EN
English

Universidad de Oviedo

School of Computer Science

SOFTWARE ARCHITECTURE

Software Architecture

Lab. 06
Distribution & Deployment

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GitHub Pages

GitHub supports creating websites

Useful por personal – project/repository

Branch **gh-pages**

GitHub Pages - examples

Organization level

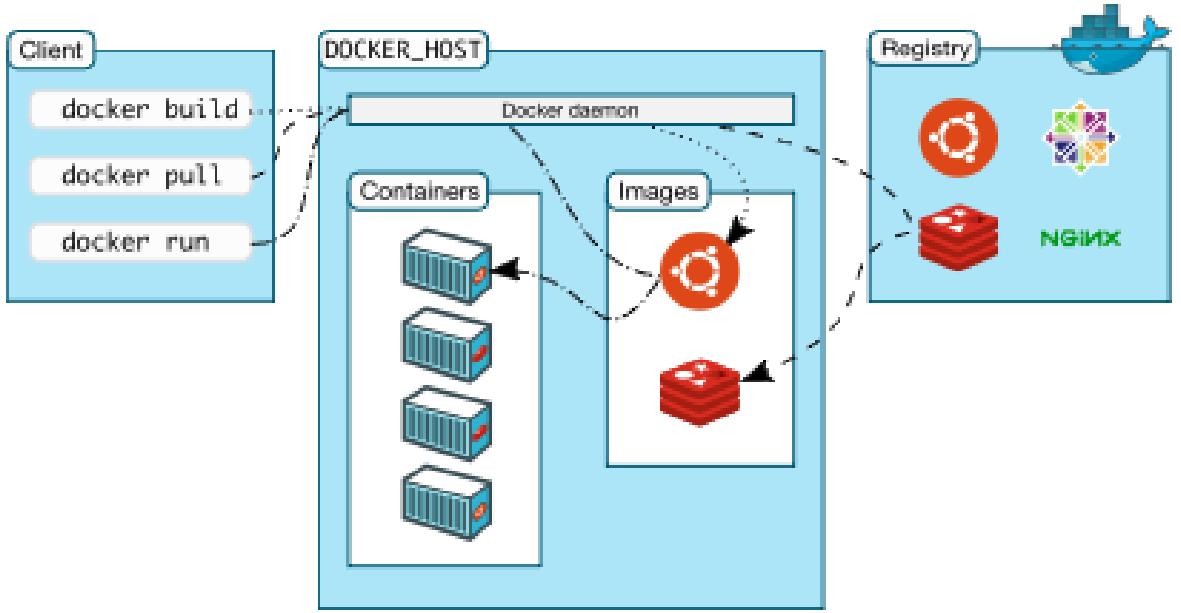
- Repository:
  - https://github.com/Arquisoft/Arquisoft.github.io
- Deployed:
  - https://arquisoft.github.io/

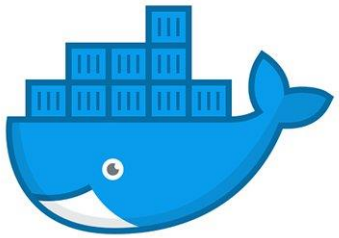
It can be very useful for personal web pages

- http://pglez82.github.io

What is Docker?

- Platform for developers and system administrators
- Based on containers
- Flexible, light, portable, scalable…





What is an image?

A file that can be used to create a runnable package

Includes all things necessary to run the application:

