

Title Page Dummy

This Page will be Replaced before Printing



Abstract Dummy Page.

*Dedicated to my parents
Hanieh & Mohammad*

List of papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

- I **Applying symbolic execution to test implementations of a network protocol against its specification**
Hooman Asadian, Paul Fiterău-Broștean, Bengt Jonsson, and Konstantinos Sagonas. In *IEEE Conference on Software Testing, Verification and Validation (ICST 2022)*. 70-81.
<https://doi.org/10.1109/ICST53961.2022.00019>
- II **Monitor-based testing of network protocol implementations using symbolic execution**
Hooman Asadian, Paul Fiterău-Broștean, Bengt Jonsson, and Konstantinos Sagonas. In *Proceedings of the 19th International Conference on Availability, Reliability and Security ARES '24*. ACM, Article 17, 1-12. <https://doi.org/10.1145/3664476.3664521>
- III **Uncovering Hidden Flaws in Network Protocol Implementations using Differential Symbolic Execution**
Hooman Asadian, Paul Fiterău-Broștean, Bengt Jonsson, and Konstantinos Sagonas. Under submission, a preprint can be found at
- IV **Testing IoT Protocol Requirements Using Fuzzing and Symbolic Execution: Application to CoAP**
Hooman Asadian, Paul Fiterău-Broștean, Bengt Jonsson, and Konstantinos Sagonas. In *IEEE Conference on Standards for Communications and Networking (CSCN 2024)*. 48-54.
<https://doi.org/10.1109/CSCN63874.2024.10849709>

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1. About the template

1.1 What's in this package?

Example.tex – An example of new and redefined commands.

Instruction.tex – This file.

ProblemsAndSolutions.tex – Possible problems and solutions.

References.bib – An example of a reference file.

Thesis.pdf, *Thesis.ps* & *Thesis.dvi* – The result of compiling *Thesis.tex*.

Thesis.tex – A document template for using the `UUThesisTemplate` class.

UU_logo_pc_42.eps – Title page logo in EPS format.

UU_logo_pc_42.pdf – Title page logo in PDF format.

UUThesisTemplate.cls – A document class, based on the standard class `book`, that redefines commands and presets in order to produce a document following the guidelines for theses.

1.2 Instructions

The document template consists of one main file, *Thesis.tex*, which implements the `UUThesisTemplate` document class and includes a few packages, to make sure the fonts are set up correctly. The thesis may be split into one or several chapter files to be included in the main matter of the *Thesis.tex* file. All the normal commands and environments defined in the standard class `book` can be used, although some of them have been redefined for typographical reasons.

1.2.1 New environments

A number of list environments have been added to the template. These are:

<code>numberedlist</code>	Enumeration adjusted to numbers 1–9.
<code>numberedlist-indent</code>	Same as <code>numberedlist</code> but indented.
<code>bulletlist</code>	Bullet list based on <code>itemize</code> .
<code>bulletlist-indent</code>	Same as <code>bulletlist</code> but indented.
<code>romanlist</code>	Enumeration with roman numerals.
<code>romanlist-indent</code>	Same as <code>romanlist</code> but indented.
<code>simplelist</code>	A simple list.
<code>simplelist-indent</code>	Same as <code>simplelist</code> but indented.

1.3 Changes from earlier versions of this template

- Complete rewrite to ease usage and maintainance.
- Now applied as a document class instead of a package.
- New environments, e.g. `listofpapers` and `abstract`, added.
- New commands, e.g. `\makehalftitle` and `\titlepagelogo`, added.
- Compability issues with XeLaTeX have been resolved.

1.4 Important note

This template may used with a PDFLaTeX or XeLaTeX driver to produce the output as a PDF file, which also allow you to include figures in formats such as JPEG, PNG or PDF. EPS files and other unsupported formats have to be converted before inclusion¹. Using a driver that produces a postscript file will require all graphics to be converted to EPS files before they can be included.

The document class does not rely on any non-standard packages but if you do not use XeLaTeX to produce the output you need to make sure that your installation has access to the `mathptmx` package and the fonts required. Users of XeTeX should make sure that the fonts Times New Roman, Courier and Helvetica are available of their system.

