Project Proposal

System Optimization

project summary:
All grid sites differ in their structure, hardware setup, and software setup. For an efficient utilization of the grid resources of a site, a good tuning of many parameters is needed. Also the requirements of grid users and LHC experiments change with time. The rapidly growing complexity of the grid sites make it difficult to perform an efficient system optimization using the current techniques. Therefore systems for automatic optimization with self-management capabilities are desirable.

The proposed framework provides a coherent and comprehensive view of the site together with a set of actions to be executed based on the status information gathered from the site resources (for example collected via HappyFace). In addition, the evaluation of the usage profiles of the cluster is performed. The set of actions depends on the results of the detailed diagnostics of the evaluated information. This approach efficiently improves the fault tolerance and resilience of the system, moreover it increases the throughput of the site and can be applied to system optimization at different levels (for example server stability, dCache usage, MC production vs. user jobs queue fair shares etc.).

The framework constantly monitors the site services and resources and evaluates the information related to the problematic behaviour or lack of performance for various parts of the typical cluster: resource management system, storage management system, worker nodes, data transfers etc. It provides all relevant information to site admins and diagnostics of the system in general, based on the predefined patterns and based on previous experience. Finally, it offers the set of actions for optimization. Furthermore, a testing framework will be considered, which comprises the set of the predefined test routines and methods to verify the effects of optimization procedures.

The experience collected by the Göttingen HEP grid group during the development of the monitoring tools and site administration at all levels (including HappyFace) allow us to extend the effort to the implementation of the proposed framework for system optimization. This project will be carried out in close collaboration with the Prof.Dr.Grabowski (*Institute for Applied Informatics*, Göttingen) and the *Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen* (GWDG). For the successful implementation of the project a new Postdoc position is desirable.

strategic relevance:
Our experience from the last years clearly shows that the missing 10-20% availability of our Tier-2 sites within WLCG are (mostly) due to (hardware & system) failures of the local clusters. This proposals aims at cluster optimization and hence at the remaining 20%.

embedding in other Grid projects:
This proposals will be based on monitoring tools such as HappyFace. It requires close collaboration with dCache and other projects.

our own contributions:
The groups of Prof.Dr.Jens Grabowski (institute of applied informatics) and A.Quadt (II.Physik) as well as the GWDG contribute experience, example patterns, several postdocs, several PhD students and several undergraduates (BSc & MSc students) to this project.

collaboration with other groups:
This project aims at a continuing close collaboration with the HappyFace core team, in particular with KIT Karlsruhe. In addition, close collaboration with GridKa as Tier-1, the Tier-2 centers in Germany and with the dCache team is foreseen and required.

ressources applied for:
one postdoc for three years

final delivery:
Software package that proposes or takes actions based on the observed cluster status and parameters according to several optimization strategies.