# Abu Naser

*Parallel and Distributed Systems, HPC, and Security.*

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## Education

Fall'16–Spring'22 **Ph.D.**, *Florida State University*, Tallahassee.
PhD. in computer Science *(3.97/4)*

2005–2010 **BSc**, *Shahjalal University of Science and Technology*, Sylhet.
BSc in Computer Science and Engineering *(3.81/4)*

## Selected Publications

- Mehran Sadeghi Lahijani*, **Abu Naser***, Cong Wu, Mohsen Gavahi, Viet Tung Hoang, Zhi Wang, and Xin Yuan. "Encrypted Collective Communication in Multi-core Clusters" *Under review, 2021* [*equal contribution]
- **Abu Naser**, Cong Wu, Mehran Sadeghi Lahijani, Mohsen Gavahi, Viet Tung Hoang, Zhi Wang, and Xin Yuan. "CryptMPI: A Fast Encrypted MPI Library" *Under review, 2021*
- Mohsen Gavahi, **Abu Naser**, Cong Wu, Mehran Sadeghi Lahijani, Zhi Wang, and Xin Yuan. "Encrypted All-reduce on Multi-core Clusters " *40th IEEE International Performance Computing and Communications Conference (IPCCC)*, 2021.
- Mehran Sadeghi Lahijani, **Abu Naser**, Cong Wu, Mohsen Gavahi, Viet Tung Hoang, Zhi Wang, and Xin Yuan. "Efficient Algorithms for Encrypted All-gather Operation" *35th IEEE International Parallel Distributed Processing Symposium (IPDPS)*, 2021.
- **Abu Naser**, Mehran Sadeghi Lahijani, Cong Wu, Mohsen Gavahi, Viet Tung Hoang, Zhi Wang, and Xin Yuan. "Performance Evaluation and Modeling of Cryptographic Libraries for MPI Communications" *https://arxiv.org/abs/2010.06139*, 2020.
- **Abu Naser**, Mohsen Gavahi, Cong Wu, Viet Tung Hoang, Zhi Wang and Xin Yuan. "An Empirical Study of Cryptographic Libraries for MPI Communications" *21st IEEE International Conference on Cluster Computing (IEEE Cluster)*, 2019.
- Mustakimur Khandaker, Wenqing Liu, **Abu Naser**, Zhi Wang, and Jie Yang. "Origin-sensitive Control Flow Integrity" *Proceedings of the 28th USENIX Security Symposium (USENIX Security)*, 2019.
- Mustakimur Khandaker, **Abu Naser**, Wenqing Liu, Zhi Wang, Yajin Zhou, and Yueqiang Cheng. "Adaptive Call-site Sensitive Control Flow Integrity" *Proceedings of the 4th IEEE European Symposium on Security and Privacy (EuroS&P)*, 2019. **[Best Paper Award]**

## Service

- AD/AE evaluation committee member, SC, 2021.

## Open Source Projects

- **CryptMPI**: CryptMPI is an encrypted communication library for the Parallel and Distributed computing architecture in the Cloud environment. It was implemented in C on top of MVAPICH and MPICH to speed up encrypted communication using novel collective algorithms, pre-computation, multithreading, and pipelining techniques. We run CG application benchmark with 128 nodes and 512 processes on PSC Bridge. Our approach reduced the overhead from 90% to 30% for the inter-node communication time. Source: https://github.com/abu-naser/CryptMPI-A-Fast-Encrypted-MPI-Library
- **Encrypted MPI Communication**: In this project, we have measured encryption performance with MPI

communication using different encryption libraries and key sizes. It was implemented using C on top of MVAPICH and MPICH.
Source: https://github.com/abu-naser/Encrypted-MPI-Communication

## Problem Solving Skills

- **UVA Online Judge** (userid an02): I was started solving programming problems and participating in programming contests since I was a second-year undergraduate student in 2006. During my undergrad, **I had solved 200+ problems at UVA using C language**.
- **Codechef** (userid an16): When I get time, I do participate in the live online programming contest. My current rating is **1728**.
- **CTF challenges pwnable.kr** (userid an16e): As a system researcher I would like to find vulnerabilities in the code. To improve my skills I solve CTF challenges.
- **Facebook CTF contest 2019**: Me and my colleague had participated the contest and solved one CTF challenge.

## Research Interests

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| HPC | MPI, OpenSHMEM. |
| Cloud | Secure Communication, Data, and I/O in cloud. |
| Security | LLC cache side-channel, Vulnerability detection. |

## Systems

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| Cluster: | PSC Bridges, Innovation, Noleland | Virtualization: | Singularity, Docker |
| Language: | C, C++, Shell script, Python | Parallel programming: | MPI, OpenMP |
| Reverse Engineering: | IDA disassembler, GDB Enhanced Features (GEF) | Compiler: | Clang, LLVM |
| System: | Linux Kernel, Intel x86-64, Intel MPX, Intel TPM, Intel CAT | | |

## Employment

2022, May–Present **Middleware Development Engineer**, *Intel*, Austin, TX, USA.
I am working on a parallel and distributed run-time system (Intel-MPI). Intel-MPI runs on top of both CPU and GPU enabled cluster system. My responsibilities include implementing new features, measuring and optimizing performance, and solving issues.

2021, May–2021, Aug **Research Aide**, *Argonne National Lab*, Lemont, USA.
I worked on the OpenSHMEM GPU (CUDA) project. In particular, I worked with OSHMPI and MPICH, which are implementation of OpenSHMEM and MPI respectively. The goal of my project was to identify the potential bottleneck in GPU to GPU inter-node communication.

2016, Aug–2021, April **Graduate Research Assistant**, *Florida State University*, Tallahassee, USA.
System and Cloud Security Research
- Designed and implemented encrypted parallel and distributed communication library CryptMPI for HPC in the cloud.
- Designed and implemented memory vulnerabilities detection and prevention system.
- LLC cache side-channel defense project for HPC applications on a multi-tenant cloud environment.
- Performance analysis of HPC workloads on multiple Docker containers running on multiple nodes.
- Clang IR instrumentation.
- LLVM pass (analysis and instrumentation).
- IDA (binary and malware analysis).
- Grant & Award:
  - Student Travel Grant (Cluster, 19), Computer Science, Florida State University.

2012,Mar-2016,July **Assistant Professor**, *Shahjalal Univeristy of Science and Technology*, Sylhet, Bangladesh.
- Taught courses in the undergraduate class.

2013, Aug-2016, July **Project Manager**, *pipilika.com*, Sylhet, Bangladesh.
A Bengali language based search engine.
- Lead a team of 8 professional developers. My role includes investment management, planning features and release, hire developers, etc.

2010, Nov–2012, Feb **Software Engineer**, *Samsung Research and Development Institute*, Dhaka, Bangladesh.
I have worked on Samsung's proprietary feature phone OS.
- Customized and developed OS based on features specification.
- Unit testing.
- Solved issues on internet module.

### Volunteer Experience

Nov 14-19, 2021 **Student Volunteer**, *The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC, 2021)*, MO, USA.
I had worked as a student volunteer in SC, 2021, and assisted the administration of the conference to organize the program.

## References

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