

Managing Power Consumption in Networks on Chips

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In this work we present a new methodology for managing power consumption of NOCs, which we formulate using closed-loop control concepts, by introducing an estimator and a controller that implement the power management methodology. The estimator is capable of very fast and accurate tracking of changes in the system parameters. Our system model combines node and network centric power management decisions. Node centric power management assumes no a priori knowledge of requests coming in from outside the core, so it implements a traditional dynamic voltage scaling and power management control algorithm. Network-centric power management utilizes interaction with the other system cores regarding power and QoS needs. The overall system is then based on renewal theory. We introduce a fast optimization method that is far faster than previous methods, and can be implemented in either hardware or software. The new methodology for power management of NOCs is tested on a system consisting of four satellite units, each implementing an estimator and a controller capable of both node and network centric power management. Our results show large savings in power with good QoS.

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