S-ESE6

Portfolio Template

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# Introduction

< Explanation document, reading guide, …>

*This guide guides the reader through the contents of your portfolio and shows where you stand in relation to your learning outcomes at a particular moment in the semester.*

*The portfolio is the collection of all partial results that you have achieved at a particular moment (snapshot) in the semester. This snapshot is made at the end of a sprint. For each learning outcome, you describe at what level you are. In addition, in the evaluation of each sprint, you describe the steps you are going to take to reach the next level.*

*At the end of the semester, your portfolio contains partial results that demonstrate that you have performed at a proficient level for all learning outcomes. You also conclude at that moment with a conclusion, which reflects on how your semester went.*

*Partial outcomes are all the products you have realised for the individual and pro task project: you can think of: Code, documents, snapshots, projects of followed tutorials, interviews, etcetera.*

*The portfolio and your reading guide are growing during the semester.*

The group project is a back-end implementation of an application that helps people manage their stress.   
The back-end has to be designed as an enterprise system, therefore enterprise architecture has to be used in the making of the product. For this specific product we have chosen to go with microservices communication through an event bus

My individual project consists of a YouTube inspired web application that will make use of microservices in order to function. This application aims to improve the chances of content creator to be discovered and become popular based on content quality. The algorithms will use likes, dislikes and a new rating called quality together with the video length in order to see how well a video is doing. On the contrary, it will also be used to identify lazy content and punish long-lazy content like reaction videos.

I have a little bit of knowledge when it comes to microservices, as I’ve had a pretty similar project back in Semester 3, however it was not based on Enterprise Software Design, which makes this way harder than before.

As of my interests, I chose this proejct because I used to run a YouTube channel that was terminated a few years ago (2018), and in the experience that I had, YouTube is not creator friendly. I wanted to create a similar experience, with some extra features sprinkled in, where the creators can feel safer than on youtube.

This semester I am looking to learn how big entersprise software is made, and I would like to achieve a website that can truly be used by millions of people.

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.*

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Description** | **Type** | **Niveau** |
| 1.1 | Sprint 0 | Group project | orienting |
| 1.2 | Sprint 1 | Group Project | beginning |

**Substantiation**

1.1: Sprint 0

In this sprint we started by getting the requirements from the PO and creating the first concept of the application. We asked questions about everything, data, target audience, UX decisions, etc. and got mostly positive feedback on everything we have shown.

We also created wireframes and presented the proped architecture of the project, to which we got the green light to.

We also decided on the technologies that should be used for the application, which are React for front-end and C# for back-end.

1.2: Sprint 1

This sprint we have set up more of the DevOps cycle by moving to Jira and reviewing eachothers code on pull requests. We have also created a unified backlog with the other groups.

Link to Jira: <https://bstoykov.atlassian.net/jira/software/projects/SWSP2/boards/1>

We now have 3 stand ups a week, where we discuss what we did and what needs to be done. These stand-ups take place Tuesday, Thursday and Friday at 10:00.

We have also started communicating more between the 3 groups.

**Reflection on my progress**

1:1: Sprint 0

I have participated in every group activity so far, giving my input and voicing my opinion when it comes to choices. I also gave a presentation to the class about NATS, a potential Event Bus server. I would say thiis is a great start to the project. This learning outcome is going to slowly be achieved over the course of the semester by just working as a group.

1.2: Sprint 1

We have started working in a kind-of professional way, which reminds me of the way of working I experienced while having my internship at Philips last semester. I am sure that once we get used to it and fine tune the details, we will have a fully professional way of working as a team.

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Niveau** |
| 1.1 | Sprint 0 | Group project | orienting |
| 1.2 | Sprint 1 | Individual project | orienting |
| 1.3 | Sprint 1 | Group Project | orienting |
| 1.4 | Sprint 2 | Individual project | beginning |

**Substantiation**

1.1: Sprint 0

In order to gather the requirements we had to come up with a list of questions, which we did.

After coming up with the questions we asked the PO with the hope of finding answers. Some questions could not be answered because they were on the more technical side, so instead we directed them to Hank.

We also had to question the technologies we had to use, in the form of an “investigation”. We can now validate the value of the choices that we made when it comes to the technologies using a list of pros and cons.

Every choice that we made so far can be justified that it is the best decision for the development of the application.

1.2:Sprint 1

I have conducted research on how other enterprise software are designed (available product analysis) , especially Youtube and Twitter, since they contain similar elements to my project. I have created a list of user stories and use cases in order to create requirements for the project.

1.3: Sprint 1

This sprint we mainly did research on how to handle communication between services, we came to the conclusion that an event-bus was not the perfect way to handle all the communication, therefore we decided to also implement an API together with a gateway.

