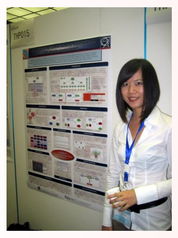
ACEOLE Project

Data Acquisition, Electronics, and Optoelectronics for LHC Experiments

ACEOLE
www.cern.ch/aceole

Yi Ling HWONG 方奕羚

Biography
Age: 27
Nationality: Malaysian
Education: Master of Engineering in Power Engineering
Interests: Music, Travel, Reading, Writing, Science, Salsa
Fellow since: 1st December 2008

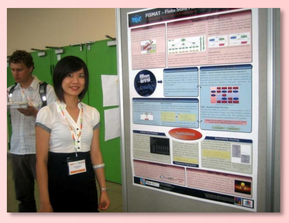


Trainings:

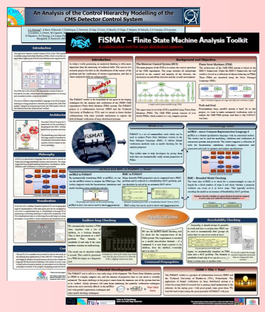
I. Formal Training Courses
1. Oracle SQL course
2. PVSS JCOP Framework course and FSM course
3. JAVA Level 1

II. Complementary Training Courses
1. Professional French course level 2, level 3, level B1
2. Presentation course (How to make a poster)
3. Confidence Building course – Leaders in Science, Learning from Experience

III. Conferences
1. Computing in High Energy Physics Conference (CHEP09)
2. Real Time Conference (RT2009)
3. International Conference for Accelerator and Large Experimental Physics Control System (ICALEPCS09)
4. EuroScience Open Forum (ESOF) Marie Curie Conference 2010
5. Computing in High Energy Physics Conference (CHEP2010)

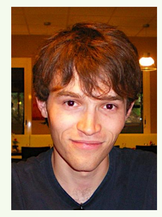


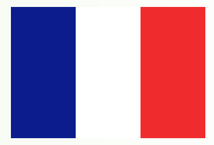
IV. Others
1. Lab instructor in the International School of Trigger and Data Acquisition (ISOTDAQ) in Ankara, Turkey
2. Supervision of student from the Technical University of Eindhoven: March – May 2010



Future plans:
I would like to expand my career in the field of Entrepreneurship and Project Management. I plan to attend courses in the Project Management Institute of Switzerland and get my certification as a project manager. And from there on, gain sufficient experience to eventually move on to entrepreneurial endeavors.

Jean-Christophe GARNIER 佐尼尔





Biography
Age: 25
Nationality: French
Education: Engineer in Computer Sciences and Mathematics
Interests: Guitar, Nature sports, Litterature, Latin dances
Fellow since: 1st October 2008

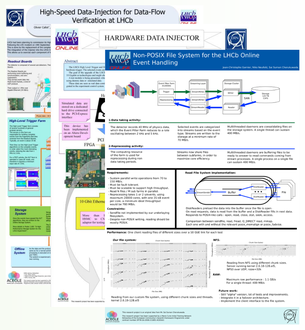
Trainings:

I. Formal Training Courses
1. Force10 Operating System Certification
2. Secure Coding in Python
3. Computer Architecture and Performance Tuning Workshop

II. Complementary Training Courses
1. Radiological Protection
2. German Course level B1
3. Presentation course (How to make a poster)
4. Confidence Building course – Leaders in Science, Learning from Experience

III. Conferences
1. Computing in High Energy Physics Conference (CHEP09)
2. Real Time Conference (RT2009)
3. Speed-Up Workshop 2009
4. Topical Workshop on Electronic for Particle Physics (TWEPP09)
5. Real Time Conference 2010
6. LHCb Weeks and LHCb Software Weeks
7. Planned : TWEPP and CHEP 2010

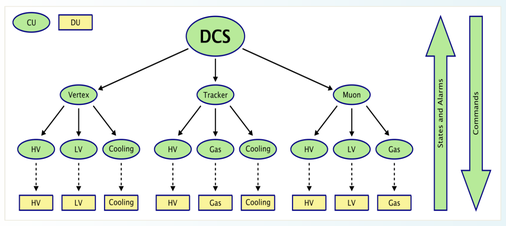
IV. Others
1. Lab instructor for CERN Summer Students
2. Guide in the LHCb Experiment
3. Author and peer-reviewer in the Transactions on Nuclear Sciences
4. Lab designer and instructor in the International School of Trigger and Data Acquisition (ISOTDAQ)
5. Supervision of interns and summer students 2009 and 2010
6. Presentation of CERN in Universities



Future plans:
Integrating the IT group of an industrial company and evolve as a project manager.

Where do I work?
I work for the Detector Control System of the Compact Muon Solenoid (CMS) experiment at CERN.

What is the Detector Control System?
The main purpose of the Detector Control System (DCS) is to ensure the correct operation of the CMS experiment. The scope of the DCS includes all subsystems involved in the control and monitor of the detector, its active elements, the electronics on and off the detector and the overall environment.



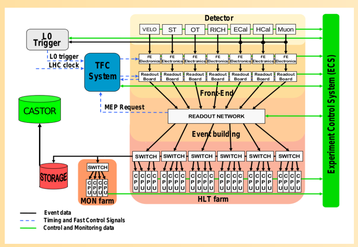
What is my project about?
I am given the task of developing an analysis tool for the Finite State Machine (FSM) system of the CMS experiment.

What are Finite State Machines?
Finite State Machines are automata used to model the control hierarchy of the Detector Control System.

