GSI Data Acquisition System MBS Version 3.0

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Current Status
In total about 65 MBS systems are currently in operation, one third of them at external sites as the latest installations at LBL Berkeley, University of Freiburg, University of Leuven, Santiago (Spain) and MPI für Kernphysik in Heidelberg. Besides the CVC and Eltec VME boards 15 PowerPC boards from CES (RIO2) are in operation. A similar number of new RIO2 systems is already planned for installation in 1999.

MBS Version 2.2
The latest MBS 2.2 is available currently as "deve" version but will be soon the "prod" version. To use this version, user programs must be rebuilt. The upgrade provides mainly remote control support needed by GUIs. In addition it provides
- simple programs for remote control and diagnostics
- file addressing relative to one project directory
- enhanced distributed cleanup procedures

MBS Version 3.0
The next major release 3.0 of MBS is in the testing phase. It will provide two basically new features:
1. Currently the data transfer between tasks and nodes is done through shared memory or memory mapped bus systems. Now alternatively message type data channels can be configured, i.e. TCP socket connections.
2. The event stream can be split to several collectors. Each collector gets complete events and can write its own tape. When producers (readout) and consumers (collector) are connected through a high bandwidth network switch, the data transfer can run in parallel.

MBS on Standard PC
With the new data channels it is possible to use standard PCs under Lynx as event builders. Therefore MBS has been ported to Lynx PCs. The advantages are lower cost, higher performance, and more flexibility in the connections through Fast Ethernet. Porting MBS to Linux would reduce costs even more.

Performance Measurements
Table 1 shows a comparison between a two processor system and a four processor system. In both cases the processors are connected via Fast Ethernet, but in the second case through a switch. The PC is a 400 MHz Pentium II, the RIO2s are 200 and 300 MHz PPC 604 CPUs.

<table>
<thead>
<tr>
<th>subevent size</th>
<th>Mb/sec</th>
<th>evts/sec</th>
<th>Mb/sec</th>
<th>evts/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 Kbyte</td>
<td>4.4</td>
<td>160</td>
<td>8.0</td>
<td>150</td>
</tr>
<tr>
<td>2 Kbyte</td>
<td>2.4</td>
<td>1200</td>
<td>4.0</td>
<td>1100</td>
</tr>
</tbody>
</table>

Table 1: Results of Performance Measurements.

The important result is that using a switch the total data rate nearly scales with the number of processors, but goes down for small subevents. The performance also strongly depends on the load balance between the readout branches. The CPU clock rate has only little effect, because the total performance of these systems is dominated by the data transfer rates.

Esonet Server
The standard Esonet library is now available on AIX and Linux. It uses rpc calls to the MBS 2.2 Esonet server.

Java GUI
After some prototyping we decided to implement the final GUI for MBS 2.2 in Java. There is one version using the Abstract Windowing Toolkit (AWT) of JDK 1.1.6, and one using the Java Foundation Classes (JFC) of Java 2. Java provides excellent connectivity, sufficient graphic capabilities, and very convenient multithread support.

The interface runs on all platforms providing Java Virtual Machines. We use it on Windows NT 4.0, Linux, and AIX. MBS had been upgraded to provide status information for the GUI. Mainly, the message servers running on each MBS node got status server threads. In the GUI, threads connect to these servers and update the windows every second. Remote distributed MBS systems can be completely startup or shut down by the GUI, and they can be completely controlled. Graphical rate meters show the event and data rates, trending histograms the history of these rates. The GUI can be stopped at any time and restarted on a different terminal without affecting the controlled MBS. Figure 1 shows the startup menu.

Java Monitor
Any MBS 2.2 node can be monitored by a graphical monitor. The monitor was derived from the GUI by removing all controlling elements. It displays the rate meters, and the information about rates, tasks, acquisition status and tape status. Like the GUI it runs on Windows, AIX and Linux.
Figure 2 shows the main menu, figure 3 the rate meters. Windows to control servers and taping are opened on request. Other windows show statistic counters and task tables of all nodes.

http://www-gsi-vms.gsi.de/daq/home

**Conclusions**
With the new GUI, the operating of MBS is much easier and convenient. The monitor allows for longterm control of experiments simultaneously from different places.