

Implementation of a Shipboard Ballistic Missile Defense Processing Application Using the High Performance Embedded Computing Software Initiative (HPEC-SI) API

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Abstract:

Advanced shipboard radar systems will be required to detect, track and classify ballistic missile targets and re-entry vehicles, as well as perform traditional Anti-Air Warfare (AAW) operations. New Open Architecture Systems, including COTS hardware as well as open system software, are required to implement the necessary algorithms for successful missile defense. Lockheed Martin MS2 has been developing such open architecture systems for the next generation Aegis Combat Systems, which will include the embedded equipment and computer programs that are necessary for an effective missile defense. Lockheed Martin has made extensive use of Open Architecture (OA) software and industry standard Application Programming Interfaces (APIs) in order to provide the Navy and Missile Defense Agency with efficient, open architecture software that exhibits unprecedented Portability across computing platforms, vendor design environments, processor architectures and technology upgrades.

As we move forward with development of a deployable shipboard missile defense system, it has become obvious that a state-of-the-art, C++ based object oriented design environment and signal processing API Library would be extremely beneficial in the development of open architecture application software, with the advantageous portability features provided by the original C-based VSIPL API. For this reason, Lockheed Martin has been an active participant in development of a next generation C++ signal and image processing API through the High Performance Embedded Computing Software Initiative (HPEC-SI).

This briefing describes an effort to implement advanced Shipboard Ballistic Missile Defense (SBMD) application algorithms utilizing HPEC-SI. Shipboard application code, previously written in the C programming language for conventional COTS PowerPC-based embedded architectures, is being converted by Lockheed Martin MS2, as an HPEC-SI Demonstration, to run under the HPEC-SI API. The C code, designed to run in a C environment, will be converted to the HPEC-SI API standard to run under a true C++ Object Oriented environment, and will eventually take advantage of the HPEC-SI parallel processing features.

Of particular interest in this conversion is a comparison of key DoD processing algorithms executed on a conventional, embedded processing architecture using C and C application libraries, as compared with execution in an embedded HPEC-SI processing environment. The goals of this effort were to:

- Demonstrate a critical embedded DoD BMD signal processing application using the HPEC-SI API under development on the HPEC-SI initiative

- Compare the engineering development metrics, contrasting the conventional C API software development environment with the C++ HPEC-SI Object Oriented software development environment, and
- Compare relative code size and development cost with the C API

In this briefing, we describe the porting of several of the signal processing algorithms that have been developed using C-based VSIPL, and port them to the HPEC-SI VSIPL++ API under development. As part of this process, the HPEC-SI community will receive valuable feedback regarding the HPEC-SI API implementation, including the development process, development metrics, development environment issues and key library functions. Eventually, the open architecture HPEC-SI VSIPL++ code developed for the Navy and MDA will be ported to a tactical system for deployment on Aegis cruisers and destroyers.