

# **EA: Poster: Multi-Semester Effort and Experience to Integrate NSF/IEEE-TCPP PDC into Multiple Department-wide Core Courses of Computer Science and Technology Department at GUPT**

Shanyu Wu, Yunhe Li, Wende Ke

Computer Science and Technology Department, Guangdong University of Petrochemical  
Technology, China

FengGu

Department of Computer Science, College of Staten Island, NY, USA 10314

**Abstract\_** In order to gradually bridge the wide gap between the rapidly developing parallel computer architectures and the traditional sequential programming approach taught in CS courses, we have been integrating NSF/IEEE-TCPP Curriculum Initiative on Parallel and Distributed Computing (PDC for short) modules into five courses of the Computer Science and Technology Department at Guangdong University of Petrochemical Technology (GUPT for short) since the fall of 2014. Faculty training and some further technical supports are offered by an external faculty member. The teaching materials such as lecture notes, reference textbooks, assignments and exam questions are revised and updated to incorporate the related parallel and distributed concepts into the existing courses.

## **BACKGROUND**

With the rapid development of parallel computer architectures, it is necessary for our graduates to prepare for their future careers where PDC knowledge is an essential requirement. There are 20 faculty members and approximately 800 students in The Computer Science and Technology Department at GUPT which offers a bachelor's degree in computer science & technology and a bachelor's degree in network engineering respectively. According to our recent surveys, a majority of our students wanted to learn about PDC topics. NSF/IEEE-TCPP Curriculum Initiative award will help integrating PDC topics into the computer science curriculum at GUPT.

## **EARLY ADOPTING COURSES**

The courses we adopted the TCPP curriculum Initiative on PDC firstly are listed in table 1.

## **EARLY EFFORTS AND STUDENTS FEEDBACK**

Efforts we have made to introduce PDC topics into current curriculum include redesigning the courses, faculty training, implementing the revised teaching program.

We have made two surveys about the breadth and depth of, and students' interest in PDC topics covered in the curriculum respectively in March and July, 2015. Students' feedback is displayed in table 2. The first survey was about revised courses implemented in the fall semester of 2014, and the second was about courses implemented in the spring semester of 2015. In the fall semester of 2014, we only introduced some PDC related basic concepts into current courses, so most students thought the breadth and depth was not enough. As we added class hours to introduce more PDC related content in the spring semester of 2015, the scores of breadth and depth increased a little, but there was no breakthrough. Both the surveys suggested that students had a deep interest in PDC topics.

Under current condition, the best approach is to smoothly integrate the selected PDC topics into the present courses. And we expect to implement more topics of TCPP curriculum after the corresponding experiment conditions are improved.

**Table 1: Early efforts**

Courses	Main Topics	Integrated PDC Topics
Fundamentals of Programming	Knowledge of control structures, functions, array and pointer, concept of class and object, data sharing and protection, and inheritance and derived class	Basic concept of parallel computing, characteristics of modern multi-core processor, concept of thread and the basics of multi-threaded program organization, and basis of OpenMP
Data Structures	Linear tables, stacks, queues, lists, array, trees and graphs, several classical searching and sorting algorithms	Programming for systems with sharing memory and distributed memory
Principles of Operating Systems	Contents of concurrency, processes, synchronization, mutual exclusion, memory management, scheduling, threads, I/O, file systems, protection and security	OS on multi-core processors, including threads scheduling mechanisms, locks and semaphores implementation mechanisms, and memory management mechanisms.
Embedded System Architecture	Embedded architectures and instruction sets, embedded program design under circumstance of embedded architectures	Structure of embedded multi-core system and the basic idea of implementing parallel computing on embedded SMP system
Application and Design of Embedded Systems		

**Table 2: Students feedback(1-Min 4-Max)**

Date	Rate	Breadth	Depth	Interest
3/2015	1	63%	67%	6%
	2	26%	24%	7%
	3	11%	9%	22%
	4	0	0	65%
	Summary results	1.48	1.42	3.46
7/2015	1	61%	53%	7%
	2	25%	27%	6%
	3	12%	14%	19%
	4	2%	6%	68%
	Summary results	1.55	1.73	3.48