Companion of the 3rd International Conference on Art, Science, and Engineering of Programming

Edited by:

Stefan Marr, University of Kent, United Kingdom
Walter Cazzola, Università degli Studi di Milano, Italy

Genova, Italy
April 1–4, 2019

1st Interconnecting Code Workshop (ICW'19)

Welcome to the proceedings of the *1st Interconnecting Code Workshop* (ICW'19), co-located with <Programming> 2019 in Genoa, Italy. Modern computer systems are often loosely coupled compositions of heterogeneous components. An important part of modern programming is the art, science, and engineering of interconnecting disparate code components to offer larger services in a reliable and scalable manner. The goal of our workshop was to facilitate an ongoing discussion, and advance the state of the art of interconnecting code in particular.

The first run of our workshop did spark some initial interest: We had 6 paper submissions, and one demo submission. We accepted 4 papers, as well as the demo. All submissions received two reviews each. Overall the discussions covered GraalVM, a universal polyglot virtual machine, and the PalCom architecture model for distributed, heterogeneous systems. We also had a fruitful discussion about whether to organize the development of distributed, heterogeneous systems, in a poly- or monorepo fashion.

To complement the contributions, ICW'19 had an invited talk. Manuel Rigger talked about Sulong, an LLVM IR interpreter, which executes on Truffle (a language implementation framework), and is used in place of a native function interface in the GraalVM. Sulong enables high-level languages, such as Ruby and Python, running on the GraalVM, to call into their native (C/C++) extensions.

We would like to thank our contributors and the invited speaker for agreeing to share their work and insights. We would also like to thank the program committee for their diligent and constructive reviewing.

We hope that you will find the proceedings as thought-provoking, as we found the workshop to be. We encourage you to get in touch with the authors, to exchange further ideas, and advance the state of the art, science, and engineering of interconnecting code.

<div align="right">

Eric Jul, Oleks Shturmov
ICW Program Chair and Co-Chair

</div>

April 2019

Invited Talks

Sulong: Executing Low-level Languages on Truffle
Manuel Rigger, ETH Zurich

Short Papers

Towards Polyglot Adapters for the GraalVM
Fabio Niephaus, Tim Felgentreff, Robert Hirschfeld

The Issue of Monorepo and Polyrepo In Large Enterprises
Nicolas Brousse

Factoring out Glue-code in Systems of IoT Devices
Boris Magnusson, Björn A. Johnsson, Görel Hedin

Live GUI Development for Service-Based Systems
Björn A. Johnsson, Boris Magnusson

Demo Presentations

Gluing Internet of Things Together
Alfred Åkesson, Mattias Nordahl, Gorel Hedin, Boris Magnusson

ICW'19 Organization

Program Committee

Amal Ahmed, Northeastern University, USA
Edd Barrett, King's College London, UK
David Chisnall, University of Cambridge, UK
Wolfgang De Meuter, Vrije Universiteit Brussel, Belgium
Stephen Kell, University of Kent, UK
Boris Magnusson, Lund University, Sweden
Manuel Rigger, ETH Zurich Switzerland

Program Chairs

Eric Jul, University of Oslo, Norway
Oleks Shturmov, University of Oslo, Norway (co-chair)

3rd Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs'19)

Welcome to the proceedings of the third Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs'19). The workshop was co-located with <Programming>'19 and took place on April 2nd, 2019 in Genoa, Italy. MoreVMs'19 aims to bring together industrial and academic programmers to discuss the design, implementation, and usage of modern languages and runtimes. This includes aspects such as reuse of language runtimes, modular implementation, language design and compilation strategies.

MoreVMs'19 is the third edition of the workshop. This year's workshop continued in the spirit of striving to enable an informal and diverse discussion on how languages and runtimes are currently being utilized, and where they need to improve further. Presentation proposals were in the form of extended abstracts. Abstracts discussing experiences, work-in-progress, as well as future visions, from either an academic or industrial perspective were welcomed. Abstracts were reviewed by the members of the program and organising committees. The Program Committee was selected with the intention of having equal parts academic and industrial affiliations. We received 5 submissions, which were all accepted for presentation.

In addition to the MoreVMs'19 talks, the workshop also hosted a session on Programming Across the System Stack (PASS). Organized by the PASS'19 program committee, MoreVMs'19 included three presentations related to the wider field of language and VM implementation concerns.

In addition to these 8 reviewed contributions, MoreVMs'19 had two invited talks. Guilherme Ottoni presented his work on "Region-Based Compilation in the HHVM JIT Compiler", which lead to a lively discussion about compilation techniques and the various tradeoffs of just-in-time compilation. Lukas Stadler gave a talk titled "VM design in an Ideal World vs. VM design in the Real World", which reported on his experience with implementing various languages as part of the GraalVM project and how aspects such as foreign function interfaces can influence language re-implementation projects.

