

VPX: The state of the ecosystem

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High-speed processing requires generous bandwidth from the board level to the I/O. VPX, with a backplane connector system supporting 6.25 Gb/s in a switched fabric architecture, is the latest generation of embedded computer systems. VPX systems are designed for flexible application of demanding high-speed protocols, such as 10G Ethernet, in harsh environments such as flight, ground defense, and other military applications. A ruggedized approach to embedded computing, VPX is most widely used in processor-intensive defense applications, particularly for C4ISR.

VPX benefits from the global backing of both the computing and aerospace/defense industries that has driven the standardization forward relatively efficiently. VPS's reliance on commercial off-the-shelf products fosters a wide international supplier base.

As the ecosystem matures, two initiatives are underway to allow VPX to evolve into a wider range of applications:

1. Connectivity modules for standardized power, optics, and RF
2. Small-form-factor systems for the smallest of applications

New Connectivity Modules

Even with the initial enthusiasm for VPX, the architecture did not realize its full potential. VITA 46, the founding VPX architecture specification, focuses on digital signals. To remedy the need for designers to create ad hoc approaches to other connectivity needs, related specifications define complementary power, fiber optic, and RF solutions within the VITA 46/VITA 65 framework. OpenVPX (VITA 65) defines profiles for various configurations at the chassis, backplane, slot, and module levels. The goal is to create compatibility between products from different vendors and to promote two-level maintenance that allows line replaceable modules (LRMs) to be swapped out in the field.

High-Density Power

The MULTI-BEAM XLE power connector, proposed as the interconnect for the VITA 62 power supply standard, is derived from a commercial design offering high current densities, hot pluggability, tolerant mating misalignment, and lower mating

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forces.

Optics and RF for VPX

VITA 66 and 67 define modules for optical and RF applications (Figure 1), adapting proven technology to new applications. By allowing LRUs and LRMs to be disconnected at the backplane, separate RF and optical modules speed assembly, maintenance, and upgrades.

VITA 66 for optics supports MT array connectors, ARINC 801 termini, or expanded beam (EB) contacts using a common module footprint. Each style has aerospace pedigree and offers different benefits in terms of density, ruggedness, reparability, and performance.

MT ferrules provide the highest-density interconnection with up to 48 fibers in a 3U system and 240 in a 6U system. ARINC 801 termini, using industry-standard 1.25 mm ceramic ferrules, offer optimal multimode and single-mode performance. The EB insert tolerates less than pristine conditions and is the best at handling shock, vibration, or repeated mating/unmating.

