Projet PARM

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Objectifs du projet

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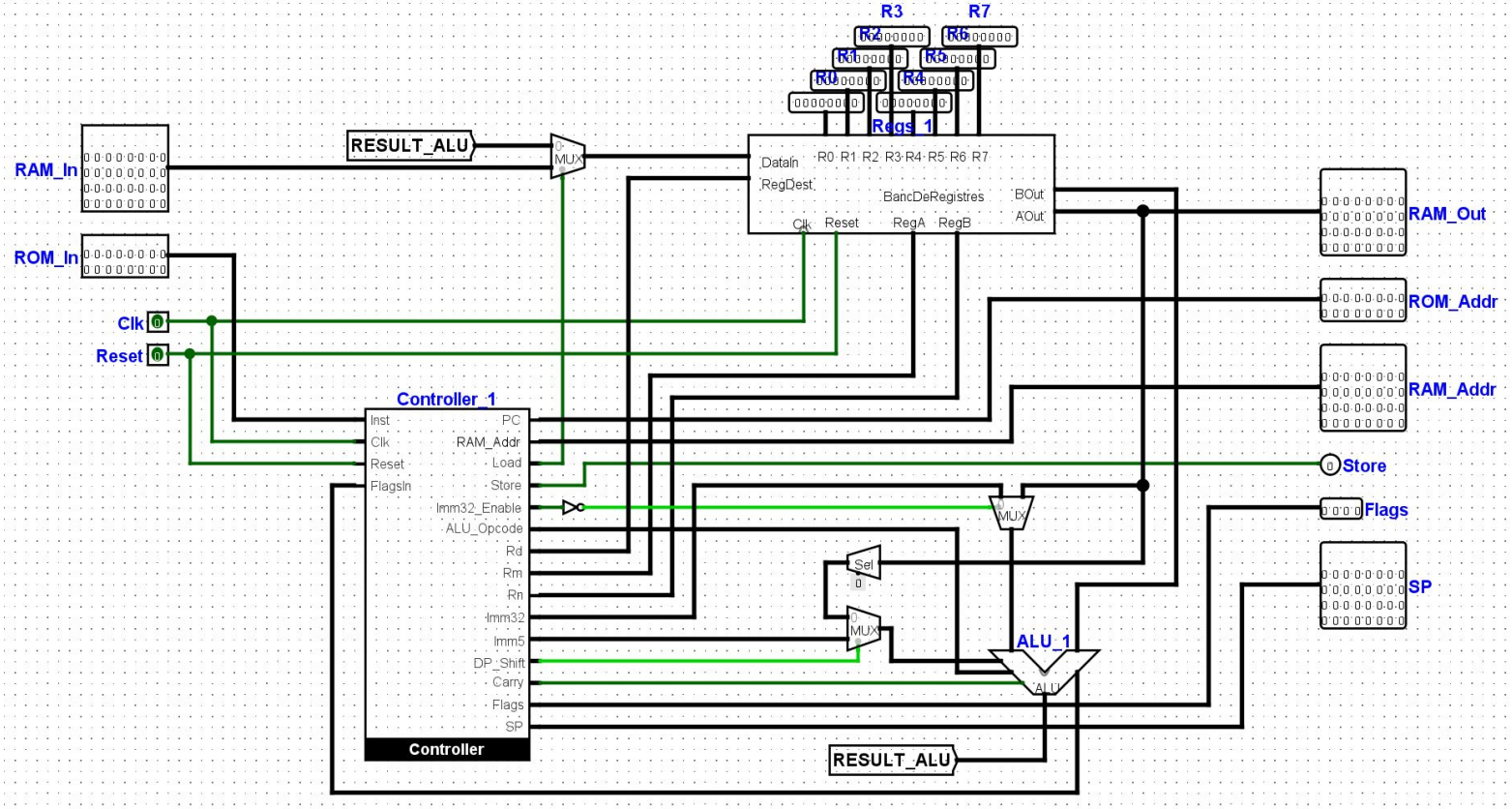
- Reproduire un microprocesseur ARM Cortex-M0
- Fonctionnement simplifié :
  - Instructions sur 16 bits
  - Seulement 16 instructions dans l'ALU
  - Données sur 32 bits
  - Adressage RAM/ROM sur 9 bits
  - Adressage RAM uniquement sur la pile (en utilisant le Stack Pointer)

