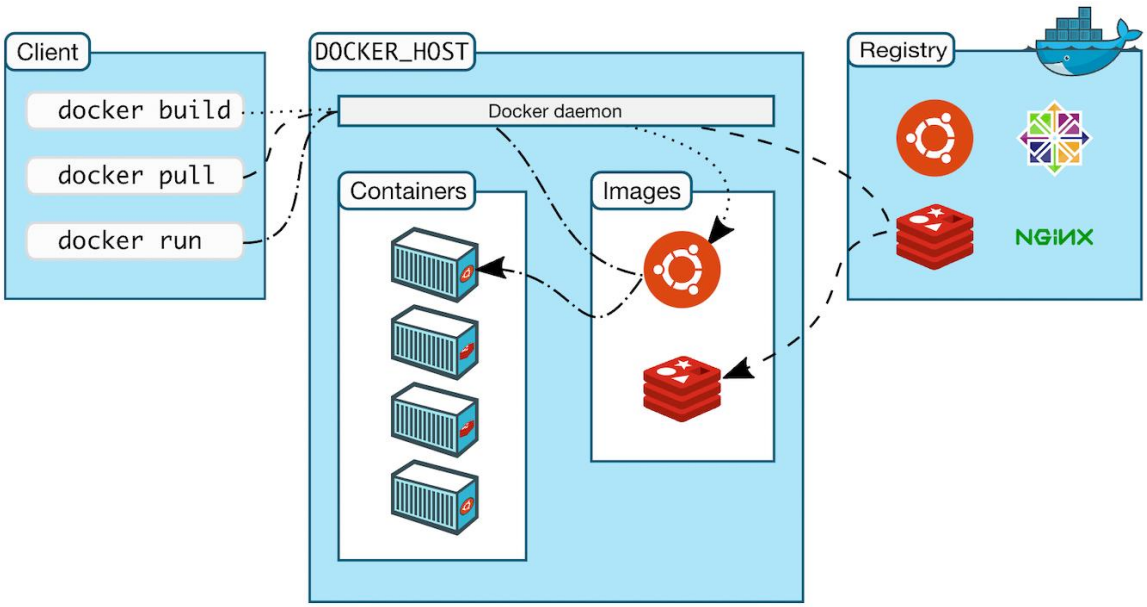
Activity No. 5: Docker practical session [10%]

Docker is a command line-based software allowing users to manipulate images and create application containers.

As presented in the course, Docker consists of two elements:

- a client, to receive commands from the user
- a server, to execute commands and manage images and containers



Docker commands architecture

Typing this command will give the Client and Server versions available on your computer.
Paste a screenshot of result

docker *version*

```
PS C:\Users\usuario> docker version
Client:
 Version:           27.0.3
 API version:       1.46
 Go version:        go1.21.11
 Git commit:        7d4bcd8
 Built:             Sat Jun 29 00:03:32 2024
 OS/Arch:           windows/amd64
 Context:           desktop-linux
error during connect: Get "http://%2F%2F.%2Fpipe%2FdockerDesktopLinuxEngine/v1.46/version": open //./pipe/dockerDesktopL
inuxEngine: The system cannot find the file specified.
PS C:\Users\usuario>
```

Usage, options and a full list of available commands can be accessed through the command line in a terminal.Type the following command

docker *--help*

The general usage of a Docker command line is as follows:

docker [OPTIONS] COMMAND [arg...]

Questions

1. How many arguments are absolutely required by the command 'docker pull' ?

R/The docker pull command requires 1 argument: the name of the image.

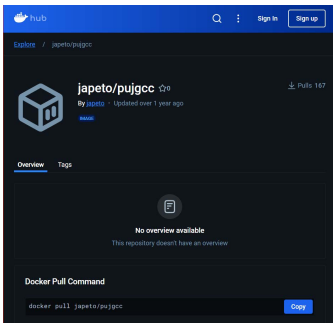
2. Do you remember what a registry is? R/ Es un sistema de almacenamiento y distribución de imágenes.

Download a predefined image available on the DockerHub

In a web browser, navigate to the DockerHub : https://hub.docker.com/

In the top search bar, type : japeto/pujgcc and paste a screenshot

Our course has images available for the development of practical sessions.



Questions

1. How many times was the *japeto* image downloaded ?R/ 167

Execute the command inside a terminal.

Paste a screenshot of result

docker pull japeto/pujgcc:v0.12

You will get an error as this image has no default tag ("latest"). So we need to specify one in the command line.