We would like to thank the authors and presenters for their submissions, the invited speakers for sharing their work and insights with us, and of course the

MoreVMs'19 and PASS'19 program committees for their diligent and constructive reviewing.

We hope that you will find this workshop companion thought-provoking, and that you will consider discussing the work with its authors or join us at MoreVMs'20 next year.

Edd Barrett, Stefan Marr, Adam Welc

May 2019   MoreVMs'19 Program Co-Chairs

Invited Talks

Region-Based Compilation in the HHVM JIT Compiler
Guilherme Ottoni, Facebook, USA

VM design in an Ideal World vs. VM design in the Real World
Lukas Stadler, Oracle Labs, Austria

MoreVMs'19 Extended Abstracts

Extending a Meta-Tracing Compiler to Mix Method and Tracing Compilation
Yusuke Izawa, Hidehiko Masuhara, Tomoyuki Aotani

Efficient Implementation of Smalltalk Activation Records in Language Implementation Frameworks
Fabio Niephaus, Tim Felgentreff, Tobias Pape, Robert Hirschfeld

Optimization Coaching for Fork/Join Applications on the Java Virtual Machine
Edgar Eduardo Rosales Rosero, Andrea Rosà, Walter Binder

To expose, or not to expose, hardware heterogeneity to runtimes!
Shoaib Akram

VM Support for Live Typing
Hernan Wilkinson

PASS'19 Papers

MoreVMs'19 Workshop Organization

Program   Nicolas B. Pierron, Mozilla, France
Committee   Walter Binder, University of Lugano, Switzerland
                 Eduard-Mihai Burtescu, Lyken Software Solutions
                 Vyacheslav Egorov, Google, Denmark
                 Tony Hosking, Australian National University / Data61, Australia
                 Christoph Kirsch, University of Salzburg, Austria
                 Lun Liu, University of California at Los Angeles, USA
                 Fabio Niephaus,
                      Hasso Plattner Institute, University of Potsdam, Germany
                 Luís Pina, George Mason University, United States
                 Manuel Rigger, ETH Zurich, Switzerland
                 Jennifer B. Sartor,
                      Ghent University and Vrije Universiteit Brussel, Belgium
                 Andy Wingo, Igalia, S.L.

Progam   Edd Barrett, King's College London, UK
Chairs   Stefan Marr, University of Kent, UK
                 Adam Welc, Uber Technologies, USA

PASS'19 Organization

Program Committee
Shoaib Akram, Ghent University, Belgium
Christoph Bockisch, Philipps-Universität Marburg, Germany
Kerstin Eder, University of Bristol, UK
Lidia Fuentes, Universidad de Málaga, Spain
David H. Lorenz, Technion—Israel Institute of Technology
Yu David Liu, SUNY Binghamton, USA
Hidehiko Masuhara, Tokyo Institute of Technology, Japan
Guido Salvaneschi, TU Darmstadt, Germany
Danfeng Zhang, Pennsylvania State University, USA
Lukasz Ziarek, SUNY Buffalo, USA

Progam Chairs
Christoph Bockisch, Philipps-Universität Marburg, Germany
Yu David Liu, SUNY Binghamton, USA
Hidehiko Masuhara, Tokyo Institute of Technology, Japan
Lukasz Ziarek, SUNY Buffalo, USA

3rd International Workshop on Programming Technology for the Future Web (ProWeb'19)

It is our distinct pleasure to welcome you to ProWeb'19.

Full-fledged web applications have become ubiquitous on desktop and mobile devices alike. Whereas "responsive" web applications already offered a more desktop-like experience, there is an increasing demand for "rich" web applications (RIAs) that offer collaborative and even off-line functionalities — Google docs being the prototypical example. Long gone are the days that web servers merely had to answer incoming HTTP requests with a block of static HTML. Today's servers react to a continuous stream of events coming from JavaScript applications that have been pushed to clients. As a result, application logic and data are increasingly distributed. Traditional dichotomies such as "client vs. server" and "offline vs. online" are fading.

The 3rd International Workshop on Programming Technology for the Future Web, or ProWeb'19, is a forum for researchers and practitioners to share and discuss new technology for programming and engineering these and future evolutions of the web.

