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Technology: Astraeus Multi-Core Testbed

Partners on the Path to Performance

The promise of orders of magnitude increase in processing speed accompanied by reduced power demands of multi-core processors comes bundled with significant development and applications challenges. Most of today's software applications and operating systems are not designed to run concurrently on parallel processors, and writing concurrent software for specific multi-core architectures is both very complex and costly. Naïve software implementations on these platforms lead to below-par performance and increased unpredictability — neither of which is acceptable in military-grade real-time systems.

To help understand this new world of multi-core processors, Lockheed Martin Advanced Technology Laboratories has developed the Astraeus multi-core testbed. Accessible from anywhere on the LMI, Astraeus hosts a variety of computing platforms that incorporate multi-core, many-core and vector-type (e.g., GPU) processor technologies. The testbed also includes prebuilt operating systems and advanced tools for simulation, benchmarking and measurement. Together these features allow a rapid start-up

for users wishing to explore behavior and performance characteristics of state-of-the-art COTS multi-core platforms.

As part of the service, Astraeus allows users to rapidly configure a platform, operating system — variations of Linux and Microsoft Windows — and compiler tool chain. The testbed provides access to a broad range of processors, including Intel Xeon, AMD Opteron, IBM PPC, IBM Cell, NVIDIA GPU, Tlera TILE64, and Clearspeed CSX700.

Astraeus manages the shared resources by coordinating users, projects and access to target platforms through an easy-to-use web-based portal. It provides both a shared infrastructure and a center of expertise to bring together detailed information about multi-core processor behaviors. The Astraeus team is actively performing experiments to quantify and measure key performance and predictability behaviors such as memory-denial of service and non-linear scaling of performance due to serialization.

Astraeus is currently supporting two Lockheed Martin programs. A pilot activity in support of the Aegis Modernization program is

examining issues of scalability of the weapons control system on future configurations of Intel Xeon multi-core processors. In a separate effort, the test bed is being used to examine performance issues associated with porting F-35 flight

planning software to a multi-core PowerPC platform.

For more information about using the Astraeus facility, please contact Daniel Waddington (daniel.waddington@lmco.com).



Two programs are currently underway on the Astraeus Testbed (left) in support of the both the Aegis cruiser and JSF-35 weapons systems.

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