

Lionel Morel

Current Position: Assistant Professor at Université de Lyon, FRANCE

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Current Position

Since 2010 — Assistant Professor - **CITI Lab**, Computer Science and Information Technologies Department, INSA de Lyon, **University de Lyon**, FRANCE.

Employment History

2007-09 — Assistant Professor - LIESP Lab, Computer Science and Information Technologies Department, INSA de Lyon, **University de Lyon**, FRANCE.

2006-07 — Post-doctoral researcher - **INRIA**, Espresso team, Rennes, FRANCE.

2005-06 — Post-doctoral researcher - Embedded Systems Lab, Computer Science Department, **Åbo Akademi**, Turku, FINLAND.

2004-05 — Teaching and Research Assistant - **Verimag lab**, ENSIMAG, INPG, Université de Grenoble, FRANCE.

2001-04 — CNRS Doctoral Fellow. PhD student at **Verimag**, Grenoble, FRANCE.

2001 — Research Intern - Computer Science and Mathematics Department, **University of Stirling**, SCOTLAND.

Education

2005 — PhD in Computer Science - Institut National Polytechnique de Grenoble, FRANCE

2001 — MSc in Computer Science - Université de Grenoble, FRANCE

1999 — BSc in Computer Science - Université de Grenoble, FRANCE

Main Research Topics and Interests

Compilation and Formal Verification applied to Synchronous Languages

Runtimes and Operating Systems Support for Dataflow/Streaming Languages

Programming Models for Parallel Systems

Performance Measurement and Performance-Aware Runtime and Operating Systems

Scientific Production

International Journal	1	National Conference	2
International Conference	16	Research Reports	3

Projects

Here is a list of research projects/tools I've been involved in.

- 2011-...** — **PERF4DF**¹ — Performance Evaluation and Performance-Aware Runtimes for Dataflow Programs on NUMA Processors. In collaboration with Manuel Selva (formerly INSA Lyon), Kevin Marquet (INSA Lyon), and (more recently) Junaid Ahmad (EPFL) and Marco Mattavelli (EPFL). The project essentially deals with:
- Instrumenting dataflow (RVC-Cal²) programs with calls to numap³ and PAPI⁴ functions in order to get metrics about memory usage of such programs while running on NUMA processors;
 - Enhancing RVC-Cal runtime and compiler in order to accelerate the execution of CAL programs on NUMA processors;
 - Benchmarking these compilation and runtime choices on NUMA processors. Experimentations are run on the grid5000 infrastructure⁵.
- The project is a direct continuation of Manuel Selva's PhD work. You can check out publications and posters on <http://lionel.morel.ouvaton.org/wp/>.
- 2007-09** — Modeling Multi-Task Device Drivers using Synchronous Languages. In collaboration with Belgacem Ben Hedia (then INSA Lyon, now CEA) and Jean-Philippe Babau (then INSA Lyon, now UBO, Brest), we showed how multi-task applications can be modeled in a synchronous language and how this model can be used to prove temporal properties on such applications.
- 2005-06** — **Rialto 2.0** — A Language for Heterogeneous Computations, I contributed defining while working as a PostDoc with Professor Johan Lilius, at Åbo Akademi, Finland. The idea of Rialto was to provide language constructs to let programmer design both essential pieces of the semantics of different models of computations *and* programs themselves. Programs could mix components of different models of computation, letting the compiler instantiate details of the interactions between the various models of computation.
- 2005-06** — **ITCEE** — Improving Transient Control and Energy Efficiency by digital hydraulics, together with Pontus Boström and Marina Walden, at Åbo Akademi, Finland. In this project, we proposed a mode-automata-like restriction of Simulink/Stateflow and the use of assume-guarantee contracts in order to help design and reason about digital controllers for hydraulics systems. The work was in collaboration with Matti Linjama and Lauri Siivonen from the Institute of Hydraulics and Automation at the Tampere University of Technology, Finland.
- 2002-05** — **GOuPIL** — A graphical tool that allows a Lustre⁶ programmer to apply various program transformations in order to ease formal validation. Techniques implemented in GOuPIL are the results of my PhD work and leveraged language constructions such as assume-guarantee contracts and array iterators to help the formal proof of safety properties on safety-critical program designed with the Lustre synchronous language.

