S-ESE6

Portfolio

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# Introduction

The 6th semester of the ICT & Software Engineering course at Fontys is focused on enterprise software. The main strategy for the projects is the agile approach called Scrum. The projects will be divided into smaller iterations called sprints. Each sprint will have a duration of three weeks. This portfolio is a collection of all the results delivered at the end of each sprint.

This document will be separated into the seven learning outcomes of the semester. In each part, current level of mastery will be described. Besides this, the steps planned to reach the next level will also be noted. At the end of the document will be a conclusion and reflection on how the semester went.

**Group project - MKB**

Dinner in Motion is a 360° restaurant. Their data input and output are mostly manual and take a lot of time. The goal is to look at the current situation and improve it.

**Individual project - Clashbots**

The individual project is focused on the blockchain. The project is an NFT collection with a game element and social platform.

**Starting Point**

At the start of the semester, the knowledge of the student about certain topics was limited to none. For the individual project, the main focus was on the blockchain. The student had no previous experience with working with the blockchain, but was interested and wanted to learn more about it.

For the group project, the main focus was on enterprise software. The student had to work together in a group with four other students. The knowledge about enterprise software was also limited, but he had some experience from his last internship.

Learning outcomes

*Indicate where you think you are on the development scale, based on the feedback from your teachers.*

*Describe to the reader for each learning outcome what you have achieved during the past sprint and why this contributes to the learning outcome. Substantiate the why with feedback from your technical tutors.*

*The portfolio grows with content; sometimes certain content will no longer be relevant. Describe each sprint from the current status of your portfolio. You use hyperlinks to refer the reader directly to material in your portfolio.*

*(Reflection on progress) indicate where you are now and what your tutors have given as feedback to grow further on the development scale.*

## 1. Enterprise software development as a team effort.

*“You develop and deploy enterprise software, both individually and as a team. You select a suitable enterprise development platform and application framework(s). You select and apply a software development process, which complies with professional industry standards. You actively share knowledge within your team and with stakeholders to improve knowledge & processes.”*

The first learning outcome will be shown in the group project. Developing enterprise software as a team is not possible in the individual project as I am working alone.

The group project will not be finished this semester and another class will pick it up next semester. This means everything I work on has to be easily transferable to the stakeholders and other class. My task in the group project is to work on the messaging system with two other teammates. This also includes research as well.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1 | Sprint 1 | Group project | Orienting |
| 2 | Sprint 2 | Group project | Beginning |
| 3 | Sprint 3 | Group project | Proficient |

**Substantiation**

0: Sprint 0 – Group project

Sprint 0 was mainly used for setting up the teams and getting to know each other. We were not able to progress in this learning outcome this sprint.

1: Sprint 1 – Group project

In the first sprint, I have worked on the current situation document. I have also interviewed one other restaurant employee (son of the owner) for more information. All the information that I have gained was put into teams, so my group can access it as well. Together with another teammate, we have added the user stories with their priorities to our team Jira board which is accessible to everyone in the group and teachers.

2: Sprint 2 – Group project

This sprint, we set up the gateway and discovery server. This was put in our GitHub organization. All the repositories we make are public, so everyone has access to it. We finished the first and second research question, which resulted in conclusions that lead to using Kafka as our messaging system. We looked into hosting but did not have enough time to actually implement this. A mock system was worked on by me, but I was not able to fully finish it.

3: Sprint 3 – Group project

This sprint, we continued with the mock-services, information service and the event sourcing. We also have a kafka server hosted on confluent, which has been tested and works to our expectations. We also distributed private API keys to the other groups, not only in our class but also class 5.

**Reflection on my progress**

0: Sprint 0 – Group project

The team did not do a lot of work this sprint, so the level is set to: **Undefined.**

1: Sprint 1 – Group project

This sprint we mainly focussed on research and user stories. We have also divided the roles for the developing part. All the documents I have created are put in teams and the other information like user stories are accessible in Jira. The main communication platform is Discord or face to face on school.

