Ptychography Scanning

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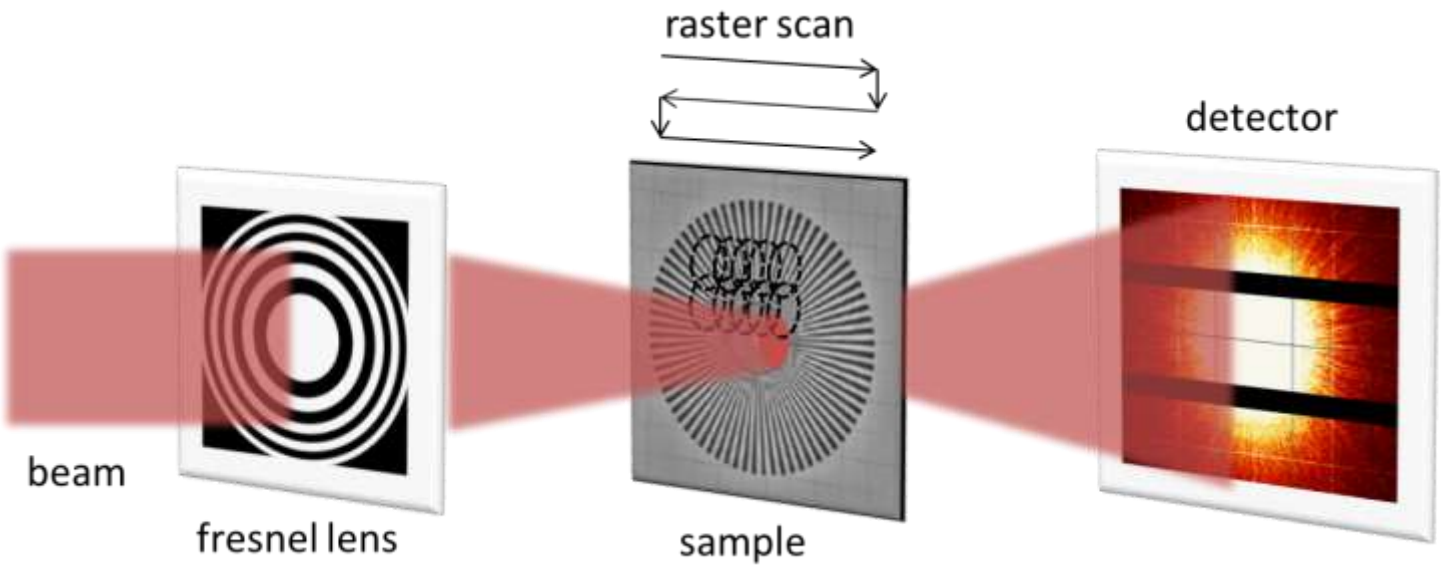
Beamline Controls
Diamond Light Source

Spring 2018 EPICS Collaboration Meeting at the APS

Contents

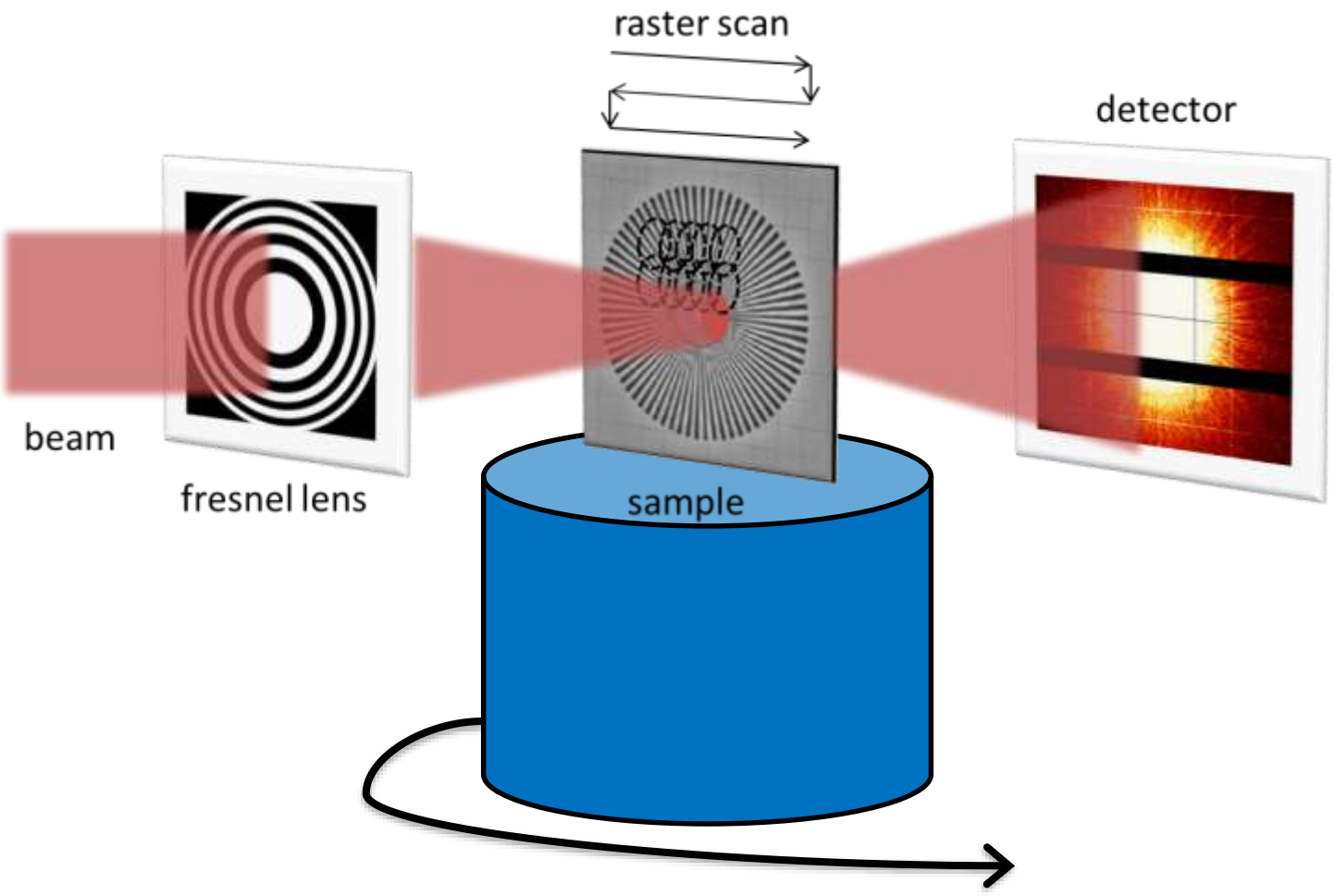
- Introduction to Ptychography
- Challenges posed for Controls
- Deploying a standard solution
- Developing support for J13 beamline