Vue générale du CPU

Chemin de données



Banc de registres

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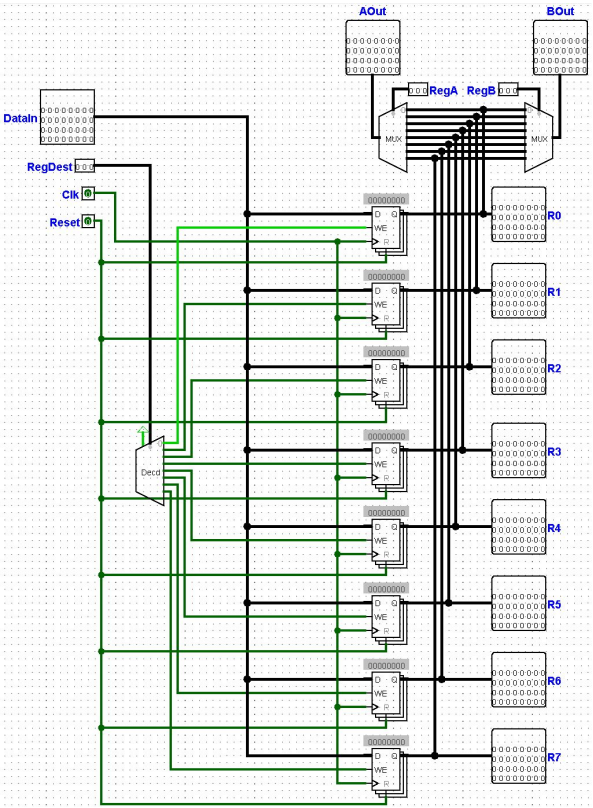
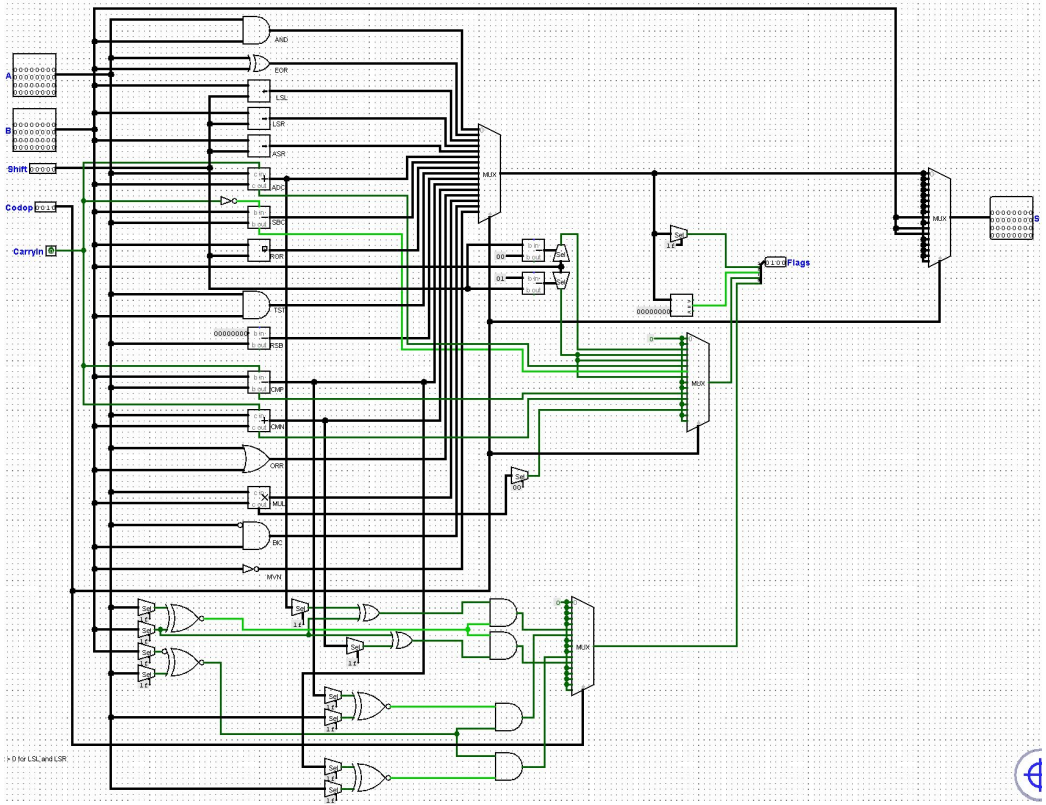


