Microservices Architecture on Energy4Life Monolithic Application

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Kevin L. Biewesch
University of Luxembourg
Email: kevin.biewesch.001@student.uni.lu

Alfredo Capozucca
University of Luxembourg
Email: alfredo.capozucca@uni.lu

Abstract

This document is a template for the scientific and technical (S&T for short) report that is to be delivered by any BiCS student at the end of each Bachelor Semester Project (BSP). The Latex source files are available at: ***https://github.com/nicolasguelfi/lu.uni.course.bics.global***

This template is to be used using the Latex document preparation system or using any document preparation system. The whole document should be in between 6000 to 8000 words [1] *(excluding the annexes) and the proportions must be preserved. The other documents to be delivered (summaries, ...) should have their format adapted from this template.*

1. Introduction (± 5% of total words)

This paper presents the bachelor semester project made by Motivated Student together with Motivated Tutor as his motivated tutor. It presents the scientific and technical dimensions of the work done. All the words written here have been newly created by the authors and if some sequence of words or any graphic information created by others are included then it is explicitly indicated the original reference to the work reused.

This report separates explicitly the scientific work from the technical one. In deed each BSP must cover those two dimensions with a constrained balance (cf. [BiCS(2018b)]). Thus it is up to the Motivated Tutor and Motivated Student to ensure that the deliverables belonging to each dimension are clearly stated. As an example, a project whose title would be "A multi-user game for multi-touch devices" could define as scientific [Armstrong and Green(2017)] deliverables the following ones:

- Study of concurrency models and their implementation
- Study of ergonomics in human-computer interaction

The length of the report should be from 6000 to 8000 words excluding images and annexes. The sections presenting the technical and scientific deliverables represent ± 80% of total words of the report.

1. i.e. approximately 12 to 16 pages double columns

2. Project description (± 10% of total words)

2.1. Domains

2.1.1. Scientific . Provide a description of the scientific domain(s) in which the project is being made.

2.1.2. Technical. Provide a description of the technical domain(s) in which the project is being made.

2.2. Targeted Deliverables

2.2.1. Scientific deliverables. Provide a synthetic and abstract description of the scientific deliverables that were targeted to be produced. Each BSP must contain some work done according to the principles of the scientific method. It basically means that you should define at least one question related to the knowledge domain of your BSP and follow part of the scientific method process to answer to this question. The description of the work done to answer this question is a scientific deliverable.

Examples of question could be:

- Is Python an adequate language for concurrent programs?
- How can we measure the ergonomic of a graphical user interface?
- How can we ensure that a program will not fail?

An answer to such question should be the result of applying partly or totally the scientific method according to its standard definition which can be found in the literature.

As you can see in this template, the scientific deliverable is entirely separated from the technical deliverable. Of course it addresses a question more or less closely related to the technical deliverable.

2.2.2. Technical deliverables. Provide a synthetic and abstract description of the technical deliverables that were targeted to be produced.

3. Pre-requisites ([5%..10%] of total words)

Describe in these sections the main scientific and technical knowledge that is required to be known by you before starting the project. Do not describe in details this knowledge but only abstractly. All the content of this section shall not used, even partly, in the deliverable sections.

3.1. Scientific pre-requisites

3.2. Technical pre-requisites

4. Scientific Deliverable 1 – What is a Microservice?

For each scientific deliverable targeted in section 2
2 provide a full section with all the subsections described below.

4.1. Requirements (± 15% of section's words)

Since Microservices (MSs) were a previously unknown concept to me, this scientific deliverable targets the familiarisation of this architectural style. In the design section we are going to elaborate on motivations behind the architecture. In the production we will explore what constitutes a MS and the assessment will highlight a few drawbacks of the MS architecture.

