

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zurich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at <http://www.springer.com/series/7411>

Mohamed Ali Kaafar · Steve Uhlig
Johanna Amann (Eds.)

Passive and Active Measurement

18th International Conference, PAM 2017
Sydney, NSW, Australia, March 30–31, 2017
Proceedings

Editors

Mohamed Ali Kaafar
CSIRO
Sydney, NSW
Australia

Johanna Amann
International Computer Science Institute
Berkeley, CA
USA

Steve Uhlig
Queen Mary University of London
London
UK

ISSN 0302-9743

ISSN 1611-3349 (electronic)

Lecture Notes in Computer Science

ISBN 978-3-319-54327-7

ISBN 978-3-319-54328-4 (eBook)

DOI 10.1007/978-3-319-54328-4

Library of Congress Control Number: 2017933285

LNCS Sublibrary: SL5 – Computer Communication Networks and Telecommunications

© Springer International Publishing AG 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The 18th edition of the Passive and Active Measurement conference (PAM) took place in Sydney, Australia, during March 30–31, 2017. The technical program included papers on a wide range of topics in Internet measurements, including performance and troubleshooting, the Web and applications, IPv6, security, and wireless.

PAM brings together both the network research and operations communities to discuss novel network measurement and analysis techniques, with a particular focus on early-stage research. PAM has traditionally focused on research and practical applications of specific network measurements. However, over the past few years, PAM has broadened its scope to encompass measurements of networked applications and systems, content distribution networks, online social networks, overlay networks, and more. Indeed, measurement technology is needed at all layers of the stack, e.g., for power profiling of hardware components, at the MAC/network/transport layers, as well as up the stack for application profiling and even to collect user feedback. Measurement technologies are being designed for the digital home, residential access networks, wireless and mobile access, enterprise, ISP, and data-center networks. PAM encourages a broad range of submissions across all these topics. We aim at understanding the role that measurement techniques can play in networked environments and applications, across different layers, and how they can serve as building blocks for broader measurement needs. This year PAM received 87 submissions originating from most continents, including North America, South America, Europe, Asia, the Pacific, and the Middle East, with authors from both academia and industry. The program was the result of a thorough review process, followed by a two-week-long discussion phase. In the first phase of the review process, papers were assigned to Technical Program Committee (TPC) members for review. The TPC consisted of 34 recognized researchers, with expertise covering the topics of interest to PAM, and were drawn mostly from academic and research institutes but also industry. Special attention was paid this year to the TPC member selection, so as to include a mix of early career and more established researchers, as well as to ensure diversity in the institutions and countries represented. The TPC worked diligently, writing many thoughtful, fair, and thorough reviews. Most papers received three reviews by the end of this stage. Also, throughout the review process, special attention was paid to conflicts (declared by the authors or not), to guarantee impartial reviewing. Indeed, more than half of the submitted papers had TPC conflicts. Papers in conflict with TPC members were marked as conflict in the conference management system and were reviewed only by non-conflicting TPC members.

At the end of the reviewing phase, marking the beginning of the discussion phase, each paper was then assigned a discussion lead among its assigned reviewers. The discussion leads were responsible for leading and moderating the discussion. By the end of the discussion phase, a consensual decision had been made by the reviewers. This led to 20 papers being accepted out of the 87 submitted. Some of the accepted

papers were assigned a shepherd to ensure that the authors addressed the reviewers comments adequately.

The final program is the result of hard work of many individuals. We thank all the authors who submitted their work to PAM. We appreciate the effort that goes into producing a quality research paper and hope that authors received useful feedback on their submissions. As program chair, I would like to extend a big thank you to our hardworking TPC members for volunteering their time and expertise with passion.

Before closing this preface, our most sincere thanks also go to our local volunteers who devoted their time and effort to make the conference possible. We would also like to thank Prashanthi Jayawardhane and the local organization chairs, Wei Bao and Jonathan Chan, for their diligence and care in reviewing logistics and organizational details. We are also grateful to Ralph Holz, who was the finance chair, Johanna Amann as the publication chair, and Kanchana Thilakarathna, who served as the publicity chair.

