16.482 / 16.561: Computer Architecture and Design

Spring 2015

Lecture 7: Key Questions March 12, 2015

1. Define fine-grained and coarse-grained multithreading.

2. Define simultaneous multithreading.

Multithreading example

Assume you are using a processor with the following characteristics:

- 4 functional units: 2 ALUs, 1 memory port (load/store), 1 branch
- In-order execution

Given the three threads below, show how these instructions would execute using:

- Fine-grained multithreading
- Coarse-grained multithreading
 - o Switch threads on any stall over 2 cycles
- Simultaneous multithreading
 - o Thread 1 is preferred, followed by Thread 2 and Thread 3

You should assume any two instructions without stalls between them are independent.

Threads:

Thread 1:	Thread 2:	Thread 3:
ADD.D	SUB.D	L.D
L.D	stall	stall
stall	L.D	stall
stall	S.D	stall
stall	L.D	stall
stall	stall	stall
SUB.D	ADD.D	stall
S.D	stall	ADD.D
stall	BNE	stall
BEQ		stall
		S.D
		stall
		stall
		BEQ

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Extra space to work on multithreading example