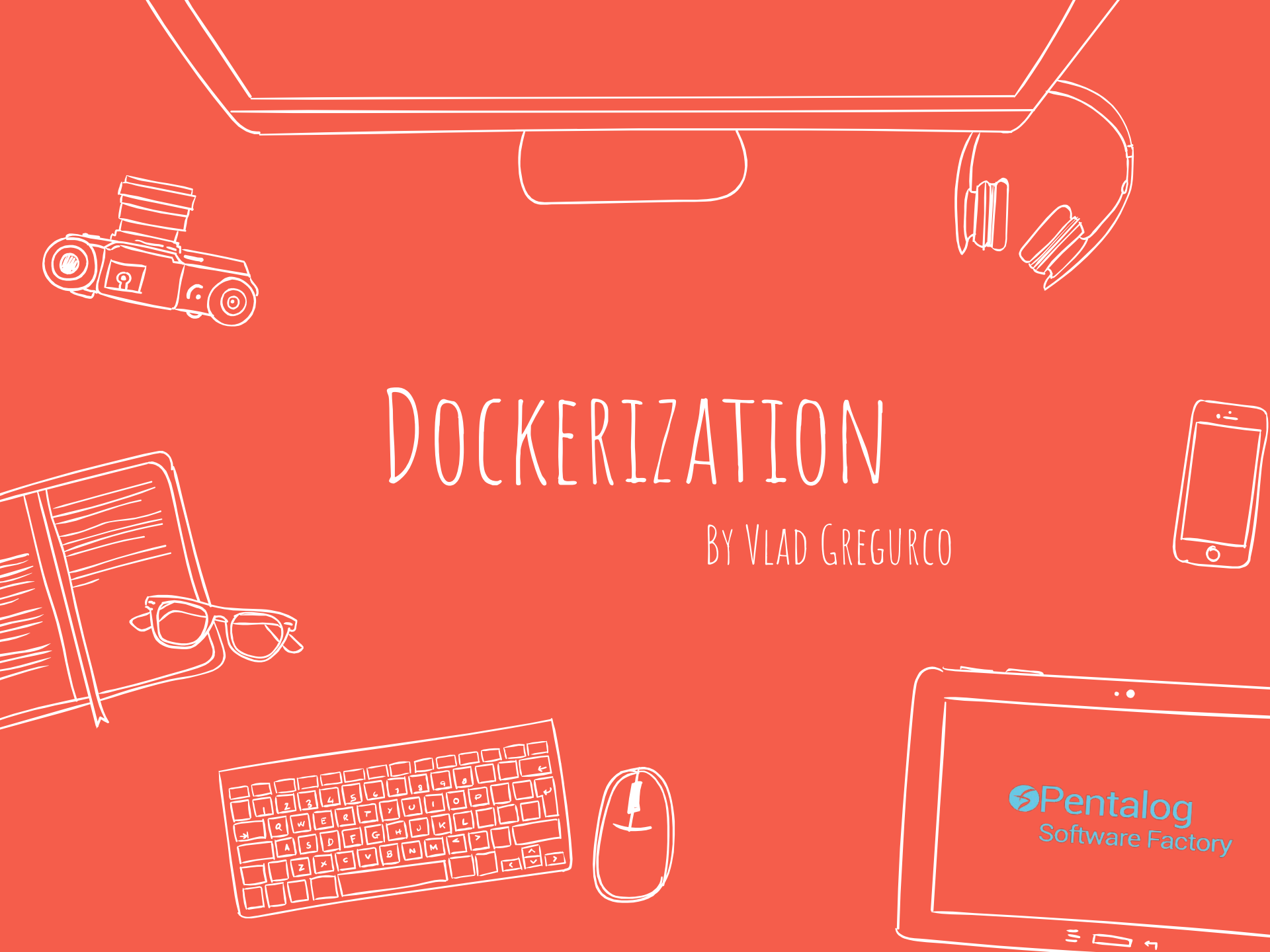
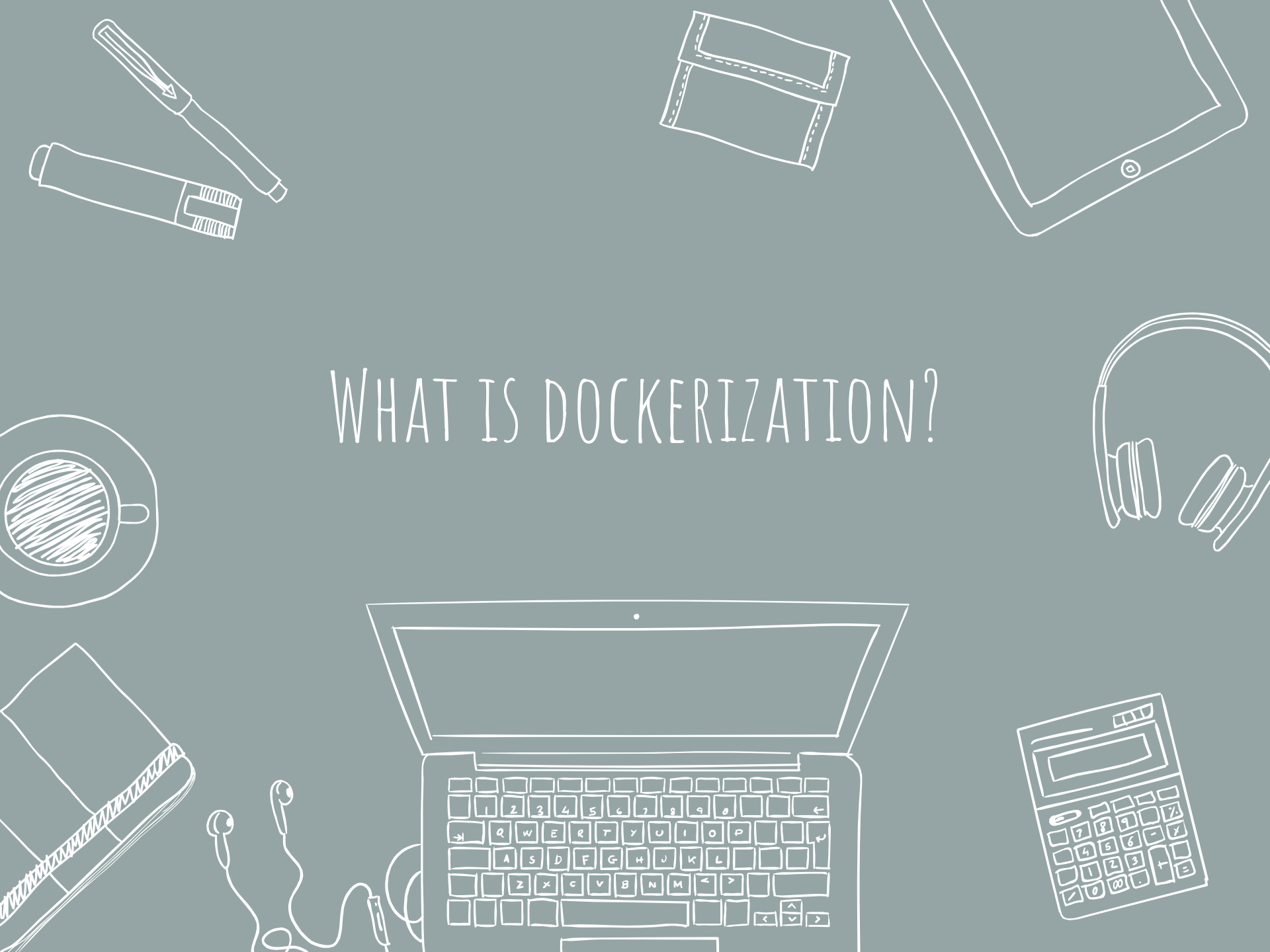
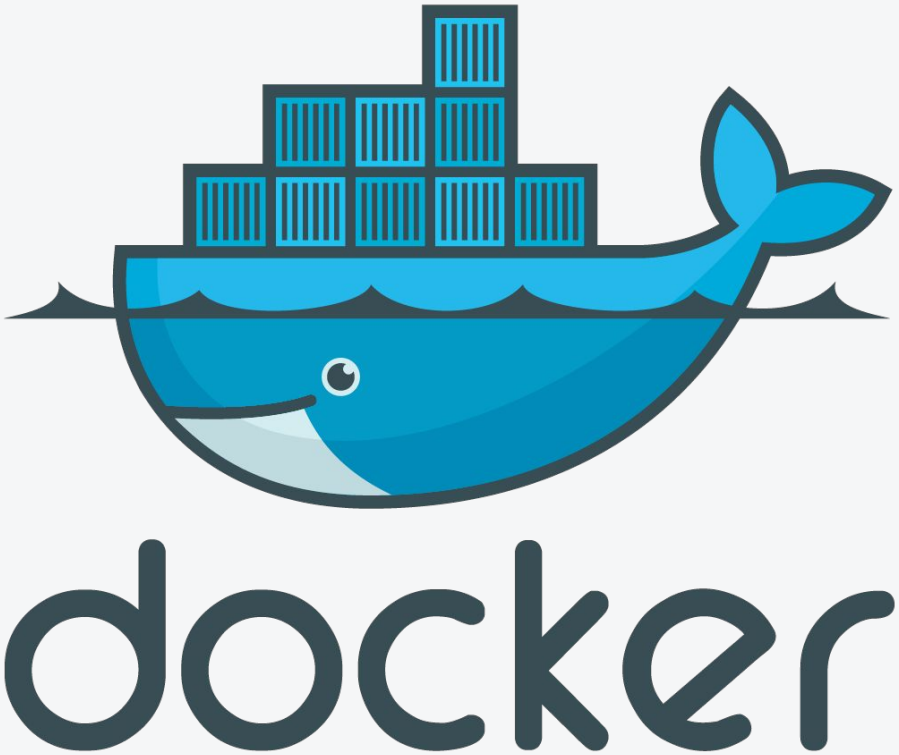
Dockerization

