Containers

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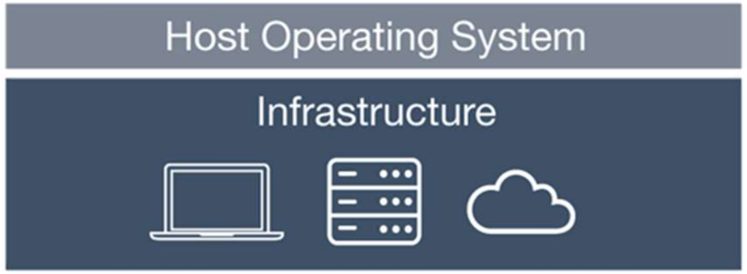
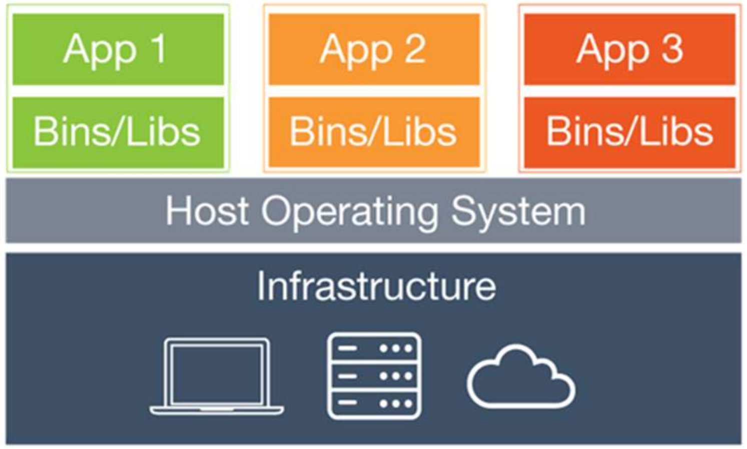
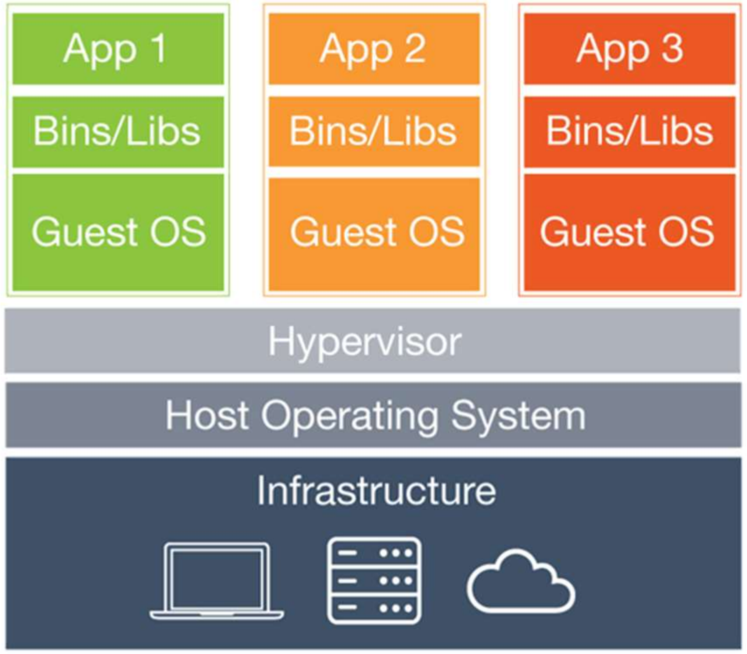
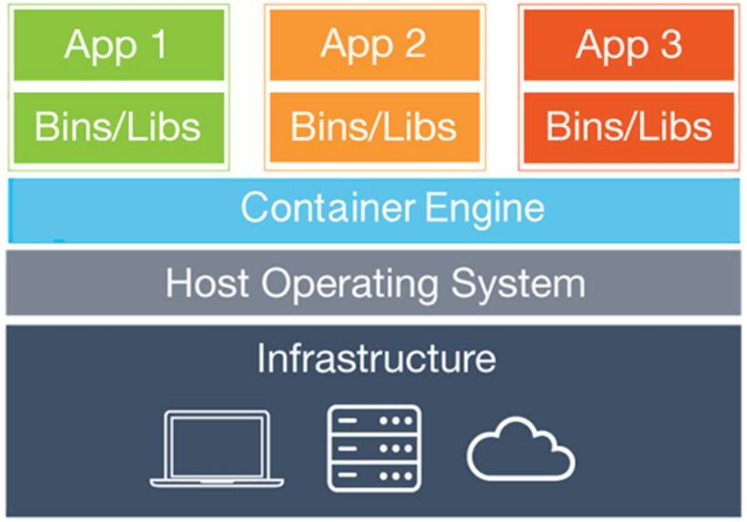
İçerik

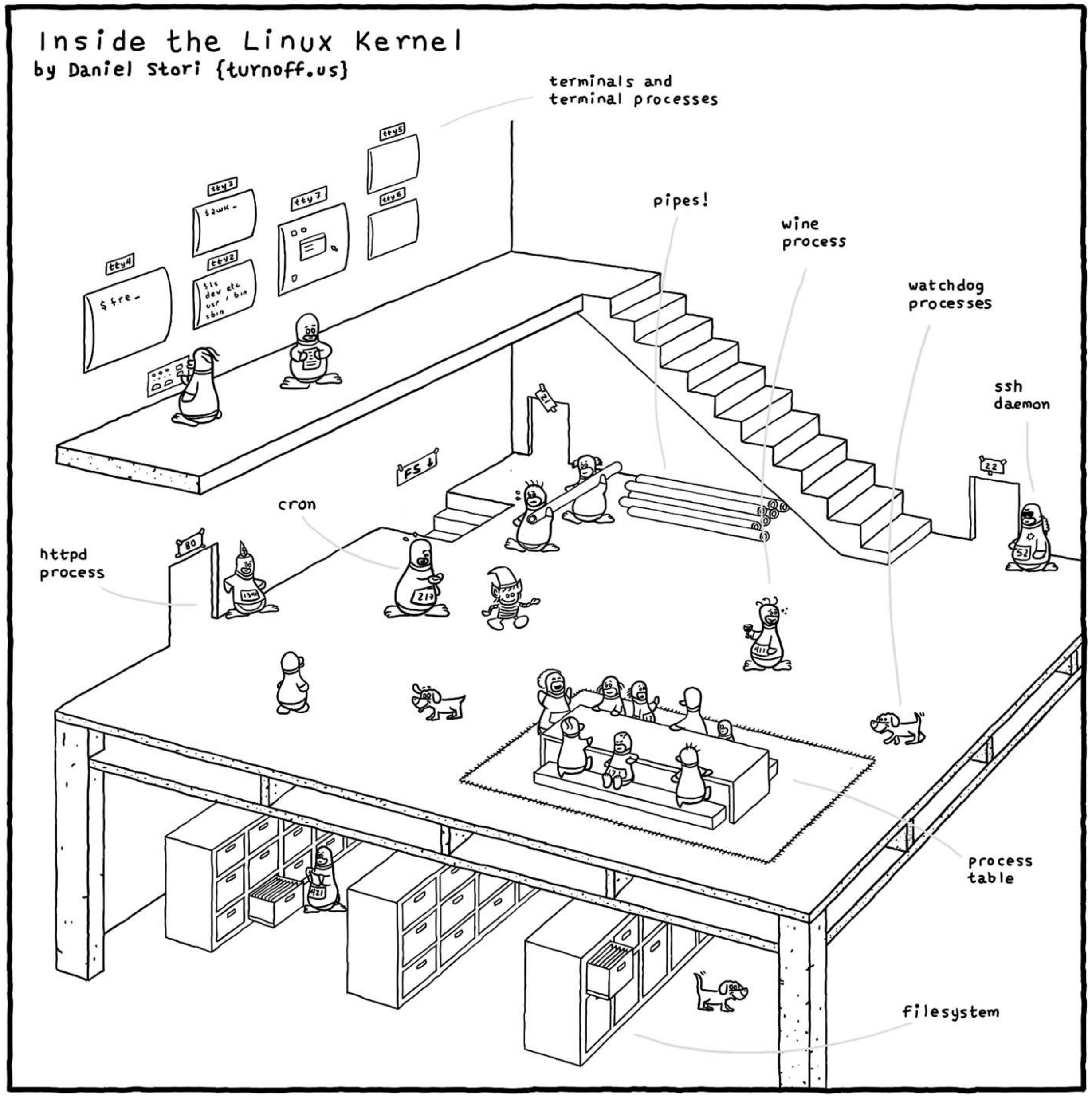
Container


Host Operating System
Infrastructure


App 1
Bins/Libs
App 2
Bins/Libs
App 3
Bins/Libs
Host Operating System
Infrastructure


