Hardware Multiplication

Multiplicand				1	0	0	1
Multiplier				1	0	1	0
				0	0	0	0
			1	0	0	1	0
		0	0	0	0	0	0
	1	0	0	1	0	0	0
Product	1	0	1	1	0	1	0

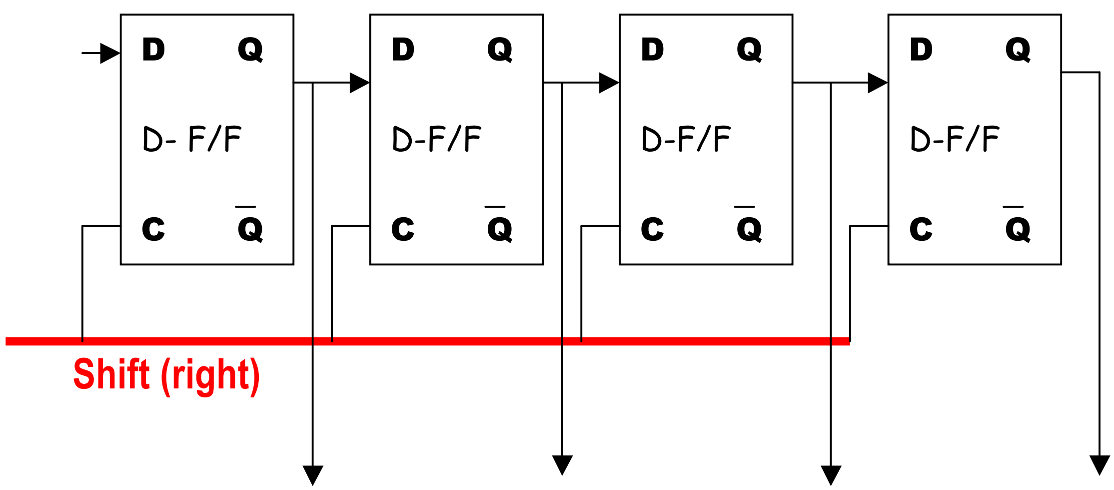
The basic operations are ADD and SHIFT. Now let us see how it is implemented by hardware.

By now, you know all the **building blocks**.

