INFN Tier1 Test Bed Facility

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The INFN Tier1 is a computing center described by a very complex infrastructure divided into various part: the hardware layer, the storage tape and disk layer, the worker nodes adopted for analysis till the SRM level used for data transfer between different computing centers.

A software update, a change in the codes or adding new hardware can unexpectedly affect the activity of production for this was made a test bed that can reproduce the various parts of the Tier1. With this system we can perform extensive testing of both software and hardware in order to certify the new parts. This poster describes the test bed and testing performed to date.

Disk Layer

The layer of the disk is realized through hardware EMC² CX380-3 connected to the Storage Area Network (SAN) through the switch Brocade 48000 with 8x4 Gbit link.

Four Logic Unit Number (LUN) in RAID 5 form two separate file systems, for a total of about 10 TB of available space. The management of the file system is carried out

Tape Layer

GPFS and TSM are widely used as separate products. Build-in functionality in both products to implement backup and archiving from GPFS. From GPFS 3.2, the concept of "external storage pool" extends the use of policy driven ILM to tape storage.

The GPFS ILM policy engine interprets the ILM policy, performs a file system metadata scan, used to identify the files which need to be migrated to tape. Once the list of files is obtained, it is passed to an external process which is run on the HSM nodes and it actually performs the migration to TSM tape backend.

using General Parallel File System (GPFS).

GPFS servers are able to access the LUNs in parallel and to export the content to clients over a LAN. In our test bed the hardware adopted for GPFS servers is Dell 1950.

StoRM and GridFTP Layer

StoRM is a Storage Resource Manager (implementing version 2.2 of the SRM standard) solution designed to leverage the advantages of cluster file systems, such as GPFS from IBM and Lustre from SUN5, and standard POSIX systems in a grid environment. It is characterized by being a SRM service for different disk based storage systems, easy-to-configure after an initial effort, efficient and secure. The latest stable version of StoRM (v1.8.x) enables the management of hierarchical storage resource through a generic interface, which is used in this configuration at the Italian INFN Tier-1 in Bologna by managing a hierarchical system that is based on GPFS and TSM. StoRM is also characterized by supporting several transfer protocols, such as gsiftp, file, https and http, publishing information by using the GLUE standard and supporting VOMS and GSI for authentication and authorization.

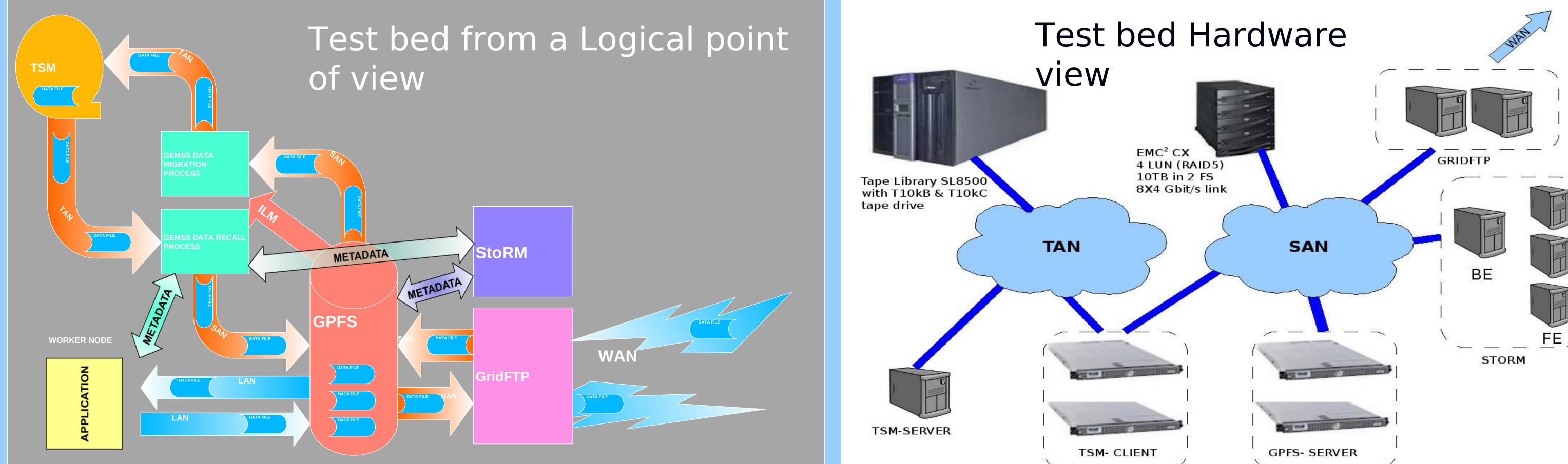
StoRM has a multi-layer architecture composed by two main stateless components, called FrontEnd and BackEnd, and one DataBase. FrontEnd exposes the SRM Web service interface, manages user authentication, stores SRM requests data into DataBase, retrieves the status of ongoing requests from DataBase, and interacts with BackEnd. BackEnd is the core of StoRM service since it executes all synchronous and asynchronous SRM functionalities.

