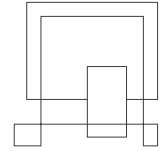


**CERN – European Organization for Nuclear Research**  
**Internship**  
**August 2021 – January 2022**

**4<sup>th</sup> Assignment**  
**Tasks**

**Franciska-Leonóra Török (ICT 293171)**  
**Software Technology Engineering**  
**5<sup>th</sup> Semester**  
**31.01.2022**

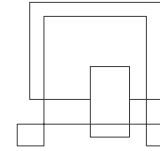
Version: May, 2019



## Preface

As in the earlier assignments have been clearly stated, the leading focus will be on the courses and new skills that have been obtained during the first 6 months at CERN in order to separate my BCs thesis from my internship work.

**Note:** Reasons for course selections that are related to the ongoing CERN project will be described, however, detailed problem statements/models/methods/results are not going to be reported as they will be only defined in the BCs thesis.



## Courses and tasks

### 1. French Integration course for beginners at Supercomm Group

The French course has been covered from my section, and it took 6 hours per week over 10 weeks + 20 hours personal work with book and exercises on an online platform. This collective course aimed to bring me to **Level A1** in French. The final exam consisted of a writing and an oral test that resulted in 37,0 points out of 50.

I must admit that French is not an easy language, however, it is amazing that something this challenging can be still picked up within weeks. In addition, the fact that moving countries motivated me to learn a new language, pushed me a little bit further to expand my communication skills, and open up to even more languages. I have heard so many times that French is a wonderful language - I could not agree more.

Nonetheless, I am still far from fluency. For starting purposes this course worth the time and energy.

### 2. Linux system administration

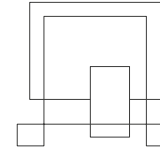
CERN provides e-learning sources on UDEMY where a large number of online courses can be acquired.

For Linux specifically, I have taken two courses:

1. Linux Mastery: Master the Linux Command Line in 11.5 Hours [1]
2. Learning Linux Essentials: Taking your first steps in Linux [2]

### Why Linux?

Linux in general makes very efficient use of the system's resources. It is believed that Linux is one of the most reliable and secure operating systems (OS). CERN highly prefers Linux over many other operating systems.



Through Linux servers, CERN used a variety of open-source technologies for several years. Moreover, CERN with Fermilab have been closely evaluating the Linux distribution landscape and they built their own Linux distribution called *Scientific Linux*. Eventually, they realized that, since they were not modifying the kernel, there was no point in setting up their own distribution; they migrated to CentOS instead. CERN can contribute to CentOS's development and distribution since CentOS is a fully open source and community driven project. However, for learning purposes, I used Kubuntu for exploring Linux, which is a friendlier distribution of Ubuntu.

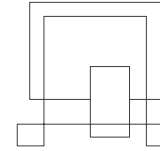
There are increasingly more science domains supported by national cyber infrastructure organizations, and Linux is widely recognized and meets the needs of broader science research.

### **3. Python and Django [3]**

There are many advantages to using Python, including its versatility and power. Since it is concise and easy to read, it is perfect to learn it as first programming language. I wish I have learned it earlier. It also enables you to do pretty much anything one desires. Python is the ideal language for anyone working in web development, machine learning, or data science.

Regarding Django, anyone can rapidly build secure, maintainable websites that are easy to develop. This is a high-level framework for Python web development that fosters rapid development and clean, pragmatic designs. Django basically simplifies web development, so developers can focus on writing their application instead of reinventing everything from scratch.

For my CERN project, the chosen technologies for its the backend heavily have led towards Python and Django for the reasons mentioned above.



#### **4. React and Typescript [4]**

Creating interactive and user-friendly UIs is easy with React. If the data changes in my project, React will automatically update and render just the right components, so it is highly effective, predictable and easy to debug.

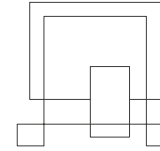
React is a popular JavaScript library, however, unlike JavaScript, TypeScript has a feature called Static typing and it supports modules. All JavaScript programs are also valid TypeScript programs since TypeScript is a superset of JavaScript. Therefore, React with Typescript have been preferred to learn during these 6 months and use for the given project's frontend side.

