Epics Video Applications

Matthew Pearson

Diamond Light Source

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- NSLS (USA) Status
  - Performance measurements using Flea cameras over channel access. RTEMS/VME5500. Kate Feng.
- SLS (Switzerland) Status
  - Linux system using open source driver. Miroslaw Dach.
- CLS (Canada) Status
  - Using system based on SLS driver. Elder Matias
- ASP (Australia) Status
  - Richard Farnsworth.
- DLS (UK) Status and Plans.
  - Machine/beamline status.
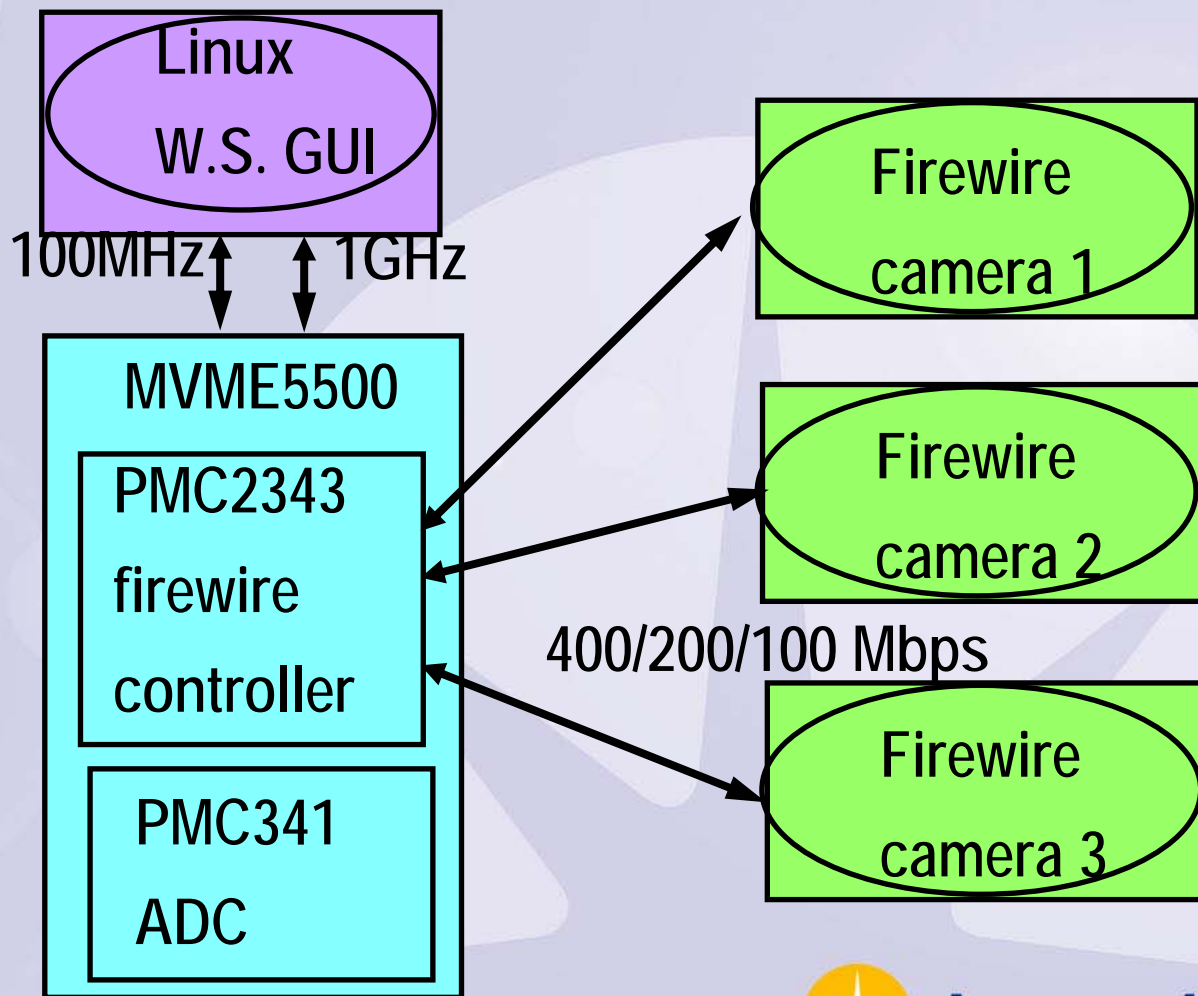 - Ideas for phase II beamlines.

