

GreenHouse

SEP4 - Process Report

Students

Mark Vincze, 224478
Priyanka Shrestha, 299543
Maria Asenova, 239533
Constantina Tripon, 253085
Daniel Railean, 294241
Ilia Nikov, 297112
Tamas Peter, 299124
Florina Toldea, 299116
Michel Sofus Engelhardt Sommer, 273966
Viggo Petersen, 314203

Supervisors

Kasper Knop Rasmussen
Knud Erik Rasmussen
Ib Havn

34928 characters

Software Technology Engineering

4th Semester, 17/12/2021

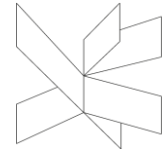
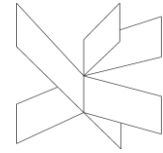


Table of content

1	Introduction	1
2	Group Description	2
3	Project Initiation	3
3.1	Project Idea	3
3.2	UP and Scrum	4
4	Project Description	6
5	Project Execution	7
6	Personal Reflections	8
6.1	Tamás Péter (299124)	8
6.2	Ilia Nikov (297112)	10
6.3	Viggo Petersen (314203)	11
6.4	Michel Sofus Engelhardt Sommer (273966)	12
6.5	Constantina Tripon (253085)	14
6.6	Mark Vincze (224478)	15
6.7	Maria Asenova (239533)	16
6.8	Priyanka Shrestha (299543)	17
6.9	Florina Toldea (299116)	19
6.10	Daniel Railean (294241)	20
7	Supervision	22
8	Conclusions	23

Appendices



1 Introduction

(Mark Vincze, Priyanka Shrestha, Maria Asenova, Constantina Tripon)

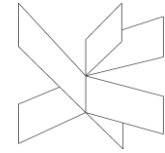
This process report details the workflow of the group behind this project. The group consists of 10 people and three specialisations, the IoT responsible for the physical device and LoRaWAN connection, the Data creating the Gateway Server and data warehouse, and the Android developing the client application. Each team member spent most of their time working based on their specialisations.

The group followed a hybrid meeting plan, but most of the meetings were remote, which proved to work out for the better.

Because of the size and requirements of the project, the group had limited ideas to choose from, so the group chose the first one generated, which was accepted by our supervisors. The working process began immediately after the project idea was accepted, as the working load from this semester was heavy, and the group did not wish to fall behind.

The sections below will describe the different stages of the working process, starting with group formation and cultural backgrounds, will focus on the agile development process and the reflections of the project from each of the members. The workflow of the team behind this project report has followed an agile approach to software development, using the Scrum methodology together with the Unified Process model.

The report will end with a brief discussion regarding supervision and an overall conclusion section.



2 Group Description

(Mark Vincze, Priyanka Shrestha, Maria Asenova, Constantina Tripon)

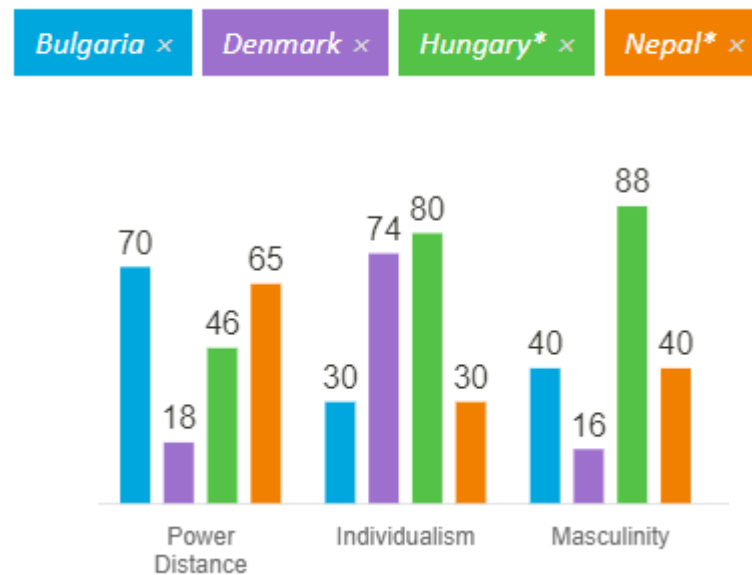
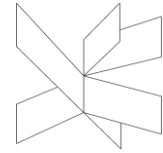


Figure 1. diagram

The team consists of 10 people coming from 5 different countries - Nepal, Bulgaria, Romania, Denmark, and Hungary. Romania and Bulgaria have the same cultural background and have similar scores for the three dimensions, such that the team decided to use only the latter for displaying the differences as seen in figure 1.

