16.482 / 16.561: Computer Architecture and Design
Fall 2014

Lecture 7: Key Questions
October 23, 2014

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

2. Define simultaneous multithreading.

<u>Multithreading example</u>
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

Extra space to work on multithreading example