ProWeb'19 received a total of five submissions. Every submission received at least three reviews by the PC members, and was carefully discussed until a consensus was reached. All decisions were based solely on the quality of the submission and on the outcome of the discussion. A keynote by Andrea Stocco from the Universitá della Svizzera Italiana (USI, Switzerland) on "How Artificial Intelligence Can Improve Web Development and Testing" completes this year's program.

We would like to thank all authors for submitting a set of high-quality submissions, and the program committee for their careful review and discussion of every submission.

<div align="right">

Coen De Roover, Filippo Ricca
ProWeb Program Co-Chairs

</div>

April 2019

Keynote

How Artificial Intelligence Can Improve Web Development and Testing
(extended abstract)
Andrea Stocco, Universitá della Svizzera Italiana (USI), Switzerland

Papers

Web Security Training [at] UniGe: an Experience (paper)
Andrea Valenza

Civic Participation Powered by Ethereum: a Proposal (paper)
Maura Cerioli, Marina Ribaudo

TryLinks: An interactive tutorial system for a cross-tier Web programming language (paper)
Junao Wu, Arek Mikolajczak, James Cheney

Orchestrated Crowdsourced Testing of a Mobile Web Application: A Case Study (paper)
Maurizio Leotta, Vincenzo Petito, Luca Gelati, Giorgio Delzanno, Giovanna Guerrini, Viviana Mascardi

GUI Testing in Production: Challenges and Opportunities (short paper)
Giovanni Denaro, Luca Guglielmo, Leonardo Mariani, Oliviero Riganelli

ProWeb'19 Workshop Organization

Program Committee   Damiano Distante, Unitelma Sapienza University of Rome, Italy
Philipp Haller, KTH Royal Institute of Technology, Sweden
Maurizio Leotta, University of Genova, Italy
Sam Lindley, University of Edinburgh, United Kingdom
Anders Møller, Aarhus University, Denmark
Cesare Pautasso, Universitá della Svizzera Italiana, Switzerland
Frank Piessens, Katholieke Universiteit Leuven, Belgium
Manual Serrano, INRIA Sophia-Antipolis, France
Andrea Stocco, Universitá della Svizzera Italiana, Switzerland
Mario Südholt, École des Mines de Nantes, France
Tom Van Cutsem, Nokia Bell Labs, Belgium

Program Chairs   Coen De Roover, Vrije Universiteit Brussel, Belgium
Filippo Ricca, University of Genova, Italy

Proceedings of the Programming Experience 2019 Workshop (PX/19)

Message From the Chairs

Imagine a software development task: some sort of requirements and perhaps a platform and programming language. A group of developers head into a vast workroom. As they design, debate and program they discover they need learn more about the domain and the nature of potential solutions they are exploring via programming.

The *Programming Experience (PX) Workshop* is about what happens in that room when programmers sit down in front of computers and produce code, especially in an exploratory way. Do they create text that is transformed into running behavior (the old way), or do they operate on behavior directly ("liveness"); are they exploring the live domain to understand the true nature of the requirements; are they like authors creating new worlds; does visualization matter; is the experience immediate, immersive, vivid and continuous; do fluency, literacy, and learning matter; do they build tools, meta-tools; are they creating languages to express new concepts quickly and easily; and curiously, is joy relevant to the experience?

The focus of the workshop is characterizing the experience of programming and considering how to improve and evolve it.

PX/19 was the 5th edition of the PX workshop. It followed the Writers' Workshop format, was well attended, and left all participants with lively discussions that extended beyond the end of the workshop. Our post-workshop proceedings allowed authors to reflect on the feedback they got from the program committee and the workshop participants, and improve their submission.

We would like to thank our program committee, all workshop attendees, and most importantly our authors for their contributions, constructive criticism, hard work, and willingness to share their ideas.

—Luke Church, Richard P. Gabriel, Hidehiko Masuhara, and Robert Hirschfeld

Papers

IDVE: an Integrated Development and Verification Environment for JavaScript.
Christopher Schuster and Cormac Flanagan

Draw This Object: A Study of Debugging Representations.
Matúš Sulír and Ján Juhár

Faster Feedback Through Lexical Test Prioritization.
Toni Mattis, Falco Dürsch, and Robert Hirschfeld

Live Software Development—Tightening the feedback loops.
Ademar Aguiar, André Restivo, Filipe Figueiredo Correia, Hugo Sereno Ferreira, and João Pedro Dias

The Meager Validation of Live Programming.
Johan Fabry

PolyJuS: A Squeak/Smalltalk-based Polyglot Notebook System for the GraalVM.
Fabio Niephaus, Eva Krebs, Christian Flach, Jens Lincke, and Robert Hirschfeld

Time Series Analysis of Programmer's EEG for Debug State Classification.
Toyomi Ishida and Hidetake Uwano