Go to the "Tags" tab and copy the pull command of version latest

Paste a screenshot of result

```
PS C:\Users\usuario> docker pull japeto/pujgcc
Using default tag: latest

What's next:
    View a summary of image vulnerabilities and recommendations → docker sco
ut quickview japeto/pujgcc
Error response from daemon: Head "https://registry-1.docker.io/v2/japeto/puj
gcc/manifests/latest": unauthorized: incorrect username or password
PS C:\Users\usuario> docker pull japeto/pujgcc
Using default tag: latest
latest: Pulling from japeto/pujgcc
aa18ad1a0d33: Pull complete
15a33158a136: Pull complete
f67323742a64: Pull complete
c4b45e832c38: Pull complete
e5d4afe2cf59: Pull complete
1efbd2d5674a: Pull complete
022a58c161f7: Pull complete
6461d3be7619: Pull complete
8287aab02fcd: Pull complete
edd3d1d6fad6: Pull complete
c6dbbe32db7e: Pull complete
Digest: sha256:9b3d7bbf410396d0a26e6bcffbb54e4239736d5a23ad694b03d93c26f9fc6
868
Status: Downloaded newer image for japeto/pujgcc:latest
docker.io/japeto/pujgcc:latest
```

docker pull japeto/pujgcc:v0.12

Question:

1. How many times do you see 'Pull complete' displayed ? Why ?R/ 11 VECES

Now, to be sure that the image was correctly pulled, let's see the list of all available downloaded images inside our workspace. ***Paste a screenshot of result***

docker image

```
Windows PowerShell
PS C:\Users\usuario> docker image

Usage:  docker image COMMAND

Manage images

Commands:
  build       Build an image from a Dockerfile
  history     Show the history of an image
  import      Import the contents from a tarball
 to create a filesystem image
  inspect     Display detailed information on on
e or more images
  load        Load an image from a tar archive o
r STDIN
  ls          List images
  prune       Remove unused images
  pull        Download an image from a registry
  push        Upload an image to a registry
  rm          Remove one or more images
  save        Save one or more images to a tar a
rchive (streamed to STDOUT by default)
  tag         Create a tag TARGET_IMAGE that ref
ers to SOURCE_IMAGE

Run 'docker image COMMAND --help' for more infor
mation on a command.
PS C:\Users\usuario>
```

```
PS C:\Users\usuario> docker image ls
REPOSITORY      TAG       IMAGE ID       CREATED         SIZE
japeto/pujgcc   latest    05141310a94c   19 months ago   1.39GB
```

Question:

1. What is the size of the japeto/pujgcc image ? R/ 1.39GB

Perform a task using a pulled image

Among the Docker commands, we will now use the 'run' command.

```
Usage:  docker run [OPTIONS] IMAGE [COMMAND] [ARG...]
```

Question:

1. What are the options and parameters of the 'run' command [OPTIONS][COMMAND][ARG...]

docker run --help

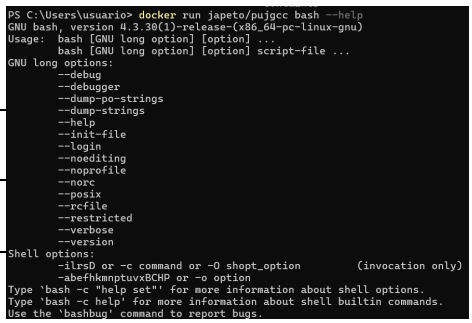
As displayed in the terminal, the description of the command is 'Run a command in a new container'. Question :

1. What is the difference between an image and a container ?

R/ Imagen: Es un archivo de solo lectura que actúa como una plantilla para crear contenedores. Contenedor: Es una instancia de la imagen en ejecución, que es mutable y puede realizar tareas aisladas dentro de su entorno.

Now, to run the application, execute the following command:
Paste a screenshot of result

docker run japeto/pujgcc bash --help



Congratulations!
You just successfully downloaded and used your first Docker image!

Running *PUJGCC* without parameters was interesting as a demonstration of Docker's features. But if we want to really run *PUJGCC*, we also need to provide parameters and, most importantly, input files.