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NSLS

Set-up:

RTEMS-4.6.x-MVME5500

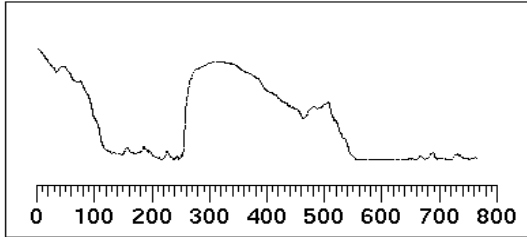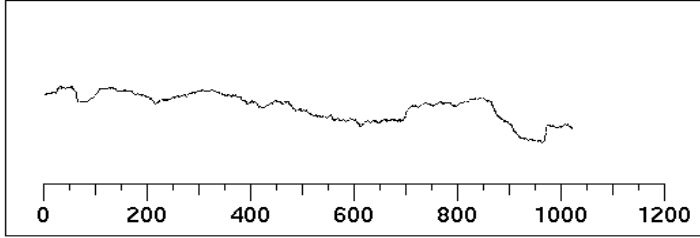SBS 2343 Firewire A adapter card.

Performance achieved:

1024*768*8bit@30Hz

Linux W.S. GUI

100MHz ↕ ↕ 1GHz

MVME5500

PMC2343 firewire controller

PMC341 ADC

Firewire camera 1

Firewire camera 2

400/200/100 Mbps

Firewire camera 3

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NSLS

See: *http://www.nsls.bnl.gov/facility/expsys/software/EPICS/*

SLS

EPICS 3.14.7 / HTTP Server

libdc1394
libraw1394

2.6.9 (Scientific Linux 4)
1394 built in

Interface Card

Flea

1394a

Ethernet

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SLS

Server performs on-line centriod finding algorithm, background subtractions, averaging (i.e. improves signal-to-noise ratio), maximum pixel intensity, standard deviation.
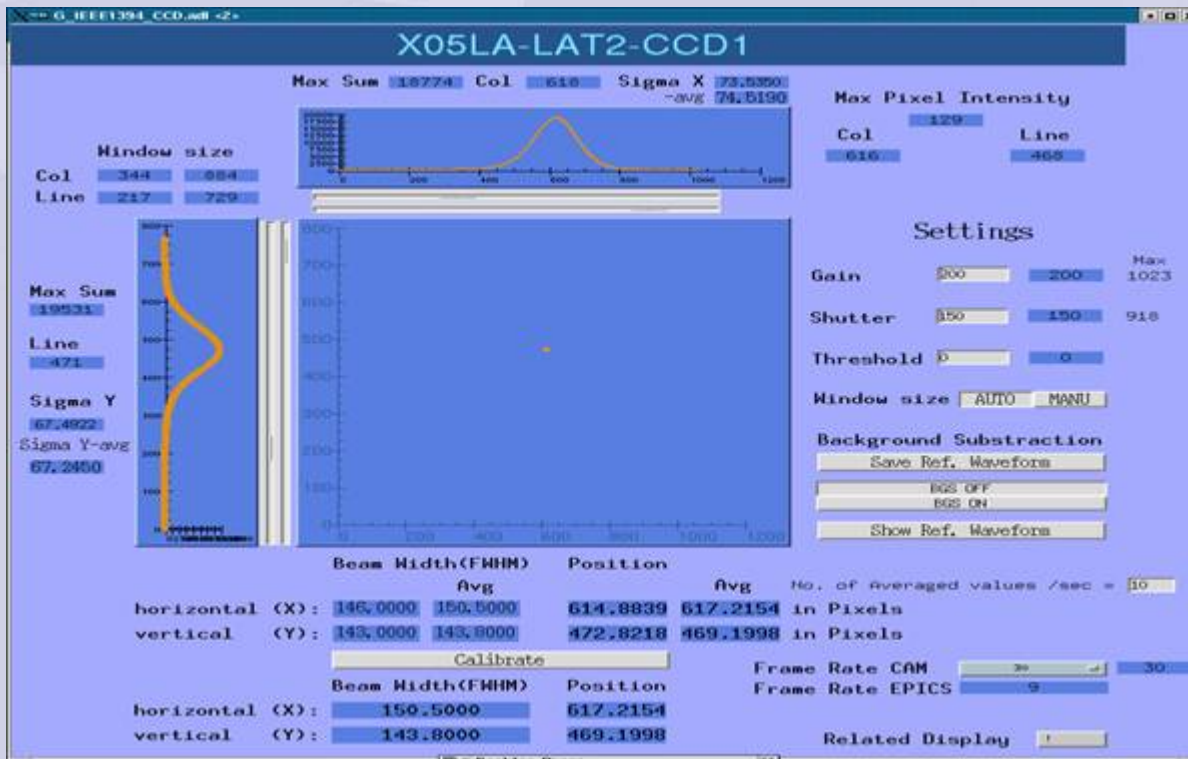
Driver is DCAM open source.

