

# **Research Evaluation**

**University of Antwerp**

**Discipline:  
Computer Science**

**Research group: LAB ON REENGINEERING (LORE)**

**Spokesperson: PROFESSOR SERGE DEMEYER**

<http://www.lore.ua.ac.be>

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*LAB ON REENGINEERING (LORE)*

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**3 Research projects**

**24**

# Chapter 1

## The research group

### 1.1 Scope and objectives

*The documentation is missing or obsolete, and the original developers have departed. Your team has limited understanding of the system and unit tests are missing for many, if not all, of the components. When you fix a bug in one place, another bug pops up somewhere else in the system. Long rebuild times make any change difficult.*

LORE is a Software Engineering group at the University of Antwerp which investigates solutions for *reengineering* problems. We see reengineering as an essential phase in any software life-cycle because software systems —especially object-oriented ones—must adapt to changing requirements in order to remain successful. To quote the book we wrote on the subject: “It is not age that turns a piece of software into a legacy system, but the rate at which it has been developed and adapted without being reengineered”<sup>1</sup>.

LORE is actively cooperating with industrial partners through research projects in order to expand and validate our expertise. In our opinion such joint-projects between industry and academia are the cornerstone for reengineering research from which both partners benefit. In that context it is important to point out that all tools that we have developed originated from research projects that were held in conjunction with industry.

### 1.2 Research topics

LORE performs research on *Software Reengineering*. In particular, we investigate:

- (a) *software models*, to express the past, present and future status of evolving software systems (**Keywords:** mining software repositories, refactoring, model inconsistencies);
- (b) *software metrics*, to control and predict the software evolution process (**Keywords:** visualization, empirical research, cost estimation);
- (c) *reverse- and re-engineering*, to transform and understand an existing system (**Keywords:** dynamic analysis, visualization, clone detection, refactoring);
- (d) *tools*, to help practitioners and to empirically validate experimental findings (**Keywords:** Fetch (Fact Extractor Tool Chain), famix (FAMOOS Information Exchange Model)).

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<sup>1</sup>S. Demeyer, S. Ducasse, and O. Nierstrasz. Object-Oriented Reengineering Patterns. Morgan Kaufmann, 2003.

### 1.3 Scientific, social and/or technological relevance of the research

Software has become omnipresent and indispensable in our information-based society. Almost all devices, machines and artefacts surrounding us incorporate software to some extent. The numerous organisations, businesses and enterprises we encounter on a daily basis could not function without software. As such, software is vital to our society and consequently the software engineering community should take up its responsibility to produce reliable software. For a long, long time, reliable software was seen as software “without bugs”. As a result, most of the software engineering research effort has concentrated on preventing, detecting and repairing mistakes in various stages of software development. However, more and more, reliable software has come to mean “easy to adapt”. Indeed today’s global society, with its extreme complexity and diversity, imposes constant pressure to change. Hence all the software that surrounds us is forced to keep pace or is bound to be replaced by something else.

Software maintenance (and consequently reengineering) is a *real* problem. Various studies and surveys indicate that over 80% of the total maintenance effort is used for noncorrective changes <sup>2</sup>. In addition, other studies indicate that software maintenance accounts for at least 50% of the total software production cost, and sometimes even exceeds 90% <sup>3</sup>.

### 1.4 Strengths and weaknesses, opportunities and threats

#### Strengths

- **Good Reputation:** The group has a good reputation, both regionally (with other software engineering research groups in Belgium and the Netherlands) as well as internationally (with other groups working on *reverse engineering, reengineering and software evolution*).
- **Industrial Cooperation:** The group has numerous contacts with industrial partners, which is necessary in the context of our “industry as a lab” vision (see p. 7).
- **Scientific Output:** Considering the small group we have, we are quite productive in terms of publications and ph.d’s.
- **Spectrum of Research Funding:** We cover the full spectrum from applied to fundamental research, which is reflected in the various sources for research funding for the group. As such we are less vulnerable to policy changes in research funding.

#### Weaknesses

- **Small Scale:** To maintain our strengths, we should not grow beyond 5 ph.d. students and 1 or 2 post-docs – this is about the maximum a single professor can supervise. This implies that we sometimes must say no to requests for partnerships.
- **Number of Journal Publications:** While the scientific output in terms of publications is good, it mainly consists of conference publications. This is quite common in a young and rapidly

<sup>2</sup>Abran, A., Nguyen, K.: Measurement of the maintenance process from a demand-based perspective. *Software Maintenance and Evolution: Research and Practice* 5(2) (1993)6390.

Pigoski, T.M.: *Practical Software Maintenance: Best Practices for Managing your Software Investment*. John Wiley and Sons (1997)

<sup>3</sup>Lientz, B.P., Swanson, E.B.: *Software maintenance management: a study of the maintenance of computer application software in 487 data processing organizations*. Addison-Wesley (1980).

Seacord, R.C., Plakosh, D., Lewis, G.A.: *Modernizing Legacy Systems: Software Technologies, Engineering Processes, and Business Practices*. 1st edn. Addison-Wesley Professional (2003)

Koskinen, J.: *Software maintenance costs*. <http://www.cs.jyu.fi/~koskinen/smcosts.htm> (2003)

moving discipline like software engineering, however not well received when compared with other scientific disciplines.

### Opportunities

- **Cooperation with FOTS:** The group cooperates closely with FOTS, another software engineering research group in our department. The two groups are complementary in the sense that FOTS concentrates on formal methods in general, and model transformation in particular. In the future a merge of the two groups may be considered.
- **Cooperation with KdG:** The University of Antwerp is part of a larger association, which promotes cooperation with a number of industrial schools in the area of Antwerp. LORE has a good relationship with one of these schools (namely KdG), which allows to maintain contact with the more hardware oriented side of software (embedded systems, automotive, ...).
- **Open Source Movement:** The open source movement makes it possible to distribute academic tool prototypes as concrete results from research projects with industry (see for example, the fetch tool – <http://www.lore.ua.ac.be/Research/Artefacts/>). It also allows to study large scale software system, produced under realistic constraints, which again fits our “industry as a lab” vision (see p. 7).
- **Increase in Visibility:** The MoVES project (a national project, joining all software engineering groups in Belgium with a few international partners) will allow us to increase our international visibility. In the context of the MoVES project, Antwerp will host the International Conference on “Automated Software Engineering” in 2010.
- **Funding opportunities:** The funding opportunities in Flanders (and Belgium) are quite good for a research group which covers both fundamental as well as applied research. As such, we should be able to cover the spectrum from applied to fundamental research in the future as well.

### Threats

- **Shortage of Ph.d. candidates:** The number of students graduating in computer science the coming years will be low, both in Antwerp as well as in the universities surrounding us. Therefore, it will be hard to fill all the open positions that will become available.
- **Budget Cuts:** The University of Antwerp will go through severe budget cuts in the coming years. This will most likely result in a reduction of funding for basic research, which will create friction between the fundamental and applied research in the group.
- **Administrative Overhead:** With the growing demand for quality control (both for teaching, research and service) comes an increasing amount of administrative burden. This absorbs a tremendous amount of energy which could be better spent on activities immediately relevant to the task at hand.

## 1.5 Future research activities, objectives and strategy

Today, LORE has obtained a firm footing in the European subtop of software engineering research, with an established reputation in our main area of expertise (software reengineering). In the next five years, we expect this group to reach international excellence, by continuing along the following lines.

**1) Research Themes.** The scope, objectives and research topics presented in sections 1.1 – p.4 and 1.2 – p.4 will not change in the near future. Nevertheless, within this framework we identified two research themes that will be our prime focus for the next five years: (a) *Mining Software Repositories* and (b) *Model Driven Engineering*. Both themes have a strong academic community (witness the

numerous workshops and conferences organized around those themes), where we have an established reputation. Moreover, both themes allow us to benefit from cooperations with other research groups within the department, namely **FOTS** (with whom we have a longstanding cooperation) and more recently **ADReM** (initial joint work).

