## Guide to running NUTAQ IDS DAQ and GRAIN Analysis

Paul Greenlees 01.12.2014

### Basic description:

A compact PCI (cPCI) crate housing up to seven NUTAQ 16 channel VHS-ADC cards (<http://nutaq.com/en/products/vhs-adc>) is used to digitize the data from IDS detectors. In order to provide a 100 MHz clock and synchronization of cards, and modified TDRi card is used.

(see e.g. <http://npg.dl.ac.uk/documents/edoc000/#GREAT>)

This gives the required clock and sync signals needed by the firmware and Data Acquisition provided by Daresbury Laboratory.

Notes on configuration and set-up from Vic Pucknell can be found in directory /MIDAS/LyrTech/ on nnids. A figure of the data network and how the data paths are currently configured is shown at the end of this guide. The first part of this document deals with set-up and configuration and the second part provides instructions for practical running of the system once configured correctly.

**Documents from Vic Pucknell copied here:**

**lyrtech\_basic.txt** (Describes how to set up and use Windows XP system running on Adlink CPU blade in cPCI crate.

Using the LyrTech system. Basic getting you started notes.

The LyrTech system consists of 1 (or more) ADC modules + a CPU module containing a standard Intel mobile processor.

1) If needed power on

The Windows XP system starts up in the usual way.

There is no login

2) Start up the components of the data acquisition system.

2.1) Double click on the System icon (starts various data acquisition system tasks)

Wait until you see the message "Completed custom startup...." in the System terminal window.

2.2) Double click on the RTDEXV4 icon (starts the data acquisition program)

Wait until you see the message "VHSADC Data Acquisition now all ready to start"

The data acquisition program initializes and detects the available VHSADC modules. Check that the number of modules found is correct.

2.3) Finally double click on the MIDAS icon (starts the MIDAS GUI)

In the Session Log window you will see the message:

"You are now working with experiment localhost"

The MIDAS GUI controls are colour coded

When there options the selected/enabled option is coloured Gold. The unselected/disabled option is coloured Blue.

For tick-boxes if choosen/selected then the box is coloured Gold and a black tick is seen. If not choosen/unselected then the box is coloured Blue.

For normal experiment control start here

3) Setup the Data Acquisition system

Go to the LyrTech Base Frame

Click on LyrTech VHS-ADC which starts the LyrTech VHS-ADC control window.

The ADC time and clocks are supplied by the TDRI module (a NIM module). Power must be on this crate before you run SETUP.

Click on Experiment Control which starts the Experiment Control (VHSADC) window.

The first time after reboot the software initialises. You will see messages at the foot of the window. Wait until these messages complete - normally this takes about 5 seconds.

Ensure "Histogramming enabled" is selected if required. To enabled click on the blue checkbox. It will turn golden.

Click on the Yellow SETUP button and select the option "Setup Everything"

The Setup procedure automatically loads all ADC settings from the currently selected parameter savefile.

Wait until you see the message "MIDAS Data Acquisition System SETUP and ready to GO" in the Session Log window.

The first time after a power on it will be necessary to synchronise the time within the ADC modules. Click on the "FPGA Programming" button. Click on the button "Generate RESYNC" and confirm the action.

The module time is only lost by power off - not by a Windows reboot.

Ensure "TS Transfer enabled" is selected if you wish the acquired data to be forwarded to the Linux workstation for further processing and possible write to disc. The software server(s) in the Linux workstation should be enabled.

4) Further setting up options

You will probably need to adjust LyrTech VHS-ADC parameters. You do this via the LyrTech VHS-ADC Client window.

From here you can load alternative firmware files into the VHS-ADCs. Click on the "FPGA Programming" button.

If you select and load a firmware file it becomes the default used in future for the automatic load during SETUP.

From here you can adjust firmware parameters. Click on the "Firmware Setup (User)" button.

You can saved any changes to firmware parameters. Click on the "Save Settings" and "Restore Settings" buttons.

The file chosen here becomes the default file used by the automatic parameter restore during SETUP.

4) Collect data

Go to the Experiment Control window

You can now use the GO and STOP button to control data acquisition.

The green GO button starts data acquisition

The red STOP button halts data acquisition.

It is useful to monitor the Statistics screen. Start via the Statistics button.