Although the team members are from different countries with different backgrounds, all the members have been staying and studying in Denmark for a couple of years. Hence the team has adapted to the Danish way of working in a team. As seen in the graph above, power distance and masculinity are low which is also reflected in the teamwork of the group. Each member of the group has been given equal responsibility to the tasks of the project.

The members of the group belong to different age groups, therefore having different levels of experience. Some members have work experience from Danish companies



which has brought wider and professional perspectives on the teamwork other than the ones taught at school.

The team is a mix of different personalities where some team members are more driven towards the final goals of the projects and have a result-oriented mindset while others more towards socialising and relationships. This has contributed to both a balanced and dynamic group environment.

3 Project Initiation

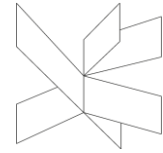
(Mark Vincze, Priyanka Shrestha, Maria Asenova, Constantina Tripon)

The main requirement for this semester project was to develop an IoT system capable of retrieving, analysing, and visualising sensor data. The project was initiated with the creation of the group contract, as seen in Appendix D in which all the rules needed to be followed were discussed. The group also discussed the workflow that should be managed such as using the planning poker for the estimation of the work breakdown process, the definition of DONE for the tasks, the naming convention for the branches and the sprint duration. Then the group moved to the role distribution for the scrum and that is the product owner, scrum master and a person to record and document the meetings.

3.1 Project Idea

The team discussed three different ideas during the idea generation phase. An automated greenhouse system to monitor the internal environment, a smart healthcare alarm to monitor sleep analysis and give tips to increase sleep quality and an incubator for an ICU, capable of monitoring the closed environment.

All ideas were approved by the supervisors, but the team decided to focus on the Greenhouse automated system because all the members thought that the case is more



realistic in a real-life scenario than the other two. Moreover, the greenhouse automated system will cover the requirements for SEP4 as it will require continuous monitoring of the environmental variables.

3.2 UP and Scrum

The project was managed using Scrum and UP. Each sprint included a small UP process bringing a user story through the stages of analysis, design, implementation, and test.

Throughout the inception phase the team documented the project idea, initialization of Scrum and UP, set milestones of deadlines and chose the technology stack for the project. The artefacts of the inception phase were a Project Description, deployment diagram and user stories.

The initialization of Scrum included appointing a product owner and a scrum master for the time frame of the project. The product backlog in Jira was set up and prioritized by the product owner. Creating the definition of done and naming convention of git branches was done as also during the inception phase.

To follow the definition of done, the team set up the following columns, as seen in figure 2. in Jira as a Sprint structure:

- 1) To do
- 2) In progress
- 3) Review
- 4) Done

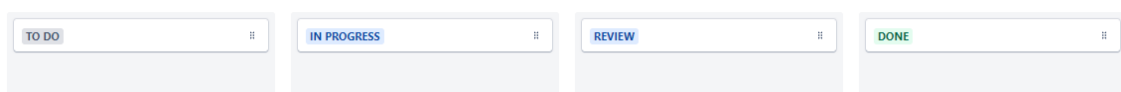
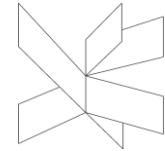


Figure 2. board



The team followed the daily stand-up meeting every day, as well as planning the sprint and estimating tasks. Sometimes the team would assign tasks to the individual specialisations, and then within each specialisation the work breakdown structure and planning poker will happen. Figure 3. shows an example of how the work breakdown structure was done in Jira. Each task is represented by a child issue.

Add epic / GREENHOUSE-4

(4) As a user, I want to be able to see data gathered by the humidity sensor so the humidity can be adjusted accordingly if needed by setting up new threshold values.

Attach Add a child issue Link issue

Description
Add a description...

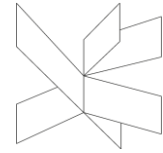
Child issues Order by ...

100% Done

GREENHOUSE-40	Identifying business process (Data)	DONE
GREENHOUSE-41	Declaring the grain (Data)	DONE
GREENHOUSE-42	Identifying dimensions (Data)	DONE
GREENHOUSE-43	Identifying Fact (Data)	DONE
GREENHOUSE-44	Star Schema (Data)	DONE
GREENHOUSE-45	Source target mapping (Data)	DONE
GREENHOUSE-47	Creation of device model (EUI, threshold (low, high), target)	DONE
GREENHOUSE-48	API for Android to CRUD for devices	DONE

Figure 3. Backlog

To deliver a project upon the agreed architecture and requirements, the team collaborated closely every day. The team was meeting every day at 09.00 for a daily stand-up meeting. This was the time of the day where teammates shared obstacles,



problems, and achievements. The rest of the working days the different specialisations were collaborating by writing on Discord channels and making meetings in Zoom.

