



DAQ system for DCDB readout

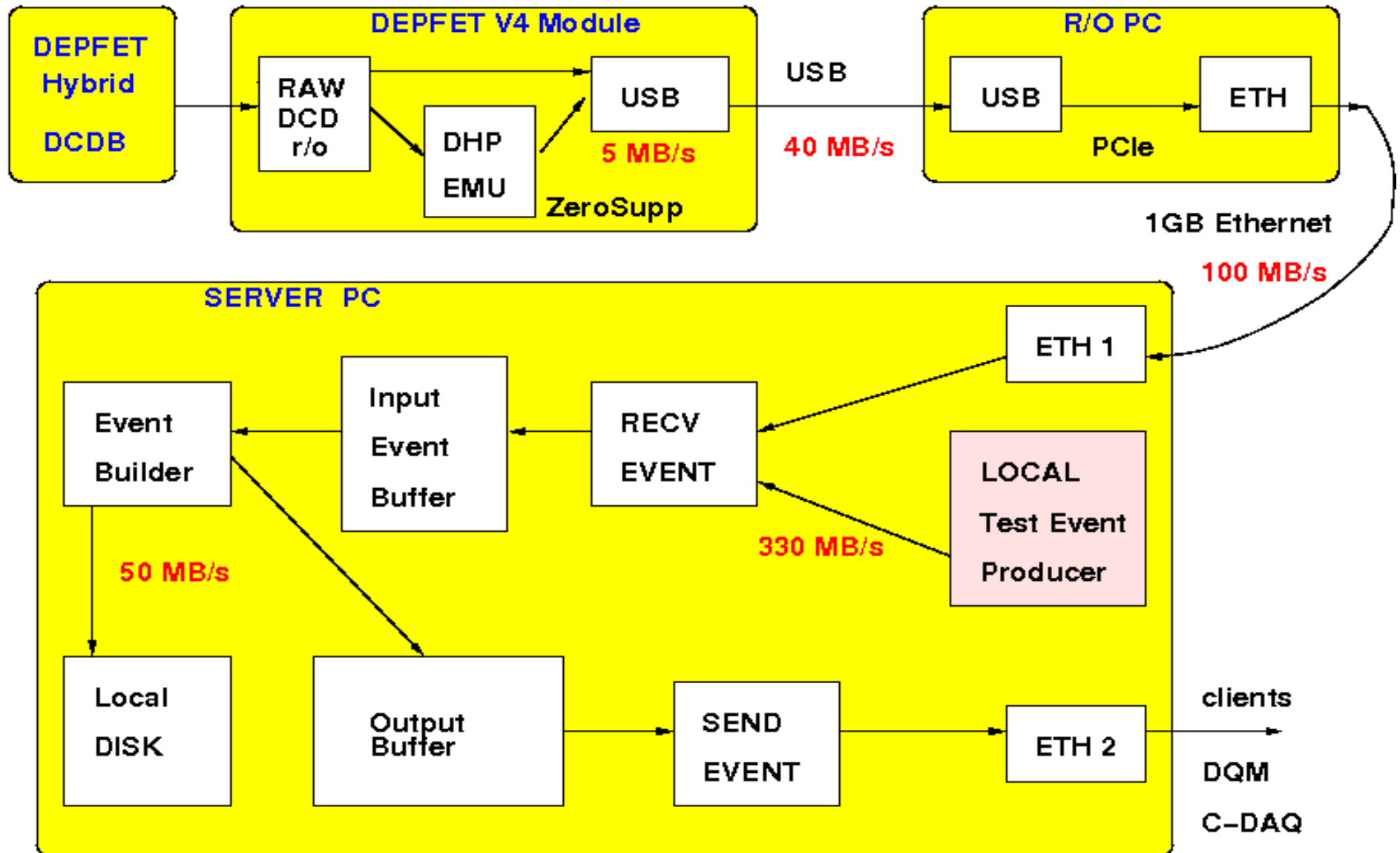
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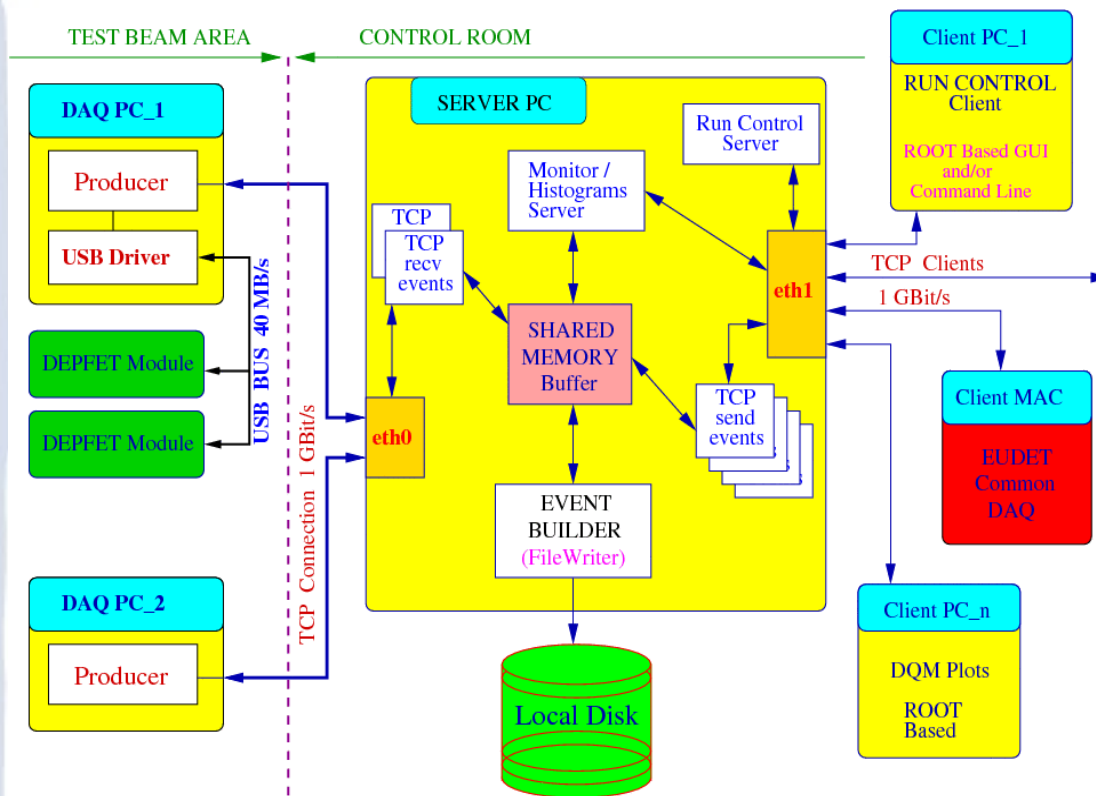
- *DAQ upgrade*
- *DCDB + Manuel's V4 readout*
- *DCDB + DHP readout*
- *Conclusion*

