IDVOC & NET2: - Project

version: 2.1.0

CENTRE DES RESSOURCES INFORMATIQUES

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About the project

Assignments ...

IDVOC project

- ➔ Will be started together
- ➔ Will make you write Dockerfiles for existing python applications
  - ◆ Learn more about Dockerfile
    - ● Learn about the syntax
    - ● Learn about the directives
  - ◆ Learn to convert a project to docker
  - ◆ A must known for the future

IDVOC project

- ➔ Will make you write a docker-compose.yml
  - ◆ Using already existing docker image
  - ◆ Using your newly built images
  - ◆ Learn about docker-compose
    - ● The docker-compose.yml file
    - ● The CLI
- ➔ Will make you interact with containers

IDVOC project

- ➔ Will make you write a .gitlab-ci.yml file
- ➔ Create a basic CI with multiple jobs

IDVOC project

- ➔ Project must be created on gitlab.cri.epita.fr
- ➔ Individual
- ➔ Project must be called IDVOC
  - ◆ If it's not called IDVOC, you won't get a grade
- ➔ I shall be added as a Maintainer of the project
  - ◆ @cyril on gitlab.cri.epita.fr
  - ◆ https://gitlab.cri.epita.fr/<your_login>/IDVOC/-/project_members
- ➔ The deadline will be for the 30th of june, 23h59

IDVOC project

➔ Expected repo architecture:

```
.
├── docker-compose.yml
├── .gitlab-ci.yml
├── nginx
│   ├── nginx.conf
│   └── generate_ca_and_certificate.sh
├── web
│   ├── app.py
│   ├── Dockerfile
│   └── requirements.txt
└── worker
    ├── app.py
    ├── Dockerfile
    └── requirements.txt
```

IDVOC project

- ➔ 3 steps
  - ◆ Plus one NET2 step
  - ◆ And advanced levels for steps
- ➔ Step 2 needs step 1, but step 3 is standalone
- ➔ Steps 1, 2 and 3 will grant you the most points
- ➔ Steps 1.5, 2.5 and 3.5 will grant you the rest of the points
- ➔ Perfect steps 1, 2 and 3 will give you a decent–ish grade
- ➔ Adding perfect steps 1.5, 2.5 and 3.5 will give you more than 20/20. Pick some elements in those steps to implement
  - ◆ Not every elements in steps 1.5, 2.5 and 3.5 are the same difficulty and length. Be wise !

Before getting started

Pay close attention to these details

IDVOC project - docker hub limits

- ➔ As explained in class, docker hub has limits
- ➔ 300+ students downloading on the hub from the EPITA IP address will trigger this limit and will ratelimit EPITA
- ➔ To avoid this, a proxy has been put in place
- ➔ Each image that doesn’t specify an endpoint **MUST** use this proxy
- ➔ The proxy is zarak.fr:8092/cache/library/

IDVOC project - docker hub limits

- Each image that doesn't specify an endpoint **MUST** use this proxy
- The proxy is zarak.fr:8092/cache/library/
- Ex:
  - ~~docker run busybox~~ -> docker run zarak.fr:8092/cache/library/busybox
  - ~~docker run grafana/loki:main~~ -> docker run zarak.fr:8092/cache/grafana/loki:main
  - ~~FROM busybox:glibc~~ -> FROM zarak.fr:8092/cache/library/busybox:glibc

IDVOC & NET2 evaluation

- ➔ Your project will be evaluated in our environment, by picking the files in red from slide 7
- ➔ You can create other files in your repo, but they will be ignored
- ➔ For the step 4, your script will be run before starting your docker-compose
- ➔ On the PIE you might have an issue with mounting files from the AFS to docker containers
  - ◆ You can put the files directly in /tmp and mount from there
  - ◆ In the test env, nginx.conf for example will be put in ./nginx/nginx.conf but also in /tmp/nginx.conf

