Aditya Basu

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About

My research interests are in *Systems Security* and *Operating Systems*. Currently I am working on generating control-flow graphs of the Linux kernel and its user-space programs using Intel® Processor Trace. The goal is to explore new metrics for system monitoring in order to defend against zero days.

Education

PhD Student in *Computer Science* (exp.) May 2022
at *Pennsylvania State University*, PA, USA
GPA: 3.85 (of 4)

B.Tech. in *Information and Communication Technology* August 2014
at *Dhirubhai Ambani Institute* (DAIICT), Gujarat, India
GPA: 9.52 (of 10) in major, 8.55 overall

Coursework

PennState
- Computer Security (A)
- Intro. to Hardware Security (A)
- Operating System Design (A)
- Fundamentals of Comp. Arch. (A)
- Intro. to Distributed Computing (A)
- Public Cloud Computing (A)
- Compiler Construction (A-)

DAIICT
- System and Network Security (A)
- Systems software (A)
- Operating systems (A)
- Embedded Hardware Design (A)
- Formal Specification & Verification (A)

Referred Publications

2020 **Automatic Generation of Compact Printable Shellcodes for x86**
Dhrumil Patel, *Aditya Basu*, Anish Mathuria.
In 14th USENIX *Workshop on Offensive Technologies* (WOOT).
(*acceptance rate*: 33.33%, *or* 12/36)

2020 **Hardware Assisted Buffer Protection Mechanisms for Embedded RISC-V**
Asmit De, *Aditya Basu*, Swaroop Ghosh, Trent Jaeger.
In *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*. (*doi*: 10.1109/TCAD.2020.2984407, *impact factor* = 2.168)

2019 **FIXER: Flow Integrity Extensions in Embedded RISC-V**
Asmit De, *Aditya Basu*, Swaroop Ghosh and Trent Jaeger.
In *Proceedings of Design, Automation and Test in Europe* (DATE).
(*doi*: 10.23919/DATE.2019.8714980, *acceptance rate*: 24%)

2014 **Automatic Generation of Compact Alphanumeric Shellcodes for x86**
Aditya Basu, Anish Mathuria, Nagendra Chowdary.
In Proceedings of 10th International Conference on Information Systems Security (ICISS).
(*doi*: 10.1007/978-3-319-13841-1_22, *acceptance rate*: 19%, *or* 25/129)

Posters & Demos

Aug. 2020 [Demo] **Flexible Process Monitoring with the Process Firewall** at *TPCP Software Security Summer School* (SSSS'20).

June 2019 [Poster] **Execution Integrity** at *Total Platform Cyber Protection (TPCP), Northeastern University.*

April 2017 [Poster] **CFI Enforcement on the Linux Kernel** at *Industry Day — Institute for Network and Security Research (INSR)*, PennState.

Industry Experience

Software Engineering Intern, Google, Cambridge, MA, USA — Summer 2019

- Added support for Intel VT-d to the Akaros kernel from UC Berkeley. This allows any PCI/PCIe device to be placed in the address space of a process or a VM.
- Wrote a CBDMA (DMA accelerator on Intel, aka IOAT) driver for Akaros. This was used to test the VT-d support.
- `https://github.com/brho/akaros/commits?author=mitthu`

Product Security Intern, NIO, San Jose, CA, USA — Summer 2018

- Worked on securing and pen-testing the ES8's (SUV) firmware and OBD-II diagnostics port.
- Wrote a driver for an on-board network switch and created patches to fix the discovered vulnerabilities.

System Operations, Media.net, Mumbai, India — 2014 - 2016

- Automated and managed their web crawling infrastructure serving >100 million reqs./day.
- Helped with recruiting and also took training sessions on (i) *Advanced Linux*, and (ii) *Networking* for new recruits.

Software Developer Intern, DAIICT, Gandhinagar, India — Summer 2013 & 2014

- Created the admission portal of the university. The portal generated merit-lists and wait-lists of candidates based on their stream preferences and scores.
- The portal also handled all emails communications, provided a web interface for the candidates and the admissions team.
- Framework used: Django (python)

Projects

Side-Channel (SC) on RSA — Verilog | 10 hrs./week | 8 weeks
Implemented RSA on an FPGA and did side-channel analysis to find the private key.

Key-Value Server-Client — C++ | 10 hrs./week | 8 weeks
A highly available key-value server supporting multiple execution models: single-threaded asynchronous model & multi-threaded synchronous model.

Personal Web Scrapbook — Django | 10 hrs./week | 8 weeks | CODE
Scrapes and saves webpages to a central server via a chrome extension.

Note-Sync Tool — C | 10 hrs./week | 4 weeks | CODE
Watches a note via inotify (on Linux) / kqueues (on Mac OS X) and syncs it upon modification.

Assistantships

Research Assistant, PennState — Fall'18 - current

Teaching Assistant, PennState – CMPSC473: Operating Systems — Spring '18

Research Assistant, PennState — 2017

Teaching Assistant, PennState – CMPSC473: Operating Systems — Fall '16

Teaching Assistant, DAIICT – IT215: Systems Software Spring '14

Skills

>10k lines: C • Python • bash • LaTeX (macros) • HTML
5k — 10k lines: Django • Puppet • Ansible • Java • CSS
Utilities: make • git • Docker • strace • gdb
Others: Linux • Mac OS X • Markdown • IDA Hex-Rays

Awards and Certifications

2014 Highest CGPA in baccalaureate among wards of SVB trust
2011 Highest percentage in HSC among wards of SVB trust
2010 In *top 2.5 percentile* of All India Engineering Entrance Examination (AIEEE)
2010 97.5/120 in Gujarat Common Entrance Test (GUJCET)
2007 Certified 'A' grade in Intermediate Drawing, Gujarat State Exam. Board

Extracurriculars

2020-21 President of *Social Dance Club* and *Shotokan Karate-do Club* at PennState.
2019-20 Coordinator of *Argentine Tango* (*of Social Dance Club*) at PennState.
2013 Started the *Linux Pack Club* at DAIICT.

Hobbies

Karate • Argentine Tango