



# Toward the Cloud Storage Interface of the INFN CNAF Tier-1 Mass Storage System

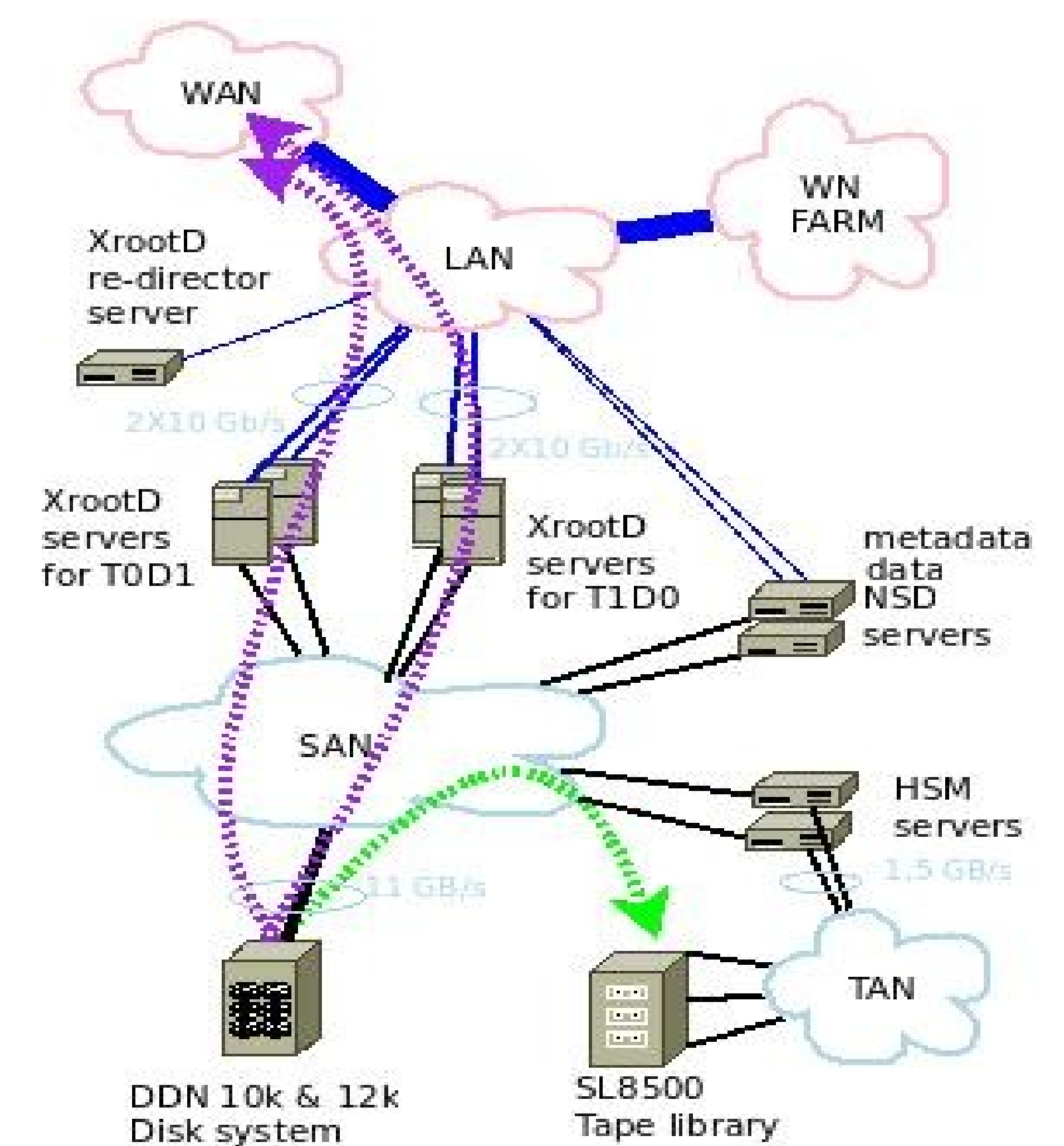
The Mass Storage System installed at the INFN CNAF Tier-1 is one of the biggest hierarchical storage facilities in Europe. It currently provides storage resources for about 12% of all LHC data, as well as to other High Energy Physics experiments.