#### **5. Kubernetes [5]**

Kubernetes nowadays is one of the most popular container orchestration technologies. We have needed something that could help with the potentially occurring compatibility issues within the CERN project that would allow to change or modify components without affecting other components – and even modify the underlying OS as required.

This had led to Docker that was able to run each component in a separate container with its own libraries and dependencies (all on the same Virtual Machine [VM] and OS, but in separate environments or containers). Basically, Docker containers are created from images of applications, and they share the underlying kernel. I would not have been able to run a Windows based container on a docker host with Linux OS on it.

Traditionally, the developer must create an application that will eventually be handed over to upstream so that it can be deployed and managed in production environments. The CERN project that I work on has been planned similarly, so through Docker it is guaranteed to run the same way everywhere.



## **6. OpenShift [6]**

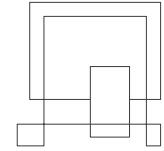
OpenShift is based on top of Docker containers and the Kubernetes cluster manager, with added operational tools that enable rapid application development, deployment, and management. Moreover, OpenShift builds on these technologies by providing a layer of supportive tools that abstract the underlying Kubernetes and infrastructure management tasks, to help developers easily deploy and manage their applications.

## **7. Photography around CERN experiments, visits and different events [7]**

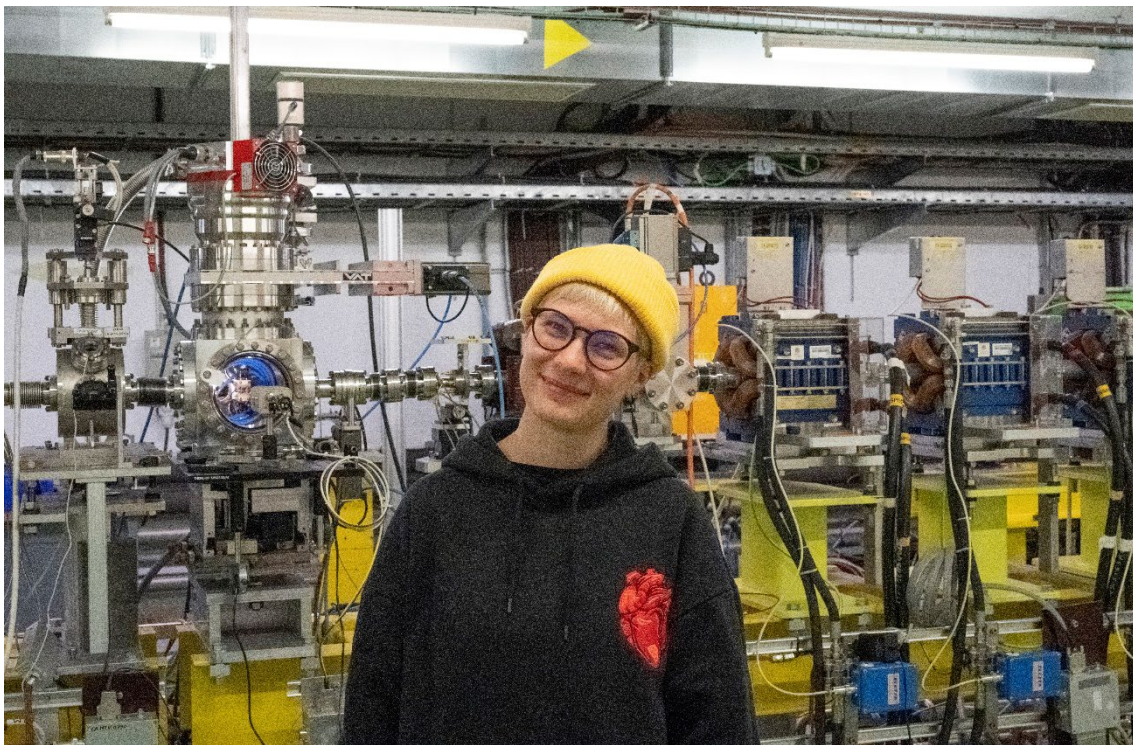
Maria Dimou, my CERN supervisor introduced me to Mónica Bello, the Curator and Head of Arts at CERN. I was invited to different events through her where I had the chance to meet the guest artists of Arts at CERN and take part in interviews and more.