¹See <https://gforge.inria.fr/projects/perf4df>

²See <http://orcc.sourceforge.net/>

³See <https://github.com/numap-library/numap>

⁴See <http://icl.cs.utk.edu/papi/pubs/index.html>

⁵See <http://www.grid5000.fr>

⁶See [https://en.wikipedia.org/wiki/Lustre_\(programming_language\)](https://en.wikipedia.org/wiki/Lustre_(programming_language))

Doctoral Supervision

2011-2015 — Manuel Selva - Université de Lyon

Title *Performance Monitoring of Throughput Constrained Dataflow Programs Executed on Shared-Memory Multi-core Architectures*

Jury Jean-François Nezan, Full Professor, INSA Rennes (reviewer)
Eduard Ayguadé, Full Professor, University of Catalunya (reviewer)
Albert Cohen, Research Director, INRIA (examiner)
Marco Mattavelli, Full Professor, EPFL (examiner)
Stéphane Frénot, Full Professor, INSA Lyon (director)
Kevin Marquet, Associate Professor, INSA Lyon (co-supervisor)
Lionel Morel, Associate Professor, INSA Lyon (supervisor)

Other Supervisions

- 2014-2015** — **Sebastian Bacanu, Kamil Deja, Max Thonagel** - Undergrad R&D project.
Topic: Programming a Many-Core platform: experiments with the Kalray MPPA.
- 2014** — **Tewodros Deneke** - PhD student from the Embedded Systems Lab at Åbo Akademi University, Turku Finlande. 6 months visit at the CITI Lab, June to December 2014.
Topic: Integration of a dataflow hevc decoder into the ffmpeg transcoding framework.
- 2014** — **Coralie SAYSSET** - MSc Université de Lyon - INSA Lyon.
Topic: Evaluation of the memory usage of dataflow programs.
- 2013** — **Franco di Pietro** - Bachelor R&D Project. National University of Santiago, Argentina.
Topic: Energy profiling methodology for micro-controller based embedded systems-
Co-supervised with Guillaume Salagnac.
- 2011** — **Moemen Cherni** - Degree Project, l'École Supérieure des Communications de Tunis.
Topic: Dynamic Extraction of temporal specifications for admission control of service-oriented applications.
- 2010** — **Chinmay Malaviya** - Bachelor R&D Project, Nanyang Technological University, School of Computer Engineering.
Topic: Deployment of Ambient Applications in Real Time Platforms.
- 2007-2008** — **Mohammed Hindawi** - MSc l'INSA de Lyon.
Topic: Description and Implementation of UML Guide Styles. Co-supervised with J-L Sourrouille, LIESP Laboratory, INSA.

PhD Jurys

- 2017** — **Małgorzata Maria Michalska**
Title: Systematic Design Space Exploration of Dynamic Dataflow Programs on Multi-core Platforms. School: École Polytechnique Fédérale de Lausanne, EPFL, Switzerland. **reviewer**.
- 2013** — **Fareed Ahmed Jokhio**
Title: Video Transcoding in a Distributed Cloud Computing Environment. School: Åbo Akademi University, Finland. **reviewer**.

Publications

Journals

- [J1] *Lionel Morel*. Array Iterators in Lustre: From a Language Extension to Its Exploitation in Validation. *EURASIP Journal on Embedded Systems*, page 59130, 2007.
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Conferences

- [C2] Manuel Selva, *Lionel Morel*, and Kevin Marquet. numap: A portable library for low level memory profiling. In *2016 International Conference on Embedded Computer Systems: Architectures, Modeling, and Simulation, SAMOS 2016, Samos, Greece, July 18-21, 2016*, 2016.
- [C3] Manuel Selva, *Lionel Morel*, Kevin Marquet, and Stéphane Frénot. Une Bibliothèque Portable de Profilage Mémoire Bas-Niveau. In *COMPAS 2016 - Conférence d'informatique en Parallélisme, Architecture et Système*, Lorient, France, June 2016. Inria, N/A.
- [C4] Manuel Selva, *Lionel Morel*, Kevin Marquet, and Stéphane Frénot. A Monitoring System for Runtime Adaptations of Streaming Applications. In *International Conference on Parallel, Distributed and Network-based Processing*, International Conference on Parallel, Distributed and Network-based Processing, Turku, Finland, March 2015.
- [C5] Tewodros Deneke, *Lionel Morel*, Sébastien Lafond, and Johan Lilius. Integration of Dataflow Components Within a Legacy Video Transcoding Framework. In *2015 IEEE Workshop on Signal Processing Systems, SiPS 2015*, Hangzhou, China, October 2015.
- [C6] Manuel Selva, *Lionel Morel*, Kevin Marquet, and Stéphane Frénot. Extending dataflow programs for guaranteed throughput. In *MES '13 - International Workshop on Many-core Embedded Systems*, Proceedings of the First International Workshop on Many-core Embedded Systems, pages 54–57, Tel Aviv, Israel, June 2013. ACM.
- [C7] Manuel Selva, *Lionel Morel*, Kevin Marquet, and Stéphane Frénot. A QoS Monitoring System for Dataflow Programs. In *COMPAS 2013 - Conférence d'informatique en Parallélisme, Architecture et Système*, Grenoble, France, January 2013. Inria, N/A.
- [C8] Johan Lilius, Andreas Dahlin, and *Lionel Morel*. Rialto 2.0: A Language for Heterogeneous Computations. In *Distributed, Parallel and Biologically Inspired Systems*, pages 7–18, Brisbane, Australia, September 2010.
- [C9] *Lionel Morel*, Jean-Philippe Babau, and Belgacem Ben Hedia. Formal modelling framework of data acquisition software using a synchronous approach for timing analysis. In *30th IFAC Workshop on Real-Time Programming and 4th International Workshop on Real-Time Software (WRTP/RTS'09)*, pages 1–8, Mragowo, Poland, October 2009.
- [C10] Firas Alhalabi, Narkoy Batouma, Mathieu Maranzana, *Lionel Morel*, and Jean-Louis Sourrouille. Centralized vs. Decentralized QoS Management policy. In *ICTTA'08*, pages 1–6, Damas, Syria, April 2008. IEEE Press.
- [C11] Mohammed Hindawi, *Lionel Morel*, Régis Aubry, and Jean-Louis Sourrouille. Description and Implementation of a UML Style Guide. In *Workshop Quality in Modeling*, LNCS 5241, pages 291–302, France, September 2008. Springer Verlag. Version courte.

