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Advancing KM3NeT Data Management: Harnessing Snakemake and Grid Computing

The KM3NeT collaboration is constructing two cutting-edge underwater neutrino detectors in the Mediterranean Sea: ARCA, which is optimized for the detection of astrophysical neutrinos, and ORCA, which aims to determine the neutrino mass hierarchy via the observation of atmospheric neutrinos. The increasing size of the detectors results in significant data volumes, requiring effective data processing and management strategies. To address the data handling demands, KM3NeT has implemented a hierarchical computing model similar to that of the LHC experiments, featuring a Tier structure for data processing and distribution. This model enables the integration of diverse computing resources, thereby improving data handling efficiency. KM3NeT has already integrated Snakemake, a contemporary workflow management system, to guarantee portability, reproducibility, and scalability across various computational environments. Snakemake optimizes and automates complex data processing tasks, enhancing flexibility and efficiency in data management.The last year, efforts are focused on integrating Grid Computing resources into the KM3NeT computing model to improve computational capabilities. This integration seeks to address the rigorous needs associated with detector calibration, simulation, reconstruction, and analysis. Grid Computing enables efficient management of workloads, including serial, multi-parallel, and GPU-optimized jobs, while facilitating frequent data transferring and sharing among collaborators. This presentation offers an overview of KM3NeT' s data processing framework, focusing on the implementation of Snakemake and the integration of Grid Computing resources. This discussion will address the challenges faced, the solutions implemented, and the current status of our data handling and computing infrastructure.

Secondary track

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