Report LHCb

Lucio Anderlini

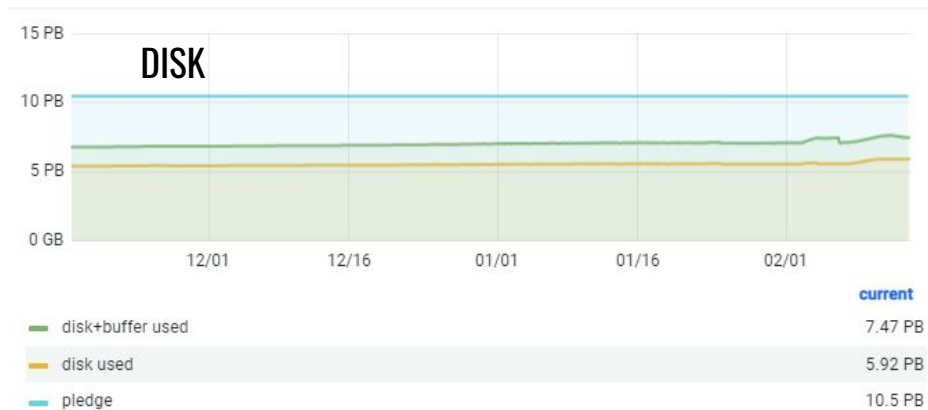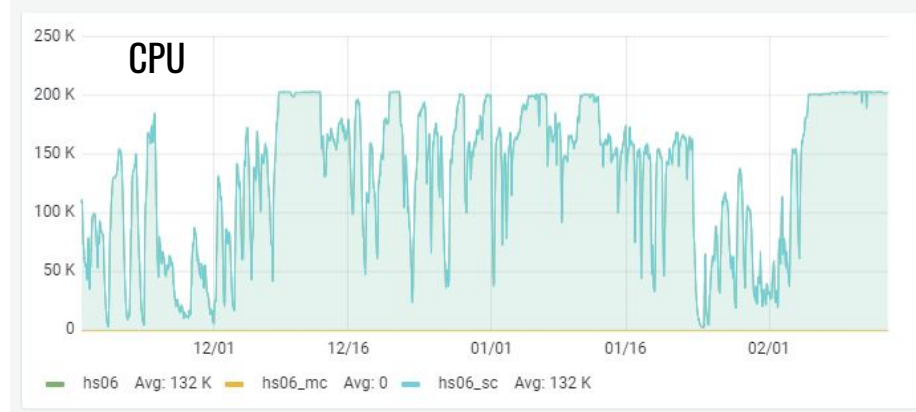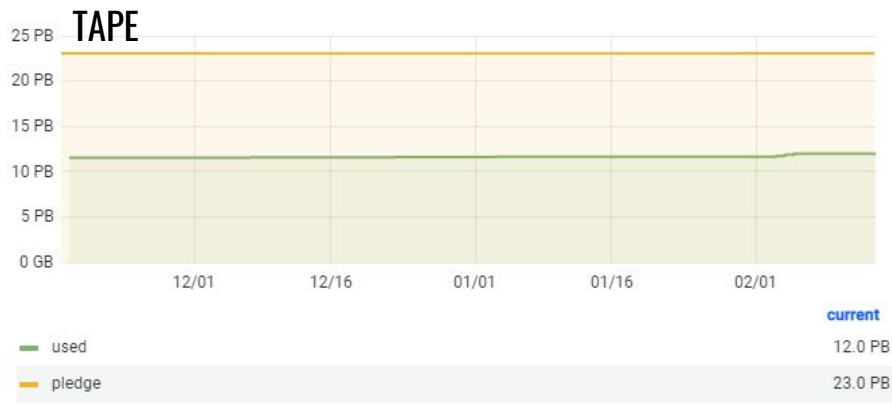**INFN** Istituto Nazionale di Fisica Nucleare
SEZIONE DI FIRENZE
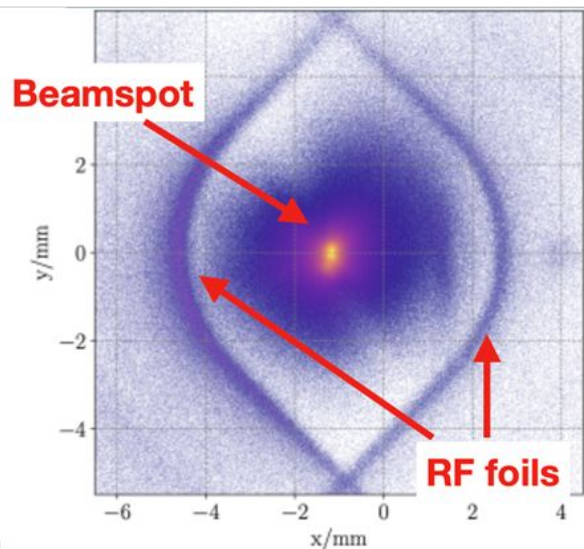
No data-taking, yet