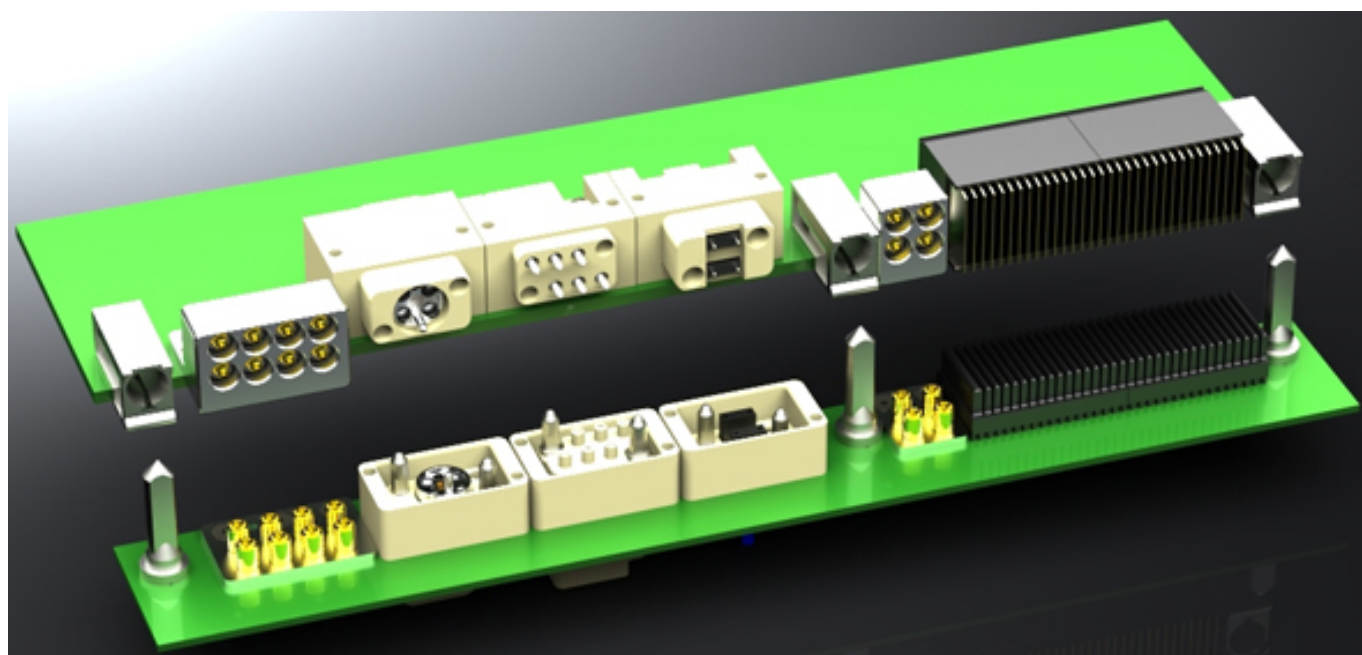


Figure 1. VITA 66 optical and VITA 67 RF modules (Source: TE Connectivity)

Small-Form-Factor (SFF) Systems

The constant drive in electronics to make smaller, faster, and cheaper systems is well known. Small-form-factor VPX systems allow use in UAVs, ground robots, and similar applications constrained by size, weight, and power (SWaP) requirements. The aim is systems small enough and rugged enough for mobile field deployment.

3U VPX systems form the first generation of SFF. Even as interest in 3U architectures is growing, designers are looking toward even smaller VPX solutions.

Efforts toward standardizing SFF systems are still in early stages, with three committees actively working on standards: VITA 73, 74, and 75. All three efforts

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share certain goals: smaller, lighter, cheaper systems that still meet ruggedness requirements. Heat management is important since small, closed systems can generate considerable heat.

One goal is to produce “cubes” that meet two-level maintenance requirements mandating that combat platforms can be repaired within 30 minutes. For SFF cubes, it means swapping the cube for a new one. While offering the advantages of reduced SWaP and LRU field repairability, SFF systems also mean reduced functionality since they emulate VPX to accommodate the small form factor. Whether each finds a niche in the market or one succeeds while the others fall by the wayside, time will tell. VPX 3U and 6U systems will remain the mainstream choice in demanding processor-intensive applications.

What’s Next for VPX?

With the advent of the new VPX connector modules and SFF standards, the stage is now set for VPX to proliferate into all kinds of rugged embedded computing applications, from large, static radar installations to miniature UAV systems. As defense organizations rely more heavily on networkingsystems subsystems, fiber will take a larger role by allowing high-speed box-to-box cabling over longer runs, with inherent EMI immunity, and at higher speeds.

As with other architectures, such as CompactPCI and ATCA, VPX will migrate to other industries requiring high-performance ruggedized solutions. Rail and commercial transportation, medical and imaging, security, and high-reliability processing are among the diverse industries where VPX will thrive.

Author’s Bio

Gregory Powers, Market Development Manager, Aerospace, Defense & Marine, TE Connectivity, has more than 25 years’ experience in development engineering and field application engineering and holds two patents relative to optic datacom devices. His areas of expertise include: electronic systems and space, rugged embedded computer packaging, high data rate board level and input/output solutions, fiber optics, spaceflight connectivity. For more information on VPX systems and products, visit www.te.com/industry/aerospace/products/ [1]

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