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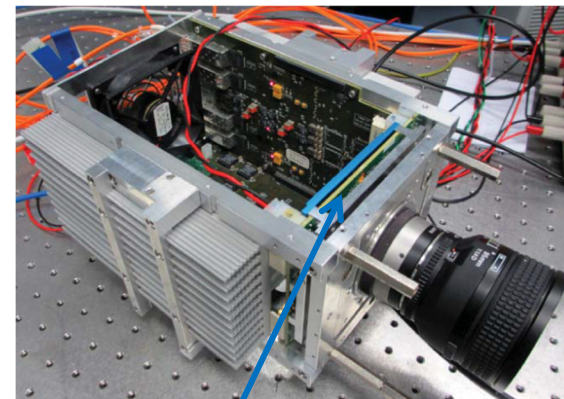
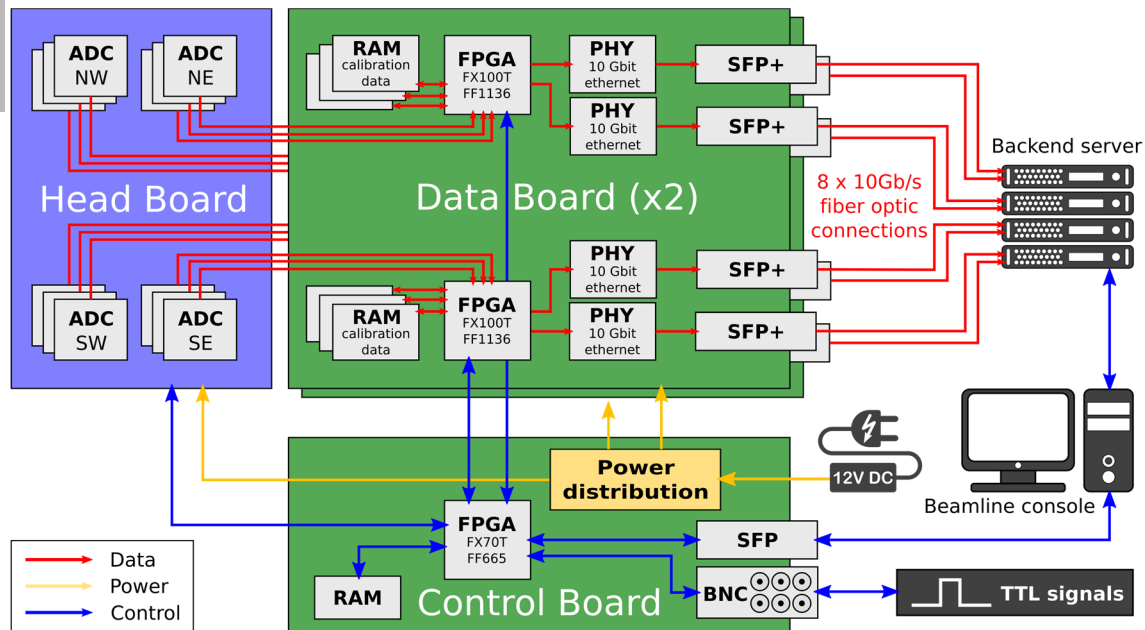
GigaFRoST (Gigabyte Fast Read-Out System for Tomography): Controls and DAQ System Design

ICALEPCS 2017, Barcelona, Spain, 12. Oct. 2017

WHY GigaFRoST?

- Pco.dimax sensor & head board
 - 2016 x 2016 pixels
 - Sub 20 um pixel size
 - kHz frame rate
 - 12 ADCs
- Custom made auxiliary electronics
- Continuously acquire & stream up to 7.7 GB/s to the backend server
- Providing a live image preview stream (handled by the backend server)

GigaFRoST architecture



Head board & sensor



Control board

Data readout board

- EPICS IOC running on the PPC of the control board
 - Control of camera parameters, system monitoring, coordination of image acquisition as well as some DAQ configuration (for backend server) via a caQtDM GUI
 - Support for ao, ai, bo, bi and waveform records
 - Epics driver + CS independent lower level driver talking to the API
 - 2-step writing to and reading from the camera
 - Direct reset / shutdown of the camera or reset of individual readout boards or even FPGAs
 - In Sync flag (EPICS PVs vs. camera parameters)



• Backend server

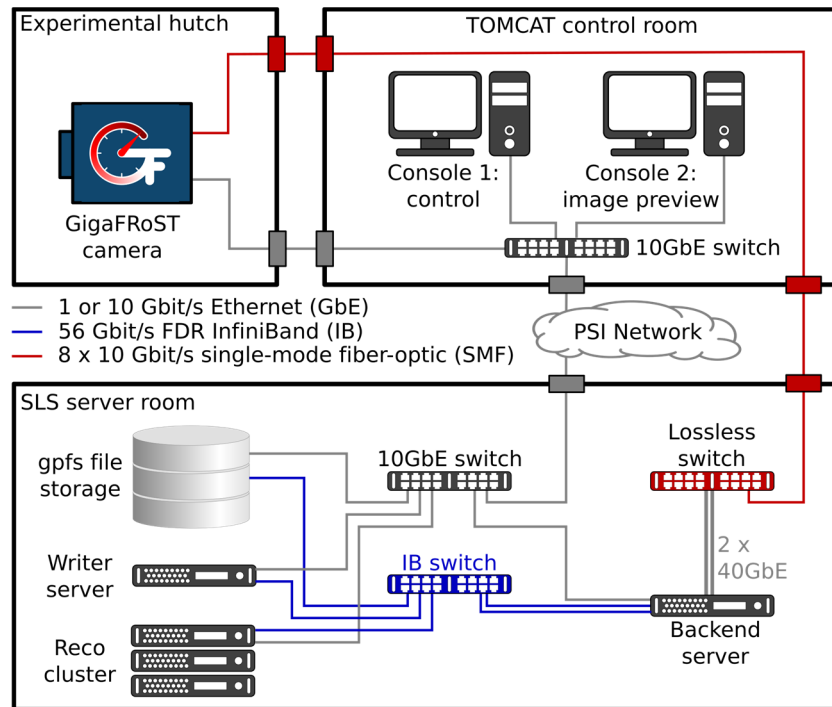
- 2 x CPU (each 14 cores, 256 GB RAM)
- Assembling the images (each CPU ½ of the image)
- Specialized ring buffer architecture for high-frequency memory access
- 2 x 56 Gbit/s InfiniBand connections downstream
- ZMQ data stream + live image preview stream

