



Today, distributed systems are the rule rather than the exception—it is almost impossible to point at any two computers in the world that are not connected in some way. Virtually all application areas, from health care to entertainment, and from industrial automation to traffic management, rely on distributed systems. Responding to challenges in this field, our mission is to model, design, implement, and analyze distributed systems and algorithms.

This is a brief annual report of the Distributed Systems (DS) Group of Delft University of Technology for the year 2018. It is meant to present the main changes and achievements of the DS group to other groups in the faculty, to our previous master's and PhD students, to our research partners, and to anyone who might be interested in a collaboration.



#### CURRENT STAFF

[Dick Epema](#), full professor (chair)  
[Lydia Chen](#), associate professor  
[Johan Pouwelse](#), associate professor  
[Jan Rellermeyer](#), assistant professor  
[Stefanie Roos](#), assistant professor  
[Alexandru Iosup](#), full professor at VU Amsterdam and associate professor at TU Delft  
Leonard Francken, guest (Authority Financial Markets)  
[Ana Lucia Varbanescu](#), associate professor (guest, UvA)  
[Nicola Zannone](#), associate professor (guest, TU/e)



#### CHANGES IN STAFF IN 2018

- Lydia Chen joined as an associate professor, with as research topic privacy-aware and adversarial learning in distributed data processing
- Stefanie Roos joined as an assistant professor, with as research topic anonymous communication networks and blockchain scalability
- Vadim Bulavintsev joined as a developer in blockchain technology
- Sobhan Omranian Khorasani joined as a PhD student in optimization of data processing frameworks



#### AWARDS IN 2018

- Alexey Ilyuskin received a best-paper nomination at CCGrid 2018



#### HIGHLIGHTS IN 2018

- The Board of the University provided additional funding for the Delft Blockchain Lab (DBL), which is led by the DS Group, for increasing the role and visibility of TU Delft in the research in blockchain technology
- The proposal for the 6-cluster DAS6 system for experimental computer science was granted by NWO



#### MAIN INDUSTRY COLLABORATION IN 2018

- ABN-AMRO, RVIG, Solvinity, Oracle, Intel, SPEC



#### SELECTED TEACHING ACHIEVEMENTS IN 2018

- Dick Epema, Johan Pouwelse and Marc Makkes (VU Amsterdam) taught for the first time the ASCI PhD course *Advanced Blockchain Engineering*
- DBL introduced the *Delft Blockchain Certificate* for MSc students who complete the courses *Blockchain Engineering*, *Distributed Algorithms*, and *Security and Cryptography* (with the Section Cyber Security)



#### SELECTED RESEARCH ACHIEVEMENTS IN 2018



##### Big-Data Processing:

- Developing run-time configuration strategies for big data cluster schedulers
- Performance improvement of Apache Spark by NUMA-aware memory management and adaptive I/O threading
- Evaluation of running Big Data systems like Spark with FaaS as an execution model



##### Scheduling:

- Performance evaluation of autoscalers for workflows
- Evaluation of the impact of the accuracy of task runtime estimates on workflow performance
- Exploring sprinting policies to enhance the tail latency for interactive jobs



##### Blockchain Technology:

- Further development of the Trustchain as an alternative to the original blockchain
- A Trustchain-based digital identity in collaboration with the Netherlands Identity Data Agency
- A mechanism for decentralized routing of payments



#### MAIN PUBLICATIONS IN 2018

- L. Y. Chen et al. "Model-Driven Computational Sprinting," *EuroSys*
- A. Ilyushkin and D. Epema, "The Impact of Task Runtime Estimates on Scheduling Workflows," *CCGrid*
- A. Iosup et al., "Massivizing Computer Systems," *ICDCS*
- J. Pouwelse et al., "A Blockchain Consensus Protocol with Horizontal Scalability," *IFIP Networking*
- J. Rellermeyer et al., "Container Density Improvements with Dynamic Memory Extension Using NAND Flash," *ApSys*
- S. Roos et al., "Settling Payments Fast and Private: Efficient Decentralized Routing for Path-Based Transactions," *NDSS*