MBS
(Multi Branch System)

The General Purpose Data Acquisition System at GSI
A short Introduction
Some New Developments

MBS homepage: http://www-w2k.gsi.de/daq/
Manpower

5 Engineers and Technicians are working fulltime for DAQ Electronics

6 Developers are working fulltime on DAQ Software

at GANIL

at GSI: 3.0x Developers: Digital Electronics: J.Hoffmann (-Therapie)

Embedded Software: W.Ott (-ZKS, -Therpie)

MBS: N.Kurz
Some Facts about MBS

- General Purpose DAQ System
- Scalable from Single-Crate Systems up to hierarchically structured Multi-Branch Systems
- > 48 Systems running (66 installed) at GSI. Standard DAQ at GSI
- > 50 Systems running (73 installed) outside GSI
- Entirely written in C; Started in 1993; Continuously developed
- Based on „UNIX like“ Real Time Operating System LynxOS
- Support for CAMAC, VME, VXI and FASTBUS

  Supported Processor Platforms:
  - CVC (CAMAC)
  - E7, RIO2, RIO3 (VME)
  - PC

- Data Transport via all address mapped buses and TCP/IP (10, 100, 1000 Mb/s)
Some more Facts

- GSI Trigger Module is mandatory: Master, Slave; 15 Trigger In, Dead Time Out, Sub-Systems distance > 150 m, etc

- GSI Time Stamp Module is optional: Master, Slave, 20 ns resolution, Single Hit, > 150 m, etc

User has to provide:

- ASCII setup files to specify hardware topology of the MBS DAQ System

- User Readout Function to specify actions for initialisation and readout on triggers

Templates and help available
• Robustness

• Standard electronics, boards (VME, CAMAC, ...)

• One Realtime Operating systems for all platforms

• "Simple" User application interface

• Concentrate on functionality and not on colours
MBS Single Processor System (Hardware View)

GSI Trigger Module:
15 Trigger Inputs,
Conversion Time setting
Dead Time output

VME Speed:
Single cycle: 5 MB/s
VME Block D32: 15 MB/s
VME Block D64: 25 MB/s

Data Monitoring: via TCP/IP sockets: Go4, ROOT, GOOSY, PAW, LEA

Data Logging:
Tape Drives
Local Disks
NFS Disks
Remote Disks (RFIO, TCP/IP)
Tape Robot (RFIO, TCP/IP)
MBS Multi Processor System (Trigger Synchronization)

**Trigger Bus:** Up to 16 trigger modules, Up to ~200 m

**Ethernet (TCP/IP):**
- 100 Mbit
- Gigabit (< 40 MB/s)

**Event builder**
LynxOS PC

Up to 16 simultaneous Event builder possible

Data Logging, Monitoring
MBS Multi Processor System (Time Stamp Synchronization)

Time Synchronization: Up to 16 Modules, up to ~200 m, 20 ns resolution

Master Trigger Module

Time Sorter
Event builder
LynxOS PC

TCP/IP

Data Logging, Monitoring

One Time sorter, Event builder
Up to 16 data sources from TCP/IP
Combining Trigger – and Time Stamp Synchronization

Event builder
LynxOS PC

Event builder
LynxOS PC

Event builder
LynxOS PC

Time Sorter
Event builder
LynxOS PC

Monitoring

Monitoring and Data Logging
Example: RISING MBS Topology

All sub-systems inside the dashed boxes are able to run as independent MBS systems.
MBS Multi Processor System, Process View

Example: 3 X 2 MBS System, 3 Readout Processors and 2 Event Builder Processors

Readout Processors

Event Builder Processors

Data Receiver → Event Buffer → Transport Process → Tape Disk

TCP/IP

N.Kurz, EE, GSI, 24-Apr-2006
Example: RISING MBS, Process View

All sub-systems inside the dashed boxes are able to run as independent MBS systems.
The SAM5 VME Module (J. Hoffmann, W. Ott)

VME:
Single Cycle: 4 MB/s
D32 Block: > 15 MB/s
D64 Block: > 30 MB/s

DSP:
TMSC6414 (600 MHz)
Data Buffering, - Filtering

GTB1,2:
Transparent Mode
Token Mode (20 MB/s each)
Up to 32 Slave GTB devices
Slave GTB Modules available
> 100 m length
MBS-AMUX System for SHIP

Trigger (Physics, Sync)

External Sync. Trigger

GTB BUS (Data, Parameters)

Up to 16 AMUX on one GTB BUS

SAM AMUX Trigger Bus

FPGA

DSP

AMUX 1 (NIM)

4 ADC Inputs

Scaler Pattern

W. Ott
J. Hoffmann

N.Kurz, EE, GSI, 24-Apr-2006
MBS-SIDEREM System for FRS, LAND, R3B

External Sync. Trigger

GTB BUS (Data, Parameters)

SIDEREM 1 (NIM)
- FPGA
- DSP

SIDEREM 2 (NIM)
- FPGA
- DSP

SAM SIDEREM Trigger Bus

Up to 16 AMUX on one GTB BUS

Double sided Silicon Strip Detector 1024 channels. Low voltage Supply.

Trigger 1, Reduced Trigger 2, Raw

N.Kurz, EE, GSI, 24-Apr-2006

W. Ott
J. Hoffmann
Trigger Treatment with VME Logic Module
VULOM (J.Hoffmann)

13 Accepted (deadtime locked)
Trigger outputs. Trigger Type 1-13

Used for Gates, Common starts, -stops, Holds,...

13 different sources
Trigger type 1-13

12 different sources
Trigger type 12, 13

Four bit encoded accepted Trigger for
Master Trigger Module input.
Trigger Type 1-13

Trigger Request from experiment

Plans: Register readout, i.e. nr. of triggers in, nr. of accepted triggers
Downscaling of triggers
...
...
Old NIM Trigger BOX