By Vlad Gregurco

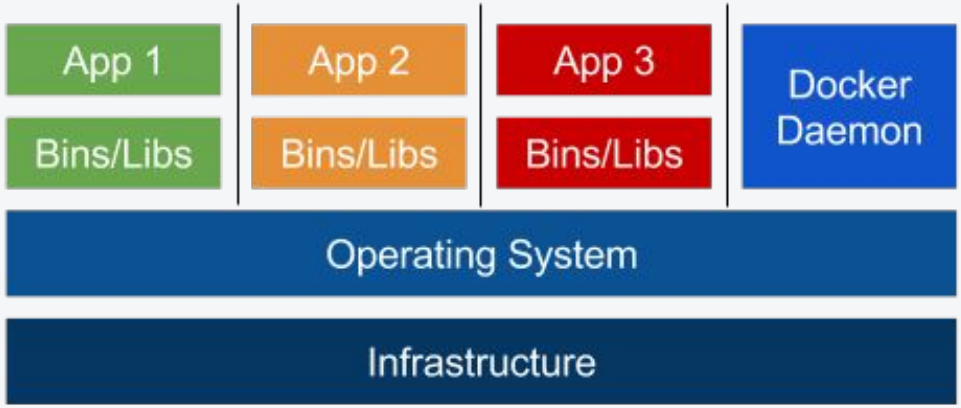


What is dockerization?



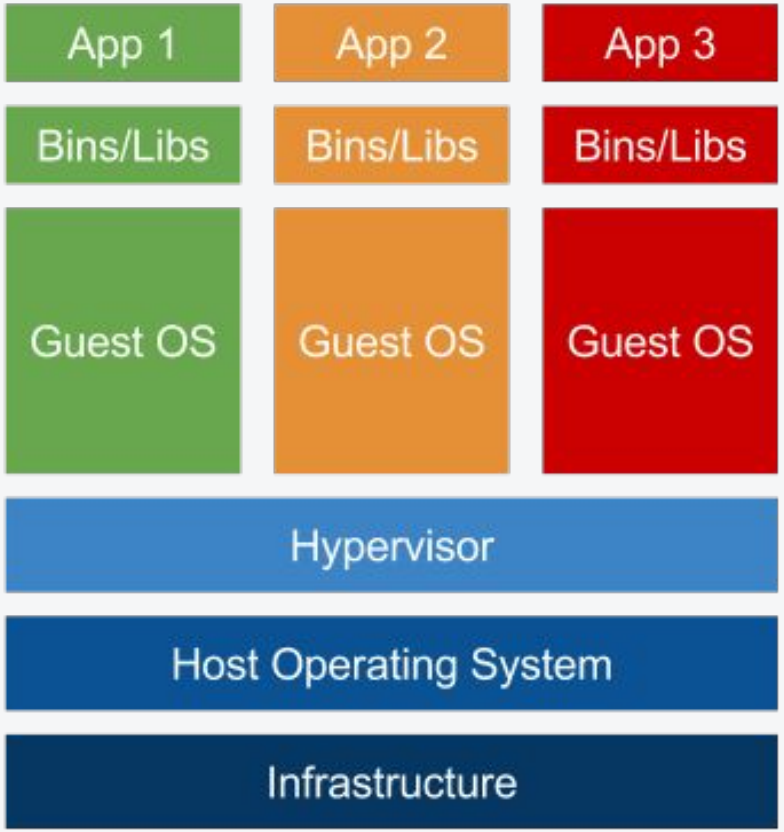


Docker logo



CONTAINER-BASED VIRTUALIZATION SCHEMA

WHAT WAS BEFORE?



