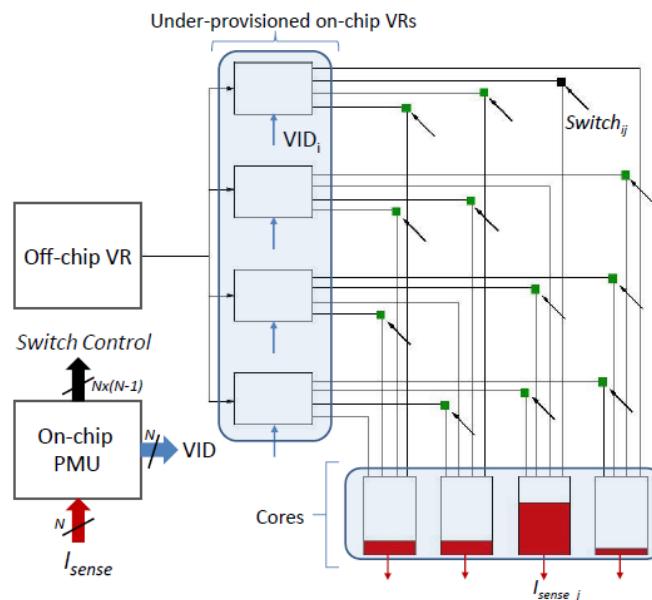# Multi-Core Processors with Improved Energy Consumption

This is a novel energy-efficient method for delivering power to multi-core and chip multi-processor systems. The method brings an increase of up to 44% in energy efficiency using under-provisioned voltage-regulators with a robust power management technique for on-chip power delivery. Energy efficiency is a critical design parameter for multi-core / multi-processor systems.

The power delivery network includes a set of voltage regulators supplying power to the multiple cores via an array of programmable switches. The network allows for a single core-processor to be supplied with power from two or more voltage regulators when the single voltage regulator power is insufficient (e.g. during "peak power"). Smaller under-provisioned voltage regulators with less maximum power consumed by the core-processors are effectively deployed. The network is reconfigurable at run-time, via the programable switches, to meet varying current demands of cores exceeding a maximum output current rating of the voltage regulators. A power delivery network real-time workload scheduling algorithm assigns tasks to the cores to limit total load current consumption below total current capability of the under-provisioned on-chip voltage regulators. The reconfiguration of the power delivery network is minimized due to energy efficient scheduling of tasks on the cores.