

WP-76

XFEL Project Progress Report (1-2012)

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Comparison of forecasted and achieved progress: Jan. 12 \rightarrow Mar. 12



- PSP 20+30) DAQ and Data Management computing, storage and s/w
 - s/w (on schedule)
 - → First release of C++/Python Boost based s/w framework made
 - → Now testing h/w (MPOD HV/LV, LPD, Timing Sync...) and s/w (PC layer...) devices
 - PyQt GUI first release made, integration with h/w and s/w devices started
 - HDF5 API developed and detector data format issues being addressed
 - → Large amount of "other" work: Alfresco (K.Wrona)...
 - Computing and storage slice test (on schedule)
 - Computing, storage and 10GE h/w for slice test (vertical slice of DAQ and DM systems from online Front End Interface to offline compute and storage ordered
 - Network and compute systems delivered, setting up started in DESY CC
 - Storage h/w expected soon
 - → Slice test aim : prove s/w and DAQ/DM architecture decisions
- **PSP 40)** Beamline DAQ: control for optics, diagnostics and laser
 - Optics and diagnostics (on schedule)
 - Beckhoff PLC h/w and f/w development continuing
 - Commercial camera station and DAQ requirements defined (WP74), PES follows
 - Laser (delayed)
 - → Specification of s/w interface stalled waiting for s/w release, now restarted

XFEL PBS homogeneous s/w framework



Purpose – provide a single s/w environment for control, DAQ, DM and SC(analysis)

Solution – standards

- Proper standardization results in modular, scalable and homogeneous software
- use C++ / Boost / Python / PyQt as core technologies
- Do not re-invent the wheel, use high quality libraries: Boost (shared_ptr, any, msm, function, asio), PyQt, OpenMQ, Log4cpp, Clmg, etc.

Issues of specific interest for control and DAQ

- s/w or h/w instances to control are called Devices = plugins created by factories in Device servers
- communication: use MOM broker (OpenMQ now) and p-2-p for large volume data transfer
- configuration and reconfiguration: XML and XSD (i.e. self-describing) driven (cmd line, file, DB)
- flow control: all devices are FSM enabled (message event driven)

Implementation – status

- first s/w release mid-March contains complete toolkit set
- Devices for h/w (MPOD, Beckhoff...) and s/w (PC layer, Data feeders...) online
- Generic GUI integration in progress

Outlook

- Final DB design and update of s/w API
- Upgrades driven by requirements (OpenMQ to ZeroMQ?)

XFEL PBS GUI development

First time shown!

- generic, multi-purpose, cross-platform GUI
- remote control
- self explaining, default layout for any device
- highly customizable user panels
- Fully integrated with s/w framework
 - many features not described
- Widgets are plugins 3rd party ones can be used with a simple wrapper (e.g. Taurus?)

Generic GUI

- Framework XML and XSD usage = self description
- Configuration attributes immediately seen
- Device driven no code generation

Outlook

- FSM visualization
- user-role driven (database)









XFEL Generic GUI view of MPOD HV/LV device (1/2)



Full Implementation chain: s/w framework + GUI + Device + HV/LV h/w

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XFEL Generic GUI view of MPOD HV/LV device (2/2)

XFEL PBS control and DAQ h/w solutions

Standards for DAQ and control

- MTCA.4 crate board: remote operation, RTM signal conditioning
- FPGA processing: data reduction/rejection and VETO generation/receiving (low latency SFP)
- 10Gbps data streaming; 1 Gbps low latency feedbak (VETO)
- DAQ and laser timing from e-machine solutions

DAQ "clock and control" MTCA.4 sequencing board development

- 16 modules = 1 Mpxl
- One fast signal sequencing link / module (or quadrant)

DAQ "train builder" ATCA readout board development

- collect image fragments from modules (10 Gbps links)
- reorganize into complete trains of pulse ordered images (cross-point)
- data processing in FPGA remove empty, no ROI… frames
- send trains Round-Robin to PC layer (10 Gbps links)
- Multi board train builder installation should satisfy 4Mpxl camera demands in 2015

MTCA.4 Fast ADC and Digitizers

- Use SIS 8300 as standard in use with e-machine groups
- Digitizer SP Devices AB family MTCA.4 and DAQ update







Prototype train builder ATCA board (STFC)

	Device	Characteristics	Provider	Usage
	Fast ADC	125 MHz, 16 bit	www.struck.de	4.5Mz shaped signals: APD, BSD
Standard XFEL Digitizer selected	Digitizer	1-7 GS/s, 14-8 bit	www.spdevices.com	eTOF, iTOF, VMI

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XFEL PBS Test slice – h/w setup in DESY-CC



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PSP 50) Experiment DAQ and electronics development (on schedule)

- Selection of high performance digitizer completed, addition design features (10Gbps data streaming and SFP low latency links) for XFEL specified, contract approved.
- Further development of Struck 8300 fast ADC MTCA.4 single crate DAQ system (FPGA f/w and s/w device integration) in preparation for WP81 beamline tests.
- VETO system "final" specification completed, needs OK from camera and other subsystem developers
- Establishing a collaboration with DataXpress collaboration to investigate VETO and DAQ performance using CFEL LCLS data.
- Commercial and webcam work started with WP74 (by A.Parenti new to WP76)

PSP 60) Pixel DAQ and electronics development

- Received the HV and LV specification from AGIPD (did not change)
- Did not receive the interlock specification from AGIPD (not critical)

XFEL 2D Synchronizer and train builder prototypes





2D synchronizer MTCA.4 RTM



Bare Train builder ATCA without:

- 10Gbps FMCs
- Memory boards

DAMC2 MTCA.4 frontend





- PSP 70) Pixel electronics development
 - 2D camera synchronization board (UCL contract on schedule)
 - Prototype of 2D camera synchronizer (Clock and Control) delivered, test phase started, no unexpected issues.
 - Train Builder readout board (STFC contract on new schedule)
 - Prototype of 2D camera DAQ board (Train Builder) delivered, smoke and power testing started.
- PSP 80) Control system interfaces
 - DOOCS
 - Interfacing to machine control system discussion started
 - Detail planning following ACC2012 control session
 - See control workshop summary talk of Kay
 - Undulator
 - → Requires DOOCS gateway work.

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PSP 90) Infrastructure

- Specification of Beckhoff and DAQ systems for use in SPB nearly complete, based on SPB + SFX implementation. Product are space, power, connectivity requirements required for hutch planning.
- Tunnel rack usage planning (WP73, WP74...)

PSP 99) Manpower

- Additional manpower hired:
 - → DB developer database content and API,
 - → PLC and control developer slow control,
 - Detector s/w+h/w integrator commercial and web cams,
 - Installation and cable data base technician advertised



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- s/w specification of laser API delayed
 - Reason: waited for first release of s/w
 - Impact: API delayed





- Initial results from vertical slice test to prove DAQ and DM architecture, capability of handling maximum rates, etc.
- Field tests of first s/w release with h/w: AGIPD HV+LV tests system, APD single crate DAQ system...
- If 2D camera DAQ board arrives tests in slice tests and with the sequencer in preparation for first camera 2D camera sub-modules
- Preparation of Beckhoff control for pnCCD system being developed by WP75
- Tunnel rack assignment and input to specification
- Integration of additional h/w devices into s/w framework: LPD, TB, CC...
- Further development of s/w framework
- Organization of a data rejection/compression/VETO workshop in the fall

...



XFEL WP schedule and critical path



- Review of installation schedule with other photon system WPs is needed.
- Update of the 2009 computing TDR needed was planned for 2011, but need to include experiment CDR input.



Scheduling of installation and commissing