Sundaresan Rajasekaran

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EDUCATION

THE GEORGE WASHINGTON UNIVERSITY
May 2018 | **Doctor of Philosophy** in Computer Science
Advisor: Prof. Timothy Wood
Thesis: Secure and Scalable Cloud Systems

STANFORD UNIVERSITY
Dec 2012 | **Certificate of Entrepreneurship**
PI/Advisor: Prof. Nan Zhang
NSF Award Number: 1158737

THE GEORGE WASHINGTON UNIVERSITY
Aug 2011 | **Master of Science** in Computer Security and Information Assurance
Advisor: Prof. Poorvi Vora

THE GEORGE WASHINGTON UNIVERSITY
May 2010 | **Master of Science** in Computer Science
Advisor: Prof. Nan Zhang

ANNA UNIVERSITY, India
May 2008 | **Bachelor of Engineering** in Computer Science
Advisor: Prof. Thirunadana Sikamani

WORK EXPERIENCE

BARKLY PROTECTS - BOSTON, MA
2017 – Present | **Senior Protection Engineer**

- Responsible for the development and maintenance of a patented hypervisor and Windows kernel filter driver.
- Implemented strong anti-exploit techniques within Windows kernel filter driver.
- Implemented Barkly's OSX Kernel Extention from scratch.
- Implemented runtime malware behavior detection for fileless attacks.
- Developed algorithms to increase the performance of the overall system.
- Reverse engineered executables to detect traces of malware.
- Analyzed memory dumps of an endpoint to detect the root cause of the failure.
- Implemented a unit testing framework for the kernel-level protection.

THE GEORGE WASHINGTON UNIVERSITY, CLOUD SYSTEMS LAB - WASHINGTON, DC
2009 – 2017 | **Cloud System Security Researcher**

Manager:
- Directly managed a small team of engineers both on-site and off-site.
- Organized and lead the Scrum team and followed agile methodology.
- Built a culture around fun, respect, humility, and accountability.
- Recruited and built teams catered to project requirements.

System Security:
- Implemented a novel security mechanisms for threat and malware detection on endpoint systems.
- Conducted extensive experimentation of security attacks on Amazon Web Services platform.
- Implemented a framework for real time detection of malware attacks in Virtual Machines.
- Used memory introspection techniques to protect VMs from memory based attacks.
- Implemented modules that run on VM Manager to reduce performance bottlenecks.
- Published several projects on top-tier conferences and Journals.

Cloud System Performance:
- Implemented a Hadoop Job scheduler for customized load balance.
- Implemented a new priority level built into Xen Hypervisor Credit Scheduler.
- Modified the Linux CPU scheduler to avoid interference between Virtual Machines.
- Implemented several algorithms to increase the CPU and memory utilization of the Cloud.
- Proposed and tested models to run Hadoop jobs using data centers' spare resources efficiently.

Privacy Preserving Systems:
- Implemented a system that efficiently mined Enterprise search engine corpus.
- Assisted in developing privacy preserving location (Anonymous GPS) based systems.
- Developed novel mathematical models for efficient output compression, input pruning, and search space pruning.
- Was one among 12 students to receive the first ever NSF I-Corps award to carry the research at Stanford University.

2013 – 2015 | **High Performance Computing Researcher**

- Helped physically build the cluster from ground up.
- Implemented the initial prototype of running OpenStack on the HPC cluster.
- Assist with the operation and maintenance of the university's 100 node HPC GPU cluster using SLURM.
- Identified and reduced performance overhead by 25% in the cluster caused by improper job scheduling.

ANNA UNIVERSITY, INDIA
2013 – 2014 | **Visiting Lecturer and Mentor**

- Taught and mentored students on several projects in virtualization technologies.
- Trained students to conduct quality research in Operating Systems.
- Trained students to work independently on offshore projects.
- Conducted a collaborative research project in Cloud Computing.

2012 – 2013 | **System Administrator**

- Used Puppet/Chef to manage to automate maintenance of the university's data center.
- Monitored and maintained DNS, WINS, NTP, DHCP for the servers.
- Moved 20% of the physical servers to AWS, and cut 70% of the costs on power.
- Wrote scripts in Python to automate database initialization and run patches to reduce 20% downtime.

2011 – 2012 | **Graduate Teaching Assistant**

- Spring 2012 | **Discrete Mathematics**, Undergraduate level
- Fall 2011 | **Network Security**, Graduate level
- Spring 2011 | **Algorithms and Data Structures**, Undergraduate level

RESEARCH

Areas: Cyber Security, Operating Systems, Virtualization, Cloud Computing, Resource allocation and Performance.

