The Large Scale European XFEL MicroTCA Installation

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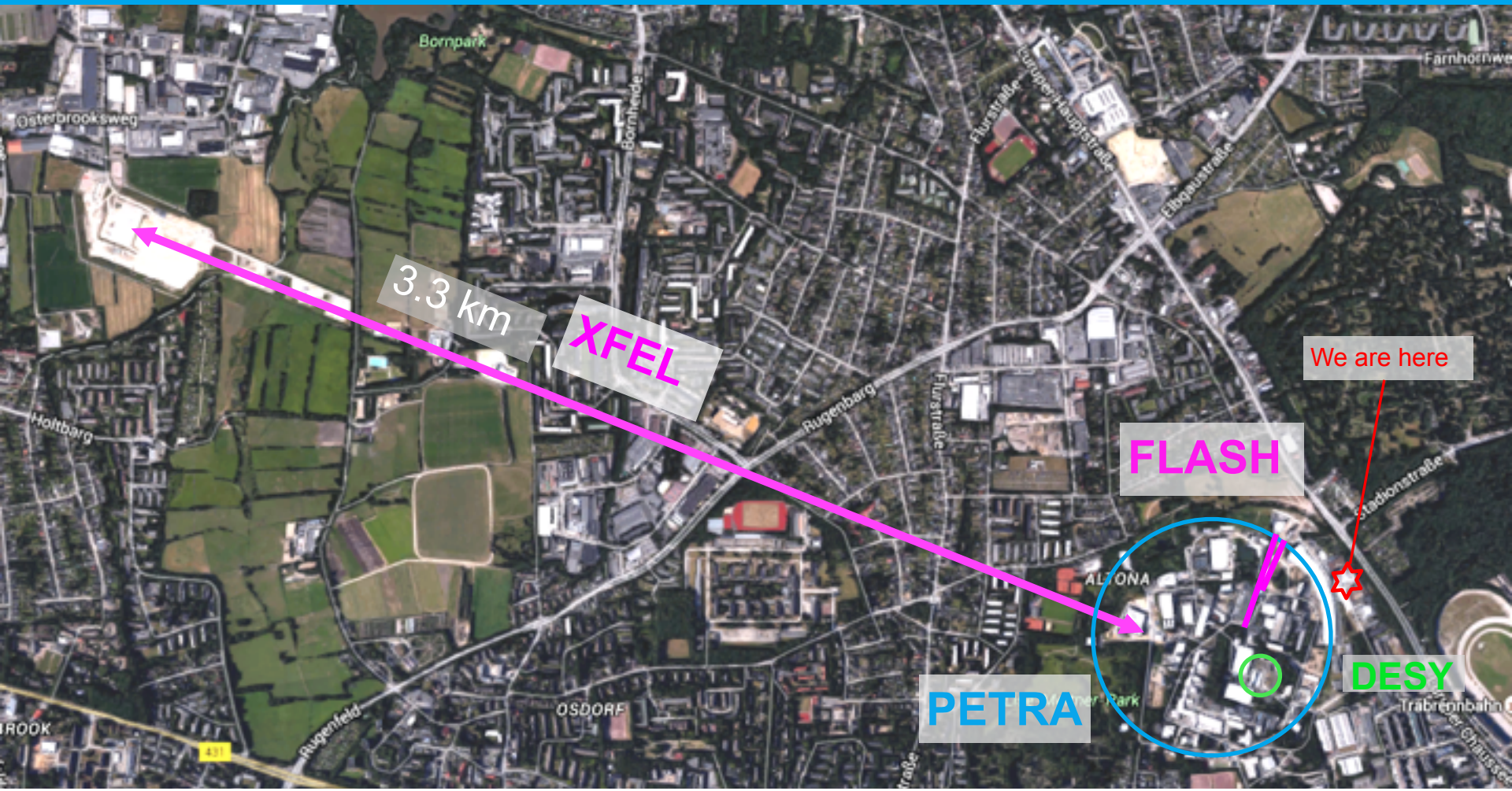
MicroTCA Workshop @ DESY, 9. Dec. 2015

