Project Management Plan

BoatRegatta

Abstract: The purpose of this document is to give details about the overall organization of the IoTracking project. It will explain the different management and technical processes we established in order to adapt to the constraints of the project and to ensure to meet our client's needs. The IoTracking project aim is to deploy an ad-hoc LoRa network from scratch and develop a user-friendly web application to allow people to follow the evolution of boat regattas in real time.

Keywords: LoRa, GPS, boat regattas, deployment of an ad-hoc network, hardware, web application.

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Revision History

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1.0	15/11/2016	Cyril ANAK STELL	Initialization
1.1	17/11/16	Mame Aminata DIOP	Project Organization
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1.3	20/01/2017	Axel CHAUVIN	Management process
1.4	23/01/2017	Cécile DUTHOIT	Work planning, layout and rereading

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1. INTRODUCTION

1. *Purpose*

This project was realized as part of our formation at INSA Toulouse. The problem was proposed by the sailing club CVRL (Ariège, France): they want to offer the public of the races they organize, a better experience. They considered to provide them a user-friendly interface to follow the evolution of the races in real time. For that purpose, we developed a web application to display the route of the regatta and the position of each boat on a map of the lake. We developed as well a device composed of sensors that is meant to be mounted on each sailing boat involved in the race. Thanks to it, we can retrieve different information such as the boat location, speed, and direction. Because the lake is located quite far from the surrounding cities, there is nearly no network coverage at the site. That is why the entire architecture of the project needed to be implemented locally, without no need of an Internet connection.

2. *Scope*

This document is meant to give details about our overall organization. It will explain the different management and technical processes we established in order to adapt to the constraints of the project and to ensure to meet our client's needs.

This document is primarily intended to be proposed to our client, CVRL Sailing Ships Club, our tutor M. Monteil, as well as any other professors involved in the evaluation of our project.

3. *Project Deliverables*

At the end of the project we will deliver a final report describing the every aspect of our project. Other papers, including this PMP, SDD, and SRS will be delivered to Mrs. Guermouche. An abstract will be sent to Mrs. Evonuk, our English professor. We will present the results of our project in front of a jury composed of our tutor, our clients, other professors, as well as other students of ISS speciality the 26th of January 2017.

4. *Schedule and budget summary*

Our project takes place between October 2016 and January 2017. We organized our work in five major phases during those four months as shown in the diagram below :

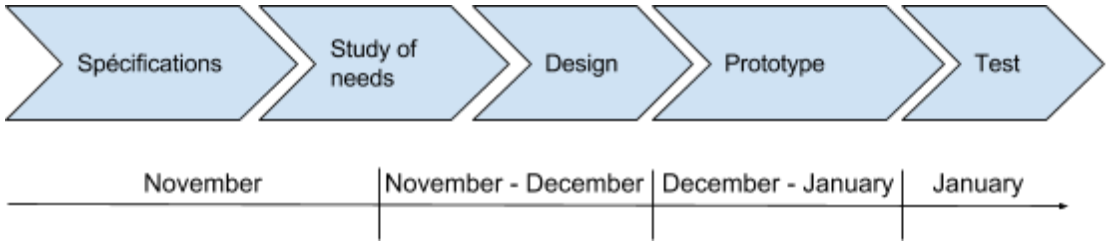

Figure 1: Schema of our general schedule

Regarding the budget we have the chance to be financially supported by our department the Electronic and Computing Engineering department. They provide us materials that we needed in order to build a fully working prototype.

2. References

The references below are the other parts of our documentation:

- Final paper
- SRS
- SDD
- Abstract
- Final presentation

3. Definitions, Acronyms, and Abbreviations

Term/Acronym	Definition
User	The one who uses the application
CVRL	*Club de Voile des Rives de Léran* (Association, our client)

4. Project organization

To successfully carry out this project, we have defined the project's external organizational entities and internal organizational structure.