What Can We Learn From Systems?
Luke Church and Mariana Marasoiu

Presentations

Projectional DSLs From the Ground Up
Meinte Boersma

Web

```
http://programming-experience.org/px19/
https://2019.programming-conference.org/track/px-2019-papers/
```

Program Committee

Titus Barik, Microsoft AI+Research, United States
Carl Friedrich Bolz-Tereick, Heinrich Heine University Düsseldorf, Germany
Parmit Chilana, Simon Fraser University, Canada
Luke Church, University of Cambridge, United Kingdom
Jonathan Edwards, United States
Richard P. Gabriel, Dreamsongs and Hasso Plattner Institute, California
Robert Hirschfeld, Hasso Plattner Institute, University of Potsdam, Germany
Jun Kato, National Institute of Advanced Industrial Science and Technology, Japan
Stephen Kell, University of Kent, United Kingdom
Stefan Marr, University of Kent, United Kingdom
Hidehiko Masuhara, School of Computing, Tokyo Institute of Technology, Japan
Jens Mönig, SAP, Germany
Yoshiki Ohshima, Viewpoints Research Institute, United States
Stephen Oney, University of Michigan, United States
Roland Perera, University of Glasgow, United Kingdom
Michael Perscheid, SAP Innovation Center, Germany
Ian Piumarta, Ritsumeikan University, Japan
Guido Salvaneschi, Technische Universität Darmstadt, Germany
Friedrich Steimann, FernUniversität in Hagen, Germany
Marcel Taeumel, Hasso Plattner Institute, University of Potsdam, Germany
Steven L. Tanimoto, University of Washington, United States
Hidetake Uwano, National Institute of Technology, Nara College, Japan
Alessandro Warth, Google, United States

Organizers

Luke Church, University of Cambridge, United Kingdom
Richard P. Gabriel, Dreamsongs and Hasso Plattner Institute, California
Robert Hirschfeld, Hasso Plattner Institute, University of Potsdam, Germany
Hidehiko Masuhara, School of Computing, Tokyo Institute of Technology, Japan

‹Programming› 2019
ACM Student Research
Competition

Competition Entries

A framework for big-step semantics
Francesco Dagnino

RML: Runtime Monitoring Language
Luca Franceschini

Exploring Example-Driven Migration
Manuel Leuenberger

Reading Logic as Code or as Natural Language Text
Patrick Rein

Automatic test case generation from UML State Machine Diagrams
Dario Olianas

BacCaml: The Meta-Hybrid Just-in-Time Compiler
Yusuke Izawa

Magritte: A Modern Shell Language
Jeanine Adkisson

Cantor Pairing in a reversible programming language
Francesco Rossini

3rd Salon des Refusés Workshop (SdR '19)

It is our pleasure to welcome you to the proceedings of the *3rd Salon des Refusés Workshop* (SdR '19), co-located with <Programming> '19 in Genoa, Italy.

The goal of every SdR is to provide space for unorthodox, thought-provoking ideas that question and expand what programming research should be about. To this end, we request papers that can provoke interesting discussions among the audience, rather than evaluating papers by their use of proofs, measurements, or controlled user studies. Each submitted paper was reviewed by three program committee members, and accepted papers were presented along with a critique that presents an alternative position, develops additional context, or summarizes discussion about the work.

The post-proceedings includes the presented papers and written versions of the presented critiques.

We hope that this years' papers and critiques inform and inspire our readers and future research. We would like to thank the authors and presenters for their submissions and the program committee for their thoughtful and constructive reviewing.

<div align="right">

Philip Tchernavskij, Luke Church
SdR Program Co-Chairs

</div>

June 2019

Invited Talks

Minimal Viable Revolution
Temporary Computation Collective
presented by Luke Church and Antranig Basman

Papers

Let Them Fail : Towards VM Built-in Behaviour that Falls Back to the Program
Tobias Pape, Tim Felgentreff, Fabio Niephaus, Robert Hirschfeld

Critiques

SdR '19 Workshop Organization

Program Committee	Antranig Basman, Raising the Floor Internationl, UK
	Stephen Kell, University of Kent, UK
	Clayton Lewis, University of Colorado Boulder, USA
	Mariana Mărășoiu, University of Cambridge, UK
	Nolwenn Maudet, University of Tokyo, Japan
	Midas Nouwens, Aarhus University, Denmark
	Tomas Petricek, University of Kent, UK
	Winnie Soon, Aarhus University, Denmark
Program Chairs	Luke Church, University of Cambridge, UK
	Philip Tchernavskij, Université Paris Sud, France