Experiment monitoring

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OLYMPUS

Collaboration Meeting Januar 2012

Massachusetts Institute of Technology

Topics

- Monitoring of the experiment status (aka Slow Control)
- Online Monitoring of DAQ and data

Slow control: overall design

- Was intermediate solution for controlling the target during test experiment.
- Extended to be complete? solution.
- Backend: EPICS on otarget and ochamber, talks to hardware, pseudo HW (VME-HV server by Jürgen Diefenbach).
- Middleware/Data persistency: Postgres Database, python scripts.
- Frontend: Python scripts / web site with javascript.

Backend

- EPICS does server discovery, channel subscription, alarms, HW.
- No persistency, data is momentous.
- Runs on
  - otarget: VME CPU below experiment, target control
  - ochamber: VME CPU below electronics hut, everything else
- Over 3000 channels as of now.

Channels: otarget

- Target:
  - Temperatures
  - Flow (setpoint, actual)
  - Gas cart valves
- Beam line
  - Pressure
  - Valves
  - Pump state
- Interlock of Target/Beam line system

Channels: ochamber (1)

- Wire Chamber
  - Valve state
  - Gas flow
  - Pressures
  - Temperatures
- Toroid
  - SPS:
    - Inflow Temperature
    - Outflow Temperature
    - Current (questionable?)
    - Alarm state
  - Tine:
    - Current setpoint
    - Current actual value (both including sign)

Channels: ochamber (2)

- Doris (via tine)
  - Beam current
  - Avg. pressure in Doris
  - Pressure close to Olympus upstream/downstream
  - Temperatures
  - Beam position (from two BPMs, x/y)
- MWPC from SPS
  - Temperatures
- SM:
  - Position

Channels: ochamber HV

- Talks via serial to LeCroy, TCP/IP to Jürgen's server
- For every channel:
  - Demand voltage
  - Measured voltage
  - Trip current
  - Ramp up/down
  - State
  - Channel enabled
  - For Caen: Temperature
- So far: WC, ToF, SM, LumiGEM
- Prepared: MWPC

Channels (not sent to DAQ)

- ToF Scalers
- SM Scalers
- Experiment/Trigger Scalers

Both are updated on the web page every second and written every 30 seconds to the DB. Not written in DAQ stream since DAQ reads the same information directly.

Middleware

- Python scripts talk to epics, fill databases, sends some data to TINE (DESY)
- Database replicated to oservice, oweb and olympus
- DAQ reads status from oservice, slow control data mixed into data stream
- Frontend on oweb talks to DB on oweb, Monitoring and control, inside DESY
- Frontend on olympus.desy.de accessible from outside, only monitoring

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- Web based, Java script.

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- Single Overview webpage with low resource usage for quick monitoring.
- Detailed, java script heavy, pages for control, detail monitoring.

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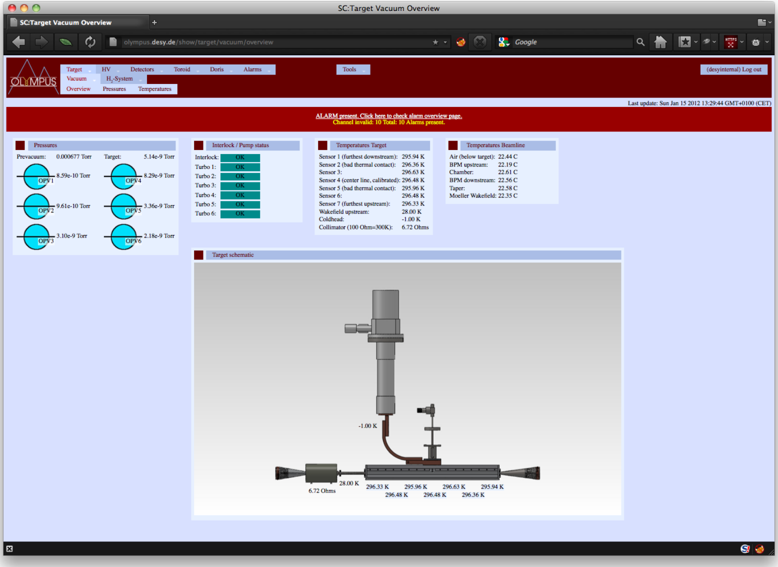
- Single Overview webpage with low resource usage for quick monitoring.
- Detailed, java script heavy, pages for control, detail monitoring.
- Web page design flexible. Send me your wishes.
- Can define different users with different rights.

Target Overview



Last update: Sun Jan 15 2012 13:29:44 GMT+0100 (CET)

ALARM present. Click here to check alarm overview page.
Channel invalid: 10 Total: 10 Alarms present.

