

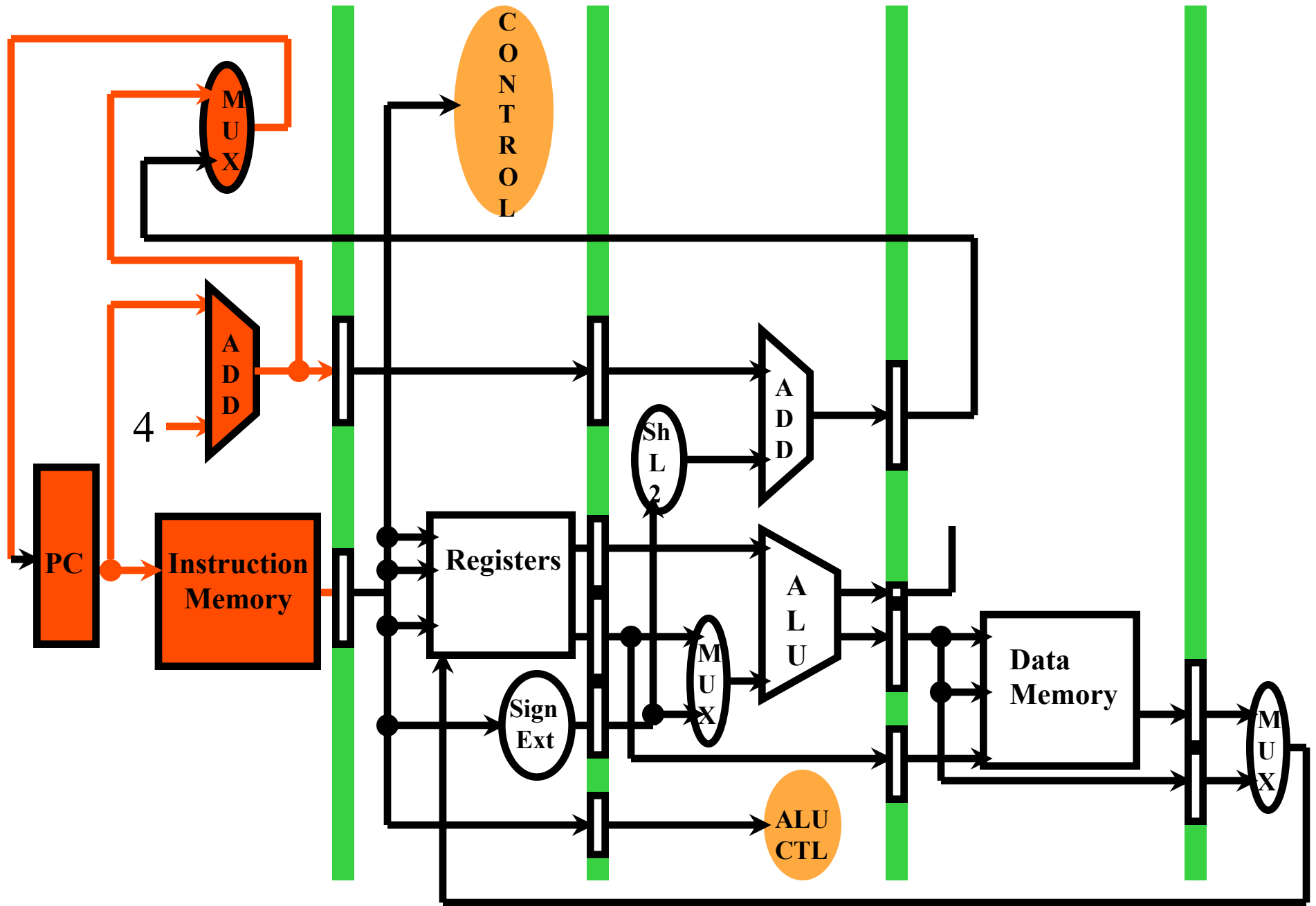
INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK



INSTRUCTION  
FETCH

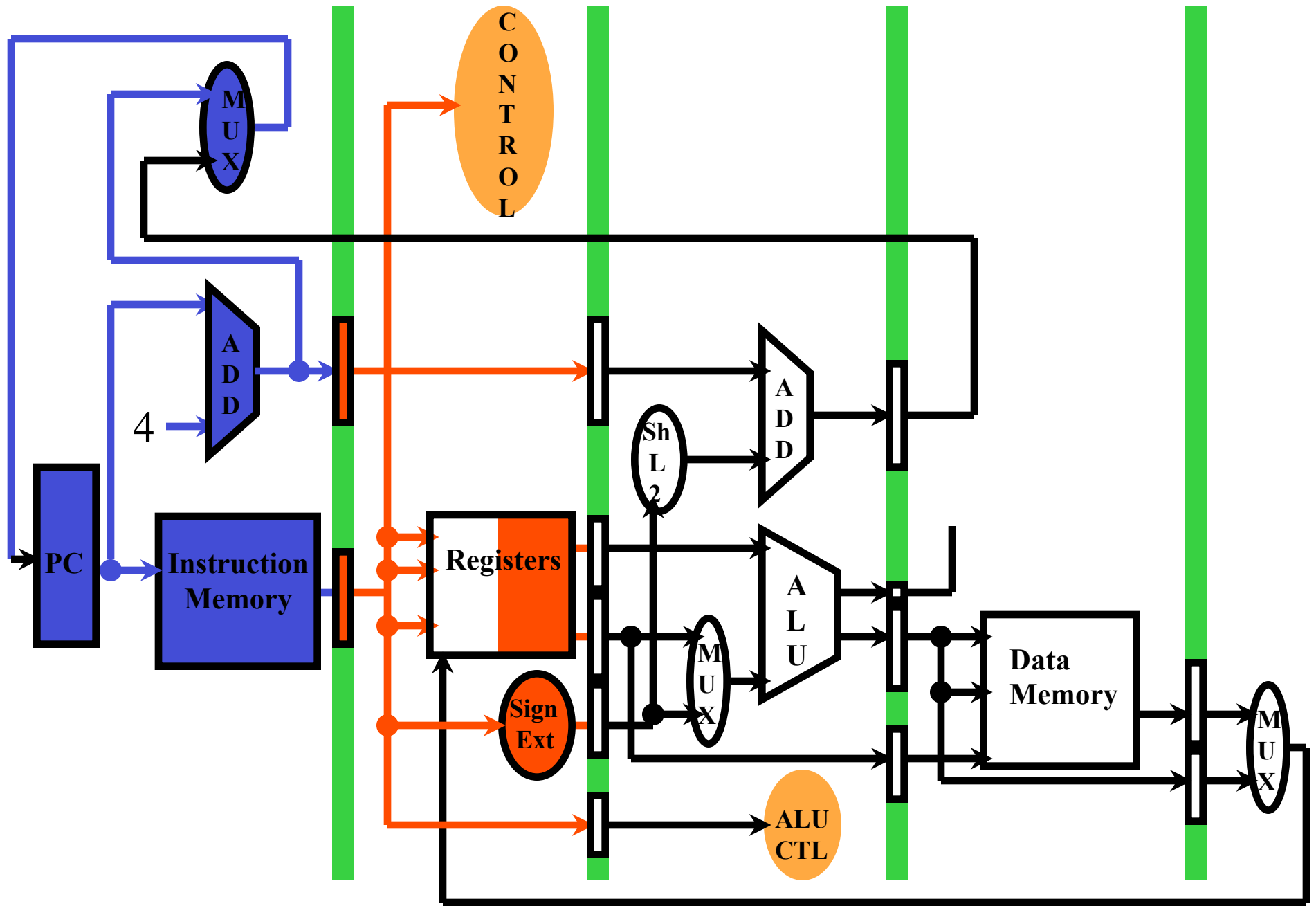
INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK





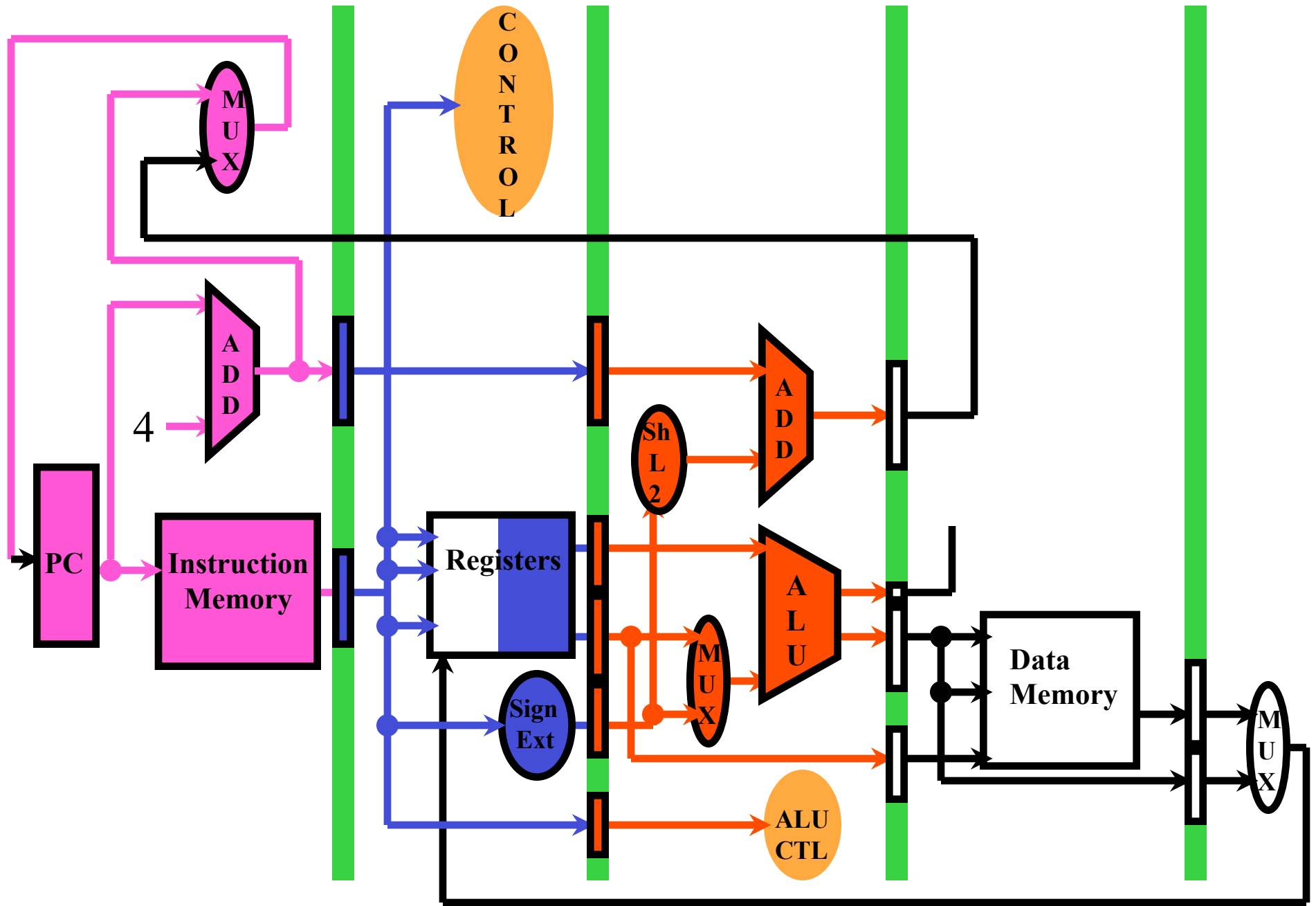
INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK



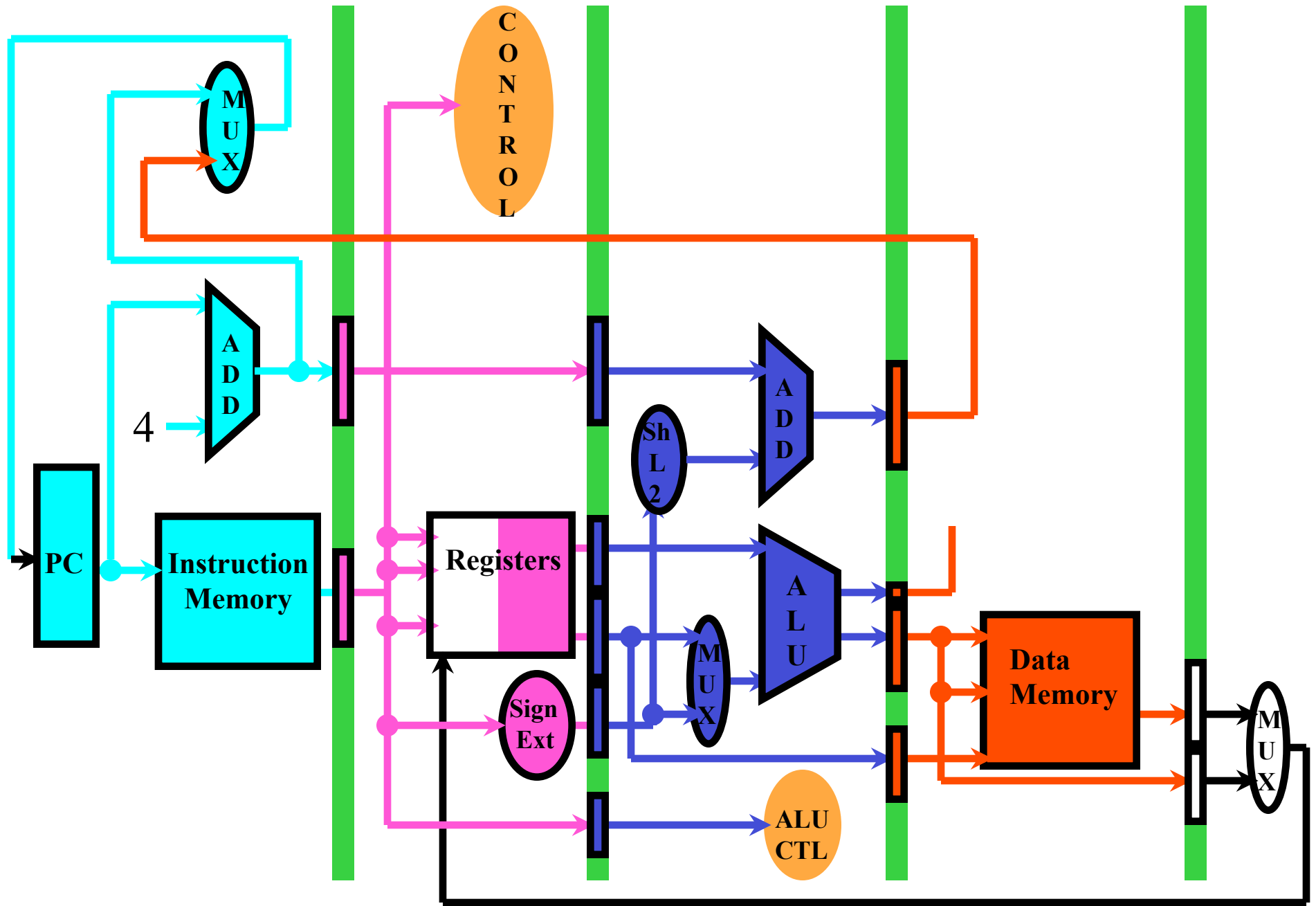
INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK



