PhD and Engineer in Computer Science and Applied Mathematics
Sebastien Mondet

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References available upon request.

Abstract

PhD and Engineer specialized in Statically-typed Functional Programming for large-scale distributed software development.

▷ Developed a large-scale distributed platform (*Big Data*, web-applications, HPC).
▷ Used code generation and formal methods for security purposes (post-doc work).
▷ Developed qualified avionics software (*DO-178B* standard).
▷ Did a cross-domain PhD and postdoc while co-advising several students (3D Geometry, Compression, Networking, Multimedia, Mobile development, Security, etc.).
▷ Quick and eager to learn both math and computer science (currently studying Coq).
▷ Proficient in OCaml; very familiar and interested in Haskell, F#, and Scala; a lot of experience with C, C++ and Java.
▷ Pragmatic, well organised, flexible, and team-worker; good problem solving skills; strong aptitude for both software development and technical writing.

Work Experience

Apr. 2014 – Present: Computer Scientist at Mount Sinai Health System

Icahn School of Medecine, Department of Genetics and Genomic Science

Development of genomics data management and analysis software.

Sept. 2011 – Mar. 2014: Software Engineer for NYU

Center for Genomics and Systems Biology, Biology Department, New York University

Software engineer (Associate Research Scientist) responsible for all computational aspects of the Genomics Sequencing Core Facility (GenCore).

▷ Architect, develop, deploy, document, and maintain *HITSCORE*: production-quality, fault-tolerant, high-performance laboratory information management system and preliminary analysis pipeline for Next Generation DNA sequencing.
▷ Full software platform, dealing with jobs running on HPC clusters, servers, tracking meta-data about samples and the facility, managing the genomic data of the sequencers (a few expensive terabytes per week); while providing a dynamic web-application for administration, monitoring, and delivering results to the clients (source).
▷ Based on discussions with bioinformaticians and users, HITSCORE was a key contributor to the facility's CSPro Certification by Illumina. The system has been in production for more than 2 years, with no major bug, and no data loss.
▷ Apply *type-theory* and functional programming advanced techniques with OCaml, PBS/Torque, PostgreSQL, Jane St Core suite, the Ocisgen web-framework (with Js_of_ocaml).
▷ Maintain Linux-based servers (Puppet, CentOS).
▷ Participate, initiate, and maintain open-source projects (see section "Software Projects").
▷ Assist bioinformaticians/biologists with Unix and HPC matters.
▷ Attended conferences (IFCP 2012, OCaml CUFP 2012 and 2013, IBM Programming Languages Day 2012) and the 2013 International Summer School on HPC Challenges in Computational Sciences.

Sept. 2009 – Jun. 2011: Post-doc at the University of Oslo

*Distributed Multimedia Systems (*DMMS*) group, University of Oslo, Norway*

SIRIUS Project: *Sensing, Adapting and Protecting Pervasive Information Spaces.*
- ▷ Co-advised PhD and Master students on Quality of Information, Distributed Complex Events Processing, and Anomaly Detection, within Sparse Mobile Ad-Hoc Networks, and Resource-Constrained Devices.
- ▷ Worked on protection middleware with focus on *safety and security of implementations* through meta-programming and formal methods (see Sec'2011 article and the Promiwag project).

Oct. 2006 – Jun. 2009: PhD in Computer Science

IRIT (Computer Science Research Institute of Toulouse), University of Toulouse, France

Simulation of large 3D natural scenes: modeling and adaptive streaming.
- ▷ *Supervision:* Prof. Mathias Paulin, Geraldine Morin, Romulus Grigoras (Vortex group).
- ▷ *Research focus:* Server resources optimization, multi-resolution content packetization, compression and progressive modeling of plant models, network measurements, mobile computing, distributed systems.
- ▷ *Software realizations: Wadis, LibGenCyl*, and OMAN (c.f. "Software Projects"). Also involved in the development of "NatSim" a visualization tool for natural scenes (Python, OpenGL/GLSL).
- ▷ *Co-Advising:* Master and Engineering students working on 3D streaming for mobile devices.
- ▷ *Internship:* Three months (2008) at the National University of Singapore, under the supervision of Dr. Wei Tsang Ooi.
- ▷ *Teaching:* Assistant at INP-ENSEEIHT (the "Monitorat" French program), labs in C Programming, Geometric Modeling, 3D Rendering, Operating Systems, Data-Bases, Multimedia.
- ▷ *Training:* Communication, Advanced English, Basic First Aid Techniques.
- ▷ *Dissertation: Adaptive Modeling and Distribution of Large Natural Scenes*, PhD thesis reviewed by Pr. Stefanie Hahmann and Pr. Eckehard Steinbach, and defended on June 8th, 2009.
- ▷ The thesis received the Léopold Escande Award 2009 of the University of Toulouse.