The daily stand ups were the heartbeat of the group work as the team members could exchange knowledge and help each other. This helped team members to stay updated and have an overview of the project.

At the end of each sprint the group made a sprint review and retrospective meeting where the tasks which were completed were documented, as seen in Appendix A. Along with that the group discussed and reflected upon what went wrong and what needs to be improved for the next sprint. The review and the retrospective of the sprint was very useful for the group as it reflects the process and helped the team to do better in the following sprint.

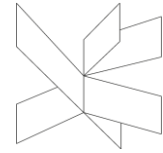
Using Discord as a major communication channel played a big role in the team collaboration. The different text channels made group work transparent as everyone had access to all discussions.

The documentation for each daily meeting can be found in Appendix C.

4 Project Description

(Ilia Nikov, Tamás Péter, Daniel Railean)

When the topic had been chosen, we started identifying the problem. With a little browsing on the internet, we found out that automating a greenhouse is a present and a challenging problem in Denmark. We aimed to be as close as we can to a real-life situation, so we also searched for some already existing apps to see today's standard. The product owner started to give problem statement ideas and the team followed it closely giving other suggestions. The IoT device was useful even at this stage since we could see what data we needed to gather with it.



When we defined the problem statement, we also tried to prioritise the questions and roughly estimate what can be done in the given time. It looked like we can handle every obstacle, but as we moved along with the project, we had to change a few parameters. For instance, at the beginning we did not know how many greenhouses could be supported by our system, so we adjusted this later. We wanted to have at least one. In the greenhouse we wanted to see and adjust the sensors and use a servo (window) as well. The team agreed on the methodology and on the time schedule. It was easy to agree because everybody was using Scrum in the same way. There were only minor differences.

In the end we managed to have a basic understanding on the topic and on the methods, we are going to use. We think the team managed to put enough ideas in this phase, so we had a lot of material to work with in the following weeks.

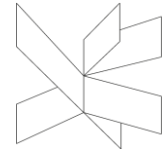
5 Project Execution

(Michel Sommer)

Communication has been good; it has been a task to manage a larger group of 10/11 persons. Especially since we came from different educations and semesters and thus learn from each other's different approaches to a task based on our individual experiences.

At the beginning of the project, we experienced disagreement about tool choices. We chose to use Google doc and Google sheets, although these do not support some basic features, to comply with the VIA guidelines. On the grounds that, a majority of group members were more familiar with these tools, hoping for a smoother work process. After which the reports are moved and formatted in Microsoft Word.

We have evaluated that we could have been more productive, by breaking tasks into smaller fractions, so instead of delegating tasks to our specialisations; Android, Data



and IoT, so that we can work on more tasks in parallel. We also discovered a tendency where communication between specialisations could have been better, it is likely that dividing tasks across group members with different specialisations could improve communication but also provide a broader understanding of the different tasks. At the same time, it must be emphasised that the communication around the design phase has been really good, with a close and thorough collaboration.

There was a wish in the group to use Jira to support our backlog, to be familiar with the tool. We ran into the issues that we were 11 group members in the start, and Jira only supports 10 group members without payment, that meant that we migrated our backlog to GitHub, using Issues to track user stories. When we started the project week, we lost a group member, and migrated back to Jira.

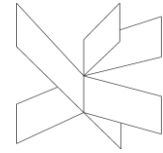
Daily communication has been run via a Discord group. When we reached project weeks, we switched to Zoom, since some group members experienced issues with blurry screens when sharing a screen. It will help in the future if we live our pride and become more open in the group regarding obstacles, and ask for help, instead of wasting time hunting an issue.

6 Personal Reflections

6.1 Tamás Péter (299124)

In the 4th semester project, our group was made of 10-11 people which was more than in the previous semesters. I liked the idea of having more people in the group and doing multiple applications at one time because it imitates a real-life situation. Also, it seems to be a good idea that people can choose a specification and work more in their favourite field. This is a good motivating factor.

Being in a big team can be challenging as well, since as we get more and more people, it is harder to communicate and keep everybody up to date with everything. At the



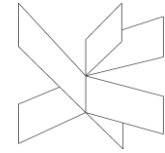
beginning it was a bit hard to be on the same page with everybody but in the sprinting period we managed to have a pretty good communication system, even though we used a lot of platforms for the same task. Scrum also helped us a lot because it was made to handle larger projects as well. We made good use of planning poker and Jira. We could not make everything work at first, but I think this is the point of this semester project to experiment with a lot of things and a lot of people.

