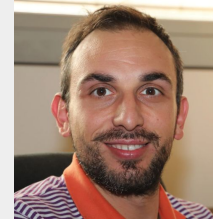# State of Storage

CdG 15 dicembre, 2023
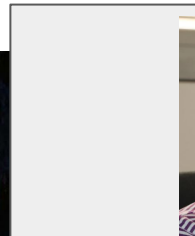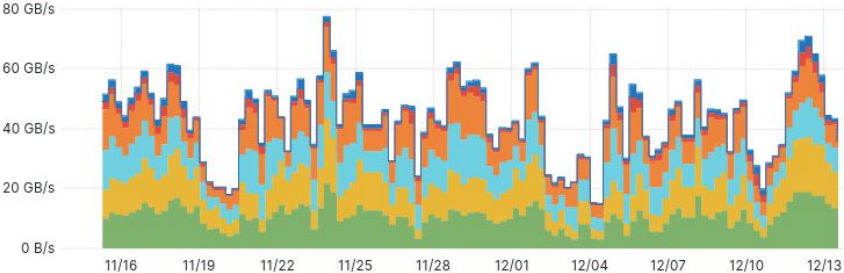
Business as usual
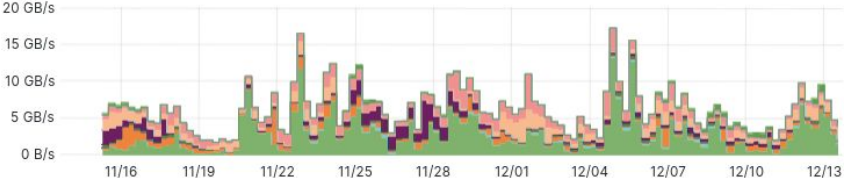
Last month

Last 6 months
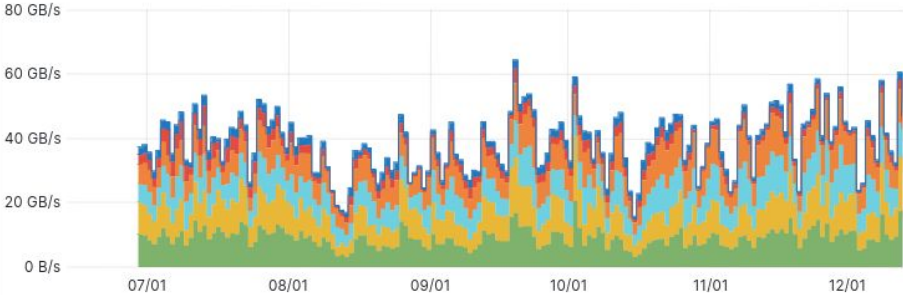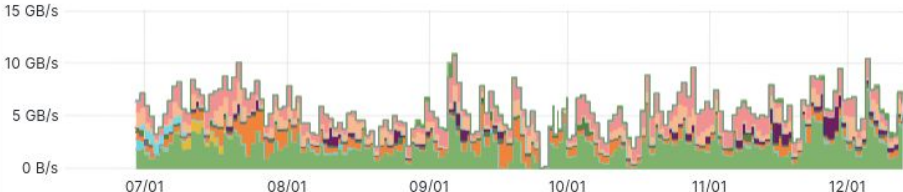
Disk storage in produzione

Installed: 53.64 PB,   Pledge 2023: 69.6 PB,   Used: 48.8 PB

Storage system	Model	Net capacity, TB	Experiment	End of support
ddn-10, ddn-11	DDN SFA12k	**10120**	ALICE, AMS	**12/2022** (+10 spare hdd)
os6k8	Huawei OS6800v3	3400	GR2, Virgo	12/2023
md-1,md-2,md-3,md-4	Dell MD3860f	2308	DS, Virgo, Archive	05/2024
md-5, md-6 e md-7	Dell MD3820f	50	metadati, home, SW	11/2023 e 12/2024
os18k1, os18k2	Huawei OS18000v5	7800	LHCb	7/2024
os18k3, os18k5, os18k5	Huawei OS18000v5	11700	CMS	6/2024
ddn-12, ddn-13	DDN SFA 7990	5840	GR2,GR3	2025
ddn-14, ddn-15	DDN SFA 2000NV	24	metadati	2025
os5k8-1,os5k8-2	Huawei OS5800v5	8999	ATLAS	2027
Cluster CEPH	12xSupermicro SS6029	3400	ALICE, cloud, etc.	2027