Fervent activity on the commissioning lightened pressure on the analysis (and then on MC productions).

CPU

TAPE

DISK

VELO incident
Damage of the RF box between VELO and Primary Vacuum (10/01/2023)

RF foils imaged in 2022

Beamspot

RF foils

Multiple equipment failures resulted in a build up of pressure beyond specification between VELO and beam volumes

RF foils have been deformed. VELO modules do not show damage

Foil to be replaced in shutdown, current or year end

Physics programme significantly affected in 2023

Farming: *getting ready to use ARM cores*

The dominant contributor to CPU requests in LHCb is the Simulation.

Credit Andrea Valassi

We have now a branch of the Simulation software compiling and running on ARM.

As it is known, PRNGs behave differently on x86 and ARM, resulting in simulated samples not bit-to-bit comparable → need physics validation (grid productions).

Plan:

- **Release** (tag) a version of the Simulation software for x86 and ARM
- Perform a first round of "**software validation**" on CERN resources not in the grid
- **Enable DIRAC** to submit jobs fpr ARM Thanks Stefano Dal Pra for enabling these studies

Finally: submit test productions on CNAF/CINECA ARM farm for full physics validation.

Storage: *Tape Challenge, reminder*

Data Acquisition

CERN EOS → CNAF DISK → CNAF BUFFER → CNAF TAPE

LHCb-TAPE

Processing & deleting

FARM
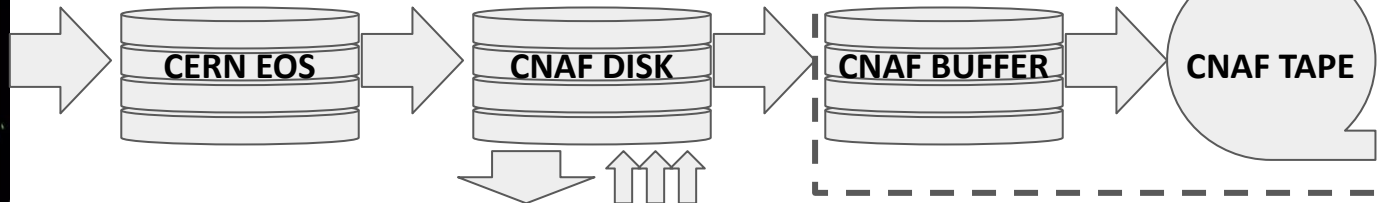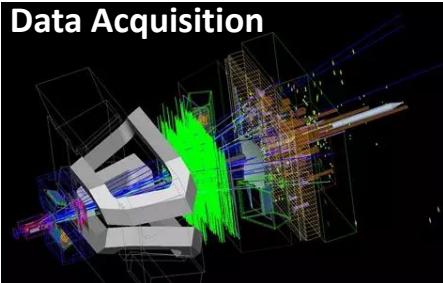
By design, data is **streamed** to tape, as <u>space on disk would be insufficient</u> to store "one session" of data-taking, interrupting the stream.
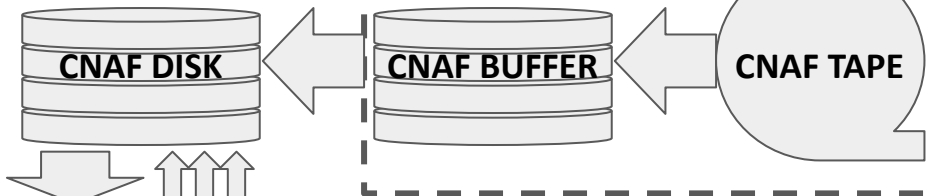
Given the constraints on buffers,
TARGET WRITE SPEED TO TAPE: 1.72 GB/s

