TRIGGER & DAQ

Convenors : Il Hung Park & Patrick Le Dû

• **The next 10 years of trigger/DAQ**	**P. Le Dû (Saclay)**	**15 min**
• **Performance of switching networks**	**J.P. Dufey (CERN)**	**40 + 5 min**
• **JLC Trigger and DAQ**	**Dr Ueda (KEK)**	**25 + 5 min**
• **BREAK**		
• **NLC Trigger and DAQ**		**25 + 5 min**
• **TESLA "Software Trigger"**	**R.Gerhards (DESY)**	**25 + 5 min**

- **Discussion organized as a "round table"...**
  - **Detectors Electronics constraints**
  - **Trigger strategies issues**
  - **"on and off line" boundaries....**

Trigger-Level Evolution

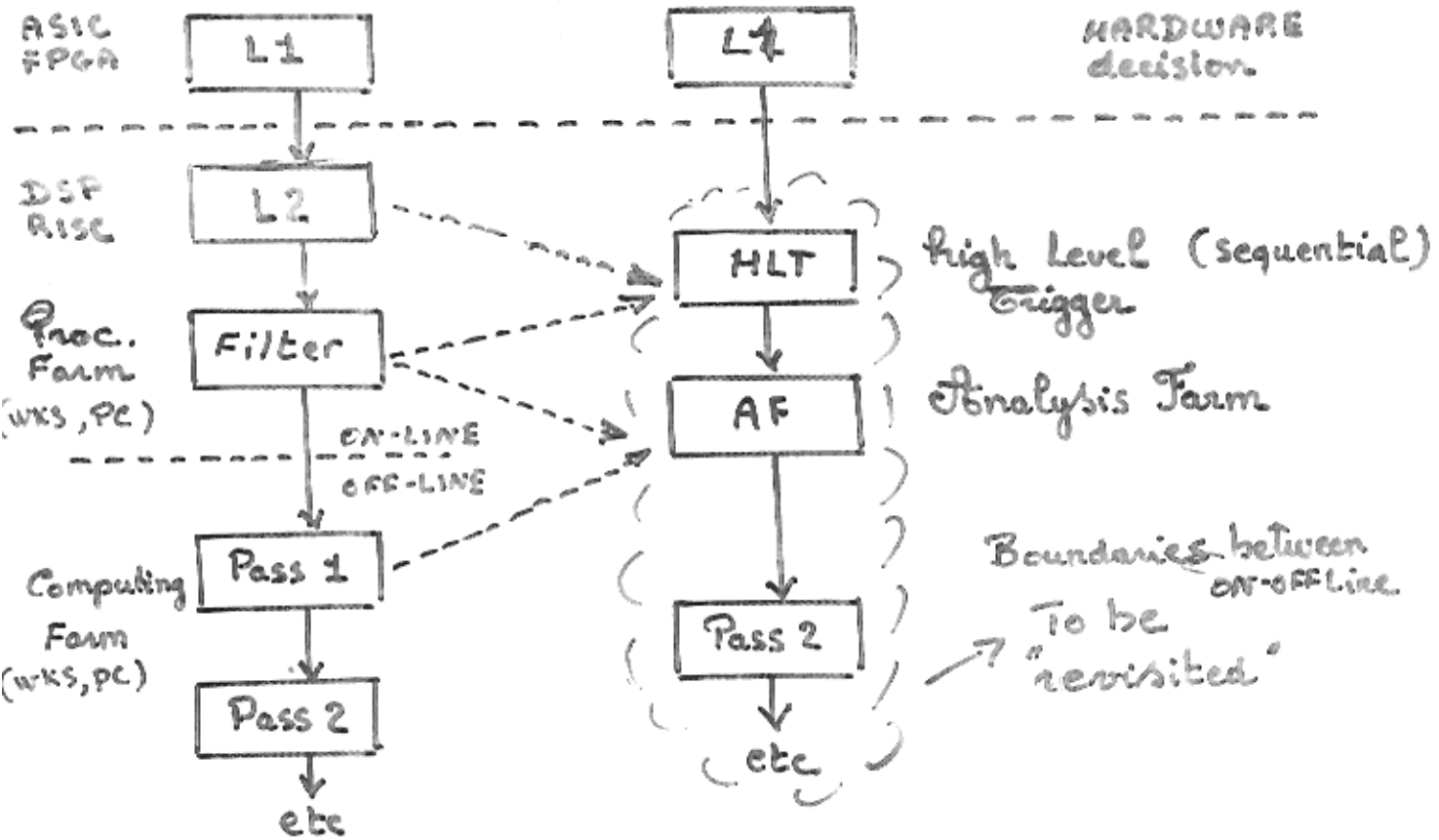
1989 → 1999 → 2009

- Increasing use of "Commodity" components
  - Take advantage of "industry standards"
  - Technology "forecast" : → very favorable..