Acquisti recenti e futuri

- Gara storage 2022 (14PB netti)
  - LENOVO DE6600: Collaudo non superato
    - Nuova proposta con apparati DDN SFA7990X
- AQ storage 2023-2024
  - Il vincitore è Huawei con sistemi OceanStore Micro 1500/1600
  - Richiesta fornitura di 64PB nel 2023
  - Installazione direttamente al Tecnopolo da inizio dicembre
- Gara Tape Library
  - Contratto presumibilmente ad ottobre / novembre
- Gare nastri
  - 53 PB: pledge + overpledge 2023
    - installato
  - Ulteriori 30 PB di nastro per repack dei dati dalla libreria Oracle
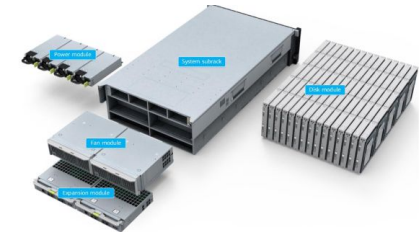   - Gara in preparazione

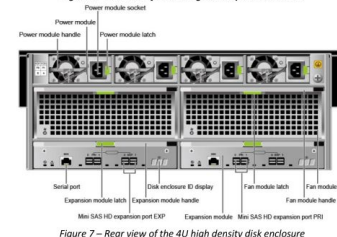Figure 6 - Structure of the 4U high density disk enclosure

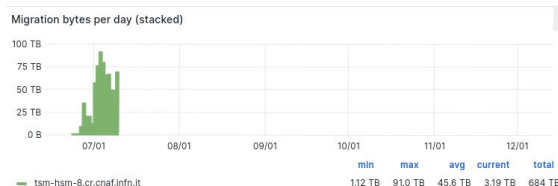Figure 7 – Rear view of the 4U high density disk enclosure

ALICE

```
Filesystem          Size  Used Avail Use% Mounted on
gpfs_tsm_alice      574T  5.2T  569T   1% /storage/gpfs_tsm_alice
gpfs_alice          7.7P  6.5P  1.2P  86% /storage/gpfs_alice
```

gpfs_alice:

- ddn-10, ddn-11 fuori manutenzione da un anno
- Per coprire guasti abbiamo tolto dalla PROD 2 LU (2x64TB, 20HDD)
- In un anno abbiamo consumato 18 dischi su 20
- Per recuperare 10 dischi "spare" abbiamo tolto un altro LU da 64TB dallo FS gpfs_alice

gpfs_tsm_alice: no data written to tape since July???

Migration bytes per day (stacked)

