# For COTS, small is the next big thing

*By Mike Southworth*
*An industry perspective from Curtiss-Wright Defense Solutions*

Later this year, Marvel will release "Ant-Man," its latest film blockbuster, proving that superheroes can come in extremely small packages. Meanwhile, the aerospace and defense embedded commercial off-the-shelf (COTS) market are well ahead of the curve. We've already started to see whole new classes of small and ultra-small line-replaceable unit (LRU) offerings that are dramatically redefining the performance, power dissipation envelope, and cost savings that can be achieved with "shoebox" and even "pocket-sized" processors and Gigabit Ethernet switch and router LRUs.

Recently, market demand has intersected with previously unattainable higher levels of integration, enabling these new classes of technology miniaturization. First installed in smaller unmanned aircraft system (UAS) platforms, these new small and ultra-small LRUs are opening up entirely new market opportunities. These LRUs are equally adept at reducing size, weight, power, and cost (SWaP-C) on helicopters and ground vehicles as well. Users can rapidly migrate toward faster and faster sensor interfaces on their manned and unmanned airborne and ground vehicles, for example, from cameras collecting high-resolution data or from radars and other onboard sensors. In cases where 10/100 Ethernet used to suffice, platforms now require Gigabit Ethernet (GbE). At the same time, designers and users are seeking ways to eliminate space and weight in already burdened platforms, leading to efforts like the US Army's VICTORY standard, which aims to reduce hardware redundancy and foster interoperability.

In response, COTS vendors have begun to leverage technology advances to address these two market drivers. One recent approach is the use of multipurpose shoebox-sized stackable LRUs that combine Core i7 processing with Cisco IOS network routing software that runs as an application on Linux or on a VMware Hypervisor. This approach adds the capabilities of a secure Cisco router or virtual machine application without adding any additional weight to the processor system. With this setup, two or more standalone functions can be deployed in a single chassis, slashing required equipment space by 50 percent and cutting weight by four to five pounds.

An even more dramatic development is the emergence of a new class of function-specific ultra-small form factor (USFF) standalone LRU solutions, such as pocket-sized network routers, switches, and computers. These small subsystems take advantage of low-power processors, like ARM and Atom, developed for battery-powered or very power-sensitive applications, such as mobile phones and tablets. The smaller hardware on these diminutive boxes also tells a big story: The latest generation of silicon, from switches to CPUs, is shrinking the size of the die and reducing power consumption. In one great example, new Ethernet switch architectures feature low-power Gigabit Ethernet PHYs capable of turning off unused ports, putting them in a low-power or idle state. They are also intelligent enough to sense the length of the cable connection, limiting power for transmitting data, to say, 10 meters, rather than defaulting to the 100-meter Ethernet specification.

What's more, rather than using traditional connectors like DTL-38999s, USFF boxes often use new "micro-miniature 38999-like" connectors which deliver all of the performance benefits of their larger 38999 cousins but in smaller, lighter, and more dense configurations. On many platforms, just finding available space to add new hardware can be a real challenge. These small, low-power USFF boxes enable system integrators to easily install the solution they require without adding significant SWaP burdens. They are limited, either in processor performance or port count, compared to larger solutions, but for many applications they hit the sweet spot in ways that designers could previously only hope for. These tiny USFF solutions also open up whole new system upgrade architecture possibilities. For example, size-optimized USFF data bridge devices can be used to translate legacy data bus protocols from a platform's traditional data buses (i.e., CAN, RS422, MIL-STD-1553) and convert them to Ethernet for the improved situational awareness offered by an IP network. This approach provides a low-cost alternative to large and expensive one-size-fits-all data concentrator/conversion solutions, for which you'll likely end up paying for much more functionality than you'd ever use or need.

USFFs are also being deployed right now. In a recent example, a tactical UAS used for reconnaissance, surveillance, and targeting required upgrades for Ethernet switching capabilities for onboard communications and sensor payload equipment. The relatively small physical size of these platforms and the noisy electromagnetic interference (EMI) generated by their communications equipment presented a challenge to the manufacturer, who was seeking a COTS networking solution. Their USFF solution was Curtiss-Wright's "pocket-sized" miniature Parvus DuraNET 20-11 and 20-12 Ethernet switches. These LRUs are 10 percent of the size of a traditional small form factor GbE switch and only 25 percent of the weight of the next lightest Ethernet switch available in the company portfolio. Using microminiature MIL-circular connectors, this type of LRU can feature eight ports of GbE or, when fitted with a miniature rectangular Quadrax connector for enhanced signal integrity, it supports six ports of shielded 10/100 Ethernet.

**Mike Southworth**
**Product Marketing Manager**
**Curtiss-Wright Defense Solutions**
**Curtiss-Wright Defense Solutions • www.cwcdefense.com**