

Divya Muthukumaran

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Objective

PhD Candidate at Penn State University graduating in August 2013 and looking for full time positions. Expertise in static program analysis for security.

Education

The Pennsylvania State University

Ph.D. Computer Science and Engineering, 3.81

Comprehensive Exam Passed: May 2013, Intended Graduation: Summer 2013

University Park

2006–2013

Anna University

B.E. Computer Science and Engineering, 82/100

Chennai India

2001–2005

Research

Title: *Ph.D Thesis - Automating Authorization Hook Placement in Programs*

Advisor: Trent Jaeger, Associate Professor, The Pennsylvania State University

Abstract: Over the last decade many efforts have been undertaken to place authorization hooks in user-space server applications such as the X server, postgres,dbus etc. These efforts involve complex manual security analysis of the program spanning several years in order to reach a consensus on the placement of these hooks. Past efforts at automation often assume significant programmer knowledge and the manual specification of security-sensitive operations and data structures in the program. My research goal is to automate both the identification of security-sensitive objects and operations and inferring authorization hook placement locations in the program using static analysis of the source code. Implemented a prototype in Ocaml using the CIL framework.

Title: *Analyzing Security Policies in Distributed Systems*

Abstract: Distributed systems are a combination of several independent components. The administrator of such systems has the cumbersome task of combining policies from the different system components and determining if they satisfy some high level notion of security. In this project, my co-authors and I have cast this as an information flow problem and have used a novel graph-cut based technique to identify errors in the system policy. I have implemented this in Python and C++.

Title: *Automating Security Mediation in Programs*

Abstract: Worked on a framework to resolve information flow errors in security-typed programs, enabling legacy code to be retrofit with comprehensive mediation to satisfy a security policy (e.g. for input validation such as sanitizers).

Title: *Ensuring the Integrity of Applications in Mobile Phone Systems*

Abstract: Mobile phones users may download malware-infected applications, which may steal or modify security-critical data. In this work, we propose a security architecture for phone systems that protects trusted applications from such downloaded code using reference monitors in the operating system and user-space services to enforce mandatory access control policies. Implemented a tool in C to extract information flow graph from SELinux policy binary.

Work Experience

Academic	
The Pennsylvania State University <i>Research Assistant</i>	University Park 2007–2013
The Pennsylvania State University <i>Teaching Assistant</i> Algorithm Design	University Park Jan 2011– May 2011
Industry	
HP Fortify <i>Senior Software Security Research Intern</i>	Palo Alto May 2013–July 2013
Going to be working on a static analysis based technique to automatically infer the placement of authorization hooks in web applications.	
HP Labs <i>Research Intern</i>	Bristol July 2012–Oct 2012
Worked on a static analysis based technique to automatically infer the placement of authorization hooks in legacy code. Demonstrated this technique by incorporating it into the HP Fortify Source Code Analysis Suite written in Java.	
Tata Consultancy Services <i>Assistant Systems Engineer</i>	India Sep 2005–Jul 2006
Member of the quality team involved in test case design and execution, verification and bug fixing.	
Sify Ltd <i>Technical Intern</i>	India May 2003–Jun 2003
Developed a data validation system using file handling and checksum techniques in Visual Basic for use in their secure access layer.	

Publications

Divya Muthukumaran, Nirupama Talele, Trent Jaeger, and Gang Tan. Generating the Least Mediation for Least Privilege. *In submission*, Apr 2013.

Divya Muthukumaran, Sandra Rueda, Nirupama Talele, Hayawardh Vijayakumar, Jason Teutsch, and Trent Jaeger. Transforming commodity security policies to enforce Clark-Wilson integrity. In *Proceedings of the 28th Annual Computer Security Applications Conference, ACSAC '12*, pages 269–278, New York, NY, USA, 2012. ACM.