Given the LHC programme (technical stop duration),
TARGET READ SPEED FROM TAPE: 1.35 GB/s

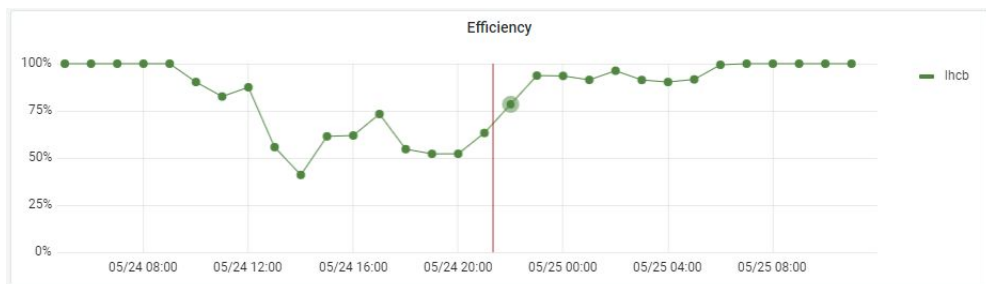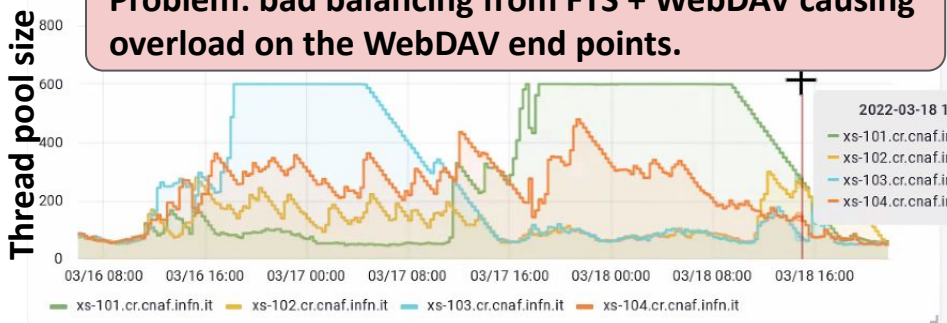CNAF DISK ← CNAF BUFFER ← CNAF TAPE

LHCb-TAPE

Reprocessing

Processing & deleting

FARM

Tape challenge: *write part*

Data challenges 2022: bandwidth substantially at target, but unsustainable error rate

Actions taken before 2023 re-trial:
- Coordination with FTS developer to improve balancing
- LHCb abandoned GridFTP for accessing jobs from the FARM to DISK in favour of POSIX (relaxed workload for the endpoints)

Problem: bad balancing from FTS + WebDAV causing overload on the WebDAV end points.

