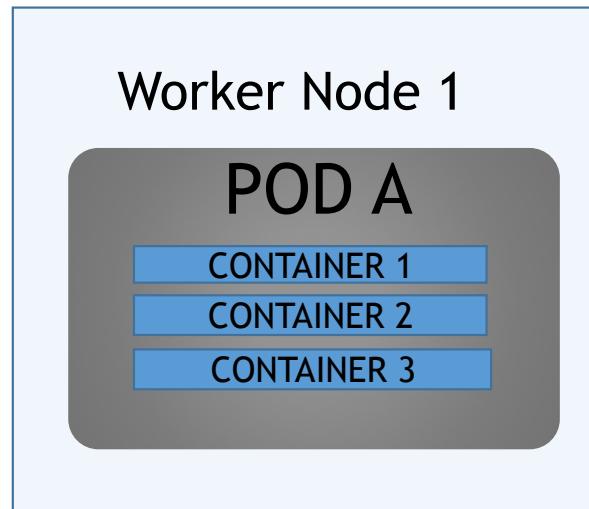
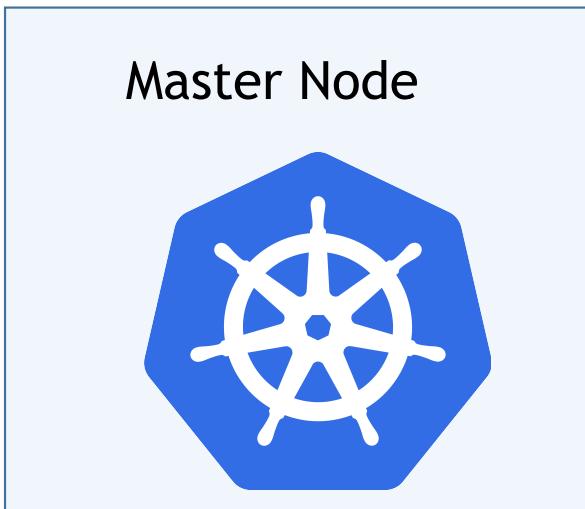
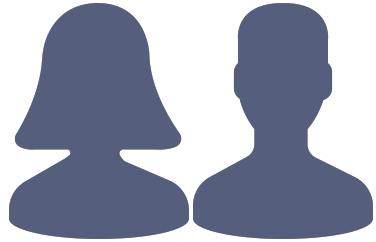
CONTAINER 1
CONTAINER 2
CONTAINER 3

CRASH

POD B

CONTAINER 1
CONTAINER 2
CONTAINER 3

Worker Node 3



```
[root@master ~]#
```

```
[root@master ~]# kubectl
```

```
[root@master ~]# kubectl get nodes
```

NAME	STATUS	AGE
worker1	Ready	2d
worker2	Ready	2d
worker3	Ready	2d

```
[root@master ~]# █
```

```
[root@master ~]# kubectl get nodes
```

NAME	STATUS	AGE
worker1	Ready	2d
worker2	Ready	2d
worker3	Ready	2d

```
[root@master ~]# kubectl get pods
```

No resources found.

```
[root@master ~]# █
```

```
[root@master ~]# kubectl get nodes
```

NAME	STATUS	AGE
worker1	Ready	2d
worker2	Ready	2d
worker3	Ready	2d

```
[root@master ~]# kubectl get pods
```

No resources found.

```
[root@master ~]# kubectl get ns
```

NAME	STATUS	AGE
default	Active	3d
kube-system	Active	3d
practice	Active	37m

```
[root@master ~]# 
```

```
[root@master ~]# kubectl get nodes
NAME      STATUS    AGE
worker1   Ready     2d
worker2   Ready     2d
worker3   Ready     2d
[root@master ~]# kubectl get pods
No resources found.
[root@master ~]# kubectl get ns
NAME      STATUS    AGE
default   Active    3d
kube-system   Active    3d
practice   Active    37m
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
practice   busybox   1/1      Running   0          23m
[root@master ~]# █
```