Divya Muthukumaran, Trent Jaeger, and Vinod Ganapathy. Leveraging "Choice" to Automate Authorization Hook Placement. In *Proceedings of the 2012 ACM conference on Computer and communications security, CCS '12*, pages 145–156, New York, NY, USA, 2012. ACM.

Divya Muthukumaran, Joshua Schiffman, Mohamed Hassan, Anuj Sawani, Vikhyath Rao, and Trent Jaeger. Protecting the Integrity of Trusted Applications in Mobile Phone Systems. *Security and Communication Networks*, 4(6):633–650, 2011.

Divya Muthukumaran, Sandra Rueda, Hayawardh Vijayakumar, and Trent Jaeger. Cut Me Some Security. In *Proceedings of the 3rd ACM workshop on Assurable and usable security configuration, SafeConfig '10*, pages 75–78, New York, NY, USA, 2010. ACM.

Dave King, Susmit Jha, Divya Muthukumaran, Trent Jaeger, Somesh Jha, and Sanjit A. Seshia. Automating Security Mediation Placement. In *Proceedings of the 19th European conference on Programming Languages and Systems, ESOP'10*, pages 327–344. Springer-Verlag, 2010.

Divya Muthukumaran, Anuj Sawani, Joshua Schiffman, Brian M. Jung, and Trent Jaeger. Measuring Integrity on Mobile Phone Systems. In *Proceedings of the 13th ACM symposium on Access control models and technologies, SACMAT '08*, pages 155–164, New York, NY, USA, 2008. ACM.

Presentations

- Presented the poster "Leveraging Choice to Automate Authorization Hook Placement" at the Usenix Security Symposium, San Francisco, CA, May 2012.
- Presented the paper "Cut Me Some Security" at the 3rd ACM Workshop on Assurable and Usable Security Configuration (SafeConfig), October 2010
- Presented the paper "Retrofitting Authorization In Legacy Programs" at the Grace Hopper Celebration of Women in Computing, September 2010.
- Presented the poster "Graph Cuts Can Be Used to Solve Security Problems" at Usenix Security 2010.
- Presented the paper "Automating Security Mediation Placement" at the 19th European Symposium on Programming (ESOP 2010), March 2008.
- Presented the paper "Measuring Integrity on Mobile Phone Systems" at the 13th ACM Symposium on access control models and technologies (SACMAT), June 2008.

Computer skills

Languages-Primary: C, C++, Ocaml

Languages-Secondary: Java, Python

Languages-Tertiary: PHP, HTML, XML, SQL

Operating Systems: Linux, Windows

Program Analysis: CIL, Polyglot

Professional Services

Reviewer.....

- IEEE Transactions on Computers, 2009
- The 2nd IEEE International Workshop on Security in Software Engineering (IWSSE 2008)

External Reviewer.....

- The 17th USENIX Security Symposium
- 2008 IEEE Symposium on Security and Privacy
- The 18th USENIX Security Symposium
- Fourth International Conference on Information Systems Security (ICISS 2008)
- Fifth International Conference on Information Systems Security (ICISS 2009)

Awards

- Usenix Security 2012 Travel Grant Award.
- CCS 2010 Student Travel Grant Award.
- ETAPS 2010 scholarship to travel to ETAPS '10 at Paphos, Cyprus to present the paper titled "Automating Security Mediation Placement".
- 19th USENIX Security Symposium Student Travel Grant.
- 18th USENIX Security Symposium Student Travel Grant.

References

Name: Trent Jaeger

Affiliation: Associate Professor, Computer Science and Engineering, The Pennsylvania State University

Email: tjaeger@cse.psu.edu

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Name: Patrick McDaniel

Affiliation: Professor, Computer Science and Engineering, The Pennsylvania State University

Email: *mcdaniel@cse.psu.edu*

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Name: Nigel Edwards

Affiliation: Senior Researcher, HP Labs Bristol

Email: *nigel.edwards@hp.com*

Citizenship

India: F1 Visa