2023

Very significant improvement. Residual error rate still dominated by bad balancing (see next slide).
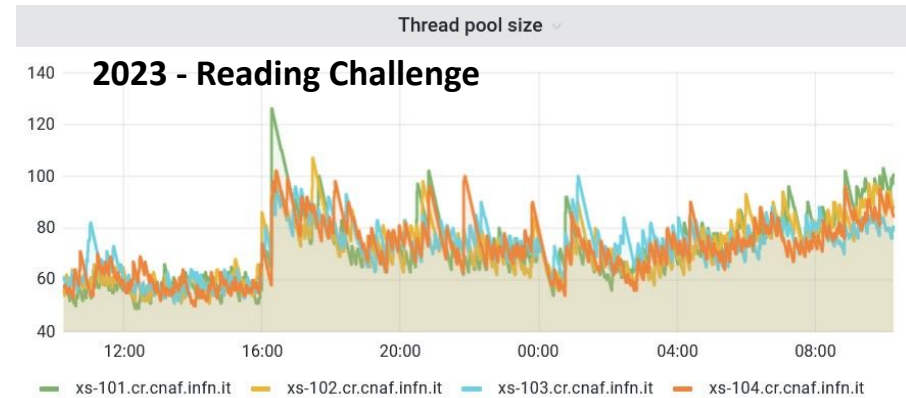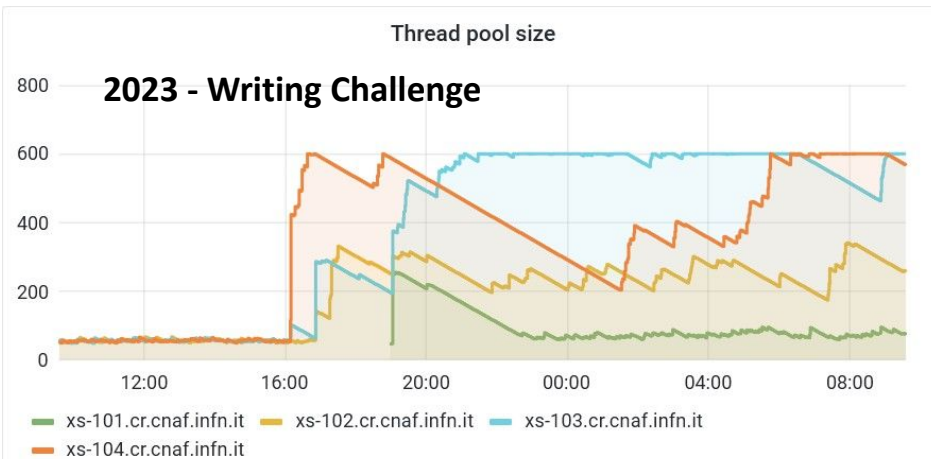
2023
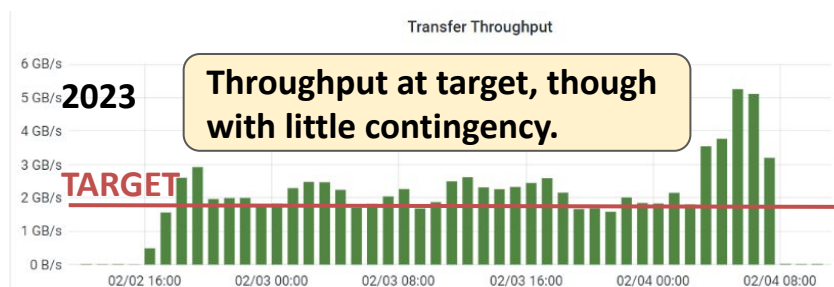
Throughput at target, though with little contingency.

TARGET

A prompt fix in LHCb-dedicated FTS instance
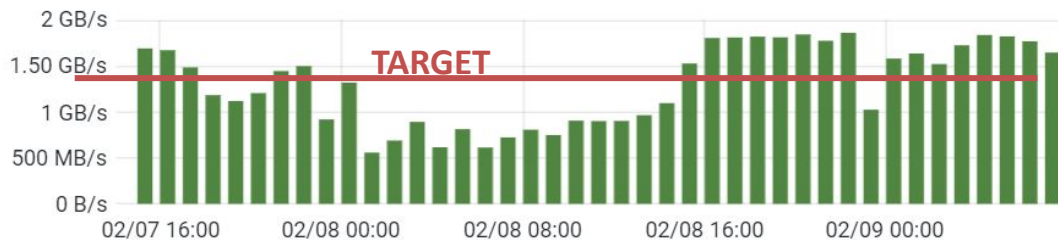
GFAL2 MR

The balancing during the writing DC was still bad and main cause of errors.