The Block Index (bottom of the window)

0 = numbers shown are the sum of all modules

n numbers shown are for module n only

Useful things to note:

SYNC data :- This is a count of the periodic time markers generated by the modules. The rate should be 1500 /sec for each module

Events : - data items (including SYNC markers)

Good Item : - data items (excluding SYNC markers)

5) Viewing histograms

From the LyrTech base menu click on "Spectrum Viewer"

The Spectrum Directory Browser starts. If needed select Resource = MemSas

Select the histogram required (vhsadc#1.E1 - energy from ADC channel 1) and double click

You should now see the energy histogram for ADC1

If collecting signal traces you can also see the most recent data trace for each ADC channel.

This is the end of the Basic instructions.

There are many other windows showing Statistical information, simple data analysis functions and setup of the ADC parameters.

Note:

When running and collecting data the leds on the ADC module RUN and OVR should not be on permanently.

If OVR is on as a solid red colour reduce the data signal input to the module.

If RUN is on as a solid green colour then the firmware is not functioning correctly. It will probably be necessary to STOP data acquisition and reload the firmware for this module. A SETUP is then required.

**lyrtech\_configure.txt** (Describes how the system can be configured to send data between various processes in acquisition chain, currently using option 2 below. Currently used ports, etc are shown in the figure at the end)

The LyrTech data acquisition system uses TCP connections to transfer data between the various components of the system. As a result these components may be distributed in different workstations but they may all be in the same workstation.

The protocols and data format used for these data links is the same in all cases and hence a number of configurations is possible.

Two potential configurations are

1) LyrTech cPCI crate (VHS-ADCs) => Data Merge => Data Storage

2) LyrTech cPCI crate (VHS-ADCs) => Data Merge => Event Builder => Data Storage

The TCP ports used are defined via configuration files. In the case of the Event Builder the input and output ports can be changed via its GUI.

1) LyrTech cPCI crate (on Windows XP system)

This uses 1 TCP connection for each ADC module. Only the destination port number of the first module needs to be defined. The remaining modules use consecutive port numbers.

Startup file contains configuration information:

**c:\MIDAS\LyrTech\StartUp\RTDEX4.cmd**

**netstring TS\_Server "192.168.0.203"** defines the IP address or name of the data destination

**netint TS\_Port 11011** defines the first of a group of IP ports for the data destination

2) Merge process (on Linux machine nnids1)

This has 1 TCP port for each ADC module to read the data sent by the LyrTech system.

input configuration file **/MIDAS/Merger/IDS/GS\_configuration**

incoming links defined by statement

**links 4 /MIDAS/Merger/link64 11011**

defines 4 links starting at port 11011 The link software is /MIDAS/Merger/link64

output configuration file **/MIDAS/Merger/IDSMerger**

The Merge combines the incoming data stream into 1 outgoing stream

**netstring TS\_Server "localhost"** defines the IP address or name of the data destination

**netint TS\_Port 10305** defines the IP port for the data destination

3) Event Builder process (added by PTG 01.12.2014)

The Event Builder (John Creswell, University of Liverpool) can be used in this case to provide two output stream copies of the data. For example, one stream can be sent to the Tape Server for direct data storage, the second stream to online sorting.

Files related to the Event Builder can be found in /MIDAS/TDR/EventBuilder/

The Event Builder requires the Message Logger process to be running, and also requires a “shmsas” daemon (see **/MIDAS/TDR/EventBuilder/README**)

These two are handled by the following lines in **/etc/rc.local** on nnids1:

**/MIDAS/MessageLogger/Linux64/messageLogger &**

**/MIDAS/TDR/EventBuilder/bin\_Linux64/shmsas /MIDAS/sas/nnids1shm –i –z &**

The following line is also needed in **/etc/hosts/**

**127.0.0.1 egmsg nnids1**

The directory **/MIDAS/log/** should also be writable by all.

The EventBuilder can be launched using the command:

**/MIDAS/TDR/EventBuilder/bin\_Linux64/TDReb-session**

Configuration of the input and output streams can be done in the GUI, more details are given below.

4) Data Storage process (Tape Server)

configuration file **/MIDAS/config/TS\_10205/TS\_configuration**

The record **/MIDAS/TapeServer/Linux64/linkTCP** defines the IP port used by data input (**default is 10305**)

The record file\_path\_base **/TapeData** defines the base directory used for writing data to disc. Note that this may be a symlink.

**lyrtech\_merge.txt** (Describes how to use the merge software)

Using the Data Merge Software

This takes data recived from the ADC modules and combines it into a single time-ordered data stream.

(1)

Look at the MIDAS icons on the top task bar. The third icon from the right hand end is Merge. Click on this.

The command /MIDAS/Merger/IDS/IDSMerger is run.