App 1
Bins/Libs
Guest OS
App 2
Bins/Libs
Guest OS
App 3
Bins/Libs
Guest OS
Hypervisor
Host Operating System
Infrastructure


App 1
Bins/Libs
App 2
Bins/Libs
App 3
Bins/Libs
Container Engine
Host Operating System
Infrastructure


Inside the Linux Kernel
by Daniel Stori {turnoff.us}
terminals and
terminal processes
tty5
tty3
tty7
tty6
tty4
tty2
$awk_
$ fre_
$ls
dev etc
usr / bin
sbin
pipes!
wine
process
watchdog
processes
ssh
daemon
22
FS
80
cron
httpd
process
process
table
filesystem

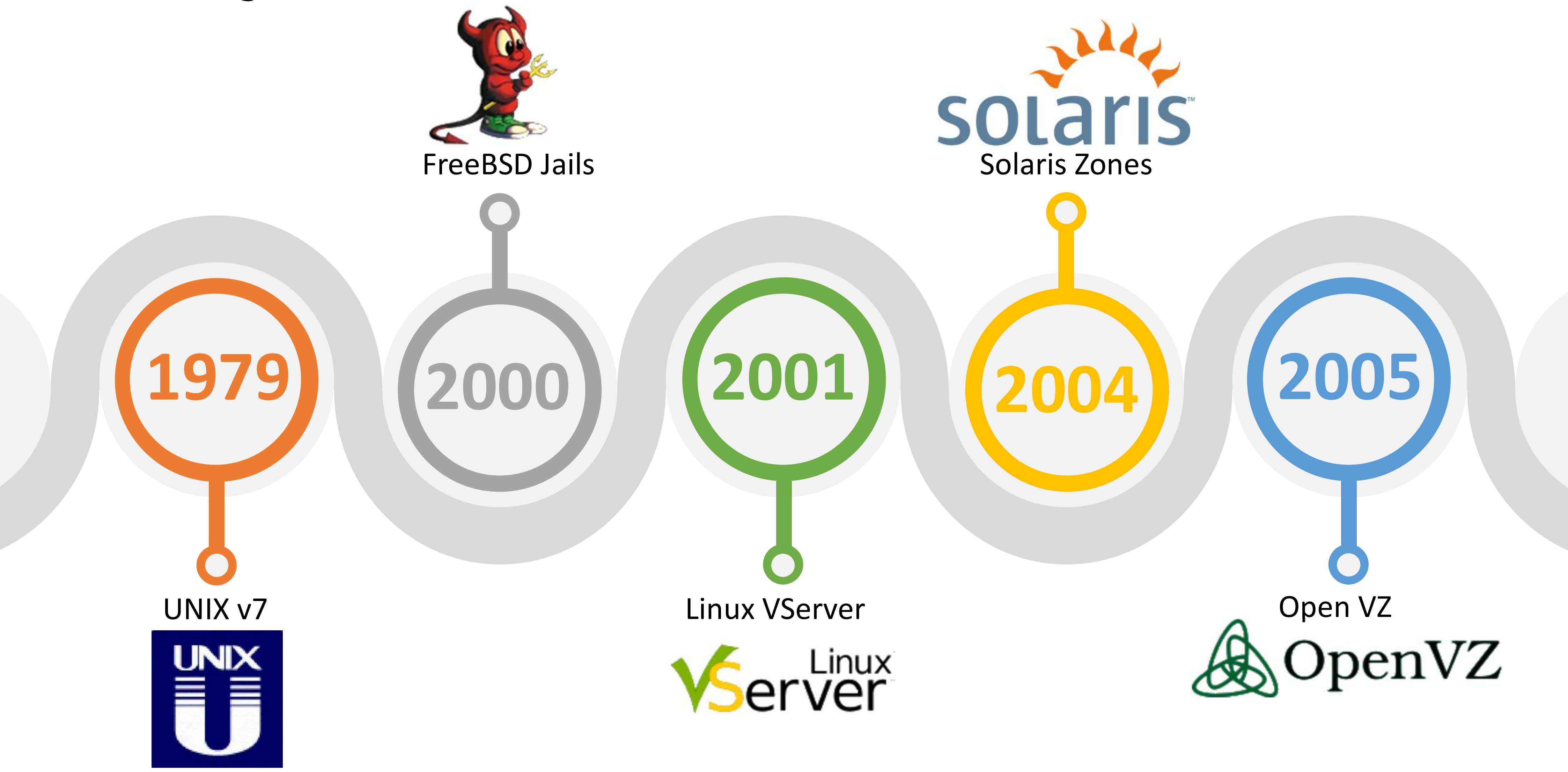
Avantajları

- Düşük donanım ihtiyacı
- Ortam izalasyonu
- Hızlı kurulum
- Çoklu ortam kurulumu
- Tekrar kullanılabilirlik
- Hızlı mikroservis geliştirme

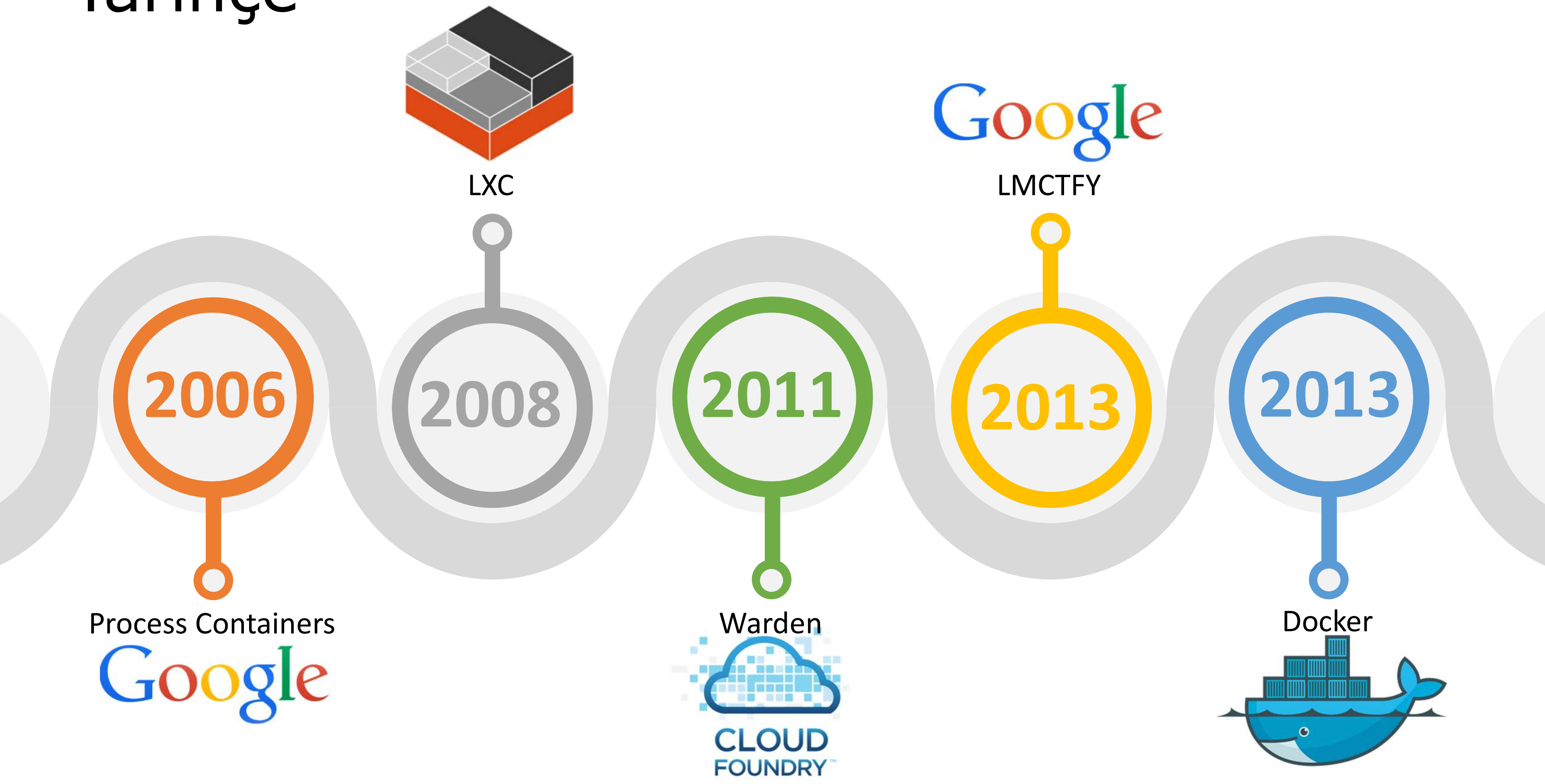
Separation of concerns

the developer **inside the container**	**the ops** **outside the container**
code	logging
libraries	remote access
package manager	network configuration
app	monitoring
data	

Tarihçe


FreeBSD Jails
solaris
Solaris Zones
1979
2000
2001
2004
2005
UNIX v7
UNIX
Linux VServer
Linux VServer
Open VZ
OpenVZ

Tarihçe


LXC
Google
LMCTFY
2006
2008
2011
2013
2013
Process Containers
Google
Warden
CLOUD FOUNDRY
Docker

En iyisi Docker mı?

