

# Re-Mapping of a Reconfigurable Generic Search DSP (RGSD) and a Generic Air Track Processor (GATP) to Multicore Technology with Linux SMP

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## Abstract

This briefing describes the effort to implement a new Open Architecture Multi-Core signal processing subsystem for the Generic Air Track Processor (GATP). The work explores the re-targeting of the Application Layer from a COTS Single-Core multicomputer platform to a Linux based Multi-Core architecture. The end goal of this effort was to achieve a low cost technology refresh of the Reconfigurable Generic Search DSP (RGSD) and a Generic Air Track Processor (GATP). Lockheed Martin MS2 and CSP, Inc. cooperated to support this effort to demonstrate rapid technology insertion and code re-use for the program.

## Objectives

The objectives of this effort were to utilize high-performance Multi-Core embedded computing with Linux to replace legacy processor equipment and the previous generation of COTS Single-Core VxWorks processors in future radar programs. Linux SMP and MPI provided the ability to easily migrate from a Single-Core architecture to a Multi-Core architecture, without the need for major redesigns. The MPI and VSIPL standards are central to this effort. The project validated the on-going benefits of Open Architecture Multi-Core Processing by reducing development efforts and providing reusable and scalable signal processing software applicable to a wide variety of radar applications.

## Methodology

Processing requirements were analyzed based on benchmarks from legacy Single-Core PowerPC hardware and new Multi-Core Linux SMP hardware.

Performance, size, and cost with the new Multi-Core architecture were compared with the embedded Single-Core architecture. Lockheed Martin and CSPI analyzed porting a mainstream defense radar signal processing application to the Multi-Core DSP through the use of industry standard Application Programmer Interfaces (APIs) and Portability Standards, such as MPI and VSIPL.

In the future, Lockheed Martin will plan to demonstrate tactical system operation using a radar simulator and scenario testing equipment. The ability to provide a realistic stimulus to the RGSD and GATP will aid in the test and evaluation of the DSP.

## Conclusion

The RGSD and GATP refresh study demonstrates that a Multi-Core based embedded DSP solution, employing Linux and MPI, is a cost-effective alternative for deployment and refresh of previous generation of COTS equipment. The new Linux-based Multi-Core architecture addresses production cost, Diminished Manufacturing Supply (DMS) issues, and facilitates the enhancement and modification of system operations without the need for a major redesign.

With the use of a Multi-Core DSP network, Lockheed Martin has established a new baseline configuration for the RGSD and the GATP, and leveraged the technical and economic benefits of Open Architecture hardware and software.