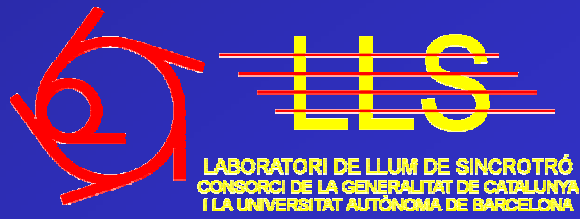
The BM16 control system with Linux and PCI

D. Beltrán, A. C. Klora (CELLS)

A. Homs, E. Papillon, D. Spruce (ESRF)



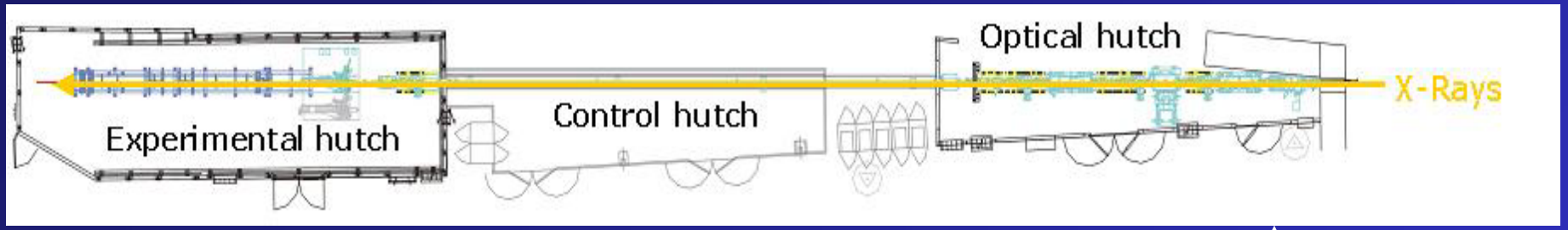
Background

- Heritage + Upgrade (from 68K/OS9, Solaris)
- Commercial products
- Compatible (and collaborate) with ESRF

Main components

- VME, PCI, cPCI, Ethernet devices
- Industrial PC
- Linux
- PCI-VME bus coupler
- Taco + Spec

Layout I (optics hutch control)