~10Hz image processing

Can also switch to using HTTP for visualization. Images can be jpeg compressed.

See: http://epics.web.psi.ch/software/firewire (can download Epics driver)

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CLS

• Using SLS Epics driver with Flea/Flea 2 and Sony DFW-SX-900 cameras.
• Exporting waveform data into Matlab for image processing.
• Used on several beamlines. Plan to use on machine.

Current set-up is similar to SLS:
Epics ver: 3.14.6
Linux (2.6.9): Scientific Linux
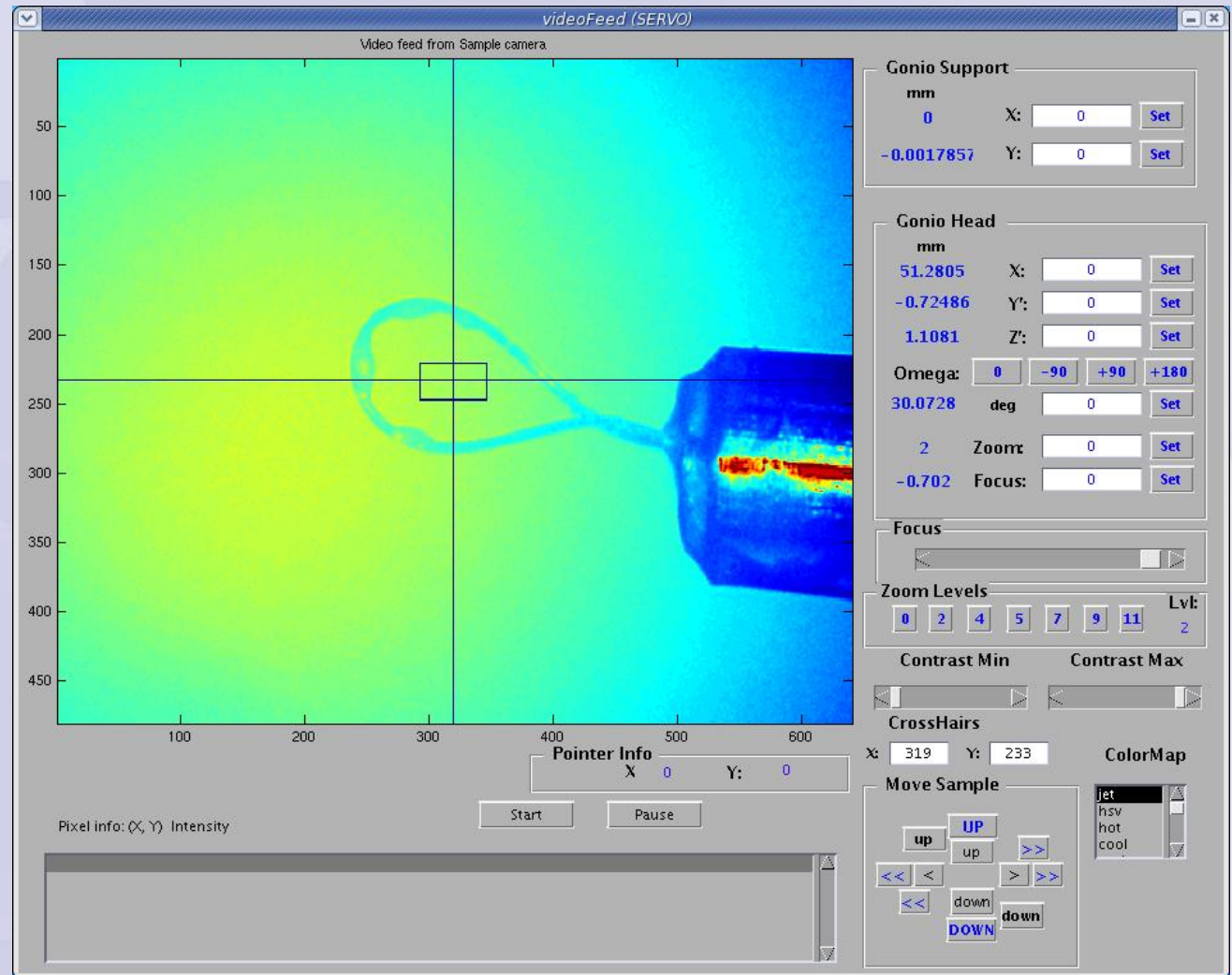ccd1394-1.2.tar.gz (from SLS website)
1394 card: variety OHCI compliant.

