

### MINI PROJECT ASSIGNMENT

This Mini Project will be carried out in groups of three students. The course staff encourages to form international groups with members from multiple nationalities if possible.

#### TASK DESCRIPTION

##### Part A- Requirement Engineering

Finns break the ice anywhere in the world! At least when it comes to ships. An impressive two-thirds of the world's icebreakers originate in Finland. But it is not just about icebreakers, Finland is a first-mover country in marine industries. Finnish marine industry consists of more than 1000 companies and employs 30000 people with an annual turnover of 8 billion € (See [marineindustries.fi](http://marineindustries.fi) for more information.) Now, Aalto University wants to have its share of the marine industry by doing a project. This project defined by the "FinTour" consortium, consists of:

- The municipalities of coastline cities that provide port facilities and in-cities procedures
- Travel companies, providing tour guides and do registration for tourists
- Shipping companies providing boats and boat crew.

FinTour is created to provide a tourism supply chain management around Finland's coastline. Now, it's your time to develop this project as an Aalto university representative. In this project, FinTour decided to provide a special tag system (named Tour-Tag) for every tour leader to gather statistical information, control rules, provide some guidance, and help tourists to make trips better. So, Tour-Tag is a software that should be implemented on currently available hardware. The system works in the following way:

1. The boats will transfer a group of tourists with a leader (tour guide) from the origin port to the destination port. All the leaders should be equipped with a Tag device.
2. The leader should set the origin and destination ports on the Tag at the beginning of the trip.
3. The boats should follow the map routes, some one-directional and bi-directional routes can be found on the map (Fig. 1).
4. The boats should have a break at all middle ports for short visits, fuel updates, and maybe boat or boat crew changes.
5. The Tags should be updated in each port at the arrival and departure.

Main functional requirement for Tour-Tag:

1. The leader should set the origin and destination ports on the Tags at the beginning of the trip.
2. The states of Tags should be updated in each port at the arrival time during the tour for collecting information and statistical purposes.
3. Tags should be connected to the backpack of the leader, where all the tourist group can see it during the trip. This helps people find their leaders and current status.
4. The Tags' interface should be accessible via mobile or laptop by using the ID code of the leader.
5. Every stop takes at least 2 hours. The boat drivers should have access to the time remaining before the departure. Also, he/she should submit the departure time for the Tags.

6. Tags should be nice, user-friendly, suitable for marine travels.

This is the “idea-level” starting point for your group work to prepare the only deliverable of part A, a Software Requirements Specification (SRS) for the new product asked by FinTour. As you can see, there are numerous open issues that you must address yourself to be able to prepare such a comprehensive document.

Please use as reference the good practices from IEEE 830:1998 (<https://ieeexplore.ieee.org/document/720574>) or the standard ISO/IEC/IEEE 29148-2011 (<https://ieeexplore.ieee.org/document/6146379>)

Note: Be aware that, you are not the only software designer for FinTour, so based on some other requirements in the project you should implement your software system on currently available hardware. The recommended hardware for Tour-Tags is a Raspberry pi 3 B+ and a 16\*16 Pimoroni PIM273 LED Matrix (all provided by the course staff). You should use them as a portable interface for the tourists, but also it can work as a server or any other useful role (Fig. 2). The GPIO port in the Raspberry Pi will be used for the RGB LED matrix. Besides, you should provide any other hardware or installation requirements in your specification document to be considered for the project.

