

## **Generating the Next Wave of Custom Silicon**

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**Abstract:** Tidal waves in computing and communications have traditionally fueled the growth of the semiconductor industry. The upcoming generation of computing does not have one clear product to drive the industry; rather a diversity of emerging applications are based on the interaction between edge devices and the cloud. Supporting differentiation amongst diverse products requires specialization of integrated circuits, which in turn requires a paradigm shift in the design of custom silicon. This paper outlines a vision to dramatically lower design costs and increase design reuse by focusing on developing digital and analog generators rather than specific instances of functional modules. The use of the open and extensible RISC-V instruction-set architecture enables customization with reduced software cost. Open-source chip generators amortize the design and verification costs across many instances. Emulation of multi-processor systems running realistic workloads on public clouds validates design decisions at a dramatically reduced cost. The methodology is illustrated by the design of a complex system-on-a-chip, accompanied with a brief tour of open-source generators.

### **Biography:**



**Dr. Borivoje Nikolić** received the Dipl.Ing. and M.Sc. degrees in electrical engineering from the University of Belgrade, Serbia, in 1992 and 1994, respectively, and the Ph.D. degree from the University of California at Davis in 1999. In 1999, he joined the Department of Electrical Engineering and Computer Sciences, University of California at Berkeley, where he is now a Professor. His research activities include digital and analog integrated circuit design and VLSI implementation of communications and signal processing algorithms. He is co-author of the book *Digital Integrated Circuits: A Design Perspective*, 2nd ed, Prentice-Hall, 2003. For work with his students and colleagues he has received the best paper awards at the IEEE International Solid-State Circuits Conference, Symposium on VLSI Circuits, IEEE International SOI Conference, European Solid-State Device Research Conference, and the ACM/IEEE International Symposium of Low-Power Electronics.