Steps

One by one

IDVOC project - Step 1

- ➔ The first step of the project is to write 2 Dockerfiles for the 2 provided apps: worker and web
- ➔ The 2 apps are available on https://gitlab.cri.epita.fr/cyril/IDVOC-public
- ➔ Those are python3 applications
  - ◆ The needed libs are in requirements.txt
  - ◆ You can install them with pip install -r
- ➔ A docker run <newly built image> shall start the application

IDVOC project - Step 1

- ➔ As it happens often, you're not the one who wrote the app
- ➔ You still have to dockerize it without knowing how it works
  - ◆ Or how python3 works
    - ● Or flask
      - ○ Or python dependencies
- ➔ It's part of your job (and assignment) to figure it out
  - ◆ [(some help tho)]
  - ◆ [(it's just some guidance)]

IDVOC project - Step 1

- ➔ Web should be listening on port 5000
- ➔ Worker should be listening on port 9000

- ➔ It is part of the assignment to figure out how the app work and how to test if your image works

IDVOC project – Step 1.5

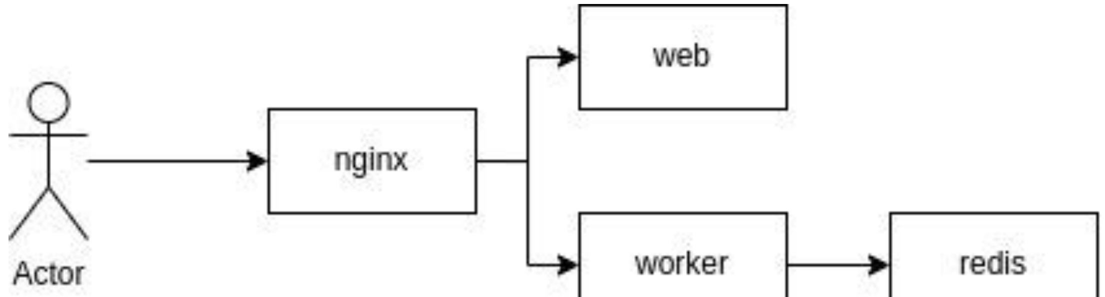
- ➔ All docker images aren't good docker images
- ➔ Let's make yours a good one
- ➔ worker and app images are similar: find a way to reuse most layers
- ➔ Find a way to not redownload the dependencies if the app changes
- ➔ Don't run the app as root ! Find a way to run it as another unprivileged user
- ➔ Knowing who the author/maintainer of an image is great. Find a way to expose this information

IDVOC project - Step 1.5

- ➔ Find the most suited base image for this image
  - ◆ It shall be small, well known (and maintained) and suits the project
- ➔ Install bash in the image, for debugging purposes
  - ◆ But limit the number of layers
- ➔ Indicate the port exposed by default
- ➔ Figure out the best syntax for the CMD/ENTRYPOINT directive

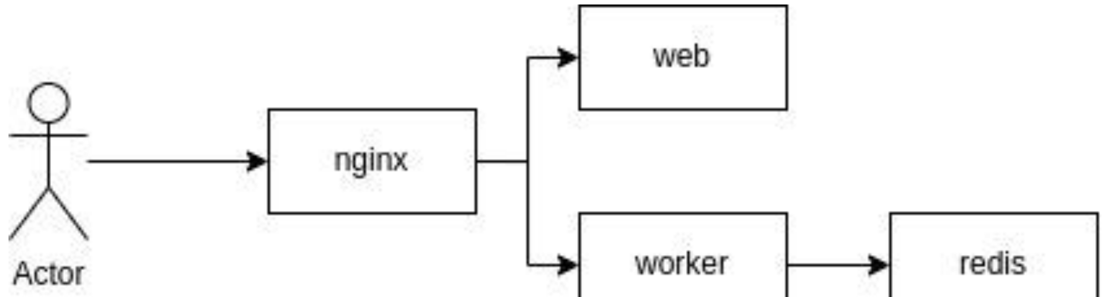
IDVOC project - Step 2

- ➔ The next step is to build this webapp architecture with docker-compose
- ➔ The webapp architecture is the following



