VITA TECHNOLOGIES

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1, 2, 3, ... Slots are In

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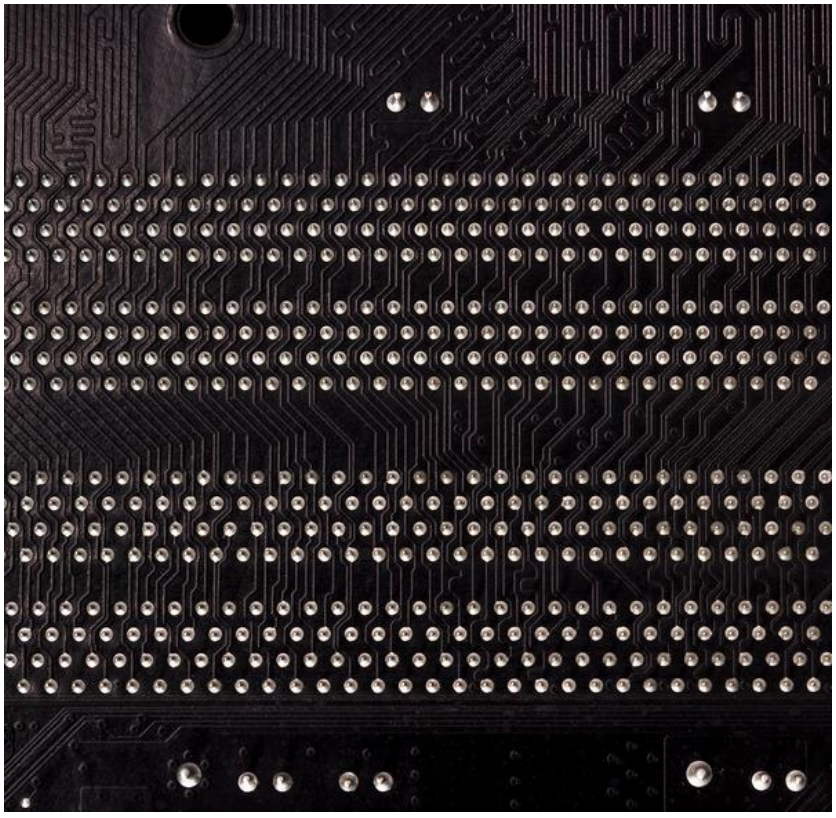

When one envisions a VPX system, the image that often comes to mind is a multislot high performance computing system full of processing and I/O boards. But there is a completely different class of VPX "systems" that range from one to three slots in size, primarily

in a 3U form factor. What do these "systems" look like and what is driving their existence?

Two applications seem to be leading the charge. Development systems with one to three slots provide engineers a quick way to get started with the development process. These are usually commercial grade, air-cooled chassis designed for use in development labs environments.

The second type are small, portable or mobile systems, usually conduction or passively cooled and designed for rugged operating environments.

Trends in slot count are emerging

One-slot: These tend to be dedicated to a very specific purpose, i.e. development system. The single slot is dependent on a backplane primarily for power and connection to external I/O.

Two-slot: Also dedicated to very specific functions, with a fair amount of application essential functionality built into the chassis. The second slot provides a degree of expandability to add or change functionality as needed.

Three-slot: The choices for three-slot VPX systems increase dramatically with many products available from virtually all VPX system suppliers. This is a sweet spot because it is still a very small size but has the capability to support a system with a dedicated processing board and a couple of slots for application specific I/O or additional processing. A three-slot system lends itself well to a simple full mesh backplane configuration for maximum bandwidth between modules. Many of the suppliers of three-slot systems offer customizable I/O so that the system can be effectively adapted to specific application needs.

To further understand what these systems look like, let's look at a few examples.

Development Systems

Many companies offer small development systems for VPX. In fact, these were the first of the products announced using VPX technology. They come with 1-3 VPX slots in a generic configuration so that board and software engineers can quickly begin the prototyping stage. The chassis is small with a power supply and cooling for a small number of VPX boards.

One of the more extreme examples is a recently announced development system, the Model 8257, from Pentek that has only one 3U VPX slot (See Figure 1). It is intended to be a quick start development platform designed for a specific 3U VPX board with a mezzanine. The backplane simply provides power to the board and provides an interface to a rear transition module for I/O access. Developers can connect a notebook or desktop PC and develop, run, and debug their application right out of the box. The advantage to this strategy is that Pentek can use an off-the-shelf chassis and with a few minor tweaks, load it with a carrier card for whatever mezzanine is preferred so that a developer can be up and running in no time. The modularity of the architecture makes it easy to incorporate other options as new products are developed. In this case, both Pentek and their customers win with a proven, cost-effective solution that can be quickly modified.

Figure 1: Model 8257 3U VPX. Photo courtesy of Pentek.

Deployable Systems

Here is where it starts to get interesting. 3U VPX lends itself well to small, mobile systems in rugged operating environments. To achieve the size, weight, and power (SWaP) goals of these applications, conduction or passive cooling strategies are often used, eliminating the need for fans.

SR Technologies implements an interesting low slot count product strategy for their products with capabilities that include waveform, protocol stack, and user interface (UI) development primarily for Signal Intelligence (SigInt)/Electronic Warfare (EW) markets. Historically these capabilities have been delivered, as individual federated tactical ‘black boxes’

incorporating general purpose processors (GPPs), RF front ends, and custom designed software-defined radios (SDRs). As open architecture standards such as VPX have emerged, customer requirements required redesigning and deploying these capabilities as 3U conduction cooled VPX modules.

As customer needs changed, SR Technologies needed to find a way to take these second-generation capabilities and deploy them back into the tactical market without large redesign efforts. For the tactical market, SWaP is at a premium and there were no easy solutions to this without designing an ecosystem of chassis to support it. For SR Technologies, the concept of a small tactical VPX chassis, incorporating just the essential elements of a standard sensor module, quickly came into focus.

Each chassis has basic building blocks within it, that are deemed essential to any operation and worthwhile of being embedded into the chassis, for example, power supply, Global Position System (GPS), and chassis management. Each module slot gets its allocation of power along with GPS on either a serial link and/or Ethernet.

Once the initial roll out of SR Technologies' developed capabilities was deployed, it was very quickly seen that any third-party capability could be inserted into the chassis with minimal cost and time. This is obviously the whole intent of the open modular standard and it played out as per this intent. From an integration viewpoint, the integration exercise became a 10-minute phone call with the third-party module developer followed up by one to two days of integration testing. Very few problems have been encountered and on a number of occasions it's been plug and play.

One of SR Technologies VPX modules is called the LANShark so it was not a stretch to call the family of chassis Sharkcages! (See Figure 2).

Currently there are single slot and dual slot Sharkcages with up to four slots to follow.

Figure 2: Sharkcage, Photo courtesy of SR Technologies.

With all of these variations, the fundamental philosophy of the cage has remained intact:

- Embed the PSU, chassis management card and GPS.
- Keep everything passively cooled
- Use common off the shelf connectors and stock all the long lead items for quick delivery.

These small systems point out how important a “system-level” strategy is to a successful VPX product line. One quickly notices that key functionality, very generic to a series of applications, can be built into the chassis. This functionality can be used over a broad range of products making it possible to swap out core VPX modules to quickly redefine a platforms mission without going through long and expensive development and integration processes.

One problem that is becoming apparent is the need for system level standards to ensure the interchangeability of system modules. A lot of

focus is going into ensuring that board-level modules comply to standards, but more work needs to be done at the next level up. Many applications consider the box level to be a replaceable unit and standards are going to be needed to make this possible.

Expect to see many more of these small 3U systems.

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