Report on Euro-TM Short Time Scientific Collaboration: From Paris to Lausanne, October 2014

Petr Kuznetsov (Télécom ParisTech) visited Rachid Guerraoui (Distributed Programming Laboratory, EPFL) on October 6-11. 2014. The goals of the visit were (1) to work on a scientific project and (2) to prepare a book for publication. Below we give a brief report on how the visit matched the goals.

On Paritial Wait-Freedom The context of the project is theoretical foundations of *transactional memory*, a convenient programming paradigm that allows concurrent threads to declare sequences of instructions on shared data as speculative *transactions* with "all-or-nothing" semantics.

The topic of the project is inherent costs and impossibilities of providing the "strongest" form of *wait-free* progress to subsets of transactions in a transactional-memory implementation. Intuitively, wait-free progress provides possibly the best way to tolerate failures and asynchrony: a thread is running *wait-free* if it makes progress (by committing all transactions it executes) regardless of the behavior of other threads (even if other threads are crashed, swapped-out, etc.). It is known that dynamic transactional memory cannot provide *wait-free* progress in the sense that every transaction commits in a finite number of its own steps. In this project, we explore the costs of providing "priviledged" (e.g., wait-free) progress to specific *classes* of transactions only.

In the week of October 6, 2014, we stated a conjecture that, once proved, will clarify how to distinguish possible from impossible in providing partial wait-freedom in TM. In particular, we want to prove that, using only reads and writes, providing wait-free progress to read-only transactions is impossible, even if we assume very weak (sequential) progress for updating transactions. We have not yet managed to prove the conjecture though, but hopefully we are not too far.

The project is undertaken by Petr Kuznetsov (Télécom ParisTech) and Srivatsan Ravi (TU Berlin, Télécom ParisTech) from the French side, and Victor Bushkov and Rachid Guerraoui (EPFL) from the Swiss side.

Lecture Notes on Concurrent Computing Also, we (Petr Kuznetsov and Rachid Guerraoui) have been woking on a collection of lecture notes on robust concurrent computing. We finished two chapters and made an overall revision of the book structure.

Overall, the visit was successful in addressing both goals stated above.