Hypervisor-based Virtualization schema

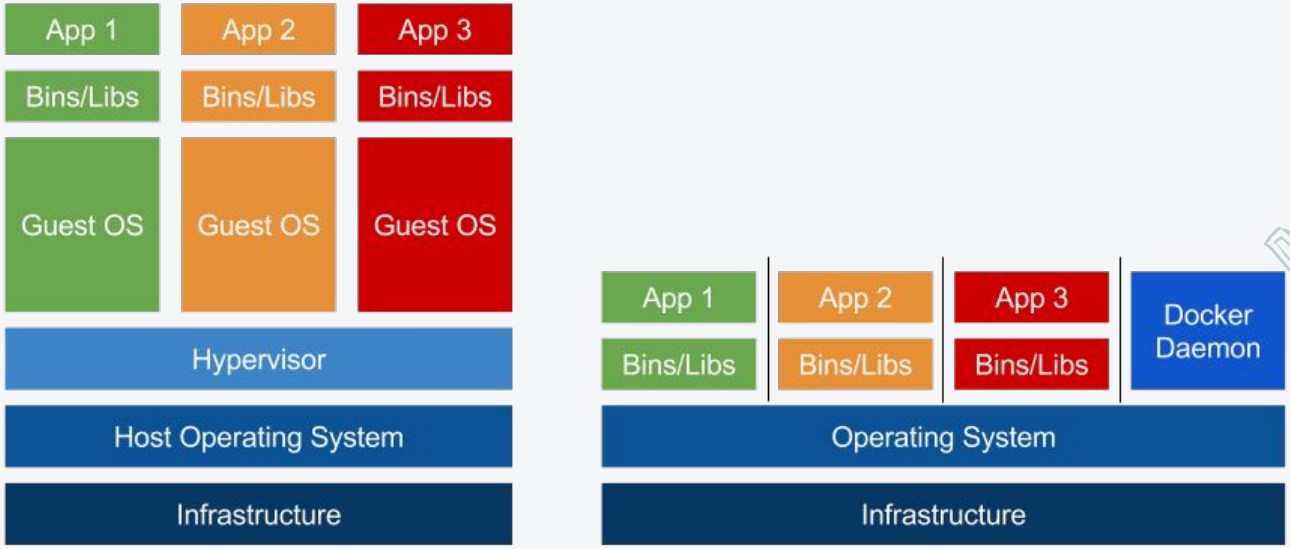
Parallels™

vmware

ORACLE VirtualBox

QEMU

Hypervisor-based Virtualization


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

Comparison


SOUNDS GOOD BUT
DO WE NEED IT?
imgflip.com

YES

Advantages

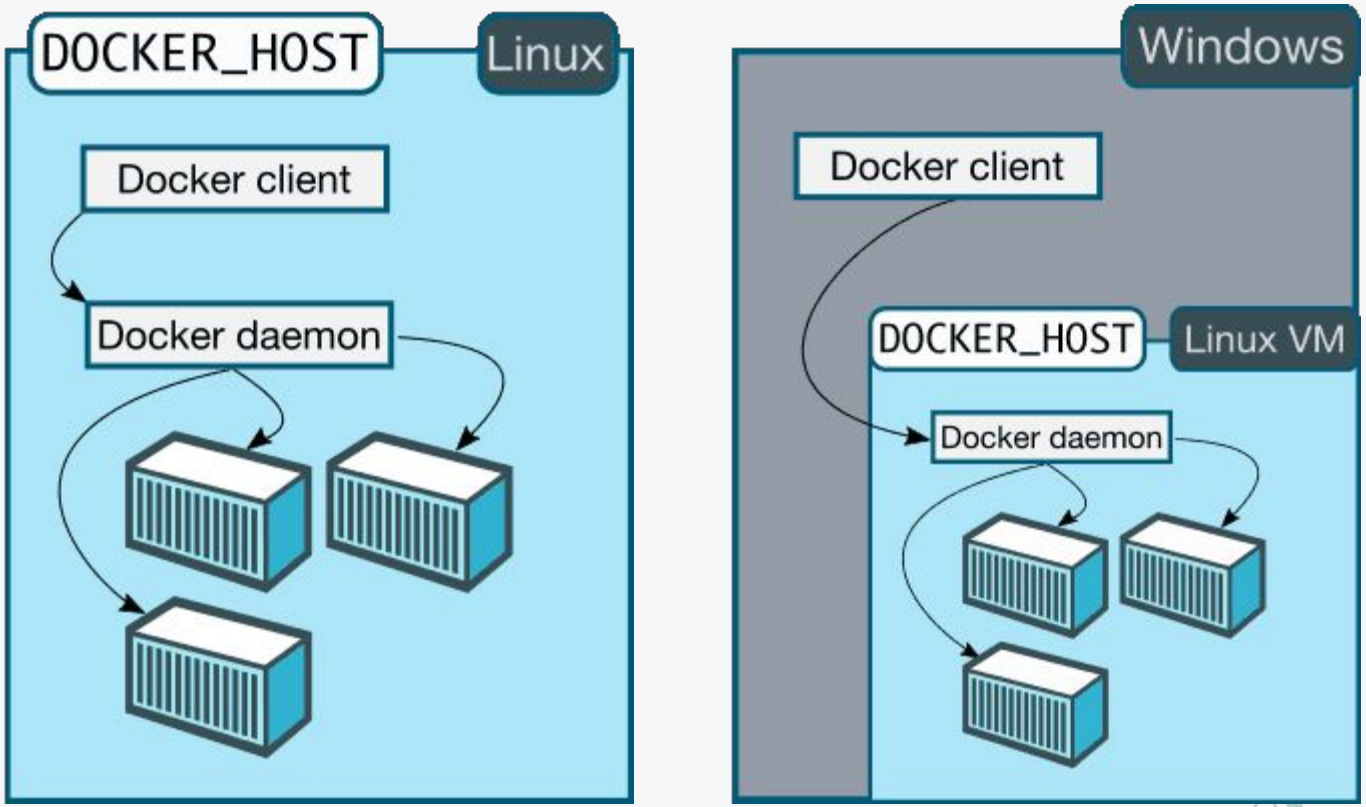
- Simple setup
- Possibility to develop different application with different dependencies
- Prepared official/community images
- Implements *“Infrastructure as Code”* principle
- Common environment for devs
- Common setup for dev/test/prod
- Security
- Isolation