- *DEPFET Data acquisition system has been upgraded for DCD readout :*
 - New data format for RAW and Zero Suppressed data
 - Upgrade DQM for new matrices
 - Upgrade offline software
 - DEPFET DAQ is integrated into EUDET telescope DAQ
- *DAQ supports now 3 systems:*
 - CURO readout based on S3A and S3B readout board
 - DCDB readout based on Manuel's FPGA board (Virtex 4)
- *DEPFET telescope is based on S3B system*
 - DAQ allows to build the system from different components : S3A, S3B, DCD/Virtex4



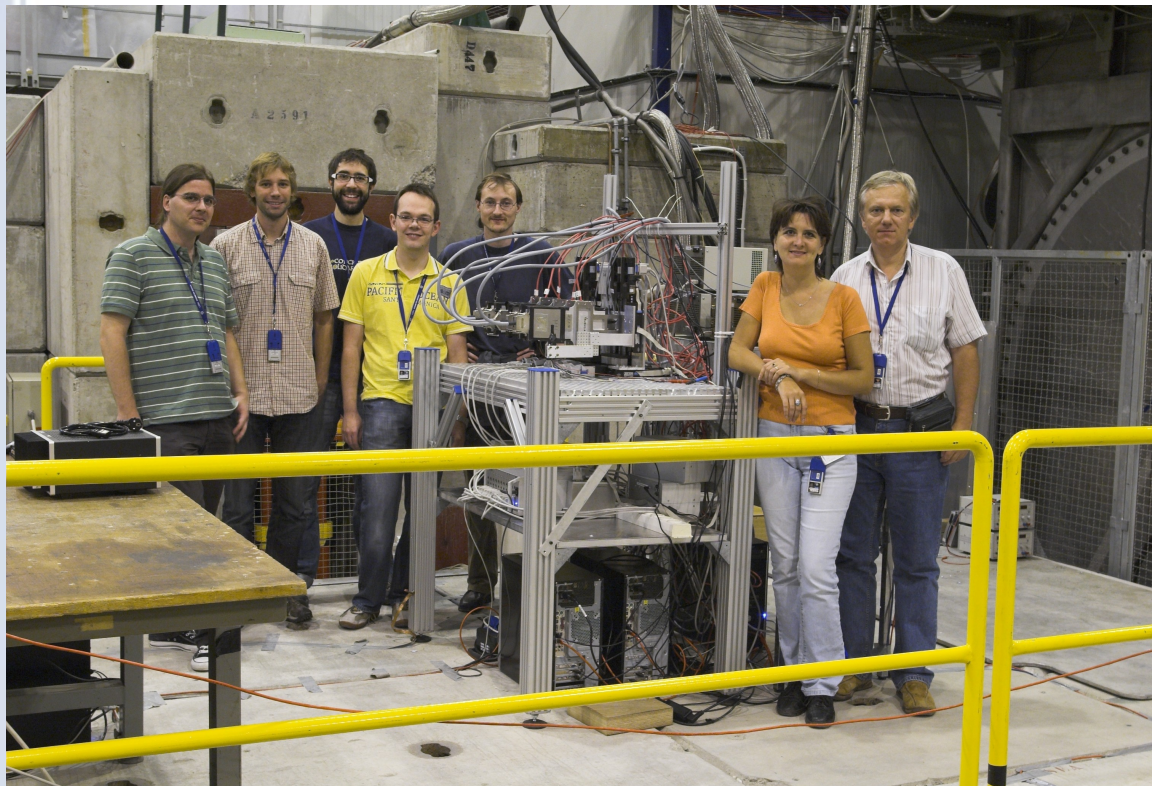
- DAQ is based on Linux network distributed client/server architecture which allows :
 - share resources and tasks
 - easy scale the system
 - remote control and monitoring
 - easy integration of other detectors

