



Cairo University
Faculty of Engineering



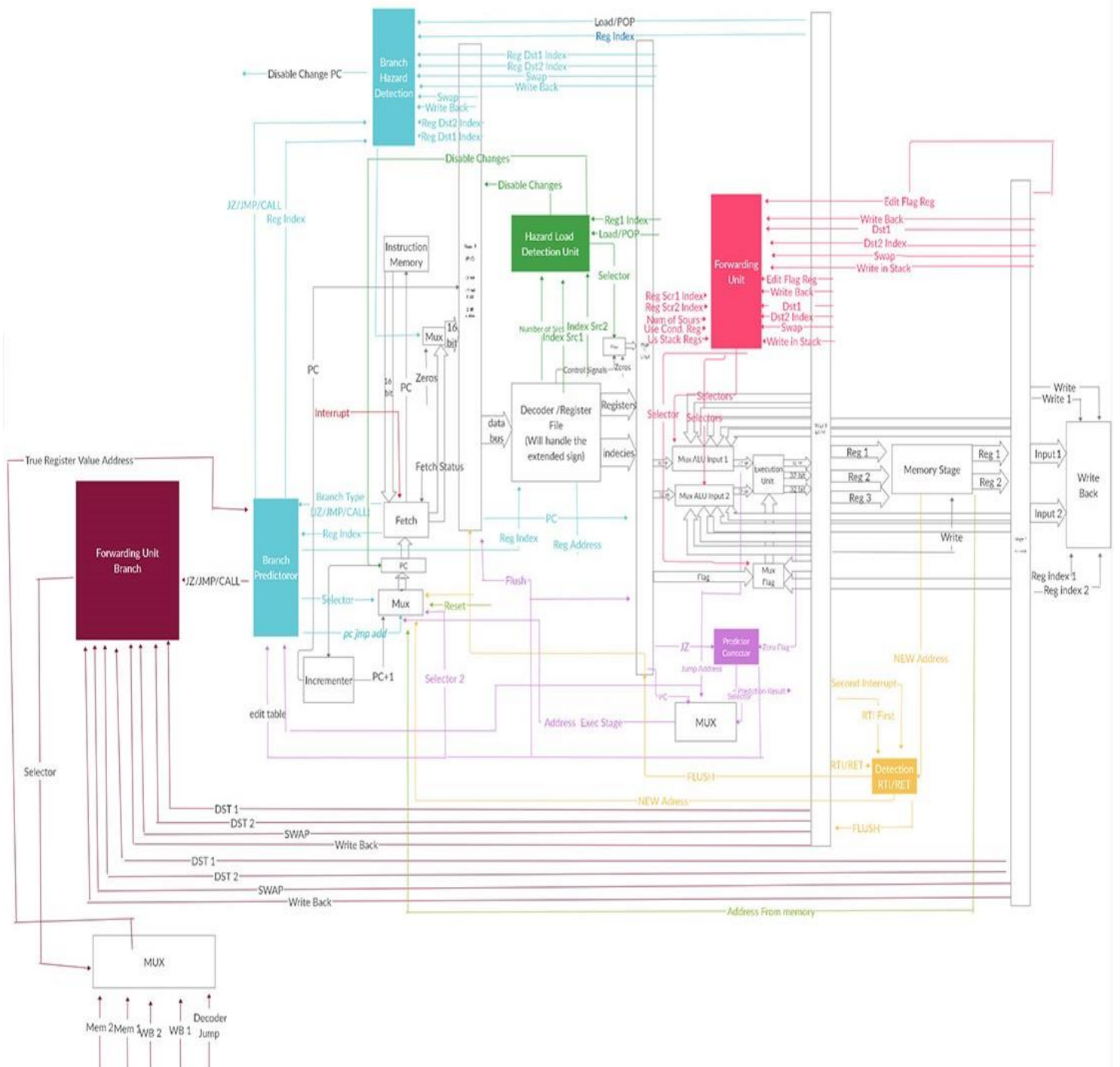
Faculty of Engineering
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Project Arch

Final delivery

Name	Section	B.N
Aly Ramzy Hassan	1	36
Mouhamed Khier	2	12
Nour Ahmed	2	31
Hager Ahmed	2	34

Full design:

