Data Acquisition and Analysis for the EuXFEL Optical Synchronization System

Virtual MT ARD ST3 Meeting

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LbSync – MSK - DESY
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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

The Optical Synchronization DAQ

Definition & Purpose

„One Data Acquisition System to capture it all.“

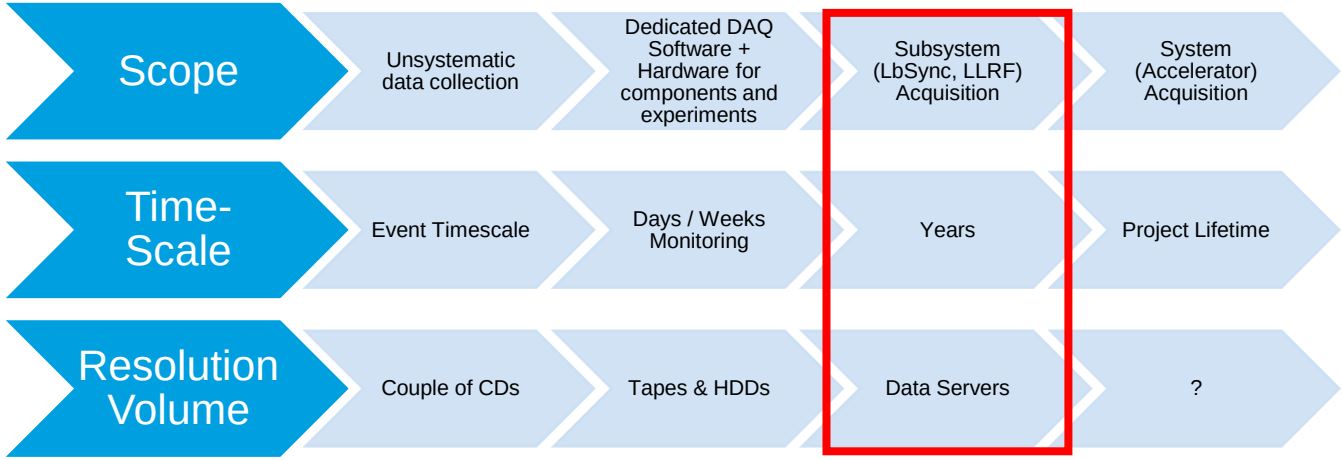
Abstract

- In-house developed DAQ system
- Collecting data from system core, client and connected systems
- Permanent operation
- 100 TB / year quota

Goals

- Reconstruct the entire subsystem state
- All data in one place
- Multiple years into the past
- Show benefit of data analysis and algorithms on subsystem level

Evolution of Data Acquisition and DAQ Systems



This Project

Core Questions for DAQ Design

New requirements need new solutions

How much and at which rate is data produced?	• Are the front-end CPUs up to the task? Protocols suited?
How much data can be transferred?	• Front-End upstream most likely bottleneck.
How much data can be stored?	• High reduction factor necessary!
How is it made accessible to users?	• Clearly documented API required!
How is data integrity ensured?	• Continuous validation desirable, much can be lost!
How is data identified?	• Labeling is inevitable, meaning of data needs to be clear!
Which data is NOT produced?	• Metadata problem – which data is required by algorithm?

The Optical Synchronization DAQ

Quick Facts

Quantitative

- 100 TB / year long term storage.
- Short ring-buffer with trip snapshot feature for excess data.
- > 100 MB / s input data rate (final).
- Front-end upstream up to or exceeding 1 Gb/s.
- Approx. 80’000 data channels (final count).
- ZeroMQ + Mutlicast (UDP) protocols.
- Multiple thousand distinct data channels manually labeled.

Qualitative

- Developed new DAQ configuration management and configuration data labelling workflow.
- Successfully commissioned for core systems and long term data channels.
- Final base commissioning around Winter 2020.
- Ongoing research on Metadata collection and storage.
- Ongoing research on data preprocessing and reduction.
- Data analysis already started.

Thank you!

Contact

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