- *Mining Software Repositories* has become a hot topic within the software reengineering community. The importance of this field is symbolised by the international workshop on “Mining Software Repositories” which quickly attained the status of a (working) conference. We were among the early researchers publishing on that topic (the paper “Finding Refactorings via Change Metrics” at OOPSLA 2000) and have continued that work in research networks like RELEASE. Also, in cooperation with data mining specialists from the ADReM group we developed a reverse engineering technique based on the mining of execution traces (the paper “Applying webmining techniques to execution traces to support the programming comprehension process” at CSMR’05).
- *Model Driven Engineering* —i.e., focus on models of software instead of code— is an old dream in the software engineering community, which recently got renewed attention with the advent of “Model Driven Architecture” (MDA), a standardization effort by OMG. In close collaboration with FOTS we investigate the topic of modeling evolving software in projects (see chapter 3 p.24) and papers (the paper “Towards automating source-consistent UML refactorings” at UML03; the paper “Formalizing refactorings with graph transformations” published in the International Journal on Software Maintenance: Research and Practice).

**2) Industry as a lab.** Research in Software Engineering requires an industrial context to validate its results. Just like biologists should observe species in their natural habitat, so should researchers in software engineering observe active teams building concrete software systems. Therefore, we seek cooperation with both SME’s and large companies. Two examples:

- Contacts within the health-care sector resulted in a research project with the “Koninklijke Apothekersvereniging Antwerpen (KAVA)” concerning e-business in the context of pharmaceutical care. This project was completed successfully in January 2005.
- Contacts with banks like KBC and Axa resulted in the project “Migration towards Service-Oriented Architectures”; which sponsors one Ph.d. student in the group.

**3) Spectrum “fundamental - applied” research.** LORE conducts both fundamental and applied research. However, feedback between the two is necessary for the benefit of both. Applied research is based on results obtained through fundamental research; however the practical problems encountered during applied research influence the agenda of the fundamental research. A concrete example:

- SERIOUS is an ITEA-project with several industrial partners (among others, Alcatel-Lucent, Nokia and Philips). This project builds on expertise obtained through fundamental research projects (the FWO project “A formal Foundation for Software Refactoring”, the IWT project ARRIBA) and the international visibility obtained in European research networks (the ESF-network “RELEASE”).

**4) National and international visibility.** To acquire and maintain academic contacts, we participate actively in many scientific events, which is important to sustain both national and international visibility. Obtaining industrial contacts on the other hand, is mainly done by means of invited lectures at industrial seminars and the book “Object-Oriented Reengineering Patterns” (a book with concrete

reengineering advice for practitioners) often serves as the subject for a speech. Two recent examples of both types of events:

- Prof. Serge Demeyer served as a keynote speaker on the “First Ideals Symposium” (Eindhoven - November 8, 2006), organised by the “Embedded Systems Institute”.
- Antwerp will host the 25th edition of the renowned “Automated Software Engineering Conference” (ASE) in September 2010.

**5) Input/output of Ph.d. students.** LORE really started as a research group in October 2002 with 4 new Ph.d. students. Since 2002 this number has grown steadily with about one new Ph.d. student every year (see also section 1.6 – p.9). It is the explicit target for each student to acquire a Ph.d. within 4 to 5 years as to guarantee a constant output level.

The status of LORE’s Ph.d. students:

Student	started	finished	expect to finish
Bart Du Bois	october 2002	september 2006	–
Andy Zaidman	october 2002	september 2006	–
Filip Van Rysselberghe	october 2002	january 2008	–
Hans Stenten	october 2002	[quit Ph.d. program due to lack of funding]	
Marijn Temmerman	january 2003	january 2008	–
Bart Van Rompaey	august 2005	–	summer 2009
Joris Van Geet	september 2006	–	autumn 2010
Anne Keller	february 2007	–	winter 2011
Jan Vlegels	october 2008	–	autumn 2012

**6) Publications in journals.** Since software engineering is such a young discipline, conferences with peer-reviewing are most commonly used for disseminating scientific results. Therefore, the acceptance ratio of a conference are often used as a quality indicator. However, we recognize that journal publications serve the additional purpose of compiling a sound foundation for the long term viability of our field. Therefore, we increase our efforts to target journal publications in order to contribute to the archived body of scientific knowledge.

- See the publication list for an overview of recently accepted journal submissions.



## 1.6 Members of the research group

Members	Academic year				
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
<b>Lecturers:</b>					
Demeyer Serge	1,00	1,00	1,00	1,00	1,00
Zaidman Andy	–	–	–	–	0,10
De Schutter Kris	–	–	–	–	0,10
<b>Research and teaching assistants:</b>					
Van Rysselberghe Filip	1,00	1,00	1,00	1,00	1,00
<b>Senior researchers:</b>					
Du Bois Bart	–	–	–	1,00	1,00
De Schutter Kris	–	–	–	0,33	–
Rieger Matthias Ernst	–	0,08	1,00	0,75	–
<b>Doctoral Students:</b>					
Du Bois Bart	1,00	1,00	1,00	–	–
Keller Anne	–	–	–	0,67	1,00
Stenten Johannes	0,42	–	–	–	–
Van Geet Joris	–	–	0,08	1,00	1,00
Van Rompaey Bart	–	0,17	1,00	1,00	1,00
Vlegels Jan	–	–	–	–	1,00
Zaidman Andy	1,00	1,00	1,00	–	–
Number of people	5	6	7	8	9
Total FTE	4,42	4,25	6,08	6,75	7,20
<b>Total research FTE</b>	<b>3,17</b>	<b>3</b>	<b>4,83</b>	<b>5,5</b>	<b>5,75</b>

## 1.7 Educational duties

Ba Inf Sc: Bachelor of Information Science

Ba Math: Bachelor of Mathematics

Ma Inf Sc: Master of Information Science

Ba Bio: Bachelor of Biology

Ba Bio-Ir: Bachelor of Bio-engineering

	<b>Courses</b>	<b>Programmes</b>	<b>ECTS credits</b>	<b>hrs</b>
S. Demeyer	Introduction to software engineering	Ba Inf Sc	6	75
	Software engineering	Ba Math		
		Ba Inf Sc	6	60
		Ba Math		
	Software Re-engineering	Ma Inf Sc	6	45
	Capita Selecta Software Engineering	Ma Inf Sc	6	45
	Software Testing	Ma Inf Sc	6	45
	Formal techniques in software engineering (see D. Janssens)	Ba Inf Sc	-	-
	<b>Total</b>		<b>30</b>	<b>270</b>
A. Zaidman	Information Science	Ba Bio	3	30
	<b>Total</b>		<b>3</b>	<b>30</b>
K. De Schutter	Computer skills	Ba Bio-ir	3	30
	<b>Total</b>		<b>3</b>	<b>30</b>

Total number of ECTS credits : **36**

## 1.8 Five key publications of the research group

1. Serge Demeyer, Stéphane Ducasse, and Oscar Nierstrasz. *Object-Oriented Reengineering Patterns*. Morgan Kaufmann, 2003. [Book].

This book reflects the three aspects of academic life: (a) *research*: results of 6 years worth of research; (b) *teaching*: course-text for master level course on “Software Reengineering”; (c) *service*: the basis for many projects together with the industry.

2. Tom Mens and Serge Demeyer, editors. *Software Evolution*. Springer-Verlag, 2008.

A book edited together with Prof. Tom Mens and collecting a number of chapters describing novel trends in software evolution research (including texts on mining software repositories) and its relations with other emerging disciplines such as model-driven software engineering, service-oriented software development, and aspect-oriented software development.

3. Tom Mens, Niels Van Eetvelde, Serge Demeyer, and Dirk Janssens. Formalizing refactorings with graph transformations. *International Journal on Software Maintenance: Research and Practice*, 15(4):247–276, July 2005. [SCI impact factor 0.457, ranked 60 / 79].

Representative for the first cooperation between the research groups LORE and FOTS, and a result of the FWO project “A Formal Foundation for Software Refactoring”.

4. Pieter Van Gorp, Hans Stenten, Tom Mens, and Serge Demeyer. Towards automating source-consistent UML refactorings. In Perdita Stevens, Jon Whittle, and Grady Booch, editors, *Proceedings UML'03 (The Sixth International Conference on The Unified Modeling Language)*, volume LNCS 2863 of *Lecture Notes on Computer Science*, pages 144–159. Springer-Verlag, 2003. [Acceptance ratio:  $30/143 = 21\%$ ; SCI impact factor 0.402, ranked 62 / 71].

Representative for the collaboration between LORE and FOTS on model-driven engineering.

