Data Acquisition Software Status

L. Mirabito

IPN Lyon, IN2P3, CNRS

February 9, 2011

Plan

1. Some reminder on XDAQ
2. DHCAL Online DAQ Status
3. Process control an User Interface
4. Configuration DataBase
5. Online DAQ futur developments

XDAQ processes

XML declaration of each web server

```
<xc:Context url="http://lyoac20:10000">
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Started with:

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/opt/xdaq/bin/xdaq.exe -c myconf.xml -h lyoac20 -p 10000
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XML declaration of each application (web service) load in the Context

```
 <!-- DIF supervisor #0-->
    <xc:Application class="DIFSupervisor" id="30" instance="0"  network="local">
 <properties xmlns="urn:xdaq-application:DIFSupervisor" xsi:type="soapenc:Struct">
<UseBackup xsi:type="xsd:boolean">false</UseBackup>
<UseShm xsi:type="xsd:boolean">true</UseShm>
<UseCCC xsi:type="xsd:boolean">true</UseCCC>
<UseDB xsi:type="xsd:boolean">false</UseDB>
<ASICType xsi:type="xsd:integer">2</ASICType>
<ASICHeaders xsi:type="xsd:string">1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48</ASICHeaders>
<DIF_Identifier xsi:type="xsd:string">FT101002</DIF_Identifier>
      </properties>
    </xc:Application>
...
<!-- Library to load -->
 <xc:Module>/data/online/opt/dhcal/lib/libDIFSupervisor.so</xc:Module>
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SOAP access to the application

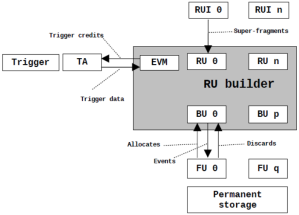
- Setting and reading of exported parameters
- Control of the application via command (State Machine)

The CMS Event Builder

See http://cms-ru-builder.web.cern.ch/cms-ru-builder/RUBUILDER_G_V1_6_0.doc

Aysnchronous collection of data source corresponding to the same trigger.

- One trigger is seen
- Each R*eadout*U*nit*I*nput* collects its fragments and pushes it to the RU
- The T*rigger*A*ccepter* sends trigger data to the EV*ent*M*anager*
- The **EVM** sends an event Id to the **B***uilder***U***nit* that will request its first buffer to each **RU** and build the event
- The event is sent to the registered **F***ilter***U***nit* that can make data coherence checks, analysis and data storage



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LDA Integration

Low Level driver

- Driver developped at LLR (D.Decotigny,N.Roche)
- SLC5 installation tested successfully at IPN
- Firmware development ongoing (Slow control OK, HR2 R/O soon)

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LDASupervisor (C.Combaret)

- XDAQ integration of LDA driver
- First prototype tested. Waiting for new firmware to complete the integration

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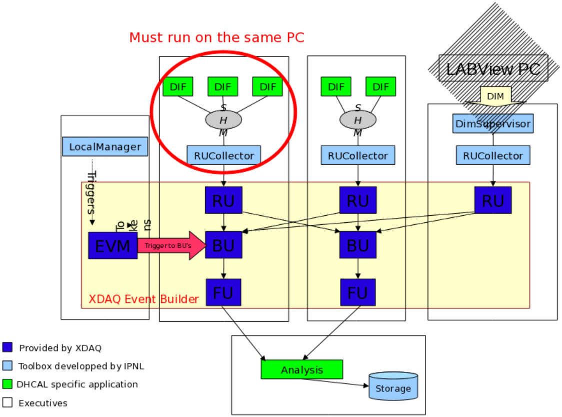
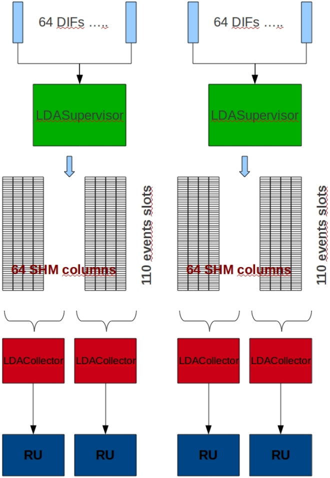
Integration in the Event Builder (L.M)

- New LDACollector for multi-dif readout
- File-based LDAEmulator
- Performances test

Reminder: The USB DIF case



The LDA Readout case



The LDAEmulator

Goal

1. Application generating up to 64 DIF events blocks
2. Realistic data : Read from data file

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Implementation

- XDAQ application reading cosmic test data file and duplicating DIF blocks in 64 DIFs
- New share memory structure to handle up to 64 DIFs
- Flexible RU interface: LDACollector handling 1 to 64 DIFs Shm columns

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Performances

- 2 LDAEmulators on 2 PCs, 2x2 LDACollectors, 4 RU-BU-FU
- 7 DIFs (TOMUVOL data) duplicated 9 times on each PCs
- Stable running: 800 Hz, 230 Mb/s

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Job Control

- XDAQ daemon started at boot time
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User Control: Python package using SOAP messages

- Parsing of the configuration file
- XDAQ process control (executives creation/destruction)
- Parameters and State Machine control
- Full access to histograms (XML messages+ PyROOT package)

Graphical User interface

Technical

PyQt package interfacing the python package written to control process. Monitoring ROOT histograms are accessible via a simplified browser and ROOT Canvas are created allowing data manipulation (Fit,rebin...)

