

Kevin POUGET
Personal details removed.
(Available on demand)

Available in April 2017

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PHD IN DEBUGGING TOOLS FOR MULTICORE AND EMBEDDED SYSTEMS

I am looking for a position in Grenoble area or remote, in a domain related to debugging, runtime environments and operating systems for high-performance computing or embedded systems.

DOMAINS OF COMPETENCES (TECHNOLOGIES I LIKE)

Through my PhD program I gained an advanced knowledge of runtime systems and their interactions with applications and the OS kernel. I am particularly interested in the following technologies:

- ✓ **Programming Languages** PYTHON and C, JAVA, C++...
- ✓ **Debugging and Development Tools** GDB, DWARF, strace, ltrace...
- ✓ **HPC Environments** OPENMP, OPENCL, MPI...
- ✓ **Operating Systems** Linux-based distributions (Arch, Fedora, ...)

EDUCATIONAL BACKGROUND

- | | | |
|--|--------------------------|-----------|
| • PhD Program | | 2010-2014 |
| University of Grenoble – France | | |
| • Master – System, Networks, Parallel Computing | With Honours | 2009 |
| University of Bordeaux – France | | |
| • M1 – System, Networks, Parallel Computing | With Honours | 2008 |
| University of Innsbruck – Austria — (Erasmus) | | |
| • Bachelor – Computer Science | With High Honours | 2007 |
| University of Limoges – France | | |

LANGUAGES

- French : Mother tongue
- English : Full professional proficiency

PROGRAMMING EXPERIENCE

- Université Grenoble Alpes (UGA, UJF, CNRS, Floralis) — France Postdoctoral Fellow
Jan. 16 / Now

Nano2017/DEMA: Debugging Embedded Multicore Applications – OpenMP performance debugging

During the second year of the project, we worked on performance debugging. We focused our efforts on interactive profiling controlled by a source-level debugger (gdb). We applied it to OpenMP parallel executions off NUMA computers. We illustrated a performance debugging methodology with the case-study of a MG.C benchmark problem. This work is done in cooperation with Aftermath, a graphical tool

for performance analysis and debugging of fine-grained task-parallel programs and run-time systems.

OpenMP, gdb, python, C, NUMA, Aftermath

Jan. 15 / Dec. 15

Nano2017/DEMA: Debugging Embedded Multicore Applications – OpenMP functional debugging

In this work we extended our programming-model centric debugger mcGDB to support the OpenMP programming standard. We added support for step-by-step execution of the fork-join aspect of OpenMP. We also paid attention to the task-based aspect of the standard, by providing a visual representation of the task graph and the ability to control their execution and scheduling.

OpenMP, gdb, python, C

Jun. 14 / Dec. 14

Mont-Blanc Project: Benchmarking of Specfem3D on the Mont-Blanc Cluster

In the second part of my job on the Mont-Blanc project, I had to evaluate the performance of Specfem3D earthquake simulation on the Mont-Blanc cluster. This cluster is composed of around 500 low-power ARM-based Samsung Exynos 5 Dual boards (originally designed for tablets). The goal of the benchmarking was to measure the energy consumption against the computational throughput, by running the simulation one or two cores, using or not the GPU acceleration. The overall goal was to evaluate the ability of the cluster design to scale up to the petaflops level.

Bash and Python scripting, Performance evaluation, HPC and embedded environment

Feb. 14 / May. 14

Mont-Blanc Project: Porting of Specfem3D from Cuda to OpenCL

Specfem3D¹ simulates seismic wave propagation at the local or regional scale based upon spectral-element method. When we started this work, it could run on GPUs, but it relied on Cuda so it could only run on Nvidia cards. Our goal was to port² its +40 kernels (with up to 80 parameters) to OpenCL environment. I was in charge of the porting of the CPU side, and led the verification/debugging work, in which I developed a “GPU exchange tracer”. gpuTrace proved to be very helpful locate the problems in our code, by comparing the trace of a faulty execution against a valid one.

