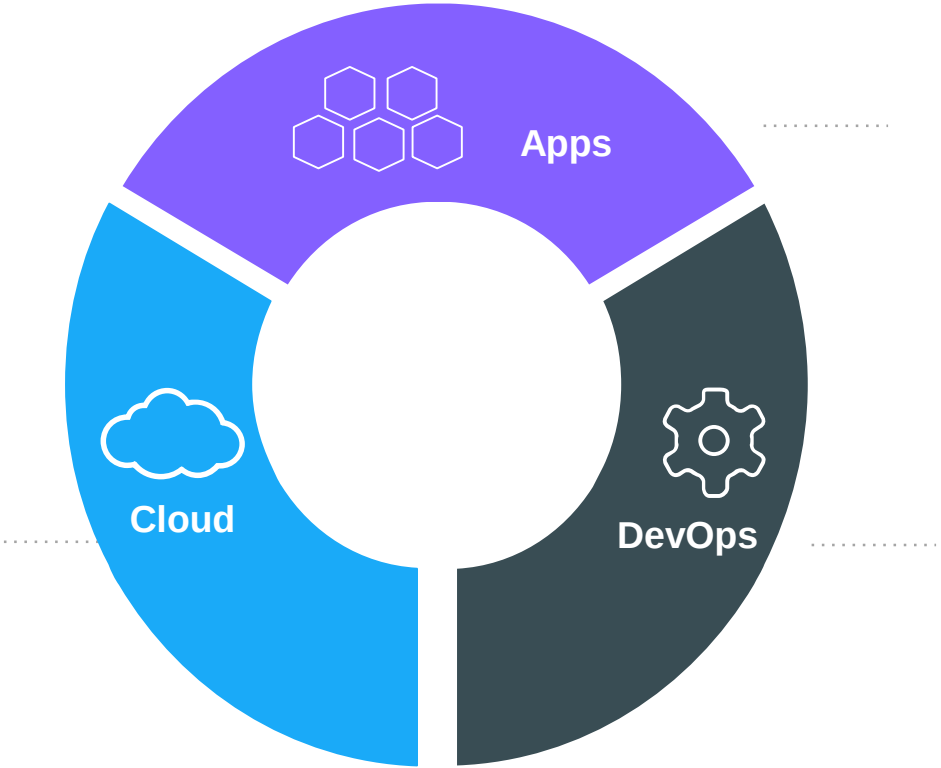
Introduction to Docker

The IT Landscape is Changing

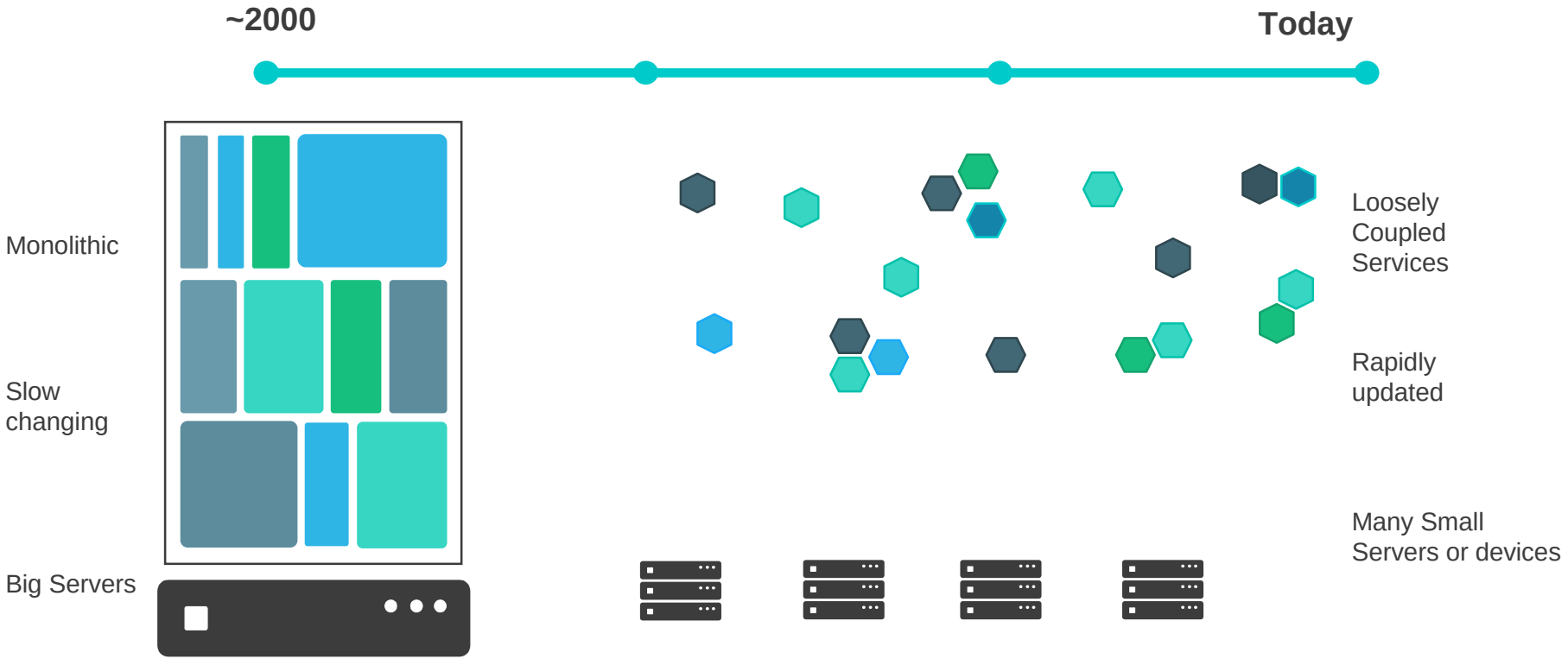


Movement in the cloud

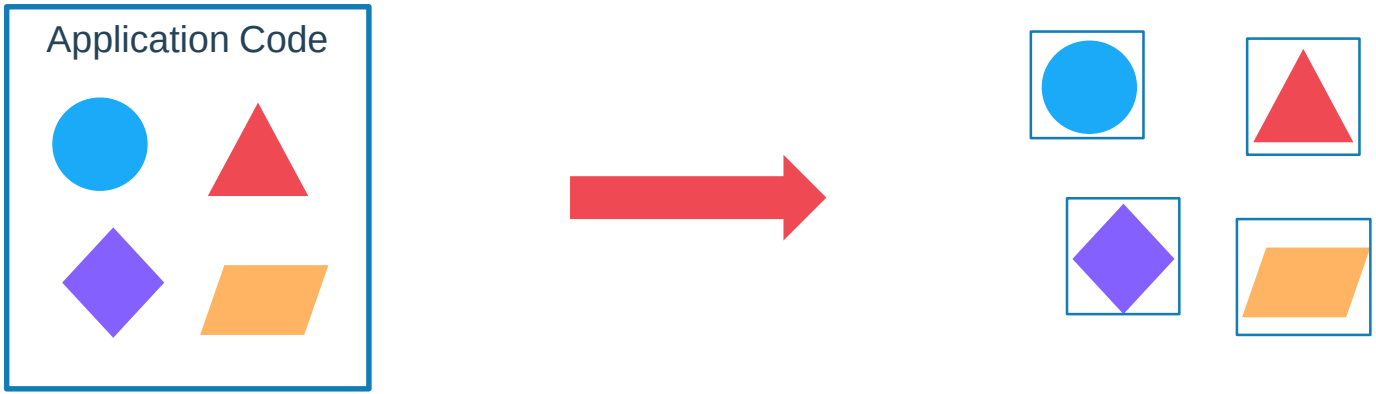
- Migrate workloads to cloud
- Portability across environments
- Want to avoid cloud vendor lock-in

