

The future of flexible HW platform architectures

Panel discussion

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Flexible hardware platform architectures have emerged as a competitor and alternative to specialized SOC designs. Important applications are mobile systems or multimedia devices. Design cost and design time reduction are the main benefits of such platforms while cost and power efficiency are the main concerns. Today, hardware platforms own a small but growing share of the embedded systems market in wireless and multimedia terminals, and telecommunication and automotive devices.

With the increasing importance of embedded software and the demand for system function updates over a product's lifetime, supported by a ubiquitous Internet access, programmable HW platforms might become dominant players. The success very much depends on the efficiency and flexibility of the programmable platform when compared to dedicated hardware solutions.

Key factors to efficiency are the design process, the programming environment, and the architecture. Application specific programmable processors are often hard to program, requiring assembly coding or specific highly tuned compilers. In the DSP world, VLIW platforms such as the Philips TriMedia or the TI TMS320i60 are more efficient to program, are more flexible, but also more expensive than ASIPs or even dedicated hardware solutions. Weakly programmable coprocessors are an efficient complement to VLIW processors, especially where application standards can be exploited. Heterogeneous architectures with multiple programmable components raise the issues of memory architecture, application task partitioning and mapping, and global control and data flow rather than the classical single component programming.

Design process and architecture influence each other. VLIW processor optimization typically uses the quantitative benchmark based approach known from general purpose processor design while coprocessor designers favor an analysis of the application to decide on the architecture. The future will bring more choices with IP libraries containing numerous programmable components and dedicated application-specific blocks, such that using an existing hardware platform and designing a new platform may

become closer alternatives depending on the volume and the application. Reconfigurable hardware architectures might blur the differences and make the choice harder. And, last but certainly not least, the required tools, tool flows and design methodologies are crucial factors with many open problems to be solved.

Complementing the rise of both programmable and dedicated HW IP blocks is a desire to see more application-oriented software virtual components, which can be easily retargeted, to new programmable HW. Just as hardware designers have envied the ease with which high-level language-based software can be recompiled to a new target, the software world is lagging the hardware world in the creation of good mechanisms to find, evaluate and bring to market 'SW IP'. The idea of a Virtual Socket Interface for SW, based on industry standards rather than proprietary operating systems, may need to emerge in order to allow the use of highly software-programmable platforms to flourish.

Finally, operating systems and APIs will have to be integrated into coherent and convenient application programming environments to enable later updates and function migration between platforms. Who will provide and configure these environments? Will there be universal or application specific standards? Will they be proprietary and controlled by one or two large companies, or based on standards with many competitors in the market?

In conclusion, there is no doubt that we will see more programmable architectures in the future. The success of hardware platforms depends on numerous factors ranging from a skillful selection of the range of applications to be covered to the design infrastructure to the programming environment.

In this panel several industrial and academic experts will share their views and opinions about what the future holds, interesting research directions, and promising developments in industry.