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. My area of expertise includes eBPF, Rust and Linux kernel. I enjoy diving deep into complex problems, trying to find the last ounce of performance boost in a myriad of interconnected components.

Work Experience

Indiana University Bloomington

Research Assistant

Advisor: Prateek Sharma

- Current Research: Targeted CPU Scheduling for a serverless platform (Linux, eBPF, SchedExt, Rust)
 - A custom CPU scheduling solution (using SchedExt framework) that uses function metadata to improve the performance of a serverless platform.
 - https://abrehman94.github.io/projects/schedext_based_scheduling.html
- Realtime Data Analytics System using MQTT, InfluxDB and Torch Serve.
 - A data analytics system using torchserve that can be deployed on edge devices (prototyped on Jetson Orin) to perform real-time data analytics.
- https://abrehman94.github.io/projects/dataanalytics.html
- Contributed to the development of a serverless platform written in Rust (publication).
 - A radical approach to serverless computing monolithic, worker centric platform.
 - https://abrehman94.github.io/projects/iluvatar.html

Siemens Industry Software Inc.

Senior Software Engineer - Hypervisor Team

• Siemens Hypervisor support on Intel Embedded Processors Elkhartlake (2021).

- Release critical bug-fixes: ACPI parser, AHCI Virtualization, NVMe Virtualization
- Mentoring a new engineer.

Mentor Graphics a Siemens Business

Senior Software Engineer - Hypervisor Team

- Virtualized UEFI interface
 - Design and development of a non-volatile variable caching infrastructure to avoid SMI generation and provide real time guarantee for Guest RTOS.
- NVMe Virtualization
 - Performance improvement of NVMe virtualization infrastructure from 700 MB/s to 1.5 GB/s. Improved the infrastructure to process
 requests across SMP cores.
 - Led a team of two engineers to deliver the project.

Software Engineer - Hypervisor Team

- Virtualized UEFI interface
- Implementation of UEFI boot support for Guest OS (Windows, Linux, RTOS) on Siemens Type 1 Hypervisor.
- Design and development of a UEFI driver for Intel Graphics Device (IGD) to allow early graphics for Linux and Windows guests.
- NVMe Virtualization
- Design and development of the infrastructure. Specifically, interrupt handling (PCI MSI-X capability) and I/O queue segregation for the virtual devices and hardware backend.
- Adapting the Linux NVMe driver to act as a Paravirtualized Client for testing purposes.
- Feature Releases for Mentor Embedded Hypervisor (Type 1)
- Design and development of VT-d DMAR/IOMMU driver to allow device isolation and memory remapping of guests.

Software Engineer - Embedded UI Graphics Team

- Qt GUI Framework version 5.4 on Nucleus RTOS
 - Porting of the framework based on a previous work for Qt 4.0.
 - Performance optimization of the ported framework.

Publications

[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%

Aug 2022 - Present

Mobile, AL, United States

Mar 2021 - Sep 2021

Lahore, Pakistan

Jan 2020 - Mar 2021

Aug 2016 - Jan 2020

Jun 2015 - Aug 2016

Education

Indiana University Bloomington

PhD in Intelligent Systems Engineering

Advisor: Prateek Sharma

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

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		
Awards		

2016	Appreciation Certificates: exceptional debugging skills, high quality work. Mentor a Siemens Business	Lahore. Pakistan
2023	Travel Grant, High-Performance Parallel and Distributed Computing 2023	Orlando, USA

Skills

Programming Languages	Rust, C/C++, Bash, Python (Pandas, NumPy)
Application Level	Distributed Systems (serverless, InfluxDB), Containerization(Docker, containerd)
Close to hardware	eBPF, Linux Kernel, Type 1 Hypervisors (ACRN/XEN/MEHV/Siemens), UEFI Driver, ACPI, x86, Lauterbach Trace-32 Debuggers
Machine Learning	PyTorch, Application of Deep Learning approach
Tools	tmux, vim, ssh, perfetto

Bloomington, United States

Aug 2022 - Present