- [C12] Mohammed Hindawi, *Lionel Morel*, Régis Aubry, and Jean-Louis Sourrouille. Description and Implementation of a Style Guide for UML. In Jean-Louis Sourrouille & Al, editor, *Quality in Modeling (co-located with MODELS'08)*, pages 31–45, Toulouse, France, September 2008.
- [C13] Jean-Louis Sourrouille, Mohammed Hindawi, *Lionel Morel*, and Régis Aubry. Specifying consistent subsets of UML. In Michal Šmialek, editor, *Educator symposium (co-located with Models'08)*, pages 26–38, Toulouse, France, September 2008. Warsaw University of Technology.
- [C14] *Lionel Morel* and Pontus Boström. Design and Validation of Digital Controllers for Hydraulic Systems. In *Tenth Scandinavian International Conference on Fluid Power*, page 1, Finland, 2007.
- [C15] *Lionel Morel* and Pontus Boström. Design and Implementation of Energy Saving Digital Hydraulic Control System. In *The Tenth Scandinavian International Conference on Fluid Power (SICFP)*, page 1, Finland, 2007.
- [C16] *Lionel Morel* and Louis Mandel. Executable Contracts for Incremental Prototypes of Embedded Systems. In *Formal Foundations of Embedded Software and Component-Based Software Architectures (FESCA)*, pages 121–135, Portugal, 2007.
- [C17] *Lionel Morel*, Pontus Boström, and Marina Waldén. Stepwise development of Simulink models using the refinement calculus framework. In *ICTAC'07 - International Colloquium on Theoretical Aspects of Computing*, pages 79–93, Macao, China, September 2007.
- [C18] *Lionel Morel* and Florence Maraninchi. Arrays and contracts for the specification and analysis of regular systems. In *Application of Concurrency to System Design, 2004. ACSD 2004. Proceedings. Fourth International Conference on*, pages 57–66, Hamilton, Canada, June 2004.
- [C19] *Lionel Morel* and Florence Maraninchi. Logical-time contracts for reactive embedded components. In *Euromicro Conference, 2004. Proceedings. 30th*, pages 48 – 55, Rennes, France, September 2004.
- [C20] *Lionel Morel*. Efficient compilation of array iterators for Lustre. In *Synchronous Languages and Applications*, page 1, France, 2002.

Thesis

- [T21] *Lionel Morel*. *Exploitation des structures régulières et des spécifications locales pour le développement correct de systèmes réactifs de grande taille*. Theses, Institut National Polytechnique de Grenoble - INPG, March 2005.
- [T22] *Lionel Morel*. Compilation Efficace d'itérateurs de Tableaux Lustre. Master's thesis, Université Joesph Fourier - Grenoble I, 2001.

Technical and Research Reports

- [R23] Manuel Selva, *Lionel Morel*, and Kevin Marquet. numap: A Portable Library For Low Level Memory Profiling. Research Report RR-8879, INRIA, March 2016.
- [R24] Pontus Boström and *Lionel Morel*. Mode-automata in stateflow/simulink. Technical Report 772, TUCS (Turku University Computer Science), 2006.
- [R25] Pontus Boström, Matti Linjama, *Lionel Morel*, Lauri Siivonen, and Marina Waldén. Design and validation of digital controllers for hydraulics systems. Technical Report 800, TUCS (Turku University Computer Science), 2006.