Mission: My research focus is on virtual machines and operating systems, combining a deep understanding of resource management in the cloud and systems security issues with an expertise in developing systems with real-world impact.

PUBLICATIONS

1. Middleware'18 | **CRIMES: Using Evidence to Secure the Cloud**, Sundaresan Rajasekaran, Zhen Ni, Harpreet Singh Chawla, Neel Shah, Timothy Wood, Emery Berger
   - Implemented a framework for online detection of cyber attacks in Virtual Machines.
   - Improved the performance of Xen Hypervisor's checkpointing mechanism by 70%.
   - Languages used: C, C++ and Python with ~10K lines of code.

2. HotCloud'16 | **Scalable Cloud Security via Asynchronous Virtual Machine Introspection**, Sundaresan Rajasekaran, Zhen Ni, Harpreet Singh Chawla, Neel Shah, Timothy Wood, Emery Berger
   - Implemented a novel security mechanism for Cloud Systems.

- Used memory introspection techniques to protect VMs from memory based attacks.
- Languages used: C and Python with ~2K lines of code.

3. IC2E'16 | **Multi-Cache: Dynamic, Efficient Partitioning for Multi-Tier Caches in Consolidated VM Environments**, Sundaresan Rajasekaran, Shaohua Duan, Wei Zhang, Timothy Wood
   - Implemented a standalone disk-storage simulator from scratch.
   - Developed models to analyze terabytes of storage trace data in sub-millisecond interval.
   - Languages used: C++ and Python with ~3K lines of code.

4. ACM Sigmetrics PER'15 | **Minimizing Interference and Maximizing Progress for Hadoop Virtual Machines**, Wei Zhang, Sundaresan Rajasekaran, Shaohua Duan, Timothy Wood, Mingfa Zhu
   - Implemented a Hadoop Job scheduler for customized load balance.
   - Modified the Linux CPU scheduler to avoid interference between VMs.
   - Languages used: Java and C with ~5K lines of code.

5. CCGrid'14 | **MIMP: Deadline and Interference aware scheduling of Hadoop Virtual Machines**, Wei Zhang, Sundaresan Rajasekaran, Timothy Wood, Mingfa Zhu
   - Implemented a new priority level built into Xen Hypervisor Credit Scheduler.
   - Implemented a tool to study the resource utilization of 192 production servers.
   - Languages used: C, C++ and Python with ~5K lines of code.

6. TKDE'14 | **On Skyline Groups**, Nan Zhang, Chengkai Li, Naeemul Hassan, Sundaresan Rajasekaran, Gautam Das
   - Developed novel mathematical models for efficient output compression, input and search space pruning.
   - Developed novel anti-monotonic properties to prune search space and filter out candidate groups.
   - Languages used: Matlab and R with ~1K lines of code.

7. TPDS'14 | **Swiper: Exploiting Virtual Machine Vulnerability in Third-Party Clouds**, Ron C Chiang, Sundaresan Rajasekaran, Nan Zhang, H Howie Huang
   - Implemented a novel workload based performance attack of Cloud Systems.
   - Conducted extensive experimentation of the attack on Amazon Web Services platform.
   - Languages used: C, C++, Java and Python with ~3K lines of code.

8. ASBD'13 | **Big Data in the Background: Maximizing Productivity while Minimizing Virtual Machine Interference**, Wei Zhang, Sundaresan Rajasekaran, Timothy Wood
   - Implemented several algorithms to increase the CPU and memory utilization of the Cloud.
   - Proposed and tested models to efficiently run Hadoop jobs using data centers' spare resources.
   - Languages used: C, Java and Python with ~2K lines of code.

9. CIKM'13 | **On Skyline groups**, Chengkai Li, Nan Zhang, Naeemul Hassan, Sundaresan Rajasekaran, Gautam Das
   - Implemented statistically sound techniques to find skyline groups.
   - Languages used: Matlab, R and Python with ~1K lines of code.

SKILL SET

Programming: C, C++, x86 Assembly, Python, Java, Matlab, Android
Agile Methodology: Confluence and Jira
Cloud Platforms: AWS, Azure, Google Cloud
Cloud tools: OpenStack, Docker, Puppet, Chef
System Tools: Bash scripting, Git, Gnuplot, LaTeX
Operating Systems: Unix, Windows, Mac

PROFILES

GitHub: http://github.com/SunnyRaj
Google Scholar: Sunny Rajasekaran

AWARDS AND HONORS

2016 | **Won** NASA Space Apps challenge
2013 | **Best teacher**, Anna University
2012 | **Speaker**, I-Corps program at NSF on University Startups Conference
2011 | **Entrepreneur Lead**, Stanford University