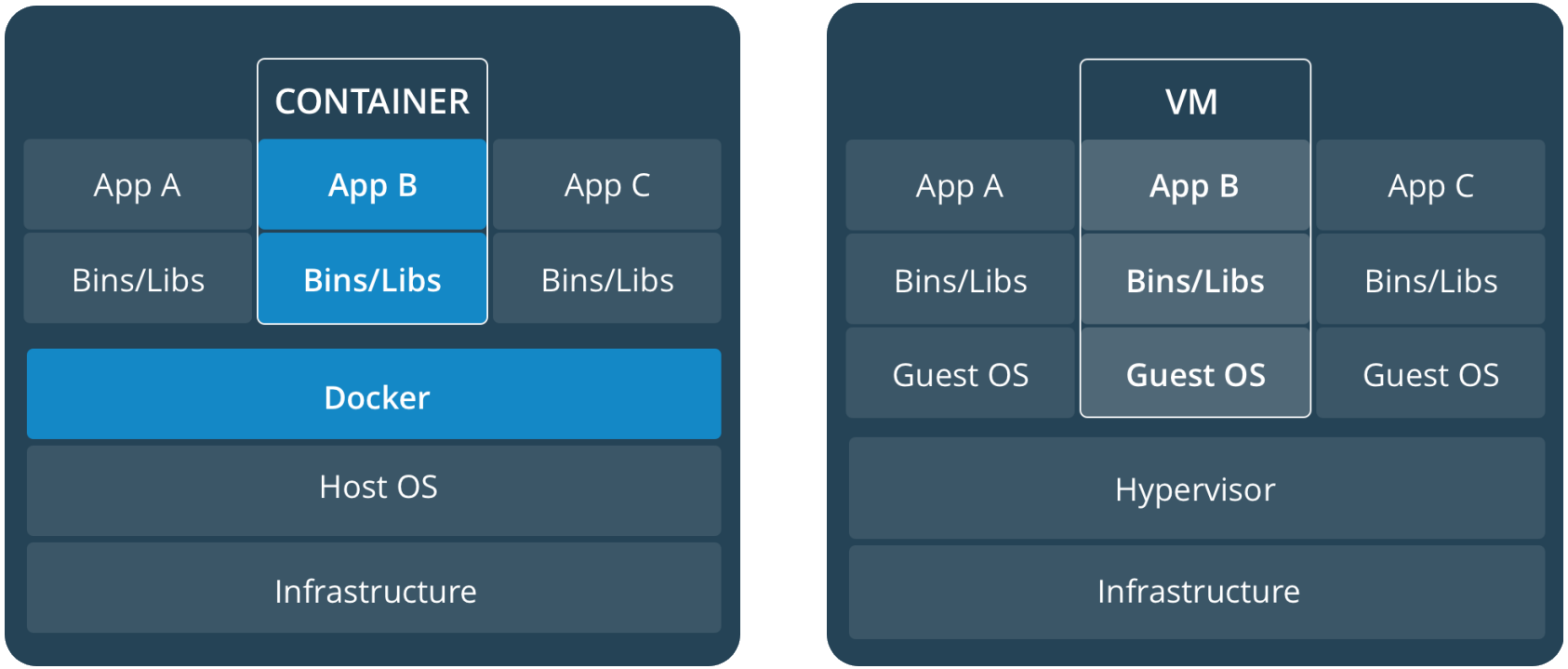
- Code
- Runtime system
- Libraries
- Runtime variables
- Configuration files

It doesn't have state and never changes

What is a container?

- It is a live instance of an image
- Docker is based on containers that enclose applications
- Docker allows orchestration between containers
- Linking several containers we can make a complex architecture

Isn't that a VM?

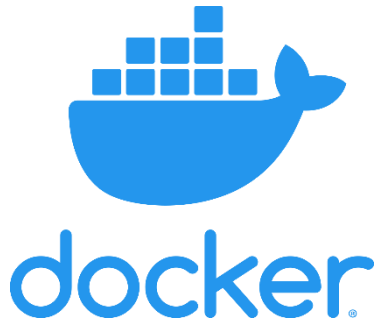


Source: https://docs.docker.com/get-started/#containers-and-virtual-machines
https://stackoverflow.com/questions/16047306/how-is-docker-different-from-a-virtual-machine

https://docs.docker.com/get-started/#containers-and-virtual-machines

Obtaining docker

- https://www.docker.com
- Available for GNU/Linux, windows and Mac
- Docker desktop (Windows/Mac)
- Docker ToolBox faq#issue3



Docker Hub

Docker image repository

https://hub.docker.com/

Higher speed for development and modularity

Tested images for well-known services

Example: Need a web-server for development

```
docker pull nginx
docker pull httpd
```

