ZEUS-Note 95-102

A reliable UDP software implementation for the PME FDDI-1 board [1]

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In the ZEUS-Note 95-81 the memory to memory and FDDI output bandwidth of the PME FDDI-1 VME-FDDI interface board were measured. Additionally a RUDP (reliable UDP) FDDI data transfer protocol was implemented.
This note extends these measurements to concurrent data transfer and FDDI operation with RUDP in a mode applicable to ZEUS online requirements.

1 Test Setup

The system used in 95-81 has been used here. A 128KB NIKHEF 2TP module's TPM (triple port memory) sources data to be transferred, via the PME-FDDI-1 board, to an INDY SGI workstation. FDDI connectivity is provided by an FDDI concentrator.

2 Additional memory to memory rate tests

The TPM of a NIKHEF 2TP module is used as the source location of data (events) to be transferred.

This is expected to be the configuration used in a ZEUS online application and the transfer rate (TPM - PME-DRAM) has to be optimized.

Two reasonable mechanisms have been investigated:
Case 1 - using the internal DMA engine of the PME board;
Case 2 - using the 2TP module as a master on the VME bus.

Table 1 shows the typical rates that are found.

Table 1.

Event size (Byte)	Total data size (MB)	Case 1 (MB/s)	Case 2 (MB/s)
65536	1638	5.6	4.55

The Case 1 solution is faster than Case 2. An additional measurement of the 2TP to 2TP rate gave 9.8 MB/s. This indicates that the Case 2 result is slowed down by the PME VME slave interface.

3 Concurrent data transfer and FDDI output implementation test

Events will be transferred from the 2TP TPM to a PME DRAM cyclic buffer. Concurrently, the buffered events will be transferred over FDDI. The read from and write to buffer pointers are maintained by the FDDI transfer and event transfer tasks respectively.

[1] Radstone Technology PLC

The event transfer is controlled by the PME in the sense that the program in the 2TP loops waiting for a word in TPM to be modified. When this occurs the 2TP will send a message to the PME mailbox region. Writing to mailbox region invokes (if not masked) an interrupt. When an interrupt occurs the running process is to be suspended and an interrupt service routine (ISR) is executed. The suspended process resumes after ISR completion.

The use of ISRs allows the PME to run in a pseudo single process mode whereby no detailed knowledge is required to optimize process scheduling. The FDDI_send process , which handles the transfer of events from the buffer to FDDI, is a single process.

The event transfer task was carried out by two ISRs: the mailbox region ISR and the ISR connected to the DMA end interrupt of the VIC068 (VME Interface Controller) chip. The first ISR set up the event DMA transfer and the other one manages the transfer of the full event. The process START_DMA is rarely used in cases when there is no space in the cyclic buffer and due to this the mailbox region ISR is not able to set up the event DMA transfer. On getting the semaphore from FDDI_send (there is some space in the cyclic buffer) START_DMA sets up this event DMA transfer.

The results of the implementation tests and some numbers from the previous ZEUS-note are given in the table 2.

The numbers in brackets have been obtained after some improvements of the program: if the entire cyclic buffer is full then FDDI_send gives the semaphore to START_DMA after transferring some number of buffered events to FDDI. In this way, in case of small event sizes (less then 50000) FDDI_send is not interrupted until it has some events to transfer over FDDI.

Table 2.

Total data size (MB)	Event size (Byte)	RUDP rate alone (MB/s)	DMA rate alone (MB/s)	FDDI_send and DMA (MB/s)
13107	131072	6.56	5.70	5.60 (—)
10000	100000	6.42	5.67	5.56 (—)
8000	80000	6.15	5.67	5.53 (—)
6000	60000	6.03	5.63	5.49 (—)
5000	50000	5.66	5.58	4.97 (5.27)
4000	40000	5.24	5.58	4.69 (4.93)
3000	30000	4.67	5.58	4.33 (4.42)
2000	20000	4.03	5.57	3.66 (3.72)

4 Conclusion

The rate tests show that the PME FDDI-1 board (running the RUDP/FDDI/EventHandler software) can be used for event transfer from 2TP modules to SGI workstations. Throughput rates of 5 MB/s are achieved for event sizes exceeding 40 KB.

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