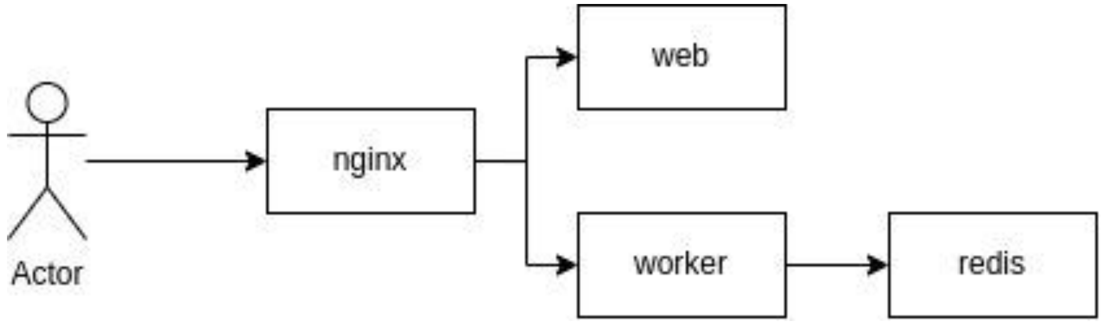
IDVOC project - Step 2

- Redis must not be directly reachable from the host machine
- The containers must be named like this:



IDVOC project - Step 2

- ➔ Figure out what docker image to use for nginx and redis
- ➔ Web and worker are obviously your 2 images built in step 1



IDVOC project - Step 2

- ➔ Configuration for nginx is provided
  - ◆ It may be overridden by the testsuite
  - ◆ It may be changed by the NET2 project
- ➔ Figure out how to provide nginx this configuration file
- ➔ Redis doesn't need configuration
- ➔ As always, find the best images for nginx and redis
  - ◆ It's better if it's official, maintained, up to date
- ➔ Find the best tag for nginx and redis
  - ◆ Avoid latest, we want the webapp to be reproducible

IDVOC project - Step 2

- ➔ Expose ports for nginx, to be able to reach it on HTTP and HTTPS
- ➔ Web and worker must not be reachable externally directly: all connections shall go through nginx
  - ◆ That’s also how you will allow the “client” to connect to your webapp using only one port

IDVOC project - Step 2.5

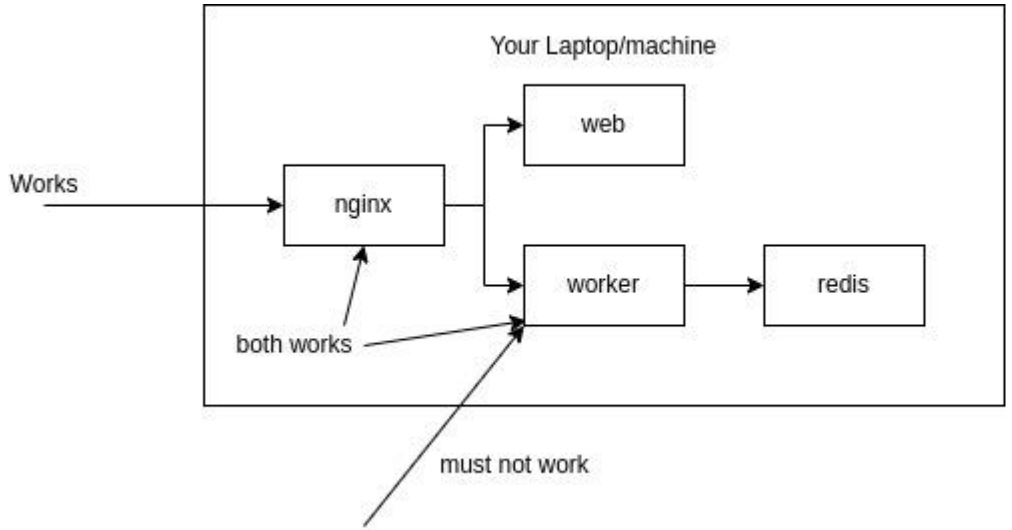
- ➔ Let's make our docker-compose better
- ➔ Use networks to isolate web and redis
- ➔ Figure a way to make the containers crash resilient
  - ◆ And make them start on host machine startup also
    - ● No need to look outside of docker-compose.yml for this
- ➔ Write good YAML
- ➔ Nginx config file shall not be edited by nginx container. Find a way to enforce this rule

