A system integrator for military, security force, and governmental-agency aircraft required a flight-worthy rugged small form-factor mission processor as part of a common mission system architecture being proposed for civil and military platform upgrades. This processor would interface with and be integral to a mission system package that includes various intelligence, surveillance, and reconnaissance (ISR) sensors, including an EO/IR FLIR camera turret, AESA maritime radar, Flash sonar, and radio data link. The mission computer would need to support multiple high definition HD-SDI camera inputs with capabilities to compress and encode video to H.264 standards and stream video across an Internet Protocol (IP) network as well as optionally store locally on high capacity disks, as well as support real-time frame grabbing of uncompressed video over HD-SDI. Since size, weight, and power (SWaP) are at a premium onboard aircraft and the platform system integrator desired the same mission package for multiple civil and military programs, the mission processor Line Replaceable Unit (LRU) would also need to integrate a managed Gigabit Ethernet switch and serial communications controllers for control/monitoring of interfaced sensor and communications devices.
Solution

The rugged, compact and modular design of the Parvus® DuraCOR® 8041 mission computer system made it an ideal solution for this customer’s aircraft mission system upgrade initiative. To expedite the customer’s initial validation of the product’s functionality, Curtiss-Wright assembled an open frame development kit based on the DuraCOR 8041’s quad-core 4th gen Core i7-based (“Haswell”) processor interfaced to relevant I/O, video, and network modules. This gave the customer the ability to simulate their mission system in the lab and perform software compatibility and performance benchmark testing. Following a successful evaluation, a modified COTS (MCOTS) variant of this modular processor subsystem was successfully and affordably integrated using rugged off-the-shelf Mini-PCIe and PCIe104 modules to meet any specialized interface requirements not already delivered by the standard Intel® chipset. Taking advantage of Curtiss-Wright’s cost competitive and quick-turn application engineering services, the customer received a system fitted with two H.264 video encoder/network streamer cards (capable of taking in HD-SDI video and distributed it over Ethernet), an HD-SDI video frame grabber (for monitoring video feed), digital I/O and serial cards (for control of EO/IR sensors, radar, sonar), as well as an 8-port Gigabit Ethernet switch card (the Parvus SWI-22-10) to connect the video encoders and CPU together and provide five additional Gigabit Ethernet ports for other on-board LRUs interfacing with the mission processor. Thanks to the modularity of the DuraCOR system architecture, the required I/O was integrated using Mini-PCIe slots on the processor carrier board together with two PC/104 I/O expansion segments that attached to the base chassis. A 2-slot removable 2.5” disk add-on segment, capable of hosting multiple 1 TB 2.5” capacity disks, was also integrated along with special MIL-DTL-38999 coaxial connector inserts for HD-SDI video for optimal signal integrity of the high definition video inputs.

Results

The aircraft system integrator now has a common mission processor system ready for integration into both civil and military mission system architectures. The MCOTS variant of the DuraCOR 8041 included all required I/O and network interfaces in a single LRU device that minimized SWaP as well as recurring and non-recurring costs. Thanks to the modularity of the subsystem architecture, the LRU integrates stands ready to support various ISR/situational awareness upgrade programs that require a multi-core rugged mission processor capable of supporting HD networked video compression, encoding, and streaming, as well as local storage and real-time video capture.

Modified COTS Mission Computer Architecture