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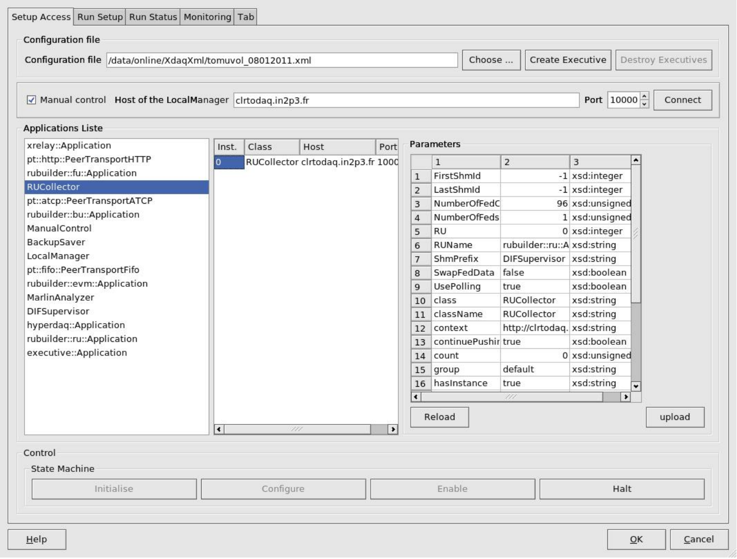
Deployment and Access

- Python-Root-PyQt (3) has to be installed (PyQt4 will allow x-platform installation)
- Remote access behind firewall using SOCKS
- Possibility to connect to a running DAQ
- Usual web access still available

Setup Access



Configuration file

Configuration file /data/online/XdaqXml/tomuvol_08012011.xml

☑ Manual control Host of the LocalManager clrtodaq.in2p3.fr Port 10000

Applications Liste

- xrelay::Application
- pt::http::PeerTransportHTTP
- rubuilder::fu::Application
- RUCollector
- pt::atcp::PeerTransportATCP
- rubuilder::bu::Application
- ManualControl
- BackupSaver
- LocalManager
- pt::fifo::PeerTransportFifo
- rubuilder::evm::Application
- MarlinAnalyzer
- DIFSupervisor
- hyperdaq::Application
- rubuilder::ru::Application
- executive::Application

Inst.	Class	Host	Port
0	RUCollector	clrtodaq.in2p3.fr	1000

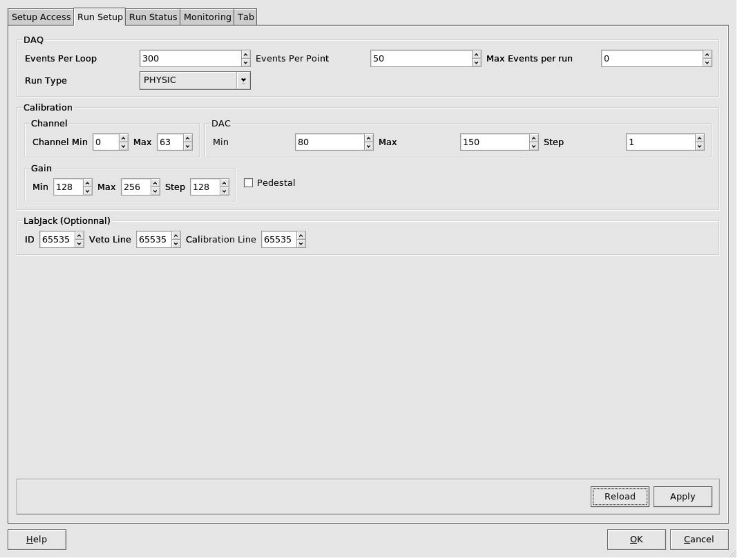
Parameters

	1	2	3
1	FirstShmId	-1	xsd:integer
2	LastShmId	-1	xsd:integer
3	NumberOfFedC	96	xsd:unsigned
4	NumberOfFeds	1	xsd:unsigned
5	RU	0	xsd:integer
6	RUName	rubuilder::ru::A	xsd:string
7	ShmPrefix	DIFSupervisor	xsd:string
8	SwapFedData	false	xsd:boolean
9	UsePolling	true	xsd:boolean
10	class	RUCollector	xsd:string
11	className	RUCollector	xsd:string
12	context	http://clrtodaq.	xsd:string
13	continuePushir	true	xsd:boolean
14	count	0	xsd:unsigned
15	group	default	xsd:string
16	hasInstance	true	xsd:string

