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## Mass storage interface LTSM for FAIR Phase 0 data acquisition

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Since 2018 several FAIR Phase 0 beamtimes have been operated at GSI, Darmstadt. Here the new challenging technologies for the upcoming FAIR facility shall be tested while various physics experiments are performed with the existing GSI accelerators. One of these challenges concerns the performance, reliability, and scalability of the experiment data storage. A new system for archiving the data from the GSI and FAIR Phase 0 experiments to long-term storage has been developed in the last years and was successfully employed in the 2019 spring beamtime.

Raw data as collected by event building software of large scale detector data acquisition has to be safely written to a mass storage system like a magnetic tape library. Besides this long term archive, it is often required to process this data as soon as possible on a high performance compute farm. A full near-online analysis is essential to give a fast feedback on the quality of the data acquired, allowing to improve detector and measurement parameters such as alignment, calibration, high voltage and electronics set-up, etc.

The C library LTSM ("Lightweight Tivoli Storage Management") has been developed at GSI IT department based on the IBM TSM software. It provides a file API that allows to write raw listmode data files via TCP/IP sockets directly to an IBM TSM storage server. Moreover, the LTSM library offers Lustre HSM ("Hierarchical Storage Management") capabilities for seamlessly archiving and retrieving data stored on Lustre file system and TSM server. That is, data can be automatically archived to low-cost storage media such as magnetic tapes and seamlessly retrieved when accessing the data on the Lustre file system.

In spring 2019 LTSM has been employed at the FAIR Phase 0 beamtimes at GSI. For the HADES experiment LTSM was implemented into the DABC ("Data Acquisition Backbone Core") event building software. During the 4 weeks of Ag+Ag@1.58 AGeV beam, the HADES event builders have transferred about 400 TB data via 8 parallel 10 GbE sockets, both to the TSM archive and to the "GSI green cube" HPC farm. For other FAIR Phase 0 experiments using the vintage MBS ("Multi Branch System") event builders, an LTSM gateway application has been developed to connect the legacy RFIO ("Remote File I/O") protocol of these DAQ systems with the new storage interface.

In this contribution the novel LTSM mass storage architecture and its applications for experiment data acquisition will be described. Experiences and storage performance measurements from HADES at FAIR Phase 0 campaign will be deeply discussed. Most recent further developments and an outlook on future enhancements will be presented.

### Consider for promotion

Yes

**Primary authors:** Dr ADAMCZEWSKI-MUSCH, Joern (GSI Helmholtzzentrum f. Schwerionenforschung GmbH); Dr STIBOR, Thomas (GSI Helmholtzzentrum f. Schwerionenforschung GmbH)

**Presenter:** Dr ADAMCZEWSKI-MUSCH, Joern (GSI Helmholtzzentrum f. Schwerionenforschung GmbH)

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