Introduction

Hi, my name is Lucas, and I am eager to learn more about enterprise software development. I already have a solid foundation laid throughout the course as a student in programming languages, such as Java, Python, C#, and SQL, and have dived further into making projects in web development. Also, I participated during my internship in a long-term project, where I developed an older application module into a new application, using a research-based approach.

My goal is to become a software developer who is capable of solving complex solutions that will meet the needs of enterprise software.

This semester, I am excited to further extend my knowledge in understanding cloud technology, DevOps practices, containerization, and more that comes into building a solution around enterprise software development.

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Individual Project Description

Throughout this semester, I had to build a software enterprise application with all the technologies and research that needed to be done to have a future-proof project that could be easily picked up by new people. See the following context to get an idea of what my project is about.

FestivalConnect is a digital platform designed to improve the festival experience. This is done through connecting enthusiasts to communities worldwide. Choosing from different interests such as music, film, literature, and art, FestivalConnect will give all these festivals a way to create their unique community. It will offer the opportunity to discover, engage, and contribute to their favorite festival genre. By having features like community forums to detailed information about festivals, FestivalConnect is the way to have meaningful interaction between festival goers and organizers, making it possible to have a closer relationship and promoting industry growth. With the use of user feedback and sharing a shared passion and memories, FestivalConnect aims to improve the festival space, solidifying connections from geographical boundaries to the diversity in festival culture.

Group Project Description

Within this group project, I collaborated with a team of other developers (students) to create a Quantum Chess Tournament System, that can be extended to host more games on it in the future. My main role in the group was back-end leader, which meant that I had the final decisions in saying how to shape and develop the back end. This does not mean that I had everything to say but more like that when there was a discussion around a topic on how to implement it, I would give the final decision that is substantiated.

Quantum Talent and Learning Centers (TLC) Eindhoven has created a game called Quantum Chess, which is a variant of chess with dynamic effects of quantum mechanics. Right now, they can only play a game on one computer, making it so that users need to be physically together with one computer. The task that the software developers need to solve is to offer a software solution where users can use an online platform where they can join tournament-hosted games held by Institutes. This system is used for engaging and collaborative competition that spans all four Quantum Talent and Learning Centers (TLCs) in the Netherlands. A user can log in to the system, sign up for a tournament, and play online hosted games. The focus will be on a user-friendly design, participants can sign up and smoothly take part. This end goal is to have a working solution with a great approach to future working software developers for this project.

Within the Progress Document, I will give a retrospective on each sprint, for the individual project. For each portfolio delivery, I will more globally look back on the whole semester, rather than a specific track. This will include how I look back on the progress I made thus far, specifically looking at the following points.

- What went well and what are you proud of?
- What did I learn?
- What feedback did you receive and did this affect me in the way of working?
- What are the main goals you want to achieve in the coming sprints?
- What do I still need to do in order to get a proficient level on each learning outcome?

First portfolio delivery

The first five weeks went fast and in this time I could get settled and adjust to the way this semester was structured. With the group project, we made a great start, and the clients are pleased working with us. Reflecting on my progress, I think I learned and progressed already, by identifying certain improvements but also the efficiency of learning in a research-based way. I am getting the feeling that with the logical argumentation and justifying of doing something, everything becomes more clear on why things are beneficial while also giving me a clearer picture of how things work, making me remember and expanding my knowledge and skillsets.

What went well?

- **Adaptability:** I could quickly change my documents or certain topics when something was not aligned with for instance the learning outcomes.
- **Project Contributions:** The communication with the project has been going well until now. Everyone is doing what they are supposed to do, for my part I actively participated in group discussions and aligned the parts to understand the project. This also included creating prototypes, developing part of the project plan, engaging with the client, and more which can be found in the learning outcomes evidence.