The main point of reference to the research was the official Microsoft Enterprise Microservice Based Applications document, specifically the part about communication which can be found at :<https://docs.microsoft.com/en-us/dotnet/architecture/microservices/architect-microservice-container-applications/communication-in-microservice-architecture>

1.4 Sprint 2

This sprint I have done a lot of reasearch into the following topics: Threads, Three.js, Best practices for c# based microservices and data encryption.

The following sources were used for research:

**Threads:**

* [**https://www.c-sharpcorner.com/article/Threads-in-CSharp/**](https://www.c-sharpcorner.com/article/Threads-in-CSharp/)
* [**https://stackoverflow.com/questions/6126616/is-dbcontext-thread-safe**](https://stackoverflow.com/questions/6126616/is-dbcontext-thread-safe)
* [**https://docs.microsoft.com/en-us/ef/core/dbcontext-configuration/**](https://docs.microsoft.com/en-us/ef/core/dbcontext-configuration/)

**Three.js**

* [**https://threejs.org/docs/index.html#manual/en/introduction/Creating-a-scene**](https://threejs.org/docs/index.html#manual/en/introduction/Creating-a-scene)
* [**https://www.youtube.com/watch?v=pUgWfqWZWmM**](https://www.youtube.com/watch?v=pUgWfqWZWmM)

**C# Microservices**

* [**https://www.youtube.com/watch?v=DgVjEo3OGBI**](https://www.youtube.com/watch?v=DgVjEo3OGBI)(Despite being an 11 hour course, it was extremely fun to watch and follow along)
* [**https://dzone.com/articles/7-microservices-best-practices-for-developers**](https://dzone.com/articles/7-microservices-best-practices-for-developers)

A document with the research of Three.js will be presented in the sprint delivery.

The reason I did research on Threads is because I am currently trying to pass many copies of a DatabaseContext to different threads.I have also discussed this with Jacco and he gave me a basic idea where to start. I have reached the conclusion that passing a reference to the DBContext instead of the DBContext itself is the correct way to do it when using multiple threads.

I have not starting writing the research document, however I am actively looking for information sources.

**Reflectie on progress**

1.1: Sprint 0

In order to come up with the list of question, we had a group meeting where everyone discussed what we have to ask. After the questions were asked and we got a few answers to them, I started working on the pros and cons list for the technologies. I provided my group with a list of possible technologies together with the pro and cons list and then we decided together on which one to use

1.2: Sprint 1

I got some feedback from the technical teachers regarding the documents, which I applied shortly after the meeting. I am still not sure how this learning outcome will be completed, as I do not really understand exactly what the criteria is. I will need to contact the teachers to gather more information.

1.3: Sprint 1 & 1.4 Sprint 2

The past sprint has been full of research in order to achieve the best result of the software, both for group and individual project.

We still haven’t played the ethics game, but this will be done in the first week of next sprint.

I think I am a lot close to reaching the learning outcomes than last sprint due to the amount of context-based research that has been done in order to deliver the best possible solution.

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Niveau** |
| 1.1 | Sprint 0 | Group project | orienting |
| 1.2 | Sprint 1 | Individual project | orienting |
| 1.3 | Sprint 2 | Individual project | Beginning |
| 1.4 | Fontys Career Day | Both | Beginning |

**Substantiation**

1.1: Sprint 0

We are currently using one of the newest and hottest technologies when it comes to services – microservices. Not only that we are using constantly evolving tools with long term support such as NATS and .NET Core.

1.2: Sprint 1

I think that Enterprise Design is the software design of the future, since the internet is seeing more and more traffic each day, and this requires a solution – Enterprise Design.

I am not sure about my career in the future, however, having knowledge in such an important aspect of Software Engineering is for sure going to help me with it.

1.2 Sprint 2

This sprint I have made sure to research the industry when in comes to standards, I have researched the correct way of handling Microservices in C#. Since this technology is still rapidly evolving, information can change at any time.

I have also researched how scalability is done in the industry, and I have chosen the way that suits my project the best.

Fontys Career Day:

On 13/04/2022 I have participated in the Fontys career day. I have discussed with Michael from game design about the specialization in game design and I found out that he wants to try to actually create a company during the specialization. I went from stand to stand and talked with the people at the companies that weren’t too busy, but none of them caught my eye. When I got to the Philips stand, some of the members were my colleagues from my internship, I started talking to them and shortly after I was telling other students about how my internship went and a few of them got interested. Free marketing I guess?