Since we still have not started with the actual coding/creating part of the project, I estimate my level on the development scale to be: **Orienting**.

2: Sprint 2 – Group project

The communication was mainly inside our group, though we did have a meeting with the other groups which I unfortunately could not attend. We have definitely improved our teamwork by having the retrospectives after each sprint. We are more comfortable working with each other. I estimate my level on the development scale to be: **Beginning**.

3: Sprint 3 – Group project

This sprint, we started with actual coding our solution. I worked on the mock services, information service and event sourcing. I also hosted the Kafka server on Confluent. Since I made these, I was also the main contact about problems and help from other groups. This contact was through email, teams and in person. I estimate my level to be: **Proficient.**

## 2. Conducting context-based research

*“You deliver professional products according to planning, which are the result of a structured and methodical investigation. You have a critical view towards your own and other people’s work, by comparing them to alternatives, judge the structured and methodical approach and consider general accepted and ethical values. Your products are validated with stakeholders and other available*

*research, and you can judge & communicate the relevance and value of the project in its own context.”*

The second learning outcome will also be shown in the group project. Conducting context-based research is important in the group project because another class will be picking it up after us. The research done should be easily transferrable to the other class.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1 | Sprint 1 | Group project | Orienting |
| 2 | Sprint 2 | Group project | Beginning |
| 3.1 | Sprint 3 | Group project | Proficient |
| 3.2 | Sprint 3 | Individual project | Proficient |

**Substantiation**

0: Sprint 0 – Group project

This sprint, I did not do any research yet.

1: Sprint 1 – Group project

For the group project, we have created a design oriented research plan. This research uses the DOT framework. Each sub question uses multiple methods, so we can verify the results through multiple ways. I have interviewed one restaurant employee (son of the owner) which we still have to transform into usable data for our research document.

2: Sprint 2 – Group project

For the group project, the team continued on the research. I personally interviewed another owner, this time of a snack bar. I converted the interview information to diagrams, which got put into the main document.

3.1: Sprint 3 – Group project

In the group project, I did research on hosting. This did not exactly follow the DOT-framework, so it was more like an investigation. The main document is as good as done.

3.2: Sprint 3 – Individual project

For the individual project, I worked on the emerging trends document. The topic was about the blockchain, specifically NFT projects. The main goal of the research was to know how to create a project by myself. The document is not fully done yet because I am implementing code alongside the research which took quite some time. This document followed the DOT-framework.

**Reflection on my progress**

0: Sprint 0 – Group project

Since I did not do any research, the level is set to **Undefined**.

1: Sprint 1 – Group project

This sprint, we have started with our research documents. I have attended a lecture with two other group members on site in which we looked at our main and sub research questions and got feedback on it. The main points were:

* Use more methods for the questions. This way, you can use the triangulation.
* Use patterns (use multiple bubbles from the dot framework).
* Combine the smaller research questions into one more sizable one.

Using this feedback, we started updating our plan.

We have created a plan for the design oriented research document and made a start on it. We are still at the beginning of the document, so for this sprint the estimated level is: **Orienting**.

2: Sprint 2 – Group project

This sprint, I worked on the research for the group project. The research I did followed the DOT-framework methods. The document is not done yet, but the progress is going steadily up. I estimate my level to be: **Beginning.**

3.1: Sprint 2 – Group project

In the group project, I have done the hosting investigation this sprint. Combined with the Emerging trends document from the individual project, I estimate my level to be on **Proficient**.

3.2: Sprint 2 – Individual project

In the Individual project, I am working on the emerging trends document about the blockchain. I estimate my level to be on **Proficient**.