Jul. 2005 – Sept. 2006: Embedded Software Engineer

Avionics Department, Atos Origin Integration (Toulouse, France)
- ▷ Developed for Airbus (EYY) of embedded air/ground communication software qualified under the DO-178B standard (HOOD design, ANSI C, LynxOS, RTRT).
- ▷ Developed for Airbus (EYT) of avionic networks testing software (ARINC 429, AFDX, UML, C++, wxWidgets).

Feb. – Jun. 2005: Master Internship

Computer Vision Team, IRIT - UMR 5505 (Toulouse, France)

Streaming of large point-based 3D scenes, adaptation to resources and navigation.
- ▷ Implemented a streaming client-server system over HTTP, TCP and DCCP; C++ with Qt/OpenGL on GNU/Linux.
- ▷ *Keywords:* Point based 3D, Compression, Adaptive Streaming.
- ▷ *Advisors:* Geraldine Morin and Romulus Grigoras.

Jun. – Jul. 2004: Engineering Internship

Dassault Aviation, (Biarritz, France)

Processing and visualization module for numerical data measured during polymerization in autoclaves.
- ▷ Wrote technical specifications.
- ▷ Developed a C++ application for MS-Windows, and Shell/C scripts for AIX/RS6000.

Publications

Peer-reviewed Articles

▷ S. Mondet, I. Alberdi, and T. Plagemann; *Generating Optimised and Formally Checked Packet Parsing Code.* IFIP SEC, 2011 [URL].

▷ M. Zhu, S. Mondet, G. Morin, W. T. Ooi, and W. Cheng; *Towards peer-assisted rendering in networked virtual environments.* ACM MM'11, 2011 [URL].

▷ W. Cheng, W. T. Ooi, S. Mondet, G. Morin, and R. Grigoraş; *Modeling Progressive Mesh Streaming: Does Data Dependency Matter?* ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP) Volume 7, Issue 2, 2011 [URL].

▷ P. Kamisiński, S. Mondet, V. Goebel, and T. Plagemann; *Resource-Aware Complex Event Processing for Mobile Ubiquitous Environments.* UbiComp'10; OPPORTUNITY Workshop, 2010 [URL].

▷ W. Cheng, S. Mondet, W. T. Ooi, R. Grigoraş, and G. Morin; *Network-Aware Streaming of Partially Ordered Media.* IEEE COMSOC MMTC E-letter Volume 5, Number 6, 2010 [URL].

▷ A. Doran, S. Mondet, R. Grigoraş, G. Morin, W. T. Ooi, and F. Boudon; *A demonstration of MobiTree: progressive 3D tree models streaming on mobile clients.* ACM Multimedia (Technical Demonstration), 2009 [URL].

▷ S. Mondet, W. Cheng, G. Morin, R. Grigoraş, F. Boudon, and W. T. Ooi; *Compact and progressive plant models for streaming in networked virtual environments.* ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP) Volume 5, Issue 3, 2009 [URL].

▷ S. Mondet, W. Cheng, G. Morin, R. Grigoraş, F. Boudon, and W. T. Ooi; *Streaming of Plants in Distributed Virtual Environments.* 16th ACM international conference on Multimedia, 2008 (**Best Paper Award**) [URL].

▷ W. Cheng, W. T. Ooi, S. Mondet, G. Morin, and R. Grigoraş; *An Analytical Model for Progressive Mesh Streaming.* 15th ACM international conference on Multimedia, 2007 [URL].

PhD Thesis

▷ S. Mondet; *Adaptive Modeling and Distribution of Large Natural Scenes.* PhD Thesis of the University of Toulouse, 2009 (Defended on June 8, 2009; awarded of the Léopold Escande Price 2009) [URL].

Master Thesis

▷ S. Mondet; *Mise en ligne de modèles 3D echelonables basés points.* Master Thesis of the INP Toulouse, 2005.

Research Activities

Reviewed for various high-impact computer-science journals and conferences including the ACM Multimedia 2009, 2010, 2011; the ACM Transactions on Multimedia Computing, Communications and Applications; NOSSDAV 2010 (Network and Operating Systems Support for Digital Audio and Video); and the Springer/ACM Multi-Media Systems Journal. Also reviewed grant applications for The Polish Science Foundation and was part of PhD recruitment committees at the University of Oslo.

Education

2006 – 2009: Philosophiæ Doctor in Computer Science

University of Toulouse, France

Thesis: *"Adaptive Modeling and Distribution of Large Natural Scenes"*

2002 – 2005: Master Degree in Computer Science and Applied Mathematics

ENSEEIHT (National Polytechnic Institute of Engineering in Electrotechnics, Electronics, Computer Science, Hydraulics and Telecommunications), Toulouse, France

▷ Engineer Diploma (French system).

▷ Research-oriented Master's degree on Software Safety and High-Performance Computing.

