Alessandro Pellegrini

Curriculum Vitæ

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Personal Information

first name	Alessandro
last name	Pellegrini
place/date of birth	Roma (Italy), Wednesday 7th January, 1987
nationality	Italian

Academic Positions

December 2014 present	**Research Fellow**, *Sapienza, University of Rome*.
September 2015 October 2015	**Visiting Researcher**, *Barcelona Supercomputing Center (BSC)*. Visit funded by the "Severo Ochoa" Excellence Program
June 2014 May 2016	**Researcher**, *IRIANC—International Research Institute for Autonomic Network Computing*. Researcher for the EU FP7 Project–Panacea.
April 2014 February 2015	**Researcher**, *CINFAI—Consorzio Interuniversitario Nazionale per la Fisica delle Atmosfere e delle Idrosfere*. Researcher for the project SIGMA (Italian PON R&C), to develop an integrated cloud system for the acquisition and management of data coming from heterogeneous sensor networks.

Teaching Activities

October 2018 present	**Contract Professor**, *University of Rome "Tor Vergata"*. Professor of the Technologies and Methodologies for the Development and Management of Data Bases course, integrative to the Data Bases and Knowledg course in the Bachelor's Degree in Computer Engineering
March 2018 present	**Contract Professor**, *Sapienza, University of Rome*. Professor of the Advanced Operating Systems and Virtualization course in the Master's Degree in Computer Engineering and Cyber Security
2015 present	**Lecturer**, *Sapienza, University of Rome*. Assistant for the "*Computer Architectures*" course, in the Bachelor's Degree in Computer Science
May 2018	**Contract Professor**, *Luiss Business School*. Professor of the Data Management for Big Data Introduction course in the Big Data Management Master
2015 2017	**Lecturer**, *Sapienza, University of Rome*. Lecturer for the "*Data Centers and High Performance Computing*" course, in the Master's Degree in Computer Science
October 2014 November 2014	**Lecturer**, *CINI—Consorzio Interuniversitario Nazionale per l'Informatica*. Course on Distributed Simulation for the Private/Public COSMIC Laboratory

2011	**Lecturer**, *Sapienza, University of Rome*.
2015	Lecturer for the "*Concurrent and Parallel Programming*" course, in the Master's Degree "*Computer Architectures and Distributed Systems*"
2012	**Lecturer**, *Sapienza, University of Rome*.
2013	Assistant for the "*Computer Architectures*" course, in the Bachelor's Degree in Computer Science
2011	**Lecturer**, *Sapienza, University of Rome*.
2012	Assistant for the "*Operating Systems*" course, in the Bachelor's Degree in Computer Science

Awards and Honors

2016	**Best Paper Award**, *20th International Symposium on Distributed Simulation and Real Time Applications (DS-RT)*.
	Award for the paper "A Lock-Free O(1) Event Pool and its Application to Share-Everything PDES Platforms"
2015	**Best PhD Thesis of the year**, *Sapienza Università Editrice*.
2012	**Best Paper Award**, *5th International ICST Conference on Simulation Tools and Techniques (SIMUTools)*.
	Award for the paper "Cache-Aware Memory Manager for Optimistic Simulations"

Memberships and Societies

October 2018 present	**HiPEAC**, *European Network on High Performance and Embedded Architecture and Compilation*, Member.
March 2012 present	**IEEE**, *Institute of Electrical and Electronics Engineers*, Member.
November 2011 present	**ACM**, *Association for Computing Machinery*, Member.

Work Experience

June 2016 December 2017	**Consultant**, *DGSIA—Direzione generale per i sistemi informativi automatizzati, Italian Ministry of Justice*.
	Assessment of the National Telematic Criminal Trial System
February 2012 October 2012	**Consultant**, *IES—Ingegneria Elettronica Sistemi s.r.l.*
	Project of a redundancy system for the HElabor microcontroller, and reliability assessment
July 2011 September 2011	**Consultant**, *Poste Italiane S.p.A.*
	Assessment and Capacity Analysis of the Business Main Core Infrastructure

National/International Projects

November 2008 present	**ROOT-Sim**, *The ROme OpTimistic Simulator*, Open Source Software Project.
	The ROme OpTimistic Simulator is an Open Source parallel/distributed HPC simulation platform, based on a simulation kernel layer that ultimately relies on MPI for data exchange. The platform transparently supports all the mechanisms associated with parallelization and optimistic synchronization.