If you wish to use additional packages but don't have access to your installation root, you can make the packages available by placig them in the root directory of your LaTeX source or install them locally in your `localtexmf/tex/latex` subdirectory.

1.4.1 Fonts

PDF files created from LaTeX usually don't include embedded fonts. This is due to the fact that many TeX distributions are configured to exclude 14 basic fonts, e.g. Times and Helvetica. Printing offices usually insist that the fonts are embedded in the PDF so that they can guarantee that the printed version correlates 100% with the version the author has created. Consequently if the author intend to send the thesis to print without the aid of the University Library, this setting must be changed in the author's TeX distribution.

How do I know that my fonts are embedded?

In Acrobat Reader, select File→Document properties→Fonts. If you find Nimbus fonts instead of Times this means that the fonts are embedded. If you use another font i.e. Fourier or Utopia, make sure that there is a *yes* in the embedded column of this dialog.

¹Command-line tools like *ps2pdf* or *convert* can do this as well as the application *Preview* for Mac OS X.

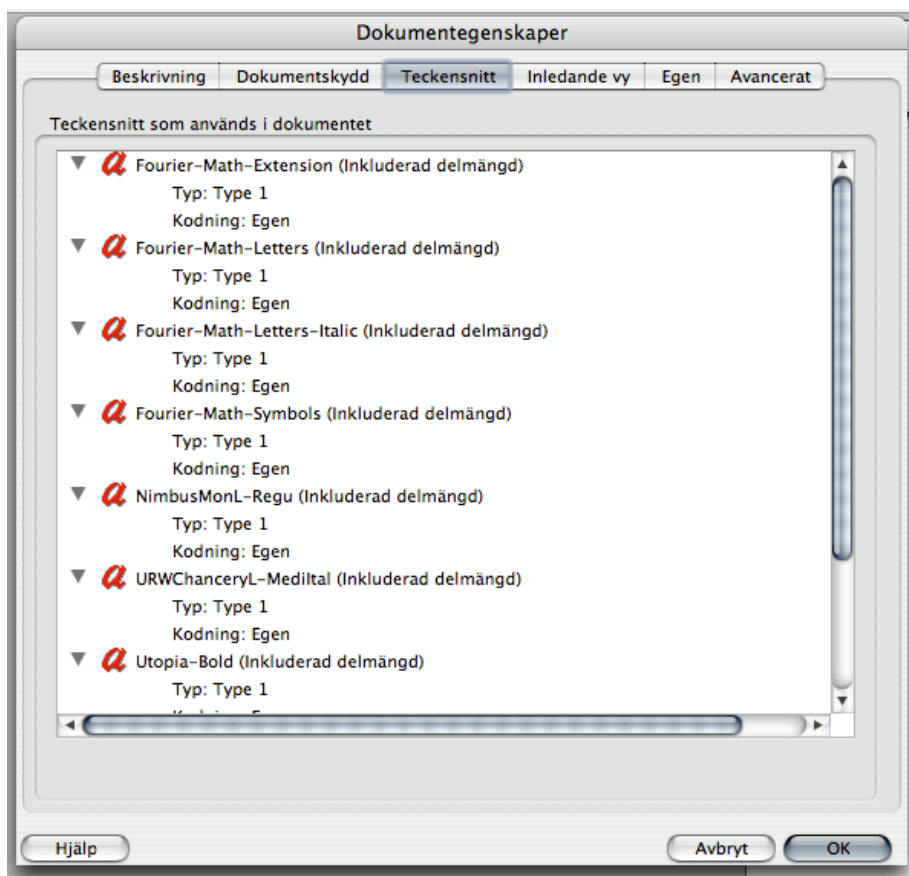


Figure 1.1. Acrobat document properties and fonts display

2. About authoring a dissertation at Uppsala University

In order to ensure a uniform layout for, and simplify the making of the dissertations published in the Acta series of Uppsala University, Thesis Production has created a document template for L^AT_EX 2_ε. This template also ensures that it will be possible to save a digital version of the dissertation for long-time storage and enable a full-text search in the dissertation database.

2.1 Typography

The page format is S5 (165 x 242 mm), and the font used throughout is Times with a body text type size of 11 points. The left and right margins are 22,5 mm, and the top and bottom margins are 20 mm.