SETUP

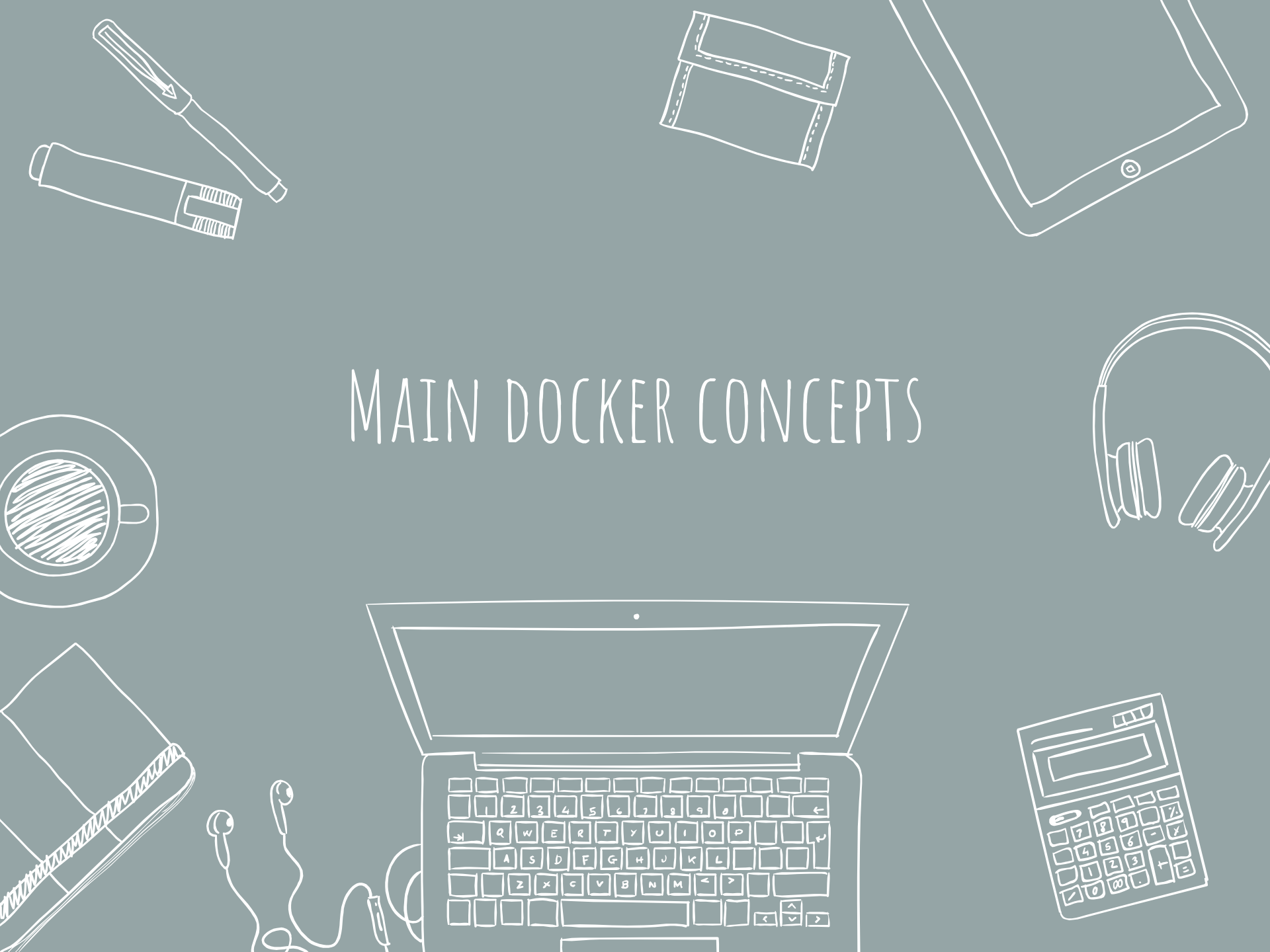
Setup

- Install docker
  - Ubuntu: https://docs.docker.com/install/linux/docker-ce/ubuntu/
  - Windows: https://docs.docker.com/docker-for-windows/install/
- Install docker-compose
  - https://docs.docker.com/compose/install/
- Search for images:
  - https://hub.docker.com/

Docker on Linux and Windows



Main docker concepts



Images

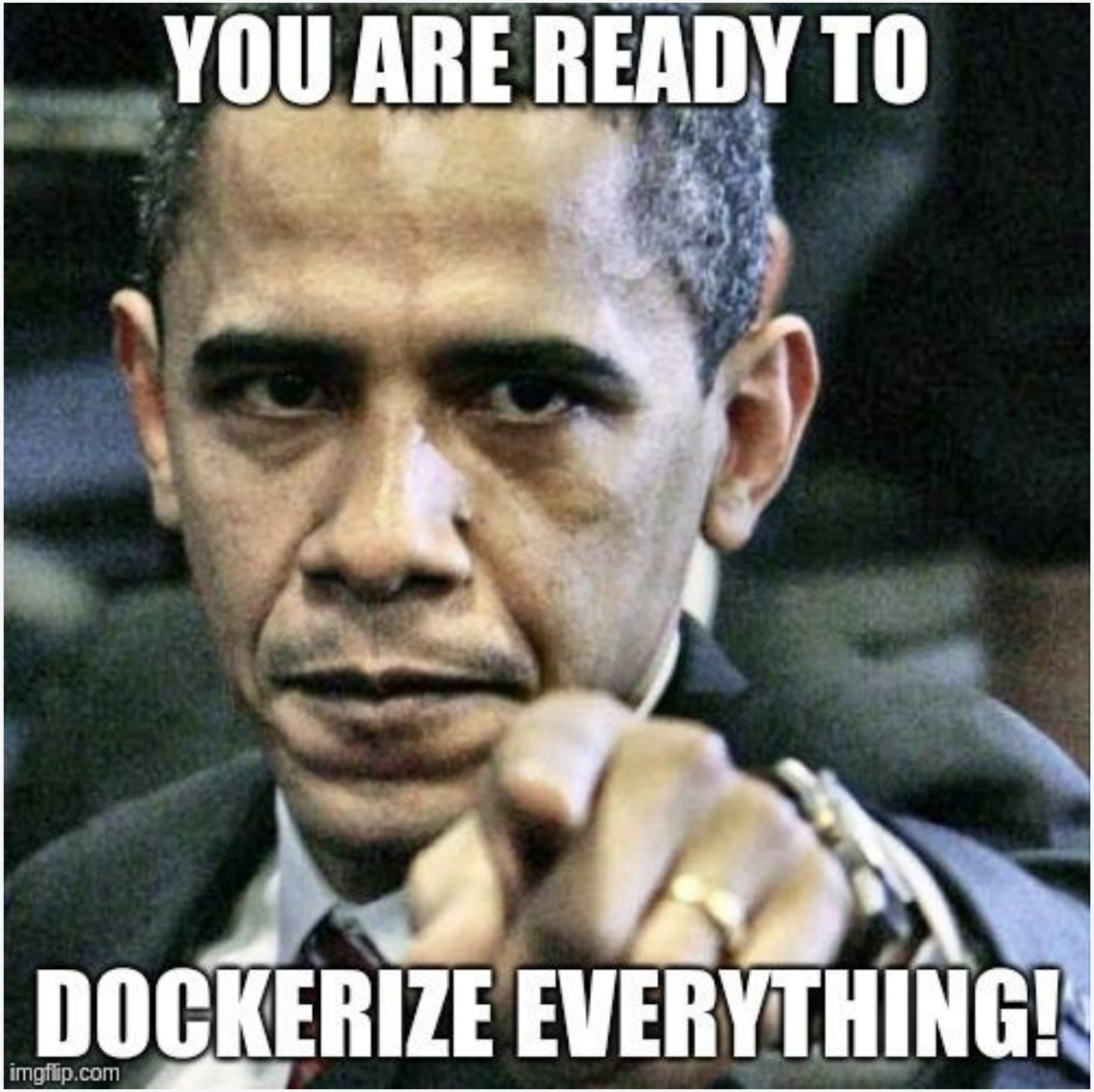
- Images are read only templates used to create containers.
- Images are created with the *docker build* command.
- Images are composed of layers of other images.
- Images are stored in a Docker registry.

Containers

- If an image is a class, then a container is an instance of a class - a runtime object.
- Containers are created from images. Inside a container, it has all the binaries and dependencies needed to run the application.
- Containers are lightweight and portable encapsulations of an environment in which to run applications.

Registries

- A registry is where we store our *images*.
- You can host your own registry, or you can use Docker's public registry which is called DockerHub.


YOU ARE READY TO
DOCKERIZE EVERYTHING!
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Run first container

Find BusyBox image

Search - Docker Hu

1

Secure https://hub.docker.com/search/?isAutomated=0&isOfficial=0&page=1&pullCount=0&q=busybox&starCount=0

Docker Store is the new place to discover public Docker content. Check it out →

busybox

2

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Repositories (1882)

All

3

busybox official	1.2K STARS	10M+ PULLS	DETAILS
arm64v8/busybox public	0 STARS	500K+ PULLS	DETAILS
s390x/busybox public	2 STARS	100K+ PULLS	DETAILS
radial/busyboxplus public | automated build	19 STARS	500K+ PULLS	DETAILS
hypriot/rpi-busybox-httpd	40	1M+	

Find last BusyBox version

library/busybox - D

Secure | https://hub.docker.com/_/busybox/

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OFFICIAL REPOSITORY

busybox

Last pushed: 10 days ago

Repo Info | Tags (2)

Short Description

Busybox base image.