*(Note added by PTG: On nnids1 this is actually* ***/MIDAS/Linux/startup/IDSMerger*** *but configuration parameters are same)*

This starts a terminal window and you will get output like this

Tidy up

master64: no process killed

link64: no process killed

merge64.EB: no process killed

Starting Merge Server

startup complete

MERGE Server: Message Initialisation failed.

MERGE Server: Message logger not contacted.

MERGE Server: MIDAS MERGE Server Build Jul 8 2014

MERGE Server: Using default startup

MERGE Server: Configuration: SHM key=11000

MERGE Server: File mapped object /SHM\_11000 of size 402732 created

MERGE Server: Shared memory ID is 3

MERGE Server: Memory mapping 402732 bytes

MERGE Server: Shared memory segment located at address 0x7ff7dfa81000.

MERGE Server: Configuration file used - /MIDAS/Merger/IDS/GS\_configuration

MERGE Server: Merge task /MIDAS/Merger/merge64.EB

MERGE Server: 4 data link tasks configured

MERGE Server: Data link /MIDAS/Merger/link64 11011

MERGE Server: Data link /MIDAS/Merger/link64 11012

MERGE Server: Data link /MIDAS/Merger/link64 11013

MERGE Server: Data link /MIDAS/Merger/link64 11014

MERGE Server: Message reporting level = 0x100fff8

MERGE Server: Message logging level = 0xfff8

MERGE Server: MERGE Server Options = 0x0

MERGE Server: Data buffer size = 64KB

MERGE Server: File mapped object /SHM\_11001 of size 134217728 created

MERGE Server: Shared memory ID is 3

MERGE Server: Memory mapping 134217728 bytes

MERGE Server: Shared memory segment located at address 0x7ff7d7a81000.

Creating NetVars #2

Output buffer length = 65504; format option = 4; transfer option = 3

NetVars created and initialised

MRGE Stats created and initialised

MRGE Statistics/Rates thread created

MRGE Statistics thread starting

MERGE Server: Link task 0 has pid 19855

MERGE Server: Link task 1 has pid 19856

MERGE Server: Link task 2 has pid 19857

MERGE Server: Link task 3 has pid 19858

MERGE Server: Merge task has pid 19859

MERGE Data Link (19855): Message Initialisation failed.

MERGE Data Link (19855): Message logger not contacted.

MERGE Data Link (19855): MIDAS MERGE Data Link Build Jul 30 2014

MERGE Data Link (19855): Started with args 0 11000 11011

MERGE Data Link (19855): Configuration: index = 0, SHM key=11000, TCP port = 11011

MERGE Data Link (19855): File mapped object /SHM\_11000 accessed

MERGE Data Link (19855): Shared memory ID is 3

MERGE Data Link (19855): Memory mapping 402732 bytes

MERGE Data Link (19855): Shared memory segment located at address 0x7f28e9e47000.

MERGE Data Link (19855): File mapped object /SHM\_11001 accessed

MERGE Data Link (19855): Shared memory ID is 3

MERGE Data Link (19855): Memory mapping 134217728 bytes

MERGE Data Link (19855): Shared memory segment located at address 0x7f28e1e47000.

MERGE Data Link (19856): Message Initialisation failed.

MERGE Data Link (19856): Message logger not contacted.

MERGE Data Link (19856): MIDAS MERGE Data Link Build Jul 30 2014

MERGE Data Link (19856): Started with args 1 11000 11012

MERGE Data Link (19856): Configuration: index = 1, SHM key=11000, TCP port = 11012

MERGE Data Link (19856): File mapped object /SHM\_11000 accessed

MERGE Data Link (19856): Shared memory ID is 3

MERGE Data Link (19856): Memory mapping 402732 bytes

MERGE Data Link (19856): Shared memory segment located at address 0x7fab97b6e000.

MERGE Data Link (19856): File mapped object /SHM\_11001 accessed

MERGE Data Link (19856): Shared memory ID is 3

MERGE Data Link (19856): Memory mapping 134217728 bytes

MERGE Data Link (19856): Shared memory segment located at address 0x7fab8fb6e000.

MERGE Data Link (19857): Message Initialisation failed.

MERGE Data Link (19857): Message logger not contacted.

MERGE Data Link (19857): MIDAS MERGE Data Link Build Jul 30 2014

MERGE Data Link (19857): Started with args 2 11000 11013

MERGE Data Link (19857): Configuration: index = 2, SHM key=11000, TCP port = 11013

MERGE Data Link (19857): File mapped object /SHM\_11000 accessed

MERGE Data Link (19857): Shared memory ID is 3

MERGE Data Link (19857): Memory mapping 402732 bytes

MERGE Data Link (19857): Shared memory segment located at address 0x7f37acbdb000.