Also developed Java client (see other talk by Elder)

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CLS

Sample viewing
& centering
on PX
Beamline.

Uses matlab
CA library.

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ASP

Flea Camera used on diagnostic Beamline

AS Borland Delphi App

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ASP

Used Gensub record to extract a region of interest to create a 16K waveform record

Also check out the Facility Status monitor at http://www.synchrotron.com.au

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1394a
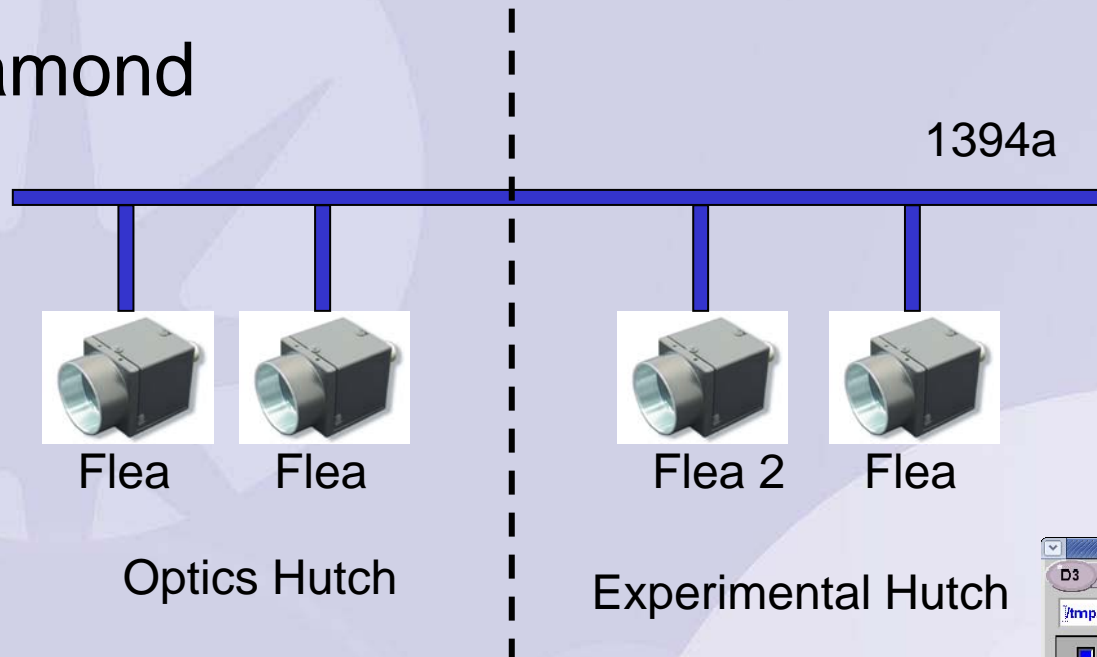
VME firewire Receiver

