



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  
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**