DABC as data acquisition framework for CBM

S. Linev, J. Adamczewski-Musch, and J. Frühauf
GSI, Darmstadt, Germany

Optical transport for ROC

For development of the different software components for the CBM readout controller (ROC) [1], the Data Acquisition Backbone Core (DABC) [2] was used. The ROC board was primarily developed to read out data from nXYTER-based frontends. With a new FPGA firmware the readout of GET4/FEET frontends is also possible [3]. In addition to the existing Ethernet based data transport, an optical fibre data transport via a special PCIe board (AVNET) was implemented to the ROC software and tested. The optical protocol [4] was designed to transport data, control and clock information over the same media. Data rates up to 200 MB/s can be achieved here. Additionally, the optical connections allow clock synchronization between many ROCs. Usage of the optic transport in ROClib is absolutely transparent and does not require any changes in user software compared to the Ethernet case.

Synchronisation with MBS

The ROC produces a time-stamped data flow and does not require external triggers for signal measurements. On the other hand, there is a lot of existing hardware, useful for different detector tests, which is read with trigger-based MBS DAQ. To synchronize the data taken by MBS with the data taken by ROC, a special SYNC-sender module was developed based on the VULOM board. This module sends a SYNC message to all ROCs every time the MBS trigger is produced. A DABC software module was implemented to search for such SYNC messages in the ROC data, and to associate subsequent data messages with the corresponding MBS trigger. The data combined together by such software can be analyzed in a Go4 analysis.

SPADIC readout

The SPADIC is a prototype chip for TRD readout, developed in Uni Heidelberg [5]. It allows to read out detector signal shapes with external trigger. Trigger signal in-put is compatible with ROC SYNC message, therefore MBS with a SYNC-sender module can be used as a trigger producer for SPADIC. Based on a library for USB readout of SPADIC [5], a DABC plugin was developed to acquire SPADIC data with DABC; this plugin was integrated into ROClib. Data from SPADIC are represented as MBS events. These can be combined together with ROC and MBS data, synchronized by the SYNC message number.

TRD/RICH/STS beamtime at CERN In this beamtime in November 2010, 4 different TRD prototypes were read out: two with MBS, another two with DABC with 6 SPADICs. In addition, one STS station and a RICH setup were read out with 3 ROCs. A DABC application was implemented to combine data from all these inputs together.

STS/GEM beamtime at COSY Figure 1 shows the DAQ setup of the COSY beamtime in December 2010: all 8 ROCs were optically connected via special Data Combiner Boards (DCB) to the AVNET PCIe board, read out by the DABC application. An additional connection for each DCB provides a clock distribution. Thus all ROC clocks were running synchronously. An MBS system was used to read out beam monitor scintillators; synchronization with ROC data was done via a SYNC sender module.

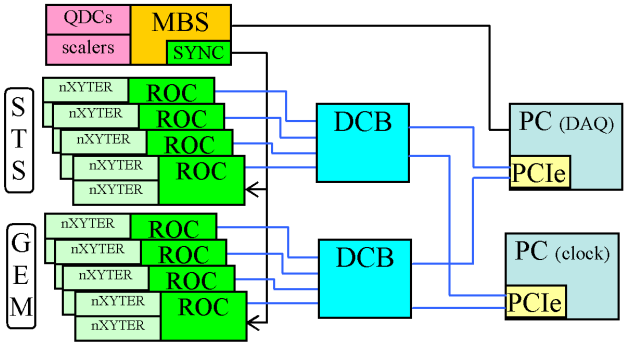

Figure 1: COSY beamtime setup

Status and outlook

Current software shows good stability and robustness in all beam tests performed up to now. Further developments are planned for closer integration of the DAQ with the experiment control system EPICS.

References

[1] S. Linev, J. Adamczewski-Musch and H. G. Essel, *CBM Progress Report 2009*, Darmstadt 2010, p. 56

[2] J. Adamczewski *et al.*, *Data Acquisition Backbone Core DABC*, IEEE Trans. Nucl. Sci. **55**, No.1 (2008) 251

[3] S. Manz and U. Kebschull, *CBM Progress Report 2009*, Darmstadt 2010, p. 52

[4] F. Lemke, S. Schenk and U. Bruening, *CBM Progress Report 2009*, Darmstadt 2010, p. 54

[5] T. Armbruster, http://www.spadic.uni-hd.de