I was a part of the Android specialisation this semester because I felt that these interactive media classes are closer to me. We could handle most of our programming obstacles and we could solve every question with communication and patience. It was also interesting to agree on the connection between the data and the android programs since it required us to understand in detail the whole design.

I have also seen that there are a lot of things going on under the hood with a system like this and it is very hard to make it and probably maintain it in the future. A lot of parts are dependent on a lot of other parts and if one stops then the system won't work. Despite this I am still very motivated to try other bigger projects like this, since in the end the result is very satisfying to see, and it feels good that we made such a thing.

To talk a bit more on the groupwork I think every person in the group tried to be as active as possible. I can really appreciate this because I know some members must work, others have family and many other things besides school. We mainly followed the group contract but sometimes we had to make exceptions because of the above-mentioned factors (work, family etc). I think this is totally alright. We were working on sep sometimes on the weekend if we knew we will have important tasks to do the other week.

Being in a multicultural group can also be challenging but in the 4th semester we got used to it and we had only advantage of this, like we could discuss how a greenhouse works in different countries with different methods. It is very good that we had a few Danes in our group because they could give us the Danish view of solving a problem and that is very important since we designed our project according to the Danish situation in this agricultural field.



There are a few things I would do differently next time. The analysis and the design phases are always the key to a good project, and I would put even more focus on them. It is hard to make them right because at that moment we don't know what we can do and what we cannot, so we also need a bit of luck to make it sufficient. Another thing would be to choose one single communication platform because this semester we used at least three of them and sometimes it was hard to check every one of them. We tried to choose only one in the beginning, but we could not find one which is working for everybody. Sometimes I get stuck with the version controlling systems, so I have to put more effort in the future to exercise with them.

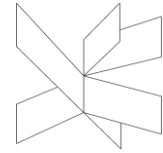
Looking back on this semester project I learned a lot of new things in all the analysis, design, implementation, and testing phases. I also could see how it is to work on a bigger project with more people. In my opinion this semester project is a good way to challenge the 4th semester students so they can go to an internship knowing a bit more about teamwork and bigger projects.

6.2 Ilia Nikov (297112)

This semester project was quite different from the previous ones, but certainly more interesting. Working with such a big group, I have to admit that initially, I was slightly overwhelmed. However, as the semester went on and each and one of us did their part, I realized how great we work together.

I think this project is the most similar to a real-life working experience, since when working in a big company, we most of the time are specialized in one area but work together with other departments to reach an end goal. I highly enjoyed developing android applications and would like to investigate the possibility of pursuing a career in android development, and this project made me realize that.

Regarding the group, as previously stated, every member is highly competent. There were never any problems with anybody not completing their tasks and such. However, when working in such a large group, it was clear that communication would be a key factor in achieving a harmonious working environment and flow. There were a few



instances where communication, or I should say, the lack of it, played a part in making tasks harder, but as the semester went along, I think we all got better at it.

Speaking specifically about the android team in specific, I believe we all worked in synchrony, and everyone was willing to help each other with any possible issues. Additionally, the only major struggle I was faced with, was retrieving the data for the line chart from the API, however this was quickly solved with the help of my teammates, proving how willing to help they were at all times.

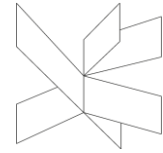
In general, this project went better than any of my previous ones, and this was highly due to my group members. I can say with certainty that I would gladly work with every single individual again and overall had a great experience.

6.3 Viggo Petersen (314203)

Since this is my first semester at VIA it is also my first Project. Therefore, there were some challenges in learning how the others had learnt to do diagrams, project structure, group work and such. However, the others in our group helped me and shared resources from their previous semesters. This was very helpful and motivating.

This project included a lot more people than I am used to from previous projects. To help the teams run smoothly I wrote up a Git workflow document and some videos, because I have a lot of experience with Git. Everybody seemed happy with this, and I was glad to contribute with my own previous experience. Because of this I also ended up helping the different teams with their setup and got a good overview of the entire project.

