T 137: DAQ Test/RO – GRID II

Time: Thursday 17:30–19:00 Location: HSZ/0301

T 137.1 Thu 17:30 HSZ/0301

Introducing Constellation - Development of a flexible DAQ Infrastructure Framework — •Stephan Lachnit — DESY, Hamburg, Germany

Test beam qualifications of new detectors are very volatile environments which require stable operation and synchronization of multiple devices while allowing for fast integration of new prototypes. For this purpose, a centralized run control software is usually used to distribute commands and to manage data recording and logging.

Constellation is an upcoming open-source DAQ infrastructure framework with the goal to implement such a run control software. The main aspect is the orchestration of different data acquisition "satellites" with the run control and other satellites for data storage.

In this talk several design concepts of Constellation will be presented, including for the Final State Machine, Messaging via ZeroMQ, zero-configuration networking, dynamic loading of DAQ modules and support for EUDAQ2 modules.

T 137.2 Thu 17:45 HSZ/0301

GUI framework and database for ATLAS ITk system tests — •Jonas Schmeing, Gerhard Brandt, Wolfgang Wagner, Marvin Geyik, and Maren Stratmann — Bergische Universtität Wuppertal

For the LHC Phase-2 upgrade, a new inner tracker (ITk) will be installed in the ATLAS experiment. It will allow for even higher data rates and will be thoroughly tested in the ATLAS ITk system tests. To operate these tests and later the final detector, a GUI and configuration system is needed. For this a flexible and scalable GUI framework based on distributed microservices has been introduced. Each microservice consists of a frontend GUI, a server running the python application, and a system-level backend.

The frontend GUI is a single-page application built with the React JavaScript library. The API for RESTful HTTP communication between the frontend and the Python app is defined via an OpenAPI specification. The Python app is the central part of each microservice. It connects to the microservices backend, such as a database or various DAQ applications. The OpenAPI and Python interfaces facilitate the maintainability and long-term upgradability of the system.

With this microservice framework, it is possible to serve specialized applications for different purposes: e.g., an API to access the data acquisition software or services to configure and monitor different hardware components. The system additionally includes multiple interfaces to a database used for storing configuration and connectivity data, data about the executed runs and their results.

T 137.3 Thu 18:00 HSZ/0301

ITk-Pixel FELIX read-out chain stress test preparations — •Matthias Drescher, Jörn Grosse-Knetter, Arnulf Quadt, and Ali Skaf — II. Physikalisches Institut, Georg-August-Universität Göttingen, Germany

The current ATLAS Inner Detector will be upgraded to an all-silicon Inner Tracker (ITk) for the experiment's phase 2 upgrade. The ATLAS ITk read-out system employs the FELIX hardware/software system for interfacing the optical fiber cables of the on-detector components to the higher level infrastructure. Each FELIX board has 24 high-speed fiber links. In the Pixel subdetector configuration, each uplink fiber is connected to an lpGBT aggregator chip, which itself bundles 7 Aurora 64b/66b data lanes at 1.28 Gbps. In our case, the Aurora data is the output of the RD53A prototype front-end chip. To ensure stable operation under full load before moving to the final large-scale read-out system, a stress test populating all 24 of these fibers is being prepared.

Due to limited hardware availability, we aim for carrying out stress tests with lpGBT and RD53A emulators implemented on several Xilinx FPGA development boards instead of the respective ASICs. The hit maps sent by the RD53A emulators are stored in fast local memory, which would be written from a central controller PC connecting to the FPGA boards via Gigabit Ethernet. In order to prepare our stress test, we had to develop a set of helping tools and procedures that might also be used independently. For example, a dedicated programmer GUI software was developed to be used with the existing CERN USB-I2C dongle.

T 137.4 Thu 18:15 HSZ/0301

Modelling Distributed Computing Infrastructures for High Energy Physics — •Maximilian Horzela[1], Henri Casanova[2], Robin Hofsaess[1], Manuel Giffels[1], Artur Gottmann[1], Günter Quast[1], Achim Streit[1], and Frederic Suter[3] — [1]Karlsruhe Institute of Technology, Karlsruhe, Germany — [2]University of Hawai'i at Manoa, Honolulu, USA — [3]Oak Ridge National Laboratory, Oak Ridge, USA

Designing distributed, heterogeneous computing-infrastructures is a challenging task. Since, due to their complexity and size, only a single design candidate can be feasibly deployed, building different prototypes is no option.

We therefore propose to simulate the behaviours of infrastructure candidates based on realistic simulation models as an accessible approach. This ansatz already proved to be successful, utilizing the MONARC simulator for the design of the original structure of the WLCG. In this spirit, a modern tool for simulation of high energy physics workloads executing on distributed computing infrastructures is presented. It is based on the SimGrid/WRENCH simulation framework, allowing to simulate complex infrastructures enhanced with models to simulate relevant data access and caching patterns.

T 137.5 Thu 18:30 HSZ/0301

Caching in Distributed Computing Infrastructures — •Robin Hofsaess, Maximilian Horzela, Manuel Giffels, Artur Gottman, and Matthias Schnepf — Karlsruher Institut für Technologie

With the steadily growing amount of data collected in several high energy physics experiments, new challenges occur when it comes to an efficient processing of the data. Besides storage, data transfers are becoming more and more limiting for the increasingly distributed computing infrastructure used by the HEP community. An efficient usage of the resources therefore make higher bandwidths necessary. However, it is often not possible to simply improve the connectivity of a resource provider leading to the necessity of other approaches. A first step here could be to reduce unnecessary data transfers by (local) caching. The talk will address the general ideas on coordinated caching within a distributed computing infrastructure - as given at KIT/GridKa - and briefly discuss its challenges. Furthermore, our future plans at KIT will be presented.

T 137.6 Thu 18:45 HSZ/0301

Belle II Grid Computing Developments in Germany — •Matthias Schnepf[1], Moritz Bauer[1], Günter Duckeck[2], Torben Ferber[1], Oliver Freyermuth[3], Andreas Gellrich[4], Manuel Giffels[1], Günter Quast[1], Michel Hernandez Villanueva[4], and Peter Wienemann[3] — [1]Karlsruhe Institute of Technology (KIT) — [2]LMU Munich — [3]Univertity of Bonn — [4]DESY Hamburg

The Belle II experiment studies B-meson decays with high precision and plans to record 50ab^{-1}, which corresponds to 50PB of recorded data. For reconstruction, simulation, and analysis, the Belle II collaboration uses several data centers around the world as a Grid, similar to the worldwide LHC Computing Grid.

To improve the global job throughput and support the local groups, several developments in Belle II Grid computing are being worked on and are applied in Germany or by German groups. In this presentation, we describe the challenges and the current development projects. These involve the Grid storage for local groups, caching techniques to increase dataset accessibility, GPU, and multicore support in the Grid for Belle II.