VxWorks

Epics 3.14.8.2

Flea   Flea   Flea 2   Flea

Optics Hutch   Experimental Hutch

Mindready VME PMC firewire
Card + driver licence (~£1200)
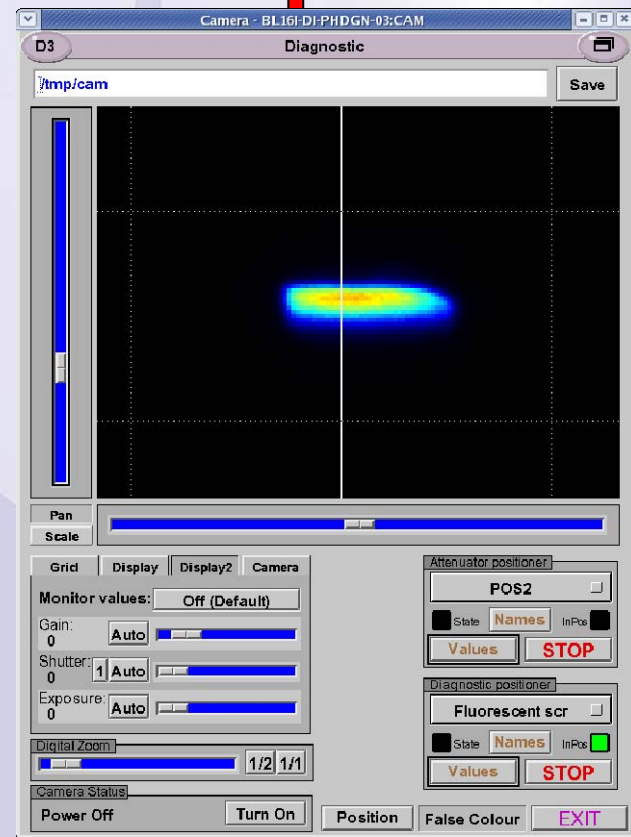
EPICS driver written by Steve Hunt.

Set up on 5 beamlines so far. Being deployed
on phase II beamlines with some modifications.

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Machine diagnostics
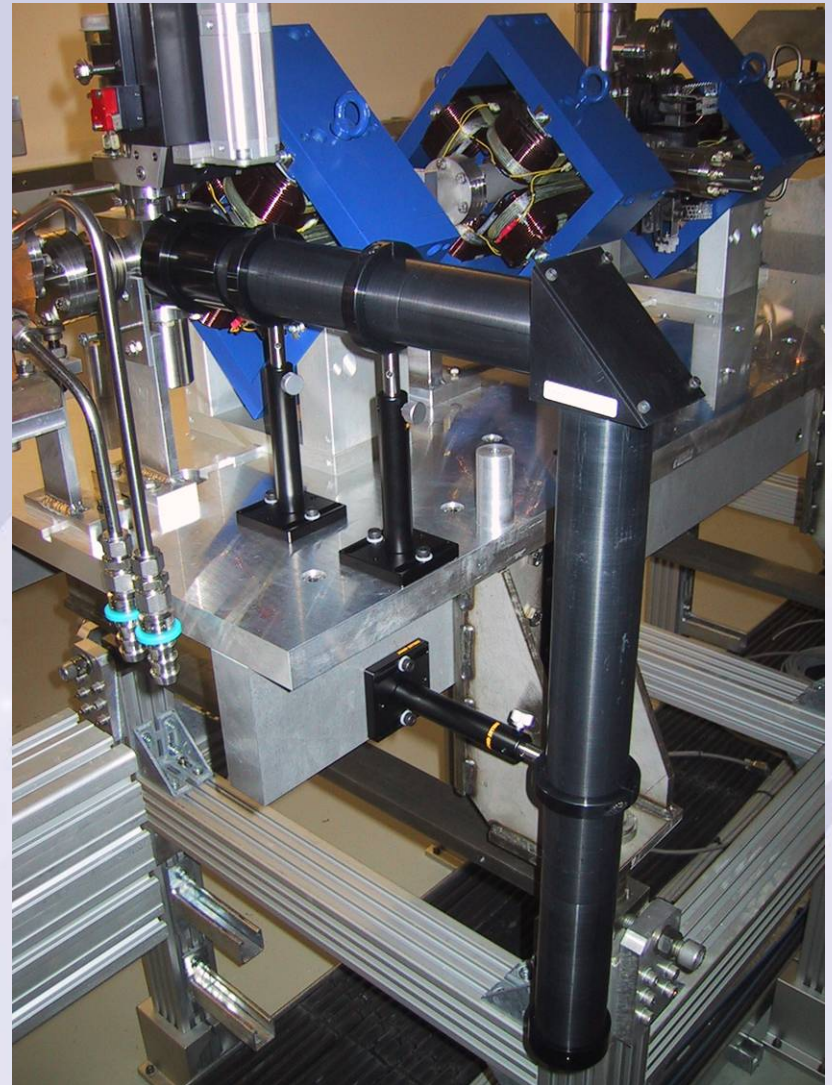
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Diamond – Plans

• Move to Flea 2
and 1394B cables.