## 3. Preparing for lifelong learning

*“You acquire skills required for your future career. You are aware of multiple career paths and can reflect which ones fit best, considering your (potential) skills and ambitions. You are aware of developments in software engineering and can signal trends.”*

The third learning outcome will be shown in the individual project. In the individual project, I am exploring the relatively new technology blockchain. Since I my knowledge about the blockchain is limited/none existent, I will have to do research on my own so that I can create my own blockchain focused project.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Individual project | Undefined |
| 1 | Sprint 1 | Individual project | orienting |
| 2 | Sprint 2 | General | Beginning |
| 3 | Sprint 3 | General | Proficient |

**Substantiation**

0: Sprint 0 – Individual projectThis sprint, I have not progressed in the lifelong learning outcome.

1: Sprint 1 – Individual project   
In the individual project, I am exploring the relatively new technology blockchain. I chose for the blockchain because I think it’s a technology that is becoming more and more popular. I am exploring this path because I think it is interesting and I want to know more about it. I created an emerging trends research plan with the main topic blockchain. I have also created the first two levels of the C4 diagrams.

2: Sprint 2 – General

This sprint, I went to a career day at Fontys TQ. There were a lot of companies which I talked to. It was interesting to see the demos and talk about real life implementations of the technologies they showed. There were also stand about the minor where I could get more information about each path.

3: Sprint 3 – General

This sprint, I locked in my minor choice to “AI for society”. I chose this because the other minors did not stimulate my interest. I have not worked with AI before, so this is a good opportunity to get more information and experience.

This semester, I have been part time working at a software company called Moonly Software. It is located in Best and I’ve been working there 12 hours per week. I have been learning a lot from my seniors at the company, and I think this also plays part in this learning outcome. At this company, we have recently also started exploring the blockchain and possible solutions, which links .

**Reflection on my progress**

0: Sprint 0 – Individual projectThis sprint, I have not progressed in the lifelong learning outcome, so the level is set to **Undefined.**

1: Sprint 1 – Individual project

I am exploring the relatively new technology blockchain, which might be a path I can take for my future career. I created an emerging trends research plan with the topic blockchain. I attended a lecture about the DOT Framework, which resulted in me seeing that my research plan was not up to par. I have also received feedback from my technical teachers, and the main point was to update my research plan to the points of the lecture I followed. I have a plan on how to increase my skill level on the blockchain, but have not executed it yet, so my estimated level for lifelong learning is: **Orienting.**

2: Sprint 2 – General

This sprint, I went to a career day where I talked to companies and got more information about real life examples. I have also talked to people about the minors and also got more information about them. I feel like I have taken another step towards preparing for the future, so the estimated level is: **Beginning.**

3: Sprint 3 – General

After looking at my options and interests, I locked in the minor “AI for society” in progressWWW. I also talked about the minors with my team mates and we discussed the details of each minor. Besides this, I have been racking up experience whilst working in a software company called Moonly Software. I have a real client and work with other colleagues. This also plays a big part in preparing for lifelong learning. This is the reason why I estimate this learning outcome to be: **Proficient.**

## 4. Scalable architectures

*“Besides functionality, you develop the architecture of enterprise software based on quality attributes. You especially consider attributes most relevant to enterprise contexts with high volume data and events. You design your architecture with future adaptation in mind. Your development environment supports this by being able to independently deploy and monitor the running parts of your application.”*

The fourth learning outcome will be shown in the group and individual project. Scalable architectures are important in enterprise software since a lot of data will flow through them. The message system will connect different applications to each other, and adding one or multiple applications should not prove to be a problem.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1 | Sprint 1 | Group project | Orienting |
| 2.1 | Sprint 2 | Group project | Beginning |
| 2.2 | Sprint 2 | Individual project | Beginning |
| 3.1 | Sprint 3 | Group project | Beginning |
| 3.2 | Sprint 3 | Individual project | Beginning |

**Substantiation**

0: Sprint 0 – Group project

This project, I did not progress in this learning outcome.

1: Sprint 1 – Group project

For the group project, I will be working on the message system. This system will handle a lot of data and should be scalable. Our group added a task for load/performance tests, which will help validate the scalability of our system. We have already created a simple architecture which will be refined more into C4 diagrams.