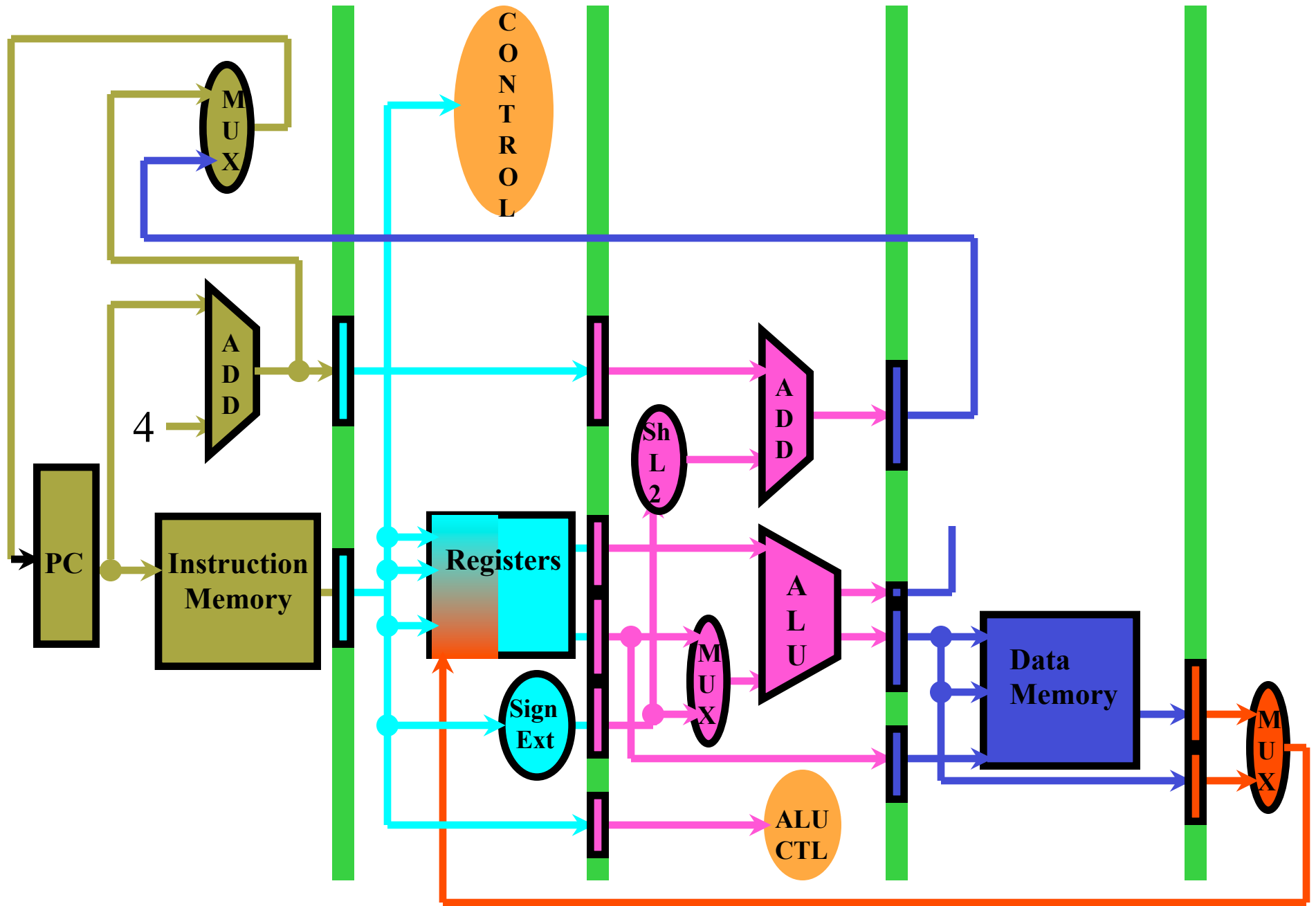
INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK



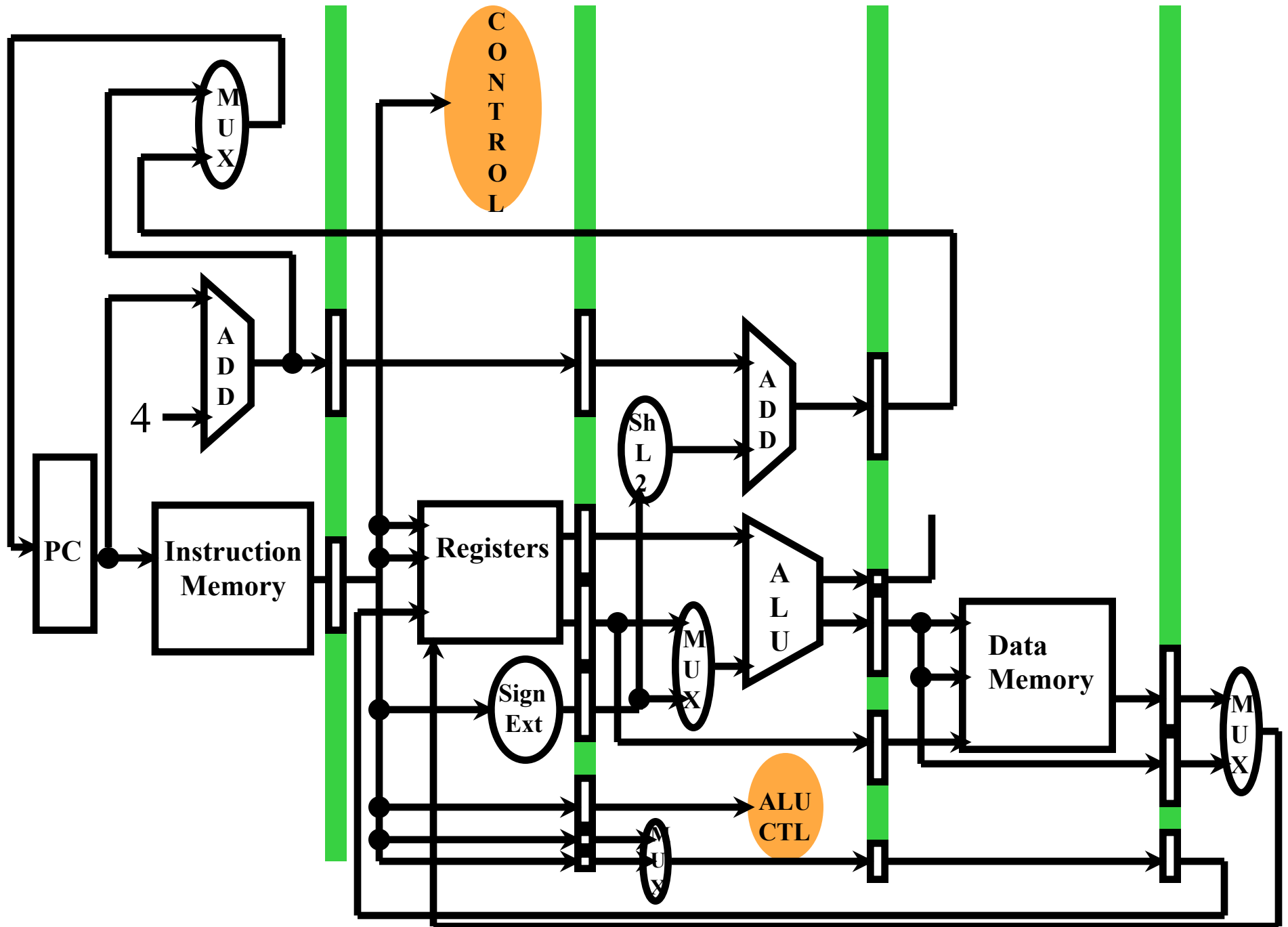
INSTRUCTION  
FETCH

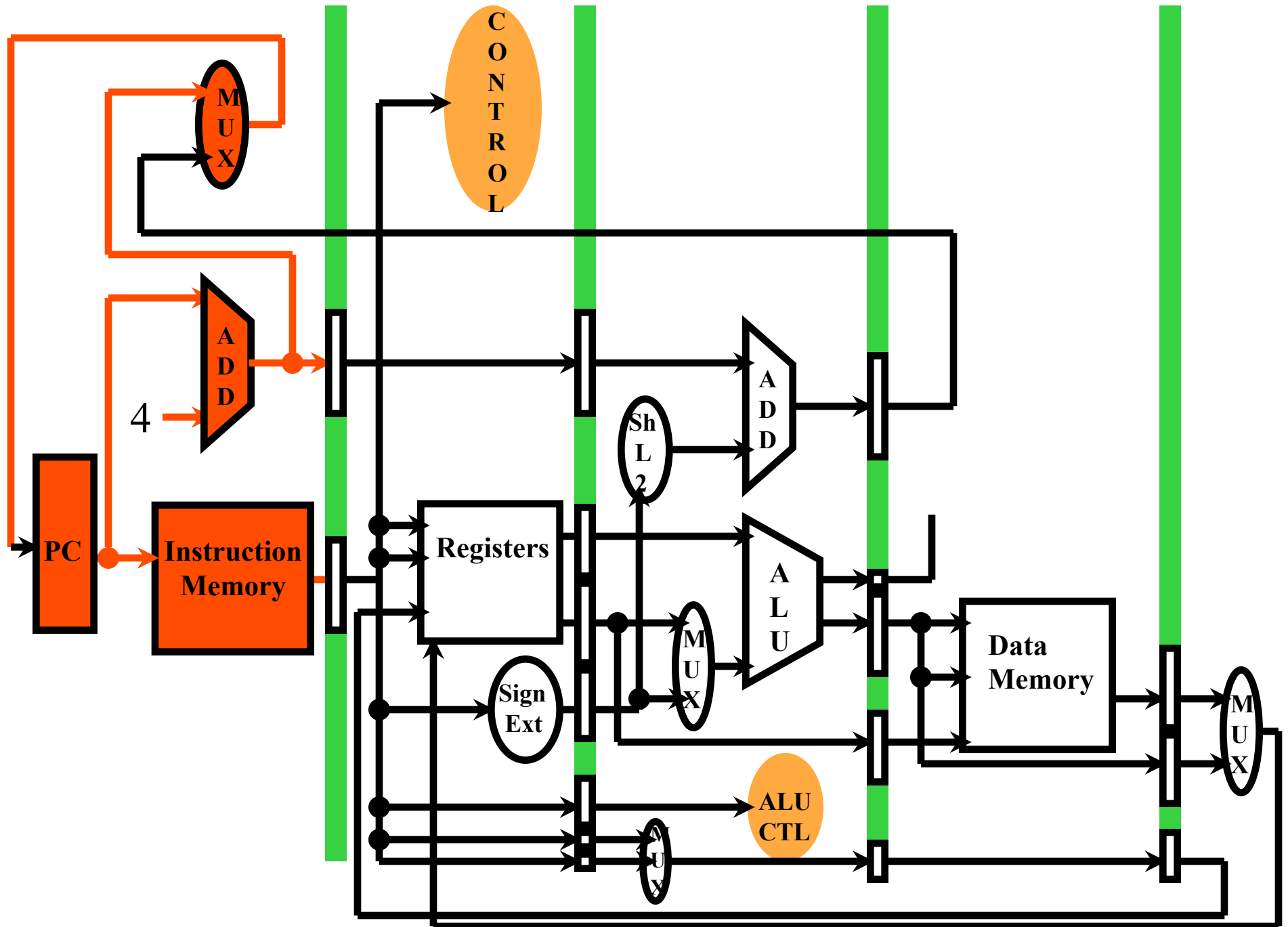
INSTR DECODE  
REG FETCH

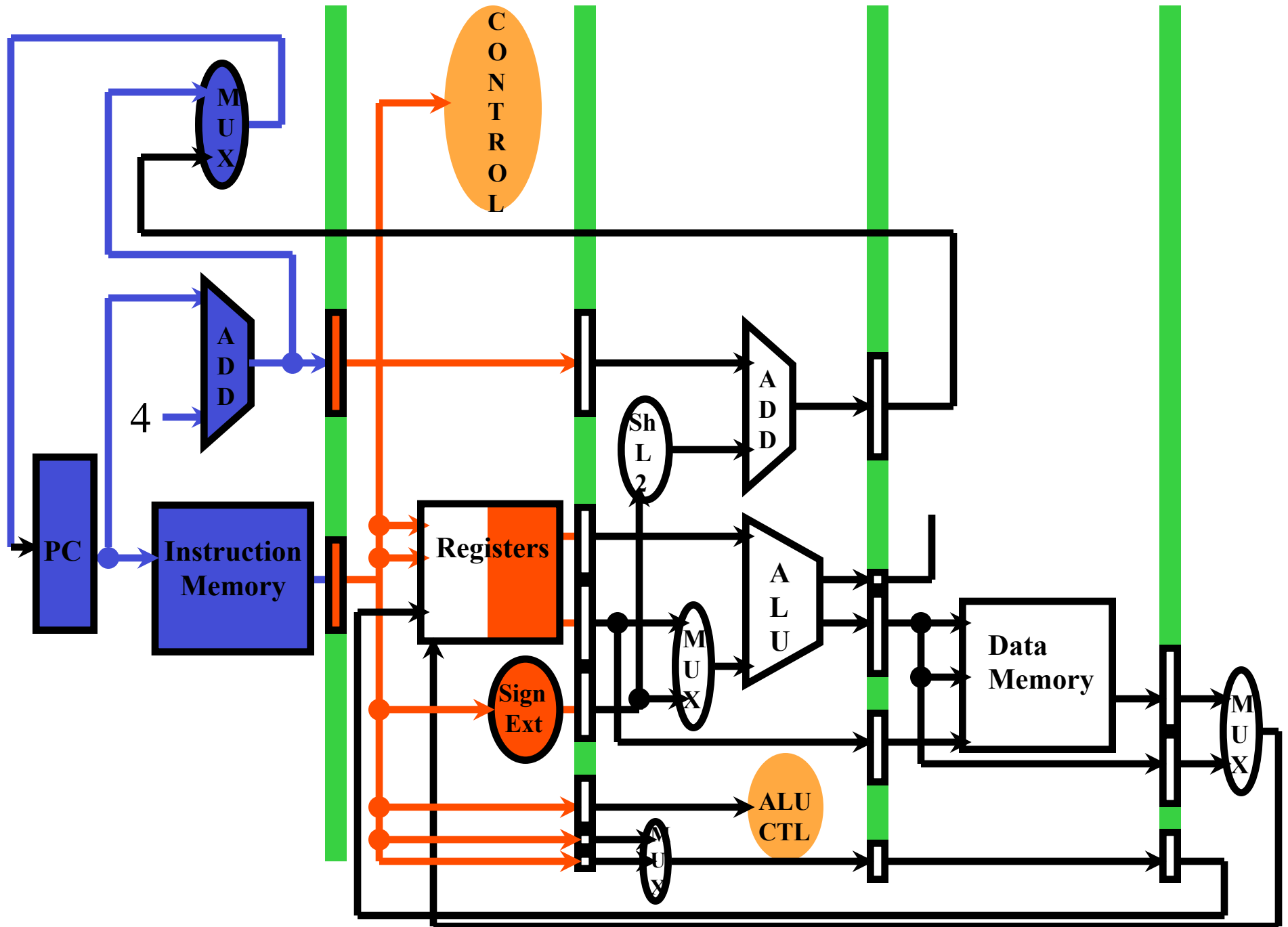
EXECUTE/  
ADDRESS CALC

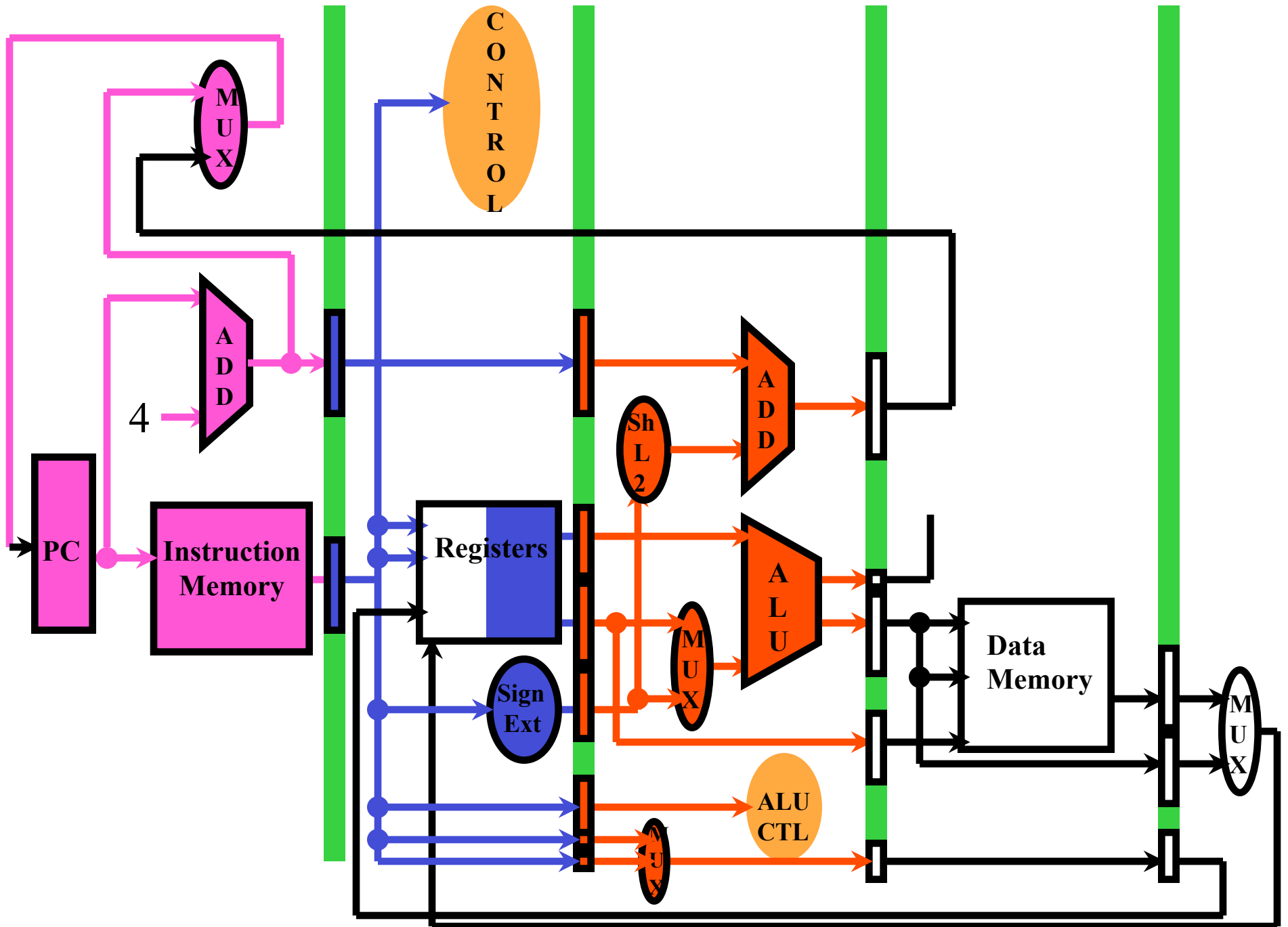
MEMORY  
