15th JLESC Workshop



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## KheOps: A Collaborative Environment for the Cost-effective Reproducibility of Edge-to-Cloud Experiments

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Distributed digital infrastructures for computation and analytics are now evolving towards an interconnected ecosystem allowing complex scientific workflows to be executed from IoT Edge devices to the HPC Cloud (aka the Computing Continuum). Understanding and optimizing the performance of workflows in such a complex Edge-to-Cloud Continuum is challenging. This breaks down to reconciling many, typically contradicting application requirements and constraints with low-level infrastructure design choices. One important challenge is to accurately reproduce the relevant behaviors of a given application workflow and representative settings of the physical infrastructure underlying this complex continuum.

Based on the limitations of the main state-of-the-art approaches like Google Colab, Kaggle, and Code Ocean, we propose KheOps, a collaborative environment for the cost-effective reproducibility and replicability of Edge-to-Cloud experiments. KheOps is composed of three core elements to enable reproducible Computing Continuum research: (1) Trovi portal: for sharing experiment artifacts; (2) Jupyter environment: for packaging code, data, environment, and results; and (3) Multi-platform experiment methodology: for abstracting all the complexities to deploy workflows on large-scale scientific testbeds with heterogeneous resources, such as Grid5000, Chameleon, FIT IoT lab, and CHI@Edge.

We illustrate KheOps with a real-life Edge-to-Cloud experiment workflow. Evaluations explore the point of view of the authors of an article (They want to make their experiments reproducible), as well as readers of an article (They want to replicate the article experiments). Results show that KheOps has proven useful for guiding authors and readers to reproduce and replicate Edge-to-Cloud experiments on large-scale scientific platforms.

## **JLESC** topic

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