

Mohsen Gavahi

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Highlights: Nine years of experience in High Performance Computing, virtualization, cloud computing, parallel programming, and computer architecture. Looking for a full-time HPC Software Engineer position.

Education

- **Ph.D.** Computer Science, Florida State University, Tallahassee, FL, USA (GPA: 3.72/4) 2017 to 10/2023
- **M.Sc.** Computer Architecture 2010 to 2012
- **B.Sc.** Computer Hardware Engineering 2004 to 2009

Professional Experience

- **Senior HPC Software Engineer, X-ScaleSolutions, OH, Columbus.** 05/2023 to Present
 - Developing new algorithms for MVAPICH library.
 - ❖ Accelerate non-blocking operations by offloading communication using Nvidia DPUs
- **Graduate Assistant, Optimization of Secure Communication in HPC Clusters, FSU, FL** 03/2021 to 10/2023
 - Evaluated encryption performance of containerized clusters (DockerSwarm and Kubernetes)
 - ❖ Applied various CNIs (Calico, Antrea, etc.) to measure encryption rates on HPC applications.
 - ❖ Observations show that available container encryption mechanisms impose a non-negligible overhead (an order of magnitude in some cases) which is not acceptable for HPC applications.
 - ❖ Experimental results disclosed that **CryptMPI** can handle encrypted communication to decline its overhead up to 5% (depending on message and node factors) on a variant of virtual clusters.
 - **CryptMPI:** Optimized versions of MVAPICH & MPICH with encrypted communication. 09/2017 to 10/2021
 - ❖ Focused on collective operations, including Allreduce, Allgather, Alltoall, Bcast, and Scatter.
 - ❖ Designed and implemented novel collective algorithms to optimally incorporate encryption.
 - ❖ Evaluated variant of cryptographic schemes (BoringSSL, OpenSSL, Libsodium, CryptoPP) to recognize best scheme with minimum overhead for HPC environment.
 - ❖ Empirical evaluation on multiple supercomputers (e.g. PSC Bridge) revealed that the proposed algorithms archive up to 10X speedup in comparison to naïve approach.
 - ❖ https://github.com/gavahi/CryptMPI_OCB
- **HPC clusters administrator and Senior Software Developer in Parallel Processing.** 03/2013 to 09/2017
 - Implemented scientific modules using GPU and Multicore Programming by CUDA.

Research Interests

- High Performance Computing
- Virtualization & Cloud Computing
- Parallel Systems & Multicore Programming
- Computer Architecture and Security

Technical Skills

- **Languages:** C, C++, Python, CUDA, Shell script
- **Parallel Prog.:** MPICH, MVAPICH, OpenMP
- **Virtualization:** Docker, Singularity, Kubernetes

Selected Publications

- **Performance of Software-based Encrypted MPI over Container Clusters** (M. Gavahi et al.) 2023
 - 42nd IEEE International Performance Computing and Communications (IPCCC)
- **Encrypted Collective Communication in Multi-core Clusters** (MS. Lahijani et al.) [under review] 2023
 - 37th ACM International Conference on Supercomputing (IPDPS)
- **Encrypted All-reduce on Multi-core Clusters** (M. Gavahi et al.) 2021
 - 40th IEEE International Performance Computing and Communications (IPCCC)
- **An Empirical Study of Cryptographic Libs for MPI Communications** (A. Naser, M. Gavahi et al.) 2019
 - 21st IEEE International Conference on Cluster Computing (CLUSTER)

Programming Honors

- Ranked **2nd** in the **13th** Memocode Hardware/Software Co-design International Contest, Austin, TX 2015
- Ranked **1st** in the **12th** Memocode Hardware/Software Co-design International Contest, Switzerland 2014