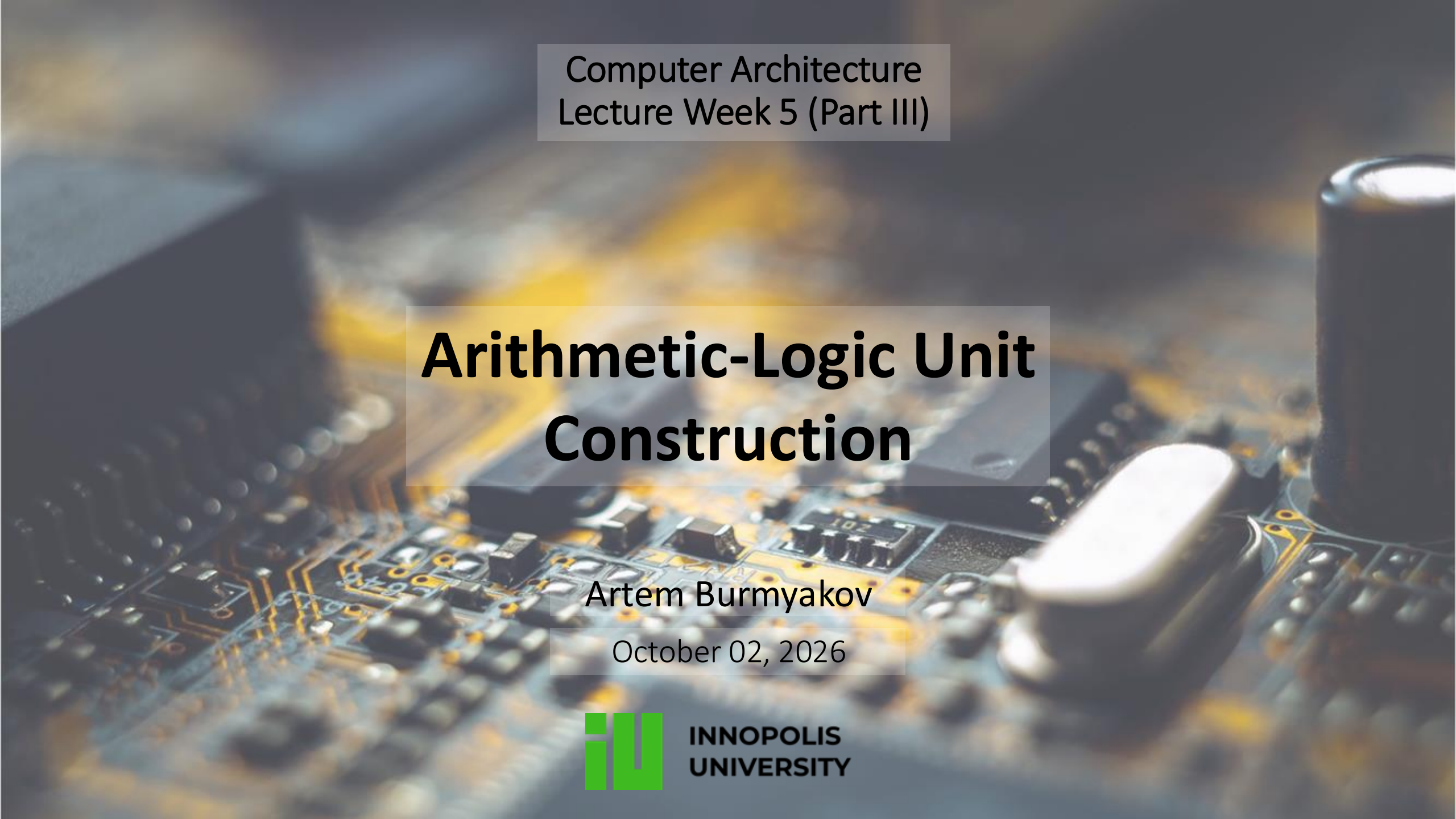




Computer Architecture
Lecture Week 5 (Part III)