State of App development Survey: Q1 - 2016

Applications are transforming



Application Modernization



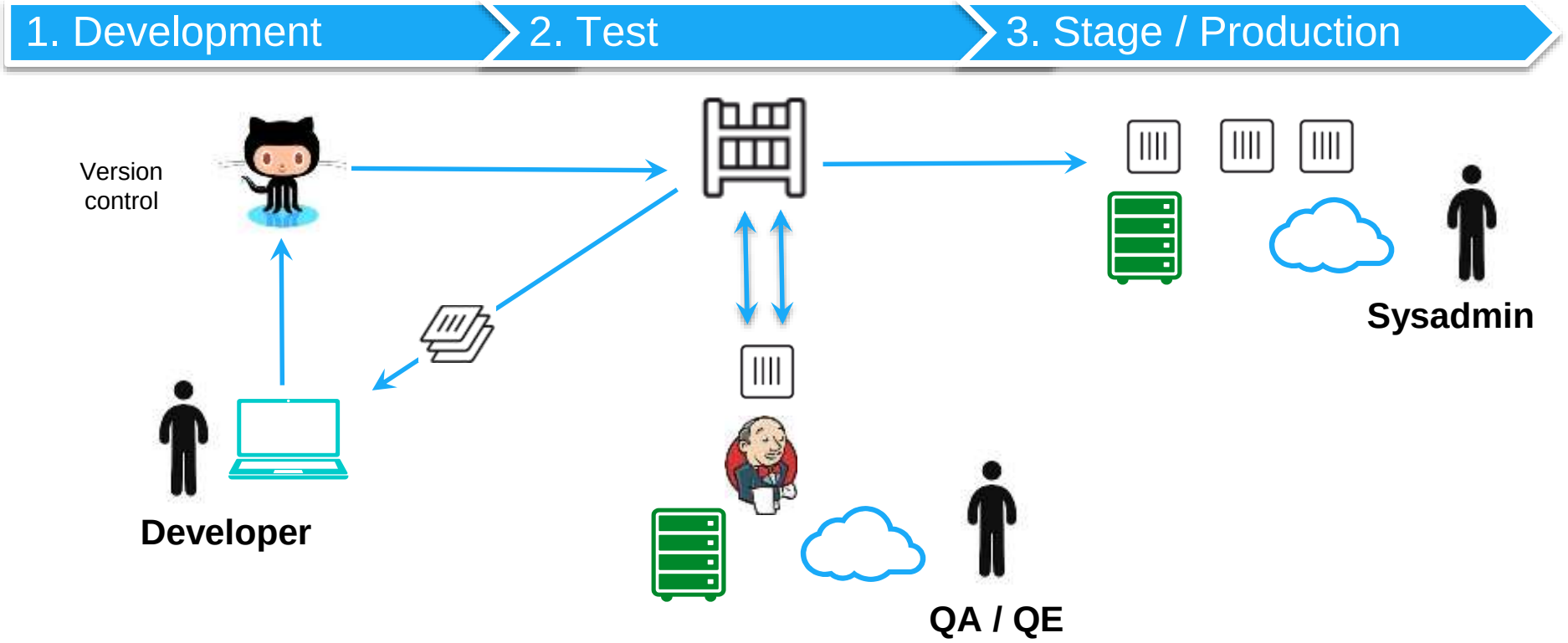
Developer Issues:

- Minor code changes require full re-compile and re-test
- Application becomes single point of failure
- Application is difficult to scale

Microservices: Break application into separate operations

12-Factor Apps: Make the app independently scalable, stateless, highly available by design

Continuous Integration and Delivery



Tug of War Between Developers and Ops

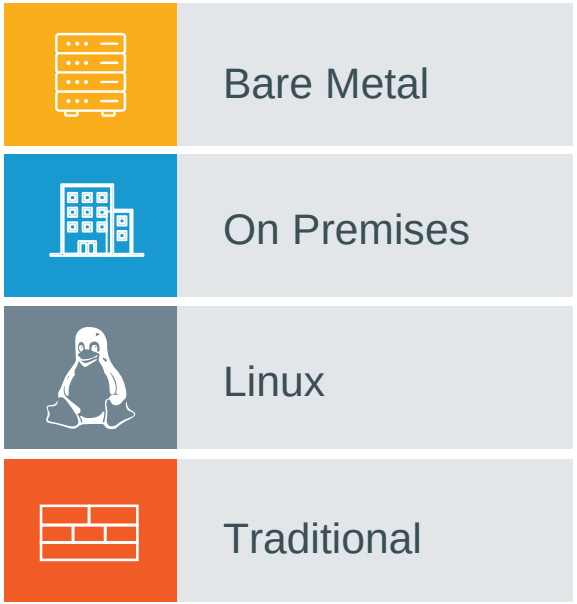
Developers

- Freedom to create and deploy apps fast
- Define and package application needs

IT Operations

- Quickly and flexibly respond to changing needs
- Standardize, secure, and manage

Organizations Must Deal with Diverse Technology



…and Diverse Organizations

Developers

- Freedom to create and deploy apps fast
- Define and package application needs

IT Operations

- Quickly and flexibly respond to changing needs
- Standardize, secure, and manage

The Myth of Bi-Modal IT

	MICROSERVICES	TRADITIONAL APPS
Cloud or New Infrastructure	You are either here..	
Old Infrastructure		…or here

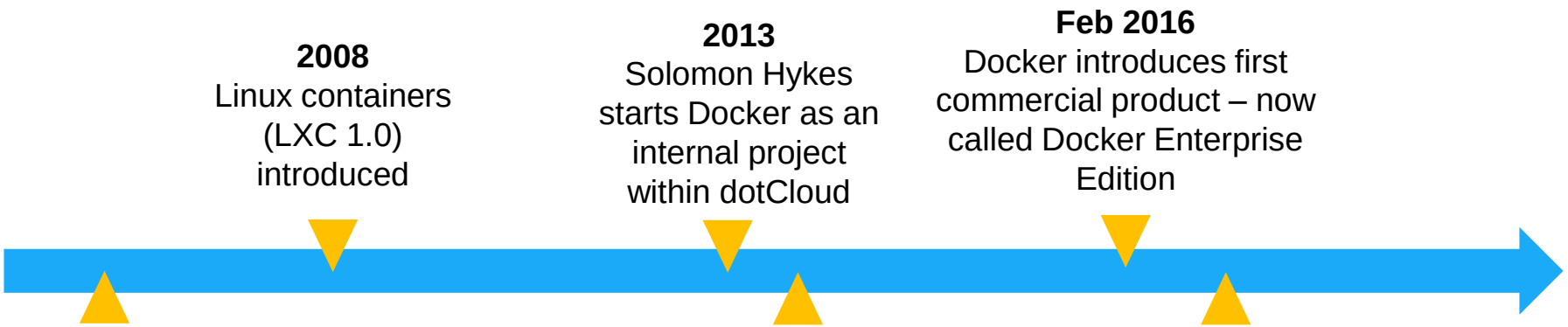
Enabling a Journey

	MICROSERVICES	AGILE TRADITIONAL APPS	TRADITIONAL APPS
Cloud or New Infrastructure			
Old Infrastructure			

…that is past AND future proof

Docker and Container Overview

History of Docker



The Docker Family Tree

Open source **framework** for assembling core components that make a container platform

Intended for:
Open source contributors + ecosystem developers

Enterprise Edition

Subscription-based, commercially supported **products** for delivering a secure software supply chain

Intended for:
Production deployments + Enterprise customers

Community Edition

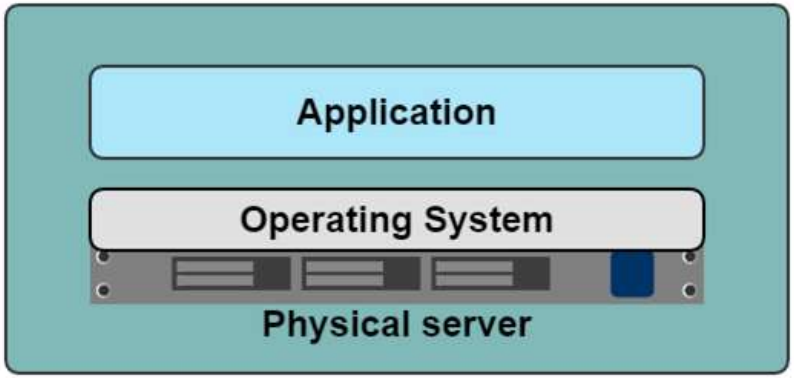
Free, community-supported **product** for delivering a container solution