Control

State Machine

Run Settings



DAQ

Events Per Loop 300
Events Per Point 50
Max Events per run 0
Run Type PHYSIC

Calibration

Channel
Channel Min 0
Max 63

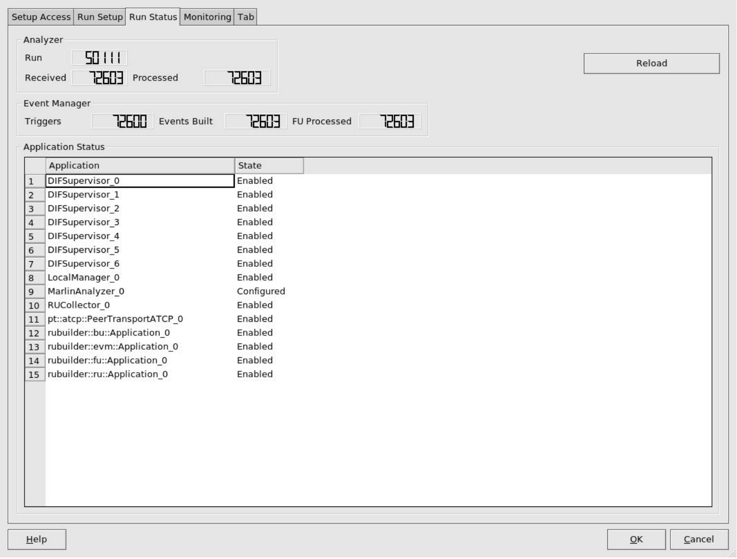
DAC
Min 80
Max 150
Step 1

Gain
Min 128
Max 256
Step 128

□ Pedestal

LabJack (Optionnal)
ID 65535
Veto Line 65535
Calibration Line 65535

Run Status



Analyzer

Run 50111

Received 72603 Processed 72603

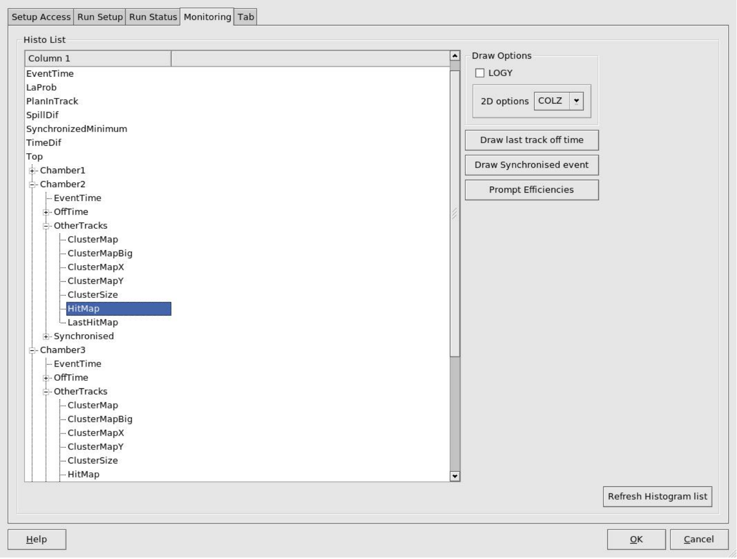
Event Manager

Triggers 72600 Events Built 72603 FU Processed 72603

Application Status

	Application	State
1	DIFSupervisor_0	Enabled
2	DIFSupervisor_1	Enabled
3	DIFSupervisor_2	Enabled
4	DIFSupervisor_3	Enabled
5	DIFSupervisor_4	Enabled
6	DIFSupervisor_5	Enabled
7	DIFSupervisor_6	Enabled
8	LocalManager_0	Enabled
9	MarlinAnalyzer_0	Configured
10	RUCollector_0	Enabled
11	pt::atcp::PeerTransportATCP_0	Enabled
12	rubuilder::bu::Application_0	Enabled
13	rubuilder::evm::Application_0	Enabled
14	rubuilder::fu::Application_0	Enabled
15	rubuilder::ru::Application_0	Enabled

