Τμήμα Μηχανικών Η/Υ & Πληροφορικής - Σεμινάρια 2020

ΔΙΑΛΕΞΗ

" Speeding-up Synchronization and Communication for Many-Core architectures"

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Περίληψη – Abstract

In the last decade, the industry has shifted its effort to many-core processors for enhancing the performance of shared memory computational systems. Therefore, an increasing number of software developers try to exploit the performance characteristics of these systems by developing applications that are based on the shared memory abstraction model. On the other hand, clusters of servers are gaining popularity and commodity software is based on efficient message passing communication. In any case, fast synchronization and communication is a prerequisite for modern large-scale applications. In this talk, we will present techniques for speeding-up synchronization and communication in both shared memory and message passing systems.

In this talk, we will discuss the design and the implementation of an efficient and flexible shared memory abstraction, called GSAS, on top of the ExaNet low-latency network architecture. The GSAS environment uses a minimal set of hardware primitives of the ExaNet architecture for providing a shared memory abstraction. The latest developments of the GSAS environment give the ability to run GSAS on top of the Infiniband network architecture. Moreover, the current development of the GSAS environment aims to provide OpenSHMEM support on top of the ExaNet and Infiniband network architectures. Our micro-benchmarks show that GSAS achieves good performance with minimal software overhead.

Moreover, an efficient concurrent resizable hash-table implementation for shared memory systems will be presented. This concurrent hash-table ensures wait-freedom as a progress property, while it achieves unprecedented performance for a wait-free resizable hash-table. In order to achieve high throughput at large core counts, our algorithm is specifically designed to retain the natural parallelism of concurrent hashing, while providing wait-free resizing. When resizing actions are rare, this concurrent hash-table implementation outperforms all existing lock-free algorithms while providing a stronger progress guarantee.

Nikolaos Kallimanis is a post-doctoral researcher in the Computer Architecture and VLSI Systems Laboratory (CARV) at Foundation of Research and Technology, Hellas (FORTH). He received his PhD in 2013 from the Department of Computer Science and Engineering, University of Ioannina, and he was granted with a fellowship for his PhD studies from the Empirikion foundation (2008-2012). He also holds a BSc (2005) and MSc (2008) from the same department. For the academic period 2003-2004, he received a fellowship and an award for outstanding performance from State Scholarships Foundation (IKY). As a post-doctoral researcher in FORTH, he has been involved in several European research projects, such as European Processor Initiative (EPI), EuroExa, ExaNoDe, ExaNeSt and EuroServer. Currently, he works in the European Processor Initiative (EPI) project and the EuroEXA project. His research has focused on concurrency, synchronization, concurrent data-structures, message passing communication protocols, large-scale computations, efficient network communication, memory allocators, resource allocation, performance evaluation, task scheduling, power performance evaluation, energy efficiency, and multithreaded computing. His research results have been published in prestigious conferences and journals, such as ACM PODC, ACM SPAA, and ACM PPOPP.

Δευτέρα 2/11/2020 – 14:00-15:00