2.1: Sprint 2 – Group project

This sprint, I focused on starting the implementation of our actual system. I made a start on the mock services with the connection to our kafka server. This kafka server was ran locally on my laptop.

2.2: Sprint 2 – Individual project

For the individual project, I created a load document. With this document, I keep estimate what kind of load each component in my system has. This results in me being able to make choices based on data instead of guessing. This is important in enterprise software because of the high volumes of events and data. I have also made all the repositories that will be needed in the future. The walking skeleton is done with simple functions and messaging with RabbitMQ.

3.1: Sprint 3 – Group project

In this sprint, I have created the event sourcing and information service for our system. We are planning to performance test these services, but unfortunately did not get to do this yet.

3.2: Sprint 3 – Individual project

For the individual project, I have mainly focused on the blockchain, so I was not able to do as much for this learning outcome.

**Reflection on my progress**

0: Sprint 0 – Group project

This project, I did not progress in this learning outcome, so the level is set to **Undefined.**

1: Sprint 1 – Group project

For scalability, we have created a simple architecture that sill has to be refined into C4 diagrams. My team mates have created a research document about what technology we should use for the system. Something that might be a problem is that I have been assigned to the message system part after they have already done the research. This means I will have to look over it and maybe do my own research if I do not totally agree with them. For scalability we are still at the beginning since we only have simple plans, so the estimated level is: **Orienting.**

2.2: Sprint 2 – Individual project

For the individual project, I created a load document. This results in me being able to make choices based on data instead of guessing. This is important in enterprise software because of the high volumes of events and data. The walking skeleton is done with simple functions and messaging with RabbitMQ, so the estimated level is: **Beginning.**

3.1: Sprint 3 – Group project

In this sprint, I have created the event sourcing and information service for our system. We are planning to performance test these services, but unfortunately did not get to do this yet. The estimated level is: **Beginning.**

3.2: Sprint 3 – Individual project

For the individual project, I have mainly focused on the blockchain, so I was not able to do as much for this learning outcome. The estimated level is: **Beginning.**

## 5. **Development & Operations (DevOps)**

*“You set up environments and tools which support your chosen software development process. You provide governance for all stakeholders’ goals. You aim for as much automation as possible, to enable short release times and high software quality.”*

The fifth learning outcome will be shown in the group and individual project. The messaging system that I am assigned to should be accessible to the other groups, so we will automate as much as possible using CI/CD to make the process more efficient.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1 | Sprint 1 | Group project | Undefined |
| 2 | Sprint 2 | Group project | Orienting |
| 3.1 | Sprint 3 | Group project | Beginning |
| 3.2 | Sprint 3 | Individual project | Beginning |

**Substantiation**

0: Sprint 0 – Group projectThis sprint, I have not progressed in this learning outcome.

1: Sprint 1 – Group project   
The DevOps part of the group project is currently still scarce. We have not set up any environments or CI/CD. To keep track of the stakeholders goals, we have created tasks and put them in Jira. The team also frequently meets the stakeholders and get feedback on our work.

2: Sprint 2 – Group project

For the group project, I have added Sonarcloud to the pipeline. This should give us some better quality assurance.

3.1: Sprint 3 – Group project

For the group project, I have added some unit tests for the services I made.

3.2: Sprint 3 – Individual project

For the individual project, I have added continuous deployment in my pipeline to AWS elastic beanstalk. I want to test out the other options (google, Microsoft and digital ocean), but did not have enough time.