Arithmetic-Logic Unit Construction

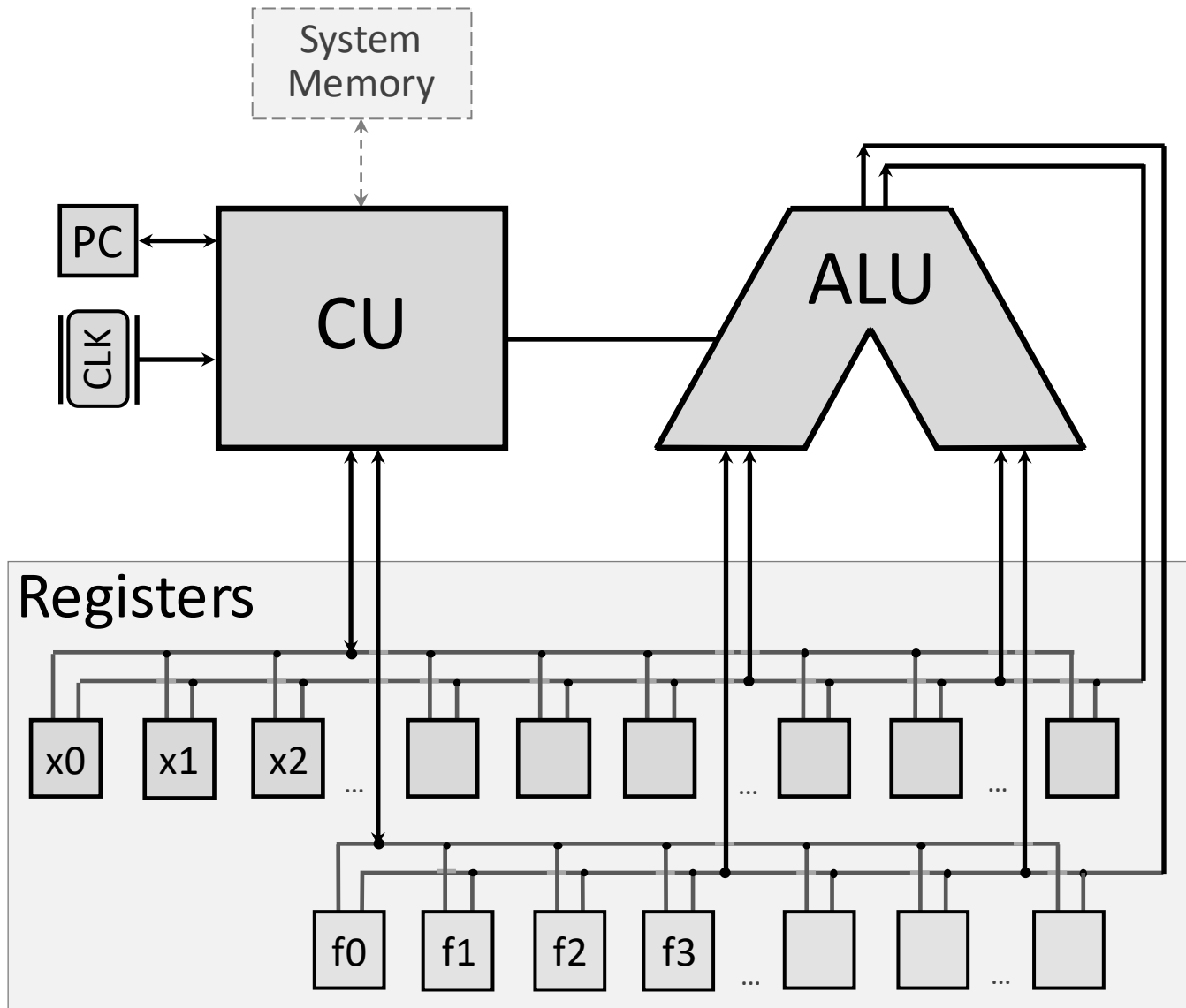
Artem Burmyakov

October 02, 2026

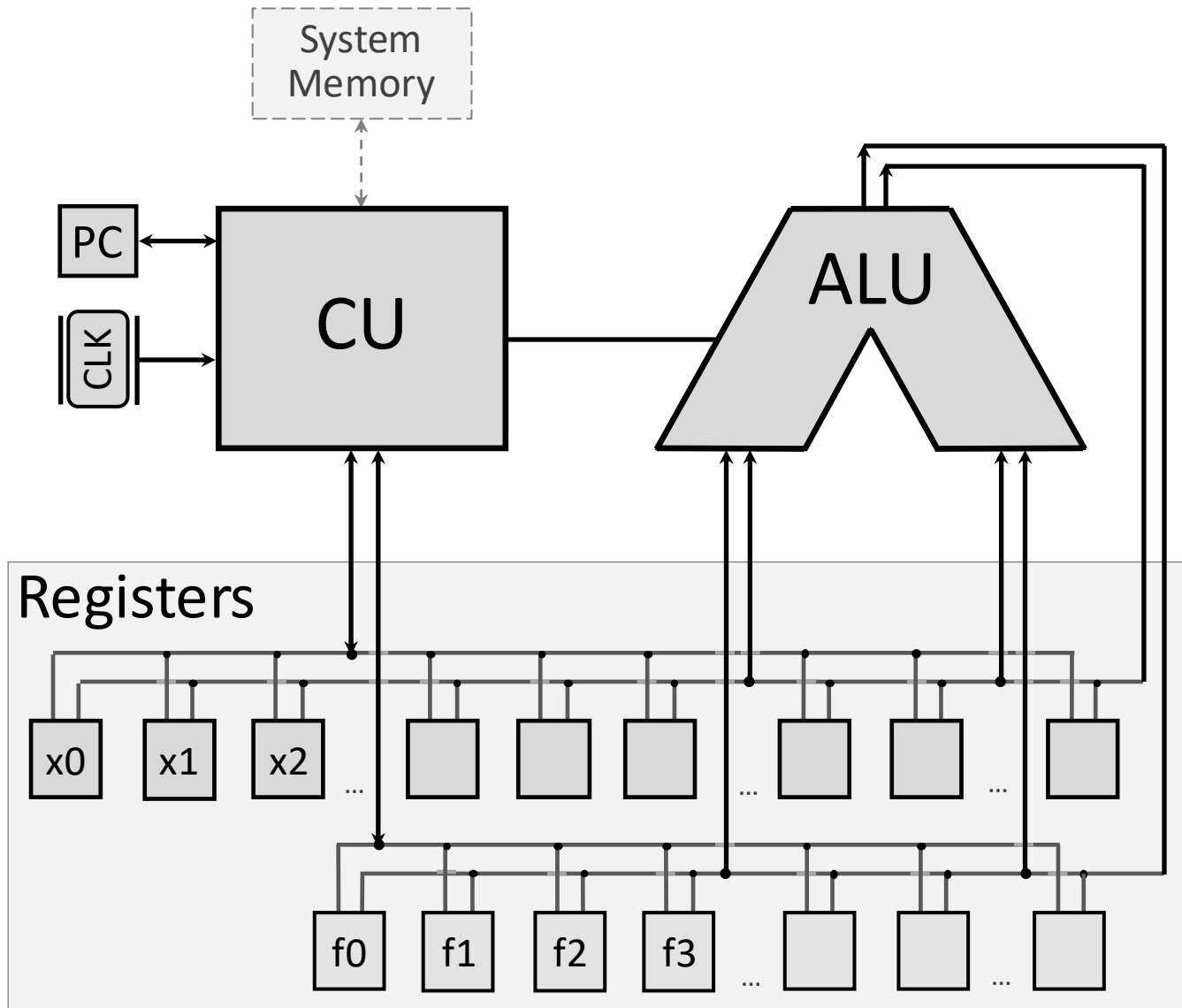


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Processor: Key Components



Processor: Key Components



Control Unit (CU):

- 1) To access memory units;