- Hepsi aynı kernel fonksiyonlarını kullanıyor
- Performansları aynı

Ayırt edici olarak bakılacaklar:

- Tasarım
- Ekosistem

LAB - chroot

Namespaces

Name	Isolates
PID	Process IDs
IPC	System V IPC, POSIX message queues
Network	Network devices, stacks, ports, etc.
Mount	Mount points
User	User and group IDs
UTS	Hostname and NIS domain name

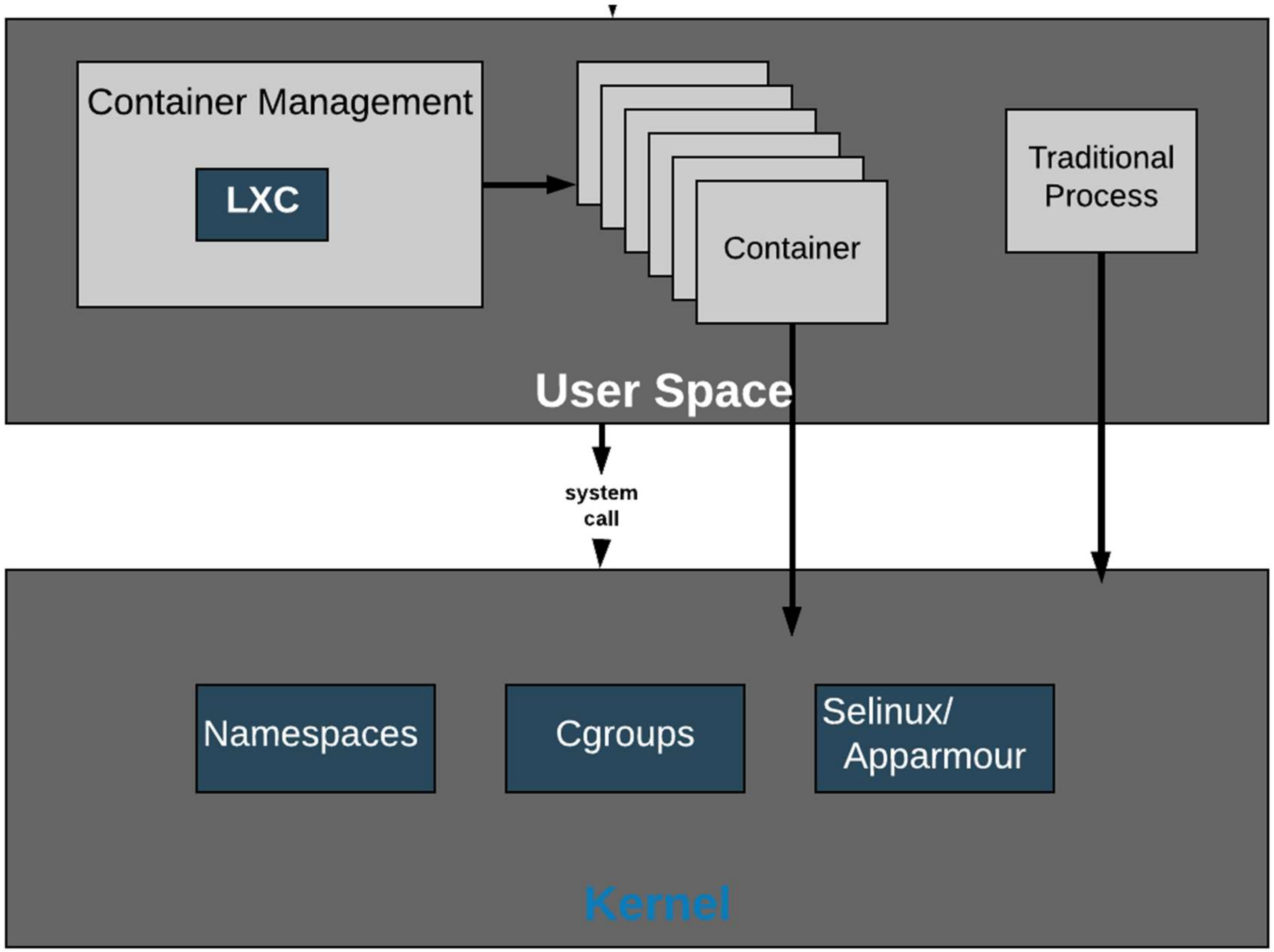
LAB - namespace

cgroups (Control Groups)

Name	Controls
cpuset	assigns individual processor/memory nodes
cpu	access to the processor resources
cpuacct	reports about processor usage
io	sets limit to read/write
memory	sets limit on memory usage
devices	allows access to devices
freezer	allows to suspend/resume
net_cls	allows to mark network packets
net_prio	set the priority of network traffic
perf_event	provides access to perf events
hugetlb	activates support for huge pages
pid	sets limit to number of processes

