

# Enabling volunteer computing for the BESIII Simulation system

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Traditional cluster computing resources can only partly meet the demand for massive data processing in the High Energy Physics (HEP) experiments, and volunteer computing remains a potential resource for this domain. It collects idle CPU time of desktop computers. Desktop Grid is the infrastructure to aggregate multiple volunteer computers to be included into a larger scale heterogeneous computing environment. Unlike traditional BOINC-based volunteer computing, in Desktop Grids we have to solve the problem of cross platform application deployment and heterogeneous resource integration. This is achieved through the virtualization technology. This way, for example, porting high energy physics simulation on desktop PCs has been implemented at CERN for the LHC experiments.

BES III is a large high energy physics experiment at IHEP, Beijing. In this contribution, we define a six-layer Desktop Grid architecture and introduce the related technologies. Based on that, we construct a volunteer computing system for the BES III simulation. It is integrated with the DIRAC workload management system which in turn aggregates also other grid, cloud and cluster resources. Besides that, the system also integrated PBS system for job submission. We use the CernVM as the basic VM image. However, to meet diverse requirements of VM images, we use a remote VM image service by incorporating the Stratuslab marketplace. The user application deployment is done using the DIRAC Pilot Framework. The paper presents the results of the system performance testing. First, based on the tests of different configuration attributes of virtual machine, we found that memory was the key factor, which effects the job efficiency. The optimal memory requirements are defined. Then, we analyze traces of the BES III simulation job execution on a virtual machine. We present the analysis of the influence of performance of the hard disk throughput and the network bandwidth on the job operation. Finally, the Desktop Grid system architecture based on BOINC for BES III simulation is proposed. The test results show that the system can meet the requirements of the BES III computing and can be also offered to other high energy physics experiments.

## Secondary Keyword (Optional)

Cloud technologies

## Primary Keyword (Mandatory)

Virtualization

## Tertiary Keyword (Optional)

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