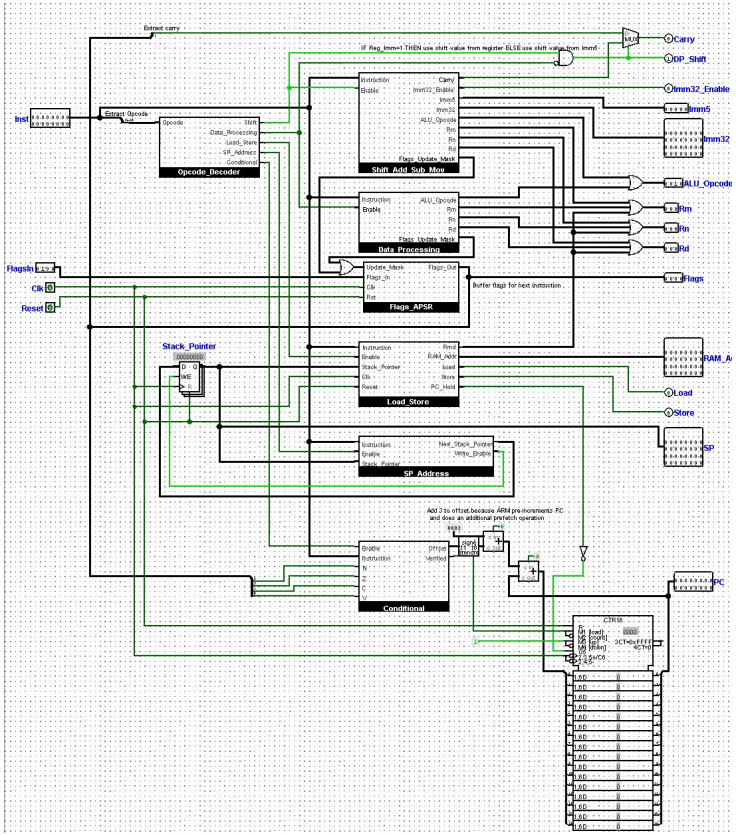
ALU

The Arithmetic and Logical Unit

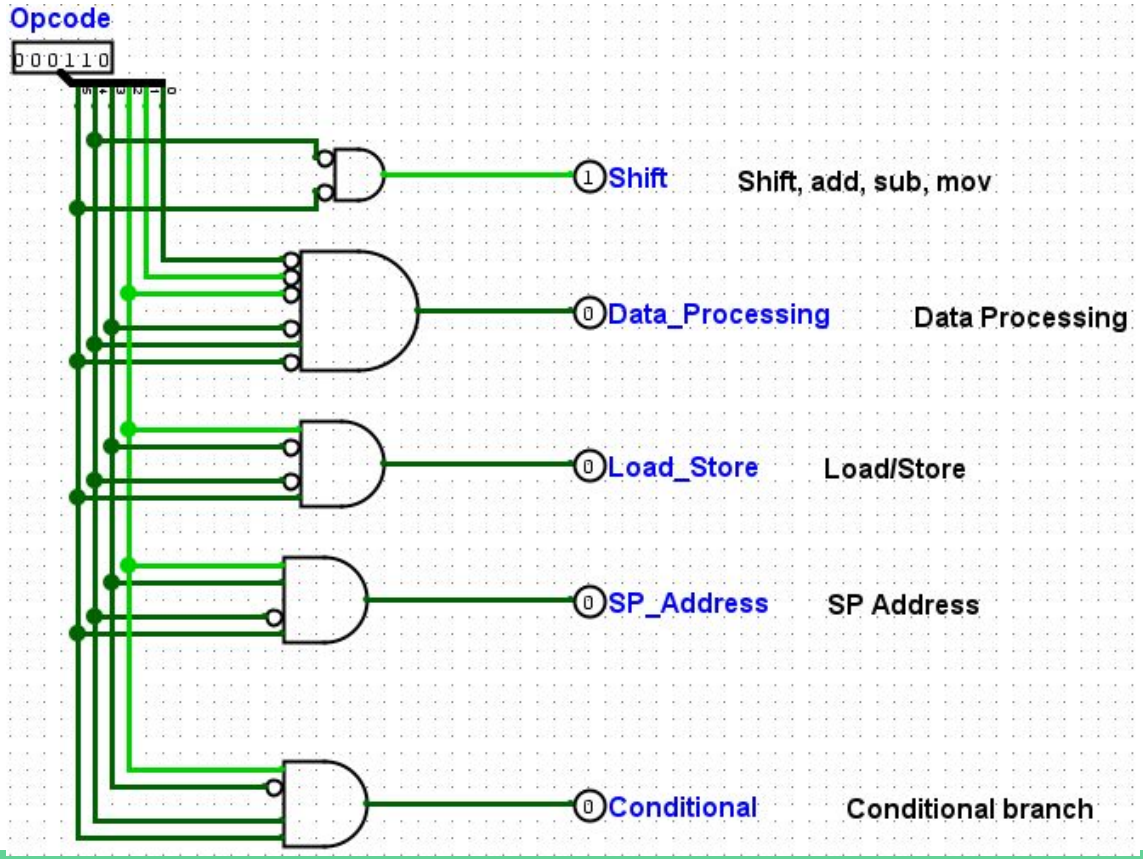


Le contrôleur

