svpdfsubject=Detta är den svenska översättningen av titeln – Detta är den svenska översättningen av undertiteln

svpdftitle=Detta är den svenska översättningen av titeln – Detta är den svenska översättningen av undertiteln

KTH ROYAL INSTITUTE
OF TECHNOLOGY

Degree Project in Technology

First cycle, 15 credits

This is the title in the language of the thesis

A subtitle in the language of the thesis

FAKE A. STUDENT
FAKE B. STUDENT

Stockholm, Sweden, 2023

This is the title in the language of the thesis

A subtitle in the language of the thesis

FAKE A. STUDENT

FAKE B. STUDENT

Bachelor's Programme in Information and Communication Technology
Date: February 15, 2023

Supervisors: A. Busy Supervisor, Another Busy Supervisor, Third Busy Supervisor
Examiner: Gerald Q. Maguire Jr.
School of Electrical Engineering and Computer Science
Host company: Företaget AB
Swedish title: Detta är den svenska översättningen av titeln
Swedish subtitle: Detta är den svenska översättningen av undertiteln

Abstract

All theses at KTH are **required** to have an abstract in both *English* and *Swedish*.

Exchange students may want to include one or more abstracts in the language(s) used in their home institutions to avoid the need to write another thesis when returning to their home institution.

Keep in mind that most of your potential readers are only going to read your `title` and `abstract`. This is why the abstract must give them enough information so that they can decide if this document is relevant to them or not. Otherwise, the likely default choice is to ignore the rest of your document.
An abstract should stand on its own, i.e., no citations, cross-references to the body of the document, acronyms must be spelled out, ...
Write this early and revise as necessary. This will help keep you focused on what you are trying to do.

Enter your abstract here!

Write an abstract that is about 250 and 350 words (1/2 A4-page) with the following components:

- What is the topic area? (optional) Introduces the subject area for the project.
- Short problem statement
- Why was this problem worth a Bachelor's/Master's thesis project? (*i.e.*, why is the problem both significant and of a suitable degree of difficulty for a Bachelor's/Master's thesis project? Why has no one else solved it yet?)
- How did you solve the problem? What was your method/insight?
- Results/Conclusions/Consequences/Impact: What are your key results/ conclusions? What will others do based on your results? What can be done now that you have finished - that could not be done before your thesis project was completed?

The following are some notes about what can be included (in terms of LaTeX) in your abstract.

Choice of typeface with \textit, \textbf, and \texttt: *x*, **x**, and `x`.

Text superscripts and subscripts with \textsubscript and \textsuperscript: A_x and A^x.

Some symbols that you might find useful are available, such as: \textregistered, \texttrademark, and \textcopyright. For example, the copyright symbol: \textcopyright Maguire 2022 results in ©Maguire 2022. Additionally, here are some examples of text superscripts (which can be combined with some symbols): ^{99m}Tc, A*, A^{\textregistered}, and A\texttrademark resulting in ^{99m}Tc, A*, A®, and A™. Two examples of subscripts are: H\textsubscript{2}O and CO\textsubscript{2} which produce H_2O and CO_2.

You can use simple environments with begin and end: itemize and enumerate and within these use instances of \item.

The following commands can be used: \eg, \Eg, \ie, \Ie, \etc, and \etal: *e.g.*, *E.g.*, *i.e.*, *I.e.*, *etc.*, and *et al.*

The following commands for numbering with lowercase Roman numerals: \first, \Second, \third, \fourth, \fifth, \sixth, \seventh, and \eighth: (i), (ii), (iii), (iv), (v), (vi), (vii), and $(viii)$. Note that the second case is set with a capital 'S' to avoid conflicts with the use of second of as a unit in the `siunitx` package.

Equations using \(xxxx \) or \[xxxx \] can be used in the abstract. For example: $(C_5O_2H_8)_n$ or

$$\int_a^b x^2\,dx$$

Note that you **cannot** use an equation between dollar signs.

Even LaTeX comments can be handled, for example: % comment. Note that one can include percentages, such as: 51% or $51\,\%$.

Keywords

Canvas Learning Management System, Docker containers, Performance tuning

Choosing good keywords can help others to locate your paper, thesis, dissertation, …and related work.

Choose the most specific keyword from those used in your domain, see for example: the ACM Computing Classification System (https://www.acm.org/publications/computing-classification-system/how-to-use), the IEEE Taxonomy (ht

tps://www.ieee.org/publications/services/thesaurus-thank-you.html), PhySH (Physics Subject Headings) (https://physh.aps.org/), ...or keyword selection tools such as the National Library of Medicine's Medical Subject Headings (MeSH) (https://www.nlm.nih.gov/mesh/authors.html) or Google's Keyword Tool (https://keywordtool.io/)

Formatting the keywords:

- The first letter of a keyword should be set with a capital letter and proper names should be capitalized as usual.
- Spell out acronyms and abbreviations.
- Avoid "stop words" - as they generally carry little or no information.
- List your keywords separated by commas (",").

Since you should have both English and Swedish keywords - you might think of ordering them in corresponding order (*i.e.*, so that the n^{th} word in each list correspond) - this makes it easier to mechanically find matching keywords.

Sammanfattning

Inside the following scontents environment, you cannot use a \includefilename as it will not end up in the for diva information. Additionally, you should not use a straight double quote character in the abstracts or keywords, use two single quote characters instead.

Enter your Swedish abstract or summary here!

Alla avhandlingar vid KTH **måste ha** ett abstrakt på både *engelska* och *svenska*.
Om du skriver din avhandling på svenska ska detta göras först (och placera det som det första abstraktet) - och du bör revidera det vid behov.

If you are writing your thesis in English, you can leave this until the draft version that goes to your opponent for the written opposition. In this way, you can provide the English and Swedish abstract/summary information that can be used in the announcement for your oral presentation.
If you are writing your thesis in English, then this section can be a summary targeted at a more general reader. However, if you are writing your thesis in Swedish, then the reverse is true – your abstract should be for your target audience, while an English summary can be written targeted at a more general audience.
This means that the English abstract and Swedish sammnfattning or Swedish abstract and English summary need not be literal translations of each other.

Do not use the \glspl{} command in an abstract that is not in English, as my programs do not know how to generate plurals in other languages. Instead, you will need to spell these terms out or give the proper plural form. In fact, it is a good idea not to use the glossary commands at all in an abstract/summary in a language other than the language used in the `acronyms.tex file` - since the glossary package does **not** support use of more than one language.

The abstract in the language used for the thesis should be the first abstract, while the Summary/Sammanfattning in the other language can follow

Nyckelord

Canvas Lärplattform, Dockerbehållare, Prestandajustering
Nyckelord som beskriver innehållet i uppsatsen eller rapporten

If you are an exchange student, use the relevant language or languages for abstracts for your home university, as this will often avoid the need for writing another thesis for your home university.
If you are fluent in other languages, feel free to add the abstracts in one or more of them.

Note that you may need to augment the set of languages used in `polyglossia` or `babel` (see the file `kththesis.cls`). The following languages include those languages that were used in theses at KTH in 2018-2019, except for one in Chinese.
Remove those versions of abstracts that you do not need.
If you add a new language, when specifying the language for the abstract, use the three-letter ISO 639-2 Code – specifically the "B" (bibliographic) variant of these codes (note that this is the same language code used in DiVA).

Résumé

Résumé en français.

Mots-clés

5-6 mots-clés

Resumen

Résumé en espagnol.

Palabras claves

5-6 Palabras claves

Sommario

Sommario in italiano.

parole chiave

5-6 parole chiave

Sammendrag

Sammendrag på norsk.

Nøkkelord

5-6 nøkkelord

Zusammenfassung

Zusammenfassung in Deutsch.

Schlüsselwörter

5-6 Schlüsselwörter

Resumé

Abstrakt på dansk.

Søgeord

5-6 Søgeord

Samenvatting

Samenvatting in het Nederlands.

Trefwoorden

5-6 trefwoorden

Kokkuvõte

Eesti keeles kokkuvõte.

Märksõnad

5-6 Märksõnad

Acknowledgments

Författarnas tack

It is nice to acknowledge the people that have helped you. It is also necessary to acknowledge any special permissions that you have gotten – for example, getting permission from the copyright owner to reproduce a figure. In this case, you should acknowledge them and this permission here and in the figure's caption.
Note: If you do **not** have the copyright owner's permission, then you **cannot** use any copyrighted figures/tables/.... Unless stated otherwise all figures/tables/...are generally copyrighted.

I detta kapitel kan du ev nämna något om din bakgrund om det påverkar rapporten på något sätt. Har du t ex inte möjlighet att skriva perfekt svenska för att du är nyanländ till landet kan det vara på sin plats att nämna detta här. OBS, detta får dock inte vara en ursäkt för att lämna in en rapport med undermåligt språk, undermålig grammatik och stavning (t ex får fel som en automatisk stavningskontroll och grammatikkontroll kan upptäcka inte förekomma)
En dualism som måste hanteras i hela rapporten och projektet

I would like to thank xxxx for having yyyy. Or in the case of two authors: We would like to thank xxxx for having yyyy.

Stockholm, February 2023
Fake A. Student Fake B. Student

Contents

1 Introduction **1**
1.1 Background . . . 2
1.2 Problem . . . 3
1.2.1 Original problem and definition . . . 3
1.2.2 Scientific and engineering issues . . . 3
1.3 Purpose . . . 3
1.4 Goals . . . 4
1.5 Research Methodology . . . 4
1.6 Delimitations . . . 5
1.7 Structure of the thesis . . . 5

2 Background **7**
2.1 Major background area 1 . . . 8
2.1.1 Subarea 1.1 . . . 8
2.1.2 Subarea 1.1.2 . . . 9
2.1.3 Subarea 1.1.2 . . . 9
2.1.4 Link layer Encapsulation . . . 9
2.1.5 IP packet headers . . . 9
2.1.6 Test for accessibility of formulas . . . 9
2.2 Major background area 2 . . . 10
2.2.1 WLAN Security . . . 10
2.2.2 Network layer security . . . 10
2.3 Related work area . . . 11
2.3.1 Major related work 1 . . . 11
2.3.2 Major related work n . . . 11
2.3.3 Minor related work 1 . . . 11
2.3.4 Minor related work n . . . 11
2.4 Summary . . . 11

3 Method or Methods **13**
3.1 Research Process . . . 15
3.2 Research Paradigm . . . 15
3.3 Data Collection . . . 16
3.3.1 Sampling . . . 16
3.3.2 Sample Size . . . 16
3.3.3 Target Population . . . 16
3.4 Experimental design/Planned Measurements . . . 16
3.4.1 Test environment/test bed/model . . . 16
3.4.2 Hardware/Software to be used . . . 17
3.5 Assessing reliability and validity of the data collected . . . 17
3.5.1 Validity of method . . . 17
3.5.2 Reliability of method . . . 17
3.5.3 Data validity . . . 17
3.5.4 Reliability of data . . . 18
3.6 Planned Data Analysis . . . 18
3.6.1 Data Analysis Technique . . . 18
3.6.2 Software Tools . . . 18
3.7 Evaluation framework . . . 18
3.8 System documentation . . . 18

4 What you did **19**
4.1 Hardware/Software design . . . /Model/Simulation model & parameters/. 19
4.2 Implementation . . . /Modeling/Simulation/. 20
4.2.1 Some examples of coding . . . 21
4.2.2 Some examples of figures in tikz . . . 22
4.2.2.1 Azure's Form Recognizer . . . 22
4.2.2.2 Hyper-V with Containers . . . 22
4.2.2.3 VM versus Containers . . . 23

5 Results and Analysis **25**
5.1 Major results . . . 25
5.2 Reliability Analysis . . . 28
5.3 Validity Analysis . . . 28

6 Discussion **29**

7 Conclusions and Future work **31**
7.1 Conclusions . . . 31
7.2 Limitations . . . 32
7.3 Future work . . . 32
7.3.1 What has been left undone? . . . 32
7.3.1.1 Cost analysis . . . 32
7.3.1.2 Security . . . 33
7.3.2 Next obvious things to be done . . . 33
7.4 Reflections . . . 33

References **35**

A Supporting materials **37**

B Something Extra **39**
B.1 Just for testing KTH colors . . . 39

C Main equations **41**
C.1 A simple example . . . 41
C.2 An even simpler example . . . 41

D README_author - the starting place for authors **43**
D.1 Advice for Author or Authors . . . 43
D.2 Author configuration of the LaTeX engine . . . 44
D.3 Author configuration of the template . . . 46
D.4 Author macros . . . 52
D.5 Starting to write . . . 54
D.5.1 Working abstract . . . 55
D.5.2 Structure of the abstracts and summaries . . . 55
D.5.3 Acronyms . . . 57
D.5.4 Some predefined macros to help when writing . . . 57
D.5.5 Additional abstract(s) . . . 57
D.5.6 Removing and hiding parts that you do not want . . . 57
D.5.7 Removing the README_notes . . . 58
D.6 Copyright or Creative Commons License . . . 58
D.6.1 Example configuration to have a CC BY-NC-ND license 59
D.6.2 Example configuration to have a CC BY-NC-ND license with a Euro symbol rather than a Dollar sign . 59
D.6.3 Example configuration to have a CC0 license . . . 60
D.7 Use of fonts within the thesis . . . 60

E README and notes about the template **63**
E.1 Introduction . . . 64
E.2 Deliminations . . . 65
E.3 Structure of the files for the template . . . 65
E.4 Expected users and their differences . . . 67
E.5 Those working in parallel with the authors(s) during the degree project . . . 67
E.5.1 Supervisor . . . 67
E.5.2 Examiner . . . 68
E.5.3 Opponent(s) and oral presentation . . . 69
E.6 Administrative staff . . . 70
E.6.1 What is a TRITA number and why does each approved thesis get assigned one? . . . 70
E.6.2 Where does the TRITA number go? . . . 71
E.6.3 What does this mean in practice? . . . 71
E.6.4 Entering the metadata into DiVA . . . 71
E.7 (Human) Readers of the thesis . . . 72
E.7.1 Machines reading the metadata or full text of the thesis 72
E.7.2 Template author and maintainers . . . 73
E.8 While writing . . . 73
E.8.1 Conventions for todo notes . . . 73
E.8.2 Turning on and off the README_notes . . . 74
E.8.3 Removing the README_notes . . . 74
E.8.4 Removing the README_notes . . . 74
E.8.5 Removing unused fonts . . . 75

List of Figures

2.1 Lots of stars (Inspired by Figure x.y on page z of [xxx]) 8
2.2 Ethernet data link layer protocol encapsulated into a IEEE 802.3 MAC packet 9
2.3 IPv4 datagram header 10
2.4 IPv6 datagram header 10

3.1 Research Process 15

4.1 Homepage icon 20
4.2 The processing of key-value extraction from a PDF document using Azure's Form Recognizer 22
4.3 Hyper-V with containers 23
4.4 Virtual machines (VMs) versus Containers 23

5.1 A GNUplot figure 27

A.1 Adobe Acrobat Reader using the paperclip icon for the attached references.bib file 38
A.2 Adobe Acrobat Reader after right-clicking on the push-pin icon for the attached references.bib file 38

D.1 Selecting a compiler (*i.e.,* TeX engine) in Overleaf 45

List of Tables

2.1 xxx characteristics 8

4.1 Configurations tested 20

5.1 Delay measurement statistics 26
5.2 RTT for 4 hosts 26
5.3 Median values of sandwich attributes 27

D.1 Examples of some national subject categories and their codes . 51

E.1 Structure of files for the template 66

Listings

4.1 Hello world in C code 21
4.2 Using a python program to access the KTH API to get all of the programs at KTH 21

If you have listings in your thesis. If not, then remove this preface page.

