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## **The Grid Enabled Mass Storage System (GEMMS): the Storage and Data management system used at the INFN Tier1 at CNAF.**

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The storage solution currently used in production at the INFN Tier-1 at CNAF, is the result of several years of case studies, software development and tests. This solution, called the Grid Enabled Mass Storage System (GEMSS), is based on a custom integration between a fast and reliable parallel filesystem (IBM GPFS), with a complete integrated tape backend based on TIVOLI TSM Hierarchical storage management (HSM) and the Storage Resource Manager (StoRM), providing access to grid users through a standard SRM interface. Since the start of the operations of the Large Hadron Collider (LHC), all the LHC experiments have been using GEMMS at CNAF for both the fast access to data on disk and the long-term tape archive. Moreover, during the last year, GEMSS has become the standard solution for all the other experiments hosted at CNAF, allowing the definitive consolidation of the data storage layer. Our choice has proved to be successful in the last two years of production with constant enhancements in the software releases, accurate monitoring of the data throughput and effective customizations to the end-user requests.

In this paper a brief description of the system is reported with a particular focus on the new improvements of the code and with detailed overview of the administration and monitoring tools. We also report all the solutions adopted in order to grant the maximum availability of the service in case of software and hardware failures and the latest optimization features within the data access process. Finally we include an overall report of the results obtained during the last years of activity from the experiment user perspective, which clearly shows the reliability and the high performance throughput that can be obtained using GEMMS.

### **Summary**

#### **SUMMARY:**

The presentation will focus on the last years improvements in the implementation of the complete Hierarchical Storage Management GEMSS system with a particular attention on the monitoring and optimization methods in the disk/tape access layers. The GEMSS primary components are described in a clear and understandable way with a particular attention in providing information on the interaction between the disk and tape layers. Detailed information will be provided on what we have learned during the last years of activity and all the system fixes and optimization that has been introduced in order to provide a stable, redundant and efficient service.

Also the reports of the last years of LHC and non-LHC experiment activity will be summarized for a clear view of the throughput and availability level obtained with the definitive choice of GEMSS as the storage solution at the INFN Tier-1 at CNAF.

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