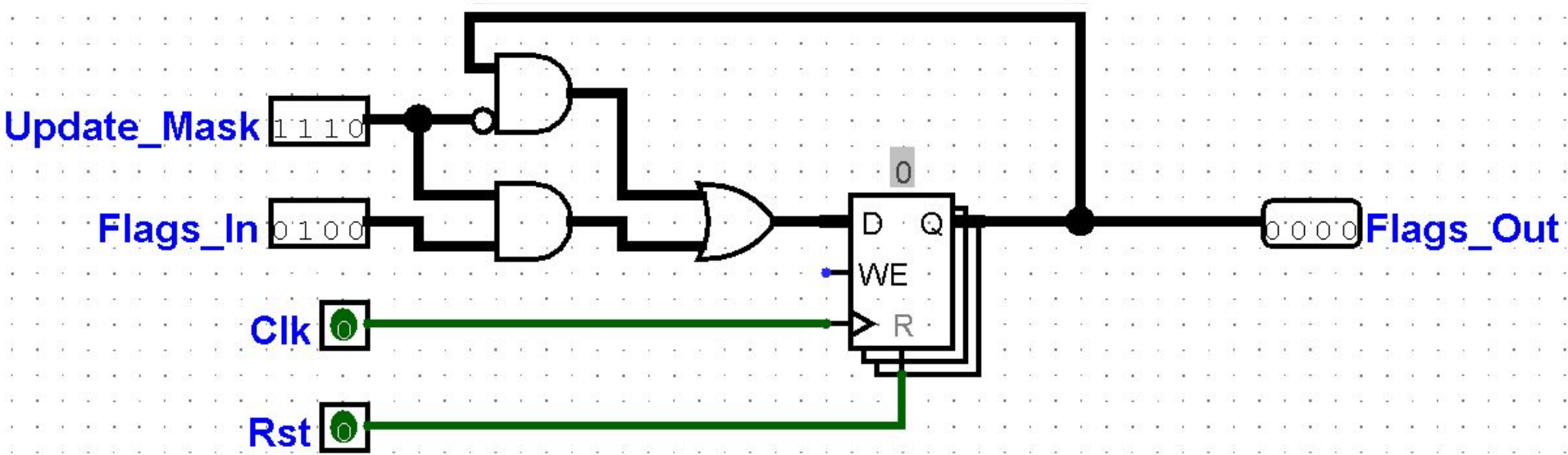
Vue globale du Controller



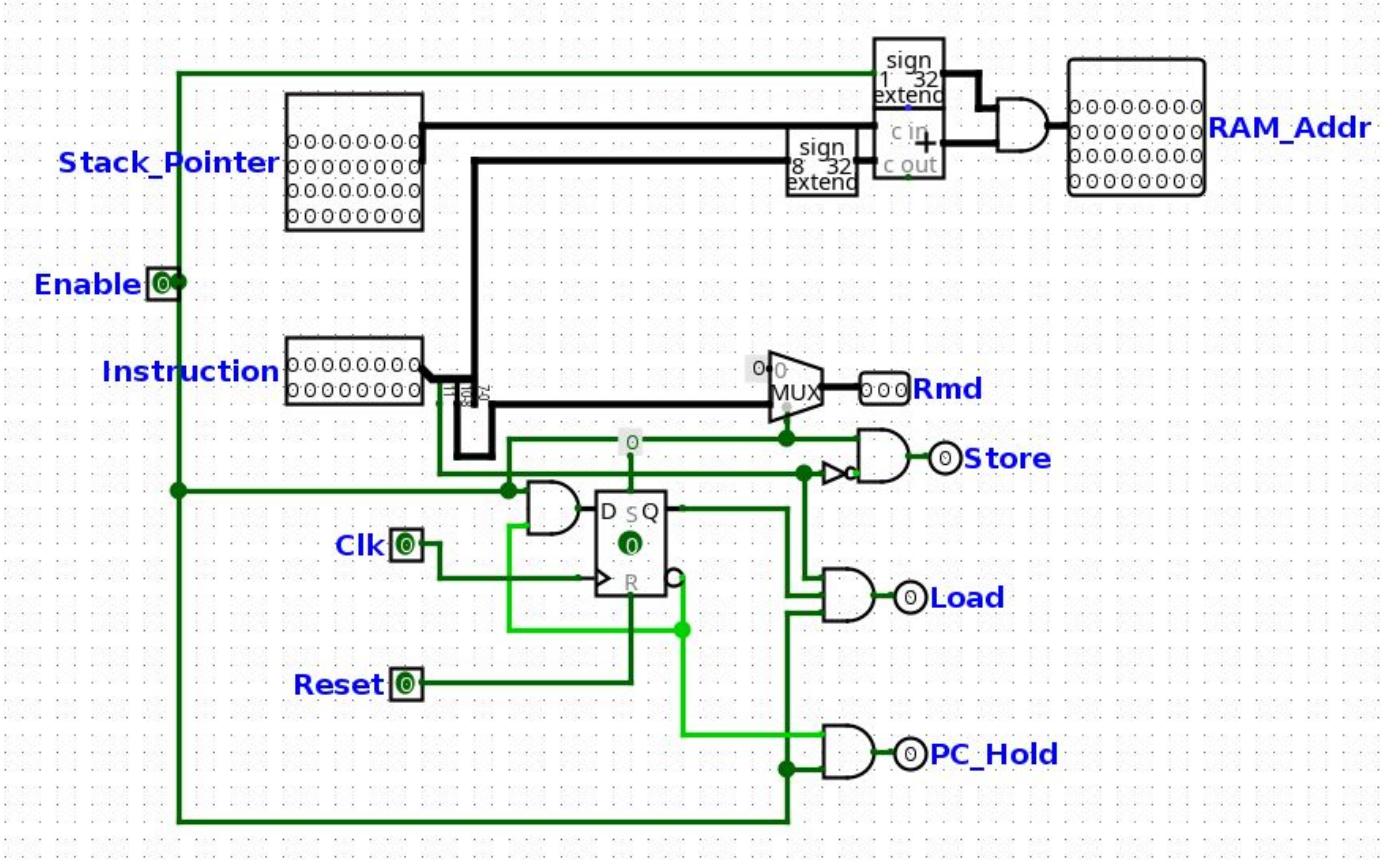
Opcode Décodeur



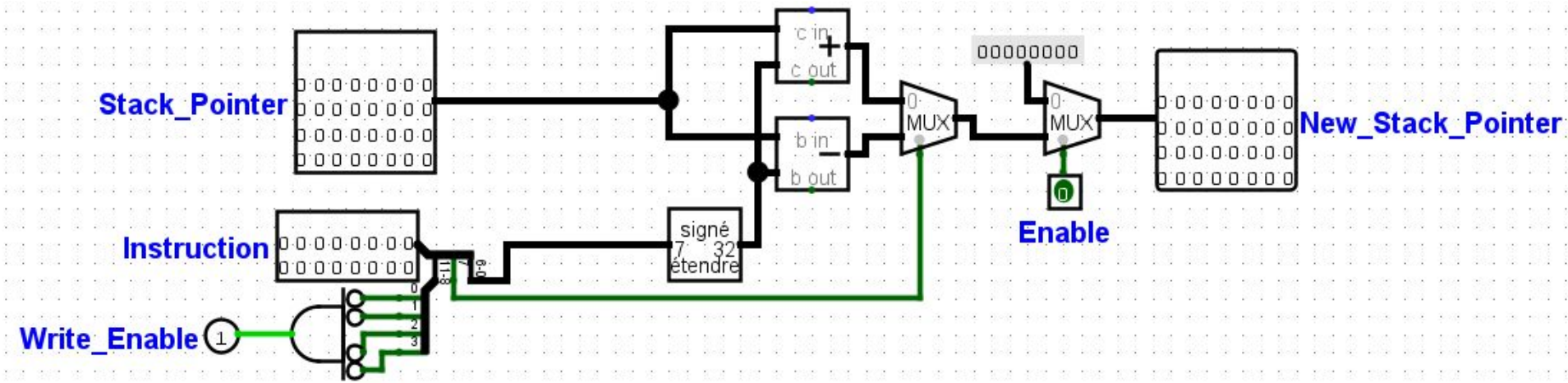