**Reflection on my progress**

0: Sprint 0 – Group projectThis sprint, I have not progressed in this learning outcome, so the level is set to **Undefined.**

1: Sprint 1 – Group project

We have received feedback multiple times and it was overall positive. The one negative point was that we were not totally sure who our client actually was. We received multiple different answers from our teachers, but eventually we got a clear answer from the project leader Carli. She stated that Bram from Dinner in Motion was our main client. Since the DevOps part is still limited, the estimated level is: **Undefined.**

2: Sprint 2 – Group project

For the group project, I have added Sonarcloud to the pipeline. This should give us some better quality assurance. Since the DevOps part is still limited, the estimated level is: **Orienting.**

3.1: Sprint 3 – Group project

For the group project, I have added some unit tests for the services I made. The estimated level is: **Beginning.**

3.2: Sprint 3 – Individual project

For the individual project, I have added continuous deployment in my pipeline to AWS elastic beanstalk. I want to test out the other options (google, Microsoft and digital ocean), but did not have enough time. The estimated level is: **Beginning.**

## 6. Cloud Services

*“You can explain what a cloud platform provider is and can deploy (parts of) your application to a cloud platform. You integrate cloud services (for example: Serverless computing, cloud storage, container management) into your enterprise application, and can explain the added value of these cloud services for your application.”*

The sixth learning outcome will be shown in the group and individual project. We will deploy our system to a cloud platform.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1 | Sprint 1 | Group project | Undefined |
| 2 | Sprint 2 | Group project | Undefined |
| 3.1 | Sprint 3 | Group project | Beginning |
| 3.2 | Sprint 3 | Individual project | Proficient |
|  |  |  |  |

**Substantiation**

0: Sprint 0 – Group project

This sprint I have not progressed in this learning outcome.

1: Sprint 1 – Group project   
We have not researched cloud services yet, since we are still at the phase where we are working on the research plan.

2: Sprint 2 – Group project

This sprint I have not progressed in this learning outcome.

3.1: Sprint 3 – Group project

In the third sprint, I looked at hosting for the kafka messaging system. Together with the group, we decided on using Confluent for the hosting, so that all the groups in this project can communicate with each other. I made an account for Confluent and made a test cluster which connected to the mock services I also worked on.

3.2: Sprint 3 – Individual project

For the individual project, I have started with testing out multiple cloud hosting platforms. I created a separate repository on GitHub for testing out continuous deployment for AWS elastic beanstalk. I got this to work, but I also wanted to try out the other options I found. I have created accounts for Azure and Google cloud, but I have not been able to start with these options yet. At the company I work at right now, we use Digital Ocean for the hosting, so I might also look at this option.

Besides the hosting for the micro services, I also use Pinata Cloud for storing and accessing the NFT pictures themselves. I first stored the actual images to IPFS, and used the CID to get the data in Pinata Cloud.

4.1: Sprint 3 – Group project

In this sprint, it has been decided that the group project is finished.

4.2: Sprint 3 – Individual project

Got kuber to work locally, and started deploying on AWS EKS manually through the terminal. Was using AWS EKS, but it was apparently not free. Was not in the free tier, and started using money. Switched to azure.

**Reflection on my progress**

0: Sprint 0 – Group project

This sprint I have not progressed in this learning outcome, so the level is: **Undefined.**

1: Sprint 1 – Group project

Since I have not started with the cloud services yet, the level is at: **Undefined.**

2: Sprint 2 – Group project

Since I have not started with the cloud services yet, the level is at: **Undefined.**

3.1: Sprint 3 – Group project

For the group project, I used Confluent for the kafka server hosting. In confluent, there is also a dashboard where the dataflow can be tracked. I estimate this learning outcome to be at: **Beginning.**

3.2: Sprint 3 – Individual project

For the individual project, I looked at multiple cloud hosting options. I have made a CICD pipeline in a testing repository that successfully deploys to AWS elastic beanstalk. For Microsoft Azure, Google Cloud and Digital Ocean, I have accounts with credits, but I have not started yet. I might look at this in the future if there is time left.

Besides the hosting for the microservices, I use Pinata Cloud for storing and accessing the NFT images. I first stored them on IPFS, and then I pinned the CID in Pinata Cloud afterwards.