MERGE Data Link (19857): File mapped object /SHM\_11001 accessed

MERGE Data Link (19857): Shared memory ID is 3

MERGE Data Link (19857): Memory mapping 134217728 bytes

MERGE Data Link (19857): Shared memory segment located at address 0x7f37a4bdb000.

MERGE Data Link (19858): Message Initialisation failed.

MERGE Data Link (19858): Message logger not contacted.

MERGE Data Link (19858): MIDAS MERGE Data Link Build Jul 30 2014

MERGE Data Link (19858): Started with args 3 11000 11014

MERGE Data Link (19858): Configuration: index = 3, SHM key=11000, TCP port = 11014

MERGE Data Link (19858): File mapped object /SHM\_11000 accessed

MERGE Data Link (19858): Shared memory ID is 3

MERGE Data Link (19858): Memory mapping 402732 bytes

MERGE Data Link (19858): Shared memory segment located at address 0x7f870cb92000.

MERGE Data Link (19858): File mapped object /SHM\_11001 accessed

MERGE Data Link (19858): Shared memory ID is 3

MERGE Data Link (19858): Memory mapping 134217728 bytes

MERGE Data Link (19858): Shared memory segment located at address 0x7f8704b92000.

MERGE Program (19859): Message Initialisation failed.

MERGE Program (19859): Message logger not contacted.

MERGE Program (19859): MIDAS MERGE Program (64-bit) Build Jul 8 2014

MERGE Program (19859): Started with args 11000

MERGE Program (19859): Configuration: SHM key=11000

MERGE Program (19859): File mapped object /SHM\_11000 accessed

MERGE Program (19859): Shared memory ID is 3

MERGE Program (19859): Memory mapping 402732 bytes

MERGE Program (19859): Shared memory segment located at address 0x7fa1ad640000.

MERGE Program (19859): File mapped object /SHM\_11001 accessed

MERGE Program (19859): Shared memory ID is 3

MERGE Program (19859): Memory mapping 134217728 bytes

MERGE Program (19859): Shared memory segment located at address 0x7fa1a5640000.

Creating NetVars #2

Output buffer length = 65504; format option = 4; transfer option = 3

NetVars created and initialised

MRGE Stats created and initialised

MERGE Data Link (19856): Starting the network interface

MERGE Data Link (19856): TCP socket receive buffer was 87380 - now 249856

MERGE Data Link (19856): TCP socket send buffer was 16384 - now 249856

MERGE Data Link (19856): MERGE Data Link using TCP port 11012.

MERGE Data Link (19856): Entering server loop

MERGE Data Link (19856): listening on port 11012

MRGE Stats created and initialised

MERGE Data Link (19857): Starting the network interface

MERGE Data Link (19857): TCP socket receive buffer was 87380 - now 249856

MERGE Data Link (19857): TCP socket send buffer was 16384 - now 249856

MERGE Data Link (19857): MERGE Data Link using TCP port 11013.

MERGE Data Link (19857): Entering server loop

MERGE Data Link (19857): listening on port 11013

MRGE Stats created and initialised

MERGE Data Link (19855): Starting the network interface

MERGE Data Link (19855): TCP socket receive buffer was 87380 - now 249856

MERGE Data Link (19855): TCP socket send buffer was 16384 - now 249856

MERGE Data Link (19855): MERGE Data Link using TCP port 11011.

MERGE Data Link (19855): Entering server loop

MERGE Data Link (19855): listening on port 11011

MRGE Stats created and initialised

MERGE Program Release V3/x86\_64 (Jul 8 2014, 10:57:50) starting

Merge: Histogramming not using threads

MRGE Stats created and initialised

MERGE Data Link (19858): Starting the network interface

MERGE Data Link (19858): TCP socket receive buffer was 87380 - now 249856

MERGE Data Link (19858): TCP socket send buffer was 16384 - now 249856

MERGE Data Link (19858): MERGE Data Link using TCP port 11014.

MERGE Data Link (19858): Entering server loop

MERGE Data Link (19858): listening on port 11014

Merge: debugging initialised: off.

