

Aalto University
School of Science
Degree Programme in Computer Science and Engineering

Stella Student

Software Processes for Dummies: Re-inventing the Wheel

Master's Thesis
Espoo, June 18, 2011

DRAFT! — March 15, 2017 — DRAFT!

Supervisors: Professor Antti Ylä-Jääski, Aalto University
Professor Pekka Perustieteilijä, University of Helsinki
Advisor: Olli Ohjaaja M.Sc. (Tech.)

Aalto University
 School of Science
 Degree Programme in Computer Science and Engineering

ABSTRACT OF
 MASTER'S THESIS

Author:	Stella Student		
Title:	Software Processes for Dummies: Re-inventing the Wheel		
Date:	June 18, 2011	Pages:	21
Major:	Data Communication Software	Code:	T-110
Supervisors:	Professor Antti Ylä-Jääski Professor Pekka Perustieteilijä		
Advisor:	Olli Ohjaaaja M.Sc. (Tech.)		
<p>A dissertation or thesis is a document submitted in support of candidature for a degree or professional qualification presenting the author's research and findings. In some countries/universities, the word thesis or a cognate is used as part of a bachelor's or master's course, while dissertation is normally applied to a doctorate, whilst, in others, the reverse is true.</p> <p>!FIXME Abstract text goes here (and this is an example how to use fixme). FIXME! Fixme is a command that helps you identify parts of your thesis that still require some work. When compiled in the custom <code>mydraft</code> mode, text parts tagged with <code>fixmes</code> are shown in bold and with <code>fixme</code> tags around them. When compiled in normal mode, the <code>fixme</code>-tagged text is shown normally (without special formatting). The draft mode also causes the "Draft" text to appear on the front page, alongside with the document compilation date. The custom <code>mydraft</code> mode is selected by the <code>mydraft</code> option given for the package <code>aalto-thesis</code>, near the top of the <code>thesis-example.tex</code> file.</p> <p>The thesis example file (<code>thesis-example.tex</code>), all the chapter content files (<code>1introduction.tex</code> and so on), and the Aalto style file (<code>aalto-thesis.sty</code>) are commented with explanations on how the Aalto thesis works. The files also contain some examples on how to customize various details of the thesis layout, and of course the example text works as an example in itself. Please read the comments and the example text; that should get you well on your way!</p>			
Keywords:	ocean, sea, marine, ocean mammal, marine mammal, whales, cetaceans, dolphins, porpoises		
Language:	English		

Acknowledgements

I wish to thank all students who use L^AT_EX for formatting their theses, because theses formatted with L^AT_EX are just so nice.

Thank you, and keep up the good work!

Espoo, June 18, 2011

Stella Student

Abbreviations and Acronyms

2k/4k/8k mode	COFDM operation modes
3GPP	3rd Generation Partnership Project
ESP	Encapsulating Security Payload; An IPsec security protocol
FLUTE	The File Delivery over Unidirectional Transport protocol
e.g.	for example (do not list here this kind of common acronyms or abbreviations, but only those that are essential for understanding the content of your thesis.
note	Note also, that this list is not compulsory, and should be omitted if you have only few abbreviations

Contents

Abbreviations and Acronyms	4
1 Introduction	6
1.1 Problem statement	7
1.2 Helpful hints	7
1.3 Structure of the Thesis	7
2 Background	8
2.1 Energy consumption of IT devices	8
2.1.1 Energy consumption of network devices	8
2.2 Simulating energy consumption	8
2.2.1 Simulating energy consumption of network devices . . .	8
2.2.1.1 Packet-level and flow-level models	8
2.2.2 SimGrid	8
3 Environment	9
3.1 LaTeX working environments	9
3.1.1 Environment	9
3.1.2 Editor	9
3.2 Graphics	10
4 Methods	13
5 Implementation	15
6 Evaluation	16
7 Discussion	17
8 Conclusions	18
A First appendix	20

Chapter 1

Introduction

This is my master's thesis, and I am very proud of it. Of course, when I write my *real* master's thesis, I will not use the singular pronoun *I*, but rather try to avoid referring to myself and speak of the research *we* have conducted—I rarely work alone, after all. Yet, both *I* and *we* are correct, and it depends on the instructor and the supervisor (of course from you, too), which one they would prefer. Anyway, the tense should be active, and passive sentences should be avoided (especially, writing sentences where the subject is presented with by preposition), so often you cannot avoid choosing between the pronouns. Life is strange, but there you have it.