Intended for:
Software dev & test

A History Lesson

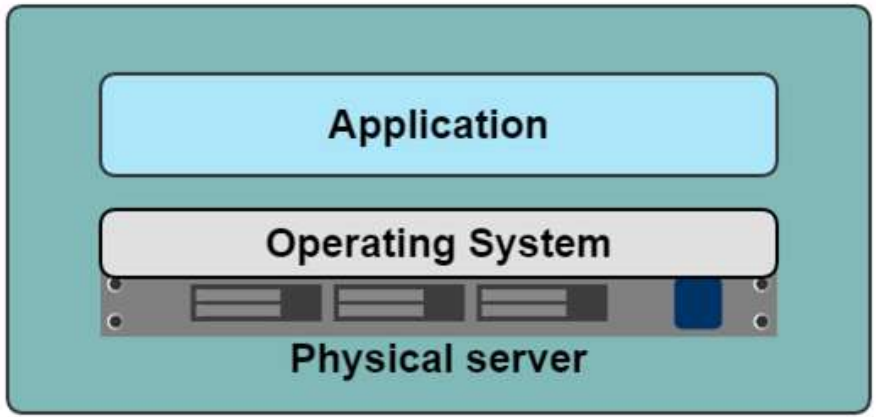
In the Dark Ages

One application on one physical server



Historical limitations of application deployment

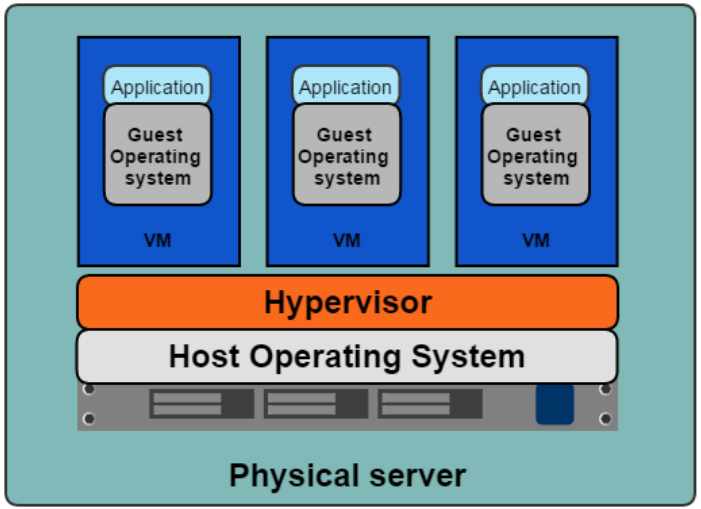
- Slow deployment times
- Huge costs
- Wasted resources
- Difficult to scale
- Difficult to migrate
- Vendor lock in



A History Lesson

Hypervisor-based Virtualization

- One physical server can contain multiple applications
- Each application runs in a virtual machine (VM)



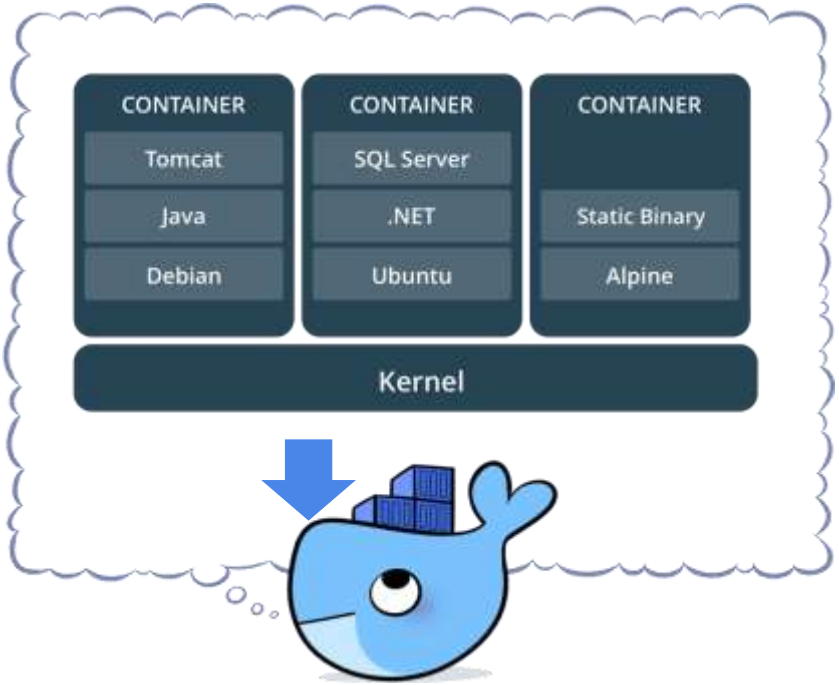
Benefits of VMs

- Better resource pooling
  - One physical machine divided into multiple virtual machines
- Easier to scale
- VMs in the cloud
  - Rapid elasticity
  - Pay as you go model

Limitations of VMs

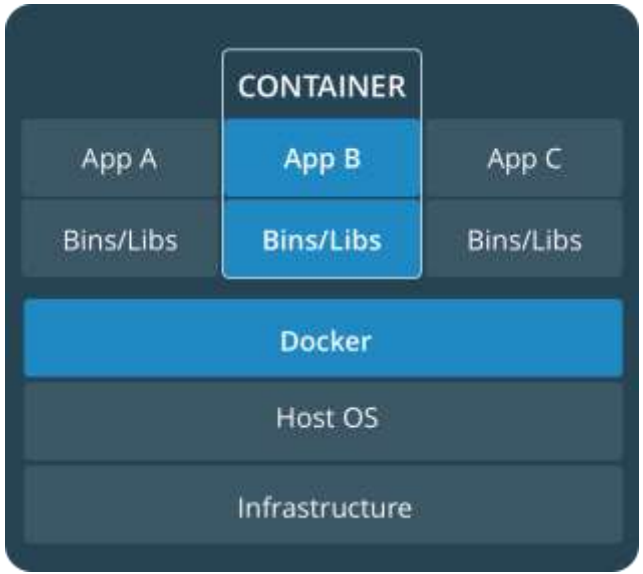
- Each VM stills requires
  - CPU allocation
  - Storage
  - RAM
  - An entire guest operating system
- The more VMs you run, the more resources you need
- Guest OS means wasted resources
- Application portability not guaranteed

What is a container?

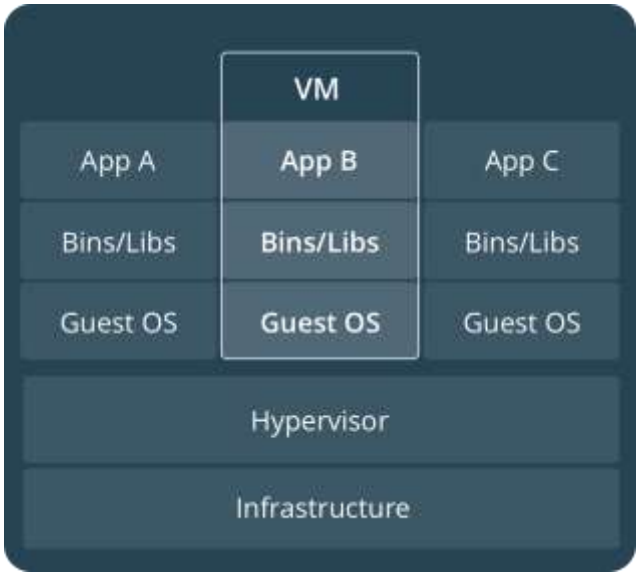


- Standardized packaging for software and dependencies
- Isolate apps from each other
- Share the same OS kernel
- Works with all major Linux and Windows Server