List of acronyms and abbreviations

This document is incomplete. The external file associated with the glossary 'acronym' (which should be called `examplethesis.acr`) hasn't been created.

Check the contents of the file `examplethesis.acn`. If it's empty, that means you haven't indexed any of your entries in this glossary (using commands like `\gls` or `\glsadd`) so this list can't be generated. If the file isn't empty, the document build process hasn't been completed.

Try one of the following:

- Add `automake` to your package option list when you load `glossaries-extra.sty`. For example:

  ```
  \usepackage[automake]{glossaries-extra}
  ```

- Run the external (Lua) application:

  ```
  makeglossaries-lite.lua "examplethesis"
  ```

- Run the external (Perl) application:

  ```
  makeglossaries "examplethesis"
  ```

Then rerun LaTeX on this document.

This message will be removed once the problem has been fixed.

The list of acronyms and abbreviations should be in alphabetical order based on the spelling of the acronym or abbreviation.

Chapter 1

Introduction

svensk: Introduktion

Ofta kommer problemet och problemägaren från industrin där man önskar en specifik lösning på ett specifikt problem. Detta är ofta ”för smalt” definierat och ger ofta en ”för smal” lösning för att resultatet skall vara intressant ur ett mer allmänt ingenjörsperspektiv och med ”nya” erfarenheter som resultat. Fundera tillsammans med projektets intressenter (student, problemägare och akademi) hur man skulle kunna använda det aktuella problemet/förslaget för att undersöka någon ingenjörsaspekt och vars resultat kan ge ny eller kompletterande erfarenhet till ingenjörssamfundet och vetenskapen.
slöser man en del eller hela delen av det ursprungliga problemet.
Erfarenheten kommer ur en frågeställning som man i examensarbetet försöker besvara med tidigare och andras erfarenhet, egna eller modifierade metoder som ger ett resultat vilket kan användas för att diskutera ett svar på undersökningsfrågan.
Detta stycke skall alltså, förutom det ursprungliga ”smala” problemet, innehålla vad som skall undersökas för att skapa ny ingenjörserfarenhet och/eller vetenskap.

The first paragraph after a heading is not indented, all of the subsequent paragraphs have their first line indented.

This chapter describes the specific problem that this thesis addresses, the context of the problem, the goals of this thesis project, and outlines the structure of the thesis.

Give a general introduction to the area. (Remember to use appropriate references in this and all other sections.)

We use the *bibtex* package to handle our references. We, therefore, use the command \cite{farshin_make_2019}. For example, Farshin, *et al.,* described how to improve LLC cache performance in [**?**] in the context of links running at 200 Gbps.

Use the glossaries package to help yourself and your readers. Add the acronyms and abbreviations to lib/acronyms.tex. Some examples are shown below:

In this thesis, we will examine the use of Local Area Networks (LANs). In this thesis, we will assume that LANs include Wireless Local Area Networks (WLANs), such as Wireless Fidelity (Wi-Fi).

1.1 Background

svensk: Bakgrund

Present the background for the area. Set the context for your project – so that your reader can understand both your project and this thesis. (Give detailed background information in Chapter 2 - together with related work.) Sometimes it is useful to insert a system diagram here so that the reader knows what are the different elements and their relationship to each other. This also introduces the names/terms/... that you are going to use throughout your thesis (be consistent). This figure will also help you later delimit what you are going to do and what others have done or will do.

As one can find in RFC 1235 [**?**] multicast is useful for xxxx. A number of different operating systems (OSes) have been used in this work, such as the following OSes: UNIX, Linux, Windows, etc. The main focus will be on one OS, namely Linux.

1.2 Problem

svensk: Problemdefinition eller Frågeställning
Lyft fram det ursprungliga problemet om det finns något och definiera därefter den ingenjörsmässiga erfarenheten eller/och vetenskapen som kan komma ur projektet.

Longer problem statement
If possible, end this section with a question as a problem statement.

1.2.1 Original problem and definition

Ursprungligt problem och definition

Some text

1.2.2 Scientific and engineering issues

Vetenskaplig och ingenjörsmässig frågeställning

some text

1.3 Purpose

Syfte

Skilj på syfte och mål! Syfte är att förändra något till det bättre. I examensarbetet finns ofta två aspekter på detta. Dels vill problemägaren (företaget) få sitt problem löst till det bättre men akademin och ingenjörssamfundet vill också få nya erfarenheter och vetskap. Beskriv ett syfte som tillfredställer båda dessa aspekter.
Det finns även ett syfte till som kan vara värt att beakta och det är att du som student skall ta examen och att du måste bevisa, i ditt examensarbete, att du uppfyller examensmålen. Dessa mål sammanfaller med kursmålen för examensarbetskursen.

State the purpose of your thesis and the purpose of your degree project. Describe who benefits and how they benefit if you achieve your goals. Include anticipated ethical, sustainability, social issues, etc. related to your project. (Return to these in your reflections in Section 7.4.)

1.4 Goals

Mål

Skilj på syfte och mål. Syftet är att åstakomma en förändring i något. Målen är vad som konkret skall göras för att om möjligt uppnå den önskade förändringen (syfte).

State the goal/goals of this degree project.

The goal of this project is XXX. This has been divided into the following three sub-goals:

1. Subgoal 1

   för att tillfredsställa problemägaren – industrin?

2. Subgoal 2

   för att tillfredsställa ingenjörssamfundet och vetenskapen – akademin)

3. Subgoal 3

   eventuellt, för att uppfylla kursmålen – du som student

In addition to presenting the goal(s), you might also state what the deliverables and results of the project are.

1.5 Research Methodology

Undersökningsmetod

Här anger du vilken vilken övergripande undersökningsstrategi eller metod du skall använda för att försöka besvara den akademiska frågeställning och samtidigt lösa det e v ursprungliga problemet. Ofta kan man använda ”lösandet av ursprungsproblemet” som en fallstudie kring en akademisk frågeställning. Du undersöker någon intressant fråga i ”skarpt” läge och samlar resultat och erfarenhet ur detta.
Tänk på att företaget ibland måste stå tillbaka i sin önskan och förväntan på projektets resultat till förmån för ny eller kompletterande ingenjörserfarenhet och vetenskap (ditt examensarbete). Det är du som student som bestämmer och löser fördelningen mellan dessa två intressen men se till att alla är informerade.

Introduce your choice of methodology/methodologies and method/methods – and the reason why you chose them. Contrast them with and explain why you did not choose other methodologies or methods. (The details of the actual methodology and method you have chosen will be given in Chapter 3. Note that in Chapter 3, the focus could be research strategies, data collection, data analysis, and quality assurance.)
In this section you should present your philosophical assumption(s), research method(s), and research approach(es).

1.6 Delimitations

Avgränsningar

Describe the boundary/limits of your thesis project and what you are explicitly not going to do. This will help you bound your efforts – as you have clearly defined what is out of the scope of this thesis project. Explain the delimitations. These are all the things that could affect the study if they were examined and included in the degree project.

1.7 Structure of the thesis

Rapportens disposition

Chapter 2 presents relevant background information about xxx. Chapter 3 presents the methodology and method used to solve the problem. ...

Chapter 2

Background

Bakgrund

When you do your literature study, you should have a nearly complete Chapters 1 and 2.
You may also find it convenient to introduce the future work section into your report early – so that you can put things that you think about but decide not to do now into this section.
Note that later you can move things between this future work section and what you have done as you may change your mind about what to do now versus what to put off to future work.

What does a reader (another x student – where x is your study line) need to know to understand your report? What have others already done? (This is the "related work".) Explain what and how prior work/prior research will be applied on or used in the degree project/work (described in this thesis). Explain why and what is not used in the degree project and give valid reasons for rejecting the work/research.

This chapter provides basic background information about xxx. Additionally, this chapter describes xxx. The chapter also describes related work xxxx.

Vilken viktig litteratur och (forsknings-)artiklar har du studerat inom området (litteraturstudie)?

2.1 Major background area 1

Viktigt bakgrundsområde 1

There are xxx characteristics that distinguish yyy from other information and communication technology (ICT) system, as shown in Figure 2.1. Table 2.1 summarizes these characteristics.

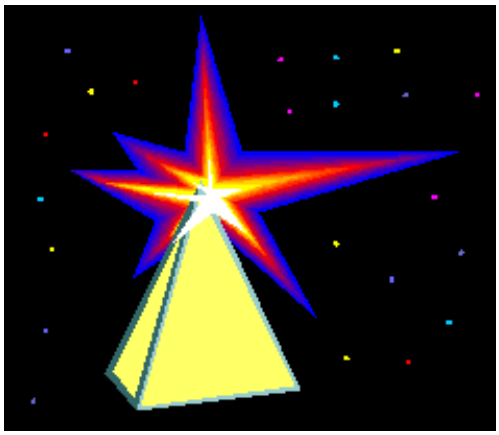


Figure 2.1: Lots of stars (Inspired by Figure x.y on page z of [xxx])

Massor av stärnor (Inspirerad av figur x.y på sidan z i [xxx])

Table 2.1: xxx characteristics

Characteristics	**Description**
α	β
1	1110.1
2	10.1
3	23.113 231

Egenskaper

Beskrivning

2.1.1 Subarea 1.1

Entangled states are an important part of quantum cryptography, but also relevant in other domains. This concept might be relevant for neutrinos, see

for example [**?**].

2.1.2 Subarea 1.1.2

Computational methods are increasingly used as a third method of carrying out scientific investigations. For example, computational experiments were used to find the amount of wear in a polyethylene liner of a hip prosthesis in [**?**]. ...

2.1.3 Subarea 1.1.2

Using the nearest data center may improve performance, see [**?**]

2.1.4 Link layer Encapsulation

See Figure 2.2 which uses the bytefield LaTeX package.

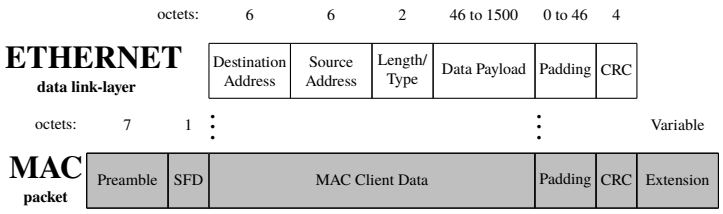


Figure 2.2: Ethernet data link layer protocol encapsulated into a IEEE 802.3 MAC packet

2.1.5 IP packet headers

The data link layer will receive a packet from the IP layer. The layout of an IPv4 packet is shown in Figure 2.3. This should be contrasted with the IPv6 header shown in Figure 2.4.

2.1.6 Test for accessibility of formulas

As can be seen in these equations: $c = 2 \cdot \pi \cdot r$ or

$$\int_a^b x^2 \, dx$$

a chemical formula: $(C_5O_2H_8)_n$ ...

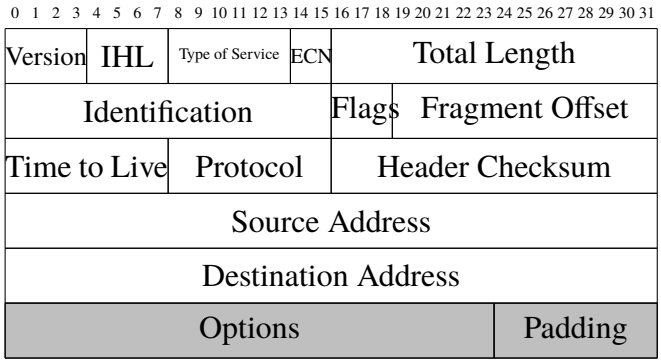


Figure 2.3: IPv4 datagram header. Light grey coloured fields are optional.

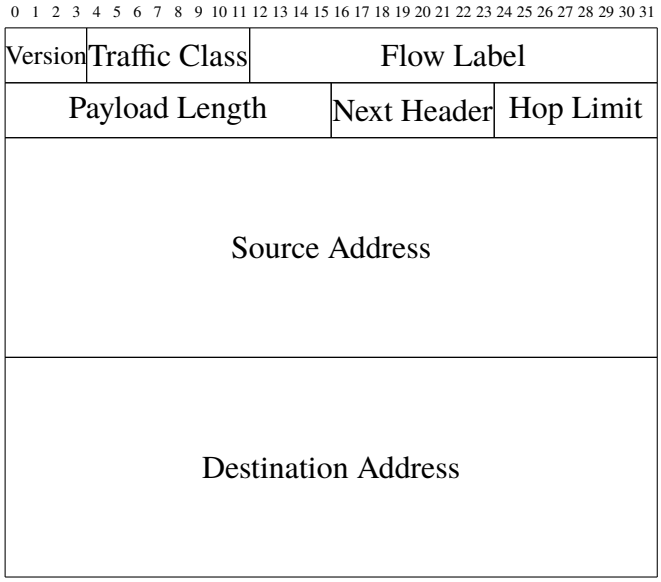


Figure 2.4: IPv6 datagram header

2.2 Major background area 2

Viktigt bakgrundsområde 2

...