By the way, the preferred order of writing your master's thesis is about the same as the outline of the thesis: you first discover your problem and write about that, then you find out what methods you should use and write about that. Then you do your implementation, and document that, and so on. However, the abstract and introduction are often easiest to write last. This is because these really cover the entire thesis, and there is no way you could know what to put in your abstract before you have actually done your implementation and evaluation. Rarely anyone write the thesis from the beginning to the end just one time, but the writing is more like process, where every piece of text is written at least twice. Be also prepared to delete your own text. In the first phase, you can hide it into comments that are started with % but during the writing, the many comments should be visible for your helpers, the instructor and supervisor.

The introduction in itself is rarely very long; two to five pages often suffice.

Problem statement

Undergraduate students studying technical subjects do not consider typography very interesting these days, and therefore the typographical quality of many theses is unacceptably low. We plan to rectify this situation somewhat by providing a decent-quality example thesis outline for students. We expect that the typographical quality of the master's theses will dramatically increase as the new thesis outline is taken into use.

Helpful hints

Read the information from the university master's thesis pages [?] before starting the thesis. You should also go through the thesis grading instructions [?] together with your instructor and/or supervisor in the beginning of your work.

Structure of the Thesis

You should use transition in your text, meaning that you should help the reader follow the thesis outline. Here, you tell what will be in each chapter of your thesis.

Chapter 2

Background

Energy consumption of IT devices

Energy consumption of network devices

How energy consumption of large-scale network is estimated?

Simulating energy consumption

How to simulate energy consumption of large-scale networks?

Simulating energy consumption of network devices

Packet-level and flow-level models

Energy consumption simulators that work at packet-level or flow-level
Advantage and disadvantages of each approach

SimGrid

Architecture of SimGrid

Its current state and capabilities

Missing models

Chapter 3

Environment

A problem instance is rarely totally independent of its environment. Most often you need to describe the environment you work in, what limits there are and so on. This is a good place to do that. First we tell you about the LaTeX working environments and then is an example from an thesis written some years ago.

LaTeX working environments

To create \LaTeX documents you need two things: a \LaTeX environment for compiling your documents and a text editor for writing them.

Environment

Fortunately \LaTeX can nowadays be found for any (modern) computer environment, be it Linux, Windows, or Macintosh. For Linuxes (and other Unix clones) and Macs, I'd recommend *TeX Live* [?], which is the current default \LaTeX distribution for many Linux flavors such as Fedora, Debian, Ubuntu, and Gentoo. TeX Live is the replacement for the older *teTeX*, which is no longer developed.

TeX Live works also for Windows machines (at least according to their web site); however, I have used *MiKTeX* [?] and can recommend it for Windows. MiKTeX has a nice package manager and automatically fetches missing packages for you.

Editor

You can write \LaTeX documents with any text editor you like, but having syntax coloring options and such really helps a lot. My personal favourite

for editing \LaTeX is the *TeXlipse* [?] plugin for the Eclipse IDE [?]. Eclipse is an open-source integrated development environment (IDE) initially created for writing Java code, but it currently has support for editing languages such as C, C++, JavaScript, XML, HTML, and many more. The TeXlipse plugin allows you to edit and compile \LaTeX documents directly in Eclipse, and compilation errors and warnings are shown in the Eclipse *Problems* dialog so that you can locate and fix the issues easily. The plugin also supports reference traversal so that you can locate the source line where a label or a citation is defined.

Eclipse is an entire development environment, so it may feel a bit heavy-weight for editing a document. If you are looking for a more light-weight option, check out TeXworks. TeXworks is a \LaTeX editor that is packaged with the newer MiKTeX distributions, and it can be acquired from <http://www.tug.org/texworks/>.

And if you are attached to your *emacs* or *vim* editor, you can of course edit your \LaTeX documents with them. Emacs at least has syntax coloring and you can compile your document with a key binding, so this may be a good option if you prefer working with the standard Linux text editors.

Graphics

When you use `pdflatex` to render your thesis, you can include PDF images directly, as shown by Figure 3.1 below.

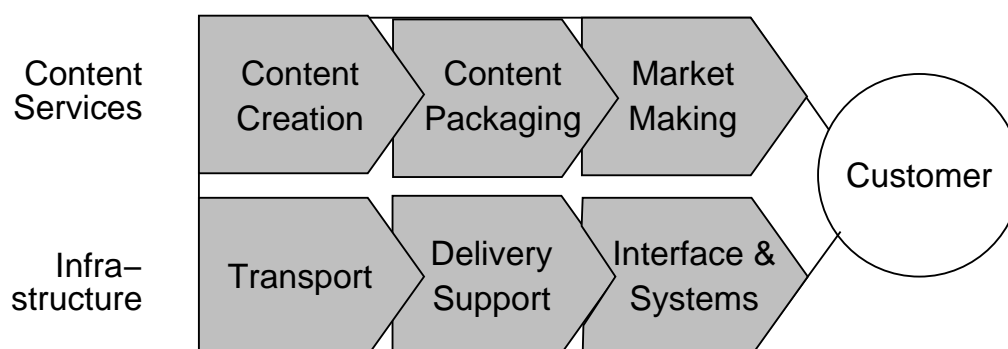


Figure 3.1: The INDICA two-layered value chain model.