Docker Pull Command

```
docker pull busybox
```

Full Description

Supported tags and respective `Dockerfile` links

- `1.28.3-uclibc`, `1.28-uclibc`, `1-uclibc`, `uclibc` (*uclibc/Dockerfile*)
- `1.28.3-glibc`, `1.28-glibc`, `1-glibc`, `glibc` (*glibc/Dockerfile*)
- `1.28.3-musl`, `1.28-musl`, `1-musl`, `musl` (*musl/Dockerfile*)
- (1) `1.28.3`, `1.28`, `1`, `latest` (*uclibc/Dockerfile*)

Quick reference

- **Where to get help**:

Run BusyBox container

```
[node1] (local) root@192.168.0.23 ~
$ docker run busybox:1.28 echo "Hello World"
Unable to find image 'busybox:1.28' locally
1.28: Pulling from library/busybox
f70adabe43c0: Pull complete
Digest: sha256:58ac43b2cc92c687a32c8be6278e50a063579655fe3090125dcb2af0ff9e1a64
Status: Downloaded newer image for busybox:1.28
Hello World
```

Docker command parts:

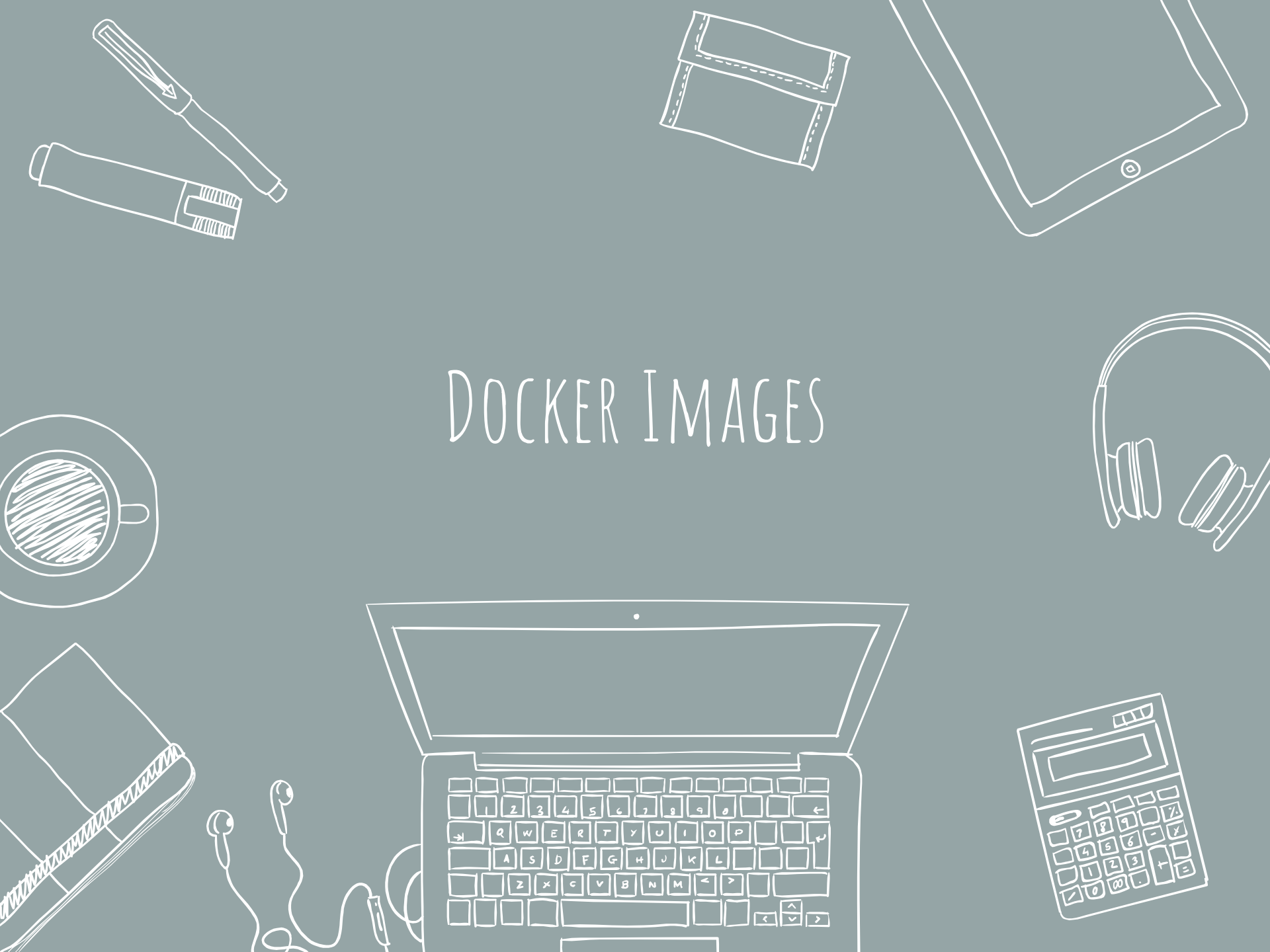
- **run** - run a command in a new container
- **busybox** - image name
- **1.28** - image version
- **Echo "hello World"** - command to execute in container

