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Executive Interview: Rodger Hosking, Cofounder and VP, Pentek

What's Pentek's origin story? What problems did you set out to solve?

Pentek's four founding members were all engineers for Wavetek Rockland Scientific, the New Jersey division of a test and measurement (T&M) company based in San Diego. We designed and manufactured frequency synthesizers, spectrum analyzers and programmable signal filters.

After Asian competition began hurting U.S.-based T&M manufacturers, in September of 1986, Wavetek scaled back by closing the New Jersey facility and moving production to San Diego. We decided to form a company that would migrate the technology we had developed for benchtop test instruments onto board-level products for embedded systems.

Our first products were frequency synthesizer modules and boards and custom frequency synthesizers for military systems. Identifying some opportunities in the intelligence community, we created Multibus I boards containing the first Texas Instruments DSP chips and analog-to-digital converters (ADC). This tight combination of data acquisition and digital

signal processing continued into Multibus II and then the first VMEbus board with a DSP chip and data converters.

Are those the same problems you are solving today, 30⁺ years later? How has the problem set changed?

We are still making industry-leading board-level products based on DSP technology and data converters for software radio and radar systems. Our digital signal processing operations have evolved from dedicated DSP chips, through Power PCs and then numerous generations of Xilinx FPGAs with DSP engines on board. FPGAs not only perform the essential DSP functions for software radio, they also provide flexible interfaces to the data converters, backplane interfaces, memories, specialized timing signals and gigabit serial links.

Through the years, the essential problems are fundamentally the same in principle, including maintaining real-time operation, preserving maximum signal fidelity and dynamic range, synchronizing acquisition and generation across multiple channels and boards, moving data at extremely high rates between system elements, all while managing temperature and environmental constraints.

However, the solutions to these problems have changed dramatically to accommodate faster components, higher density packaging and system interfaces. Our latest products feature data converters operating at up to 6.4 GSPS, a far cry from our first ADCs running at 50 kSPS! That's over five orders of magnitude — and that means continually rethinking virtually every design aspect each time technology advances.

What types of products does Pentek offer and what applications do they support?

We offer open architecture board-level products for architectures including XMC, FMC, VPX, PCIe, cPCI, uTCA, AMC and VME. These FPGA and data converter products are widely used in systems for radar, communications, electronic warfare and countermeasures, data acquisition, waveform generation, SIGINT, COMINT, and wireless telecom. We also incorporate these boards in a line of real-time analog and digital signal recorders, which are complete, ready-to-use instruments with recording and playback rates up to 8 GB/sec.

Tell us about the mix of Pentek's business.

Over 90 percent of our products go to government and defense end users, since we sell primarily to large, prime defense contractors. They integrate

our products with those of other vendors, add the application software and operator interfaces to create functional systems suitable for deployment.

About 30 percent of our sales are export.

Your tag line is "setting the standard for digital signal processing." How do you do that?

We strongly believe in partnering with our customers to make them successful by offering consultative advice to help select the most appropriate products and system architecture that meet their requirements.

Our hardware products are delivered as complete products, fully equipped with operational functions typically required in real-time embedded systems. This provides a good starting infrastructure so they can add customization through software and FPGA development.

We build in critical features like multi-channel synchronization, triggering, time-stamping, direct memory access engines, as well as PCIe and GigE system interface engines. Our development tools support high level design entry, including an API for software and a graphical representation of FPGA designs. Full source code is provided along with numerous operational examples.

Lastly, we offer free lifetime applications support for all of our products. Together, we feel that these rather unique and vital support points justify our tag line!

How do you create value for your customers?

By designing the latest technology devices into open architecture boards, fully tested, characterized and supported with software and FPGA development tools, our customers can save man-years of development and greatly reduce risks in delivering that new technology to their customers on time.

As a COTS vendor, Pentek offers catalog products with competitive market-based prices and deliveries and a wide range of options to suit specific needs. This is considered a very attractive alternative to in-house custom development and manufacturing by a majority of our customers.

What transitions in the market are providing growth opportunities?

Steadily increasing complexity and density of critical components like FPGAs and data converters make it more attractive for customers to

purchase higher-level system components with most of the difficult hardware and software engineering problems solved in a functional subsystem or module. Our boards nicely meet these needs, especially when supported with our high level development tools.

Many new software radios and radars are migrating to phased-array antennas that require separate channels for each element. Here, higher channel density solutions with reduced size, weight, power and cost per channel open up new opportunities that were previously impractical.

A good example is our new QuartzXM RFSoC module with eight wideband channels of analog-to-digital and digital-to-analog conversion, advanced FPGA fabric, multi-core ARM processor and dual 100 GigE interfaces. Based on the Xilinx Zynq UltraScale+ device, the QuartzXM module is about the size of a deck of playing cards, ideal for custom, small form factor applications.

How does RF fit in Pentek's strategy and your product roadmap?

Pentek offers some RF products, but since each application tends to be unique, customers usually want to use their own antennas and connect to our products with specialized RF-to-IF circuitry. We've made this easier by providing very wideband IF analog ADCs and DACs capable of accepting signal bandwidths of several GHz.

The Holy Grail for software-defined systems is an antenna followed by an ADC, then FPGAs and software. Semiconductor processes and digital ICs have made tremendous strides toward this vision. Where do you see the number of bits and samples per second going? Is there an end in sight?

Fortunately, the roadmap for data converters with higher resolution and sampling rates seems unbounded.

One big challenge is simply getting all of the data connected to a suitable source or destination at those very high rates. The use of JESD204 gigabit interfaces mitigates this somewhat — but with a huge tradeoff in complexity and latency.

New semiconductor technology will emerge to improve data converter elements, like sample-and-holds, comparators and error correction circuitry. Time-multiplexing of multiple data converters operating in concert will continue to boost both rates and resolution, while more sophisticated calibration techniques will help remove gain, offset and linearity errors among the segments.

Tell us about your background and what led you to cofound Pentek.

I have always been fascinated with electricity and electronics, and I've built hundreds of gadgets as a hobbyist back when you could actually hold the parts in your hand and solder the leads together.

In college, I became very interested in digital signal processing and was very fortunate to work in my first job for a brilliant scientist from Bell Labs. In a small company in 1971, we built the first commercial digital speech synthesizers, digital filters and direct digital frequency synthesizers. This was a perfect combination of building electronic hardware and putting DSP to work. After growth and several corporate transitions of the same initial company, I had the pleasure of gradually meeting and working with the other cofounders of Pentek.

To paraphrase Steve Jobs, after 30[+] years, what keeps you motivated to return to the office each day?

As an engineer at heart, I always love to solve problems. Working with customers to understand their needs, coming up with a solution and then explaining how that solution will meet their requirements is very rewarding. I enjoy sharing my ideas and new technology through articles and presentations.

And, lastly, it's a pleasure to work with the great team we have at Pentek, within the culture we have collectively created over these many decades.

https://www.microwavejournal.com/artides/32469-executive-interview-rodger-hosking-co-founder-and-vp-pentek