HUA ZHOU

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FIRMWARE ENGINEER

Experienced Firmware engineer with 15+ years of specialized experience in embedded system development, focusing on crafting C code for SSD and printer controllers. Proficient in leveraging diverse data structures to facilitate communication and synchronization among multicore systems, alongside managing asynchronous tasks. Expert in high-speed hardware communication protocols such as PCIE and NAND FLASH. Demonstrated ability in designing, optimizing, and enhancing multicore embedded firmware architectures. Capable of independently handling large-scale module design, implementation, and testing, ensuring robustness and efficiency in mission-critical applications.

• Low-Level Programming • Communication Protocols • SOLID Principles • Microcontrollers • Problem Solving • Efficiency Improvement • Data Structures • Multithreading • Test • Driven Development

Languages: C, Python
Databases: MySQL
SDLC: Agile, waterfall
Tools: VSCode, Jupyter Notebook, IntelliJ, GitHub, GDB, Visual Studio, Jira, Makefile
Platforms: Linux, windows
Protocols: PCIe, NVMe, NAND Flash, SPI, I2C, UART

PROFESSIONAL EXPERIENCE

*CAREER NOTE: Completed on-campus studies and currently taking distance education courses to complete a **Master's Degree in Computer Science** (Available for full-time, W-2 employment).*

PETAIO, Shanghai, China • 02/2021 – 02/2024
SSD Controller Company.

Staff Firmware Engineer
- Designed a new IO path architecture using C, resolving compatibility issues with lower-yield NAND flash for a key SSD project, achieving an 80% yield improvement and maintaining supplier reliability.
- Conducted root cause analysis (RCA) on an ASIC design bug in the PCIe core module and developed a firmware workaround, enabling the successful client testing and sale of 10,000 SSDs at $800 per card.
- Engineered a trace log system that stores logs in NAND Flash, providing comprehensive module interfaces, significantly enhancing SSD failure analysis rates by 30%, streamlining diagnostics for customer returns.
- Implemented core NVMe features like Trims in firmware, utilizing collaborative controllers to distribute commands and asynchronously manage responses, enhancing performance and efficiency.
- Resolved critical firmware and hardware integration challenges, focusing on PCIe and NAND interactions, to address bottlenecks and accelerate customer testing outcomes.
- Built a data analysis system to extract firmware data from SSDs and analyze it using Python, empowering test engineers to identify internal issues and prioritize task allocation more effectively.

Technologies Used: C, ASIC, Nand FLash Array, PCIE, SOC, ARC, GDB, GIT, Jira.

NETINT, Shanghai, China • 04/2019 – 02/2021
SSD/Video Controller Company.

Staff Firmware Engineer
- Developed a new firmware architecture for an SSD PCIe 4.0 controller using C++, optimized for an SoC with 18 RISC CPU cores, boosting read IOPS from 300k to 1M, marking a 300% performance improvement.
- Implemented a wear-leveling module in SSD firmware using tree structures, linked lists, and a lifecycle-balancing algorithm for NAND blocks, extending SSD lifespan by 60 times and enhancing reliability.
- Conducted RCA of garbage collection errors in the write amplification algorithm, resolving inaccuracies with a redesigned algorithm, successfully passing customer validation, enabling release of 100 sample units.
- Built an automated testing system using Jenkins, expanding lab capacity from 5 to 100 testing devices for simultaneous machine testing, significantly improving efficiency.
- Simplified complex firmware logic by implementing state machines, enhancing code maintainability and guiding colleagues in adopting coding quality best practices.

- Trained testing engineers in Python for creating NVMe protocol-based testing scripts, advancing PCIe NVMe SSD validation capabilities and improving testing precision.

Technologies Used: *ASIC, Nand FLash Array, PCIE, SOC, ARC, GDB, GIT, Jira.*

CNEXLABS, Shanghai, China ● 01/2017 – 06/2018
SSD controller Company.

Senior Firmware Engineer
- Designed and implemented a checkpoint mechanism algorithm using linked list nodes to manage the map snapshot efficiently, reducing power-up time from 30 seconds to just 2 seconds, enabling faster system initialization.
- Guided the testing team in leveraging Python to build an automated PCIe SSD testing system, enhancing testing speed and precision across various environments.

Technologies Used: *ASIC, Nand FLash Array, PCIE, SOC, ARM, Python, C.*

HP, Shanghai, China ● 02/2011 – 10/2016
Inkjet Printer sector in HP.

Firmware Engineer
- Developed firmware for five mainstream commercial printers using C programming and embedded systems, incorporating advanced servo mechanics to deliver high-performance products.

Technologies Used: *I2C, SPI, ASIC, SOC, ARM, RTOS, GreenHill, ARM.*

MICRON, Shanghai, China ● 10/2008 – 02/2011
Semi-conductor company.

Firmware Engineer
- Developed the firmware for Micron's first-generation SATA SSD using the C programming language, successfully delivering the C300 SSD, acclaimed as the fastest SSD in the world at its release.

Technologies Used: *SATA, NADN Flash Array, ASIC, SOC, ARM.*

SILICON MOTION, Shanghai, China ● 11/2005 – 10/2008
Semi-conductor company.

Firmware Engineer
- Designed and developed various applications for UDisk, including Fingerprint UDisk and E-Ink UDisk, utilizing C programming on the 8051 controller.

Technologies Used: *C8051, SPI, I2C, Nand Flash Array, SOC, ASIC.*

EDUCATION

Master of Science in Computer Science
(In progress via distance education; expected completion 12/2026)
Maharishi International University, Fairfield, Iowa

Key Courses: Big Data Technology, Web programming, Algorithm, Web Application Architecture

Master in Computer Technology Engineering
ASU, Tempe, Arizona (07/2024)
Key Courses: Principle of Algorithm, Machine Learning, Social Network

Bachelor in Information Engineering
Tongji, Shanghai, Shanghai (07/2005)

CERTIFICATIONS

STALLING OPERATION OF IMAGING DEVICES (USA Patents)
Density modulated auto-duplexing (USA Patents)
Asymmetric striping method on flash-based storage devices (China Software invention patent)