Merge: opening buffer for Merge\_EventBuffer, size 0x800

Merge: returning merge memory at virtual 0x158c840

Event Buffer virtual address: 0x158c840

Merge: initialising for 3 asps: 0 1 2

Merge: opening buffer for asp0\_Data, size 0x3c0000

Merge: returning merge memory at virtual 0x7fa1a41b5010

ASP Data buffer 0 (asp0), length 3932160 (0x3c0000) bytes mapped at: 0x7fa1a41b5010 - 0x7fa1a457500f

Merge: opening buffer for asp1\_Data, size 0x3c0000

Merge: returning merge memory at virtual 0x7fa1a3df4010

ASP Data buffer 1 (asp1), length 3932160 (0x3c0000) bytes mapped at: 0x7fa1a3df4010 - 0x7fa1a41b400f

Merge: opening buffer for asp2\_Data, size 0x3c0000

Merge: returning merge memory at virtual 0x7fa1a3a33010

ASP Data buffer 2 (asp2), length 3932160 (0x3c0000) bytes mapped at: 0x7fa1a3a33010 - 0x7fa1a3df300f

Queue 0 (asp0) starts at 0x7fa1a41b5010

Queue 1 (asp1) starts at 0x7fa1a3df4010

Queue 2 (asp2) starts at 0x7fa1a3a33010

Merge: GREATWordOrder set to 1

Merge: OutputTrace set to 1

Merge: Histogramming using threads

MERGE Merge setup complete

Data Acquisition using tape server localhost on port 10305

Initialising communication with tape server

Setting Transfer Block Size 65536

Setting Transfer Mode 3

Setting Overlap Mode 0

Setting nice 0

TCP transfer library version 3.12

TCP socket send buffer was 16384 - now 249856

TCP socket receive buffer was 87380 - now 249856

TCP socket created OK - now connecting to localhost port 10305

Transfer Error - : Connection refused

connect() failed:

MERGE now ready to be initialised and started

(2)

Look at the MIDAS icons on the top task bar. The fourth icon from the right hand end is "TclHttpd for Merge/TapeServer". Click on this.

The command **/MIDAS/TclHttpd/Linux64/TclHttpd-server** is run.

This starts a terminal window and you will get output like this

…….

(3)

Look at the MIDAS icons on the top task bar. The second icon from the left is "MIDAS for Merge". Click on this.

A terminal window is created and the command

**/MIDAS/bin\_Linux64/MIDAS64-session Merge /MIDAS/experiments/Merge**

runs.

A GUI window is created labelled "Merge Base Frame"

NOTE: You will already have completed this step when starting the Data Storage Server (Tape Server)

This contains a menu item "Merge". Click on this.

The control window for the Merge Server starts

There is 1 data link for each ADC module. The GUI is configured for 8 links but only 4 are configured for the Merge. Links 4 => 7 are coloured grey and are inactive. Link 4 is not currently in use and is coloured red. Links 0 => 3 are in use and are coloured green when connected to an ADC source and receiving data and golden when not connected or not receiving data.

By clicking on the link you can change its state between in use and not in use.

To SETUP the Merge software click on the button "Configure & Setup". You can then Go or Stop. It is reasonable to leave the program permanently in the GO state.

The "Merge Program Pause State" can switch between Off (received data is processed and merged) or On (received data is discarded).

The "Merge Data Transfer State" can switch between Off (merged data is discarded) and On (merged data is forwarded to the Storage Server).

When actively collecting data for storage on disc set Pause State = Off and Transfer State = On.

**lyrtech\_datastorage.txt** (Describes how to use the TapeServer and store data to disc)

Using the Data Storage Software (TapeServer)

(1)

Look at the MIDAS icons on the top task bar. The icon second from right is TapeServer. Click on this.

The command script **/MIDAS/Linux/startup/TapeServer** is run.

This starts a terminal window and you will get output like this

Tidy up

master: no process killed

stats: no process killed

driver: no process killed

linkTCP: no process killed

Starting Tape Server

startup complete

MIDAS Tape Server: Message logger not contacted.

MIDAS Tape Server: MIDAS Tape Server Build February 14 2014

MIDAS Tape Server: Unable to change scheduling priority - Permission denied

MIDAS Tape Server: Using default startup

MIDAS Tape Server: Configuration: UDP port = 10205, SHM key=10205.

MIDAS Tape Server: File mapped object /SHM\_10205 of size 1331104 created

MIDAS Tape Server: Shared memory ID is 3

MIDAS Tape Server: Shared memory segment located at address 7f45841a6000.