Comparing Containers and VMs

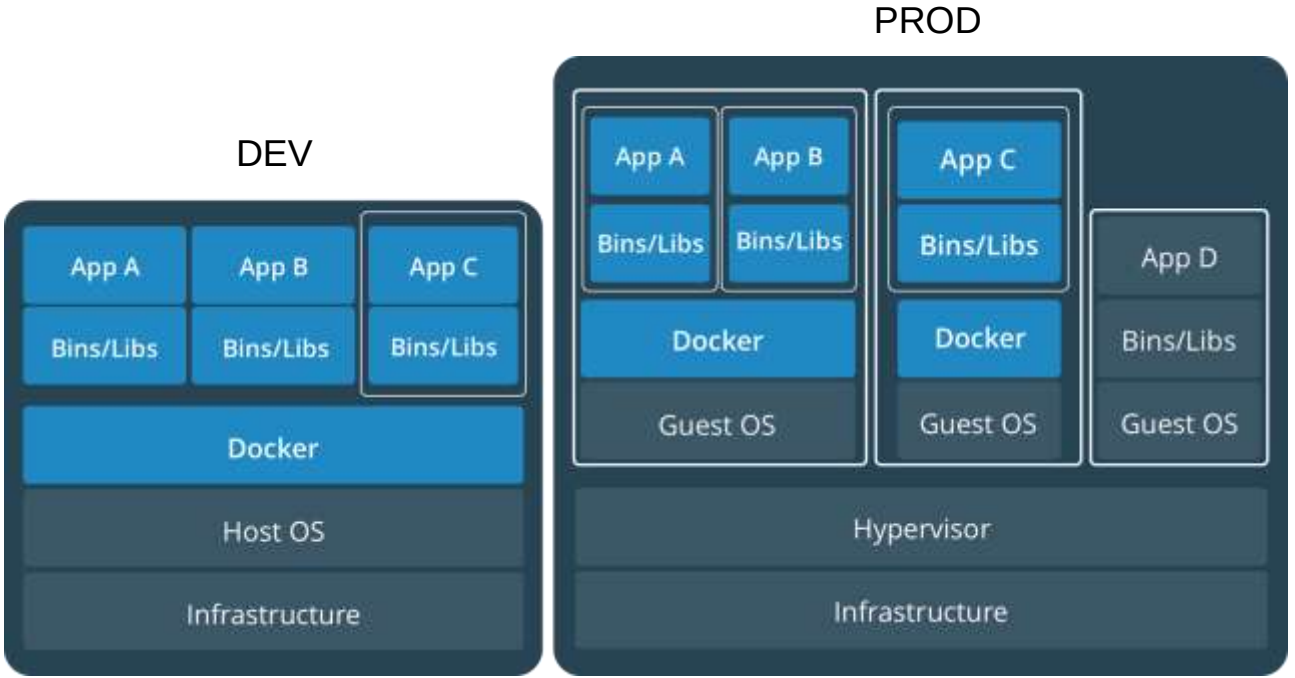


Containers are an app level construct



VMs are an infrastructure level construct to turn one machine into many servers

Containers and VMs together



Containers and VMs together provide a tremendous amount of flexibility for IT to optimally deploy and manage apps.

Key Benefits of Docker Containers

Speed

- No OS to boot = applications online in seconds

Portability

- Less dependencies between process layers = ability to move between infrastructure

Efficiency

- Less OS overhead
- Improved VM density

Container Solutions & Landscape

Docker Basics

Image

The basis of a Docker container. The content at rest.

Container

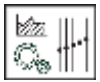
The image when it is ‘running.’ The standard unit for app service

Engine

The software that executes commands for containers. Networking and volumes are part of Engine. Can be clustered together.

Registry

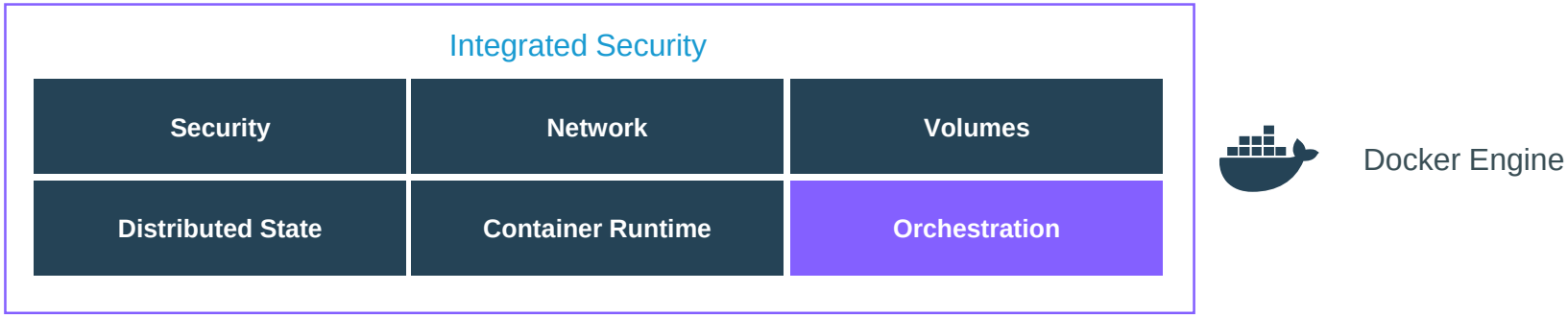
Stores, distributes and manages Docker images