ACCESS

WRITE  
BACK

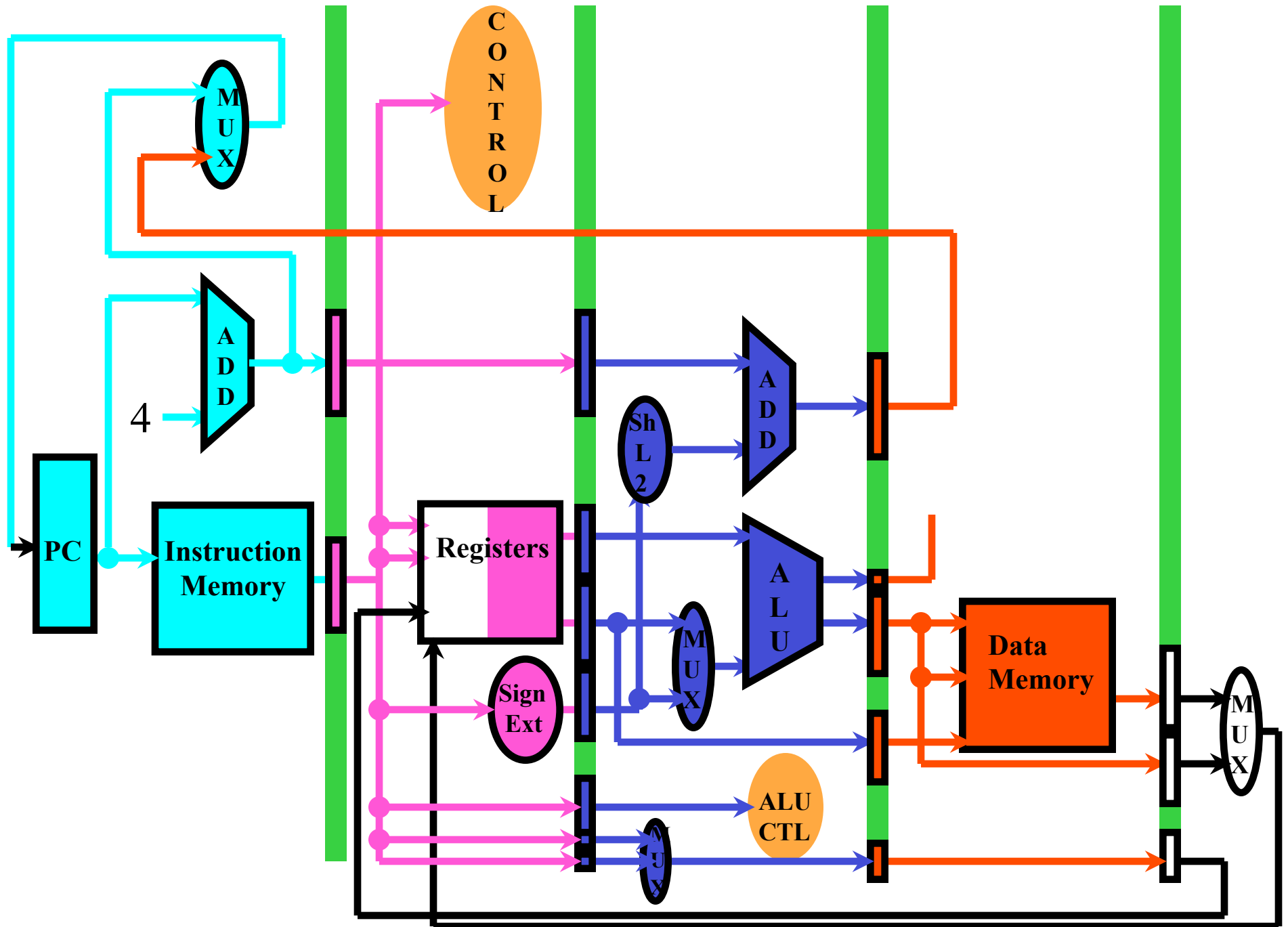


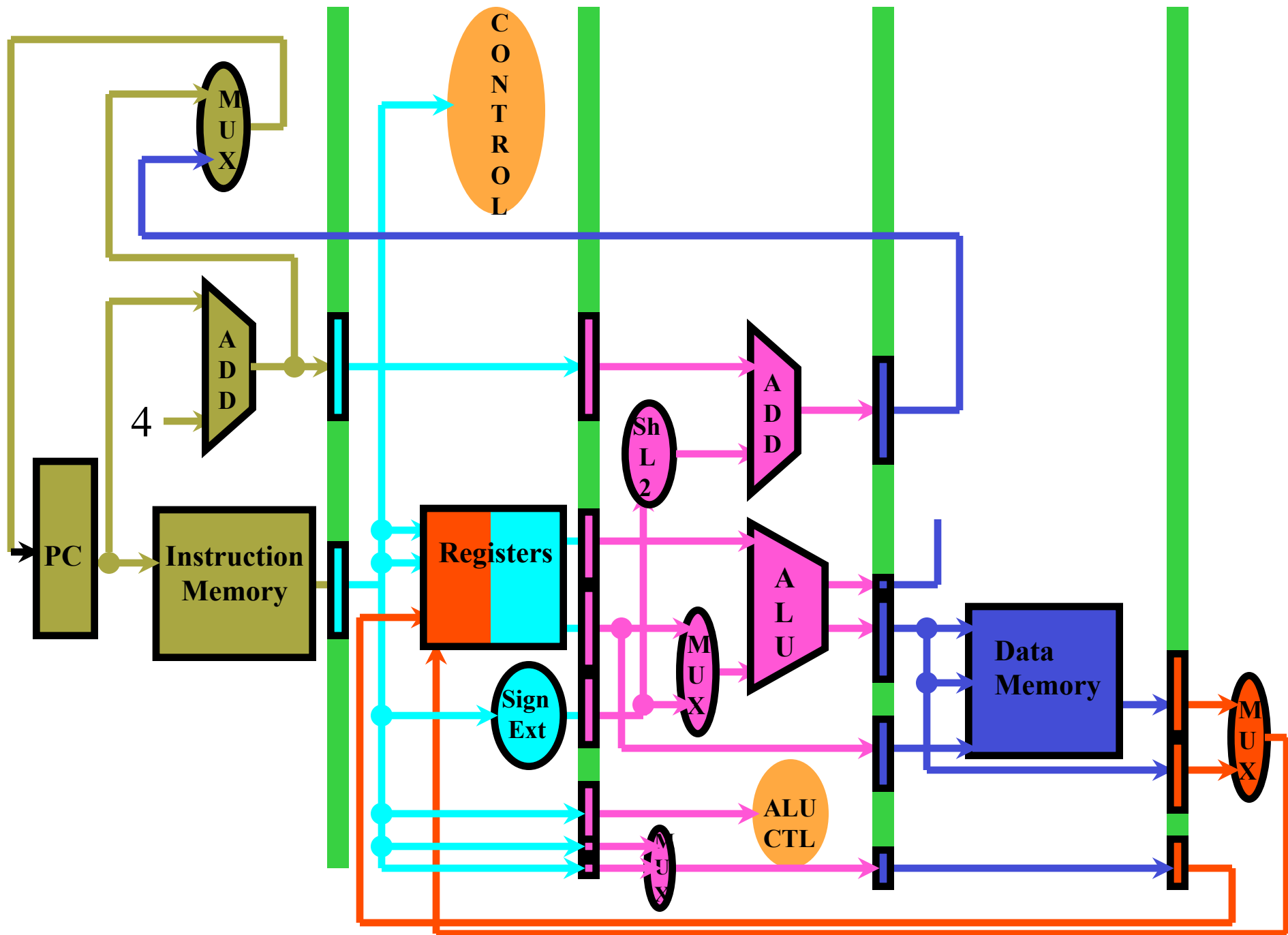


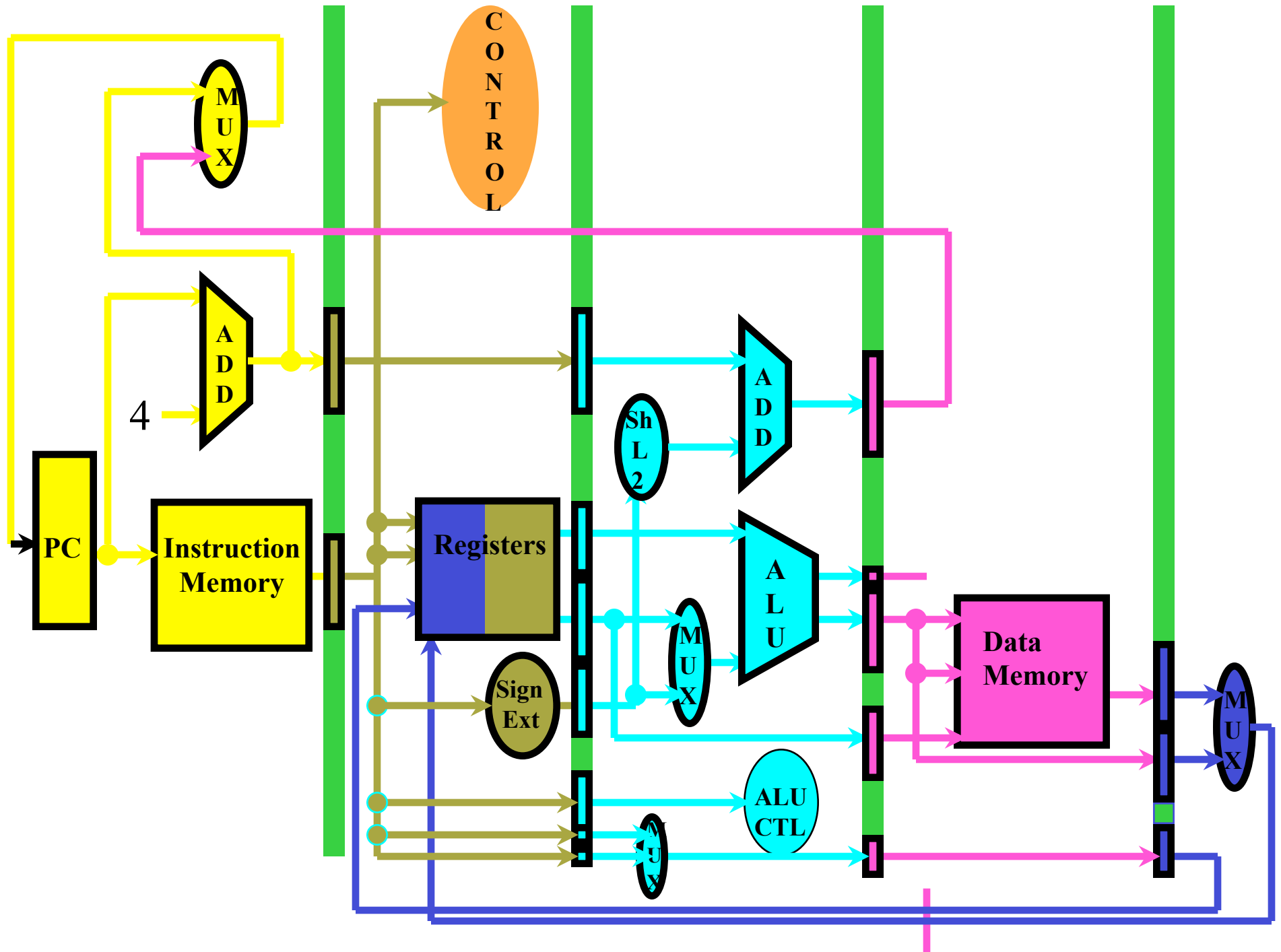






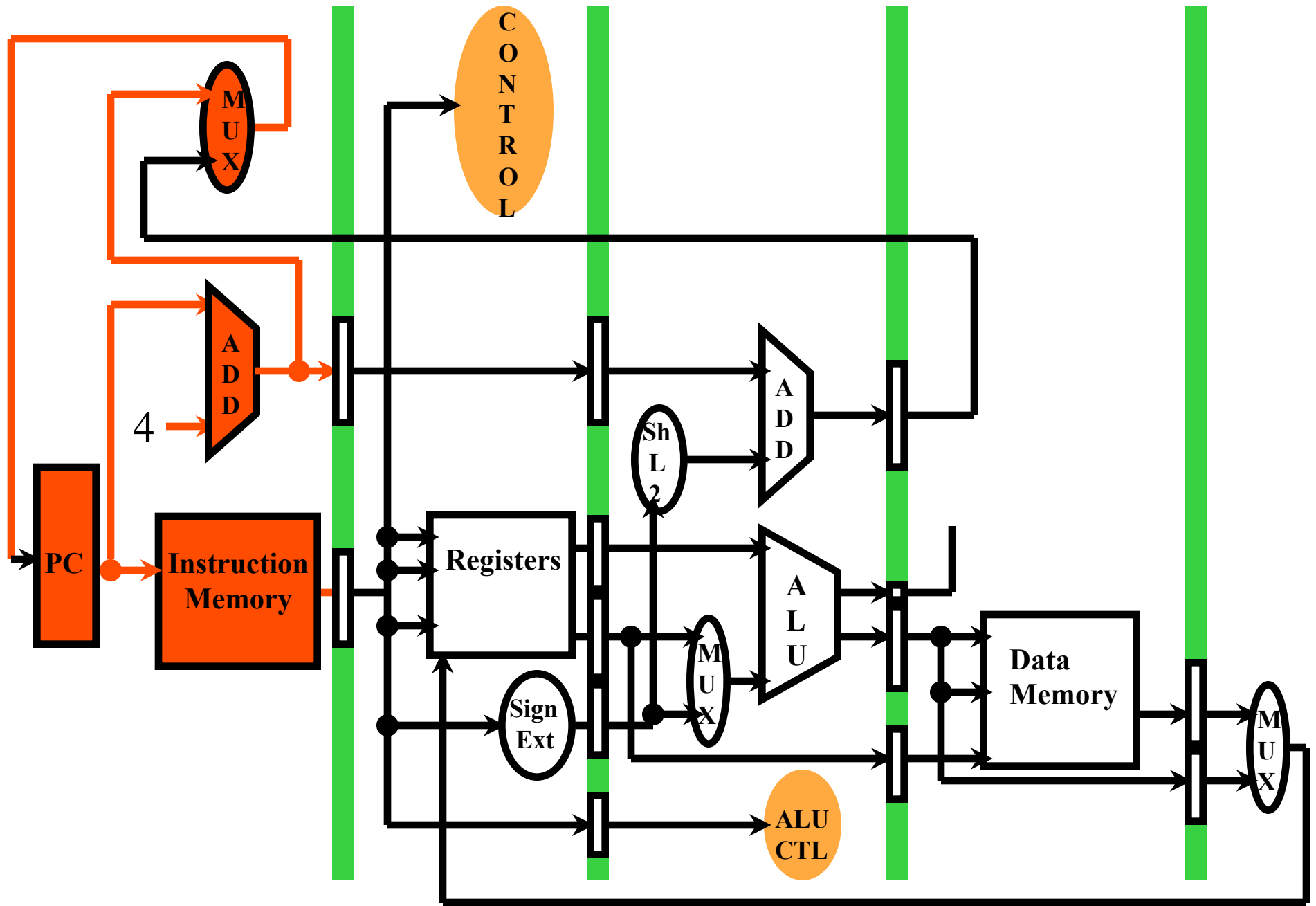






# Data Hazards

- Software: nop