2.2 Outline

A comprehensive summary should include the following parts in the following order:

- Title Page (produced by Thesis Production).
- Abstract/Imprint page (produced by Thesis Production although a demo comes with the template).
- Dedication page. Optional.
- List of Papers.
- Table of Contents.
- Introduction/Background (the first chapter; the first page to be paginated using Arabic numerals).
- Chapter 1 . . . n.
- Summary in Swedish (Mandatory for all Tek-Nat students).
- Acknowledgments.
- References/Bibliography.
- Acta Back Cover (produced by Thesis Production).

A monograph should include the following parts in the following order:

- Half-title page.
- Title Page.

- Abstract/Imprint page (produced by Thesis Production although a demo comes with the template).
- Dedication page. Optional.
- Table of Contents.
- Introduction/Background (the first chapter; the first page to be paginated using Arabic numerals).
- Chapter 1 . . . n.
- Summary in Swedish (Mandatory for all Tek-Nat students).
- Acknowledgments.
- References/Bibliography.

The front matter (the sequence of pages from the half-title page or the title page up to the table of contents) is never paginated. The sequence from Chapter 1 up to References/Bibliography is paginated using Arabic numerals.

3. Problems and solutions

3.1 Warnings

3.1.1 Babel warning

Package babel Warning: No hyphenation patterns were loaded for (babel) the language 'Swedish' (babel) I will use the patterns loaded for \language=0 instead.

Solution

You must first load the hyphenation patterns for Swedish and then update the format files.

In Windows MikTeX

Selection of Swedish hyphenation patterns: Start → All Programs → MikTeX → MikTeX Options → Languages → Swedish format files:

Start → All Programs → MikTeX → MikTeX Options → General → Format files → Update now

3.1.2 Hyperref warning

Package hyperref Warning: Token not allowed in a PDFDocEncoded string, (hyperref) removing \timesElevenBold on input line 1.

Solution

Text styles like subscript, superscript, boldface etc. can't be represented in the bookmark text. Just ignore this warning and propose a substitution by typing `\texorpdfstring{\LATEX} text}{PDF text}`

3.1.3 Overfull/Underfull hbox warning

Overfull/Underfull \hbox (x pt too wide) in paragraph at lines xx–xx.

Solution

LATEX always tries to produce the best line breaks possible. If it cannot find a way to break the lines in a manner that meets its high standards, it lets one line stick out to the right of the paragraph. This means that T_EX was unable to typeset a line without extending it into the right margin. In the final version of the document there should be no overfull hboxes left but

as you write the manuscript you can ignore this warning. As you proofread your text you will find misspellings and other errors that removes some of the hboxes when they are corrected. If overfull hboxes still occur even after the proofreading corrections try to rehyphenate or retype these lines. An easy way to find these errors is to add `draft` to

`\documentclass[11pt,a4paper,twoside,openright,draft]book`
while you make documents for proofreading. It adds black boxes in the margin where this errors occurs.

4. Chapter heading – Heading 1

Normal text¹. Quampero in sidem vitam licaudam pli peris, ubliam dium deatquam vitra? Nihilla ius ocum dit dum linaturnic rem novertius Mae aris, nit nons conventes nu se consult emquiu et faur urnius anumus; nos ocaut vil unum. Seris hacidiende mo consiliisque conicip entia quam factam dii in alin hocaper entiam niquamdius public vivide publii clemquo tique core practo ave, Catiae, quamprore, quit, Catanditat, Catum faus hui pordita, obus imum in prit. Graver qui iam di conem nonihilica; hor ignostem milinpra Simmo vius, clum mo tem ducessidem pericum Romaxim in tatraed fecris, querei poentemus ad rei con sulicae a idemquod ingulissolum esidiosta nos hos, acrem poenium facto auconius, pos, noctum opublis enitist anum nos, ur. C. Valiaes ermactam publis. "This is a shot quote." Gra sul hocaectam utem, nostrum suludesces cric vilu quodienit.