IDVOC project - Step 2.5

- Protect our host runner
  - Put some RAM limit for each container to 100 MiB
  - Limit the CPU to 1 for web and worker
- Hostname looks better if it's not randomly generated
  - Give each container a hostname
- Give redis a volume for persistent data
- Expose worker and web directly, but on local machine only
  - They will still be reachable from outside the host machine via nginx

IDVOC project - Step 2.5

➔ Web reachable only locally on port 5000, worker on 9000



IDVOC project – Step 2.5

➔ Use some YAML anchors to avoid repeating yourself too much

IDVOC project - Step 3

- ➔ You have a project, it's nice, but it needs some CI
- ➔ Write a .gitlab-ci.yml file to create a CI
- ➔ The CI shall be basic:
  - ◆ Two stages called lint and display-lint
  - ◆ In lint stage, 2 jobs
    - ● Each job will do the same thing, but one for web and one for worker
  - ◆ In display-lint, 1 job

IDVOC project – Step 3

- ➔ The lint jobs shall run pylint on its project, to check code quality
  - ◆ You'll see that there is indeed some quality failure. Fix it
- ➔ They need also to write a report of the code quality and provide it as an artifact
- ➔ The display-lint job needs to read this report and print it

IDVOC project - Step 3.5

- ➔ Since both lint job are kinda the same, find a way to not write the image part twice
  - ◆ Nor the stage within the job
- ➔ Allow the CI to be run only on commit push, and if the commit message doesn't contain "no-ci"
- ➔ Printing the report must also be done even if any of the 2 first jobs failed

~~IDVOC~~ NET2 project - Step 4

- In the nginx/ folder, you must write a generate_ca_and_certificate.sh script, that will generate a CA, a certificate and sign that certificate with the CA
- The CA files must be named ca.crt and ca.key
- The certificate files must be named net2.example.org.crt and net2.example.org.key
- Certificates and keys must not be committed in Git
- Go back to the course for explanations and examples
- The script must be completely automatic, no prompting should occur

NET2 project - Step 4

- Information for the CA
  - Subject:
  - C = FR, ST = <State of your campus>, L = <City of your campus>, O = EPITA, OU = NET2, CN = NET2
  - No password
- Information for the certificate
  - Subject:
  - C = FR, ST = <State of your campus>, L = <City of your campus>, O = EPITA, OU = NET2, CN = net2.example.org
  - It must be able to handle the net2.example.org domain and its subdomains too

NET2 project - Step 4.5

- Bonuses
  - Cleanup all generated (CSR and EXT) files
  - Mount the certificates in the nginx container and modify the nginx.conf file to use them
    - Only add lines, do not remove any existing lines

Advices

One will have to read it carefully

IDVOC project – Advices

- ➔ The project will take some time, as usual, start early
- ➔ The project is voluntarily vague on some points. The point is to provide a context that may be a bit similar to the one you may have in enterprise later on
  - ◆ However, don't hesitate to ask me any question
- ➔ Start by the easy stuff before getting to the hard one
- ➔ You know the drill about cheating by now
  - ◆ And its consequences
  - ◆ And how it's checked

IDVOC project - Advices

➔ Correction will be mostly automatic. Don’t miss a typo

➔ Trust me, while being minimalistic and a bit dumb, this project is really realistic in terms of what can be asked and expected for most of you. Take it seriously and try to learn

Dementors

- ➔ Some dementors will be run and made available to you
- ➔ The goal of those dementors is not for you to do some moulinette-driven-development
- ➔ It’s about making sure you don’t fail your submission because of a typo
- ➔ The dementor will be provided as a gitlab issue on your project. If by the end of the dementor period your friends got an issue but you didn’t, double check the submission instructions.
  - ◆ If it appears to be correct but still didn’t receive, reach me out
  - ◆ If any question on the dementor, reply to the issue with your question

Slides available on zarak.fr/

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