I was part of the IoT team, which was the team I was hoping to join. The three other members of this team were the people I had done other projects with and knew well. This made it easier to get started on the project, as we had already worked together a lot. We already had certain days where we would meet at school to do other homework, so fitting the semester project into those days was simple. Despite this we still had some minor issues about not always being great at scheduling and



communicating but overall, it wasn't a problem. It was mostly in the beginning where we sometimes focused too much on a single task and a single person ended up doing a big chunk of code alone. This was also resolved as we all got better at communicating and doing smaller tasks at a time, so we all got to be more productive and work better together. By the end the communication and workflow were good, not only within the IoT team but also with the other teams.

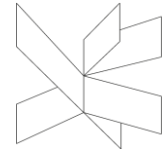
There are a few parts I would have liked to do differently. Mainly agreeing on a single platform from the start. We ended up using multiple platforms for both our meetings and our Scrum board. So, at times it was hard to know exactly where to look for things. The reason for all these platforms wasn't because people couldn't agree, but more because of restriction. We switched to GitHub for our Scrum, because Jira was restricted to 10 people, but ended up going back to Jira. We switched to Zoom because some people had issues with Discord and the video quality was often better on Zoom. Another thing I would have liked, was to have started earlier on the coding part. We found some bugs in the drivers, so it took us a while to get the code to a functional state in the beginning. I think if we had worked better together in the beginning, we could have found those bugs earlier and solved them.

Overall, I think this project was a very positive first semester project for me. I learned a lot about how the semester projects are structured and what the expectations are. This will definitely help me in the 6th semester.

6.4 Michel Sofus Engelhardt Sommer (273966)

It is always a challenge to work in a large group, especially if it is with people that are new together, we wear some, from other educations and semesters. Then the project topic and the semester project are a relatively large project for us, at present for us, in our education.

For the greater good I compromised on our Google drive as our platform chosen tool which collides with my browser, and new dyslexic tools, when I took a test on Thursday before the start of the semester which showed that I was dyslexic. In addition, I have



experienced several functions that we must use according to VIA's guidelines, and which are not supported by the platform we chose to use. It is not a rant, but to me it feels like dubious work, having to format all documents in a different tool than the one we worked in.

Our change project management tools were an issue, and I feel it had a cost in productivity. We started using Jira, a tool I looked forward to being more familiar with, but before we got started, we ran into their payment wall, moved all our backlog to GitHub, and then back again, and yes, I think I learned the basis on the platform as I desired.

Besides that, I am amazed at the good communication in the group and how thoroughly the other group members worked. Especially with the design and analysis phase and again in the daily stand-up meetings.

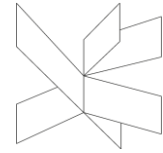
I like to have a good feeling with the project, but with the span of three specialisations, and the short project period, trust to other group members has been mandatory, just like in real life in a workplace.

I was part of the IoT specialisation, as I hoped working with the same people as in other courses, which has probably made it easier to collaborate from day one on the project.

I have used GitHub for all my lessons since second semester but in this project, I will state that I have learned way more about the use of GitHub, and its options.

I try to practice giving space to others in connection with group work but found that it is the same few people who are active when the whole group discusses a topic ... but I must admit that some weight and experience make it a challenge, and given our group description, it makes sense with our flat hierarchy, and where masculinity is assessed quite low in Denmark.

I will say that a luxury challenge during this semester has been all the ideas I have got, but which I have had to put on a to-do list until the semester is finished, including a



restful server, with a local LoRa gateway based on an SX1262 module... it is a bit of a hassle to live outside Horsens municipality, therefore I have also been dependent on someone else being able to test my code, on a device. But also, projects as a FreeRTOS car, and some Android apps I could keep going. so, I look forward to getting an internship, writing software in loop tests. So, there will also be some time to thin out the to-do list.

I will definitely say that I have learned that I need to interpret more, and / or ask for help.

6.5 Constantina Tripon (253085)

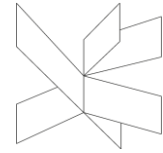
The learning curve for this semester project increased exponentially in a very short time. During this project report I have developed new skills in data analytics and using tools such as PowerBI for data visualisation.

I have acquired a basic understanding of Amazon Web Services. Because of the workload and time constraints, I did not have the opportunity to go in depth with the topic, but I know the steps needed for creating a server application and deploying it to AWS.

During the previous semester project, I really understood the importance of the design phase when developing a software system, and how disadvantageous it can be if not done right. We had some step backs during this semester project as well, but we managed to control the situation within the team, by solving the problem together.

By using the Spring Boot framework, I had the opportunity to strengthen the knowledge I have developed in the previous semester and improve the endpoints for the RESTful architecture.