2.2.1 WLAN Security

2.2.2 Network layer security

...

2.3 Related work area

Relaterade arbeten

2.3.1 Major related work 1

Relaterade arbeten 1

Carrier clouds have been suggested as a way to reduce the delay between the users and the cloud server that is providing them with content. However, there is a question of how to find the available resources in such a carrier cloud. One approach has been to disseminate resource information using an extension to OSPF-TE, see Roozbeh, Sefidcon, and Maguire [**?**].

2.3.2 Major related work n

Relaterade arbeten

2.3.3 Minor related work 1

Mindre relaterat arbete 1

...

2.3.4 Minor related work n

Mindre relaterat arbete n

2.4 Summary

Sammanfattning

Det är trevligt om detta kapitel avslutas med en sammanfattning. Till exempel kan du inkludera en tabell som sammanfattar andras idéer och fördelar och nackdelar med varje - så som senare kan du jämföra din lösning till var och en av dessa. Detta kommer också att hjälpa dig att definiera de variabler som du kommer att använda för din utvärdering.

It is nice to have this chapter conclude with a summary. For example, you can include a table that summarizes other people's ideas and benefits and drawbacks with each - so as later you can compare your solution to each of them. This will also help you define the variables that you will use for your evaluation.

Chapter 3

Method or Methods

Metod eller Metodval

This chapter is about Engineering-related content, Methodologies and Methods. Use a self-explaining title.
The contents and structure of this chapter will change with your choice of methodology and methods.

Describe the engineering-related contents (preferably with models) and the research methodology and methods that are used in the degree project.
Give a theoretical description of the scientific or engineering methodology you are going to use and why have you chosen this method. What other methods did you consider and why did you reject them?
In this chapter, you describe what engineering-related and scientific skills you are going to apply, such as modeling, analyzing, developing, and evaluating engineering-related and scientific content. The choice of these methods should be appropriate for the problem. Additionally, you should be conscious of aspects relating to society and ethics (if applicable). The choices should also reflect your goals and what you (or someone else) should be able to do as a result of your solution - which could not be done well before you started.

The purpose of this chapter is to provide an overview of the research method used in this thesis. Section 3.1 describes the research process. Section 3.2 details the research paradigm. Section 3.3 focuses on the data collection techniques used for this research. Section 3.4 describes the experimental design. Section 3.5 explains the techniques used to evaluate

the reliability and validity of the data collected. Section 3.6 describes the method used for the data analysis. Finally, Section 3.7 describes the framework selected to evaluate xxx.

Vilka vetenskaplig eller ingenjörs-metodik ska du använda och varför har du valt den här metoden. Vilka andra metoder gjorde du övervägde du och varför du avvisar dem. Vad är dina mål? (Vad ska du kunna göra som ett resultat av din lösning - vilken inte kan göras i god tid innan du började) Vad du ska göra? Hur? Varför? Till exempel, om du har implementerat en artefakt vad gjorde du och varför? Hur kommer du utvärdera den. Syftet med detta kapitel är att ge en översikt över forsknings metod som används i denna avhandling. Avsnitt 3.1 beskriver forskningsprocessen. Avsnitt 3.2 beskriver forskningsparadigmen detaljerat. Avsnitt 3.3 fokuserar på datainsamlingstekniker som används för denna forskning. Avsnitt 3.4 beskriver experimentell design. Avsnitt 3.5 förklarar de tekniker som används för att utvärdera tillförlitligheten och giltigheten av de insamlade uppgifterna. Avsnitt 3.6 beskriver den metod som används för dataanalysen. Slutligen, Avsnitt 3.7 beskriver ramverket som valts för att utvärdera xxx.
Ofta kan man koppla ett antal följdfrågor till undersökningsfrågan och problemlösningen t ex
(1) Vilken process skall användas för konstruktion av lösningen och vilken process skall kopplas till denna för att svara på undersökningsfrågan?
(2) Hur och vilket resultat (storheter) skall presenteras både för att redovisa svar på undersökningsfrågan (resultatkapitlet i denna rapport) och redovisa resultat av problemlösningen (prototypen, ofta dokument som bilagor men vilka dokument och varför?).
(3) Vilken teori/teknik skall väljas och användas både för undersökningen (taxonomi, matematik, grafer, storheter mm) och problemlösning (UML, UseCases, Java mm) och varför?
(4) Vad behöver du som student leverera för att uppnå hög kvaliet (minimikrav) eller mycket hög kvalitet på examensarbetet?
(5) Frågorna kopplar till de följande underkapitlen.
(6) Resonemanget bygger på att studenter på hing-programmet ofta skall konstruera något åt problemägaren och att man till detta måste koppla en intressant ingenjörsfråga. Det finns hela tiden en dualism mellan dessa aspekter i exjobbet.

3.1 Research Process

Undersökningsrocess och utvecklingsprocess

Figure 3.1 shows the steps conducted to carry out this research.

Figur 3.1 visar de steg som utförs för att genomföra
Beskriv, gärna med ett aktivitetsdiagram (UML?), din undersökningsprocess och utvecklingsprocess. Du måste koppla ihop det akademiska intresset (undersökningsprocess) med ursprungsproblemet (utvecklingsprocess) denna forskning.
Aktivitetsdiagram från t ex UML-standard

Figure 3.1: Research Process

Example of using customized item labels.

Some steps in the process:

Step 1 plan experiment,

Step 2 conduct experiment,

Step 3 analyze data from the experiment, and

Step 4 discuss the results of the analysis.

Forskningsprocessen

3.2 Research Paradigm

Undersökningsparadigm
Exempelvis
Positivistisk (vad/hur fungerar det?) kvalitativ fallstudie med en deduktivt (förbestämd) vald ansats och ett induktivt(efterhand uppstår dataområden och data) insamlade av data och erfarenheter.

3.3 Data Collection

Datainsamling
(Detta bör också visa att du är medveten om de sociala och etiska frågor som kan vara relevanta för dina data insamlingsmetod.)

This should also show that you are aware of the social and ethical concerns that might be relevant to your data collection method.

3.3.1 Sampling

Stickprovsundersökning

3.3.2 Sample Size

Provstorleken

3.3.3 Target Population

Målgruppen

3.4 Experimental design and Planned Measurements

Experimentdesign/Mätuppställning

3.4.1 Test environment/test bed/model

Describe everything that someone else would need to reproduce your test environment/test bed/model/… .

Testmiljö/testbädd/modell
Beskriv allt att någon annan skulle behöva återskapa din testmiljö / testbädd / modell / …

3.4.2 Hardware/Software to be used

Hårdvara / programvara som ska användas

3.5 Assessing reliability and validity of the data collected

Bedömning av validitet och reliabilitet hos använda metoder och insamlade data

3.5.1 Validity of method

Giltigheten av metoder
Har dina metoder gett dig de rätta svaren och lösningarna? Var metoderna korrekta?

How will you know if your results are valid?

Remember that validity is about the *accuracy* of a measurement while reliability is about the *consistency* of the measurement values under the same conditions (*i.e.,* repeatability).

3.5.2 Reliability of method

Tillförlitlighet av för metoder
Hur bra är dina metoder, finns det bättre metoder? Hur kan du förbättra dem?

How will you know if your results are reliable?

3.5.3 Data validity

Giltigheten av uppgifter
Hur vet du om dina resultat är giltiga? Är ditt resultat rättvisande?

3.5.4 Reliability of data

Tillförlitlighet av data
Hur vet du om dina resultat är tillförlitliga? Hur bra är dina resultat?

3.6 Planned Data Analysis

Metod för analys av data

3.6.1 Data Analysis Technique

Dataanalysteknik

3.6.2 Software Tools

Mjukvaruverktyg

3.7 Evaluation framework

Utvärdering och ramverk
Metod för utvärdering, jämförelse mm. Kopplar till kapitel 5.

3.8 System documentation

Systemdokumentation
Med vilka dokument och hur skall en konstruerad prototyp dokumenteras? Detta blir ofta bilagor till rapporten och det som problemägaren till det ursprungliga problemet (industrin) ofta vill ha. Bland dessa bilagor återfinns ofta, och enligt någon angiven standard, kravdokument, arkitekturdokument, designdokumnet, implementationsdokument, driftsdokument, testprotokoll mm.

If this is going to be a complete document consider putting it in as an appendix, then just put the highlights here.

Chapter 4

What you did

Choose your own chapter title to describe this

[Vad gjorde du? Hur gick det till? – Välj lämplig rubrik (“Genomförande”, “Konstruktion”, ”Utveckling” eller annat]

What have you done? How did you do it? What design decisions did you make? How did what you did help you to meet your goals?

Vad du har gjort? Hur gjorde du det? Vilka designval gjorde du? Hur kom det du hjälpte dig att uppnå dina mål?

4.1 Hardware/Software design . . . /Model/Simulation model & parameters/. . .

Hårdvara / Mjukvarudesign ... / modell / Simuleringsmodell och parametrar / . . .

Figure 4.1 shows a simple icon for a home page. The time to access this page when served will be quantified in a series of experiments. The configurations that have been tested in the test bed are listed in Table 4.1. In 7.0 % of cases, there was an error indicating xxxxx.

Figur 4.1 visar en enkel ikon för en hemsida. Tiden för att få tillgång till den här sidan när den laddas kommer att kvantifieras i en serie experiment. De konfigurationer som har testats i provbänk listas ini tabell 4.1.
Vad du har gjort? Hur gjorde du det? Vilka designval gjorde du?

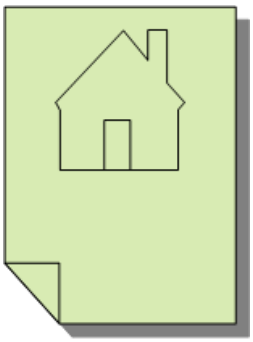


Figure 4.1: Homepage icon

Table 4.1: Configurations tested

Configuration	Description
1	Simple test with one server
2	Simple test with one server

Testade konfigurationer

4.2 Implementation . . . /Modeling/Simulation/. . .

Implementering . . . / modellering / simulering / . . .

Two commonly used simulators are:

Mininet This simulator uses traffic control (`tc`) to simulate network devices connected by links with specific bandwidth, packet loss rates, qdisc methods, etc.

ns-2 or ns-3 simulator These simulators are very useful for simulating wireless communication links between moving devices. You can specify the mobility patterns of the nodes.

4.2.1 Some examples of coding

This section is simply to show some example of how you can include code in your thesis - this is not a section you would have in your thesis.

Det här avsnittet är helt enkelt för att visa ett exempel på hur du kan inkludera kod i ditt examensarbete - det här är inte ett avsnitt du skulle ha i ditt examensarbete.

Listing 4.1 shows an example of a simple program written in C code.

Listing 4.1: Hello world in C code

```
int main() {
printf("hello, world");
return 0;
}
```

In contrast, Listing 4.2 is an example of code in Python to get a list of all of the programs at KTH.

Listing 4.2: Using a python program to access the KTH API to get all of the programs at KTH

```
KOPPSbaseUrl = 'https://www.kth.se'

def v1_get_programmes():
    global Verbose_Flag
    #
    # Use the KOPPS API to get the data
    # note that this returns XML
    url = "{0}/api/kopps/v1/programme".format(KOPPSbaseUrl)
    if Verbose_Flag:
        print("url: " + url)
    #
    r = requests.get(url)
    if Verbose_Flag:
        print("result of getting v1 programme: {}".format(r.text)
    #
    if r.status_code == requests.codes.ok:
        return r.text           # simply return the XML
    #
    return None
```

4.2.2 Some examples of figures in tikz

This section is simply to show some example of how you can draw your own figures for in your thesis - this is not a section you would have in your thesis.

Det här avsnittet är helt enkelt för att visa ett exempel på hur du kan rita dina egna figurer i ditt examensarbete – det här är inte ett avsnitt du skulle ha i ditt examensarbete.

These figures are just some examples to show that you can draw your own figures for in your thesis. This has two advantages: (i) you do not have to worry about copyrights – as these are your own figures and (ii) the text is now readable and not simply a picture of text – so screen readers can read the figure's contents to someone who is listening to the contents of your thesis.

4.2.2.1 Azure's Form Recognizer

Figure 4.2 shows the processing of key-value extraction from a PDF document using Azure's Form Recognizer.

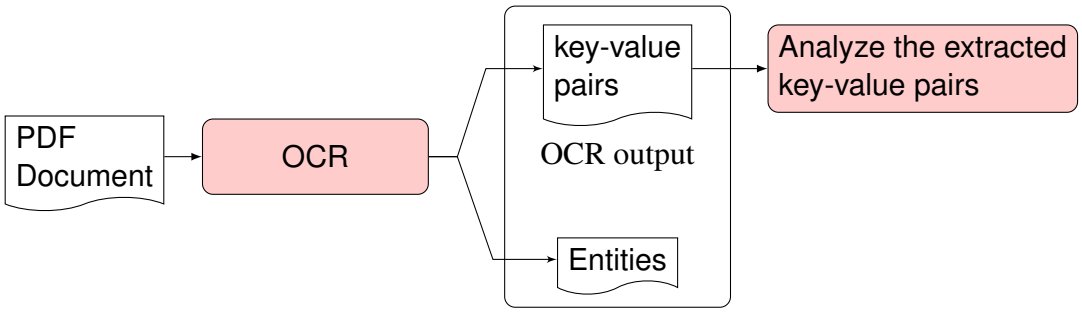


Figure 4.2: The processing of key-value extraction from a PDF document using Azure's Form Recognizer

4.2.2.2 Hyper-V with Containers

Figure 4.3 shows how Hyper-V deals with containers.