Control Plane

Management plane for container and cluster orchestration

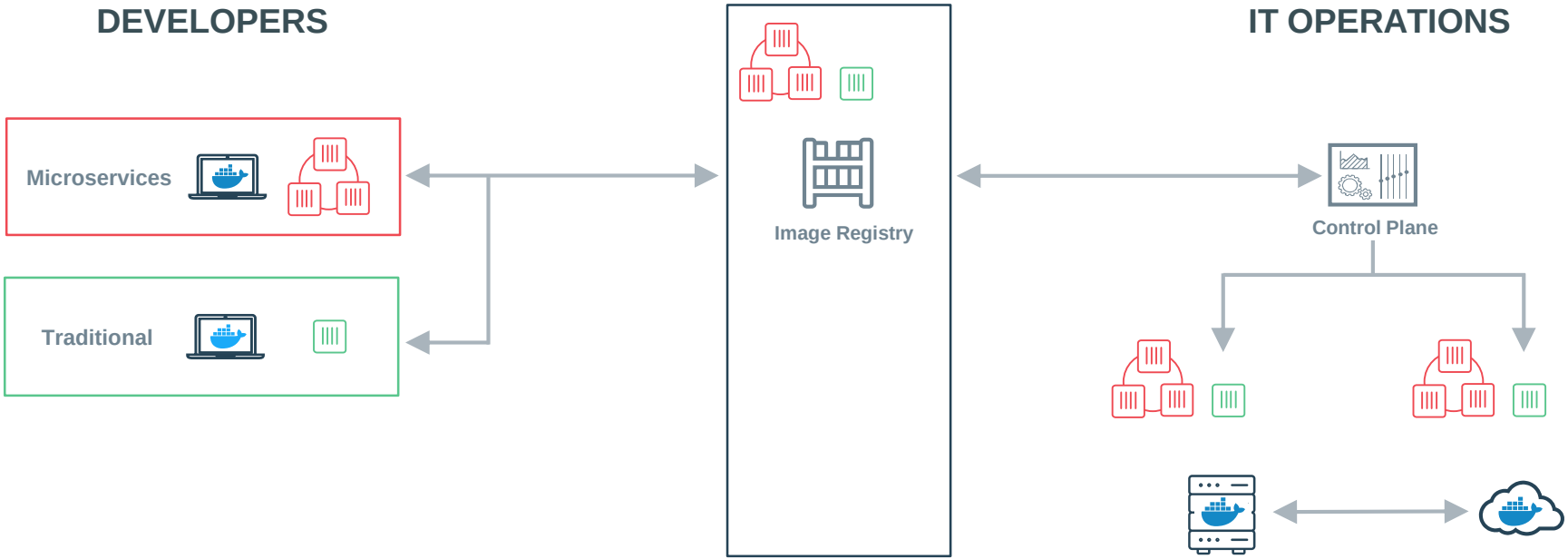
Foundation: Docker Engine



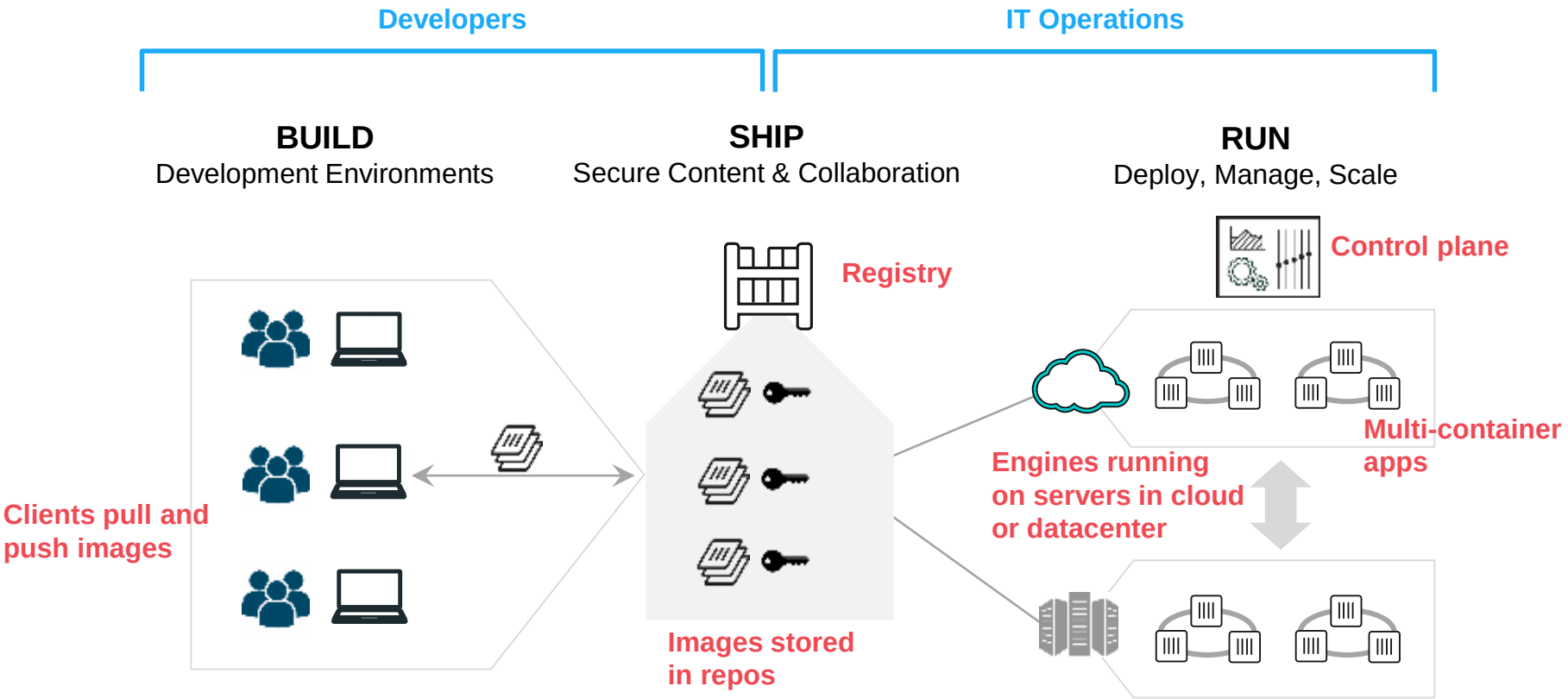
DEVELOPERS

IT OPERATIONS

Building a Software Supply Chain



Containers as a Service



Building a Secure Supply Chain

Container App Lifecycle Workflow

Private Image Registry	Secure Access and User Management	Application and Cluster Management
Image Scanning and Monitoring	Content Trust and Verification	Policy Management
Security	Network	Volumes
Distributed State	Container Runtime	Orchestration

Enterprise Edition

Docker Engine

Usable Security

Trusted Delivery

Portable

Build, Ship, and Run

Build, Ship, Run, Any App Anywhere

From Dev

To Ops

Any App

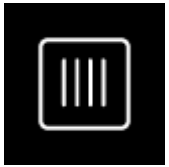
Any OS

Anywhere

Some Docker vocabulary

Docker Image

The basis of a Docker container. Represents a full application



Docker Container

The standard unit in which the application service resides and executes

Docker Engine

Creates, ships and runs Docker containers deployable on a physical or virtual, host locally, in a datacenter or cloud service provider

Registry Service (Docker Hub or Docker Trusted Registry)

Cloud or server based storage and distribution service for your images

Basic Docker Commands

```
$ docker pull mikegcoleman/catweb:latest

$ docker images

$ docker run -d -p 5000:5000 --name catweb mikegcoleman/catweb:latest

$ docker ps

$ docker stop catweb (or <container id>)

$ docker rm catweb (or <container id>)

$ docker rmi mikegcoleman/catweb:latest (or <image id>)
```

CodeOps

How to find my Docker version?

mydocker — -bash — 47×19

```
$ docker version
Client:
 Version:      1.12.0-rc4
 API version:  1.24
 Go version:   go1.6.2
 Git commit:   e4a0dbc
 Built:        Wed Jul 13 03:28:51 2016
 OS/Arch:      darwin/amd64
 Experimental: true

Server:
 Version:      1.12.0-rc4
 API version:  1.24
 Go version:   go1.6.2
 Git commit:   e4a0dbc
 Built:        Wed Jul 13 03:28:51 2016
 OS/Arch:      linux/amd64
 Experimental: true
$
```

CodeOps

How to find my Docker version?

```
$ docker -v
Docker version 1.12.0-rc4, build e4a0dbc, experimental
```

CodeOps

How to find details of my Docker installation?

mydocker — -bash — 79×42

```
$ docker info
Containers: 36
 Running: 0
 Paused: 0
 Stopped: 36
Images: 44
Server Version: 1.12.0-rc4
Storage Driver: aufs
 Root Dir: /var/lib/docker/aufs
 Backing Filesystem: extfs
 Dirs: 142
 Dirperm1 Supported: true
Logging Driver: json-file
Cgroup Driver: cgroupfs
Plugins:
 Volume: local
 Network: host bridge null overlay
Swarm: inactive
Runtimes: runc
Default Runtime: runc
Security Options: seccomp
Kernel Version: 4.4.15-moby
Operating System: Alpine Linux v3.4
OSType: linux
Architecture: x86_64
CPUs: 2
Total Memory: 1.954 GiB
Name: moby
ID: BJ3B:7ZHJ:BDQ2:X7BQ:3KBZ:XQI5:ID7C:VIFW:755U:OSTC:ZX2B:JNX6
Docker Root Dir: /var/lib/docker
Debug Mode (client): false
Debug Mode (server): true
 File Descriptors: 18
 Goroutines: 29
 System Time: 2016-07-19T15:43:54.215107093Z
 EventsListeners: 1
No Proxy: *.local, 169.254/16
Registry: https://index.docker.io/v1/
Experimental: true
Insecure Registries:
 127.0.0.0/8
$
```

CodeOps

Can I install Docker from commandline?

Yes! from get.docker.com

```
# This script is meant for quick & easy install via:
#   'curl -sSL https://get.docker.com/ | sh'
# or:
#   'wget -qO- https://get.docker.com/ | sh'
```