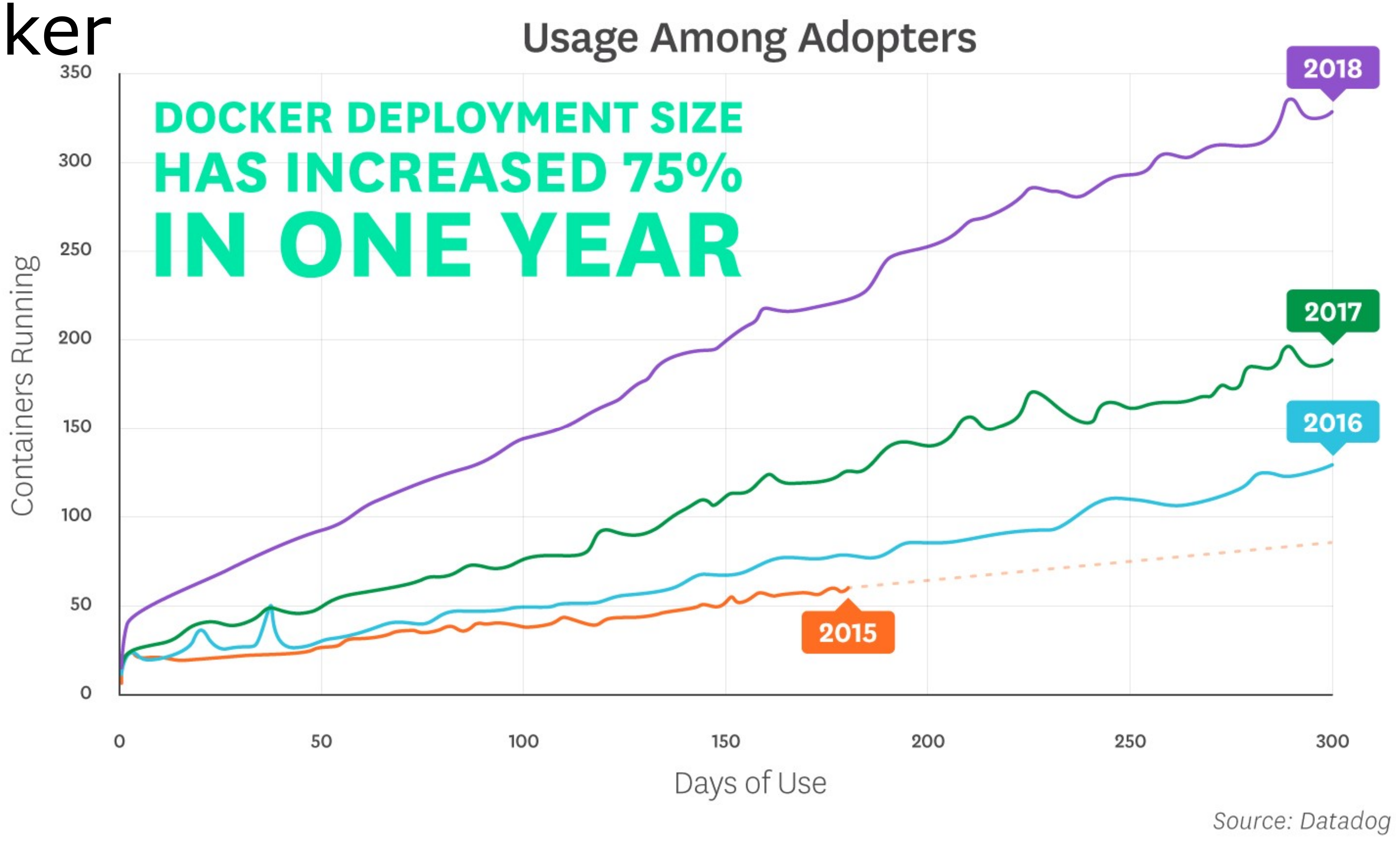
LAB - cgroups

LXC

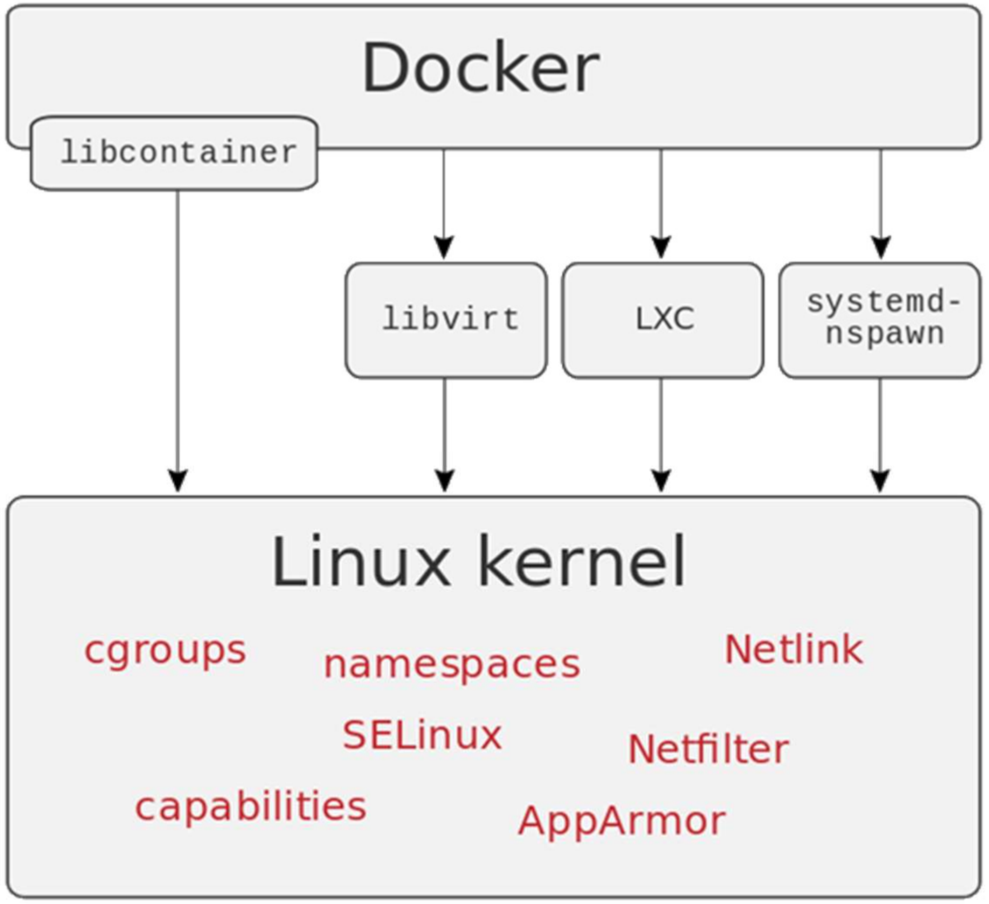

Container Management
LXC
Container
Traditional Process
User Space
system call
Namespaces
Cgroups
Selinux/ Apparmour
Kernel

LAB - LXC

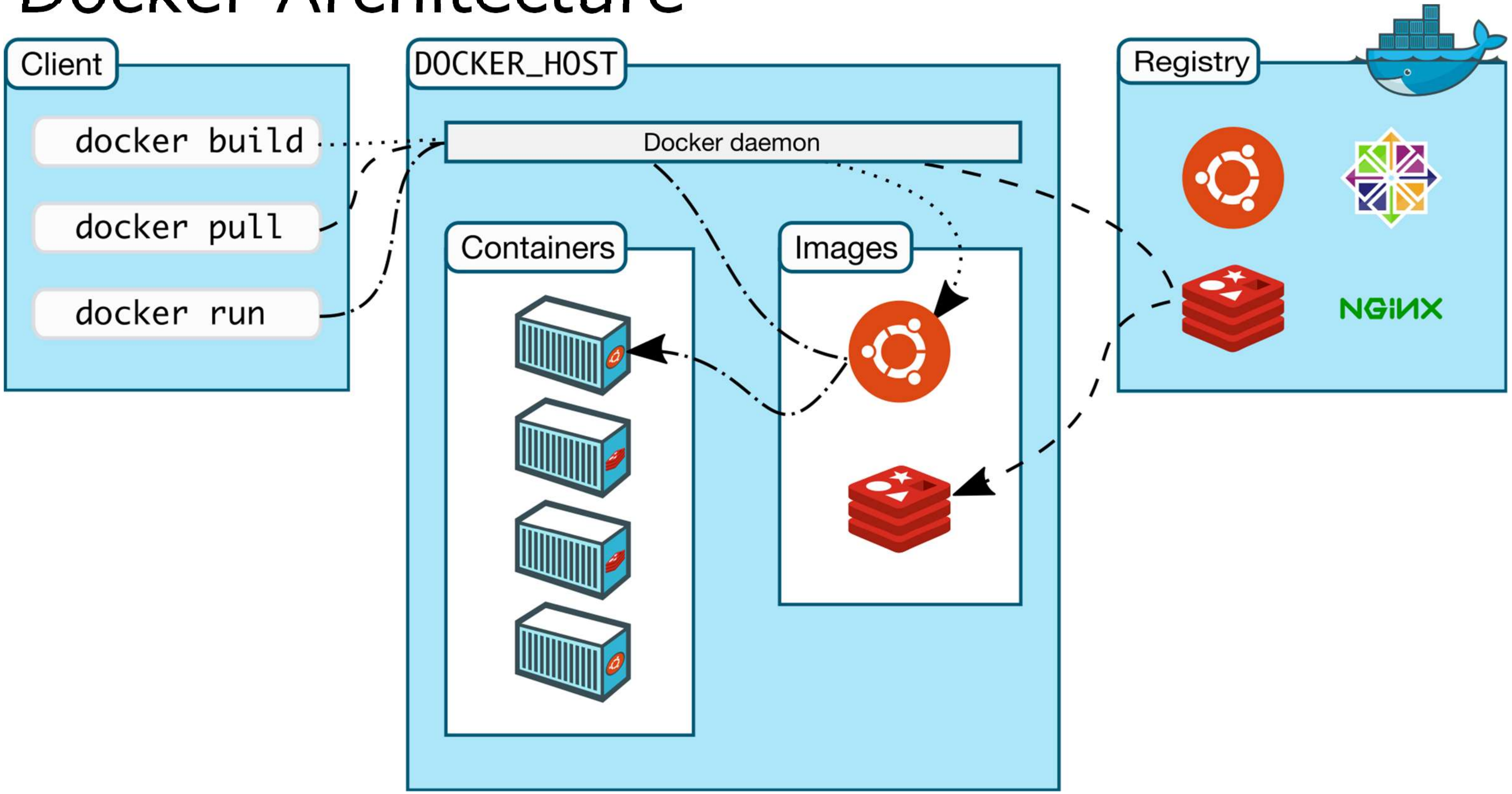
Docker


Usage Among Adopters
DOCKER DEPLOYMENT SIZE
HAS INCREASED 75%
IN ONE YEAR
Containers Running
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
Days of Use
2018
2017
2016
2015
Source: Datadog

Docker


Docker
libcontainer
libvirt
LXC
systemd-nspawn
Linux kernel
cgroups
namespaces
Netlink
SELinux
Netfilter
capabilities
AppArmor

