Chun-Yi Liu
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Research Interests

Solid-State disks (SSDs), Storage Systems, Parallel Computing, Computer Architectures, Embedded Systems

Education

Pennsylvania State University State College, PA, U.S.A
Ph.D student in Computer Science and Engineering Aug. 2015–present
National Taiwan University Taipei, Taiwan
M.S. in Networking and Multimedia Sep. 2009 – Aug. 2011
National Taiwan University Taipei, Taiwan
B.S. in Computer Science & Information Engineering Sep. 2005 – Jun. 2009

Selected Publication

Chun-Yi Liu, Jagadish B. Kotra, Myoungsoo Jung, Mahmut Kandemir, Chita R. Das "SOML Read: Rethinking the Read Operation Granularity of 3D NAND SSDs," ASPLOS 2019

Chun-Yi Liu, Jagadish B. Kotra, Myoungsoo Jung, Mahmut Kandemir, "PEN: Enabling Partial Erase for 3D NAND Flash Technology," FAST 2018

Research Experience

Performance and reliability issues of 3D NAND flash Pennsylvania State University
Dr. Mahmut Taylan Kandemir Jan. 2016 - Present

- Designed and developed a hardware and software framework to mitigate the performance and reliability degradation from the "Big Block" problem of 3D NAND flash. On average, the write latency reduces 44.3%, and the write amplification has a 2.6x reduction.
- Designed and evaluated a novel SOML (Single-Operation-Multiple-Location) read operation on 3D NAND flash to mitigate the reduced low chip-level parallelism issue. On average, a 8-chip SSD with SOML read support can outperform a 16-chip baseline SSD.

Storage requirements for the deep-learning algorithm Pennsylvania State University
Dr. Mahmut Taylan Kandemir Apr. 2016 – Jul. 2016

- Analyzed the storage access patterns of the Alexnet on top of the deep-learning framework, Caffe. From the analyses, accessing image database is not the bottleneck of modern deep-learning algorithm.

Wear-leveling mechanisms on Solid-State Disks Institute of Information Science, Academia Sinica
Dr. Yuan-Hao Chang Sep. 2014 – Jun. 2015

- Designed a new wear leveling mechanism to mitigate the read disturbance problem so that the endurance of flash storage system can be improved. The proposed method reduces up to 17% of erase operations resulted from read requests.

Energy-Efficient Wireless-Network Data-Collection Systems National Taiwan University
Dr. Ai-Chun Pang Jul. 2010 – Dec. 2010

- Designed and developed a framework to evaluate the power consumption of system components including CPU, wireless adapter, and DRAM. The devices consume up to half of power consumption.
- Designed an energy-efficient scheduling algorithm for Wireless Data Collection Systems by considering both processors and peripheral devices to save up to 49% energy consumption.

Technology Development Programs – ITRI PACDUO National Taiwan University
Dr. Tei-Wei Kuo Sep. 2009 – Jul. 2010

- Ported the OKL4 microkernel to our DSP evaluation board PACDUO.
- Evaluated the paravirtualization in the OKL4 framework and developed several Linux device drivers.
- Evaluated the potential of offloading the computation to the DSP processor in the H.264 decoder of FFmpeg.

Working Experience

Software Engineer Internship
Panasas Inc. Jun. 2018 – Aug. 2018

- Designed the new storage organization to integrate NVDIMMs into the new storage systems. By adopting NVDIMMs, the systems can still preserve the data consistencies after a crash without battery protections.

Engineer
Infortrend Corporation, Research & Development department Oct. 2011 – Aug. 2014

- Developed the firmware and library of RAID file system providing disk virtualization.
  - Enhanced the efficiency of reclaim (trim) function that recycles the RAID-system data storage space by combining the reclaim requests to reduce the overhead for the file system.
  - Accelerated the RAID to RAID backup speed by processing multiple data blocks at the same time to reduce the overhead of file system metadata flushing.
  - Redesigned and Developed the error handling procedure of RAID to RAID backup so that the volume can complete data backup even when the network or disk space is temporarily unavailable.
  - Enhanced the efficiency of Tier Migration by providing more hints from previous sub-operations to shrink the appropriate space search range.
  - Redesigned and developed the volume expansion operation to provide a better guarantee of the integrity of metadata under the power failure.
  - Resolved several application issues including deadlock and unexpected crashes.
- Designed and developed a framework to evaluate the RAID performance under a large number of simultaneous video playbacks.

Skills

Programming: C, C++, Python, PHP, HTML, CSS, Javascript, JAVA, MATLAB, Verilog, x86 Assembly, UML, Linux kernel programming
Operating Systems: Linux, FreeBSD, Windows
Languages: Mandarin Chinese, English