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## A self-configuring control system for storage and computing departments at INFN CNAF Tier1.

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The storage and farming departments at the INFN CNAF Tier1 manage approximately thousands of computing nodes and several hundreds of servers that provides access to the disk and tape storage.

In particular, the storage server machines should provide the following services: an efficient access to about 15 petabytes of disk space with different cluster of GPFS file system, the data transfers between LHC Tiers sites (Tier0, Tier1 and Tier2) via GridFTP cluster and Xrootd protocol and finally the writing and reading data operations on magnetic tape backend.

One of the most important and essential point in order to get a reliable service is a control system that can warn if problems arise and which is able to perform automatic recovery operations in case of service interruptions or major failures.

Moreover, during daily operations the configurations can change, i.e. if the GPFS cluster nodes roles can be modified and therefore the obsolete nodes must be removed from the control system production, and the new servers should be added to the ones that are already present.

The manual management of all these changes is an operation that can be somewhat difficult in case of several changes, it can also take a long time and is easily subject to human error or misconfiguration. For these reasons we have developed a control system with the feature of self-configure itself if any change occurs. Currently, this system has been in production for about a year at the INFN CNAF Tier1 with good results and hardly any major drawback.

There are three major key points in this system. The first is a software configurator service (e.g. Quattor or Puppet) for the servers machines that we want to monitor with the control system; this service must ensure the presence of appropriate sensors and custom scripts on the nodes to check and should be able to install and update software packages on them. The second key element is a database containing information, according to a suitable format, on all the machines in production and able to provide for each of them the principal information such as the type of hardware, the network switch to which the machine is connected, if the machine is real (physical) or virtual, the possible hypervisor to which it belongs and so on. The last key point is a control system software (in our implementation we choose the Nagios software), capable of assessing the status of the servers and services, and that can attempt to restore the working state, restart or inhibit software services and send suitable alarm messages to the site administrators.

The integration of these three elements was made by appropriate scripts and custom implementation that allow the self-configuration of the system according to a decisional logic and the whole combination of all the above-mentioned components will be deeply discussed in this paper.

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