

GEM readout for SBS

Alexandre Camsonne

SBS meeting

June 25th 2015

Data rates at 100 % occupancy

- Assume 120 000 channels of trackers
- 3 samples readout assume 16 bit = 2 bytes encoding
- At 100 % : $120\ 000 \times 2 \times 3 = 720\ \text{Kbytes}$
- Assume rate of 3 KHz = 2.16 GB/s

MPD

- 2048 channels per board
- 12.2 KB / event
- VME320 = 200 MB/s
- At 3 KHz = 36.6 MB/s per board
- Total data :
- Max rate with full board : 16.4 KHz
- VXS crate for trigger distribution or VME64X crate
- $120\ 000 / 2048 = 59$ MPDs
- Need 11 crates with 6 MPD per crate using VME320
- 3 racks

MPD with optical link

- Each link 1 Gbit/s = 125 MB/s
- 1 SSP has 8 x 4 Gbit links = 32 MPD
- Need 2 SSPs only
- SSP has 8 Gbit link to GTP, can use 8 SSP to increase bandwidth : 64 Gbit = 8 Gbytes/s to GTP
- Need to look into readout
 - VME if data is reduced enough 200 MB/s
 - VXS at least 500 MB/s per lane, 2 GB/s on 4x

MPD with optical link

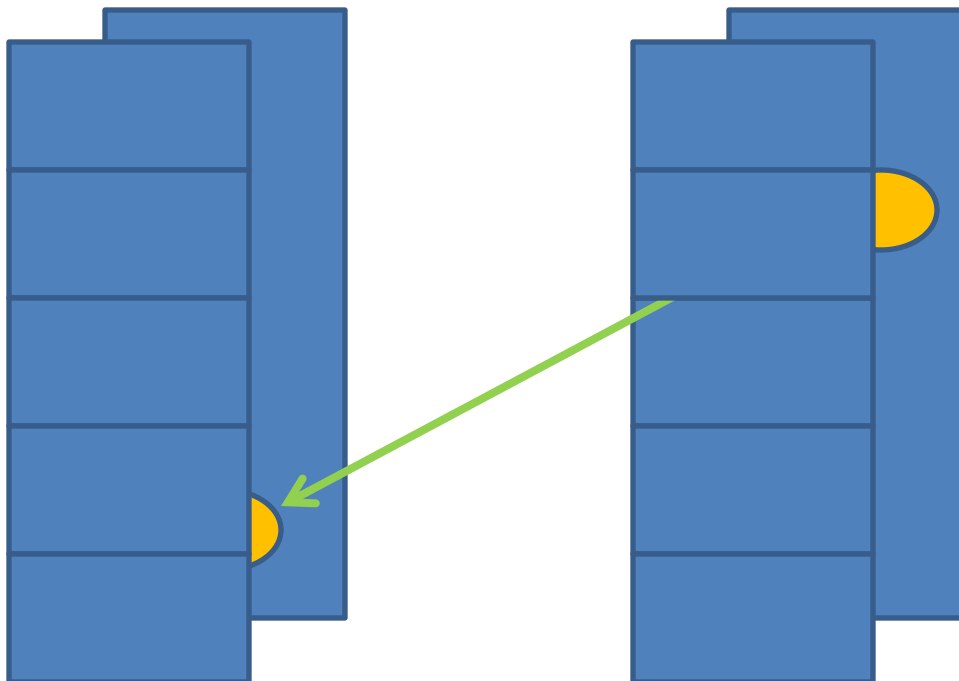
- MPD tested optical link
- Need interfacing with SSP
- Data reduction SSP and GTP
- VME or VXS readout
- 2 intel CPUs with VXS connector

Status

- 5 MPD in Test Lab
- 1 full front track chamber
- 1 CODA computer
- UVA VXS crate
- CNU Intel CPU
- New Concurrent Intel CPU
- C library by Bryan Moffit being tested
- Implementation of INFN software and CODA

GEp5

- Option to reduce region of interest by adding Fast Clear or Validation from trigger module



- Only take GEM data in region of interest from calorimeters
- To be implemented
- To be simulated

Number of crates

- All MPD options : 11 crates
- Planned : all MPD in one crate
 - VXS crate 15 K\$
 - 2 SSP = 10 K\$
 - 8 SSP = 40 K\$
 - 1 GTP 5K\$
 - Intel CPU 5 K\$
- 30 K\$ to 65 K\$

Data reduction

- MPD
 - Baseline suppress and threshold
 - Clustering (read neighboring)
 - Digital filter
 - Data reduction on SSP, GTP
 - CODA
 - L3 farm (Not planned but all detectors data available for data reduction)
- Assume 250 MB/s nominal recording rate

Timeline

- June to July 17 : MPD C library testing
- July 16th 17th : Evaristo and Paolo coming
 - Test chamber with CODA
 - Test SSP readout
- August : cosmics and pulser test for performance
- End of August : small scale Gep DAQ setup
Fastbus + FADC Hcal trigger + GEM readout

Man power

- Alexandre Camsonne
- Bryan Moffit
- Chao Gu
- Kondo Gnanvo
- Nilanga Liyanage
- Evaristo Cisbani
- Paolo Musico
- Will need Electronics and DAQ group support

Conclusion

- Assuming 3 KHz coincidence trigger, need 3 racks maximum at 100 % occupancy using VME readout
- Or 1 VXS crate with 2 SSPs can use more SSPs to increase bandwidth
- With resources from digital filtering can do deconvolution on SSP or GTP
- Must look at data reduction algorithms if occupancy is high into SSP or GTP
- Need to define readout :
 - VME straightforward but limited
 - VXS needs more work if doable