5. Marijn Temmerman, Edgar Daylight, Franky Catthoor, Serge Demeyer, and Tom Dhaene. Optimizing data structures at the modeling level in embedded multimedia. *Journal of Systems Architecture*, to appear, 2007. [SCI impact factor 0.402, ranked 32 / 44].

A result of our research effort in the field of embedded systems together with the inter-university research center (IMEC) in Leuven

## 1.9 Quantitative Summary

### Scientific publications

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Articles in peer reviewed journals	0	1	1	0	0	0	1	0	3
Articles in peer reviewed proceedings	0	3	0	1	2	4	7	7	0
Books and book chapters	0	0	0	0	1	0	1	0	2
PhD theses defended at University of Antwerp	0	0	0	0	0	0	0	2	2

### Research funding

	2004	2005	2006	2007
University research fund	4.783	5.217	29.900	0
Research foundation - Flanders	3.099	61.899	58.800	58.800
International funding	31.220	11.582	0	0
Government funding	156.800	156.800	117.600	75.000
Private funding	6.250	55.000	183.692	232.818
<b>Total</b>	202.151	290.498	389.992	366.619

## Chapter 2

# Scientific activity

### 2.1 Publications

#### 2.1.1 Articles in peer reviewed journals

##### 2007

Bart Van Rompaey, Bart Du Bois, Serge Demeyer, and Matthias Rieger. On the detection of test smells: A metrics-based approach for general fixture and eager test. *Transactions on Software Engineering*, 33(12):800–817, 2007.

Paolo Tonella, Marco Torchiano, Bart Du Bois and Tarja Systä. Empirical studies in reverse engineering: state of the art and future trends. *Empirical Software Engineering*, 12(5):1382–3256, 2007.

Marijn Temmerman, Edgar Daylight, Francky Catthoor, Serge Demeyer, and Tom Dhaene. Optimizing data structures at the modeling level in embedded multimedia. *Journal of Systems Architecture*, 53(8):539-549, 2007.

##### 2005

Tom Mens, Niels Van Eetvelde, Serge Demeyer, and Dirk Janssens. Formalizing refactorings with graph transformations. *International Journal on Software Maintenance: Research and Practice*, 15(4):247–276, July 2005. [SCI impact factor 0.457, ranked 60 / 79].

##### 2001

Serge Demeyer. Extensibility via a meta-level architecture. *Journal of Network and Computer Applications*, 24(1):63–74, January 2001. [SCI impact factor 0.929, ranked 36 / 79].

##### 2000

Serge Demeyer, Koen De Hondt, and Patrick Steyaert. Consistent framework documentation with computed links and framework contracts. *Computing Surveys*, 32(1es):Article No. 34, March 2000. [SCI impact factor 7.4, ranked 1 / 71].

## 2.1.2 Monography as an author or editor

### 2008

Tom Mens and Serge Demeyer, editors. *Software Evolution*. Springer-Verlag, 2008.

### 2003

Serge Demeyer, Stéphane Ducasse, and Oscar Nierstrasz. *Object-Oriented Reengineering Patterns*. Morgan Kaufmann, 2003.

## 2.1.3 Articles in peer reviewed (conference) proceedings

### 2006

Christian F. J. Lange, Bart Du Bois, Michel R. V. Chaudron, and Serge Demeyer. An experimental investigation of UML modeling conventions. In Oscar Nierstrasz, editor, *Proceedings Models/UML'06 (The 9th International Conference on Model Driven Engineering Languages and Systems)*, volume LNCS 4199 of *Lecture Notes on Computer Science*, pages 27–41. Springer-Verlag, 2006. [Acceptance ratio: unknown; SCI impact factor 0.402, ranked 62 / 71].

Bart Van Rompaey, Bart Du Bois, and Serge Demeyer. Characterizing the relative significance of a test smell. In *Proceedings of the 22nd International Conference on Software Maintenance (ICSM2006)*, pages 391–400. IEEE Computer Society, September 2006. [Acceptance ratio:  $(41 + 4)/147 = 28\%$ ].

Andy Zaidman, Bart Du Bois, and Serge Demeyer. How webmining and coupling metrics can improve early program comprehension. In *Proceedings of the 14th International Conference on Program Comprehension (ICPC2006) pages*, pages 74–78. IEEE Computer Society, 2006. [Acceptance ratio:  $(23+8)/64 = 48\%$ ].

Filip Van Rysselberghe, Matthias Rieger, and Serge Demeyer. Detecting move operations in versioning information. In *Proceedings of the 10th Conference on Software Maintenance and Reengineering (CSMR'06)*, pages 271–278. IEEE Computer Society, 2006. [Acceptance ratio:  $27+4/65 = 42\%$ ].

Andy Zaidman, Bram Adams, Kris De Schutter, Serge Demeyer, Ghislain Hoffman, and Bernard De Ruyck. Regaining lost knowledge through dynamic analysis and aspect orientation - an industrial experience report. In *Proceedings of the 10th Conference on Software Maintenance and Reengineering (CSMR'06)*, pages 89–98. IEEE Computer Society, 2006. [Acceptance ratio:  $27+4/65 = 42\%$ ].

Andy Zaidman, Orla Greevy and Abdelwahab Hamou-Lhadj. Workshop on Program COMprehension through Dynamic Analysis (PCODA'06). In *Proceedings of the 13th Working Conference on Reverse Engineering (WCRE2006)*, pages 315–315. IEEE Computer Society, October, 2006

Bart Du Bois, Serge Demeyer, Jan Verelst, Tom Mens, and Marijn Temmerman. Does god class decomposition affect comprehensibility? In *Proceedings of the IASTED International Conference on Software Engineering*, pages 346–355. IASTED/ACTA Press, 2006. [Acceptance ratio:  $82/178 = 46\%$ ].

### 2005

Oscar Nierstrasz, Stéphane Ducasse, and Serge Demeyer. Object-oriented reengineering patterns – an overview. In Michael Lowry Robert Glück, editor, *Proceedings of Generative Programming*

and Component Engineering (GPCE 2005), pages 1–9. LNCS 3676, 2005. [Invited paper; SCI impact factor 0.402, ranked 62 / 71].

Serge Demeyer. Refactor conditionals into polymorphism: What is the performance cost of introducing virtual calls ? In *Proceedings ICSM'05 (International Conference on Software Maintenance)*, pages 627–630. IEEE Press, 2005. [Acceptance ratio:  $(55 + 25) / 180 = 44\%$ ].

Serge Demeyer, Filip Van Rysselberghe, Tudor Gîrba, Jacek Ratzinger, Radu Marinescu, Tom Mens, Bart Du Bois, Stéphane Ducasse Dirk Janssens, Michele Lanza, Harald Gall Matthias Rieger, and Mohammad El-Ramly. The LAN-simulation: A refactoring teaching example. In *Proceedings IWPSE'05 (8th International Workshop on Principles of Software Evolution)*, pages 123–131. IEEE Press, 2005. [Acceptance ratio:  $(13 + 13) / 54 = 48\%$ ].

Tom Mens, Michel Wermelinger, Stéphane Ducasse, Serge Demeyer, and Robert Hirschfeld. Challenges in software evolution. In *Proceedings IWPSE'05 (8th International Workshop on Principles of Software Evolution)*, pages 123–131. IEEE Press, 2005. [Acceptance ratio:  $(13 + 13) / 54 = 48\%$ ].

Marijn Temmerman, Edgar Daylight, Franky Catthoor, Serge Demeyer, and Tom Dhaene. Moving up to the modeling level for the transformation of data structures in embedded multimedia applications. In *Proceedings SAMOS'05 (Fifth meeting of the Embedded Computer Systems: Architectures, MOdeling, and Simulation)*, volume LNCS — of *Lecture Notes on Computer Science*. Springer-Verlag, 2005. [Acceptance ratio:  $47/114 = 41\%$ ; SCI impact factor 0.402, ranked 62 / 71].

Bart Du Bois, Serge Demeyer, and Jan Verelst. Does the reengineering pattern “Refactor to Understand” improve program comprehension? In *CSMR 2005 Proceedings (Conference on Software Maintenance and Reengineering)*, pages 334–343. IEEE Press, 2005. [Acceptance ratio:  $(33 + 5) / 81 = 46.9\%$ ].

Andy Zaidman, Toon Calders, Serge Demeyer, and Jan Paredaens. Applying webmining techniques to execution traces to support the programming comprehension process. In *CSMR 2005 Proceedings (Conference on Software Maintenance and Reengineering)*, pages 134–142. IEEE Press, 2005. [Acceptance ratio:  $(33 + 5) / 81 = 46.9\%$ ].

