Laboratory 1: Short project

Cloud computing and distributed — Master's degree in Machine Learning and Cybersecurity for Internet Connected Systems

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Contents

Abstract

Docker, Compose, Swarm

1 Introduction

In this short project you will deploy a digital infrastructure for a company. You need to design a digital transformation to microservices where you containeraise with docker the company's infrastructure. It consists on basic services, a core application, and Learning Management System (LMS).

1.1 Conditions

- Work in teams of 3
- Deadline: 28th November
- Results. You must deliver:
  1. Your `compose.yml` files
  2. Your `Dockerfile` files
  3. The necessary surrounding files for building the `Dockerfile`
  4. Documentation about how you are deploying the services, including how you manage data and backups
  5. Additional documentation you wish to notice

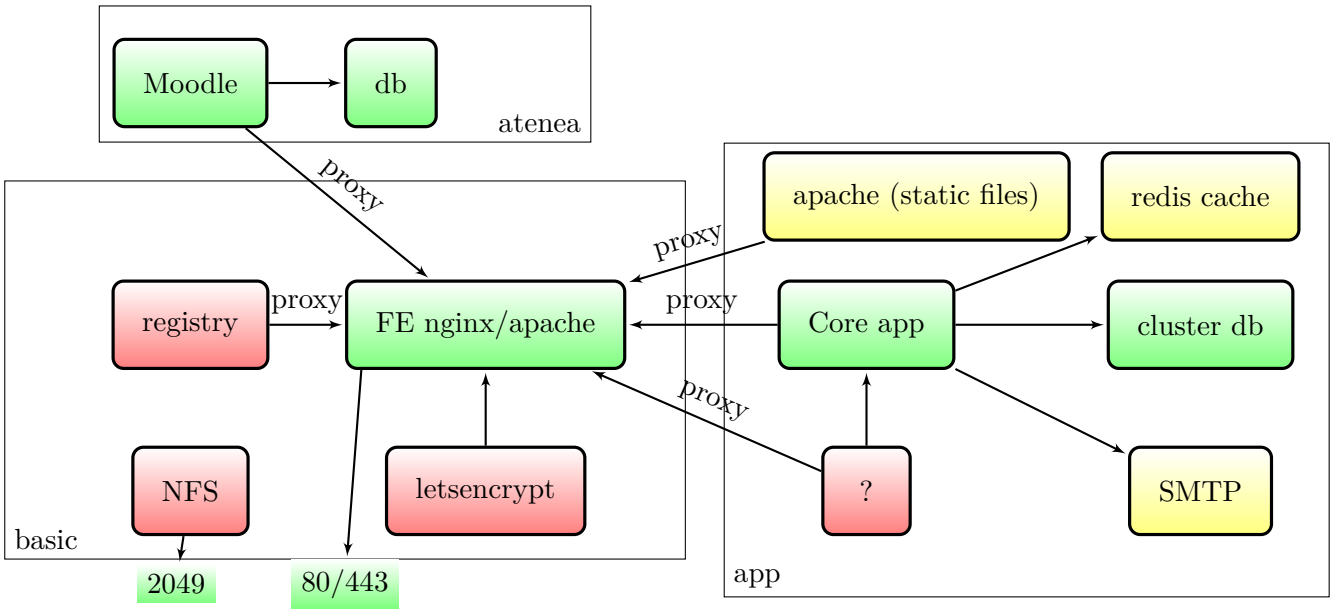

Figure 1: Infrastructure

1.2 Tools

- Docker
- Docker compose
- Docker swarm
- Others: e.g. cloud providers, DNS services...

2 Infrastructure

You need to setup the cloud infrastructure showed in Figure 1. There are three stacks:

- Basic: basic services shared for all infrastructure
  - frontend/web: An nginx/Apache/similar proxying to other services
  - letsencrypt: Providing TLS for the frontend
  - registry: A docker container registry (alternatively you can use docker hub or one from a cloud provider)
  - NFS: A sharing disk utility (you can use NFS or the alternative you like)
- App: let us containerise a typical application you use with a microservices orientation
  - Core app: the core application, e.g. a python app
  - cluster db: the application DBMS that yo need to deploy clustered
  - apache: or similar for serving static files
  - redis: a cache service for your app

  - SMTP: a forwarding mails to a mail provider (SMTP server e.g. msmtp-mta)
  - ? means suprise me, e.g. a grafana service.
- Atenea: let us containerise the LMS you are used to
  - Moodle: `https://download.moodle.org/releases/latest/`
  - db: At least Moodle requires MariaDB or MySQL or Postgres or MSSQL or Oracle

In Figure 1 the volumes are not shown. Use any volumes you need.

3 Deployment

Deploy on a docker swarm with al least 3 nodes. You can deploy wherever you want:

- In-house on your house, such as with raspberrys or old pcs
- On-premises on your laptop with full virtual machines
- On a public cloud provider
- ...

You will need some technology to share the disk between different nodes.

You should at least have two `compose` files:

- `compose.yml` for running on local environment (e.g. without TLS nor mapped volumes)
- `production.yml` the full infrastructure for deploying to production

For deploying, there should not be extra steps needed aside building docker images and deploying the `compose` files. All services need to be defined scalable to multiple containers. Except for CronJobs services and except for DBMS that do not allow autoscaling.