

# IaaS Cloud Benchmarking: Approaches, Challenges, and Experience

[Invited Talk]

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## ABSTRACT

Over the past five years, Infrastructure-as-a-Service (IaaS) clouds have grown into the branch of ICT that offers services related to on-demand lease of storage, computation, and network. One of the major impediments in the selection and even use of (commercial) IaaS clouds is the lack of benchmarking results, that is, the lack of trustworthy quantitative information that allows (potential) cloud users to compare and reason about IaaS clouds.

In this talk we discuss empirical approaches to quantitative evaluation of IaaS clouds, toward cloud benchmarking. Both industry and academia have used empirical approaches for years, but with limited success for IaaS clouds and similar systems (e.g., grids) due to the complexity and size of challenges. We present initial results of our research into cloud workload characterization, including Big Data applications. We present the lessons we have learned in developing the SkyMark framework for cloud performance evaluation and the results of our SkyMark-based investigation of three research questions: What is the performance of production IaaS cloud services? How variable is the performance of widely used production cloud services? and What is the impact on performance of the provisioning and allocation policies that interact with IaaS clouds?

In contrast to previous attempts, our research combines empirical and other approaches, for example modeling and simulation, for gaining more insight; is based on a combination of short-term and multi-year measurements, for ensuring the longevity of our results; and uses large, comprehensive studies of several real clouds, for reducing the threats to validity related to the experimental environment. This presentation can also provide useful insights for fields related to benchmarking, for example experimental evaluation conducted in other large-scale distributed systems.

Last but not least, we present a road-map toward cloud benchmarking and the way we plan to progress on it with other members of the RG Cloud WG of the Standard Performance Evaluation Corporation (SPEC) (<http://research.spec.org/working-groups/rg-cloud-working-group.html>).

**Note:** talk based on the homonym article [1].

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## Categories and Subject Descriptors

K.6.2 [Management of Computing and Information Systems]: Installation Management—*benchmarks*; D.2.8 [Software Engineering]: Metrics—*performance measures*

## Keywords

cloud benchmarking, cloud computing, service-oriented architectures, performance measures, experimental research

## Bio

Dr. Alexandru Iosup is an Assistant Professor with the Parallel and Distributed Systems Group at the Delft University of Technology (TU Delft). He has received in 2009 his Ph.D. in Computer Science from TU Delft, the Netherlands. He was a visiting scholar at U.Wisconsin-Madison and U.California-Berkeley in the summers of 2006 and 2010, respectively. Dr. Iosup has received a Veni grant (the Dutch equivalent of the US NSF CAREER), and has participated in several EU and Dutch projects. His research interests are in the area of distributed computing systems and their applications (keywords: cloud computing, peer-to-peer systems, scientific computing, massively multiplayer online games, scheduling, scalability, reliability, performance evaluation, workload characterization). He is the author of over 50 refereed scientific publications and has received several awards and distinctions, including best paper awards at IEEE CC-Grid, Euro-Par, and IEEE P2P. He is the co-founder of the Grid Workloads, the Peer-to-Peer Trace, and the Failure Trace Archives, which provide open access to workload and resource operation traces from large-scale distributed computing environments. He is member of the ACM and IEEE, and Steering Committee member of the SPEC Research Group.

## Acknowledgments

Supported by the STW/NWO Veni grant @larGe (11881).

## References

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