- 2) To synchronise instructions execution;
- 3) Other

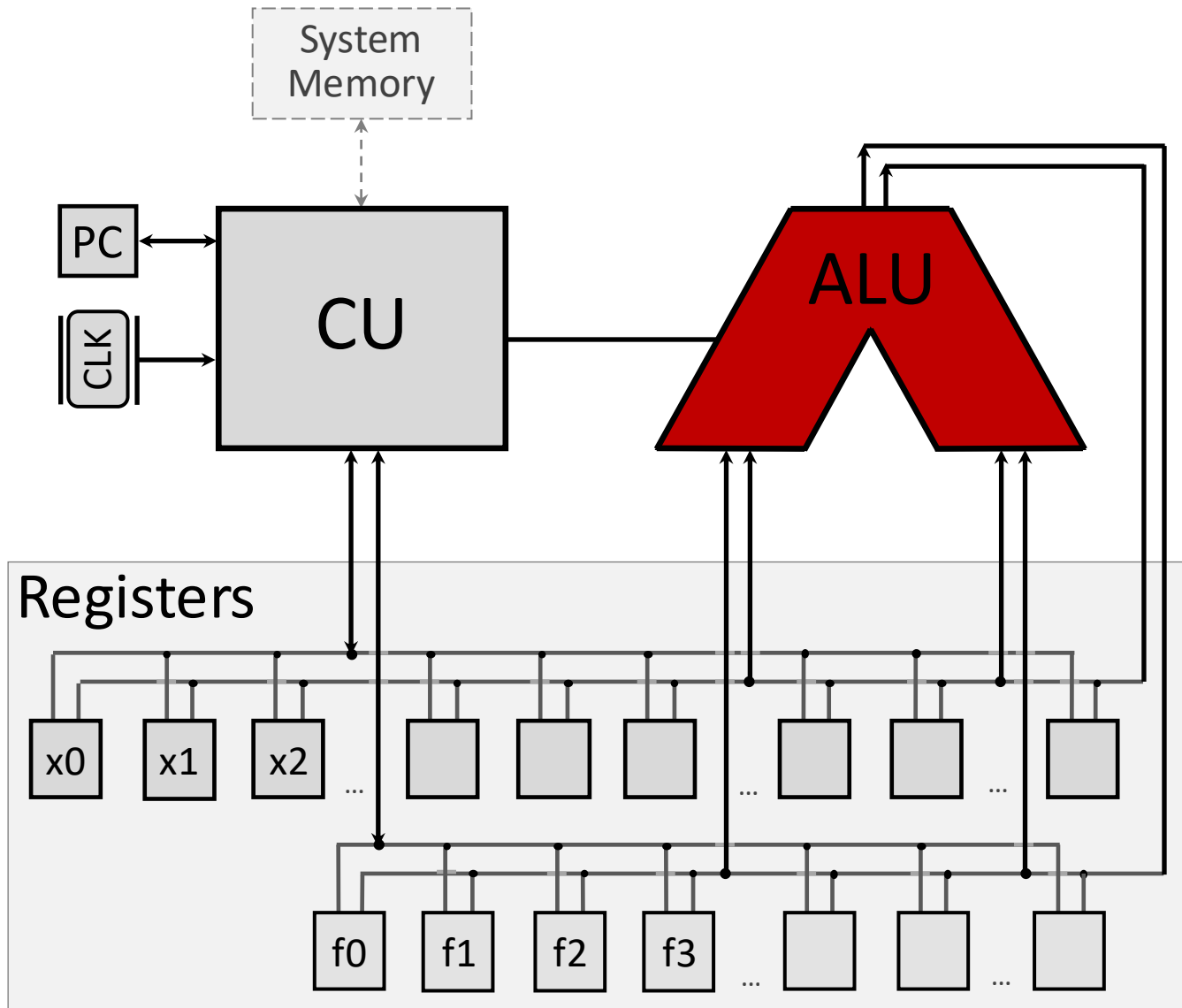
Arithmetic Logic Unit (ALU):

- 1) To implement arithmetic and logic instructions

Registers:

- 1) To synchronise input arguments to ALU;
- 2) To decode instructions;
- 3) To capture a result from ALU

