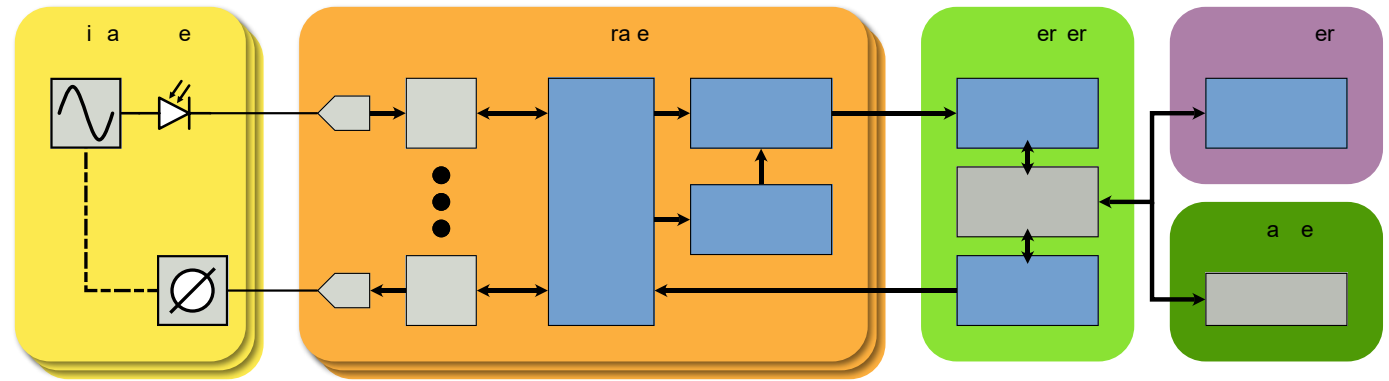


Subsystem Level Data Acquisition for the Optical Synchronization System at European XFEL

Motivation, Challenges & Solutions, Status & Experience

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- Hamburg, 14.05.2021

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- Timeline
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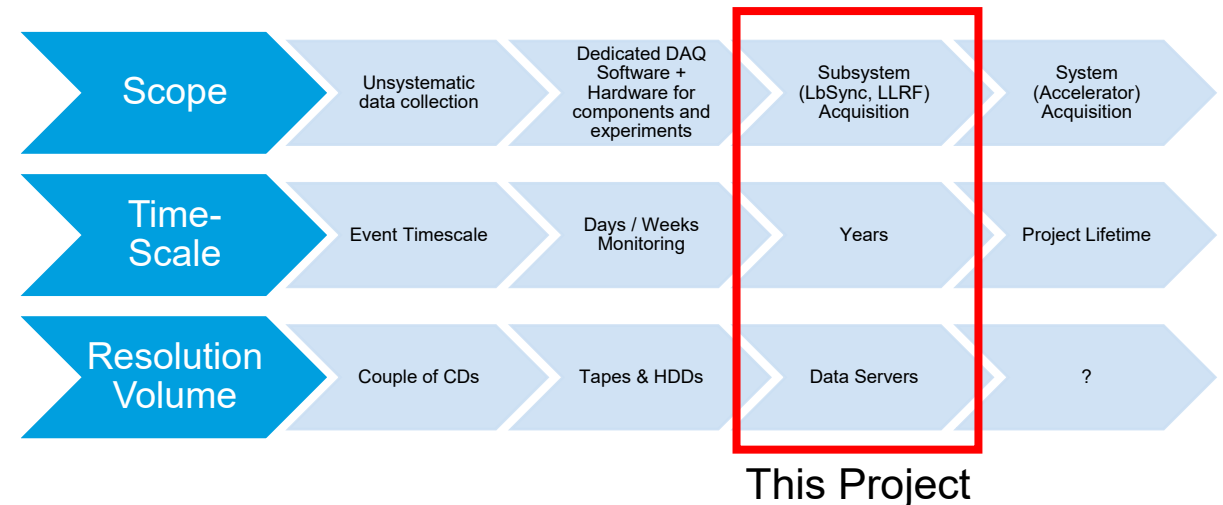
Motivation

- Data has become a new fundamental resource in science and the economy.
- New requirements on DAQ solutions.
- Optical Synchronization so far completely untapped.
- Data required for system analysis, performance evaluation and anomaly investigation.