HELMHOLTZ ASSOCIATION

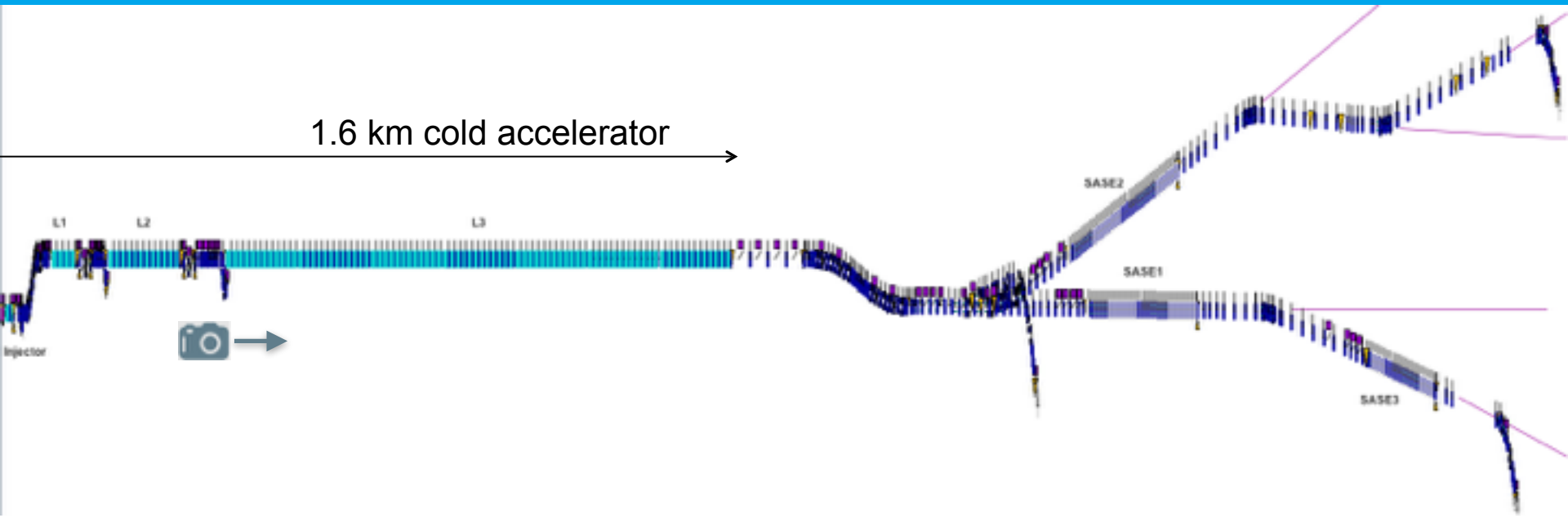
DESY

The Projects: FLASH and XFEL (and REGAE, AMTF)



A MicroTCA Crate in XFEL

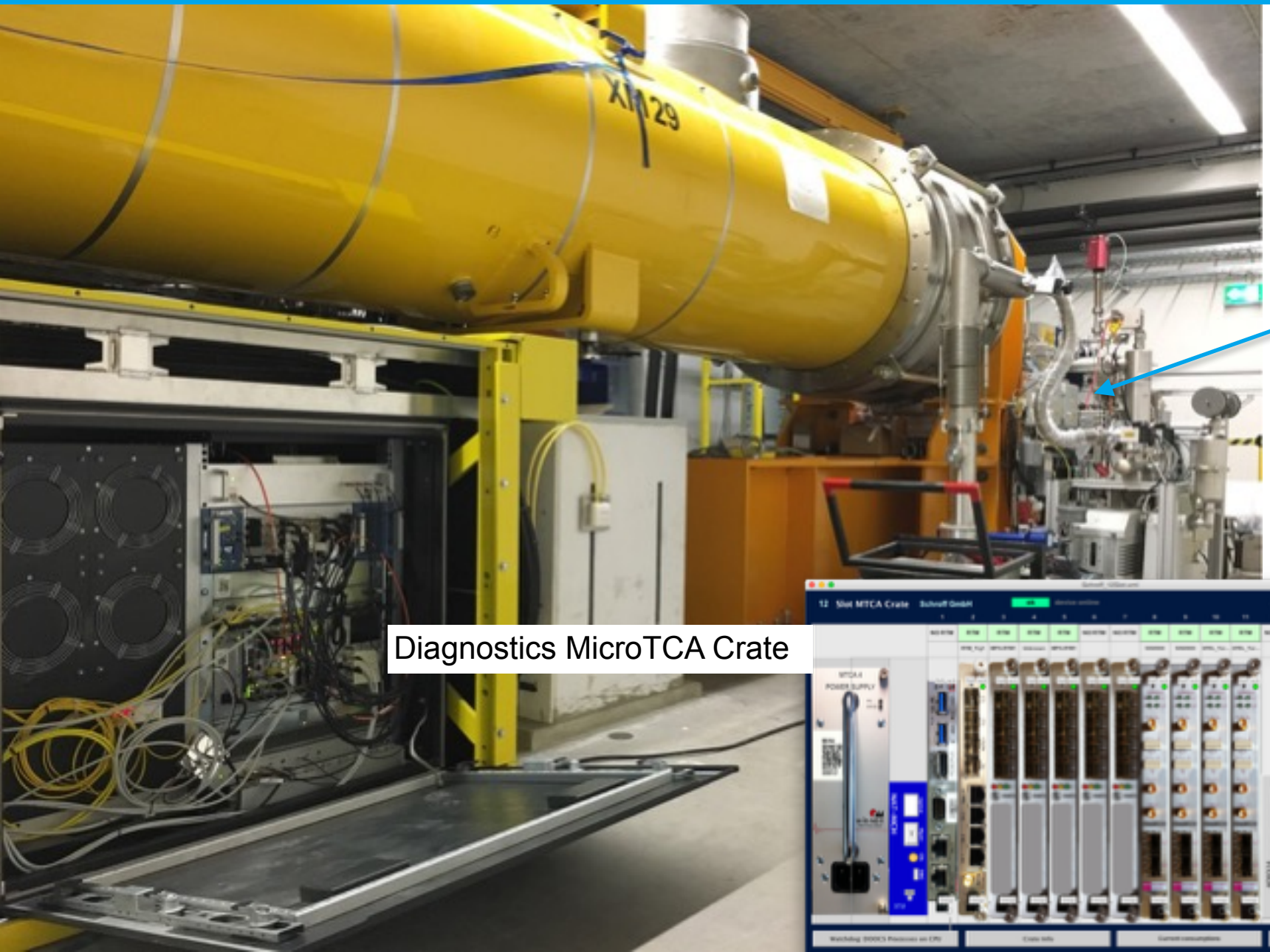
Planned MicroTCA Crates for XFEL



Total Number of MicroTCA crates > 200:

- 58 LLRF
- 53 Coupler Interlocks
- 50 Diagnostics
- 21 Special Diagnostics
- 20 Vacuum, Magnets
- 20 Experiments

