CoaXPress White Paper

WP-4: CoaXPress Roadmap

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1 Introduction

This document describes some roadmap options for CoaXPress.

It is one out of a set of papers that describe the CoaXPress interface. Other White Papers discuss cables, implementation etc in more detail.

The latest versions of the White Papers (as well as much more information about the standard), can be found at http://www.coaxpress.com.

For a complete description of CoaXPress you are referred to the formal specification document. The *Japan Industrial Imaging Association* is leading the World Wide standardization of CoaXPress. So for more information please visit the JIIA website at http://www.jiia.org.

2 Faster Speeds

CoaXPress is currently defined up to 6.25 Gbps. This rate is a practical choice based on available FPGA SERDES parts, and not the cable drivers and equalizers which could already be made to run faster.

SERDES are currently limited to 6.5 Gbps (Xilinx) or 8.5 Gbps (Altera). History suggests that these speeds will rise in each generation of FPGAs, so that (for instance) 12.5 Gbps SERDES may be readily available in three or four years.

The key advantage here of CoaXPress compared to standards using differential twisted pair cables is that the only problem resulting from the higher speed is higher attenuation, and improvements in equalizer technology are likely to at least partly counter this, so allowing long cables to continue to be used.

Differential pair suffers from the same attenuation problem (in fact slightly worse for a given cable size), but also suffers from intra-pair skew problems (i.e. a difference of length between the two wires forming the pair). Intra-pair skew is an important performance limiter for differential (twisted pair) cables at higher speed, because of the difficulty in making the cables with precisely matched lengths and twists. This is why high speed differential cables tend to be very stiff, because that helps maintain the integrity of the construction.

Therefore for CoaXPress it is quite realistic to expect a doubling of speed per cable to be an option in three or four years.

Note that CoaXPress is already a multi-speed standard, covering speed ranges from 1.25 Gbps to 6.25 Gbps with automatic bitrate discovery. Therefore adding additional high speeds does not have any affect on the protocol – all that is needed is to agree on the new speeds within the standardization process, and add electrical parameters at those speeds.

3 Lower Speeds

Many users want more speed – so why slower? The answer is that many existing installations have analog cameras connected using very long lengths of low grade 75Ω coax cable. These installations could easily take advantage of modern cameras if they could retain the existing cabling. While CoaXPress can achieve high speeds on quite long lengths of low grade cable, it can't do the impossible!

Dropping down to lower speeds allows much longer lengths of low grade cable to be reliably used, and still give sufficient bandwidth for many low to medium resolution cameras, or intelligent high resolution cameras with built in frame buffers or compression.

While the full electrical specification has not been finalized for lower speeds, there are already a set of defined speeds between 0.125 Gbps and 1 Gbps.

The specification for these lower speeds could be defined by a Working Group within the standardization process.

4 Multi-Cable Options

CoaXPress allows more than one BNC cable to be used to link the camera to the frame grabber, so allowing higher speeds than is possible with a single cable.

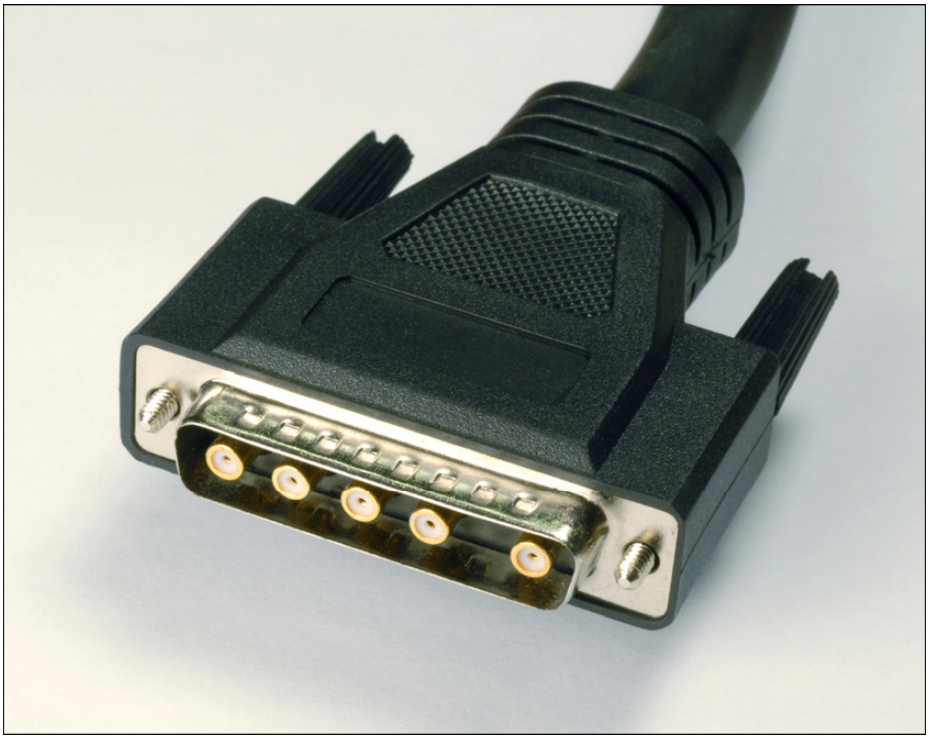
While two or maybe even three separate cables may be considered OK, at very high speeds a neater solution is needed. See the cables White Paper for more details on these options.

4.1 5W5 Cable

Conventional D-sub connectors are available with coaxial inserts in numerous configurations. Many in the industry will remember the 13W3 connectors used for many years by Sun Microsystems on their workstation monitor cables. In this terminology, 13W3 means 13 ways total, 3 of which use coax (so 10 conventional pins).

A 5W5 solution has been chosen for investigation because it allows 5 coaxial cables in a "B" sized shell (as used on a conventional 25 way D-sub), so allowing up to 31.25 Gbps. A "B" shell fits both standard PC cards, and common industrial form-factor computers. It should also fit cameras of this performance.

A photo of a sample cable is shown below:



5W5 Cable

4.2 Alternatives

Connector and cable firms are looking into compact multi-cable solutions for high speed cameras. The 5W5 shown above is simply one example of what can be done. Part of the standardization work will be to evaluate the proposals and choose one type to add to the standard.

4.3 Power

Note that Power over CoaXPress (PoCXP) is already defined per connector (13W per connector). Therefore large high performance cameras that need multiple cables can draw more power than smaller cameras with only one cable.

5 Faster Uplink

CoaXPress combines the downlink with camera data, the uplink with camera control, and camera power into one coax cable. This does give a very elegant solution for most cameras, however it limits the uplink bandwidth.

In future, high speed systems may need faster triggers or even bidirectional data. Therefore on for example a 5 way cable like the 5W5 shown in the previous section, we can have 4 cables for the downlink (25 Gbps) and one dedicated as a 6.25 Gbps uplink. This will allow very fast camera control and triggers, or the ability to send large data files to the camera.

As with the options for faster speed, the protocol is designed ready for this. It is symmetrical, so the existing “high speed” protocol that currently runs only on the downlink from the camera to the frame grabber would simply be used on the uplink as well.

Again the details of this are part of the standardization process – for now there are probably too few systems that really need this bandwidth to get a meaningful group discussion to form an optimum solution.

6 Second Sources

It is anticipated that a second source for the EqcoLogic components will be available by the time that the standardization of the initial CoaXPress standard is completed by JIIA.

In the meantime an ESCROW agreement is being set up to guarantee availability should EqcoLogic not be able to supply parts for any reason.