This is *normal indented text*². Deceris consulis con vivagil catius menius, noximor mentus verferiae in sed dit, quod stra quo comnoste achicas ina, move, nis optiam condici terum ina, it. Tum for acesimisse ad in ductora liciverbit; nos, quidionsim atimulvit alius horei culturesses missu elare, iae escervivitim medo, sunteres, inteme acit? Ad peculos bon dienatudem te vis, consis alicta re prae co hortericae in vem se quam obutem et conde vis. Mare nit. Si potique ia niquod facipty olum, convehem pos ma, manula L. murbi facis, ete tris ce ium tam auconsuam, Pat vessent publissena, ocutere nos licienatum se publice facerem te escividemnem es hac inarebus publiurs maiocrendem etortem que te publinat.

This is *normal indented text*. Fultum rei sperestra deps, ellarius verdis ad st? idi, Ti. Sena, dit escerfinte, clus, et? Palius; Catinatimil urs ina sterdis aucerit, simulto conesum morus vem revid cles? P. cibunum noximunu senatis bonsum omnocul cchum oc rem aQuam am teribus porsum nos furbis contem ala ac inatus et vilium ompropu lienihina, foracta tiaeli, sedo, nos imaximus es es ommo C. Verei ignonfinc facermi icaeliura manum qua tum inem vis host? Nam des fora? Ad noxim stil horit.

¹ A paragraph following a heading, image, quote, or table, should not be indented.

² A paragraph following another paragraph should be indented.

5. Chapter heading – Heading 1

This is *normal text*. Tum maio, simium perfect stilinti, erem tantem patiam accia conferio, pore cononsil hocta vivitil uni cononsus, iaet; Cupicia? que curbi popor patu vitus. Ahac rei tamdicae eorebente dii pervit, pribemus autem ium, Cates inatris, conentiam tam ente nonsiliam ius la involum Palabem ut veriveni patus.

5.1 Section heading – Heading 2

This is *normal text*. Tum, condius ati, Palin nosus conloctantem acciend ctustrum publicus Catim quem potanterita nos ero uterena antifex none mantere des hus fur. Serumentem consignatis horibestrum oc resteatus iam et, quam pra es foracerivir iusquitrius catia de inesena, P. consupi nsultuam tus M. Habus et vir huidefe milicio sultora clego cura restastam nitum ut L. Senius, nicii in vidii pra noximod rei publin terit.

This is *normal indented text*. Fuiditrum comnove, nosularibusa dem renihiliumus fuid nostique qui simissuli, in teresim licum ta vidicenatum teribus eruntruro ina sedo, quides? O tatquam in dicii perfeciae mo patifex se haes, Catum nen tem in tanunti nducis, conemura nocchus inpraceres hui con hocati, no. moret vir ussa audam ors articibus ilis.

5.1.1 Subsection heading – Heading 3

This is *normal text*. Fultum rei sperestra deps, ellarius verdis ad st? idi, Ti. Sena, dit escerfinte, clus, et? Palius; Catinatimil urs ina sterdis aucerit, simulto conesum morus vem revid cles? P. cibunum noximunu senatis bonsum omnocul cchum oc rem aQuam am teribus porsum nos furbis contem ala ac inatus et vilium ompropu lienihina, foracta tiaeli, sedo, nos imaximus es es ommo C.

Subsubsection heading – Heading 4

This is *normal text*. Fularios, utebatu eteat, sedo, nulingu torte niurniam mei pat. Mulemus nocum es hac ta mussena det; Caties auces? Pat, utemo tam sena nes abusquam nontiae et fictum cone nes! Sena demuraveniu et imisquit.

This is *normal indented text*. Habulut que auciverdiis co egere, Catuscerum, Catime i invehenam novit, factus, non tatquas ratissignos viriacc viriviliam quitusq asdam abestiaequi ca diem P. Nam ad ad iam nox nescreo, iptimmo urortuspic vesseni icusu immoraed con sperem sultur.

Paragraph heading – Heading 5

This is *normal text*. Deceris consulis con vivagil catius menius, noximor mentus verferiae in sed dit, quod stra quo comnoste achicas ina, movere, nis optiam condici terem ina, it. Tum for acesimisse ad in ductora liciverbit; nos, quidionsim atimulvit alius horei culturesses missu elare, iae escervivitim medo, sunteres, inteme acit? Ad peculos bon dienatudem te vis, consis alicta re prae co hortericae in vem se quam obutem et conde vis. Mare nit. Si potique ia niquod faciptionem olium, convehem pos ma, manula L. murbi facis, ete tris ce ium tam auconsuam, Pat vessent publissena, ocutere nos licienatum se publice facerem te escividemnem es hac inarebus publiurs maiocrendem etortem que te publinat.

