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# Guest editorial: special issue on multicore systems

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The exponential increase in the transistor count predicted by Moore's law led to the development of processing devices with billions of transistors. To exploit the performance improvements made available by current manufacturing technologies, chip vendors are integrating more cores running at reduced frequencies, allowing higher performance while keeping power and heating problems under control. This trend is common to both the high-end and embedded computing markets, introducing fundamental new challenges to software and operating systems developers.

Multicore technologies for embedded computing systems pose new challenges in real-time application design that arise because of temporal coupling between processing cores. This coupling arises because of the shared physical resources in the multicore architecture.

The real-time community is designing new task models to match the expressiveness of widely used parallel programming models. Efficient resource management protocols are designed to deal with the extensive sharing of hardware and software resources peculiar of multi-core systems. New scheduling approaches and schedulability tests are studied for applications running on multi-core systems. Tools and algorithms are developed in order to bound the multiple factors that affect the task response times, like memory and bus contention, task interference, synchronization, communication, scheduling and system overhead.

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The papers included in this special issue address some of these crucial problems related to multicore systems.

The first paper by Georgia Giannopoulou, Nikolay Stoimenov, Pengcheng Huang, Lothar Thiele and Benoit Dupont de Dinechin is devoted to the problem of scheduling and analysis for mixed-criticality applications that run on multi/many-core platforms. This work also presents a design exploration framework for optimizing the resource utilizations under mixed-criticality timing constraints.

The second paper in this special issue, by Muhammad Ali Awan, Patrick Meumeu Yomsi, Geoffrey Nelissen and Stefan M. Petters, studies the problem of task-to-core allocation onto heterogeneous multicore platforms such that the overall energy consumption of the system is minimized, adopting a realistic power model.

The third paper, by Paolo Valente, in this special issue on Multicore Systems, studies a new tardiness bound for implicit deadline tasks, scheduled by preemptive global EDF on a symmetric multiprocessor.

In summary, this special issue offers a small crosscut of current research trends in real-time multicore systems, with subjects ranging from scheduling theory, to task allocation with energy management and techniques to schedule and analyze mixed-criticality real-time systems.