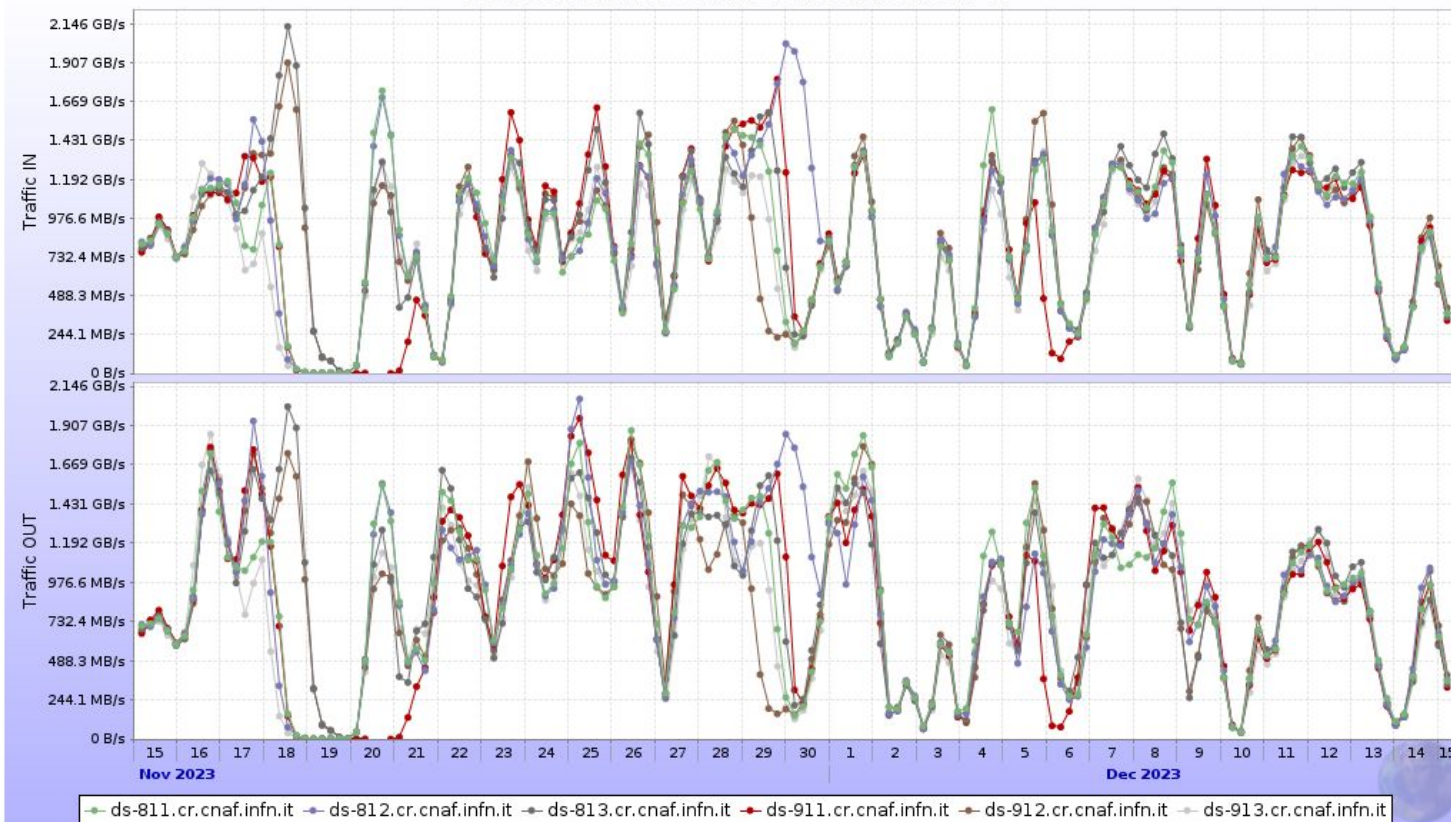|	min	max	avg	current	total
tsm-hsm-8.cr.cnaf.infn.it	1.12 TB	91.0 TB	45.6 TB	3.19 TB	684 TB

Current SW in PROD

- GPFS 5.1.2-11
- StoRM BackEnd 1.11.22 (latest)
- StoRM FrontEnd 1.8.15 (latest)
- StoRM WebDAV 1.4.2 (latest)
- StoRM globus gridftp 1.2.4
- XrootD 5.5.4-1
  - ALICE CEPH updated to 5.5.5-1.el8
- Ceph 16.2.6 (Pacific)

