Foundation built on FPGAs

Active Silicon turns 30 in September. **Greg Blackman** speaks to founder Colin Pearce on building the company and the importance of FPGA technology

Xilinx FPGAs have been central to Active Silicon over its 30 years in business. Colin Pearce founded the company on 5 September 1988, originally as a Xilinx FPGA consultancy, at around the time Xilinx launched FPGAs into Europe. Now, virtually all of Active Silicon's products use Xilinx technology, with one of the latest based around a Xilinx Zynq system-on-chip, targeting the emerging embedded vision market.

Chris Beynon, now technical director, was involved in the company from the start, and joined full-time a couple of months later as a significant shareholder, owning 26 per cent of Active Silicon; Pearce owns 51 per cent. The balance went to Martin Bone and Keith Baker, who joined over the next couple of years.

Before forming Active Silicon, Pearce had worked on video broadcast standards, as well as spending a year working with Xilinx technology at a small start-up. 'I realised the two – Xilinx FPGAs and video – could be interesting,' he said.

To get started Pearce remortgaged his house, borrowed money from the bank, and bought a PC for around £2,000 – 'that was a lot of money back then,' he remarked. He knew the Xilinx distributor in the UK, through which Active Silicon got its first few sales leads as a Xilinx design and consultancy firm.

Early projects included a hardware-based controller for a lift company, which turned out to be a long-standing client, and work on the Inmarsat maritime communication technology.

In 1990, Active Silicon released its first product, the S2200, a plug-in image capture and display board for the Sun Microsystems workstation. The board sold well throughout the 1990s, with the last one sold more than 20 years later, in 2012.

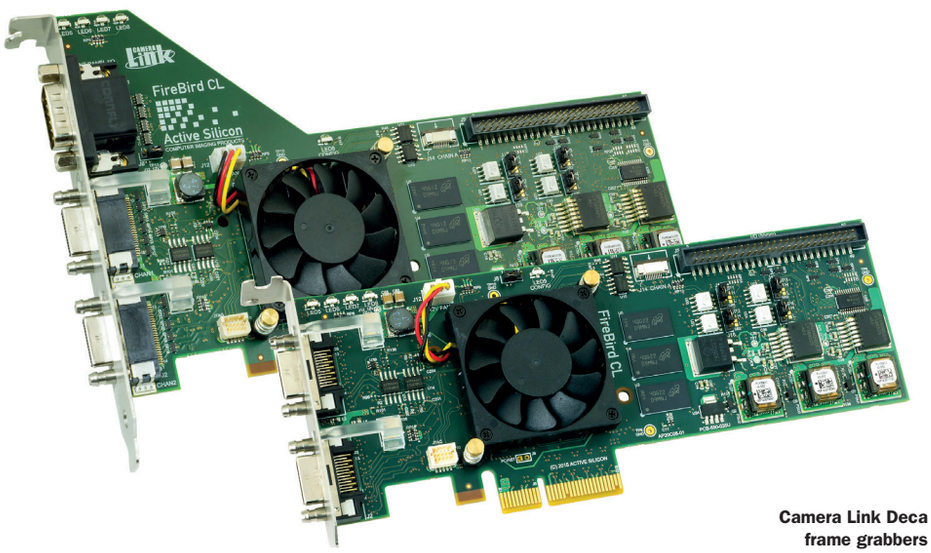
'The barrier to entry for the sort of products we're doing was far less when we started than it is today,' Pearce said. 'Back then we had the ISA bus and an affordable oscilloscope to debug the electronics. But now, with the PCI Express Gen3 bus, you need an analyser that will cost in the region of £100,000. To start up now doing what we do would require a much larger capital investment.'

Pearce described Active Silicon as a privately owned company that's taken a medium-risk organic growth trajectory. 'Today you'd need to borrow more money to start a vision company, which would invariably mean you have another investor involved, and they would push the business hard for growth,' he said. 'While there's less chance of the business surviving on a higher trajectory growth curve, the ones that do would probably do rather well. Forming a company now, you might be forced down that more aggressive route because you need to borrow more money to get into the market, particularly in leading-edge hardware design, although this is less the case for software.'

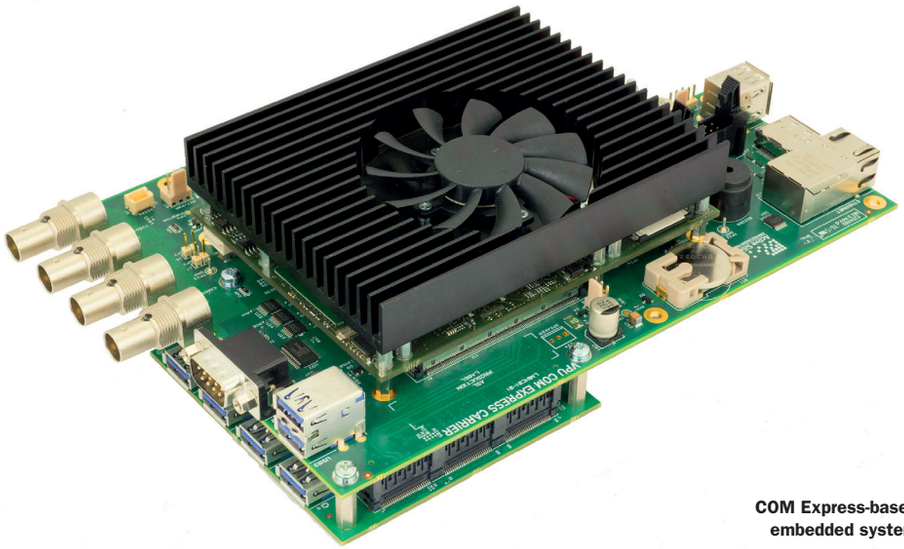
Colin Pearce

Active Silicon's core market is OEMs, selling machines into sectors such as life sciences, medical imaging, industrial inspection and various other high-tech niche industries. Systems for these markets often need components that will be available for a long time, which is what Active Silicon offers.