Ptychography



Coherent scanning diffraction microscopy

Ptycho-tomography

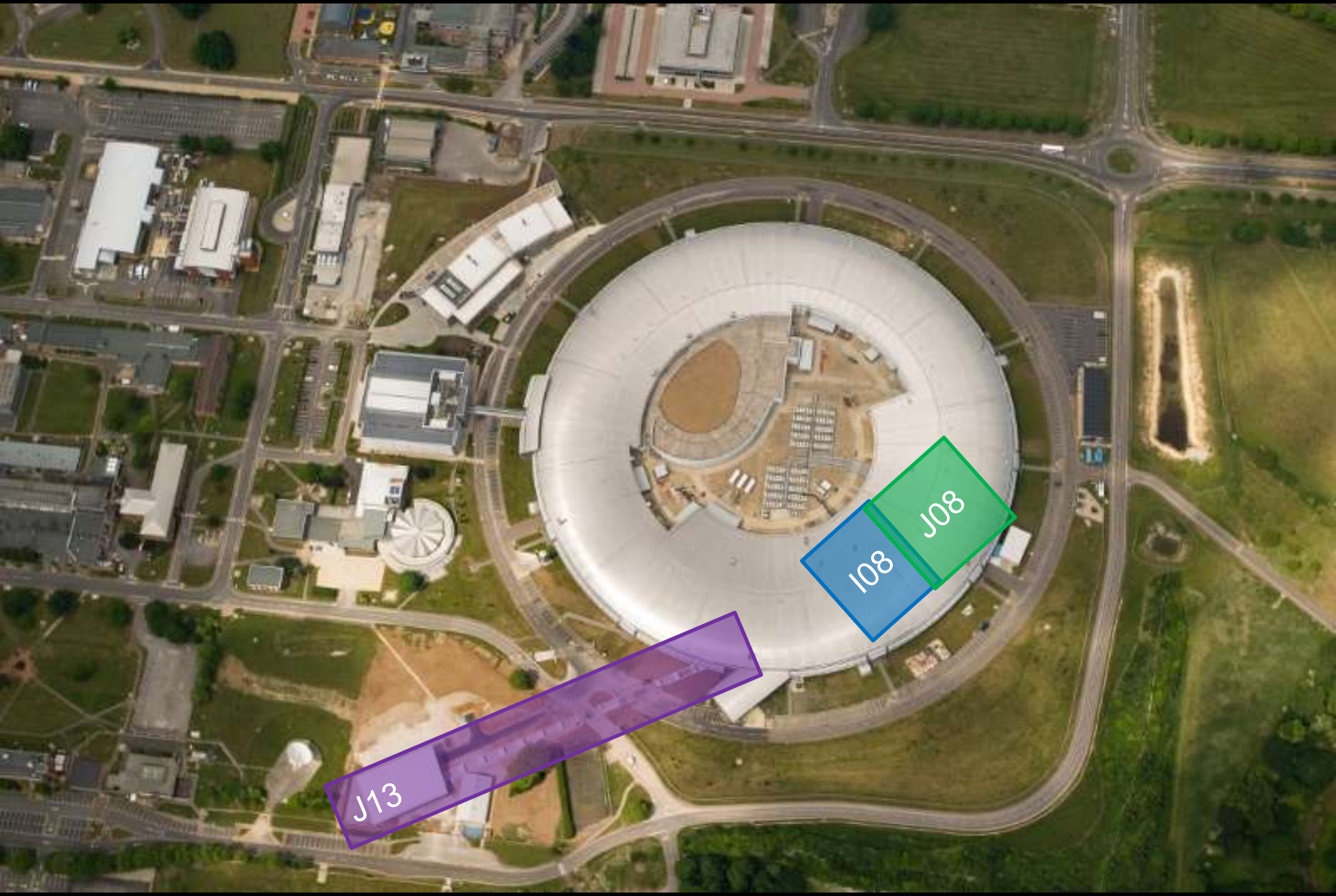


Big datasets

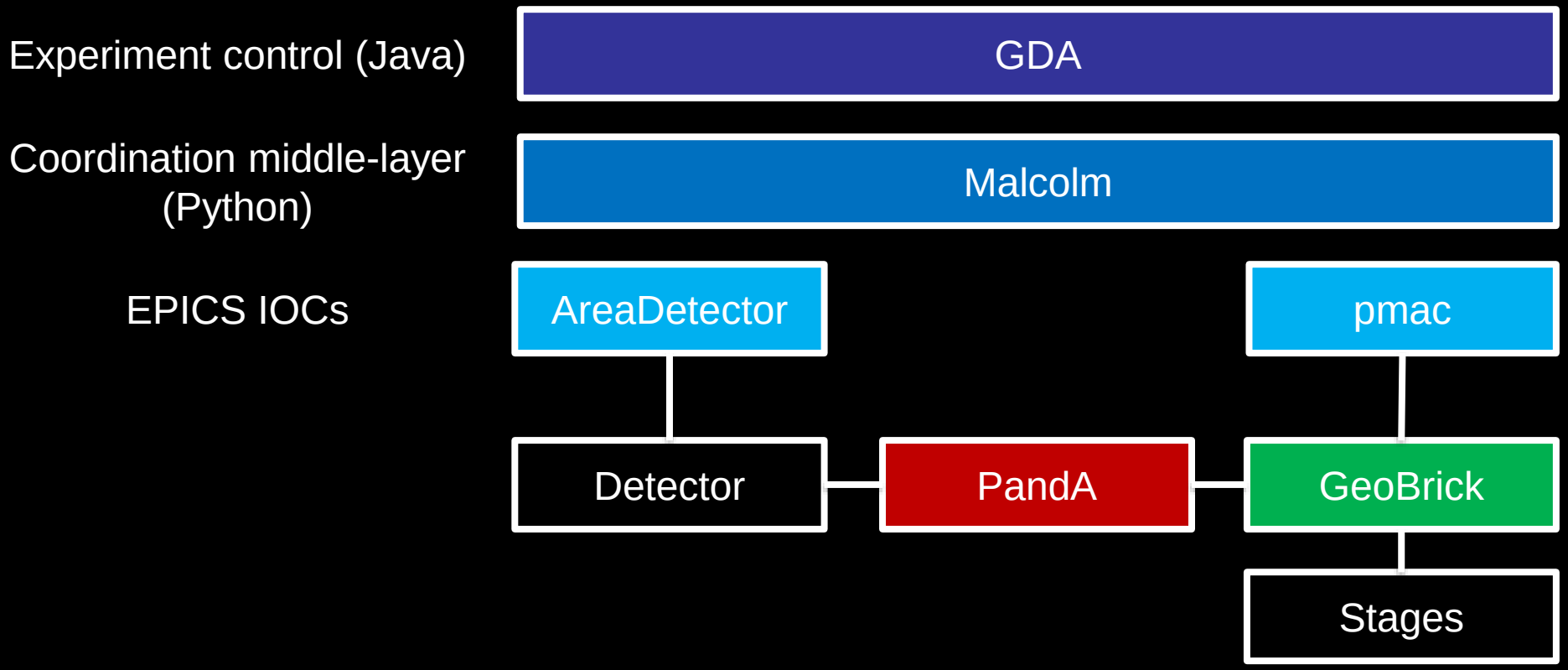
30 * 30 images	*	**1000** projections	~	**1 million** frames	*	**8 MB**	~	**8 TB**
One projection		One ptychotomo		One dataset		One frame		

