Features of the new MBS Production Version 6.2

N.Kurz[1], *J.Adamczewski-Musch*[1], *and S.Linev*[1]
[1]CSEE, GSI, Darmstadt, Germany

Introduction

The general purpose data acquisition system MBS has been used in the past by a vast majority of GSI experiments. It will also be applied by many experiments at FAIR (e.g. NUSTAR) for data taking and for tests of future FAIR detector systems. A new production version 6.2 has been rolled out in 2013 to accommodate the requirements of experiments. Its new features and improvements, like support of new processor boards, PCI Express, Linux, and 10Gbit Ethernet will be described. For detailed information the MBS homepage (www.gsi.de → @work → Experiment-Elektronik → Datenerfassung → MBS) and release notes 6.2 therein can be consulted.

New Features

Linux for PCs: Currently the DEBIAN Linux versions with code names Lenny, Squeeze and Wheezy are fully supported as 32 bit machines. They have been set up to boot and run diskless as all MBS nodes.

10Gbit Ethernet: Due to ever increasing data rates, 10 Gigabit Ethernet has become inevitable and is now supported on PCs for all Linux flavours mentioned above. In a typical MBS setup a data throughput of 700 MB/s could be achieved without further software optimization.

Linux for RIO4 VME processor: Up to MBS version 5.0 LynxOS was the only supported real-time operating system available. Since the existence of LynxOS for future VME processor boards seems not be guaranteed, an effort has been undertaken to run MBS with Linux on the RIO4. A kernel module for the TRIVA VME trigger module has been developed. MBS is now fully supported. Single cycle VME A32D32 read accesses show a 10% higher speed with Linux compared to LynxOS. Network write speed is two times faster on Linux (80 MB/s). MBS template user readout functions are available.

IPV VME processor board: According to the supplier, the VME processor RIO4 will be purchasable for some years, but a follow up model seems not to be available at the time being with the performance characteristics required. In addition, the PPC processor chip utilized on the RIO4 will not be developed further. In a survey, alternative VME processor boards have been assessed.

The IPV 1102 from the company IOxOS has been identified as a candidate for the future. Its heart is a PowerPC P2020 from Freescale. Again a kernel module for the TRIVA trigger module has been developed and the IPC 1102 is now fully integrated into MBS. Simple template MBS user readout functions and VME mapping examples for more advanced VME block accesses are available.

PCI Express based MBS readout systems: Prior to MBS version 6.2, commodity PC hardware was used solely as MBS event-builders. New hardware developments made by CSEE department of GSI (www.gsi.de → @work → Experiment-Elektronik → Digitalelektronik → Module) required to extend the MBS PC capabilities as front end readout processors.

The PCI Express data concentrator board PEXOR and trigger module TRIXOR are the base of this new readout system. LynxOS drivers and Linux kernel modules for PEXOR and TRIXOR, and MBS user readout functions have been developed. They allow to control and readout frontend electronics (FEBEX, GEMEX) connected to PEXOR via optical links.

The TRIXOR has identical functionality as the VME trigger module TRIVA. It is possible to interconnect any number of TRIXOR and TRIVA modules on a common trigger system, to setup highly flexible MBS DAQ systems.

New sorting modes in MBS time sorter process m_to: The MBS time sorter and event-builder task is used to combine data from independent DAQ systems based on time stamp information. Up to now the TITRIS time stamp system developed by CSEE was used for this purpose.

Three new Foreign DAQ systems required to implement three new time stamp sorting algorithms: To combine the PANDA GEM-TPC system with FOPI an algorithm based on COMPASS (CERN) hardware was implemented. The EURICA experiment at RIKEN required an algorithm to combine BIGRIPS and MBS systems with the LUPO time stamper from RIKEN. Finally, AGATA and RISING MBS DAQ was combined using the AGAVA/GTS hardware provided from the AGATA community.

Currently supported MBS processor platforms

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LynxOS 2.5:          CVC, E7, RIO2, PC
LynxOS 3.1:          RIO3
LynxOS 4.0:          RIO4, PC
Linux Debian   2.6: PC
Linux Debian   3.2: PC
Linux Sugarhat 2.6: RIO4
Linux DENX     3.3: IPV
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