Arithmetic-Logic Unit: Hardware Implementation



Control Unit (CU):

- 1) To access memory units;
- 2) To synchronise instructions execution;
- 3) Other

Arithmetic Logic Unit (ALU):

- ## 1) To implement arithmetic and logic instructions

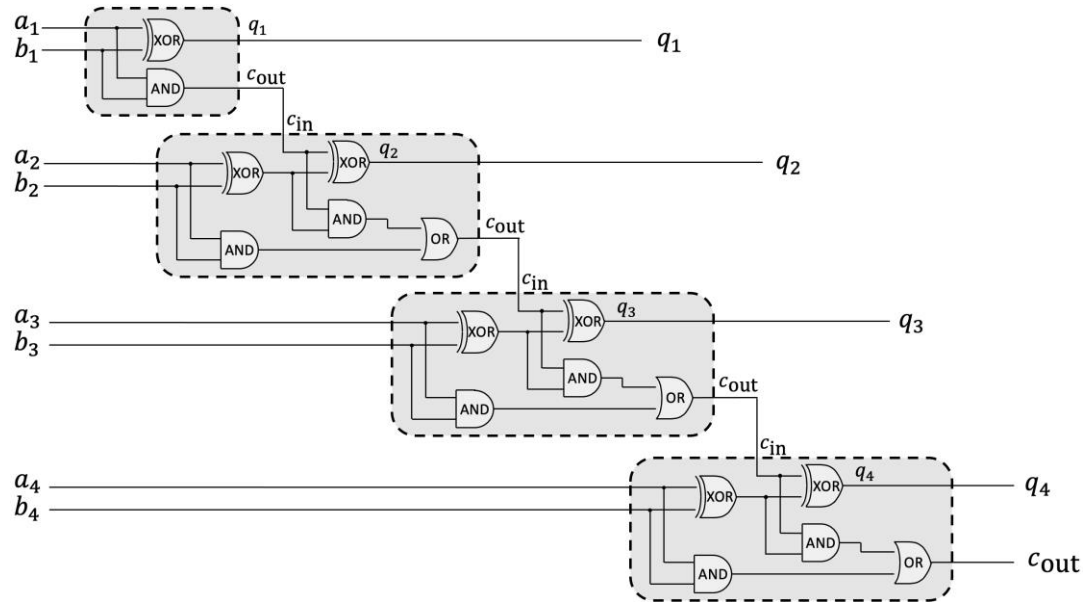
Registers:

- 1) To synchronise input arguments to ALU;
- 2) To decode instructions;
- 3) To capture a result from ALU

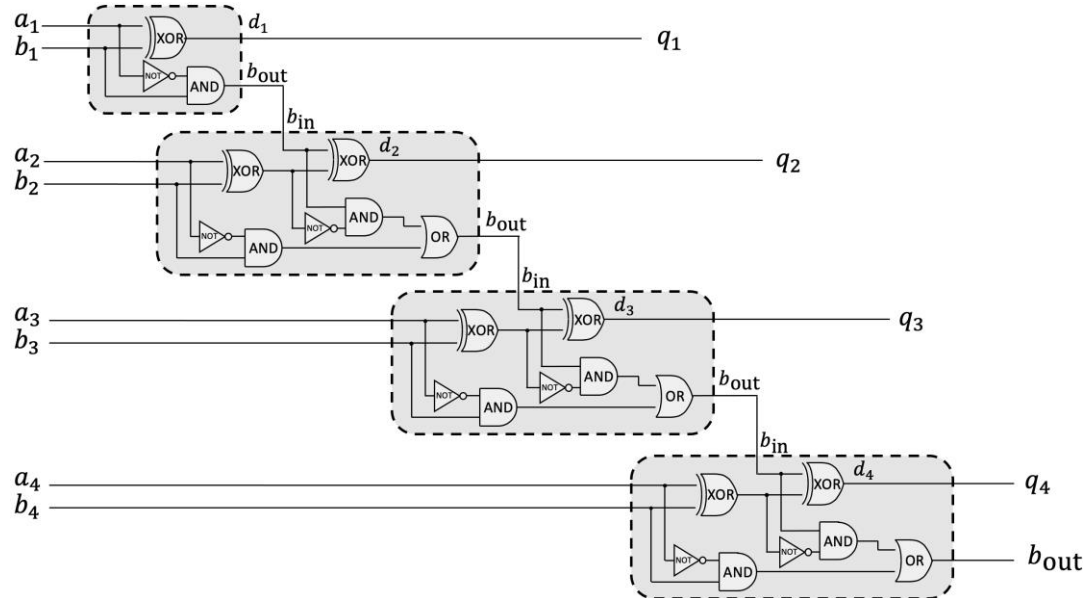
ALU Hardware Implementation

Considered instructions: “+”, “-”, “*”, “/”

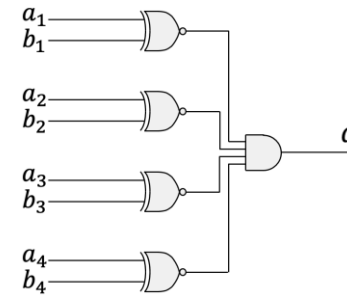
Adder (+)



Subtractor (-)

