Design research

UWB positioning area 51

# 

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# Research goal

The goal of this research is finding out how we can improve the current project during our time in this prof assignment.

# Research questions

## Main question

Based on different prototypes, how can this project contribute to building a software solution that improves BMX sport by tracking the movement and/or other parameters of athletes?

## Sub questions

What requirements are connected to the entire project and which ones are only for this sub-project?

Based on the requirements which prototype is reusable and how is this going to continue developing?

How are we going to implement multiple data types from different sensors in our system and adhere to the SOLID principles?

# Research methods

1.1 Available product analysis, document analysis

1.2 problem analysis, explore user requirements. interview.

1.3 problem analysis, user requirements

# Preface

In this document we described our process of answering the design questions we had.

# What requirements are connected to the entire project and which ones are only for this sub-project?

On the basis of our customer interview and meetings with the product owner we have made a list of requirements and categorized them using the MoSCoW method. This means we split the requirements in “**Must have**”, “**Should have**”, “**Could have**” and “**Won't have**”.

## Must have

* See the speed/Acceleration/Height/etc. (i.e relevant available data) at current timestamp
* Be able to connect 1 MQTT server for receiving pozyx data.
* Developers should be able to easily add more protocols and/or file formats for importing/exporting (live or regular) data
* for the SD6 course
  + Automatic unit testing
  + Automatically published (working) executables for windows
  + Automatically published (working) executables for android
* Export data to the following formats:
  + JSON and CSV
* Import data from the following format(s)/protocol(s):
  + JSON
* Record measurement data for 1 user per recording device

## Should have

* Offset the measurement data in time
* Offset the (positional) measurement data in space
* Be able to connect to more than 1 sensor system for receiving data
* Measure the average speed over a period of time
* User can select a timestamp and the system provides data at that timestamp (e.g. speed, position)

## Could have

* Save and load user settings

## Won’t have

* Finalized user interface
* Data synchronisation between program instances.
* ability to connect to more than 1 sensor system (though the possibility to do so should be in the design)
* The new 3d view of the park
* Video support

## Conclusion

In conclusion we created a list of requirements that are connected to the entire project but by using this method you can also see what we plan to finish for this project. The must haves is what we are going to finish in our “sub-project”. The should haves are what we are going to implement if we have more time than expected. The could and won’t haves are probably not going to be implemented in the time we are working on the project. To view the nodes of this interview, see **attachment 1.**

# Based on the requirements which prototype is reusable and how is this going to continue developing?

To answer this question we made a separate research document about the existing software. In this research we answer the question: “[**What software programs/code does USPC already have, what do they do and are they scalable and extensible?**](https://docs.google.com/document/d/1iiI2CoZ3EZht1PJasyZ4LYml1wE9_K3h/edit#heading=h.1fob9te)”

In this document we have made a list of the existing prototypes:

