Resolved: Specialized Architectures, Languages, and System Software Should Largely Supplant General-purpose Alternatives within the Next Decade

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Abstract

The field of computing has struggled since its inception with the tension between specialization and generalization. Specialized architectures, programming languages, and system software promise better performance (across many metrics, including efficiency, productivity, etc.) for workloads that match their specialization objective. General-purpose architectures, languages, and system software sacrifice extremes of performance for specific workloads, seeking acceptable performance across a much wider range. While specialized alternatives have always had their place, general-purpose architectures, languages, and system software have dominated main-stream computing systems for the past several decades. But with Dennard scaling already gone and the end of Moore's Law looming, some have argued that general-purpose computing platforms must naturally give way to specialization.

In this debate, two teams of highly-opinionated experts will debate the proposition that specialized architectures, languages, and system software should largely supplant general-purpose alternatives within the next decade. Arguments in favor of specialization include energy efficiency in the post-Dennard scaling era, performance scaling in the post-Moore's law era, and improvements in programmer productivity. Arguments against include the large investment needed to create specialized hardware and software components, lack of tools and interfaces to create reusable components, the semantic gap from overspecialization, and security vulnerabilities and general correctness issues due to interoperation of specialized components.