EPICS Support for PCO Dimax and Edge Cameras

Tim Madden

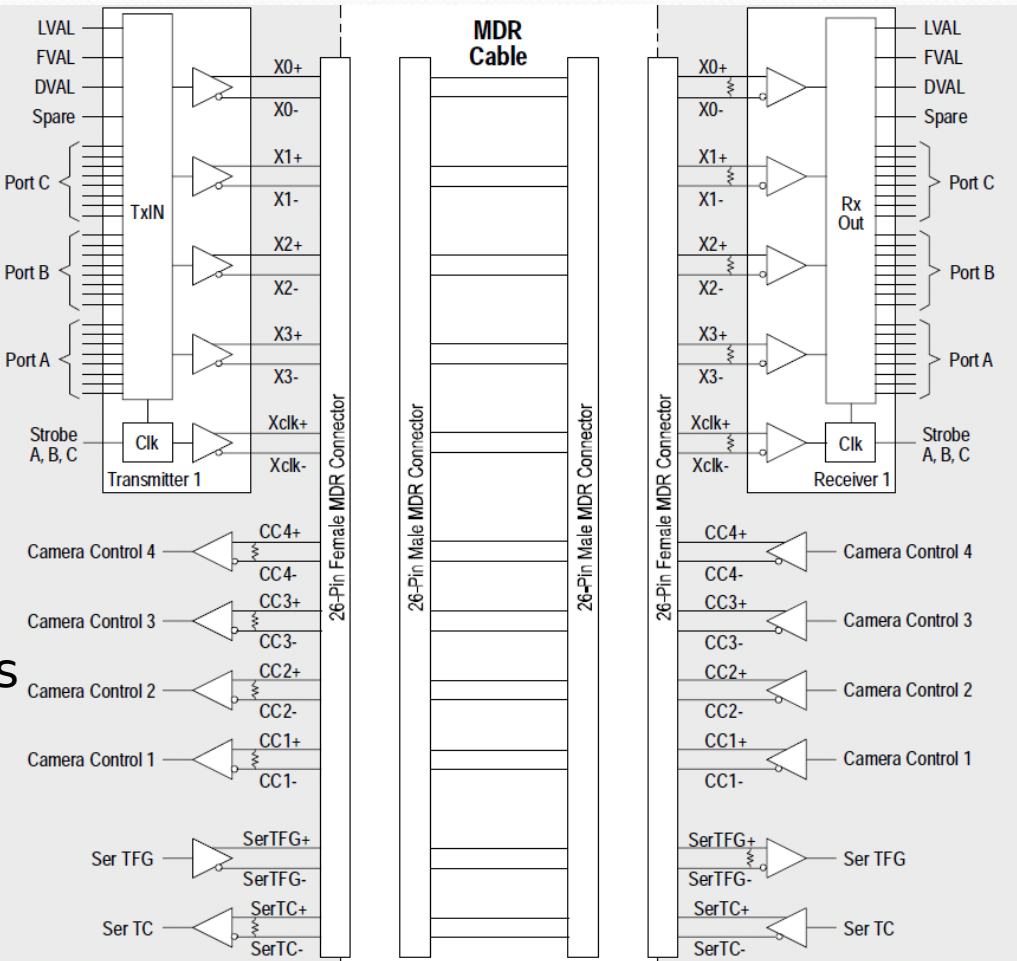# Camera Link Interface

- Camera Link Specs
  - Serial interface over 4 LVDS pairs.
  - Chipset to convert 28 parallel buss to high speed serial buss, and vice versa.
  - Serial RS232 to setup camera.
  - One or two cables.
  - 10m length max.
  - 85 MHz clock rate max (on parallel buss).
    - 85MHz is pixel rate for 16bit cameras.
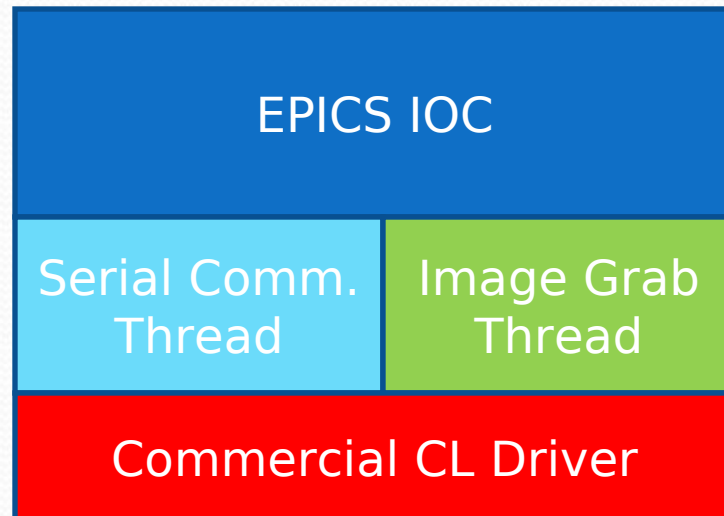 - 2.3Gbit/sec on serial lines.

Camera Link Connections

Driver Structure

- Thread for grabber
- Thread for serial port
- Threads for GUI/epics etc.

EPICS IOC	
Serial Comm. Thread	Image Grab Thread
Commercial CL Driver	

Dimax Driver

- On-Camera RAM
- Live View
  - For setup of experiment
- Memory Dump
  - 60MBsec to avoid overflowing disk.
  - 8fps for 2kx2k frames.
  - 6min to download a measurement.