** To run commands it's possible to use https://labs.play-with-docker.com/ , **but** better is to do it locally*

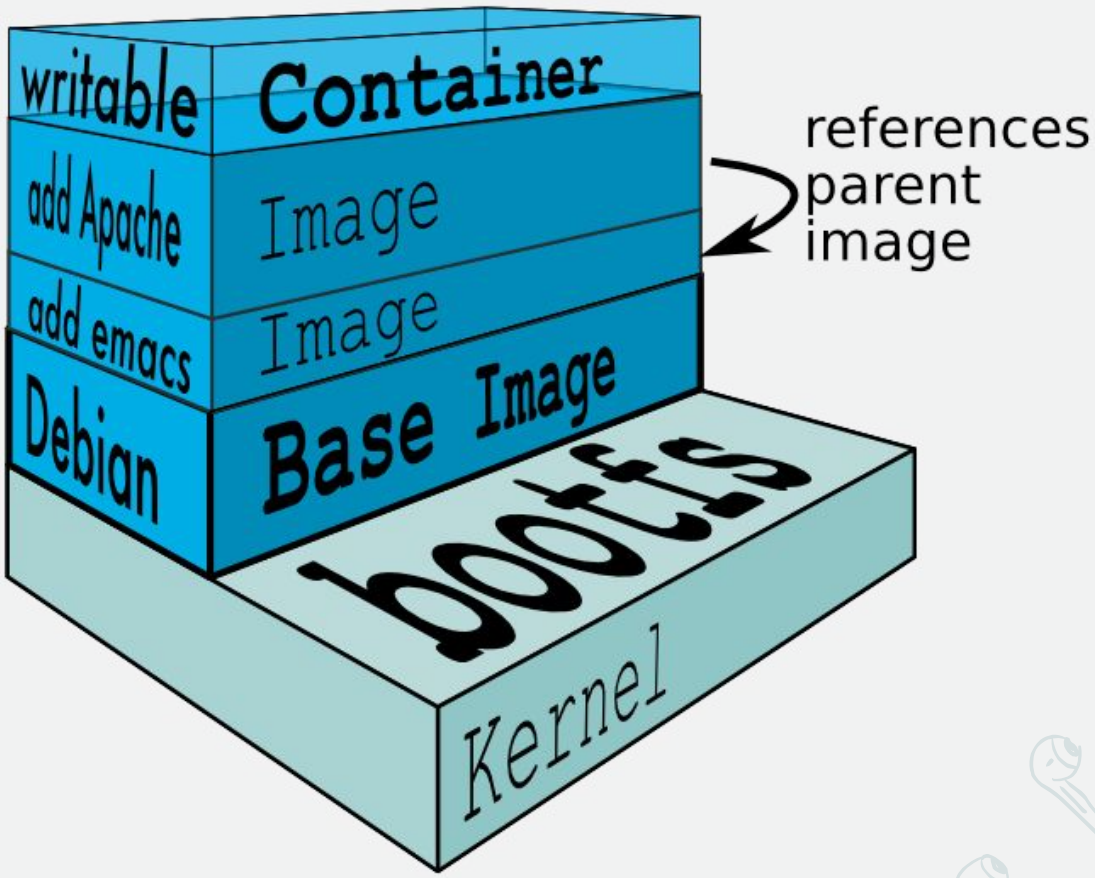
Practical Part

- Run: docker run busybox:1.28 **ls**
- Run:
  - docker run **-it** busybox:1.28
  - Create inside the container an empty file
  - Exit from container
  - Run first command once again
  - Check if file exists
- Run:
  - docker run **-d** busybox:1.28 sleep 1000
  - docker **ps**
  - docker ps **-a**
  - Try docker run command with **--rm** and **--name** options
  - docker **inspect** container_id
- Run:
  - docker run -d **-p 8888:80** nginx:1.13
  - Open a browser with address localhost:8888
  - docker **logs** container_id
  - docker logs **-f** container_id

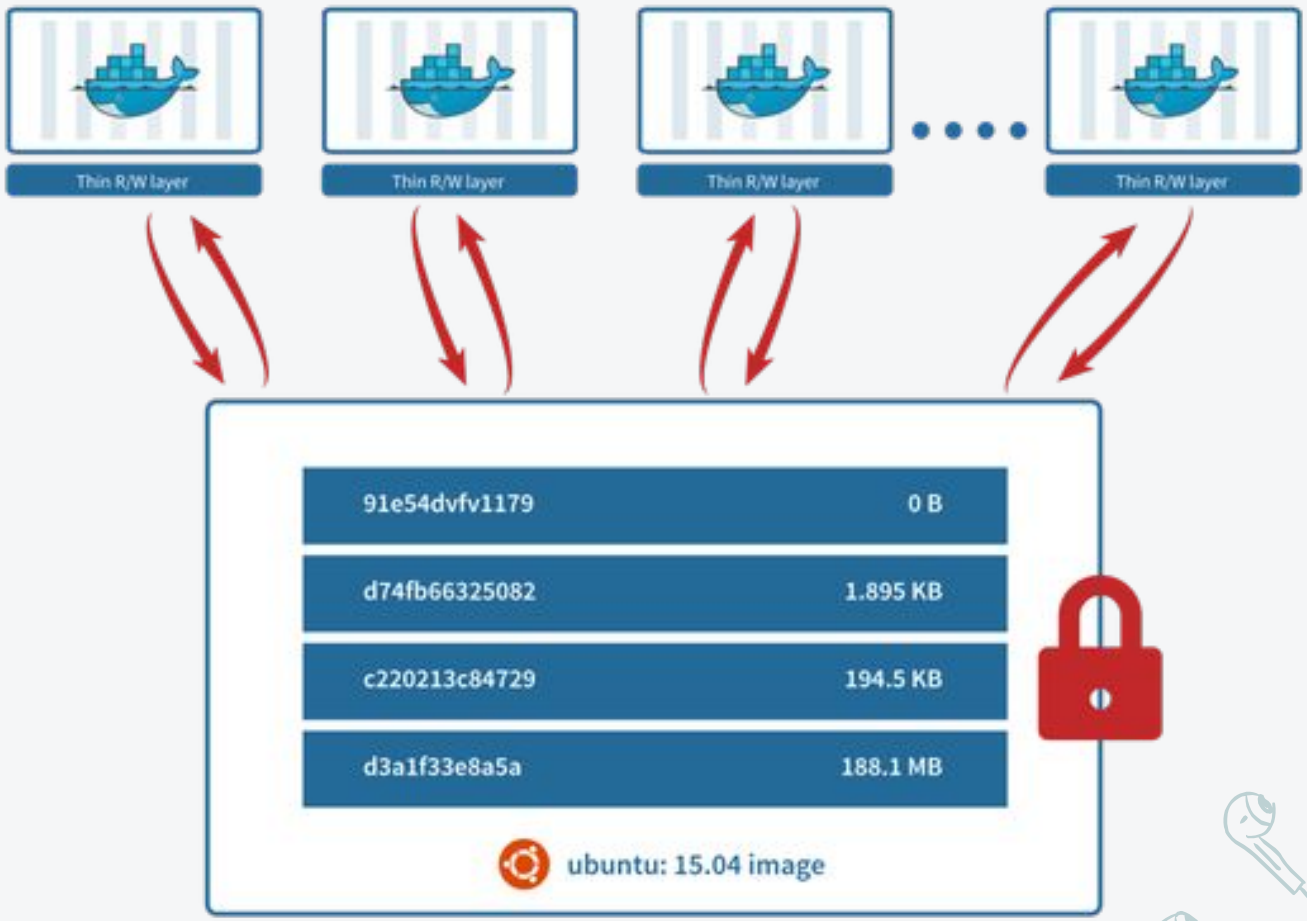
Docker Images



Docker Image Layers



Docker Image Layers



Build docker image (commit command)

- Run: *docker run -it debian:jessie*
- Check that git is not installed
- Run: *apt-get update && apt-get install git*
- Check that git is installed and exit from container
- Run:
  - *docker ps -a* and find there the container id of debian
  - *docker commit container_id your_login/debian:1.0*
  - *docker images*
- Check that new image appeared
- Run: *docker history your_login/debian:1.0.0*

Note: Now you can push this image to registry or run containers based on this image.