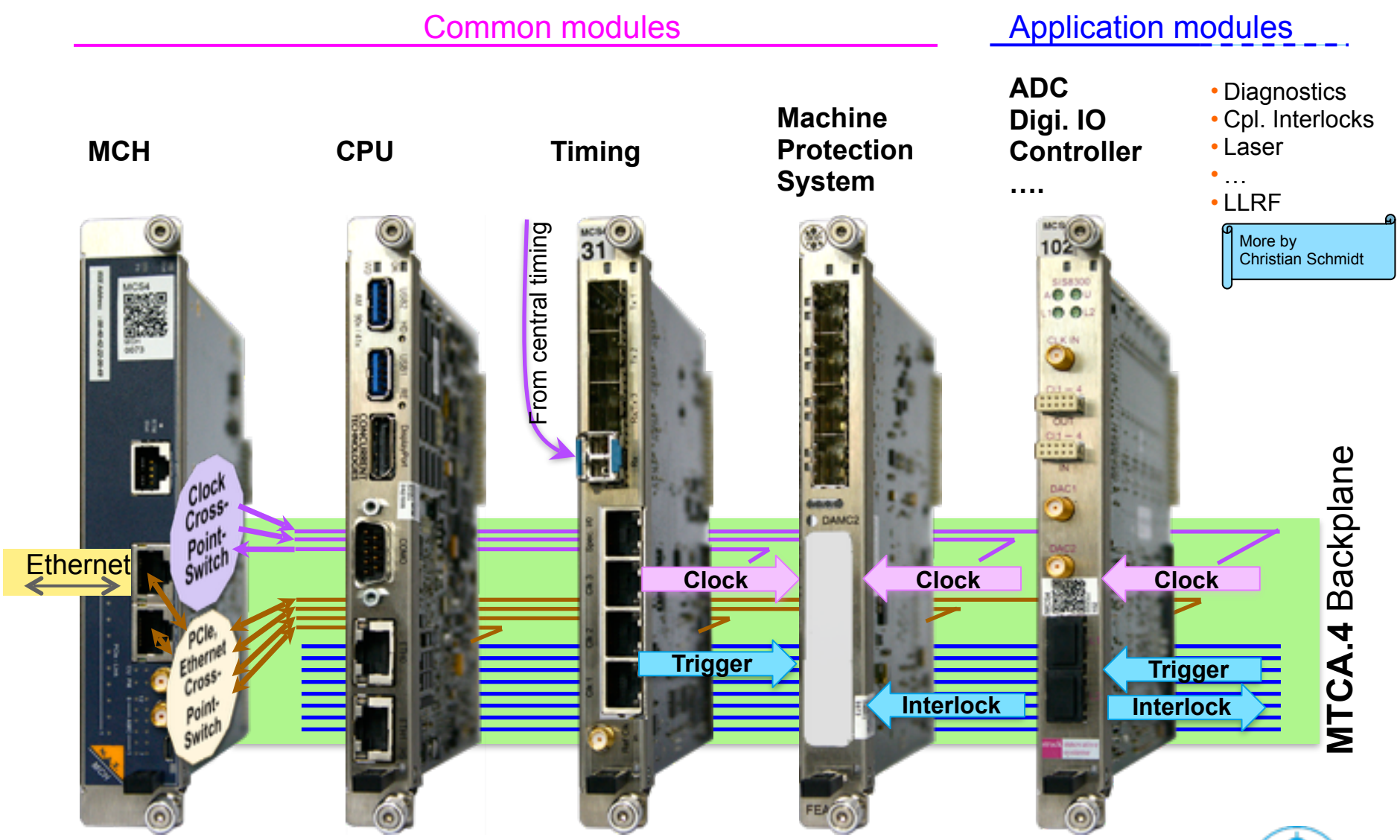
A MicroTCA Crate in the Injector



XFEL Injector

- 15 MicroTCA crates are operational
- Cool-down of the two cryo modules just started
- Start of beam operation next week

