

Aanjhan Ranganathan

Universitaetstrasse 6 – 8092 Zurich – Switzerland

☎ +41 44 632 34 82 • ✉ aanjhan@inf.ethz.ch • 🌐 www.aanjhan.com

Research Interests

Security of autonomous cyber-physical systems, wireless networks, trusted computing architecture, proximity verification and positioning, sensory perception.

Education

ETH Zurich

Doctor of Sciences

Zurich, Switzerland

2010–2016

École Polytechnique Fédérale de Lausanne

Master of Science, 5.62/6

Lausanne, Switzerland

2008–2010

SSN College of Engineering (Anna University)

Bachelor of Engineering, 82/100

Chennai, India

2001–2005

Doctoral Thesis

Title: *Physical-layer Techniques for Secure Proximity Verification and Localization*

Supervisor: Prof. Dr. Srdjan Capkun

Description: Analysed and proposed novel architectures for secure localization and proximity verification. Designed and implemented a spoofing resilient GPS receiver.

Master Thesis

Title: *Snoop Filtering for Low Power Embedded Multiprocessor Systems*

Supervisors: Prof. Dr. Paolo Ienne, Prof. Dr. Philip Brisk, Dr. Theo Kluter

Description: Quantified the benefits of using cache snoop filters to reduce memory subsystem energy in embedded multiprocessor systems.

Awards & Honors

Cyber Award 2016: awarded the 1st place for outstanding research in the Cyberspace and Information research program by the Federal Department of Defense, Switzerland

ETH Medal for Outstanding Doctoral Dissertation: ETH Zurich, Switzerland 2016

Regional Winner-Switzerland: European Space Agency's Navigation Competition 2016

Distinguished Alumni Award: SSN Institutions, Chennai, India 2007

Young Scientist Award: awarded by the Indian Science Monitor in 2005

Experience

Academic.....

System Security Group, ETH Zurich

Zurich, Switzerland

Post-doctoral Researcher

May 2016–present

Enhancing the performance and effectiveness of a spoofing resistant GPS receiver by enabling support for relay attack detection and other GNSS constellations. Designing a MAC-layer specifically for secure localization and evaluating its performance and security guarantees.

System Security Group, ETH Zurich

Zurich, Switzerland

Doctoral Research Assistant

September 2010–May 2016

Worked on a variety of topics ranging from physical-layer security of wireless systems to designing trusted computing architectures for mixed-criticality applications.

Processor Architecture Laboratory, EPFL

Lausanne, Switzerland

Research Assistant

March 2010–July 2010

Developed a cryptographic hardware platform based on Arduino for performing differential power analysis attacks. Also worked on an extension to my Master thesis.

Industry.....

Robert Bosch Engineering and Business Solutions

Bengaluru, India

Senior Software Engineer

June 2005–June 2008

Responsible for the requirements analysis, design, implementation, testing and release of several CAN-networked electronic control units such as parking assist, bluetooth phone interface, Kombi display and Klima (climate control). Interacted with the technical and management teams from Volkswagen and Audi.

Internships.....

Google Inc. (Summer of Code)

Contract Employee

May 2009–August 2009

Worked for the RTEMS (www.rtems.org) project, a real-time operating system used in space flights, networking and many medical devices.

Teaching.....

ETH Zurich

Zurich, Switzerland

Semester and Master theses supervision

- On the feasibility of relay attacks on authenticated GNSS signals, Dominic Bruetsch, Semester thesis, 2016
- Locating Tags using Unmanned Aerial Vehicles, Carl Olsson, Semester thesis, 2015
- Detection of Spoofing Attacks on Wireless Multilateration Systems, Patrick Leu (in co-operation with Armasuisse), Master thesis, 2015
- Detection of GPS Spoofing Attacks, Hildur Ólafsdóttir, Master thesis, 2014
- On the Security of Powerline Communication Systems, Baron Oldenburg, Semester thesis, 2012
- Smart and Secure WiFi Pairing, Pascal Brogle, Masters thesis, 2011

Lectures

I have delivered graduate lectures on secure localization, distance bounding, broadcast wireless communication authentication techniques, GPS, anti-jamming techniques

Teaching Assistant

Head TA for Design of Digital Circuits (undergraduate course) taught by Prof. Dr. Srdjan Capkun, Prof. Dr. Markus Pueschel (2014) and Dr. Frank Gurkaynak
Security of Wireless Networks laboratory (Masters) by Prof. Dr. Srdjan Capkun

Open Source.....