Flag ASPR


Update_Mask
1 1 1 0
Flags_In
0 1 0 0
Clk
0
Rst
0
0
D
Q
WE
R
0 0 0 0
Flags_Out

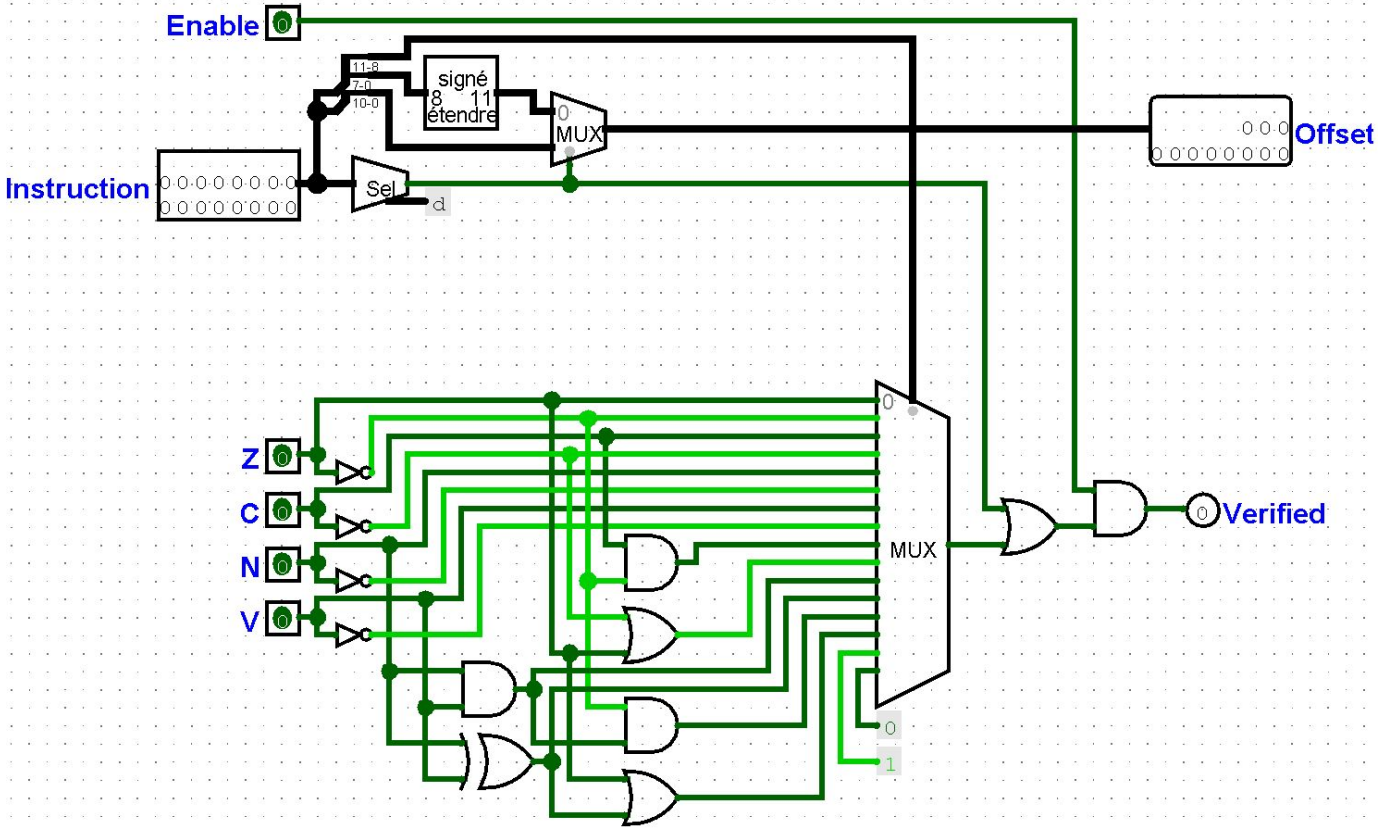
Load/Store


Stack_Pointer
Enable
Instruction
sign
1 32
extend
sign
8 32
extend
c in
c out
RAM_Addr
MUX
Rmd
Store
Clk
D S Q
R
Load
Reset
PC_Hold