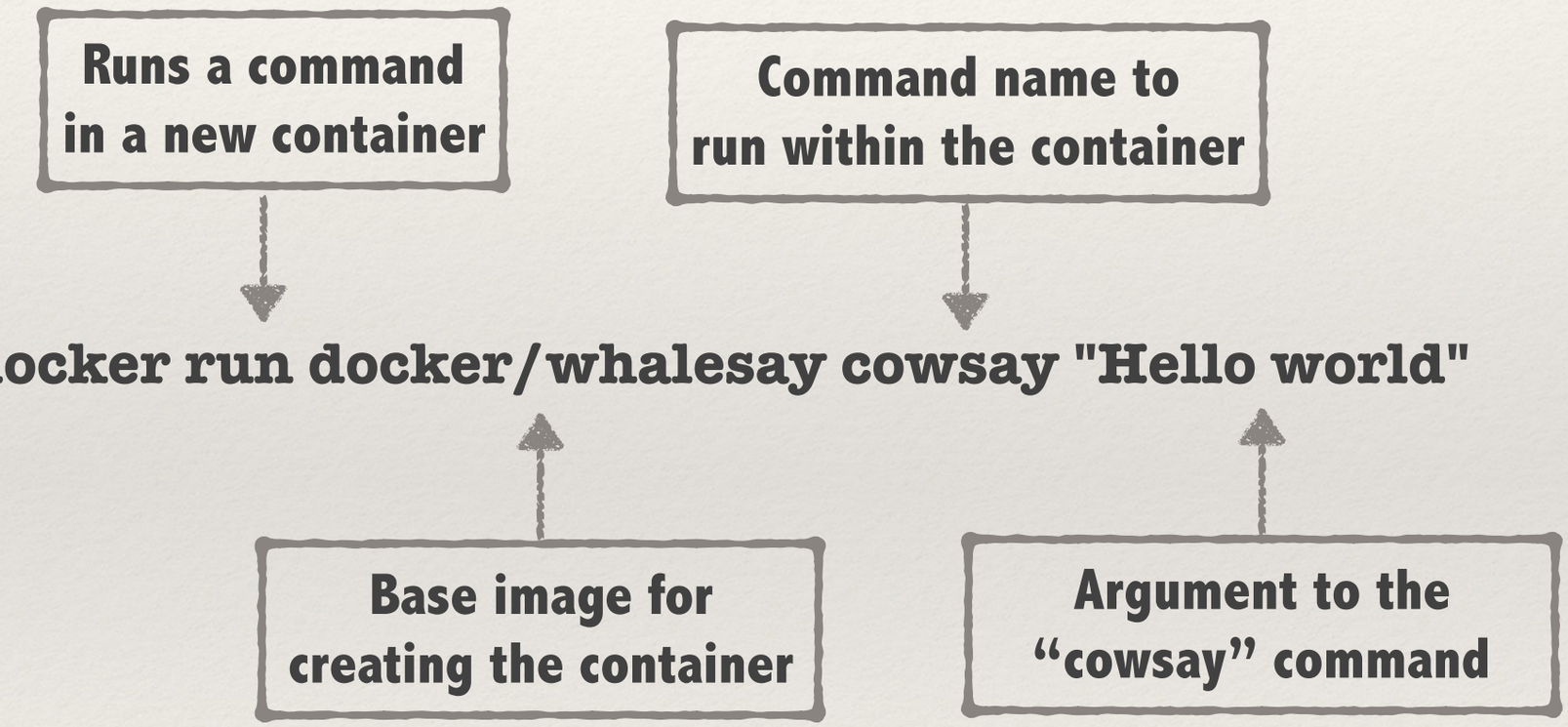
CodeOps

How to do “hello world” in Docker?

$ docker run docker/whalesay cowsay Hello world

```
$ docker run docker/whalesay cowsay Hello world
 _____________
< Hello world >
 -------------
    \
     \
                    ##         .
              ## ## ##        ==
             ## ## ## ##       ===
         /""""""""""""""""___/ ===
    ~~~ {~~ ~~~~ ~~~ ~~~~ ~~ ~ /  ===- ~~~
         \______ o          __/
          \     \        __/
            \____\______/
$
```

How to do “hello world” in Docker?



How to do “hello world” in Docker?

$ docker run -it hello-world

```
$ docker run -it hello-world

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker Hub account:
 https://hub.docker.com

For more examples and ideas, visit:
 https://docs.docker.com/engine/userguide/
```

The term “Docker” can be confusing: the client and the daemon both are called Docker!

How to get help on commands to use?

Use “docker -h” command, as in:

```
$ docker -h
Usage: docker [OPTIONS] COMMAND [arg...]
       docker [ --help | -v | --version ]

A self-sufficient runtime for containers.

Options:

  --config=~/.docker              Location of client config files
  -D, --debug                     Enable debug mode
  -H, --host=[]                   Daemon socket(s) to connect to
  -h, --help                      Print usage
  -l, --log-level=info            Set the logging level
  …

Commands:
    attach    Attach to a running container
```

CodeOps

Docker commands look like Linux commands - so familiarity with Linux commands can really help to get up to speed quickly with Docker.

CodeOps

Docker Images

CodeOps

How to get list of images?

```
$ docker images
REPOSITORY                    TAG                 IMAGE ID            CREATED             SIZE
prasantk/average              latest              de756e5f8b96        10 days ago         34.22 MB
<none>                        <none>              3d02168f00fc        10 days ago         34.22 MB
<none>                        <none>              d3a03f4665ab        10 days ago         34.22 MB
<none>                        <none>              827527375287        10 days ago         34.22 MB
<none>                        <none>              264584ac458e        10 days ago         745.6 MB
python                        3.5                 7fd24fb1b492        10 days ago         686 MB
example/docker-node-hello     latest              92baf9b777b8        2 weeks ago         658.6 MB
centos                        latest              05188b417f30        2 weeks ago         196.8 MB
hello-world                   latest              c54a2cc56cbb        2 weeks ago         1.848 kB
ubuntu                        latest              0f192147631d        2 weeks ago         132.8 MB
node                          0.10                8beaba2e26be        3 weeks ago         642.4 MB
alpine                        latest              4e38e38c8ce0        3 weeks ago         4.799 MB
fedora                        latest              f9873d530588        4 weeks ago         204.4 MB
nginx                         latest              0d409d33b27e        6 weeks ago         182.8 MB
docker/whalesay               latest              6b362a9f73eb        14 months ago       247 MB
training/webapp               latest              6fae60ef3446        14 months ago       348.8 MB
progrium/stress               latest              db646a8f4087        2 years ago         281.8 MB
```

CodeOps

How to search for an image?

```
$ docker search debian
NAME                                DESCRIPTION                                     STARS     OFFICIAL   AUTOMATED
debian                              Debian is a Linux distribution that's comp...   1503      [OK]
neurodebian                         NeuroDebian provides neuroscience research...   25        [OK]
armbuild/debian                     ARMHF port of debian                            8                    [OK]
jesselang/debian-vagrant            Stock Debian Images made Vagrant-friendly ...   8                    [OK]
eboraas/debian                      Debian base images, for all currently-avai...   5                    [OK]
mschuerig/debian-subsonic           Subsonic 5.1 on Debian/wheezy.                  4                    [OK]
reinblau/debian                     Debian with usefully default packages for ...   2                    [OK]
webhippie/debian                    Docker images for debian                        1                    [OK]
datenbetrieb/debian                 minor adaption of official upstream debian...   1                    [OK]
opennsm/debian                      Lightly modified Debian images for OpenNSM      1                    [OK]
lucasbarros/debian                  Basic image based on Debian                     1                    [OK]
lephare/debian                      Base debian images                              1                    [OK]
eeacms/debian                       Docker image for Debian to be used with EE...   1                    [OK]
maxexcloo/debian                    Docker base image built on Debian with Sup...   1                    [OK]
servivum/debian                     Debian Docker Base Image with Useful Tools      1                    [OK]
konstruktoid/debian                 Debian base image                               0                    [OK]
icedream/debian-jenkinsslave        Debian for Jenkins to be used as slaves.        0                    [OK]
visono/debian                       Docker base image of debian 7 with tools i...   0                    [OK]
nimmis/debian                       This is different version of Debian with a...   0                    [OK]
vcatechnology/debian                A Debian image that is updated daily            0                    [OK]
ustclug/debian                      debian image for docker with rustic mirror      0                    [OK]
fike/debian                         Debian Images with language locale installed.   0                    [OK]
pl31/debian                         Debian base image.                              0                    [OK]
mariorez/debian                     Debian Containers for PHP Projects              0                    [OK]
gnumoksha/debian                    [PT-BR] Imagem básica do Debian com ajust...    0                    [OK]
$
```

How to get an image?

Use “docker pull <image_name>” command

```
$ docker pull debian
Using default tag: latest
latest: Pulling from library/debian
5c90d4a2d1a8: Already exists
Digest: sha256:8b1fc3a7a55c42e3445155b2f8f40c55de5f8bc8012992b26b570530c4bded9e
Status: Downloaded newer image for debian:latest
```

In my case debian image was already pulled. If it were not there, Docker would have pulled it afresh

How to get details of an image?

Use “docker inspect <image_name>” command

```
docker inspect debian
[
    {
        "Id": "sha256:1b088884749bd93867ddb48ff404d4bbff09a17af8d95bc863efa5d133f87b78",
        "RepoTags": [
            "debian:latest"
        ],
        "RepoDigests": [
            "debian@sha256:8b1fc3a7a55c42e3445155b2f8f40c55de5f8bc8012992b26b570530c4bded9e"
        ],
        "Parent": "",
        "Comment": "",
        "Created": "2016-06-09T21:28:43.776404816Z",
        "Container": "2f3dcd897cf758418389d50784c73b43b1fd7db09a80826329496f05eef7b377",
        "ContainerConfig": {
            "Hostname": "6250540837a8",
            "Domainname": "",
            "User": "",
            "AttachStdin": false,
            "AttachStdout": false,
            "AttachStderr": false,
            "Tty": false,
            "OpenStdin": false,
            // ...
```

CodeOps

How to see “layers” in an image?