The Building Blocks

A shift register

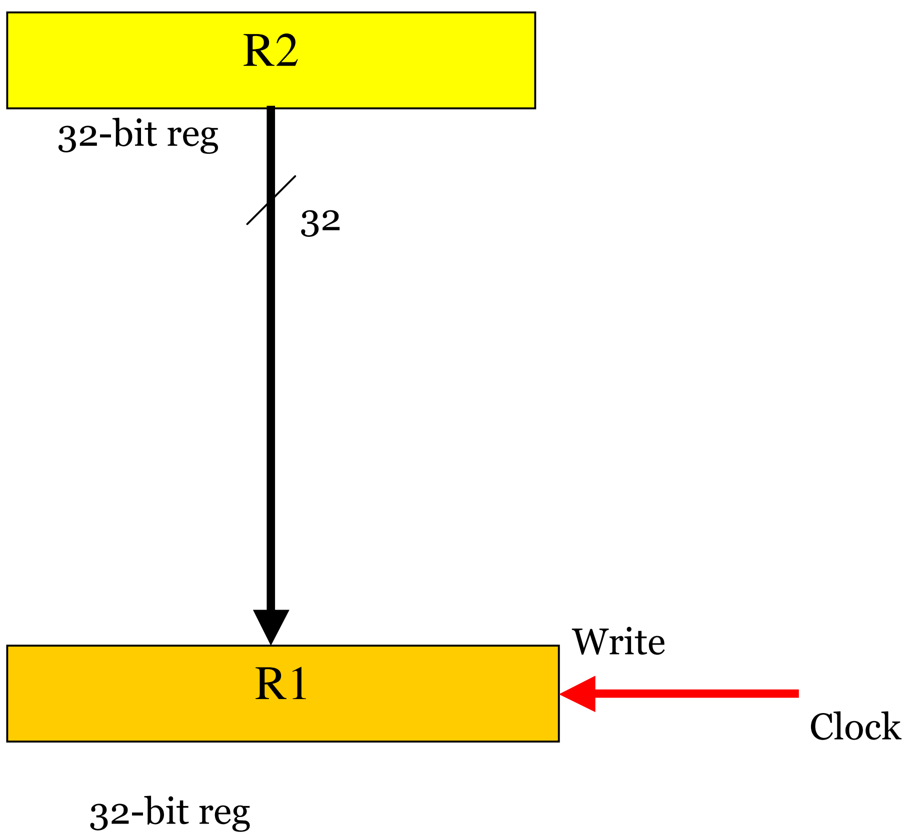
Review how a D flip-flop works



With each clock pulse on the shift line, data moves one place to the right.

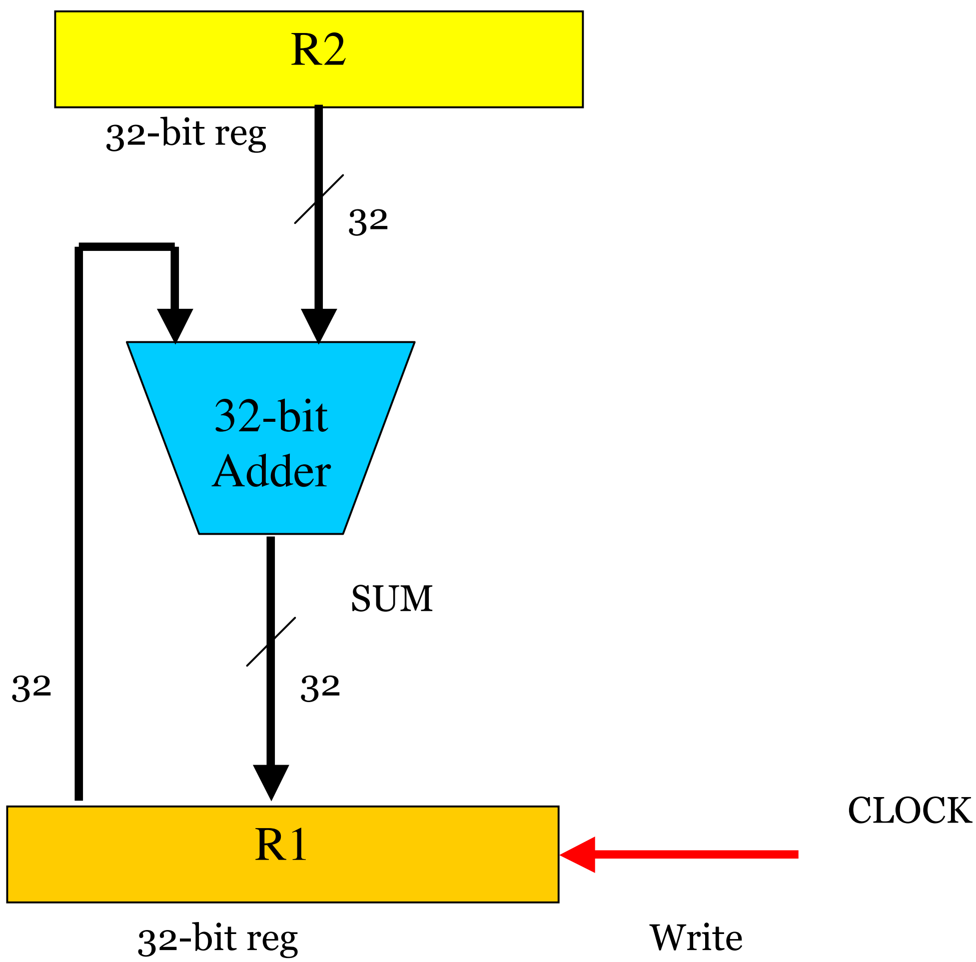
Executing r1:= r2

How to implement a simple register transfer r1:= r2?