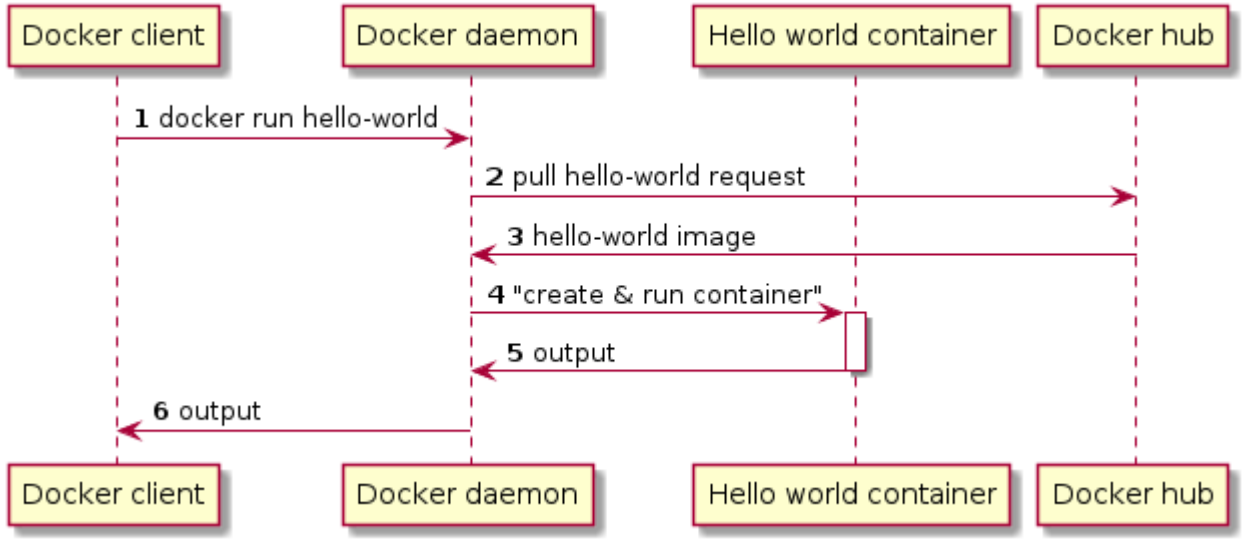
Docker step by step

Install Docker

```
$ docker -v
```

Run “Hello World”

```
$ docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
1b930d010525: Pull complete
Digest: sha256:f9dfddf63636d84ef479d645ab5885156ae030f...
Status: Downloaded newer image for hello-world:latest
```



Docker example running Linux

Run Ubuntu

```
$ docker run -it ubuntu:latest /bin/bash
. . .
root@813cb77cebb2:/# ls -la
total 72
drwxr-xr-x   1 root root 4096 Mar 30 05:46 .
drwxr-xr-x   1 root root 4096 Mar 30 05:46 ..
-rwxr-xr-x   1 root root    0 Mar 30 05:46 .dockerenv
drwxr-xr-x   2 root root 4096 Mar 11 21:05 bin
drwxr-xr-x   2 root root 4096 Apr 24  2018 boot
drwxr-xr-x   5 root root  360 Mar 30 05:47 dev
drwxr-xr-x   1 root root 4096 Mar 30 05:46 etc
. . .
drwxr-xr-x   1 root root 4096 Mar 11 21:03 usr
drwxr-xr-x   1 root root 4096 Mar 11 21:05 var
root@813cb77cebb2:/#
```

Docker status

Commands to check status

```
λ docker image ls
REPOSITORY    TAG     IMAGE ID       CREATED         SIZE
hello-world   latest  fce289e99eb9   14 months ago   1.84kB

λ docker container ls --all
CONTAINER ID  IMAGE       COMMAND  CREATED       STATUS
8b6518da11db  hello-world "/hello" 9 minutes ago Exited (0) 9 minutes ago
```

https://github.com/pglez82/docker_cheatsheet

Docker simple web server

Run a web server with Docker

Run in background

publish:expose port

```
$ docker run --detach --publish=80:80 --name=webserver nginx
Unable to find image 'nginx:latest' locally
latest: Pulling from library/nginx
68ced04f60ab: Pull complete
28252775b295: Pull complete
a616aa3b0bf2: Pull complete
Digest: sha256:2539d4344dd18e1df02be842ffc435f8e1f699cfc55516e2cf2cb16b7a9aea0b
Status: Downloaded newer image for nginx:latest
b7e9213eb3367cd465b29701a7e6441a7210
```

