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Managing virtual machines with Vac and Vcycle

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We compare the Vac and Vcycle virtual machine lifecycle managers and our experiences in providing production job execution services for ATLAS, LHCb, and the GridPP VO at sites in the UK and at CERN. In both the Vac and Vcycle systems, the virtual machines are created outside of the experiment's job submission and pilot framework. In the case of Vac, a daemon runs on each physical host which manages a pool of virtual machines on that host, and a peer-to-peer UDP protocol is used to achieve the desired target shares between experiments across the site. In the case of Vcycle, a daemon manages a pool of virtual machines on an Infrastructure As A Service cloud system such as OpenStack, and has within itself enough information to create the types of virtual machines to achieve the desired target shares. Both systems allow unused shares for one experiment to temporarily taken up by other experiments with work to be done. The virtual machine lifecycle is managed with a minimum of information, gathered from the virtual machine creation mechanism (such as libirt or OpenStack) and using the proposed Machine/Job Features API from WLCG. We demonstrate that the same virtualmachine designs can be used to run production jobs on Vac and Vcycle/OpenStack sites for ATLAS, LHCb, and GridPP, and that these technologies allow sites to be operated in a reliable and robust way.

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