

## [SORS: Memory Bandwidth and System Balance in HPC Systems - 2024 update](#)

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### **Abstract**

This talk reviews the history of supercomputing systems with a focus on the "balance" between computation and memory access and on the interaction of technology, architecture, and market forces in driving the evolution of these systems. Since the "Attack of the Killer Micros" began over 30 years ago, the combination of Moore's Law and Dennard Scaling have led to astounding increases in the computational capabilities of microprocessors, while the technology behind memory subsystems has not enjoyed comparable performance improvements. The increasing imbalance between computation and memory access costs has led to stunningly complex processor implementations with increasing design and fabrication costs as well as increasingly opaque and confounding performance characteristics.

A review of new technologies (such as HBM) shows that the difficulties of delivering increased memory bandwidth are not alleviated unless the underlying computer architectures are changed in fundamental ways. The combination of technology trends and economic factors suggest that system balances will continue to shift in the same directions -- favoring workloads with increasingly high compute intensity and increasing available concurrency.



### Short Bio

John joined TACC in 2009 as a Research Scientist in the High Performance Computing Group after a twelve year career in performance analysis and system architecture in the computer industry. His industrial experience includes 3 years at SGI (performance analysis and optimization on the Origin2000 and performance lead on the architecture team for the Altix3000), 6 years at IBM (performance analysis for HPC, processor and system design for Power4/4+ and Power5/5+), and 3 years at AMD (accelerated computing technologies and performance analysis). Prior to his industrial career, John was an oceanographer (Ph.D., Florida State) with six years as an assistant professor at the University of Delaware, where he was engaged in research and teaching on numerical simulation of the large-scale circulation of the oceans.

## Speakers

**Speaker:** John D. McCalpin, Research Scientist, Texas Advanced Computing Center

**Host:** Petar Radojkovic. Established Researcher, Memory technologies, Computer Sciences Department, BSC.

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