GitHub is a tool we needed to use from the second semester, but I have managed to have a decent understanding of it now, during this project report, even more, using the command line for the git commands. The commits will not show an equal proportion as all the members of the specialisation wanted to have a good understanding of the software development process, so we had pair programming sessions. The proof of



concepts was developed and implemented by all of us, and the remaining part, not so much from our perspective, was divided in two groups.

The knowledge behind Scrum and Up started developing from the second semester and I have come to appreciate it and favour it in my working process. It was my first-time using Jira, but the learning process was fast, as it was easy to navigate around and very helpful when it comes to burning tasks, as shown in the burndownchart in Appendix B.

Having the knowledge from the previous semesters, regarding semester projects and group work integration, adapting to the current group situation was not that hard. The group has developed and maintained a constant workflow, minor communication issues that were discussed and overcome, and has always met deadlines.

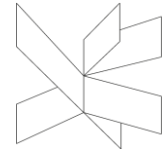
6.6 Mark Vincze (224478)

This semester we had to start out as a larger group because of the size of the curriculum we had to cover. Meaning that we had three teams inside the group selected out by the chosen specialisations.

I was undertaking tasks in the data specialisation as I like to work with backend and data, I was very glad as well to make this choice. Three other people were in my specialisation, I was 90 % of the time working only with them, as for the rest of the group was mostly also working in their specialisations.

The larger group also meant that we had to do meetings about the idea of the project, we had some misunderstandings over the whole picture, but we could always solve these. I think in the future, more planning is needed right at the ideation part. But the size of the group also meant that we could cover more and learn more from each other's part.

I feel like I learned a lot with this project about how to work with a real-like problem, besides the curriculum, I have learned how to set up a CI/CD pipeline, which made the development and testing part so much easier, as we could always have our application server running after with the latest push to git and interacting through the connection



without us having to always run it. Also learned more about configuring virtual machines to accommodate different software's (e.g., Ms SQL Server) and use them.

As working with data warehouses only came in this semester, it proposed a greater challenge and some confusion, but after working more and getting help from our supervisor it started to make even more sense on the whys and hows.

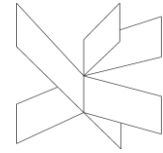
In the data specialisation, we followed pair programming when we implemented the application. I think this worked out really well and we could eliminate bugs easier and follow the guidelines. We were tracking our work by breaking down the main stories and creating a Trello table.

Overall, I had an exceptional time working on the project, it was a good experience working like this and I understood how crucial it is to have a good understanding amongst.

6.7 Maria Asenova (239533)

The scope of the SEP4 project was much larger than what I am usually used to. I like to be involved in every part of the project, as well as to be the person who keeps track of the overview and what needs to be done. This semester this was not quite possible. This was due to the fact that we were 10 people instead of 4, as well as the amount of work to be done.

In terms of management and team environment, Scrum has proved once again to be the best tool to use. The daily stand up played a big role in the teamwork as it was the time to ensure everyone is on the right track. On the other hand, the sprint review and retrospective were done individually within the specializations. Looking back at it now, I understand that it would have been quite beneficial for the teamwork if they were done together. It would have taken much more time and effort in the beginning, but it would have been beneficial in the long term. I believe it would have contributed to the team building and team environment. We would have also done better and more if we got to talk within the team about what actually went wrong and how we can improve.

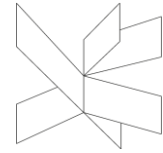


Each specialization took responsibility for their own part of the implementation; therefore, I did not get work on the Android App, nor on the IoT part. That would have been good to experience but also difficult to manage. As the project progressed the different specializations got deep understanding of the different parts of the project, therefore switching teams would have also taken more time. Working on the data specialization gave me deeper knowledge and more practice with the topics learned in DAI this semester. On the other hand, there were many other tasks to be completed. During this semester project I have gotten to improve my Git skills. I also started to use the Git command line interface instead of the CTAs provided in IntelliJ. I have not worked with WebSocket's before and besides that we only implemented the client, this gave me a very good understanding of how the technology works and when it is a good idea to use it. Using the IoC framework, Spring Boot, and working with RESTful web services was not new to me as I have built my SEP3 project based on these technologies. On the other hand, I have not used the JPA repository within a Spring Boot application before, so that was interesting to get to know about. I did not get to set up the CI/CD pipelines and AWS but I acquired a stable knowledge of how it's done. Working with GitHub actions was new to me as I have not heard of the concept before. It turned out to be a great tool for testing and a good checklist for developers before a branch merge.