Requirements from the experiments at the (LHC) Large Hadron Collider and from other High Energy Physics cases, are leading to investigate the adoption of more flexible and user-friendly methods for accessing the storage over the WAN. These ideas include both the storage federation implementation and, in general, promising cloud-like approach of sharing data storage. In particular the computing sites are divided in geographic federations permitting the direct file-access of the "federated" storage between sites. At CNAF a specific integration between GEMSS Storage System and Xrootd has been developed in order to match the requirements of the CMS and ALICE experiments, using ad-hoc Xrootd modifications. CMS changes have been validated and are already available in the official Xrootd integration builds. This integration is currently in production. Moreover, an alternative approach for the storage federations based on http/webdav, in particular for the Atlas use case is in pre-production and appropriate large scale tests are under way.

## ALICE ATLAS CMS XROOTD

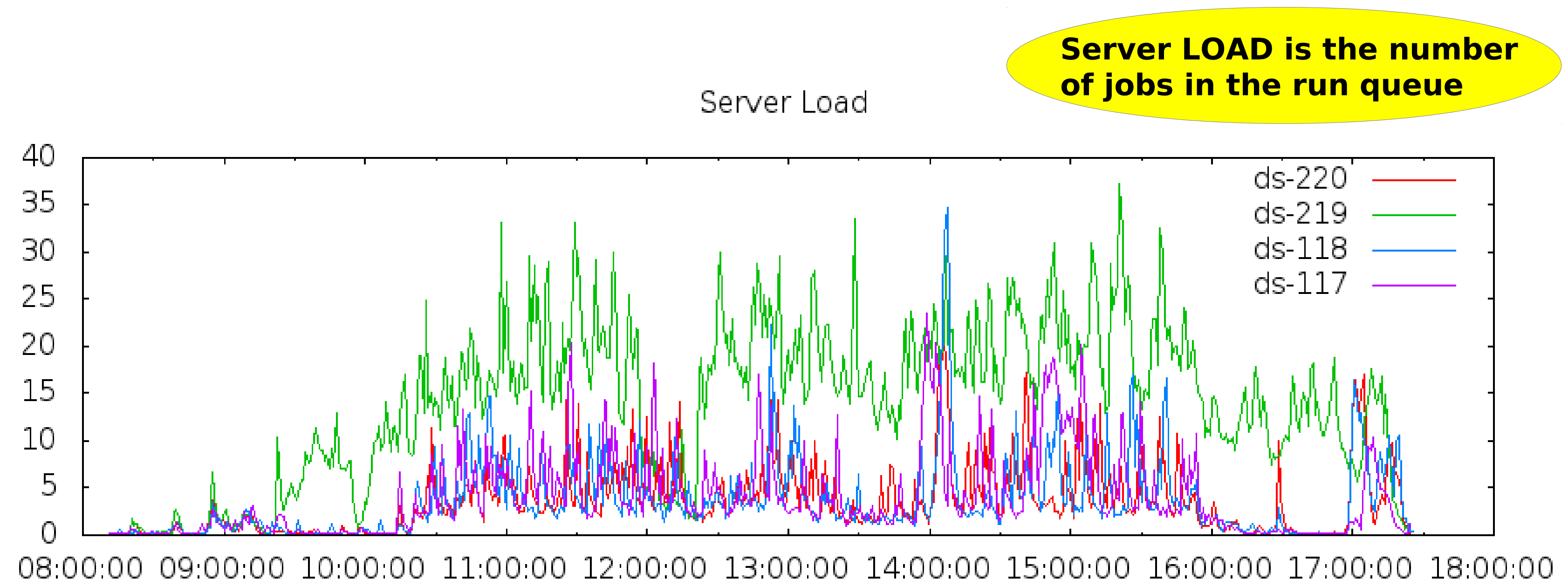
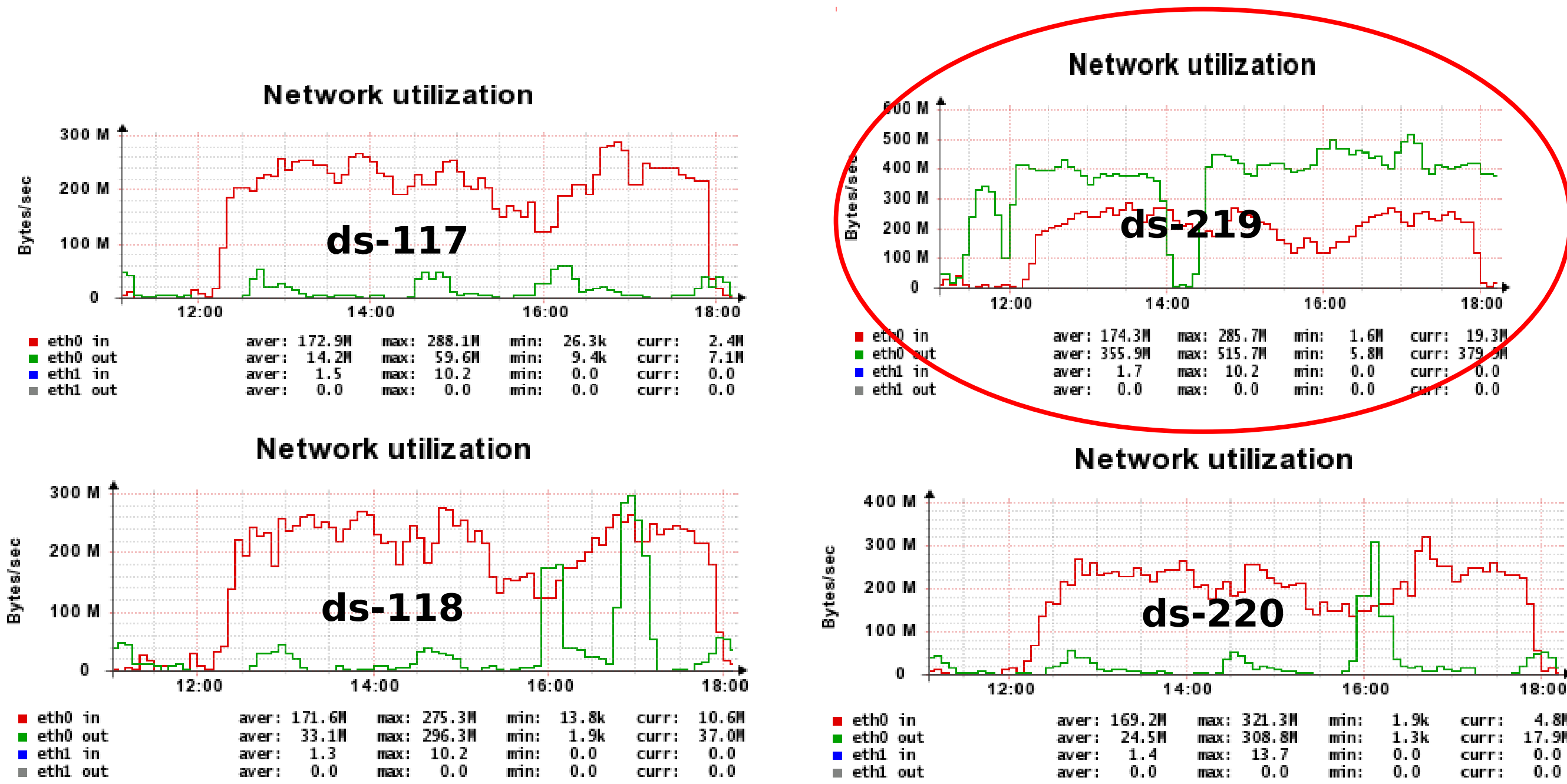
- Xrootd is a protocol for data access, a user joined to a Federation can move, read and write data inside federated sites.
- 2 type of Xrootd server, one for disk only and one for buffer disk.
- Each ATLAS/CMS server is a SL5.4 and Xrootd 3.3.3 with a single redirector; for ALICE the server is SL6.3 with Xrootd 3.3.2
- Each Xrootd group is collected in a DNS Alias to exploit this feature for balancing and to remove/upgrade server with data always available.
- Data access via Storage Area Network (SAN), TSM-HSM Servers move data from Tape to disk buffer and vice versa.
- A Plugin was made to protect the tape system from excessive stress and avoid memory consume in the Xrootd server.
- Users Authentication is done via X509 Certificate.

