

Compiler Assisted Energy Reduction Techniques for Embedded Processors

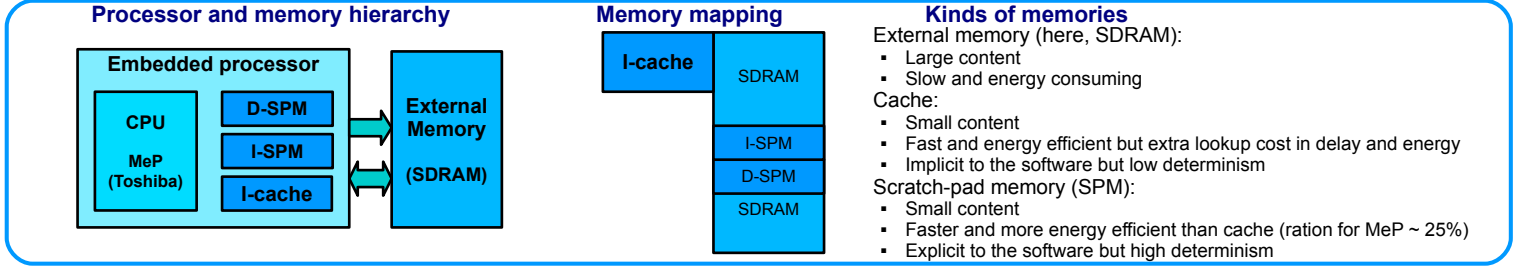
Lovic Gauthier and Tohru Ishihara
Kyushu University / System LSI Research Center



Context

Memory accesses: major source of energy consumption in embedded systems

Target system and memory

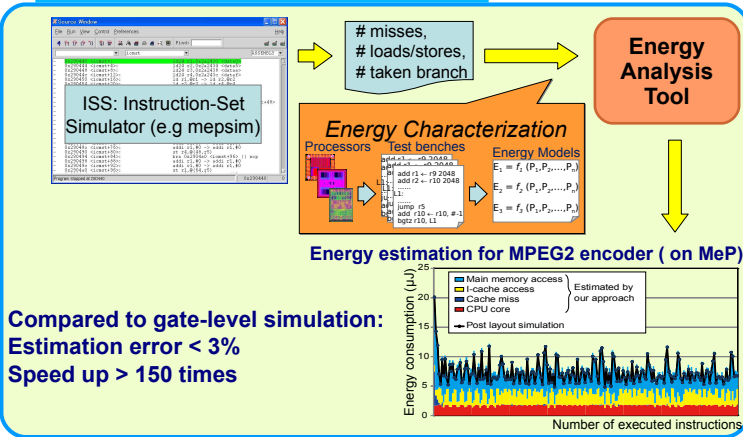


Contribution

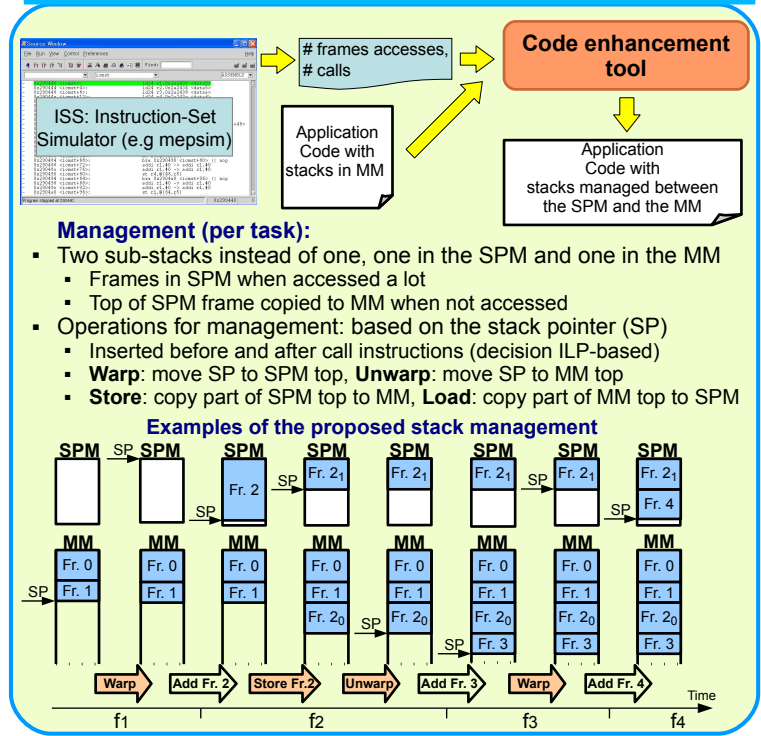
A set of tools for optimizing the usage of the SPM in order to reduce the energy consumption:

1. Tool for fast energy characterization of the processor running an application
2. Tool for modifying the application code to manage the tasks' stacks between the SPM and the external memory (MM)
3. Tool and additional OS context switch procedure for sharing the SPM among the tasks of a multi-task system

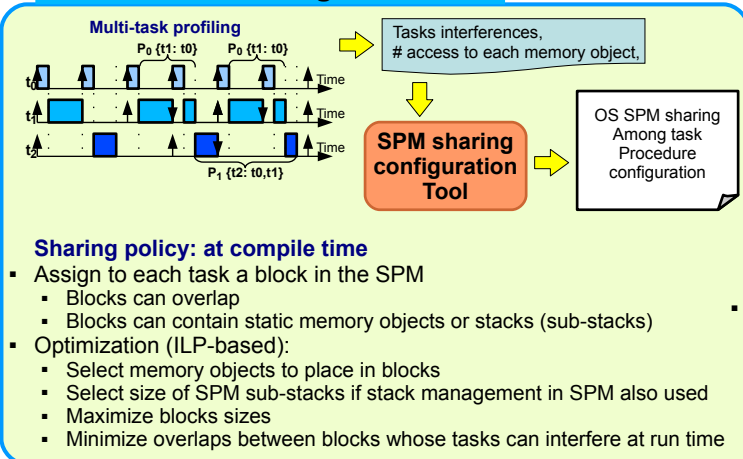
1. Energy characterization tool



2. Management of the stack between SPM and MM



3. Multi-task sharing of the SPM

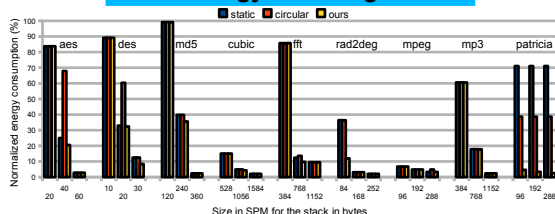


Results

69% of energy consumption reduction for data accesses with 1Kb D-SPM

63% of energy consumption reduction for code accesses with 8Kb I-SPM (compared to I-cache)

Stack energy with single tasks



Set A	aes, des, md5, cubic, fft, rad2deg, mpeg, mp3, patricia
Set B	aes, des, md5, cubic, fft, rad2deg, patricia
Set C	aes, des, md5, cubic, fft
Set D	cubic, fft, rad2deg

Static and stack data energy with multi-task

