

# Abu Naser

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

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## Education

- Fall'16– **Ph.D.**, *Florida State University*, Tallahassee.  
Spring'22 Ph.D. 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" *25th IEEE International Conference on Cluster Computing (IEEE Cluster)*, 2023.
- Mohsen Gavahi, **Abu Naser**, Mehran Sadeghi Lahijani, Cong Wu, Zhi Wang, and Xin Yuan. "Performance of Software-based Encrypted MPI Communication over Container Clusters " *42nd IEEE International Performance Computing and Communications Conference (IEEE IPCCC)*, 2023.
- 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 (IEEE 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**, Cong Wu, Mehran Sadeghi Lahijani, Mohsen Gavahi, Viet Tung Hoang, Zhi Wang, and Xin Yuan. "CryptMPI: A Fast Encrypted MPI Library" <https://arxiv.org/abs/2010.06471>, 2020.
- **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 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

HPC MPI, OpenSHMEM.

Cloud Secure Communication, Data, and I/O in cloud.

Security LLC cache side-channel, Vulnerability detection.

## Systems

Cluster: PSC Bridges, Innovation, Noleland      Virtualization: Singularity, Docker

Language: C, C++, Shell script, Python      Parallel MPI, OpenMP  
programming:

Reverse IDA disassembler, GDB Enhanced      Compiler: Clang, LLVM  
Engineering: Features (GEF)

System: Linux Kernel, Intel x86-64, Intel MPX, Intel TPM, Intel CAT

## Employment

2022, **Middleware Development Engineer**, Intel, Austin, TX, USA.

May–Present 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, **Research Aide**, Argonne National Lab, Lemont, USA.

May–2021, I worked on the OpenSHMEM GPU (CUDA) project. In particular, I worked with OSHMPI and Aug 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, **Graduate Research Assistant**, *Florida State University*, Tallahassee, USA.
- Aug–2021, System and Cloud Security Research
- April
- 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–**Assistant Professor**, *Shahjalal Univeristy of Science and Technology*, Sylhet, Bangladesh.
- 2016,July
- Taught courses in the undergraduate class.
- 2013, **Project Manager**, *pipilika.com*, Sylhet, Bangladesh.
- Aug–2016, A Bengali language based search engine.
- July
- Lead a team of 8 professional developers. My role includes investment management, planning features and release, hire developers, etc.
- 2010, **Software Engineer**, *Samsung Research and Development Institute*, Dhaka, Bangladesh.
- Nov–2012, I have worked on Samsung's proprietary feature phone OS.
- Feb
- Customized and developed OS based on features specification.
  - Unit testing.
  - Solved issues on internet module.

### Volunteer Experience

- Nov 14–19, **Student Volunteer**, *The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC, 2021)*, MO, USA.
- 2021
- 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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Dr. Zhi Wang  
Associate Professor  
Department of Computer Science  
Florida State University  
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