HADES trbnet data formats for DABC and Go4

J. Adamczewski-Musch[1], S. Linev[1], E.Ovcharenko[2], and C.Ugur[1]

[1]Common Systems/Electronics, GSI, Darmstadt, Germany, [2]ITEP, Moscow, Russia

Introduction

The *hadaq* data format via the *trbnet* transport protocol is used for many years to take data of the HADES experiment. The new TRB3 generation of read-out hardware is investigated for application with several FAIR experiments, e.g. PANDA and CBM. To support such developments, plug-in software has been implemented for the data acquisition framework DABC and the online/offline analysis framework Go4.

Plug-in for DABC

The *hadaq* plug-in defines an additional software library with the DABC framework. It provides classes to receive *trbnet* packets from the front-end boards via multiple UDP/Ethernet data streams and to align different message streams with respect to the "readout id" of the central trigger system (CTS). The resulting events may be stored in the standard HADES list mode data (*hld*) format. This re-implements the basic functionality of the current HADES production event builder software (Fig.1). The existing HADES event builder control system may even control the DABC event builders, since the export of the required parameters via shared memory to EPICS is completely emulated here.

A special DABC software module ("*MbsTransmitter*") allows wrapping the original *hadaq* data format into generic data packets of the MBS framework. As a consequence, data from *trbnet* frontends can be combined with data from other sources with MBS-type format by means of the generic MBS combiner module of DABC. Additionally, the *trbnet* data can be stored in MBS listmode (*lmd*) format or can be delivered to online monitoring clients like Go4 via standard MBS streamserver or eventserver protocols. As the *hadaq* plug-in can read *hld* files, also a conversion between *hld* and *lmd* files is possible.

Implementations for Go4

Generic unpacker code for *trbnet* data has been implemented as Go4 "processor" class. This expects the *hadaq* events to be wrapped into MBS event containers, as it is delivered by the DABC *hadaq* plug-in. Besides a special Go4 "user event source" class allows to read data directly from *hld* files and to wrap them into MBS containers as input for the processor. So the Go4 online analysis can either directly connect to the DABC application for quality monitoring or it can replay recorded data both from *hld* or *lmd* formatted list-mode files.

On top of this generic scheme, dedicated analysis codes for the TRB3 FPGA-TDC frontends [1] have been implemented in Go4. They can evaluate the TDC frontend format with up to 65 channels of time stamped messages. Each hit message contains a coarse time and a fine time counter value and leading/trailing edge property. A calibration procedure for the fine time counters allows correcting FPGA variations to improve individual channel resolution to 10 ps. An absolute timestamp range of 45 minutes is achieved by evaluating intermediate "epoch counter" messages. The time difference of each hit against a reference channel can be used in Go4 for hit selection with a time cut.

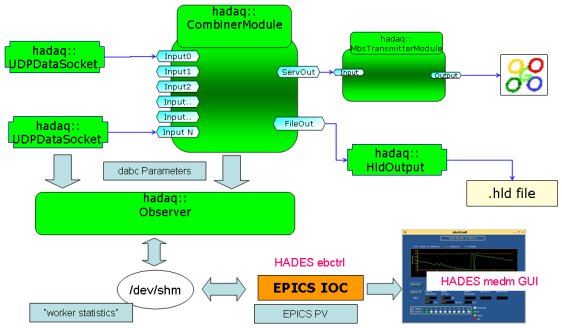

Figure 1: DABC components configured for HADES event building: Combined data channels can be saved as *hld* or *lmd* files. Go4 online monitoring may connect to MBS *streamserver* socket. The existing HADES eventbuilder control system with EPICS is fully supported.

Applications

At a test beam of CBM detector prototypes at CERN PS in November 2012, the DABC *hadaq* plug-in performed self triggered data readout from parts of the CBM-RICH prototype. The TRB3-TDC analysis had been integrated to the Go4 based CBM test beam framework [2] and was here running in the online monitoring.

A first version of the Go4 *hadaq* analysis was used for test beams of PANDA-DIRC collaboration at MAMI facility in February 2012. Most recent tests at COSY facility did benefit from applying the CBM improved analysis.

References

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