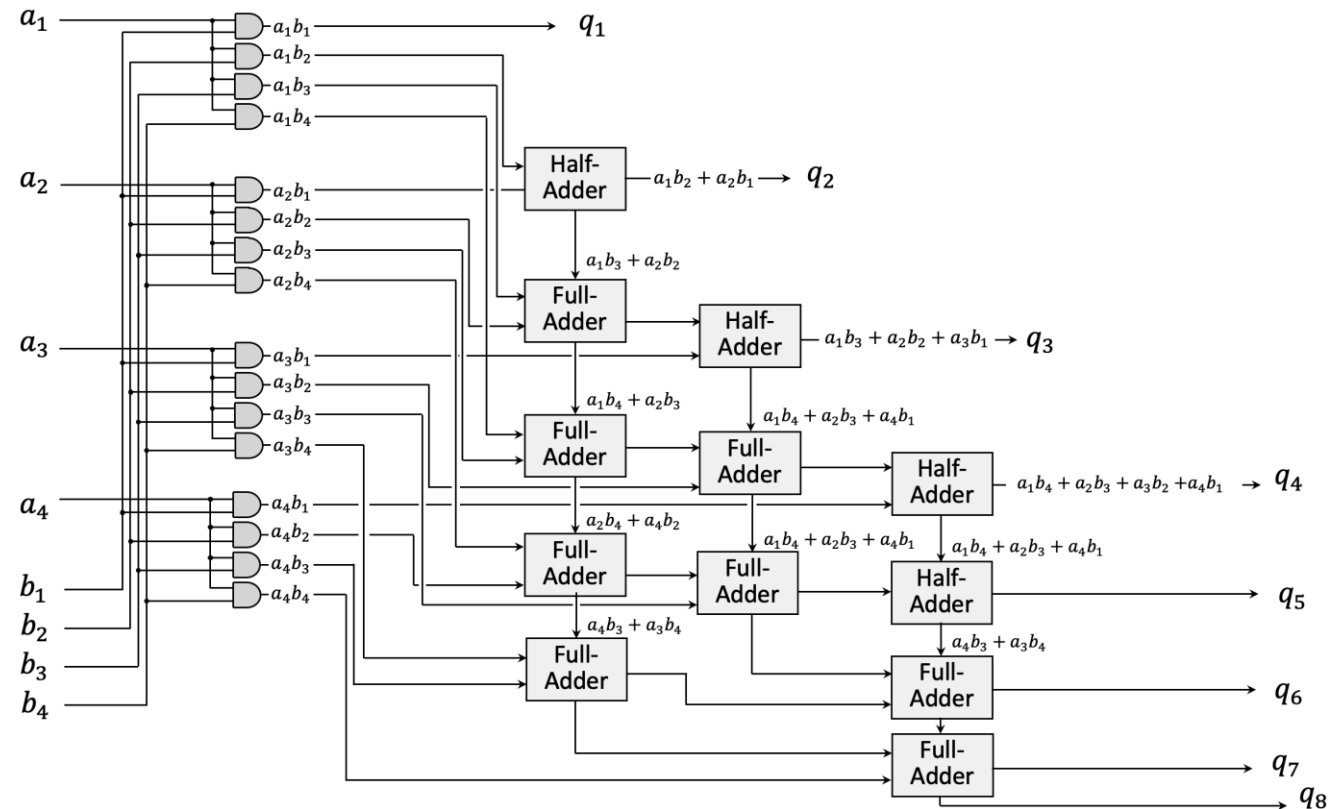


Equality Checker (=?)



Recap:
Some Instructions
Implementations

Multiplicator (*)



ALU Hardware Implementation

Adder “+”

Subtractor “-”

Multiplicator “*”

Divider “/”

ALU Hardware Implementation: Input pins

Arg. 1

Adder “+”

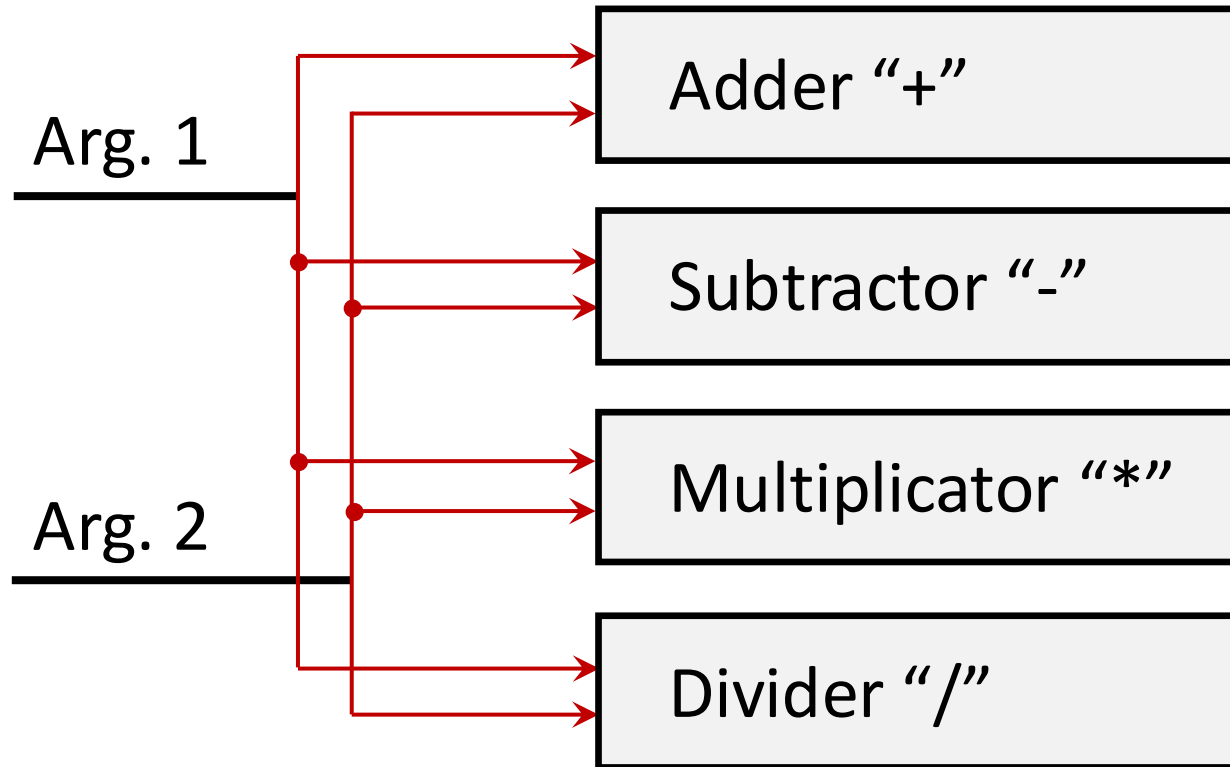
Subtractor “-”

