Pyrate: a novel system for data transformations, reconstruction and analysis for the SABRE experiment

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The pyrate framework provides a dynamic, versatile, and memory-efficient approach to data format transformations, object reconstruction and data analysis in particle physics. Developed within the context of the SABRE experiment for dark matter direct detection, pyrate relies on a blackboard design pattern where algorithms are dynamically evaluated throughout a run and scheduled by a central control unit. The system intends to improve the user experience, portability and scalability of offline software systems currently available in the particle physics community, with particular attention to medium to small-scale experiments. Pyrate is implemented with the python programming language, allowing easy access to the scientific python ecosystem and commodity big data technologies. This presentation addresses the pyrate design and implementation.