- DAQ uses USB 2.0 for data transfer from DEPFET R/O board to PC and TCP/IP to send data to Event Builder .
- The DAQ components are:
 - a LINUX based USB driver for the DEPFET DAQ board
 - a USB readout client transferring data to an event builder via network;
 - an Event Builder assembling complete events and storing in a shared memory buffer;
 - an event server send complete event to consumers (file writer, DQM, upper level DAQ, histogram server);
 - online Data Quality Monitoring (DQM) package based on ROOT.

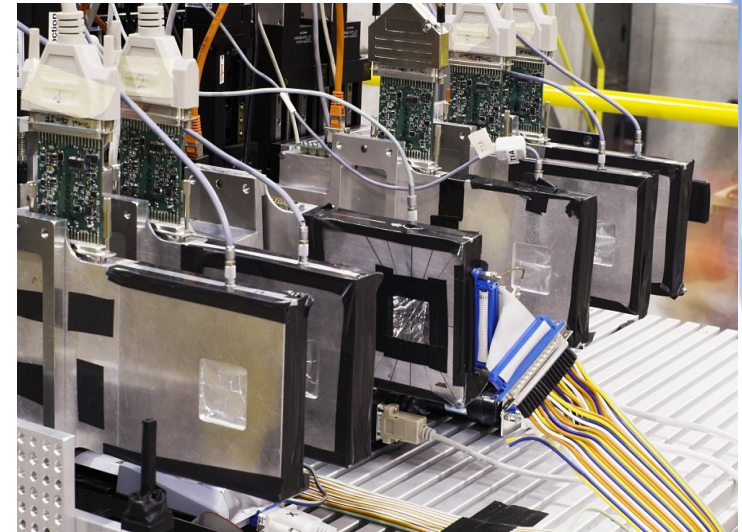


- *Jul-Aug 2008, August 2009*
- *CERN SPS H6 beam line*
- *120 GeV pions*

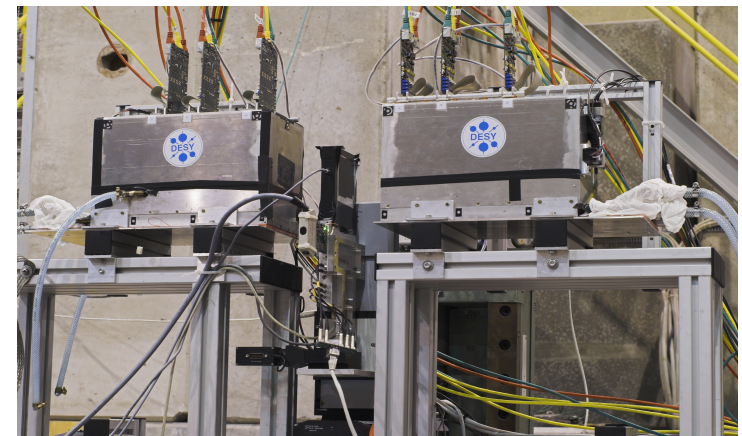
Test beam crew also important part of tests