1. *External interfaces*

On the one hand our tutor is Thierry Monteil, a professor at INSA in the Electrical and Computer Sciences department (*GEI, Génie Electronique et Informatique*).

On the other hand, we are working for CVRL. This club is located along the banks of Montbel lake, in Ariège, France. They are an association that organizes boat regattas among other activities.

To be sure that we are following the approved specifications with them, we are using an Agile approach. Thus, we often plan meetings with them and M. Monteil.

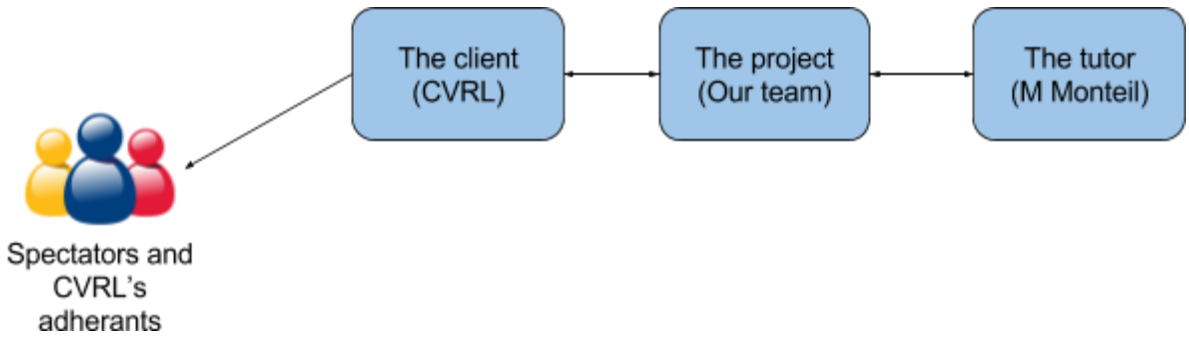

Figure 2: Schema of our external interfaces

2. *Internal structure*

Our team is composed of seven people working on this project and each person is an expert in their domain - four network and telecommunication experts, one computer science expert, one automatic control and electronics expert, and one business expert. Figure 3 presents each member of our team.

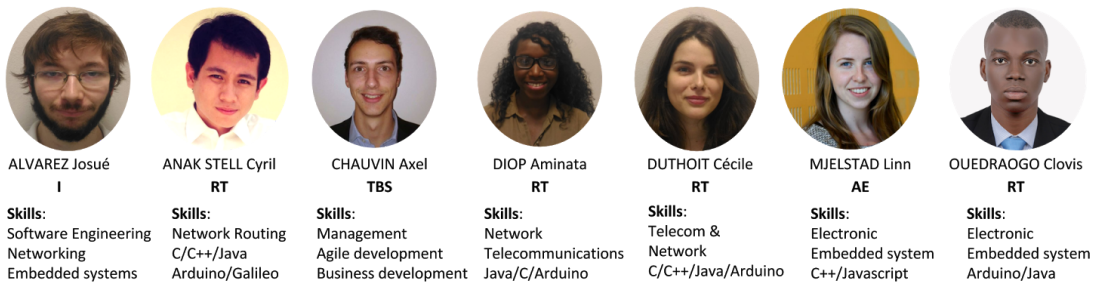

Figure 3: Schema of our team

3. *Roles and responsibilities*

Based on our domain of expertise and the skills that we wanted to develop by working on this project, we all chose which part of the project we wanted to work on. In addition to the following division, Axel Chauvin will be in charge of managing the project.