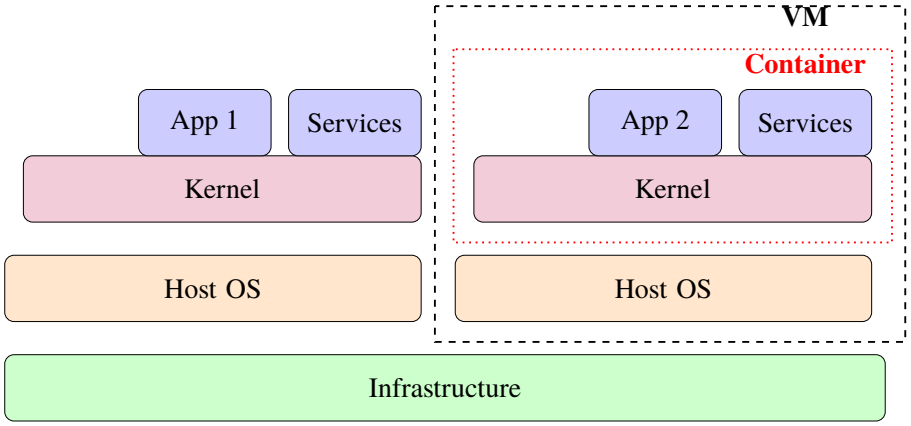
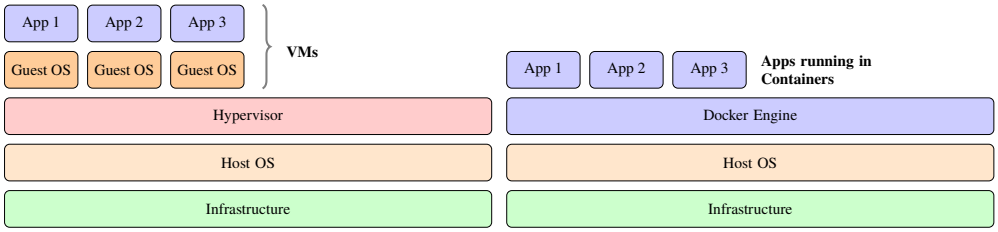


Figure 4.3: Hyper-V with containers

4.2.2.3 VM versus Containers

Figure 4.4 shows a comparison of virtual machines (VMs) versus containers.



(a) VM (b) Containers

Figure 4.4: Virtual machines (VMs) versus Containers

Chapter 5

Results and Analysis

svensk: Resultat och Analys

Sometimes this is split into two chapters.
Keep in mind: How you are going to evaluate what you have done?
What are your metrics?
Analysis of your data and proposed solution
Does this meet the goals which you had when you started?

In this chapter, we present the results and discuss them.

I detta kapitel presenterar vi resultaten och diskutera dem.
Ibland delas detta upp i två kapitel.
Hur du ska utvärdera vad du har gjort? Vad är din statistik?
Analys av data och föreslagen lösning
Innebär detta att uppfyllelse av de mål som du hade när du började?

5.1 Major results

Huvudsakliga resultat

Some statistics of the delay measurements are shown in Table 5.1. The delay has been computed from the time the GET request is received until the response is sent.

Lite statistik av fördröjningsmätningarna visas i Tabell 5.1. Förseningen har beräknats från den tidpunkt då begäran GET tas emot fram till svaret skickas.

Table 5.1: Delay measurement statistics

Configuration	**Average delay (ns)**	**Median delay (ns)**
1	467.35	450.10
2	1687.5	901.23

Table 5.2 shows the measurement of round trip times from four hosts to and from a server.

Table 5.2: Result for the ping measurements of RTT for 4 hosts

	host to server RTT in ms			
Host	min	avg	max	mdev
h1	5.625	5.625	5.625	0.0
h2	2.909	2.909	1.909	0.0
h3	5.007	5.007	5.007	0.0
h4	2.308	2.308	2.308	0.0

Fördröj mätstatistik

Konfiguration | Genomsnittlig fördröjning (ns) | Median fördröjning (ns)

Figure 5.1 shows an example of the performance as measured in the experiments.

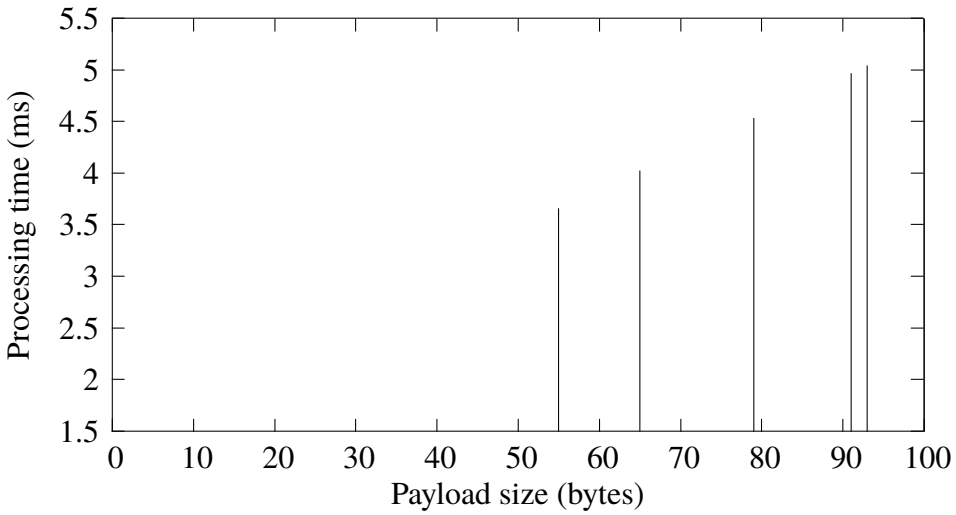


Figure 5.1: Processing time vs. payload length

Given these measurements, we can calculate our processing bit rate as the inverse of the time it takes to process an additional byte divided by 8 bits per byte:

$$\text{bit rate} = \frac{1}{\frac{\text{time}_{\text{byte}}}{8}} = 20.03 \quad kb/s$$

Table 5.3 shows another table in which some values have been set in bold (using \B) to emphasize them. Note how the `S` formatting has been modified so that it considers the weight of the characters and this is able to decimal align even these hold faced numbers with the numbers in the column above them.

Table 5.3: Median values of sandwich attributes

	sites	
Attribute	**A**	**B**
price (in SEK)	36.5	71.3
protean (g)	97.2	100.0
salt (mg)	9.7	9.3
Average customer rating in %	**82.2**	**89.9**

5.2 Reliability Analysis

Analys av tillförlitlighet
Tillförlitlighet i metod och data

5.3 Validity Analysis

Analys av validitet
Validitet i metod och data

Chapter 6

Discussion

Diskussion
Förbättringsförslag?

This can be a separate chapter or a section in the previous chapter.

Chapter 7

Conclusions and Future work

Slutsats och framtida arbete

Add text to introduce the subsections of this chapter.

7.1 Conclusions

Slutsatser

Describe the conclusions (reflect on the whole introduction given in Chapter 1).

Discuss the positive effects and the drawbacks.
Describe the evaluation of the results of the degree project.
Did you meet your goals?
What insights have you gained?
What suggestions can you give to others working in this area?
If you had it to do again, what would you have done differently?

Uppfyllde du dina mål?
Vilka insikter har du fått?
Vilka förslag kan du ge till andra som arbetar inom detta område? Om du skulle göra detta igen, vad skulle du ha gjort annorlunda?

7.2 Limitations

Begränsande faktorer
Vad gjorde du som begränsade dina ansträngningar? Vilka är begränsningarna i dina resultat?

What did you find that limited your efforts? What are the limitations of your results?

7.3 Future work

Vad du har kvar ogjort?
Vad är nästa självklara saker som ska göras?
Vad tips kan du ge till nästa person som kommer att följa upp på ditt arbete?

Describe valid future work that you or someone else could or should do. Consider: What you have left undone? What are the next obvious things to be done? What hints can you give to the next person who is going to follow up on your work?

Due to the breadth of the problem, only some of the initial goals have been met. In these section we will focus on some of the remaining issues that should be addressed in future work. ...

7.3.1 What has been left undone?

The prototype does not address the third requirment, *i.e.,* a yearly unavailability of less than 3 minutes, this remains an open problem. ...

7.3.1.1 Cost analysis

Example of a missing component

The current prototype works, but the performance from a cost perspective makes this an impractical solution. Future work must reduce the cost of this solution, to do so a cost analysis needs to first be done. ...

7.3.1.2 Security

Example of a missing component

A future research effort is needed to address the security holes that results from using a self-signed certificate. Page filling text mass. Page filling text mass. ...

7.3.2 Next obvious things to be done

In particular, the author of this thesis wishes to point out xxxxxx remains as a problem to be solved. Solving this problem is the next thing that should be done. ...

7.4 Reflections

Reflektioner

Vilka är de relevanta ekonomiska, sociala, miljömässiga och etiska aspekter av ditt arbete?

What are the relevant economic, social, environmental, and ethical aspects of your work?

One of the most important results is the reduction in the amount of energy required to process each packet while at the same time reducing the time required to process each packet.

The thesis contributes to the United Nations (UN) Sustainable Development Goals (SDGs) numbers 1 and 9 by xxxx.

In the references, let Zotero or other tool fill this in for you. I suggest an extended version of the IEEE style, to include URLs, DOIs, ISBNs, etc., to make it easier for your reader to find them. This will make life easier for your opponents and examiner.
IEEE Editorial Style Manual: https://www.ieee.org/content/dam/ieee-org/ieee/web/org/conferences/style_references_manual.pdf

Låt Zotero eller annat verktyg fylla i det här för dig. Jag föreslår en utökad version av IEEE stil - att inkludera webbadresser, DOI, ISBN osv. - för att göra det lättare för läsaren att hitta dem. Detta kommer att göra livet lättare för dina opponenter och examinator.

If you do not have an appendix, do not include the \cleardoublepage command below; otherwise, the last page number in the metadata will be one too large.

Appendix A

Supporting materials

Here is a place to add supporting material that can help others build upon your work. You can include files as attachments to the PDF file or indirectly via URLs. Alternatively, consider adding supporting material uploaded as separate files in DiVA.

The BibTeX references used in this thesis are attached.

Some source code relevant to this project can be found at https://github.com/gqmaguirejr/E-learning and https://github.com/gqmaguirejr/Canvas-tools.

Your reader can access the attached (embedded) files using a PDF tool such as Adobe Acrobat Reader using the paperclip icon in the left menu, as shown in Figure A.1 or by right-clicking on the push-pin icon in the PDF file and then using the menu to save the embedded file as shown in Figure A.2.

An argument for including supporting material in the PDF file is that it will be available to anyone who has a copy of the PDF file. As a result, they do not have to look elsewhere for this material. This comes at the cost of a larger PDF file. However, the embedded files are encoded into a compressed stream within the PDF file; thus, reducing the number of additional bytes. For example, the references.bib file that was used in this example is 10 617 B in size but only occupies 4261 B in the PDF file.

DiVA is limited to ≈1 GB for each supporting file. If you have very large amounts of supporting material, you will probably want to use one of the data repositories. For additional help about this, contact KTH Library via researchdata@kth.se.

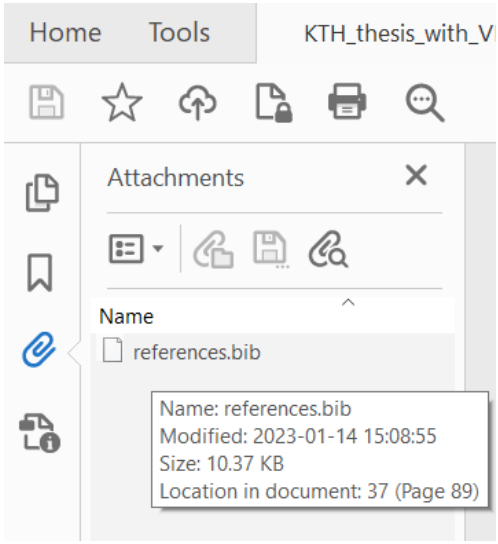


Figure A.1: Adobe Acrobat Reader using the paperclip icon for the attached references.bib file

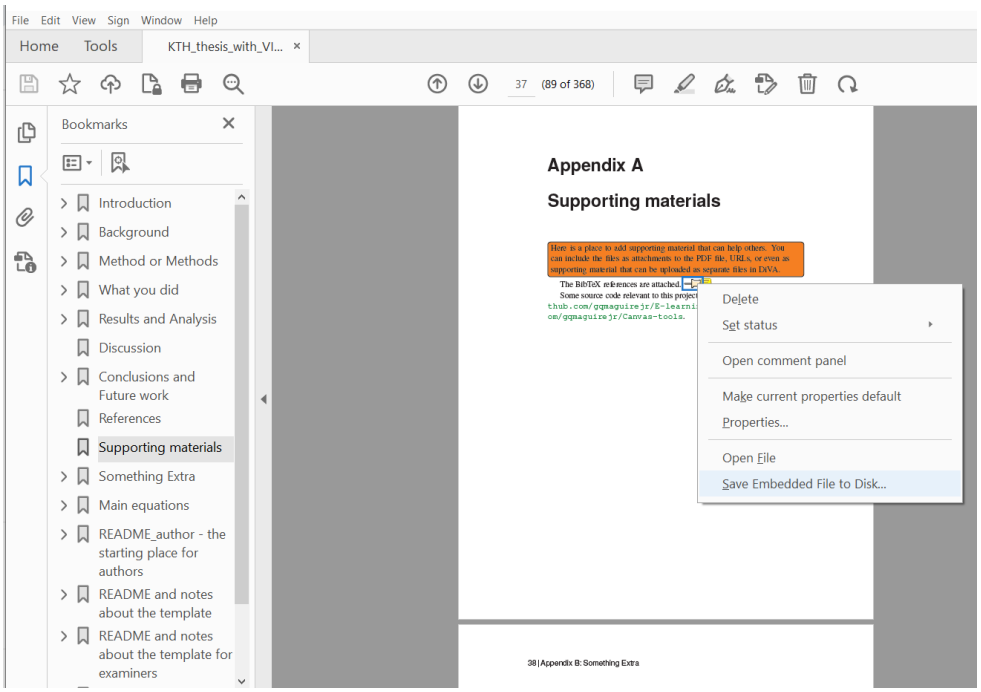


Figure A.2: Adobe Acrobat Reader after right-clicking on the push-pin icon for the attached references.bib file

Appendix B

Something Extra

svensk: Extra Material som Bilaga

B.1 Just for testing KTH colors

You have selected to optimize for print output

- Primary color
  - kth-blue
  - kth-blue80
- Secondary colors
  - kth-lightblue
  - kth-lightred
  - kth-lightred80
  - kth-lightgreen
  - kth-coolgray
  - kth-coolgray80

black

Appendix C

Main equations

This appendix gives some examples of equations that are used throughout this thesis.

