Efficient Compiler-Architecture Interaction for Low-Cost Soft Error Resilience

**ABSTRACT**

In this talk, I will present Turnstile, a hardware/software cooperative technique for low-cost soft error resilience. Leveraging recent advances on sensor-based soft error detection, Turnstile achieves 100% recovery with near-zero silent data corruption (SDC), by taking into account the detection latency. The compiler forms verifiable regions and selectively inserts store instructions to checkpoint the value of written registers so that Turnstile can treat updates to registers/memory in a unified way. At runtime, for each region, Turnstile regards any written data (memory/registers) as unverified, and thus holds them in a store queue until they spend the time of the error detection latency. If no error is detected during the time, original stores are merged into memory systems, and registers are checkpointed. When an error is detected, Turnstile invalidates unverified store queue entries, finds a recovery point (i.e., the region next to the most recently verified region) to rollback beyond the detection latency, and restores the checkpointed register values. Then, it simply redirects program control to the recovery point. The experiment results demonstrate that Turnstile can offer guaranteed soft error recovery without incurring significant performance overhead (<8% on average).

**BIOGRAPHY**

Changhee Jung is an Assistant Professor in Computer Science at Virginia Tech. His research interests include compilers, computer architectures, software engineering, and dependable systems. His work has appeared in top conferences such as MICRO, PLDI, ICSE, ASPLOS, PPOPP, and SC (Best Student Paper Finalist, 2016). He received Google Faculty Research Award (2015) and the Silver Prize in the SAMSUNG HumanTech Thesis Competition (2005).

Changhee received his PhD degree in Computer Science from Georgia Tech in 2013. During the three summers between 2010 and 2012, he worked as a software engineering intern with the compiler optimization team at Google. From 2005 to 2008, he was a member of the research staff at ETRI (Electronics and Telecommunications Research Institute), Korea.

All are welcome!