BIT3 — VME Bus — VPAP | VCT6

BIT3 — VME Bus — VPAP | VCT6 | ADC | DAC | DI/O

Vacuum systems

PLC interlock

Fiber optics

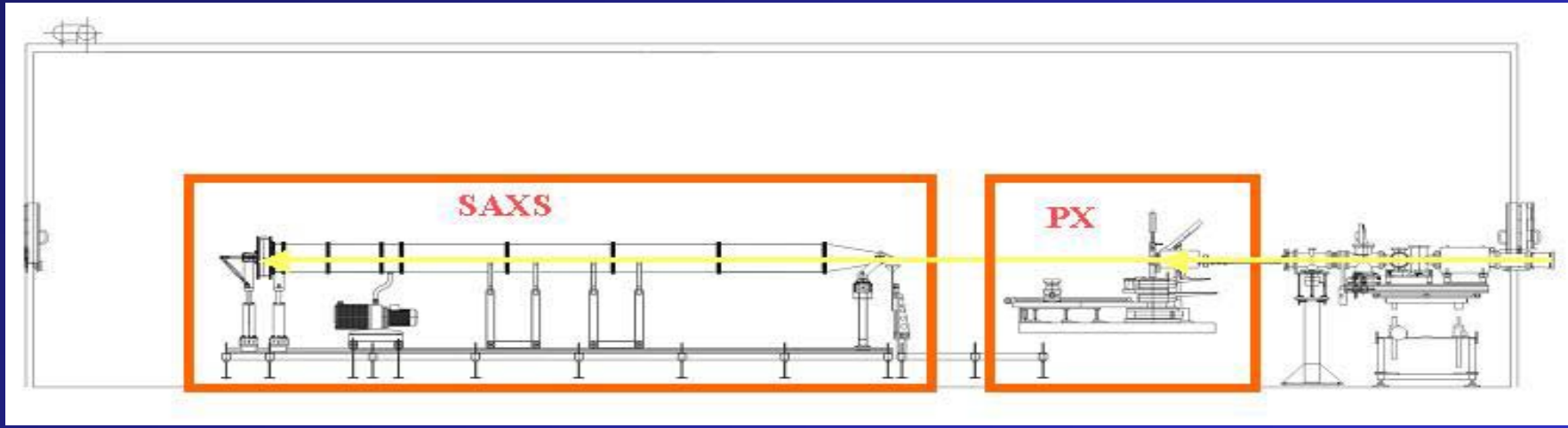
RS-232

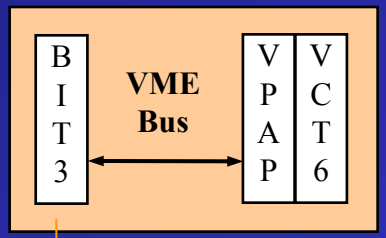
bm16ctrl

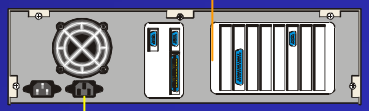
bm16serial

Ethernet

Layout II (exp. hutch control)