June 2014 May 2016	**PANACEA**, *Proactive Autonomic Management of Cloud Resources*, EU FP7 Project.

The main objective of the PANACEA project is to provide Proactive Autonomic Management of Cloud Resources, based on Machine Learning, as a remedy to the exponentially growing Cloud complexity. Main targets are: i) proactive autonomic management of Cloud resources, ii) proactive software migration within the Cloud(s), iii) efficient usage of Cloud resources, iv) monitoring, controlling, and proactively managing applications' execution.

April 2014 February 2015	**SIGMA**, *Sistema Integrato di sensori in ambiente Cloud per la Gestione Multirischio Avanzata*, National Italian Project.

The Integrated Sensors System in Cloud Environments for Advanced Multirisk Management (SIGMA) is a multi-layered architecture for acquiring, integrating, and elaborating heterogeneous data coming from differentiated sensor networks. Its goal is to enhance (both environmental and factory) monitoring and control systems to provide data useful for the prevention of risk situations.

Peer-Review Activities and Service

Editorial Boards

2019 **TOMACS**, *Editorial Board for PADS 2018 Special Issue*, ACM.

Chairmanship

2019 **Reproducibility Co-Chair**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (PADS)*.

2018 **General Co-Chair**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (PADS)*.

2016 **Program Co-Chair**, *IEEE International Symposium on Network Computing and Applications (NCA)*.

2016 **Financial Chair**, *IEEE International Symposium on Network Computing and Applications (NCA)*.

2015 **Financial Chair**, *IEEE International Symposium on Network Computing and Applications (NCA)*.

Review Activity for Journals

SIMPAT, *Journal of Simulation Modelling Practice and Theory*, Elsevier.

TOMACS, *Transactions of Modeling and Computer Simulation*, ACM.

JPDC, *Journal of Parallel and Distributed Computing*, Elsevier.

NGC, *New Generation Computing*, Springer.

IEEE Access, IEEE.

CBM, *Computers in Biology and Medicine*, Elsevier.

COMLAN, *Computer Languages, Systems and Structures*, Elsevier.

Scientific Programming, Hindawi.

JSS, *Journal of Systems and Software*, Elsevier.

SoftwareX, Elsevier.

Conference Program Committees

2017 present	**ACM SIGSIM PADS**, *PC Member of the ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*.
2015 present	**IEEE/ACM DS-RT**, *PC Member of the IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*.

2015 2017	**IEEE NCA**, *PC Member of the IEEE International Symposium on Network Computing and Applications (NCA).*
2015 2017	**IEEE DPDNS**, *PC Member of the Workshop on Dependable Parallel, Distributed and Network-Centric Systems (DPDNS).*
2014 present	**SIMULTECH**, *PC Member of the Workshop on Dependable Parallel, Distributed and Network-Centric Systems (DPDNS).*

Education

November 2010 November 2013	**PhD Course**, *Sapienza, University of Rome*, Judgment: Outstanding. Thesis Title: **Techniques for Transparent Parallelization of Discrete Event Simulation Models**
December 2010	**Licence to Practice Computer Engineering**, *Sapienza, University of Rome*.
November 2008 November 2010	**Master's Degree in Computer Engineering**, *Sapienza, University of Rome*, Mark: *110/110*. Thesis Title: **Autonomic State Saving of Simulation Objects in Optimistic Simulation Systems**
November 2005 November 2008	**Bachelor's Degree in Computer Engineering**, *Sapienza, University of Rome*, Mark: *105/110*. Thesis Title: **Efficient and Transparent Tracking of Dynamic Memory Updates with Arbitrary Granularity in Optimistic Simulation Architectures**
November 2000 November 2005	**Classical Lyceum Diploma**, *Pontificio Istituto Apollinare*, Rome, Italy, Mark: *100/100*.

