

Francis M. David

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OBJECTIVE

Seeking a challenging career in the software industry

INTERESTS

Operating Systems, Reliability and Security

EDUCATION

PhD in Computer Science, University of Illinois at Urbana-Champaign

Expected: May 2008

Thesis: *Building a Reliable Operating System*

Advisor: Professor Roy H. Campbell

BTech in Computer Science, Indian Institute of Technology Madras, India

May 2001

Thesis: *Learning-Intrusion Detection System for Mobile Wireless Networks*

Advisor: Professor S. V. Raghavan

PROFESSIONAL POSITIONS

Research Assistant

University of Illinois

Advisor: Professor Roy H. Campbell

August 2004-present

Working on the design and implementation of next generation dependable operating systems with a focus on reliability and security issues. My thesis introduces CuriOS, an operating system that uses novel state management and recovery techniques to achieve dramatic improvements in reliability. Most of this research is being conducted in the context of ARM processor-based mobile device architectures which are expected to play a major role in the computing environment of the future.

We are also exploring advanced attacks against computer systems and are developing techniques to counter such threats. We have developed Cloaker, a proof-of-concept rootkit that exploits hardware features for concealment and highlights the weaknesses of existing security measures. We advocate architecture-specific integrity checks as a potential deterrent to such malware.

Teaching Assistant

University of Illinois

Supervisors: Marsha Woodbury and Roy H. Campbell

August 2001-July 2004

Taught lab sessions, prepared and graded homework and exams for CS105 (Introduction to Computing), CS423 (Operating Systems) and CS523 (Advanced Operating Systems). Helped create a course plan for CS523 that incorporated student-selected learning material with peer-reviewed assignments and projects.

Internship

Supervisors: Nayeem Islam and Manuel Roman

DoCoMo Research

Summer 2005

Developed support for visual component composition of DoCoMo's Micro Building Blocks technology using BeanBox from Java Beans. Performed a survey of software errors, their causes and recovery techniques.

Internship

Supervisors: Cezary Dubnicki and Cristian Ungureanu

NEC Research

Summer 2003

Worked on building a massively distributed content addressable block storage system. Responsible for the design and implementation of the disk storage component, encryption component, hashing component and the driver interface. This project is now a commercial product from NEC called HYDRAsTOR.

Internship

Group: Distribution Center - Upstream

Amazon.com

Summer 2002

Worked on the Amazon Fulfillment Center Management Console, a web interface for developers to manage and visualize order flow at the various distribution centers.

Internship

Supervisors: Rahul Garg and Vipul Bansal

IBM Research

Summer 2000

Designed and implemented resource allocation algorithms for web server farms which used agents and auctions to dynamically partition and reserve resources.

AWARDS AND HONORARIES

- Best Student Paper Award, IEEE Symposium on Security and Privacy, 2008
- Travel Scholarship, IEEE Symposium on Security and Privacy, 2008
- Travel Scholarship, ACM Symposium on Operating Systems Principles, 2007
- Travel Scholarship, USENIX Annual Technical Conference, 2007
- Outstanding Teaching Assistant Award, Department of Computer Science, UIUC, 2004
- Outstanding Teaching Assistant Award, Department of Computer Science, UIUC, 2003
- Travel Scholarship, USENIX Annual Technical Conference, 2003
- Outstanding Teaching Assistant Award, Department of Computer Science, UIUC, 2002
- Ranked in the top 1% of about 100,000 students who wrote the extremely competitive Joint Entrance Examination, for admission to undergraduate study at the Indian Institutes of Technology, 1997
- Ranked in the top 1% of about 150,000 students in the Tamil Nadu Professional Courses Entrance Examination, 1997
- Ranked 1st amongst about 5,000 students in the Pondicherry Engineering College Entrance Examination, 1997
- Ranked 1st in my high school in the State School Leaving Certificate Exam, 1997