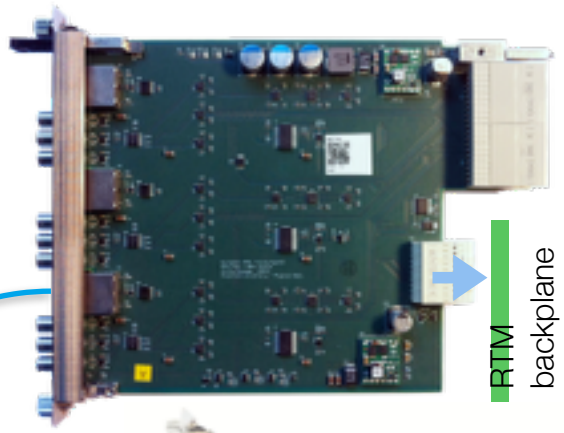
XFEL MicroTCA Crates

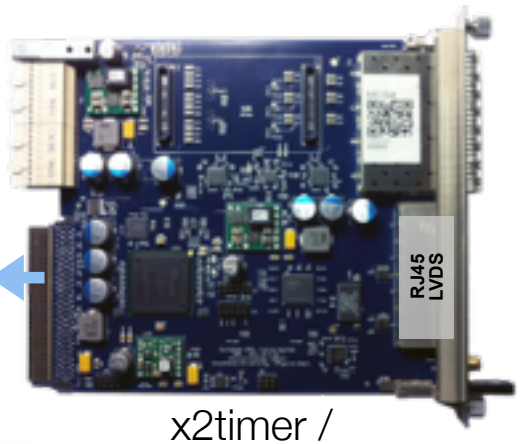


Timing: Synchronization of all Subsystems

9 Lemo outputs (50 Ohm):
- Triggers, Clocks, Data
- 3 channels with 5ps resolution

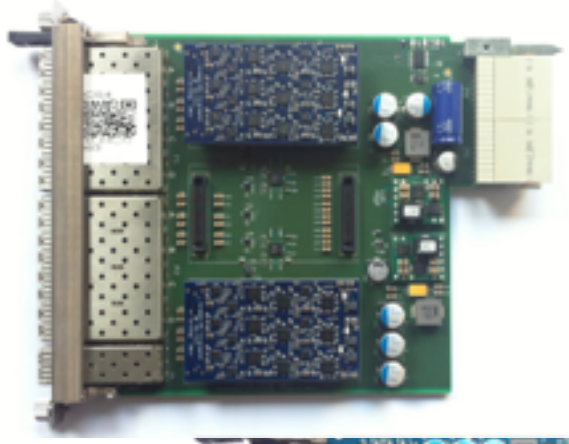
> 100 m





x2timer / NAMC-psTimer receiver /transmitter

9 SFP outputs:
- with length compensated fiber links

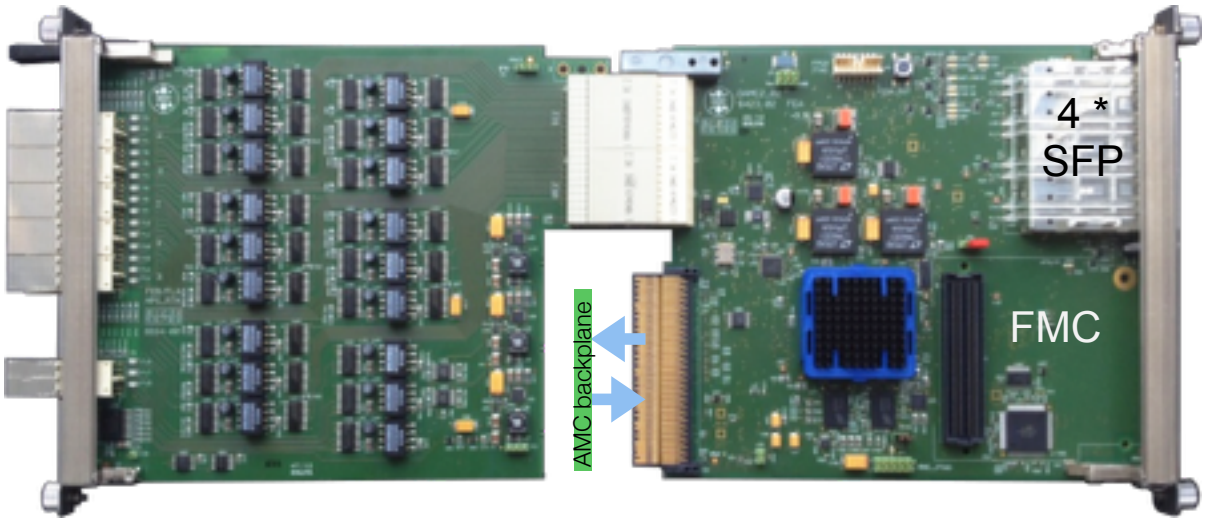


9 Fiber outputs (ST):
- Triggers, Clocks, Data
- used for modulators

More by Christoph Stechmann

The XFEL Machine Protection Systems

- RTM to adapt subsystems
- AMC = DAMC2
  - Virtex-5 FPGA
  - ~ 800 Boards for XFEL

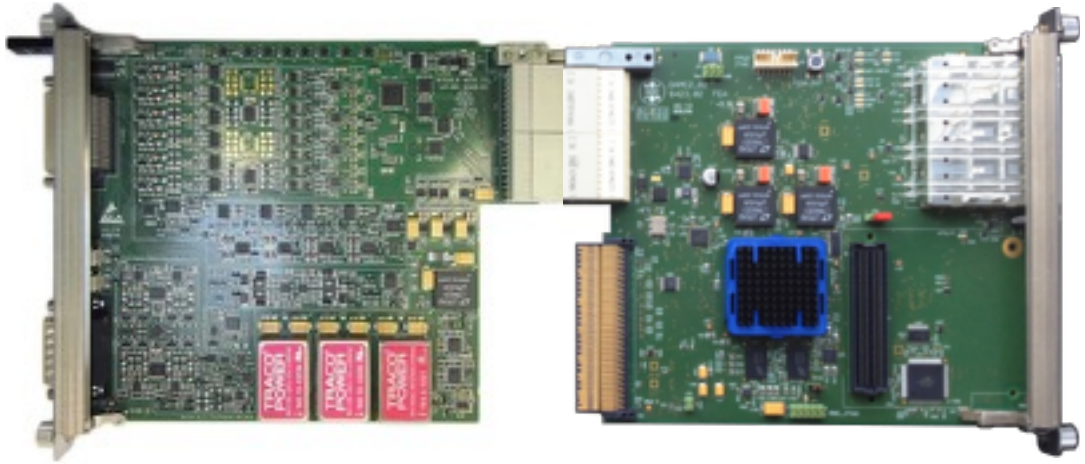


Further Subsystemsare based on DAMC2:

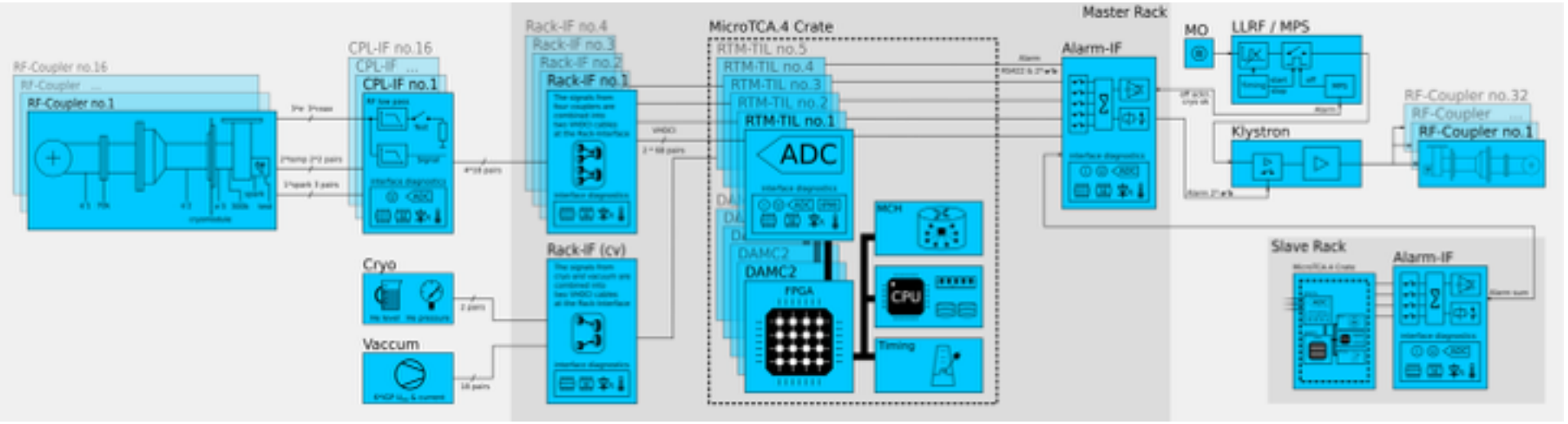
- Beam Loss Monitors
- Beam Position Monitor Interface
- Clock & Trigger Contr. For Exp.
- Wire Scanner