RTEMS contributor (<https://www.rtems.org>), 2010–2011

Developer and maintainer of gnusim8085, an 8085 simulator (<http://gnusim8085.github.io>)

Publications

- [1] Aanjhan Ranganathan and Srdjan Capkun. Are we really close? Verifying proximity in wireless systems. *under submission*.
- [2] Aanjhan Ranganathan. *Physical-layer Techniques for Secure Proximity Verification & Localization*. PhD thesis, 2016.
- [3] Hildur Olafsdóttir, Aanjhan Ranganathan, and Srdjan Capkun. On the security of carrier phase-based ranging. *arXiv preprint arXiv:1610.06077*, 2016.
- [4] Daniel Moser, Patrick Leu, Vincent Lenders, Aanjhan Ranganathan, Fabio Ricciato, and Srdjan Capkun. Investigation of Multi-device Location Spoofing Attacks on Air Traffic Control and Possible Countermeasures. In *Proceedings of the 22nd Annual International Conference on Mobile Computing and Networking (MobiCom)*, 2016.
- [5] Der-Yeuan Yu, Aanjhan Ranganathan, Ramya Jayaram Masti, Claudio Soriente, and Srdjan Capkun. SALVE: Server Authentication with Location VERification. In *Proceedings of the 22nd Annual International Conference on Mobile Computing and Networking (MobiCom)*, 2016.
- [6] Aanjhan Ranganathan, Hildur Olafsdóttir, and Srdjan Capkun. SPREE: Spoofing Resistant GPS Receiver. In *Proceedings of the 22nd Annual International Conference on Mobile Computing and Networking (MobiCom)*, 2016.
- [7] Aanjhan Ranganathan, Boris Danev, and Srdjan Capkun. Proximity Verification for Contactless Access Control and Authentication Systems. In *Proceedings of the 31st Annual Computer Security Applications Conference (ACSAC)*, 2015.
- [8] Ramya Jayaram Masti, Devendra Rai, Aanjhan Ranganathan, Christian Müller, Lothar Thiele, and Srdjan Capkun. Thermal Covert Channels on Multi-core Platforms. In *Proceedings of the 24th USENIX Security Symposium (USENIX Security 15)*, 2015.
- [9] Der-Yeuan Yu, Aanjhan Ranganathan, Ramya Jayaram Masti, Claudio Soriente, and Srdjan Capkun. W-SPS: Designing a Wide-Area Secure Positioning System. Cryptology ePrint Archive, Report 2015/230, 2015.
- [10] Der-Yeuan Yu, Aanjhan Ranganathan, Thomas Locher, Srdjan Capkun, and David Basin. Short paper: Detection of GPS Spoofing Attacks in Power Grids. In *Proceedings of the 2014 ACM conference on Security and privacy in wireless & mobile networks (WiSec)*, 2014.
- [11] Aanjhan Ranganathan, Boris Danev, and Srdjan Capkun. Low-power Distance Bounding. *arXiv preprint arXiv:1404.4435*, 2014.