• Improve cabling
layout on beamlines.

• Better repeaters
(are testing AVT 4-port 1394B industrial repeater).

• Long term plan to move to GigE cameras. Cameras are starting to
appear (have tested Pulnix TMC1405 colour). True plug&play! (?)

• No concrete software plans yet. Are investigating using
RTP for video transport and using compression.
Have developed an RTP server which supports any
DCAM firewire camera (Flea/Flea2/AVT Oscar colour).
No Epics integration as yet.
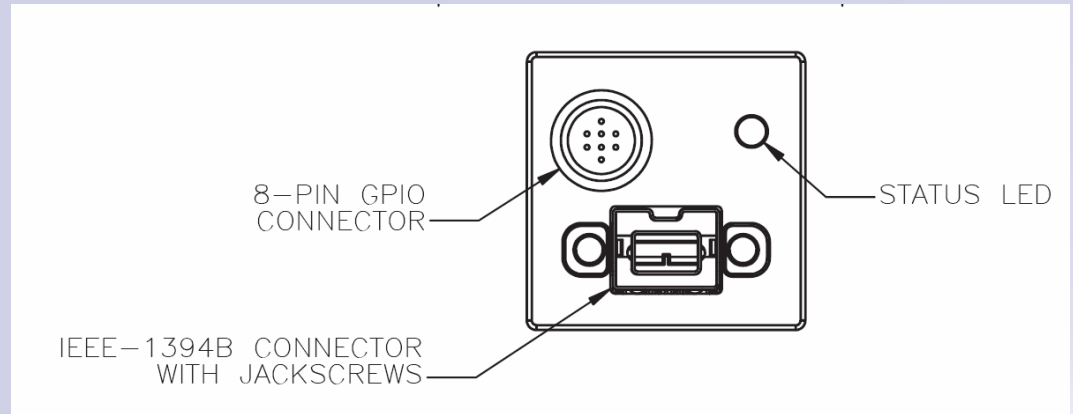
Acknoledgements

Kate Feng - NSLS,
Miroslaw Dach - SLS,
Elder Matias – CLS,
Richard Farnsworth – ASP,
Mark Heron, Guenther Rehm - DLS

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Additional Slides

Solution 1:

Firewire B cameras, cables and repeaters
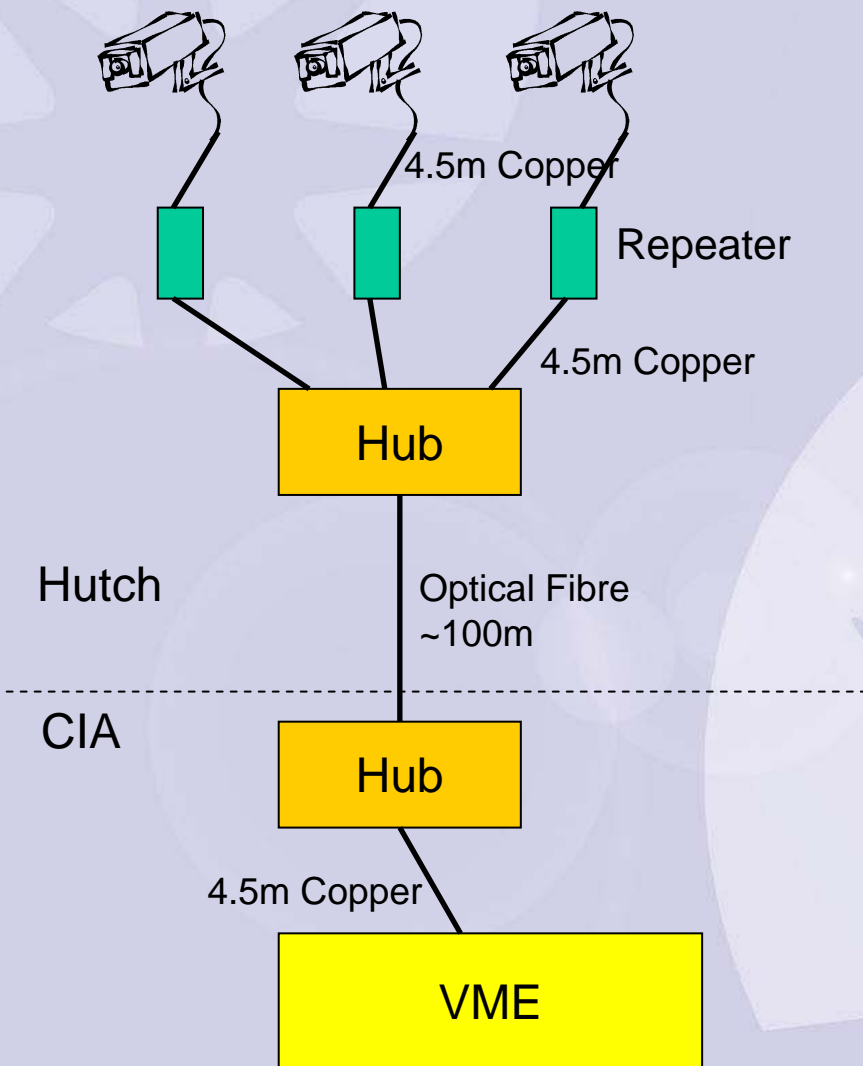
Identical set-up for every hutch.
VME can take two inputs.

