Applying Open Standards to FPGA IP Interfaces

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The use of field programmable gate array (FPGA) computing is increasing within the defense community. There is a complementary explosion of private investment into start-up companies offering software tools intended to make FPGA computing easy. So far these tools see more investigations than actual deployment. Thus, the FPGA computing that is finding its way into the field was probably programmed by a hardware engineer using a Register Transfer Level (RTL) language.

Those hardware engineers are finding themselves in new territory. Their designs are exchanging data structures with complex software systems. The system architect is likely asking the hardware lead about reconfiguring the FPGA compute nodes at run-time, possibly moving algorithms between hardware and software implementations. The software lead is asking about code reuse.

Software systems use interface standards to meet these requirements. Such standards date back to the invention of the linker found today in all software tool chains. Software eventually migrated toward component programming which combines the interface standards with metadata that provides more interface details.

Major users of FPGA computation, like the FPGA vendors themselves, have created various interface and component standards, usually invented from scratch on a department basis. Mercury Computer Systems found itself in a similar place with various light-weight, departmental standards created within the base company and within some of the companies Mercury acquired.

The proposed presentation describes a project Mercury launched in an attempt to leverage formal standards created within the ASIC industry as the basis for FPGA interface and component standards. The project was used internally, as well as evangelized externally to customers and competitors. The process is not yet completed, but the company is now successfully exchanging IP blocks with a board vendor and with a few prime contractors. Engineers are engaged in making the work a formal extension to the standards with which we started.

This HPEC presentation will describe the standards Mercury selected, the extensions and profiles needed to create this new domain, and the performance implications of using standard interfaces with detailed benchmarking. The performance benchmarking is just getting started now so we cannot preview the results in this abstract. However, it will be complete by HPEC.