Some commands

```
docker info
docker ps
docker image ls
docker container ls –all
docker pull
docker run
docker stop
docker rm
```

Example 1: Running solid locally

Node solid server

Docker image available at

https://hub.docker.com/r/nodesolidserver/node-solid-server

Pull image

```
$ docker pull nodesolidserver/node-solid-server
```

Run image

```
$ docker run -p 8443:8443 --name solid nodesolidserver/node-solid-server
```

Browse the App at https://localhost:8443

How to build an image

DSL to build images

We need to create a file, called **Dockerfile**

It contains commands necessary to build the image

Keywords: `FROM`, `RUN`, `ADD`, `COPY`, `ENV`, `EXPOSE`, `CMD`…

Dockerfile

```
FROM ubuntu
CMD echo "Hi Software architecture students"
```

Building an image

1. Create a folder for the project
2. Edit a Dockerfile (no extension)
3. docker build –t image_name .
4. docker images (list images)
5. docker run image_name

Dockerfile

```
FROM ubuntu
CMD echo "Hi ASW students"
```

```
λ docker build -t "example1" .
Sending build context to Docker daemon  2.048kB
Step 1/2 : FROM ubuntu
latest: Pulling from library/ubuntu
5bed26d33875: Pull complete
...
Digest: sha256:bec5a2727be7fff3d308193cfde3491f8fba1a2...
Status: Downloaded newer image for ubuntu:latest
 ---> 4e5021d210f6
Step 2/2 : CMD echo "Hi Software architecture students"
 ---> Running in 9d5516995c2b
Removing intermediate container 9d5516995c2b
 ---> 41784c740df4
Successfully built 41784c740df4
Successfully tagged example1:latest
```

```
λ docker images
REPOSITORY TAG    IMAGE ID  CREATED        SIZE
example1   latest 41784c740 32 seconds ago 64.2MB
```

```
λ docker run example1
Hi ASW students
```

Example 2:

LoMap webapp

https://github.com/Arquisoft/lomap_0/tree/master/webapp

```
1  FROM node:18.13.0
2  LABEL org.opencontainers.image.source https://github.com/arquisoft/lomap_0
3  COPY . /app
4  WORKDIR /app
5  #Install the dependencies
6  RUN npm install
7
8  ARG API_URI="http://localhost:5000/api"
9  ENV REACT_APP_API_URI=$API_URI
10
11 #Create an optimized version of the webapp
12 RUN npm run build
13
14 #Execute npm run prod to run the server
15 CMD [ "npm", "run", "prod" ]
16 #CMD ["npm", "start"]
```

Example 3:

LoMap restapi

https://github.com/Arquisoft/lomap_0/tree/master/restapi

```
1   FROM node:18.13.0
2   LABEL org.opencontainers.image.source https://github.com/Arquisoft/lomap_0
3   COPY . /app
4   WORKDIR /app
5   #Install the dependencies
6   RUN npm install
7   CMD [ "npm", "start" ]
```

Combining multiple docker containers

- Docker compose allows modularization of an application or architecture
- Different services are defined that communicate among them
- Each service is in a separate container
- File: docker-compose.yml
- LoMap docker-compose file

Running Docker compose

Configuration

- We can configure multiple services
- Each service can depend on others
- By default, all services share the same network and are accessible through their container name

Running

- For running (or stopping) a docker-compose file we execute:
  docker-compose (up|down)

Extra information

Small repository with all the basic commands used in docker:

https://github.com/pglez82/docker_cheatsheet

Tips

Force rebuild in docker-compose

```
$ docker-compose up --build --force-recreate
```