C.1 A simple example

The following example is adapted from Figure 1 of the documentation for the package nomencl (https://ctan.org/pkg/nomencl).

$$a = \frac{N}{A} \tag{C.1}$$

The equation $\sigma = ma$ follows easily from Equation (C.1).

C.2 An even simpler example

The formula for the diameter of a circle is shown in Equation (C.2) area of a circle in eq. (C.3).

$$D_{circle} = 2\pi r \tag{C.2}$$

$$A_{circle} = \pi r^2 \tag{C.3}$$

Some more text that refers to (C.3).

Appendix D

README_author - the starting place for authors

This document, written by Gerald Q. Maguire Jr, describes the thesis template that I have developed for use at KTH Royal Institute of Technology (KTH). It is important to note that the template is **not prescriptive**, as not every thesis will have all of the parts that the template shows. However, if there is something that you decide to leave out, you should make a conscious decision to do so and you should consider the impact this may have on your thesis being approved by the examiner.

Fundamental to the design of the template are several key factors:

- Helping students be successful in their degree project,
- Helping students produce a high-quality thesis, and
- Supporting all of the (relevant) phases of the degree project process.

This document is a work in progress.

D.1 Advice for Author or Authors

One of the hardest problems an author faces is getting started writing, *i.e.,* the blank sheet of paper – empty file barrier. The template provides a non-blank starting point; hence, avoiding the blank paper barrier. Additionally, the template provides some initial structure, basically, an Introduction, Methods, Results, and Discussion (IMRAD) structure, so that there are hints of where to place material. Moreover, there are places (and notes) about material that the

student should consider adding; for example, the "required reflections" section in the final chapter.

The template (located in the file `examplethesis.tex`) also provides some examples of commonly occurring types of content, so that one can easily find examples of how to include a figure, table, code listing, *etc*. These examples are not meant to be exhaustive and quite often the student will probably need to learn new LaTeX commands in the course of writing their thesis.

As an author, the first step is to configure the LaTeX engine that you will use to process the files - see Appendix D.2. The second step will be to configure the template - see Appendix D.3. The third step will be to make sure that the information about you, your supervisor(s), and the examiner are correct in the file `custom_configuration.tex` - this information uses the macros described in Appendix D.4. Now that you have a lot of the administrative details taken care of it is time to start to write - see Appendix D.5.

Note that if you are using Overleaf, it is a good idea to rename the project to a name that includes your name. This will make it easier for your adviser(s) and examiner to find your project in the list of projects they may have in Overleaf.

If you have more detailed questions about the template itself - see Appendix E.

D.2 Author configuration of the LaTeX engine

The template should work with pdfLaTeX, XeLaTeX, and LuaLaTeX. If you are using Overleaf, I strongly recommend using XeLaTeX — as this will get the `Arial` fonts correct for the KTH cover. If you are running the compiler on your local machine and you use XeLaTeX **and** you have `Arial` as a system font, then it will be able to use it. Similarly, for LuaLaTeX. For pdfLaTeX I have used \fontfamilyhelvet, *i.e.,* Helvetica, as it is a sans serif font.

One student reported problems with fontspec not loading the fonts properly when running locally with macOS 12.4, TeXLive 2022, LaTeX Workshop on VS Code, and XeLaTeX - the solution is described at `https://tug.org/TUGboat/tb39-2/tb122robertson-fontspec.pdf`.

If you are using Overleaf, it is easy to select the compiler (*i.e.,* TeX engine) by using the drop-down menu, as shown in Figure D.1.

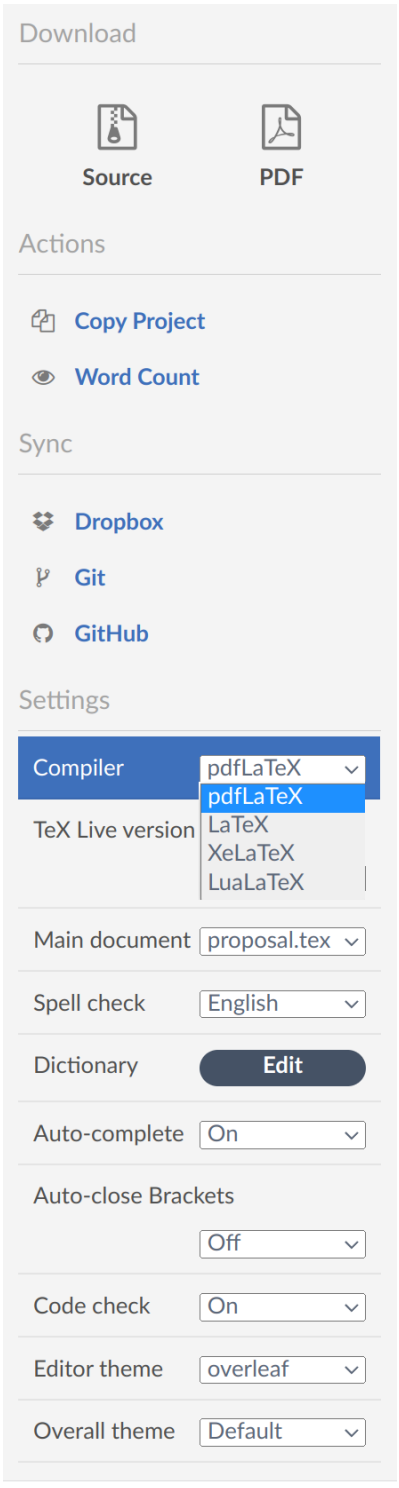


Figure D.1: Selecting a compiler (*i.e.*, TeX engine) in Overleaf

D.3 Author configuration of the template

The template is designed to handle a thesis written in English or Swedish. You can set the default language to 'english' or 'swedish' by passing an option to the documentclass. Note that the language option is written in all lowercase letters; for example, to set the document's language to English:

```
\documentclass[english]{kththesis}
```

To set the document's language to Swedish (uncomment the following line):

```
\documentclass[swedish]{kththesis}
```

The language option 'swedish' sets the conditional `\ifinswedish` to true. Among many other things, this conditional is used to configure the KTH cover and the title page to use the chosen language.

The two most common bibliographic engines are supported, *i.e.,* BibTeX and BibLaTeX. To set the language to English and use the bibliographic engine to BibTeX you would say:

```
\documentclass[english, bibtex]{kththesis}
```

To set the language to Swedish and use the bibliographic engine to BibLaTeX you would say:

```
\documentclass[swedish, biblatex]{kththesis}
```

The above illustrates that you can pass multiple options to the document class separated by commas. Also, note that the options were passed as all lowercase letters.

You can, of course, also modify the formatting of the citations and bibliography. See for example the following code snippet:

```
\ifbiblatex
    %\usepackage[language=english,bibstyle=authoryear,
       ↪ citestyle=authoryear, maxbibnames=99]{biblatex
       ↪ }
    %\usepackage[style=numeric,sorting=none,backend=
       ↪ biber]{biblatex}
    \usepackage[bibstyle=authoryear,citestyle=authoryear,
       ↪  maxbibnames=99,language=english]{biblatex}
    % alternatively you might use another style, such as
       ↪  IEEE
    %\usepackage[style=ieee]{biblatex}
    \addbibresource{references.bib}
```

```
    %\DeclareLanguageMapping{norsk}{norwegian}
\ else
    % The line(s) below are for BibTeX
    \  bibliographystyle  {bibstyle/myIEEEtran}
    %\bibliographystyle{apalike}
\ fi
```

To optimize for digital output (this changes the color palette) add the option: `digitaloutput`. There are also options for A4 or G6 paper: `a4paper` or `g5paper` (respectively). The is an option for `nomenclature`, to produce and refer to equations as shown in Appendix C . Finally, there are options for a 1st cycle thesis or 2nd cycle thesis: `bachelor` and `master` (respectively); however, these two options are **not** currently used.

One of the first things that the author(s) will want to do is add the working title and subtitle to the thesis. This is done using the \title, \subtitle, \alttitle, and \altsubtitle macros as shown below:

```
\ title {This is the title in the language of the thesis}
\ subtitle {A  subtitle  in the language of the thesis}

% give the alternative title -i.e., if the thesis is in
   ↪ English,
% then give a Swedish title
\  alttitle  {Detta är den svenska översättningen av titeln}
\  altsubtitle  {Detta är den svenska översättningen av
   ↪ undertiteln}
% alternative, if the thesis is in Swedish, then give an
   ↪  English title
%\alttitle{This is the English translation of the title}
%\altsubtitle{This is the English translation of the
   ↪ subtitle}
```

Setting these values once and then using them in many places reduces the work to change them while at the same time ensuring consistency.

Some additional configuration that the author(s) might do is to set the values of the macros related to the course cycle, course code, date of the thesis, number of credits, degree/exam name, subject area, and if the degree is done external to KTH to set the host information. Consider the snippet below for a student admitted to the “Bachelor’s Programme in Information and Communication Technology (TCOMK)” program and enrolled in the degree project course “IA150X Degree Project in Information and Communication Technology, First Cycle 15.0 credits” and working at a company “Företaget

AB”:

```
\hostcompany{Företaget AB} % Remove this line if the
   ↪ project was not done at a host company

\date{\today}

\courseCycle{1}
\courseCode{IA150X}
\courseCredits{15.0}

\programcode{TCOMK}
\degreeName{Bachelors degree}
% Note that the subject area for a Bachelor's thesis (
   ↪ Kandidatexamen)
% should be either Technology or Architecture
% If the thesis is in Swedish, these would be: teknik |
   ↪ arkitektur
% -- Note the use of lower case for the Swedish subject
   ↪ area
\subjectArea{Technology}
```

Note that in the above macros you have to give the English or Swedish names in the arguments to \degreeName and \subjectArea - as shown below:

```
\degreeName{Kandidatexamen}
\subjectArea{teknik}
```

For a CDATE student enrolled in the course “DA231X Degree Project in Computer Science and Engineering, Second Cycle 30.0 credits”, the cycle, program, course code, degree, and subject area information would be:

```
\programcode{CDATE}
\courseCycle{2}
\courseCode{DA231X}
\courseCredits{30.0}
\degreeName{Degree of Master of Science in Engineering}
\subjectArea{Computer Science and Engineering}
```

The set of possible values for the English or Swedish names in the arguments to \degreeName are:

```
\degreeName{Higher Education Diploma}
\degreeName{Högskoleexamen}

\degreeName{Bachelors degree}
```

```
\degreeName{Kandidatexamen}

\degreeName{Master of Architecture}
\degreeName{Arkitektexamen}

\degreeName{Degree of Master of Science in Engineering}
\degreeName{Civilingenjörs}

\degreeName{Magister}
\degreeName{Magisterexamen}

\degreeName{Degree of Master of Science}
\degreeName{Masterexamen}

\degreeName{Master of Science in Engineering and Master
   ↪ of Arts in Education degree}
\degreeName{Civilingenjör och lärare examen}

\degreeName{Degree of Master of Science in Secondary
   ↪ Education}
\degreeName{Ämneslärarexamen}

\degreeName{Both}  # Degree Project in the Field of
   ↪ Technology <teknikområde> and the Main Field of
   ↪ Study <huvudområde>
\degreeName{Same}  # The case when the field of
   ↪ technology <teknikområde> and main field of study
   ↪ <huvudområde> are the same.
```

For the last two cases, the code compares the values of subjectArea and secondSubjectArea.

You can find a list of the program codes and school acronyms in the file: `lib/schools_and_programs.ins`.

There are a set of rules about what is to be displayed on the KTH cover. These can be found at https://www.kth.se/social/group/spraakkommitten/page/omrade-for-examensarbete/.

One of the reasons for many of the macros shown above and below is to collect the information that is needed to report the approved thesis in Digitala Vetenskapliga Arkivet (DiVA) and to report the title(s) and grade in Lokalt adb–baserat dokumentationssystem (LADOK).

National subject categories are a **required** field in the DiVA record. These

categories follow a definition by SCB (nowadays known as Statistikmyndigheten or in English: Statistics Sweden) and HSV (Högskoleverket - nowadays known as Universitetskanslersämbetet (UK-ämbetet) and Universitets- och högskolerådet (UHR) or in English: Swedish Higher Education Authority and Swedish Council for Higher Education). While these codes refer to research areas, these codes are also used in KTH to indicate the area of the thesis. The guidance that I received from the Linköping University library was that one should try to use 5-digit codes when possible. Some examples of these codes are shown in Table D.1.