DEPFET Telescope



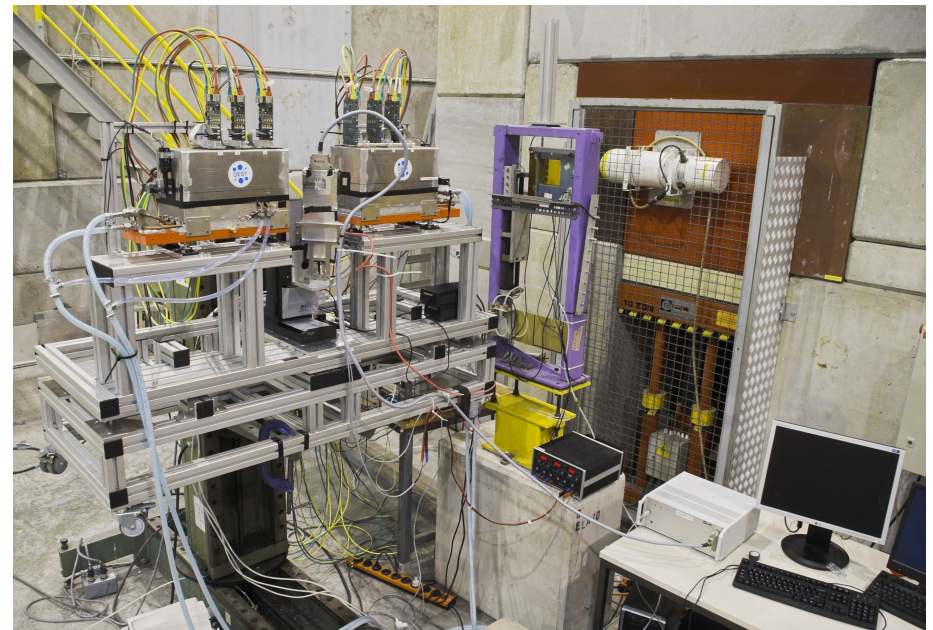
EUDET Telescope + DEPFET as DUT



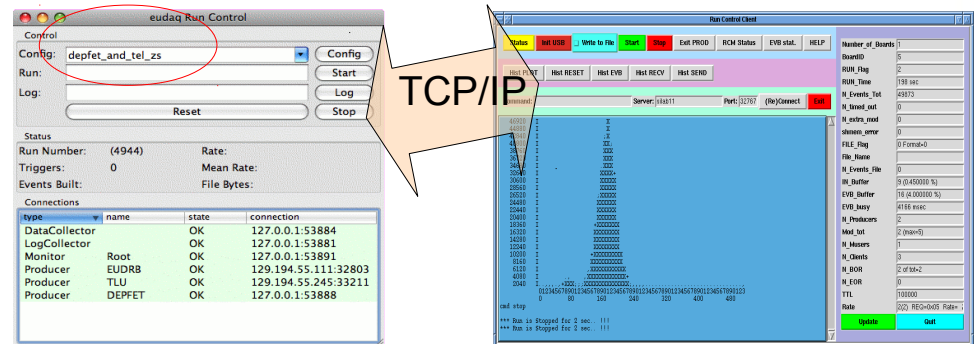
EUDET project is a program to develop the infrastructure, to facilitate the experimentation and to enable the analysis of data using shared equipment and common tools.

JRA1- test beam infrastructure (EUDET Telescope)

- *6 EUDET Modules MAPS - Monolithic active pixel sensors :*
 - 7.7x7.7 mm²,
 - 256x256 pixels
 - pitch 30x30 μm²
- *MVME6100 PowerPC computer with general purpose acquisition boards (EUDRB) inside the VME64x crate connected to 1GB ethernet HUB*
- *EUDET DAQ server on MAC PC , 1GB Ethernet*
- *Trigger Logic Unit (TLU)*
- *DEPFET DUT with Readout PC*
- *About 2 million events collected*



DEPFET DUT is steered by the EUDET DAQ software



EUDET Run Control DEPFET Run Control

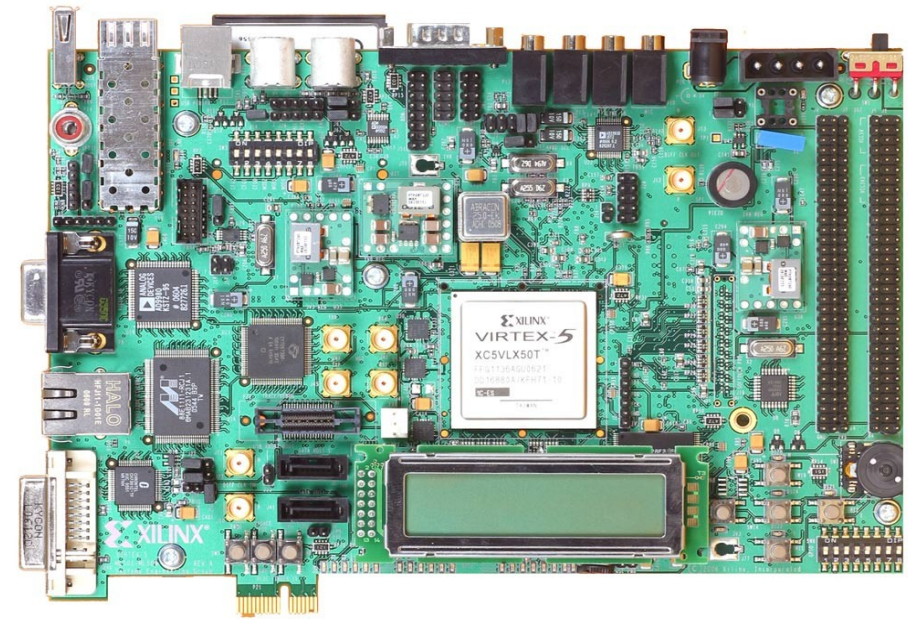
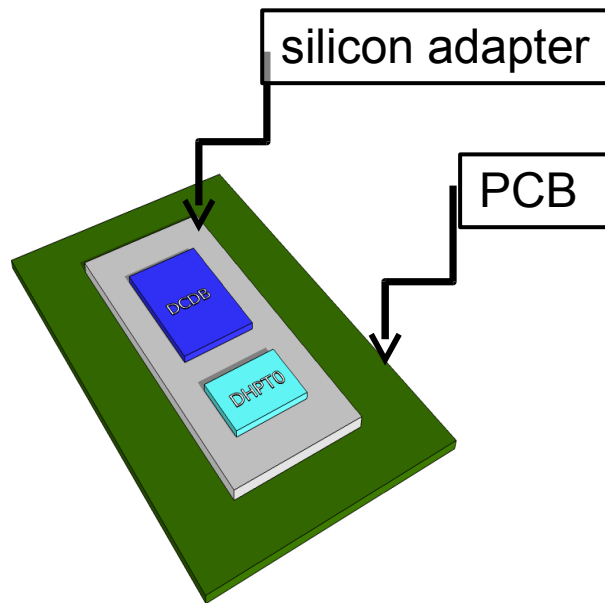
- *development of an DHP 0.1 test system*