High rates of data collection

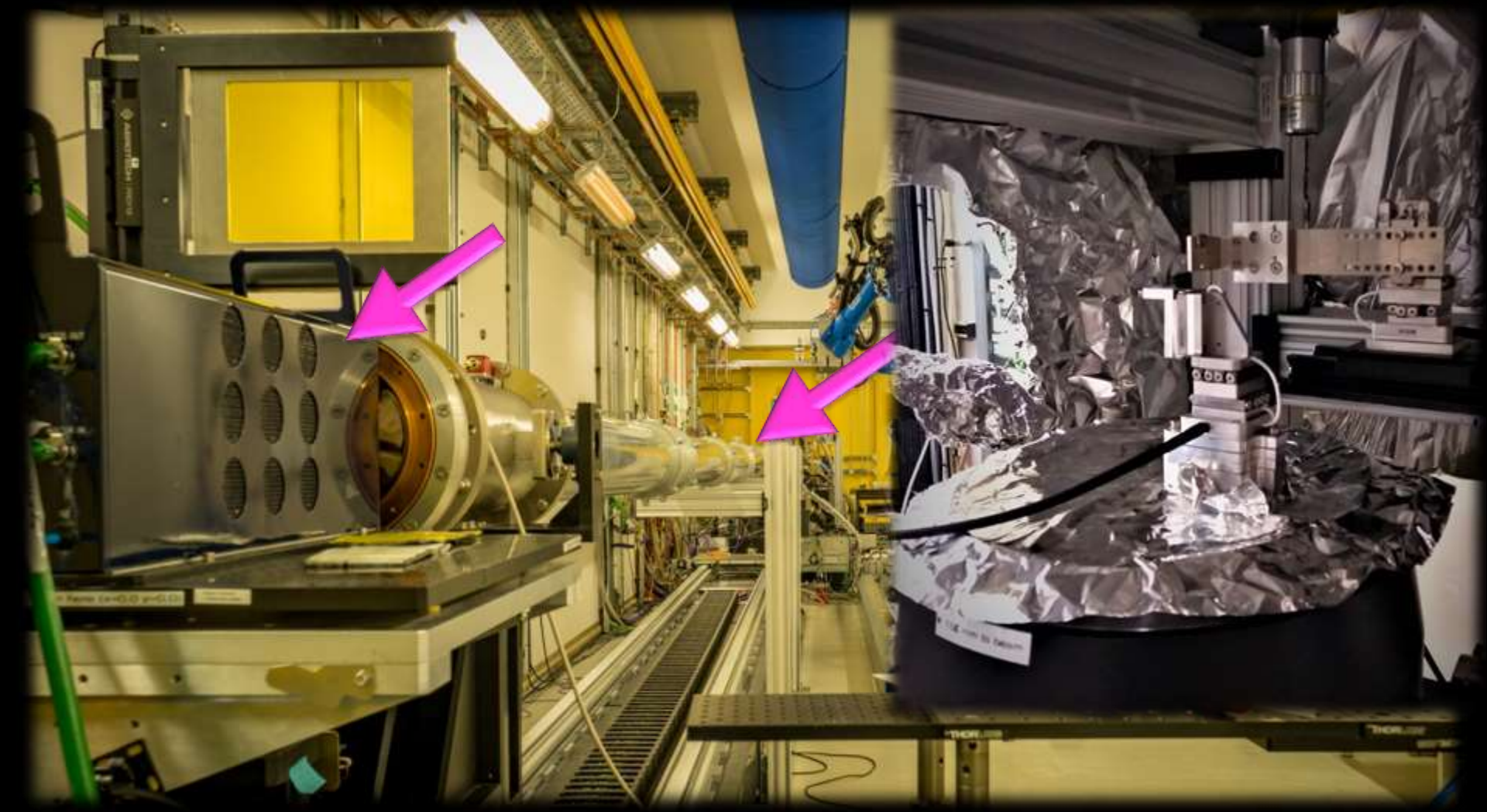
Fine and stable motion

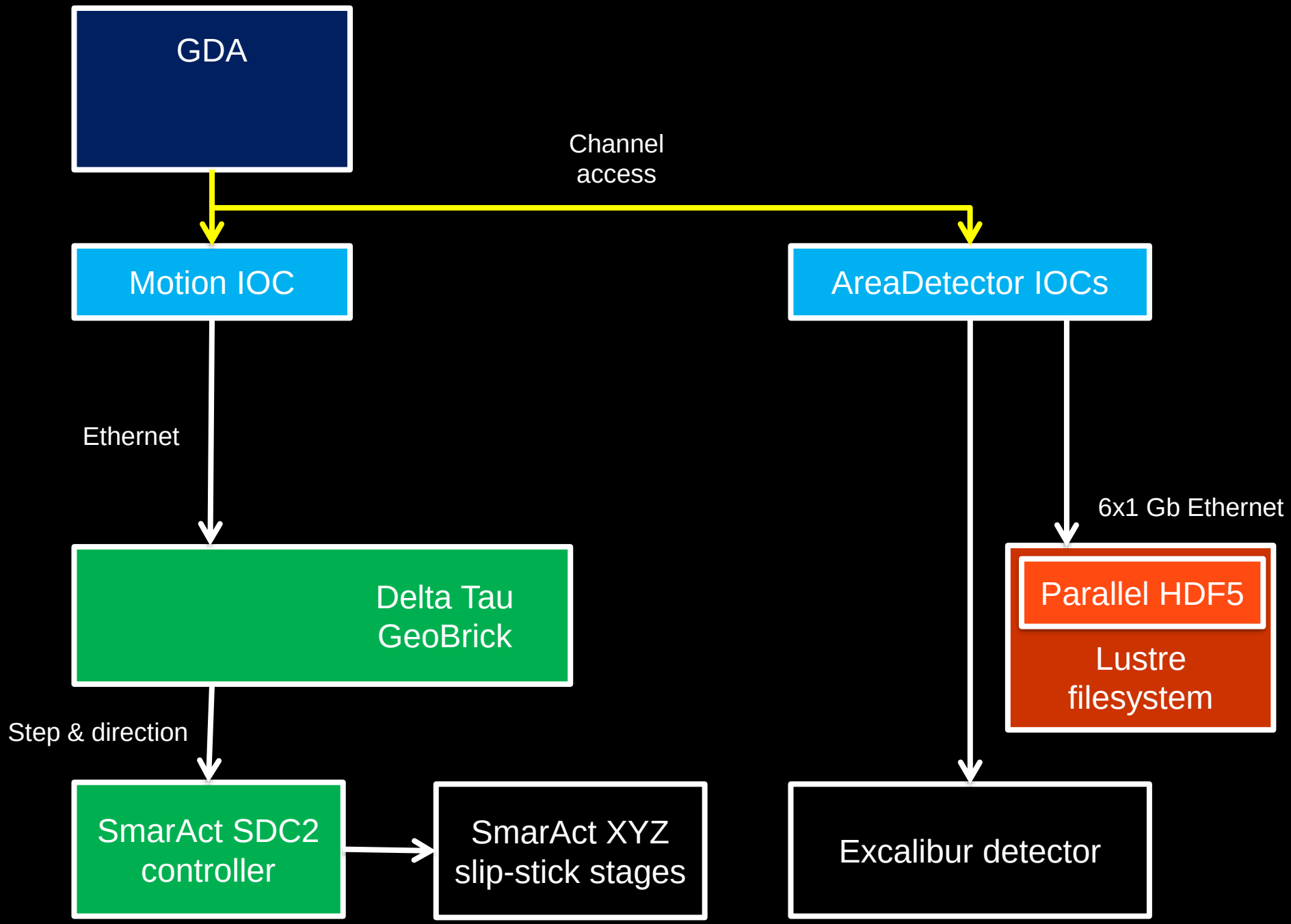