- Hardware: stall



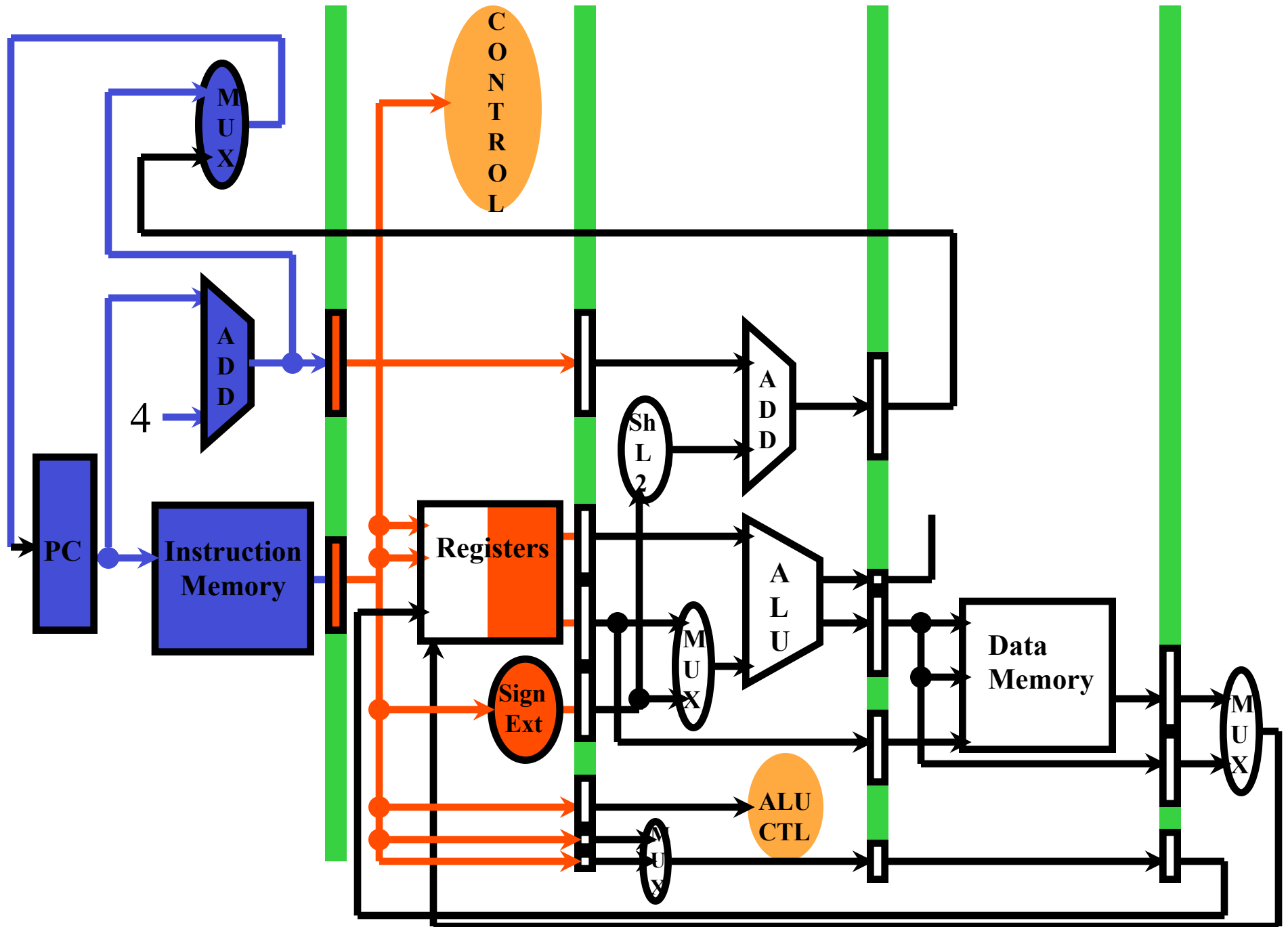
INSTRUCTION  
FETCH

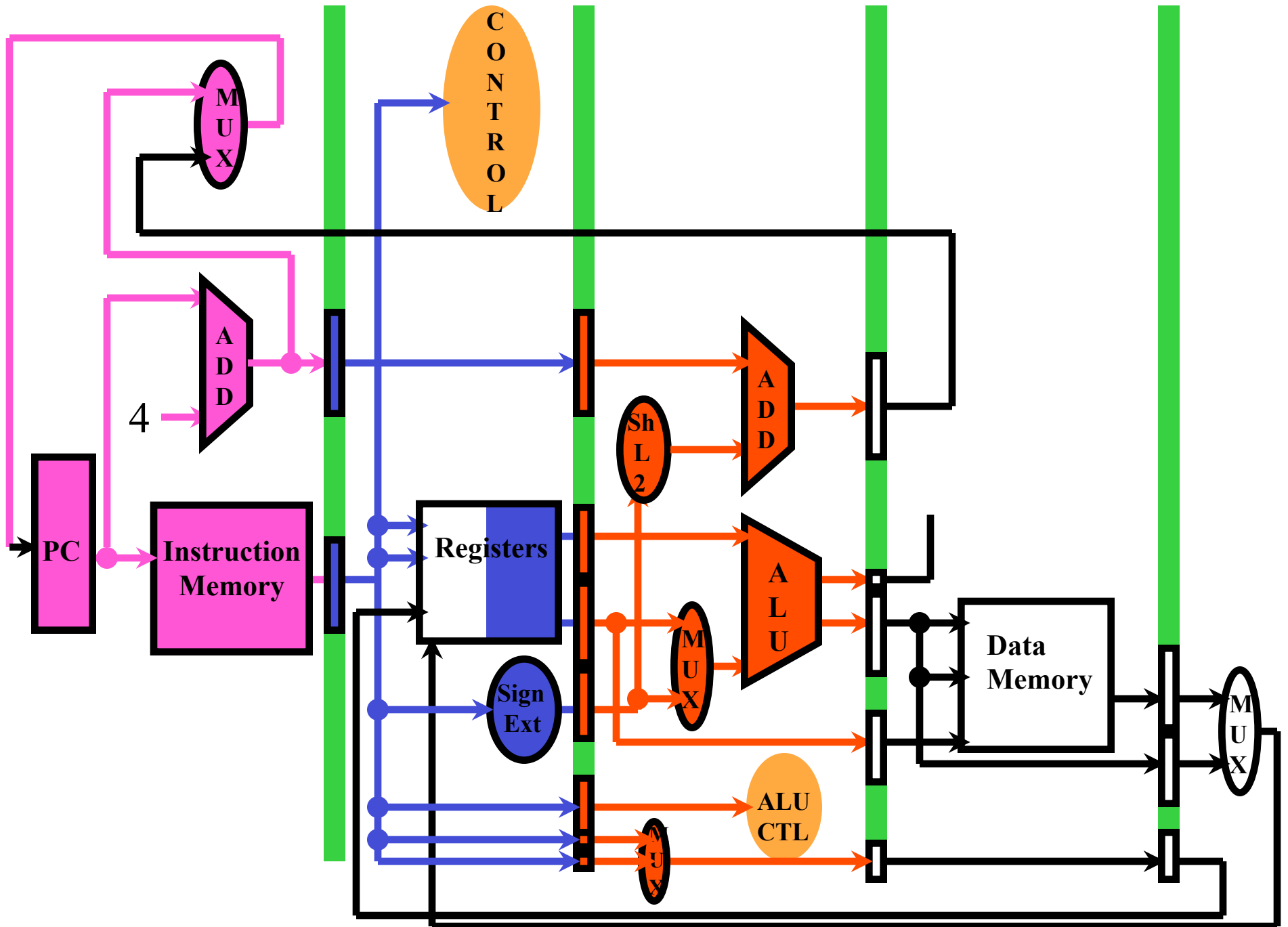
INSTR DECODE  
REG FETCH

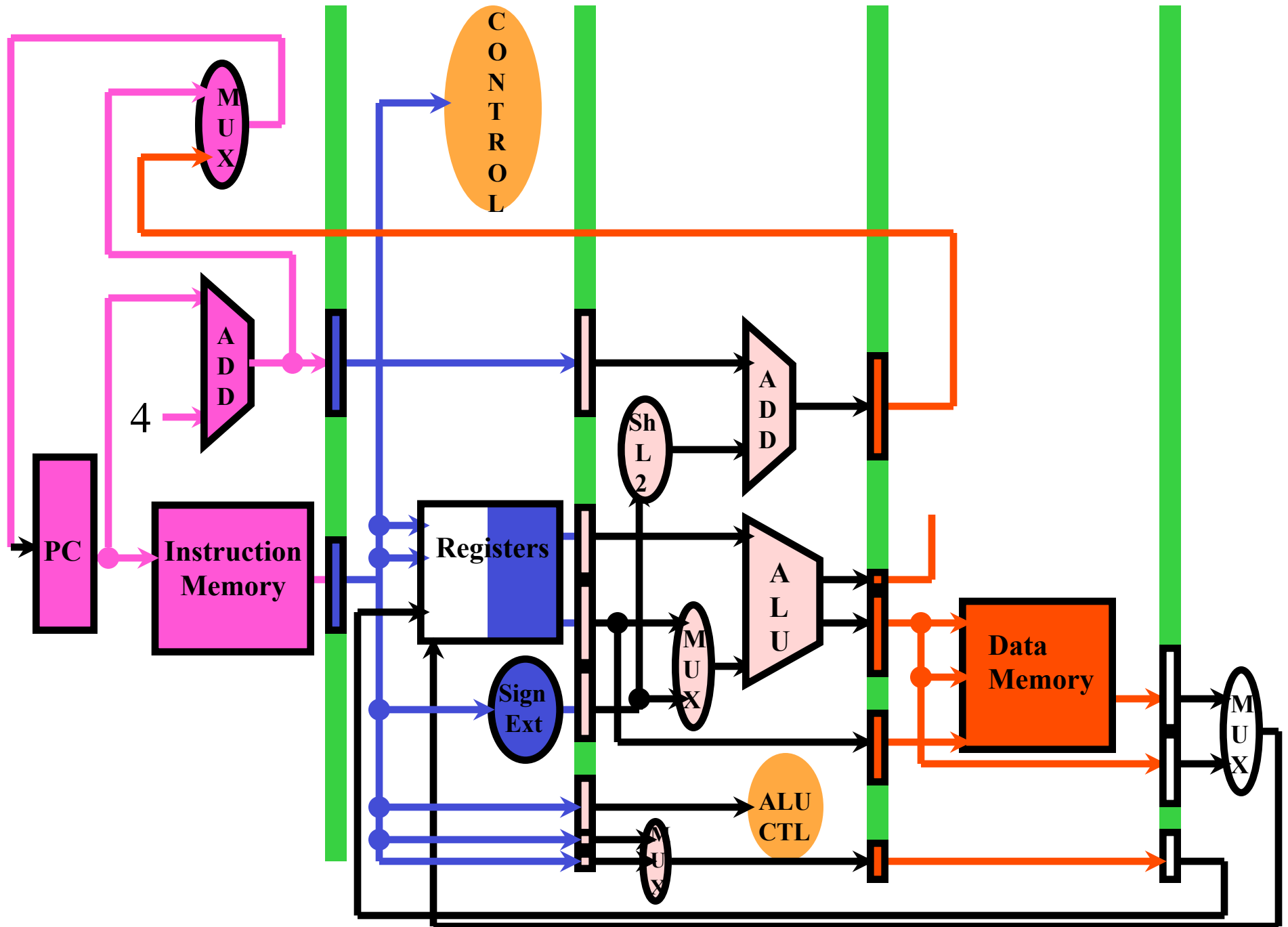
EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

