Abdul Rehman

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Summary

Ph.D. student with 8+ years of systems software development (6 years of full time industrial position) and systems research (2 years) experience. I enjoy diving deep into complex problems, trying to find the last ounce of performance boost in myraid of interconnected components. Currently, I am trying to add Machine Learning to the mix to solve the problem of sustainable computing.

Education

Indiana University Bloomington *Bloomington, United States*

PhD in Intelligent Systems Engineering *Aug 2022 - Present*

Advisor: Prateek Sharma

- Research area: sustainable computing
- CGPA 3.91/4.00
- **Courses:** Compilers, Cloud Computing, Operating Systems, Applied Algorithms, Deep Learning, Signal Processing using Machine Learning

Research Assistant *Aug 2022 - Present*

- Development of Realtime Data Analytics System using MQTT, InfluxDB and Torch Serve (see projects).
- Developing Linux Scheduling policies for sustainable computing (in progress).
- Development of a high performance serveless platform (publication).

National University of Sciences and Technology *Islamabad, Pakistan*

Electrical Engineering *Aug 2011 - June 2015*

- CGPA 3.92/4.00
- **Courses:** Embedded Systems, Digital System Design, Digital Signal Processing

Publications

Published

[1] Alexander Fuerst, **Abdul Rehman**, Prateek Sharma. Ilúvatar: A Fast Control Plane for Serverless Computing. *High-Performance Parallel and Distributed Computing(HPDC) '23*, Acceptance Rate 21%

Pending

[1] **Abdul Rehman**, Prateek Sharma. FineGrain Scheduling for Energy Efficient FaaS. *pending*, submission

[2] **Abdul Rehman**, Alexander Fuerst, Prateek Sharma. FaasMeter: Energy Profiling for Serverless Functions. *pending*, submission

Work Experience

Siemens Industry Software Inc. *Mobile, Alabama, United States*

Senior Software Engineer - Hypervisor Team *Mar 2021 - Sep 2021*

- Enabling Siemens Hypervisor support on cutting edge Intel Embedded Processors Elkhartlake (2021).
  - Found, estimated and fixed issues. For instance ACPI parser, AHCI Virtualization and NVMe Virtualization components required bug-fixing.
  - Mentored a new engineer on this project.

Mentor Graphics a Siemens Business *Lahore, Pakistan*

Senior Software Engineer - Hypervisor Team *Jan 2020 - Mar 2021*

- Improvements to virtualized UEFI interface to make it production ready.
  - Designed and developed non-volatile variable caching infrastructure to help avoid SMI generation and provide real time gurantees for Guest RTOS.
- Improvements to NVMe Virtualization to make it production ready.
  - Improved NVMe virtualization infrastructure performance from 700 MB/s to 1.5 GB/s by making the infrastructure distrubted across homogeneous processors.
  - Led a team of two engineers in bug-fixing and finalizing the deliverable.

Software Engineer - Hypervisor Team *Aug 2016 - Jan 2020*

- Enabling UEFI boot support for Guest OS (Windows, Linux, RTOS) of Siemens Hypervisor.
  - Implemented the virtualized UEFI interface using trap and emulation method for UEFI calls backed by a virtual UEFI image built using EDKII.
  - Designed and developed a UEFI driver for Intel Graphics Device (IGD) to allow early graphics for Linux and Windows guests. It is required to draw splash screen and display recovery mode menus.
- Enabling NVMe virtualization for Guest OS (Windows, Linux, RTOS) of Siemens Hypervisor.
  - Contributed to design of the infrastructure specifically interrupt handling and I/O queue segregation.
  - Developed Linux NVMe driver into a Paravirtualized Client.
  - Added interrupt handling infrastructure for utilization of PCI MSI-X capability, including emulation support for virtualized devices.
- Developing features for Mentor Embedded Hypervisor (later ACRN Intel Hypervisor).
  - Designed and developed VT-d DMAR/IOMMU driver to allow device isolation and thereby enable 1:N memory mapping of guests.
  - Developed tracing infrastructure for hypervisor to trace VMEXITs and generate useful reports.

Software Engineer - Embedded UI Graphics Team *Jun 2015 - Aug 2016*

- Ported QT GUI Framework version 5.4 to Nucleus RTOS. This port was based on a previous work done for Qt 4.0.
- Optimized performace of Ported Qt GUI Framework by profiling and removing deadcode in event loops.
- Developed unit tests for Qt based 3D Automotive Instrument Cluster HMI.

Projects

Edge-IoT-Analytics-Box - Extensible Data Analytics System

Indiana University Bloomington *Dec 2023 - May 2024*

- A data analytics system that can be deployed on edge devices (protyped on Jetson Orin) to perform real-time data analytics.
- **Github:** https://github.com/COS-IN/Edge-IoT-Analytics-Box

Ilúvatar: A Fast Control Plane for Serverless Computing

Indiana University Bloomington *Aug 2022 - May 2023*

- We built a new control plane in Rust to provide FaaS with low overhead.
- **Github:** https://github.com/COS-IN/iluvatar-faas

Awards

2023 **Travel Grant**, High-Performance Parallel and Distributed Computing 2023 *Orlando, USA*

2016 **Appreciation Certificates: exceptional debugging skills, high quality work**, Mentor a Siemens Business *Lahore, Pakistan*

Skills

Programming Languages	Rust, C/C++, Bash, Python (Pandas, NumPy)
Systems Development	Operating Systems, ACRN/XEN/MEHV/Siemens Hypervisor, Docker, containerd, Distributed Systems
Embedded Development	UEFI Driver, Linux Driver, ACPI, Lauterbach Trace-32 Debuggers, Intel x86 platform
Machine Learning	PyTorch, Designing End to End ML solution