You can also include JPEG or PNG files, as shown by Figure 3.2.

You can create PDF files out of practically anything. In Windows, you can download PrimoPDF or CutePDF (or some such) and install a printing



Figure 3.2: Eeyore, or Ihaa, a very sad donkey.

driver so that you can print directly to PDF files from any application. There are also tools that allow you to upload documents in common file formats and convert them to the PDF format. If you have PS or EPS files, you can use the tools `ps2pdf` or `epspdf` to convert your PS and EPS files to PDF.

Furthermore, most newer editor programs allow you to save directly to the PDF format. For vector editing, you could try Inkscape, which is a new open source WYSIWYG vector editor that allows you to save directly to PDF. For graphs, either export/print your graphs from OpenOffice Calc/Microsoft Excel to PDF format, and then add them; or use `gnuplot`, which can create PDF files directly (at least the new versions can). The terminal type is `pdf`, so the first line of your plot file should be something like `set term pdf`

To get the most professional-looking graphics, you can encode them using the TikZ package (TikZ is a frontend for the PGF graphics formatting system). You can create practically any kind of technical images with TikZ, but it has a rather steep learning curve. Locate the manual (`pgfmanual.pdf`) from your \LaTeX distribution and check it out. An example of TikZ-generated graphics is shown in Figure 3.3.

Another example of graphics created with TikZ is shown in Figure 3.4. These show how graphs can be drawn and labeled. You can consult the example images and the PGF manual for more examples of what kinds figures you can draw with TikZ.

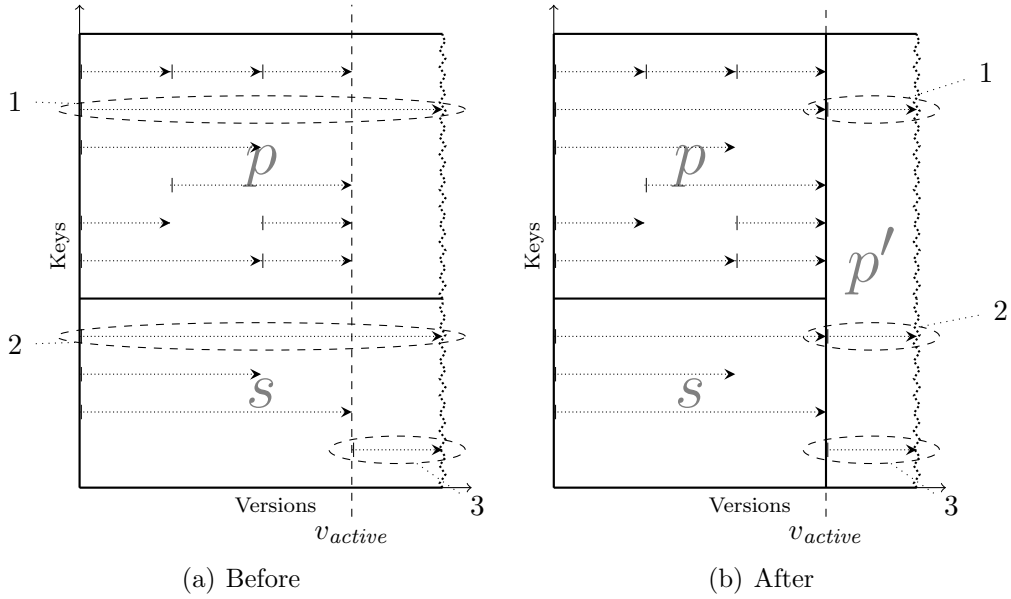


Figure 3.3: Example of a multiversion database page merge. This figure has been taken from the PhD thesis of Haapasalo [?].