PROFESSIONAL SERVICE

- Session scribe for ACM Symposium on Operating Systems Principles, 2007
- External reviewer for IBM Journal of Research and Development, 2007
- Session scribe for USENIX Annual Technical Conference, 2007
- Mentor for class project groups in CS523: Advanced Operating Systems, 2006 and 2007
- External reviewer for FAST and USENIX conferences, 2004
- Session scribe for USENIX Annual Technical Conference, 2003
- Member of the Graduate Employees Organization, UIUC, 2001-2008
- Member of the Campus Network Administration Group, Netlab, IIT Madras, 2000

INVITED TALKS

- “Hardware Features can Undermine Software Security” Microsoft Research, Redmond, WA, June 2, 2008
- “Advanced Rootkits for the ARM Processor” CUInfoSec: Special Interest Group for Information Security, Champaign-Urbana, IL, April 17, 2008.

PUBLICATIONS

Journal Articles and Book Chapters

- [1] **Francis M. David**, Jeffrey C. Carlyle, Ellick M. Chan, David K. Raila and Roy H. Campbell. Exception Handling in the Choices Operating System. In *Advanced Topics in Exception Handling Techniques*, C. Dony, J. L. Knudsen, A. Romanovsky, A. Tripath eds., Springer-Verlag Inc., 2006.

Conference and Workshop Papers

- [2] **Francis M. David**, Ellick M. Chan, Jeffrey C. Carlyle and Roy H. Campbell. CuriOS: Improving Reliability through Operating System Structure. In *USENIX Symposium on Operating Systems Design and Implementation (OSDI'08)*, Dec, 2008 (14% acceptance rate, 26/193)
- [3] Ellick M. Chan, Jeffrey C. Carlyle, **Francis M. David**, Reza Farivar and Roy H. Campbell. BootJacker: Compromising Computers using Forced Restarts. In *ACM Conference on Computer and Communications Security (CCS'08)*, Oct, 2008 (18% acceptance rate, 51/281)
- [4] **Francis M. David**, Ellick M. Chan, Jeffrey C. Carlyle, Roy H. Campbell. Cloaker: Hardware Supported Rootkit Concealment. **Best Student Paper Award**. In *IEEE Symposium on Security and Privacy (SP'08)*, May, 2008 (11% acceptance rate, 28/249)

- [5] **Francis M. David**, Bill Donkervoet, Jeffrey C. Carlyle, Ellick M. Chan, Roy H. Campbell. Supporting Adaptive Application Mobility. In *International Workshop on Pervasive Systems (PerSys'07)*, November, 2007
- [6] **Francis M. David**, Roy H. Campbell. Building a Self-Healing Operating System. In *IEEE International Symposium on Dependable, Autonomic and Secure Computing (DASC'07)*, September, 2007
- [7] Lin Tan, Ellick M. Chan, Reza Farivar, Nevedita Mallick, Jeffrey C. Carlyle, **Francis M. David**, Roy H. Campbell. iKernel: Isolating Buggy and Malicious Device Drivers Using Hardware Virtualization Support. In *IEEE International Symposium on Dependable, Autonomic and Secure Computing (DASC'07)*, September, 2007
- [8] **Francis M. David**, Jeffrey C. Carlyle, Ellick M. Chan, Philip A. Reames, Roy H. Campbell. Improving Dependability by Revisiting Operating System Design. In *Workshop on Hot Topics in Dependability (HotDep'07)*, June, 2007 (27% acceptance rate, 6/22).
- [9] **Francis M. David**, Jeffrey C. Carlyle, Roy H. Campbell. Context Switch Overheads for Linux on ARM Platforms. In *Workshop on Experimental Computer Science (ECS'07)*, June, 2007
- [10] **Francis M. David**, Jeffrey C. Carlyle and Roy H. Campbell. Exploring Recovery from Operating System Lockups. In *USENIX Annual Technical Conference (USENIX'07)*, June, 2007 (19% acceptance rate)
- [11] Xiaodong Li, Zhenmin Li, **Francis M. David**, Pin Zhou, Yuanyuan Zhou, Sarita V. Adve and Sanjeev Kumar. Performance-Directed Energy Management for Main Memory and Disks. In *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'04)*, October, 2004 (14% acceptance rate, 24/169).
- [12] Qingbo Zhu, **Francis M. David**, Christo F. Devaraj, Zhenmin Li, Yuanyuan Zhou and Pei Cao. Reducing Energy Consumption of Disk Storage Using Power-Aware Cache Management. In *International Symposium on High-Performance Computer Architecture (HPCA'04)*, February, 2004 (17% acceptance rate, 27/153).

