

16.482 / 16.561: Computer Architecture and Design

Summer 2015

Lecture 7: Key Questions

June 11, 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
 - Switch threads on any stall over 2 cycles
- Simultaneous multithreading
 - 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:

ADD.D

L.D

stall

stall

stall

stall

SUB.D

S.D

stall

BEQ

Thread 2:

SUB.D

stall

L.D

S.D

L.D

stall

ADD.D

stall

BNE

Thread 3:

L.D

stall

stall

stall

stall

stall

stall

ADD.D

stall

stall

S.D

stall

stall

BEQ

Extra space to work on multithreading example