Arg. 2

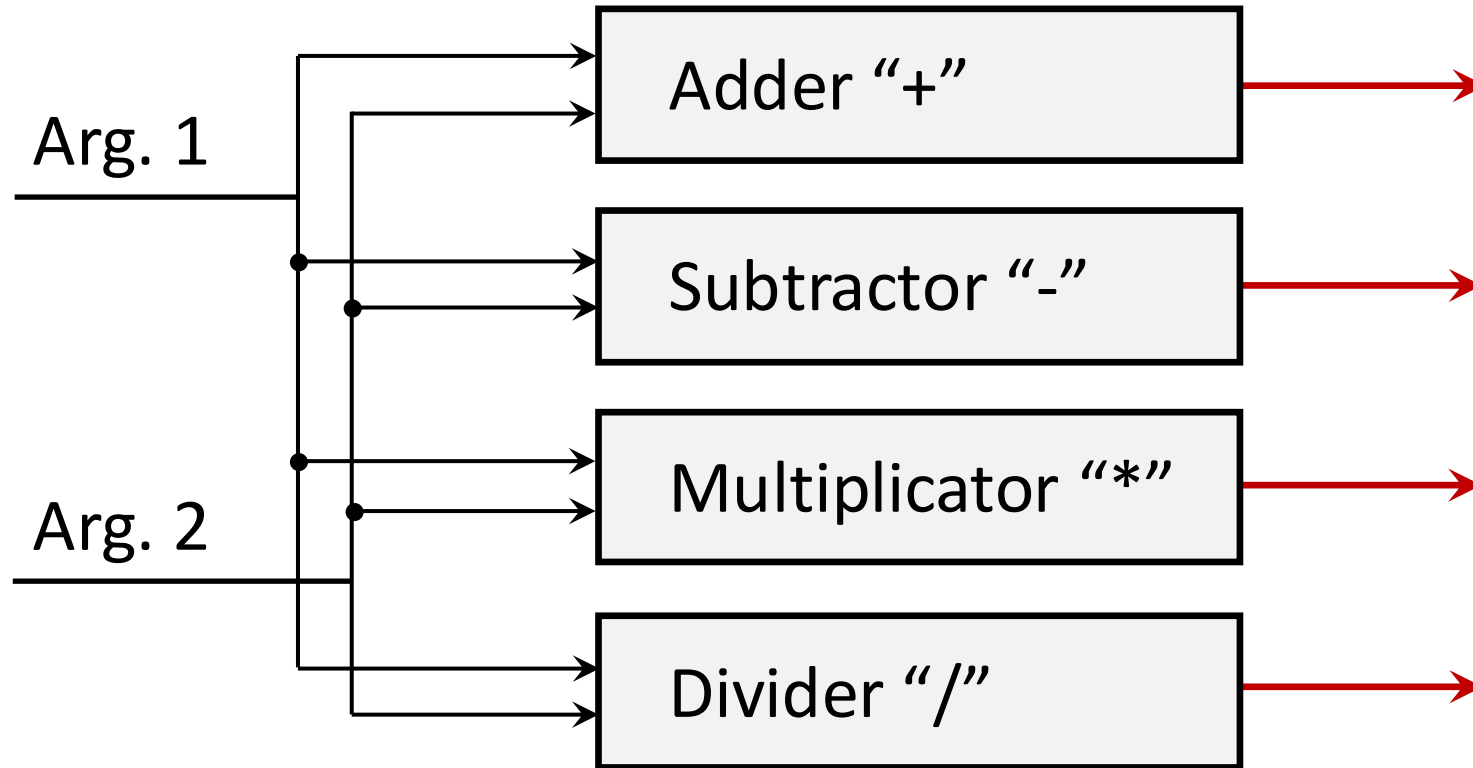
Multiplicator “*”

Divider “/”

