



**Special Issue on
Benchmarking, Experimentation Tools, and Reproducible Practices for
Data-Intensive Systems from Edge to Cloud**

Software: Practice and Experience (Wiley Press)

Call for Papers

As data analytics and machine learning pervade our cities, factories, and homes, the computing infrastructures for data-intensive systems are becoming more challenging. That is, the vision of widely deployed, intelligent, and cyber-physical IoT systems will not be implemented with centralized cloud resources alone. Such resources are simply too far away from sensor-equipped devices and users, leading to high latency, bandwidth bottlenecks, and unnecessary energy consumption. Additionally, there are often privacy and safety requirements mandating distributed architectures. Thus, new distributed computing paradigms are emerging, promising to provide computing and storage in closer proximity to data sources and users.

The emerging distributed computing environments of edge and fog computing can provide additional resources within mobile networks, ISP infrastructures, or even low Earth orbit (LEO) satellites. The resulting diverse and dynamic environments pose significant challenges to the performance, dependability, and efficiency of data-intensive systems deployed onto such infrastructures. Meanwhile, it is far less clear how to best benchmark, evaluate, and test the behavior of systems that span IoT devices, edge nodes, and cloud resources.

For instance, IoT-sensor stream processing systems might be deployed to continuously optimize the operation of urban infrastructures (such as public transport systems, water networks, or medical infrastructures). The behavior of such systems must be assessed thoroughly before they can be deployed to edge and fog infrastructures. Furthermore, these systems must be evaluated reproducibly under the expected computing environment conditions, including variations of such conditions, given the inherently unsteady nature of IoT environments. In addition, there are increasing concerns about the energy consumption and emissions of ICT (and particularly distributed ML-based applications), further warranting close inspection of the behavior of new data-intensive applications.

Despite significant research and development efforts towards better benchmarking, experimentation tools, and reproducible practices for data-intensive systems that span from edge to cloud, further research is urgently needed. We, thus, invite high-quality research papers on this topic for a special issue of *Software: Practice and Experience*.

Topics of interest include but are not limited to:

- physical and hybrid IoT testbeds, (co-)simulation and emulation of IoT environments, and testing frameworks for edge and fog computing
- programming systems, instrumentation libraries, and domain-specific languages for the configuration of reproducible experiments with data-intensive edge-cloud applications
- distributed monitoring, tracing, and error detection methods for data-intensive systems that span from devices to clouds
- evaluation tools to investigate edge/fog/cloud resource management (e.g., scheduling, dynamic scaling, and live migration)
- testing and benchmarking of network technologies and protocols, heterogeneous IoT devices, and varieties of edge/fog/cloud resources
- benchmarking and experimentation tools to assess resource usage, power consumption, dependability and fault tolerance, real-time behavior, or security and privacy aspects of data-intensive applications
- low-cost, adaptive, and configurable monitoring/tracing/logging systems for resource management, network shaping and/or large-scale application deployment
- tools and practices for estimating energy consumption and carbon emissions of data-intensive applications deployed across edge/fog/cloud computing environments
- usability of testbeds, testing frameworks, benchmarks, and experimentation tools
- interoperable formats and repositories for sharing device, network, systems and/or application performance models
- representativeness, reproducibility, and repeatability of experiments, benchmarks, and tests in edge/fog/cloud computing environments
- legal and privacy aspects of reproducibility and data sharing in context of geo-distributed testing and experimentation
- all of the above topics in the context of LEO edge computing (as well as LEO edge computing coupled with terrestrial edge computing)

Important Dates

Submission: February 28, 2023

Notification: April 30, 2023

Revision due: May 31, 2023

Notification of final acceptance: June 30, 2023

Submission of final revised manuscript: July 31, 2023

Publication date (tentative): Fall 2023

Special Issue Paper Submission

This special issue seeks submission of papers that present novel and innovative ideas. It also welcomes submissions of extended versions of selected papers presented in related conferences

and workshops (such as ICFEC, SEC, CCGrid, IC2E, and Middleware or, for example, the TDIS workshop). All submissions (including invited submissions) go through a regular peer review process.

We seek submission of papers that present new, original and innovative ideas for the first time in SPE. Submission of "extended versions" of already published works (e.g. conference or workshop papers) is only encouraged if they contain a significant amount of new and original ideas/contributions and at least 50% new material. If you are submitting an extended version, you must submit a cover letter detailing (1) the "Summary of Differences" between the manuscript submitted to SPE and any earlier publications, (2) a clear list of new and original ideas/contributions in the SPE manuscript (identifying the sections where they are proposed/presented), (3) confirming the percentage of new material, and (4) attaching the original conference or workshop paper. Otherwise, the submission will be "desk rejected" without reviews.

While submitting a paper to this issue, please select "SPE-SI_Benchmarking, Experimentation Tools, and Reproducible Practices for Data-Intensive Systems from Edge to Cloud" in the submission system.

Regular Issue Submission

If you have a paper on edge, fog, or cloud computing which does not match the requirements of this Special Issue, we encourage you to submit it as a regular paper to *Software: Practice and Experience*. The journal has expanded its coverage to specifically include these distributed computing paradigms.

Guest Editors

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