COSC FACULTY CANDIDATE 2010 SEMINAR

SPEAKER: Dr. Xiaoning Ding, Ohio State University
DATE: MARCH 29, 2010
TIME: 11:00 AM
WHERE: PGH 232

TITLE: Advancing Operating Systems to Address Resource Contention Challenges in Multi-core Processors

We have entered the multi-core era! In a multi-core processor, each core has its own private resources, such as pipeline, registers, and L1 caches. The aggregated computing resources allow a multi-core processor to offer greater computing capability with less power consumption than that of a single-core processor by executing multiple threads concurrently. However, the multiple cores share the last level cache (LLC) and a narrow data path to the memory. Thus, concurrent running threads can contend for these resources in an out-of-control fashion to severely degrade performance. Keeping the working sets of the running threads in LLC is the pivotal point to reduce the contention by effectively reducing long-latency memory accesses and lowering the usage of the shared data path. Operating system, being a key resource manager, can play a critical role for this purpose.

I will introduce a set of effective enhancements in OS scheduling and buffer cache management in order to maintain the working sets of running threads in LLC. The main system component is a shared cache aware scheduling framework for multi-core processors by extending the LLC hardware design with a set of low overhead profiling units to measure working set sizes and to collect other locality information of running threads. With rich knowledge of locality related information, the OS scheduler can effectively make thread assignments such that the working sets of running threads can be held within the capacity of LLC. A supporting system component is a buffer cache design for multi-core systems, which avoids the working sets of the running threads being polluted by burst file accesses. Experimental performance results will be presented to show the effectiveness of the proposed methods. I will present my future research in the end of the talk.

Bio:
Xiaoning Ding is receiving his Ph.D. degree in Computer Science and Engineering at the Ohio State University. He is working in experimental computer systems areas, including operating systems, computer architecture, distributed systems, and database systems. Collaborating with researchers at IBM T.J. Watson Research Center, he has designed and implemented several effective solutions for testing and diagnosing applications migrated into the emerging cloud computing environments. Several his open source system prototypes have been used by industries and research community, including DULO (appeared in USENIX'05) and BP-Wrapper (appeared in ICDE'09). He received a Graduate Research Award at Ohio State in 2007, and the Best Student Paper Award in USENIX LISA'08.