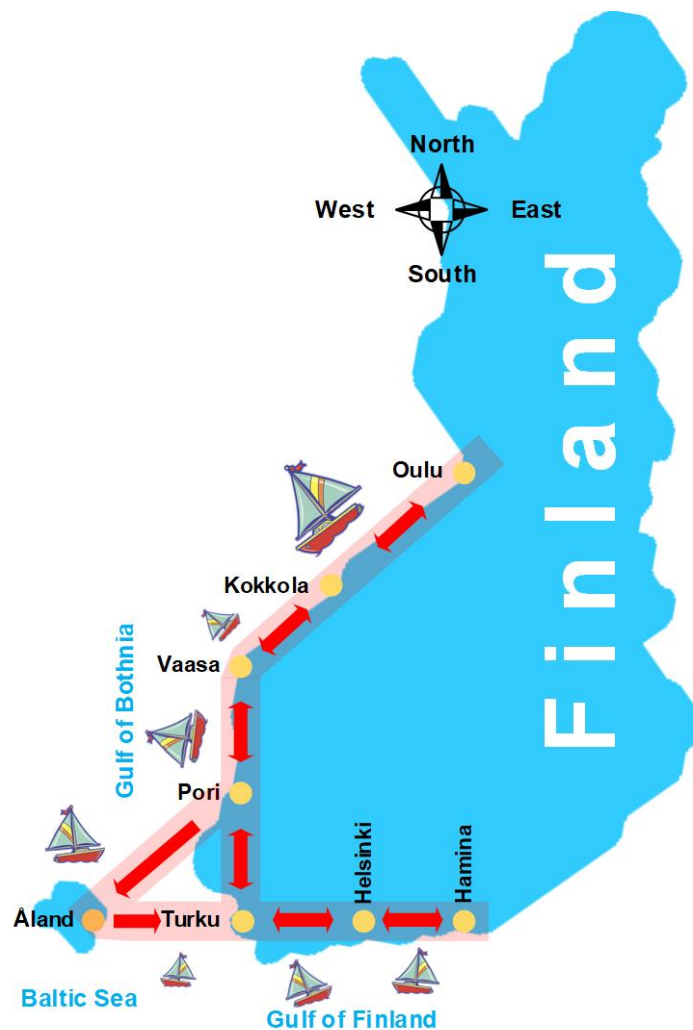


Fig. 1. Map of tour routes

## Part B- Implementation and project documentation

In this step, you should design and implement the first prototype on the raspberry pi 3 B+ board to cover the requirements from part A. You should try to meet as many specifications as possible from the requirement engineering phase. The general structure of your system could be based on your own design and methodology but based on our expectations, you should provide a solution based preferably on a web application (service-oriented architecture), a set of user interfaces (GUI and led display), and finally a data acquisition/storage system. The course staff strongly suggest using repositories for your code development as Github or Aalto version (GitLab based) and shared locations for teamwork over documents as Google Drive or Office 365.

The deliverable for part B includes:

- A design report which might allow your work to be used and maintained in the future for other people
- A user manual to operate the system (including a test plan)
- The updated versions of your SRS document
- A back up of your code and if available, the link to your public repository

Take care that *innovation* and *creativity* play a key role in the software market, so use them as much as possible in this project.

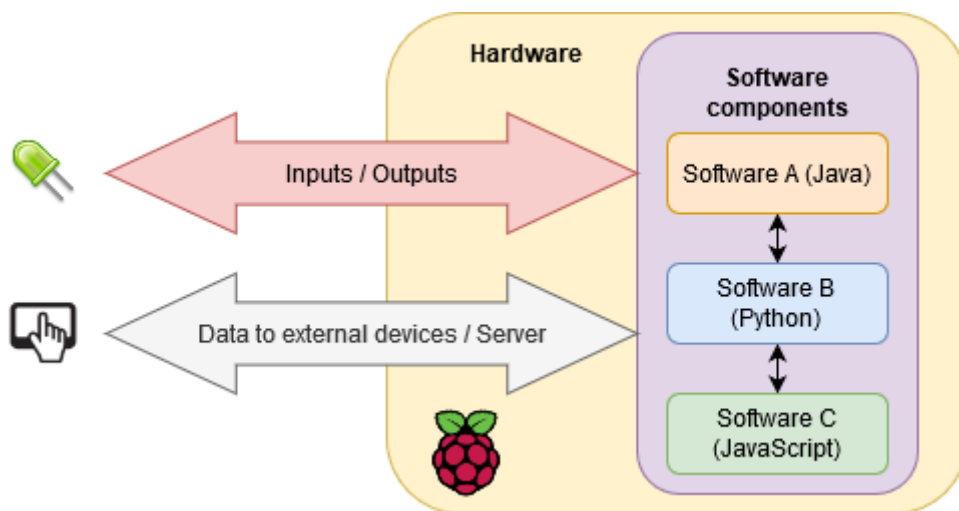


Fig. 2. Example of system components and data flows (sketch)

### SPECIFIC GUIDELINES

There is naturally no single correct way to complete this mini-project.

