TDTS07 Lab Report 3

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1 Simulation-based design space exploration for energy minimization

Data$	Instruction$	Freq.	Energy	Time
4096 4-way	8192 direct	1/(5ns)	45uJ	1.6ms
4096 4-way	512 4-way	1/(5ns)	32uJ	1.7ms
4096 4-way	512 4-way	1/(5ns*10)	20uJ	16ms
512 4-way	512 2-way	1/(5ns*5)	18.7uJ	8.3ms
512 4-way	512 2-way	1/(5ns*2)	19.7uJ	3.6ms
1024 4-way	512 2-way	1/(5ns*12)	18.5uJ	18.8ms
1024 2-way	512 2-way	1/(5ns*12)	18.4uJ	18.8ms

Table 1: Configuration

A selection of the tested configuration can be seen in table 1. The first line in the table is the default configuration and the last one the best one achieved. Several other configuration were also tried, but did not improve the result so the changes were reverted. The first thing tried was to reduce the cache sizes and try different associativity. This improved the energy efficiency considerably as long as the cache misses did not increase to much. Then because there was much time left frequency scaling was introduced. Using any sort of scaling improved the result, scaling further only made slight improvements. The most important thing to improve was the caches.

2 Communication in MPSoCs

The result of this assignment is divided in two parts

2.1 Comparison of scratchpad and shared memory

Statistics	Scratchpad	Shared
Execution time	10ms	14ms
Concurrent execution time	6.6ms	10ms
Bus busy %	56.25%	44.89%
Bus accesses P0	73244	141450
Bus accesses P1	119954	103202
Bus accesses P2	120568	139390

Table 2: Comparison

The relevant statistics are presented in table 2. It can be seen that with the default configuration, the scratchpad have better performance.

3 Mapping and Scheduling

3.1 Scheduling exercise

In this assignment, since nothing else was given we assume that the processors run at the same frequency and that the transfer time between them is zero. This can also be confirmed as the minimal execution time since worst case

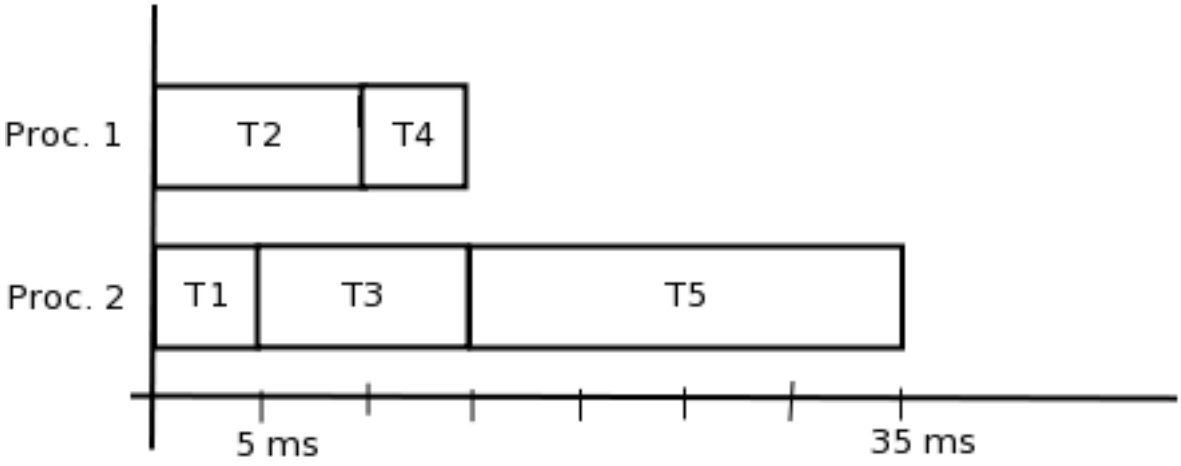

Figure 1: Task schedule

propagation time is 35 ms.

3.2 Extract execution times for the GSM codec

Task	First run (cycles)	Second run (cycles)
Init	6002	X
GetInputAudio	4576	4726
Preprocess	14480	14258
LPC_Analysis	51759	50138
ShortTermAnalysisFilter	92101	92035
LongTermPredictor2	64820	67037
	66932	68269
	66262	67599
	66085	67093
RPE_Encoding2	11552	11374
	10705	10632
	10667	10623
	10675	10666
Add2	1431	1445
	1319	1319
	1319	1319
	1319	1319
Encode	3364	2818
Output	3634	3522

Table 3: Execution times for GSM Encoder

Task	First run	Second run
Init	6086	X
GetInputAudio	1151	1129
Decode	2722	2540
RPE_Decoding2	2793	2232
	3099	3078
	3015	3015
	2979	2979
LongTermSynthesis2	4790	4608
	4608	4608
	4608	4608
	4580	4580
ShortTermAnalysisFilter	109882	108185
PostProcessing	7470	7106
Output	16631	16575

Table 4: Execution times for GSM Decoder