Results to be proud of:

- Project Milestones Achieved: With the task prioritization and the way I made the documents for an individual track, I managed to achieve my goals. Also, the goals I set during a daily stand-up meeting with the group project, I managed to succeed.
- Collaboration: The overall group and flow of working are pleasing to work in. Everyone is open and we have an effective way of working with each other. Apart from the research plan misplanning of the group, it went well.

What Have I Learned?

I learned something really important which is also what I going to work on in the next sprint. On the day of the delivery, I planned to do some finalizations on the individual part. Due to having to do the research plan for the group project almost all by myself at the last notice, which also had a deadline on that day. This meant I couldn't properly finish the things I wanted to finish, which resulted in more stress and work. Therefore I am going to work on optimizing my overall schedule, so that the last-day improvements for a sprint, do not be on the final day of delivery. This also means that reflecting with the team is important so that this will not happen another time. Nonetheless, I learned to finish the most important parts with proper task prioritization and time management.

Also the proper structures on how to tackle a research document I gained a lot of insight in. This means that instead of just researching something, you need to have proper guidance for yourself to come to the right conclusion. So looking at multiple options, and structuring a big question into smaller sub-sections, helped me with doing research.

Overall this first phase of the semester improved both my technical skills and understanding but also the management of the importance of good project management.

Feedback?

Apart from the feedback stated in (Jacobs, Progress Document, Sprint 1), there was not a lot of personal feedback. Before the sprint, I proposed the initial project of the way of working to my semester coach, and we quickly concluded that it is important to set goals that can be done within a sprint, instead of finishing it halfway and then next sprint you do the other half. The other small thing was to focus on non-functional requirements and not a lot on functional requirements.

Main Goals to Work on
For coming next delivery of the portfolio, I am going further on expanding and applying the knowledge I gained from the research, and apply it in the application. Also for the group project, I mainly did documentation, so I also actually want to implement functions to the application and work on my technical skills. Furthermore, an important thing is for both tracks to properly understand and justify the architecture that is designed and then applying into context.
At the same time also continue on new research questions to further expand my knowledge on new topics that are important for enterprise applications.

Reaching proficiency level
It is early in the semester and most topics I have not yet looked into in real depth, such as cloud distributed data, security, and DevOps.
Until now, I only did research and I haven't gotten the chance to apply the research I did. Therefore, for the technical LOs most of them, I only did some mentioning of non-functional requirements and some research on frameworks and architecture. So, there is going to be more applied such as setting up a proper CI/CD and having an architecture that is structured and aligned with the non-functional requirements
For professional LOs, start looking at more different kinds of non-functional aspects, but also keep researching to justify my choices. This also means having a proactive attitude towards my teachers and explaining my choices on certain topics.
Another important thing is to be critical of my team members and provide feedback, by doing peer reviews.
So for upcoming delivery, focus on applying the knowledge that you gain from discussing with team members, justifying decisions to stakeholders, and researching to go to the next level.

Second Portofolio Delivery

In these three weeks between the first and this portfolio delivery, I managed to further extend my knowledge. I finally started implementing parts of my architecture, where I throughout learned more about topics around it. Furthermore, by also doing research besides the implementation I became more conscious of the decisions I made since the research gave me more awareness regarding the non-functional requirements.

What went well?
- **Improvement**: The understanding of aspects such as security and architecture are becoming more clear.
- **Future Perspective**: Investing my time in finding what I want as a graduation project and looking at what I find important in a future career path.
- **Team Improvements**: based on the feedback our team received from the stakeholders, we worked on this together and discussed a proper way to tackle these issues mainly the semester coach described.

What can be better?
Apart from what is in (Jacobs, 2024, Progress Document, Sprint 2), specifying the user stories more strictly to the stakeholders in the group project is a must to work on.

Results to be proud of:
The progression I made is quite a lot, and the way of working with the improved schedule I made, I now have a clearer view of work which gave me less stress and improved my productivity. The implementation of the services I created is nicely structured and ready to be further extended.