Papers Under Review

- [13] Ellick M. Chan, **Francis M. David**, Jeffrey C. Carlyle and Roy H. Campbell. Runtime Integrity Checking of an Operating System.

Technical Reports

- [14] **Francis M. David** and Roy H. Campbell. Recovering from Operating System Errors. Department of Computer Science Technical Report, UIUCDCS-R-2007-2831, March 2007
- [15] **Francis M. David**, Ellick M. Chan, Jeffrey C. Carlyle and Roy H. Campbell. Porting Choices to ARM Architecture Based Platforms. Department of Computer Science Technical Report, UIUCDCS-R-2007-2830, March 2007

Posters

- [16] **Francis M. David**, Ellick M. Chan, Jeffrey C. Carlyle and Roy H. Campbell. QInject: A Virtual Machine based Fault Injection Framework In *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'08)*, March, 2008
- [17] Ellick M. Chan, **Francis M. David**, Jeffrey C. Carlyle and Roy H. Campbell. MemCrawler: Discovering Structures in Memory In *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'08)*, March, 2008
- [18] **Francis M. David**, Ellick M. Chan, Jeffrey C. Carlyle and Roy H. Campbell. Dependable Mobile Device Operating Systems. In *Illinois Wireless Systems Symposium*, September, 2007
- [19] Roy H. Campbell, Ellick M. Chan, Chang-young Jung, Philip A. Reames, Rishi Bhardwaj, **Francis M. David** and Jeffrey C. Carlyle. Isolation using Virtualization on Mobile Devices. In *ITI Workshop on Dependability and Security*, December, 2006
- [20] **Francis M. David** and Roy H. Campbell. Choices Operating System Reliability. In *Illinois Department of Computer Science Affiliates Conference*, April, 2006
- [21] **Francis M. David**, Jeffrey C. Carlyle, Ellick M. Chan and Roy H. Campbell. Choices Mobile OS: Reliability, Adaptation and Remote Management. In *Illinois Department of Computer Science Affiliates Conference*, April, 2005

Other Articles

- [22] **Francis M. David**. Transparent Recovery from Operating System Errors. In *Dependable Systems and Networks (DSN'07) Student Forum*, June, 2007
- [23] Jeffrey C. Carlyle, **Francis M. David** and Roy H. Campbell. Back in a Flash! - Fast Recovery using Non-Volatile Memory. In *Dependable Systems and Networks (DSN'07) Fast Abstracts*, June, 2007
- [24] Philip A. Reames, Ellick M. Chan, **Francis M. David**, Jeffrey C. Carlyle and Roy H. Campbell. A Hypervisor for Embedded Computing. In *Illinois Journal of Undergraduate Research*, April, 2007

PUBLISHED SOFTWARE SYSTEMS

Available at <http://choices.cs.uiuc.edu/>

- **Choices-ARM**: ARM port of the Choices Object-Oriented Operating System. This has been used as a teaching tool in several basic and advanced operating systems courses at the University of Illinois.
- **CurIOS**: Research operating system incorporating advanced recovery techniques for high reliability.
- **QInject**: Fault injection tool based on virtualization technology.

REFERENCES

Professor Roy H.Campbell
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