

## **SORS: Big Data Processing in Large-Scale Network Analysis and Billion-Scale Social Simulation**

**Speaker:** **Toyotaro Suzumura** (IBM Research, University College Dublin and Tokyo Institute of Technology)

### **Abstract:**

Graphs will be a prominent computational workload in the Exascale era. Large graph analysis is a dilemma faced by programmers in various domains such as scientific applications, biology, national security, business analytics, and so forth. In this talk we present our research project called ScaleGraph which is an open-source X10 library for massive graph analytics targeting large scale graph analysis scenarios.

Next, we introduce other effort that pursue the ultimate performance of large-scale graph analytics in the Graph500 benchmark recently paid attention by the Supercomputing community as one of the important big data benchmarks. We have developed a scalable and high-performance implementation of BFS (Breadth First Search) for large distributed

environments based on 2D partitioning and other methods such as communication compression and vertex sorting. Our optimized implementation can handle BFS of a large graph with Scale 35 (34.3 billion vertices and 549.7 billion edges) with 462.25 Giga TEPS (Traversed Edges Per Second) while using 1366 nodes and 16,392 CPU cores. The talk will also cover more recent activities and the trend in this area.

We finally will introduce a platform for billion-scale social simulations. Towards the contribution to the human society, global economy, ecology, the analysis of human brain characteristics and our daily life, the research in multi-agent simulation is entering into the era of simulating billion-scale agents. Although prior arts tackle distributed agent simulation platform to achieve this goal, it is not sufficient to simulation billion-scale agent behaviors. Based on this observation, we introduce our work for building such an infrastructure platform that handles billion-scale agent simulation platform.

### **Short Biography:**

Toyotaro Suzumura received his Ph.D. in Computer Science from Tokyo Institute of Technology in 2004 mainly focusing on Grid computing and highly distributed systems mainly supervised by Prof. Satoshi Matsuoka. He published top-tier international conferences such as ACM/IEEE Supercomputing and IPDPS during his Ph.D, and also spent part of his Ph.D. research activities in San Diego Supercomputing Center, eXtreme Scale Computing led by Prof. Dennis Gannon, and Innovation Computing Laboratory led by Prof. Jack Dongarra. He joined IBM Research - Tokyo in 2004 and had involved with several projects such as high performance XML processing, the PHP scripting language, stream computing, the X10 programming language and so forth. Since 2010, he has started to develop an X10-based billion-scale agent simulation platform on highly distributed systems and its application to large-scale traffic simulation. He has also explored billion-scale large scale analytics and been leading an open source graph library called ScaleGraph (<http://www.scalegraph.org>) and also continuously achieves 3rd or 4th place in the big graph processing competition called Graph500. He also had taken a role of a visiting associate professor at the Graduate School of Information Science and Engineering of Tokyo Institute of Technology since April 2009 for almost 5 years and supervised 16 students including 3 Ph.D. students. Since April, 2013, He also serves as a visiting associate professor at University College Dublin, Ireland. He has published 50 reviewed paper for international conferences and workshops, 41 domestic conferences, and 12 international patents. He is now a

co-principal investigator for two Japanese government projects called "JST CREST" by leading both large-scale graph analytics and billion-scale agent simulation towards exa-scale computing environment.

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