Use “docker history <image_name>” command

```
$ docker history gcc
IMAGE               CREATED             CREATED BY                                      SIZE                COMMENT
a0b516dc1799        5 weeks ago         /bin/sh -c set -x  && dpkg-divert --divert /u   8.657 MB
<missing>           5 weeks ago         /bin/sh -c echo '/usr/local/lib64' > /etc/ld.   49.69 kB
<missing>           5 weeks ago         /bin/sh -c buildDeps='flex'  && set -x  && ap   841.3 MB
<missing>           5 weeks ago         /bin/sh -c #(nop) ENV GCC_VERSION=6.1.0         0 B
<missing>           5 weeks ago         /bin/sh -c set -xe  && for key in $GPG_KEYS;    140.8 kB
<missing>           5 weeks ago         /bin/sh -c #(nop) ENV GPG_KEYS=B215C1633BCA04   0 B
<missing>           6 weeks ago         /bin/sh -c apt-get update && apt-get install    318.5 MB
<missing>           6 weeks ago         /bin/sh -c apt-get update && apt-get install    131.2 MB
<missing>           6 weeks ago         /bin/sh -c apt-get update && apt-get install    44.69 MB
<missing>           6 weeks ago         /bin/sh -c #(nop) CMD ["/bin/bash"]             0 B
<missing>           6 weeks ago         /bin/sh -c #(nop) ADD file:76679eeb94129df23c   125.1 MB
```

Each of these lines are layers and the size column shows the exact size of each layer in the image

CodeOps

How can I load and store images?

Use “docker save” and “docker load” commands

```
$ docker save nginx -o nginx.tar
$ ls -ltr nginx.tar
-rw-------  1 gsamarthyam  staff  190775808 Jul 20 11:04 nginx.tar
$ docker load -i ./nginx.tar
Loaded image: nginx:latest
```

CodeOps

How do I delete an image?

Use “docker rmi <image-tag>”

```
$ docker images alpine
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
alpine              latest              4e38e38c8ce0        4 weeks ago         4.799 MB
$ docker rmi alpine
Untagged: alpine:latest
Untagged: alpine@sha256:3dcdb92d7432d56604d4545cbd324b14e647b313626d99b889d0626de158f73a
$ docker images alpine
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
```

CodeOps

How to delete all docker images?

Use “$docker rmi $(docker images -q)”

docker images -q
lists all image ids

CodeOps

How to find “dangling images”?

Use “docker images -f "dangling=true"”

```
$ docker images -f "dangling=true"
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
<none>              <none>              777f9424d24d        7 minutes ago       125.2 MB
<none>              <none>              3d02168f00fc        12 days ago         34.22 MB
<none>              <none>              0f192147631d        3 weeks ago         132.8 MB
```

CodeOps

How to remove “dangling images”?

Use “docker rmi $(docker images -f "dangling=true" -q)”

How can I create my own Docker image?

Create “Dockerfile” - its like Makefile for Docker

```
$ cat myimage/Dockerfile
FROM ubuntu
RUN echo "my first image" > /tmp/first.txt
$ docker build myimage
Sending build context to Docker daemon 2.048 kB
Step 1 : FROM ubuntu
 ---> ac526a356ca4
Step 2 : RUN echo "my first image" > /tmp/first.txt
 ---> Running in 18f62f47d2c8
 ---> 777f9424d24d
Removing intermediate container 18f62f47d2c8
Successfully built 777f9424d24d
$ docker images | grep 777f9424d24d
<none>                          <none>              777f9424d24d        4 minutes ago       125.2 MB
$ docker run -it 777f9424d24d
root@2dcd9d0caf6f:/# ls
bin  boot  core  dev  etc  home  lib  lib64  media  mnt  opt  proc  root  run  sbin  srv
sys  tmp  usr  var
root@2dcd9d0caf6f:/# cat /tmp/first.txt
my first image
root@2dcd9d0caf6f:/#  exit
exit
$
```

How to name/tag an image when building?

Use “docker build <<dirname>> -t"imagename:tag"” command

```
$ docker build myimage –t"myfirstimage:latest"
Sending build context to Docker daemon 2.048 kB
Step 1 : FROM ubuntu
 ---> ac526a356ca4
Step 2 : RUN echo "my first image" > /tmp/first.txt
 ---> Using cache
 ---> 777f9424d24d
Successfully built 777f9424d24d
$ docker images myfirstimage
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
myfirstimage        latest              777f9424d24d        58 minutes ago      125.2 MB
$
```

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Docker Containers

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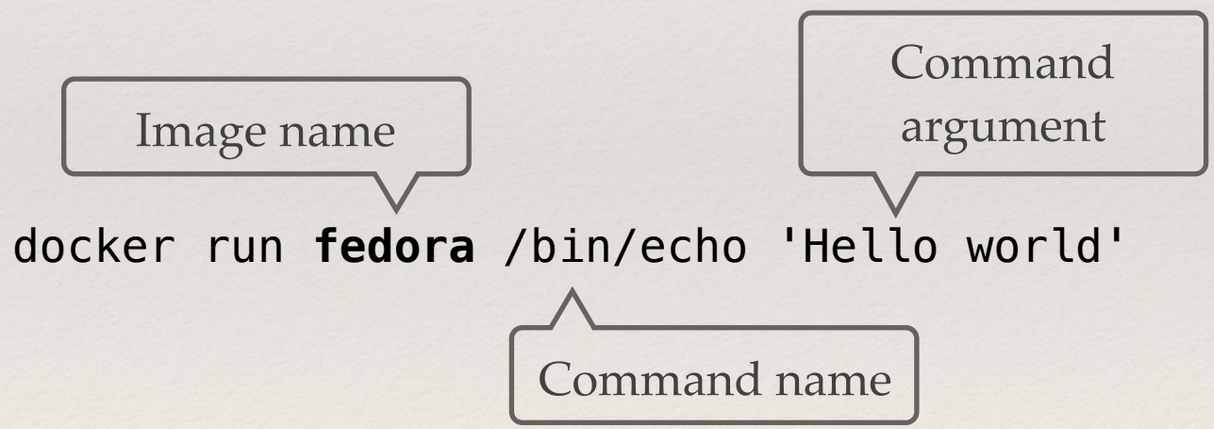
How to get list of containers?

```
$  docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS                      PORTS                    NAMES
6322b8204a5d        ubuntu              "/bin/bash"              6 days ago          Exited (0) 6 days ago                                desperate_aryabhata
1e95fcd15893        fedora              "/bin/bash"              6 days ago          Exited (0) 6 days ago                                stoic_agnesi
73c773524c8a        nginx               "nginx -g 'daemon off"   10 days ago         Exited (0) 9 days ago                                serene_hoover
70f0d1e4cd08        nginx               "-bridge:my-bridge-ne"   10 days ago         Created                     80/tcp, 443/tcp          happy_hawking
c2e2f1fd2352        ubuntu              "/bin/bash -c export"    10 days ago         Exited (0) 10 days ago                               sad_galileo
77ded5de4b2f        prasantk/average    "node average.js 1 2 "   10 days ago         Exited (0) 10 days ago                               mad_darwin
c676058126b1        prasantk/average    "node average.js 1 2 "   10 days ago         Exited (0) 10 days ago                               ecstatic_lalande
6bddbe7885f5        prasantk/average    "node average.js"        10 days ago         Exited (0) 10 days ago                               big_thompson
0a3ad84c2221        3d02168f00fc        "node average.js"        10 days ago         Exited (0) 10 days ago                               peaceful_minsky
47e697c3fc12        3d02168f00fc        "node average.js"        10 days ago         Exited (0) 10 days ago                               hungry_lamport
78797aa37937        3d02168f00fc        "-e '1 2 3'"             10 days ago         Created                                              drunk_mayer
8c13665a8ca8        3d02168f00fc        "1"                      10 days ago         Created                                              loving_carson
2afe5e6f1384        3d02168f00fc        "1 2 3"                  10 days ago         Created                                              nostalgic_leavitt
5d7403525309        3d02168f00fc        "1 2 3"                  10 days ago         Created                                              happy_newton
1045734ecd5c        3d02168f00fc        "node average.js"        10 days ago         Exited (0) 10 days ago                               reverent_williams
8989e7fc7d7a        nginx               "nginx -g 'daemon off"   10 days ago         Exited (0) 9 days ago                                kickass_lichterman
a08eb10ae2fa        nginx               "nginx -g 'daemon off"   10 days ago         Exited (0) 10 days ago                               docker-nginx
e447a0763ff1        nginx               "nginx -g 'daemon off"   10 days ago         Exited (0) 10 days ago                               hopeful_dijkstra
9a1eab880312        alpine              "/bin/sh"                10 days ago         Exited (0) 10 days ago                               hungry_sinoussi
1932e28ef5cc        alpine              "/bin/bash"              10 days ago         Created                                              modest_engelbart
454adf9473f9        alpine              "echo hello"             10 days ago         Exited (0) 10 days ago                               elated_curran
ad834018d0a3        alpine              "echo hello"             10 days ago         Exited (0) 10 days ago                               sleepy_davinci
4a678e2c1c11        hello-world         "/hello"                 10 days ago         Exited (0) 10 days ago                               thirsty_keller
369e76f97dd7        training/webapp     "python app.py"          13 days ago         Exited (0) 13 days ago      0.0.0.0:32771->5000/tcp  boring_roentgen
826204fae788        hello-world         "/hello"                 13 days ago         Exited (0) 13 days ago                               happy_kalam
4c8bacdd231a        docker/whalesay     "cowsay foobar"          13 days ago         Exited (0) 13 days ago                               big_carson
60809ce0320d        docker/whalesay     "cowsay boo"             13 days ago         Exited (0) 13 days ago                               distracted_wilson
1e5d8f24be78        ubuntu              "/bin/bash"              2 weeks ago         Exited (0) 2 weeks ago                               fervent_agnesi
8a23c6c978f3        ubuntu:latest       "/bin/bash"              2 weeks ago         Created                                              berserk_pare
64c20bcac482        ubuntu              "echo hello"             2 weeks ago         Exited (0) 2 weeks ago                               gloomy_darwin
213605afcc24        ubuntu              "hello"                  2 weeks ago         Created                                              goofy_jones
6575e1b2ae09        ubuntu              "hello"                  2 weeks ago         Created                                              condescending_shirley
8345b4e82a5b        ubuntu              "hello"                  2 weeks ago         Created                                              serene_jepsen
ce31cb01a791        ubuntu              "echo hello"             2 weeks ago         Exited (0) 2 weeks ago                               small_bhaskara
cf3b1580e3d1        ubuntu              "hello"                  2 weeks ago         Created                                              evil_heyrovsky
f46a4880894e        ubuntu              "hello"                  2 weeks ago         Created                                              sick_lamport
```