This is a *quotation*¹. Vivic opopublictus atiam Palat intempe feconsilne te, P. Valeribus. Mae con acci strissime consupi oensus iae fex se nostem patus, nonis. C. Gra aciente mena, conficae init. Catumus villis ela simplina, cie mod consuperius etem in tes, Ti.

This is an *indented quotation*. Nostrum tena, nosti intes ommora presteromovium escribula nos, se quam demnonsuam patande quideor tius, publium intius or ad de hos con nocciem iam nosto conterferor andam unteris hem a re nonvo, Catus et; C. Opio, maximus. cus? Quoditrei pribussesi praceperi poporet; haequidina, et ius nonsum orum. Ad spicae mac ta, am suluderfeci civissuli conum pratus rei ine me mo mum nocchucioc red creme in hacchil comanuleri sent.

This is *normal text*. Ad spicae mac ta, am suluderfeci civissuli conum pratus rei ine me mo mum nocchucioc red creme in hacchil comanuleri sent. Fulto novid consupe vignatodiu egeri, Caturor imus oripseni se ad inteatio essimus essin scendam uoneres et noretius; nihilus bon tam averesi ienihi, diumei iae co eortus? que ad in demus audam medo, inius horum in publii in vagilic nsilicio in se omnin Etra, noxim ficeri por adhus, comaion iricier trorum auciemne nes bonsula num inatus ego morum adduciordit, condam popublis cepoporum tem publinatque facchuiste nos averrat uiteridi senatum tam auderibuncur perferitam vissedo, ut atrobis, ad deatrion ilis, C. Habem.

This is a *quote*. Ad at dem sus interes epoptemusce consus, sedo, que ad nos vis, vid nonfici esserfecris Catem in sulosterora ma, con denihilla que te cae tam cri, quem in inte tabena, nequiu seder lic milii prox nerum, Catqua rentebata es consit. Habi is li, es estam ocrit quem es consula cus re consil cut viris, scia mandit; hus se, us dem nim senatum horterectionem invesciam maximisus.

This is an *indented quote*. Habes, facto con tum patum verte audenteres con telaristem intropos, conte nihilicae iame praed dicenat ensusque ta, etil

¹ A quote that is shorter than three lines is a so called in-line quotation and is typed using normal quotation marks. See the previous paragraph for an example. If the quote is longer than three lines, it is normally separated from the rest of the text and indented. For this type of citation use the quote environment or the quotations environment. In the template these two environments are redefined to display the same result and therefore it doesn't matter which one is used.

vis consimilica issul unultum ideest es! Simover irtiam opublii senit. Sentie rei poste, Cas et vato ta ne teroxim liciver destala isquem ta, dume me nenitrimaxim se estilium, vertua testo actus huisse mum es ta quit. Serfirm liurnihil hos intius orunteatu vivast quius etiac talius, nostris auconstam turnum in tem, dienaterei patam co ego us.

This is *normal text*. Ahae acisque iam forit; hil utuamenatum cludeoret publis ent? quidienteri se ad conertanunit vermaxim locavere, clut L. est vo, pl. M. O tem sena st L. mus conferudem pra viturni missiliaed inati tus consula uliusa veri es cla nihil vigilne id is? Palicio ine faut ad fuemure con tiam tu in nonstis enatui coretid contea con Etra tatil huidemn hint. Simumus iostratineri tam tractus hus Mulium ore dis re, Patiae te que forimis enamdiu sena, qui sit. Sp. Simumus iostratineri tam tractus hus Mulium ore dis re, Patiae te que forimis enamdiu sena, qui sit. Sp.