Docker Architecture



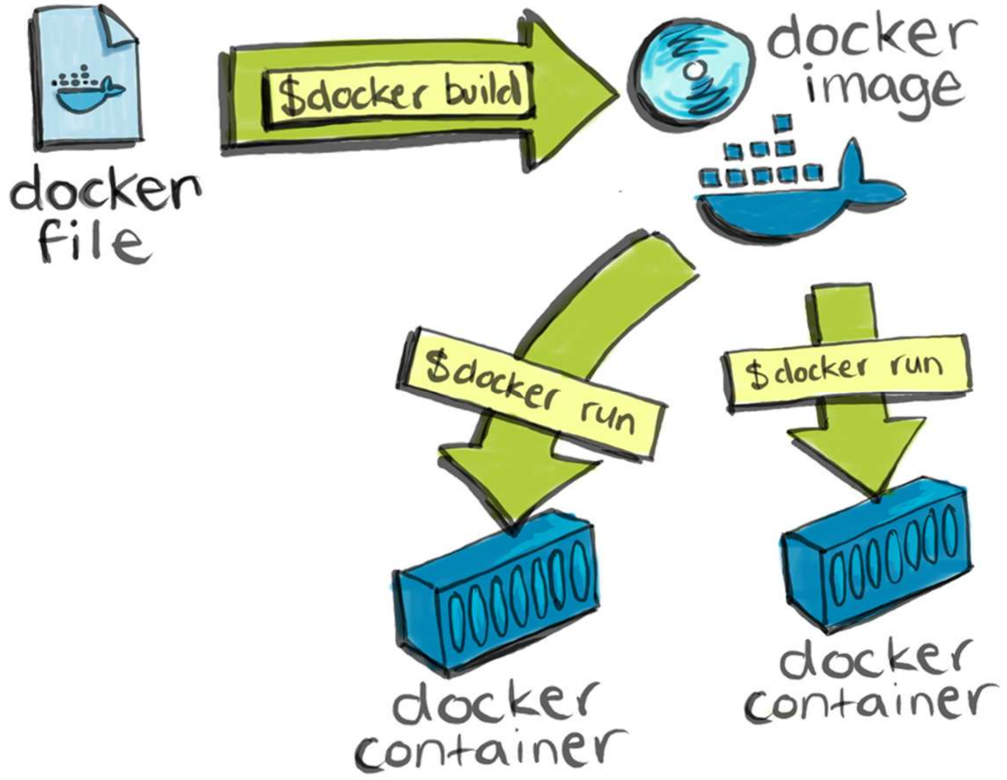
LAB - Docker

Docker

How First Time, Solomon Hykes shows docker to the public : The future of Linux Containers

https://www.youtube.com/watch?v=362sHaO5eGU

Dockerfile



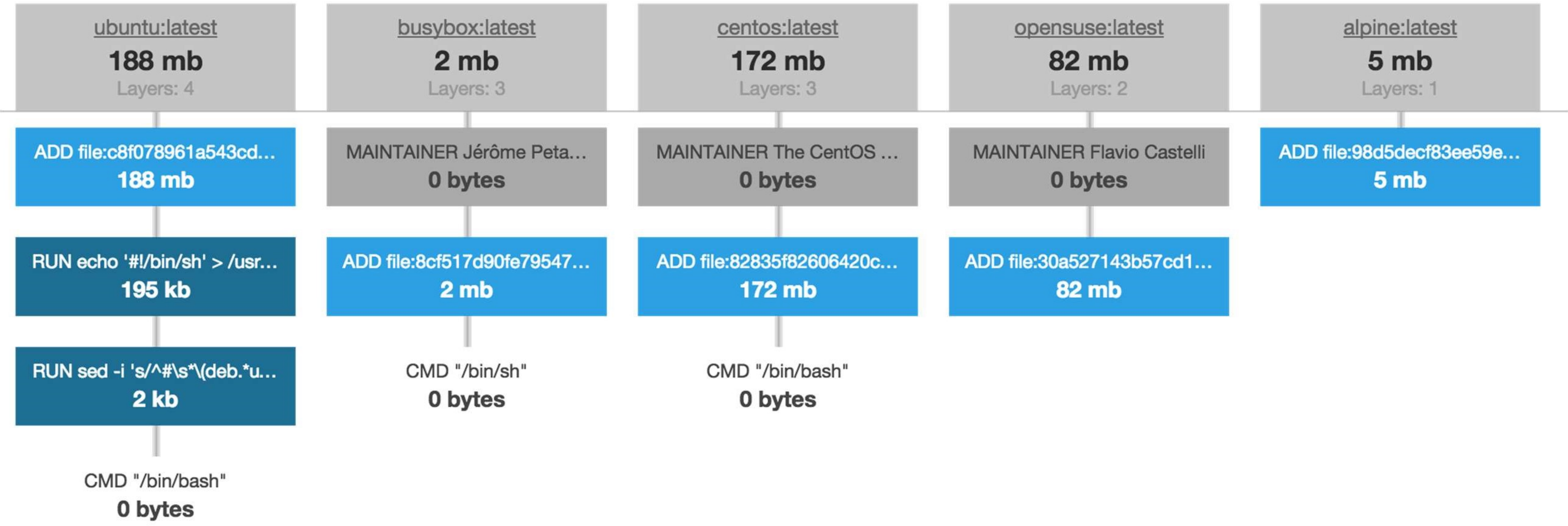
```
# Comment
INSTRUCTION arguments
```

```
docker build context [-f docker_file_path]
```

FROM

```
FROM <image>[:<tag>] [AS <name>]
```

Base image karşılaştırma



ubuntu:latest
188 mb
Layers: 4
- ADD file:c8f078961a543cd... 188 mb
- RUN echo '#!/bin/sh' > /usr... 195 kb
- RUN sed -i 's/^#\s*\(deb.*u... 2 kb
- CMD "/bin/bash" 0 bytes

busybox:latest
2 mb
Layers: 3
- MAINTAINER Jérôme Peta... 0 bytes
- ADD file:8cf517d90fe79547... 2 mb
- CMD "/bin/sh" 0 bytes

centos:latest
172 mb
Layers: 3
- MAINTAINER The CentOS ... 0 bytes
- ADD file:82835f82606420c... 172 mb
- CMD "/bin/bash" 0 bytes

opensuse:latest
82 mb
Layers: 2
- MAINTAINER Flavio Castelli 0 bytes
- ADD file:30a527143b57cd1... 82 mb

alpine:latest
5 mb
Layers: 1
- ADD file:98d5decf83ee59e... 5 mb

WORKDIR

Sonraki komutlar için çalışma dizini belirler

COPY & ADD

```
COPY [--chown=<user>:<group>] <src>... <dest>

COPY [--chown=<user>:<group>] ["<src>",... "<dest>"]

ADD [--chown=<user>:<group>] <src>... <dest>

ADD [--chown=<user>:<group>] ["<src>",... "<dest>"]
```

RUN

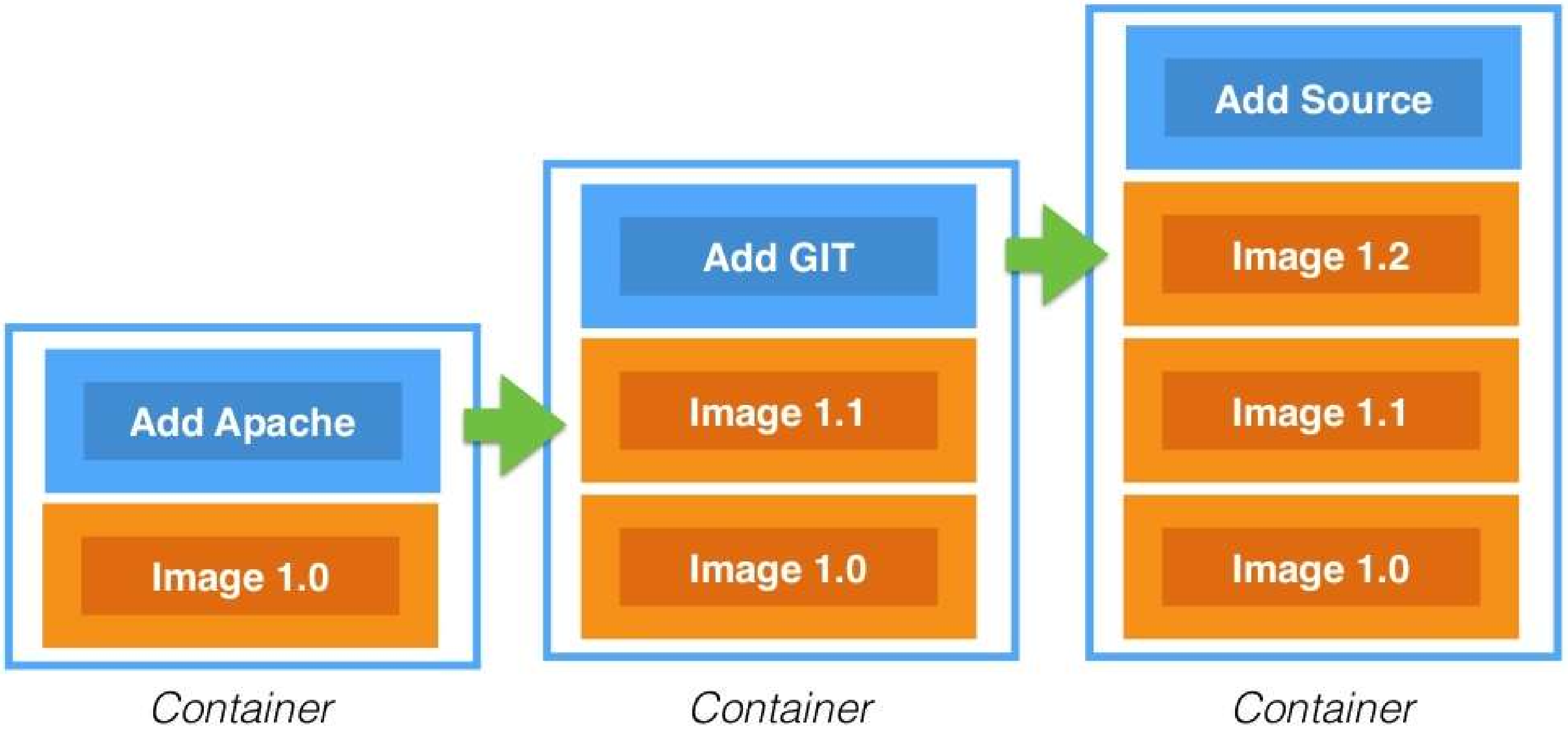
```
RUN ["executable", "param1", "param2"]

RUN <command>
```