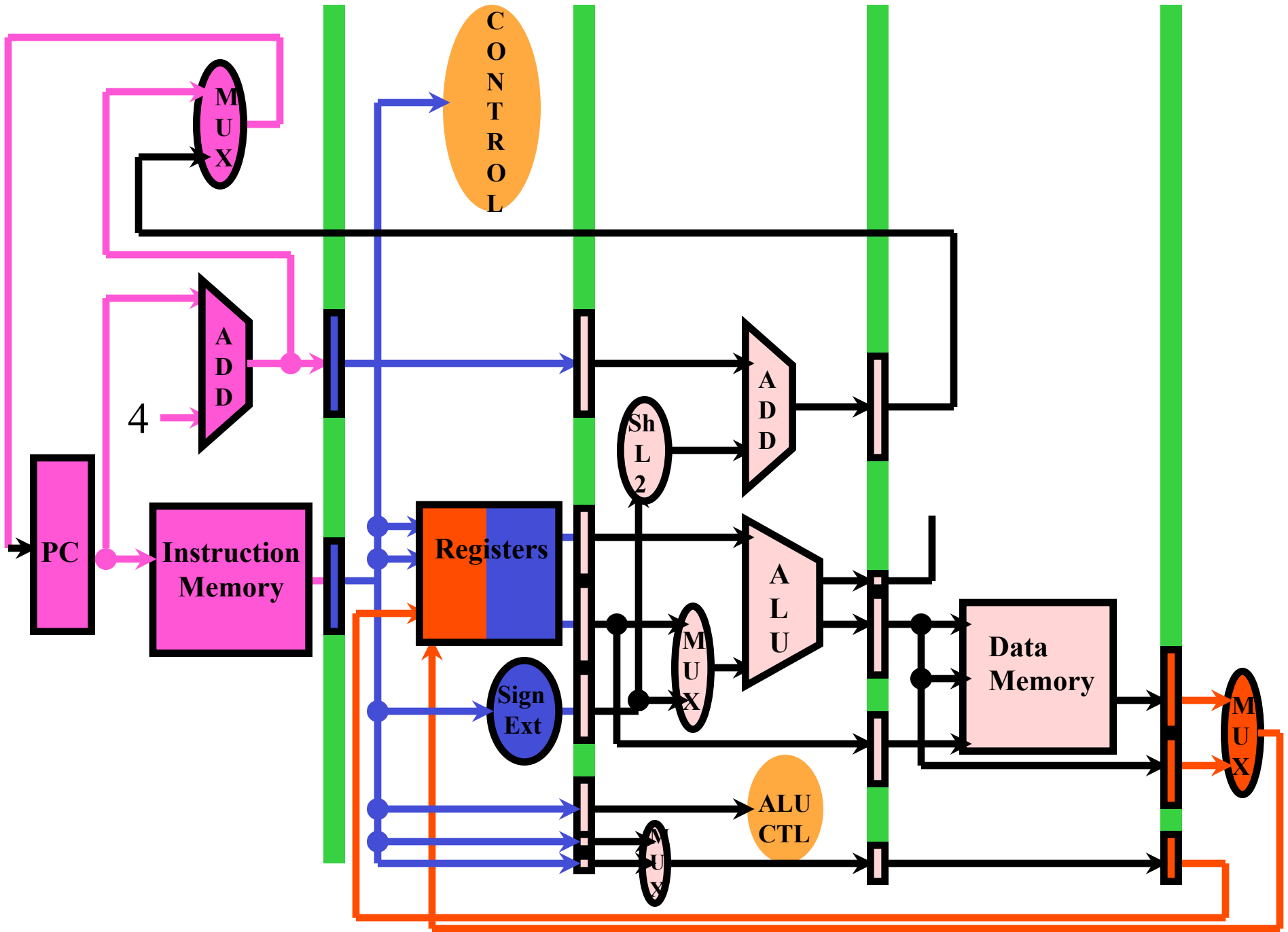
WRITE  
BACK

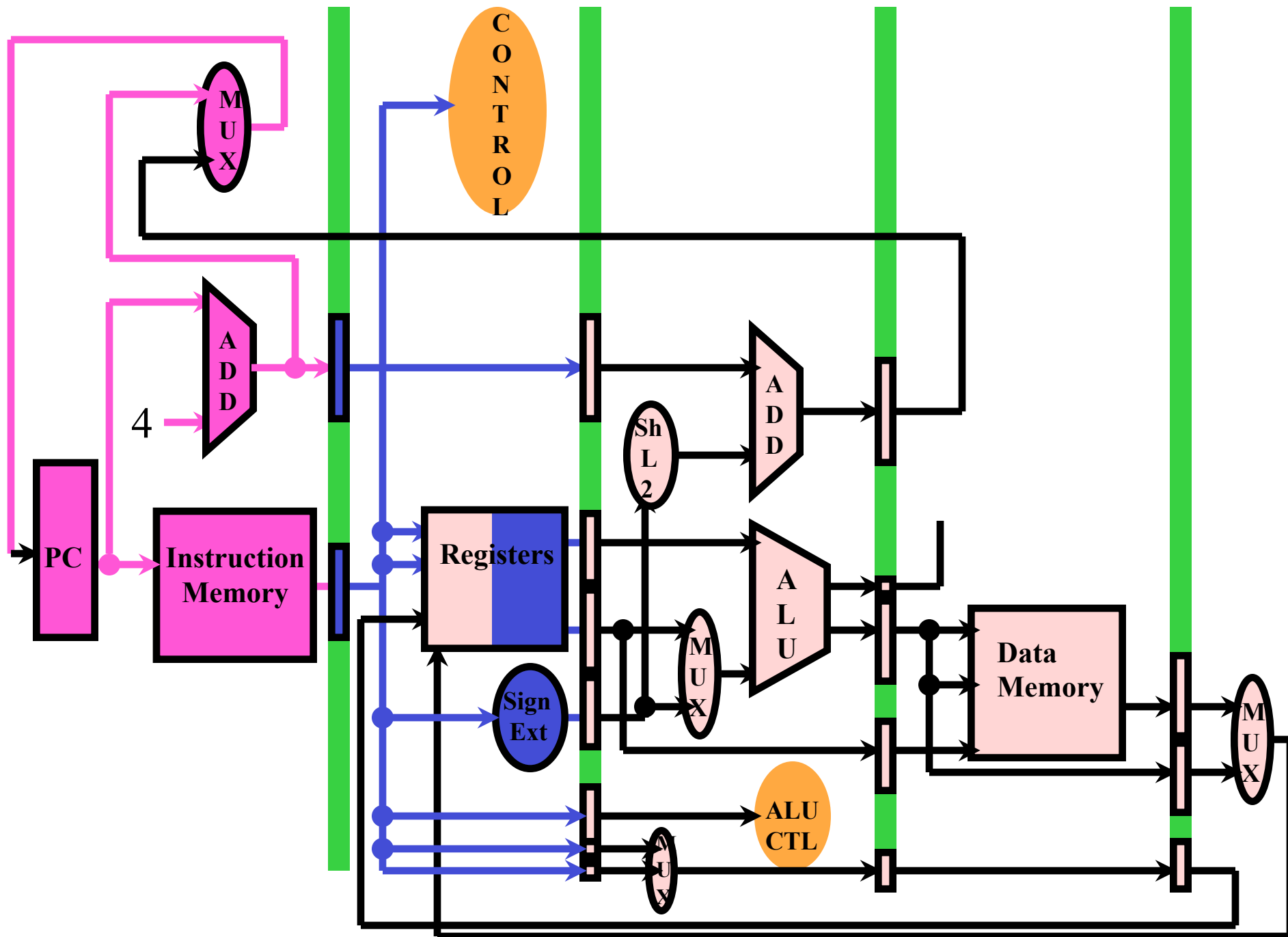


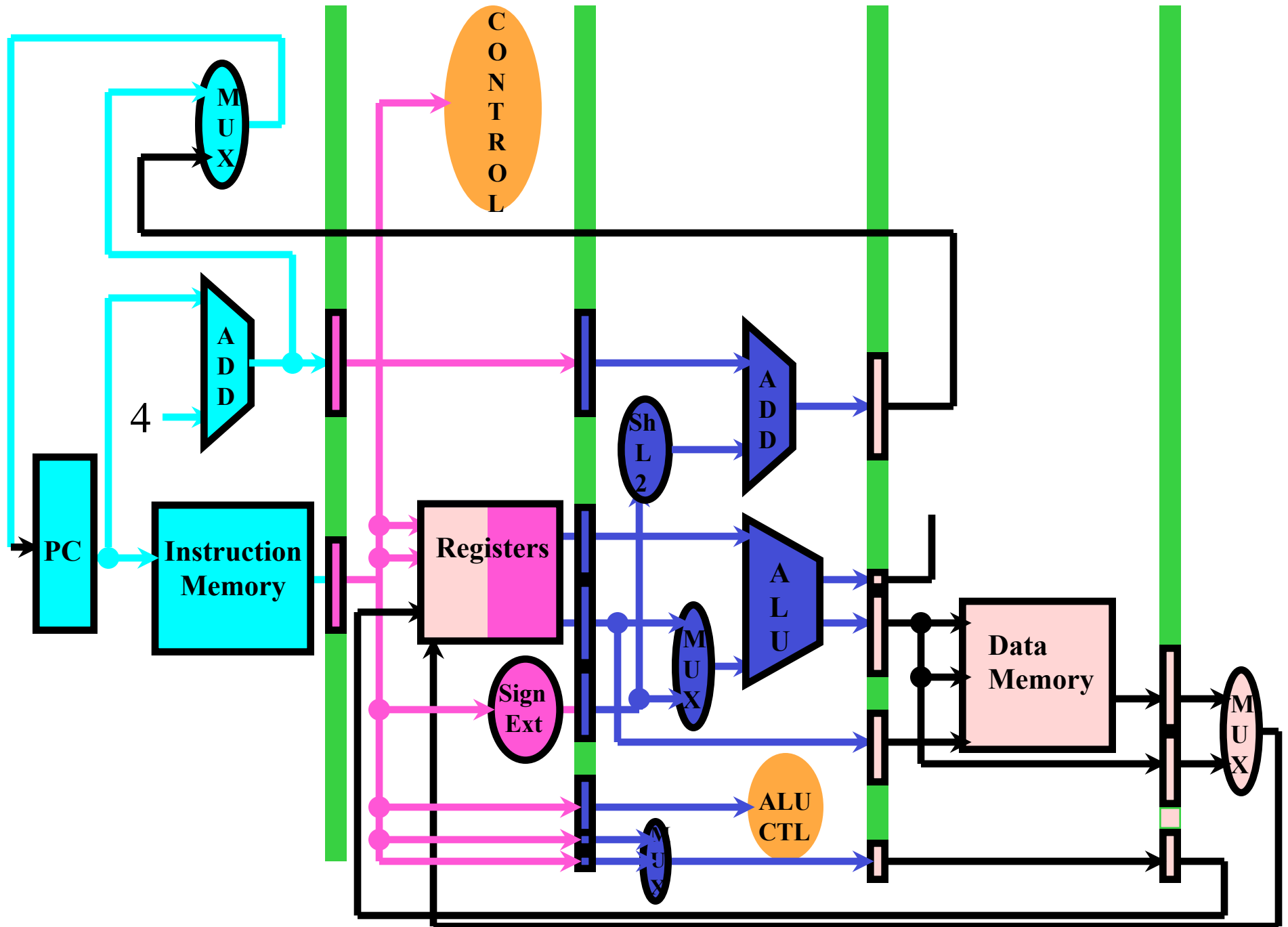


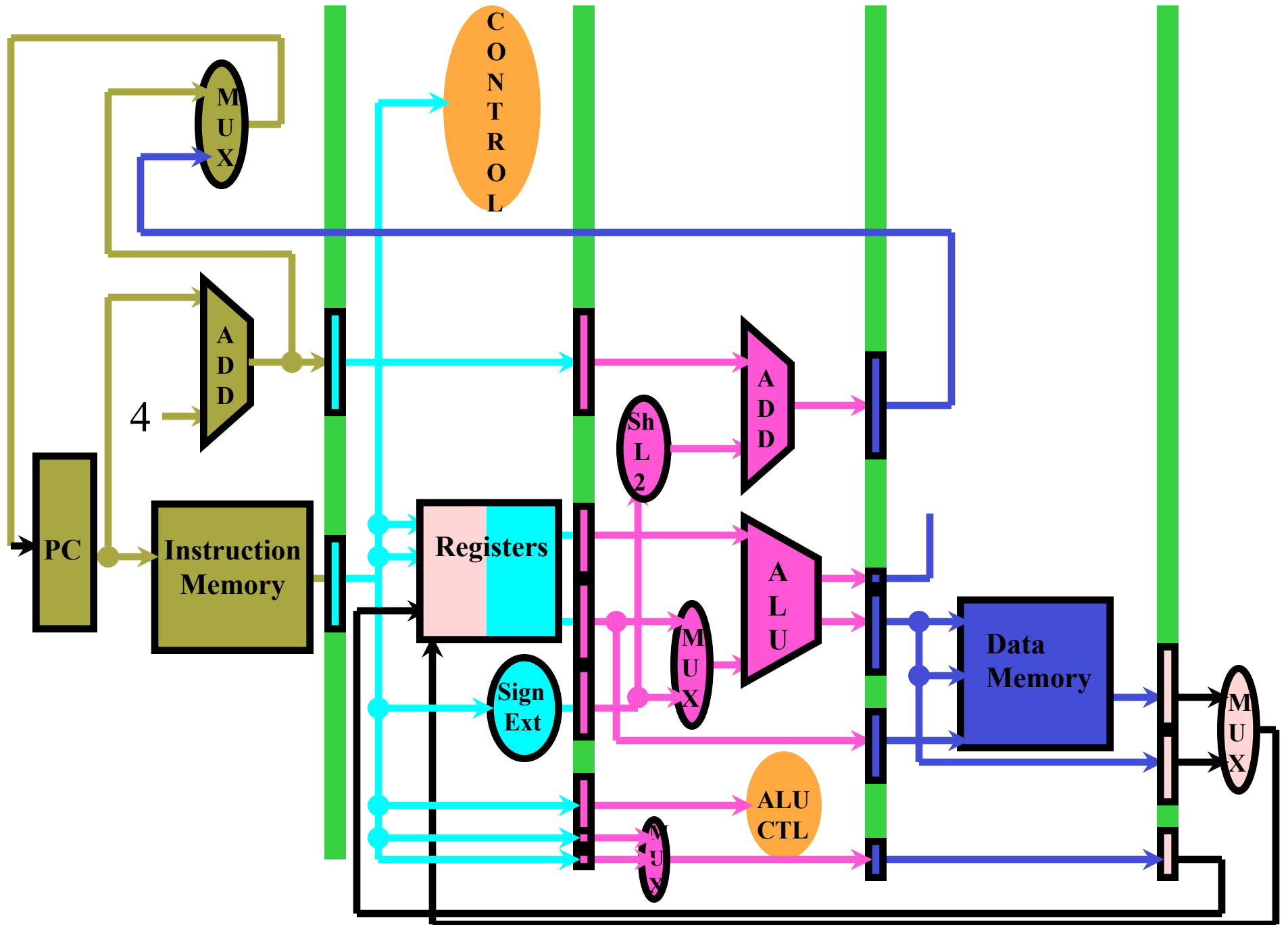


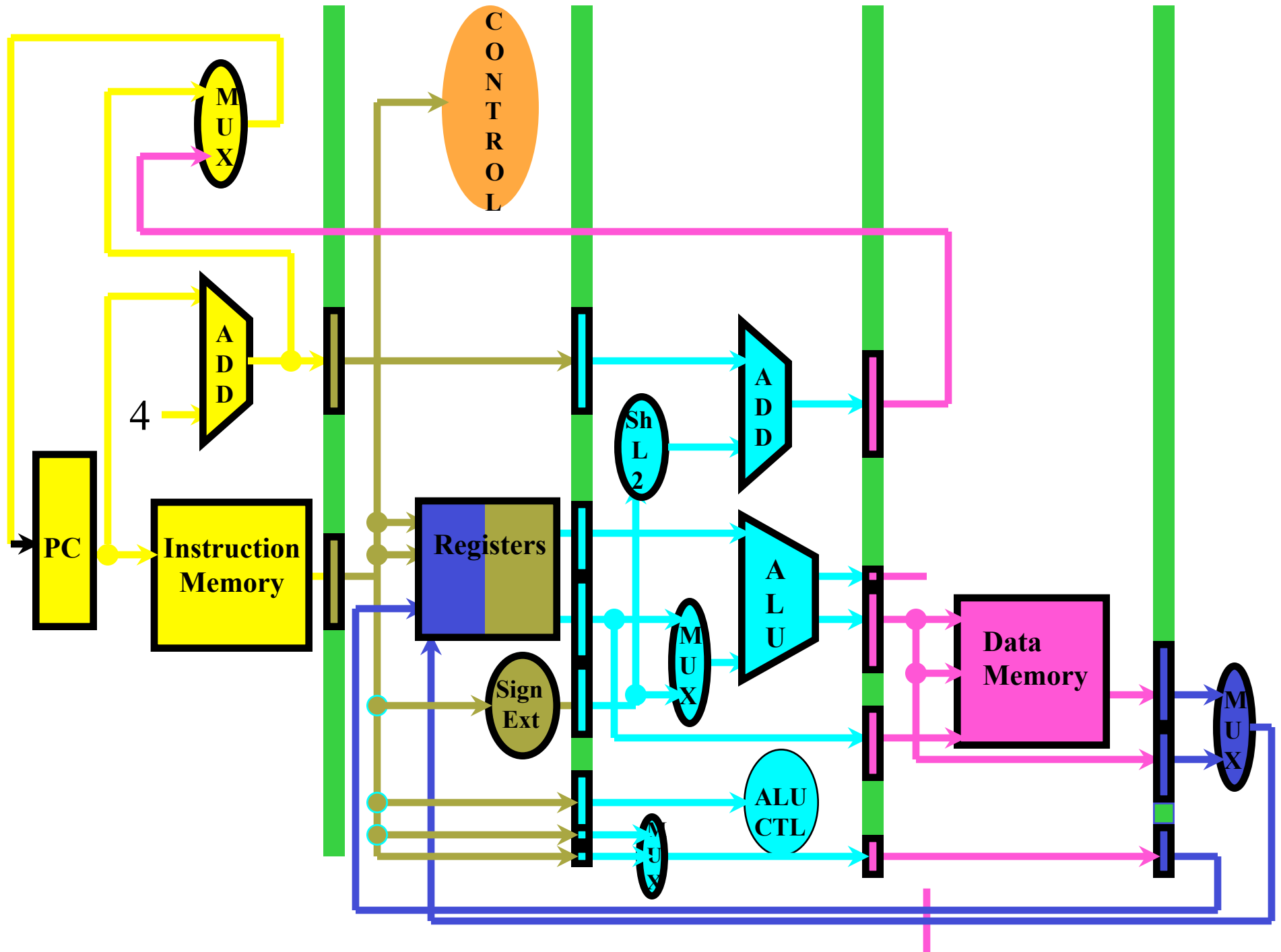




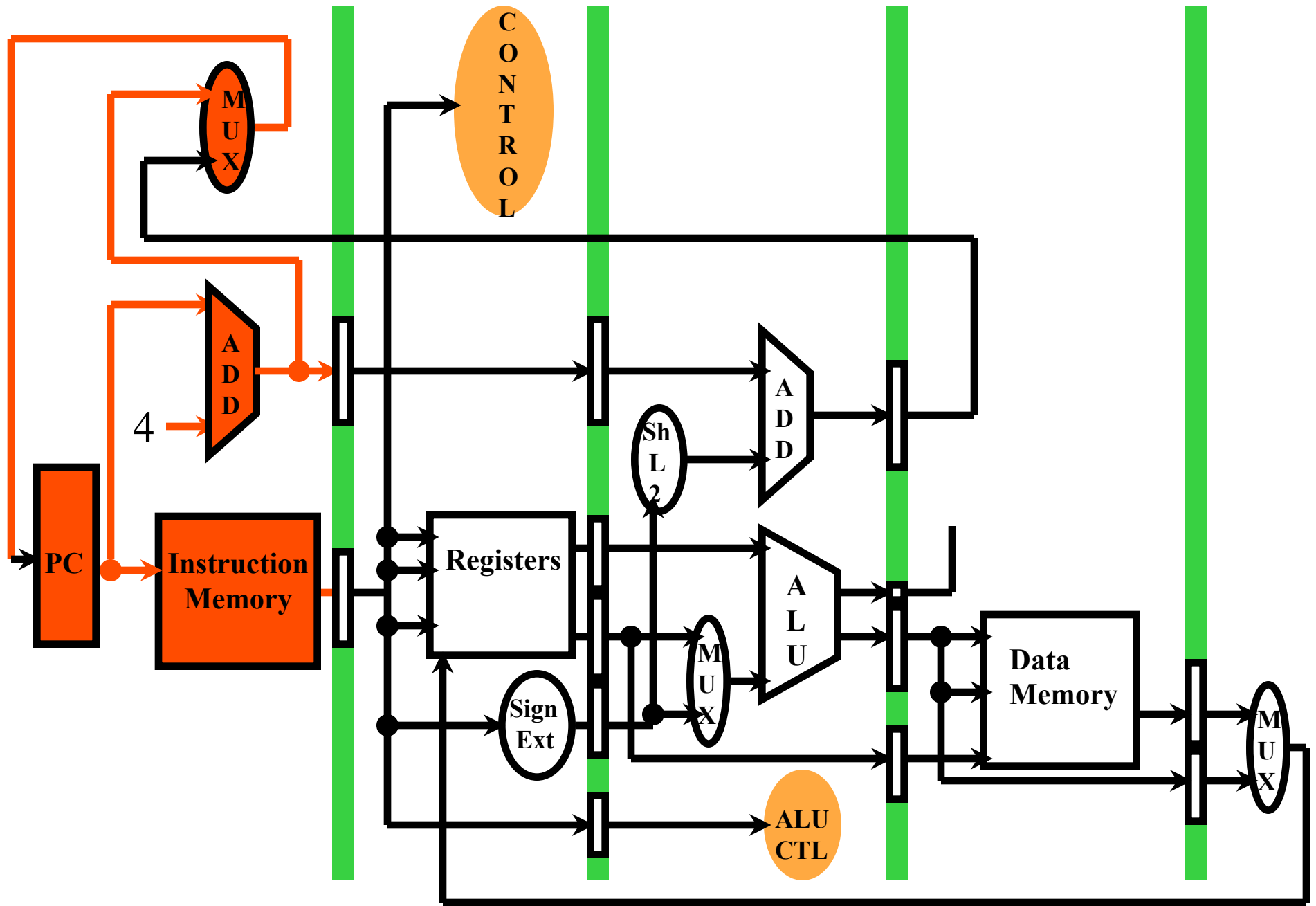








# Branch Hazard



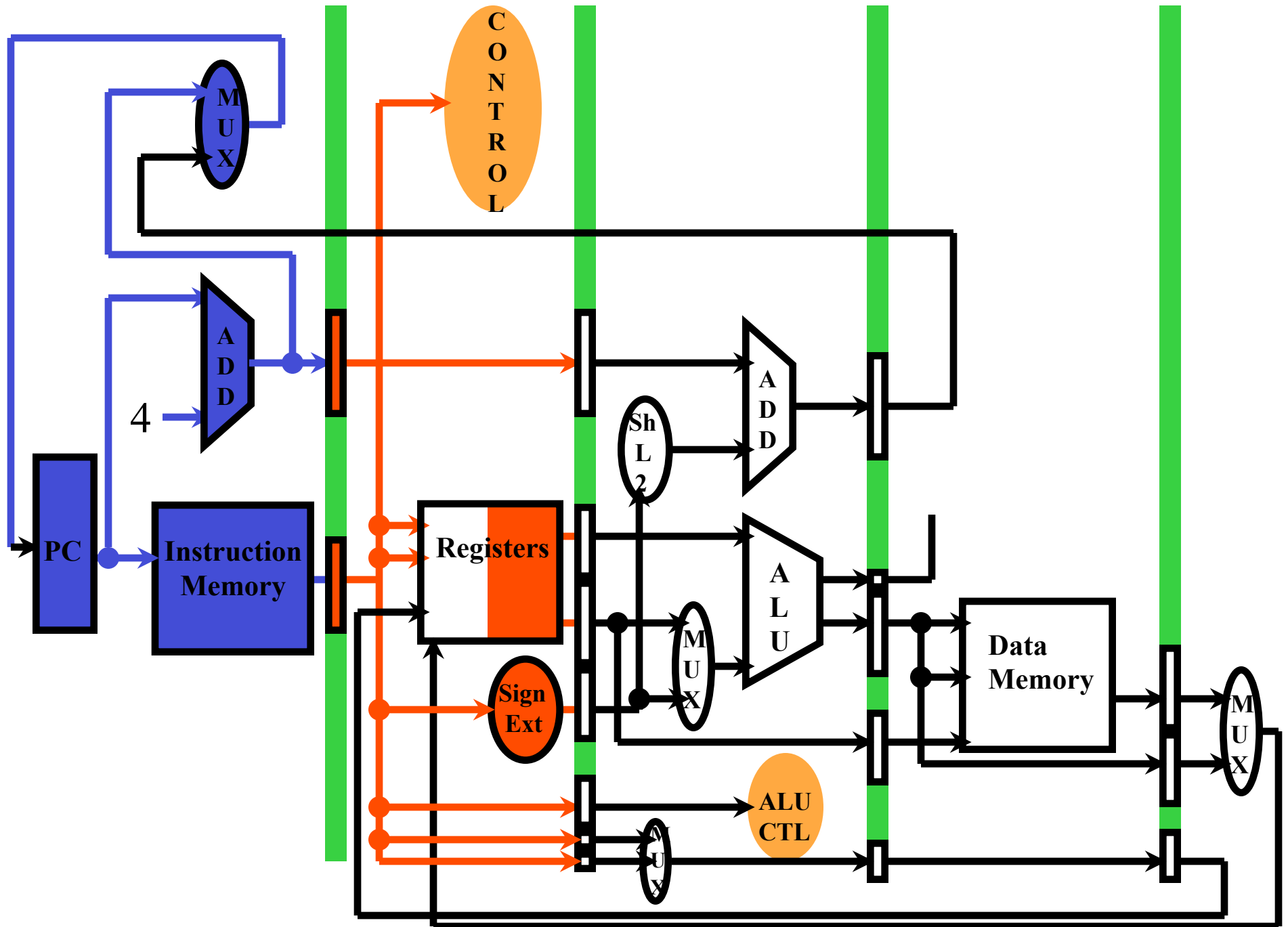
INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