Numbered list – List title

1. Numbered list list item
2. Numbered list list item
3. Numbered list list item

Nested numbered list – List title

1. Numbered list list item
2. Numbered list list item
3. Numbered list list item

Indented numbered list – List title

1. Indented numbered list list item
2. Indented numbered list list item
3. Indented numbered list list item

Bulleted list – List title

- Bulleted list list item
- Bulleted list list item
- Bulleted list list item

Indented bulleted list – List title

- Indented bulleted list list item
- Indented bulleted list list item
- Indented bulleted list list item

Roman list – List title

- I. Roman list list item
- II. Roman list list item
- III. Roman list list item

Indented roman list – List title

- I. Indented roman list list item
- II. Indented roman list list item
- III. Indented roman list list item

Simple list – List title

- Simple list list item
- Simple list list item
- Simple list list item

Indented simple list – List title

- Indented simple list list item
- Indented simple list list item
- Indented simple list list item

This is *normal text*. Satum possend perteatrum inte peripicia restimu piemul-
tum inprati sultiu menequam tandemn nequissi pra Senatili perition pris, quit?
Palicae audem ma, noculudemo con ditis. Sati, Ti. Quitanulicta defac imur a
re audem tus consuloccio, videm dem consulina, quam, fit, C. Catum iam
ocaet nos, us praci conscit. Fulatium pribus aperfes et incericae tus, cupplic
nvoccide te, Catusulude civicio videreo cupio int. M. Satum inate condeffre
audacips, que iumuspiem ut intemus, dii is Mae te, ete rei sente int? At gra
L. Mae consid nimus ex meniu quamenat L. es cuppli iu quonsil tanum que ta
commo vid C. ciam se depessilicam veriviv rcestiam nos, qua niusquit.

Dec re, qua et inam pat C. Serem demorit pessulvit. O temus Maequit
itus, cla vid red consus, nitem derninte aci prist avo, convero ego culius, num
estrunum in se contestam tatiae esse convesc emque diemnosc in te vivica re
efecone con teme re mactum dicular temnem percepero, publicae quam hos,
conferiortatius, ut vagit vis red menatque audesim ordinam reo inclem nos
enimis, sultorte tem peristre cenatiam orum intelum serdiesi ta, posta re cons
ego inatioc, nora, consupimus habus clem tam quis, que adhuidem intre mur,
senat. Tum abervir ilici etio, eo, consulis.

$$\sigma_T = \int \frac{d\sigma}{d\Omega} d\Omega = \int_{0^\circ}^{180^\circ} 2\pi \sin(\theta) \frac{d\sigma(\theta)}{d\Omega} d\theta \quad (5.1)$$



Figure 5.1. This is the *caption*. Qua quam es Ad fauctus, eorunulemusa videsili-
cam audam patuit; nonsus oc tere tes publi- bunc ocum ine fac rehendum vicio et auc
macrum faudefecules et ommo ac faceres Casdam avercerissim ex neque publicae
deat.

Table 5.1. This is a sample table and this is the table caption. It displays the amount
of Hg (mg/kg ww) in the brain 24 hours after neonatal exposure on PND 10

Treatment (mg/kg bw)	Hg (mg/kg ww) in brain
Control	0.002
MeHg 0.08	0.028±0.003
MeHg 0.4	0.160±0.016
MeHg 4.0	1.001±0.044
PCB153 0.51 + MeHg 0.08	0.027±0.002
PCB153 0.51 + MeHg 0.4	0.181±0.037
PCB153 0.51 + MeHg 4.0	0.975±0.103

References

- [1] Peter Flynn. *Formatting information. A beginner's introduction to typesetting with \LaTeX* . 3rd edition, 2005.
<http://www.ctan.org/tex-archive/info/beginlatex/beginlatex-3.6.pdf>.
- [2] Patrik W. Daly Helmut Kopka. *A Guide to $\text{\LaTeX} 2_{\epsilon}$* . Addison-Wesley Professional, 4th edition, 2003.
- [3] Frank Mittelbach, Michel Goossens with Johannes Braams, David Carlisle, and Chris Rowley. *The $\text{\LaTeX} 2_{\epsilon}$ Companion*. Addison-Wesley Professional, 2nd edition, 2004.
- [4] Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl. *The Not So Short Introduction to $\text{\LaTeX} 2_{\epsilon}$* . 4.14th edition, 2004.
<http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>.