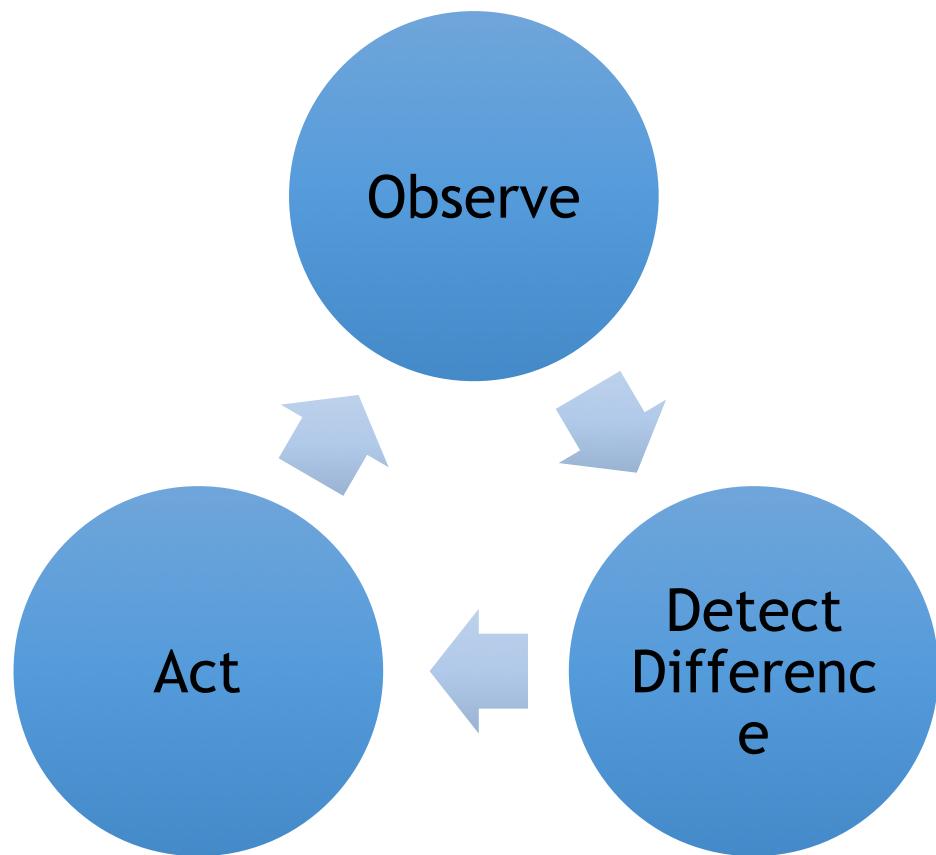
```
[root@master ~]# kubectl get nodes
NAME      STATUS    AGE
worker1   Ready     2d
worker2   Ready     2d
worker3   Ready     2d
[root@master ~]# kubectl get pods
No resources found.
[root@master ~]# kubectl get ns
NAME      STATUS    AGE
default   Active    3d
kube-system   Active    3d
practice   Active    37m
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
practice   busybox   1/1      Running   0          23m
[root@master ~]# kubectl run webapp --image=nginx --port=80
deployment "webapp" created
[root@master ~]#
```

```
[root@master ~]# kubectl get nodes
NAME      STATUS    AGE
worker1   Ready     2d
worker2   Ready     2d
worker3   Ready     2d
[root@master ~]# kubectl get pods
No resources found.
[root@master ~]# kubectl get ns
NAME      STATUS    AGE
default   Active    3d
kube-system   Active    3d
practice   Active    37m
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
practice   busybox   1/1      Running   0          23m
[root@master ~]# kubectl run webapp --image=nginx --port=80
deployment "webapp" created
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
default    webapp-856210044-sgk6q  1/1      Running   0          1m
practice   busybox   1/1      Running   0          27m
[root@master ~]# █
```

```
[root@master ~]# kubectl get nodes
NAME      STATUS    AGE
worker1   Ready     2d
worker2   Ready     2d
worker3   Ready     2d
[root@master ~]# kubectl get pods
No resources found.
[root@master ~]# kubectl get ns
NAME      STATUS    AGE
default   Active    3d
kube-system   Active    3d
practice   Active    37m
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
practice   busybox   1/1      Running   0          23m
[root@master ~]# kubectl run webapp --image=nginx --port=80
deployment "webapp" created
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
default   webapp-856210044-sgk6q  1/1      Running   0          1m
practice   busybox   1/1      Running   0          27m
[root@master ~]# kubectl delete pod webapp-856210044-sgk6q
pod "webapp-856210044-sgk6q" deleted
[root@master ~]# █
```

```
[root@master ~]# kubectl get nodes
NAME      STATUS    AGE
worker1   Ready     2d
worker2   Ready     2d
worker3   Ready     2d
[root@master ~]# kubectl get pods
No resources found.
[root@master ~]# kubectl get ns
NAME      STATUS    AGE
default   Active    3d
kube-system   Active    3d
practice   Active    37m
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
practice   busybox   1/1     Running   0          23m
[root@master ~]# kubectl run webapp --image=nginx --port=80
deployment "webapp" created
[root@master ~]# kubectl get pods --all-namespaces
NAMESPACE  NAME      READY    STATUS    RESTARTS   AGE
default    webapp-856210044-sgk6q  1/1     Running   0          1m
practice   busybox   1/1     Running   0          27m
[root@master ~]# kubectl delete pod webapp-856210044-sgk6q
pod "webapp-856210044-sgk6q" deleted
[root@master ~]# kubectl get pods
NAME      READY    STATUS    RESTARTS   AGE
webapp-856210044-jhqcd  1/1     Running   0          3m
[root@master ~]# █
```

Desired State vs Observed State



Summery