What have I learned?
The first thing is the importance of being critical when working in a file where structure and punctuation are hard to spot but are extra error-prone on it. Therefore, the thing that kept me a bit busy was working within the .yml file. This taught me that I needed to be extra alert when working on this file, which is also stated in my (Jacobs, 2024, Progress Document, Sprint) how I plan on improving this. Moreover, with the combined research and implementation, I became more self-aware of the importance of non-functionals that I stated.

Feedback
For the group project in general we have to be more transparent and communicate with user stories towards the client. Apart from that, I only had the feedback on the previous delivery and a meeting with the technical teacher, which gave me clarity that the research questions were approved.

Main goals to work on
My main goal for the next delivery is to have an up-and-running system, with a basic functionality that aligns with the architecture that is created and stated in my C4 diagram. Furthermore, since we going towards the final three sprints, I will focus on the last four modules: GDPR, Cloud, DevSecOps, and Observebility.

Reaching proficiency level
The first two LOs are almost on proficiency level and look further into the law. The second one, as a group we need to view that we show user stories to the client furthermore showing a proactive attitude to the teachers throughout the course.
For the technical outcomes, some need more research to start implementing what is best for the project(s). Nevertheless, these practices that are in line with the learning outcomes and non-functional requirements need to be implemented and validated by the stakeholders, which I will focus on in the coming sprints as well.

Third Portofolio Delivery

Compared to the previous delivery, I could manage to expand my knowledge further. I managed to fully implement authentication and authorization, with a proper architecture flow. Furthermore, I managed to complete my research documents for the individual track, which meant that I also came up with more requirements that I needed to be aware of to properly handle the nonfunctional.

What went well?
During the period of the previous delivery and this one, the documentation went great, I managed to fully complete my research which also meant that I could focus on implementation.

- **Communication**: Throughout the latest sprint from the group project, we had a lot of meetings with the clients. This went smoothly and we got compliments from the main clients themselves on how we were handling this opportunity/situation.
- **Adaptability**: From the discussions and meetings in the group project we could quickly adapt to the major changes that the client is prioritizing.
- **Awareness**: With conducted research, I became more aware of doing implementation and keeping in mind if they impact the main non-functional requirements that I set.

What can be better?
The things I can improve on personally wrote down (Jacobs, 2024, Progress Document, Sprint 3). Apart from that due to giving documentation so much time, implementation was a bit left behind, which also meant that LOs such as scalable architecture need more attention as well as DevOps. So the approach of doing and implementing part of the application is good, but it needs to be the main focus now for the remaining part of the semester.

Results to be proud of:
Having the login and register fully implemented with the proper handling of security and flow in the architecture. Furthermore, I'm proud of the smoothness of the documentation and finalizing that part.

Feedback
For the group project, we need to keep up the good work. Regarding the individual project, focus on the technical learning outcomes and focus on the implementation. During the meetings with the teachers, I have several feedback sessions to discuss what to do next to gain proficiency level.

What have I learned?
For the nontechnical part, becoming more aware of how things can impact your application when implementing a specific functionality. Also with the remaining time there is not a lot of time left and that implementation is now the most crucial part to successfully round of this semester.
Feedback. Regarding the technical side, I improved my technical skills in points of debugging certain issues and being aware of what bottlenecks can break my services.

Main goals to work on
My main goal for the individual part is to have a deployed application that can be monitored and can handle the expected load. Also to have a fully automated pipeline with various analyzing tools, tests, security checks, and deployments. The main goal is to make the structured approach and plan it in such a way that I can receive feedback from the teachers without having to wait for approval.
For the group project, we have to fully settle in to get the application working and implement the remaining parts to have a demonstration working for the tournament event.

Reaching proficiency level
The first two learning outcomes are on proficiency level. Also for the technical learning outcomes, I managed to receive feedback that the learning outcomes for distributed data and cloud are on proficiency level. For the remaining learning outcomes I need to deploy my application on the cloud and add monitoring to it so that I can do benchmark testing. Focus on implementing a fully automated pipeline with security checks in the CI.

