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Computing Activities at the Spanish Tier-1 and Tier-2s for the ATLAS experiment in the LHC Run3 period and towards the High-Luminosity Phase (HL-LHC)

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This work is going to show the Spanish Tier-1 and Tier-2s contribution to the computing of the ATLAS experiment at the LHC during the Run3 period. The Tier-1 and Tier-2 GRID infrastructures, encompassing data storage, processing, and involvement in software development and computing tasks for the experiment, will undergo updates to enhance efficiency and visibility within the experiment.

The fundamental objective of this work is, on one hand, to provide data processing services in a stable manner for 24 hours a day every day of the year with a reliability greater than 95% in the conditions that the experiment needs and, on the other hand, to undertake the resolution of the problems posed by Run3 in which we are fully involved. The potential time interval of validity of this contribution covers a large part of Run3 and the beginning of the Long Shutdown 3 (LS3), namely the period 2022-2026. Central to our efforts is to engage actively with the various challenges inherent in research and development, in preparation for the upcoming, more intricate phase represented by the High-Luminosity LHC (HL-LHC).

We generate billions of simulated events annually for different physics processes. We capitalize on National High Performance Computers like the MareNostrum, part of the Supercomputing Spanish Network. We employ Data Lakes, a versatile paradigm for storing vast amounts of data crucial for the experiment's physics analyses. We belong to the core of GRID centers sufficiently reliable to house critical data and provide a first level of support to local ATLAS physicists.

A new activity in this work is the development and implementation of what we call the "Facility for Interactive Distributed Analysis". This initiative aims to facilitate data analysis work for physicists at Spanish centers (IFIC, UAM, and IFAE) by orchestrating the distributed nature of initial analysis phases with subsequent interactive phases involving reduced data files. The ultimate goal is to produce publishable physics results or contributions tailored for workshops and conferences.

The ATLAS Tier-1 and Tier-2 sites in Spain have contributed and will continue to contribute significantly to research and development in computing. These efforts include the evaluation of various models aimed at enhancing computing performance and data storage capacity to meet the demands of the LHC High Luminosity era.

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