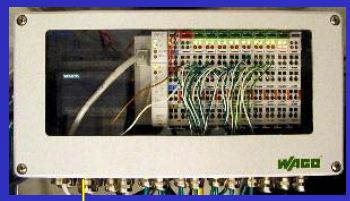


bm16ctrl

RS-232

rocket16

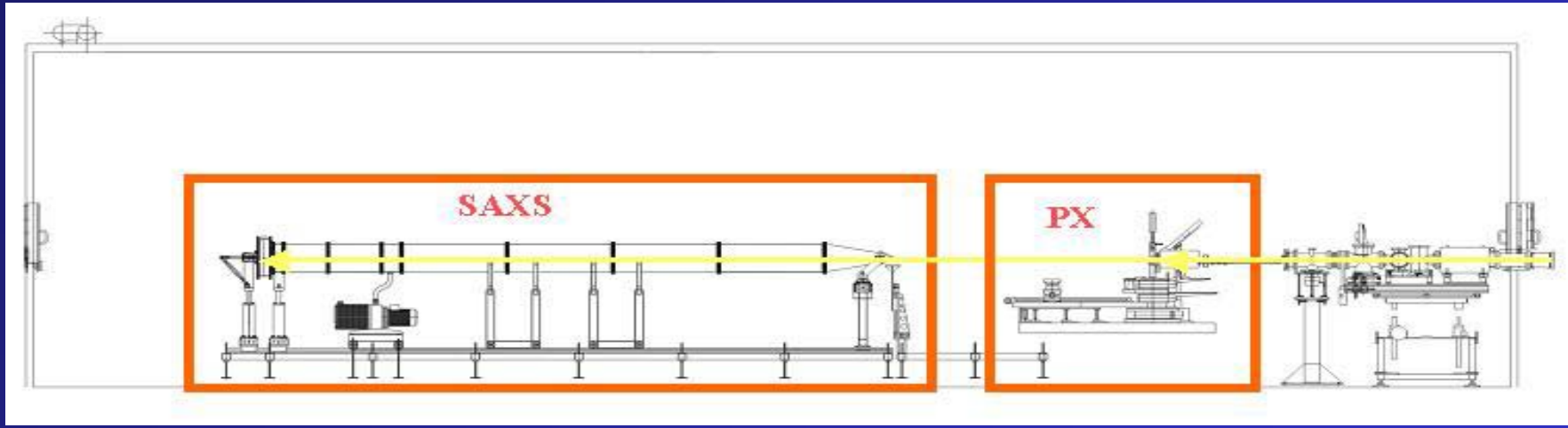
A I/O, D I/O