Monitoring

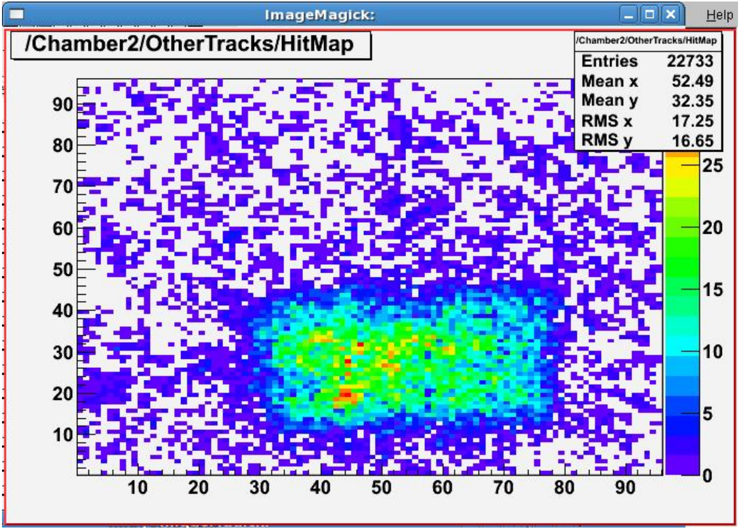


```
EventTime
LaProb
PlanInTrack
SpillDif
SynchronizedMinimum
TimeDif
Top
 + Chamber1
 - Chamber2
     EventTime
   + OffTime
   - OtherTracks
       ClusterMap
       ClusterMapBig
       ClusterMapX
       ClusterMapY
       ClusterSize
       HitMap
       LastHitMap
   + Synchronised
 - Chamber3
     EventTime
   + OffTime
   - OtherTracks
       ClusterMap
       ClusterMapBig
       ClusterMapX
       ClusterMapY
       ClusterSize
       HitMap
```

□ LOGY

2D options COLZ

ROOT Access



/Chamber2/OtherTracks/HitMap

Entries	22733
Mean x	52.49
Mean y	32.35
RMS x	17.25
RMS y	16.65

Futur developments

Issue with the current version

- Process control runs on 1 place only (multiple process access)
- XML description of the application boring and proned to bug
- GUI deploiement on Linux only

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Control DB

- Software description
- Configuration description
- Running Configuration entry + process id's to allow remote handling of the run.

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QT4 migration

Migrate the GUI to PyQT4: Windows and MACos full support

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Two steps development

Currently, SQLITE

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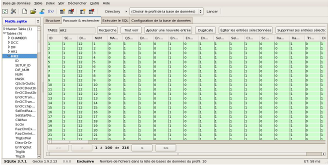

TABLE HR2

ID	SE...	DI...	NUM	MA...	QS...	En...	En...	En...	En...	En...	Sel...	Sel...	Cl...	Sc...	Ra...	Ra...	Tri...	Di
1	1	12	1	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
2	1	12	2	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
3	1	12	3	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
4	1	12	4	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
5	1	12	5	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
6	1	12	6	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
7	1	12	7	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
8	1	12	8	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
9	1	12	9	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
10	1	12	10	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
11	1	12	11	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
12	1	12	12	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
13	1	12	13	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
14	1	12	14	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
15	1	12	15	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
16	1	12	16	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
17	1	12	17	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
18	1	12	18	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
19	1	12	19	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
20	1	12	20	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
21	1	12	21	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
22	1	12	22	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1

1 à 100 de 216

SQLite 3.7.1 Gecko 1.9.2.13 0.6.8 Exclusive Nombre de fichiers dans la liste de bases de données du profil: 10 ET: 58 ms

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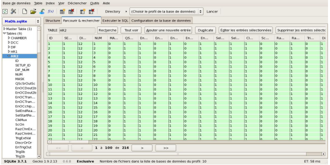

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4	1	12	4	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
5	1	12	5	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
6	1	12	6	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
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12	1	12	12	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
13	1	12	13	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
14	1	12	14	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
15	1	12	15	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
16	1	12	16	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1
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Final version:ORACLE (G.Beaulieu)

- Keep full history (versions) of all parameters sets
- Multi-partitions
- Run database
- Interface to XDAQ via sqlite generated file

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Analysis: Current Status and issues

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- All Filter Unit's provide their data to one *MarlinAnalyzer* responsible for data formatting and monitoring
- Two data collections stored: *RU_XDAQ* (raw) and *DHCALRawHits*
- All noise frames kept: Possible huge data size

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Monitoring

- One unique monitoring processs (*MarlinAnalyzer*) handling all events
- Large number of Histograms per chamber: well-suited for few chambers beam test or comsic data taking. Not scalable at m^3 level

Hints for larger systems

Data Storage (March 2011)

- Distributed *MarlinAnalyzer's* on all PC's. Run file splitted.
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Monitoring and Event Display (LLR+IPNL May 2011)

- Keep only DAQ related monitoring histograms in the *MarlinAnalyzer*
- Build a (non-XDAQ) publish-subscribe mechanism in the *MalinAnalyzer* to distribute events on request
- Independant monitoring MARLIN process requesting events
- Possible DRUID event display using the same mechanism