The Coupler Interlocks

RTM of the coupler interlock



DAMC2



http://srf2015proc.triumf.ca/prepress/papers/thpb080.pdf

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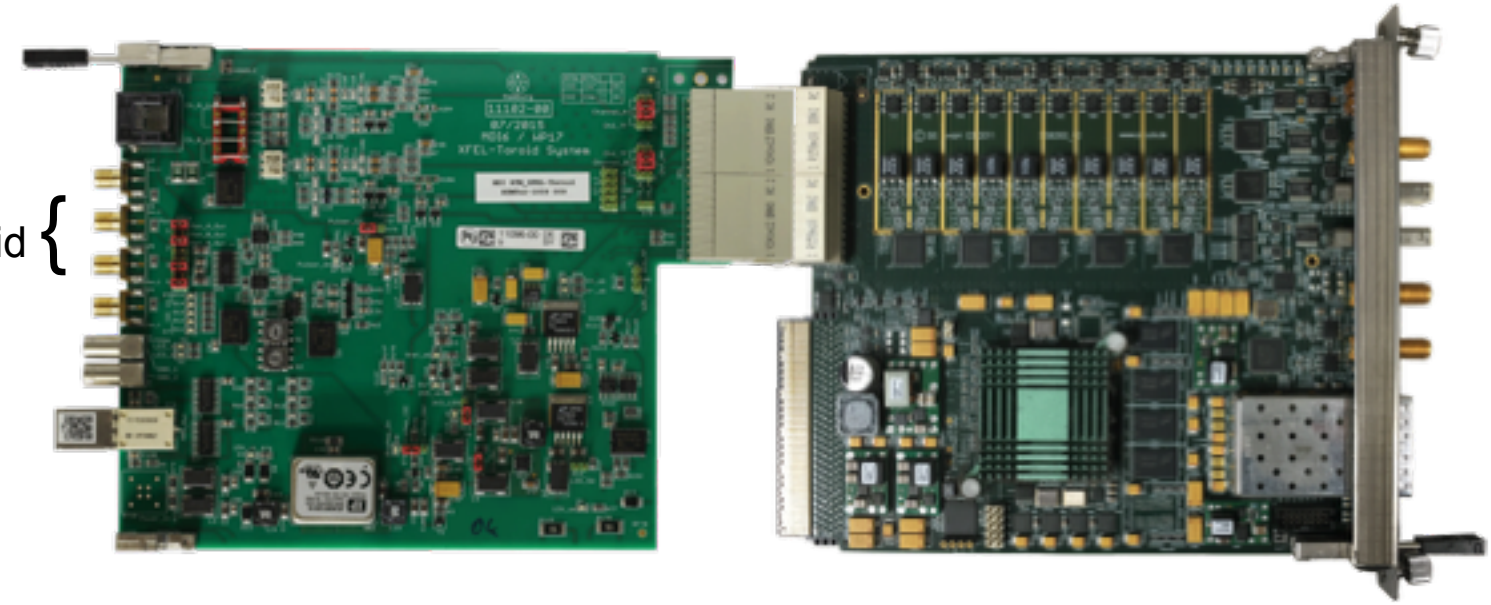
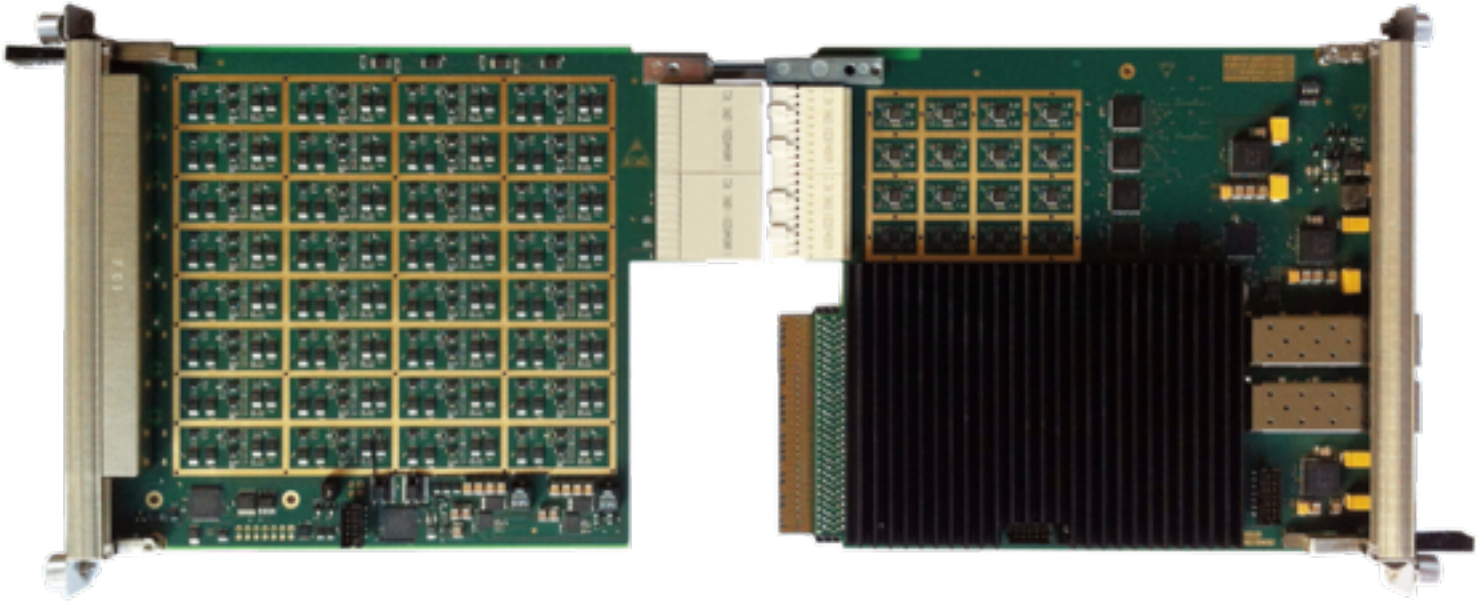
Toroid Protection System