**Reflectie on progress**

1.1: Sprint 0 & 1.2: Sprint 1

I do not get why this is a learning outcome, why do I need to asses my skills and ambitions in order to search for a specific career when the Software field is one of the most volatile ones? It just doesn’t make any sense to prepare for a specific career as a Software Engineer when everything software-related can be learned in such a short amount of time when compared to other career choices and the flavor of the month technology can change in the blink of an eye (i.e: Monolithic architecture becoming obsolete when it comes to high traffic).

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Level** |
| 1.1 | Sprint 0 | Group project | orienting |
| 1.2 | Sprint 1 | Individual | orienting |
| 1.3 | Sprint 2 | Individual project | Beginning |

**Substantiation**

1.1: Sprint 0

We have designed a microservice architecture which accomodates infinite scalability of the microservices.

We are also using Docker and Kubernetes in order to scale, which are two tools specifically made for this.

1.2: Sprint 1

I am also designing an infinetly scalable architecture with microservice, and I am also using docker and kubernetes in my individual project

1.3 Sprint 2

During this sprint I have reseached ways to scale architecture, and following the industry standard, I have dockerized all my services. I then used and application called MiniKube together with Kubernetes in order to horizontally scale my application. Due to the architecture that I have and NATS, horizontal scalability can be done automatically without chaning anything. The mosti tested as of now, the application works with 30 copies of each service, and the load balancer works as intended.

**Reflectie on progress**

1.1: Sprint 0 & 1.2: Sprint 1

So far only the architecture plan has been created and no prototype is available.

The learning outcome will be reached once I can showcase the scalability in action.

1.3: Sprint 2

In this sprint I have learned a lot about scalability, from the different kinds of scalability, to how they can be implemented. I have chosen to go with a scalable architecture.

I feel that this amount of progress is getting me much closer to achieving this learning outcome

## **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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Level** |
| 1.1 | Sprint 0 | Group project | orienting |
| 1.2 | Sprint 1 | Individual project | orienting |
| 1.3 | Sprint 1 | Group project | beginning |
| 1.4 | Sprint 2 | Individual project | beginning |

**Substantiation**

1.1: Sprint 0

We still haven’t set up the DevOps, however we have set up the development and testing environment, which consists of GitHub.

1.2 Sprint 1

I have set up the DevOps, which uses AzureDevOps, the GitHub repository (which will also be used as CI/CD).

I have also Docker-ized the Event Bus.

Github link: <https://github.com/Snechar/WatchTime>

Event Bus Docker: <https://hub.docker.com/repository/docker/snechar/eventbus>

1.3 Sprint 1

As a class we have moved together to Jira, where we are working in a professional way. The task are linked to GitHub.

As a group, we have set up even more automatic CD pipelines in GitHub and in the Docker itself.

1.4 Sprint 2

I have continued using Azure DevOps and I have linked user stories to pulls on GitHub. I have also fully set up CD in my pipelines and I am currently working to set up the CI as well, however a few problems have arisen while trying to test a Nats Connection, due to the fact that GIT does not respect the port of the docker container while running tests, so the tests may fail randomly due to the NATS server being hosted on a different port.

**Reflectie on progress**

1.1: Sprint 0

This learning outcome will be reached when a good DevOps pipeline has been reached – a DevOps linked to GitHub, full CI/CD implementation, etc.

1.3 Sprint 1 & 1.4 Sprint 2

I am slowly achievent a complete DevOps pipeline, once CI has been implemented, the only thing that is left to do is to fine-tune the process. I think that I am much closer to completing the learning outcome that in the previous sprint.

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Level** |
| 1.1 | Sprint 0 | Group project | orienting |
| 1.2 | Sprint 1 | Individual | orienting |
| 1.3 | Sprint 2 | Individual | beginning |

**Substantiation**

1.1: Sprint 0

Due to the enterprise software architecture, we can easily use cloud services in our project, we have already discused about cloud database scalability and autoscaling with the group, and will continue research in the following sprints

1.2: Sprint 1

Due to the nature of my individual project, scalable databases might not be needed, however what the project needs is auto-scaling and monitoring, which can easily be achieved with cloud services.

In the following sprint I will do further research

1.3 Sprint 2

I have made my docker containers cloud safe by binding the ports to the containers. Finding a suitable cloud service to host my containers is the only thing left before I can host them.

Due to the architecture that was designed in the beginning, it is extremely easy to have the services hosted in the cloud. As long as the NATS server is accessible, all the other microsrevices will function as normally.

I have also started setting up the Kubernetes cluster and tested it using 30 copies of the pods, this is the most my home computer can handle without completely crashing.

**Reflectie on progress**

1.1: Sprint 0 & 1.2 Sprint 1

With good architecture cloud services can be easily implemented later in the development cycle, as all that needs to be changed is the IP of the communication.

Cloud services also take care of a lot of problems developers have to deal with, like automate scalability, monitoring, resource management, etc.