## 2004

Bart Du Bois, Jan Verelst, and Serge Demeyer. Refactoring - improving coupling and cohesion of existing code. In *Proceedings WCRE'04 (Working Conference on Reverse Engineering)*, pages 144–151. IEEE Press, 2004. [Acceptance ratio:  $28/78 = 36\%$ ].

Filip Van Rysselberghe and Serge Demeyer. Studying software evolution information by visualizing the change history. In *Proceedings ICSM'04 (International Conference on Software Maintenance)*, pages 328–337. IEEE Press, 2004. [Acceptance ratio:  $48/122 = 39\%$ ].

Filip Van Rysselberghe and Serge Demeyer. Evaluating clone detection techniques from a refactoring perspective. In *Proceedings ASE'04 (Automated Software Engineering)*, pages 336–339. IEEE Press, 2004. [Acceptance ratio:  $51/183 = 28\%$ ].

Andy Zaidman and Serge Demeyer. Managing trace data volume through a heuristical clustering process based on event execution frequency. In Claudio Riva, editor, *Proceedings CSMR'04 (Euromicro Working Conference on Software Maintenance and Reengineering)*, pages 329–338. IEEE Press, 2004. [Acceptance ratio:  $33/62 = 52\%$ ].

**2003**

Bart Du Bois and Serge Demeyer. Accommodating changing requirements with EJB. In Dimitri Konstantas, Michel Leonard, Yves Pigneur, and Shusma Patel, editors, *Proceedings OOIS'03 (Object-Oriented Information Systems)*, volume LNCS 2817 of *Lecture Notes on Computer Science*, pages 152–163. Springer-Verlag, 2003. [Acceptance ratio: 40/80 = 50%; SCI impact factor 0.402, ranked 62 / 71].

Pieter Van Gorp, Hans Stenten, Tom Mens, and Serge Demeyer. Towards automating source-consistent UML refactorings. In Perdita Stevens, Jon Whittle, and Grady Booch, editors, *Proceedings UML'03 (The Sixth International Conference on The Unified Modeling Language)*, volume LNCS 2863 of *Lecture Notes on Computer Science*, pages 144–159. Springer-Verlag, 2003. [Acceptance ratio: 30/143 = 21%; SCI impact factor 0.402, ranked 62 / 71].

**2002**

Tom Mens, Serge Demeyer, and Dirk Janssens. Formalising behaviour preserving program transformations. In Andrea Corradini, Hartmut Ehrig, Hans-Jörg Kreowski, and Grzegorz Rozenberg, editors, *Proceedings ICGT2002 (First International Conference on Graph Transformation)*, volume 2505 of *Lecture Notes in Computer Science*, pages 286–301. Springer-Verlag, 2002. [Acceptance ratio: 26/45 = 57%].

**2000**

Serge Demeyer, Stéphane Ducasse, and Oscar Nierstrasz. Finding refactorings via change metrics. In *Proceedings OOPSLA'2000 (Conference on Object-Oriented Programming, Systems, Languages and Applications)*, Reappeared in ACM SIGPLAN Notices 35(10), pages 166–177. ACM Press, October 2000. [Acceptance ratio: 26/143 = 18%; SCI impact factor 0.190, ranked 66 / 77].

Sander Tichelaar, Juan Carlos Cruz, and Serge Demeyer. Design guidelines for coordination components. In Janice Carroll, Ernesto Damiani, Hisham Haddad, and Dave Oppenheim, editors, *Proceedings SAC'2000 (ACM Symposium on Applied Computing)*, pages 270–277. ACM, March 2000. [Acceptance ratio: 194/457 = 42%].

Sander Tichelaar, Stéphane Ducasse, Serge Demeyer, and Oscar Nierstrasz. A meta-model for language-independent refactoring. In *Proceedings ISPSE'2000 (International Symposium on Principles of Software Evolution)*. IEEE Press, November 2000. [Acceptance ratio: 22/51 = 43%].

**2.1.4 Invited articles in theme books****2008**

Serge Demeyer. Object-oriented reengineering. In Tom Mens and Serge Demeyer, editors, *Software Evolution*. Springer-Verlag, 2008.

**2005**

Stéphane Ducasse, Tudor Gîrba, Michele Lanza, and Serge Demeyer. Moose: a Collaborative and Extensible Reengineering Environment. In Massimiliano Di Penta and Maarit Harsu, editors,

*Tools for Software Maintenance and Reengineering*, RCOST / Software Technology Series, pages 55 – 71. Franco Angeli, 2005.

### 2.1.5 Workshop proceedings as editor

#### 2006

Andy Zaidman, Orla Greevy and Abdelwahab Hamou-Lhadj. *Proceedings of the Workshop on Program Comprehension through Dynamic Analysis (PCODA'06)*, Technical Report. University of Antwerp - June 2006.

Serge Demeyer, Stéphane Ducasse, Yann-Gaël Guéhéneuc, Kim Mens, and Roel Wuyts, editors. *Proceedings of the ECOOP'06 Workshop on Object-Oriented Re-engineering (WOOR'06)*, Technical Report. University of Berne - Software Composition Group, June 2006.

#### 2005

Serge Demeyer, Stéphane Ducasse, Kim Mens, and Roel Wuyts, editors. *Proceedings of the ECOOP'05 Workshop on Object-Oriented Re-engineering (WOOR'05)*, Technical Report. University of Berne - Software Composition Group, June 2005.

#### 2004

Serge Demeyer, Stéphane Ducasse, Kim Mens, and Roel Wuyts, editors. *Proceedings of the ECOOP'04 Workshop on Object-Oriented Re-engineering (WOOR'04)*, Technical Report. University of Antwerp - Department of Mathematics and Computer Science, June 2004.

#### 2003

Serge Demeyer, Stéphane Ducasse, and Kim Mens, editors. *Proceedings of the ECOOP'03 Workshop on Object-Oriented Re-engineering (WOOR'03)*, Technical Report. University of Antwerp - Department of Mathematics and Computer Science, June 2003.

### 2.1.6 Workshop Papers and Reports without External Refereeing

#### 2007

Bart Du Bois, Bart Van Rompaey, Karel Meijfroidt and Erik Suijs. Supporting Reengineering Scenarios with FETCH: an Experience Report. In *3rd International ERCIM Symposium on Software Evolution*, October, 2007.

Matthias Rieger, Bart Van Rompaey, Karel Meijfroidt and Paul Olievier. Refactoring for Performance: An Experience Report. In *3rd International ERCIM Symposium on Software Evolution*, October, 2007.

Joris Van Geet and Serge Demeyer. Lightweight visualisations of COBOL code for supporting migration to SOA. In *3rd International ERCIM Symposium on Software Evolution*, October 2007.

Matthias Rieger, Bart Van Rompaey, and Serge Demeyer. Refactoring state machines. In *Sixth Nordic Pattern Languages of Programs Conference (VikingPloP)*, September 2007.

Serge Demeyer, Bart Du Bois, Matthias Rieger, and Bart Van Rompaey. The LAN-simulation: A refactoring lab session. In *Proceedings of the 1st Workshop on Refactoring Tools*. University



of Berlin, 2007.

Matthias Rieger, Bart Van Rompaey and Roel Wuyts. Teaching FAMIX about the Preprocessor. In *Proceedings of the 1st Workshop on FAMIX and Moose in Reengineering (FAMOOSr)*. June, 2007

Bart Van Rompaey. Making FAMIX Test-Aware In *Proceedings of the 1st Workshop on FAMIX and Moose in Reengineering (FAMOOSr)*. June, 2007

Bart Du Bois, Christian F. J. Lange, Serge Demeyer, and Michel R. V. Chaudron. A qualitative investigation of UML modeling conventions. In Thomas Kuhne, editor, *Models in Software Engineering, Workshops and Symposia at MoDELS 2006*, volume LNCS 4364 of *Lecture Notes on Computer Science*, pages 91–100. Springer-Verlag, 2007.

## 2006

Serge Demeyer, Stéphane Ducasse, Yann-Gaël Guéhéneuc, Kim Mens, and Roel Wuyts. Workshop on object-oriented reengineering. In *Object-Oriented Technology (ECOOP'06 Workshop Reader)*, volume LNCS xxx of *Lecture Notes in Computer Science*. Springer-Verlag, 2006.