MIDAS Tape Server: Configuration file used - /MIDAS/config/TS\_10205/TS\_configuration

MIDAS Tape Server: Stats task /MIDAS/TapeServer/Linux64/stats

MIDAS Tape Server: Using device file /dev/file/0 /MIDAS/TapeServer/Linux64/driver

MIDAS Tape Server: Using device sink /dev/null/0 /MIDAS/TapeServer/Linux64/driver

MIDAS Tape Server: Data link /MIDAS/TapeServer/Linux64/linkTCP 10305

MIDAS Tape Server: Message reporting level = 0x180fff8

MIDAS Tape Server: Message logging level = 0xfff8

MIDAS Tape Server: Tape Server Options = 0x2

MIDAS Tape Server: File device path base = /TapeData

MIDAS Tape Server: Data buffer size = 65536

MIDAS Tape Server: Tape block size = 65536

MIDAS Tape Server: File mapped object /SHM\_110205 of size 4195880 created

MIDAS Tape Server: Shared memory ID is 3

MIDAS Tape Server: Shared memory segment located at address 7f4583da5000.

MIDAS Tape Server: File mapped object /SHM\_210205 of size 3100 created

MIDAS Tape Server: Shared memory ID is 3

MIDAS Tape Server: Shared memory segment located at address 7f4584305000.

MIDAS Tape Server: Capabilities restored.

MIDAS Tape Server: Master global area initialised.

MIDAS Tape Server: Stats task has pid 28131

MIDAS Tape Server: Driver process for /dev/file/0 has pid 28132

MIDAS Tape Server: Driver process for /dev/null/0 has pid 28133

MIDAS Tape Server: Link task 0 has pid 28134

MIDAS Tape Server: Starting the RPC interface

MIDAS Tape Server: Created RPC Program 28000205 Version 4 on UDP port 10205.

MIDAS Tape Server: Entering server loop

MIDAS Tape Server: MIDAS Tape Server now available on UDP port 10205.

MIDAS Tape Statistics: Message logger not contacted.

MIDAS Tape Statistics: MIDAS Tape Statistics Build February 14 2014

MIDAS Tape Statistics: Started with args 10205

MIDAS Tape Statistics: Configuration: SHM key=10205

MIDAS Tape Driver (28132): Message logger not contacted.

MIDAS Tape Driver (28132): MIDAS Tape Driver Build February 14 2014

MIDAS Tape Driver (28132): Started with args 0 10205

MIDAS Tape Statistics: File mapped object /SHM\_10205 of size 1331104 created

MIDAS Tape Driver (28132): Configuration: driver=0, key=10205.

MIDAS Tape Statistics: Shared memory ID is 3

MIDAS Tape Driver (28133): Message logger not contacted.

MIDAS Tape Driver (28133): MIDAS Tape Driver Build February 14 2014

MIDAS Tape Statistics: Shared memory segment located at address 7f1f89727000.

MIDAS Tape Driver (28133): Started with args 1 10205

MIDAS Tape Driver (28132): File mapped object /SHM\_10205 of size 1331104 created

MIDAS Tape Driver (28132): Shared memory ID is 3

MIDAS Tape Driver (28133): Configuration: driver=1, key=10205.

MIDAS Tape Driver (28132): Shared memory segment located at address 7f2a1c7fc000.

MIDAS Tape Driver (28132): Using device /dev/file/0 of type file.

MIDAS Tape Driver (28133): File mapped object /SHM\_10205 of size 1331104 created

MIDAS Tape Driver (28133): Shared memory ID is 3

MIDAS Tape Driver (28133): Shared memory segment located at address 7f708728d000.

MIDAS Tape Driver (28133): Using device /dev/null/0 of type sink.

MIDAS Data Link (28134): Message logger not contacted.

MIDAS Data Link (28134): MIDAS Tape Data Link Build February 14 2014

MIDAS Data Link (28134): Started with args 10205 10305

MIDAS Data Link (28134): Configuration: SHM key=10205, TCP port = 10305

MIDAS Data Link (28134): File mapped object /SHM\_10205 of size 1331104 created

MIDAS Data Link (28134): Shared memory ID is 3

MIDAS Data Link (28134): Shared memory segment located at address 7f5ba5d7b000.

MIDAS Data Link (28134): Starting the network interface

MIDAS Data Link (28134): TCP socket receive buffer was 87380 - now 458752

MIDAS Data Link (28134): TCP socket send buffer was 16384 - now 458752

MIDAS Data Link (28134): MIDAS Data Link thread 0 using TCP port 10305.

MIDAS Data Link (28134): Entering server loop

MIDAS Data Link (28134): thread 0 listening on port 10305

(2) (N.B. this described above)

Look at the MIDAS icons on the top task bar. The second icon from the left is "MIDAS for Merge". Click on this.

A terminal window is created and the command

**/MIDAS/bin\_Linux64/MIDAS64-session Merge /MIDAS/experiments/Merge**

runs.