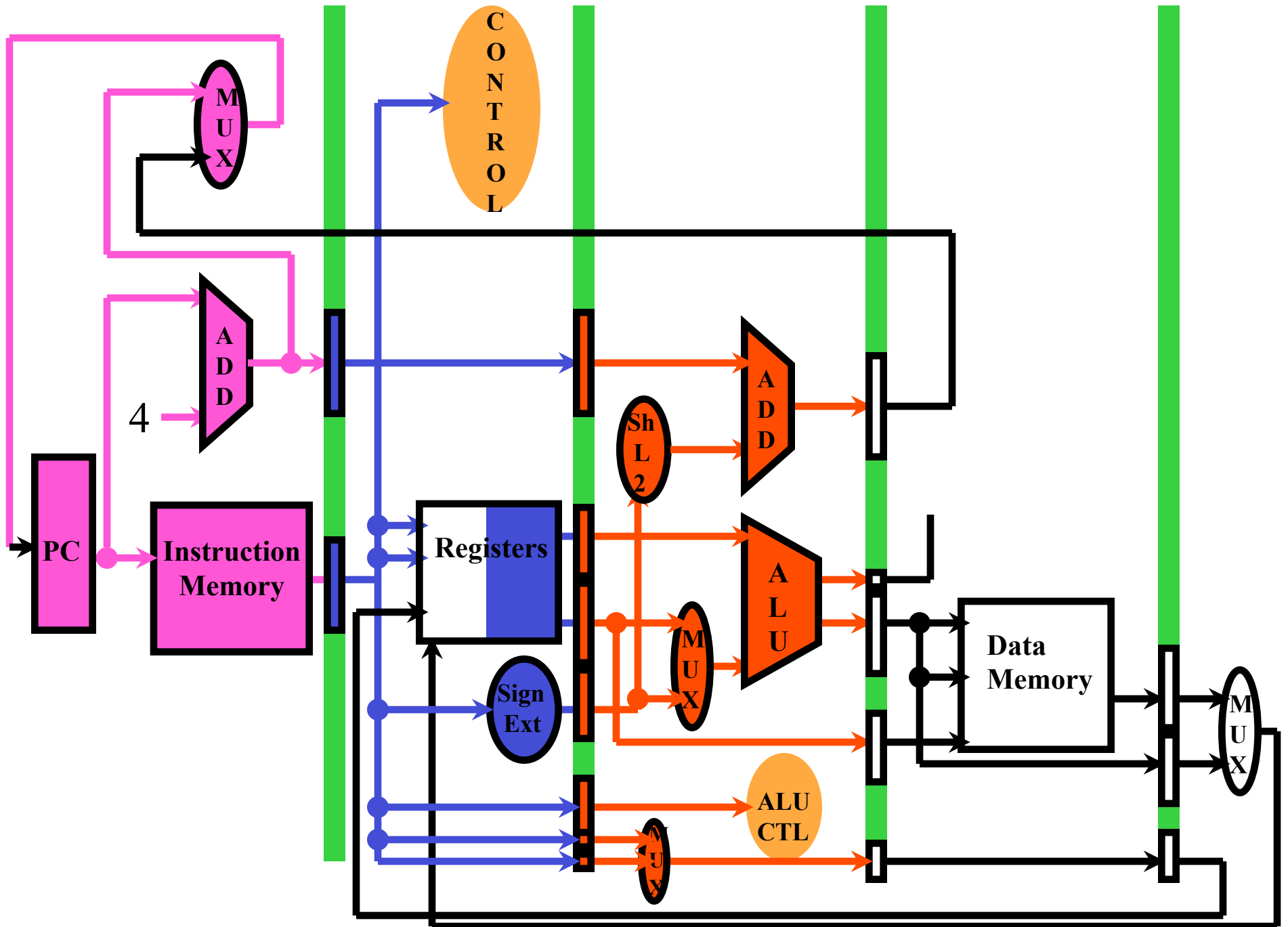
EXECUTE/  
ADDRESS CALC

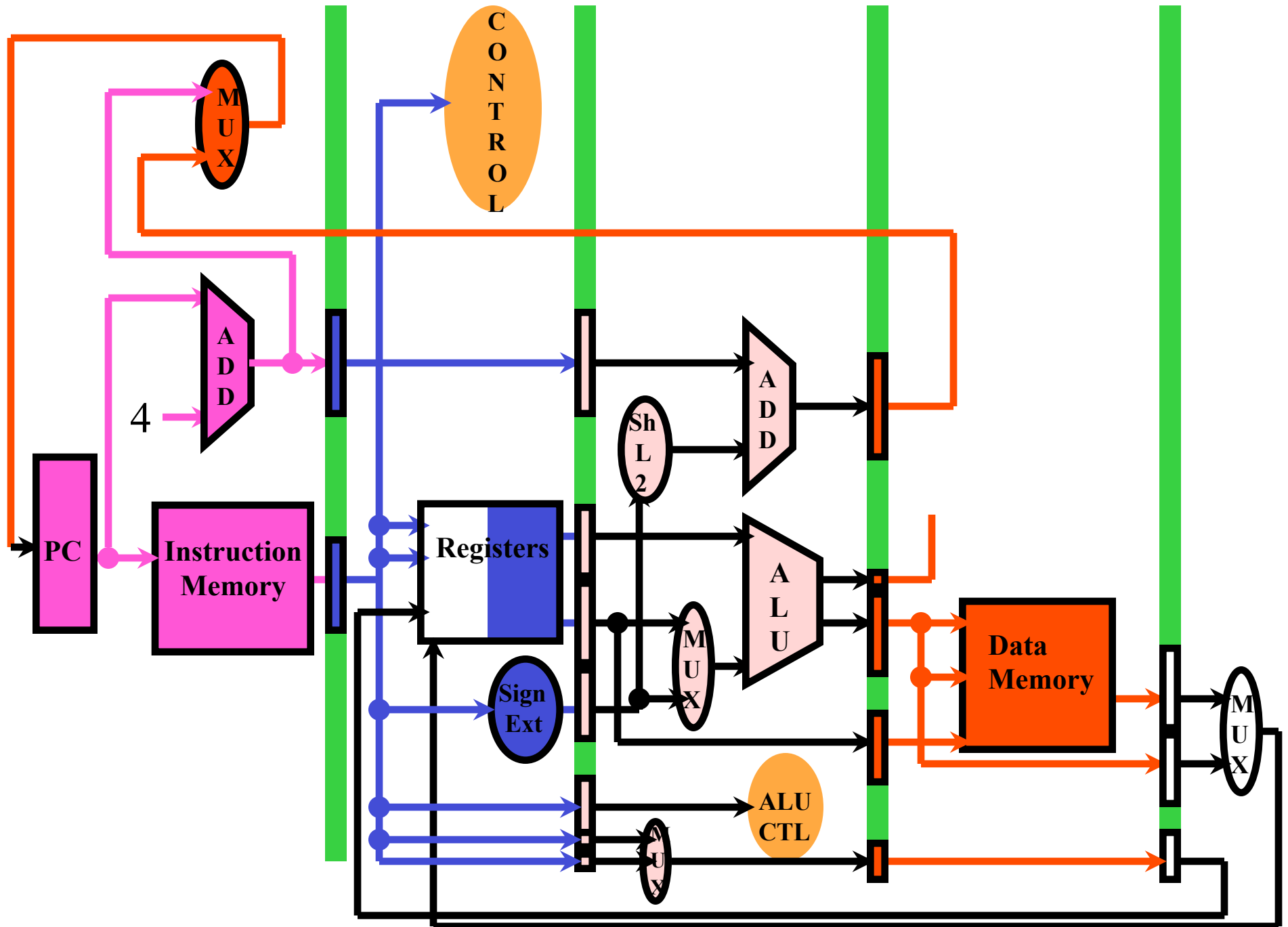
MEMORY  
ACCESS

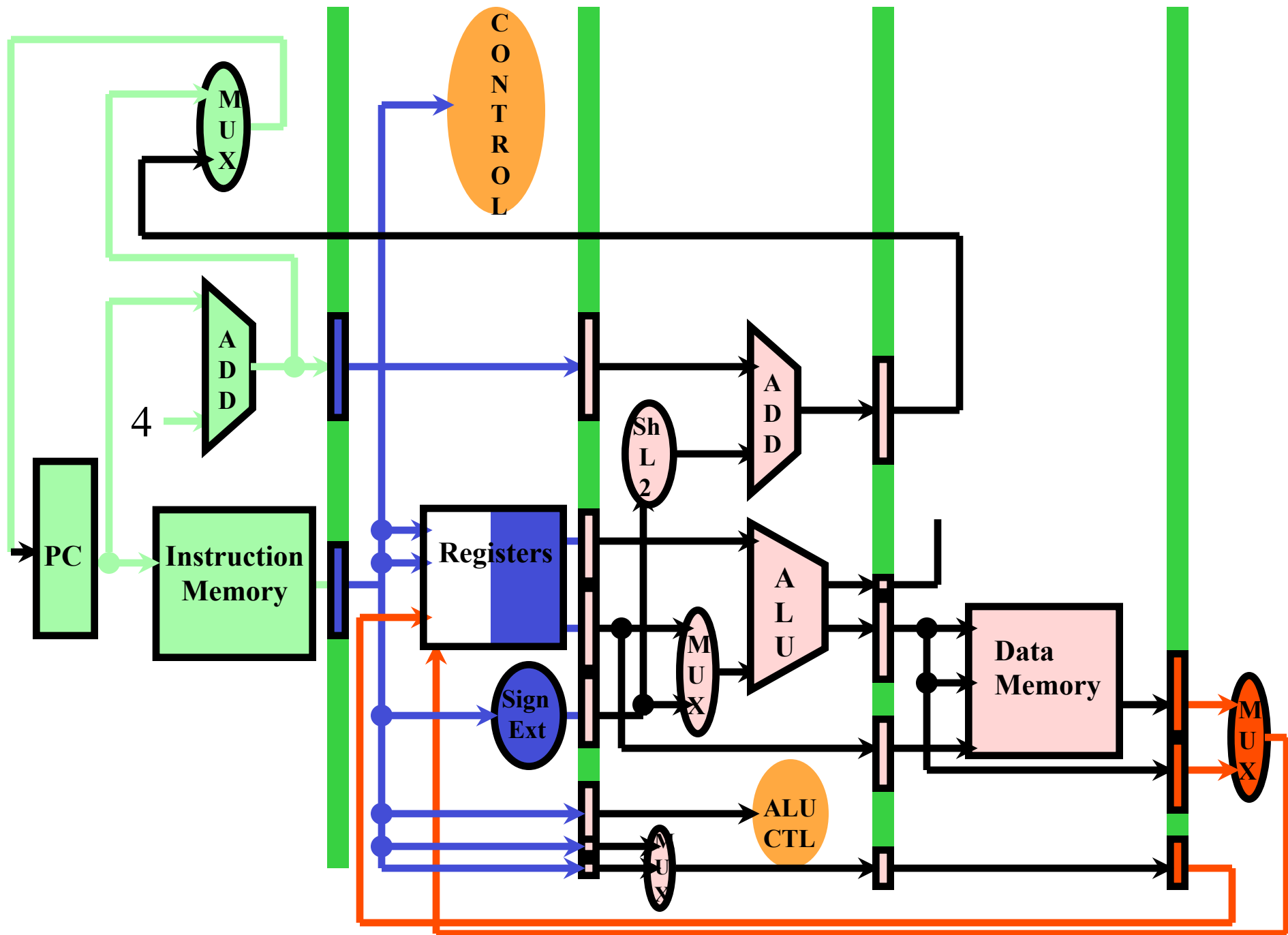
WRITE  
BACK

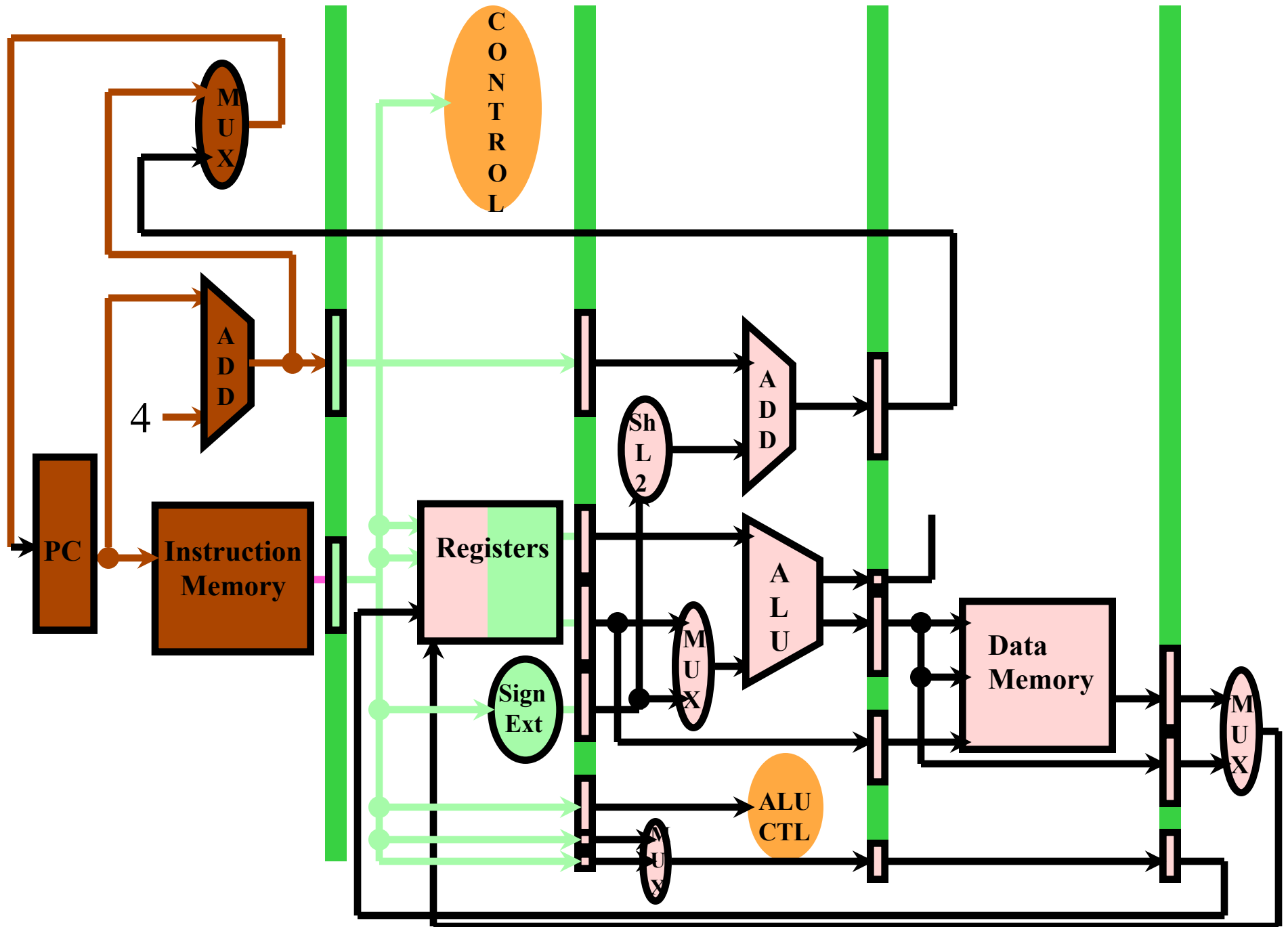


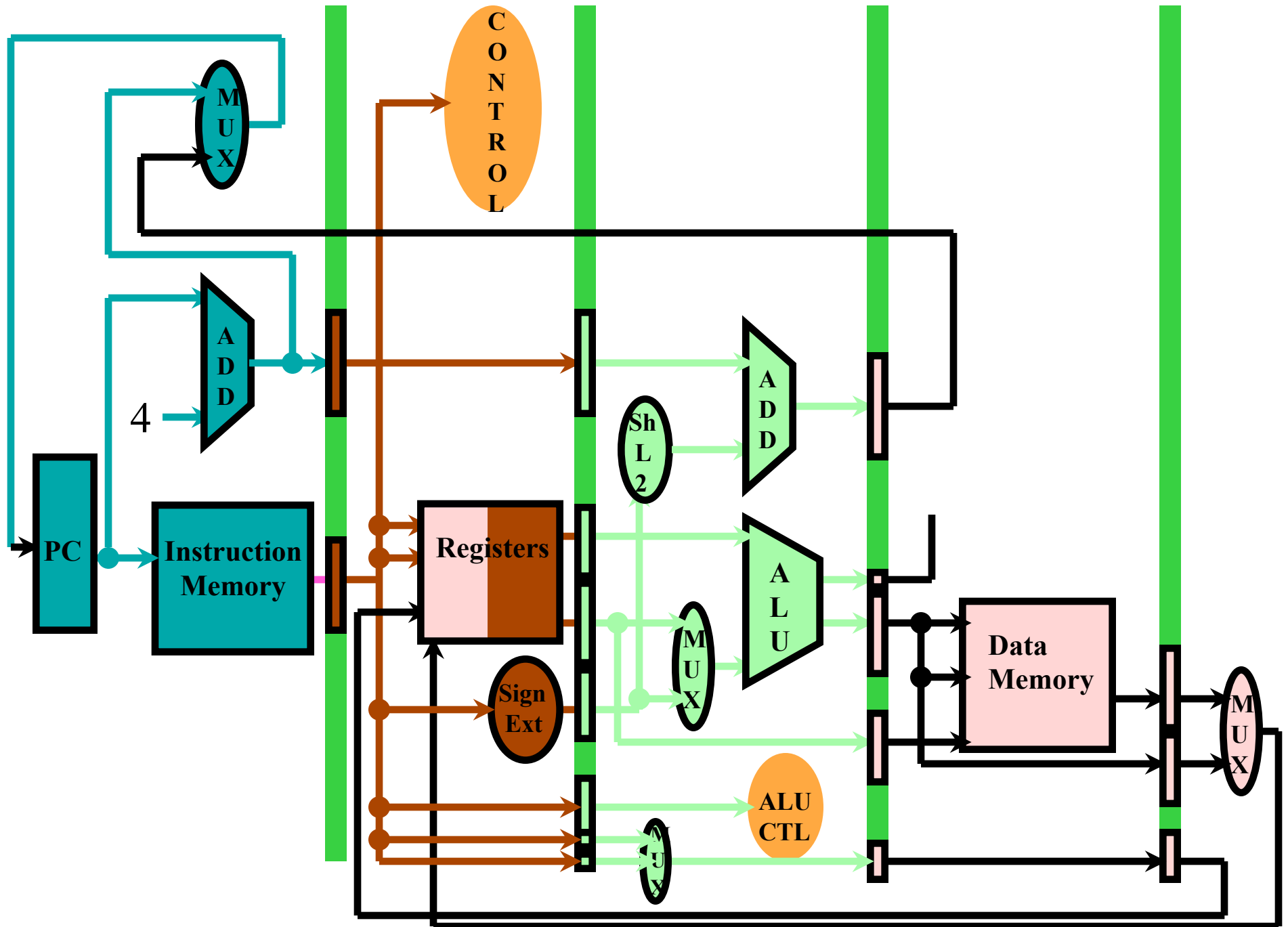








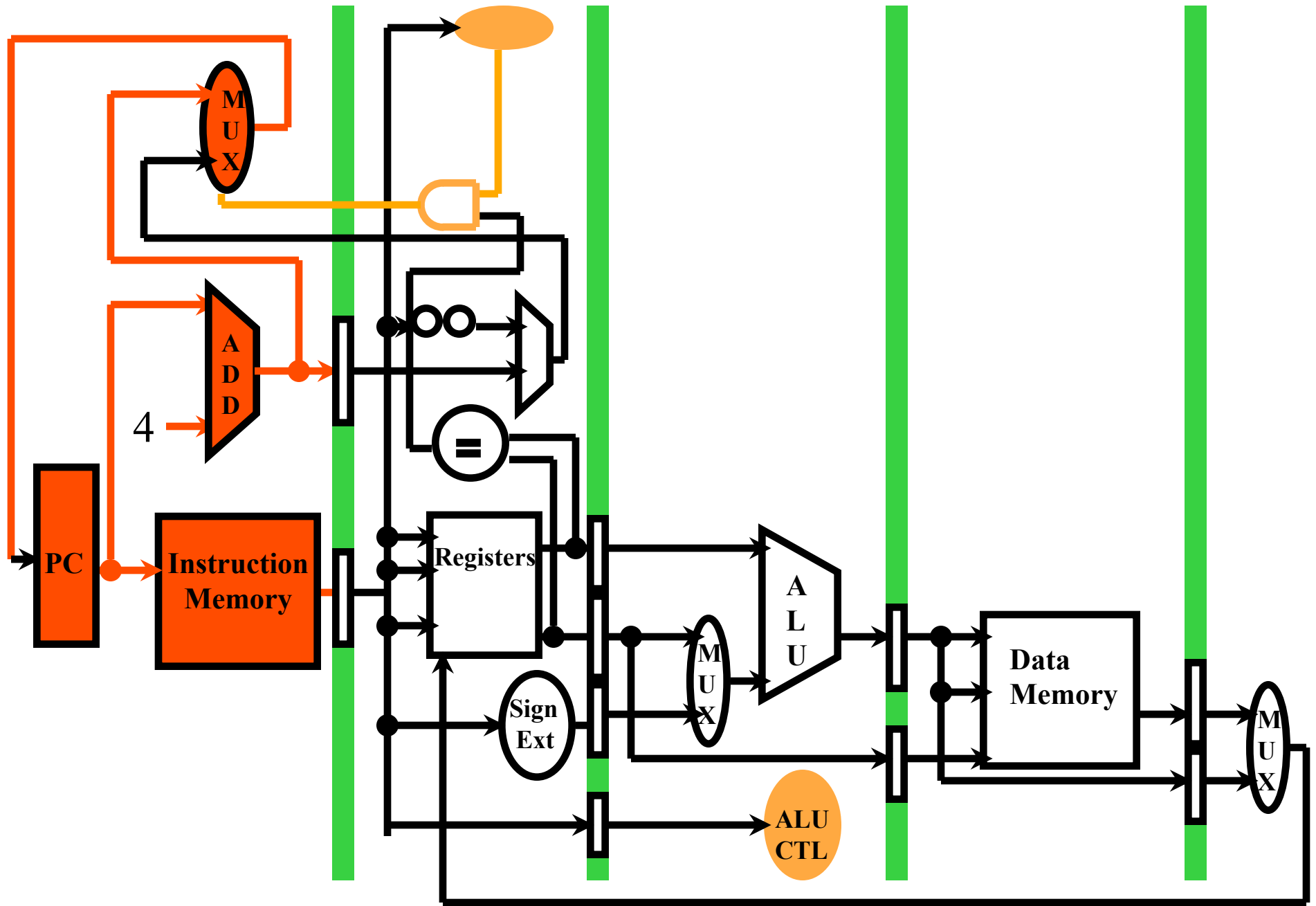




# Branch Hazard

Accelerate Branch Target Computation