We hope you enjoyed the proceedings.

March 2017

Dali Kaafar
Steve Uhlig

Organization

General Chair

Mohamed Ali (Dali) Kaafar Data61-CSIRO, Australia

Program Chair

Steve Uhlig Queen Mary University of London, UK

Finance Chair

Ralph Holz University of Sydney, Australia

Local Arrangements Chairs

Wei Bao University of Sydney, Australia
Jonathan Chan Data61-CSIRO, Australia

Web Chair

Guillaume Jourjon Data61-CSIRO, Australia

Publicity Chair

Kanchana Thilakarathna Data61-CSIRO, Australia

Publication Chair

Johanna Amann ICSI, USA

Submission Chair

Timm Boettger Queen Mary University of London, UK

Steering Committee

Fabio Ricciato	University of Salento, Italy
George Riley	Georgia Institute of Technology, USA
Ian Graham	Endace, New Zealand
Neil Spring	University of Maryland, USA
Nevil Brownlee	The University of Auckland, New Zealand
Nina Taft	Google, USA

Matthew Roughan	University of Adelaide, Australia
Rocky K.C. Chang	The Hong Kong Polytechnic University, Hong Kong, SAR China
Yong Liu	New York University, USA
Xenofontas Dimitropoulos	University of Crete, Greece
Mohamed Ali (Dali) Kaafar	Data61-CSIRO, Australia

Program Committee

Mark Allman	ICSI, USA
Gianni Antichi	University of Cambridge, UK
Fabian Bustamante	Northwestern University, USA
Alberto Dainotti	CAIDA, UC San Diego, USA
Xenofontas Dimitropoulos	FORTH and ETH Zurich, Switzerland
Amogh Dhamdhere	CAIDA/UC San Diego, USA
Benoit Donnet	University of Liege, Belgium
Anja Feldmann	TU Berlin, Germany
Kensuke Fukuda	National Institute of Informatics, Japan
Monia Ghobadi	Microsoft research, USA
Sergey Gorinsky	IMDEA, Spain
Ralph Holz	University of Sydney, Australia
Te-Yuan Huang	Netflix, USA
Thomas Karagiannakis	MSR, UK
Myungjin Lee	University of Edinburgh, UK
Youngseok Lee	Chungnam National University, Korea
Simon Leinen	SWITCH, Switzerland
Yong Li	Tsinghua University, China
Marco Mellia	Politecnico di Torino, Italy
Alan Mislove	Northeastern University, USA
Andrew Moore	University of Cambridge, UK
Cristel Pelsser	University of Strasbourg, France
Maria Papadopoulou	FORTH, University of Crete
Costin Raiciu	Universitatea Politehnica din București, Romania
Michael Rabinovich	Case Western Reserve University, USA
Cigdem Sengul	Nominet, UK
Justine Sherry	UC Berkeley, USA
Georgios Smaragdakis	MIT/TU Berlin, Germany
Rade Stanojevic	Telefonica, Spain
Kanchana Thilakarathna	Data 61, Australia
Guillaume Urvoy-Keller	University of Nice, France
Narseo Vallina-Rodriguez	IMDEA Networks/ICSI, Spain
Gaogang Xie	ICT, CAS, China

Sponsoring Institutions

Data61-CSIRO, Australia

Akamai, USA

University of New South Wales, Australia

University of Sydney, Australia

Contents

IPv6

Understanding the Share of IPv6 Traffic in a Dual-Stack ISP	3
<i>Enric Pujol, Philipp Richter, and Anja Feldmann</i>	
On the Potential of IPv6 Open Resolvers for DDoS Attacks	17
<i>Luuk Hendriks, Ricardo de Oliveira Schmidt, Roland van Rijswijk-Deij, and Aiko Pras</i>	
Something from Nothing (There): Collecting Global IPv6 Datasets from DNS	30
<i>Tobias Fiebig, Kevin Borgolte, Shuang Hao, Christopher Kruegel, and Giovanni Vigna</i>	