\nationalsubjectcategories{}	comma separated list of national subject category codes - each a 3 or 5 digit code

An example for a thesis in Computer Science and Computer Systems:

```
\ nationalsubjectcategories {10201, 10206}
```

You can find the subjects and their codes in:
https://www.scb.se/contentassets/3a12f556522d4bdc887c4838a37c7ec7/standard-for-svensk-indelning--av-forskningsamnen-2011-uppdaterad-aug-2016.pdf
and
https://www.scb.se/contentassets/10054f2ef27c437884e8cde0d38b9cc4/oversattningsnyckel-forskningsamnen.pdf

Table D.1: Examples of some national subject categories and their codes

Code	Category (in Swedish)	Category (in English)
102	Data- och informationsvetenskap (Datateknik)	Computer and Information Sciences
10201	Datavetenskap (datalogi)	Computer Sciences
10202	Systemvetenskap, informationssystem och informatik (samhällsvetenskaplig inriktning under 50804)	Information Systems (Social aspects to be 50804)
10203	Bioinformatik (beräkningsbiologi) (tillämpningar under 10610)	Bioinformatics (Computational Biology) (applications to be 10610)
10204	Människa-datorinteraktion (interaktionsdesign) (Samhällsvetenskapliga aspekter under 50803)	Human Computer Interaction (Social aspects to be 50803)
10205	Programvaruteknik	Software Engineering
10206	Datorteknik	Computer Engineering
10207	Datorseende och robotik (autonoma system)	Computer Vision and Robotics (Autonomous Systems)
10208	Språkteknologi (språkvetenskaplig databehandling)	Language Technology (Computational Linguistics)
10209	Medieteknik	Media and Communication Technology
10299	Annan data- och informationsvetenskap	Other Computer and Information Science
202	Elektroteknik och elektronik	Electrical Engineering, Electronic Engineering, Information Engineering
20201	Robotteknik och automation	Robotics
20202	Reglerteknik	Control Engineering
20203	Kommunikationssystem	Communication Systems
20204	Telekommunikation	Telecommunications
20205	Signalbehandling	Signal Processing
20206	Datorsystem	Computer Systems
20207	Inbäddad systemteknik	Embedded Systems
20299	Annan elektroteknik och elektronik	Other Electrical Engineering, Electronic Engineering, Information Engineering

D.4 Author macros

It is assumed that there can only be 1 or 2 authors. For many years now 2nd cycle theses are expected to only have one author.

For the author or first author, there are a number of macros defined to store information about the author, so that it can later be used in multiple places – for example, the KTH cover (produced with `\kthcover`), the title page (produced with `\titlepage`, the "For DIVA" section at the end of the thesis (produced with `\divainfo{pg:lastPageofPreface}{pg:lastPageofMainmatter}`), and possibly a JavaScript Object Notation (JSON) file named `for-diva.json` produced as a by product of the `\divainfo`. Note that the actual section name has DiVA set in all caps - which hopefully should not occur in the thesis! If the string DiVA set in all caps, does have to appear, then the section heading should be preceded by four euro signs and followed by four more euro signs (as is done this doucment).

The author-related macros are:

`\authorsLastname{}`	the last name of the author*
`\authorsFirstname{}`	the first name of the author
`\email{}`	the KTH e-mail address of the author
`\kthid{}`	the author's kthid, this generally starts with the string ·"u1" and is a unique identifier for every KTH user.
`\authorsSchool{}`	the value is generally of the form: `\schoolAcronym{EECS}`. The currently supported school acronyms are: ABE, CBH, EECS, ITM, and SCI. These are defined in the file `schools_and_programs.ins`.

If the first author is not in Stockholm, Sweden when the acknowledgements are written, then add that information via the macros described below. This information will be used when generating the acknowledgements signature. The acknowledgements signature is the text at the end of the

*Note that the author's name can include a suffix such as ", Jr." or " Jr.", i.e., the suffix can be separated with a comma or not – as the author prefers to write their name.

acknowledgements and it gives the place where the author(s) is/are when writing the acknowledgements and also gives the date and name(s).

\authorCity{A City}	specify the city
\authorCountry{A Country}	specify the country
\authorCityCountryDate{}	pass into this function the month and year for the acknowledgement. This can be a string such as January 2022 or it can be a LaTeX expression, such as \MONTH\enspace\the\year.

If there is a second author and the place, month, and year are **all** the same, then specify the month and year for only the **first** author:

```
\authorCityCountryDate{\MONTH\enspace\the\year}
```

If there is a second author and the place is different, then say:

```
\authorCityCountryDate{}
```

If there is a second author, the macros are:

\secondAuthorsLastname{} the last name of the 2nd author

\secondAuthorsFirstname{} the first name of the 2nd author

\secondemail{} the KTH e-mail address of the 2nd author

\secondkthid{} the 2nd author's kthid

\secondAuthorsSchool{} the school of the 2nd author

If the second author is not in the same place as the first author, then add the relevant information using the macros below. This information will be used when generating the acknowledgements signature.

\secondAuthorCity{A City} specify the city

\secondAuthorCountry{A Country} specify the country

\secondAuthorCityCountryDate{\MONTH\enspace\the\year} pass into this function the month and year for the acknowledgement

If the second author is the same place as the first author, then comment out or delete the \secondAuthorCityCountryDate{} as shown below:

```
%\secondAuthorCityCountryDate{}
```

D.5 Starting to write

As you write you will notice "todo" notes in the template. They follow the following conventions:

```
\generalExpl{Comments/directions/... in English}
\sweExpl{Text på svenska}
\engExpl{English descriptions about formatting}
\sweExpl{warnings}
```

D.5.1 Working abstract

I generally recommend that every student start by writing a working abstract, this will help you keep your focus. To find where you can start to enter your abstract look in the *examplethesis.tex* file for the line:

```
\generalExpl{Enter your abstract here!}
```

There is lots of information already in the template to help you with entering text, equations, *etc.,* in your abstract. **NB** Abstracts are supposed to stand by themselves, this means no footnotes, no cross-references, no figures, no tables, *etc*.

I suggest avoiding the use of the defined acronyms in abstracts *i.e.,* spell them out rather than using the glossary commands. This is due to the fact that the `glossaries` package (that is being used to support acronyms) does not directly provide support for multiple languages and because I do not understand how to programmatically create plurals of acronyms in Swedish or other languages. Even in an English abstract, it is desirable to avoid using the glossary commands - as this makes subsequent processing of the abstracts harder - since one has to make sure that the list of acronyms and their definitions are provided to any program that will process this LaTeX source code. For this reason, later versions of this template include the acronyms.tex file after the metadata for DiVA.

D.5.2 Structure of the abstracts and summaries

The basic LaTeX structure for an abstract or summary is shown below (for the case of an English abstract and a Swedish summary *i.e.,* sammanfattning):

```
\begin{abstract}
  \markboth{\abstractname}{}
\begin{scontents}[store-env=lang]
eng
\end{scontents}

\begin{scontents}[store-env=abstracts,print-env=true]
here is where you abstract goes.
\end{scontents}

\subsection*{Keywords}
\begin{scontents}[store-env=keywords,print-env=true]
% If you set the EnglishKeywords earlier, you can
   ↪ retrieve them with:
```

```
\InsertKeywords{english}
% If you did not set the EnglishKeywords earlier then
   ↪ simply enter the comma separate keywords here:
%such as: Canvas Learning Management System, Docker
   ↪ containers, Performance tuning
\end{scontents}
\end{abstract}

\ cleardoublepage
\babelpolyLangStart{swedish}
\ begin {abstract}
    \ markboth {\abstractname}{}
\ begin {scontents}[store-env=lang]
swe
\end{scontents}
\ begin {scontents}[store-env=abstracts,print-env=true]
Swedish summary goes here
\end{scontents}
\ subsection *{Nyckelord}
\ begin {scontents}[store-env=keywords,print-env=true]
% SwedishKeywords were set earlier, hence we can use
   ↪ alternative 2
\InsertKeywords{swedish}
\end{scontents}
\end{abstract}
\babelpolyLangStop{swedish}
```

It is important to note that the contents of the `scontents` environment for the abstracts are stored **verbatim**, *i.e.*, the LaTeX is **not** executed. The reason for this is to be able to later have a program that can manipulate the source LaTeX to convert it to HTML for use in announcements, calendar events, and for DiVA. This means that if you write the following:

```
\ begin {scontents}[store-env=abstracts,print-env=true]
\ input {abstract.txt}
\end{scontents}
```

what will end up in your abstract in the metadata save for DiVA will simply be: `"\inputabstract.tex"` – which means that someone will have to cut and paste your actual abstract to insert it into DiVA.

It is also important to that that the following lines:

```
\ begin {scontents}[store-env=lang]
eng
```

```
\end{scontents}
```

must to be before the `scontents` environment for the abstracts and keywords – as these lines indicate what language the subsequent abstract and keywords are in. The three-character code used for the language is the ISO 639-2 Code – specifically the "B" (bibliographic) variant of these codes — as these codes are used in the DiVA metadata to tag what language is used.

D.5.3 Acronyms

You may want to define an acronym to help you with your writing, as this can both reduce the amount of typing and help your reader by providing consistent use of acronyms. The acronyms' definitions can be found in the file *lib/acronyms.tex*. The file contains some examples. I generally try to sort the lines to help find which acronyms I already have defined and keep track of the new one(s) I want to add.

D.5.4 Some predefined macros to help when writing

The file *lib/defines.tex* includes some macros that will help you when writing. This includes \etc, to give you "*etc.,* ", \eg, \ie, and \etal. The file also defines \first, \Second, ... \eighth to give you (i), (ii), (iii), ... $(viii)$. Note that 'Second' is written with an initial capital letter to avoid conflict with the unit 'second' in the `siunitx` package.

D.5.5 Additional abstract(s)

All theses at KTH are **required** to have an abstract in both *English* and *Swedish*. However, in addition to this, many students want to add abstracts in additional languages. The template comes pre-configured with places for abstracts in several other languages. If there is a language that you want to use that is not already supported, there are directions for how to add an additional language. If there are abstracts in languages that you do not want, please delete them or comment them out (see Appendix D.5.6).

D.5.6 Removing and hiding parts that you do not want

It is quite likely that you will find parts of the template that you do not want/need. One way of dealing with this is to delete them, and another way is to comment them out. Personally, I like to comment things out, in case I

actually do want to be able to read it in the LaTeX file or uncomment it later. To comment out a portion of the file, simply use the following environment:

```
\begin{comment}
    **** what you want to comment out ****
\end{comment}
```

For example, if you are not interested in the Swedish language `todo` notes, you can look for lines with "\sweExpl" in them and comment them out (or delete them).

D.5.7 Removing the README_notes

At some point you will no longer want this README information. You can remove it by removing the line \include{README_notes/README_notes} – from the *examplethesis.tex* file. You can then remove the **README_notes** directory.

Unless you are an examiner or an administrator you can delete the file: `README_notes/README_examiner_notes.tex` and delete the include of this file from near the end of the template (*i.e., examplethesis.tex*. You can also delete the directory **README_notes/README_examiner-figures**.

D.6 Copyright or Creative Commons License

It is possible to have several variants of the bookinfo page*:

copyright — If you want to have a bookinfo page, include the line saying \bookinfopage.

Creative Commons (CC) — If you want to have a bookinfo page but want to have a Creative Commons license, then include \bookinfopage and use and configure the `doclicense` package as described below.

none — If you do **not** want to have a bookinfo page, comment the line saying \bookinfopage and add a \cleardoublepage.

*When printed double sided, the bookinfo page is the back of the title page.

For background about Creative Commons licenses, see: https://www.kb.se/samverkan-och-utveckling/oppen-tillgang-och-bibsamkonsortiet/open-access-and-bibsam-consortium/open-access/creative-commons-faq-for-researchers.html and https://kib.ki.se/en/publish-analyse/publish-your-article-open-access/open-licence-your-publication-cc.

Note that the lowercase version of the Creative Commons license has to be used in the modifier, *i.e.,* one of: by, by-nc, by-nd, by-nc-nd, by-sa, by-nc-sa, or zero. For the list of supported licenses, see the documentation for the `doclicense` package.

Note that if the `doclicense` package is used, it automatically redefines `\bookinfopage` to be `\bookinfopageCC`.

D.6.1 Example configuration to have a CC BY-NC-ND license

```
\usepackage[
    type={CC},
    modifier={by-nc-nd},
    version={4.0},
    hyphenation={RaggedRight},
]{doclicense}
```

Note that the option "hyphenation=RaggedRight" can be used with the configuration of the package to set the license information with a ragged right margin rather that as a filled and justified paragraph.

D.6.2 Example configuration to have a CC BY-NC-ND license with a Euro symbol rather than a Dollar sign

```
\usepackage[
    type={CC},
    modifier={by-nc-nd},
    version={4.0},
    imagemodifier={-eu-88x31}, % to get Euro symbol
       ↪ rather than Dollar sign
    hyphenation={RaggedRight},
```

```
]{doclicense}
```

D.6.3 Example configuration to have a CC0 license

```
\usepackage[
    type={CC},
    modifier={zero},
    version={1.0},
]{doclicense}
```

D.7 Use of fonts within the thesis

The choice of fonts is a very individual matter and may be affected by the kind of content that you are trying to write, the language that you are writing in, and what you want to convey to your reader. However, some points to keep in mind are:

- Use fonts with serifs for the body of your thesis, their presence makes it much easier for your reader.
- Use sans serif fonts for headings. This helps your reader distinguish them from the body.
- Be very careful when using fonts that are not widely available*. Unless you embed the fonts that you have used, your reader may not see what you want them to see. Ideally, you should embed all fonts – even if you only embed the subset you use.
- Although there are fonts that have a huge number of characters in them, they might not have the characters that you need.
- There are also fonts that, although they have a vast number of characters in them, do not have the math table that LaTeX needs to be able to set mathematical content†.

*For example, even though it is widely used. not everyone has the Arial font.

†An example of such a font is Google's Noto font. Even though it includes a vast number of characters, it lacks a math table – although there is an awareness of this missing feature

What can you do when the fonts you use are missing characters that you need to use? One solution is to use a font that has the character(s) that you want and then make use of them in the places that you need to.

The details of working with different fonts and characters is a rather complex area and not for the faint-hearted. However, if you **really** want to have specific characters, XeLaTeX and LuaLaTeX have the means to help you realize what you want.

Appendix E

README and notes about the template

This document, written by Gerald Q. Maguire Jr, describes the thesis template that I have developed for use at KTH Royal Institute of Technology (KTH) and provides some background about why it is the way that it is. It is important to note that the template is **not prescriptive**, as not every thesis will have all of the parts that the template shows. However, if there is something that you decide to leave out, you should make a conscious decision to do so and you should consider the impact this may have on your thesis being approved by the examiner.

