The BM16 control system with Linux and PCI

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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)

Experimental hutch

Control hutch

Optical hutch

X-Rays

BIT 3 VME Bus VPAP VCT 6

BIT 3 VME Bus VPAP VCT 6 ADC DAC DI / 0

Fiber optics

Vacuum systems

PLC interlock

bm16ctrl

bm16serial

Ethernet

Vacuum systems

PLC interlock

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Ethernet
Layout II (exp. hutch control)

- BM16ctrl
- VME Bus
- VPA
- VCT
- Ethernet
- Rocket16
- WA/BM16A

RS-232
A I/O, D I/O
Layout Ⅲ (detector control)
Software architecture

bm16ctrl

ProDC  TRDGUI
SPEC
TACO
DS MAXE  DS CTM
VPAP  VCT6

Ethernet

bm16saxs

TACO
DS TRD
C500
Software components

- Suse 7.2
- 2.4.18 SMP
Software performance

DS on local
PC: 50 µs
(X 60)

DS on remote
PC: 150 µs
(X 20)

DS on VME
CPU: 3 ms

10 µs  100 µs  1 ms  10 ms

Duration of a single access to the hardware
### Automation

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

\[
\text{Pos} = x - x_1
\]
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

Flexmotion

Hook kernel buffer

0 | Counts | Motor Pos.
1 | ...    | ...
2 | ...    | ...

System call

TACO/TANGO call

SPEC
Single CPU
Dual CPU
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)