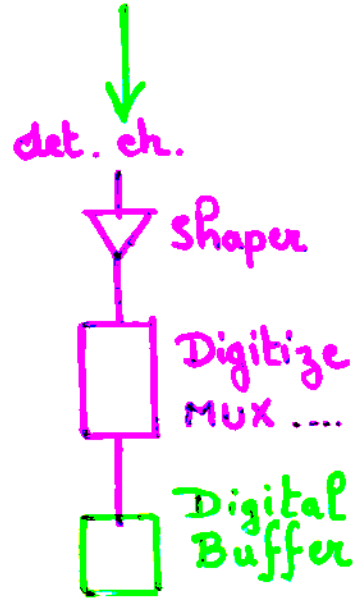
Review of the Trigger Studies

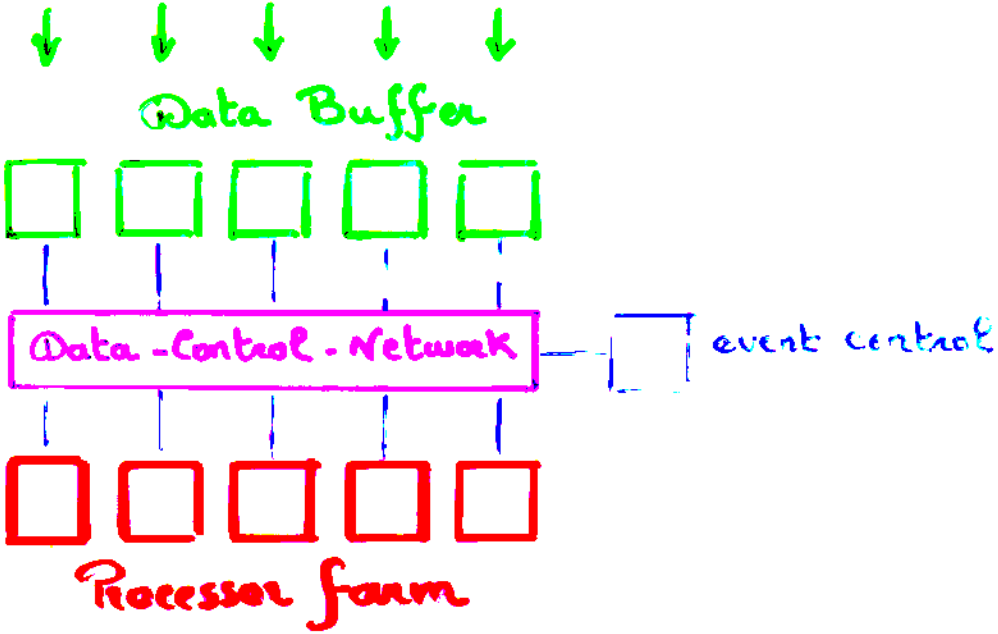
(P. LeDü, R. Gerhards, G. Eckerlin)

P. Le Dû
LC Oxford meeting
march 99

Trigger Issues and Constraints.

Baseline Concept : Dead time less Software Selection





Constraints on Detector electronics

Selection Strategy

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Input Parameters (cont.)

	Channels	Sampling (MHz)	Datasize (bit)	Bandwidth (MByte/s)
CCD	840M	50	16	100
APS	200M	10	16	20
FwdSi	10M	50	16	100
ITC	1k	40	16	80
TPC	720k	40	16	80
Calo	340k	3	16	6
Muon	200k	3	1	0,3
Mask	1k	3	16	6

▽ Has to be x-checked by the detector groups ! ▽

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Occupancies

- using :
  - 6 tracks / bunch ?
  - 1200 photons / bunch ✓ Carsten Hensel
  - 2% conversions → !check!
  - 10 % photons above 10MeV → !check!
  - 1200 charged hits for VTX region ✓ C.H.
  - 100 charged hits for ITC region
  - 10 charged hits for TPC region
- we get per bunch:
  - 1230 hits for CCD (assume ~~2~~ 8 pads each)
  - 130 for ITC & FwdSi(assume 4 ch. each) ← ?
  - 40 for TPC (with 150 pads)
  - 126 for Calo (with 20 channels each)
- 2 bytes datasize
- 2 bytes for time and channel decoding

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Datavolume

	Samples per hit	hits per BX	hits per train	sample per train	Mbyte per train
CCD	1	1230*2 /8	6,94M	6,94M	27,75 *4
FwdSi	1	130*4	1,47M	1,47M	5,87
ITC	4	130*4	1,47M	5,87M	14,66
TPC	4	40*150	16,9M	67,7M	169,20
Calo	1	126*20	7,11M	7,11M	28,43
Muon	1	30*10	846k	846k	3,38
Mask	1	30*10	846k	846k	3,38
				Total	252,67

assuming 2 byte per sample
2 byte for time and channel per hit

↓ 1GB/s
1% of LHC
100 GB!

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Conclusions

- about 10Giga channels total
- frond end bandwidth 300TByte/s
- digitising at frond end
  (16bit @ 50MHz output)
- → with zero suppression <300MB/tr.
  (bandwidth 1,5GB/sec)
- with MUX about 100M channels
- Z-Factory needs full TPC readout
  (L1 - Trigger would not help!)
- → software filter is the right choise
- → start thinking about filter strategy
  may have impact on the detector!
  "Bunch of Interest"
  ↓
  Bunch tagger ?

Trigger / DAQ session @ Sitges

Convenors
- F. Le Diberder — Tesla
- Tony Barker — NLC (Colorado)
- Il Hung Park — JLC (KEK)

My suggestion for the agenda:

- 30 years of T/DAQ (1980 - 2010) (30')
  a review of architectures, technologies
  lessons - extrapolation to the future

Outlines
- Tesla "Software" Trigger (40')
  - Physics rates and signatures - topologies
  - Background rates and signatures - topologies
  - "Software Trigger concept"
  - Data bandwidth/volume (updated)
  - Selection strategies
  - Issues and Constraints (electronics, ...)
- NLC (40')
- JLC (40')
- Discussion 30'h - 1h ?

Total 3h - 4h