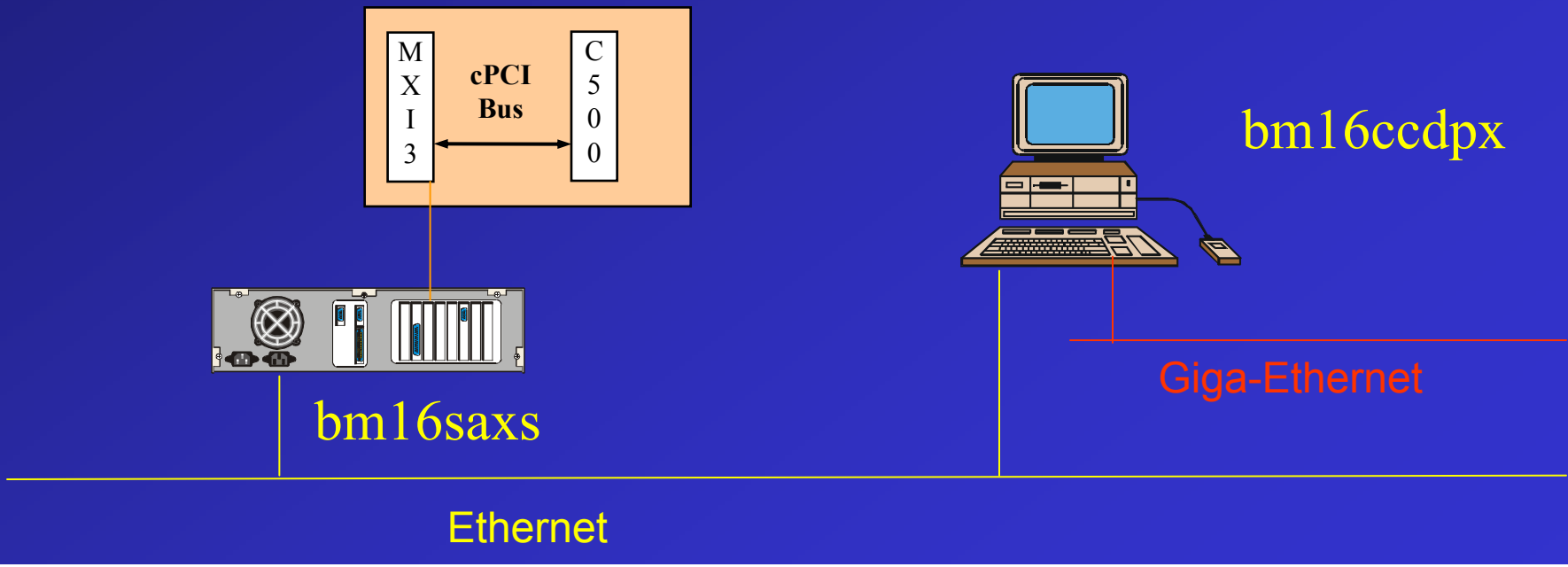


wcbm16a

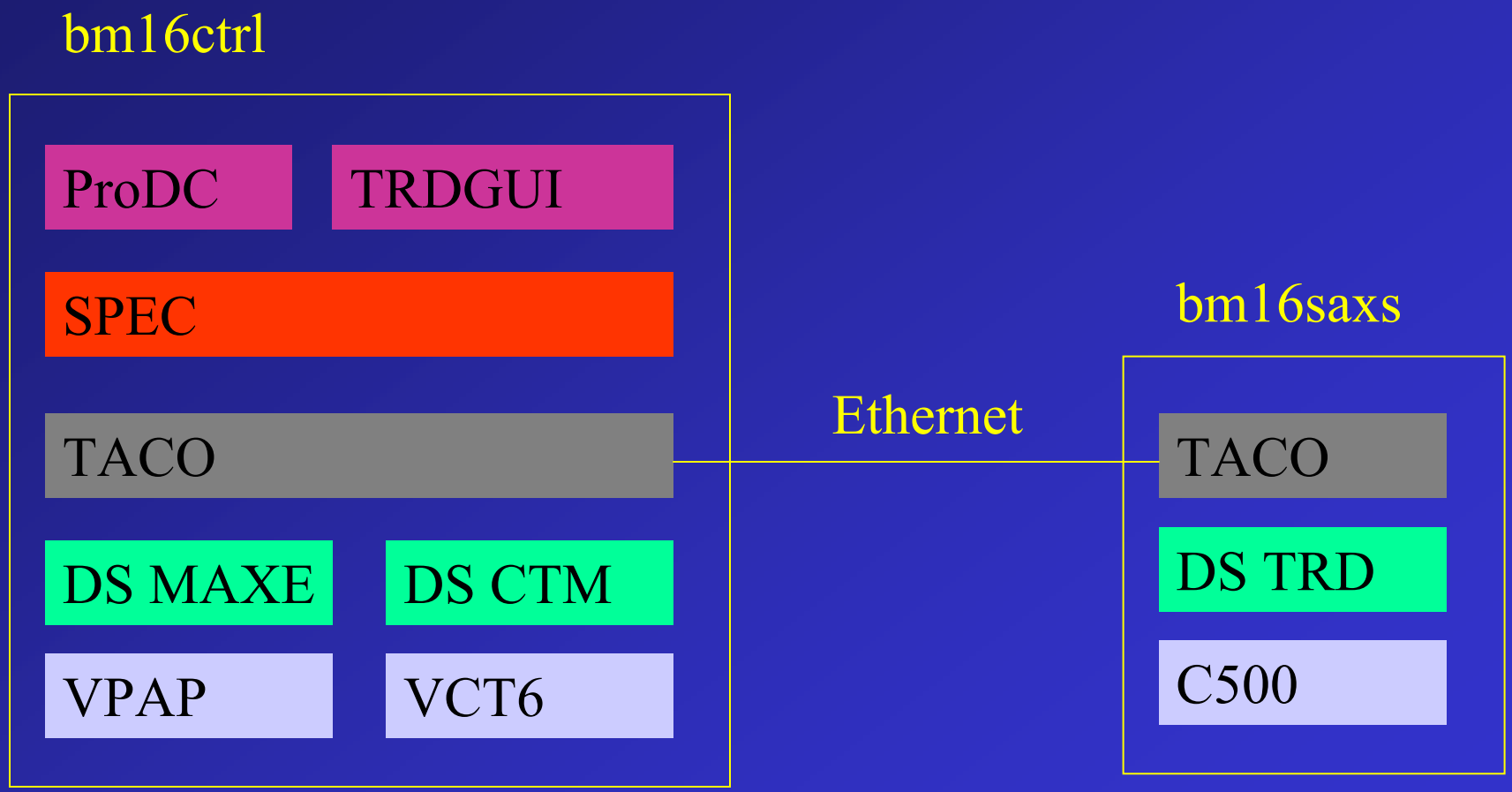
Ethernet

Layout III (detector control)