J08
I08
J13

Standard Hardware Triggered Scanning framework

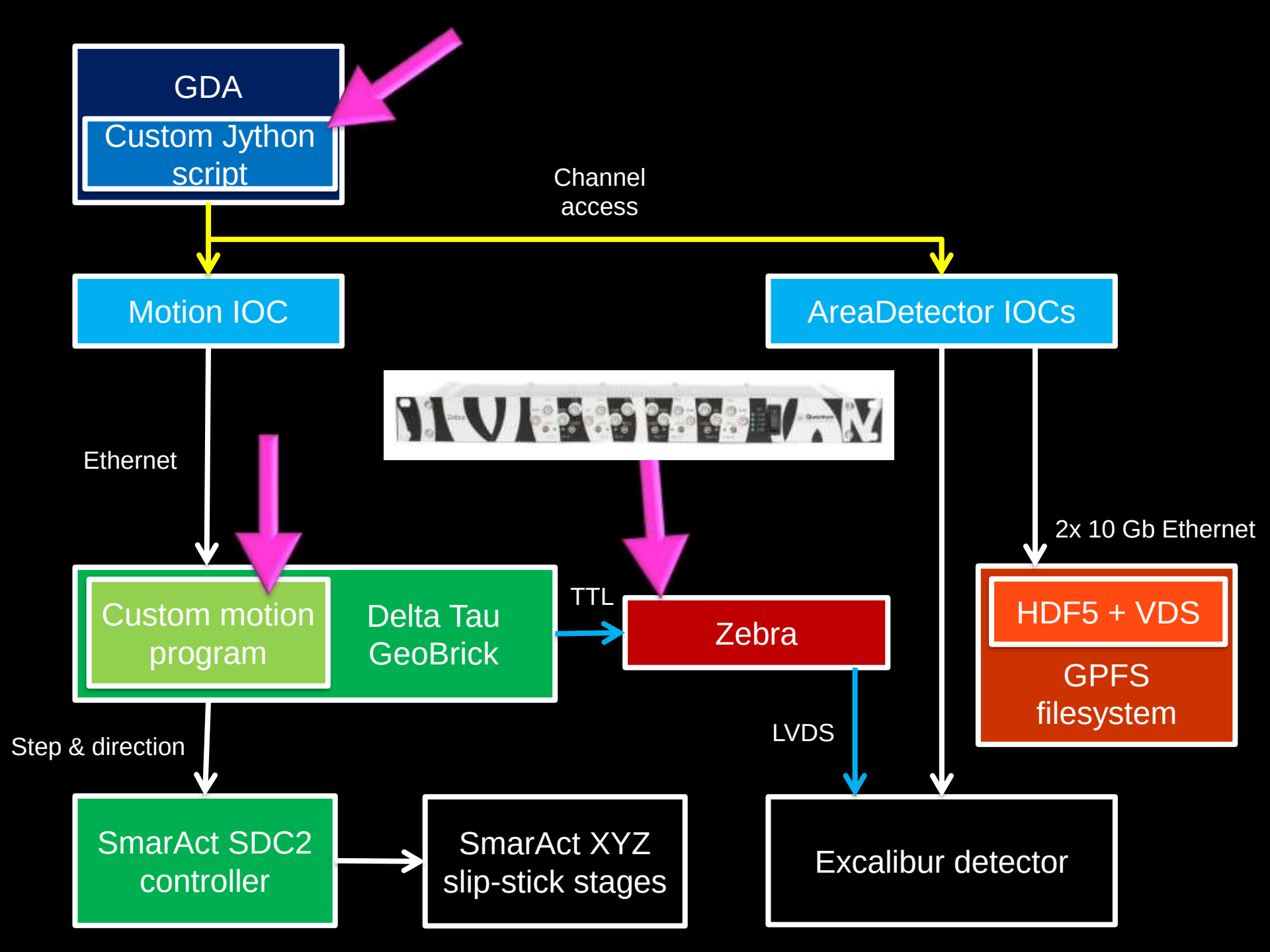


J13 beamline

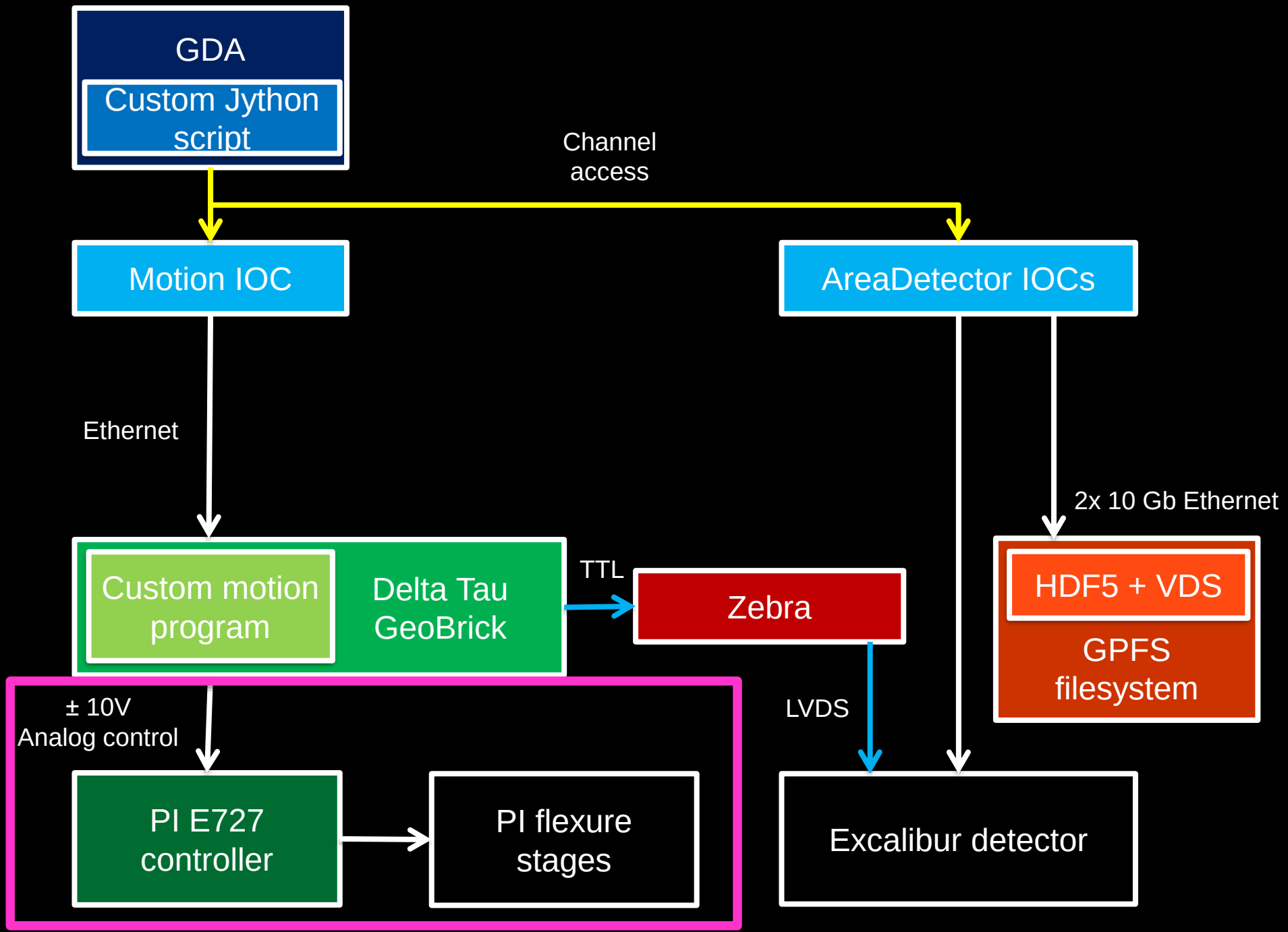