- [12] Nils Ole Tippenhauer, Luka Malisa, Aanjhan Ranganathan, and Srdjan Capkun. On limitations of friendly jamming for confidentiality. In *Proceedings of the 34th IEEE Symposium on Security and Privacy (S&P)*, 2013.
- [13] Ramya Jayaram Masti, Claudio Marforio, Aanjhan Ranganathan, Aurélien Francillon, and Srdjan Capkun. Enabling Trusted Scheduling in Embedded Systems. In *Proceedings of the 28th Annual Computer Security Applications Conference (ACSAC)*, 2012.
- [14] Aanjhan Ranganathan, Nils Ole Tippenhauer, Boris Škorić, Dave Singelée, and Srdjan Capkun. Design and implementation of a terrorist fraud resilient distance bounding system. In *Proceedings of the 17th European Symposium on Research in Computer Security (ESORICS)*, 2012.
- [15] Aanjhan Ranganathan, Ali Galip Bayrak, Theo Kluter, Philip Brisk, Edoardo Charbon, and Paolo Ienne. Counting stream registers: An efficient and effective snoop filter architecture. In *Proceeding of the 18th IEEE International Conference on Embedded Computer Systems (SAMOS)*, 2012.
- [16] Aanjhan Ranganathan, Boris Danev, Aurélien Francillon, and Srdjan Capkun. Physical-layer attacks on chirp-based ranging systems. In *Proceedings of the 5th ACM conference on Security and Privacy in Wireless and Mobile Networks (WiSec)*, 2012.
- [17] Aanjhan Ranganathan. Adaptation of Linux and *BSD in automotive embedded software. Technical report, SAE Technical Paper, 2007.

Talks

Secure Proximity Verification and Localization—Challenges and Applications:

- Workshop on RFID and IoT Security, Hong Kong, 2016. (Invited Talk)
- Expert Workshop on Cyber Security Risks in the Internet of Things - Applications to Connected Vehicles and Medical Devices, SwissRe Zurich, Switzerland, 2016. (Invited Talk)

SPREE: A Spoofing Resistant GPS Receiver:

- Annual International Conference on Mobile Computing and Networking (MobiCom), NY, USA, 2016. (Conference talk)
- University of California, Los Angeles, USA, 2015. (host: Prof. Dr. Mani Srivastava)

Physical-layer Techniques for Secure Proximity Verification and Localization:

- Princeton University, USA, 2016. (host: Prof. Dr. Prateek Mittal)
- MIT, USA, 2016. (host: Prof. Dr. Dina Katabi)

Proximity Verification for Contactless Access Control and Authentication Systems: Annual Computer Security Applications Conference (ACSAC), Los Angeles, USA, 2015.

Thermal Covert Channels on Multicore Platforms:

- Zurich Information Security Center Day, Zurich, Switzerland, 2015.
- Usenix Security Symposium, Washington D.C., USA, 2015.

Design and implementation of a terrorist fraud resilient distance bounding system: European Symposium on Research in Computer Security (ESORICS), Pisa, Italy, 2012.

Counting stream registers: An efficient and effective snoop filter architecture: International Conference on Embedded Computer Systems (ICSAMOS), Samos, Greece, 2012.

Physical-layer attacks on chirp-based ranging systems: ACM Conference on Security and Privacy of Wireless and Mobile Networks (WiSec), Tucson, USA, 2012.

Professional Activities

- Technical Program Committee member for RFIDSec 2016

- Shadow Program Committee member for AsiaCCS 2017
- Reviewer for IEEE Transactions on Mobile Computing 2016
- Reviewer for IEEE Transactions on Industrial Informatics 2016
- Reviewer for IEEE Communications Magazine 2016
- Reviewer for IEEE Transactions on Information Forensics & Security 2016
- Technical Program Committee member for "Smart Medical Devices - from Lab to Clinical Practice" workshop 2015, 2016
- Reviewer for IEEE/ACM Transactions on Networking 2015
- Reviewer for ACM Transactions on Embedded Computing Systems 2015
- Reviewer for IEEE Journal of Selected Topics in Signal Processing 2014
- Reviewer for Transactions on Emerging Telecommunications Technologies 2014

References

- Prof. Dr. Srdjan Capkun, ETH Zurich, Switzerland (capkuns@inf.ethz.ch)
- Prof. Dr. Mani Srivastava, University of California, Los Angeles, USA (mbs@ee.ucla.edu)
- Prof. Dr. Neal Patwari, University of Utah, Salt Lake City, USA (npatwari@ece.utah.edu)
- Prof. Dr. Patrick Tague, Carnegie Mellon University (Silicon Valley), USA (patrick.tague@sv.cmu.edu)
- Prof. Dr. Ivan Martinovic, Oxford University, UK (ivan.martinovic@cs.ox.ac.uk)