My supervisor also approved an Adobe packages' license for the CERN project and for other photos' editing for publication to the CERN Document Server (CDS). These photos that I have taken throughout the visits were necessary for the project that I work on, and they are available in the appendices. Several photos have also been selected by the CERN Social Media team as *#PhotoOfTheWeek*.

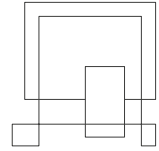
Walking around CERN experiments (like CMS, ATLAS, ALICE and LHCb) also made me closer to particle physics. Right below, you can see a few places that I have visited at CERN.



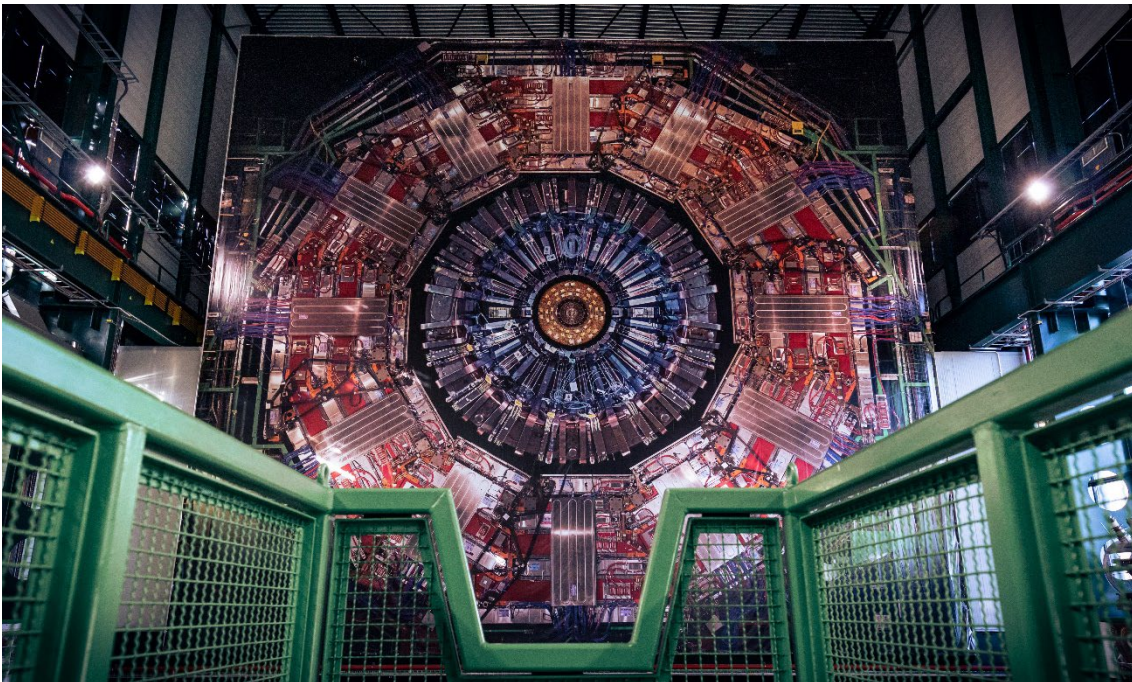
*ALICE Experiment – CERN, Sergy*



*CLIC Experiment – CERN, Meyrin*

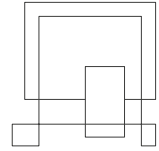


*Silicon detector visit – CERN, Meyrin*

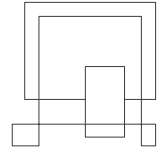


*CMS Experiment – CERN, Cessy*

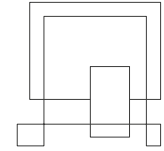




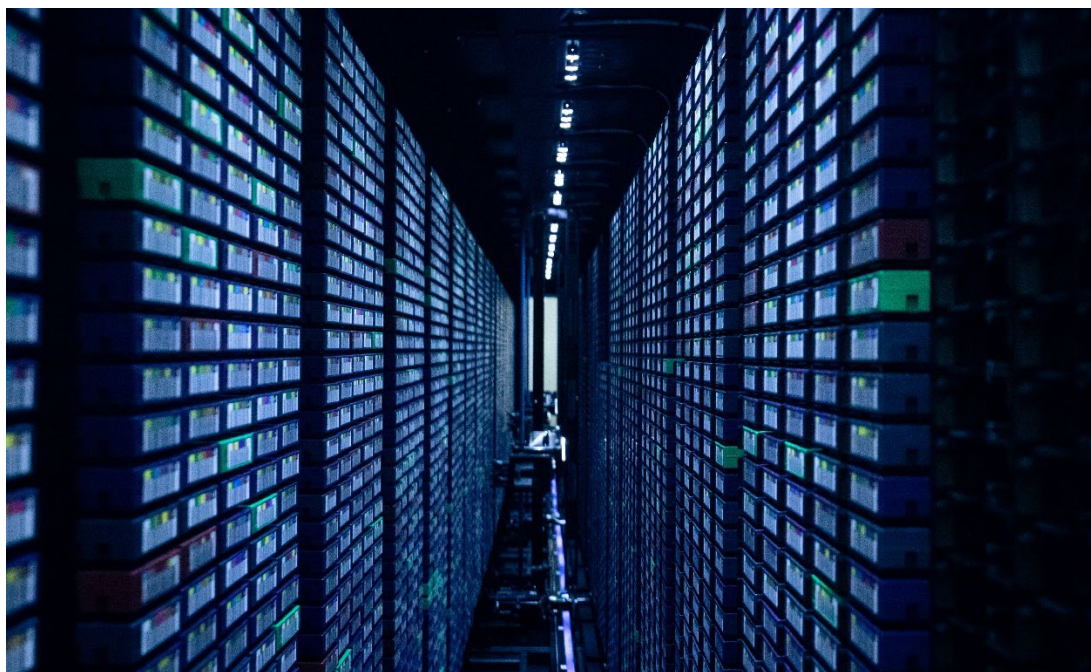
*LHCb Experiment – CERN, Ferney-Voltaire*



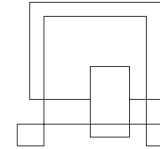
*Antimatter Factory – CERN, Meyrin*