This learning goal will be reached when the services have been hosted on the cloud.

1.3 Sprint 2:

While I am making progress on the cloud services in my individual project, I will not host my individual project services on the cloud, the credits provided by Fontys are not enough to host the services for more than a few days because the boot-up of the service is very expensive.

While I do believe I am closer to reaching the outcome, I will try to reach this outcome in the group project using the cloud services offered by the PO and Fortress.

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Level** |
| 1.1 | Sprint 0 | Group project | Orienting |
| 1.2 | Sprint 1 | individual | Orienting |
| 1.3 | Sprint 1 | Group | Beginning |
| 1.4 | Sprint 2 | Individual | Beginning |

**Substantiation**

1.1: Sprint 0

We will follow the security by design principles which are mentioned in the provided document.

1.2: Sprint 1

I will also follow the security by design principles.

1.3 Sprint 1

In this sprint I have done very important research due to the remarks of the teachers – data encryption.

In the group project we are currently encrypting data using the AES-256 14 block GCM, which is currenty the industry gold standard.

1.4 Sprint 2

In this sprint I have made the account microservice, which needs to be very secure due to the handling of persona information such as passwords that might be reused by users in other applications.

For the account itself I am using the Microsoft Identity package combined with the Json Web Token package. These 2 combined offer a huge ammount of security in the form of Claims, where the user has to be identified using the JWT validation. On top of that, a valid issuer (microservice) and audience (user listening location) need to be valid.

The passswords are, of course, hashed using a 516bit salt.

JWT Link: <https://jwt.io/>

Identity Link: <https://docs.microsoft.com/en-us/azure/active-directory/develop/>

Not only that, but all the data that goes trough the event-bus has been also encrypted using AES-256 14 block GCM.

AES: <https://en.wikipedia.org/wiki/Advanced_Encryption_Standard>

GCM: <https://en.wikipedia.org/wiki/Galois/Counter_Mode>

I have also made sure to make my code immune to SQL injections by using Entity Framework, sanitizing all inputs and following their considerations.

Entity Security:<https://docs.microsoft.com/en-us/dotnet/framework/data/adonet/ef/security-considerations>

**Reflectie on progress**

1.1: Sprint 0

This learning outcome will be achieved when I can prove that my application is secure against cyber attacks.

1.3 Sprint 1 & 1.4 Sprint 2

I have been following the security standards and I implemented hasing and encryption for sensitive data. I think that I am getting closer to reaching the learning outcome

## 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.

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

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Beschrijving** | **Type** | **Level** |
| 1.1 | Sprint 0 | Group project | Orienting |
| 1.2 | Sprint 1 | Individual | Orienting |
| 1.3 | Sprint 2 | Individual | Beginning |

**Substantiation**

1.1: Sprint 0 & 1.2: Sprint 1

Due to the microservice architecture, we have to use the microservice specific implementation, which is that each microservice should have it’s own database.

1.3 Sprint 3

I created a Consistency Keeper for the event bus, which keeps data between microservices consistent.

As before, I am still following the best practices for Microservices, which is that each microservice has it’s own database.

**Reflectie on progress**

1.1: Sprint 0

I am not sure how to achieve this outcome due to the fact that we’re stuck using the microservice implementation with no real way of explaining why other than the “best practice”.

1.3 Sprint 2

I think I am getting closer to the learning outcome by respecting the design principles of enterprise microsystems.

# Reflection

*Reflect here on your (study) process per sprint.*

*Where are you getting stuck, what is going well, where do you need help. This is not about the content; you have described this in the learning outcomes.*

Sprint 1

For the beginning of a project, I think we’re doing well. We have created a strong base for implementation with the enterprise design principles that we have been following so far.

The group communication is going amazing, we all voice our opinions and discuss every problem we encounter. This also applies to the whole class – I feel like the 3 different groups are more connected than groups I had in the previous semester.

I do however have some problems with my individual project. I have run into a problem similar to one from semester 3. This problem in video streaming like YouTube, since a video cannot just be fully loaded before playin, as this would take entire minutes, especially when talking about very long videos.

I do not know who to discuss this problem with, as I’ve already done a lot of research and I could not find anything.

Sprint 2

Overall, this sprint was good, I have learned a lot about all the learning outcomes and coded quite a bit.

Our group’s way of working has become more professional and now we have a simple version of DevOps, and the communication with other groups has been way better.

In my individual project I am learning a lot about back-end microservices, microservice architecture itself , scalability, and cloud services.

I do still have the problem of not knowing how to stream videos, I have created a prototype but it does not work as expected. I am thinking of creating an API for the video streaming and using protocol 206 to stream content.

# 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?*