Computing@PNNL
SEMINAR SERIES

Optimizing Recursive Task Parallel Programs

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June 12, 2017 | 1PM | CSF Darwin

In his talk, Dr. Nandivada will present a new optimization DECAF that optimizes recursive task parallel, or RTP, programs by reducing the task creation and termination overheads. DECAF reduces the task termination (join) operations by aggressively increasing the scope of join operations (in a semantics-preserving way) and eliminating the redundant join operations discovered on the way. DECAF further extends the traditional loop-chunking (LC) technique to perform load-balanced chunking, at runtime, based on the number of available worker threads. This helps reduce the redundant parallel tasks at different levels of recursion. He also will discuss the impact of exceptions to these techniques and extend them to handle RTP programs that may throw exceptions. DECAF has been implemented in the X10v2.3 compiler and tested over a set of benchmark kernels on two different hardwares (a 16-core Intel and 64-core AMD system). With respect to the base X10 compiler extended with LC, DECAF achieved a geometric mean speed up of 2.14× and 2.53× on the Intel and AMD systems, respectively. Dr. Nandivada also will present an evaluation with respect to the energy consumption on the Intel system and show that, on average, the DECAF versions consume 71.2% less energy compared to the LC versions. He also will briefly discuss recent advances in MHP (may-happen-in-parallel) analysis for task parallel programs that make computation of MHP information scalable.

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