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Proposed Event Data format for the HFT

From Control Shell to NIOS

Commands

- Reset (file spec as integer number <5 bit) – initialize registers and put all firmware/software to known state (hot pixel = 0) This triggers a sequence of events including configuring the MIMOSTAR(s) via JTAG. The file is the JTAG configuration file.
- Take Full Frame (N, S, CDS) – take full frame of data, N=number of full frames, CDS = 1 for CDS, CDS = 0 for raw data
- Normal Data Taking – begin run and take triggers from TCD input. In this mode, we can generate our own triggers from our TCD for troubleshooting and calibration. We produce 18 bit addresses from CDS and cluster finding.
- Take Fixed Number of Events (N,S, R) – begin a run and take a fixed number of frames. N=number of full frames. S=1 to write data to disk, S=0 to not store data. R = run number. This is in normal data taking mode.
- Hot Pixel Load (file spec as integer number <5 bit) – load the hot pixel map
- Read Pixel Statistics – get the means and RMS for the pixels

NIOS implements this in the commands to the front end (Thorsten) via the agreed control interface.
These are passed to the front end via a clock synchronous interface consisting of commands that control the basic functions of the front end. These commands form a CSR that should be latched with the initiation of any command that results in a readout of data. Similarly, the busy state of the front end as well as the status registers should be latched resulting in a instantaneous "snapshot" of the detector status at the commencement of the data taking event.

This should all be included in the event data header.

It is assumed that the lower level testing and troubleshooting will all happen from inside the NIOS environment bypassing the normal triggered event path.

Proposed event data format per data stream from Mimostar output:

<u>Fixed Length Header (64 bytes)</u>

<u>Byte</u>

1-4	AAAAAAAA tag for beginning of event
5-6	3-bit control shell command, 5 bit argument
7-8	Trig command bit0-3, DAQ command bit 0-3 (from TCD)
9-10	12 bit Token (from TCD)
11-12	snapshot of FE/NIOS commands and status bits.
13-14	Mimostar position on ladder, ladder address
15-64	reserved (for future use, possible comment space?) All set to 0 unless specified

All bytes specified here will consist of 16 bit words with the leading unassigned bits set to 0 .

Variable Length Event Data (Normal Data Taking)

Serial stream of 18 bit addresses extended to the appropriate 32 bit word boundary at the end with 0s.
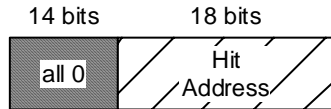
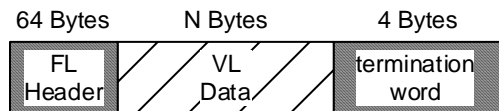## Fixed Length Event Data (Full Frame Data)

Note: these events will be identifiable by the snapshot of the FE/NIOS command and status bits.
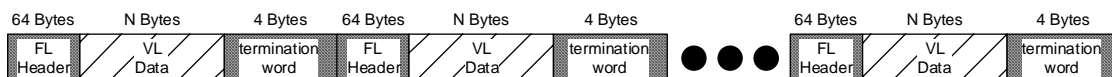
Serial stream of 320 x 640 32 bit numbers for future

Serial stream of 128 x 660 32 bit numbers for the HFT 2006 test.
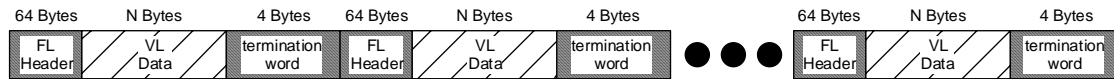
Proposed Data format for Data Stream:

The data from a single Mimostar output /Event FIFO then looks like this:

For the HFT 2006 test and for readout during testing, events are stored sequentially in a file that contains a run and is less than 2 GB in size.

In the data taking in STAR, we will deliver events on a ladder/MB basis where the data has the form (per ladder)

64 Bytes	N Bytes	4 Bytes	64 Bytes	N Bytes	4 Bytes		64 Bytes	N Bytes	4 Bytes
FL Header	VL Data	termination word	FL Header	VL Data	termination word	● ● ●	FL Header	VL Data	termination word

10 Mimostar Datastream, Event data is in mixed order

The termination word is the one used for the RORC/SIU and consists of EEEEEEEE. Note that this implies that DAQ must count the number of data files to know when all of the data for a particular event has arrived. We suggest that the file name for each data steram be a generated from the header and consist of the token and the mimostar ID.