Languages

Italian	Mother Tongue	
English	Proficient (C2)	*CAE – Cambridge University (2004). Mark: C* *FCE – Cambridge University (2003). Mark: B* *PET – Cambridge University (2002). Mark: Passed* *KET – Cambridge University (2001). Mark: Passed with Merit*
Spanish	Independent (B2)	*Diploma Básico de Español – Cervantes (2002). Mark: 81/100*
French	Independent (B1)	*DELF 1 – St. Louis de France (2002). Mark: 12,35/20*
Japanese	Entry level	

Technical Skills

- Software Requirements: techniques and modeling
- Hardware Requirements: project and development
- Assessment of Large Scale Systems
- Development of non-critical embedded devices
- Development of dedicated management software

Computer Skills

Operating Systems	Unix, Windows
Programming Languages	C, Assembly, PHP, C++, Java, HTML5, CSS, SQL
Office Automation	LaTeX, Microsoft Office
Graphics and Multimedia	Adobe Photoshop, Adobe Premiere, Adobe Audition, Adobe After Effects, The Gimp

Artistic Skills

- Studied piano for 14 years
- Studied violin for 5 years
- Self-learning guitarist

Attachments

1 List of Publications
2 Summary of the Ph.D. Thesis

Attachment 1: List of Publications

Books

[1] Alessandro Pellegrini. *Parallelization of Discrete Event Simulation Models*. Studi e Ricerche. Sapienza Università Editrice, November 2015.

Book Chapters

[2] Diego Rughetti, Pierangelo Di Sanzo, Alessandro Pellegrini, Bruno Ciciani, and Francesco Quaglia. Tuning the level of concurrency in software transactional memory: An overview of recent analytical, machine learning and mixed approaches. In Rachid Guerraoui and Paolo Romano, editors, *Transactional Memory. Foundations, Algorithms, Tools, and Applications*, volume 8913 of *Lecture Notes in Computer Science*, pages 395–417. Springer International Publishing, 2015.

[3] Francesco Quaglia, Alessandro Pellegrini, and Roberto Vitali. Reshuffling PDES platforms for multi/many-core machines: a perspective with focus on load sharing. In Daniele Gianni, Andrea D'Ambrogio, and Andreas Tolk, editors, *Modeling and Simulation-based Systems Engineering Handbook*. Crc Pr I Llc, December 2014.

Journal Articles

[4] Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. Anonymous readers counting: A wait-free multi-word atomic register algorithm for scalable data sharing on multi-core machines. *IEEE Transactions on Parallel and Distributed Systems*, 2018. To appear.

[5] Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia. Transparently mixing undo logs and software reversibility for state recovery in optimistic pdes. *ACM Transactions on Modeling and Computer Simulation*, 27(2), May 2017.

[6] Alessandro Pellegrini and Francesco Quaglia. A fine-grain time-sharing time warp system. *ACM Transactions on Modeling and Computer Simulation*, 27(2), May 2017.

[7] Alessandro Pellegrini, Sebastiano Peluso, Francesco Quaglia, and Roberto Vitali. Transparent speculative parallelization of discrete event simulation applications using global variables. *International Journal of Parallel Programming*, 44(6):1200–1247, December 2016.

[8] Pierangelo Di Sanzo, Francesco Quaglia, Bruno Ciciani, Alessandro Pellegrini, Diego Didona, Paolo Romano, Roberto Palmieri, and Sebastiano Peluso. A flexible framework for accurate simulation of cloud in-memory data stores. *Simulation Modelling Practice and Theory*, 58(2):219–238, July 2015.

[9] Alessandro Pellegrini, Roberto Vitali, and Francesco Quaglia. Autonomic state management for optimistic simulation platforms. *IEEE Transactions on Parallel and Distributed Systems*, 26(6):1560–1569, June 2015.

[10] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. Load sharing for optimistic parallel simulations on multi core machines. *SIGMETRICS Performance Evaluation Review*, 40(3):2–11, August 2012.

Conference Articles

[11] Mauro Ianni, Romolo Marotta, Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia. Optimizing simulation on shared-memory platforms: the smart cities case. In *Proceedings of the 2016 Winter Simulation Conference*, WSC. IEEE Computer Society, December 2018. To appear.

[12] Mauro Ianni, Romolo Marotta, Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia. The ultimate share-everything pdes system. In *Proceedings of*

the 2018 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS. ACM, May 2018.

[13] Stefano Conoci, Davide Cingolani, Pierangelo Di Sanzo, Alessandro Pellegrini, Bruno Ciciani, and Francesco Quaglia. A power cap oriented time warp architecture. In *Proceedings of the 2018 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS. ACM, May 2018.

[14] Matteo Principe, Tommaso Tocci, Alessandro Pellegrini, and Francesco Quaglia. Porting event & cross-state synchronization to the cloud. In *Proceedings of the 2018 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS. ACM, May 2018. Candidate for (but not winner of) the Best Paper Award.

