mbspex and pexornet - Linux device drivers for PCIe optical receiver data acquisition and control

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**pexornet components**

**X86 PC**

- GUI
- gosipcmd
- ifconfig
- iftop
- libpexornet.a
- ioctl()

- webserver
- readout.c
  - DABC recv()
  - recvfrom()

- wireshark

**network device**

- pex0

**Linux Kernel**

- pexornet.ko

**PCIe layer**

- DMA

**DMA**

- dmabuf

**network layer**

- skb buf
  - data

**control systems**

**DAQ**

**commands and tools**

**library**

**kernel module**

- gosipcmd –a ifconfig pex0 mtu 64000 ethtool pex0
- ifconfig pex0 mtu 64000 ethtool pex0
- ioctl()
- webserver
- readout.c
- DABC recv()
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mbspex and pexornet - linux device drivers for PCIE optical receiver data acquisition and control

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Abstract

The GSI PEXOR family of PCIE boards are used as interface for data acquisition from various external front-ends. Ideally up to a charge of various fiber channels. Communication with the hardware is possible via the provided PCIe UVPX connection. To ensure a robust and reliable operation, a network driver has been developed. The new driver has been developed to work with the Linux 3.2 version with default drivers. Both the driver and its configuration have been tested. To date several experimental configurations have been tested. It can be applied for driver configuration and data transfer. Moreover, the characteristics of the board and its drivers have been evaluated. A special version of a DAS software with modified DAS has been implemented with the framework SIC. Delivering the same quality as the former version. A major feature is the ability to monitor and control the data flow. Readout performance of a fast setup has been evaluated both with DAQ / frontend, and with DAQ / backend.

mbspex components

- character driver accessible via dev/piex)
- getting and using via /dev/mbspci/mbsport
- all licensed and recovered control via user idxx
- consumer access is provided by kernel module
- mambo maps physical DMA buffer memory outside kernel space (MBS port), indexed at last time
- critical data points are summarised to be evaluated in standard via msg
- readout data required for readout tailored for DAQ software framework VIDS

pexornet components

- network driver registered as interface port
- debugging and monitoring via /proc/mbspci/mbport
- all licensed and recovered control via user idxx
- interface configuration with generic network tools
- consumer control access is provided to kernel module
- internal port of DMA buffers according the defined BTU
- trigger interface is based on data from readout data request, state and configuration
- readout protocol against control access by operators
- front-end data is written via generic socket on UDP port of client a virtual remote host
- various DAQ frameworks and other software may read and inspect data

DAQ with mbspex

Data rate testing at 160 mbspex modules of 2 PEXOR 800-mm wide systems at rate of 200 mbspex DAQ systems. IO 2 MB/s, test with 3000 GB of data. Decoded data is written to a file in the srd format.

DAQ with DAPC/pexornet

Data rate testing at DAPC/mbspex modules of 2 PEXOR 800-mm wide systems at rate of 200 mbspex DAQ systems. IO 2 MB/s, test with 3000 GB of data. Decoded data is written to a file in the srd format.

control GUIs

- DAQ system configured in heuristics (Configurator)
- online configuration via telnet
- confidence level of acquired data available over DAQ system
- DAQ system can be used for DAQ and Control
- smart DAQ system can be used over SIC framework

Conclusions

- all functional and operational tests were successful
- performance and all aspects of mbspex matches or even surpasses existing systems
- design is based on the open source software architecture
- the drivers can be used for any USP receiver
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