• File writing and storage

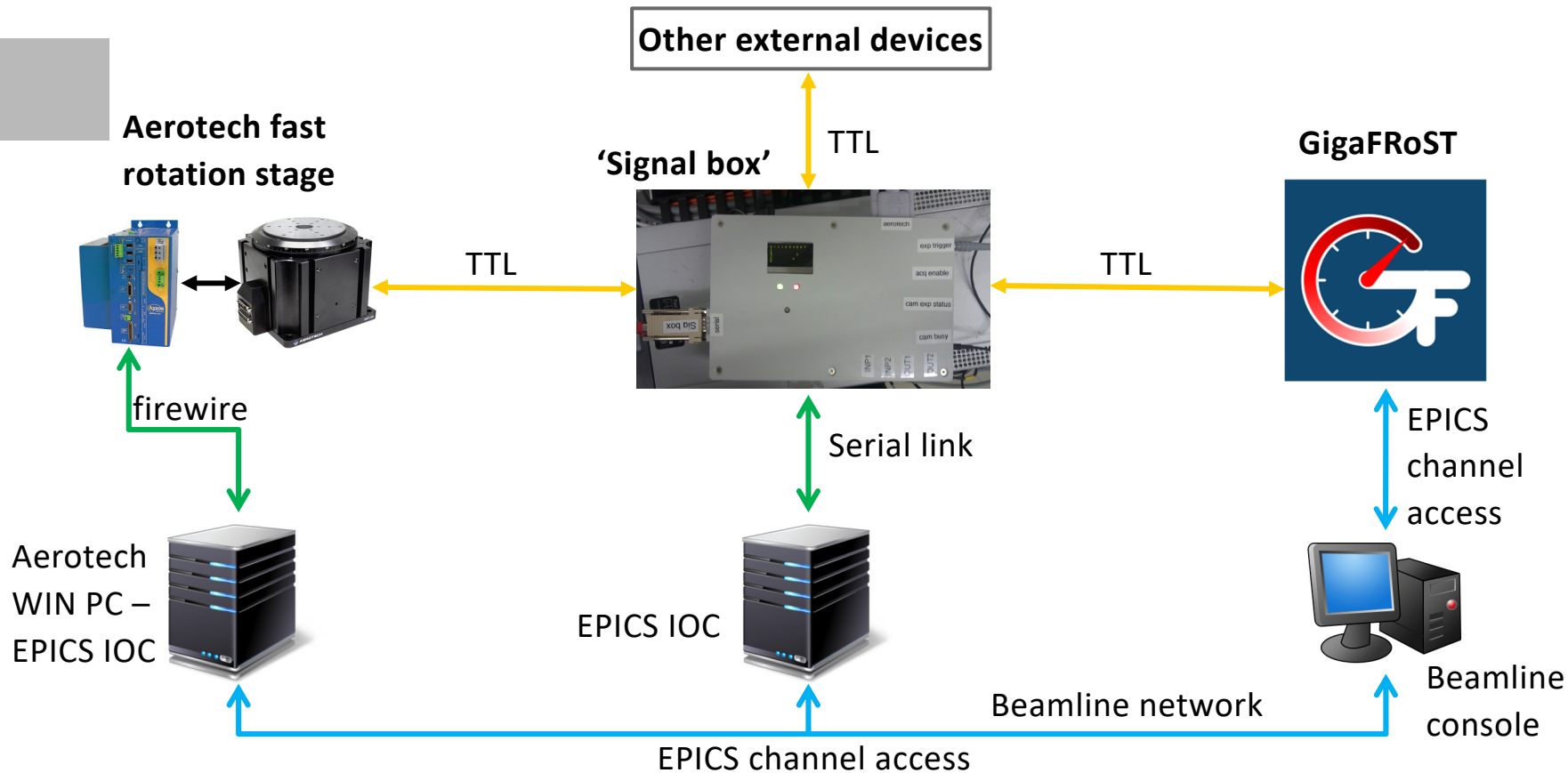
- Subscribing to the ZMQ data stream
- Packaging images into HDF5 files
- Storing on a GPFS file storage server

• Current limitations and expandability

- Writing data from the backend server downstream is currently limited to approx. 2.2 GB/s



Supporting infrastructure for image acquisition sync



My thanks go to

- **R. Mokso & C. Schlepuetz** from Tomcat BL for driving the project
- **G. Theidel** for FPGA FW, Linux OS and GigaFRoST API
- **E. Schmid** for HW design
- **D. Zimoch** for providing EPICS core for selected architecture
- **H. Billich** for developing the backend server (& **A. Babic** for continuing his work)
- **S. Ebner & T. Zamofing** for setting up the HDF5 file writing and ZMQ streaming infrastructure