Next Level DAQ System

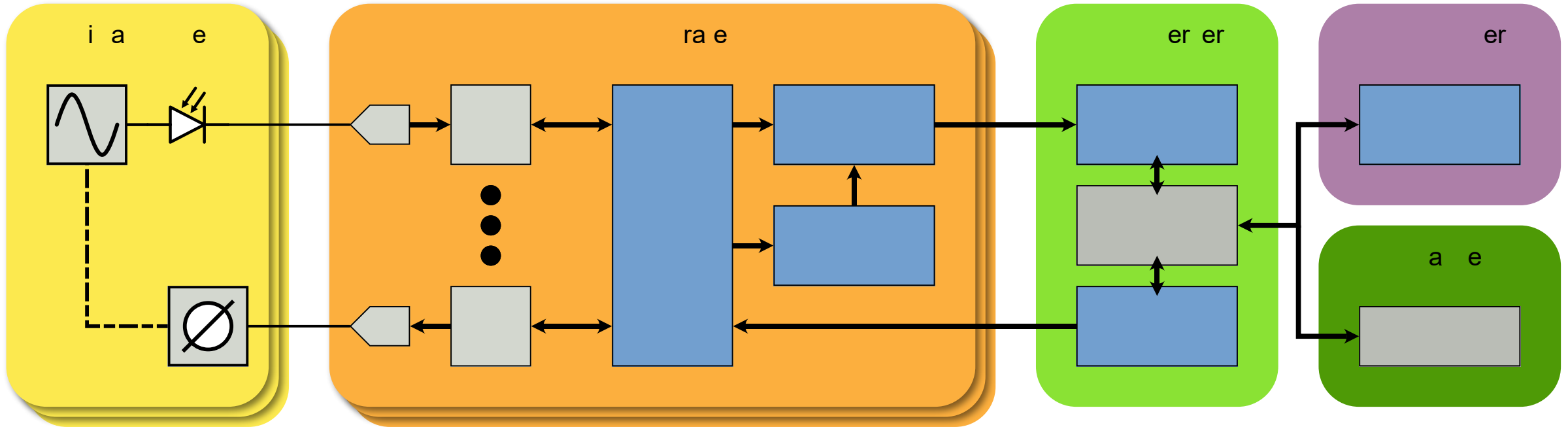
- More data channels
- Longer time periods
- More processing