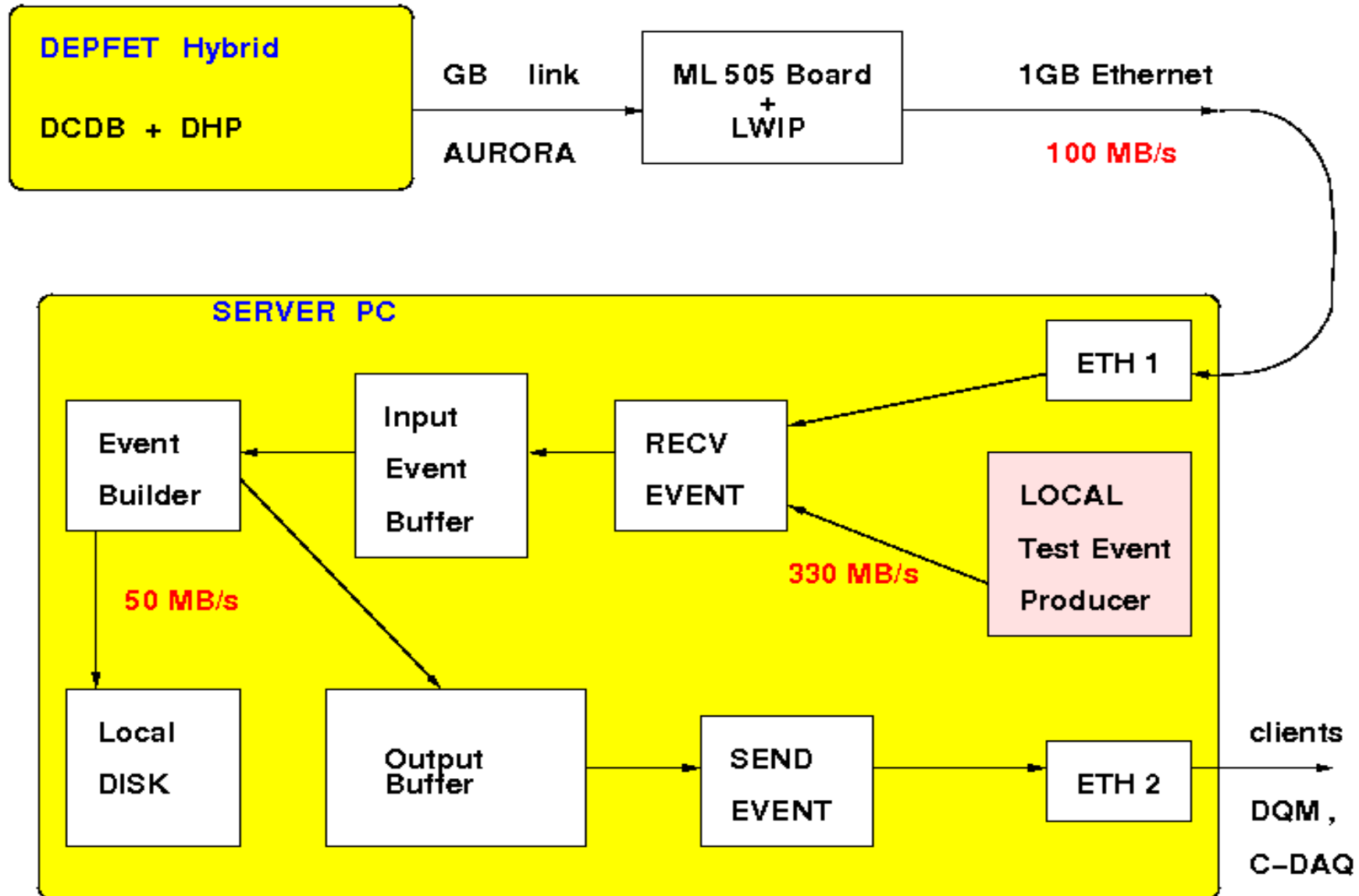
- based on commercial evaluation board (ML-505)
- basis for PXD6 matrix r/o with DHP