A fix in GFAL2 has been promptly deployed, before the *reading* part of the challenge, drastically improving the balancing (conditions similar enough to draw conclusions?)

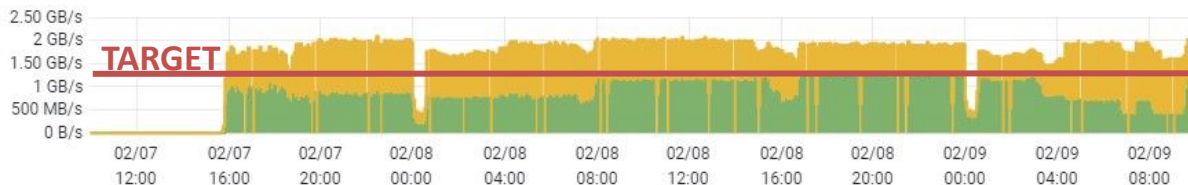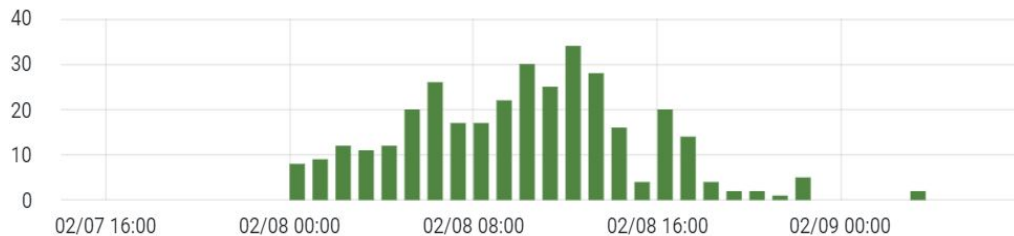# Tape challenge: *Reading Part*

Staging challenge affected by a temporary problem (not fully understood), resulting in a bump of errors and effective throughput significantly below target.

No evident correlation with t1metria/TAPE, above target.

It's being followed up.

t1metria/GPFS for copies buffer → disk is consistent, with FTS monitoring

Tape challenge: *final remarks*

- Significant improvement on the writing part, still not perfect, but most probably ready for data taking.

- Temporary problem observed during the reading challenge <u>halving the effective throughput</u>, not completely understood.

- Due to the delays in the data-taking due to the VELO incident, it is probably worth to schedule another attempt once the migration to Tecnopolo is over

- <u>Many, many thanks to all the people involved!</u>
  <u>Special mention for Lucia, Enrico and Andrea</u>

Using the Cloud, status report

- Identified a **task** at the boundary between data analysis and machine learning, used to evaluate cloud-based resources for LHCb data analysis involving multiple INFN units, using **ML_INFN resources as a test-bed**.
- Workflow entirely ported to **Cloud-native tools** [link], including dedicated docker
- Storage solution based on an lhcb-dedicated instance in **MinIO**
- LHCb researchers from **Florence** and **Milano Bicocca** involved in the evaluation

The evaluation is ongoing.
Most important limitations raised (*e.g.*
- lack of persistency of the $HOME/.ssh directory used to interact with baltig,
- difficulties in the configuration of MinIO,
- too large docker file used for distributing software not available on cvmfs
- …)

Thanks cloud support! Thanks D. Spiga!

are precious to the development of the infrastructure and are being followed up.

Conclusion

- **VELO incident will significantly delay data acquisition plans for this year**

- Fervent activity in LHCb to prepare simulation software for **ARM** *thanks Farming!*

- Tape challenge has showed **significant improvement at CNAF** for storing and processing the **incoming data stream**, though the error rate was still high *thanks Storage!*

- **Unexpected drop in throughput during the reading challenge** to be understood

- VELO incident may offer the opportunity for **another trial** after migrating to Tecnopolo

- Evaluation of the **Cloud infrastructure for analysis workflow involving GPUs** is ongoing and produces feedback hopefully useful to improve the service. *thanks Cloud!*