Moreover, BackEnd is able to use advanced functionalities provided by some file systems to accomplish space reservation requests. BackEnd uses a plug-in mechanism to easily extend new support for different file systems. DataBase is used to only store SRM requests data and space metadata. It does not hold any crucial information but only transient data. An accidental loss of the full database simply leads to failing ongoing SRM requests; space metadata will be recreated at next restart. Files transfers performed via gsiftp protocol are handled by GridFTP servers that are able to calculate file checksum on the fly.

GridFTP is an extension of the standard File Transfer Protocol (FTP) for use with Grid computing. It is defined as part of the Globus toolkit, under the organization of the Global Grid Forum (specifically, by the GridFTP working group). The aim of GridFTP is to provide a more reliable and high performance file transfer for Grid computing applications. This is necessary because of the increased demands of transmitting

data in Grid computing - it is frequently necessary to transmit very large files, and this needs to be done fast and reliably

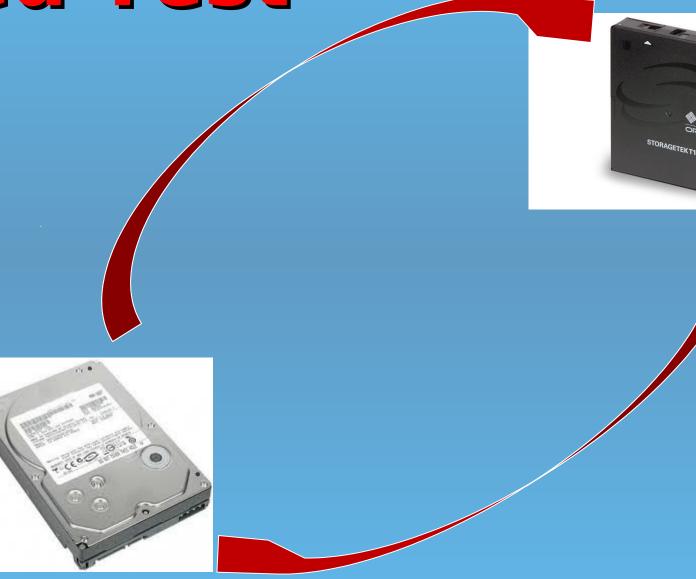
Tests performed belong to the functional testing level that verifies any SRM functional specification. Each test reproduces a certain use case in order to verify the SRM functional specification. Each use case can be implemented by using different SRM clients, such as dCache client, lcg-utils, and StoRM client. Some examples are: move a file from the local node to the storage element by using the gsiftp protocol; move a file between the local node and the storage element by using the gsiftp protocol.



Performed Test

With this test bed were performed different types of tests. From StoRM virtualization to the validation of different versions of software and hardware now in production. In particular the functioning of the HSM system adopted to CNAF. Tests were made on the operation of tape drives T10kC with a new version of TSM. The test provided in addition to the basic features of reading and writing another important check on the checksums of files before and after their migration to tape to ensure the integrity of the data.

Currently the service of StoRM on virtual machine is used by ALICE experiment and the new drive T10kC by all LHC VO.



• First a file of random numbers is written to disk and calculated the checksum.

• In a second step the file is copied to tape and then removed from disk (only a stub file stay on disk).

• Each time the file is retrieved from tape to disk the checksum is recalculated.

•These three operations are performed many times to ensure the data integrity with new hardware and software.