- *Xilinx ML505 (Virtex®-5 LXT)*

- *PC communication:*

- PCI Express x1 (2.5Gb/s)
- 1Gb/s Ethernet



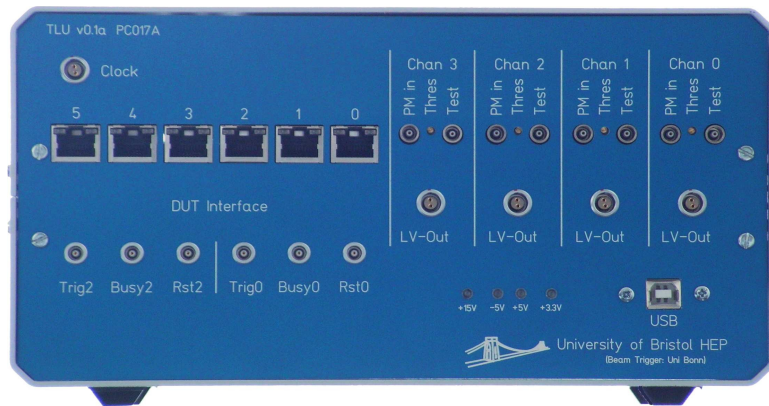


- *DEPFET Data acquisition system has been upgraded for DCD readout*
- *DQM has been upgraded for RAW DCD readout*
- *EUDAQ: "DEPFETConverterPlugin" has been upgraded for DCD readout.*
- *Offline software:*
 - *Eutelescope: "DEPFETReader" has been upgraded for DCD readout*

TO DO:

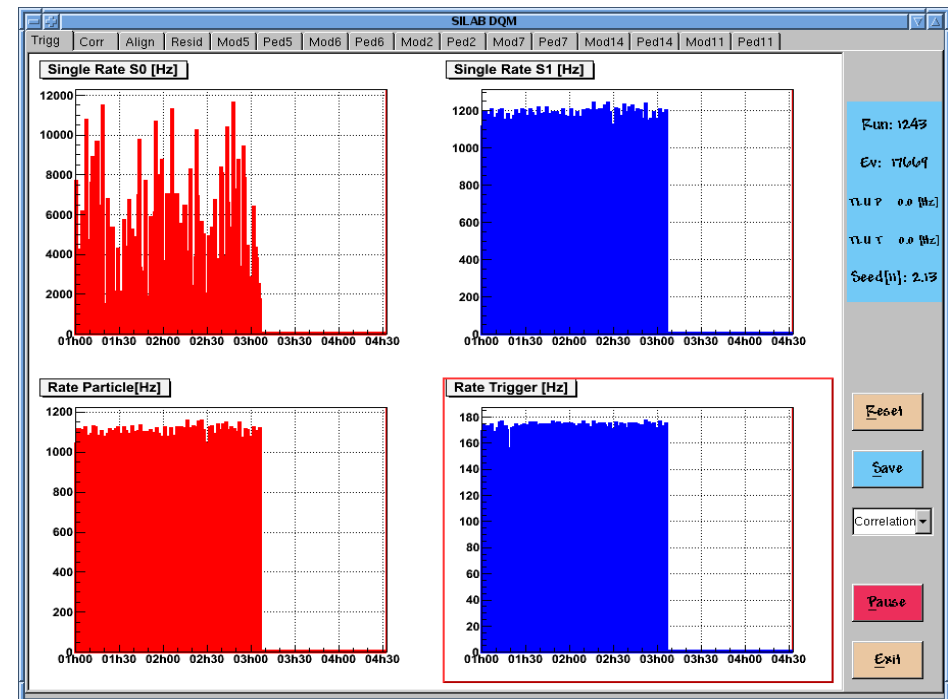
- *Virtex4 board :*
 - *Matrix geometry to r/o channel mapping*
 - *Upgrade DQM and offline software for data with DHP emulation*
 - *Upgrade EUDAQ DQM Monitor*
- *Virtex5 : integration DCDB + DHP readout based on ML-505 evaluation board*