Filesystems

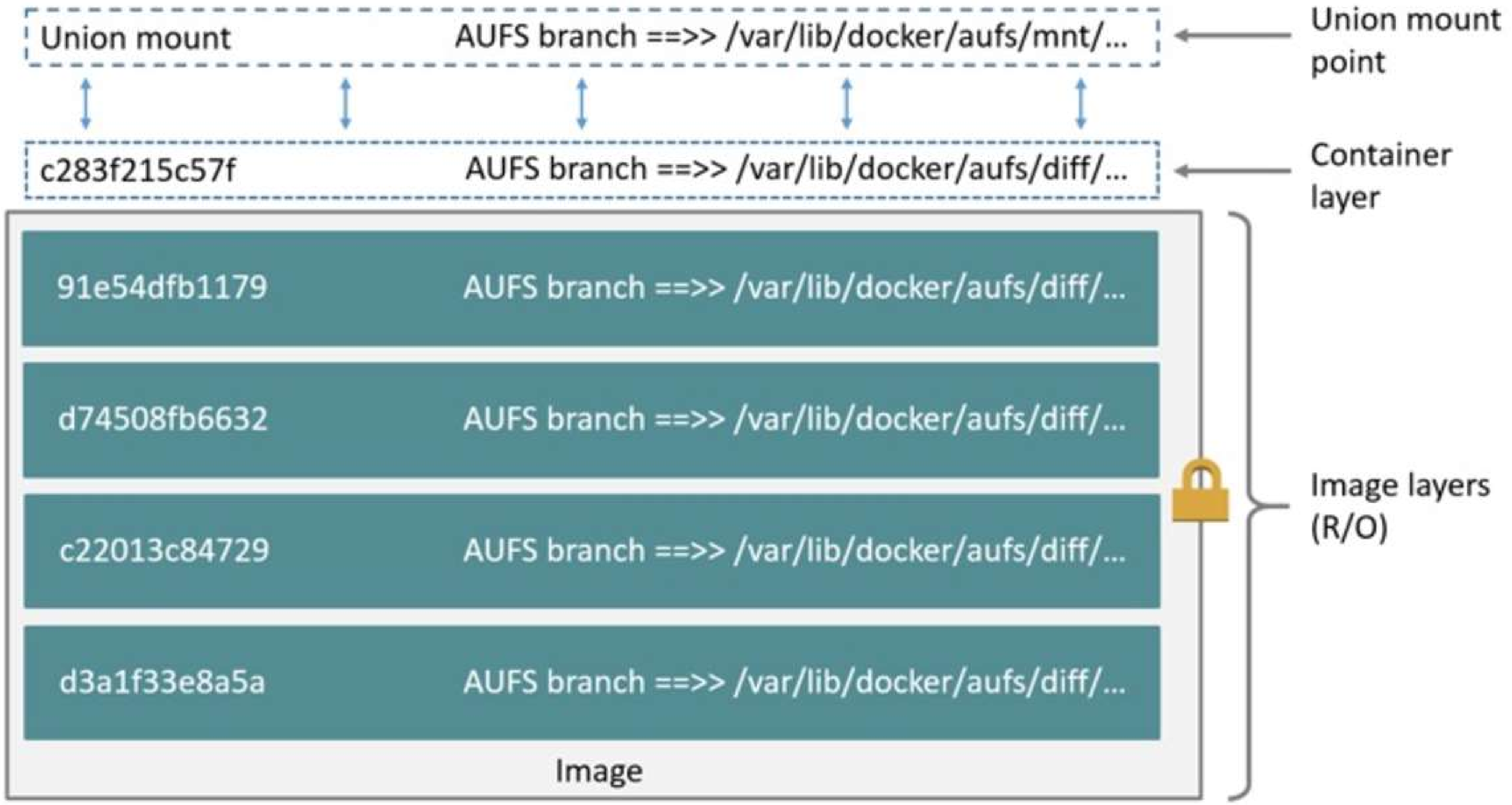
- Unioning filesystems
  (AUFS, overlayfs)
- Snapshotting filesystems
  (BTRFS, ZFS)
- Copy-on-Write block devices
  (thin snapshots with LVM or device-mapper)

Linux distribution	**Recommended storage drivers**
Docker Engine - Community on Ubuntu	overlay2 or aufs (for Ubuntu 14.04 running on kernel 3.13)
Docker Engine - Community on Debian	overlay2 (Debian Stretch), aufs or devicemapper (o lder versions)
Docker Engine - Community on CentOS	overlay2
Docker Engine - Community on Fedora	overlay2

AUFS


Add Apache
Image 1.0
Container
Add GIT
Image 1.1
Image 1.0
Container
Add Source
Image 1.2
Image 1.1
Image 1.0
Container

AUFS


Union mount
AUFS branch ==>> /var/lib/docker/aufs/mnt/...
Union mount point
c283f215c57f
AUFS branch ==>> /var/lib/docker/aufs/diff/...
Container layer
91e54dfb1179
AUFS branch ==>> /var/lib/docker/aufs/diff/...
d74508fb6632
AUFS branch ==>> /var/lib/docker/aufs/diff/...
c22013c84729
AUFS branch ==>> /var/lib/docker/aufs/diff/...
d3a1f33e8a5a
AUFS branch ==>> /var/lib/docker/aufs/diff/...
Image
Image layers (R/O)

CMD

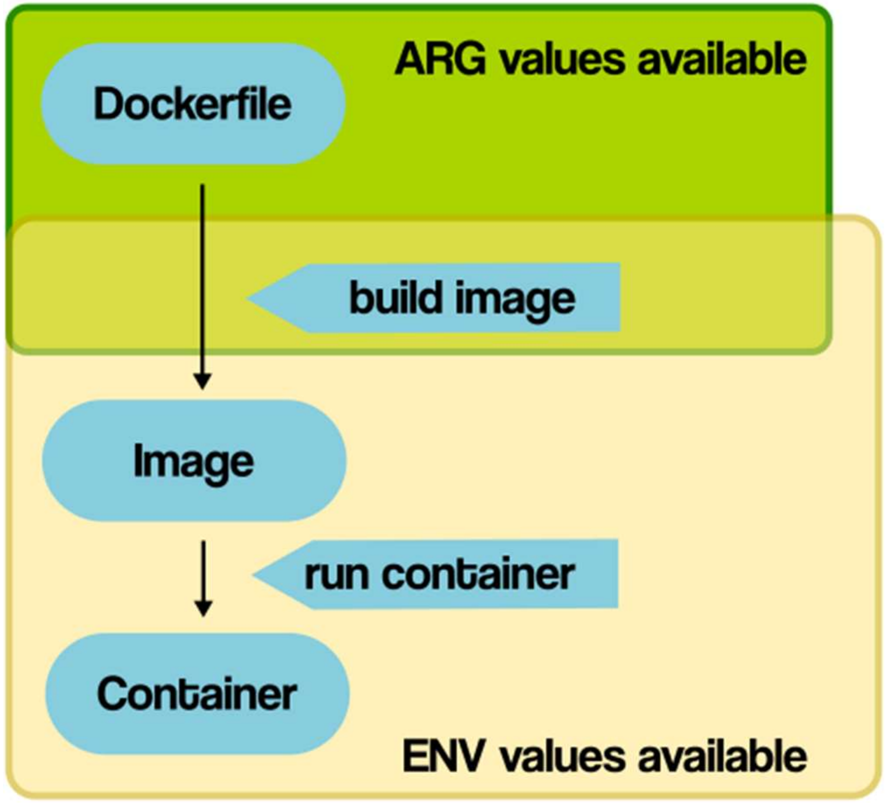
```
CMD ["executable", "param1", "param2"]

CMD command param1 param2

CMD ["param1", "param2"]
```