Joris Van Geet and Andy Zaidman. A Lightweight Approach to Determining the Adequacy of Tests as Documentation. In *Proceedings of the 2nd Workshop on Program Comprehension through Dynamic Analysis (PCODA'06)*; Editor(s) Andy Zaidman, Abdelwahab Hamou-Lhadj and Orla Greevy. University of Antwerp, October, 2006

## 2005

Oscar Nierstrasz, Stéphane Ducasse, and Serge Demeyer. Objektorientierte re-engineering-muster: ein Überblick. *ObjektSpektrum*, 2005(6):46–51, 2005.

Serge Demeyer, Stéphane Ducasse, Kim Mens, and Roel Wuyts. Workshop on object-oriented reengineering. In *Object-Oriented Technology (ECOOP'05 Workshop Reader)*, volume LNCS xxx of *Lecture Notes in Computer Science*. Springer-Verlag, 2005.

## 2004

Marijn Temmerman, Edgar Daylight, Serge Demeyer, Franky Catthoor, and Tom Dhaene. About the need of model-driven architecture in the design of embedded systems. In Uwe Assman, editor, *Proceedings MDFAFA'04 (Workshop on Model Driven Architecture: Foundations and Applications)*, 2004.

Jan Hidders, Jan Paredaens, Roel Vercammen, and Serge Demeyer. A light but formal introduction to XQuery. In *Proceedings XSYM'04 (Second International XML Database Symposium)*, volume LNCS 3186 of *Lecture Notes on Computer Science*, pages 5–20. Springer-Verlag, 2004. [Acceptance ratio: 15/58 = 26%; SCI impact factor 0.402, ranked 62 / 71].

Filip Van Rysselberghe and Serge Demeyer. Mining version control systems for facts (frequently applied changes). In *Proceedings MSR'04 (International Workshop on Mining Software Repositories)*, pages 48–52. IEE (Institution of Electrical Engineers), 2004.

Roel Wuyts, Stéphane Ducasse, Serge Demeyer, and Kim Mens. Workshop on object-oriented reengineering. In Jacques Malenfant and Bjarte M. Østvold, editors, *Object-Oriented Technology (ECOOP'04 Workshop Reader)*, volume LNCS 3344 of *Lecture Notes in Computer Science*. Springer-Verlag, 2004. [SCI impact factor 0.402, ranked 62 / 71].

Bart Du Bois and Serge Demeyer. Opportunities and challenges in deriving metric impacts from

refactoring postconditions. In Serge Demeyer, Stéphane Ducasse, Kim Mens, and Roel Wuyts, editors, *Proceedings WOOR'04 (ECOOP'04 Workshop on Object-Oriented Re-engineering)*, June 2004.

Andy Zaidman, Toon Calders, Serge Demeyer, and Jan Paredaens. Selective introduction of aspects for program comprehension. In *WARE2004 Proceedings (WCRE Workshop on Aspect Reverse Engineering)*, 2004.

## 2003

Tom Mens, Serge Demeyer, Bart Du Bois, Hans Stenten, and Pieter Van Gorp. Refactoring: Current Research and Future Trends. In *Proceedings LDTA'03 (Third Workshop on Language Descriptions, Tools and Applications)*, volume Electronic Notes in Theoretical Computer Science – 72. Elsevier, March 2003.

Filip Van Rysselberghe and Serge Demeyer. Reconstruction of successful software evolution using clone detection. In Tommi Mikkonen, Michael W. Godfrey, and Motoshi Saeki, editors, *Proceedings International Workshop on principles of software evolution (IWPSE'03)*, pages 126–130. IEEE Computer Society Press, 2003.

Filip Van Rysselberghe and Serge Demeyer. Evaluating clone detection techniques. In Tom Mens, Juan F. Ramil, Michael W. Godfrey, and Brian Down, editors, *Proceedings ELISA'03 (International Workshop on Evolution of Large-scale Industrial Software Applications)*, pages 25–36. Vrije Universiteit Brussel, September 2003.

Marijn Temmerman, Edgar Daylight, Serge Demeyer, Franky Catthoor, and Tom Dhaene. Towards energy-conscious class transformations for data-dominant applications: a case study. In Koen De Bosschere, editor, *Proceedings PA3CT'03 (3rd PA3CT Symposium)*, 2004.

Serge Demeyer, Stéphane Ducasse, Kim Mens, Adrian Trifu, Rajesh Vasa, and Filip Van Rysselberghe. Workshop on object-oriented reengineering. In *Object-Oriented Technology (ECOOP'03 Workshop Reader)*, volume LNCS 3013 of *Lecture Notes in Computer Science*. Springer-Verlag, 2004. [SCI impact factor 0.402, ranked 62 / 71].

Pieter Van Gorp, Hans Stenten, Tom Mens, and Serge Demeyer. Enabling and using the UML for model-driven refactoring. In Serge Demeyer, Stéphane Ducasse, and Kim Mens, editors, *Proceedings WOOR'03 (ECOOP'03 Workshop on Object-Oriented Re-engineering)*, pages 37–40. Universiteit Antwerpen, July 2003.

Andy Zaidman and Serge Demeyer. Using a variant of sliding window to reduce event trace data. In Serge Demeyer, Stéphane Ducasse, and Kim Mens, editors, *Proceedings WOOR'03 (ECOOP'03 Workshop on Object-Oriented Re-engineering)*, pages 4–9. Universiteit Antwerpen, July 2003.

Filip Van Rysselberghe and Serge Demeyer. Studying software evolution using clone detection. In Serge Demeyer, Stéphane Ducasse, and Kim Mens, editors, *Proceedings WOOR'03 (ECOOP'03 Workshop on Object-Oriented Re-engineering)*, pages 71–75. Universiteit Antwerpen, July 2003.

## 2001

Serge Demeyer. Ecoop 2001 - workshop on object-oriented architectural evolution - position statement. In *Proceedings of ECOOP 2001 Workshop on Object-Oriented Architectural Evolution*, June 2001.

Serge Demeyer, Tom Mens, and Michel Wermelinger. Towards a software evolution benchmark.

In Tetsuo Tamai, Mikio Aoyama, and Keith Bennett, editors, *Proceedings IWPSE'2001 (4th International Workshop on Principles of Software Evolution)*, pages 147–177. ACM Press, September 2001.

Tom Mens and Serge Demeyer. Future trends in software evolution metrics. In Tetsuo Tamai, Mikio Aoyama, and Keith Bennett, editors, *Proceedings IWPSE'2001 (International Workshop on Principles of Software Evolution)*, pages 83–86. ACM Press, September 2001.

## 2000

Serge Demeyer, Stéphane Ducasse, and Oscar Nierstrasz. 'interview during demo': a sample reverse engineering pattern. In *Proceedings of OOPSLA 2000 Workshop on Scenario-Based Round-Trip Engineering*, October 2000.

Serge Demeyer, Stéphane Ducasse, and Oscar Nierstrasz. A pattern language for reverse engineering (2). In *Proceedings EUROPLP'2000 (5th European Conference on Pattern Languages of Programming and Computing, 1999)*, pages 189–208, Konstanz, Germany, July 2000. UVK Universitätsverlag Konstanz GmbH.

Serge Demeyer and Harald Gall. Workshop on object-oriented re-engineering (WOOR'99). *ACM SIGSOFT Software Engineering Notes*, 25(1):27–27, January 2000.

Stéphane Ducasse, Serge Demeyer, and Oscar Nierstrasz. Tie code and questions: a reengineering pattern. In *Proceedings EUROPLP'2000 (5th European Conference on Pattern Languages of Programming and Computing, 1999)*, pages 209–217, Konstanz, Germany, July 2000. UVK Universitätsverlag Konstanz GmbH.

Stéphane Ducasse, Serge Demeyer, and Oscar Nierstrasz. Transform conditionals to polymorphism. In *Proceedings EUROPLP'2000 (5th European Conference on Pattern Languages of Programming and Computing, 1999)*, pages 219–252, Konstanz, Germany, July 2000. UVK Universitätsverlag Konstanz GmbH.

Sander Tichelaar, Stéphane Ducasse, and Serge Demeyer. FAMIX and XMI. In *Proceedings WCRE'2000 (7th Working Conference on Reverse Engineering)*, November 2000.