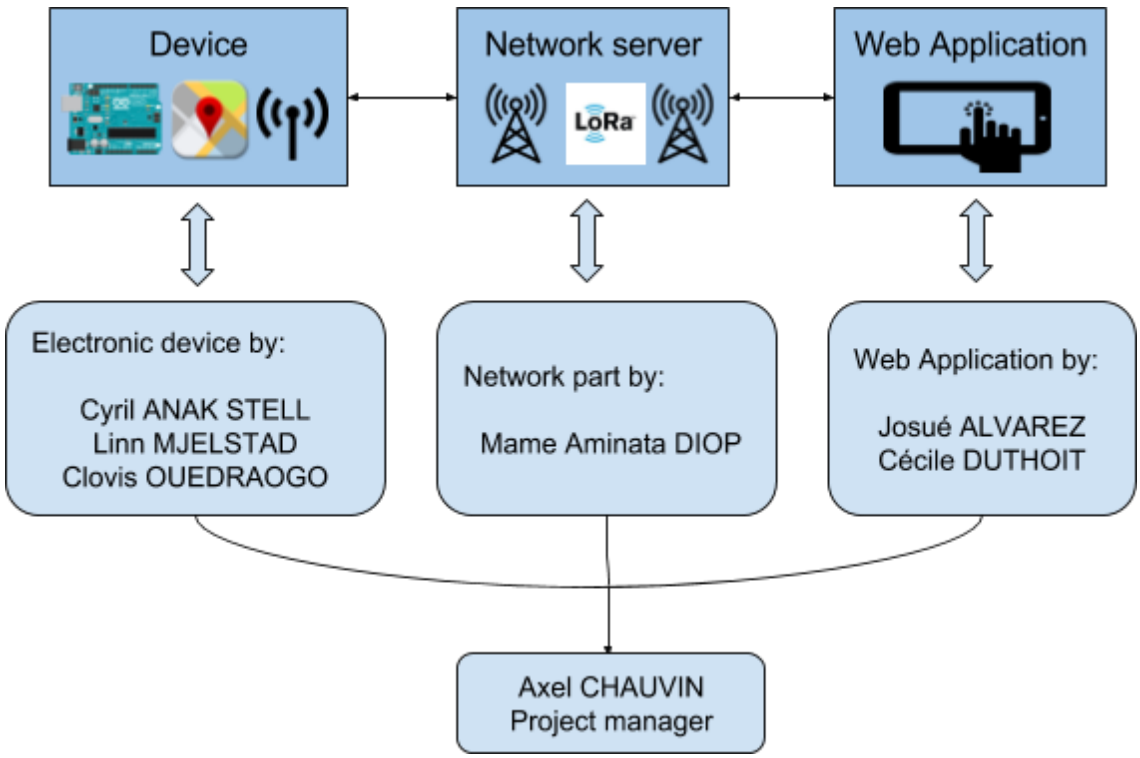

Figure 4: Schema of the division of tasks

5. Management process

1. *Start-up plan*

1. Estimation

To complete our project we have a tight schedule of three months. In order to organize our work we will use the planning poker method. Usually used with agile development, it will allow us to have a precise estimation of the effort and size of every part of the project.

2. Staffing

Our project is composed of specific technical parts, therefore, it requires a large range of skills and knowledge. Moreover, the different parts have common interfaces to communicate, thus, the three groups have to work closely with each other. For that purpose all members will be involved in the different phases of our project from specifications to test.

3. Resource Acquisition

To acquire the materials that we need, we first have to understand the needs of our client and to have thought about the specifications of the solution we will provide. Then we must search for the materials that respect these constraints. Our department taking over the order of all materials, we just have to tell them what devices we have chosen from which provider. In order to respect the schedule of our different phases this order needs to be done early November. We hope to receive our order before the end of November in order to familiarize with the devices and to respect our schedule to prototype our

work.

4. Staff training

As this project concludes our five years of studies at INSA Toulouse, we have yet important technical groundings. Nevertheless, we will have to deal with technical problems that we have not met the past years. In order to be able to handle these challenges, we have to follow different training. For the web application, some members of the groups are used to manipulate several programming languages and have top notch experiences in that domain. However the use of quite new technologies may be less easy to deal with but numerous training programs and tutorials are available on the internet. During this semester, classes are also provided to introduce to SOA. Thus, we will be able to understand the related technologies and to integrate them in our project.

