

Universidade de Aveiro
DETI
Projeto em Engenharia Informática

Mobility platform in Aveiro Tech City Living

Lab Infrastructure

Milestone 3

Grupo 3

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1 Summary

This report describes the progress in the project so far and the prototype developed, as well as the conditions that influenced its development. In the first section it will be approached how the group organizes its tasks and how its members communicate between them and with the Advisors of the project. The difficulties that were found when developing the project will also be described. Three sections follow describing the main three modules of the project, including their current states and the planning of their future tasks throughout the next weeks. Lastly, the group's takeaway from the project so far is presented in the final section.

2 Conditions of the realization of the prototype

After every weekly meeting with the Advisors, the group would establish tasks to complete until the next meeting and would distribute them between the members considering the priority of the tasks and the skills of the team members. A google sheets document is used to manage the completion of these tasks, the team members that completed them and their priority.

Taking into account the reality that we are facing today we had to adapt by working in a distance collaborative environment. In order to do that we used online platforms like Discord and Zoom, in which we can share screens and do collaborative calls. We also used text messaging through WhatsApp.

The access to devices and platforms necessary for the development of our project were given by accessing telework services (VPN) of the Instituto de Telecomunicações.

To keep in touch with the Advisors, Dr^a. Susana Sargento and Dr. Pedro Rito, the group used Zoom for weekly calls, where the updates and difficulties in the development of the project would be discussed. Apart from the weekly call, the Advisors also give support in the platform Slack.

The video prepared in this milestone presentation (available [here](#)) was recorded in collaboration, apart from the voice overs which were recorded individually. Then the parts were gathered and edited to make the transitions seamless and to present the prototype in a clear and effective way.

2.1 Difficulties that influenced the development of the prototype

Throughout the project realization the group faced some obstacles, most of them were easily solved but some involved hard work from the team. We got in contact with technologies and tools that we never worked with before, however some studying on the topics allowed us to solve these issues.

In the present moment, the group is trying to find a *DeepStream* object detection model that is also capable of detecting boats (*moliceiros*, in our case) with good accuracy and performance, as our current model cannot detect boats.

Regarding Wi-Fi sniffing, several observations and tests had to be made to find the best time interval of packets detection in order to obtain the most accurate values.

Since we are a group that is working on a project inside the Aveiro Tech City Living Lab we had to communicate with the rest of the team that is working on the ACTLL whenever we had to use certain materials, tools or technologies that they were responsible for. We also had to coordinate with them to better integrate our project with the rest of the investigation group.

As will be noticeable further into the report we have yet to have a video camera mounted at Cais da Fonte Nova. The Advisors already have authorization from Aveiro's Town Hall to mount the camera, however we are waiting for a mechanical piece to be made that is responsible for securing the camera in the smart lamp post.

We aim to improve our project by also estimating how many people are inside a traveling *moliceiro*. To do this we will place a device on board of several *moliceiros* that will count how many people are on board of each. One of the problems that will require solving is talking with the *moliceiros* companies to ask for their agreement and cooperation in order to place the devices inside the *moliceiros*. We also need to chose and buy the correct batteries for the devices. Lastly, we will need to recharge the batteries whenever they are low (for example, during the night) in order to avoid having the device run out of battery during the day.

3 Sniffing Module

3.1 Current State

Until the time of writing this report, the progress that was made in this module is the following:

- Understanding how monitor mode works and how we can capture packets in a certain area
- Capture of probe requests packets through PyShark. These packets are obtained directly from the interface of the network adapter (set in monitor mode).
- Development of a python script that analyzes packets sent by client devices strictly searching for access points in broadcast
- Estimation of the number of people in the area by counting the number of different MAC addresses in the captured packets
- Sending of data in topics to the local broker in the APU located in the smart lamp post and reception of the messages in the central broker in IT

3.2 Future Tasks

Currently the sniffing module is finished, however the next step is to integrate the sniffing module in the *moliceiros* in order to estimate the number of people inside each boat for statistical purposes. This could lead to some changes in the sniffing module as we test it further.

Week	Planning
Week 10 (17/05 - 23/05)	Preparation of sniffing devices to place in the <i>moliceiros</i>
Week 11 (24/05 - 30/05)	Installation of the devices and capture of data from each <i>moliceiro</i>
Week 12 (31/05 - 06/06)	Conclusion of the previous task
Week 13 (07/06 - 13/06)	Realization of final tests
Week 14 (14/06 - 15/06)	Delivery of Milestone 4

Table 1: Future tasks in the development of the Sniffing module

4 Object Detection module

4.1 Current State

Until the time of writing this report, the progress that was made in this module is the following:

- A *Nvidia* software development kit named *DeepStream* was installed in the Jetson Nano to allow the usage of a streaming analytics toolkit for this module
- Different models were tested in order to find the best one in terms of performance and accuracy
- A python script that detects people, vehicles and two wheeler vehicles was developed
- The data resulting from the previous tasks is being sent in topics to the local broker in the APU and a central broker in IT is receiving these messages
- The backend of the application is connected to these topics allowing it to receive the collected data and to present it in the dashboard
- Several corrections were necessary in the program throughout the project to optimize the detection process and minimize delays in processing frames sent from the camera stream

4.2 Future Tasks

Week	Planning
Week 10 (17/05 - 23/05)	Find model that detects boats and adapt the python script to this new situation
Week 11 (24/05 - 30/05)	Conclusion of the previous task
Week 12 (31/05 - 06/06)	Analyze the frames sent from the camera stream in Cais de Fonta Nova (if the camera is installed)
Week 13 (07/06 - 13/06)	Realization of final tests
Week 14 (14/06 - 15/06)	Delivery of Milestone 4

Table 2: Future tasks in the development of the Detection module

5 Web Application

5.1 Current State

Until the time of writing this report, the progress that was made in this module is the following:

- Creation of a map that allows users to switch between smart lamp posts on different locations
- Visualization in real-time of the sniffing and object detection values
- Show the ten last sniffing and detection values on a chart.
- Translation of the web application, and possibility for users to change the interface language
- Creation of a login and sign up page for administrators
- Display of notifications of possible errors on the Jetson Nano or on the APU for the administrators
- Creation of a mock-up page to display the number of people inside the *moliceiros* on Cais da Fonte Nova

5.2 Future Tasks

Week	Planning
Week 10 (17/05 - 23/05)	Work with persisted data to show the information on the charts
Week 11 (24/05 - 30/05)	Implement the page that is going to show the people inside <i>moliceiros</i> and respective charts
Week 12 (31/05 - 06/06)	Conclusion of the previous tasks
Week 13 (07/06 - 13/06)	Realization of final tests
Week 14 (14/06 - 15/06)	Delivery of Milestone 4

Table 3: Future tasks in the development of the Web Application

6 Conclusion

Up until this phase the team performed tasks that involved building the system incrementally and by iterations, making sure that the viability of the system was always evident. This allowed the group to better organize its goals and the development of the prototype.