Final Portofolio Delivery

So for the technical learning outcomes, I still had to do some things. All of them were on beginning since I gained feedback to have proficiency you need to have a working solution inside the deployment. So that is what I did, I finished all the products and requirements and properly documented the implementation inside of the portfolio. I managed to complete the deployment with automatic scaling, monitoring, and load testing. Furthermore, implemented the requirements for distributed data and the needed functionalities for users according to the GDPR. I also implemented all the testing levels, with a full operational CI/CD pipeline containing all the stages (build, test, security, publish, and deployment), and implemented security measurements such as authentication and authorization, OWASP, security in CI, and securing sensitive data. Finally, cloud services that benefit the application are based on non-functional requirements.

What went well?

During this last phase of this semester, I managed to complete all the implementation that was needed to set a great result.

- Effective Communication: From this last phase I had a proactive attitude towards the teachers, with this open and effective communication, I made sure that I managed to complete all the project goals and requirements.
- Documentation: I still had to do a lot of documentation for the group project, making some needed research documents as well as the whole research report. This went smoothly and I delivered a research that I am proud of.
- Technical Achievement: with constant meetings and staying in touch with the teachers, I could properly plan my activities and implement the functionalities that were needed.

Results to be proud of:

- **Professional development**: By having quite a few talks with the stakeholders of the group project, but also the individual talks with my teachers, I gained more confidence when explaining things.
- **Implementation**: For all the things that I have done for the group project, I am proud of standing behind the product and the research we delivered. Also for the individual track, I managed to complete all the requirements that were asked.

Feedback

I gained some feedback for the individual track, when implementing something and publishing it to the portfolio, reason why this contributes to the nonfunctional requirements. So over time, I did this and all the implementation documents have great reasonings on why it contributes to my nonfunctional requirements. For the group project, we gained a bit of feedback to align the research we have done to the actual product. This means that when doing a demonstration of the product show how the research contributes to the outcome.

What have I learned?

As this semester concludes, I learned a lot of things from working in a group for a client to properly explaining the benefits of a certain functionality to my teacher. I became more self-aware of the things that I am doing while also having a reason for why I am doing this. Also further improving my working way in an agile way, greatly contributing to my professional attitude. Nevertheless, with a clear and structured approach in this research-based semester, I managed to complete the requirements for both the individual and project tracks. All and all I gained a lot of new information about making an enterprise software application.

The main goals that I achieved during this semester are having on the individual track a fully functional application that meets the requirements adhering to the nonfunctional requirements and being ready to expand. Furthermore, my technical skills in critical areas were identified at the beginning of the semester and improved throughout this semester.

Next Steps

- **Continuous Improvement:** Moving forward, I aim to further extend my knowledge about enterprise software applications by looking at the nonfunctional requirements, especially performance, security, privacy, and scalability.
- **Reflection and Growth:** By reflecting on this semester, I can gain this growth and apply this in future project management and my technical decision-making, making sure that I further expand my professional capabilities.

Learning Outcomes Evaluation

In my document about how I am going to achieve the learning outcomes, I described what I envisioned to do to pass that semester (proficiency on all LO's). This process I quite followed, in a way that I tried to approach in the same matter. Nevertheless, through the last 2 sprints, this changed a bit, since I had weekly meetings with my teachers. Therefore, based on their feedback them and my own awareness of what is left to be done, I made a plan on a weekly base for the last 2 sprints.
I will go over each LO and q*uickly explain what I have done for it and why it is proficient.