Regarding the network part, we also have lectures and projects about the Internet of Things proposed by our professors to familiarize with this domain. We have the chance to a network expert part of our group working part-time at Orange. In addition to her knowledge, we can find some documentations on the Internet as well.

For the device part, the main source of information is the documentation provided by our suppliers. We can also ask professors of GEI and other supervising staff for more specific advice.

As well, we have access to a lot of documents on the internet about project management, agile development and innovation. The last point will also be discussed during lectures.

Even though we can plan some trainings we have to follow, we will ultimately face problems that we do not know how to resolve. That is also the goal of projects: learn how to deal with unexpected problems and resolve them by ourselves.

2. *Work planning*

1. Work activities

We decomposed our work in several user activities for each part.

Web application and server:

- LoRa data recovery
- Application diffusion
- Races management
- Map management
- Races display

Network:

- LoRa server set up
- Gateways and devices communication
- Recovery of the data
- Dimensioning
- LoRa gateways set up

Hardware:

- GPS coordinates recovery
- Autonomy

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- Communication with the network
- Battery charger
- Gateways powering

2. Schedule allocation

Figure 5 presents our Gantt with the different tasks we had to do, who were in charge and our progress.

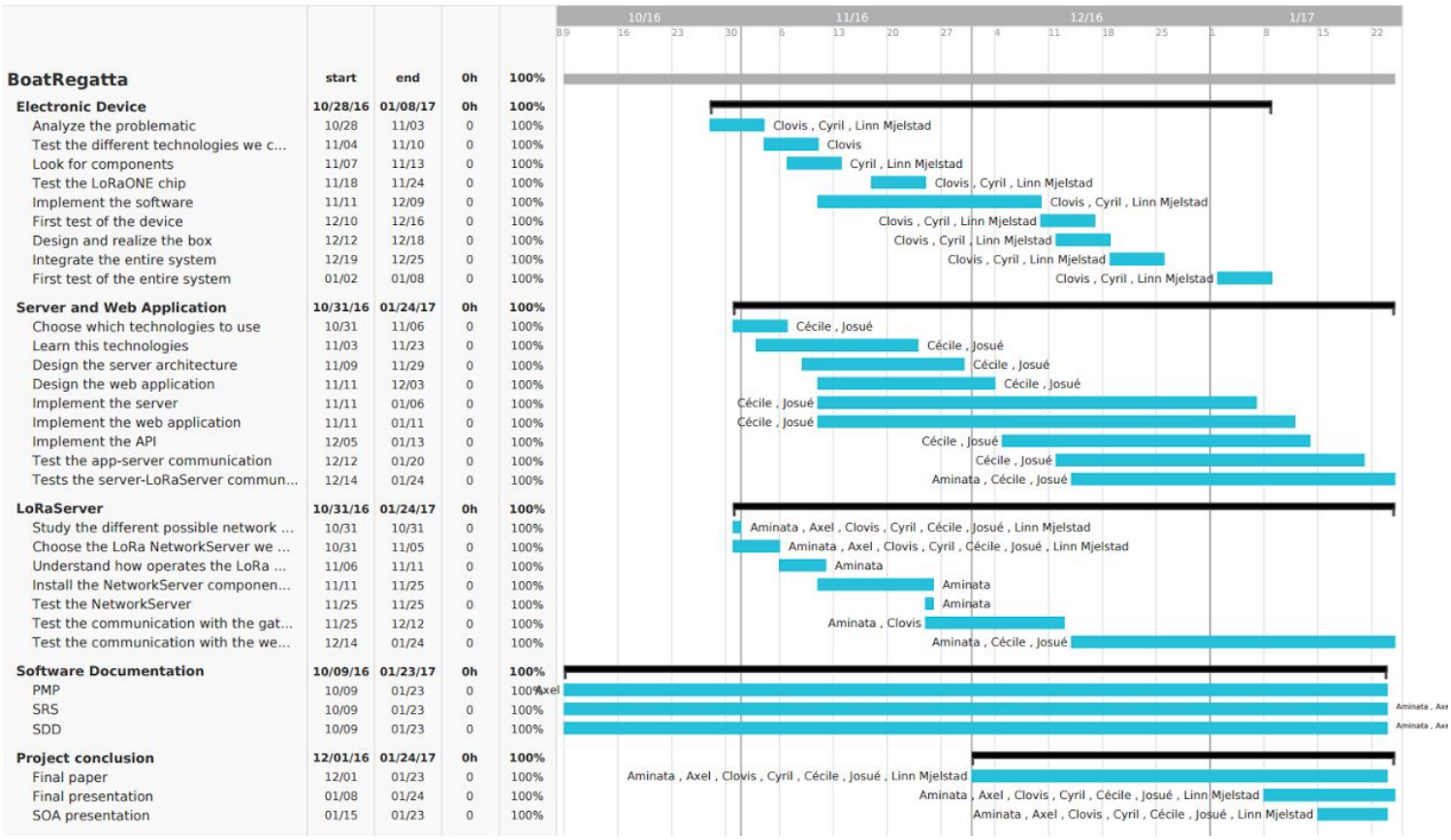

Figure 5: Gantt diagram

3. Resource allocation

In order to complete our project, we have access to the electronic and computing department. It includes the access to free working room as well as practical exercices room containing most of the materials we may need. The building is accessible during work hours and late evening the week but also the week-end if we ask for it. We will use our personal computers as well.

The materials that we will use for the network part is as listed below :

- Three LoRa ChisteraPi (shields from SnootLab)
- Three Raspberry Pi 3 B

The materials needed for the device :

- Two LoRaONE devices (from SODAQ)
- Two LoRaONE shields

- Two microUSB cables
- Two device batteries

4. Budget allocation

The cost of the materials that we need represents our whole budget. The estimated cost is approximately 731€, 147€ for the network and 143€ for the device. It will be fully covered by our department. The other materials accessible at the GEI is free. The potential cost of travels in order to meet the client is at our expense.

