

Thinking in Parallel: Hardware to Software – Adopting the TCPP Core Curriculum in Computer Systems Principles



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Problem

Introducing parallelism into an existing course is difficult

Goal #1

Re-focus course material to make parallelism a common thread

Goal #2

Migrate course material over time, teach students to think in parallel, reduce gap in understanding

Introduction

Introducing parallelism into an existing course is difficult if it is not the underlying theme. At the same time it is possible to re-focus existing course material by making it a common “thread” starting on the first day of class. This approach was used to improve student success rates in CMPSCI 230: Computer Systems Principles, a core course in the School of Computer Science at the University of Massachusetts Amherst. This course covers many aspects of the TCPP Core Curriculum with special attention to processes, threads, networking, and web services toward the second half of the semester. Prior to making parallelism a topic of study from day one students encountered severe difficulties with later programming assignments that focus entirely on processes, threads, concurrency, and synchronization. This gap in understanding was attributed to the disconnect in student understanding when transitioning from a sequential to a parallel programming model. Making parallelism present in lectures, assignments, and exercises throughout has drastically improved the success in later projects and assignments.

Approach

- Introduce parallelism on day one.
- Make parallelism a common “thread”.
- Extend existing lecture material to include formally or informally topics in parallelism in each class.
- Enhance earlier assignments with problems that will encourage students to think in parallel.

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