XrootD ALICE CEPH

Network traffic on ALICE::CNAF::CEPH

Tickets and more

- ALICE
  - Planning XrootD configuration restyling of GPFS cluster. Goals:
    - Manage configuration files with Puppet
    - Revert to original configuration with all servers acting as managers as well
    - Upgrade to latest version in production (5.5.4-1.el7)
  - ds-802.cr.cnaf.infn.it was removed from production and upgraded using puppet (22/11)
    - Check on the status of the service has been included within sensu framework of check and remediation
    - Waiting for Francesco and Mario feedback to proceed with the other endpoints
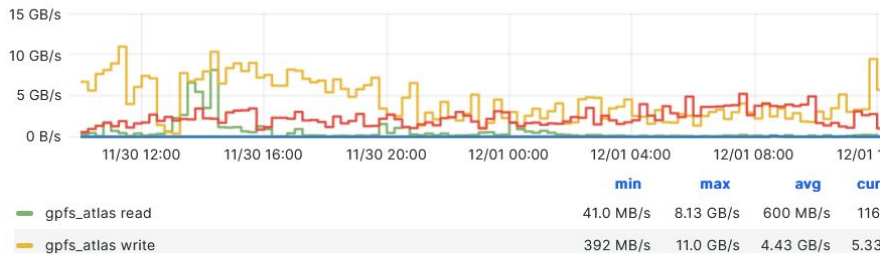
Tickets and more

- ATLAS
  - Low transfer efficiency (GGUS 164631)
    - StoRM WebDAV was not restarted after certificate renewal, fixed
  - StoRM Tape REST installed and configured; no tests yet (ATLASGROUPTAPE)
- CMS
  - GridFTP still used, only for SAM tests :-(
  - StoRM Tape REST installed and configured; no tests yet and it did not help in getting rid of GridFTP :-(
  - CMS tape (4796 files) with problems at mount time
    - Waiting for feedback about data recovery to remove volume
  - Problems when archiving files, resulting in 0 checksum files archived on tape (GGUS 162945)
    - Either a StoRM or a FTS issue; waiting for reply
    - We reported 28 additional files without checksum which have been migrated to tape
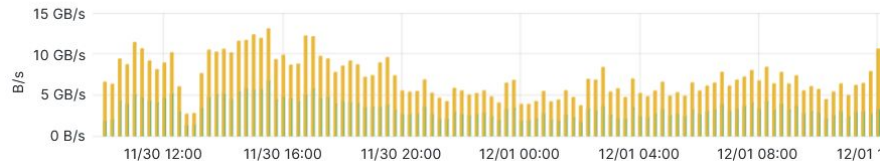
Tickets and more

- 30/11: in view of DC24, ATLAS and CMS simultaneously transferred data from T0 to all T1 for 12 hours
- No saturation for us, but we would like to know more about failures observed
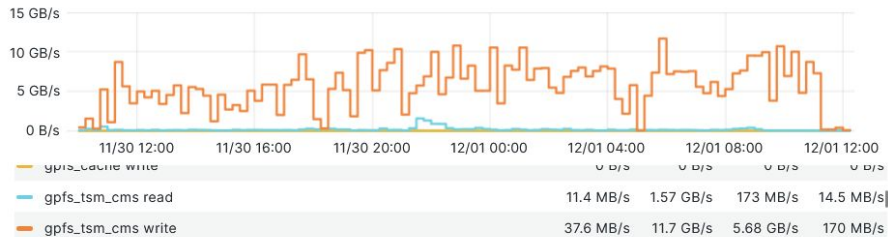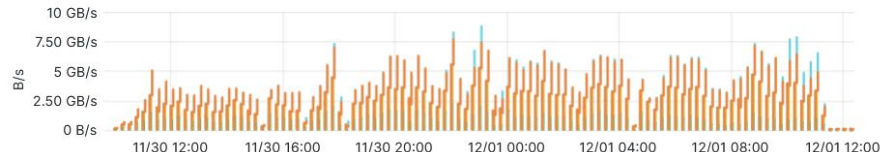- According to our monitoring, CMS injection led to much lower error rate.

Tickets and more

- LHCb
  - Tests with StoRM Tape REST started, and here is a ticket: GGUS [164634](#)
  - GGUS [164502](#): Data transfer problems, due to misconfiguration of restart remediators for StoRM WebDAV
  - GGUS [164032](#): User fts transfers from INFN are failing
    - Still in progress, but FTS and StoRM WebDAV developers have been involved
    - StoRM WebDAV provides storage tokens (macaroons) via the oauth/token endpoint, but FTS retrieves macaroons from the resource path. This should not be allowed by StoRM WebDAV ([STOR-1602](#)), no matter permissions of the storage area.

