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Q&A with Rodger Hosking, Pentek

By Anne Fisher, Managing Editor

Why radar system designers now have the resources at hand to usher in a new level of coverage for military, government, border protection, and homeland security applications.

*Editor's Note: Earlier this year Pentek **introduced** an eight-channel A/D & D/A converter, 3U OpenVPX board based on the Xilinx Zynq UltraScale+ RFSoC FPGA (Figure 1). Pentek Vice-President and Co-Founder Rodger Hosking tells us more here about the significance of the new board—the first in the company's Quartz Architecture family.*

Rodger Hosking, Pentek

EECatalog: **Please describe the kinds of radar applications that are now possible with the advent of the Model 5950.**

Rodger Hosking, Pentek: While the Model 5950 RFSoC board is powerful enough to handle virtually all types of radars, it offers significant advantages for systems with these critical requirements:

- Low latency
- Small size and weight
- High channel density
- Low cost per channel
- Low power

Any one of these drivers could open up new types of radars for deployed environments where older technology made them impractical or impossible. For example, the low latency feature alone could support

much more effective EW countermeasure systems, so fighter jets can do better in avoiding detection and evading enemy fire.

Figure 1: The Model 5950, an eight-channel A/D & D/A converter, 3U OpenVPX board based on the Xilinx Zynq UltraScale+ RFSoC FPGA.

In combination, the cumulative effects of the above RFSoC advantages will revolutionize radar system design by integrating the antenna elements, RF circuitry, data acquisition, waveform generation, and digital signal processing into self-contained, distributed sub-systems. Because these can be deployed on smaller platforms like UAVs, and are affordable enough for widespread, remote installations, they offer a radically new level of coverage for military, government, border protection, and homeland security.

EECatalog: **What underlying issues had to be addressed before the Quartz architecture could achieve latency at a low enough level to allow it to support certain applications?**

Hosking, Pentek: Pentek's Quartz architecture is a technology enabler, making RFSoC devices easier to integrate into custom systems. Several man-years of electrical, mechanical, software, and FPGA design efforts yielded the necessary infrastructure to connect power, control, cooling, and shielding, while maintaining maximum performance levels of the

RFSoC. The Quartz architecture preserves operation of the RFSoC so that its inherent low latency can be thoroughly exploited within a constrained system environment.

EECatalog: **What factors put Pentek in a position to be able to offer a board that capitalizes on RFSoC?**

Hosking, Pentek: With more than 30 years' experience in developing and delivering embedded system products that feature tightly integrated data conversion and DSP devices, Pentek is uniquely positioned to understand and anticipate the needs of systems integrators seeking to incorporate RFSoC technology within their offerings. Our QuartzXM system-on-module architecture eliminates a huge amount of electrical and mechanical design otherwise required to support the RFSoC chip. This includes critical circuit board and packaging design rules for RF signal paths, clocking and synchronization, power supplies, filtering, and thermal management strategies.

Pentek's Navigator Board Support Package includes libraries and drivers for both the Arm processor and the host system processor running under Linux and Windows. Pentek's Navigator FPGA Design Kit provides IP source code for standard factory-installed functions and application examples including data acquisition, digital RF memory, data streaming, and waveform generation.

U.S. Air National Guard photo by Airman 1st Class Tiffany A. Emery

EECatalog: **What's the short-term outlook for the Quartz architecture family and what's the long-term outlook? How will Pentek keep the Quartz architecture family relevant going forward?**

Hosking, Pentek: Our current Quartz product line consists of the Model 5950 3U VPX RFSoC board for OpenVPX and the smaller QuartzXM module for custom form factor systems. Our proven track record of supporting customers for success will help ensure design wins and follow-on production for some large program opportunities.

These first products will be followed by other open standard form factor products and new products based on future RFSoC offerings from Xilinx. The software and IP code developed for our first products should easily migrate to these later offerings.

Our RFSoC Quartz architecture has enjoyed an exceptional level of initial customer interest, giving strong evidence that this new technology resonates with customers' needs and will play a major role in the embedded market for the foreseeable future.

EECatalog: **Both standard 3U OpenVPX and custom boards work with the Model 5950—is that in anticipation of the 3U OpenVPX/custom balance staying at whatever ratio it is at, or will OpenVPX overtake custom?**

Hosking, Pentek: OpenVPX will continue to dominate open-architecture board and backplane systems for deployed military and government applications. As evidenced by healthy market adoption and numerous vendors, OpenVPX will continue to evolve to support new technology and interfaces as required.

When OpenVPX cannot meet the SWaP-C constraints of certain applications, custom form factor systems step up to meet the challenges. Our QuartzXM RFSoM is designed expressly to support these designs by easing the development efforts and preserving maximum performance.

The balance between OpenVPX and custom designs will be driven by customer requirements and may change over time in either direction as new technology, new threats, and new strategies emerge.

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