	DRAM	Proc. Power	
LEP-1989	128-512 kB	1-5 Mips	) x 100
Today 1999	4-8 MB	≃ 400 Mips	) x 10-100?
2004 - 2009	> 64 MB	≥ 5 Gips	

➢ Memory and Processing Power quasi "illimited".

- Flexible Boundaries for Processing Strategies:



➢ more complex algorithms are moving "on-line" analysis

➢ "on-line" and "off-line" boundaries are flexible
New concept of the "computing model"

LC - T-DAQ

NLD Thoughts

(an update of the keystone meeting)

J.J. Russel SLAC
(on behalf)
by email 26/04/99

- 2 remarks:

Both →
- → Simple : in T/DAQ nothing technologically challenging.
- → complex : running linear Collider is unlike running any other type of accelerator.
  - ➢ High Quality Beam on every Bunch very challenging.
  - ➢ More intimate connection between Machine and Detector
    ex: SLD → very limited subset of detector available on every BX.

- T/DAQ : some radical approach:

→ Moving everything (all "policy") out of the embedde systems part of the DAQ. (selection algorithms ...)

➢ {No Real Time Trigger}

→ Avoid DAQ to be vertically integrated (like BBar !)

... political and logistic nightmare

➢ Clear separation of boundaries.
definition

→ Is it technically feasible ?

Some ideas .... to be explored !

➢ All detector elements must run in a un-triggered mode.
what about VTX ?

➢ Packaging and shipping data to generic General Purpose Processors.

➢ Route "bad pulses" to accelerator people.

➢ Replace "Feature extraction" Algorithms by | semi-loss
lossless data compression

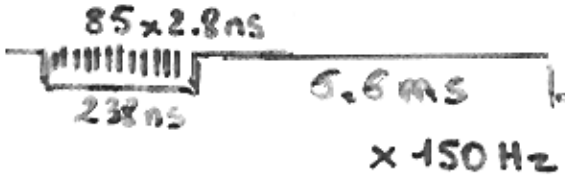
- on Technologies:

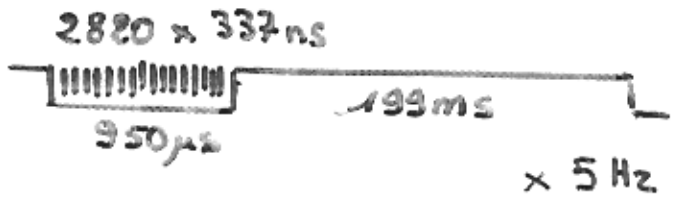
→ try to take advantage of what the future brings.

➢ high bandwidth, but not very low latency networks

➢ busses will be less important and perhaps non existant (ex: machine is moving on NO BUSS for reliability reasons!).

Bunch Structure





Concept :

- no Hardware Trigger Logic
- DAQ triggered every Train Xing.
- Bunch ID by "off line"

- Store data of one Bunch Train
  - . No hardware Trigger
  - . Zero Suppression or/and data compression ...
  - . Sw Selection between Trains

Data Volume

- VTX: 320M → 1.4 MB
- CDC: 17M → 12 MB
- Cal : 21M → 32 kB
- μ : ?

