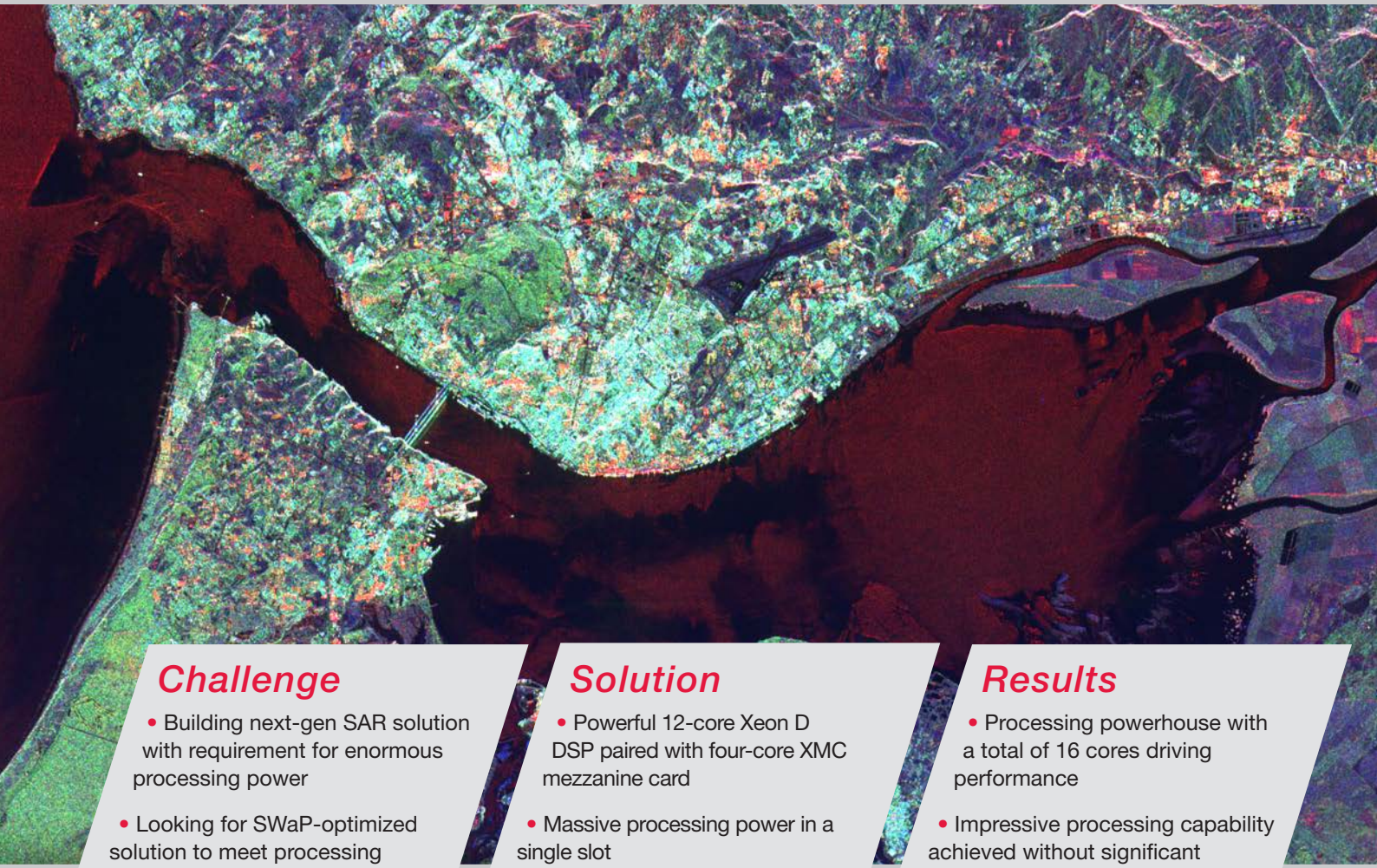
CASE STUDY

Maximizing Processing Power in SAR Applications

CURTISS-WRIGHT

DEFENSE SOLUTIONS



Challenge

- Building next-gen SAR solution with requirement for enormous processing power
- Looking for SWaP-optimized solution to meet processing requirements in a single slot
- Seeking solution with minimal complexity and development time

Solution

- Powerful 12-core Xeon D DSP paired with four-core XMC mezzanine card
- Massive processing power in a single slot
- Commercial off-the-shelf (COTS) technology for quick deployment