Fundamental to the design of the template are several key factors:

- Helping students be successful in their degree project,
- Helping students produce a high-quality thesis, and
- Supporting all of the (relevant) phases of the degree project process.

There are several thousand theses written each year by KTH students. Every approved thesis will be entered into Digitala Vetenskapliga Arkivet (DiVA) (independent of whether the full text is made available via DiVA). Collecting the data necessary for DiVA was a major driving force in the design of the template. This data is useful for many of the phases of the degree project, such as announcing the oral presentation.

This template is **not** designed for use by TIMTM and TMMTM students - as students in these two programmes are using a different structure for their reports (there is another template available for them).

This document is a work in progress.

E.1 Introduction

This template evolved (radically) from an earlier thesis template that was widely used at KTH. The direction of this evolution was based on the DOCX template that was developed over many years for use with students for whom I was the examiner and/or supervisor. The suggested structure and contents of the thesis reflect my experience as an examiner for more than 590 degree projects and the experience I have had as a teacher and examiner for the course II2202 Research Methodology and Scientific Writing. The template also reflects my interest as a member of KTH's Language Committee in facilitating the parallel use of English and Swedish at KTH, as well as supporting other languages. The latter aspect reflects my experience with double-degree students, who often need to have at least the abstract of their thesis available in the language(s) of their home university. The thesis template also reflects my experience in entering the metadata for hundreds of theses into DiVA and announcing a very large number of degree project seminars.

Appendix E.4 describes several different groups of users and how the template is relevant to them.

There were several major thoughts influencing the design of this template:

Thought 1 The template should help a student be successful in their degree project and help them produce a high-quality thesis in conjunction with their degree project.

Thought 2 The template should help support all of the (relevant) phases of the degree project process.

Thought 3 Redundant data entry should be minimized in order to increase consistency.

Thought 4 There are several thousand theses written each year at KTH. In fact, theses are the second most common type of publication at KTH.

Thought 5 Every approved thesis will have at least its metadata entered into DiVA. DiVA features multi-language support for title, subtitle, abstract, and keywords.

E.2 Deliminations

This template is **not** designed for use by TIMTM and Media Management TMMTM students - as students in these two programmes are using a different structure for their reports (there is another template available for them).

Additionally, I have been told by one of my colleagues in applied mathematics that theses in this area generally do not follow the Introduction, Methods, Results, and Discussion (IMRAD) structure.

Some parts of the template are conditional based on the value of a switch: `\ifinswedish`. The idea is to easily have a single template that supports theses written in English or Swedish. However, in many places, the conditional has not been used but could be. Examples of this include the Swedish names for chapters and sections. Generally this information is in a note after the English chapter or section name. More complete implementation of the use of this condition remains as future work.

The template does not fully support the G5 paper format. In particular, the KTH cover (produced with `\kthcover)` and back cover (produced with `\kthbackcover)`) have only been adapted for A4 paper. Support for G5 paper remains as future work.

The handling of the subject area (Swedish: Område för examensarbete) is currently incomplete and remains as future work. Personally, I'm still struggling to understand the rules and how one knows what the correct values are (especially for cases of (i) dual degrees and (ii) combinations of technical subjects and education degrees).

E.3 Structure of the files for the template

Table E.1 shows the structure of the files for the template. These files are generally taken either from an existing Overleaf project, a ZIP file, or a github.

One hope is that by automatically extracting information from various sources, this information is more likely to be *correct* and *consistent* (supporting Thought 3). This approach has been used to generate two of the files used for the template. These files are:

1. The file `custom_configuration.tex` contains macros and values for configuring a project. These values are generally expected to be known at the start of the project, *e.g.,* author(s), supervisor(s). examiner, course code for the degree project program code, *etc*. While this file can be manually edited, it was designed to be generated by

a program that I have written that extracts most of the data from the Canvas course being used in conjunction with the degree project. One of the goals of using such a program is to automatically extract data from Canvas, the KTH profile Application Programming Interface (API), Kurs- och programplaneringssystemet (KOPPS), and other sources. The macros for defining this information are described in Sections D.4, E.5.1, and E.5.2 - for authors, supervisors, and examiner (respectively).

2. The file `schools_and_programs.ins` contains the English and Swedish names of schools and programs. This information was extracted by a program from KOPPS.

We will assume that these files have been generated by someone. Later we will examine who this someone might be for each of these files.

Table E.1: Structure of files for the template

bibstyle	**directory containing files related to the style of the bibliography**	
	`myIEEEtran.bst`	a bibtex style file
figures	**directory containing files for figures**	
lib	**directory containing various library files**	
	`acronyms.tex`	a place to define the acronyms that will or might be used
	`defines.tex`	some generally useful defines
	`includes-after-hyperref.tex`	a special include file for packages that have to be included **after** the hyperref package
	`includes.tex`	a centralized place to include packages that might be useful
	`kthcolors.tex`	defines a number of colors from the KTH palette
	`pdf_related_includes.tex`	includes to be able to add the title and other information to the PDF file
	`schools_and_programs.ins`	English and Swedish names of schools and the programs
`custom_configuration.tex`		macros and values for configuring a project
`examplethesis.tex`		an example of the thesis itself
`kth_logo.png`		the KTH logo for use on the cover
`KTH_ROYAL_INSTITUTE_OF_TECHNOLOGY_logotype.png`		KTH logotype for use on the English language cover
`kththesis.cls`		the kththesis class file
`README_notes.tex`		these notes
`references.bib`		references that may be cited in the thesis

E.4 Expected users and their differences

This template is relevant to several different sets of users:

Users 1 Author or Authors (see Appendix D.1),

Users 2 Those working together with the author(s) during the degree project process (see Appendix E.5),

Users 3 Administrative staff working with the document after it has been approved by the examiner (see Appendix E.6), and

Users 4 The (hopefully) many (human) readers of the final document (see Appendix E.7).

Users 5 The (hopefully) many computers reading the metadata and the full text of the final document (see Appendix E.7.1).

Users 6 Those who are maintaining or updating this template (see Appendix E.7.2).

Each of these different sets of users has different needs and perspectives. The following subsections describe these needs and perspectives.

For information for authors see Appendix D - located in the file `README_author.tex`.

E.5 Those working in parallel with the authors(s) during the degree project

Those working together with the author(s) during the degree project process include the examiner, supervisor(s), and the opponent(s).

E.5.1 Supervisor

If a degree project is done in industry, there is generally an industrial supervisor in addition to the academic supervisor(s). The template supports up to 3 supervisors (typically an academic supervisor, an industrial supervisor, and sometimes an additional academic or industrial supervisor). The choice of up to three reflects my experience and observation of prior theses in DiVA. Note that there is expected to be at least one supervisor. The supervisors are enumerated as A, B, and C. For each of A, B, and C as appropriate, replace the "X" in the following macros:

\supervisorXsLastname{} the last name of the supervisor

\supervisorXsFirstname{} the first name of the supervisor

\supervisorXsEmail{} e-mail address of the supervisor

If the supervisor is from within KTH, then add their KTHID, School, and Department info:

\supervisorXsKTHID{} the supervisor's kthid

\supervisorXsSchool{} the school of the supervisor

\supervisorXsDepartment{} the department of the supervisor

If the supervisor is from outside of KTH, then add their organization with:

\supervisorXsOrganization{} the supervisor's organization

E.5.2 Examiner

I assume that there is only a single examiner for a given thesis*. For this examiner, the relevant macros are:

\examinersLastname{} the last name of the examiner

\examinersFirstname{} the first name of the examiner

\examinersEmail{} e-mail address of the examiner

If the examiner is from within KTH, then add their KTHID, School, and Department info:

\examinersKTHID{} the examiner's kthid

\examinersSchool{} the school of the examiner

\examinersDepartment{} the department of the examiner

*Statistically, there are very few theses with multiple examiners, and this generally occurs for students either in a double degree program or when there are two students in a 1st cycle degree project from different schools, then there might be one examiner for each student. As the case of more than one examiner occurs very infrequently, I have left it for future work. The pseudo-JSON structure is set up to handle multiple examiners, but additional macros would be needed in a similar fashion as used for multiple supervisors, and this metadata would have to be conditionally added where appropriate.

If the examiner is from outside of KTH, then add their organization with:

\examinersOrganization{} the examiner's organization

I assume that someone (such as the examiner) will generate the file: `custom_configuration.tex`. This assumption is based upon the fact that the examiner knows who the student or students are who will be working on a given degree project, who the supervisor or supervisors are, what program the student is in, course code, ... Ideally, this file should be generated automatically by some computer program so that each student or pair of students in a group gets a customized template automatically via the Canvas course. However, currently, the file is generated using a command line program (`create_customized_JSON_file.py`) to generate a JavaScript Object Notation (JSON) file. Subsequently, a separate program (`customize_LaTeX_project.py`) takes this JSON data and creates the appropriate LaTeX commands and inserts this information into the file and then inserts this file into a ZIP file, either replacing or augmenting the `custom_configuration.tex` within this ZIP file (if one exists). There is an option for this second program `-initialize` that causes the program to simply replace the file rather than appending the new information to the end of the file.

The above programs are available from `https://github.com/gqmaguirejr/E-learning`. The README file for this github contains information about how to run the programs, their options, and gives examples.

E.5.3 Opponent(s) and oral presentation

Unlike the supervisors and examiner, the macros related to the opponent and oral presentation are in the `examplethesis.tex` file. The macro for the opponent(s) is:

\opponentsNames{} the names (in normal name order) of the opponent or opponents

When there are multiple opponents, separate their names with '\&'; for example, A. B. Normal \& A. X. E. Normalè.

For the oral presentation, the following macros are filled in once the examiner has scheduled your oral presentation:

\presentationDateAndTimeISO{} date and time of the presentation is ISO format, for example: 2022-03-15 13:00

\presentationLanguage{}	three letter abbreviation for the language of the presentation according to three letter ISO 639-2 Code – specifically the "B" (bibliographic) variant of these codes (note that this is the same language code used in DiVA), generally eng or swe
\presentationRoom{}	a room name and/or "via Zoom https://kth-se.zoom.us/j/ddddddddddd"
\presentationAddress{}	location of the room, for example: Isafjordsgatan 22 (Kistagången 16)
\presentationCity{}	city where the presentation occurs, generally: Stockholm

E.6 Administrative staff

Once a thesis is approved by the examiner we need to add the TRITA number. The TRITA number is assigned by the student affairs office of the school from an annual series of numbers.

E.6.1 What is a TRITA number and why does each approved thesis get assigned one?

TRITA stands for Transactions for the Royal Institute of Technology, with the letter "A" appended to it. The TRITA definition is the 1971 report, "Mall för publikationsserier vid Kungl. Tekniska högskolan i Stockholm"", TRITA-LIB-1001, http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-127656.

The format for TRITA numbers for degree projects is TRITA-⟨school acronym⟩-EX-YYYY:nnnn, where nnnn is a sequential number starting from 1 each year with the numbers assigned in chronological order to approved theses ("numren delas ut kronologiskt först när examinatorn godkänt arbetet." - according to one of KTH's archivists). Note that the list of assigned TRITA numbers is archived each year*. The year, YYYY, is based on the year that the

*It seems that this archiving is done twice a year.

thesis was approved.

The TRITA number value can be set with a macro that takes two arguments: series and year:number as shown below:

```
% for entering the TRITA number for a thesis
\trita{TRITA-EECS-EX}{2022:00}
```

E.6.2 Where does the TRITA number go?

The TRITA number will appear on the back cover of the thesis. It is also stored as part of the metadata that is entered into DiVA.

E.6.3 What does this mean in practice?

Currently, at EECS the TRITA number is only assigned to the thesis when the examiner has approved the thesis and submitted the PDF of the approved thesis (with cover) to the student affairs office. Of course, this does not make a lot of sense because the back cover is already on the thesis! This means that someone in the student affairs office must either (i) edit the sequential number part of the TRITA number (using some PDF tool) or (ii) they need to make a new back cover and replace the existing back cover. A better solution would be to inform the examiner of the TRITA number and the examiner can see that this number is inserted into the macro shown above and this can enable the number to appear on the back cover and as an added bonus be included in the metadata for DiVA.

Note that it is expected that in 2023, this process will change – thus the assignment of the TRITA number and the application of the back cover would be done by the student affairs office (as only they have the relevant information)*.

E.6.4 Entering the metadata into DiVA

If a thesis has used this template the "For DIVA" page contains the metadata for DiVA and an administrator can cut and paste this data into DiVA. Alternatively, this metadata can be extracted with a program from the PDF file to produce a JSON file that can subsequently be used to create a MODS file for import into DiVA. The LaTeX compiler can in many cases produce a file called "fordiva.json" that contains the metadata.

*Note to maintainers: This means that the back cover can be removed from this template.

The programs that can be used to extract data and to take a JSON file and create a MODS file are available from `https://github.com/gqmaguirejr/E-learning`.

Note that the import of the MODS file does **not import the collaboration data**, even though this is in the file. This is a limitation of the DiVA import function. Therefore, this information has to be manually entered along with uploading of the PDF file itself.

E.7 (Human) Readers of the thesis

Some theses have very few downloads from DiVA while some have had hundreds of thousands of downloads. Therefore, you should keep in mind that you have a wide range of human readers of your thesis. The readers include other students looking for information related to their own thesis or because they are interested in the future work that you have suggested to work on for their own degree project. Additionally, researchers who are looking for your results may find your thesis relevant to them. In many cases, companies will look at theses for ideas about what the state of the art is - in a number of cases theses have been important as "prior art" and this invalidated patents that had been issued if the patent was submitted after the thesis became public (hence it pays to get theses public as soon as possible). Other human readers are the UKÄ review teams that examine the degree programs offered at KTH. Finally, as KTH is a public agency, it is important that the general public know what is done at KTH*.