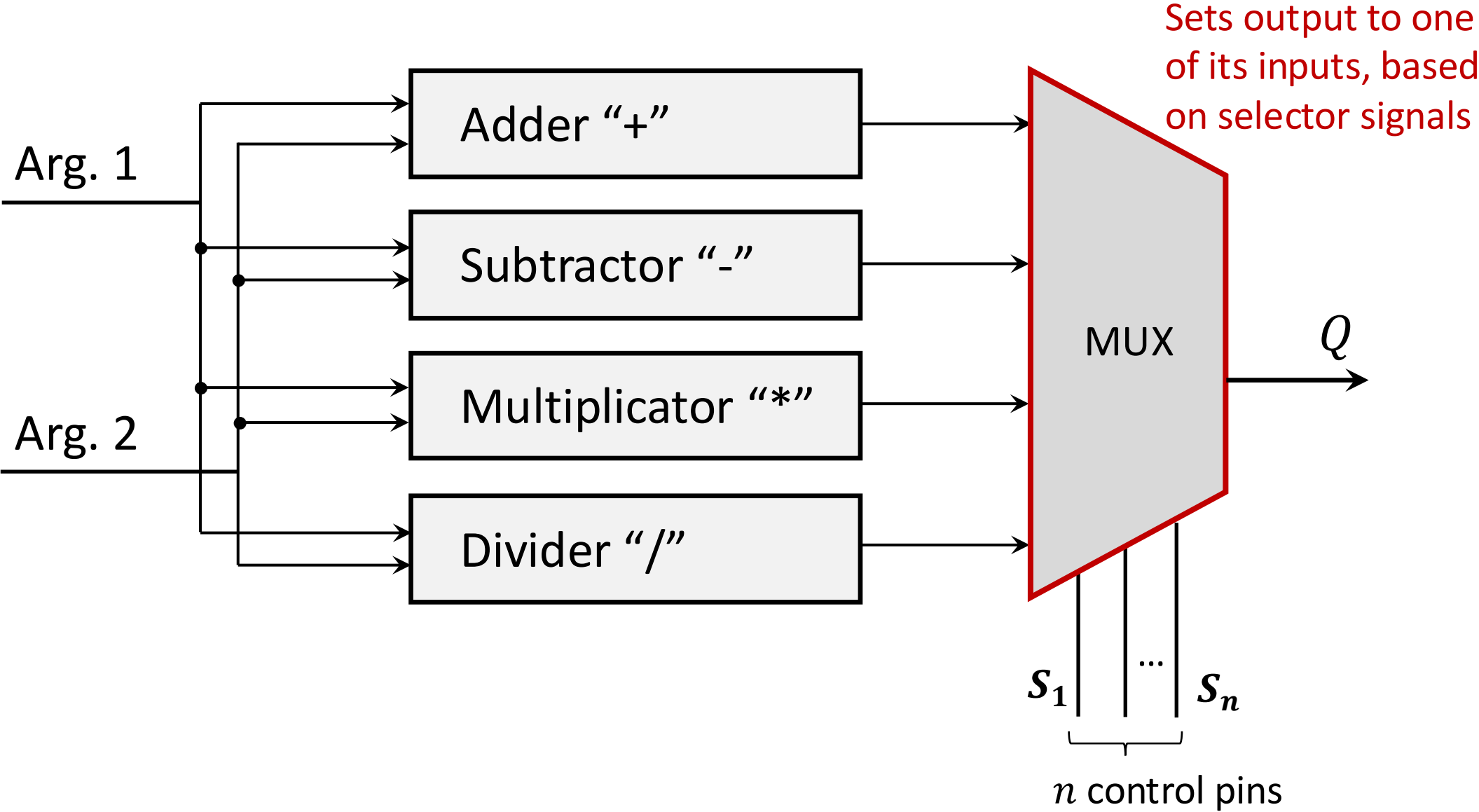
ALU Hardware Implementation: Inputs propagation



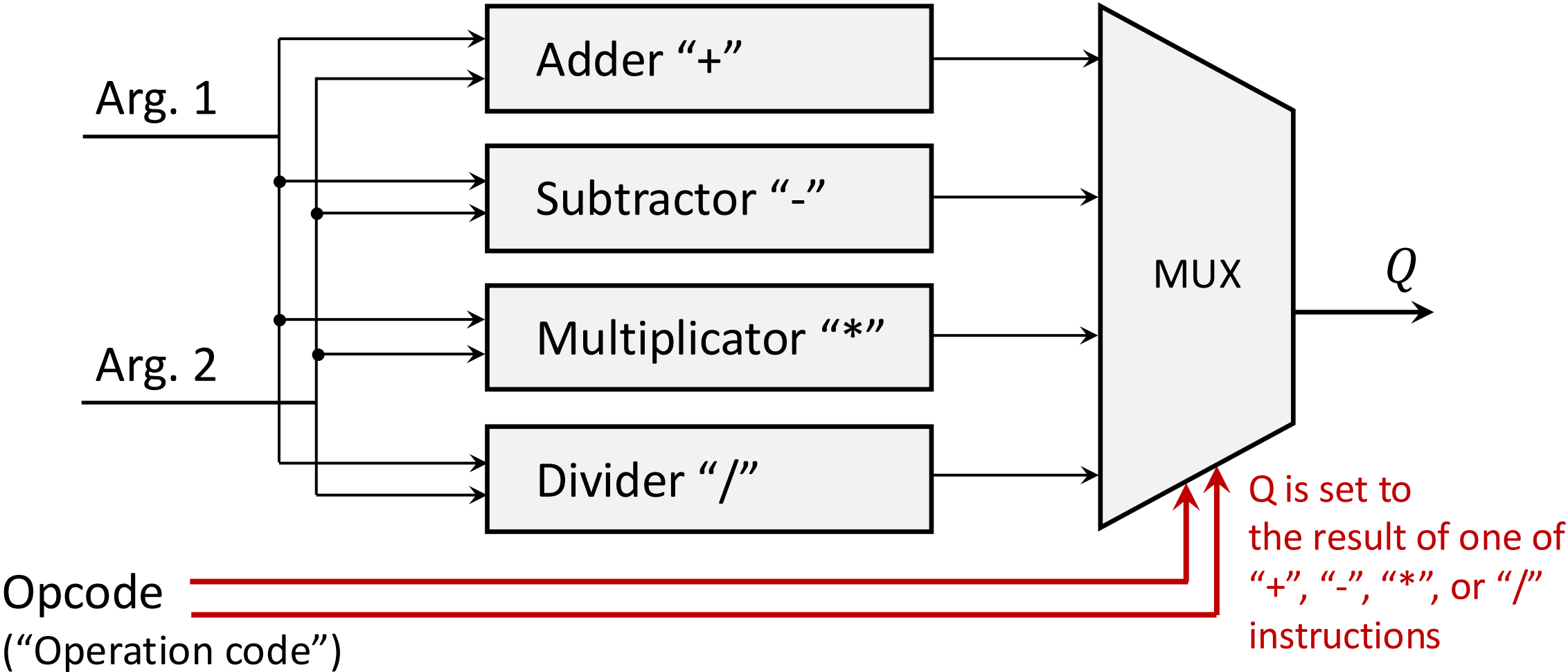
ALU Implementation: Propagation of instructions results