Pros:
• Fully Firewire B chain
• Upgradeable at the VME end.
• Very long optical cable length.

Cons:
• Short Firewire cables need repeaters.
• Cannot chain Firewire B all the way back to CIA, so need optical fibre.
• Hubs are ~£800 each.
• If 3 hutch (eg. I15), need another VME readout.
• Very expensive overall.

4.5m Copper
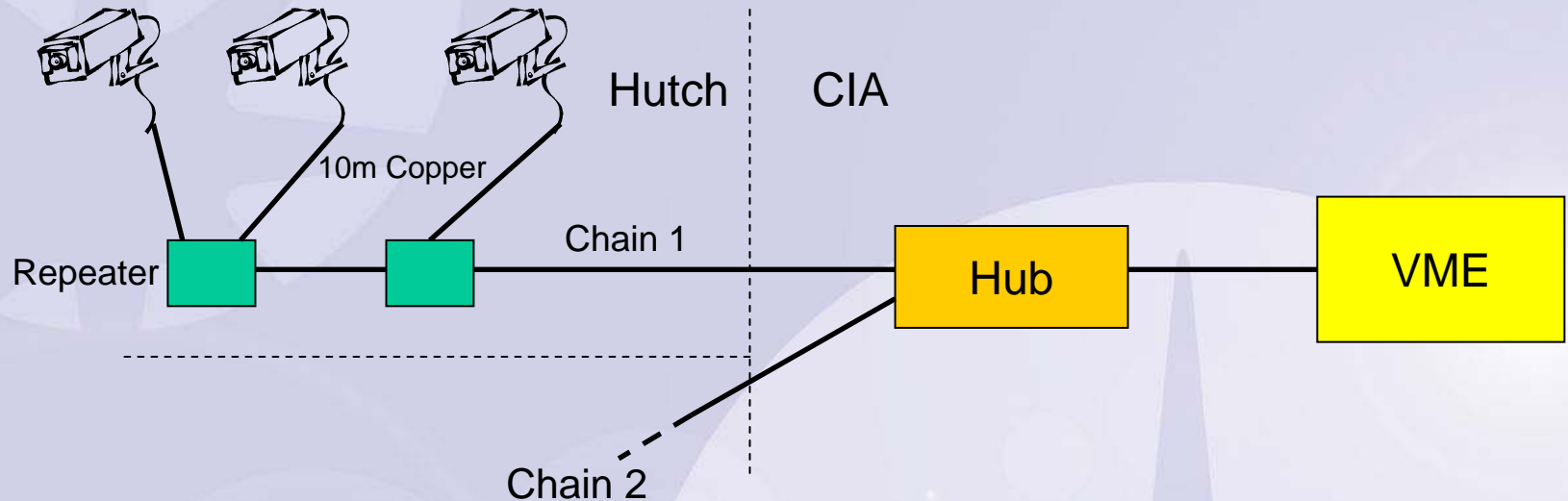
Repeater

4.5m Copper

Hub

Hutch

Optical Fibre ~100m

CIA

Hub

4.5m Copper

VME

26/4/07

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Solution 2:

Firewire A cameras, cables and repeaters

Hutch   CIA

10m Copper

Chain 1

Repeater

Hub

VME

Chain 2

Some improvements:
• Separate chain per hutch.
• Max 4 cameras per chain (important if using PCI readout in future).
• Better 'industrial' repeaters.
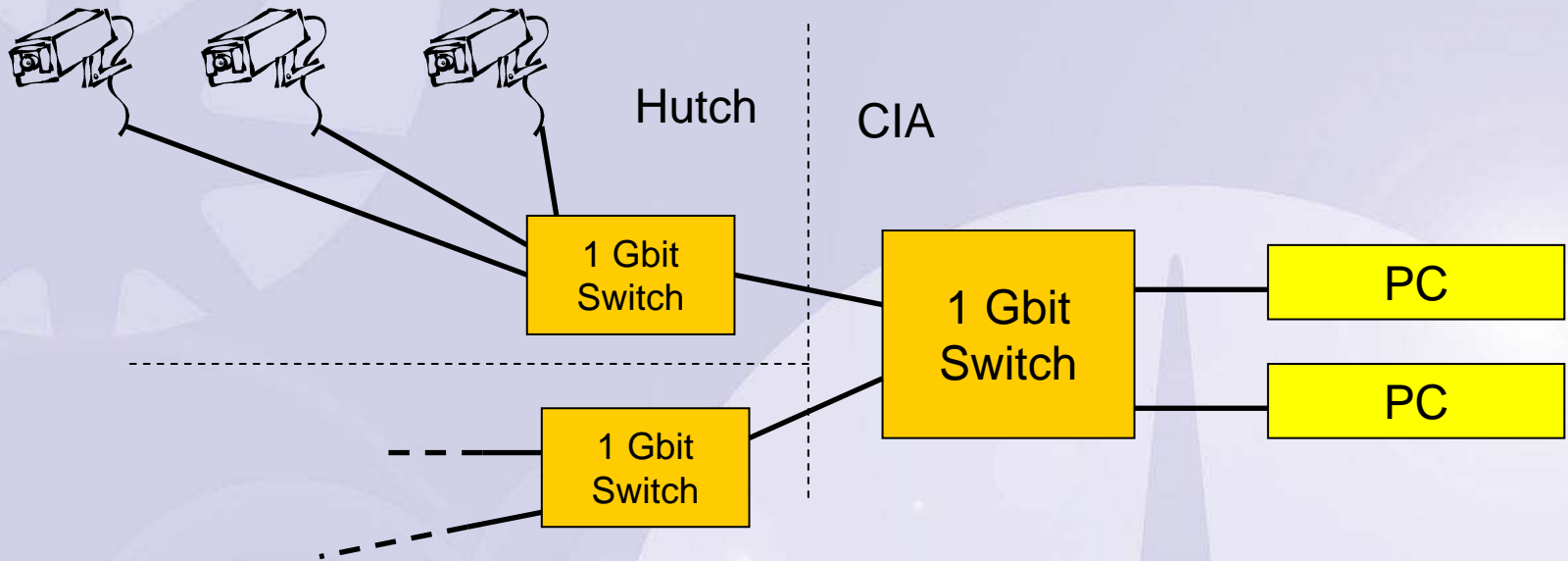
Pros:
• Cheap.
• Upgradeable at the VME end.
• Separate chains lessen bandwidth issues.
• Long cable lengths.
• Can still use Firewire B cameras with adapter.

Cons:
• Will always be Firewire A data rate.
May be problem in future with high res or colour cameras.
• No locking cables.

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Solution 3 (for the later Phase II beamlines):
Gigabit Ethernet Cameras, cables and switches.

Hutch | CIA

1 Gbit Switch

1 Gbit Switch

1 Gbit Switch

PC

PC

Separate subnet for cameras.
Only visible via PC readout (which does compression, processing, etc).

Pros:
• Machine vision industry is leaning towards GigE cameras (the GeniCam standard).
• High bandwidth.
• Cheap – fairly standard networking.
• PC readout.

Cons:
• Need to test available cameras.
• Significant shift in architecture.
• No open source GigE driver available.

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