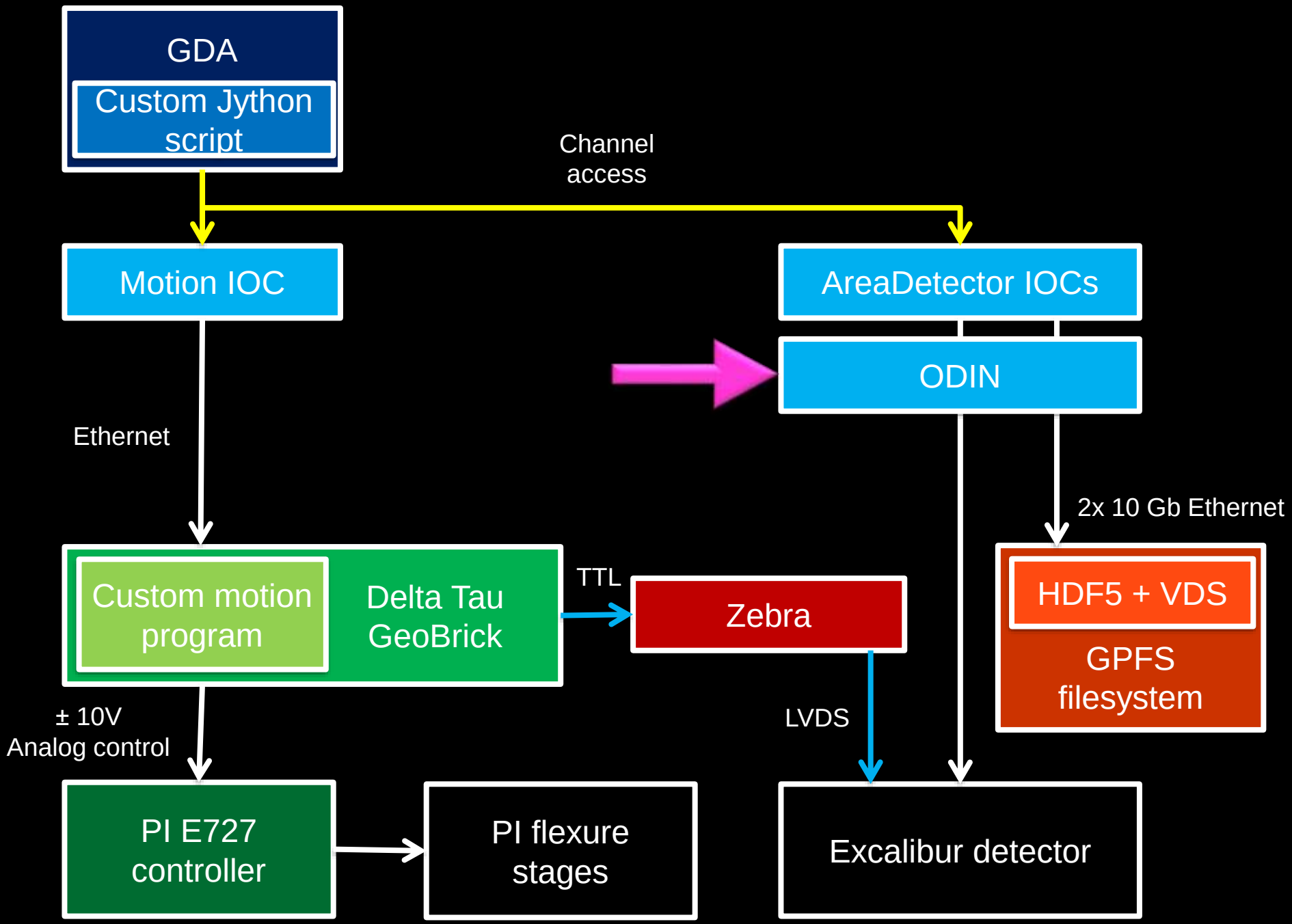

GDA
Channel access
Motion IOC
AreaDetector IOCs
Ethernet
6x1 Gb Ethernet
Delta Tau GeoBrick
Parallel HDF5
Lustre filesystem
Step & direction
SmarAct SDC2 controller
SmarAct XYZ slip-stick stages
Excalibur detector

