Minrui Tian

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Education

University of Minnesota - Twin Cities
Minneapolis, MN
Bachelor of Science, Computer Science Anticipated May 2024

- Current GPA: 3.93/4.0
- Advisor: Jon Weissman

Research Interest

I am interested in the co-design of applications, computer networks, and systems to accelerate performance by leveraging algorithms, software and hardware. My current research focuses on providing a framework for automation deployment over geo-distributed heterogeneous IoT devices.

Honors

Global Excellence Scholarship	2021-2024
Maximillian Lando Scholarship	2023-2024

Research Experience

Research Assistant - Dense IoT Project(Aiming for Middlewar 2024) Jan.2023-Present

- Developed a Python Execution Engine as the kernel of a distributed IoT system. Utilized REST API, and WebSocket API and implemented load balancing functionality to enable assigning advanced programming tasks across heterogeneous devices to achieve complex automation, enhance efficiency, and ensure effective communication on AWS EC2 for scalability.
- Implemented caching for kernel instances to optimize leader-follower node communication, boosting overall performance.
- Deployed Raspberry Pis running kernel instances with Zigbee Sticks to connect to Aqara sensors

Work Experience

Software Engineer Intern – Resource Pro May.2023-August.2023

- Led the deployment of a RoBERTa natural language processing model in C++ using Microsoft's Onnxruntime framework and CMake for compilation on Visual Studio.
- Enhanced efficiency by encapsulating C++ deployment into a function with C++/CLI for data retrieval and result uploading that leveraging C# and .NET to seamlessly interact with Azure Service Bus Queue. This optimization achieved a notable 3x performance improvement compared to the previous Python-based deployment approach.

Projects

MiniOS — Development of a Unix XV6 Operating System on VMware Linux Ubuntu

- Successfully implemented a bootloader capable of switching processors from real mode to protected modes and reading the kernel from memory via x86 special I/O instructions.
- Designed and implemented a memory management system, including a physical memory allocator for kernel and virtual memory that efficiently maps virtual addresses to physical memory addresses.
- Implemented preemptive multitasking among multiple active user-mode environments, ensuring that no single task monopolizes the CPU, enhancing overall system responsiveness and fairness, allowing multiple applications or processes to run concurrently and giving the illusion of simultaneous execution to users.
- Developed a simple file system that supports reading, writing, and deleting files.supports essential file operations, including reading, writing, and deleting files. With file system support, users and applications can store data persistently and the OS is more versatile and useful for various tasks and applications.

- Created a driver for a network interface card-E1000 that interacts with the network server, which allows the OS to communicate over a network by sending and receiving data packets, which facilitates network connectivity.

PubSubRPC - Distributed Publish-Subscribe Mechanism

- Implemented a centralized distributed system using RPC communication, allowing users to join, subscribe, publish, and unsubscribe to articles.
- Led the design of the PubSubRPC system, emphasizing scalability, reliability, and ease of use. Defined the interaction patterns for joining, subscribing, publishing, and unsubscribing processes.

XFS - A” Serverless” Distributed File System

- Developed a “serverless” fault-tolerant distributed file system consisting of an information-tracking server and multi-thread clients capable of retrieving file locations and downloading files from other clients.
- Designed and integrated fault-tolerance mechanisms to ensure rapid recovery from failures, continually serving its users and maintaining data integrity and system availability.
- Featured client nodes with load-balancing considering loads and latency to increase performance.

Relevant Courses:

- Cloud Computing, Algorithms and Data Structures, Operating Systems, Program Design and Development, Database System Management, Distributed Systems, Internet Programming, Intro to Networking, Computer Security

Skills

- Python, Java, C, R, C++, Go, PostgreSQL, HTML, CSS, Ubuntu, Javascript, Git, Linux, Version Control, UML
- GoogleTest, Agile, Doxygen, QEMU, Scrum, Docker, Node.JS, AWS, WebSocket, RPC, MySQL, Azure, CMake