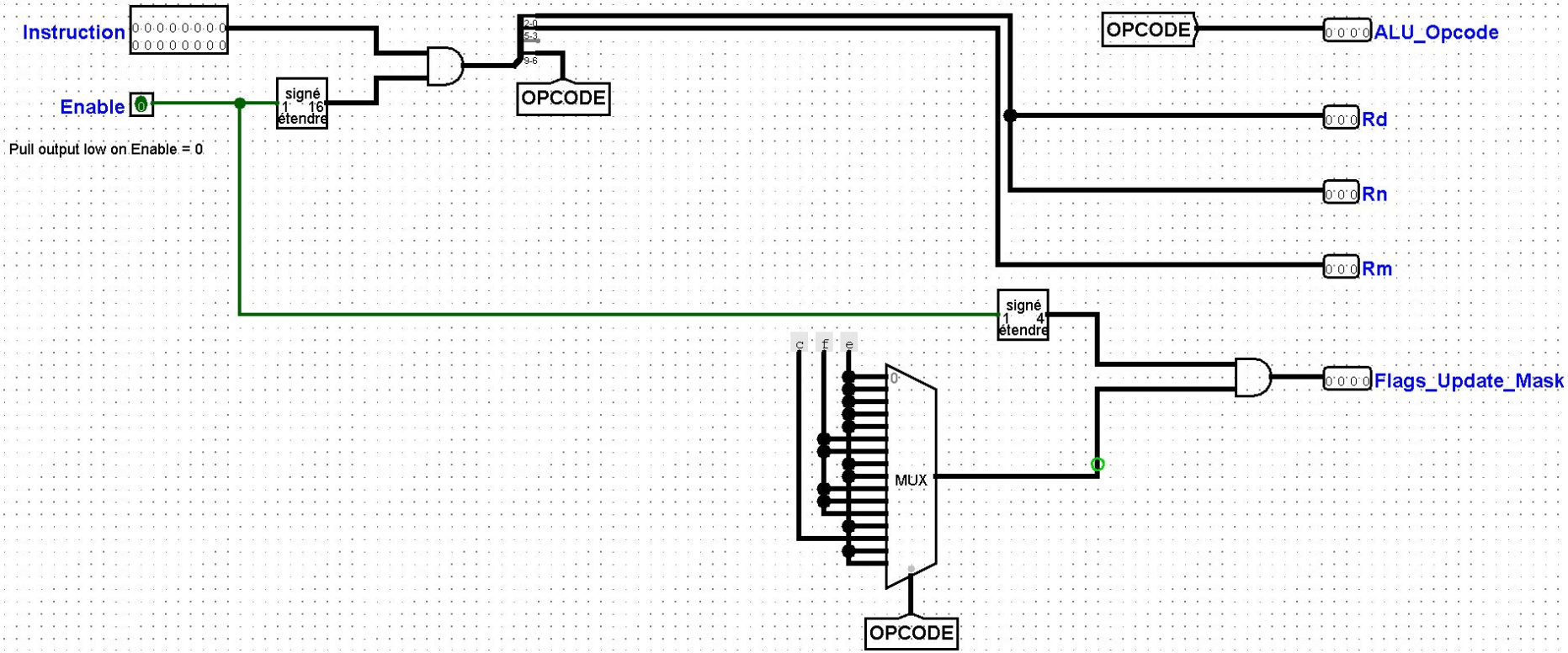
SP Address


Stack_Pointer
Instruction
Write_Enable
1
c in
c out
b in
b out
signé
7 32
étendre
0
MUX
00000000
0
MUX
0
Enable
New_Stack_Pointer