Seminars

- 2017** — Séminaire d'Informatique pour les Etudiants, Scientifiques, et Tous ceux que l'informatique intéressé à l'ENS Lyon (SIESTE)— “Synchronous Languages 101”.
- 2016** — Journée Langages LIP ENS Lyon— “Synchronous Languages 101”, together with Laure Gonnord.
- 2015** — Journée Calcul LIP ENS Lyon — “NUMA Profiling for Dynamic Dataflow Applications”.
- 2014** — Seminar on Compilation and Execution of Streaming Programs — “Runtime Monitoring of Throughput-Constrained Dataflow Programs”
- Regional day on Embedded Systems (SEMBA) — “Runtime Monitoring of Throughput-Constrained Dataflow Programs”
- 2013** — Seminar at the Turku University Computer Science Departement — “Dataflow Models of Computations and Languages”.
- Presentation to members of GRAME (see <http://www.grame.fr/>) — “Compilation and Execution of Dataflow Programs”, together with Kevin Marquet.
- 2011** — Seminar at the Turku University Computer Science Departement — “Synchronous Languages”.
- Seminar at the Turku University Computer Science Departement — “Building Ambient Systems”.
- 2010** — Seminar at the CITI Lab — “Java for real-time”.
- Seminar at the CITI Lab — “Lustre – a synchronous life”.
- Seminar at the CITI Lab — “Formal Modeling of Multi-Task Device Drivers for the Validation of Timing Properties”.
- 2009** — Workshop Synchron — “Formal Modeling of Multi-Task Device Drivers for the Validation of Timing Properties”.
- 2007** — Verimag Workshop — “Rialto: A language for heterogeneous computations”.
- LIESP Lab Seminar (INSA) — “Executable Contracts for Incremental Prototypes of Embedded Systems”.
- 2006** — ARTIST Workshop on Models of Computations and Concurrency — “Rialto: A language for heterogeneous computations”.

Titles, grants and service

- 2016-17** — I hold a Région Rhône-Alpes Grant, for cooperation with Marco Mattavelli's group at EPFL, Lausanne, Switzerland.
- 2015 ...** — I'm PC member for PDP's special session on Energy Efficient Management of Parallel Systems, Platforms and Computations.
- 2014 ...** — I'm INSA Lyon's **supervisor for exchange programs with partner universities in Denmark and Finland**.
- 2012 ...** — I'm elected at the CITI Lab's council, acting as **council chairman**.
- 2011 ...** — I hold the title of **Docent from Åbo Akademi University**, in Turku, Finland.
I'm a regular reviewer for the following conferences: DATE, ISVLSI, PDP.

Teaching

I do most of my teaching at the Computer Science Department, INSA Lyon, Université de Lyon.

Present

Currently, I'm in charge (lecturer) of the following courses:

- Since Sept 2016** — **Computer Organization**, run together with Christian Wolf, at the Computer Science and Information Technologies Dept, INSA Lyon.
- Since 2015** — together with Christian Wolf, I run the **Programming Massively Parallel Processors (GPUs)**, as part of the M2 curriculum at the Computer Science and Information Technologies Dept, INSA Lyon.
- Since 2012-13** — together with Guillaume Salagnac, I run the **Operating Systems** course which is part of the Information Science & Technologies Semester organized by INSA Lyon for english-speaking students.

Apart from the courses mentioned above, I'm regularly involved (teaching assistant) in courses including:

- 2016-17** — **Compiler Design**, at INSA Lyon, run by Eric Guérin and Florent de Dinechin.
- Since 2013** — **Advanced Operating Systems**, at INSA Lyon, run by Kevin Marquet.
- 2016-17** — **Operating Systems**, at INSA Lyon, run by Guillaume Salagnac.
- Since 2015** — **Computer Organization**, at Université Lyon 1, run by Nicolas Louvet and Laure Gonnord.
- 2016-17** — **Compiler Design**, at École Normale Supérieur de Lyon, run by Laure Gonnord.

Past

In the more or less recent past, I've been in charge (lecturer) of the following course:

- 2008-2013** — I was in charge of the **Advanced Operating Systems** course, at INSA Lyon.
- 2010-2013** — I was in charge of the **Embedded Software** course, within the Master of Science in Embedded Systems, Université Libanaise, Beyrouth, Lebanon.
- 2005-2006** — I was in charge of the course **Models of Computations and Concurrency**, within the Master's degree in Embedded Computing, at Åbo Akademi, Turku, Finland.