I have always enjoyed taking individual work and programming by myself. Being part of the data engineering specialization, which did not have a lot to implement in Java, we did pair programming. I enjoyed it very much as we could exchange knowledge and come up with better ideas together rather than working individually.

6.8 Priyanka Shrestha (299543)

This semester there were eleven people in the group which is much bigger than the groups that I was used to working with in previous semesters and I was nervous at first because of the size of the group as it could be very challenging to work with a large group. There was a high chance that the team members could have conflicts and



disagreements and as a matter of fact there were times where that happened. However, at the end of the day we would always come to a conclusion and end it on good terms.

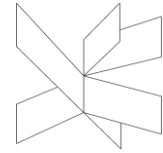
Also, scrum played a vital role in teamwork this semester as the teams were working with different specialisations and there would have been a communication gap if not for scrum.

I chose to work with data specialisation because I found myself enjoying and thriving towards learning more of it. It was challenging as there was a lot to learn, to do and go beyond what we knew from school to get the best of our part. There were four people in the data specialisation, and it was an amazing group. We worked very closely with others switching the tasks so that we got experience in every section of the project.

By the end of the project, I got a handful of experience in the ETL process, the initial load, and the incremental load. Along with that I also got to work with testing the data warehouse which I only had theoretical knowledge of. There was also the cloud workshop in the middle of the semester where we learned to host the application in an AWS service which will be very helpful for my internship as it is something that most of the companies use.

There are a few things I feel that could have been better. If we have arranged more supervision meetings along the way, it could have saved our time and the project could have been better. We had a time where we were confused, and we made two different versions of the data warehouse which could have been avoided if we had requested a supervision meeting sooner. But at the same time this is a learning phase for us, and we learn from our mistakes. We also were not consistent in the platforms we were using for communication and workflow management which affected the documentation of the first two sprints so I would definitely take this as a lesson for my future projects.

The experience was very different as we were a large group and had three specialisations and also a big project. The learning goals of the semester were huge, and the schedule was tight, before the project period, and on top of that, searching for



the internship put pressure on me. However, the project went very well, and I got to learn a lot from it. I appreciate the effort of each member of the team and the supervision.

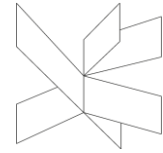
6.9 Florina Toldea (299116)

This semester was a totally new approach for me. We were a bigger number of students in the group, we were having different specialisations and we had to cooperate as best as possible, keeping in mind the details mentioned before. Even with these details, I think that our final product is pretty good.

It was a challenge because of the new technologies that were presented and used for creating the system. In the beginning I thought it would be almost impossible to communicate properly and work in such a way that no one “bothers” someone else’s work, but we managed to do it pretty soon and pretty good, I would say. It was also so interesting to work on different specialisations and still give each other feedback and opinions on each other’s work. I think I was also lucky regarding my group. I would not work with other people for this SEP, than the colleagues I have had. For me it was a very nice workflow and experience. I am happy and grateful that I had the chance to work with each of them for this project and I also learned a lot from all of them. Of course, some of us have different experiences than others, but this is what brought a new perspective to the project, and I think it made a good difference.

Regarding the supervision, I think it was helpful enough for our questions and obstacles. As in every semester, I had amazing teachers to learn from and look up to. I think that they set a very good example of how we should present ourselves for the internship and how to do our tasks. In a short sentence, I think that this SEP was a very good trial for what is to come in our next semester. And after this semester project I feel more ready for the internship than before.

What was interesting is that I got to learn new technologies and how to work with them. I got the chance to improve my old skills and learn new ones. Also, by having new colleagues, with different experience in the field, I think helped me a lot to open more



my vision regarding the process and work for a project and upgrade on a larger scale my personal and coding related skills.

Something that I would change for this semester project is the timeframe and organisation. I say this because I would have loved to be able to also change, at some point, the specialisation for this project until I got to go through all the steps that need to be done for the project in each department. So, of course, the timeframe would also be different than the one we had.

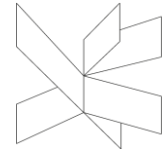
In the end, it was different from what I have had in my semester projects before. It was better, it was more challenging and more structured. I think that there are still a lot of things to learn or to improve. I think that for sure what I have done for this semester project and what I have seen my colleagues do for it is something that will help me in the future. But what I am excited the most for is that there are many more experiences like this to come and I cannot wait for them.

For sure this semester project changed my vision on this kind of work, and I hope it was a good experience for everyone that participated in it. The only thing I am sad about is that I did not have more time to discover more of my part of the project. Ending this, I would like to thank everyone that was in this process with me and wish them good luck in the future.