E.7.1 Machines reading the metadata or full text of the thesis

The file `pdf_related_includes.tex` contains LaTeX code that stores the title, author(s), and keyword information into the PDF document in such a way that if you ask for the properties of the PDF file you will get this data. This information makes it easier for machines to get this information from the PDF file.

Additionally, many search engines (such as Google's search engine) mine DiVA for the metadata and if the full text of the thesis is published via DiVA then they also process the full text of the thesis. The result is that search engines can find the content in these theses. This is likely to increase the

*This is an important part of the Swedish Offentlighetsprincipen.

probability that someone will download your thesis if they think it is relevant to them – increasing the number of your human readers (see Appendix E.7).

E.7.2 Template author and maintainers

KTH periodically changes the cover design for theses, introduces new programs of study, eliminates programs of study, reorganizes administratively, and faculty move between schools, departments, and divisions. It can be expected that this template will need to evolve with these changes.

For example, if there is a change in schools or programs then there needs to be changes made to the file `schools_and_programs.ins`. While the current file was extracted from KOPPS, the program that does this will need to be replaced because further development of KOPPS has been terminated by KTH's central IT unit which plans to transition all of this information to Lokalt adb–baserat dokumentationssystem (LADOK).

As another example, on 13 December 2021 there was a change in the KTH cover for 1st and 2nd theses, and the cover generator web service was shutdown. The initial draft version of the cover used a proprietary font (TheSans B4 SemiLight and TheSans B6 SemiBold). The version that was publicly introduced uses another proprietary font (Arial) and officially only existed as a DOCX file for a thesis in Swedish. The result is that I had to make my own version in LaTeX to try to emulate the DOCX cover. This lead to a lot of effort, but one can get a reasonable cover with the correct font as described in Appendix D.2.

E.8 While writing

As was noted in Appendix D.1 the thesis template contains lots of examples, notes, and comments. One method used to provide additional information is the use of \todo. A number of different types of `todo` notes have been used in the thesis. These are described in Appendix E.8.1.

E.8.1 Conventions for todo notes

The example thesis text includes extensive comments, directions, and warnings. These follow the form shown below:

```
\generalExpl{Comments/directions/... in English}
\sweExpl{Text p svenska}
\engExpl{English descriptions about formatting}
```

```
\warningExpl{warning}
```

and appear as:

Comments/directions/... in English

Text på svenska

English descriptions about formatting

warning

Each of the above is a macro, so as usual in LaTeX you can redefine it - even defining it to produce nothing! Several previous students have placed these re-definitions in the `custom_configuration.tex` file.

E.8.2 Turning on and off the README_notes

As the various README notes are targeted at different readers, you may or not want to see them. It is very easy to turn them on or off by adding or removing a percent ('%') character before the relevant \begin{comment} and \end{comment} comments around each set of notes.

For example, if you are a student writing a thesis, I would suggest turning off everything except for the `README_author.tex` and `README_notes.tex` sets of notes. However, I would suggest keeping the other README files around (at least for a little while) as a source of examples of how to do things. Despite having spent a very large number of hours working on the template and drafts of students' theses, I find some of the README files very helpful as a reminder of how to do things.

E.8.3 Removing the README_notes

At some point you will no longer want this README information. You can remove it by removing the line \include{README_notes/README_notes} – from the `examplethesis.tex` file. If you have removed the other README* files from the **README_notes** directory, you can then remove the **README_notes** directory.

E.8.4 Removing the README_notes

At some point, you will no longer want this README information. You can remove it by removing the line \include{README_notes/README_notes} – from the `examplethesis.tex` file. If you have removed the other

README* files from the **README_notes** directory, you can then remove the **README_notes** directory.

E.8.5 Removing unused fonts

This version of the template may also have some font information, in the form of Opentype Font files (with the extension ".otf") and TrueType Font font files (with the extension ".ttf"). If you are not using these fonts (and no longer are using any of the README files), then you can delete these font files.

README acronyms

This document is incomplete. The external file associated with the glossary 'readme' (which should be called `examplethesis.tld`) hasn't been created.

Check the contents of the file `examplethesis.tdn`. If it's empty, that means you haven't indexed any of your entries in this glossary (using commands like `\gls` or `\glsadd`) so this list can't be generated. If the file isn't empty, the document build process hasn't been completed.

Try one of the following:

- Add `automake` to your package option list when you load `glossaries-extra.sty`. For example:

  ```
  \usepackage[automake]{glossaries-extra}
  ```

- Run the external (Lua) application:

  ```
  makeglossaries-lite.lua "examplethesis"
  ```

- Run the external (Perl) application:

  ```
  makeglossaries "examplethesis"
  ```

Then rerun LaTeX on this document.
This message will be removed once the problem has been fixed.

TRITA-EECS-EX- 2023:0000

€€€€ For DIVA €€€€

{
"Author1": { "Last name": "Student",
"First name": "Fake A.",
"Local User Id": "u100001",
"E-mail": "a@kth.se",
"organisation": {"L1": "School of Electrical Engineering and Computer Science",
}
},
"Author2": { "Last name": "Student",
"First name": "Fake B.",
"Local User Id": "u100002",
"E-mail": "b@kth.se",
"organisation": {"L1": "School of Architecture and the Built Environment",
}
},
"Cycle": "1",
"Course code": "IA150X",
"Credits": "15.0",
"Degree1": {"Educational program": "Bachelor's Programme in Information and Communication Technology"
,"programcode": "TCOMK"
,"Degree": "Bachelors degree"
,"subjectArea": "Technology"
},
"Title": {
"Main title": "This is the title in the language of the thesis",
"Subtitle": "A subtitle in the language of the thesis",
"Language": "eng" },
"Alternative title": {
"Main title": "Detta är den svenska översättningen av titeln",
"Subtitle": "Detta är den svenska översättningen av undertiteln",
"Language": "swe"
},
"Supervisor1": { "Last name": "Supervisor",
"First name": "A. Busy",
"Local User Id": "u100003",
"E-mail": "sa@kth.se",
"organisation": {"L1": "School of Electrical Engineering and Computer Science",
"L2": "Computer Science" }
},
"Supervisor2": { "Last name": "Supervisor",
"First name": "Another Busy",
"Local User Id": "u100003",
"E-mail": "sb@kth.se",
"organisation": {"L1": "School of Architecture and the Built Environment",
"L2": "Architecture" }
},
"Supervisor3": { "Last name": "Supervisor",
"First name": "Third Busy",
"E-mail": "sc@tu.va",
"Other organisation": "Timbuktu University, Department of Pseudoscience"
},
"Examiner1": { "Last name": "Maguire Jr.",
"First name": "Gerald Q.",
"Local User Id": "u1d13i2c",
"E-mail": "maguire@kth.se",
"organisation": {"L1": "School of Electrical Engineering and Computer Science",
"L2": "Computer Science" }
},
"Cooperation": { "Partner_name": "Företaget AB"},
"National Subject Categories": "10201, 10206",
"Other information": {"Year": "2023", "Number of pages": "1,75"},
"Copyrightleft": "copyright",
"Series": { "Title of series": "TRITA-EECS-EX" , "No. in series": "2023:0000" },
"Opponents": { "Name": "A. B. Normal & A. X. E. Normalè"},
"Presentation": { "Date": "2022-03-15 13:00"
,"Language":"eng"
,"Room": "via Zoom https://kth-se.zoom.us/j/ddddddddddd"
,"Address": "Isafjordsgatan 22 (Kistagången 16)"
,"City": "Stockholm" },
"Number of lang instances": "10",
"Abstract[eng]": €€€€

Enter your abstract here!

Write an abstract that is about 250 and 350 words (1/2 A4-page) with the following components:

- What is the topic area? (optional) Introduces the subject area for the project.

- Short problem statement
- Why was this problem worth a Bachelor's/Master's thesis project? (*i.e.*, why is the problem both significant and of a suitable degree of difficulty for a Bachelor's/Master's thesis project? Why has no one else solved it yet?)
- How did you solve the problem? What was your method/insight?
- Results/Conclusions/Consequences/Impact: What are your key results/ conclusions? What will others do based on your results? What can be done now that you have finished - that could not be done before your thesis project was completed?

€€€€,
"Keywords[eng]": €€€€
Canvas Learning Management System, Docker containers, Performance tuning €€€€,
"Abstract[swe]": €€€€

Enter your Swedish abstract or summary here!

Alla avhandlingar vid KTH **måste ha** ett abstrakt på både *engelska* och *svenska*.
Om du skriver din avhandling på svenska ska detta göras först (och placera det som det första abstraktet) - och du bör revidera det vid behov.

If you are writing your thesis in English, you can leave this until the draft version that goes to your opponent for the written opposition. In this way, you can provide the English and Swedish abstract/summary information that can be used in the announcement for your oral presentation.
If you are writing your thesis in English, then this section can be a summary targeted at a more general reader. However, if you are writing your thesis in Swedish, then the reverse is true – your abstract should be for your target audience, while an English summary can be written targeted at a more general audience.
This means that the English abstract and Swedish sammnfattning or Swedish abstract and English summary need not be literal translations of each other.

Do not use the \glspl{} command in an abstract that is not in English, as my programs do not know how to generate plurals in other languages. Instead, you will need to spell these terms out or give the proper plural form. In fact, it is a good idea not to use the glossary commands at all in an abstract/summary in a language other than the language used in the `acronyms.tex file` - since the glossary package does **not** support use of more than one language.

The abstract in the language used for the thesis should be the first abstract, while the Summary/Sammanfattning in the other language can follow

€€€€,
"Keywords[swe]": €€€€
Canvas Lärplattform, Dockerbehållare, Prestandajustering €€€€,
"Abstract[fre]": €€€€

Résumé en français. €€€€,
"Keywords[fre]": €€€€
5-6 mots-clés €€€€,
"Abstract[spa]": €€€€
Résumé en espagnol. €€€€,
"Keywords[spa]": €€€€
5-6 Palabras claves €€€€,
"Abstract[ita]": €€€€
Sommario in italiano. €€€€,
"Keywords[ita]": €€€€
5-6 parole chiave €€€€,
"Abstract[nor]": €€€€
Sammendrag på norsk. €€€€,
"Keywords[nor]": €€€€
5-6 nøkkelord €€€€,
"Abstract[ger]": €€€€
Zusammenfassung in Deutsch. €€€€,
"Keywords[ger]": €€€€
5-6 Schlüsselwörter €€€€,
"Abstract[dan]": €€€€
Abstrakt på dansk. €€€€,
"Keywords[dan]": €€€€
5-6 Søgeord €€€€,
"Abstract[dut]": €€€€
Samenvatting in het Nederlands. €€€€,
"Keywords[dut]": €€€€
5-6 trefwoorden €€€€,
"Abstract[est]": €€€€
Eesti keeles kokkuvõte. €€€€,
"Keywords[est]": €€€€
5-6 Märksõnad €€€€,
}

en-USpdfsubject=¢generalExpl{Enter␣your␣abstract␣here!}˙Write␣an␣abstract␣that␣is␣about␣250␣and␣350␣words␣(1/2␣A4-page)␣␣with␣the␣following␣components:˙%␣key␣parts␣of␣the␣
␣that␣could␣not␣be␣done␣before␣your␣thesis␣project␣was␣completed?˙¢end{itemize}˙
svpdfsubject=¢generalExpl{Enter␣your␣Swedish␣abstract␣or␣summary␣here!}˙¢sweExpl{Alla␣avhandlingar␣vid␣KTH␣¢textbf{mÃ¥ste␣ha}␣ett␣abstrakt␣pÃ¥␣bÃ¥de␣¢textit{engelska}␣och␣
␣och␣du␣bÃ¼r␣revidera␣det␣vid␣behov.}˙˙¢engExpl{If␣you␣are␣writing␣your␣thesis␣in␣English,␣you␣can␣leave␣this␣until␣the␣draft␣version␣that␣goes␣to␣your␣opponent␣for␣the␣written␣oppo
␣since␣the␣glossary␣package␣does␣¢textbf{not}␣support␣use␣of␣more␣than␣one␣language.}˙˙¢engExpl{The␣abstract␣in␣the␣language␣used␣for␣the␣thesis␣should␣be␣the␣first␣abstract,␣whi
fr-FRpdfsubject=RÃ©sumÃ©␣en␣franÃ§ais.
es-ESpdfsubject=RÃ©sumÃ©␣en␣espagnol.
itpdfsubject=Sommario␣in␣italiano.
nopdfsubject=Sammendrag␣pÃ¥␣norsk.
de-DEpdfsubject=Zusammenfassung␣in␣Deutsch.
dapdfsubject=Abstrakt␣pÃ¥␣dansk.
nlpdfsubject=Samenvatting␣in␣het␣Nederlands.
etpdfsubject=Eesti␣keeles␣kokkuvÃţte.

acronyms.tex

```
%%% Local Variables:
%%% mode: latex
%%% TeX-master: t
%%% End:
% The following command is used with glossaries-extra
\setabbreviationstyle[acronym]{long-short}
% The form of the entries in this file is \newacronym{label}{acronym}{phrase}
%                                    or \newacronym[options]{label}{acronym}{phrase}
% see "User Manual for glossaries.sty" for the details about the options, one example is shown below
% note the specification of the long form plural in the line below
\newacronym[longplural={Debugging Information Entities}]{DIE}{DIE}{Debugging Information Entity}
%
% The following example also uses options
\newacronym[shortplural={OSes}, firstplural={operating systems (OSes)}]{OS}{OS}{operating system}

% note the use of a non-breaking dash in long text for the following acronym
\newacronym{IQL}{IQL}{Independent Q^^e2^^80^^91Learning}

\newacronym{KTH}{KTH}{KTH Royal Institute of Technology}

\newacronym{LAN}{LAN}{Local Area Network}
\newacronym{VM}{VM}{virtual machine}
% note the use of a non-breaking dash in the following acronym
\newacronym{WiFi}{Wi^^e2^^80^^91Fi}{Wireless Fidelity}

\newacronym{WLAN}{WLAN}{Wireless Local Area Network}
\newacronym{UN}{UN}{United Nations}
\newacronym{SDG}{SDG}{Sustainable Development Goal}
```