What are the challenges of my project?
There are 30,000 FSM nodes in the CMS DCS. The diversity in the development philosophy of different sub-detector groups and the enormous amount of parameters to be monitored is a fundamental aspect of a large-scale experiment such as the CMS detector. The size and complexity of the system renders the development of an analysis tool a challenging task, and that was why FiSMAT was born.

Where do I work?
I work for the Online Group of the LHC beauty (LHCb) experiment at CERN.

What is the Online Group?
The Online System in LHCb comprises all aspects of online computing for data acquisition (DAQ), experiment controls, as well as the Timing and Fast Control. It provides the infrastructure for the data taking for the High Level Triggers, as well as the control, configuration and monitoring of the entire experiment.

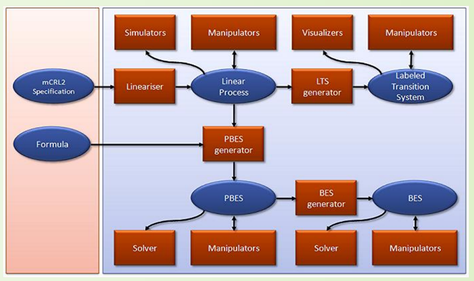


What is my work?
Engineer, Software Developer and System Administrator, my projects are various and they cover a wide range of skills and technologies. I notably implemented a Dataflow Emulator which permits large scale tests of the experiment systems. I am responsible for the data handling in our DAQ storage system, and I am working on the research of a next data acquisition system with new network technologies (InfiniBand and 10 Gigabit Ethernet).

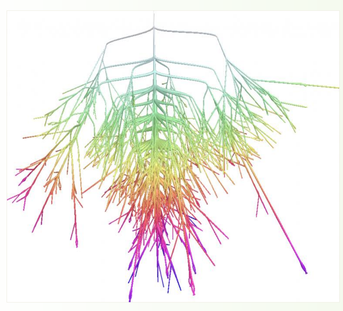
Next LHCb data acquisition system ?
The LHCb upgrade aims to read the detector at the full rate of 40 MHz. It would correspond to a bandwith of about 24000 Gb/s. Then the project consists in studying new technologies and to see if we can scale our current architecture to meet these new requirements, or if we should design a new architecture.

FiSMAT – The Finite State Machine Analysis Toolkit

What is FiSMAT?
The Finite State Machine Analysis Toolkit, or FiSMAT, is a set of commandline tools which can be used to analyse Finite State Machines written in the State Manager Language.



What are the technologies used in FiSMAT?
FiSMAT contains tools based on two technologies: the mCRL2 toolset and Bounded Model Checking (BMC).

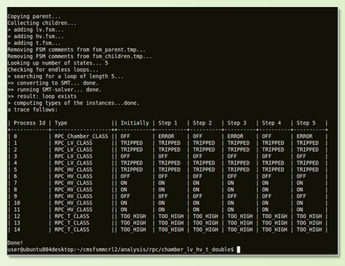


What is mCRL2?
mCRL2 (micro Common Representation Language 2) is a formal specification language with an associated toolset. The toolset can be used for modelling, validation and verification of concurrent systems.

How is mCRL2 applied in FiSMAT?
By (automatically) translating SML to mCRL2, we can use the mCRL2 toolset to analyse the FSM logic. The toolset supports tools for linearisation, simulation, state-space exploration and generation. FiSMAT uses mCRL2 for the verification of global properties of the FSM system, such as command and state propagation.

What is Bounded Model Checking (BMC)?
The basic idea of BMC is to check for a counterexample in runs of length for a fixed number of steps k and check whether a property violation can occur in k or fewer steps. This typically involves encoding the model as an instance of Satisfiability (SAT) problem.

What are the properties that can be verified with BMC?
BMC can be used for the verification of local properties. So far we have developed tools for the verification of endless-loops freedom, the reachability of states and that there are no states that can never be left.

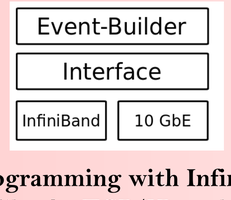


InfiniBand Event- Builder for Full Rate Detector Readout

What is InfiniBand?
InfiniBand is a bidirectional link with low latency and high bandwidth.. It is now famous for High Performance Computing (HPC) cluster implementations.

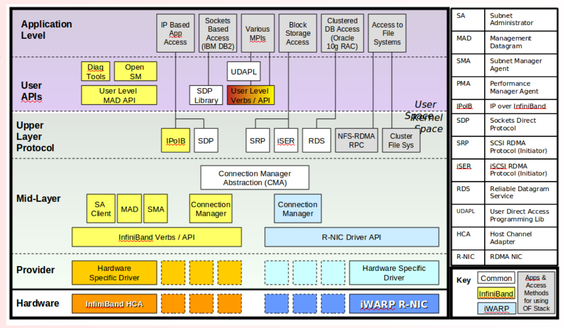
What is an Event-Builder?
An Event-Builder is a system which reads data (event fragments) coming from N sources, assembles them all together in one event, and sends this event to one output for analysis.

How is it implemented in LHCb?
Data sources are acquisition boards. For each event, they all send their data to a farm node for analysis. A farm node is a commodity server. Sources and destinations are interconnected with standard network technologies. Most of the software is based on Linux.



Generic Event-Builder?
We want to compare the performance of Event-Builders based on InfiniBand and 10 GbE. The idea is to develop an interface to separate the core software of the Event-Builder from the media specific software.

Programming with InfiniBand?
Unlike the TCP/IP stack, InfiniBand does not offer an elegant integration into the Linux kernel yet. The integration of InfiniBand into Linux is mainly the work of the Open Fabric Alliance. There are many ways to use InfiniBand, Remote Direct Memory Access, Socket traps, etc. Both of them radically changes the software "philosophy". A comparison of their performance is required before to compare with 10GbE.



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