Comparative analysis between Frame Grabbers for camera readout in CYGNUS

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Survey of Frame Grabbers

- Manufacturers:
  - **Sensoray** (sensoray.com), US
  - **Active Silicon** (activesilicon.com), UK
  - **Kaya Instruments** (kayainstruments.com), Israel
  - **Euresys** (euresys.com), Belgium

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Sensoray - Model 817

- Manufacturer: Sensoray
- Model: 817
- 16 channels
- URL of FG: www.sensoray.com/products/817

Sensoray - Model 817

- The following information appears on the website:

> Model 817 is a legacy product and is not recommended for new designs. Legacy products are available but may have lead times up to 12 weeks and minimum order requirements. For new designs, use our **Product Finder** to find a comparable product or **contact our Design Support Team**.

- In contact with the manufacturer, he confirmed that the model is not suitable for new designs.

- When asked about other FG of the brand, similar to the 817, the manufacturer informed that the model 812 can be adopted, but it does not offer compression.

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Sensoray - Model 812

- Manufacturer: Sensoray
- Model: 812
- 8 channels
- URL of FG: www.sensoray.com/products/812

Sensoray - Model 812

- Approximate cost: U$ 202,00 (FG) + U$ 25,00 (Adapter cable DB-15 to BNC)
- Approximate cost/channel: U$ 28,38
- The manufacturer was asked about the type of compatible control (FPGA, GPU ...), but there is still no feedback
  - An important information given by the manufacturer in a previous email is that this model does not work with high resolution, which could disqualify you for the project
- Relevant information in the documentation:

Software

Software Development Kits (SDKs) are available for Linux and Windows. The SDKs include drivers, programming samples, and documentation to enable developers to quickly start and create custom applications for the board.

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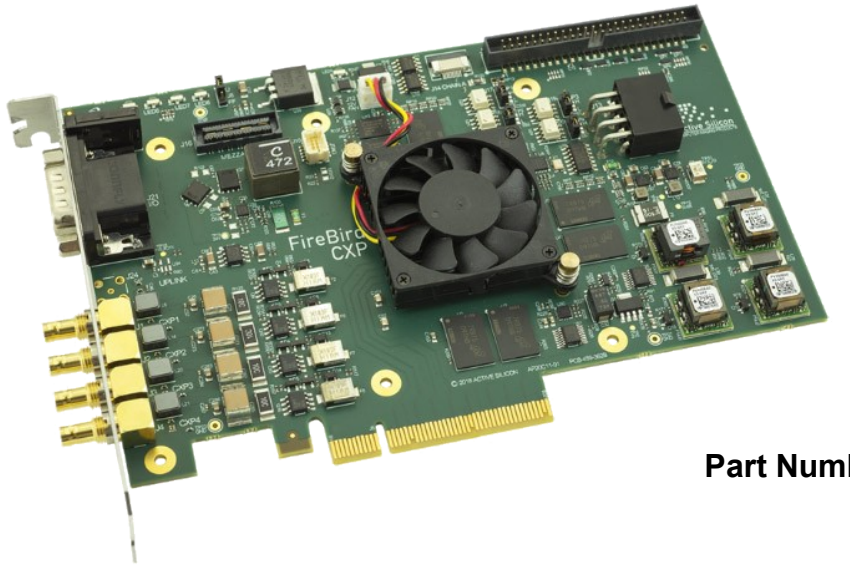
Active Silicon - Firebird

- Manufacturer: Active Silicon
- Model: Firebird 4XCXP12-3PE8
- 4 channels
- Accepts control by FPGA or GPU-Direct (NVidia)
- URL of FG: www.activesilicon.com/products/firebird-coaxpress-frame-grabber-4xcxp12-3pe8



Part Number: AS-FBD-4XCXP12-3PE8

Active Silicon - Firebird

- Approximate cost: waiting quotation from the manufacturer
- The manufacturer does not offer any model above 4 channels (CoaXPress there is no way to multiplex these signals. The single cable is carrying power to the camera, communications uplink to the camera and very high speed serial downlink (6.25 Gbps) data to the framegrabber. This CoaXPress standard interface is designed to be point to point.)
- An interesting observation of this model is that in the demonstrations of use of Nvidia GPUs, FGs from this manufacturer are recommended
  - The Active Silicon Firebird models have a system called ActiveDMA engine, which promises acquisition with zero CPU usage.
  - You must check the cost per channel and the number of slots needed, to get a sense of the viability of this model.