Sander Tichelaar, Stéphane Ducasse, and Serge Demeyer. FAMIX: Exchange experiences with CDIF and XMI. In *Proceedings of the ICSE 2000 Workshop on Standard Exchange Format (WoSEF 2000)*, June 2000.

## 2.2 Activities

Below is a list of activities by LORE members during the last 8 years (since its inception in 2000). In each category, items are listed in reverse chronological order.

### 2.2.1 Supervision of PhDs completed at the University of Antwerp

Demeyer S. 16/01/2008  
Optimizing Abstract Data Types Models for Dynamic and Data-Dominant Embedded Applications. (M. Temmerman)

Demeyer S. 11/01/2008  
Studying Historic Change Operations: Techniques and Observations. (F. Van Rysselberghe)

Demeyer S. 6/09/2006  
A Study of Quality Improvements by Refactoring. (B. Du Bois)

Demeyer S. 6/09/2006  
Scalability Solutions for Program Comprehension through Dynamic Analysis. (A. Zaidman)

### 2.2.2 Supervision of PhDs at other universities

Demeyer S. 24/10/2007  
Assessing and Improving the Quality of Modeling: a Series of Empirical Studies about the UML.  
(Christian Franz Jozef Lange)

### 2.2.3 Membership of PhD committees

- Technische Universiteit Delft (the Netherlands), Marius Mann, January 2008
- Universiteit Antwerpen (Belgium), Roel Vercammen, January 2008
- Vrije Universiteit Brussel (Belgium), Isabel Michiels, August 2007
- Universiteit Leuven (Belgium), Yves Vandewoude, March 2007
- Universiteit Leuven (Belgium), Pieter Bekaert, June 2006
- Vrije Universiteit Brussel (Belgium), Dirk Deridder, June 2006
- Universiteit Gent (Belgium), Kris Deschutter, May 2006
- University of Strathclyde (UK), Douglas Kirk, July 2005
- Universität Bern (Switzerland), Matthias Rieger, June 2004
- Rijksuniversiteit Groningen (the Netherlands), Jan Gerben Wijnstra, December 2004
- Rijksuniversiteit Groningen (the Netherlands), Rob van Ommering, December 2004
- Universität Bern (Switzerland), Michele Lanza, May 2004
- Universiteit Leuven (Belgium), Koen Hendrickx, February 2003
- Rijksuniversiteit Groningen (the Netherlands), Jilles Van Gorp, February 2002
- Vrije Universiteit Brussel (Belgium), Tom Tourwé, September 2002

### 2.2.4 Invited lectures

- ICSM'2005 Boedapest, Hungary – September, 2005 – Object-oriented reengineering Patterns
- FNRS Contact Day on Software (re-)engineering Louvain-la-neuve, Belgium – May, 2003 – Object-oriented reengineering Patterns
- Belgian Java Users Group Antwerpen, Belgium – November, 2002 – Object-oriented reengineering Patterns
- OOPSLA'2003 Anaheim, California – November, 2003 – Object-oriented reengineering Patterns (tutorial)
- OOPSLA'2002 Seattle, Washington – November, 2002 – Object-oriented reengineering Patterns (tutorial)

### 2.2.5 Conference presentations

See section “Articles in Conference Proceedings” – 2.1.3 p.13.

### 2.2.6 Fellowships, prizes and distinctions

Not applicable.

### 2.2.7 Membership of jury’s of scientific prizes

Not applicable.

### 2.2.8 Membership of scientific committees

- **Program Chair** ESUG’2007 - European Conference on Smalltalk – Lugano, Switzerland – August 2007
- **Models’2007** - 10th International Conference on Model Driven Engineering Languages and Systems – Nashville, USA – September/October 2007
- **IWPSE’2007** - 9th International Workshop on Principles of Software Evolution – Dubrovnik, Croatia – September 2007
- **ECMDA’2007** - 3rd European Conference on Model Driven Architecture; Foundations and Applications – Haifa, Israel – June 2007
- **MSR’2007** - 4th International Workshop on Mining Software Repositories – Minneapolis, USA – May 2007
- **SAC’2007** - 22nd Annual ACM Symposium on Applied Computing – Seoul, Korea – March 2007
- **ICSOFT’2007** - International Conference on Software and data Technologies – Barcelona, Spain – July 2007
- **CSMR’2007** - 11th European Conference on Software Maintenance and Reengineering – Amsterdam, the Netherlands – March 2007
- **WICSA’2007** - 6th Working IEEE/IFIP Conference on Software Architecture – Mumbai, India – January 2007
- **Models’2006** - 9th International Conference on Model Driven Engineering Languages and Systems – Genova, Italy – October 2006
- **ESUG’2006** - European Conference on Smalltalk – Prague, Tjechie – September 2006
- **ICSOFT’2006** - International Conference on Software and data Technologies – Setubal, Portugal – September 2006
- **ECMDA-FA’2006** - European international Conference on model Driven Architecture – Bilbao, Spain – July 2006
- **PSI’06** - Sixth International Andrei Ershov Memorial Conference PERSPECTIVES OF SYSTEM INFORMATICS – Novosibirsk, Akademgorodok, Russia – June 2006
- **ICPC’2006** - 14th International Conference on Program Comprehension – Athene, Griekenland – June 2006
- **IASTED-SE’2006** - The IASTED International Conference on SOFTWARE ENGINEERING – Innsbruck, Austria – February 2006
- **WICSA’2005** - The fifth Working IEEE/IFIP Conference on Software Architecture – Pittsburgh, VS – November 2005

- IWPC'2005 - 13th International Workshop on Program Comprehension – St.Louis, VC – May 2005
- ESUG'2005 - European Conference on Smalltalk – Brussels, Belgium – August 2005
- ESUG'2004 - European Conference on Smalltalk – Kothen, Germany – September 2004
- FASE'2004 - Fundamental Approaches to Software Engineering – Barcelona, Spanje – April 2004
- ESUG'2003 - European Conference on Smalltalk – Bled, Slovenia – August 2003

### **2.2.9 Membership of the editorial board of international journals**

Not applicable.

### **2.2.10 Leadership positions in scientific organizations**

Not applicable.

### **2.2.11 Involvement in spin-off companies**

Not applicable.

### **2.2.12 External activities that contribute to the research**

- Reviewer for the Jacquard Programme, a 10 year software engineering research program in the Netherlands (October 2004, May 2005)
- Reviewer for the IWT, SME-Programme, (2002 untill now)
- Reviewer for the European Commission, Fifth Framework Programme (July 2001 untill December 2003)
- Advisor for the central board of farm@d - Belgium (from February 2001 up untill now)
- Advisor for Technology Rating - The Netherlands (October 2000)

### **2.2.13 National and international collaboration**

At the national level, we had/have projects with all software engineering reserach groups within flanders and many in wallonia.

At the european level we have partnerships with many other reserach groups working on software evolution and related fields.

- Via MoVES project: see <http://prog.vub.ac.be/moves/>
- Via SERIOUS project: see <http://www.hitech-projects.com/euprojects/serious/>
- Via ERCIM Working Group on Software Evolution: see <http://w3.umh.ac.be/evol/members/members.html>
- Via RELEASE network: see <http://www.esf.org/release/>
- Via SEGRAVIS network: see <http://www.segravis.org/>

### **2.2.14 Stays abroad**

- february 2006, Serge Demeyer visited the Technical University of Zurich and the University of Lugano, both in Switzerland.
- june 2003, Bart Du Bois visited the SIMULA research center in Oslo, Norway.

### 2.2.15 Other

- Organizing WOOR'06. ECOOP'06 Workshop on Object-Oriented Reengineering. A workshop organised as part of the European Conference on Object-Oriented Programming. Nantes, France; July, 2006.
- Organizing MetaModelling'06. A Tutorial on Meta-Models, Meta-Classes and Meta-Objects by Prof. Stphane Ducasse. Brussels, Belgium; March, 2006.
- Organizing WOOR'05. ECOOP'05 Workshop on Object-Oriented Reengineering. A workshop organised as part of the European Conference on Object-Oriented Programming. Glasgow, UK; July, 2005.
- Organizing BENEVOL'04. 2nd BELgium Netherlands Workshop on software EVOLution. A workshop bringing together some groups from the nearby universities working on software evolution. Antwerp, Belgium; July, 2004.
- Organizing WOOR'04. ECOOP'04 Workshop on Object-Oriented Reengineering. A workshop organised as part of the European Conference on Object-Oriented Programming. Oslo, Norway; June, 2004.
- Organizing WOOR'03. ECOOP'03 Workshop on Object-Oriented Reengineering. A workshop organised as part of the European Conference on Object-Oriented Programming. Darmstadt, Germany; July, 2003.