GO FASTER ASAP

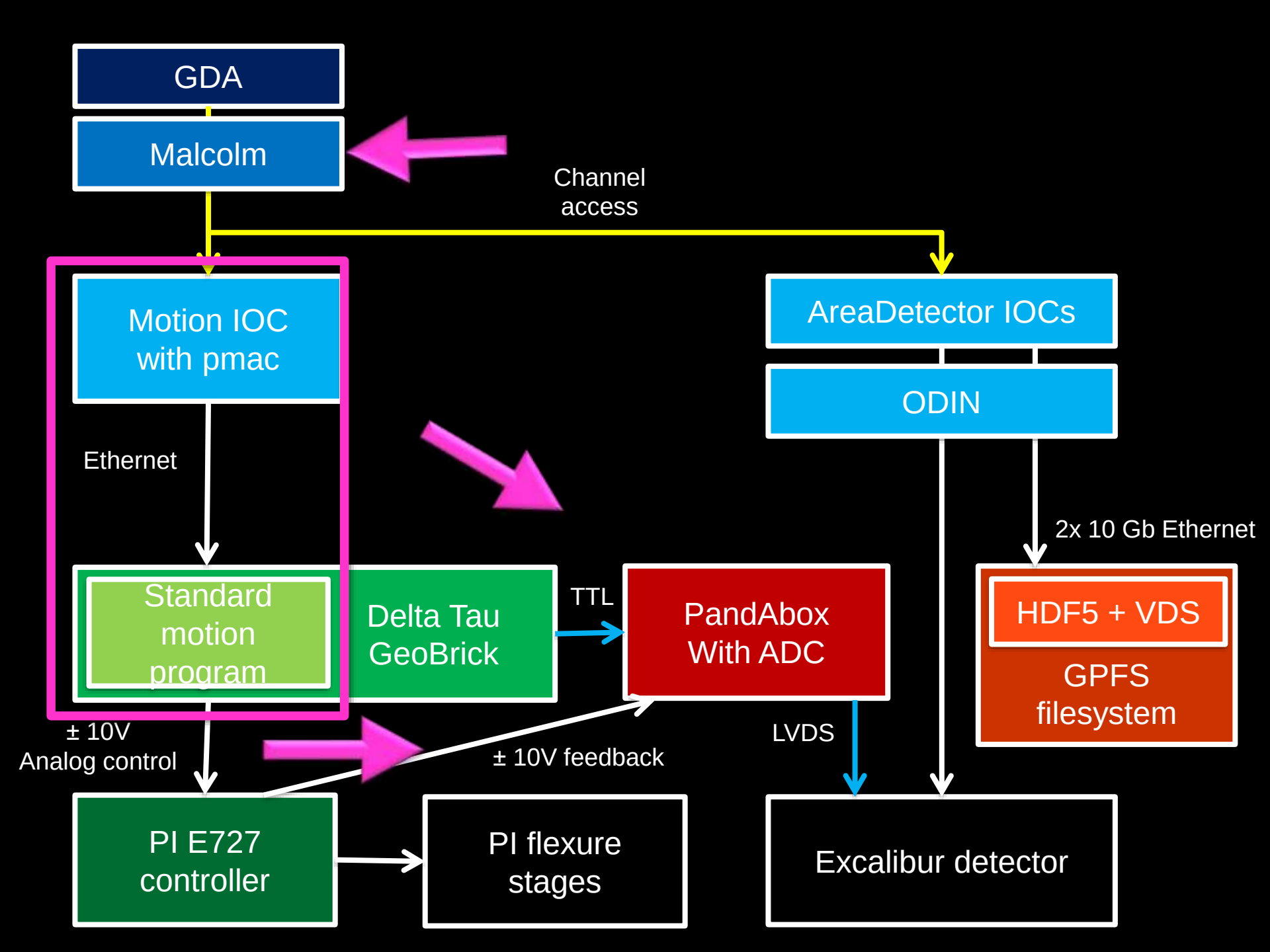

GDA
Custom Jython script
Channel access
Motion IOC
AreaDetector IOCs
Ethernet
2x 10 Gb Ethernet
Custom motion program
Delta Tau GeoBrick
TTL
Zebra
HDF5 + VDS
GPFS filesystem
LVDS
Step & direction
SmarAct SDC2 controller
SmarAct XYZ slip-stick stages
Excalibur detector

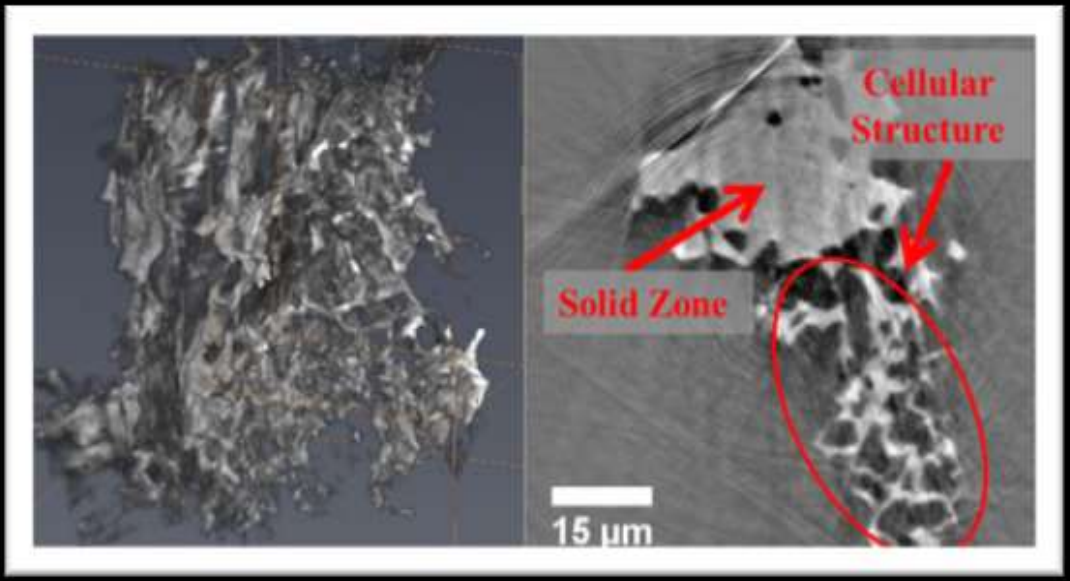
STAGE PERFORMANCE AND DETECTOR RELIABILITY


GDA
Custom Jython script
Channel access
Motion IOC
AreaDetector IOCs
Ethernet
2x 10 Gb Ethernet
Custom motion program
Delta Tau GeoBrick
TTL
Zebra
HDF5 + VDS
GPFS filesystem
± 10V Analog control
LVDS
PI E727 controller
PI flexure stages
Excalibur detector


GDA
Custom Jython script
Channel access
Motion IOC
AreaDetector IOCs
ODIN
Ethernet
2x 10 Gb Ethernet
Custom motion program
Delta Tau GeoBrick
TTL
Zebra
HDF5 + VDS
GPFS filesystem
± 10V Analog control
LVDS
PI E727 controller
PI flexure stages
Excalibur detector

MAKE IT WORK WITH COMMON FRAMEWORK


GDA
Malcolm
Channel access
Motion IOC with pmac
AreaDetector IOCs
ODIN
Ethernet
2x 10 Gb Ethernet
Standard motion program
Delta Tau GeoBrick
TTL
PandAbox With ADC
HDF5 + VDS
GPFS filesystem
± 10V Analog control
± 10V feedback
LVDS
PI E727 controller
PI flexure stages
Excalibur detector



Nanocellular polymer sample, showing a 3D rendering (left) and a single reconstructed slice (right). (Courtesy of S. Perez)

Bumblebee wing. 100 x100 µm FOV (Courtesy D. Eastwood)

Thank you

Acknowledgements

J13 Beamline Team

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Controls & Data Acquisition

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Motion Control & Electrical Tec

Lee Hudson, Nico Rubies, Russell Marshall

Detector Group

Scott Williams

References

Pmac support module
https://github.com/dls-controls/pmac

Pymalcolm
https://github.com/dls-controls/pymalcolm

PandaBox
http://quantumdetectors.com/pandabox/

ODIN detector framework
https://github.com/odin-detector

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