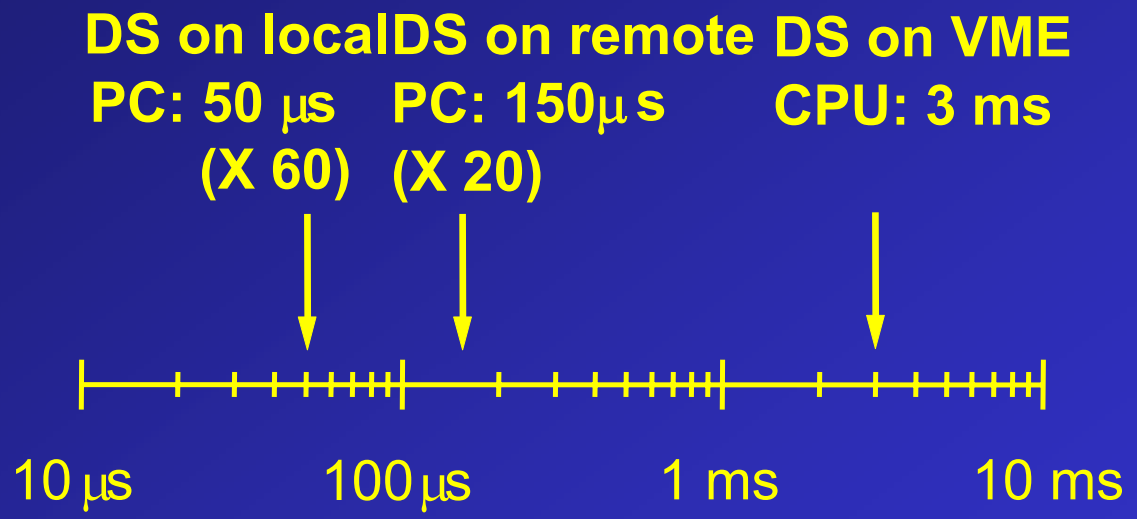
Software architecture



Software components

- Suse 7.2
- 2.4.18 SMP

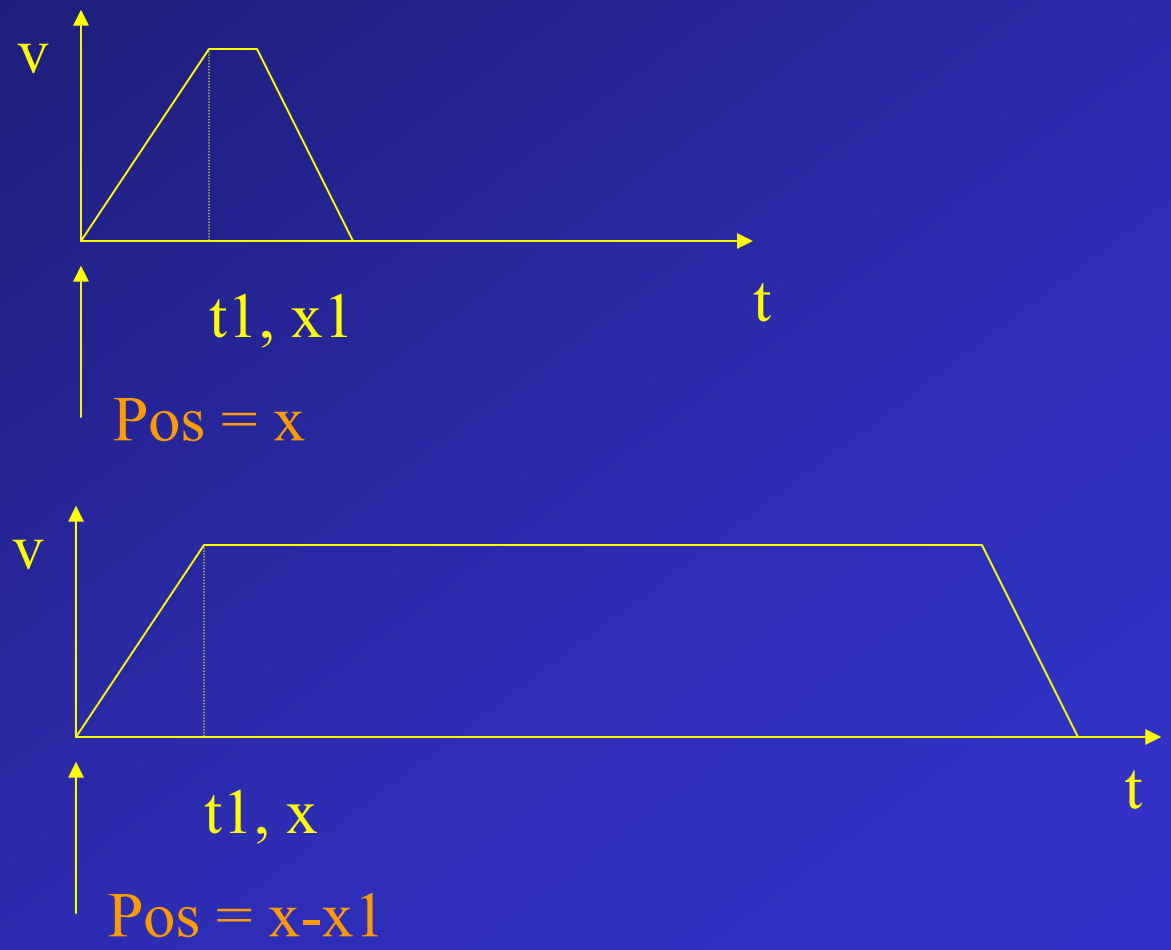
Software performance



Duration of a single access to the hardware

Automation

- **Spec macros**
  - Oscillation at constant speed (zap)