Edge Driver

- No memory on camera
- Buffer frames in Host memory
- Non-standard Camera Link
  - 10 Tap
  - Dalsa grabber works with it.
  - 2 cables.
- Several data formats output by camera
  - Driver recognizes only 16 bit format.
  - Fast and slow sensor scan supported
  - 30 fps for 2160X 2560 pixels.
  - >100fps for smaller images.
- Software needs to descramble image. Can grabber do it?
  - Seems to run fast enough (a few ms computer time).
  - Requires extra memcpy of image data.

Dalsa grabber

- Generic serial code to control camera
- Reused Grabber EPICS support.
  - Reused code from Tieman's CCD Image Server and Platinum CCD and FCCD projects.
- PCO does not officially support Dalsa
- Dalsa works fine with PCO hardware.
- Need to load different firmware for Edge versus Dimax
  - Edge uses non-standard 10-tap format, requiring different firmware.
  - Dalsa supplies application to update firmware.

Camera Link cable problem

- PCO uses max. data rate on cable
- Tomo Beam line uses max. length 10m cable
- "Edge" of spec.
- Data gets fowled based on data content.

Status

- Both Edge and Dimax drivers in AD1-6
- Same driver controls both Edge and Dimax.
  - There is really only ONE driver.
  - Driver figures out which camera is plugged in.
- 32 bit Windows
- Developing with J. Gephart 64 bit Windows.
- MEDM user screens supported for Edge and Dimax
- Image J for viewing.
- Saves TIFF for huge files, so far. Multiple images in single TIFF.
- If >2GB, read TIFF as binary.
- Can save into multiple multi-image files.
  - Example: Save 1000 images into 10 100-frame files.
- For alternate image sizes, type in nominal size. Driver calculates exact legal image size and configures camera and grabber.

MEDMs

EDGE

PCOEdge_User.adl

asyn port	Null	
EPICS name	PCOIOC:cam1:	
Manufacturer	PCO-Cooke	
Model	PCO Edge Camera	
Sensor size	2560	2160
	2560	2160
ROI Size	2560	2160
Exposure time	0.000	0.000
Delay Time	0.000	0.000
Frame Rate	1.000	1.000
Acquire period	0.000	1.000
# Images	0	0
# Images complete		0
Frame Rate		0.000

Done

Acquire Start Stop
Detector state Idle
Time remaining 0.000
Image counter 0 0
Image rate 0.0
Array callbacks Enable Enable

Scan Speed Normal Normal
Descramble On On

More

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pco_general.adl

Serial Port
Open Close 1
CheckStats 304

PCO General
SelfTest
DefaultSettings
Health Stat 16
Health Warn 0
Health Err 0

PCO Sensor
Sensor Format Standard Standard
Pixel Rate(Hz) 0 95333333
DoubImg Mode OFF OFF
ADC Mode (1,2) 0 0
Temp Setpt (C) 0 5
Offset Mode Auto Auto
Noise Filt Mode OFF Off

CDI Mode No
DSNU Mode OFF
DSNU Init Mode

Timing
Exp Timebase ns ns
Dly Timebase ns ns
FPS Mode Off Off
Cam Status IDLE
Exp Trig Stat FALSE
Trigger Mode Auto Auto

On-Camera Recording
Storage Mode Recorder Recorder
Rec Submode Sequence Sequence
Record Status Idle Idle
Acq Mode Auto Auto
AcqEn Sig Stat FALSE
Timestamp Mode NoStamp NoStamp
Arm PCO Camera
RecStop Event None None
NImgs Rec Stop 0 0
Stop Recording

ReInitGrabber

Camera Link
CL Pix Freq 0 85000000
CC Lines 0 0
CL Baudrate 9600 115200
CL PixPerClk 0 5
CL Continuous 0 1

Engineering Screens

pco_memory.

On-Camera Memory
RamSize (Pages) 0
Pixels/Page 0
Seg0 NPages 0 0
Seg1 NPages 0 0
Seg2 NPages 0 0
Seg3 NPages 0 0
Clear Active Segment
ActiveSeg 0-3 0 1

Memory Readout
Read This Seg 0 0
Start Img 0 0
End Img 0 0
Do Read
Req Image Whilst Recording
Cancel Read

Seg0 NImages 0
Seg0 Max Images 0
Seg1 N Images 0
Seg2 N Images 0
Seg2 Max Images 0
Seg3 N Images 0
Seg3 Max Images 0

Bit Alignment LSB MSB

[ ] >

Dimax

PCODimax_User.adl

asyn port	Null	
EPICS name	PCOIOC:cam1:	
Manufacturer	PCO-Cooke	
Model	PCO Edge Camera	
Sensor size	2560	2160
	2560	2160
ROI Size	2560	2160
Exposure time	0.000	0.000
Delay Time	0.000	0.000
Frame Rate	1.000	1.000
Acquire period	0.000	1.000
# Images	0	0
# Images complete		0
Frame Rate		0.000
LiveView	No	No

Done

Acquire Start Stop
Detector state Idle
Time remaining 0.000
Image counter
Image rate
Array callbacks Enable Enable

Reset Memory
Seg0 NImages 0
Seg0 Max Images 0
Dump Counter 0

Dump Wait(ms) 50 50
Max Rate(kB/s) 50000 50000
MissedFrames 0 0
RepeatFrames 0 0

Dump Mem Cancel More

High level detector functions

- Detector hardware has too many knobs.
- Should EPICs driver be user-friendly and hide knobs?
  - Needed for MEDM based screens.
- Should EPICS driver be "dumb" and simply expose knobs as PVs
  - Bad idea for use of MEDM screens.
- Some "user PVs" and "engineering PVs" implemented.
  - User screen with few knobs and engineering screens with many knobs.