Total : 340M → 13,5 MB per B train

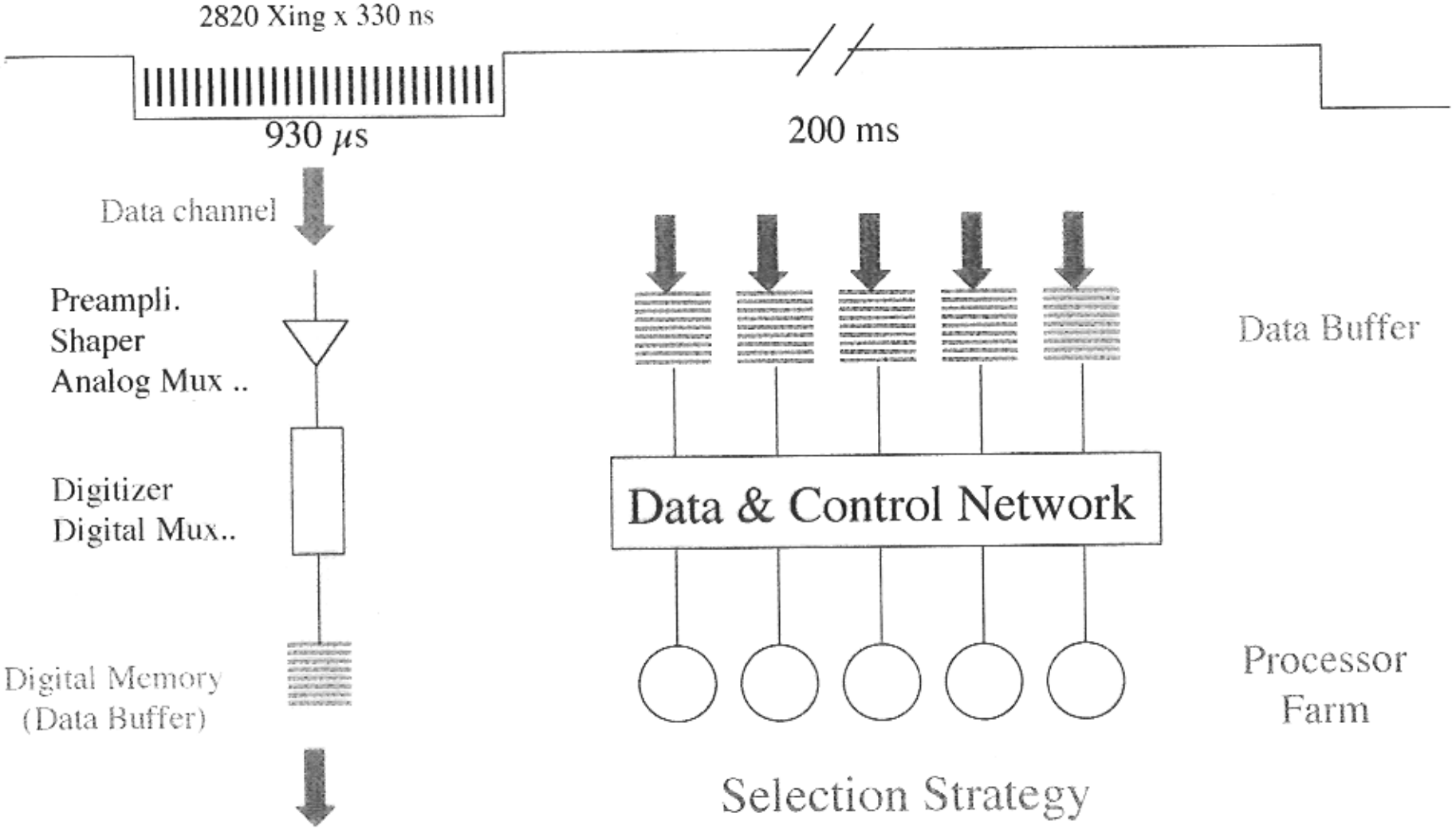
- CCD = 840M
- APS = 400M

TPC : 720K
Fw Si : 10 M
Calor : 340K
muon : 200K

400-800M → 335 MB

Raw data	16 Gbit/s	⟷	13 Gbit/s
Filter 1:10	1,6 Gb/s		40 Mb/s
DST	100 MB/sec		5
Storage	10 TBytes/day (eq. 1 Hr)	← ? →	50 TB/year

Tesla "Software Trigger " concept



Conclusion

- No hardware "Trigger"
  - → dead time free
  - → no compromize on Physics
  - } no data loss !
  - → flexible (programmable ...)
  - → cost effective (OTS technologies)
  - → scalable
  - → Portable (off-line sw in on-line env.)

- Nothing technologically challenging.

- Constraints on "Front End Electronics"
  - → CCD, TPC (Occupancy)
  - → Bunch ID (NLC/SLC)
  - → Read 1 ms continously (Tesla)

- "On-Offline" computing model (Common)
  - → event selection/(rejection) strategies
  - → event analysis and processing.
    (common ressources ...)
  - → event access .... event/data compression !