Proceedings

MADWeb 2020

Workshop on Measurements, Attacks, and Defenses for the Web

February 23, 2020 San Diego, California

Published by the





Internet Society 11710 Plaza America Drive Suite 400 Reston, VA 20190

Copyright © 2020 by the Internet Society.

All rights reserved.

This volume is published as a collective work. The Internet Society owns the copyright for this publication and the copyrights to the individual papers are retained by their respective author[s].

Address your correspondence to: NDSS Program Manager, Internet Society, 11710 Plaza America Drive, Suite 400, Reston, VA 20190 USA, tel. +1 703 439 2120, fax +1 703 326 9881, ndss@elists.isoc.org.

The papers included here comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interest of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors or the Internet Society.

ISBN Number (Digital Format) 1-891562-63-0

Additional copies may be ordered from:



Internet Society
11710 Plaza America Drive
Suite 400
Reston, VA 20190
tel +1 703.439.2120
fax +1 703.326.9881
http://www.internetsociety.org

Proceedings of MADWeb 2020 – Workshop on Measurements, Attacks, and Defenses for the Web

Table of Contents

Program Committee Chairs' Message Organizing Committee

Monsters under the Web, and How to Defeat them

Browser-Based Deep Behavioral Detection of Web Cryptomining with CoinSpy Conor Kelton, Aruna Balasubramanian, Ramya Raghavendra, Mudhakar Srivatsa

Protecting Users from Compromised Browsers and Form Grabbers Sirvan Almasi, William J. Knottenbelt

The Art of (Self) Defense

Building Robust Phishing Detection System: an Empirical Analysis

Jehyun Lee, Pingxiao Ye, Ruofan Liu, Dinil Mon Divakaran, Mun Choon Chan

Lessons Learned from SunDEW: A Self Defense Environment for Web Applications Merve Sahin, Cedric Hebert, Anderson Santana De Oliveira

A Few-Shot Practical Behavioral Biometrics Model for Login Authentication in Web Applications

Jesús Solano, Lizzy Tengana, Alejandra Castelblanco, Esteban Rivera, Christian Lopez, Martin Ochoa

Got Privacy?

K-resolver: Towards Decentralizing Encrypted DNS Resolution
Nguyen Phong Hoang, Ivan Lin, Seyedhamed Ghavamnia, Michalis Polychronakis

Studying the Privacy Issues of the Incorrect Use of the Feature Policy Beliz Kaleli, Manuel Egele, Gianluca Stringhini

An Adaptive Method for Cross-Platform Browser History Sniffing Anxin Huang, Chen Zhu, Dewen Wu, Yi Xie, Xiapu Luo

Bots and Anti-bots

Shepherd: a Generic Approach to Automating Website Login

Hugo Jonker, Stefan Karsch, Benjamin Krumnow, Marc Sleegers

FP-Crawlers: Studying the Resilience of Browser Fingerprinting to Block Crawlers Antoine Vastel, Walter Rudametkin, Romain Rouvoy, Xavier Blanc

Program Committee Chairs' Message

The web connects billions of devices, running a plethora of clients, and serves billions of users every single day. To cope with this widespread adoption, the web constantly changes, with a constant stream of new technologies to develop web applications and ever-more complicated web browsers to render them. These rapid changes of the web's ecosystem are not always studied from a security perspective, resulting in new attack vectors that were never observed before.

The proposed workshop aims to attract researchers that work on the intersection of browser evolution, web security, and large-scale measurements. Our goal is to create and sustain a new venue for discussing the rapid changes to web technologies from a security perspective, how we can protect users, and how can we make future browsers more secure without hindering the evolution of the web.

To this end, we invited researchers to contribute to the second Workshop on Measurements, Attack, and Defenses for the Web (MADWeb), co-located with NDSS Symposium 2020 in San Diego. This year the workshop received 60% more submissions than last year, which indicates the excellent growth and confirms our intuition that the research community wants a security and privacy workshop dedicated to the web. More specifically:

- 17 Program Committee members supported the reviewing process, including prominent representatives of academic and industrial research
- 16 papers were submitted to the workshop, out of which the Program Committee selected 10
- 1 paper was selected for the best paper award based on its outstanding reviewing scores
- 3 student authors were granted travel support
- 2 invited talks were scheduled (from academia and from industry) on the crucial topics of web and browser security

The wide range of topics covered by the accepted papers is remarkable, as it indeed covers all the three thrusts of the workshop, i.e. measurements, attacks, and defenses. In fact, we see that in addition to securing browsers and browser policies, researchers work on improving core infrastructures like DNS, proposing new technologies to combat web vulnerabilities, applying machine learning techniques for efficient malware and phishing detection, protecting against bots, and improving web crawlers. We are looking forward to having a great and productive discussion at the workshop, and we expect that the number and diversity of web-related research topics will keep growing in future editions of MADWeb.

Oleksii Starov, Alexandros Kapravelos, and Nick Nikiforakis General Chair, NDSS 2020

Organizing Committee

Program Committee Chairs

Oleksii Starov, *Palo Alto Networks*Alexandros Kapravelos, *North Carolina State University*Nick Nikiforakis, *Stony Brook University*

Program Committee

Yinzhi Cao, Johns Hopkins University Louis DeKoven, Facebook Adam Doupé, Arizona State University Steven Englehardt, Mozilla William Hewlett, Palo Alto Networks Luca Invernizzi, Google Engin Kirda, Northeastern University Sebastian Lekies, Google Jason Polakis, University of Illinois at Chicago Tamara Rezk, INRIA Walter Rudametkin, Polytech Lille Peter Snyder, Brave Ben Stock, CISPA Helmholtz Center Gianluca Stringhini, Boston University Giovanni Vigna, UC Santa Barbara Weihang Wang, University at Buffalo Yuchen Zhou, Palo Alto Networks