HK 30: Accelerators and Instrumentation I

Time: Tuesday 14:00–16:00 Location: H-ZO 80

Group Report HK 30.1 Tu 14:00 H-ZO 80

FPGA Based Compute Nodes for Trigger and Data Acquisition in HADES and PANDA — •Ming Liu[1], Johannes Lang[1], Zhen'an Liu[2], Hao Xu[2], Qiang Wang[1], Dapeng Jin[2], Sören Lange[1], Johannes Roskoss[1], Andreas Kopp[1], David Münchow[1], and Wolfgang Kühn[1] for the PANDA-Collaboration — [1]II. Physikalisches Institut, Universität Giessen, Germany — [2]IHEP Beijing, China

Modern experiments in hadron and nuclear physics such as HADES and PANDA at FAIR require high performance trigger and data acquisition solutions which - in the case of PANDA - can cope with more than 10ˆ7 reactions/s and data rates in the order of 100 GB/s.

As an universal building block for such high performance systems, an ATCA compliant FPGA based Compute Node (CN) has been designed and built. Sophisticated online filtering algorithms can be executed on 5 XILINX Virtex-4 FX60 FPGAs. Each CN features up to 10 GBytes of DDR2 memory. Multiple CNs can communicate via optical links, GBit Ethernet and the ATCA Full Mesh backplane. The total bandwidth of a single CN exceeds 35 GB/s. The system is highly scalable ranging from small configurations in a single shelf to large multi-shelf solutions.

The talk will present the architecture as well as performance results for first algorithms, which have been implemented in the framework of the HADES trigger upgrade.

This talk has been supported in part by BMBF (06 Gi 179 & 180, Internationales Büro) and GSI

HK 30.2 Tu 14:30 H-ZO 80

The PandaRoot framework for simulation and analysis — •Stefano Spataro for the PANDA-Collaboration — II. Physikalisches Institut, Gießen, Germany

The Panda experiment at the future FAIR facility in Darmstadt will study anti-proton proton and anti-proton nucleus collisions with beam momenta up to 15 GeV/c.

To simulate the detector performance for the physics program (involving charm spectroscopy, electromagnetic form factors, hypernuclei, etc.) and to evaluate different detector concepts, a software framework is presently under development, called "PandaRoot".

The "PandaRoot"software is installed and tested on more than 20 platforms. It is mainly based on ROOT and Virtual Monte Carlo packages, and it runs on an Alien-based GRID infrastructure.

Several event generators and transport models can be used by changing few macro options. This allows an easy comparison and validation of results. Different algorithms for tracking and reconstruction are under development and optimization, to achieve the requirements of the experiment in terms of performances. Moreover, the analysis tools framework, Rho, has been implemented as well as a fast simulation code.

In this report a status of the current activities inside the PandaRoot framework will be presented, in terms of detector simulations, reconstruction algorithms and analysis of physics benchmark channels.

This work was supported in part by BMBF (06 GI 180, 06 MZ 225I), GSI (GIKÜH), University of Groningen and NWO 680-47-120.

HK 30.3 Tu 14:45 H-ZO 80

ALICE T2-Zentrum bei GSI — •Kilian Schwarz, Peter Malzacher, Victor Penso und Mykhaylo Zynovyev — GSI, Planckstr. 1, D-64291 Darmstadt

Bei GSI wird ein Tier2-Zentrum für das ALICE-Experiment betrieben. Die Hauptaufgabe eines Tier2-Zentrums sind Monte-Carlo-Simulation und individuelle Datenanalyse durch lokal ansässige Wissenschaftler. Hierzu müssen lokale Kopien von Daten aus dem Grid angelegt werden. Um diesen Aufgaben gerecht werden zu können, wird ein mit xrootd betriebener Fileserver - Cluster unterhalten, auf den Daten mit Grid-Methoden von außerhalb kopiert werden können. Für die lokalen Datenanalysen mit einer stationären PROOF-Farm oder in der GSI-Batchfarm dynamisch erzeugten PROOF-Clustern werden die Daten auf ein angeschlossenes Lustre-Cluster kopiert, welches den Vorteil einer POSIX-Schnittstelle vorweisen kann. Da die gleichen Maschinen sowohl mit interaktiven PROOF-Analysen sowie lokalen und aus dem Grid kommenden Simulationsjobs betrieben werden, müssen die Prioritäten entsprechend angepasst werden. Um schnell auf unerwartete Situationen reagieren zu koennen, werden alle essentiellen Dienste mit einem MonaLisa-basierten Monitoring-System überwacht. Der anwendungsbasierte Datenzugriff wird durch Testen und Optimieren der Netzwerkkonfiguration kontinuierlich verbessert.

Die im Rahmen der ALICE-Aktivitäten gewonnenen Erfahrungen werden für das FAIR-Projekt weiterverwendet werden.

HK 30.4 Tu 15:00 H-ZO 80

The PANDA Grid — •Paul Bühler for the PANDA-Collaboration — Stefan Meyer Institute, Vienna, Austria

In order to fulfill the computing demands of the future PANDA experiment at FAIR in Darmstadt a dedicated computing infrastructure will be required. A conceivable way of acquiring and managing the necessary computing power for simulations and data analysis is the Grid model. As an alternative to a centralized computing center this model allows to pool independent resources from multiple institutes or organizations.