- Your document for the first part of the project shall be balanced, complete, correct, easily understandable, and unambiguous
- It is recommended that the implementation for the second phase is based on the provided hardware

- There are no requirements about what programming language should be used. You can use the one of your preference. However, the course staff recommends Python, since the LED matrix has a very convenient library for it (<https://github.com/pimoroni/unicorn-hat-hd>)

Your SRS document must include at least the following specifications:

- Context diagram with complementary definitions
- External interface requirements for inputs and outputs
- Functional requirements (formal/semi-formal/informal specification techniques as seen appropriate)
- Performance requirements
- Design constraints (such as hardware, operating environment, and possible standards)
- Software-system attributes (including, for example, maintainability, reliability, and security)

Finally, remember that the future cooperation of FinTour with Aalto University depends on the possible success of this product! So, do your best :)

### GENERAL SCHEDULE

- **Introduction** 02/05/2021 10:00 to 11:00
- **Group conformation open in MyCourses** 02/05/2021 12:00 to 02/10/2021 12:00
- **Handout of hardware** 02/11/2021 10:00 to 14:00
- **Deadline for part A - requirement engineering** 02/25/2021 23:55
- **Deadline for part-B implementation and final project document** 03/25/2021 23:55
- **Presentation day** 03/26/2021 10:00 to 13:00
- **Deadline for peer review** 04/01/2021 23:55
- **Hardware return** 04/09/2021 10:00 to 14:00

The handout and return of hardware will take place at the Aalto Factory of the Future, located in the Computer Science building, room B144 (Accessible from the big door at Konemiehentie 2 H). Presentations will be held online. Each group will have a 10 minutes slot.

### OTHER CONSIDERATIONS

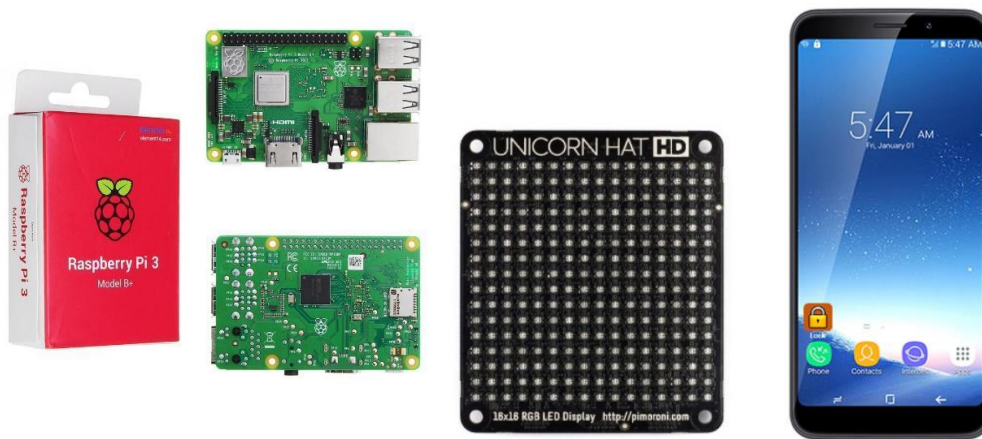
The professional-looking report must be written in English. It should include a cover page with full names, student identification numbers, and e-mail addresses of the group members. All the code and implementation reports shall be added as a separate annex document. Only one member of the group should submit the deliverables in MyCourses as a zip folder.

The implementation part must be demonstrated during the presentation day online sessions (10 minutes slot).

Peer review should be submitted using the format ELEC-E8408 Mini-project peer review 2021.xlsx.

If some member of a project group thinks that the workload was shared unfairly between group members, he/she should notify the instructor by e-mail and describe the case briefly. The instructor will discuss with the group members the workload shares before grading the Mini-Project Report.

Practical issues related to the Mini Project can be discussed during the regular exercise hour on Fridays (11:15–12:00). Use this opportunity effectively to make sure that you have understood the task description.



### PROJECT BIDDING (OPTIONAL):

If you have a project idea for a different system that fits better your technical skills, you can present it to the staff for further consideration. One group of 3 people will be selected and sponsored to implement their proposal as an alternative for the Tour-Tag mini-project. However, the deliverables and schedule are the same as presented in the *general schedule* section, starting from the deadline for part A (requirement engineering).

To participate in the bidding, please fill the tender format attached and submit it before 02/10/2021 10:00 on MyCourses (ELEC-E8408 Mini-project tender format 2021.xlsx). The course staff will publicly announce the bid winner on 02/15/2021 at 12:00. The format includes fields for the system description, functional requirements, and bill of materials. The system description and functional requirements can be presented in the same fashion as they are for Tour Tag in this document. For the bill of materials, please specify all the materials needed to prototype your idea and include a link from one of the following online stores for each item: [RS](#), [DigiKey](#), or [Farnell](#).

The awarding of the bidding is the exclusive responsibility of the course staff. The tendering process can be considered void by the course staff.