

Renuka Kumar

She/Her/Hers | PhD Candidate | Security Researcher | Software Architect
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◇ Experience Summary

- 10+ years industry experience in Silicon Valley in software development and design lead roles that include managing remote teams for software delivery
- 5+ years of research and training experience in systems and software security
- Successfully led multiple high-impact security research projects in real world mobile deployments that required working end-to-end, across different layers of the protocol stack
- Proficiency in security analysis of complex software, various programming languages, and build environments

◇ Education

2019-Present: PhD Candidate, Dept. of Computer Science & Engr., University of Michigan, Ann Arbor, GPA 4.0/4.0

2001-2003: M.S, Dept. of Electrical Engr., University of Southern California

1996-2000: BS, Dept. of Computer Science & Engr., Amrita Institute of Technology & Science

◇ Work Experience

Sept 2019 – present: **Graduate Student Research Assistant, University of Michigan, Ann Arbor**
Advised by Professor Atul Prakash and Professor Roya Ensafi

- *A Large-scale Investigation into Geographic Equity of Mobile Apps, Under Submission to USENIX Security Symposium, 2021*
- *Security Analysis of Unified Payment Interface and Payment Apps in India, USENIX Security Symposium, Aug 2020.* We conducted a security analysis of India's widely deployed and undocumented mobile payments infrastructure called UPI to reveal server-side flaws that can lead to potentially devastating attacks.
 - *Used JEB* for decompiling, *mitmproxy* and *Open VPN* setup for traffic interception, *Cuckoo Sandbox* for dynamic analysis, *UIAutomator* for input sniffing, and *Wireshark* for packet capture analysis
 - *Impact:* The attacks were responsibly disclosed to the Indian government agency, which confirmed that a critical action was taken per our disclosures.

Aug 2013 – Jun 2019 – **Research Faculty, Center for Cybersecurity Systems & Networks, Amrita University**
About: Center for Cybersecurity is a center of excellence designated by the Government of India, that fosters research in the area of Cybersecurity.
Select Projects:

- *Hybrid Analysis Framework to Detect Malicious Android Apps*: Developed a first of its kind hybrid analysis framework to detect malicious Android apps for Indian Government.
- Obtained seed funding from EMC-RSA (2014) and then secured funding by Government of India's Defence Research and Development Organization (DRDO) (2017) for a team of five research assistants.
- Architected the end-to-end workflow of the analysis engine ground up, including a comprehensive reporting system that uses MITRE's attack matrix.
- Implemented specific parts of the framework including the entire static analyzer, setting up the dynamic analysis framework using Cuckoo Sandbox, and authoring a unit testing engine using JUnit
- Reverse engineered Android apps to determine its behavior to establish ground truth
- *Similarity Analysis of Android Apps*: This research conducts a study on the similarity of Android applications to find common (malicious) components across different applications.
- *Towards Accuracy in Similarity Analysis of Android Applications*, Sreesh K., **Renuka Kumar**, Sreeranga Rajan, published in 14th International Conf. on Information Systems Security, 2018
- *Intel SGX-based Botnet* (Collaboration with VU, Amsterdam): This research explores the possibility of exploiting Intel SGX's features to develop a potent P2P botnet
- *A Systematic Study on Static Control Flow Obfuscation Techniques*, **Renuka Kumar**, Anjana Mariam Kurian, arXiv.org

Jul 2007 – Jul 2013 Senior Software Engineer, PLX Technology Inc. (now Broadcom), California

Lead Engineer for DMA-Based Networking Application (2012-2013)

TCP/IP layer being a heavy protocol adds a lot of overhead in terms of packet construction thereby reducing the effective bandwidth available for transfers and increasing system latency. PLX's GEN3 chips have a built in DMA Engine that can be used to transfer data to remote hosts. PLX's network driver eliminates the overhead of TCP and also bypasses intensive CPU processing by using simple DMA transfers.

- Developed an interactive software utility demonstrating multiple push and pull DMA transfers.
- Developed a sample app for customers demonstrating the efficiency of the DMA-based networking feature with performance stats showing bandwidth utilization.
- Collaborated with hardware design engineers to test proof of concept on simulation environment.
- Customer and engineering support.