OpenCL, Cuda, LD_PRELOAD, gpuTrace³, BOAST⁴, geophysics simulation

- University of Grenoble and STMicroelectronics — France

PhD

Dec. 10 / Feb. 14

Programming Model-Centric Debugging for Multicore and Embedded Applications

Our contribution consisted in a novel approach for interactive debugging, named Programming Model-Centric Debugging, as well as a prototype debugger implementation. Model-centric debugging raises interactive debugging to the level of programming models, by capturing and interpreting events generated during the application execution (e.g. through breakpointed API function calls). We illustrated how to apply this approach to three different programming models, software components, dataflow and kernel-based programming. Then, we detailed how to develop a debugger prototype based on GDB, for STMicroelectronics’ STHORM programming environment. STHORM development toolkit provides supportive environments for component, dataflow and kernel-based programming. We also demonstrated how to tackle software debugging with our debugger prototype through four case studies: an augmented reality feature tracker built with components, a dataflow implementation of the H.264 video decoding standard and two scientific HPC computing applications.

C and Python programming, GDB internals, Linux internals

- Thinkshield Ltd — London, England

IT Consultant

Feb. 10 / May. 10

Migration of the Integration engine to a new Patient Administration System (PAS)

¹https://github.com/geodynamics/specfem3d_globe/

²https://github.com/geodynamics/specfem3d_globe/pull/251

³<https://github.com/kpouget/gpuTrace>

⁴<http://ieeexplore.ieee.org/xpl/login.jsp?arnumber=6657917>

The PAS is a key component in hospital information systems. It allows the registration, admission, transfer, discharge, . . . of patients. These information are then routed to the different downstream systems (A&E, radiology, . . .) through the Trust Integration Engine. During this project, the PAS of two Imperial College Hospital where merged together. My work was to implement the new routing and rewriting rules to be applied in the new system. I carried out this project through all of the development steps; from the redaction of the specifications to the Live deployment and investigations of Live issues; via the implementation and testing phases.

Java Caps, Integration Engine, Glassfish, HL7, Java/EE

- CEA (French Atomic Authority) — Île-de-France, France Work placement – Master II
Apr. 09 / Sep. 09

Specification and Implementation of a Debugging API for User-Level Thread Libraries

User and hybrid thread-libraries have the ability to handle threads with higher performance than kernel libraries. However, the debuggers are not natively able to distinguish threads at the user level. The module I developed offers a simple and focused API to the thread library which allows their threads to be debugged in a normalized fashion (through the Sun Thread_DB interface).

C, Thread libraries and Debuggers internals, Linux system programming, x86 assembly

TEACHING

- University Grenoble Alpes INF302: Language and Automaton (Licence 2)
Lab teacher (47h, Sep. - Dec. 2016)
- Coadvisor a Master I and II student working on runtime verification and debugging:
Interactive Property Checking at Runtime with a Debugger [1] (Apr. - Jul. 2015, Apr. - Jul. 2016)
- Main technical advisor on a 2nd-year student from ENSTA engineering school:
Performance study of ST/CEA STHROM platform (in French, apr. - aug. 2016)

PUBLICATIONS

Papers available on demand, PhD thesis is [online](#)⁵.

- [1] Raphaël Jakse, Yliès Falcone, Jean-François Méhaut, and Kevin Pouget. Vérification interactive de propriétés à l'exécution d'un programme avec un débogueur. In *Compas2016*, Lorient, France, July 2016.
- [2] Kevin Pouget. *Programming-Model Centric Debugging for Multicore Embedded Systems*. PhD thesis, Université de Grenoble, École Doctorale MSTII, feb 2014.
- [3] Kevin Pouget, Patricia López Cueva, Miguel Santana, and Jean-François Méhaut. Interactive Debugging of Dynamic Dataflow Embedded Applications. In *Proceedings of the 18th International Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS)*, Boston, Massachusetts, USA, may 2013. Held in conjunction of IPDPS.
- [4] Kevin Pouget, Patricia López Cueva, Miguel Santana, and Jean-François Méhaut. A novel approach for interactive debugging of dynamic dataflow embedded applications. In *Proceedings of the 28th Symposium On Applied Computing (SAC)*, pages 1547–1549, Coimbra, Portugal, apr 2013.
- [5] Kevin Pouget, Miguel Santana, Vania Marangozova-Martin, and Jean-François Mehaut. Debugging Component-Based Embedded Applications. In *Joint Workshop Map2MPSoC (Mapping of Applications to MPSoCs) and SCOPES (Software and Compilers for Embedded Systems)*, St Goar, Germany, may 2012. Published in the ACM library.