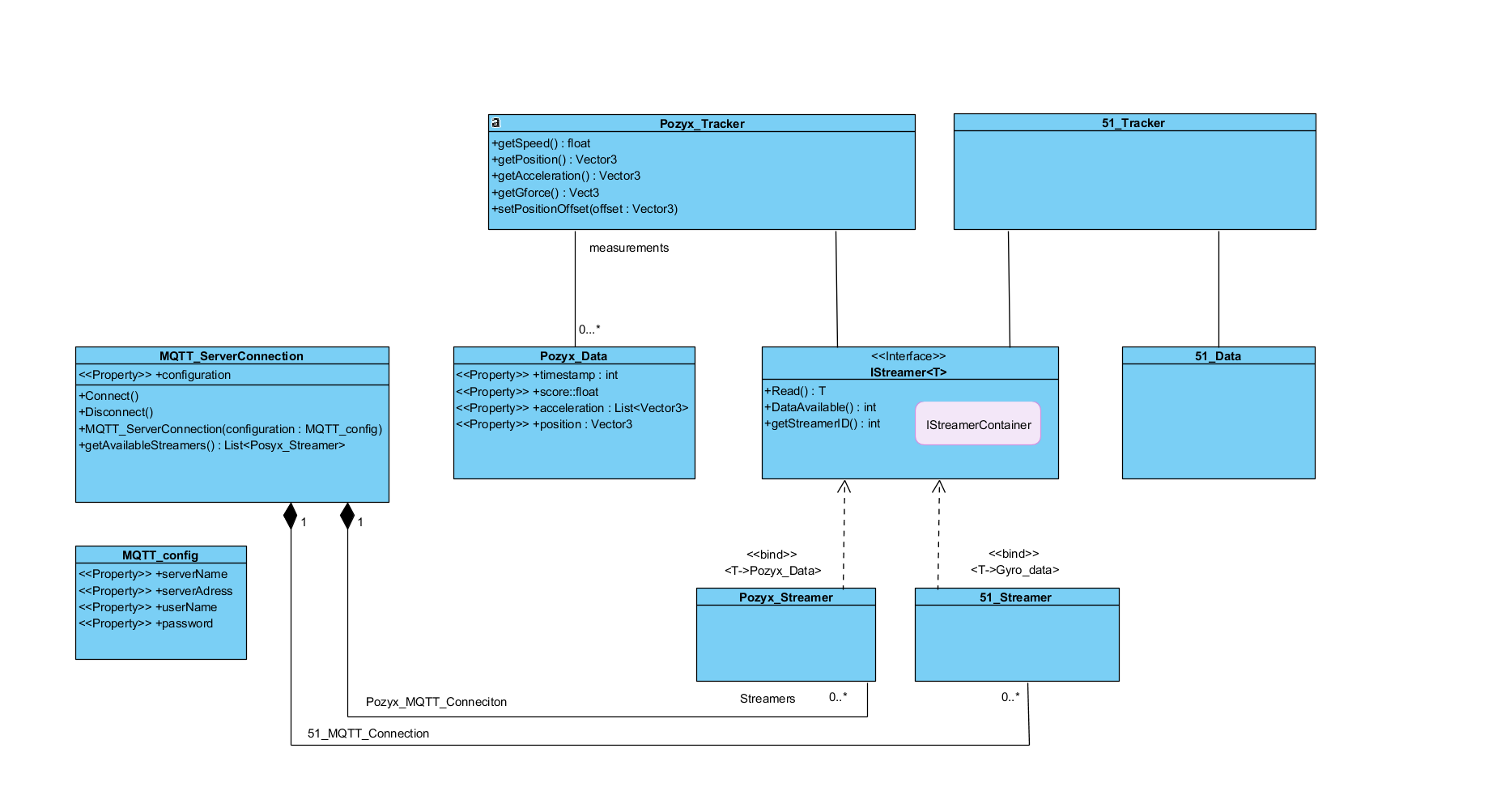
|  |  |
| --- | --- |
| **Project name** | **link** |
| Proof of concept website | [Bmx-in-motion](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPVlrM084X0RlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%20Sensor%2FBMX%20In%20Motion%20%28Arno%20Borgers%29) |
| Mqtt local logger | [Programma-Jesse](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPWZ3TkZBX0hlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%20Sensor%2FProgramma%5FJesse%2Fapplication%2Ewindows64) |
| Mqtt sensor Logger | [“Python”](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPWZ3TkZBX0hlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%20Sensor%2Fpython) |
| Proof of concept data visualizers | [SMC-final-zonderlogo](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPWZ3TkZBX0hlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%20Sensor%2FSMC%5Ffinal%5Fzonderlogo) & [Smc-sensor-programma](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPWZ3TkZBX0hlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%20Sensor%2FSmc%5Fsensor%5Fprogramma) |
| SMC\_arno | [SMC-arno](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPWZ3TkZBX0hlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%5Farno) |
| Unity data logger and visualizer | [SMC-V1.0](https://innosportslab-my.sharepoint.com/personal/info_innosportlabsportenbeweeg_nl/_layouts/15/onedrive.aspx?originalPath=aHR0cHM6Ly9pbm5vc3BvcnRzbGFiLW15LnNoYXJlcG9pbnQuY29tLzpmOi9nL3BlcnNvbmFsL2luZm9faW5ub3Nwb3J0bGFic3BvcnRlbmJld2VlZ19ubC9Fb1JsWk9OSGVlbEVzenZoTzFvMTVaMEJidXlDZG5MWW1JZERfNzNoTzZHTnp3P3J0aW1lPWZ3TkZBX0hlMkVn&id=%2Fpersonal%2Finfo%5Finnosportlabsportenbeweeg%5Fnl%2FDocuments%2FMedewerkers%20InnoSportLab%2FUSPC%20%2D%20general%2F3%2E%20BMX%2FSMC%5FV1%2E0) |

Out of this research we conclude that most of the existing prototypes are not usable. We are however going to improve on the **Proof of concept data visualizers.**

## Conclusion

In conclusion we are going to improve the data visualizers by making the code object oriented and SOLID so it's more scalable and easier to understand for future programmers. In this application we are also going to make the MQTT connection and make it possible to actually receive Pozyx data. For more information about the existing software research, see **attachment 2.**

# How are we going to implement multiple data types from different sensors in our system and adhere to the SOLID principles?

To answer this question we had to brainstorm about how we want to make this system. We are working with a tracking system that gives us JSON pozyx data over MQTT but we also have to think about adding other sensors (for instance a heartbeat sensor) which may give a different type of data in a different format. To tackle this we want to make our sensor data generic. We are going to do this by using templates on the streamers. 

This way we can have different types of data (and steamers) and still keep to the single responsibility principle.

We asked Karin Dieleman for feedback on this idea. After telling her what our project is and explaining about the diagram and why we needed this container class, she agreed this was the right way to do it. For us this was the conformation to continue with this idea. To view the feedback nodes we received, see **attachment 3.**

## Conclusion

We are going to template the streamers. This way the data is generic until we need to know what type of data it is higher up in the diagram. By doing this we prevent problems with different data types and still adhere to the SOLID principles.

# 

# Based on different prototypes, how can this project contribute to building a software solution that improves BMX sport by tracking the movement and/or other parameters of athletes?

We have set up a list of requirements for this project and we have made clear what we as a group want to accomplish during this prof assignment period. This has been talked over with the customer and we now both have a good vision on what is going to be done at the end of this working period. This includes working further on the **Proof of concept data visualizers** which was one of the prototypes the customer already had. We are not going to touch much of the other prototypes. We already thought out a system we want to make and tackled some of the problems. This design has been looked over by an experienced teacher and has been approved.

In conclusion, we are going to contribute to this project by building a data visualization application that can directly receive poxyz data over mqtt and is expencible in the sense of adding multiple sensors and new data types. This data is going to be shown in the applications user interface for trainers or bmx riders to see their runs.

# Attachments

* **Attachment 1**: User requirements interview with product owner and customer - Click [here](https://docs.google.com/document/u/0/d/1mR6_0QHRvH0-yxM-y158Ob4t8pOnYAZKRAT8qwm3ayw/edit).
* **Attachment 2**: Research existing software - Click [here](https://docs.google.com/document/d/1iiI2CoZ3EZht1PJasyZ4LYml1wE9_K3h/edit#).
* **Attachment 3**: Notes to feedback class diagram - Click [here](https://docs.google.com/document/d/1PKfsjQlRAApi9ObDHX0pVJcQuucNE_0j7I7zx7ehRSs/edit).