Proposal to hold a full-day workshop at SIGCOMM 2016 on the topic of

NetPL: Networking and Programming Languages

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1 Introduction

This workshop will bring together researchers from two areas that are increasingly mutually relevant: computer networks and programming languages. The goal of this workshop is to provide a venue for researchers in these traditionally separate communities to collaborate, applying their diverse perspectives towards the development of novel networking applications. The program of this full-day workshop will consist primarily of invited talks, with an emphasis on encouraging engaging technical discussions. This workshop was previously held at a programming languages conference, ECOOP. Holding the second gathering of the workshop at SIGCOMM will help realize the goal of connecting the two communities. Overall, NetPL will help make the two communities more aware of problems and solutions that they can attempt jointly, leading to better-designed programming abstractions and techniques to enable more flexible and performant networking in different environments (e.g., datacenters, corporate, home, etc).

The relevance of languages to computer networks is currently very apparent in software-defined networking (SDN), where the behaviour of the network is expressed programmatically in a manner independent of the networking hardware. Beyond SDN, this relevance is underscored by wider uses of languages for computer networks. Historically, pcap expressions are perhaps the best example of this – a domain-specific language for expressing packet filters – and BPF, the low-level virtual architecture to which pcap expressions are compiled. Specialised languages are used to express access and resource policies, programmable data planes, and embedded languages have been used for traffic generation and packet crafting.

Many practical aspects of networking could be improved by designing suitable languages for expressing the operator's needs, but such languages are rarely designed by language specialists. This workshop aims to address this mismatch, by bridging between the two areas, enabling language specialists to apply the wealth of theoretical and practical knowledge on designing and implementing languages that has been developed over the years. It would allow networking specialists to build systems that can rely on the tooling and reasoning frameworks for such languages, that in turn can improve the degree to which reasoning can be automated. This can make possible higher-level control of aspects of computer networks, the low-level details of which are managed automatically.

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We want this workshop to gather researchers interested in the broad interaction between languages and networking. So far this research is spread across various venues. Owing to interdisciplinarity, it is not easy for the two communities (networking and programming languages) to meet, despite complementary intellectual interests. NetPL will serve as the gathering point for researchers of both communities who are interested in working with the other community, and will help attract newcomers. The use of languages and formal methods in networking is a growth area, and this workshop will help build the intellectual and social links that a healthy research community depends on.

2 Prior organisation

This workshop has previously taken place in 2015 at ECOOP, a conference on programming languages. Having this workshop alternate between taking place at a PL and at a networking conference would help it realise its goal to better connect the two communities.

In the prior instance of this workshop, we were able to raise around 7K EUR in support from industrial sponsors (Microsoft Research and Huawei), demonstrating the interest in the topic outside of the academic community. We used this money to fund PhD travel grants (3 students total) and to pay for a workshop dinner to which the speakers were invited. Speakers were asked to fund travel and conference registration fees themselves. We plan to follow a similar approach for the SIGCOMM instantiation.

3 Scope

It is important to clarify that the scope of this workshop goes strictly beyond SDN. We aim to enable language specialists to better understand opportunities in networking, and networking specialists to better understand opportunities enabled by specially-designed languages.

Language-centric research of the following aspects of computer networks is in scope:

- specification and topology
- testing and measurement
- programmable data plane abstractions
- packet/traffic generation
- packet/traffic analysis
- security
- resource availability or control
- policy languages
- interoperability between networking-related languages
- composition of networking-related languages

Practical aspects of languages, particularly if oriented towards solving networking problems, are also in scope:

- how to model and prototype languages rapidly
- what semantic structures are best suited to the networking domain

4 Workshop format

The full-day workshop will consist of invited talks, mini-tutorials, and a panel discussion to encourage interaction among attendees. No formal proceedings will be published. The workshop is intended to stimulate dialogue between two communities, and not interfere with the publication of the ideas discussed – there are larger venues for this, and with more archival record for such dissemination. To this end, presenters may talk about previously published results, current developments, or speculate on future needs. Having only invited speakers will ensure high-quality and timely content. This will overcome the problem faced by new workshops to attract enough submissions. Attending the workshop will be open to all, not only the invited speakers, and the workshop will be run in a way that allows all attendees to participate, irrespective of whether they are speakers.

We will offer speakers flexibility to give a talk or mini-tutorial. (If there are mini-tutorials, then there would be at most two in the entire workshop.) One of the sessions during the workshop will consist of an open discussion led by a panel, consisting of researchers from the programming language and networking communities.

The theme of this workshop resonates with other recent initiatives: the *1st Workshop on Programming Languages and Verification Technology for Networking* at POPL, and the Dagstuhl seminar on *Formal Foundations for Networking*. Holding this workshop at SIGCOMM would complement these initiatives, and give this growing body of research more visibility to researchers in networking.

At ECOOP, NetPL attracted 25 attendees. We think that this workshop can attract an audience of 60 attendees at SIGCOMM, owing to this being the workshop's second gathering, SIGCOMM's size and profile, and the increasing interest from the networking community in PL.

