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Architecture of a new data taking and analysis infrastructure and services for the next generation detectors of Petra3 at DESY

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Data taking and analysis infrastructures in HEP have evolved during many years to a well known problem domain. In contrast to HEP, third generations synchrotron light sources, existing and upcoming free electron laser are confronted an explosion in data rates which is primarily driven by recent developments in 2D pixel array detectors. The next generation will produce data in the region upwards of 50 Gbytes per second. At synchrotrons, data was traditionally taken away by users following data taking using portable media. This will clearly not scale at all.

We present first experiences of our new architecture and services underlying by results taken from the resumption of data taking in March 2015. Technology choices were undertaken over a period of twelve month. The work involved a close collaboration between central IT, beamline controls, and beamline support staff. In addition a cooperation was established between DESY IT and IBM to include industrial research and development experience and skills.

In technological terms the next generation detectors exceeds current generations in order of magnitudes by data volume, -rate as well as complexity at an exponential growth. We are challenging unpredictable data access demands, computing platform and OS version integration (i.e. Windows), but still requiring acceptable bandwidth for DAQ rate at the final storage system.

Our approach integrates HPC technologies for storage systems and protocols. In particular, our solution uses a single filesystem instance with a multiple protocol access, while operating within a single namespace - ubiquitous NFS & SMB access to same repository. We are targeting a system supporting distributed parity, decent erasure codes - to allow very fast rebuilds and a high availability level for the capacity disk based resources, multiple cluster, asynchronous file replication, high speed networking - Infiniband FDR & 10/40GE Ethernets, storage class memory (SSD & FlashDIMM) to run the high IOPS burst buffering layer within the architecture.

Primary authors: STRUTZ, Marco (DESY); Mr GASTHUBER, Martin (DESY); APLIN, Steven (DESY)

Co-authors: LEWENDEL, Birgit (Deutsches Elektronen-Synchrotron (DE)); Mrs KUHN, Manuela (DESY); Mr DIETRICH, Stefan (DESY); Mr ENSSLIN, Uwe (DESY); GUELZOW, Volker (Deutsches Elektronen-Synchrotron (DE))

Presenter: GASTHUBER, Martin (Deutsches Elektronen-Synchrotron (DE))

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