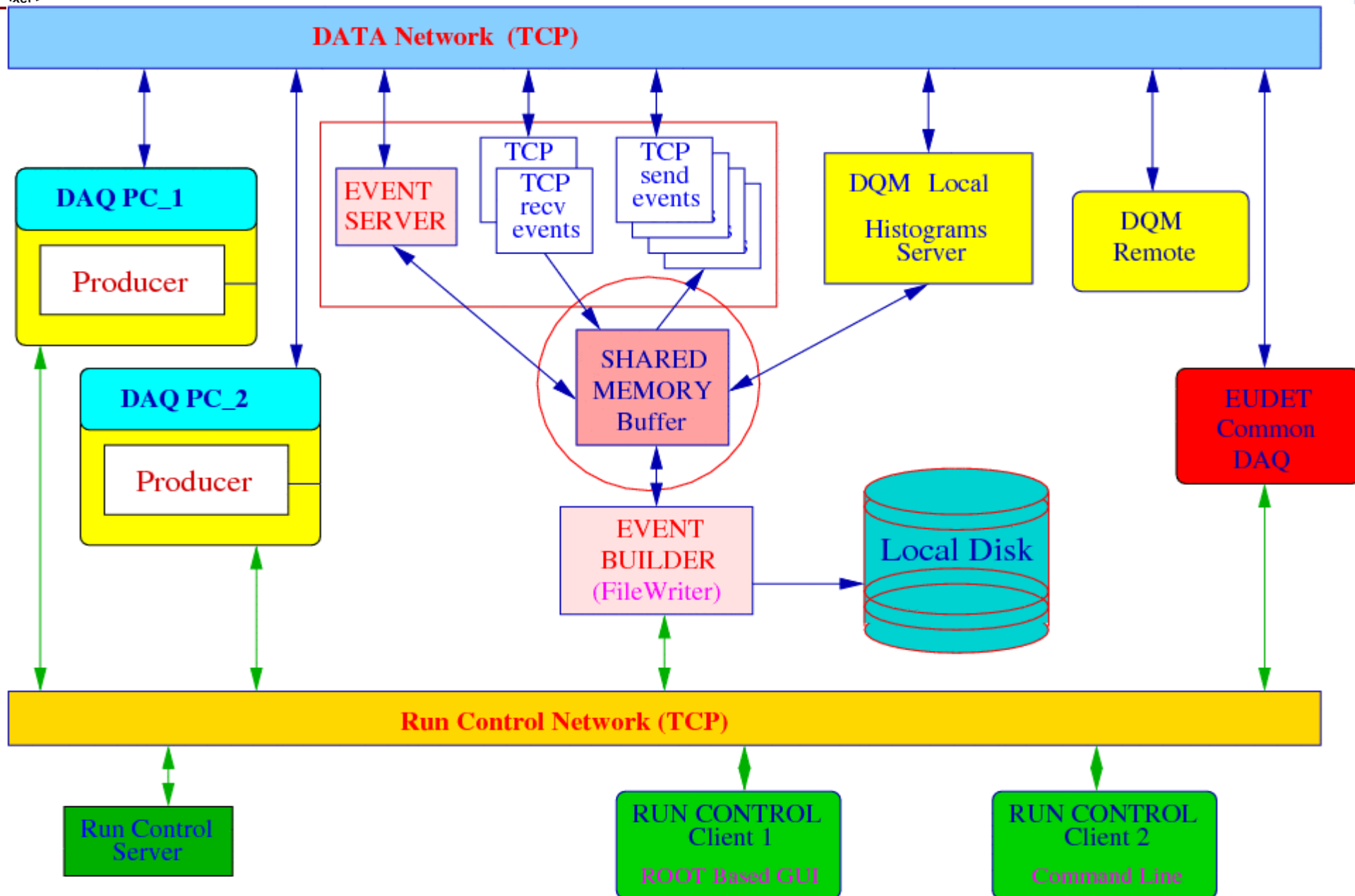
Backup Slides



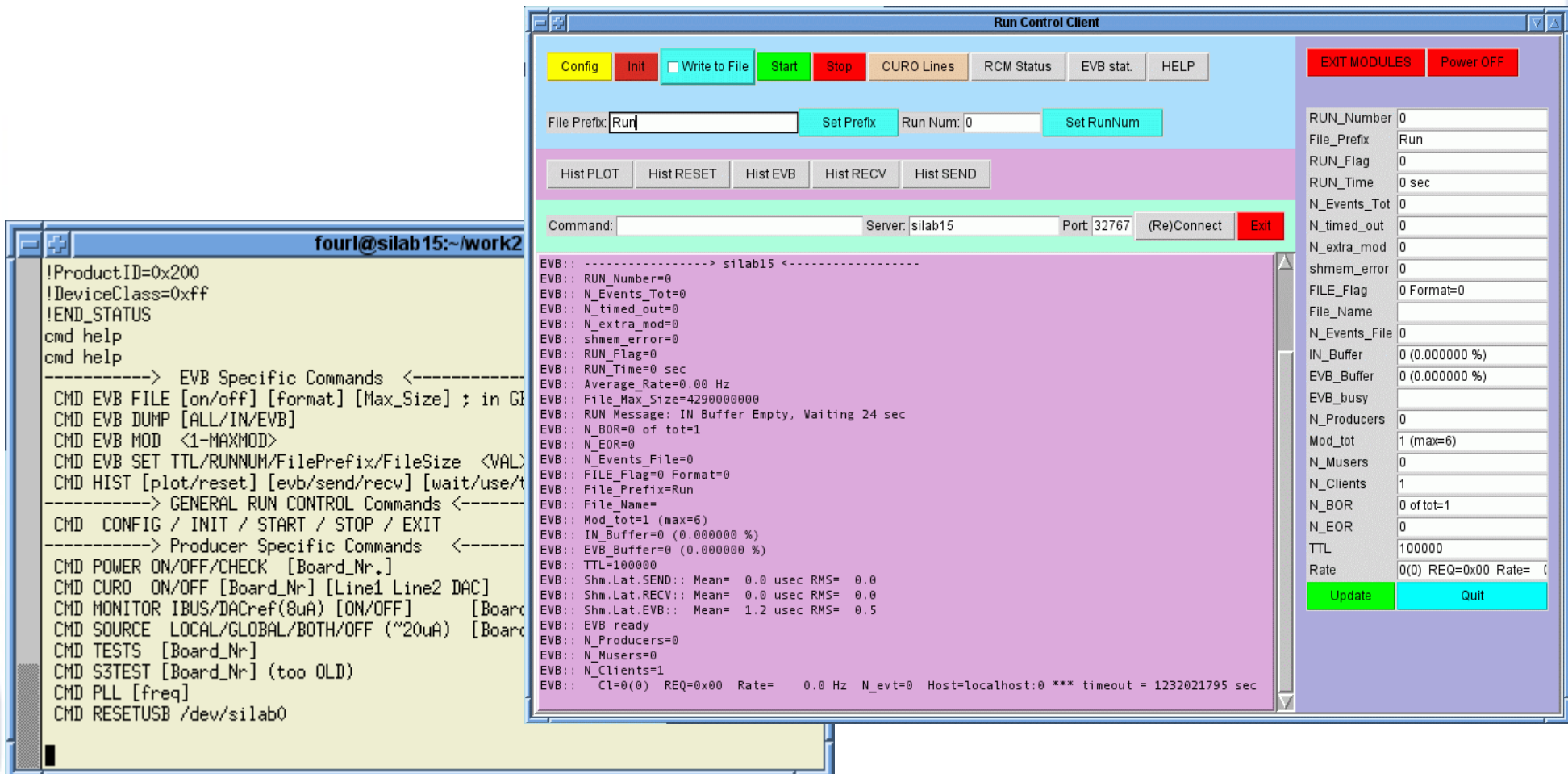
- A dedicated Trigger Logic Unit (TLU) accepts signals from the scintillators or external trigger and generates a signal to trigger the system.
- Each trigger carries a unique number and time stamp.