Tickets and more

- Gsiftp protocol via StoRM backend is still available for a few experiments
  - Tests srm+https and feedback very <mark>welcome</mark> (Belle, Xenon)
  - Goal: remove gsiftp protocol and switch off GridFTP
- CTA-LST
  - GridFTP switched on for CTA-LST storage areas to allow Third-party copies from PIC (gsiftp)
- Dampe
  - GridFTP "plain" still used
    - Testing XrootD server at IHEP to perform the transfers to CNAF (WP6-Datacloud)
- Dune
  - New storage area with scope-based authN/Z (WLCG profile) and VOMS roles
  - Errors due to old LSC file: unfortunately we are not notified of changes for FNAL voms servers
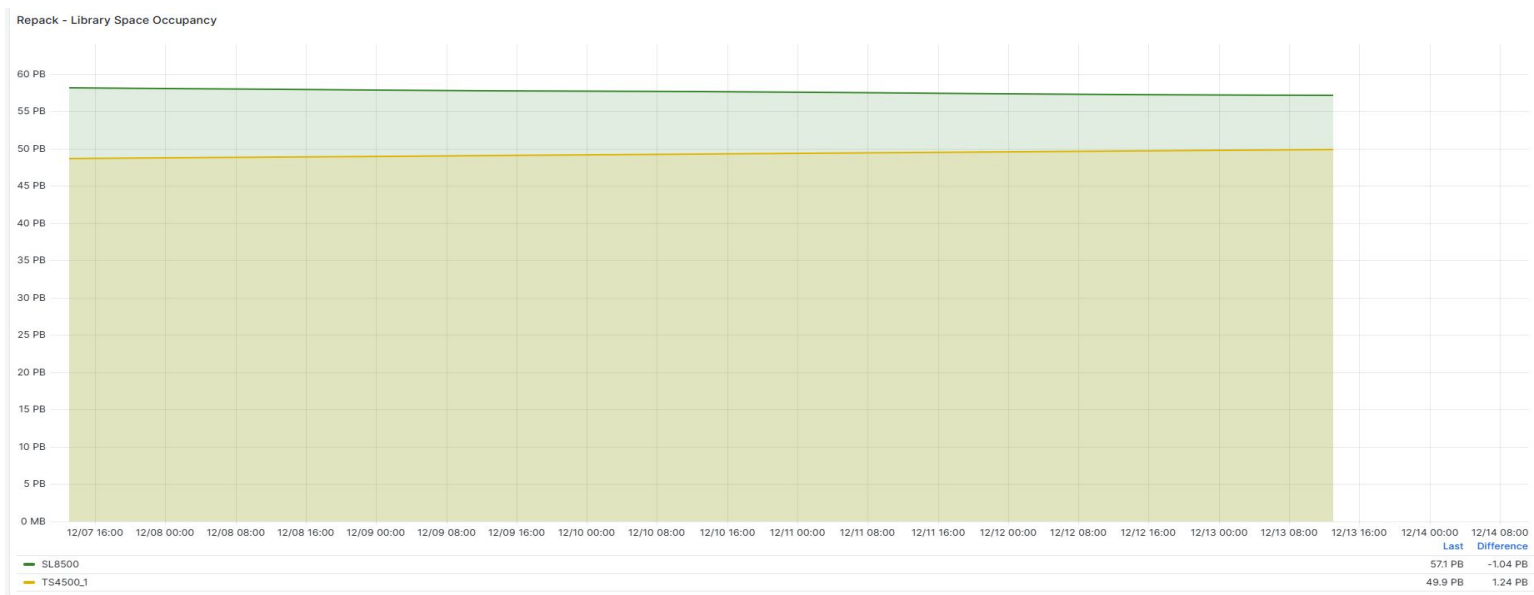
Stato tape

Last month

MSS bytes in/out (per day)

|	min	max	avg	current	total
out traffic (recalls)	4.12 TB	245 TB	83.7 TB	43.0 TB	2.43 PB
in traffic (migrations)	8.99 TB	114 TB	58.5 TB	8.99 TB	1.70 PB

Migration Oracle -> IBM

- 1 anno di tempo stimato per terminare la migrazione alle condizioni attuali (sono previste cancellazioni?)