ENTRYPOINT

```
ENTRYPOINT ["executable", "param1", "param2"]
```

```
ENTRYPOINT command param1 param2
```

ARG & ENV



Dockerfile:

```
ARG required_var
ARG var_name=default_value
ENV foo=foo_value
ENV bar=${var_name}
```

Override ARG values:

```
docker build . --build-arg var_name=value
```

Overrice ENV values:

```
docker run -e "foo=other_foo_value" [...]
docker run --env-file=env_file_name [...]
```

EXPOSE

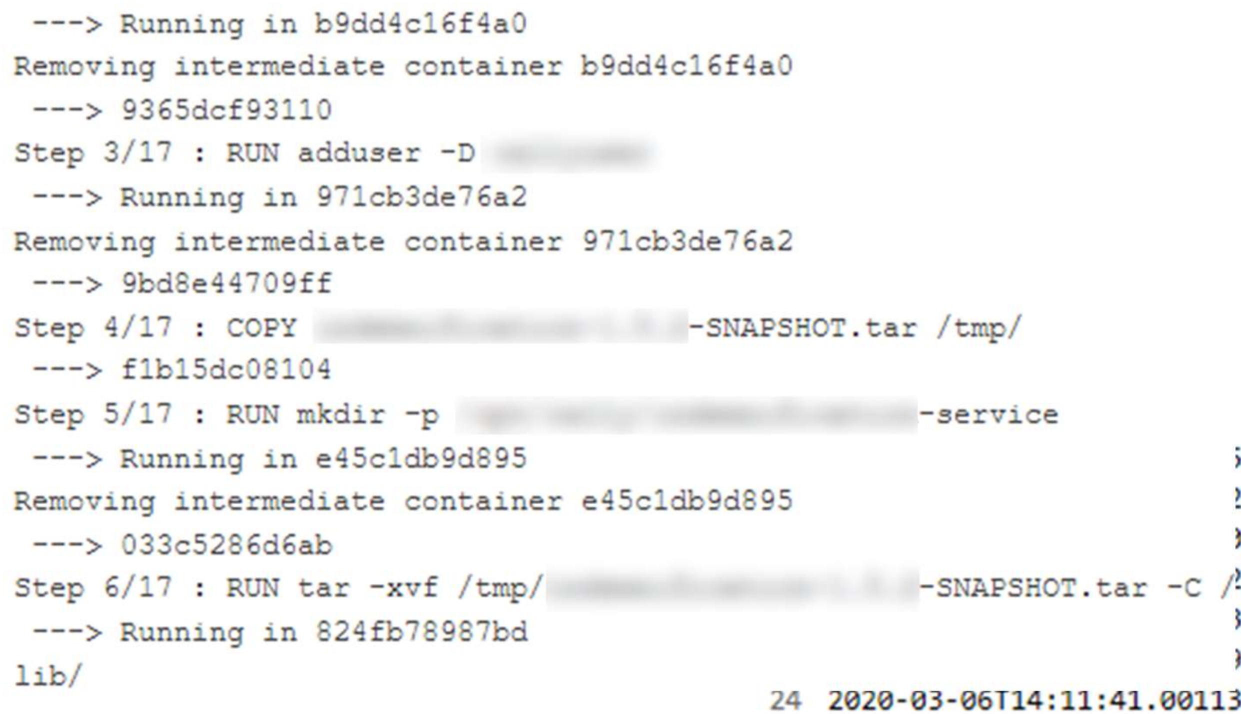
```
EXPOSE <port> [<port>/<protocol>...]
```