'There has been an evolution of technology, particularly on the computer interface buses,' Pearce noted. The company's first product was



Camera Link Deca frame grabbers



COM Express-based embedded system

based on the ISA bus, which was relatively slow. Then PCI came along in the 1990s and PCI Express after that. 'The evolution of the computer bus has been a key aspect and also an enabling technology that has allowed frame grabbers to not really be frame grabbers anymore – the name frame grabber is an old fashioned misnomer now,' Pearce continued.

'The first products we made did capture video frames and transfer them across the bus, but you couldn't do it in real time. Faster buses were a bit of a revolution; you could now stream live video straight into system memory. That's essentially what we still do, with a bit of image processing on the way.'

The speeds are much quicker and PCB layout has become a significant specialist area. 'Now, the electronics need to be analysed in sophisticated CAD environments to make sure the PCB tracking is going to work at the speeds required,' he added.

Pearce observed that every new piece of technology brings with it opportunities as well as threats. He recalled that when Gigabit Ethernet – and a few years' later GigE Vision – came out, everyone predicted the death of the frame grabber. GigE Vision, however, wasn't fast enough for many applications, and there was still a place for acquisition products at the high-end, which is where Active Silicon positions itself – it offers Camera Link, HD-SDI, LVDS, and CoaXPress frame grabbers. 'We are seeing history repeat itself with 10GigE, and while the technology will work for some areas, it is tricky to compete with a dedicated technology such as CoaXPress,' Pearce said.

In 2008, manufacturer Adimec approached Active Silicon to work on a new interface standard that would become CoaXPress, the high-speed video transmission standard designed to run over coaxial cables. Adimec, Active Silicon and the semiconductor company Eqcologic, later bought by Microchip, led the CoaXPress consortium. When Adimec proposed the idea, 'we said this looks interesting technology', Pearce recalled; 'we want to be at the forefront, we want to be doing the fastest boards, we'll be involved.'

CoaXPress won the Vision Award in 2009 and is now a significant portion of Active Silicon's business, according to Pearce. 'It [CoaXPress] has been slower to take off than we expected,' he said, 'although now there are quite a few OEMs taking decent volumes – probably about a 50:50 mix with Camera Link in terms of revenue at the high-end. Established companies are wary of change, so they have tended to stick with Camera Link because it's a simple, long-established technology, but it's running out of steam with the speeds that are available.'

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Pearce also pointed to markets in remote surveillance – for instance, surveillance on nuclear plants – where there are still a lot of analogue cameras installed. He sees an opportunity in moving some of these more specialist industrial surveillance applications to an HD platform.

Active Silicon will launch a product at the Vision trade fair in Stuttgart in November that transmits HD video over long cable lengths for remote surveillance applications. One of the target markets is pipe inspection, in sewer repair robots or oil and gas pipe inspection. 'They want to be driving small robots down pipes with long cables, and they've got a copper infrastructure using analogue low-resolution technology that they want to change to HD, so we see opportunities there,' he explained.

Along with the frame grabbers, a significant amount of Active Silicon's revenue is from embedded vision systems – almost half of the company's revenue comes from custom embedded PCs, which has been the case for many years. These industrial PCs are built into medical machines, for instance. The embedded PCs are designed to last a long time, and are not subject to the rapid changes found in the consumer PC market.

Pearce views the more recent trend of system-on-chips and using small, powerful compute boards to engineer distributed vision systems as important for the company, but one that is yet to yield significant revenue streams. The company is working on running one of its embedded automation products – currently based on a custom embedded PC – on an Arm platform, and it's refining the method of cross-compiling the algorithms to run on Linux. 'Video over IP is a massive market and we're looking at ways we can expand some of our products into that market with the embedded technology,' Pearce said.

'In the future there will be the compute platform – which will be a system-on-chip – and then there will be a sensor,' he continued. 'This could affect the frame grabber business, because who needs a PC and a frame grabber when we can use a system-on-chip?' He said there's a threat to the frame grabber business and to embedded PCs, as well as camera manufacturers generally, but there are also opportunities. 'We're familiar with how to work with this emerging small, form-factor embedded technology – it's using Xilinx and Arm parts, and we can cross-compile our SDKs to run on Arm. We also support the Nvidia Jetson GPU-based processor; we do quite a lot of work with GPUs.'

Pearce noted that the embedded compute boards can also run neural networks, which is what the company will be able to do with its yet-to-be-released embedded Zynq-based product. 'We can apply some of the deep learning kits to that because there's plenty of FPGA resource.' After 30 years in business, FPGA technology remains key for Active Silicon.