2000 – 2002: CPGE ("Classes Préparatoires aux Grandes Écoles", previously known as "Math sup/spé")

CPGE Louis Barthou, Pau, France

Undergraduate 2 years prestigious program for competitive entrance exams into national engineering schools; *speciality* "Mathematics and Physics".

Skills

Programming Languages

OCaml, C, Unix Shells, Coq, Scala, F#, Java, Ruby, C++, Python, Ada, SML, Perl, Fortran, Lisp, Prolog, VHDL, assemblers (68k, i386 and PIC).

Operating Systems

GNU/Linux, OpenBSD, Android, Mac OSX, Solaris, MS Windows.

Administration of a Linux-based development server during 3 years for more than 50 users: Subversion, DokuWiki, Redmine, and Git; with Apache2 (https), OpenLDAP …

Technologies

UML 2.0, SDL, HOOD, XML/CSS/XSLT, Data-Base systems, Real-time, CORBA, IP networks, Avionic networks, MANET routing, OpenGL (ES) rendering pipeline.

Tools

UNIX/POSIX tools, Coq, (La)TeX, Scilab/Matlab, SVN/Git.

Applied Mathematics

Geometric Modeling, Optimization, Hilbertian signal analysis, Fourier analysis, Optimal control, Graph theory, Partial differential equations, Bayesian classification.

Human Languages

▷ *French*: native speaker
▷ *Spanish*: native speaker
▷ *English*: very fluent
▷ *German and Norwegian*: basic knowledge

Software Projects

Computer Science Research

Promiwag is a code-generation library (for now) specialised in packet-parsing code. It generates C or OCaml code on which safety/security properties are *formally proved*. It uses Why and Alt-Ergo for automatic formal proofs.

▷ seb.mondet.org/promiwag

WAlk-through DIstant Scenes is an experimental testbed for Client-Server streaming of 3D scenes. It implements streaming over TCP, UDP, DCCP; uses OpenGL, SDL, GNU Triangulated Surfaces Library, 3DS Max file format.

LibGenCyl is a library for manipulating 3D models of plants represented by Generalized Cylinders. It provides efficient progressive (de)compression, export (SVG, VRML, OpenAlea), and OpenGL rendering.

OMAN is a toolkit for traffic generation, measurements, and tunneling toolkit, for networking experiments over TCP, UDP and DCCP. It provides an UDP tunneling system for DCCP on WAN experiments.

Master Thesis's Project was a C++ client-server system for streaming point-based (a.k.a. "splat-based") 3D scenes. It streamed over HTTP (Apache with CGI), TCP and DCCP. The *Visualization* client was based on PointShop3D's render engine.

Open Source Projects

Biocaml is a standard library for solving Bioinformatics problems with OCaml.

▷ biocaml.org

PBS is a helper library for dealing with the PBS/Torque scheduler from OCaml.

▷ github.com/smondet/pbs

Webpdb is a basic protein visualizer based on WebGL and `js_of_ocaml`.

▷ bitbucket.org/smondet/webpdb

Sosa is a set of APIs (module types) that define what a string of characters should be, and a set of modules and functors that implement them.

▷ bitbucket.org/smondet/sosa

Pvem is a module providing simple handling of an error monad type based on polymorphic variants.

▷ bitbucket.org/smondet/pvem

Pvem_lwt_unix is library high-level operating-system library focussing meaningful abstractions comprehensive error handling.

▷ bitbucket.org/smondet/pvem_lwt_unix

Pvem_lwt_file_lock is an experimental library for dealing with NFS-compliant file locks.

▷ bitbucket.org/smondet/pvem_lwt_file_lock

Bufx is a module implementing "passive buffered pipes", in the style of the Cryptokit.

▷ bitbucket.org/smondet/bufx

EFMP is a library providing an Embedded Domain Specific Language for managing processes and jobs on different hosts with different backends (for now only, direct calls, nohup setsid process trees, and PBS/Torque jobs).

▷ github.com/smondet/efmp

Bracetax is a simple and deterministic text-processing syntax.

▷ seb.mondet.org/bracetax

Sebib, *S-Expressions for Bibliography*, was a practical bibliography management system. (MIT license, `http://seb.mondet.org/sebib`).

▷ seb.mondet.org/sebib

Yaboon is a set of reusable OCaml modules (*Yet Another Bunch Of OCaml Modules*, MIT License).

▷ yaboon.googlecode.com

Locoseq is a real-time midi-sequencer designed for live performance (Jack Audio Connection Kit, LablGTK, MIT License).

▷ locoseq.googlecode.com

Personal Activities

Music

Classical, electric and bass guitars.

Have played in and/or initiated various bands, in various styles: *Rock*, *Hard rock*, *Funk*, *Electro-jazz*, and *Tribal Grind Core*.

Currently playing bass in Lucrative Jacket, and acoustic guitar in Plasmonic Wood.

Sports

Taekwondo (*3rd Keup*), Running, Cross-country skiing.

Hobbies

Juggling, Digital Photography, Cinema.