Web and Applications

The Web, the Users, and the MOS: Influence of HTTP/2 on User Experience	47
<i>Enrico Bocchi, Luca De Cicco, Marco Mellia, and Dario Rossi</i>	
Internet Scale User-Generated Live Video Streaming: The Twitch Case	60
<i>Jie Deng, Gareth Tyson, Felix Cuadrado, and Steve Uhlig</i>	
Internet Access for All: Assessing a Crowdsourced Web Proxy Service in a Community Network	72
<i>Emmanouil Dimogerontakis, Roc Meseguer, and Leandro Navarro</i>	

Security

A First Look at the CT Landscape: Certificate Transparency Logs in Practice	87
<i>Josef Gustafsson, Gustaf Overier, Martin Arlitt, and Niklas Carlsson</i>	
Where Is the Weakest Link? A Study on Security Discrepancies Between Android Apps and Their Website Counterparts	100
<i>Arash Alavi, Alan Quach, Hang Zhang, Bryan Marsh, Farhan Ul Haq, Zhiyun Qian, Long Lu, and Rajiv Gupta</i>	
Patch Me If You Can: A Study on the Effects of Individual User Behavior on the End-Host Vulnerability State	113
<i>Armin Sarabi, Ziyun Zhu, Chaowei Xiao, Mingyan Liu, and Tudor Dumitraş</i>	

Performance

Application Bandwidth and Flow Rates from 3 Trillion Flows Across 45 Carrier Networks.	129
<i>David Pariag and Tim Brecht</i>	
Measuring What is Not Ours: A Tale of 3 rd Party Performance.	142
<i>Utkarsh Goel, Moritz Steiner, Mike P. Wittie, Martin Flack, and Stephen Ludin</i>	
The Utility Argument – Making a Case for Broadband SLAs	156
<i>Zachary S. Bischof, Fabián E. Bustamante, and Rade Stanojevic</i>	

Latency

Why Is the Internet so Slow?!	173
<i>Ilker Nadi Bozkurt, Anthony Aguirre, Balakrishnan Chandrasekaran, P. Brighten Godfrey, Gregory Laughlin, Bruce Maggs, and Ankit Singla</i>	
Anycast Latency: How Many Sites Are Enough?	188
<i>Ricardo de Oliveira Schmidt, John Heidemann, and Jan Harm Kuipers</i>	
Where Has My Time Gone?	201
<i>Noa Zilberman, Matthew Grosvenor, Diana Andreea Popescu, Neelakandan Manihatty-Bojan, Gianni Antichi, Marcin Wójcik, and Andrew W. Moore</i>	

Characterization and Troubleshooting

Mind the Gap Between HTTP and HTTPS in Mobile Networks	217
<i>Alessandro Finamore, Matteo Varvello, and Kostantina Papagiannaki</i>	
Using Loops Observed in Traceroute to Infer the Ability to Spoof	229
<i>Qasim Lone, Matthew Luckie, Maciej Korczyński, and Michel van Eeten</i>	
A Characterization of Load Balancing on the IPv6 Internet	242
<i>Rafael Almeida, Osvaldo Fonseca, Elverton Fazzion, Dorgival Guedes, Wagner Meira Jr., and Ítalo Cunha</i>	

Wireless

Enhancing WiFi Throughput with PLC Extenders: A Measurement Study . . .	257
<i>Kittipat Apicharttrisorn, Ahmed Osama Fathy Atya, Jiasi Chen, Karthikeyan Sundaresan, and Srikanth V. Krishnamurthy</i>	

Cutting Internet Access Costs Through HTTPS Caching: A Measurement Study. 270
 Prerna Gupta, Mohammedsalman Patel,
 and Kameswari Chebrolu

Author Index 283