4.2. Design (± 30% of section's words)

[**KB:**Talk about motivations]

4.3. Production (± 40% of section's words)

[**KB:**Talk about characteristics]

4.4. Assessment (± 15% of section's words)

[**KB:**Talk about drawbacks]

5. Scientific Deliverable 2 – What is the relationship between DevOps and Microservices?

5.1. Requirements

This scientific deliverable aims to find a relationship between the DevOps approach and the MS style. In the design section we are therefore first going to introduce aspects of both DevOps and MSs. The production section will then draw parallels between the presented characteristics which in turn allows us to observe how both concepts are connected to each other. In the assessment we will talk about threats to the validity of our discussions.

5.2. Design

[**KB:**Talk about characteristics of DevOps and MS]

5.3. Production

[**KB:**Make the connection between both concepts]

5.4. Assessment

[**KB:**Threats to validity of the discussion in production section]

6. Technical Deliverable 1 – Does E4L allow for easy deployment of adjacent Microservices?

6.1. Requirements

Our case study consisted in creating a MS relying on the Energy4Life (E4L) application. The latter is built using a monolithic architecture, and we want to find out how easy it is to deploy an adjacent MS application.

The MS to be created should allow us to test the hypothesis that MSs are easy to create and deploy. Further, it should fit into our E4L case study—we will have our service display a graph based on data collected by the E4L application. To close everything off, we shall also create a GitLab pipeline that automates the deployment of this MS.

Hence, the design section will tackle all the steps we had to undertake in order to reach the final and fully automated deployment pipeline. The production section will dive into the technical details and difficulties of each step. The assessment is going to lay out our judgement on how easy it was to deploy the MS given the current E4L application architecture.

6.2. Design

[**KB:**Methodlogy: Steps required to achieve final solution]

6.3. Production

[**KB:**More details on each step + difficulties encountered]

6.4. Assessment

[**KB:**Was is easy to deploy MS?]

Acknowledgment

The authors would like to thank the BiCS management and education team for the amazing work done.

7. Conclusion

The conclusion goes here.

References

[BiCS(2018a)] BiCS Bachelor Semester Project Report Template. https://github.com/nicolasguelfi/lu.uni.course.bics.global University of Luxembourg, BiCS - Bachelor in Computer Science (2017).

[BiCS(2018b)] Bachelor in Computer Science: BiCS Semester Projects Reference Document. Technical report, University of Luxembourg (2018)

[Armstrong and Green(2017)] J Scott Armstrong and Kesten C Green. Guidelines for science: Evidence and checklists. *Scholarly Commons*, pages 1–24, 2017. https://repository.upenn.edu/marketing_papers/181/

[1] Impact of Multiple Modalities on Emotion Recognition: Investigation into 3D Facial Landmarks, Action Units, and Physiological Data. *Diego Fabiano, Manikandan Jaishanker and Shaun Canavan*

[2] Deformable Synthesis Model for Emotion Recognition. *Diego Fabiano and Shaun Canavan*

[3] Emotion Recognition using Spatiotemporal Features from Facial Expression Landmarks. *Hamid Golzadeh, Diego R. Faria, Luis J. Manso, Anikó Ekárt and Christopher D. Buckingham*

[4] Facial Landmark-Based Emotion Recognition via Directed Graph Neural Network. *Quang Tran Ngoc, Seunghyun Lee and Byung Cheol Song*

[5] Facial Expression Recognition Using Facial Landmarks and Random Forest Classifier. *M. I. N. P. Munasinghe*

[6] I Know How You Feel: Emotion Recognition with Facial Landmarks. *Ivona Tautkute, Tomasz Trzcinski and Adam Bielski*

[7] Spatial Temporal Graph Convolutional Networks for Skeleton-Based Action Recognition *Sijie Yan, Yuanjun Xiong and Dahua Lin*

[8] Survey on RGB, 3D, Thermal, and Multimodal Approaches for Facial Expression Recognition: History, Trends, and Affect-related Applications *Ciprian A. Corneanu, Marc Oliu, Jeffrey F. Cohn, and Sergio Escalera*

[9] Classic Human Anatomy in Motion: The Artist's Guide to the Dynamics of Figure Drawing; Chapter 4. Facial Muscles and Expressions https://doctorlib.info/anatomy/classic-human-anatomy-motion/5.html

8. Appendix

All images and additional material go there.