[15] Simone Economo, Emiliano Silvestri, Pierangelo Di Sanzo, Alessandro Pellegrini, and Francesco Quaglia. Prompt application-transparent transaction revalidation in software transactional memory. In *Proceedings of the 16th IEEE International Symposium on Network Computing and Applications*, NCA, pages 114–119. IEEE Computer Society, October 2017.

[16] Dimiter R. Avresky, Alessandro Pellegrini, and Pierangelo Di Sanzo. Machine learning-based management of cloud applications in hybrid clouds: a hadoop case study. In *Proceedings of the 16th IEEE International Symposium on Network Computing and Applications*, NCA, pages 114–119. IEEE Computer Society, October 2017.

[17] Tommaso Tocci, Alessandro Pellegrini, Francesco Quaglia, Josep Casanovas-García, and Toyotaro Suzumura. Orchestra: An asynchronous wait-free distributed gvt algorithm. In *Proceedings of the 21st IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*, DS-RT. IEEE Computer Society, October 2017.

[18] Mauro Ianni, Romolo Marotta, Alessandro Pellegrini, and Francesco Quaglia. Towards a fully non-blocking share-everything pdes platform. In *Proceedings of the 21st IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*, DS-RT. IEEE Computer Society, October 2017.

[19] Mauro Ianni, Romolo Marotta, Alessandro Pellegrini, and Francesco Quaglia. A non-blocking global virtual time algorithm with logarithmic number of memory operations. In *Proceedings of the 21st IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*, DS-RT. IEEE Computer Society, October 2017. Candidate for (but not winner of) the Best Paper Award.

[20] Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. A wait-free multi-word atomic (1,n) register for large-scale data sharing on multi-core machines. In *Proceedings of the 2017 IEEE Cluster Conference*, CLUSTER. IEEE Computer Society, September 2017.

[21] Davide Cingolani, Alessandro Pellegrini, Markus Schordan, Francesco Quaglia, and David R. Jefferson. Dealing with reversibility of shared libraries in pdes. In *Proceedings of the 2017 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS. ACM, May 2017.

[22] Romolo Marotta, Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. A conflict-resilient lock-free calendar queue for scalable share-everything pdes platforms. In *Proceedings of the 2017 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS. ACM, May 2017.

[23] Emiliano Silvestri, Simone Economo, Pierangelo Di Sanzo, Alessandro Pellegrini, and Francesco Quaglia. Preemptive software transactional memory. In *Proceedings of the 17th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing*, CCGrid. IEEE Computer Society, May 2017.

[24] Alessandro Pellegrini and Pierangelo Di Sanzo. On the optimization of collaborative kerbside waste collection. January 2017.

[25] Alessandro Pellegrini, Cristina Montañola-Sales, Francesco Quaglia, and Josep Casanovas-Garcia. Programming agent-based demographic models with cross-state and message-exchange dependencies: A study with speculative pdes and automatic load-sharing. In *Proceedings of the 2016 Winter Simulation Conference*, WSC. IEEE Computer Society, December 2016.

[26] Romolo Marotta, Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. A lock-free o(1) event pool and its application to share-everything pdes platforms. In *Proceedings of the 20th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*, DS-RT. IEEE Computer Society, September 2016. Winner of the Best Paper Award.

[27] Simone Economo, Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia. Configurable and efficient memory access tracing via selective expression-based x86 binary instrumentation. In *Proceedings of the 24th IEEE Internation Symposium on Modelling, Analysis and Simulation of Computer and Telecommunication Systems*, MASCOTS. IEEE Computer Society, September 2016.

[28] Alessandro Pellegrini, Cristina Montañola-Sales, Francesco Quaglia, and Josep Casanovas-Garcia. Load-sharing policies in parallel simulation of agent-based demographic models. In *Proceedings of the 4th Workshop on Parallel and Distributed Agent-Based Simulations*, PADABS. LNCS, Springer-Verlag, August 2016.

[29] Romolo Marotta, Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. A non-blocking priority queue for the pending event set. In *Proceedings of the 9th EAI International Conference on Simulation Tools and Techniques*, SIMUTools, pages 46–55. ICST, August 2016.

