The State of State

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Abstract

We are all aware of the "memory wall" and the deleterious effects of bandwidth and latency limitations on performance. We also watch with some degree of amazement at the relentless march of Moore's Law as ever-larger numbers of transistors are used in increasingly clever architectural and microarchitectural techniques to attempt to reduce the effects of the wall. What have not risen to the same level of consciousness, however, are the effects that all of this has on the size of "program state" and our ability to manipulate it, and move it, to avoid the wall. Instead, the Law of Unintended Consequences has left us with heavier and heavier state, which in turn condemns them to continued existence in the bowels of bigger and bigger microprocessor chips, and farther and farther away from the data they seek in memory.

This talk is a plea to architects to reconsider what we have been doing to ourselves, and ask if there are alternatives that have been overlooked. The talk will begin by revisiting the notion of state, and plot its explosive growth over the last 30 years. The key points of expansion will be correlated with architectural and microarchitectural "advances." Then we will walk through some observations gained from exploring designing in some emerging technologies, and ask the question of what alternative execution models, particularly premised on light weight states, might do to increase performance and reduce complexity.