6.10 Daniel Railean (294241)

This semester was quite different from the previous ones, the main difference being the size and the organisation of the group. Our team was made of three smaller teams of 3 and 4 people working on the same product but from different sides, and I liked it a lot because it resembles the real-world approach out in the industry.

Being in a big team was challenging, as when the team scales up, so do the communication and management problems, but we remained organised by keeping everything in a shared drive and attending to the agreed communication channel. Scrum helped us a lot because handling big projects with a lot of people is its purpose.



We used spreadsheets as well as a 3rd party app for the planning and scrum documentation, and overall, the organisation issues were overcome.

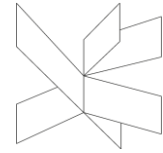
I was a member of the team that worked on the Android client and its authentication server, and during the process I learned a lot about developing a user-friendly interface and a good app experience. Our team did succeed in creating a fast, secure, reliable, and beautiful looking Android app that can handle all the course requirements and with small extra work will be able to show push notifications that would be sent by the data team.

I also encountered obstacles, specifically with displaying the Chart correctly when there is no data present in the source and scaling it depending on the interval chosen by the user, as well as with the local database, which is caching the user retrieved data, so it can be shown even without the internet. We handled the issues as a team and were helpful to each other.

I think we did succeed in creating a good app architecture, with a good user interface and nice functionality, which can easily satisfy a user's needs and at the same time being easy to maintain and expand upon, and writing android specific unit and UI tests, to make the development more pleasant and fast would be the next step, I think that I think we should have done from the beginning.

If I had a chance to change something, I would put more effort into agreeing on the interfaces and developing a server mock-up according to them from the beginning. That way a lot of the issues would be overcome, and the team dependencies can be uncoupled, just like it is done in real-life projects.

The project was under version control during the whole time, which helped a lot with managing the work of multiple persons at the same time. All the updates to the main branch being done mostly through pull requests and the experience I had with the git from the previous semesters, helped a lot as we managed to keep the source organized and with a clean history.



In the end, I learned a lot this semester, I really liked it, and I appreciate the effort of all team members and supervisors which contributed to this great result.

7 Supervision

(Michel Sommer)

The supervision was provided by Knud Erik Rasmussen, Ib Havn and Kasper Knop Rasmussen. They have all been very supportive and helpful throughout the project, the whole group is grateful for their inputs. The questions we had were mainly about analysis and design, ensuring that the project covers user stories. Ensuring that at every milestone (inception, elaboration, construction etc.), was kept on track.

Android

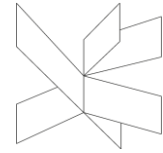
The Android specialisation asked Kasper Knop Rasmussen 2-3 times during the semester project, in addition to feedback on our hand-ins. We asked for help when we found multiple solutions for a problem to select the most efficient direction. We also asked when we were in doubt about the requirements of the android app. We always got a quick and useful answer.

Data

The data specific supervision was provided by Knud Erik Rasmussen. We have benefited greatly from our supervision. We used it to build the final version of the Star Schema and finalise the ETL, helped us find a strategy for handling 'trash data' which was very helpful, and also pointed out some small mistakes we have not noticed before.

IoT

The IoT specific supervision was provided by Ib Havn. We discovered issues in the start of the project, getting the PoC up and running. Using non implemented methods in the LoRa driver, so we would have preferred easier access to supervision at the beginning of the project, before handing in the PoC, maybe even as a workshop.



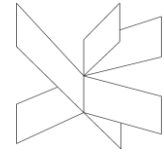
8 Conclusions

(Iliia Nikov, Tamás Péter, Daniel Railean)

In conclusion, the group had a great-work ethic overall. SCRUM and Unified Process proved to be great tools and gave us an advantage when it comes to organizing our tasks and workload. The group did not experience any major issues, except minor disagreements, and there was open communication throughout the semester, with only a few exceptions as previously mentioned.

Additionally, we managed to do, in general, everything we aimed for in the beginning, although we have learned that by breaking larger tasks into smaller ones, and having better communication between the specializations, we could have done even more. Overall, the supervisors played a crucial role in this project, as we have used them to our advantage, and they were always ready to help.

The main lesson we got from this project is that communication is key when working in such a large group. It is highly important to organize tasks accordingly and to update all group members on what we are working on to prevent misunderstandings and future conflicts.



Appendix A - Sprint planning, review, and retrospective

Appendix B - Burndown chart

Appendix C - Daily Stand-ups

Appendix D - Group Contract