[30] Alessandro Pellegrini. Optimizing memory management for optimistic simulation with reinforcement learning. In *Proceedings of the 2016 International Conference on High Performance Computing & Simulation Workshops*, HPCS, pages 26–33. IEEE Computer Society, July 2016.

[31] Davide Cingolani, Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. Mixing hardware and software reversibility for speculative parallel discrete event simulation. In *Proceedings of the 8th Conference on Reversible Computation*, RC, pages 137–152. Springer-Verlag, July 2016.

[32] Andrea La Rizza, Giuseppe Casarano, Gilberto Castellani, Bruno Ciciani, Luca Passalacqua, and Alessandro Pellegrini. Machine learning-based elastic cloud resource provisioning in the solvency ii framework. In *Proceedings of the 2016 IEEE 36th International Conference on Distributed Computing Systems Workshops*, ICDCS, pages 44–48. IEEE Computer Society, June 2016.

[33] Alessandro Pellegrini, Pierangelo Di Sanzo, and Dimiter R. Avresky. Proactive cloud management for highly heterogeneous multi-cloud infrastructures. In *Proceedings of the 21st IEEE Workshop on Dependable Parallel, Distributed and Network-Centric Systems*, DPDNS. IEEE Computer Society, May 2016.

[34] Nazzareno Marziale, Francesco Nobilia, Alessandro Pellegrini, and Francesco Quaglia. Granular time warp objects. In *Proceedings of the 2016 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS, pages 57–68. ACM, May 2016.

[35] Ilaria Di Gennaro, Alessandro Pellegrini, and Francesco Quaglia. Os-based numa optimization: Tackling the case of truly multi-thread applications with non-partitioned virtual page accesses. In *Proceedings of the 16th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing*, CCGrid, pages 292–300. IEEE Computer Society, May 2016.

[36] Vanessa Büsing-Menses, Cristina Montañola-Sales, Josep Casanovas-Garcia, and Alessandro Pellegrini. Analysis and optimization of a demographic simulator for parallel environments (poster paper). In *Proceedings of the 2015 Winter Simulation Conference*, WSC. IEEE Computer Society, December 2015.

[37] Emanuele Santini, Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. Htm based speculative parallel discrete event simulation of very fine grain models. In *Proceedings of the 22nd International Conference on High Performance Computing*, HiPC. IEEE Computer Society, December 2015.

[38] Dimiter R. Avresky, Pierangelo Di Sanzo, Alessandro Pellegrini, Bruno Ciciani, and Luca Forte. Proactive scalability and management of resources in hybrid clouds via machine learning (short paper). In *Proceedings of the 14th IEEE International Symposium on Network Computing and Applications*, NCA, pages 114–119. IEEE Computer Society, September 2015.

[39] Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia. RAMSES: Reversibility-based agent modeling and simulation environment with speculation support. In *Proceedings of the 3rd Workshop on Parallel and Distributed Agent-Based Simulations*, PADABS, pages 466–478. LNCS, Springer-Verlag, August 2015.

[40] Pierangelo Di Sanzo, Alessandro Pellegrini, and Dimiter R. Avresky. Machine learning for achieving self-* properties and seamless execution of applications in the cloud. In *Proceedings of the Fourth IEEE Symposium on Network Cloud Computing and Applications*, NCCA, pages 51–58. IEEE Computer Society, June 2015.

[41] Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia. Transparently mixing undo logs and software reversibility for state recovery in optimistic pdes. In *Proceedings of the 2015 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS, pages 211–222. ACM, June 2015.

[42] Alessandro Pellegrini and Francesco Quaglia. Numa time warp. In *Proceedings of the 2015 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS, pages 59–70. ACM, June 2015.

[43] Alessandro Pellegrini and Francesco Quaglia. Time-sharing time warp via lightweight operating system support. In *Proceedings of the 2015 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS, pages 47–58. ACM, June 2015.

[44] Alessandro Pellegrini, Pierangelo Di Sanzo, and Dimiter R. Avresky. A machine learning-based framework for building application failure prediction models. In *Proceedings of the 20th IEEE Workshop on Dependable Parallel, Distributed and Network-Centric Systems*, DPDNS, pages 1072–1081. IEEE Computer Society, May 2015.

[45] Alessandro Pellegrini and Francesco Quaglia. Wait-free Global Virtual Time computation in shared memory Time-Warp systems. In *Proceedings of the 26th International Conference on Computer Architecture and High Performance Computing*, SBAC-PAD. IEEE Computer Society, October 2014.