Migration Oracle -> IBM

- Rate di migrazione attuale ~2.1 GB/s con 9 processi paralleli
- Rate riempimento IBM → Rate migrazione + Rate scritture
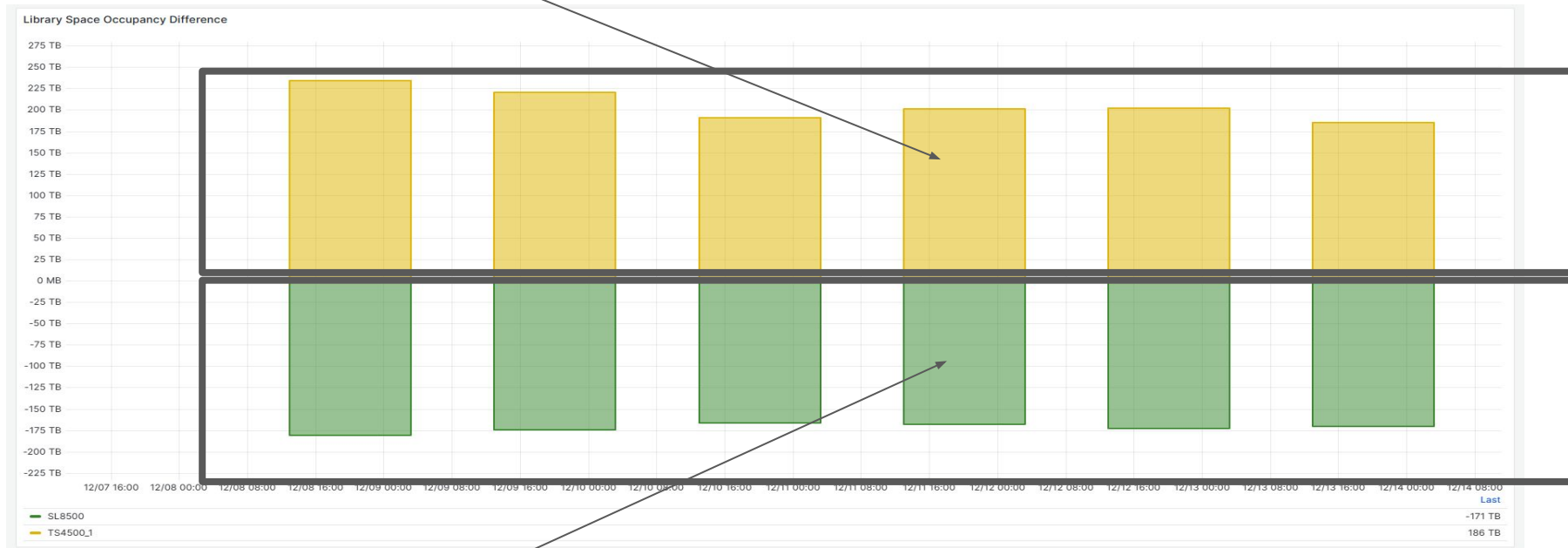
- Svuotamento Oracle

Stato tape

- Liberi ~46 PB (Scratch tape sulla libreria IBM).
- Usati ~112 PB.
  - In preparazione gara per altri 30 PB

Library	Tape drives	Max data rate/drive, MB/s	Max slots	Max tape capacity, TB	Installed cartridges	Used space, PB	Free space, PB
SL8500 (Oracle)	16*T10KD	250	10000	8.4	~10000	57.1	-
TS4500 (IBM)	19*TS1160	400	6198	20	5104	49.9	46