One for All and All for One: Scalable Consensus in a Hybrid Communication Model

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Date : 16 May 2019 (Thursday)
Time : 2:30 p.m. - 3:30 p.m.
Venue : Room PQ303, 3/Floor, PQ Core, Mong Man Wai Building,
The Hong Kong Polytechnic University

Abstract
This talk will address consensus in an asynchronous model where the processes are partitioned into clusters. Inside each cluster, processes can communicate through a shared memory, which favors efficiency. Moreover, any pair of processes can also communicate through a message-passing communication system, which favors scalability. In such a “hybrid communication” context, the talk will present two simple binary consensus algorithms (one based on local coins, the other one based on a common coin). These algorithms are straightforward extensions of existing message-passing randomized round-based consensus algorithms. At each round, the processes of each cluster first agree on the same value (using an underlying shared memory consensus algorithm), and then use a message-passing algorithm to converge on the same decided value. The algorithms are such that, if all except one processes of a cluster crash, the surviving process acts as if all the processes of its cluster were alive (hence the motto “one for all and all for one”). As a consequence, the hybrid communication model allows us to obtain simple, efficient, and scalable fault-tolerant consensus algorithms. As an important side effect, according to the size of each cluster, consensus can be obtained even if a majority of processes crash.

About the Speaker
Michel Raynal is an Emeritus Professor of Informatics, IRISA, University of Rennes, France. His research interests are the basic principles of distributed computing systems. Recognized as a world leading researcher in distributed computing, he is the author of numerous papers on this topic (more than 170 articles in int’l scientific journals, and more than 330 papers in int’l conferences). He is also well-known for his 12 books on distributed computing. Michel Raynal is a senior member of the prestigious “Institut Universitaire de France”, and a member of Academia Europaea. He was the recipient of the 2015 Int’l Award “Innovation in Distributed Computing” (also known as SIROCCO Prize), and recipient of the 2018 “Outstanding Technical Achievement in Distributed Computing” IEEE Award. Michel Raynal is also “Distinguished Chair Professor on Distributed Algorithms” at the Polytechnic University (PolyU) of Hong Kong. Michel Raynal chaired the program committee of the major conferences on distributed computing (e.g., ICDCS, DISC, SIROCCO, OPODIS, ICDCN, etc.), and has been member (or head) of their steering committees. He is the recipient of several “Best Paper” awards of major conferences (including ICDCS 1999, 2000 and 2001, SSS 2009 and 2011, Europar 2010, DISC 2010, PODC 2014). He gave lectures on distributed computing in many universities all over the world.