

Software and System Synthesis for Venture-Backed Success

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Biography

Dr. Juan-Antonio Carballo is the semiconductor and systems Partner at IBM's Venture Capital group and a co-founder of Argon Venture Partners, the first US-Canada early-stage VC firm. He advises and directs emerging companies that develop leading-edge semiconductor, EDA, and hardware systems in North America and China. As IBM's Partner he has established technical and business relationships with over 100 VCs and technology companies, and has created a number of first-time VC initiatives as IBM's VC lead for the Power architecture and blade computing. As a result he was named Number 1 in the "Top 40 Under 40" list by American Venture Magazine in 2006. Prior to this role, he was IBM's Research Division lead for adaptive communication chips and systems, where he received several IBM Research and Corporate awards for his work.

He also has prior stays with Digital Equipment, LSI Logic, Accenture, and EDF. He has 23 patent filings and over 50 articles in scientific, technical, and business publications. He is a Chair of the ITRS Design Technology Roadmap, Chair of the IEEE Design Automation Committee, ICCAD Publicity Chair, and the 2004-5 CTO of the VSIA Alliance. He has organized over a dozen conferences and symposiums, and is frequently mentioned in top technology and business publications. He holds a Ph.D. in Electrical Engineering from the University of Michigan, an MBA from the College des Ingenieurs (Paris) and an M.Sc. in Telecommunications Engineering from UPM (Madrid).

Extended Abstract

As hardware and semiconductors commoditize, special purpose software still remains a vibrant boon for venture capital investors. Critical bottlenecks still exist at the system and solution design level. As each bottleneck is addressed through custom Silicon advances (Memory, I/O, interconnect, multi-core processors), the remaining bottlenecks are first addressed through software acceleration, programmable logic-based acceleration, and on certain cases, subsequent custom chip design. Software synthesis, especially as it is applied to software-programmable fabrics, can play a critical role given the tight time to market constraints that venture-backed start-ups face.

The Open Source Conundrum. The open-source software stack with Linux (LAMP) as its cornerstone is increasingly the preferred choice for newly venture-funded companies. Open hardware is also starting to change the world of hardware venture investing. This trend is leaving integration and system and software level design as the key differentiators. The consequently lower barriers to entry are an opening for venture-backed innovative companies, yet at the same time exacerbate the time-to-market pressures.

It is no surprise then that venture investments open platform start-ups grew over 40% in the last five years, and can be 20% or more capital efficient. A look at the fundamental

return-on-investment model coupled with actual cost and margin data for existing companies quickly shows that open platform investment can be more profitable and lead more quickly to substantial profits. Yet it requires start-up companies to concentrate on differentiators that can be quickly and effectively implemented around such platforms.

SoCs death greatly exaggerated? The venture capital investment necessary to develop a custom system-on-chip has grown near the \$100 million mark over the last decade. Yet an analysis of investment data shows that start-ups have quickly reconfigured themselves into global, non-vertically-integrated entities whose overall NREs costs have been roughly kept under control in the last five years. Team globalization and supply chain disintegration have helped this trend, partially postponing the death of the SoC and turning it into a myth for now. Yet it remains clearly difficult to bet on a custom SoC project given the enormous upfront investment, thereby accentuating the need for a clear differentiator. Programmable logic solutions have sprung in importance as an alternative for all but the most performance-dependent designs.

Looking for the “Special Sauce”. Critical to most start-ups’ success is the determination of their differentiated technology and their ability to sustain and protect that differentiation until the business is in strong position to succeed. Given the coupled trends of hardware commoditization, open source growth, and extreme cost-intensive SoC innovation, it becomes increasingly hard to differentiate at the component level. As a result, an increasing number of venture-backed companies are focusing on system- or software-level innovation.

Yet many system and solution innovations continue to become ever more power- and performance sensitive. System-level bottlenecks continue to be brought down through capital-intensive component innovation, including fast mass storage memory, high-performance I/O technologies, and energy-efficient multi-core SoCs. Remaining bottlenecks can be solved through custom hardware design and special purpose software that bypasses conventional high-overhead software.

The role of synthesis and hardware programmability. Synthesis technologies and programmable logic are increasingly playing a critical role in implementing the software- and system-level “special sauce”. As critical bottlenecks are solved via custom software approaches. Software and programmable logic teams are growing in size and importance in venture-backed companies. An analysis of investment return data indicates that board-level and box-level investments can provide a sizable multiple return, either via merger and acquisition (M&A) exit or initial public offering (IPO) exit. As the trends described accelerate, fewer substantial SoC exits happen yet opportunities at the system and software level intensify. Further data analysis shows the opportunity and the investment in the Billions of dollars.

Productive software-style synthesis can provide tremendous help to implement special purpose algorithms for the increasingly important market associated with special-purpose systems and solutions that include accelerator software and programmable logic. Quickly and effectively developing custom algorithms onto programmable platforms will enable board, card, and appliance start-ups to live or die based on their speed to market and differentiated value.

Conclusion. Software-style synthesis on programmable fabrics and platforms will become increasingly critical to venture-capital funded companies in the context of increasing SoC NRE costs, hardware commoditization, and open source software growth.