A GUI window is created labelled "Merge Base Frame"

This contains a menu item "Tape Control". Click on this.

The control window for the Tape Server starts

For the item under "Available Drives" click on Allocated. No turns to Yes

In the "Load Tape" menu select "Initialise" and follow the on window instructions.

The Volume name will be a directory created under the Tape Server file root (/TapeData)

You can now choose a "Run Name Prefix" and/or "Run Number". The file name in the direct will be these concatenated. Ie R3.

Click on "Server State" Go and you are ready to write incoming data to disc.

(3)

If you now return to the LyrTech Experiment Control.

Ensure that the Readout is in the GO state and that the TS Transfer Enabled is selected (tick).

The tick box will be RED if there is no data connection (or the acquisition is in STOP state) and will be GREEN if there is an active data connection.

The Tape Server terminal will show progress

MIDAS Tape Server: Initialising volume on device /dev/file/0.

MIDAS Tape Server: Mounting volume EXPT4 on device /dev/file/0.

MIDAS Tape Server: Opening file R3 on device /dev/file/0.

MIDAS Data Link (28134): thread 0 accepted connection from 192.168.0.200, port 58930

MIDAS Data Link (28134): buffer size changed to 65536

MIDAS Data Link (28134): thread 0 client closed connection

MIDAS Data Link (28134): thread 0 listening on port 10305

and there will be a "spinner" in the last line which changes as each data block is written to disc.

## Practical guide to running the DAQ and online analysis with GRAIN

The following assumes that the system is correctly configured and that the part of the system on the Windows XP blade in the crate is ready to send out data, but in the “Stopped” state. The steps and instructions below are for the system using the EventBuilder and GRAIN for online analysis.

Bringing up the Linux PC side of the system to take data:

1. On pcids03 (ssh –X upcids02@192.168.0.10), to go directory /home/upcids03/proxy and execute the shell script ./proxy.sh if it is not already running. A window should appear “Grain TCP Proxy (on pcids03.cern.ch)”. The proxy is now listening on port 10310 for data which will be sent from the EventBuilder, and can make it available for the GRAIN online analysis.

1. On nnids1, there are a number of launcher icons on the top menu bar:

From right to left:

TDR EB Session

TapeServer

Merge

TclHttpd for Merger/TapeServer

MIDAS for Merge

MIDAS for IDS (not used here)

1. Click on “TDR EB Session”

A terminal window appears and some output is printed as startup scripts are executed. Then a MIDAS base frame (TDR EB) and a Session Log appear. The text “You are now working with experiment TDR.nnids1” should appear in the session log.

1. Click on “TDR Event Builder”

A new window “TDR Event Builder Control” should appear. Click “Load Prog” in the middle. Another console window opens “TDR Event Builder Exec TDRmain”. Wait for a second or two until “TDR processes ready for use” appears.

1. On the “TDR Event Builder Control” window, you can now click “EB Control”. Another window “TDR Event Builder Setup” appears.

Here you can configure the input and output data streams.

Output0 is sent to the online sort GRAIN proxy running on pcids03. Output1 is sent to the TapeServer which will soon be running on nnids1

Input: Select “Online” from the drag-down box.

Input: Click RunFiles setup and check that the Data Transfer Port is 10305

Output0: Select “TapeServer” from the drag-down box.

Output0: Ensure Enable “RawData” box is clicked (pink)

Output0: Click RunFiles setup and check that the following is seen:

Host: 192.168.0.10

Port: 10310

Output1 Select “TapeServer” from the drag-down box.

Output1: Ensure Enable “RawData” box is clicked (pink)

Output1: Click RunFiles setup and check that the following is seen:

Host: localhost

Port: 10405

At the top, the only box which should be ticked is “Transmit to Output”. This is all the configuration which is needed.

1. On the “TDR Event Builder Control” window, you can now click “Install”.

You will see more text appear in the “TDR Event Builder Exec TDRmain” window. The EventBuilder sets up the communication with the input and outport streams/ports.

1. You can now setup the TapeServer and Merge. Click on the “TapeServer” launcher on the menu bar. A terminal window appears and some text as the various scripts are executed.
2. Now click on the “Merge” launcher on the menu bar. Again a terminal appears and some text as the various scripts are executed. Wait until it stops.
3. Now click on the “TclHttpd for Merge/TapeServer" launcher. Again a terminal appears and some text as the various scripts are executed. Wait until it stops.
4. Now click on the “MIDAS for Merge" launcher. A terminal window is created and a GUI window is created "Merge Base Frame"

This contains a menu item "Merge". Click on this.

