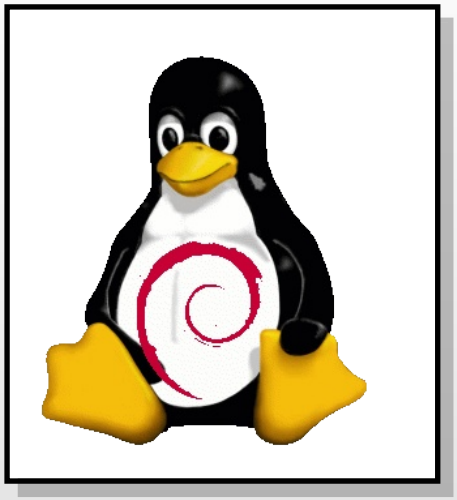

Debian for Control Software

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on behalf of
Beamline Control Unit – Software Group

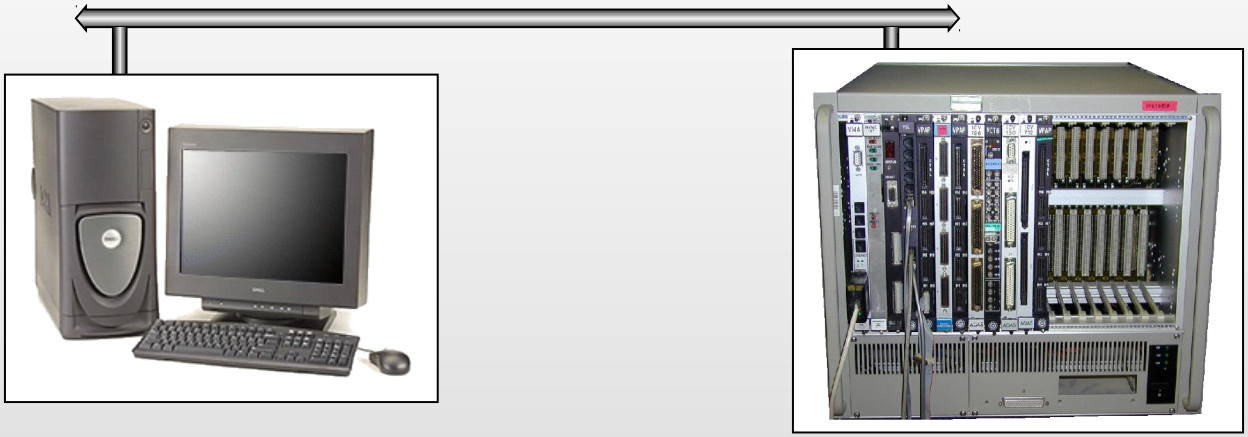
In collaboration with
Accelerator Control Unit & CCTF

ISDD – ESRF

Talk Outline

- Introduction
- Needs for Control Software
- Current and next steps

Introduction – History



Main control workstation

- HP-UNIX
- Solaris
- SuSE (6.4, 7.2, 8.2)
- RedHat EL (4, 5)
- Cent OS (5)

VME based instrumentation

- Diskless Motorola CPU(s)
- OS/9
- ASD: **Debian 3**, RedHat EL 4
- EXPD: PCI/VME bus couplers

Introduction – General I/O computers

- Industrial Rackable PCs
- General hardware control
  - PCI, PCI-Express, FPGA
  - 100/1000 Mbps Ethernet
  - USB, GPIB, RS-232/422/485
  - Modbus (Ethernet, Serial)
- Commercial and in-house hardware
- Low-latency
- Remote access
- Many TACO/TANGO servers

Introduction – Detector computers

- High performance servers
- Fast imaging detector control
  - PCI-Express
  - 10 Gbps Ethernet
- Commercial and in-house hardware
- Future: GPU (?)
- Remote access
- Very fast local/remote storage
- 300 – 1000 MByte/s
- One/few TACO/TANGO servers

Introduction – Control Workstations

- Medium/high performance workstations
- Main control orchestrator
  - Synchronise control PCs
  - Ethernet visualisation cameras
- Moderate speed storage
- Many TACO/TANGO clients
- Control & Data analysis GUI
- Future: online data reduction GPU (?)

Needs – General I/O computers

- Fixed hardware: stable releases
- Real-time control
  - Linux capabilities:
    - CAP_SYS_NICE
      - CPU process/IRQ affinity
    - CAP_RAW_IO, CAP_IPC_LOCK
    - CAP_NET_RAW
  - Real time, low latency patch
  - Xenomai

Needs – Detector computers

- Fixed hardware: stable releases
- High I/O data throughput
  - Fast local filesystem (RAID0)
  - Multiple fast links
    - To detectors
    - To storage/buffer/analysis PC
    - 10/40/100 Gbps Ethernet
    - External PCI-Express
- Basic low-latency mechanisms:
  - CPU affinitiy, CAP_SYS_NICE, …
- GPU support (?)

Needs – Control Workstations

- Evolving hardware
  - Regular repository upgrade
- Strong graphics support
  - 2D/3D acceleration
- Fast network support
  - 1 Gbps for controlling hardware
  - 10 Gbps for central storage
- Limited privileged functionality
- GPU support (?)

Current – next steps

- Software deployment
  - Starting packages: RPM repository
  - Future: Debian repositories (?)
  - Maximise OS support: Python
- Privileged access
  - Capabilities (pam.d)
  - LD_LIBRARY_PATH (ld.so.conf.d)
  - First introduced in 2008
  - Now being exploited
- Real time: Xenomai (?)
- Network (filesystem) support
  - Local buffer infrastructure

Thank you!

Any question, comment?