We expect to have 5 talks, 2 mini-tutorials, and a panel-led discussion session in this workshop, arranged according to the following timing sketch:[1]

1. Welcome (5 mins)
2. Talk (30 mins)
3. Mini-tutorial (1 hour)
4. Break (20 minutes)
5. Talk x 3 (90 minutes total)
6. Lunch (90 minutes)

[1]This programme sketch is based on the program of last year's SIGCOMM workshop on C2B(I)D: `http://conferences.sigcomm.org/sigcomm/2015/c2bid.php`

7. Mini-tutorial (1 hour)
8. Talk (30 minutes)
9. Break (20 minutes)
10. Panel discussion (60 minutes total)

5 Advertising plan

Since this is a cross-disciplinary workshop, we will reach out to both of the targeted communities by writing on mailing lists of both communities. Since the workshop would be held at SIGCOMM, reaching the networking audience would be easier since many of our target networking audience is likely to attend SIGCOMM already. Reaching out to the programming languages audience will be more challenging, but we have drawn up a list of researchers in PL whom to invite.

6 Workshop organizers

The organizers' research interests and activity spans both the networking and programming language communities, and this makes them ideally placed to organize, promote, and run the workshop.

Marco Canini Marco Canini is an assistant professor in the ICTEAM institute at the Université catholique de Louvain. His research interests are in distributed systems, large-scale computing and computer networking with emphasis on cloud computing and programmable networks. Marco obtained his Ph.D. in computer science and engineering from the University of Genoa in 2009 after spending the last year as a visiting student at the University of Cambridge, Computer Laboratory. He holds a laurea degree with honors in computer science and engineering from the University of Genoa. He was a postdoctoral researcher at EPFL from 2009 to 2012 and after that a senior research scientist for one year at Deutsche Telekom Innovation Labs & TU Berlin. He also held positions at Intel Research and Google. Professor Canini was a co-organizer of the first NetPL workshop.

Arjun Guha Arjun Guha is an assistant professor of Computer Science at the University of Massachusetts Amherst. He enjoys tackling problems in systems using the tools and principles of programming languages. Apart from software-defined networking, he works on Web security and system configuration languages. He received a PhD in Computer Science from Brown University in 2012 and a BA in Computer Science from Grinnell College in 2006. Arjun was the co-chair of the *Workshop on Programming Languages and Verification Technology for Networking*, which was co-located with POPL 2015.

Robert Soulé Robert Soulé is an assistant professor at the Universitá della Svizzera italiana (USI). His research interests are in distributed systems, networking, and applied programming languages. His recent work has focused on software-defined networks and graph database query optimization. He is the recipient of the Best Paper award at ACM DEBS 2012, and a Google Faculty Research Award for data-center modeling. Prior to joining USI he was a postdoctoral associate at

Cornell University. He received his Ph.D. from New York University in 2012, and his B.A. from Brown University in 1999. For two years, he was a research co-op in the Data Intensive Systems and Analytics Group at IBM T. J. Watson Research Center. Professor Soulé was a co-organizer of the first NetPL workshop.

Nik Sultana Nik Sultana is a research associate at the Cambridge University's Computer Lab. He is interested in modeling and analysis of formal languages, and in the design and implementation of domain-specific languages. He is also interested in theorem-proving and its tool support. He received his Ph.D. from Cambridge University in 2015, after graduating with an MSc from Kent University, and BSc from the University of Malta.

7 Invitation plan

We have contacted the following potential invitees for an indication of whether they would be interested to participate, all of whom expressed interest. Note that, besides the recognizable world-renowned networking researchers, several of our invited speakers are leading experts from the programming languages and formal methods community, and are very active researchers in the areas covered by NetPL.

- Andy Wingo, Igalia
- Boon Thau Loo, University of Pennsylvania
- Changhoon Kim, Barefoot Networks
- Derek Dreyer, Max Planck Institute for Software Systems
- Jennifer Rexford, Princeton University
- Mooly Sagiv, Tel Aviv University
- Nate Foster, Cornell University
- Nick McKweon, Stanford University
- Nikolaj Bjorner, Microsoft Research
- Shriram Krishnamurthi, Brown University
- Stuart Wray, Netronome
- Timothy Roscoe, ETH Zurich

8 Timeline

December-March Inviting speakers to give talks.

Before end of May, 2016 Talk abstracts collected from speakers.

Before mid-June, 2016 Program available online.

Before mid-June, 2016 List of organization details.

9 Sketch of the 'Call for Participation'

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[NOTE: "XXX" indicates that a datum is not currently available or confirmed]

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NetPL 2016 Call for Participation
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The Second Workshop on Networking and Programming Languages,
co-located with SIGCOMM 2016
August XXX, 2016
Salvador, Brazil
http://XXX

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The NetPL workshop will provide a forum to bring together researchers
and practitioners from the fields of programming languages, formal
methods, and networking. Recent technological trends, such as
software-defined networking and network functions virtualization, have
created an opportunity for researchers in these traditionally separate
communities to collaborate, applying their diverse perspectives
towards the development of novel networking applications. But the
interaction between the two areas goes back a long way, since
domain-specific languages such as pcap and BPF, have been used in
networking for decades. The workshop will target the broadest
interpretation of the intersection between networking and programming
languages, and will not be specially focused on SDN. The program will
consist of invited talks, with an emphasis on encouraging engaging
technical discussions amongst the attendees.


Invited speakers:

     XXX
     XXX
     XXX
     XXX
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     XXX

Full program:

     http://XXX
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Registration for NetPL 2016 is now open. The early registration
deadline is XXX:

    http://XXX

For information on the venue, hotels, and traveling, please see the
conference website at:

    http://conferences.sigcomm.org/sigcomm/2016/