The control window for the Merge Server starts

1. To SETUP the Merge software click on the button "Configure & Setup". You can then click GO. It is reasonable to leave the program permanently in the GO state.
2. Now click on the “Tape Control” menu item on the Merge Base Frame. The “Tape Drive Control” window opens. Click on the “No” button under Allocated? button, and then “Load Tape” -> “Initialise New Tape”.

You can then add the directory you wish to write data to in the dialog which opens and set the run number, if required.

1. Now move the the Windows XP machine in the corner, and ensure that the “TS Transfer Enabled” button is clicked. Click the green “GO” button.
2. On the Merge Control window you can click “refresh”. If the data is being merged the links should be green, and the Merge State “GOing” and Merging should be seen. You can also open the Merge Statistics and check that things are incrementing if you wish.

!!! VERY IMPORTANT: If the links don’t turn Green, do the following steps:

1. Stop on Windows machine. Do resync just in case

2. Stop Merge.

3. Click on required links (0,1,2 for three ADC cards)

4. Click on Configure and Setup

5. Go Merge

6. Go on Windows machine

1. Now go to the “TDR Event Builder Control” window and click “GO”. Some text will appear in the window.
2. You can now send the data from the Merge to the EventBuilder and on to the TapeServer and GRAIN proxy. Go to the “Tape Drive Control” window and click “Server State” GO. (or click No Storage and GO if you want to test without writing data to disk).
3. Now go the the “Merge” control window and click “Merge Data Transfer State” to ON. This starts sending data from the Merge to the EventBuilder.
4. Go to the “TDR Event Builder Control” window and click on “EB statistics”. You should see that the input blocks and output blocks are incrementing.
5. Go to the Grain TCP Proxy window. You should see that there is a connection from 192.168.0.203 and that the RX counter is increasing.
6. Data should now be going to disc and to the Grain Proxy. You can see this e.g. by issuing the command “ls –lt | head –n 3” in a terminal window where you have cd’d to the correct directory on /TapeData/. It can also be seen in the “Tape Drive Control” window (Kbytes/sec should not be zero).

## Online sorting with GRAIN

The following is a brief introduction to running online sorts with GRAIN. For a given experiment, it is good practice to have the following example directory structure under ~/Experiments/ISXXX/ on pcids03:

Directory:

conf – containing triggering and event .conf files and .gains gainmatching files.

spectra – containing sorted .aida format spectrum files, etc

sortcodes – containing .java sortcodes and .class compiled files

Paths to these directories and to your java compiler can be found under the “Settings” button on the menu bar at the top of the GRAIN window. Example files with comments can be found e.g. in the IS579 directory under Experiments.

1. On pcids03 ((ssh –X upcids02@192.168.0.10), to go directory /home/upcids03/grain and execute the shell script ./grain.sh

The GRAIN analysis system starts.

1. Click on the “Cog” icon (fifth button from left at top). The Grain Sorter window appears. Here you can set the parameters for your sort.
2. Click the “Setup” tab if necessary. From the “Input Handler” drag-down box select “Grain TCP Proxy Stream” and click “Setup”. Check that the settings are XXXX + YYYYY. Port 10310, etc
3. From the “Event Data Parser” drag-down box select “Filtering TDR Raw” and click “Setup”. Here you can select the configuration file .conf and gains file .gains from the relevant directory. The “Rate” part does not require any configuration.
4. From the “Grain Event Format” select “Great Standalone”. Nothing more needed here.
5. Under “Sort Class” click “Browse” and navigate to your required online sort class file.
6. Under “Results File” click “Browse” and enter the required name for your resulting spectra file (e.g. runXX\_online.aida)
7. Click “Run”. You will see some messages in the console window at the bottom and a tree structure of spectra appear in the “Datasources” pane on the main analysis window.
8. On the “Grain Sorter” window you can click the “Statistics” tab and make sure there is some input rate visible.
9. Enjoy looking at your spectra.

## Changing runs

The simplest way to do this is to leave keep most of the data acquisition processes running, and just to stop the Merge Transfer and writing to Disc. The EventBuilder and Proxy will then just wait for reconnection of the data sources without problems (hopefully!)

Stop Run:

* On the Merge control - Click “Off” on the “Merge Data Transfer State”
* On the Tape Drive Control – Click “Stop” on the Server state

Start Run:

* On the Tape Drive Control – Click “Go” on the Server state
* On the Merge control - Click “On” on the “Merge Data Transfer State”

On the Grain Sorter window you can “Stop”, answer yes/no to the dialog which pops up, change the name of the results file and click “Run”.