I estimate this learning outcome to be at: **Proficient**

## 7. Security by design

*“You investigate how to minimize security risks for your application, and you incorporate best practices in your whole software development process.”*

The seventh learning outcome will be shown in the group and individual project. Security plays a big role in enterprise software. The system we will make has to be secure, since a lot of data will flow through it. The best practises will be investigated and common techniques will be implemented.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1 | Sprint 1 | Group project | Undefined |
| 2 | Sprint 2 | Group project | Undefined |
| 3.1 | Sprint 3 | Group project | Beginning |
| 3.2 | Sprint 3 | Individual project | Beginning |

**Substantiation**

0: Sprint 0 – Group project

This sprint I have not progressed in this learning outcome**.**

1: Sprint 1 – Group project   
The system that I am working on is the messaging system. We will also create an auth service, but this is not my task. I will mainly look at the best practices and common techniques for messaging services. The most common security issues will also be looked at by using OWASP.

2: Sprint 2 – Group project

This sprint I have not progressed in this learning outcome**.**

3.1: Sprint 3 – Group project

In the group project, I created a test cluster for the other groups to connect to. We currently have distributed API keys to the other groups that include a Key and a Secret. By using this key, we can control who has access and remove one if necessary. For the end presentation, we will create a production cluster, but this costs quite some credits, so we will wait until the presentation.

3.2: Sprint 3 – Individual project

For the individual project, I have looked into authentication and authorization in Web3. In Web3, you have a wallet that you use to pay and login with. Currently, I have created a connection between MetaMask (the most popular cryptocurrency wallet) and my minting dapp.

**Reflection on my progress**

0: Sprint 0 – Group project

This sprint I have not progressed in this learning outcome, so the level is: **Undefined.**

1: Sprint 1 – Group project

Together with the team, we have looked at possible solutions to auth issues. We have added this part to the architecture. The feedback from Jacco on this architecture was positive. The architecture is also simple and has to be refined. The security part of our system has not been researched yet, so the estimated level is: **Undefined.**

2: Sprint 2 – Group project

This sprint I have not progressed in this learning outcome, so the level is: **Undefined.**

3.1: Sprint 3 – Group project

In the group project, we distributed API keys to the other groups that include a Key and a Secret. By using this key, we can control who has access and remove one if necessary. Together with the work done in the individual project, I estimate my level to be at: **Beginning.**

3.2: Sprint 3 – Individual project

For the individual project, I have looked into authentication and authorization in Web3. In Web3, you have a wallet that you use to pay and login with. Currently, I have created a connection between MetaMask (the most popular cryptocurrency wallet) and my minting dapp. Together with the work done in the individual project, I estimate my level to be at: **Beginning.**

## 8. Distributed data

*“You are aware of specific data requirements for enterprise systems. You apply best practices for distributed data during your whole development process, both for non-functional and functional requirements. You especially take legal and ethical issues into consideration.”*

The eighth learning outcome will be shown in the group and individual project. Since the messaging system will be handling the data of users, we have to be careful with ethical and legal issues.

**Development (undefined, orienting, beginning, proficient, advanced)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Level** |
| 0 | Sprint 0 | Group project | Undefined |
| 1.1 | Sprint 1 | Group project | orienting |
| 1.2 | Sprint 1 | Individual project | orienting |
| 2.1 | Sprint 2 | Group project | orienting |
| 2.2 | Sprint 2 | Individual project | orienting |
| 3.1 | Sprint 3 | Group project | Proficient |
| 3.2 | Sprint 3 | Individual project | Proficient |

**Substantiation**

0: Sprint 0 – Group project

This sprint I have not progressed in this learning outcome**.**

1.1: Sprint 1 – Group project  
We have not started the research for distributed data yet, since we are still refining the design oriented research plan.

1.2: Sprint 1 – Individual project

I have given each micro service their own database. This way, the saved data is distributed over all services. I am also working with the Blockchain and IPFS, which will also store data.