Kaya Instruments - Komodo

- Manufacturer: Kaya Instruments
- Model: Komodo KY-FGK-801
- **8 channels**
- Control by DMA (physical address support (GPU transfers)); FPGA
- Approximate price: US$ 1.650,00
- Approximate price/channel: US$ 206,25
- Unable to load user logic into the FPGA of this model

Euresys - CoaxLink

- Manufacturer: Euresys
- Model: CoaxLink Octo
- **8 channels**
- Control by GPU Direct
- Approximate price: US$ 2.599,00
- Approximate price/channel: US$ 324,88
- DMA support for AMD DirectGMA and NVidia (Cuda)

Preliminary Conclusions

- For Active Silicon (Firebird) models, depending on the cost per channel, it may be viable for the project due to its integration with Nvidia's GPU's via GPU-Direct (the number of slots required must also be considered, as the models of this manufacturer have a maximum of 4 channels)
- Sensoray's model 812 is much cheaper than the others surveyed, but there is no detailed information on the types of control accepted and the analysis in the datasheet, the capture quality is not good, which can cause problems in the use of neural networks
- The Euresys model (CoaxLink Octo) is the one that includes the best features for the project (DMA, customizable logic), but its approximate cost is much higher
- Possibility of working together with the 4-channel model from the same manufacturer

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Preliminary conclusions

COMPARATIVE - FRAME GRABBER'S								
Manufacturer	**Model**	**Number of channels**	**Compatible Processing**	**Origin**	**Approximate cost**	**Approximate cost/channel**	**URL of FG**	**Datasheet**
Sensoray	Model 817	16	Awaiting information	Imported	Waiting for quote	Waiting for quote	http://www.sensoray.com/products/817.htm	http://www.sensoray.com/downloads/man_817_hw_1.0.4.pdf
Sensoray	Model 812	8	Awaiting information	Imported	US$227,00	US$28,38	http://www.sensoray.com/products/812.htm	http://www.sensoray.com/downloads/man_812_hw_1.0.3.pdf
Active Silicon	Firebird 4XCXP12-3PE8	4	Yes (FPGA)/GPU Direct	Imported	Waiting for quote	Waiting for quote	https://www.activesilicon.com/products/firebird-coaxpress-frame-grabber-4xcxp12-3pe8/	https://www.activesilicon.com/wp-content/uploads/DATASHEET-Frame-grabber-CoaXPress-CXP-12-Family.pdf
Kaya Instruments	KY-FGK-801	8	Yes (FPGA)/GPU Direct	Imported	US$1.650,00	US$206,25	https://kayainstruments.com/komodo-8-channel-coaxpress-frame-grabber/	https://storage.kayainstruments.com/s/komodo-cxp-8ch-documentation
Euresys	Coaxlink Octo	8	Yes (GPU-Direct or DirectGMA)	Imported	US$2.599,00	US$324,88	https://www.euresys.com/en/Products/Frame-Grabbers/Coaxlink-series/Coaxlink-Octo	http://downloads.euresys.com/Documents/Euresys_DataSheet_CoaxlinkOcto_ENU.pdf

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Preliminary conclusions

COMPARISON - BEST MODELS								
Model	**Cost**	**Cost\channel**	**DMA**	**Connectors (camera)**	**Interface (camera)**	**Number of channels**	**Number of lines**	**Interface FG**
KY-FGK-801 (Kaya)	US$1.650,00	US$206,25	GPU-Direct	DIN1.0/2.3 CXP-6	CoaXPress 1.0 and 1.1	8	40 I/O lines: •4 differential inputs•4 differential outputs•8 singled-ended TTL inputs/outputs•8 singled-ended LVTTL inputs/outputs•8 opto-isolated inputs•8 opto-isolated outputs	PCI Express 3.0
CoaxLink Octo (Euresys)	US$2.599,00	US$324,88	GPU-Direct/ DirectGMA	DIN1.0/2.3 CXP-6	CoaXPress 1.0, 1.1 and 1.1.1	8	10 I/O lines on INTERNAL I/O connector: • 2 differential inputs (DIN) • 2 singled-ended TTL inputs/outputs (TTLIO) • 4 isolated inputs (IIN) • 2 isolated outputs (IOUT) •NOTE: The number of I/O lines can be extended using I/O modules attached to the I/O EXTENSION connector.	**PCI Express 3.0**

Some questions

- For the sizing of the motherboard and the number of frame grabbers required, the following information will be required:
  - total number of cameras transmitting simultaneously
  - image resolution per camera
  - frame rate
  - pixel format (bit-depth)

- Is there a defined camera model? Which one?