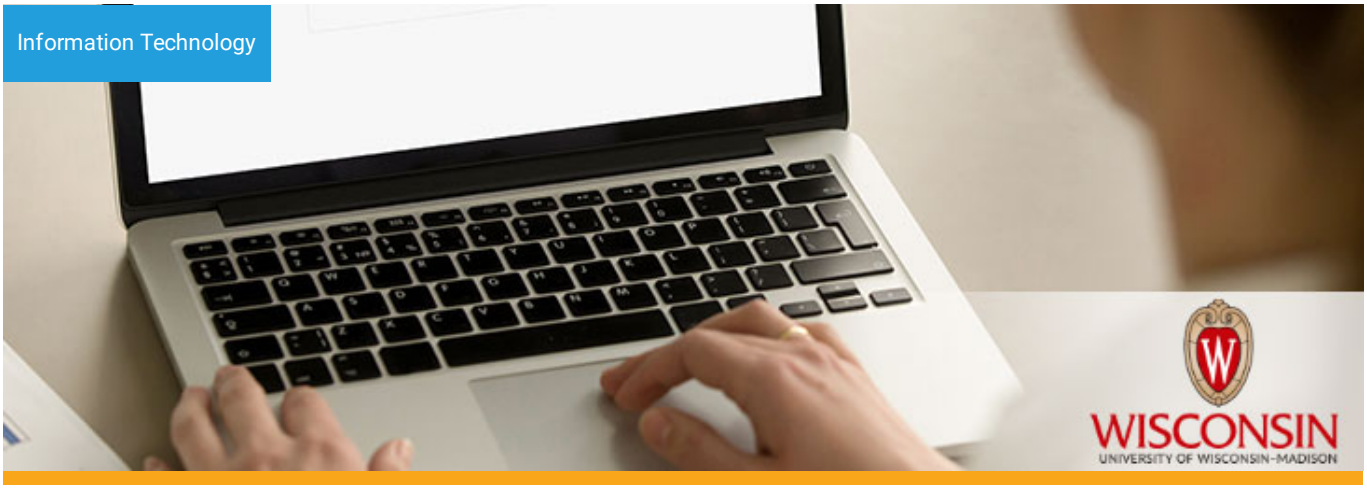
Information Technology



Over-Provisioned Multicore Processor Computing System

View U.S. Patent No. 7,962,774 in PDF format.

WARF: P07520US

Inventors: Gurindar Sohi, Koushik Chakraborty, Philip Wells

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an over-provisioned multicore processor system (OPMS).

Overview

Today, computer processors may have dual or multiple "cores," the processing parts of central processing unit (CPU) chips, to exploit increasing transistor density. Typically, cores are provisioned for simultaneous operation at all times, consuming a large fraction of the power budget, and leading to the problem of global power dissipation, where the heat emitted by the entire chip housing the cores cannot be fully dissipated using cost-effective cooling methods. In addition, an individual core may experience local high-temperature spots, leading to thermal emergencies impacting reliable operation on that core. As the technology develops, the ability to integrate more processing cores is far outpacing the ability to power them up and cool them simultaneously.

The Invention

UW-Madison researchers have developed an over-provisioned multicore processor system (OPMS) that integrates more processing cores than would normally be allowed by the power budget. The system does not increase the number of cores running at a given time, but rather keeps them in variable states of activity and quiescence, and flexibly assigns computation onto processing cores.

The invention spreads the computational load over the additional cores, and enables several techniques to improve system performance and energy efficiency. In particular, an OPMS can enable both static and dynamic heterogeneity, where different processing elements are assigned tasks to which they are best suited, thereby improving power-performance for a range of applications. The invention includes a controller for the cores that may be implemented in firmware, software and/or circuitry.

Applications

- Multicore computer processing systems

Key Benefits

- Used with techniques such as computation spreading, the flexibility in assigning computation in an OPMS improves the locality of memory references, while avoiding contention delays and software synchronization problems.
- Use of multiple cores with computation spreading reduces heat production and increases energy efficiency.
- Energy-delay product, a fundamental parameter for measuring energy efficiency, of typical workloads can be improved by 5 to 20 percent.
- Allows cores not actively performing an operation to reduce static power from leakage while retaining certain predictive state
- Technology can easily be implemented on existing mechanisms.

Additional Information

For More Information About the Inventors

- Gurindar Sohi

Tech Fields

- Information Technology : Hardware

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842