## Chapter 3

# Research projects

Below is an overview of the projects where LORE participated in during the last 8 years (since its inception in 2000).

A detailed list (generated by the research administration of the University of Antwerp) of the research projects can be found in the appendix. According to the list attached, LORE has attracted **€3.019.020** of research funding over the period **1/10/2003 – 29/2/2008**. Members of the research group have also been involved as co-principle investigator in **€425.470** of research funding attracted by colleagues acting as principle investigator. A detailed list of these research projects too is attached herewith. Below is an overview.



	<b>Project Name</b>	<b>Period</b>	<b>LORE Budget</b>
<b>European Projects</b>			
	<i>RELEASE</i> : Research Links to Explore and Advance Software Evolution [Research network sponsored by the European Science Foundation]	2002-2004	93.660 EUR (TOTAL)
	<i>SEGRAVIS</i> : Syntactic and Semantic Integration of Visual Modelling Techniques [European research Training Network]	2002-2006	62.812 EUR
	<i>SERIOUS</i> : Software Evolution, Refactoring, Improvement of Operational and Usable Systems [ITEA – Eureka label]	2005-2008	495.000 EUR
<b>National Fund (Federal and Regional)</b>			
	<i>MoVES</i> : Fundamental issues in software engineering: Modelling, Verification and Evolution of Software [Sponsored by the federal government]	2007-2011	400.000 EUR
	“Separation of Concerns” with High-level Software Models [Grant/Regional fund]	2004-2008	135.174 EUR
	A formal foundation for software refactoring [Project/Regional fund]	2003-2006	227.480 EUR
	Formal support for the transformation of software models [Project/Regional fund]	2005-2008	235.200 EUR
	Transforming Human Interface Designs via Model Driven Engineering [Project/Regional fund]	2008-2011	234.000 EUR
	Foundation of software evolution [Network/Regional fund]	2001-2005	15.493 EUR
<b>With industrial sponsors</b>			
	<i>Optimma</i> : Optimized MP-Soc Middleware for Event-driven Applications [Basic Research Project / IWT]	2008-2011	523.798.01 EUR
	<i>ARRIBA</i> : Architectural Resources for the Restructuring and Integration of Business Application [Basic Research Project / IWT]	2002-2006	627.200 EUR

	<b>Project Name</b>	<b>Period</b>	<b>LORE Budget</b>
<b>With industrial sponsors (continued)</b>			
	<i>Volges</i> : from specific steering to a generic platform [SME Project / IWT]	2008-2011	93.930 EUR
	e-Business in the pharmaceutical care [SME Project / IWT]	2004	6.250 EUR
	Migration to Service-Oriented Architectures [Direct industrial sponsor / KBC and AXA]	2006-2010	243.000 EUR
<b>Sponsored by the University of Antwerp</b>			
	Development of energy conscious software refactoring techniques for embedded systems.	2004-2005	10.000 EUR
	Guidelines for Improving the Testprocess During Software Maintenance.	2006	29.900 EUR

**Faculty :** Faculteit Wetenschappen  
**Department :** Dept. Wiskunde-informatica  
**Team :** Lab On Reengineering (LORE)

**Project title :** Foundations of Software Evolution. **Id :** 3512

**Duration :** from 01/01/2001 until 31/12/2005 **Project type :** Research project

**Principal investigator :** Demeyer Serge from 01/01/2001 until 31/12/2005

**Funding :**

7005 FWO wetenschappelijke 01/01/2001 31/12/2005  
 onderzoeksgemeenschappen

**Budget : € 15.493,35**

**Project title :** Network on Proposed Software Evolution. (RELEASE) **Id :** 4476

**Duration :** from 01/01/2002 until 31/12/2004 **Project type :** Research project

**Principal investigator :** Demeyer Serge from 01/01/2002 until 31/12/2004

**Co-principal investigator :** Janssens Dirk from 01/01/2002 until 31/12/2004

**Funding :**

3914 ESF 01/01/2002 31/12/2004

**Budget : € 93.660,00**

**Project title :** ARRIBA : Architectural Resources for the Restructuring and Integration of Business Applications. **Id :** 784

**Duration :** from 01/10/2002 until 30/09/2006 **Project type :** Research project

**Principal investigator :** Demeyer Serge from 01/10/2002 until 30/09/2006

**Co-principal investigator :** Janssens Dirk from 01/10/2002 until 30/09/2006

**Funding :**

5018 GBOU (Generisch Basisonderzoek aan de 01/10/2004 30/09/2005  
 Universiteiten)  
 5018 GBOU (Generisch Basisonderzoek aan de 01/10/2005 30/09/2006  
 Universiteiten)  
 5018 GBOU (Generisch Basisonderzoek aan de 01/10/2003 30/09/2004  
 Universiteiten)  
 5018 GBOU (Generisch Basisonderzoek aan de 01/10/2002 30/09/2003  
 Universiteiten)

**Budget : € 627.200,00**

**Project title :** Development of energy conscious software refactoring techniques for embedded systems. **Id :** 4498

**Duration :** from 01/02/2004 until 31/12/2005 **Project type :** Research project

**Principal investigator :** Demeyer Serge from 01/02/2004 until 31/12/2005

**Co-principal investigator :** Dhaene Tom from 01/02/2004 until 31/12/2005

**Funding :**

541200016 BOF: Academiseringskredieten 01/02/2004 31/12/2005

**Budget : € 10.000,00**

**Faculty :** Faculteit Wetenschappen**Department :** Dept. Wiskunde-informatica**Team :** Lab On Reengineering (LORE)**Project title :** Ebusiness in the Farmaceutical Care. **Id :** 20159**Duration :** from 20/02/2004 until 31/08/2004 **Project type :** Research project**Principal investigator :** Demeyer Serge from 20/02/2004 until 31/08/2004**Funding :**

800000016	Koninklijke Apothekersvereniging van Antwerpen (KAVA)	20/02/2004	31/08/2004
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**Budget : € 6.250,00****Project title :** Formal support for the transformation of software models. **Id :** 4662**Duration :** from 01/01/2005 until 31/12/2008 **Project type :** Research project**Principal investigator :** Demeyer Serge from 01/01/2005 until 31/12/2008**Co-principal investigator :** Janssens Dirk from 01/01/2005 until 31/12/2008**Funding :**

7010	FWO Groepsprojecten	01/01/2005	31/12/2005
7010	FWO Groepsprojecten	01/01/2007	31/12/2007
7010	FWO Groepsprojecten	01/01/2006	31/12/2006
7010	FWO Groepsprojecten	01/01/2008	31/12/2008

**Budget : € 235.200,00****Project title :** Workshop on Object-Oriented reengineering. **Id :** 20364**Duration :** from 01/06/2005 until 30/09/2005 **Project type :** Collaboration  
Research project**Principal investigator :** Demeyer Serge from 01/06/2005 until 30/09/2005**Funding :**

3914	ESF	01/06/2005	30/09/2005
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**Budget : € 5.360,00****Project title :** International workshop on principles of software evolution. **Id :** 20450**Duration :** from 01/09/2005 until 30/09/2005 **Project type :** Collaboration  
Research project**Principal investigator :** Demeyer Serge from 01/09/2005 until 30/09/2005**Funding :**

3914	ESF	01/09/2005	30/09/2005
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**Budget : € 6.222,17****Project title :** ITEA SERIOUS : Software evolution, refactoring of operational & usable systems. **Id :** 20477**Duration :** from 01/09/2005 until 31/08/2008 **Project type :** Research project**Principal investigator :** Demeyer Serge from 01/09/2005 until 31/08/2008**Funding :**

800100004	Alcatel Bell	01/09/2005	31/08/2008
8020	IWT - indirecte financiering via de bedrijfswereid	01/09/2005	31/08/2008