Software Lead for SDK, PLX Technology Inc. (now Broadcom), CA

Designed, developed and managed PLX's SDK GUI that includes a broad range of technologies including client-server programming, C#/Java, .NET, Perl & Shell Scripting, HTML, Objected Oriented Design, C++. The GUI is the first of its kind in the industry for the market that PLX is in. Instrumental in moving all development to Linux

and also ported an extensive C# based GUI into Java for support across multiple platforms. Led an offshore development team.

- Developed all data abstractions, object hierarchies and workflow for the GUI
- Created a Java RMI Server that interfaces with a C++ library using JNI.
- Implemented a fully automated *make-based* build environment, which includes extensive pre-processing using Shell & Perl scripts. Support in windows using DOS batch files.
- Designed and developed software that uses PLX's chips internal debug features for ease of monitoring and debugging.
- As a part of team growth, recruited and trained software engineers for the Offshore Team in India for development and QA
- Created project timelines and deliverables and ensured on-time delivery of software, guided in developing software test plans.
- Documentation and Field application engineer/Customer support.

For Software Development Kit (SDK) API, Driver, Support (2007 - 2012)

- Implemented User API library in C/C++ for SDK.
- Collaborated with hardware engineers for the development of PLX's drivers – including algorithms for device scanning and enumeration, I2C support etc.
- Developed an interactive tool in C++ for testing and debugging PLX's chips.
- Co-authored user manuals for the API.
- Collaborated with marketing team to define the new features/look-and-feel of the SDK/GUI.
- Core contributor to technical design and architecture discussions

Jun 2003 – Member of Technical Staff, Kasenna Inc (now Espial), California

Jul 2007

Kasenna Inc., a spin-off of SGI's Broadband Media Software division, is a software technology company building a standards-based video delivery platform called MediaBase XMP SE, for acquiring, managing, distributing and delivering audio and video content over IP, ATM and HFC networks.

- Played a pivotal role in designing the basic paradigms for workflow management of large video networks (using Java, C++ & CORBA). For workflow management, single handedly developed a cache propagation algorithm for propagation of content from a library server to cache servers.
- Developing and testing MediaBase XMP SE integration API in Java.
- Key architect of a Java Swing based client application that is a centralized control for a network of MediaBase servers. The only one of its kind, the tool is a powerful UI that enables server monitoring, content management and usage monitoring, reporting and so forth.
- Experience in internationalizing GUI (Java), generating reports using Jasper Reports and JfreeCharts.
- Enhancing their existing web services interface for integration with MediaBase XMP SE. The interface enables a soap client, to access MediaBase's services via an HTTP (Tomcat) server and Apache Axis SOAP engine.
- Extending and supporting the server-side interface to MediaBase (in C++).

Collaborating with QA for unit testing, user documentation, customer support

Jun 2000 – Software Engineer, Patni Computer Systems, Bombay, India

Jul 2001 For General Electric Corporation (US): Developed business critical application to monitor Service Level Agreements called e-SLA using Java and JSP, with an Oracle database backend connected using JDBC. The success of the project helped capture the bulk of the business from GE and personally received appreciation from the company.

- Designed the look and feel of the site and implemented specific project modules
- Led the team in design and code reviews and orchestrated integration cycle testing.
- Provided product support, prototype demonstrations and authored user manuals

◇ **Awards & Honors**

- Affiliated with honor societies Tau Beta Pi (TBP) and Eta Kappa Nu (HKN)
- Security CVEs: CVE-2017-9818, CVE-2017-9819, CVE-2017-9820, CVE-2017-982, CVE-2018-15660, CVE-2018-15661, CVE-2018-17401, CVE-2018-17402, CVE-2018-17403, CVE-2018-17403. Disclosures posted at <https://github.com/magicj3lly/appexploits>
- Grants: EMC-RSA, India, Defence Research and Development Organization, Govt. of India
- Academic Excellence Award, Amrita University (academic year 2014-2015)
- Multiple industry awards for excellent contribution, commitment and performance

◇ **Training**

- Software Security, Coursera Certification
- Training in PCI/PCIe Devices (PLX Inc., sponsored)
- Training in Linux/Windows Driver Development (PLX Inc., sponsored)
- Linux Systems Programming –from UCSC Silicon Valley Extension, Grade A (PLX Inc., sponsored)

◇ **Personal**

Languages: English, Hindi, Malayalam, Tamil

Volunteering: Volunteer at Embracing the World charities for over 20 years

Residency Status: US Citizen