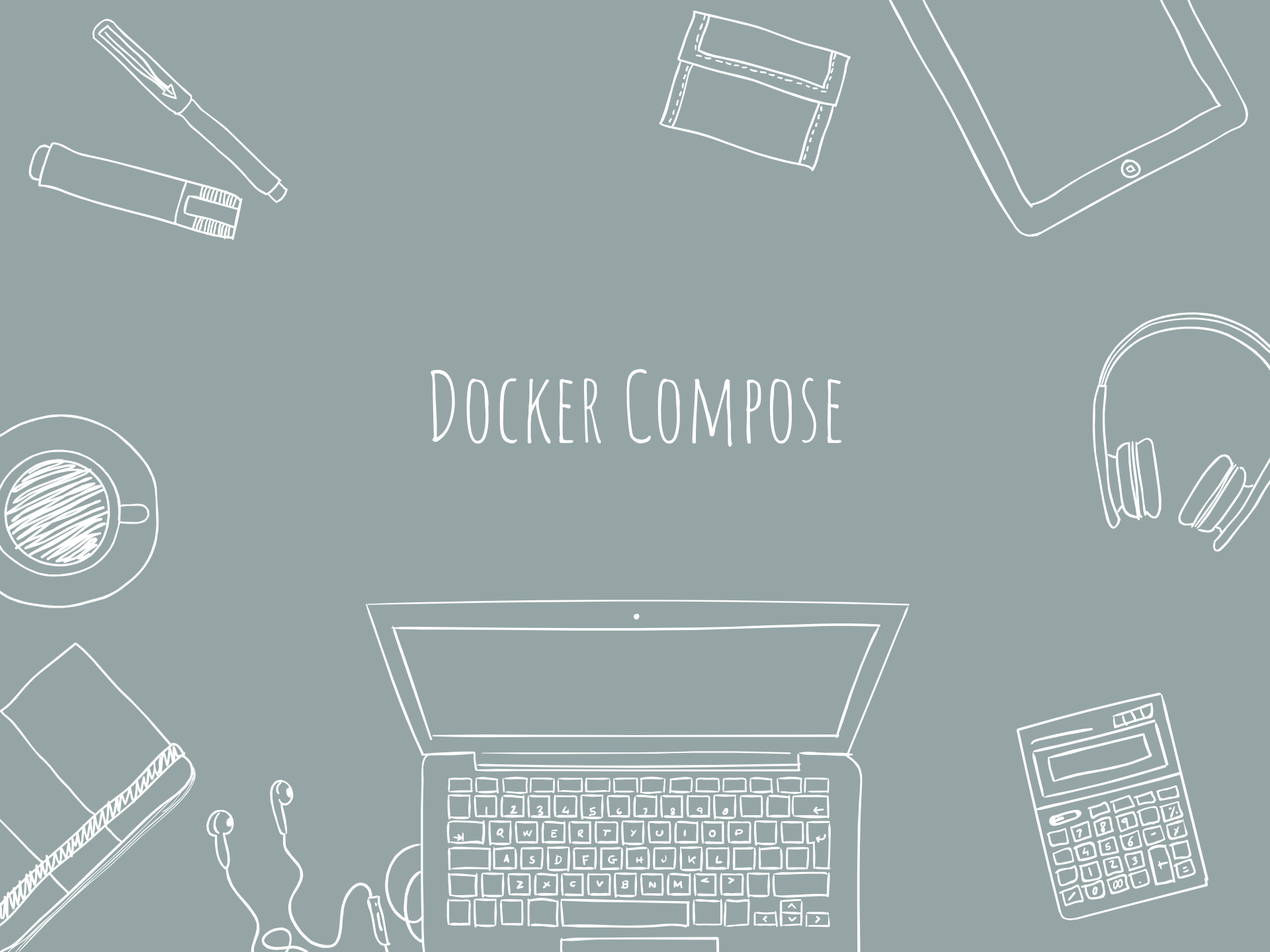
Build docker image (dockerfile)

- Create new file with name *Dockerfile* and next content:

```
FROM debian:jessie

RUN apt-get update && apt-get install -y git
```

- Run: *docker build -t your_login/debian_from_dockerfile .*
- Run: *docker images*
- Check that image is created
- Try to do the same build but split **run** in two commands. See the history of the image.

Docker Compose



Docker Compose

- Docker compose is a very handy tool to quickly get docker environment up and running.
- Docker compose uses yaml files to store the configuration of all the containers, which removes the burden to maintain our scripts for docker orchestration.

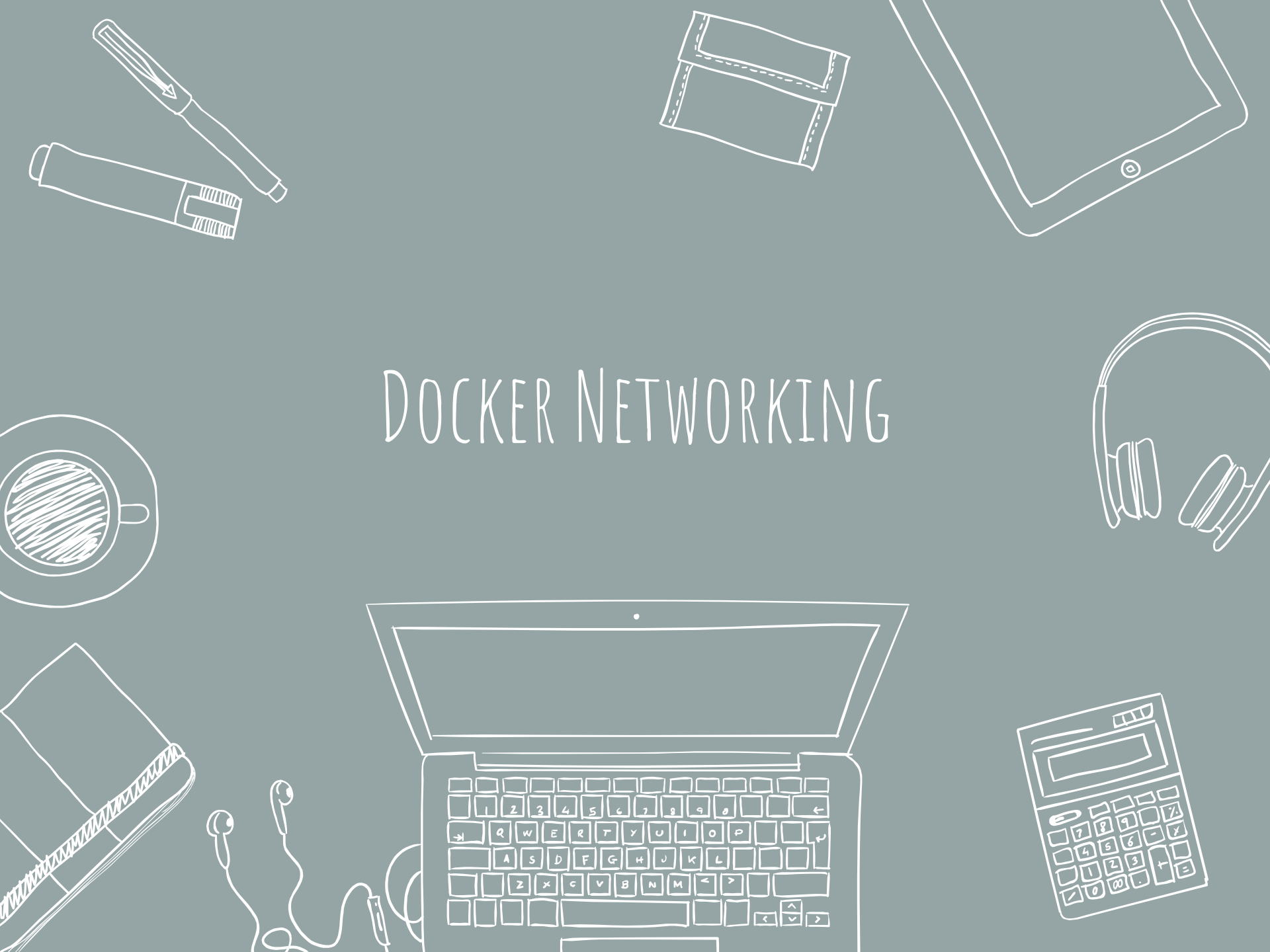
Docker Compose Config example

```yaml
version: "3.1"
services:
    redis:
      image: redis:alpine
      container_name: project-redis

    mysql:
      image: mysql:5.7
      container_name: project-mysql
      working_dir: /application
      volumes:
        - .:/application
      environment:
        - MYSQL_ROOT_PASSWORD=password
        - MYSQL_DATABASE=project_db
        - MYSQL_USER=user
        - MYSQL_PASSWORD=password
      ports:
        - '3306:3306'

    webserver:
      image: nginx:alpine
      container_name: project-webserver
      working_dir: /application
      volumes:
          - .:/application
          - ./phpdocker/nginx/nginx.conf:/etc/nginx/conf.d/default.conf
      ports:
       - "8080:80"

    php-fpm:
      build: phpdocker/php-fpm
      container_name: project-php-fpm
      working_dir: /application
      volumes:
        - .:/application
```