Pressures

Prevacuum:	0.000677 Torr	Target:	5.14e-9 Torr
OPV1	8.59e-10 Torr	OPV4	8.29e-9 Torr
OPV2	9.61e-10 Torr	OPV5	3.36e-9 Torr
OPV3	3.10e-9 Torr	OPV6	2.18e-9 Torr

Interlock / Pump status

Interlock:	OK
Turbo 1:	OK
Turbo 2:	OK
Turbo 3:	OK
Turbo 4:	OK
Turbo 5:	OK
Turbo 6:	OK

Temperatures Target

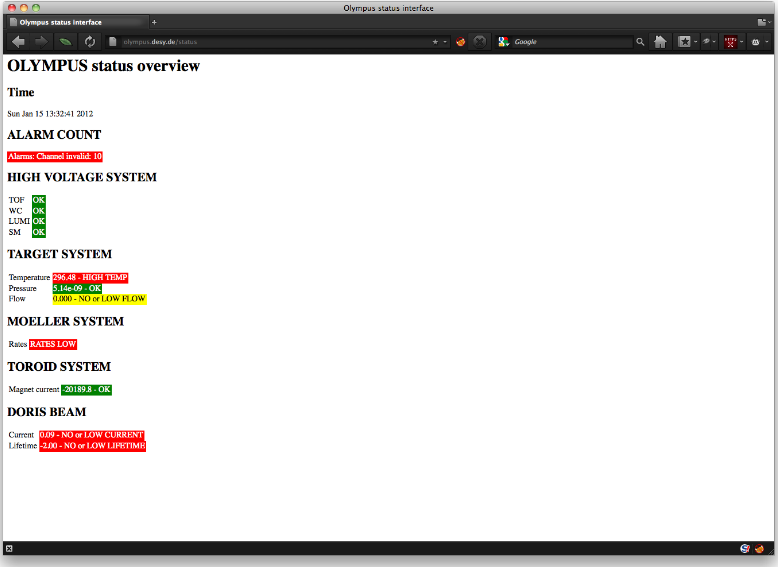
Sensor 1 (furthest downstream):	295.94 K
Sensor 2 (bad thermal contact):	296.36 K
Sensor 3:	296.63 K
Sensor 4 (center line, calibrated):	296.48 K
Sensor 5 (bad thermal contact):	295.96 K
Sensor 6:	296.48 K
Sensor 7 (furthest upstream):	296.33 K
Wakefield upstream:	28.00 K
Coldhead:	-1.00 K
Collimator (100 Ohm=300K):	6.72 Ohms

Temperatures Beamline

Air (below target):	22.44 C
BPM upstream:	22.19 C
Chamber:	22.61 C
BPM downstream:	22.56 C
Taper:	22.58 C
Moeller Wakefield:	22.35 C

Target schematic

Simple Status page



OLYMPUS status overview

Time

Sun Jan 15 13:32:41 2012

ALARM COUNT

Alarms: Channel invalid: 10

HIGH VOLTAGE SYSTEM

TOF	OK
WC	OK
LUMI	OK
SM	OK

TARGET SYSTEM

Temperature	296.48 - HIGH TEMP
Pressure	5.14e-09 - OK
Flow	0.000 - NO or LOW FLOW

MOELLER SYSTEM

Rates	RATES LOW

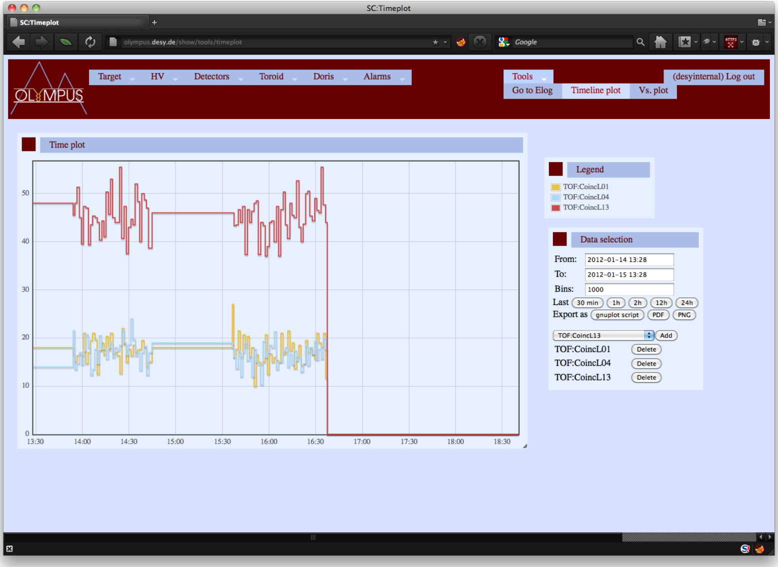
TOROID SYSTEM

Magnet current	-20189.8 - OK

DORIS BEAM

Current	0.09 - NO or LOW CURRENT
Lifetime	-2.00 - NO or LOW LIFETIME

Time plot



From: 2012-01-14 13:28

To: 2012-01-15 13:28

Bins: 1000

TOF:CoincL13

Online data quality monitoring

- Need SIMPLE plots for all aspects
  - Detectors
  - Trigger
  - DAQ
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  - Plugin/Histogram for Explora
    - For most people not possible, has to be implemented by DAQ group.

Online data quality monitoring

- Need SIMPLE plots for all aspects
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- Two possibilities:
  - Plugin/Histogram for Explora
    - For most people not possible, has to be implemented by DAQ group.
  - Plugin for OCooker
    - Slightly slower.
    - Same framework as cooker.
    - Can be tested with Visual Cooker.

Non exhaustive list of ideas

- Trigger: Trigger pattern, Raw Rates, Prescaled Rates
- DAQ: Dead time, Event size
- ToF: Hits/bar, left vs. right, TDC spectra, ADC spectra
- WC: Wire multiplicity, hit multiplicity, wire maps,...
- MWPC: wire maps, multiplicity, etc... (implemented in own system?)
- LumiGEM: Maps, multiplicity, ...
- SM: Luminosity, 2D histos, ...
- SlowCtrl: Presence of data, Lumi, ...

This has to be provided by the detector groups BEFORE FRIDAY.