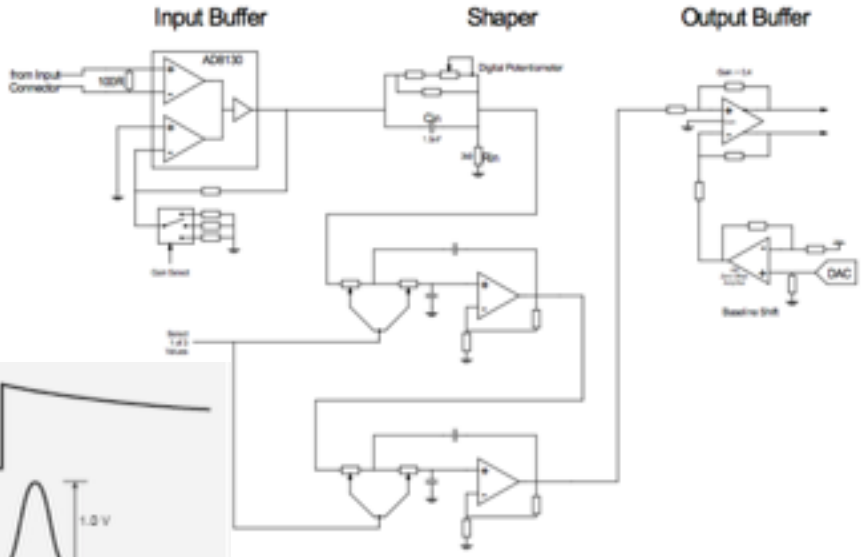


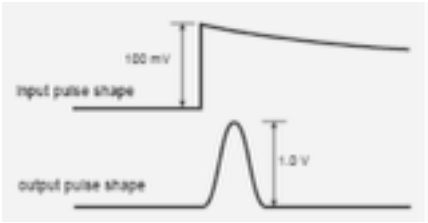
- Toroid readout and protection RTM + SIS8300L AMC
- Low noise: ~0.2 pC RMS (old system has 2 pC noise)
- Firmware features fast commissioning

© T. Lensch, J. Lund-Nielsen, M. Werner

Tews 32 Channel ADC with Versatile Shaper





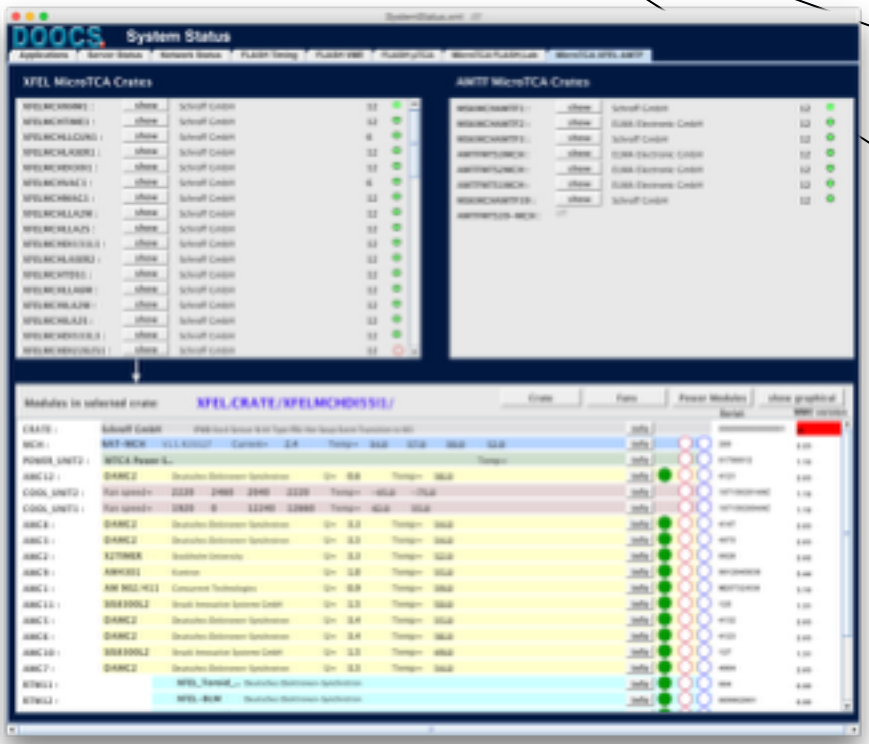


TAMC532:

- Kintex 7 (70T…410T)
  - with ≧ 2*256MB RAM
- 32 analog channels, configurable
- 12 bit ADC, 75 MSPS
- or 14 bit ADC, 50 MSPS
- Complex low jitter clock generation
- 2 SFP IO
- Application: 128 ch. spectrometer

Further XFEL Subsystems Based on MicroTCA, COTS

- Diagnostics
  - Photon energy and position, GSPS
- Special Diagnostics
  - Cameras
  - Kicker
- Magnets & Vacuum