Docker Compose Commands

- **docker compose up** - starts up all the containers.
- **docker compose ps** - checks the status of the containers managed by docker compose.
- **docker compose logs** - outputs colored and aggregated logs for the compose-managed containers.
- **docker compose logs -f** - outputs appended log when the log grows.
- **docker compose logs *container_name*** - outputs the logs of a specific container.
- **docker compose stop** - stops all the running containers without removing them.
- **docker compose rm** - removes all the containers.
- **docker compose build** - rebuilds all the images.

Docker Networking

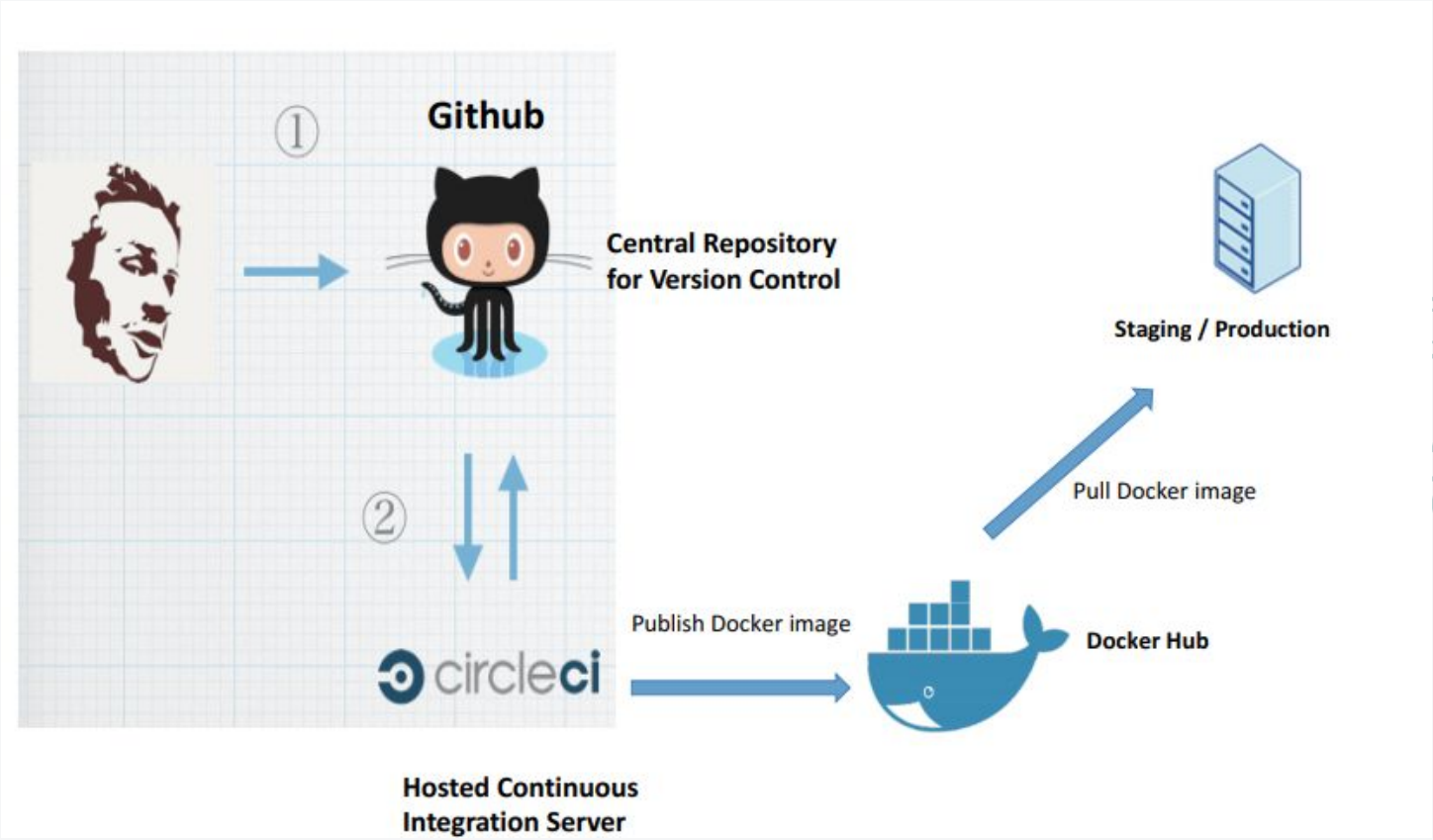


Docker Network Types

- **Closed Network / None Network** - disable all networking.
- **Bridge Network** - the default network driver which allows containers connected to the same bridge network to communicate.
- **Host Network** - adds a container on the host's network stack.

Complete CI Workflow

Complete CI Workflow



Final Tips And Tricks

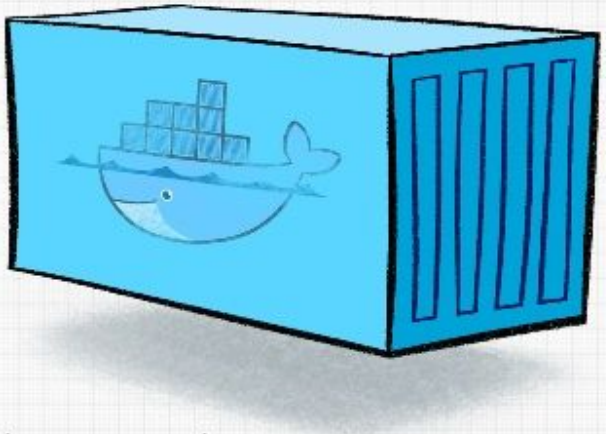
- Use Docker
- Use Docker Compose in case running multi-containers
- Whenever possible, use current Official Repositories as the basis for your image
- Use minimal base image as it's possible
- Be always up to date with last changes

More information

- Docker Documentation: https://docs.docker.com
- Symfony Devs Slack / Docker channel: https://symfony-devs.slack.com/messages/C6Y94Q3CZ
- Docker online sandbox: https://labs.play-with-docker.com
- DockerCon 2017: https://www.youtube.com/playlist?list=PLkA60AVN3hh_nihZ1mh6cO3n-uMdF7UlV
- Docker YouTube Channel: https://www.youtube.com/channel/UC76AVf2JkrwjxNKMuPpscHQ
- Generator of docker compose config: https://phpdocker.io/generator

Quotation

The real value of Docker is not technology



It's getting people to agree on something

Questions?