Setup

Polytech Angers - Mobile Robotics

Docker memo

Build and recover images

- Build an image from Dockerfile

```
docker build -t <imagename> .
```

This command should be done in the directory where the `Dockerfile` is (the `.` parameter indicates the current directory as working directory). The `-t` option is to provide a name to the image (a tag can be added as `<imagename>:<tagname>`)

- Save an image into a file

```
docker save -o <filename>.tar <imagename>:<imagetag>
```

The `-o` option is to set the output file name.

It can also be done calling `gzip` to compress the file

```
docker save <imagename>:<imagetag> | gzip > <filename>.tar.gz
```

- Load an image from a file

```
docker load -i /path/to/file.tar.gz
```

The `-i` is to provide the file path/name.

- Create a new `<targetimage>:<targettag>` that refers to `<sourceimage>:<sourcetag>`

```
docker image tag <sourceimage>:<sourcetag> <targetimage>:<targettag>
```

Basic commands

- List all the current images

```
docker images
```

- Remove an image

```
docker rmi <imageID> -f
```

The ID of an image is displayed when listing the images (`docker images`). The `-f` option is to force the removal.

- List all the current containers

```
docker ps -a
```

The `-a` is to display even non-running containers (by default `ps` shows only running containers)

- Start a container (basic step)

```
docker run -it --rm --name <containername> <imagename>:<imagetag>
```

The option `-i` is of interactive (to keep STDIN open even if not attached), `-t` is to allocate a pseudo-TTY, `--rm` to automatically remove the container when it exits, `--name` to set a name to the container.

Note : In the mobile robotic module we will use a run script to mount volumes and redirect display

- remove a container

```
docker rm <name or id>
```

the name and the id of the containers are displayed with `docker ps -a`.

To remove all the existing containers:

```
docker ps --filter status=exited -q | xargs docker rm
```

`docker ps --filter status=exited -q` lists all the containers with the exited status (the `-q` option is to display only the id). `xargs` allows to execute the `docker rm` commands according to the standard input, here it is the result of the `docker ps` command.

Note that the same can be done for all the created containers: `docker ps --filter status=created -q | xargs docker rm`

- Attach a new terminal to a running container

To attach a new terminal to a running container, you can start a bash and attach it to a terminal. To do so, the following command can be used:

```
docker exec -it <name or id> bash
```

`exec` allows to execute a command in a running terminal, `-it` for interacted and tty options (to attach the result of the exec into the current terminal), the name and the id of the container can be display with `docker ps`, and `bash` to start a bash command prompt in the container.

The considered docker image

- Based on Ubuntu 22.04
- `ros-humble-desktop` for ROS2
- `ignition-fortress` for Gazebo
- `ros-humble-ros-gz` and `ros-humble-ros-ign-bridge` for ROS/Gazebo bridge
- `python3-colcon-common-extensions` for Colcon

Running the image for the mobile robotic module

You first need to load the image into your docker environment. The `docker images` command result should look like:

```
REPOSITORY   TAG               IMAGE ID       CREATED        SIZE
ros2         base              f69fadcf3ac3   5 hours ago    4.25GB
```

Note that the IMAGE ID and the CREATED time could differ...
If the image is not loaded, please proceed to the corresponding commands presented before.

The working directory

From now, you have the image loaded in your docker environment. Your working directory should look like.

```
.
├── wdir [directory]
└── docker [directory]
    ├── run_linux_novnc.bash [file]
    ├── run_linux_x11.bash [file]
    ├── run_windows_novnc.ps1 [file]
    └── wdir [file]
```

In other world you should have the `run` file in a `docker` directory and a `wdir` directory next to it.

To start a docker container, connect it to a graphic server and mount the `wdir` volume, a `run` script is given:

- `run_linux_novnc.bash` : when using a linux host, this will use a novnc server for the graphic user interface
- `run_linux_x11.bash` : when using a linux host, to connect the container directly to the x11 server of the host
- `run_windows_novnc.ps1` : when using a windows host, this will use a novnc server for the graphic user interface

> Note: if your are on Linux you may want to the x11 script, the novnc configuration is a safety net when connecting to the x11 server does not work.

Once this is done you should have the following line on you prompt:

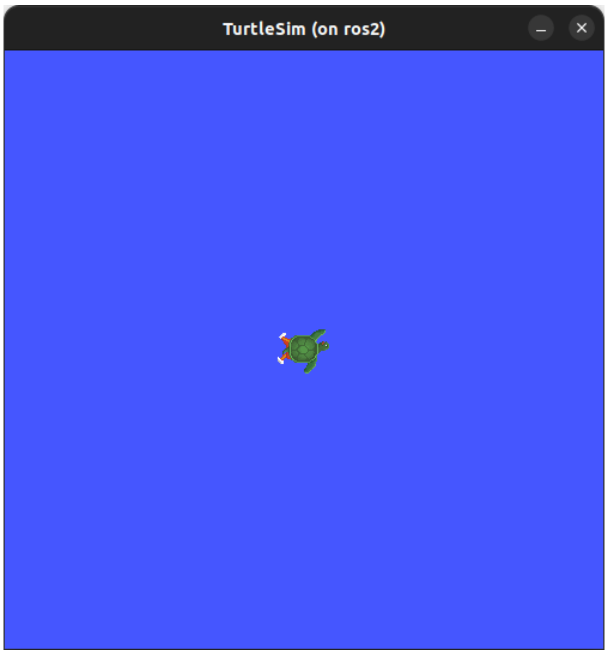
```
$ ./run_linux_x11.bash
[+] Running 1/1
 ⠿ Container ros2  Started
```

From now, your container should be started and running. Just to make sure everything is fine, try the following command in a new prompt connected to your container (check the *attach a new prompt to a container* part of this document - or attach your vscode to the running container : `Open a Remote Window > Attach to running container > ros2`).

To check that ROS2 is set up properly you can run the command:

```
ros2 run turtlesim turtlesim_node
```

You should see a new window looking like (the turtle may differ):


TurtleSim (on ros2)