## Xrootd layout adopted in production



## CMS XROOTD LOAD TEST

In this Load Test, ds-219 is the only CMS gridftp-xrootd server available, in the meanwhile ds-117, ds-118, ds-220 are CMS gridftp server (the same hardware for all four servers), to compare the gridftp traffic. In green the output traffic, ds-219 have an heavy I/O due to xrootd transfer. The CPU Load (to the left) is slightly greater for xrootd but still in an acceptable range.



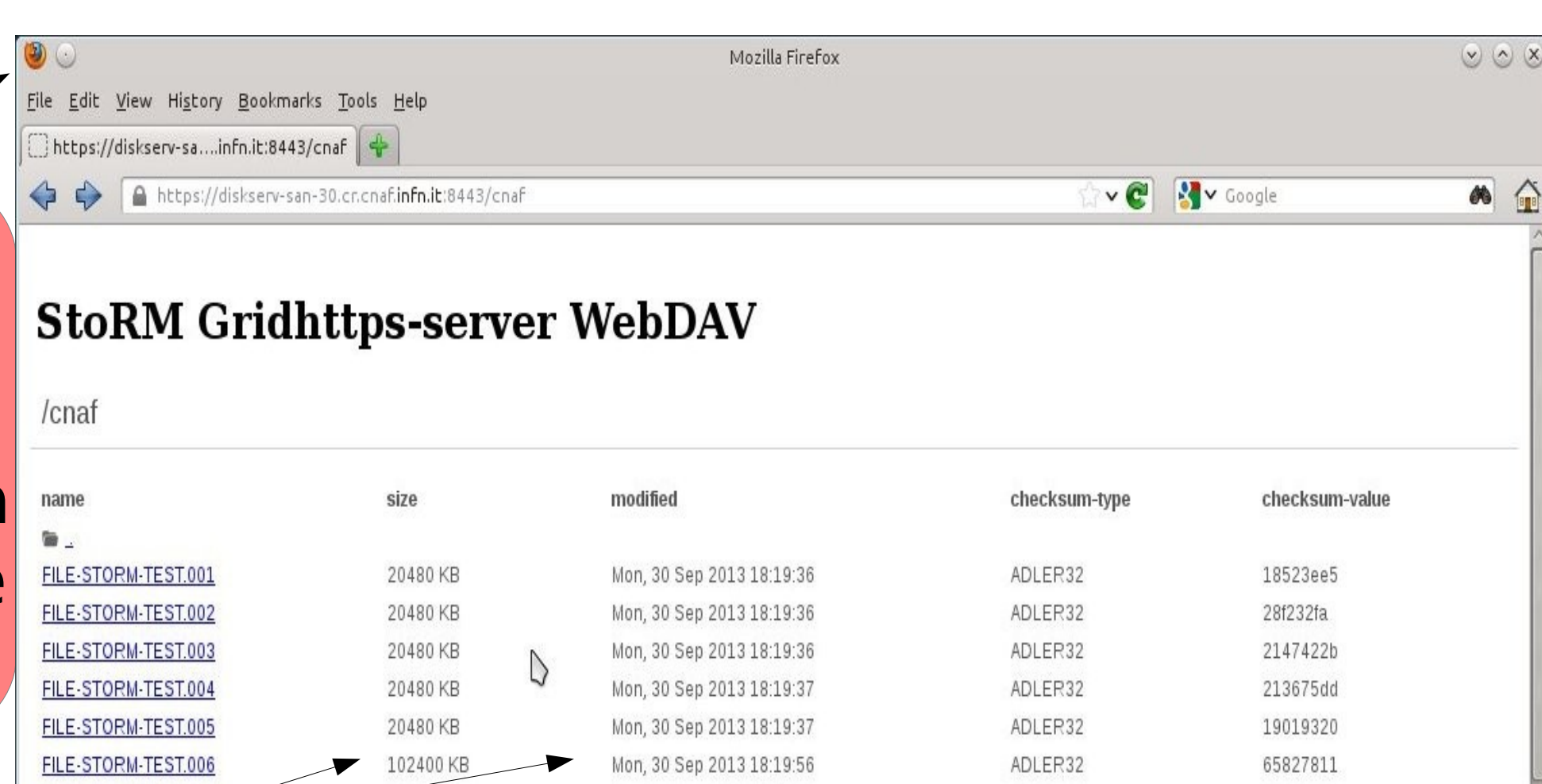
Server LOAD is the number of jobs in the run queue

## StoRM-WebDAV integration

- StoRM is an Storage Resource Manager v2.2 implementation. StoRM provides data management capabilities in a Grid environment to share, access and transfer data among heterogeneous and geographically distributed data centres. StoRM works on each POSIX filesystems but it also brings in Grid the advantages of high performance storage systems based on cluster file system (GPFS or Lustre)

- The latest version of StoRM provides a new interface that combines the storage management operations and file-transfer in compliance with the standard WebDAV. It allows you to mount remote storage or just browse the data in a storage space via a web browser with or without X509 authentication.

A standard browser to explore the storage area and read file contents.



File Name, Size and Modification time informations

Checksum type and value

## WebDAV Web Distributed Authoring and Versioning:

- extension of the Hypertext Transfer Protocol (HTTP).
- makes the Web a readable and writable medium.
- good framework for users to create, change and move documents on a server (e.g. a web server or web share).

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