**Budget : € 495.000,00**

**Faculty :** Faculteit Wetenschappen**Department :** Dept. Wiskunde-informatica**Team :** Lab On Reengineering (LORE)**Project title :** Guidelines for Improving the Testprocess During Software Maintenance. **Id :** 20835**Duration :** from 01/01/2006 until 31/12/2006 **Project type :** Research project**Principal investigator :** Demeyer Serge from 01/01/2006 until 31/12/2006**Fellow :** Van Rompaey Bart from 01/01/2006 until 31/12/2006**Funding :**

541200004 BOF: Opvangmandaten IWT 01/01/2006 31/12/2006

**Budget : € 29.900,00****Project title :** Chair "Migration to Service Oriented Architectures". **Id :** 21265**Duration :** from 01/09/2006 until 31/12/2010 **Project type :** Research project**Principal investigator :** Demeyer Serge from 01/09/2006 until 31/12/2010**Funding :**

800200005 KBC 01/09/2006 31/12/2010

800200006 AXA Belgium nv. 01/09/2006 31/12/2010

**Budget : € 243.000,00****Project title :** Fundamentele belangen in Software Engineering: Modelleren, Verifiëren en Evoluëren van Software. (MoVES) **Id :** 21356**Duration :** from 01/01/2007 until 31/12/2011 **Project type :** Collaboration  
Research project**Principal investigator :** Demeyer Serge from 01/01/2007 until 31/12/2011**Co-principal investigator :** Paredaens Jan from 01/01/2007 until 31/12/2011**Co-principal investigator :** Janssens Dirk from 01/01/2007 until 31/12/2011**Funding :**

4106 IUAP-VI (1/1/2007-31/12/2011) 01/01/2009 31/12/2009

4106 IUAP-VI (1/1/2007-31/12/2011) 01/01/2011 31/12/2011

4106 IUAP-VI (1/1/2007-31/12/2011) 01/01/2007 31/12/2007

4106 IUAP-VI (1/1/2007-31/12/2011) 01/01/2008 31/12/2008

4106 IUAP-VI (1/1/2007-31/12/2011) 01/01/2010 31/12/2010

**Budget : € 400.000,00****Project title :** From specific targeting to a generic target platform (VOLGES). **Id :** 22337**Duration :** from 29/10/2007 until 28/10/2009 **Project type :** Research project**Principal investigator :** Demeyer Serge from 29/10/2007 until 28/10/2009**Funding :**

8020 IWT - indirecte financiering via de bedrijfswereld 29/10/2007 28/10/2009

**Budget : € 93.930,00**

**Faculty :** Faculteit Wetenschappen

**Department :** Dept. Wiskunde-informatica

**Team :** Lab On Reengineering (LORE)

**Project title :** Transforming Human Interface Designs via Model Driven Engineering. **Id :** 22226

**Duration :** from 01/01/2008 until 31/12/2011 **Project type :** Collaboration  
Research project

**Principal investigator :** Demeyer Serge from 01/01/2008 until 31/12/2011

**Co-principal investigator :** Janssens Dirk from 01/01/2008 until 31/12/2011

**Funding :**

7010	FWO Groepsprojecten	01/01/2010	31/12/2010
7010	FWO Groepsprojecten	01/01/2011	31/12/2011
7010	FWO Groepsprojecten	01/01/2009	31/12/2009
7010	FWO Groepsprojecten	01/01/2008	31/12/2008

**Budget : € 234.000,00**

**Project title :** Optimized MP-SoC Middleware for Event-driven Applications. **Id :** 22249

**Duration :** from 01/01/2008 until 31/12/2011 **Project type :** Research project

**Principal investigator :** Demeyer Serge from 01/01/2008 until 31/12/2011

**Funding :**

5020	SBO (Strategisch Basisonderzoek)	01/01/2008	31/12/2011
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**Budget : € 523.798,01**

**Lab On Reengineering (LORE)** number of projects : 15

**Total budget : € 3.019.013,53**

**Team :** Formal techniques in software engineering (FOTS)

**Project title :** Syntactic and Semantic Integration of Visual Modelling Techniques. (SegraVis)

**Id :** 4160

**Duration :** from 01/10/2002 until 30/09/2006 **Project type :** Research project

**Principal investigator :** Janssens Dirk from 01/10/2002 until 30/09/2006

**Co-principal investigator :** Demeyer Serge from 01/10/2002 until 30/09/2006

**Funding :**

3507	HUMAN POTENTIAL (Menselijk onderzoekspotentieel en verdieping van kennis op sociaal-econ. gebied)	01/10/2002	30/09/2006
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**Budget : € 62.812,00**

**Project title :** A Formal Foundation for Software Refactoring.

**Id :** 4113

**Duration :** from 01/01/2003 until 31/12/2006 **Project type :** Research project

**Principal investigator :** Janssens Dirk from 01/01/2003 until 31/12/2006

**Co-principal investigator :** Demeyer Serge from 01/01/2003 until 31/12/2006

**Funding :**

7010	FWO Groepsprojecten	01/01/2003	31/12/2003
7010	FWO Groepsprojecten	01/01/2004	31/12/2004
7010	FWO Groepsprojecten	01/01/2005	31/12/2005
7010	FWO Groepsprojecten	01/01/2006	31/12/2006

**Budget : € 227.480,00**

**Project title :** "Separation of Concerns" with High Level Software Models.

**Id :** 4706

**Duration :** from 01/10/2004 until 30/09/2006 **Project type :** Research project

**Principal investigator :** Janssens Dirk from 01/10/2004 until 30/09/2006

**Co-principal investigator :** Demeyer Serge from 01/10/2004 until 30/09/2006

**Fellow :** Schippers Hans from 01/10/2004 until 30/09/2006

**Funding :**

541200018	BOF: Rugzak FWO	01/10/2004	31/12/2005
700300001	FWO tijdelijke mandaten: aspirant	01/10/2004	30/09/2006

**Budget : € 65.780,00**

**Project title :** "Separation of Concerns" with High Level Software Models.

**Id :** 21090

**Duration :** from 01/10/2006 until 30/09/2008 **Project type :** Research project

**Principal investigator :** Janssens Dirk from 01/10/2006 until 30/09/2008

**Co-principal investigator :** Demeyer Serge from 01/10/2006 until 30/09/2008

**Fellow :** Schippers Hans from 01/10/2006 until 30/09/2008

**Funding :**

541200018	BOF: Rugzak FWO	01/10/2006	30/09/2008
700300002	FWO tijdelijke mandaten: aspirant 1ste hernieuwing	01/10/2006	30/09/2008

**Budget : € 69.394,00**

**Demeyer Serge**

**Co-principal investigator**

number of projects

4

**total budget : €**

**425.466,00**

# Serge Demeyer — Short CV

<b>Name:</b>	Serge Demeyer	<b>Faculty:</b>	Sciences
<b>Date of birth :</b>	22.11.1965	<b>Department:</b>	Mathematics and Computer Science
<b>Position:</b>	Professor (“Hoofdocent”)	<b>Research team:</b>	LORE (Lab on Reengineering)

Serge Demeyer is a professor at the University of Antwerp (Department of Mathematics and Computer Science) where he leads a research group investigating the theme of “Software Reengineering” (LORE - Lab On REengineering). His main research interest concerns software engineering (more precisely, reengineering in an object-oriented context) but due to historical reasons he maintains a heavy interest in hypermedia systems as well. He is an active member of the corresponding international research communities, serving in various conference organization and program committees.

He has written a book entitled “Object-Oriented Reengineering” and edited a book on “Software Evolution”. He also authored a considerable amount of peer reviewed articles, some of them in highly respected scientific journals. He completed his M.Sc. in 1987 and his Ph.D. in 1996, both at the “Vrije Universiteit Brussel”. After his Ph.D., he worked for three years in Switzerland, where he served as a technical co-ordinator of an European research project.

<b>Institution and location</b>	<b>Degree</b>	<b>Year(s)</b>	<b>Field of study</b>
Vrije Universiteit Brussel	Bachelor	1985	Computer Science
Vrije Universiteit Brussel	Master	1987	Computer Science
Vrije Universiteit Brussel	PhD	1996	Sciences

## Career

- 10/1987 - 09/1996: Researcher (PROG - University of Brussels) (in between 09/1988 - 09/1989: Military Service)
- 10/1996 - 12/1999: Post-doc; technical coordinator of an ESPRIT Project (SCG - University of Berne, Switzerland)
- Since 01/2000: Professor leading the research group LORE (Lab On Reengineering - University of Antwerp)