

第 23 回先進スーパーコンピューティング環境 (ASE) 研究会実施報告

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東京大学情報基盤センターASE研究会 (Advanced Supercomputing Environment) は内外からの講演者を招いて不定期に開催している。2016年7月6日(水)に実施された第23回ASE研究会¹では、来日中の Subodh Sharma 博士 (Indian Institute of Technology, Delhi) に「Performance Tuning of MPI Programs via Model Checking」と題して講演をしていただいた。Sharma 博士から「HPC システムの省電力技術」、「計算科学教育」について議論をしたいという要望があったため、当該トピックについての学内・センター教員からの講演も実施した。学内外から合計 20 名の出席者があり、活発な議論が行われた。

表 1 プログラム

時間帯	講演者	題 目
14:00-14:10	Reiji Suda (The University of Tokyo)	Opening
14:10-15:10	Subodh Sharma (Indian Institute of Technology, Delhi)	Performance Tuning of MPI Programs via Model Checking
Message Passing Interface (MPI) is widely considered to be the lingua-franca of High Performance Computing (HPC). Indeed, it is a fact that most supercomputers in recent times run programs developed using MPI. Nevertheless, developing MPI programs that are correct and performant remains a huge challenge. In this talk, I will first discuss some of the strategies that we developed to formally verify MPI programs for correctness (such as absence of communication deadlocks, violations of safety assertions, etc.). I will then discuss how we can build automated performance tuners for MPI applications using the discussed verification techniques.		
15:10-15:40	Massaki Kondo, and Thang Cao (The University of Tokyo)	Demand-Aware Power Management for Power-Constrained HPC Systems
As limited power budget is becoming one of the most crucial challenges in developing supercomputer systems, hardware overprovisioning is an attractive way to design exascale HPC systems. Traditionally, a scheduler in HPC systems determines when and where to allocate jobs. For overprovisioned systems, the schedulers also need to care about power allocation to each job. An easy way is to set a fixed power cap for each job so that the total power consumption is within the power constraint of the system. This fixed power capping does not necessarily provide good performance since the effective power usage of jobs changes throughout their execution. Moreover, because each job has its own performance requirement, fixed power cap may not work well for all the jobs. In this talk, we introduce a demand-aware power management framework where the scheduler optimizes power cap of each CPU so that the required performance level of each job is satisfied while improving system throughput by making good use of available power budget.		
15:40-16:10	Kengo Nakajima (The University of Tokyo)	CSE Education in the University of Tokyo and Activities of the CS Alliance
16:10-16:15		Closing
Interdisciplinary and intensive education program for undergraduate and graduate students in is essential for the future development of CSE (Computational Science and Engineering). In the University of Tokyo, we have been discussion on a campus-wide CSE education program since 2008, and various types of lectures and exercises have been provided. In April 2016, the CS (Computational Science) Alliance was established for this campus-wide CSE education program and promotion of interdisciplinary research by 13 schools and institutes of the University of Tokyo. In this talk, education program of the geophysics department, and intensive courses by Information Technology Center are introduced. Moreover, activities of the CS Alliance are overviewed.		

¹ <http://www.cc.u-tokyo.ac.jp/event/ase/23.html>