A web-based e-Science Analysis Center for large-collaboration astrophysics analysis. Application to the Dark Energy Survey

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Abstract. *The scale of recent astronomical projects not only produces huge amounts of data but also requires a large collaboration effort to succeed, challenging soft, hard and peopleware. Winning this challenge demands an infrastructure to manage large data volumes operation, development of scientific codes and their application to data. This infrastructure should allow one to keep track of data and process provenance, easily fine-tune algorithms and compare them extracting the best results out of the analysis. These results must be produced in a timely fashion, requiring parallelized workflows, whenever possible. Also, reproducibility is key, allowing internal peer-review of results, which should be shared and accessible across a world-wide distributed collaboration. At LIneA we are at an advanced stage of development of such web-based e-Science Analysis Center which is being used by the Dark Energy Survey (DES). It uses open-source software such as Python to wrap scientific codes (in C, Fortran, IDL, etc) and provide the web framework (TurboGears), PostgreSQL for the database and related (e.g. Q3C and pgpool), and XML for configurable workflows interpreted with XSL, producing web pages that interface the Orchestration that submits jobs to a cluster of hundreds of cores. We describe the analysis of galaxy clusters in the Portal. Galaxy clusters probe both the expansion rate of the universe and the growth rate of its structures. Counting clusters as a function of mass and redshift, when combined with other probes, such as SN Ia, Baryonic Acoustic Oscillations and Weak lensing, allows one to put tight constraints on cosmological parameters measurements. In order to count clusters and get to cosmology, we first need to understand how clusters are found and how their masses are measured. DES Cluster of Galaxies Working Group is tackling these matters by analyzing a simulated galaxy catalog that reproduces DES observations. Using these catalogs we can develop, test, fine-tune and compare cluster finding algorithms, their mass proxies and, finally, get to the cosmological parameters. All this operation is largely simplified by the infrastructure provided by the Portal, where one can manage data provenance, its analysis and compare processes side-by-side.*