⁵<https://tel.archives-ouvertes.fr/tel-01010061/en/>

- [6] Kevin Pouget, Marc Pérache, Patrick Carribault, and Hervé Jourden. User level DB: a debugging API for user-level thread libraries. In *Parallel Distributed Processing, Workshops and Phd Forum (IPDPSW), 2010 IEEE International Symposium on*, pages 1–7, 2010.
- [7] The Mont-Blanc Project Team. The Mont-Blanc prototype: An Alternative Approach for HPC Systems. In *International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*, Salt Lake City, United States, November 2016.

TALKS

- Kevin Pouget, Miguel Santana, and Jean-François Méhaut. *Programming-Model Centric Debugging for OpenMP*, at 2nd OpenMPCon Developers Conference, oct 2016, Nara, Japan.
- Kevin Pouget, Miguel Santana, and Jean-François Méhaut. *Programming-Model Centric Debugging for OpenMP/OMPss* at 4th JLESC Workshop, Bonn, Germany, dec. 2015
- Kevin Pouget, Miguel Santana, and Jean-François Méhaut. *Programming-Model Centric Debugging for Multicore Embedded Systems*. At the 2nd workshop on Multicore Application Debugging (MAD), Athens, Greece, oct 2014.
- Kevin Pouget, Miguel Santana, and Jean-François Méhaut. *Programming-Model Centric Debugging for Multicore Embedded Systems: OpenCL/Cuda Debugging*. At the HPC GA workshop, Bordeaux, France, jan 2014
- Kevin Pouget, Miguel Santana, and Jean-François Méhaut. *Supporting Parallel Component Debugging Using the GDB Python Interface*. At the 2nd GNU Cauldron, Prague, Czech Republic. jul 2012.

SIDE PROJECTS

Projects developed on my free time for personal use.

- ✓ **WebAlbums**⁶ Web-application for managing collections for pictures based on tags and albums. Long-time project (started in 2007) started to learn about Java web-programming and MVC.
→ *JQuery/JS programming, J2EE/Java glassfish/JPA, MySQL/MariaDB, XSLT, HTML, git*
- ✓ **Multicopter**⁷/**Arduino**⁸ Building of a quadcopter from scratch, and initial experimentation with Arduino controller, with the idea to embed the Arduino-controlled sensors into the quadcopter.
→ *micro-controller programming, simple electronics and aerodynamics*
- ✓ **Self-hosting**⁹ Administration of self-hosted online services, for learning purpose but also to detach myself from “all-inclusive” commercial solutions.
→ *web, RSS aggregator, git repository, DNS, email, ssh, cloud...*
- ✓ **break *0x972**¹⁰ Online blog where I share tips and ideas related to my working and personal interests on computer science and debugging.
→ *debugging, gdb, python, web-hosting*

MISCELLANEOUS SKILLS AND INTERESTS

- Free and open-source software enthusiasm

⁶<https://github.com/wazari972/WebAlbums-3/tree/develop>

⁷<https://github.com/wazari972/Multicopter>

⁸<https://github.com/wazari972/Arduino>

⁹<https://0x972.info>

¹⁰<https://blog.0x972.info/>

- Github¹¹ and self-hosted¹² repositories of my side projects
- StackOverflow profile¹³ and CV¹⁴
- Judo (black belt, preparing 2nd dan), white-water kayak, scuba diving (2* diver, 1* cave diver)
- Discovering the Alps, the country and the world

¹¹<https://github.com/wazari972?tab=repositories>

¹²<https://lab.0x972.info/>

¹³<http://stackoverflow.com/users/341106/kevin>

¹⁴<http://careers.stackoverflow.com/kevinpouget>