Although PANDA is not expected to acquire data before the year 2016 the PANDA collaboration is already experimenting with the PANDA Grid. The PANDA Grid uses the AliEn middleware which is entirely built around Open Source components and has been developed by the ALICE collaboration at CERN. The PANDA Grid currently consists of 10 sites. Due to the optimized installation procedures and portability of the AliEn software it is easy to add new resources, allowing the Grid to be expanded without disturbing its continuous operation. AliEn provides tools to pool hardware resources but also to manage the installation of common software packages. This feature is exploited to distribute, install, and update the PANDA analysis software (PandaRoot) on the different sites and with this to enable the PANDA Grid to perform PANDA related tasks. It is intended that PANDA Grid will provide in the order of 2-3000 CPUs by the end of 2008 and then constitute a powerful tool for upcoming PANDA detector design and physics case studies.

HK 30.5 Tu 15:15 H-ZO 80

Application of a versatile digital readout system for the PANDA Micro Vertex Detector — •Marius C. Mertens, James Ritman, and Tobias Stockmanns for the PANDA-Collaboration — Forschungszentrum Jülich GmbH, Institut für Kernphysik, Jülich

The Micro Vertex Detector (MVD) for the PANDA experiment at the Facility for Antiproton and Ion Research (FAIR) will be the innermost subdetector. Challenges include its triggerless readout and a high occupancy due to its proximity to the interaction point. Thus, the MVD design foresees hybrid silicon pixel sensors for the inner layers, silicon strip sensors for the outer layers and a custom frontend chip which can sustain high data rates for the readout. During the development of the MVD, a powerful and flexible system is needed to test detector electronics. Both the suitability of existing concepts and newly developed circuits have to be evaluated. Thus, we built a reconfigurable digital readout system based on a Virtex 4 FPGA in order to support a variety of frontend electronics. This is achieved by a modular design of hardware, firmware and software. Currently, the digital readout system interfaces to an Atlas pixel detector frontend chip (FE-I3) to assess its suitability for the PANDA MVD. A future step is the connection of a frontend chip specifically designed for the PANDA MVD (ToPiX), which is currently under development at INFN Torino. We will present the test setup based on the digital readout system with special focus on the application of prototype testing. Results from the readout of the Atlas FE-I3 will be shown, along with an outlook on tests with the ToPiX frontend chip. Supported in part by the EU and FZ-Jülich.

HK 30.6 Tu 15:30 H-ZO 80

A Sampling ADC Data Acquisition System for the Electromagnetic Calorimeters of COMPASS — •Alexander Mann, Heinz Angerer, Igor Konorov, Markus Krämer, and Stephan Paul — Physik-Department E18, Technische Universität München

For the readout of the two electromagnetic calorimeters of the two stage COMPASS spectrometer at CERN, a sampling ADC (SADC) based data acquisition system was developed. The shaped photomultiplier signals are continuously digitized with 80 MHz and processed within field programmable gate arrays (FPGAs). The FPGAs implement zero suppression, latency buffering and provide an option to derive online calorimeter trigger decisions. In total, 4704 calorimeter channels are currently read by two different SADC module types with 10 bit and 12 bit resolution, respectively. With modified FPGA firmware, the same modules are also used in other applications, e.g. for medical imaging (PET) and ultracold neutron experiments.

This work is supported by the BMBF, the Maier-Leibnitz-Labor Garching, the Cluster of Excellence Exc153 and FutureDAQ (EU I3HP, RII3-CT-2004-506078).

HK 30.7 Tu 15:45 H-ZO 80

Interaktive Datenanalyse mit stationären und dynamisch erzeugten PROOF-Clustern — •Kilian Schwarz, Peter Malzacher und Anar Manafov — GSI, Planckstr. 1, D-64291 Darmstadt

Alle vier LHC-Experimente haben erfolgreich zentral gesteuerte, über das Grid weltweit verteilte Monte-Carlo-Simulationen durchgeführt. Die mit der Analse der erzeugten Datenmengen verbundenen Herausforderungen (hunderte von individuellen Analysejobs im Grid, einfach zu handhabende Benutzerschnittstellen, Job-Scheduling, anwendungsspezifische Anforderungen an Datenzugriff, Netzwerk und CPU) werden im Rahmen des Hochenergiephysik Community Grids des D-Grid - Projekts bearbeitet.

Zu diesen Zweck wurde bei GSI ein Softwarepaket "PROOF on Demand“ entwickelt, mit dessen Hilfe Benutzer PROOF - Cluster dynamisch dort generieren können, wo sie Daten analysieren wollen. Dies ist bereits jetzt zentrenübergreifend unter Verwendung der von allen LHC-Epxerimenten verwendeten Grid-Middleware gLite möglich. Implementationen für lokale Batch-Systeme (LSF) sowie fuer die ALICE-Grid - Middleware AliEn sind im Entstehen.

Fuer lokale Datenanalyse mit PROOF unterhält die GSI ein stationäres PROOF-Cluster, auf dem jeder einzelne Benutzer 160 PROOF-Prozesse starten kann. Die Datenspeicherung erfolgt auf einem an die Batch-Farm angebundenen Lustre Cluster. I/O und Netzwerkkonfiguration wird stetig optimiert.