3. *Project control*

The main metric that we will use is quality and customer satisfaction. As the needs have been clearly stated by the project owners, we know what the final product should be. However as there are many variables and constraints that needs to be taken into account throughout the project, changes may be inevitable. Therefore, we intend to be in constant contact with the product owners to keep them updated with our progress. By doing this, we are able to constantly and immediately have an idea of our product owners satisfaction.

1. Requirements control

We will follow as close as possible the specifications that have been given by the product owners. If there shall be any changes due to other factors, we will notify the product owners and will propose a new solution to meet an initial goal. We will constantly document our solution to ensure good traceability. This will allow us to easily determine an error and rectify it.

2. Scheduling control

We will use the scrum, agile and Gantt method to help planning and execution of our tasks. The deadline to come up with a prototype is in january and is known to every party concerned. Every task to be done will be categorised according to priority and difficulty. If we are not able to follow our planning due to external factors, we will notify the product owners so they will have a realistic expectation of our final product. A corrective action when actual progress does not conform to planned progress will be to redistribute our human resource. We will try to have more people working on a task that is taking too long.

3. Budget Control

We have been told specifically that our solution must be very low cost. Therefore, when looking for solutions, we will search for the cheapest components while respecting the requirements. We will then notify the product owners about the possible costs of our solutions. We will then gauge our budget based on their comments and advice. If during the project, the actual cost does not conform to the budgeted cost, we will either try to find a simpler and cheaper solution or try to justify the increase in cost to the product owners.

4. Quality Control

We will do constant test of our solution to ensure that the solution and the components that we use meets the safety standards and the requirements of the product owners. The product owners will be involved throughout the whole process. This will allow us to gauge their satisfaction. Furthermore, we will organise weekly meeting and discuss about our progress and direction. By doing this, we will be able to audit, verify and validate the work of each team member.