[46] Alessandro Pellegrini and Francesco Quaglia. Programmability and performance of parallel ECS-based simulation of multi-agent exploration models. In *Proceedings of the 2nd Workshop on Parallel and Distributed Agent-Based Simulations*, PADABS. LNCS, Springer-Verlag, August 2014.

[47] Alessandro Pellegrini and Francesco Quaglia. Transparent multi-core speculative parallelization of DES models with event and cross-state dependencies. In *Proceedings of the 2014 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS, pages 105–116. ACM, May 2014.

[48] Diego Rughetti, Pierangelo Di Sanzo, and Alessandro Pellegrini. Adaptive transactional memories: Performance and energy consumption tradeoffs. In *Proceedings of the Third IEEE Symposium on Network Cloud Computing and Applications*, NCCA. IEEE Computer Society, February 2014.

[49] Alessandro Pellegrini and Francesco Quaglia. The ROme OpTimistic Simulator: A tutorial (invited tutorial). In *Proceedings of the 1st Workshop on Parallel and Distributed Agent-Based Simulations*, PADABS. LNCS, Springer-Verlag, August 2013.

[50] Alessandro Pellegrini and Francesco Quaglia. A study on the parallelization of terrain-covering ant robots simulations. In *Proceedings of the 1st Workshop on Parallel and Distributed Agent-Based Simulations*, PADABS. LNCS, Springer-Verlag, August 2013.

[51] Alice Porfirio, Alessandro Pellegrini, Pierangelo Di Sanzo, and Francesco Quaglia. Transparent support for partial rollback in software transactional memories. In *Proceedings of the International Euro-Par 2013 Conference*, Euro-Par. LNCS, Springer-Verlag, August 2013.

[52] Alessandro Pellegrini. Hijacker: Efficient static software instrumentation with applications in high performance computing (poster paper). In *Proceedings of the 2013 International Conference on High Performance Computing & Simulation*, HPCS, pages 650–655. IEEE Computer Society, July 2013. Candidate for (but not winner of) the Outstanding Poster Paper Award.

[53] Francesco Antonacci, Alessandro Pellegrini, and Francesco Quaglia. Consistent and efficient output-stream management in optimistic simulation platform. In *Proceedings of the 2013 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, PADS, pages 315–326. ACM, May 2013.

[54] Alessandro Pellegrini and Giuseppe Piro. Multi-threaded simulation of 4G cellular systems within the LTE-Sim framework. In *Proceedings of the 8th IEEE International Workshop on the Performance Analysis and Enhancement of Wireless Networks*, PAEWN. IEEE Computer Society, March 2013.

[55] Pierangelo Di Sanzo, Francesco Antonacci, Bruno Ciciani, Roberto Palmieri, Alessandro Pellegrini, Sebastiano Peluso, Francesco Quaglia, Diego Rughetti, and Roberto Vitali. A framework for high performance simulation of transactional data grid platforms. In *Proceedings of the 6th ICST Conference of Simulation Tools and Techniques*, SIMUTools. ICST, March 2013.

[56] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. A load sharing architecture for optimistic simulations on multi-core machines. In *Proceedings of the 19th International Conference on High Performance Computing*, HiPC. IEEE Computer Society, December 2012.

[57] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. Assessing load sharing within optimistic simulation platforms (invited paper). In *Proceedings of the 2012 Winter Simulation Conference*, WSC. Society for Computer Simulation, December 2012.

[58] Alessandro Pellegrini, Roberto Vitali, Sebastiano Peluso, and Francesco Quaglia. Transparent and efficient shared-state management for optimistic simulations on multi-core machines. In *Proceedings 20th International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems*, MASCOTS, pages 134–141. IEEE Computer Society, August 2012.

[59] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. Towards symmetric multi-threaded optimistic simulation kernels. In *Proceedings of the 26th International Workshop on Principles of Advanced and Distributed Simulation*, PADS, pages 211–220. IEEE Computer Society, August 2012.

[60] Roberto Vitali, Alessandro Pellegrini, and Gionata Cerasuolo. Cache-aware memory manager for optimistic simulations. In *Proceedings of the 5th ICST Conference of Simulation Tools and Techniques*, SIMUTools. ICST, March 2012. Winner of the Best Paper Award.

