

Monitoring tools of COMPASS experiment at CERN

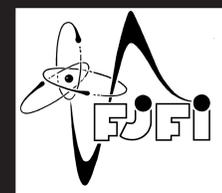
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Introduction

Nowadays, all modern high energy physics experiments are substantially dependent on fast and reliable data acquisition systems that are able to collect large quantities of data supplied by various detectors. The COMPASS is a high energy particle experiment with a fixed target located at the SPS of the CERN laboratory in Geneva, Switzerland. This poster briefly introduces the data acquisition system of the COMPASS and is mainly focused on the part that is responsible for the monitoring of the nodes in the whole newly developed data acquisition system of this experiment.

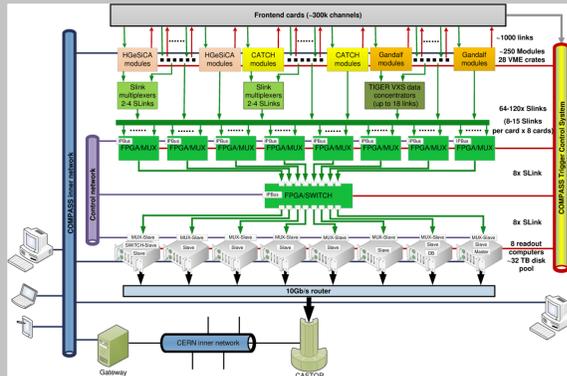
DAQ overview

Upgrade of the old DAQ

- ▶ Obsolete PCI technology
- ▶ Insufficient capacity and speed

FPGA cards

- ▶ Field-programmable gate array
- ▶ Load balancing, buffering (ROB) (18 GB/30s)
- ▶ Event building



Message Browser

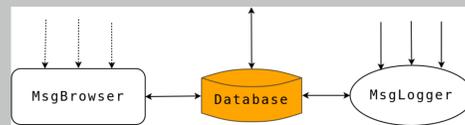
UI Design of the Message Browser application

- ▶ Qt GUI Application
- ▶ Displays messages from the database
- ▶ Receives new messages via network
- ▶ Communicates via DIM library
- ▶ Independent from the other parts of DAQ (case of accident, ...)
- ▶ MVC design pattern



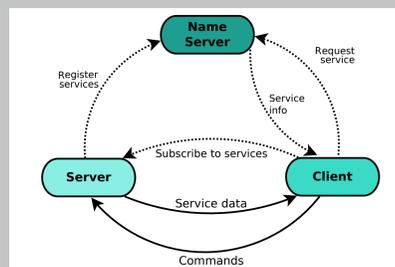
Message Logger

- ▶ Simple console application
- ▶ Receives messages via network (DIM library)
- ▶ Relevant messages are stored into the database



DIM Library

- ▶ A communication library originally developed for CERN
- ▶ Based on the client/server paradigm
- ▶ Extended by DNS (Dim Name Server)
- ▶ Service is a basic communication tool
- ▶ Service can contain data of any size
- ▶ Server - publishes services
- ▶ Client - subscribes to services, controls servers using commands



Filtering

Column selector

ID Sender Run Spill Event Message

ID	Sender	Run	Event	Message
274	test2 (17)	100	102	Query test
275	test2 (18)	100	102	Query test
276	test2 (18)	100	102	Query test
277	test2 (17)	100	102	Query test
273	test (16)	29	85	moje entry join
241	Test003 (3)	27	5	moje entry
242	Test003 (3)	27	6	moje entry
243	Test003 (3)	27	7	moje entry

Filter settings

From - To: 2014 07 29 10:56:09 - 2014 07 30 10:56:09

Messages, Page: 1000 / 1

APPLY FILTER

Message filter

Sender

Severity

Run number

Exact: Current 1000

Range: From 1000 To 1500

Spill number

Exact: 55

Range: From 25 To 55

Event number

Exact: 5

Range: From 3 To 6

Severity filter

Severity

Other

Info

Warning

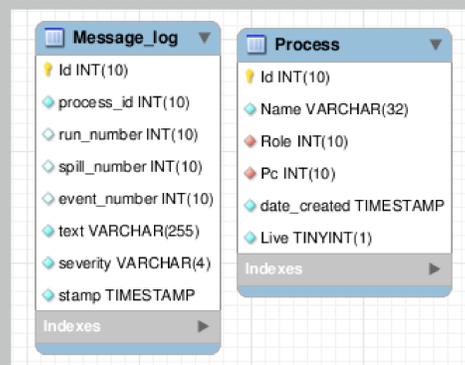
Error

Fatal Error

Check All / Uncheck All

Database

- ▶ Message log - the largest table inside the DAQ database
- ▶ MyISAM storage engine - optimized for heavy read operations
- ▶ Only one foreign key - referential integrity is to be kept programmatically
- ▶ Currently stamp column is indexed for faster ordering
- ▶ Other tables - InnoDB storage engine (foreign key support for referential integrity)



Acknowledgement

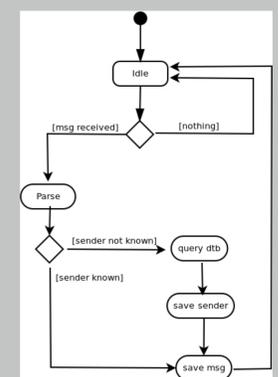
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References

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- [4] M. Bodlak, V. Frolov, V. Jary, S. Huber, I. Konorov, D. Levit, A. Mann, J. Novy, S. Paul, and M. Virius: New data acquisition system for the COMPASS experiment
- [5] M. Bodlak, V. Jary, J. Novy, J. Tomsa, M. Virius: Reporting Tool for the Data Acquisition System Ostrava, IT for Praxis, 2014

Online Mode

- ▶ Receives messages immediately from network
- ▶ No need to poll the database for new messages
- ▶ Usage of DIM library
- ▶ The same principal as in the MsgLogger, but the messages are only displayed, not stored to the database



Tests

- ▶ Repeated loading of messages
- ▶ 100-50 000 messages loaded 100 times in a row
- ▶ Time needed to save the data into the data structure
- ▶ Time needed to complete the whole task
- ▶ Tests rerun at least 10 times.
- ▶ Storing of 100 msgs - 1.17 ms
- ▶ Loading of 100 msgs - 2.88 ms

