Aditya Basu

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Bio.

I am a final year PhD candidate with expertise in solving security challenges that arise from the design of file-system APIs. In my recent paper, I investigated the newly added case-insensitivity support to Ext4 and found that this leads to inconsistent behavior in popular copy utilities like tar and zip, as well as vulnerabilities in dpkg and AppArmor.

I am currently developing a non-invasive kernel extension using Berkeley Packet Filter (BPF) to bring consistent handling of case-insensitivity throughout the OS. My previous work includes writing compilers for alphanumeric shellcode generation, and designing security-focused hardware extensions for RISC-V.

I am passionate about understanding technologies and platforms from a systems' perspective in order to tackle performance bottlenecks and determine security lapses.

Education

PhD Candidate in *Computer Science* (exp.) May 2024
at *Pennsylvania State University*, PA, USA
GPA: 3.85 (of 4). Advised by Trent Jaeger.

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

Work Experience

Research Intern, Microsoft Research, Redmond, WA, USA Summer 2022
Integrated HDFS with our Nimble framework (published in OSDI '23) to detect rollback attacks by untrusted cloud providers.
Skills: Golang • Java • HDFS • Bash • LXC Containers • Docker | **Code:** github.com/mitthu/hadoop-nimble

Software Engineering Intern, Google, Cambridge, MA, USA Summer 2019
Added support for Intel VT-d to the Akaros kernel allowing any PCI/PCIe device to be placed in the address space of a process or a VM. Also wrote a driver for Intel's DMA accelerator (IOAT).
Skills: C • QEMU • GDB • x86 Assembly | **Code:** github.com/brho/akaros

Product Security Intern, NIO, San Jose, CA, USA Summer 2018
Pen-tested ES8's (SUV) firmware via the OBD-II diagnostics port and wrote a driver for an on-board network switch.
Skills: C • Python

System Operations, Media.net, Mumbai, India 2014 - 2016
Managed the web crawling infrastructure that served >100 million reqs./day. Also conducted training sessions on Linux and networking.
Skills: C • Python • Java • Bash • AWS • Puppet • Ansible • Docker • Mesos • Hadoop

Software Developer Intern, DAIICT, Gandhinagar, India Summer 2013 & 2014
Developed the university's admissions portal to generate merit-lists and wait-lists of candidates based on their module preferences and standardized test scores.
Skills: Python • Django Framework • HTML • CSS • JavaScript • PostgreSQL

Skills

>10k lines: C • Python • Golang • bash • LaTeX (macros) • HTML
5k — 10k lines: x86 Assembly • C++ • Java • BPF • Django • Puppet • Ansible • CSS
Utilities: make • git • Docker • strace • GDB • Protocol Buffers
Others: Linux • Mac OS X • Markdown • HDFS • IDA Hex-Rays • Intel® Processor Trace

Research Artifacts

Collision detector identifies name collisions from Auditd traces [Golang • bash]
Nimble-aware Hadoop detects rollback attacks on HDFS [Java • Protobuf]
Printable Shellcode Compiler transforms shellcode: binary → printable [C • x86 asm]
Alpha Loader transforms shellcode: binary → compact ASCII [C • x86 asm • Python • Bash]

Publications

1. **TALISMAN: Tamper Analysis for Reference Monitors.** Frank Capobianco, Quan Zhou, *Aditya Basu*, Trent Jaeger, Danfeng Zhang. In *Network and Distributed System Security Symposium (NDSS)*. 2024.
   Acceptance rate: 15%, or 104/694 • Publication
2. **Unsafe at Any Copy: Name Collisions from Mixing Case Sensitivities.** *Aditya Basu*, Jack Sampson, Zhiyun Qian, Trent Jaeger. In *21st USENIX Conference on File and Storage Technologies (FAST)*. 2023.
   Acceptance rate: 23%, or 28/122 • Recipient of USENIX Student Grant • Publication • Code
3. **Nimble: Rollback Protection for Confidential Cloud Services.** Sebastian Angel, *Aditya Basu*, Weidong Cui, Trent Jaeger, Stella Lau, Srinath Setty, Sudheesh Singanamalla. In *17th USENIX Symposium on Operating Systems Design and Implementation (OSDI)*. 2023.
   Acceptance rate: 19.6%, or 50/255 • Publication • Code (HDFS) • Code (Nimble)
4. **Automatic Generation of Compact Printable Shellcodes for x86.** Dhrumil Patel, *Aditya Basu*, Anish Mathuria. In *14th USENIX Workshop on Offensive Technologies (WOOT)*. 2020.
   Acceptance rate: 33.33%, or 12/36 • Publication • Code
5. **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*. 2020.
   Impact factor: 2.168 • DOI: 10.1109/TCAD.2020.2984407
6. **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)*. 2019.
   Acceptance rate: 24% • DOI: 10.23919/DATE.2019.8714980
7. **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)*. 2014.
   Acceptance rate: 19%, or 25/129 • DOI: 10.1007/978-3-319-13841-1_22 • Code

Posters & Demos

Detecting and Preventing Resource Naming Attacks at *Collaborative Research Alliance (CRA), Delaware*. Poster. 2023.

Provenance using Process Introspection at *Collaborative Research Alliance (CRA) Bootcamp, University of California, Irvine*. Poster. 2022.

Flexible Process Monitoring with the Process Firewall at *Total Platform Cyber Protection (TPCP) Software Security Summer School (SSSS)*. Demo. 2020.

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

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

Assistantships

Research Assistant, PennState	2017-current (except when TA)
Lead Teaching Assistant, PennState – Operating Systems	Spring 2023
Teaching Assistant, PennState – Operating Systems	Fall 2016, Spring 2018
Teaching Assistant, DAIICT – Systems Software	Spring 2014

Extracurriculars

President of *Shotokan Karate-do Club* at PennState	2022-23
President of *Social Dance Club* at PennState	2022-23
Co-ordinator of *Argentine Tango* at PennState	2019-20
Started the *Linux Pack Club* at DAIICT	2013