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## Effective Dynamic Integration and Utilization of Heterogenous Compute Resources

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Increased operational effectiveness and the dynamic integration of only temporarily available compute resources (opportunistic resources) becomes more and more important in the next decade, due to the scarcity of resources for future high energy physics experiments as well as the desired integration of cloud and high performance computing resources. This results in a more heterogenous compute environment, which gives rise to huge challenges for the computing operation teams of the experiments.

At the Karlsruhe Institute of Technology we design solutions to tackle these challenges. In order to ensure an efficient utilization of opportunistic resources and unified access to the entire infrastructure, we developed the Transparent Adaptive Resource Dynamic Integration System (**TARDIS**). A scalable multi-agent resource manager providing interfaces to provision as well as dynamically and transparently integrate resources of various providers into one common overlay batch system. Operational effectiveness is guaranteed by relying on **COBaID** - the Opportunistic Balancing Daemon and its simple approach of taking into account the utilization and allocation of the different resource types, in order to run the individual workflows on the best-suited resource respectively.

In this contribution we will present the current status of integrating various HPC centers and cloud providers into the compute infrastructure at the Karlsruhe Institute of Technology as well as our experiences gained in a production environment.

### Consider for promotion

Yes

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