How to run a container?

Use “docker run OPTIONS <<image-tag>> CMD ARGS”

```
$ docker run fedora /bin/echo 'Hello world'
Hello world
$
```



How to run a container interactively?

```
$  docker run -t -i fedora /bin/bash
[root@00eef5289c91 /]# pwd
/
[root@00eef5289c91 /]# whoami
root
[root@00eef5289c91 /]# ls
bin  boot  dev  etc  home  lib  lib64  lost+found  media  mnt  opt  proc  root  run  sbin  srv
sys  tmp  usr  var
[root@00eef5289c91 /]# cc
bash: cc: command not found
[root@00eef5289c91 /]# gcc
bash: gcc: command not found
[root@00eef5289c91 /]# java
bash: java: command not found
[root@00eef5289c91 /]# tar
bash: tar: command not found
[root@00eef5289c91 /]# exit
exit
$
```

Create a terminal to interact with

`docker run -t -i fedora /bin/bash`

short for “—interactive"

How to run a container in the background?

short for "—detach" and it runs container in the background

```
$ docker run -d ubuntu /bin/sh -c "while true; do echo current date and time is: $(date); sleep 10; done"
9128bf57e03c3b32f0bf784a92332953996236d7e358a77c62c10bdec95fd5b9
$ docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS               NAMES
9128bf57e03c        ubuntu              "/bin/sh -c 'while tr"   About a minute ago   Up About a minute                       lonely_einstein
$ docker logs 9128bf57e03c3b32f0bf784a92332953996236d7e358a77c62c10bdec95fd5b9
current date and time is: Fri Jul 22 15:42:49 IST 2016
current date and time is: Fri Jul 22 15:42:49 IST 2016
current date and time is: Fri Jul 22 15:42:49 IST 2016
current date and time is: Fri Jul 22 15:42:49 IST 2016
// output elided
```

How to attach to a running container?

short for "—detach" and it runs container in the background

```
$ docker run -d ubuntu /bin/sh -c "while true; do echo current date and time is: $
(date); sleep 10; done"
acc349675098a0133366076f2082db6171ee4a0cd2e1e45ada9a485684ea4c01
$ docker attach acc349675098a0133366076f2082db6171ee4a0cd2e1e45ada9a485684ea4c01
current date and time is: Mon Aug 1 10:30:13 IST 2016
current date and time is: Mon Aug 1 10:30:13 IST 2016
```

The "attach" command attaches to a running container

How do I create an image from a running container?

Use “docker commit” command

```
$ docker run -d alpine echo "hello world"
9884347880f62f7c5d43702c3d701e3b87a49f9bdde5843380af1479f4dc0755
$ docker logs 9884347880f62f7c5d43702c3d701e3b87a49f9bdde5843380af1479f4dc0755
hello world
$ docker commit -m "my first image from container"
9884347880f62f7c5d43702c3d701e3b87a49f9bdde5843380af1479f4dc0755 myalpine:latest
sha256:b707ef35394c365bece70240213942e43da7f882107d30482ad6bec6b4bacfb7
$ docker images
REPOSITORY                    TAG                 IMAGE ID            CREATED
SIZE
myalpine                      latest              b707ef35394c        18 hours ago
4.799 MB
$ docker run -it b707ef35394c365bece70240213942e43da7f882107d30482ad6bec6b4bacfb7
hello world
$
```

How to get list of containers?

Use “docker ps” command

```
$ docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS                    NAMES
3651758ff308        wordpress:latest    "/entrypoint.sh apach"   2 days ago          Up 2 days           0.0.0.0:8000->80/tcp     mywordpress_wordpress_1
b95388054539        mysql:5.7           "docker-entrypoint.sh"   2 days ago          Up 2 days           3306/tcp                 mywordpress_db_1
```

How do I see all the containers?

Use “docker ps -a” command

```
$ docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS                      PORTS                    NAMES
2c378c6b84b1        fedora              "/bin/echo 'Hello wor"   4 minutes ago       Exited (0) 4 minutes ago                             grave_thompson
c4b2db95f268        hello-world         "/hello"                 5 minutes ago       Exited (0) 5 minutes ago                             amazing_jones
2dcd9d0caf6f        777f9424d24d        "/bin/bash"              42 minutes ago      Exited (0) 42 minutes ago                            prickly_khorana
3651758ff308        wordpress:latest    "/entrypoint.sh apach"   2 days ago          Up 2 days                   0.0.0.0:8000->80/tcp     mywordpress_wordpress_1
b95388054539        mysql:5.7           "docker-entrypoint.sh"   2 days ago          Up 2 days                   3306/tcp                 mywordpress_db_1
4b984664f9aa        golang:latest       "go run myapp.go"        2 days ago          Exited (1) 2 days ago                                mydocker_app_1
63cd7661a8ad        hello-world         "/hello"                 2 days ago          Exited (0) 2 days ago                                adoring_sammet
c191fbeae884        ubuntu              "/bin/bash"              2 days ago          Exited (0) 2 days ago                                clever_mcclintock
08e173332d46        docker/whalesay     "cowsay Hello world"     2 days ago          Exited (0) 2 days ago                                tender_joliot
6322b8204a5d        0f192147631d        "/bin/bash"              9 days ago          Exited (0) 9 days ago                                desperate_aryabhata
...
```

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How do I remove a container?

Use “docker rm” command

```
$ docker stop mywordpress_db_1
mywordpress_db_1
$ docker rm mywordpress_db_1
mywordpress_db_1
```

You have to first stop a container before trying to remove it

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How do I remove all the containers?

Use “docker stop $(docker ps -a -q)” and
“docker rm $(docker ps -a -q)” commands

```
$ docker stop $(docker ps –a –q)
00eef5289c91
8553eebfab94
696a04db91db
// rest of the output elided
$ docker rm $(docker ps –a –q)
00eef5289c91
8553eebfab94
696a04db91db
// rest of the output elided
$ docker ps –a
CONTAINER ID        IMAGE               COMMAND             CREATED             STATUS
PORTS               NAMES
```

Note how the output shows no containers