Detecting an opportunity

Modular systems enable customised radar solutions. By **Simon Fogg**.

The interplay between hardware and software is vital to the success of systems in the defence sector. However, traditional relationships between system integrators and suppliers invariably don't provide much flexibility in customising solutions. Cambridge Pixel aims to give freedom back to its customers by adopting a more open and modular approach.

Cambridge Pixel has been developing solutions for radar and sensor processing since 2007 and supplies its software based SPx radar scan conversion solutions to customers such as BAE Systems Mission Systems, which is deploying them on the Royal Navy's Type 45 Destroyers and the Queen Elizabeth Class aircraft carriers. Although 70% of the company's business is military, its technology also has uses in security and air traffic control applications.

David Johnson, managing director, recalled the company's origins laid in recognising changes in multicore processing and graphics technology. "There was an emergence of high processing hardware platforms, which meant we could use software to provide solutions that had previously required special hardware," he said. "That key technology shift enabled us to start the business and do what we do."

From this starting point, the company has offered an unusually flexible approach to defence technology by separating the software from the hardware. For example, a regular supplier might have specific technology that a customer requires, but it might also have mandated that the customer buys certain hardware or a particular processor. "People were concerned about getting locked into a particular supplier," observed Johnson.

Cambridge Pixel describes itself as 'hardware agnostic' – customers can choose which hardware platform they want or how much software to purchase. "We're giving them the control over how they build their system," said Johnson.

The company claims it can provide anywhere between 10% and 90% of the solution, depending upon their customers' in house capabilities. Johnson argued this flexibility puts the customer back in control of configuring the system, which is ultimately more cost effective.

However, this may not be the only reason why Cambridge Pixel is succeeding in the defence

sector, where there are much larger competitors. Johnson said the company's support system is vital; in such a specialist area of technology, it's not practical for larger companies to keep these radar and video processing skills in their own business. "They need to outsource the capability; buy in the expertise that they need," he said. "But they need to do that in a way which makes them feel comfortable."

Cambridge Pixel's customers are typically system integrators, who take the company's software and components and blend them with hardware and subsystems from other manufacturers to create a complete command and control system. One example is BAE supplying to the Royal Navy, another is Frontier supplying to the US Navy. "Although this is a key product for them, it's a small part of their overall system," said Johnson.

When working with these companies, Cambridge Pixel seeks to offer a fluid engineer-to-engineer relationship, plus the support required for a sector that is adapting constantly to changing circumstances. "These military programmes evolve and requirements change, and companies need to feel like they've got a trusted relationship," Johnson added. If operational needs change, the companies know it's possible to make the necessary amendments.

Johnson pointed to Cambridge Pixel's recently announced technology transfer agreement with Samsung Thales (STC) in South Korea. In order to aid the development of its own solutions, STC

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Moving to PCI-Express basis

Responding to the growing popularity of PCI-Express as a primary interconnect, Cambridge Pixel has developed the HPx-200e, a primary radar acquisition card that supports multiple analogue and digital inputs.

The HPx-200e can capture one 12bit video input or two 8bit channels. The board uses an fpga for preprocessing of the radar video before transferring the data over PCI Express to driver software running under Windows or Linux. The onboard fpga also offers the ability for data processing functions to be expanded for customised applications.

wanted to fully understand the products, not just buy and install them. "We supply product, but we're also supplying training, we're supplying knowledge and we're giving them an extra degree of understanding of how our products work so they can customise and adapt them," said Johnson. "They can apply a first level of support in country before they have to come back to us and ask for changes."

The partnership with STC reflects Cambridge Pixel's approach to giving system integrators more control over the solution they're buying. If the customer needs something altered, it's important that they have the ability to configure and adapt the product without being totally reliant on the supplier for support. "We've given them a different model of working," said Johnson.

Johnson described how Cambridge Pixel aims to provide an incremental path to product improvements, rather than the more traditional model where customers may need to start again with their systems every five years. "It's an approach to providing a solution where flexibility is inherent in the product," he noted. "You've built something in there that allows it to evolve over time." Instead of customers throwing away everything they've invested in and buying a whole new set of hardware, there's a clear step by step path to enhancing a solution.

An example of this inherent flexibility could be designing a product to support multicore processors. "If I've got four processor cores this year and I've got eight cores next year, then my software can adapt to gain the performance benefits that the evolutions in the hardware will give it," said Johnson. Tying the performance improvements in software to the development of the hardware will allow benefits to occur naturally.
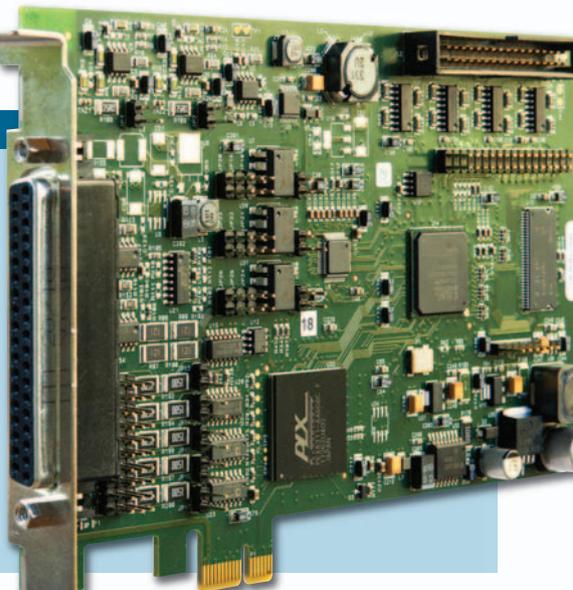
The final element in Cambridge Pixel's approach returns to how the company began – by exploiting developments in computing technology. An example is using graphics processors as parallel processors to offload data processing. "We can use the graphics processor as a coprocessor to get massive computing power," said Johnson. "So we can run algorithms in a combination of the cpu and gpu and again get high performance using hardware that's probably on everyone's desk in the office."

The company's software platforms seek to match this, with some code developed to run on the gpu, and other code developed to run on the cpu, creating a heterogeneous hardware platform. "You've got hardware technology evolving and computer languages that are developing to exploit that hardware," said Johnson. "And we're exploiting that technology."

Regarding the future, the company has recently expanded its products to address camera video processing as the gpu can also be used as a processor for camera video signals. "When you combine the processing of the radar and the processing of the video, you've got the potential to extract more information from the scene you're looking at," said Johnson. "It's all about exploiting what we can do with low cost, commodity hardware, but doing so in a way that preserves the flexibility and gives modules of expertise."

Somewhere between all these different dynamics is a simple approach. Johnson believes it comes down to recognising that customers are at the centre of what the company does. "We started Cambridge Pixel with customers right at the forefront of our focus and we've kept that focus," he concluded. "That's key to business success."