Evolution of Data Acquisition and DAQ Systems



Architecture

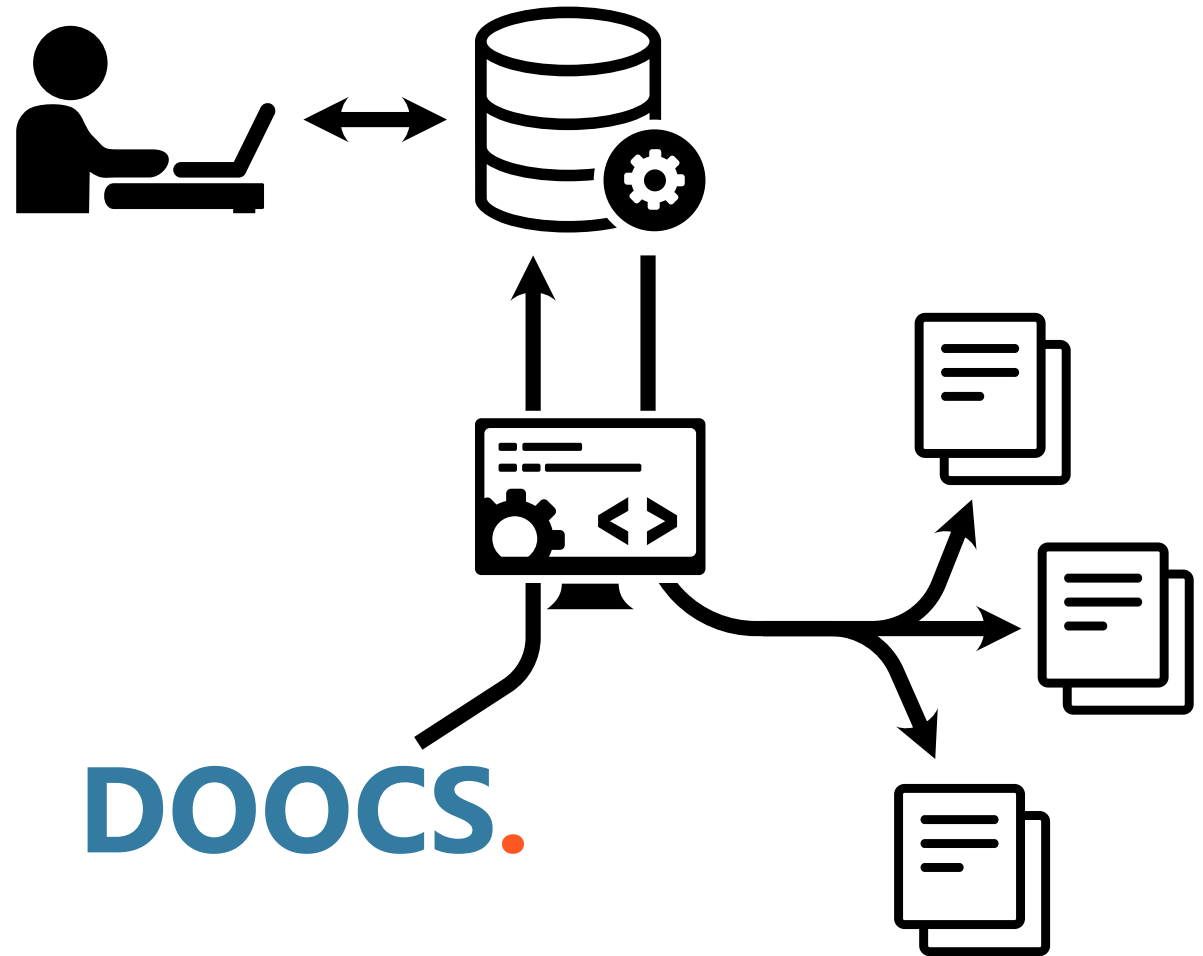
DAQ Data Flow



Architecture

Configuration Management

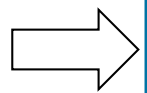
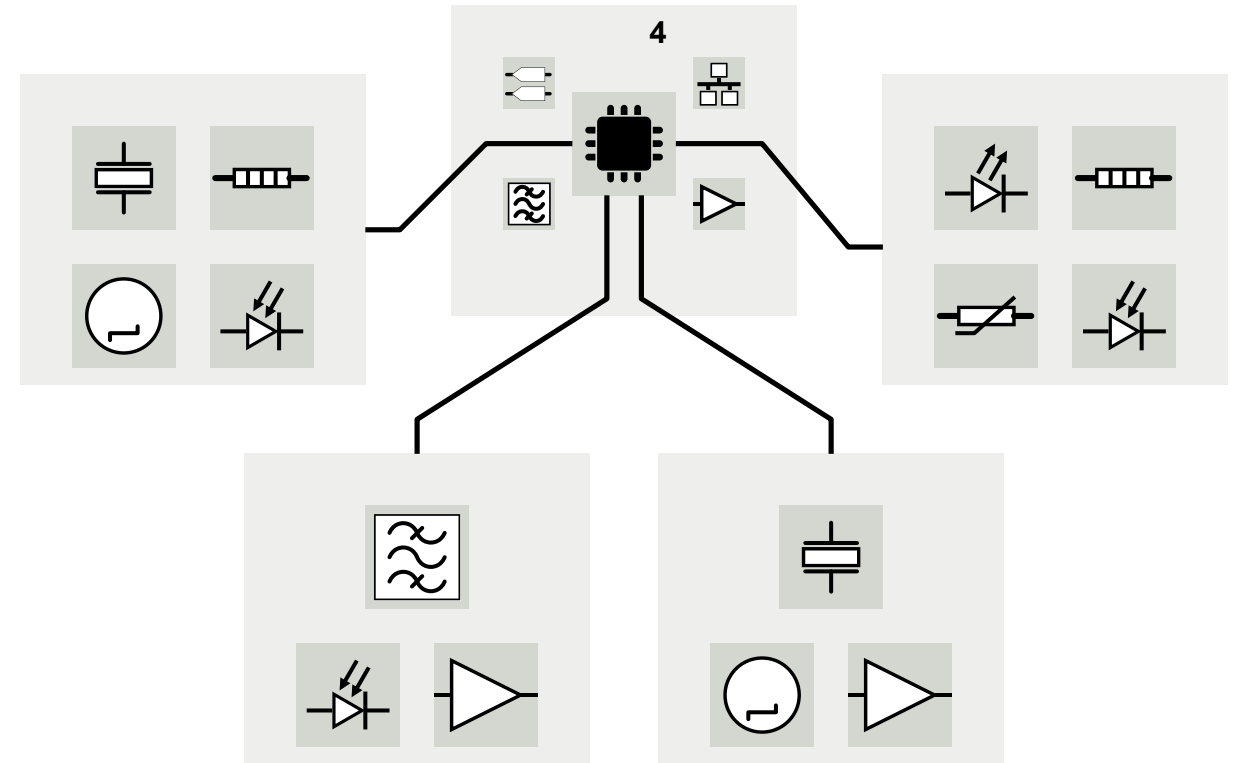
- As system is under development, data channels are added, removed or change meaning.
- Configuration database tracks changes of recorded data channels over time.
- Tools help to automate the process.
- Manual labelling still necessary.
- Configuration files for the DAQ processes generated automatically.



Facts & Figures

Optical Synchronization System (Core)

- Approx. **40'000** !
(30'000 for e ore + 10'000 for ien / a a e e)
- ~ 67% @ 0 Hz (virtually constant)
 - Settings, Configuration, Calibration
- ~ 17% @ 0-10 Hz (rarely changing)
 - Slow Diagnostics
- ~ 14% @ 10 Hz (machine rate)
 - Fast Monitoring
- ~ 2% @ up to 100 MHz (full-rate measurements)
 - Raw Signals and Algorithm I/O



~75 TB / year long-term archive

Ongoing Projects

With data from the new DAQ system

- Multiple projects started based on acquired data.
- Experience to be used for new DAQ instances for other subsystems.
- More data for many more projects to come.



“ a i n e Learning La er ea o e for e Op i a
n roni za ion e a e E ropean XF EL”

Helmholtz AI Consultant Team for Matter Research
(<https://www.hzdr.de/db/Cms?pOid=60710&pNid=0>)

Thank you for your interest!

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