VOLUME

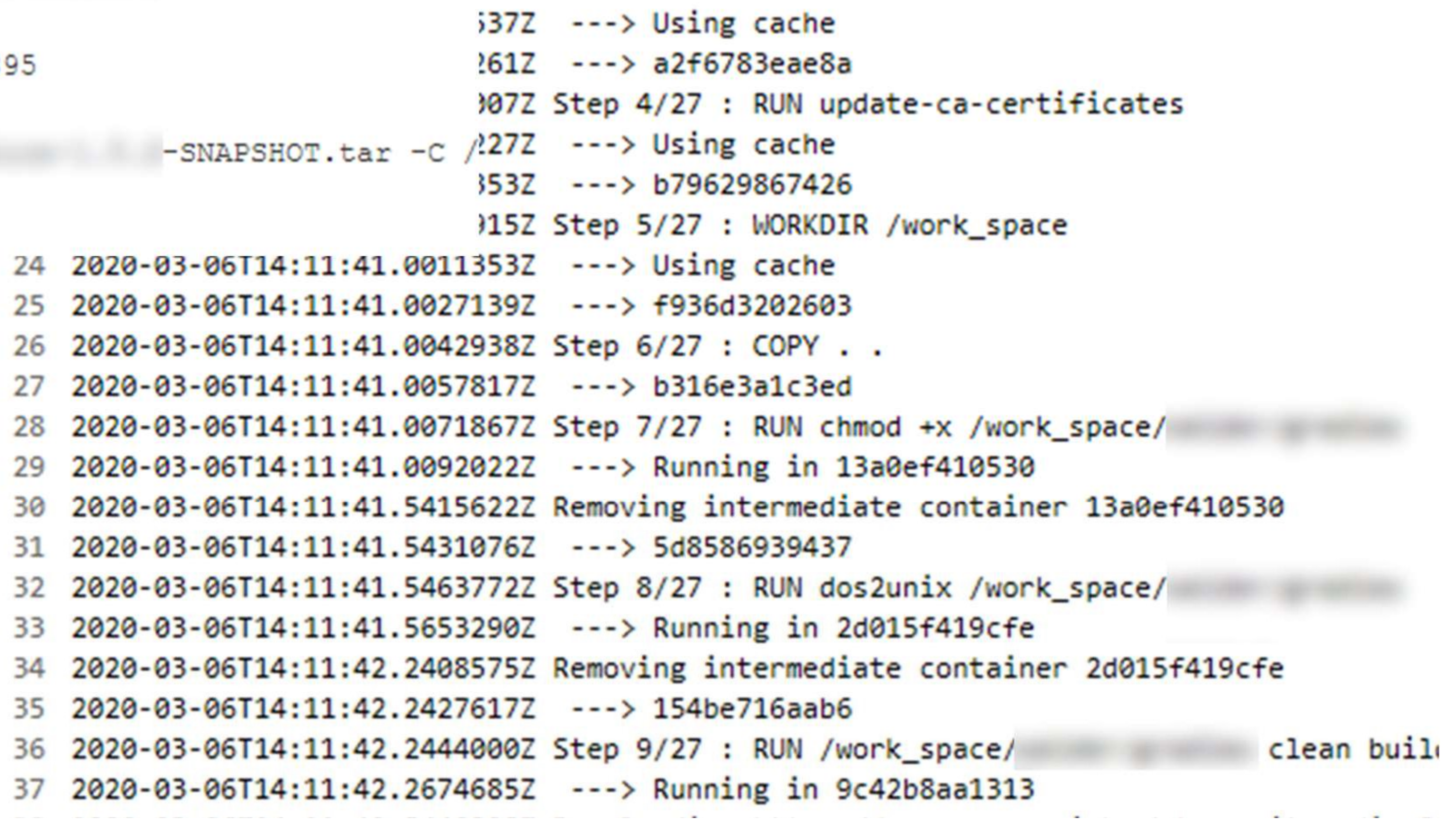
```
VOLUME ["/data"]
```

LAB - Dockerfile

LAB – Multi-Stage Build



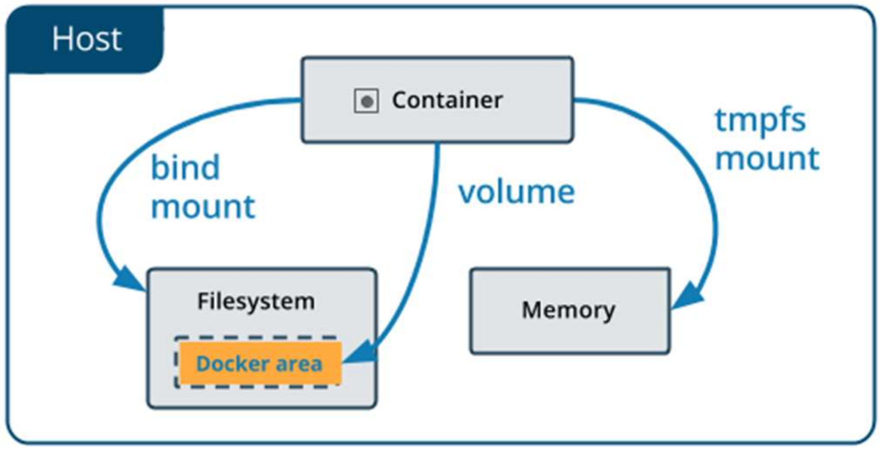
```
 ---> Running in b9dd4c16f4a0
Removing intermediate container b9dd4c16f4a0
 ---> 9365dcf93110
Step 3/17 : RUN adduser -D [redacted]
 ---> Running in 971cb3de76a2
Removing intermediate container 971cb3de76a2
 ---> 9bd8e44709ff
Step 4/17 : COPY [redacted]-SNAPSHOT.tar /tmp/
 ---> f1b15dc08104
Step 5/17 : RUN mkdir -p [redacted]-service
 ---> Running in e45c1db9d895
Removing intermediate container e45c1db9d895
 ---> 033c5286d6ab
Step 6/17 : RUN tar -xvf /tmp/[redacted]-SNAPSHOT.tar -C /
 ---> Running in 824fb78987bd
lib/
```



```
537Z  ---> Using cache
261Z  ---> a2f6783eae8a
007Z Step 4/27 : RUN update-ca-certificates
227Z  ---> Using cache
353Z  ---> b79629867426
015Z Step 5/27 : WORKDIR /work_space
2020-03-06T14:11:41.0011353Z  ---> Using cache
2020-03-06T14:11:41.0027139Z  ---> f936d3202603
2020-03-06T14:11:41.0042938Z Step 6/27 : COPY . .
2020-03-06T14:11:41.0057817Z  ---> b316e3a1c3ed
2020-03-06T14:11:41.0071867Z Step 7/27 : RUN chmod +x /work_space/[redacted]
2020-03-06T14:11:41.0092022Z  ---> Running in 13a0ef410530
2020-03-06T14:11:41.5415622Z Removing intermediate container 13a0ef410530
2020-03-06T14:11:41.5431076Z  ---> 5d8586939437
2020-03-06T14:11:41.5463772Z Step 8/27 : RUN dos2unix /work_space/[redacted]
2020-03-06T14:11:41.5653290Z  ---> Running in 2d015f419cfe
2020-03-06T14:11:42.2408575Z Removing intermediate container 2d015f419cfe
2020-03-06T14:11:42.2427617Z  ---> 154be716aab6
2020-03-06T14:11:42.2444000Z Step 9/27 : RUN /work_space/[redacted] clean buil
2020-03-06T14:11:42.2674685Z  ---> Running in 9c42b8aa1313
```

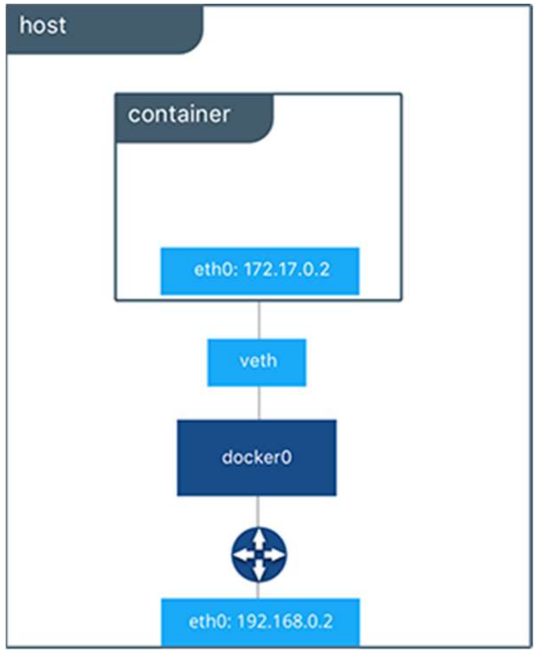
VOLUME

```
VOLUME ["/data"]
```



Network

- Bridge
- Host
- None
- Overlay
- Macvlan



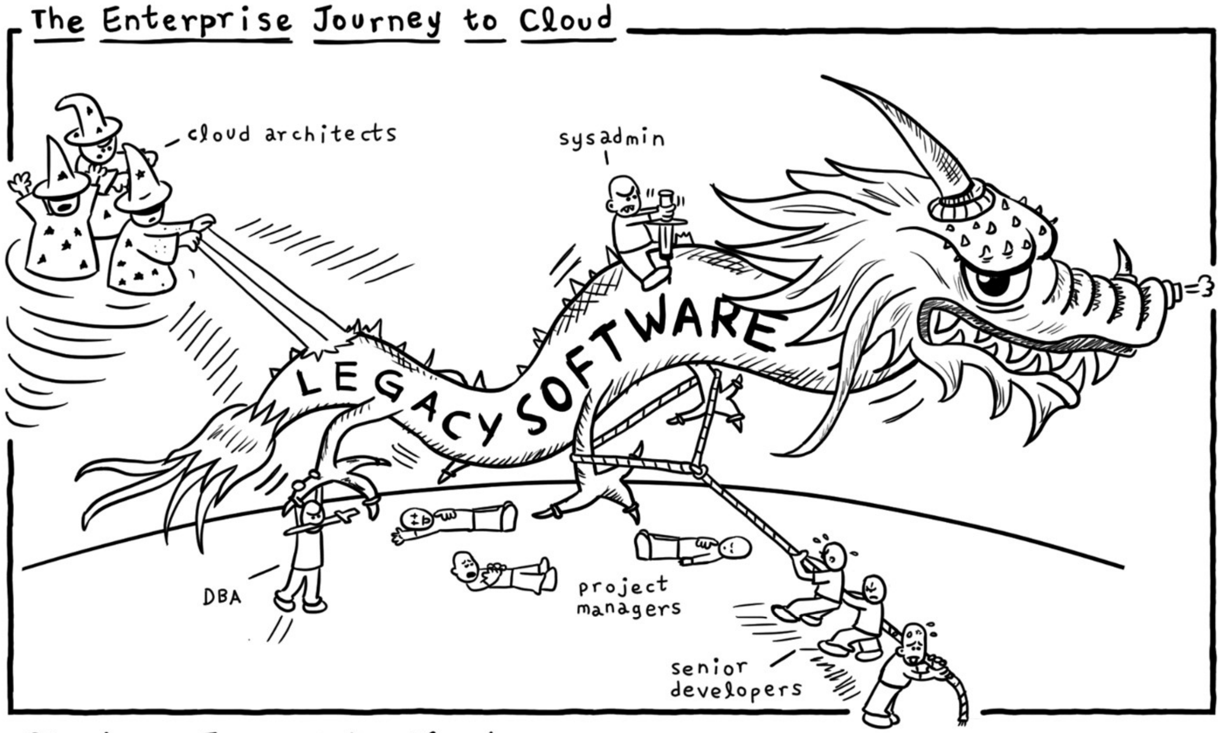
LAB – Docker-Compose

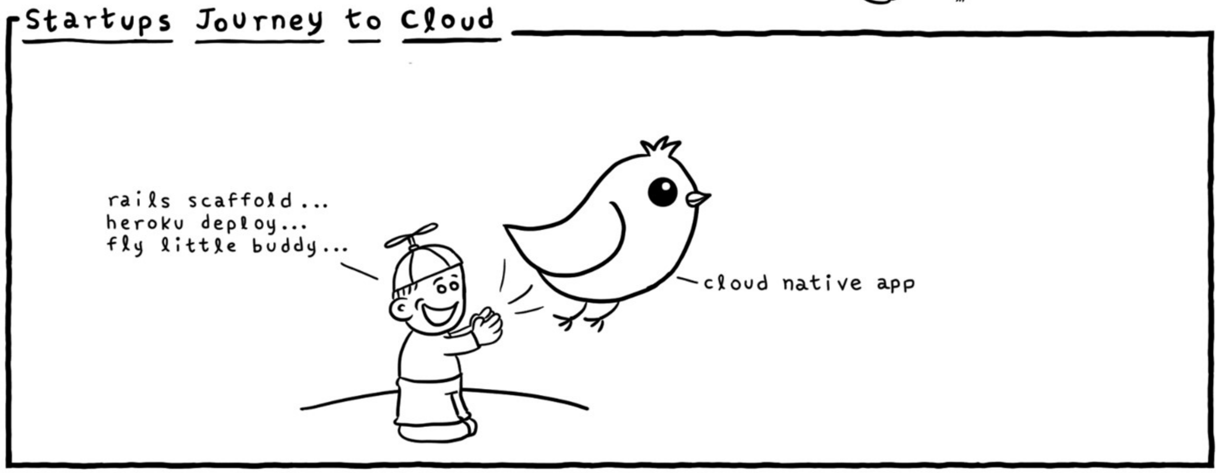
Gelecek Program

Docker Swarm

Kubernetes

OpenShift





Daniel Stori {turnoff.us}
Thanks to Michael Tharrington

Teşekkürler

https://github.com/mbdemirkan/containerCourse