

Benchmarks and Models for Blockchain

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ABSTRACT

Blockchain is a highly popular paradigm for non-centralized applications, especially in finance and trade. Performance is a major challenge for blockchains, since consensus approaches are known not to scale. In this presentation we address blockchain performance, from the perspective of model-based prediction as well as benchmark-based assessment. We present research results about smart contracts in the Ethereum blockchain and discuss the requirements for generic benchmarks for blockchain performance.

Benchmarking is a common approach to compare industry-class systems. As blockchain technologies mature, the role of reliable benchmarks will become increasingly important. However, definitions of benchmarks for blockchains are still in their infancy. We argue that there is a clear need for benchmarks, and that benchmarks should be based on the sound scientific principles of metrology [1]. A variety of important performance issues should be addressed, including the performance of the proof (be it work, stake, or other), transaction processing and block creation. Moreover, in all these situations, establishing energy consumption benchmarks is critical in determining if incentives are in place for miners to operate the blockchain system.

A particularly interesting element in some blockchains is the mechanism of smart contracts. For instance, in Ethereum, the fees associated with executing contracts depend on the benchmarked performance of the operation code. In [2] it was demonstrated that uncertainty with respect to the correctness of the anticipated execution time impacts the decisions miners will take. We will discuss improved benchmarking approaches for operational code.

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CCS Concepts/ACM Classifiers

• General and reference ~ Measurement • General and reference ~ Performance

Author Keywords

Blockchain; benchmark; performance; performance modeling

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BIOGRAPHY

Aad van Moorsel is a Professor at the School of Computing in Newcastle University and was its Head of School from 2012-2017. He worked in industry from 1996 until 2003, first as a researcher at Bell Labs/Lucent Technologies in Murray Hill and then as a research manager at Hewlett-Packard Labs in Palo Alto, both in the United States. He got his PhD in computer science from Universiteit Twente in The Netherlands and has a Masters in mathematics from Universiteit Leiden, also in The Netherlands. After finishing his PhD he was a postdoc at the University of Illinois at Urbana-Champaign, Illinois, USA, for two years. He is the author of over 100 peer-reviewed research papers, and holds three US patents. His research group at Newcastle University conducts research in security, privacy and trust, with applications in payment, blockchain and smart systems. The group's research all contains elements of quantification, be it through system measurement, predictive modelling or on-line adaptation.



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