CoaXPress v2.0
addresses need for speed

Chris Beynon, Active Silicon's CTO and technical chair for the CoaXPress standard, gives an update on what's new in version 2.0

In June the Japan Industrial Imaging Association released CoaXPress v2.0 and components supporting it are now coming to market. Adopted as an official JIIA standard in 2010, CoaXPress remains the best option for applications requiring data rates over 5Gb/s or demanding complex triggering. The latest specification brings several advantages to machine vision systems.

The first is speed. In order to support the fastest cameras on the market, CoaXPress 2.0 increases the existing speed of 6.25Gb/s per link to 10Gb/s (CXP-10) or 12.5Gb/s (CXP-12). Links can be concatenated, so a four-link frame grabber can now transfer data at 50Gb/s, much faster than the 5Gb/s of USB3 Vision or 10Gb/s of 10 GigE Vision. Additionally, CoaXPress is a technology designed specifically for machine vision and is therefore more reliable than USB3 Vision or 10 GigE Vision, providing continuous and sustained data rates.

The uplink speed has also been doubled for version 2.0 to 42Mb/s, enabling trigger rates over 500kHz without the additional cost of a dedicated high-speed uplink. The precise, real-time triggering capability of CoaXPress, with camera control and digital video options all over one cable, make the standard ideal for high-speed line scan and area scan applications, such as flat panel and PCB inspection.

Version 2.0 also enables a single camera to send data to more than one frame grabber, even supporting boards in different PCs. An enormous benefit of CoaXPress is the extended cable lengths that are possible – high-quality data transmission is proven at 40m for CXP-12, compared to around 10m for Camera Link and 16m for USB3. With the facilitation of multiple destinations, how data is moved around a vision system is now even more flexible.

GenICam-compliant event packets have been added to v2.0, to allow the camera to send status information to the frame grabber, for example, start of exposure. It still includes GenTL for a plug-and-play experience and will soon add the GenDC standard for streaming complex data types.

The preferred connector for version 2.0 is the micro-BNC, also known as HD-BNC. The transceiver chipset used in CoaXPress frame grabbers uses a cable driver at the camera and an equaliser chip at the frame grabber, connecting directly to a serialiser or deserialiser (SERDES), which are built into most FPGAs. Together, these parts are extremely compact and offer a low-power solution. Power-over-CoaXPress remains at 13W per cable.

News from IVSM

Technical committees came together in Stresa, Italy for the International Vision Standards Meeting (IVSM) in early October. This is the biannual forum to evaluate all the standards and plan for the future. The meeting included the first CoaXPress plug-fest following the release of CoaXPress v2.0, and a very pleasing 24 combinations of camera and frame grabber products passed interoperability tests at CXP-12. Frederik Voncken, of Adimec, was appointed technical vice-chair of CoaXPress. Macom and Microchip, the two physical layer suppliers, added their input to conclude the meeting.

The roadmap for CoaXPress was also discussed at the meeting and a draft text for the next release, 2.1, was reviewed. The main change was the addition of support for GenDC, which will allow CoaXPress to send more complex image formats such as 3D. Version 2.1 is planned

> ❝ Faster speeds will be demanded by the industry and, at speeds above 20Mb/s, optical is the way forward ❞

The preferred connector for version 2.0 is the micro-BNC.

to be released in Q1 2020. Looking further ahead, faster speeds will be demanded by the industry and, at speeds above 20Mb/s, optical is the way forward. Therefore, an elegant proposal was presented to the committee to map existing well-proven CoaXPress protocol to XGMII, to allow use of existing – and future – Ethernet physical layer components.

Vision-assisted surgery

As a dedicated machine vision standard, CoaXPress has been widely adopted into applications including industrial inspection, life science, surveillance, aerospace and medical imaging. It is proven to be more robust and reliable than USB3 or GigE, and offers far higher speeds and much longer cable lengths than Camera Link. The appeal of a single, flexible and cost-effective cable to transfer all data and power is a definite advantage for integration into existing systems.

One of Active Silicon's customers in vision-assisted surgery has summed up its appeal: 'The specific benefit for us with CoaXPress is the ability to run long cables outside the treatment environment, as we have seen PC failures in such a harsh environment. Our latest specification camera can only operate at three metres over Camera Link, but we have had no problem at 45 metres with CoaXPress.'

Furthermore, as the components become smaller and speeds increase, the appeal of CoaXPress is growing outside traditional sectors. Robotics, automotive and aerospace applications are now enjoying the benefits of faster, more adaptable and more reliable image acquisition. The use of a frame grabber maximises CPU capacity for other processing tasks – a must for the world of Industry 4.0.

Several manufacturers are now introducing CXP-12 products to the market. Active Silicon's FireBird frame grabbers support the fast vision systems, using DMA Engine technology, ActiveDMA. This technical innovation applies Risc-based processor techniques and guarantees high speed, low-latency image data transfers and zero CPU intervention. With hardware like this, vision systems can be introduced or upgraded at low cost, adding enhanced imaging capability across a wide range of sectors. ●