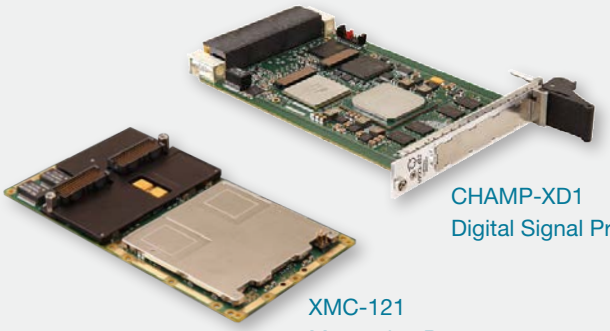
Results

- Processing powerhouse with a total of 16 cores driving performance
- Impressive processing capability achieved without significant development time
- Single-slot solution to optimize SWaP

Challenge

An engineering firm seeking to build the next generation synthetic aperture radar (SAR) faced challenges in delivering an enormous amount of processing power in a compact, lightweight solution. Typically mounted on aircraft, SAR devices create high-resolution 2D or 3D images using data collected via antennae. SAR devices require the latest embedded computing technology in order to process observations in real time and deliver detailed image maps.

As with all airborne electronics, size, weight and power (SWaP) optimization is critical in deployed SAR applications. Aiming to balance high performance with SWaP constraints, this customer turned to Curtiss-Wright to develop a single-slot processing powerhouse. The customer also wanted a rugged 16-core Xeon® D solution, but the Intel® 16-core Xeon® D does not support the full industrial temperature range as the 12-core device does.



CHAMP-XD1
Digital Signal Processor

XMC-121
Mezzanine Processor

Solution

In order to deliver maximum processing power within the single slot available, Curtiss-Wright's CHAMP™-XD1 Digital Signal Processor (DSP) was paired with the small but mighty XMC-121 mezzanine processor.

The Curtiss-Wright CHAMP-XD1 was designed for use in compute-intensive applications, such as SAR, multi-mode radar, Signal Intelligence (SIGINT), Electro-Optical/Infrared (EO/IR) and Electronic Warfare (EW). It features an Intel Xeon D D-1559 processor, offering an impressive 12 cores and floating-point performance to deliver a peak mathematical throughput of 576 GFLOPS. The CHAMP-XD1's 3U OpenVPX™ form factor adds the substantial bandwidth and interoperability of the VITA 65 standard.

Building on the CHAMP-XD1's SWaP-optimized design, the XMC-121 mezzanine card adds Intel's Xeon 7th Generation "Kaby Lake" processor to deliver an additional four cores of processing power without any additional footprint outside the CHAMP-XD1's single slot. Combined, the CHAMP-XD1 and XMC-121 deliver 16 cores of processing power with low power consumption and space requirements.

The solution supports a PCI Express® (PCIe) Fabric Communications Library from Dolphin Interconnect Solutions® to ensure high-speed, low-latency communication between the customer's CHAMP-XD1 DSP and XMC-121 mezzanine using their native PCIe connections. This software library hides the complexities and technical details of programming directly to PCIe devices, and presents an easy to use software API to applications developers wishing to send high-speed messages and bulk data between computing nodes.

Results

Together, the CHAMP-XD1 and XMC-121 create a rugged, enormously powerful processing solution that can deliver optimal performance in the harshest environments. With its minimal power consumption and small footprint, this solution enables Curtiss-Wright's customer to meet the demanding computing requirements of its SAR application while optimizing SWaP.

The Dolphin Fabric Communications Library makes it simple for the two cards to work as one unified computing solution, leveraging their native eight-lane PCIe Gen3 interfaces to reach connectivity speeds of up to 64 Gbps. By removing the complexity for the applications developer, the Dolphin software enables these speeds that would be otherwise impossible to achieve without significant development time. For Curtiss-Wright's customer, the CHAMP-XD1 and XMC-121's support of this Dolphin software significantly reduced development time. As well, the Commercial Off-the-Shelf (COTS) CHAMP-XD1 and XMC-121 provided the required functionality for the customer's application without any custom modification or additional development work.

In order to support the customer's solution throughout the lifecycle of its program, Curtiss-Wright offers Total LifeCycle Management services designed to mitigate any challenges associated with leveraging COTS technology for long-term, mission-critical systems. With direct access to a dedicated team of Lifecycle Specialists, real-time health analysis reports and a variety of product longevity solutions, Curtiss-Wright customers can proactively manage DMS challenges, increase program stability and mitigate financial risk.

Image Credit: NASA/Jet Propulsion Laboratory

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