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Leveraging distributed resources through high throughput analysis platforms for enhancing HEP data analyses

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The analysis of data collected by the ATLAS and CMS experiments at CERN, ahead of the next phase of high-luminosity at the LHC, requires a flexible and dynamic access to big amounts of data, as well as an environment capable of dynamically accessing distributed resources. An interactive high throughput platform, based on a parallel and geographically distributed back-end, has been developed in the framework of the “HPC, Big Data e Quantum Computing Research Centre” Italian National Center (ICSC), providing experiment-agnostic resources. Starting from container technology and orchestrated via Kubernetes, the platform provides analysis tools via Jupyter interface and Dask scheduling system, masking complexity for frontend users and rendering cloud resources flexibly.

An overview of the technologies involved and the results on benchmark use cases will be provided, with suitable metrics to evaluate preliminary performance of the workflow. The comparison between the legacy analysis workflows and the interactive and distributed approach will be provided based on several metrics from event throughput to resource consumption. The use cases include the search for direct pair production of supersymmetric particles and for dark matter in events with two opposite-charge leptons, jets and missing transverse momentum using data collected by the ATLAS detector in Run-2 (JHEP 04 (2021) 165), and searches for rare flavor decays at the CMS experiment in Run-3 using large datasets collected by high-rate dimuon triggers.

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