Accelerate Branch Detection



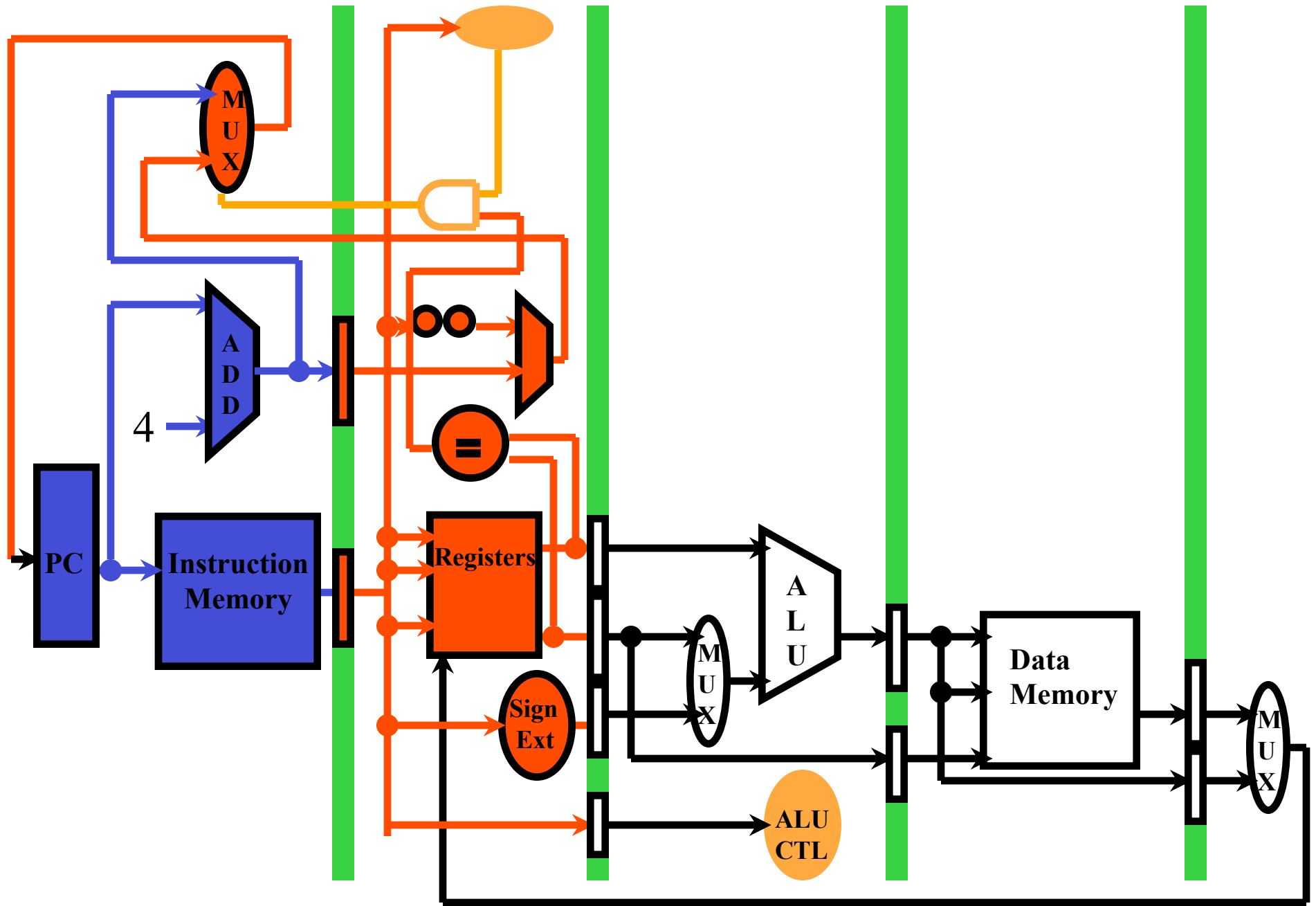
INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK



INSTRUCTION  
FETCH

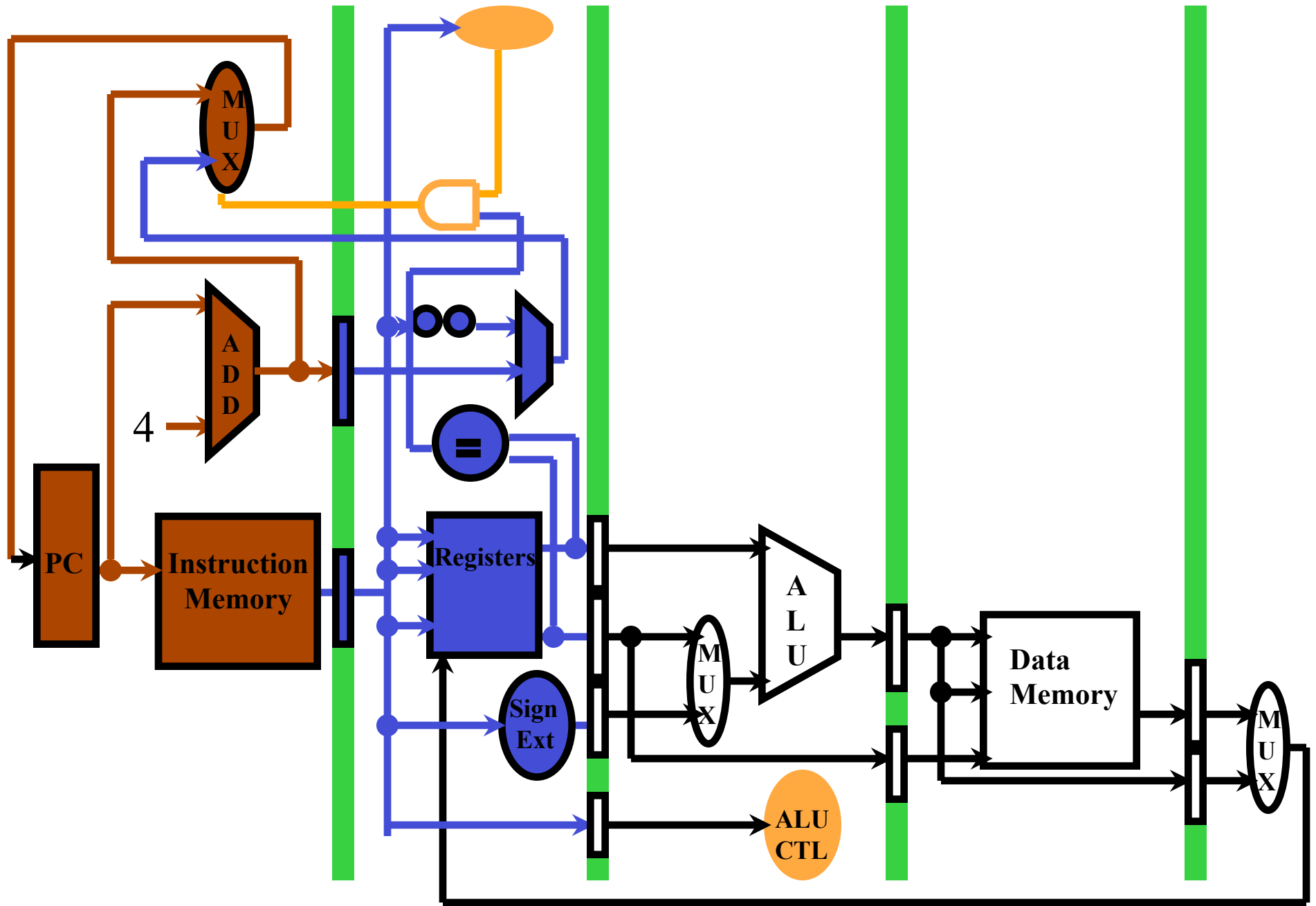
INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK





INSTRUCTION  
FETCH

INSTR DECODE  
REG FETCH

EXECUTE/  
ADDRESS CALC

MEMORY  
ACCESS

WRITE  
BACK