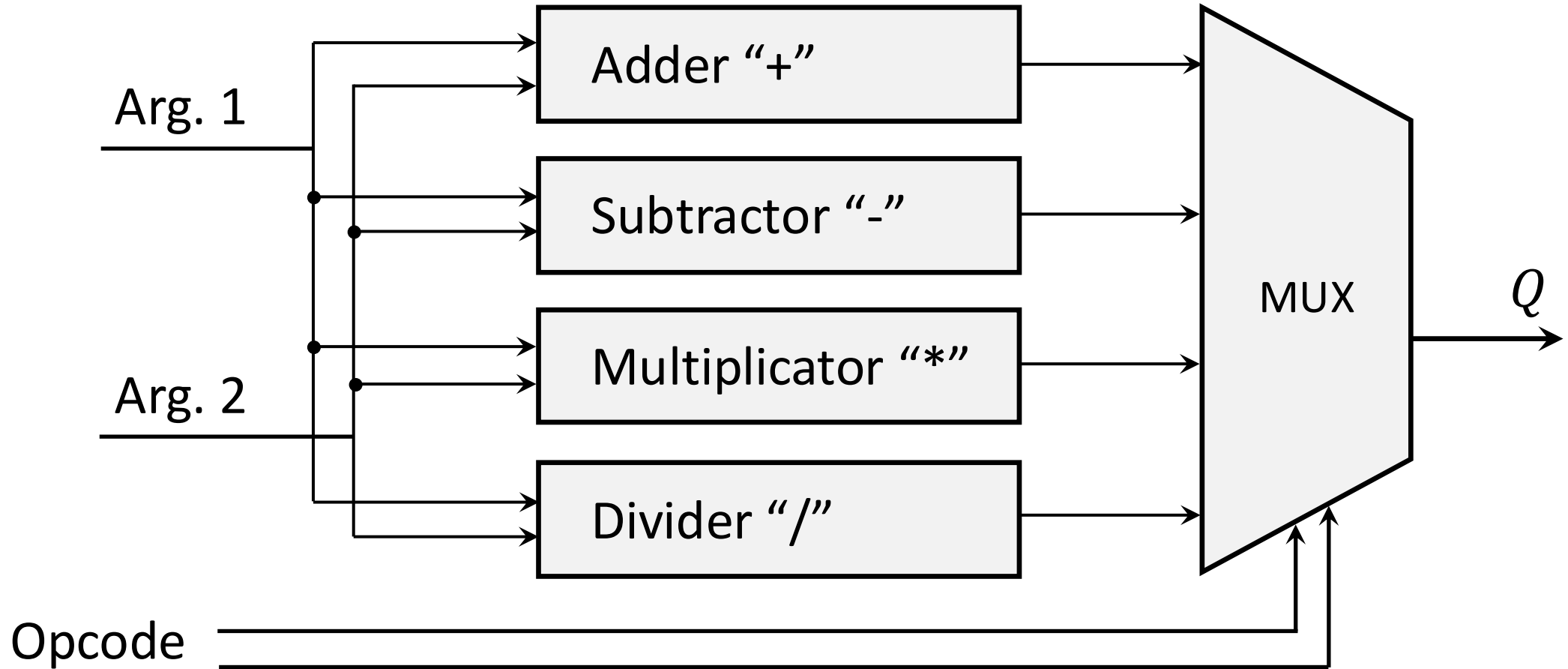
ALU Implementation: Choice of an appropriate instruction result



ALU Implementation: Choice of an appropriate instruction result



ALU Implementation: Choice of an appropriate instruction result



For a simple CPU:

Clock cycle length $\sim$ an execution time of the most time consuming instruction

ALU Implementation: Choice of an appropriate instruction result

