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SkyGrid - where cloud meets grid computing

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Computational grid (or simply 'grid') infrastructures are powerful but restricted by several aspects: grids are incapable of running user jobs compiled with a non-authentic set of libraries and it is difficult to restructure grids to adapt to peak loads. At the same time if grids are not loaded with user-tasks, owners still have to pay for electricity and hardware maintenance. So a grid is not cheap and small/medium scientific experiments have difficulties working with such a computational model.

To address these inflexibility issues we present SkyGrid - a system that integrates cloud technologies into grid systems. By cloud technologies we mean mainly virtualization that allows both virtualization of user jobs and computational hardware. Virtualization of user jobs is performed by means of Docker - a lightweight Virtual Machine system. Virtualization of hardware is provided by YARN or similar platforms. SkyGrid unties users from the computational cluster architecture and configuration. Also the virtualization approach we propose enables some extreme cases like volunteer computing inside browsers by means of PNaCl technology and running jobs on super-computers. In this paper we present the requirements and architecture of SkyGrid, interfaces available to end-users and interfaces to other systems. Also we provide a description of a real case study of system usage for the SHiP experiment integrating private cloud resources from several universities as well as volunteer computing resources into a single computational infrastructure.

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