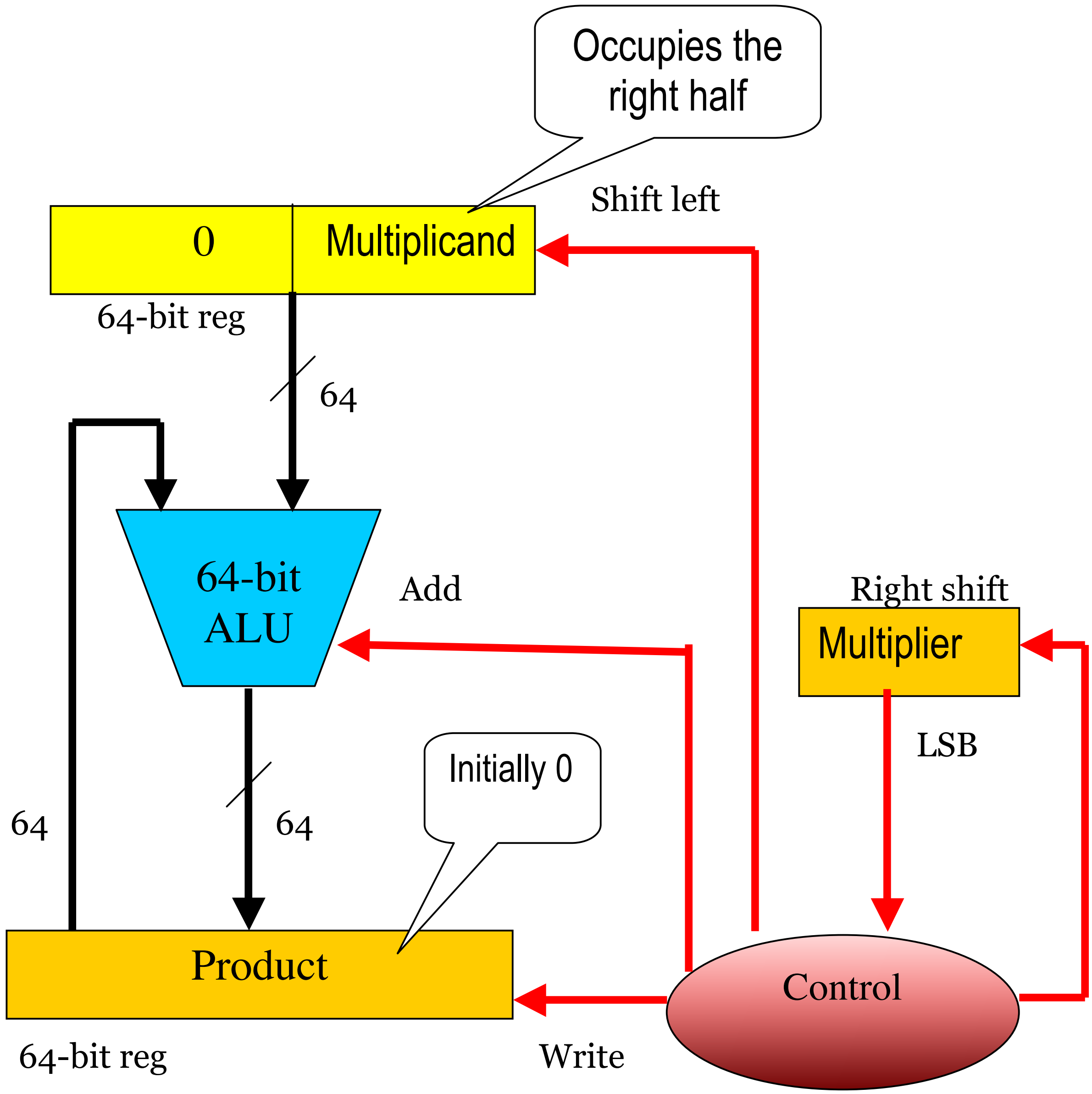
It requires only one clock pulse to complete the operation.

Executing r1:= r1 + r2



It requires only one clock pulse to complete the operation.

A Hardware Multiplier



If LSB of Multiplier = 1 then *add* else *skip*;

Shift left multiplicand & shift right multiplier

How to implement the control unit?

Division

The restoring division algorithm follows the simple idea from the elementary school days. It involves subtraction and shift. Here is an implementation by hardware