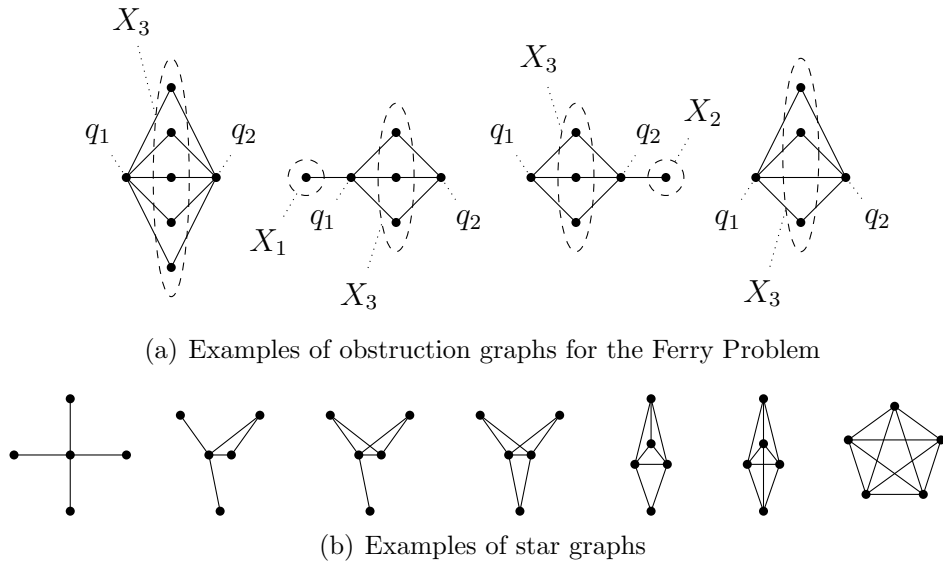


Figure 3.4: Examples of graphs drawn with TikZ. These figures have been taken from a course report for the graph theory course [?].

Chapter 4

Methods

You have now stated your problem, and you are ready to do something about it! *How* are you going to do that? What methods do you use? You also need to review existing literature to justify your choices, meaning that why you have chosen the method to be applied in your work.

If you have not yet done any (real) methodological courses (but chosen introduction courses of different areas that are listed in the methodological courses list), now is the time to do so or at least check through material of suitable methodological courses. Good methodological courses that concentrates especially to methods are presented in Table 4.1. Remember to explain the content of the tables (as with figures). In the table, the last column gives the research area where the methods are often used. Here we used table to give an example of tables. Abbreviations and Acronyms is also a long table. The difference is that longtables can continue to next page.

Code	Name	Methods	Area
T-110.6130	Systems Engineering for Data Communications Software	Computer simulations, mathematical modeling, experimental research, data analysis, and network service business research methods, (agile method)	T-110
Mat-2.3170	Simulation (here is an example of multicolumn for tables)	Details of how to build simulations	T-110
S-38.3184	Network Traffic Measurements and Analysis	How to measure and analyse network traffic	T-110

Table 4.1: Research methodology courses

Chapter 5

Implementation

You have now explained how you are going to tackle your problem. Go do that now! Come back when the problem is solved!

Now, how did you solve the problem? Explain how you implemented your solution, be it a software component, a custom-made FPGA, a fried jelly bean, or whatever. Describe the problems you encountered with your implementation work.

Chapter 6

Evaluation

You have done your work, but that's¹ not enough.

You also need to evaluate how well your implementation works. The nature of the evaluation depends on your problem, your method, and your implementation that are all described in the thesis before this chapter. If you have created a program for exact-text matching, then you measure how long it takes for your implementation to search for different patterns, and compare it against the implementation that was used before. If you have designed a process for managing software projects, you perhaps interview people working with a waterfall-style management process, have them adapt your management process, and interview them again after they have worked with your process for some time. See what's changed.

The important thing is that you can evaluate your success somehow. Remember that you do not have to succeed in making something spectacular; a total implementation failure may still give grounds for a very good master's thesis—if you can analyze what went wrong and what should have been done.

¹By the way, do *not* use shorthands like this in your text! It is not professional! Always write out all the words: “that is”.

Chapter 7

Discussion

At this point, you will have some insightful thoughts on your implementation and you may have ideas on what could be done in the future. This chapter is a good place to discuss your thesis as a whole and to show your professor that you have really understood some non-trivial aspects of the methods you used...

Chapter 8

Conclusions

Time to wrap it up! Write down the most important findings from your work. Like the introduction, this chapter is not very long. Two to four pages might be a good limit.

Bibliography

Appendix A

First appendix

This is the first appendix. You could put some test images or verbose data in an appendix, if there is too much data to fit in the actual text nicely.

For now, the Aalto logo variants are shown in Figure A.1.



(a) In English



(b) Suomeksi



(c) På svenska

Figure A.1: Aalto logo variants