**Business Case**

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(TINF20C, SWE I Praxisprojekt 2021/2021)

Project: Websockets im LwIP HTTP Server

Customer: Rentschler & Holder

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|  |  |  |  |

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# Purpose and scope

The goal is to fix the architectural flaws of the patch "#9525 (httpd: add websocket support)" in coordination with the project community. This experimental base should be improved and brought through the approval process in the open-source project.

Furthermore, a demo server is to be designed and implemented in a virtual environment under Windows.

For demonstration and testing purposes of the features, a GUI-based test client shall be designed and implemented.

# Reasons for the BC

In this business case, we want to overview what the costs and risks are in advance of the project. This overview is used to decide how profitable the project is and whether it is worth implementing. Where might problems arise during marketing?

The customer requires delivery of the project by 05.11.2021, with a maximum of 180 working hours per employee.

# Expected benefit

|  |  |
| --- | --- |
| Use / Benefits | Justification / Measurement |
| Standardization | Users have a full-featured resource-efficient IP stack with http support on Windows systems and do not have to do without any standard functionality of the TCP/IP stack. |
| Cost reduction / efficiency increase | The resource-efficient structure of the source code allows users to deploy the lwIP stack even on low-power devices. |

Table 1: Qualitative and quantitative project benefits

# Expected limitations

Due to the ongoing Covid-19 pandemic and constantly changing regulations, it is now unfortunately not possible to collaborate regularly in our office. Thus, the focus is on working in the home office, which increases the risk of communication problems.

During the project, the project staff has limited time to work on the project. All employees study alongside their work, and full-time work performance cannot be expected.

# Time frame

The project will begin on Sept. 10, 2021 and is expected to be completed by May 20, 2022. From December 2021 to February 2022, work can only continue on a limited basis due to internal company restructuring measures. This has been taken into account in the schedule. The following specific targets are to be achieved:

Semester 3:

* The documentation should be recorded in the Customer Requirement Specification (CRS), System Architecture Specification (SAS) and System Requirement Specification (SRS).
* The analysis phase must take place in the lecture weeks 1-6 (until 15.10.2021)
* The design phase is to take place in lecture weeks 7-11. The first implementation of a prototype is also scheduled here in order to reduce the project risk in the following semester.
* The following documents must be submitted by 10.12.2021 at the latest: CRS, BC, SRS, SAS, project plan.
* Project documentation and operating instructions must be submitted by XX.XX.2022.

Semester 4:

* Implementation of the system and creation of module documentation (MOD)
* Carry out system testing and create a system test plan
* Finalisation of all documents to be submitted
* Product presentation

Detailed working time allocation of employees to task areas (specified in working hours):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Laura Reeken  (Project Manager) | Benjamin Esenwein  (Product Manager) | Yannis Plaschko  (Test Manager) | Maximilian Meier  (Head of Development) | Lucas Kaczynski  (Technical Editor) | Isabel Schwalm  (System Architect) |
| Documentation | 35 | 30 | 30 | 30 | 40 | 25 |
| Analysis | 20 | 20 | 20 | 20 | 25 | 25 |
| Design | 10 | 15 | 5 | 10 | 5 | 20 |
| Coding | 20 | 25 | 25 | 30 | 25 | 30 |
| Testing | 15 | 20 | 40 | 20 | 20 | 20 |
| GitHub organization | 20 | 20 | 5 | 20 | 10 | 10 |
| Meetings | 20 | 20 | 20 | 20 | 20 | 20 |
| Customer exchange | 10 | 5 | 5 | 5 | 5 | 5 |
| Project management | 20 | 20 | 5 | - | 5 | - |
| Presentation | 5 | 5 | 5 | 5 | 5 | 5 |
| Total (hours) | 175 | 180 | 160 | 160 | 160 | 160 |

Table : Project plan

# Risks

* Communication risk

All employees started working on the project while still working from home and have learned the necessary basic skills in digital communication. The tools used include Signal, Discord and GitHub.

The risk of miscommunication is reduced to a minimum because the employees already know each other well. This makes it less likely that there will be discrepancies between expectations, requirements and work packages.

* Financial risk

The financial risk is considered to be low, since the employees of the project are students who have not yet completed their professional training and thus work during their studies. However, there is a lack of in-depth experience in the project environment, which means that it is not possible to work productively and fully effectively from the first minute.

* Implementation risk

All employees have been able to acquire basic knowledge of the C programming language in the first and second semesters. After a basic refresher course, the risk of the project failing can be classified as low based on this aspect.

* Personnel risk

Employees may be temporarily absent during the project due to other activities. This can result in competence gaps that may be difficult to fill. This could also lead to scheduling problems that need to be taken into account in the scheduling process.

Measures:

* Conduct consistent documentation and communication within the team so as not to make any employee indispensable due to prior knowledge.
* Quickly build up buffer time to avoid having to access overtime at the end of the project

[130 Projektrisiken, die auch dein Projekt treffen könnten (projekte-leicht-gemacht.de)](https://projekte-leicht-gemacht.de/blog/methoden/projektrisiken/130-projektrisiken-beispiele/)

# Cost Calculation

Due to the current Corona pandemic, most of the work is done in the home office. The rent for an office is still payable, but the heating costs are minimal.

A server in Germany was rented for the project. This incurs monthly costs of 60 euros.

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| --- | --- | --- | --- | --- | --- | --- | --- |
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| Documentation | 35 | 30 | 30 | 30 | 40 | 25 | 19,01 % |
| Analysis | 20 | 20 | 20 | 20 | 25 | 25 | 13,07 % |
| Design | 10 | 15 | 5 | 10 | 5 | 20 | 6,53 % |
| Coding | 20 | 25 | 25 | 30 | 25 | 30 | 15,58 % |
| Testing | 15 | 20 | 40 | 20 | 20 | 20 | 13,57 % |
| GitHub organization | 20 | 20 | 5 | 20 | 10 | 10 | 8,54 % |
| Meetings | 20 | 20 | 20 | 20 | 20 | 20 | 12,06 % |
| Customer exchange | 10 | 5 | 5 | 5 | 5 | 5 | 3,52 % |
| Project management | 20 | 20 | 5 | - | 5 | - | 5,03 % |
| Presentation | 5 | 5 | 5 | 5 | 5 | 5 | 3,02 % |
| Total (hours) | **175** | **180** | **160** | **160** | **160** | **160** | **100,00 % = 995 hours** |
| Hourly wage[[1]](#footnote-2) | 26,50 € | 25,00 € | 24,50 € | 25,50 € | 20,00 € | 27,50 € |  |
| Estimated total costs per employee | 4.637,50 € | 4.500,00 € | 3.920,00 € | 4.080,00 € | 3.200,00 € | 4.400,00 € |  |
| TOTAL costs | **24.737,50 €** | | | | | |  |

Table : Project costs

|  |  |  |  |
| --- | --- | --- | --- |
|  | Price | Duration | Total costs |
| Office costs | 760 € | 6 months | 4.560 € |
| Internet | 50 € | 24 months | 1.200 € |
| Additional costs | 100 € | 6 months | 600 € |
| TOTAL |  |  | 6.350 € |

Table : Fixed costs

# Offer

We now have to add a profit to the costs incurred for the project. For the profit, we choose a mark-up of 30% after the risk analysis. This results in the following offer for the client:

|  |  |
| --- | --- |
| Costs | 31.087,50 € |
| Profit (30 %) | 9.326,25 € |
| Offer | 40.413,75 € |

Table : Final summation

1. (Source: stepstone.de) [↑](#footnote-ref-2)