

DEVELOPMENT ENVIRONMENTS:

Meeting increasing competitive challenges

By Rich Hoefle, Freescale Semiconductor

Silicon ICs, software, development tools, and board designs work interdependently to reduce time to market and increase competitiveness. Any of these that work independently from the others will be less effective.

Several key enablers affect how engineers develop products today. The first is change. The pace at which technology changes is ever growing, and the dynamics of this change across regional boundaries profoundly influences competitiveness. The second is time to market, which, with the ability to integrate the efforts of regionally dispersed teams, has become a crucial factor in determining who will win global competitive wars. A third component involves the sophistication level of the customer chain. All levels of the customer chain increasingly demand customized solutions to fit unique needs, at a mass market price.

Semiconductor dynamics

Semiconductor technology has been affected by these enablers, resulting in an expanding range of core architectures at higher levels of integration, with more sophisticated peripheral sets, and at lower price performance points. As a result, designers face an increasingly complex set of choices, such as chip architecture, development tool environments, and software libraries, any of which can make the difference between success and failure in creating a winning product. From the invention of the original 4-bit microprocessor, transistor densities have driven the creation of several migration paths. One path involves a higher level of integration involving memory and peripherals, resulting in reduced system complexity and cost. The other path involves higher performance cores, typically still surrounded by subsystem components. Due to its complex programming nature and density-intensive Harvard architecture, engineers often relegated DSP technology for use only in those applications that demanded high math processing, which could afford the higher system cost and the availability of engineers comfortable with programming this architecture.

To provide resiliency against change while reducing time to market and meeting the user's need for custom solutions, four components must work together efficiently to meet these needs for DSP users:

Smaller semiconductor process geometry sets

The migration of semiconductor technology from the .25 μ and four/five-layer metal processes into .18 μ with six layers has made the Harvard architecture traditionally associated with DSP architectures a more cost effective solution. Extra transistor availability has enabled designers to create address register sets and instructions similar to those found in a traditional MCU, but with the added performance of a DSP and at a comparable price, hybrids such as the 56800/E family became friendlier for MCU-centric designers to program. Higher transistor budgets have also contributed to more sophisticated peripheral sets, simplifying the programming process. High-performance DSPs, such as the MSC8100 StarCore-based DSP family, can now build concurrent processing modules found on RISC architectures.

Development tool environment

Semiconductor technology alone does not speed time to market. Advanced tool sets with higher-level programming languages and added features have further reduced time to market. Metrowerks' CodeWarrior offers integrated tool suites with plug-in capability, enabling designers to use tool-specific functionality, such as multi-event profiling and non-intrusive software analysis. To further simplify the designer's task, tools such as Processor Expert™ allow quick initialization of the processor without writing the C code and understanding peripherals, markedly decreasing the learning curve. Organizations with multiple development teams contributing code to a large software project have a growing need to simulate potential algorithms then translate them into optimized code to implement on a target via common API sets. Often, these tools include required target boards, which enable the opportunity to exercise the code and assess real-time performance before investing resources in specific hardware target designs.

Production-quality software libraries

Software remains a high cost in overall system development. The traditional code production metric of seven lines of maintainable code per day, plus two lines, has driven vendors to provide software libraries and applications containing optimized production-worthy code from which a designer can quickly start the project. Standards committees have simpli-

fied this development step for such application spaces as telecom, networking, and automotive. Semiconductor manufacturers, including Freescale, have created API definitions from which any written software supports interoperability, resulting in maximum reuse. Freescale provides more than 130 separate, optimized-code library elements for the 56800/E product families, across a wide variety of library functions and application spaces, to enable the designer to immediately start building a custom application atop a standard template.

Board environment

To further meet the demand for more customized solutions, manufacturers can focus board offerings as reference designs for a specific end application, such as a modem, allowing the customer to simplify certification procedures by modeling the exact layout on the reference design. There are traditional instrumentation products that allow processing of raw data before uploading to the computer or development environments, allowing a designer to rapidly prototype a system concept before investing time and money in a unique target. For example, Freescale has enabled its 56800/E designers by providing a modular board system with controller cards and a variety of daughter cards, focusing on unique applications ranging from telephony to motor control. A developer can interconnect the appropriate boards, use the software develop-

ment environment to link the necessary libraries and applications together, and run the base application in a short amount of time, allowing the designer to focus efforts on the unique added value of the application.

New options meet development challenges

As competition increases, the ability to provide customers with the necessary building blocks of silicon, software, development tools, and board designs is critical to reducing time to market and increasing competitiveness. Suppliers are rising to the challenge, providing an ever-increasing assortment of options and tools.

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