4. *Risk Management*

We have identified a few risks in our project and here will describe the measures and actions that we will take to avoid or minimise them.

- Time shortage
    - The probability of this happening is quite high as we have a very complex project and only have 2 months at our disposal. Firstly, we require time to learn the new technology before using it. Secondly, the materials that we need will only arrive at the end of November and that gives us very little time to carry out required tests.
    - To ensure meeting the deadline, we will commit more personal time on the project and try to do all the preparation that we can before the materials actually arrive. We will also split the work equally and each project member shall be working on a part of the project that is coherent to his speciality to ensure full efficiency.
    - We have planned our project through Gantt and this will enable us ensure our project is advancing at the correct rate. If we do not meet our milestones in the time allocated, we will allocate more human resource on the particular part of the project that is blocking us.
    - If we do not meet the deadline, we will at the least provide all the proper documentation so another team will be able to continue the project in the future. The overall impact of this risk high because we are not able to fully satisfy our client.
- Solution that will not work
    - The probability of this happening is quite low because we have done a very careful study of all the technology and the materials that we will need. Therefore, we are 80% sure that everything will work together properly. However, we are not able to tests the materials before buying them and the description of the materials in their respective website is not accurate.
    - To avoid this problem, we will contact the manufacturers of the product that we wish to use and check with them if everything is in order and compatible with our system. We will also only buy from credible websites with very good reputations. We will also look for reviews of the product online to make sure that other previous users are satisfied with it.
    - If our solution does not work, we will need to evaluate which part of the project has failed. Since other teams may also work with the technology similar to ours, we may use their prototype to test our solution.
    - We will always try to identify this risk at an early stage so that we can discuss and cooperate with other teams if required. The impact of this risk is high because it will further delay our schedule and also become very dependent on the success of other teams.
- Miscommunication
    - The probability of this happening is medium because we are technically two groups

working on the same system prototype. There is seven of us all together and we have several product owners and this may complicate things in terms of communication.

- To avoid this problem, we have decided to work closely together despite being two different groups. We will need to identify the interfaces between all parts of our solution so it is known to each member of the team. We will work in the scrum and agile method to ensure that we communicate with each other frequently. Furthermore, we have done a team-building session that will help us work more easily together.
- If we do enter a situation where an information is not clear, we will refer to the specifications and our product owners. If we disagree and tensions between member of the team rises, we will call for an emergency meeting to settle the issue efficiently.
- The impact of this risk high because each member of the team needs to do their part at contribute accordingly for our project to be successful.

6. Technical process

1. *Methods, Tools and Techniques*

6.1.1 Development methodologies

To carry out this project, we have chosen Scrum as our working method, which is an Agile method. Agile methods are based on the principle that specifying and planning in detail the whole of a product before developing it (predictive approach) is counterproductive. The idea is to set a first objective on short terms and start on the road without delay. Once this first objective is reached, a short pause is made and the route is adapted according to the situation of the moment. And so on until reaching the final destination.

6.1.2 Programming languages and other notations

- Arduino for the embedded system
- MongoDB for the database
- Typescript, NodeJS, Angular 2, for the web interface
- Typescript, NodeJS, Express JS, for the web server

6.1.3 The tools and techniques

- Arduino IDE
- Visual Studio Code
- GitHub

2. *Product Acceptance*

To determine acceptability of the deliverable work products we define the following objective criteria :

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- Test:

We must be able to plot the position of a runner during the race. This plot may be refresh at least 6 times in one minute.

- Demonstration: To demonstrate that our service is working, we will connect the device to the gateway, which will even communicate with the web server database. In the absence of being able to make a full-scale test, we change the positioning device and we observe its change of position on the web map. These results are considered acceptable if the arrangement of the device is one day every 10 seconds with a resolution of 10 m.