≦ 7 GSPS ADC

16 * RS-232 IO

4* Ethernet IO

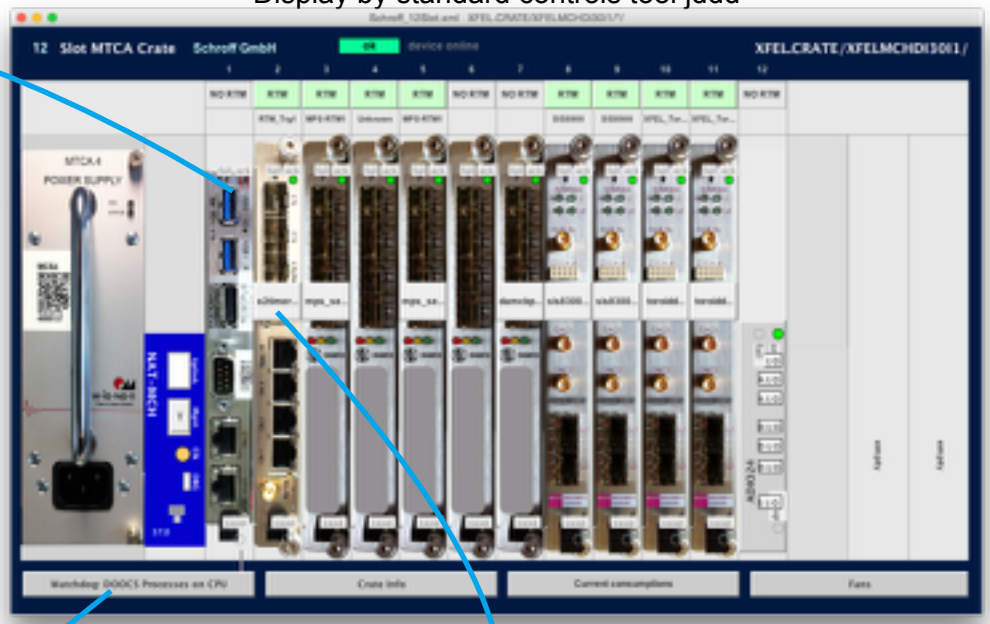
Digi/analog IO

4* CAN IO

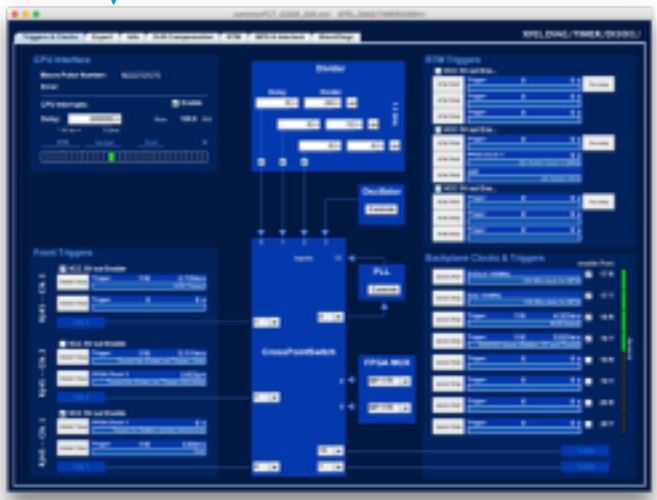
MicroTCA Remote Management Views

Management View

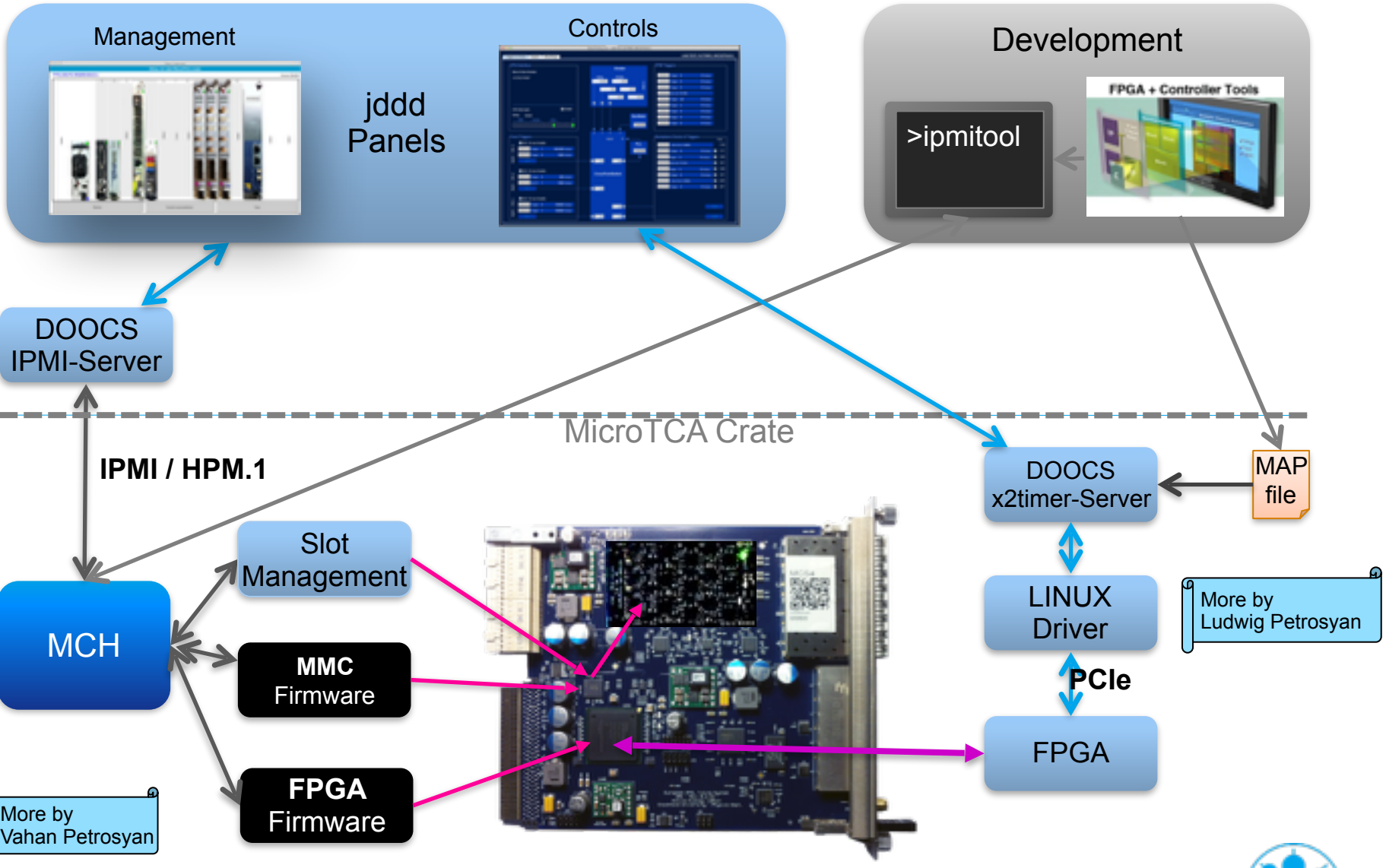
Display by standard controls tool jddd



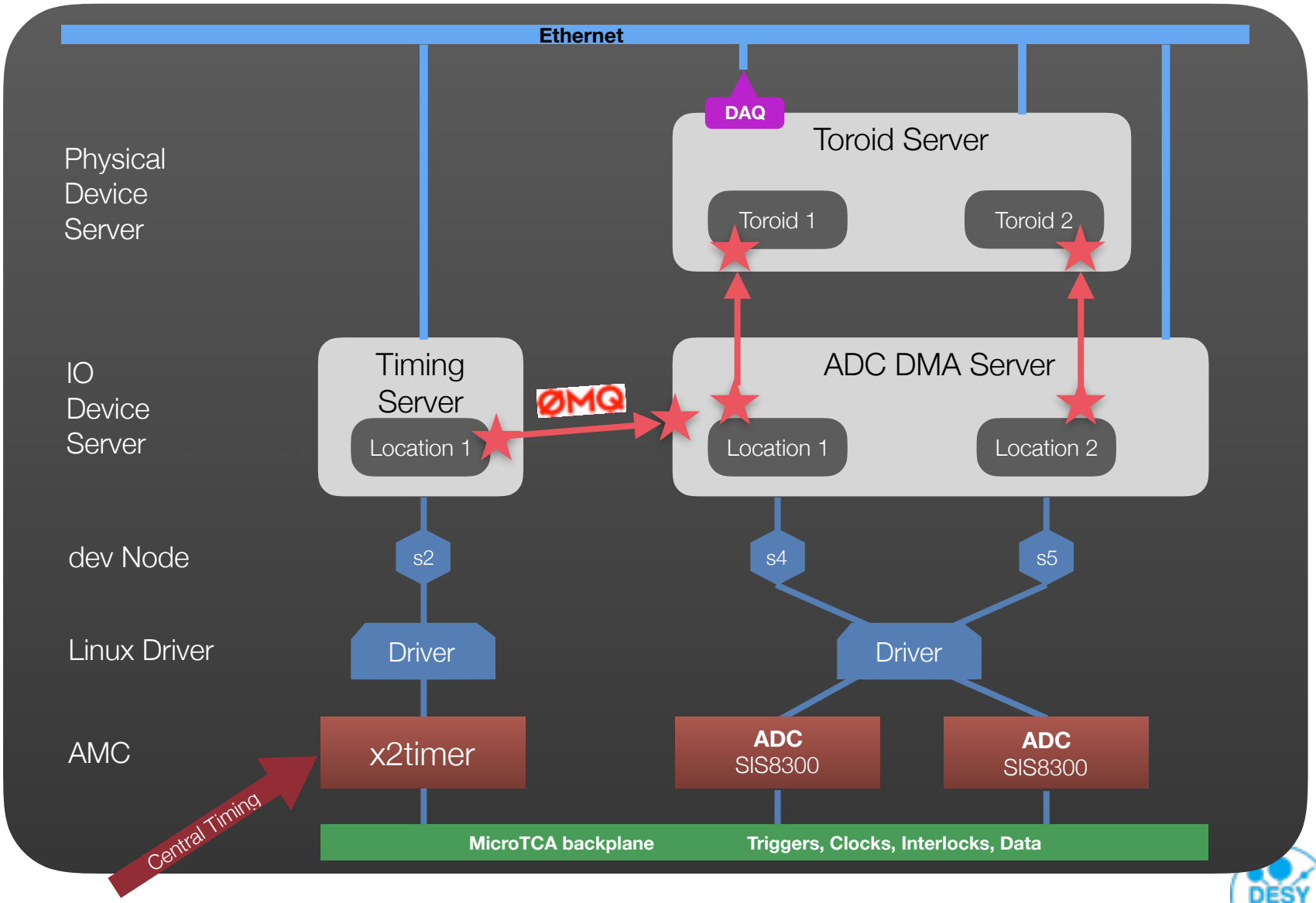
DOOCS Control System View



Management, Controls and Development Interfaces



Fast Data Processing from MicroTCA to Server



Conclusions

- Status
  - > 50% of the cryo modules are installed
  - 20% of the MicroTCA crates are in operation
  - All mission critical MicroTCA modules are in operation
  - Software and installation procedure are in operation
  - **FLASH**: 20 MicroTCA operate 24/7
    - upgrade of the remaining ~50 VME crates planned

- Next steps
  - Operation of the Gun and XFEL Injector just started
  - 2016: operation of XFEL