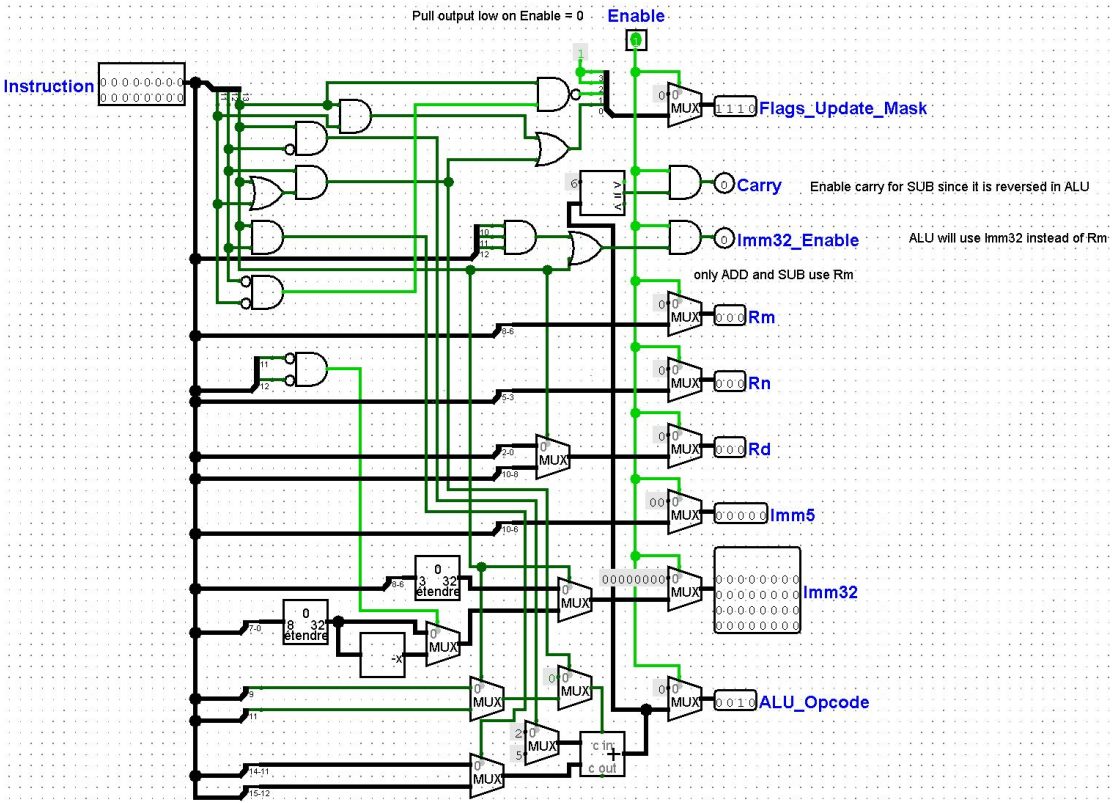
Conditional



Data Processing



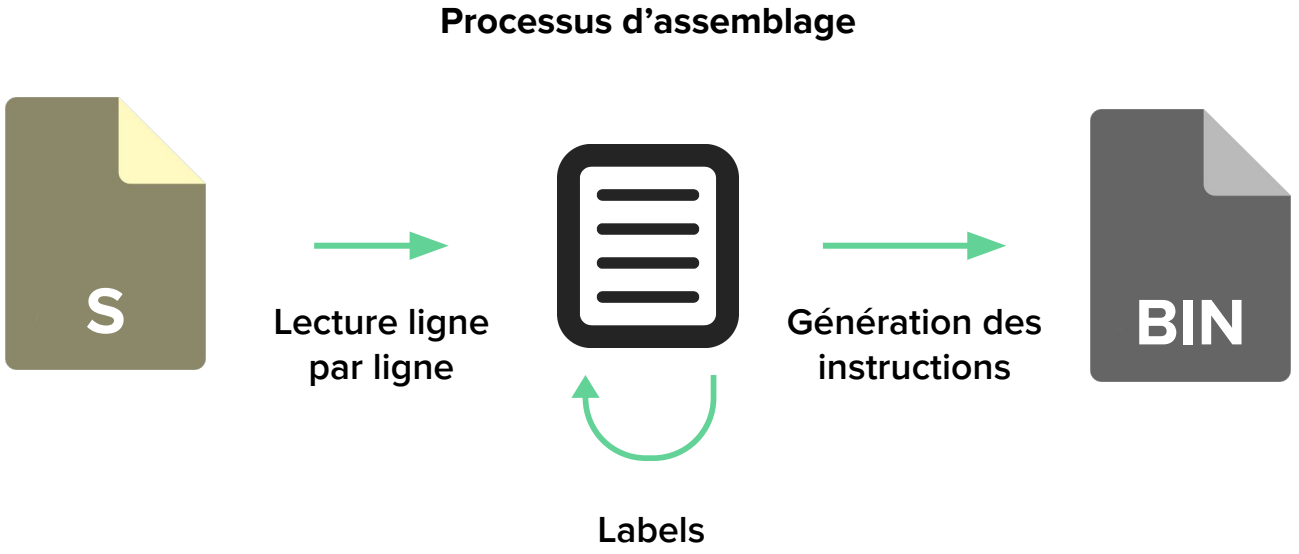
Shift, add, sub, mov



Avengers

Convertisseur d’assembleur ARM vers le format binaire de Logisim

Assembleur


Processus d'assemblage
S
Lecture ligne par ligne
Génération des instructions
BIN
Labels

Assembleur

```c
#include "parm.h"

void run()
{
 BEGIN();
 int a = 1;
 int b = 2;
 int c = a+b;
 RES = c;
 END();
}
```

simple_add.c

```
v2.0 raw
b098 b0ff b0f1
2001 9002 2002
9001 9802 9901
1840 9000 9800
9009 e7fe e7fe
e7fd
```

simple_add.bin

```
run:
  .fnstart
  .pad    #96
  sub     sp, #96
  @APP
  sub     sp, #508
  @NO_APP
  @APP
  sub     sp, #452
  @NO_APP
  movs    r0, #1
  str     r0, [sp, #8]
  movs    r0, #2
  str     r0, [sp, #4]
  ldr     r0, [sp, #8]
  ldr     r1, [sp, #4]
  adds    r0, r0, r1
  str     r0, [sp]
  ldr     r0, [sp]
  str     r0, [sp, #36]
  b   .LBB0_1
.LBB0_1:
  b   .LBB0_2
.LBB0 2:
  b   .LBB0 2
.Lfunc_end0:
  .size   run, .Lfunc_end0-run
  .cantunwind
  .fnend
```

simple_add.s

Conversion 100% conforme

0001100 001 000 000

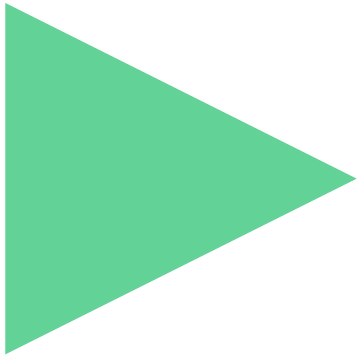
r1 r0 r0

Assembleur - Tests

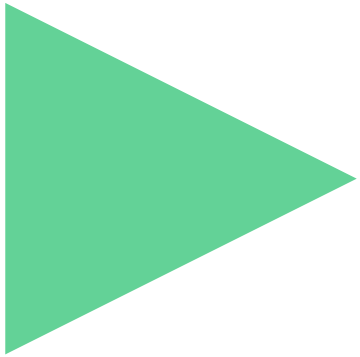
BASH

THE BOURNE-AGAIN SHELL

Assembleur - Démo



Processeur - Démo



Merci de votre attention