2.1: Sprint 2 – Group project

For the group project, we are making the connection between the groups. This connection will be a kafka messaging server. To keep track of all the data and events, we will make an event sourcing and information service. Unfortunately, there was not enough time to fully finish this.

2.2: Sprint 2 – Individual project

This sprint, I have not progress in this learning outcome in the individual project.

3.1: Sprint 3 – Group project

In this sprint, I have finished the event sourcing and information service. We can now see all the events and the latest entities from the other groups.

3.2: Sprint 3 – Individual project

This sprint, I have started on the emerging trends document, which also touches the blockchain and NFT’s. I have created 1000 NFT’s that are stored on IPFS with their metadata. Pinata Cloud was used to pin the CID and to easily access the images.

**Reflection on my progress**

0: Sprint 0 – Group project

This sprint I have not progressed in this learning outcome, so the level is: **Undefined.**

1.1: Sprint 1 – Group project

In a question meeting with our client Bram, he told us that he does not handle the data himself. The third party software that he uses handles the GDPR. Since the system we are developing will handle the data instead of the third party software, we have to research and be careful with the GDPR rules.

1.2: Sprint 1 – Individual project

I have given each micro service their own database. This way, the saved data is distributed over all services. I am also working with the Blockchain and IPFS, which will also store data. The estimated level for distributed data is: **orienting.**

2.1: Sprint 2 – Group project

For the group project, we are making the connection between the groups. This connection will be a kafka messaging server. To keep track of all the data and events, we will make an event sourcing and information service. Unfortunately, there was not enough time to fully finish this. The estimated level for distributed data is: **orienting.**

2.2: Sprint 2 – Individual project

This sprint, I have not progress in this learning outcome in the individual project. The estimated level for distributed data is: **orienting.**

3.1: Sprint 3 – Group project

In this sprint, I have finished the event sourcing and information service. We can now see all the events and the latest entities from the other groups. The estimated level for distributed data is: **Proficient.**

3.2: Sprint 3 – Individual project

This sprint, I have started on the emerging trends document, which also touches the blockchain and NFT’s. I have created 1000 NFT’s that are stored on IPFS with their metadata. Pinata Cloud was used to pin the CID and to easily access the images. The estimated level for distributed data is: **Proficient.**

# Reflection

In this chapter, I will describe the process of the sprint: what went well, what could’ve gone better, and where I might need help.

**Sprint 0**

In sprint zero, we mainly focused on getting to know the team and setting up communication platforms. We were not able to work on anything yet.

**Sprint 1**

In this sprint, most of the learning outcomes are still at orienting, which is fine in my opinion because it’s still the beginning of the semester. I have created a start for nearly all outcomes and the overall feedback is positive. There were times in the project where I started too late with certain tasks. For the next sprints, I will make a planning for myself so that this will not happen anymore. I have not reached the low-point where I need to ask for help yet. From previous experiences, I can tell that I sometimes don’t ask for help when I really should have. So my goal I set for myself is to not delay help when I am struggling with my tasks.

**Sprint 2**

In this sprint, most of the learning outcomes are at beginning. A couple are still at orienting/undefined. I think I my progress could be a bit faster, but there should not be anything to worry about right now. General feedback that I am receiving is normal and there are no special points I can point out. I am going to start with the blockchain soon, which might be a bit too complex for me to figure out myself. I might need help with this, but I will try on my own first.

**Sprint 3**

In this sprint, most of the learning outcomes are at proficient. A couple are still at beginning. I spent a lot of time on the blockchain. This resulted in me not focusing on the learning outcomes as much. I feel like I am a little behind, but nothing to be worrying about yet. The feedback I am receiving is still positive.

**Sprint 4**

**Sprint 5**

# Conclusion

*Here, at the end of the semester, you reflect on your process and end result. You can also refer back to the goals you set in the introduction, to see to what extent you were able to achieve them.*

*Also mention what you are proud of, what you would like to do differently in the coming semesters and whether you have come to different insights about the field of study. Is there perhaps a particular subject you would like to explore further?*