1. **Professional Standard**: I made a full research report for both the group project and the individual track. I answered all the sub-questions of my individual track using the DOT Framework and separated them into separate documents. Each document contains research with the implementation that followed from the research. Furthermore, for the group project, I also did the research plan, with also answering sub-questions regarding database, security, testing, and cloud computing. Also, I wrote an ethical design document including a concrete conclusion that led to new requirements. Contributing heavily to the group project doing research and also doing extensive research for individuals is in my opinion advanced. (group project research report grade: Good). Furthermore, did research on automatic scaling using machine learning. (Advanced)
2. **Personal Leadership**: I worked in a SCRUM team as a back-end lead. The process of SCRUM went well with the team. The customer was happy and more than two sprint deliveries were well received by the teacher and customer. We did stand-up meetings every week. Documented my possible choice of an internship position (Graduation preparation). Also, I did a LO plan for the semester. Finally, I reflected on each sprint about the progress and the plans while also having an extensive reading guide. Furthermore, for my personal development and interest, I did a research and applied machine learning to automatically scale. (Advanced)
3. **Scalable Architecture**: I set the requirements of my application throughout the documents that I made. With these requirements, I came up with an architecture design that is implemented and documented on how it contributes to the non-functional requirements. Furthermore, I did load testing on my deployed application which could automatically scale up and down. Also, I applied to CronJobs for services that the services will scale during the weekends because of the peak traffic. Advanced: Furthermore, I made a research report for using machine learning to predict autoscaling with the use of Prophet and KEDA (Kubernetes Event-Driven Scaling add-on).
4. **DevOps**: I made a fully automated CI/CD pipeline, with all the stages having building, testing, analyzing, security scans, publishing, and deploying. Furthermore, I made several kinds of tests to verify the application readiness. Also, I can monitor my application.
5. **Cloud Native**: I chose a cloud provider and made a document on what services can benefit my application. I integrated the chosen services and deployed my application on the cloud. The services that I used in Azure were Key Vault, Azure MySQL Server, Kubernetes Cluster, Azure Load testing, and Grafana monitoring. In the research of applying machine learning for auto-scaling, I used Kubernetes Deployment with Keda, that used a Scaled Object. (Advanced)
6. **Security By Design**: I implemented authentication and authorization inside the application. Also, I secured sensitive data by using for example variables for secrets. Moreover, I looked into several security principles such as OWASP, and implemented needed security to prevent these attacks. Finally, integrated security checks inside of the CI pipeline.
7. **Distributed Data**: I made an extensive document covering the data requirements, and privacy-sensitive data in my application and reasoned around ethical considerations, and functionality plans to comply with the regulations of GDPR, Evaluated data stores using CAP theorem, and finally listed design decisions for my architecture with distributed data stores. Based on this I implemented all the

data stores based on the CAP theorem (message broker, MySQL database, caching). Additionally, implemented the regulations that were needed for GDPR (Updating and Deleting a user, and password requirements).

Reflection

Reflecting on the semester, I can say that I had significant growth and development, both professionally and personally. I could quickly adapt to my group, and when there were big changing requirements I could quickly and actively contribute to these changes inside the group project, making sure we did everything to reach the goals. Some other personal key factors that I grew on are effectively managing my time, and prioritizing my tasks, which improved my productivity and reduced stress. Structuring my research into sections improved my documentation and technical understanding.

With the continous feedback from the teachers, adjusted my way of approaching this semester, trying to adjust to the feedback and achieving this within a sprint and keeping the nonfunctional requirements in mind. This led me to a more clear view of what they wanted me to show them and gain a proficiency level on each learning outcome.

During this semester, I came across some real challenges but with the improved planning and task prioritization approach I could manage the workload. Also applying the DOT Framework for documentation, helped me structure the approach of doing this research-based semester. With the way I was working for the group project and also for what I delivered for my individual project, I am proud of what I managed to deliver. I expanded my technical skills, gained more confidence in meetings, improved my planning, and enhanced the communication inside the group project.

Conclusion and Final Thoughts

This semester has been a real journey, with making significant growth in learning new things and professional growth. Having a structured research approach, while combining the practical implementation, made me improve my technical skills. Moving forward, I am committed to continuously improving, and applying all the things that I have learned this semester to new projects, and further expanding my knowledge in enterprise software development.