Automation

- **Spec macros**
  - Energy scans
  - Quick realignment
  - Xbpm scans

Fast data acquisitions: Hook

VCT6
Counter/Timer

Counting gate

Interrupts

Hook kernel module

Count & encoder channels

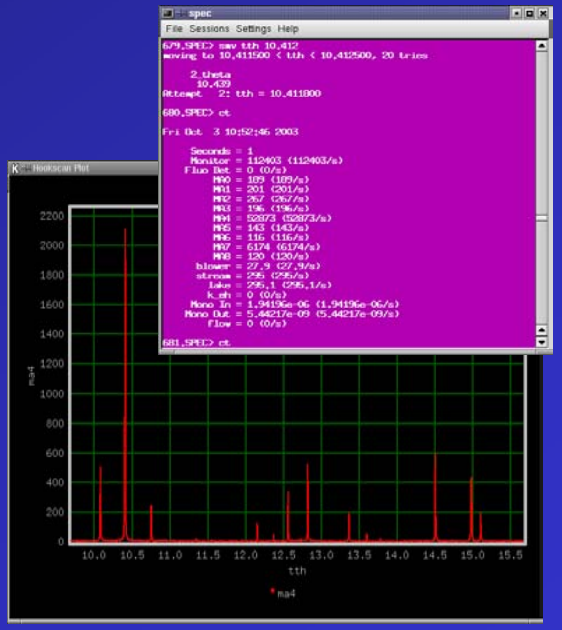
0	Counts	Motor Pos.
1	…	…
2	…	…

Hook kernel buffer

Flexmotion

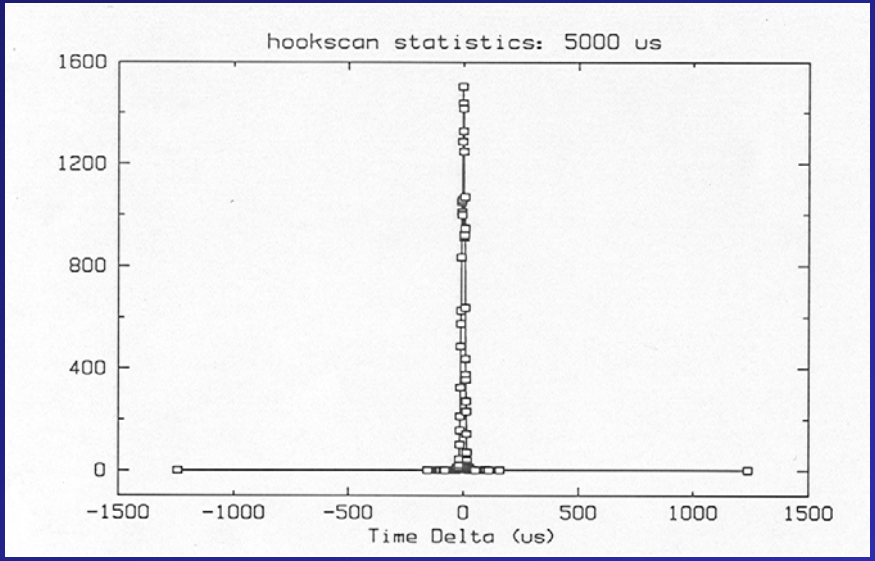
System call

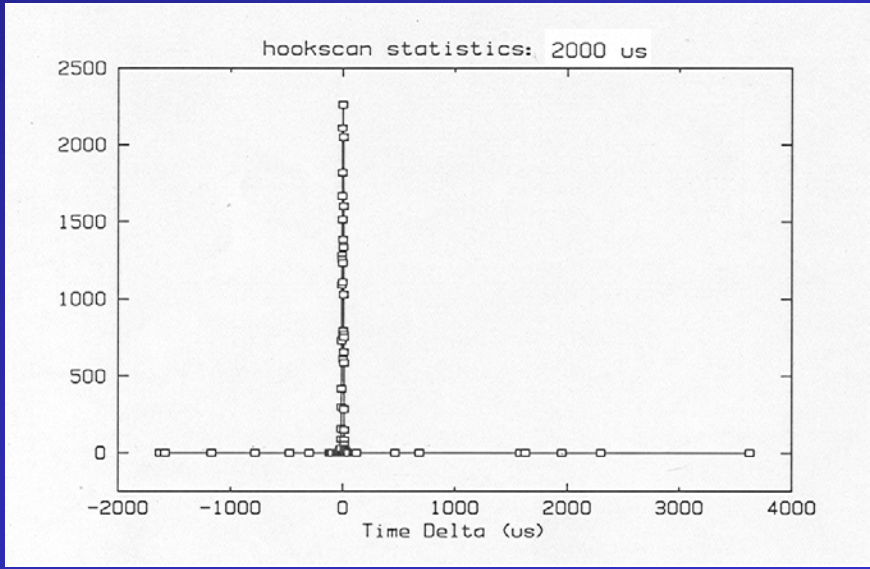
TACO/TANGO call



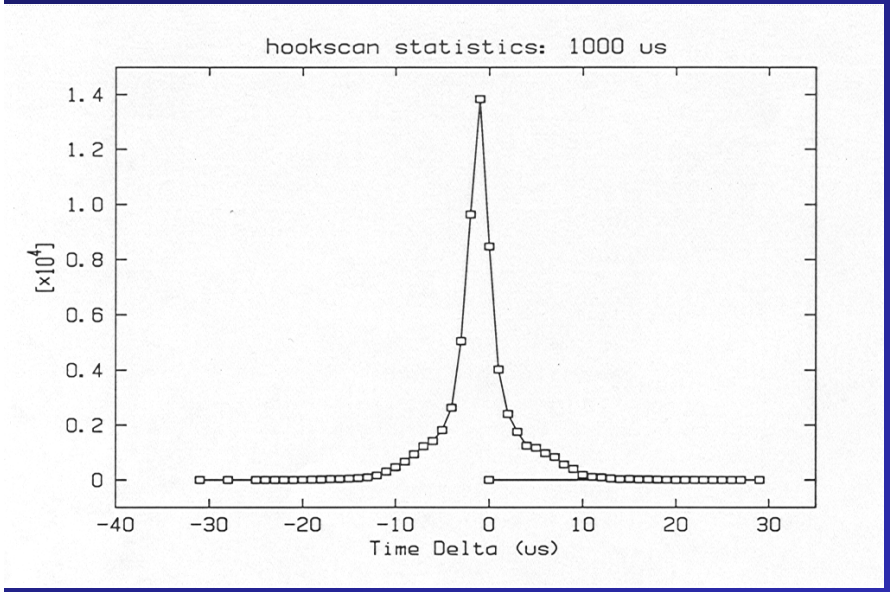
SPEC

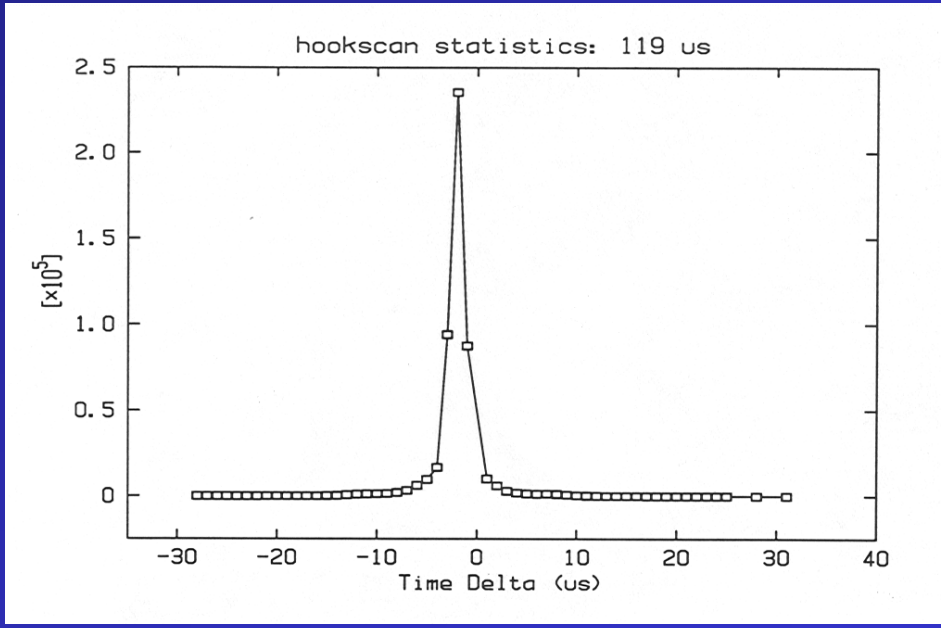
Single CPU


hookscan statistics: 5000 us
1600
1200
800
400
0
-1500
-1000
-500
0
500
1000
1500
Time Delta (us)


hookscan statistics: 2000 us
2500
2000
1500
1000
500
0
-2000
-1000
0
1000
2000
3000
4000
Time Delta (us)

Dual CPU


hookscan statistics: 1000 us
[x10^4]
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
-40
-30
-20
-10
0
10
20
30
Time Delta (us)


hookscan statistics: 119 us
[x10^5]
2.5
2.0
1.5
1.0
0.5
0
-30
-20
-10
0
10
20
30
40
Time Delta (us)

Conclusions

- Beamline control with Linux/PCI
- Linux is not real time …

  … but 2 CPUs help a lot!
- Multiplied by 20 the limit speed
- Flexibility, Maintenance, Upgrade
- Automation (spec macros)