Find the paths to bind

To bind our current folder to the /data/ folder located inside a container, we first need the absolute path of the current folder, obtained through the unix pwd command.
Paste a screenshot of result

pwd

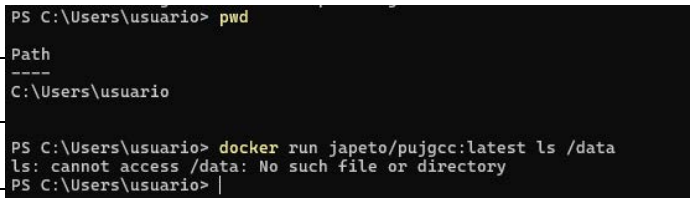
```
PS C:\Users\usuario> pwd

Path
----
C:\Users\usuario
```

This path will be used in further commands through ${PWD}.

Instead of running ls command to /home/ files, we will now just list the content of the /data/ folder inside the container but bind with the host.
Paste a screenshot of result

docker run japeto/pujgcc:latest ls /data



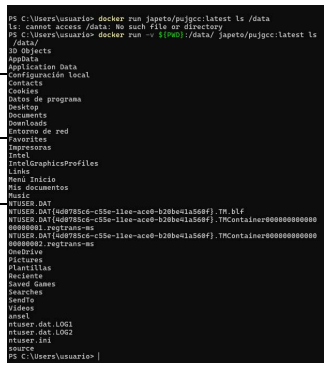
If nothing appears, it is normal: the folder is empty and only serves as a "*branching point*".

We now have the paths of the two folders we want to bind together.

Bind a local folder into a container

To perform the folder mapping between the current folder and /data inside the image, the syntax is simple. ***Paste a screenshot of result***

docker run -v ${PWD}:/data/ japeto/pujgcc:latest ls /data/

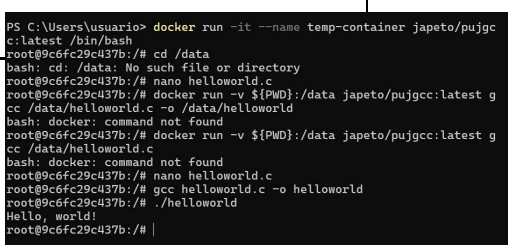


Question:

1. Is the displayed list the same as what is in your current folder?
   R/ NO

Finally, we can run C on a C or C++ file located in the Data folder. Change the name of the file to any of the provided files.
Paste a screenshot of result

docker run -v ${PWD}:/data/ japeto/pujgcc:latest gcc /data/helloworld.c



Restart and detach a container

Learn how to re-use a container where you installed something

Use the start command to restart the container created in the last exercise
Paste a screenshot of result

docker start -ti mycontainer /bin/bash

Go back to the container using the exec command instead of the run command.
Paste a screenshot of result

docker exec -ti mycontainer /bin/bash

Question :

1. *What happens now when you exit the container? Is it stopped?*
   R/ No se detiene por default

Check with and ***Paste a screenshot of result***

docker ps -l

```
PS C:\Users\usuario> docker start mycontainer
mycontainer
PS C:\Users\usuario> docker exec -it mycontainer /bin/bash
root@ed9c9b08f80b:/# exit
exit

What's next:
    Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug mycontainer
    Learn more at https://docs.docker.com/go/debug-cli/
PS C:\Users\usuario> docker ps -l
CONTAINER ID   IMAGE                 COMMAND              CREATED         STATUS                     PORTS     NAMES
4812c3aac174   japeto/pujgcc:latest   "/data/helloworld"   4 minutes ago   Exited (0) 4 minutes ago             optimist
ic_taussig
PS C:\Users\usuario>
```

In fact, the container keeps on running. This is because re-starting a container turns it into a "detached process" running in the background. Alternatively, we could have added the -d option to the first docker run command, creating directly a detached container.

Finally, you can stop the container.

docker stop mycontainer

```
PS C:\Users\usuario> docker stop mycontainer
mycontainer
PS C:\Users\usuario>
```

This is the end of the practical session. We hope you enjoyed it. Don't hesitate to ask any questions and feel free to contact us any time after the session!

List of commands

Search the available versions of an image in the Docker registry:

docker search

Pulling an image:

docker pull

Starting a container on a given image running a single command:

docker run -ti

Starting a container on a given image running a single command (detached):

docker run -d

List all containers and their status

```
docker ps -l
```

List all pulled images

```
docker images
```

Removing one local container

```
docker rm
```

Removing one local image

```
docker rmi
```

Clean all containers

```
docker rm $(docker ps -aq)
```

Clean all images (after cleaning the containers)

```
docker rmi $(docker images -aq)
```

Observations

- Deliveries must be made in teams of 4. Using a public repository on github and a pdf report
- If you do not understand the instructions for any of the activities, do not hesitate to write to jeffersonamado.pena@javerianacali.edu.co.