- H6 line with 120 GeV pions
- Coincidence rate of 2 scintillators is about 1000 Hz
- DAQ with slow readout sequence (readout full matrix 64x128) accepts 180-220 Hz depending on number of readout PCs.
- Data volume rate for 6 modules is about 20 GB / hour
- One disk of 500GB is filled in 1-2 days
- Hot swapping RAID system allows to change the disks without stopping taking data





- Run control server can accept commands from different clients:
 - Command line interface via Telnet
 - TCL/TK or Root GUI
 - Another program with TCP connection to Run Control



The image shows a terminal window on the left and a GUI window titled "Run Control Client" on the right.

Terminal Window (four1@silab15:~/work2):

```

!ProductID=0x200
!DeviceClass=0xff
!END_STATUS
cmd help
cmd help

-----> EVB Specific Commands <-----
CMD EVB FILE [on/off] [format] [Max_Size] ; in GI
CMD EVB DUMP [ALL/IN/EVB]
CMD EVB MOD <1-MAXMOD>
CMD EVB SET TTL/RUNNUM/FilePrefix/FileSize <VAL>
CMD HIST [plot/reset] [evb/send/recv] [wait/use/t

-----> GENERAL RUN CONTROL Commands <-----
CMD CONFIG / INIT / START / STOP / EXIT

-----> Producer Specific Commands <-----
CMD POWER ON/OFF/CHECK [Board_Nr.]
CMD CUR0 ON/OFF [Board_Nr] [Line1 Line2 DAC]
CMD MONITOR IBUS/DACref(8uA) [ON/OFF] [Board
CMD SOURCE LOCAL/GLOBAL/BOTH/OFF ("20uA) [Board
CMD TESTS [Board_Nr]
CMD S3TEST [Board_Nr] (too OLD)
CMD PLL [freq]
CMD RESEUSB /dev/silab0
    
```

Run Control Client GUI:

The GUI has a top toolbar with buttons: Config, Init, Write to File, Start, Stop, CURO Lines, RCM Status, EVB stat, HELP. Below the toolbar are input fields for File Prefix (Run) and Run Num (0), with Set Prefix and Set RunNum buttons. A Command field is empty, and the Server is silab15, Port is 32767. There are (Re)Connect and Exit buttons. A status area shows EVB:: messages, including: EVB:: RUN_Number=0, EVB:: N_Events_Tot=0, EVB:: RUN_Message: IN Buffer Empty, Waiting 24 sec, EVB:: IN_Buffer=0 (0.000000 %), EVB:: EVB ready, EVB:: N_Clients=1, EVB:: Cl=0(0) REQ=0x00 Rate= 0.0 Hz N_evt=0 Host=localhost:0 *** timeout = 1232021795 sec.

On the right side of the GUI, there are EXIT MODULES and Power OFF buttons, and a table of status variables:

RUN_Number	0
File_Prefix	Run
RUN_Flag	0
RUN_Time	0 sec
N_Events_Tot	0
N_timed_out	0
N_extra_mod	0
shmem_error	0
FILE_Flag	0 Format=0
File_Name	
N_Events_File	0
IN_Buffer	0 (0.000000 %)
EVB_Buffer	0 (0.000000 %)
EVB_busy	
N_Producers	0
Mod_tot	1 (max=6)
N_Musers	0
N_Clients	1
N_BOR	0 of tot=1
N_EOR	0
TTL	100000
Rate	0(0) REQ=0x00 Rate= (

At the bottom of the status area are Update and Quit buttons.

- Network Data Acquisition system allows to run powerful Data Quality Monitor on dedicated PC in real time
- DQM is based on ROOT :
 - includes various data access methods : file, shared memory, network
 - online data processing – pedestal and common mode calculation, cluster reconstruction and simple tracking.
 - can also act as network histogram server
- advanced DQM functionality allows to find most of DAQ and DEPFET matrix problems during the run
- WEB interface for remote DQM