[61] Alessandro Pellegrini, Roberto Vitali, and Francesco Quaglia. The ROme OpTimistic Simulator: Core internals and programming model. In *Proceedings of the 4th International ICST Conference on Simulation Tools and Techniques*, SIMUTools. ICST, 2011.

[62] Alessandro Pellegrini, Roberto Vitali, and Francesco Quaglia. An evolutionary algorithm to optimize log/restore operations within optimistic simulation platforms. In *Proceedings of the 4th International ICST Conference on Simulation Tools and Techniques*, SIMUTools. SIGSIM, 2011.

[63] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. Autonomic log/restore for advanced optimistic simulation systems. In *Proceedings of the Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems*, MASCOTS, pages 319–327. IEEE Computer Society, 2010.

[64] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. Benchmarking memory management capabilities within root-sim. In *Proceedings of the 13th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*, DS-RT. IEEE Computer Society, 2009.

[65] Alessandro Pellegrini, Roberto Vitali, and Francesco Quaglia. Di-DyMeLoR: Logging only dirty chunks for efficient management of dynamic memory based optimistic simulation objects. In *Proceedings of the 2009 ACM/IEEE/SCS 23rd Workshop on Principles of Advanced and Distributed Simulation*, PADS, pages 45–53. IEEE Computer Society, 2009. Candidate for (but not winner of) the Best Paper Award.

Technical Reports

[66] Matteo Principe, Alessandro Pellegrini, Francesco Quaglia, and Bruno Ciciani. Transparent distributed cross-state synchronization in optimistic parallel discrete event simulation. Technical report, Sapienza, University of Rome, December 2017.

Talks Given (without Proceedings)

[67] Alessandro Pellegrini and Francesco Quaglia. On the relevance of wait-free coordination algorithms in shared-memory hpc: The global virtual time case. Workshop di Informatica Quantitativa, October 2014.

[68] Alessandro Pellegrini. Adaptive transactional memories: Performance and energy consumption tradeoffs (poster + talk). Euro-TM Workshop on Transactional Memory, April 2014.

[69] Alessandro Pellegrini. A symmetric multi-threaded architecture for load-sharing in multi-core optimistic simulations. Workshop di Informatica Quantitativa, July 2012.

Attachment 2: Summary of the Ph.D. Thesis

Simulation is a powerful technique to represent the evolution of real-world phenomena or systems over time. It has been extensively used in different research fields (from medicine to biology, to economy, and to disaster rescue) to study the behaviour of complex systems during their evolution (*symbiotic simulation*) or before their actual realization (*what-if analysis*).

A traditional way to achieve high performance simulations is the employment of Parallel Discrete Event Simulation (PDES) techniques, which are based on the partitioning of the simulation model into Logical Processes (LPs) that can execute events in parallel on different CPUs and/or different CPU cores, and rely on synchronization mechanisms to achieve causally consistent execution of simulation events. As it is well recognized, the optimistic synchronization approach, namely the Time Warp protocol, which is based on rollback for recovering possible timestamp-order violations due to the absence of block-until-safe policies for event processing, is likely to favour speedup in general application/architectural contexts.

However, the optimistic PDES paradigm implicitly relies on a programming model that shifts from traditional sequential-style programming, given that there is no notion of global address space (fully accessible while processing events at any LP). Furthermore, there is the underlying assumption that the code associated with event handlers cannot execute unrecoverable operations given their speculative processing nature. Nevertheless, even though no unrecoverable action is ever executed by event handlers, a means to actually undo the action if requested needs to be devised and implemented within the software stack.

On the other hand, sequential-style programming is an easy paradigm for the development of simulation code, given that it does not require the programmer to reason about memory partitioning (and therefore message passing) and speculative (concurrent) processing of the application.

My PhD Thesis presents methodological and technical innovations which will show how it is possible, by developing innovative runtime mechanisms, to allow a programmer to implement its simulation model in a fully sequential way, and have the underlying simulation framework to execute it in parallel according to speculative processing techniques. Some of the approaches we provide show applicability in either shared- or distributed-memory systems, while others will be specifically tailored to multi/many-core architectures.

I show, during the development of these supports, what is the effect on performance of these solutions, which will nevertheless be negligible, allowing a fruitful exploitation of the available computing power. In the end, I highlight which are the clear benefits on the programming model that the model developer will experience by relying on these innovative solutions.

Wednesday 21st January, 2015