*ATLAS Experiment – CERN, Meyrin*



*Data Centre – CERN, Meyrin (once selected as #PhotoOfTheWeek)*



## Appendices

1. Linux Mastery: Master the Linux Command Line in 11.5 Hours:  
<https://cern.udemy.com/course/linux-mastery>
2. Learning Linux Essentials: Taking your first steps in Linux:  
<https://cern.udemy.com/course/learning-linux-essentials-taking-your-first-steps-in-linux>
3. Python Django 2021 - Complete Course:  
<https://cern.udemy.com/course/python-django-2021-complete-course>
4. React and Typescript:  
<https://cern.udemy.com/course/react-and-typescript-build-a-portfolio-project>
5. Learn Kubernetes:  
<https://cern.udemy.com/course/learn-kubernetes>
6. Learn OpenShift:  
<https://cern.udemy.com/course/learn-openshift>
7. My photos for CERN:  
[https://cds.cern.ch/search?ln=en&cc=Photos&sc=1&p=franciska&action\\_search=Search&op1=a&m1=a&p1=&f1=&c=Photos&c=PhotoLab+Archives&c=PhotoLab+Archives+Images](https://cds.cern.ch/search?ln=en&cc=Photos&sc=1&p=franciska&action_search=Search&op1=a&m1=a&p1=&f1=&c=Photos&c=PhotoLab+Archives&c=PhotoLab+Archives+Images)