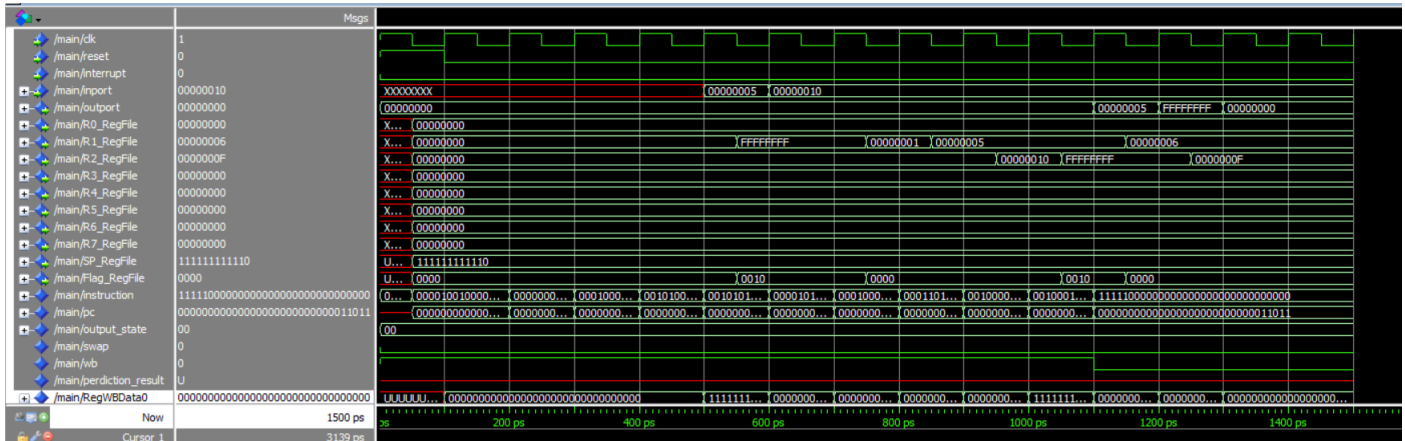


The unfinished parts of our processor:

- 1- Cash memory
- 2- Branch prediction

One operand file:

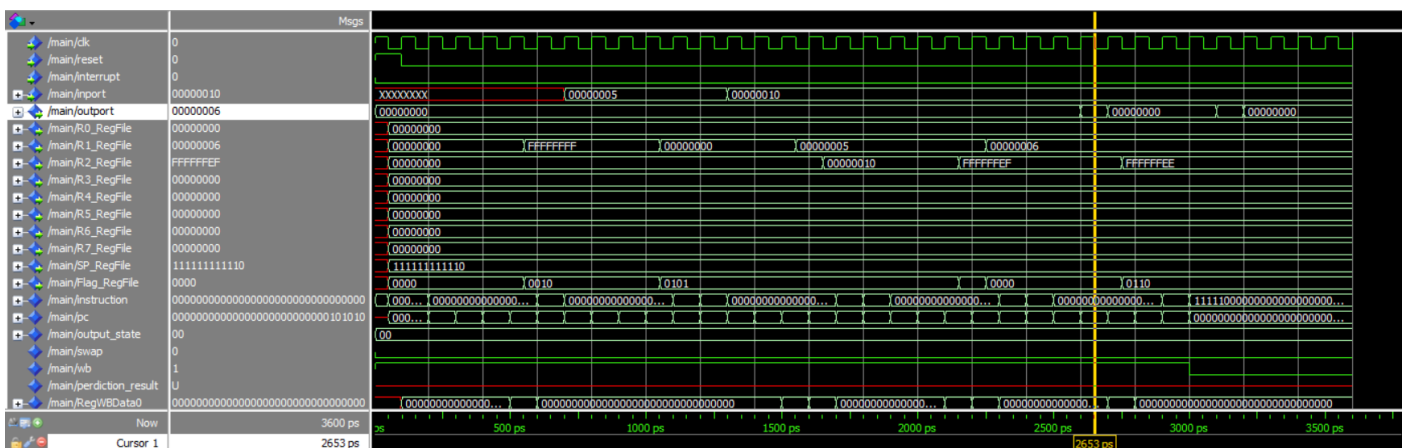
Before forwarding without no operation

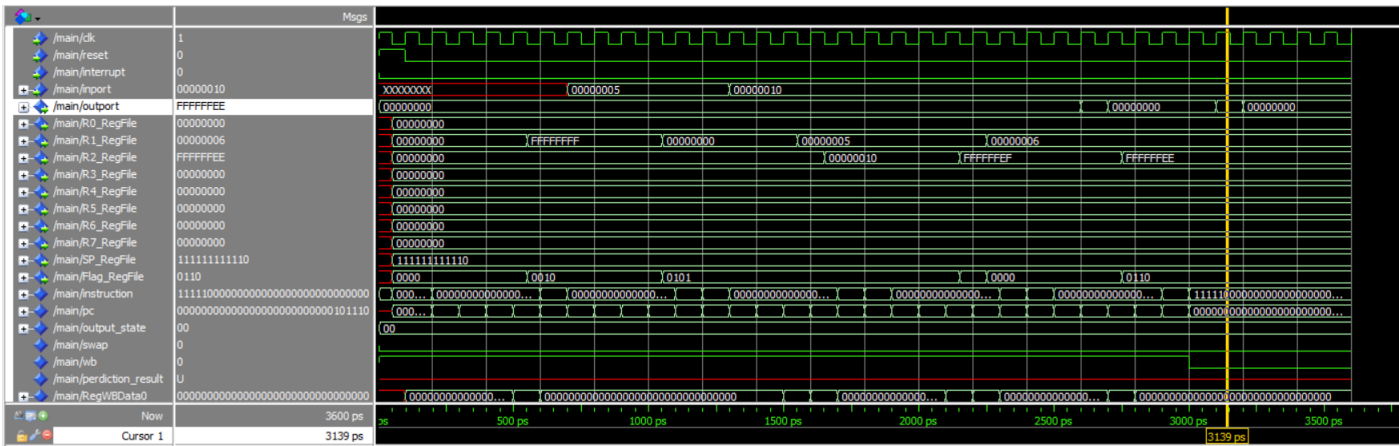


Hazards faced without forwarding:

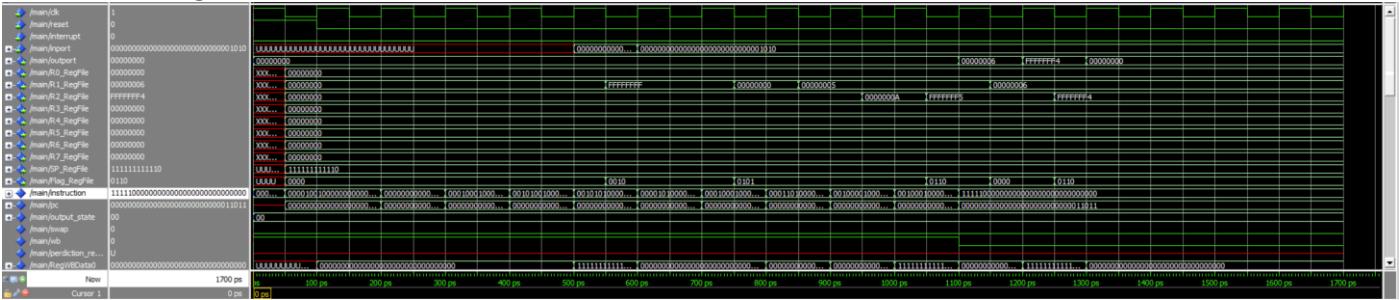
- 1- Inc R1 hazard is read after write.
- 2- Not R2 hazard is read after write.
- 3- Dec R2 hazard is read after write.
- 4- Out R1 hazard is read after write.
- 5- Out R2 hazard is read after write.

Before forwarding with no operation(solving the hazards with nop)



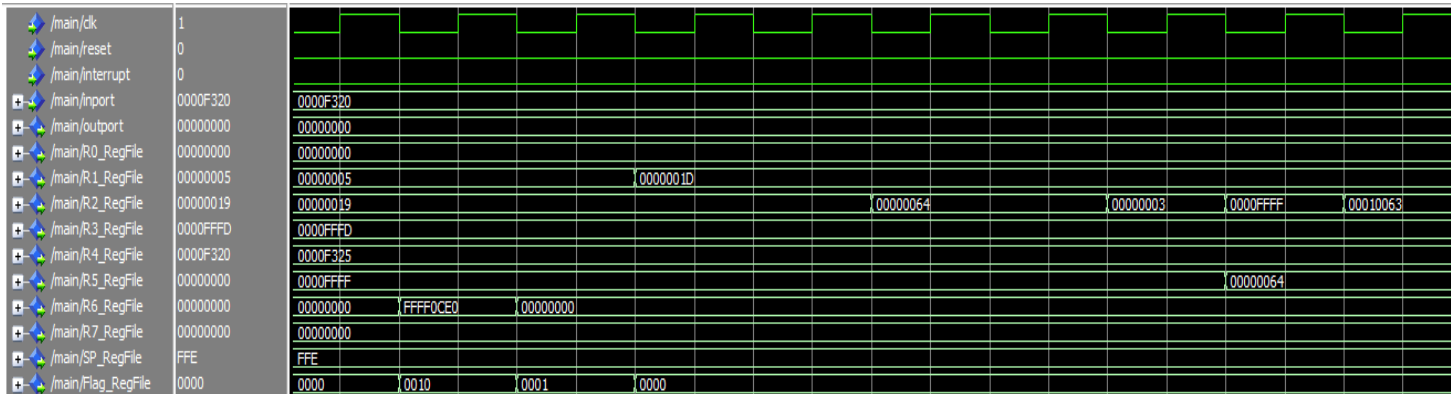
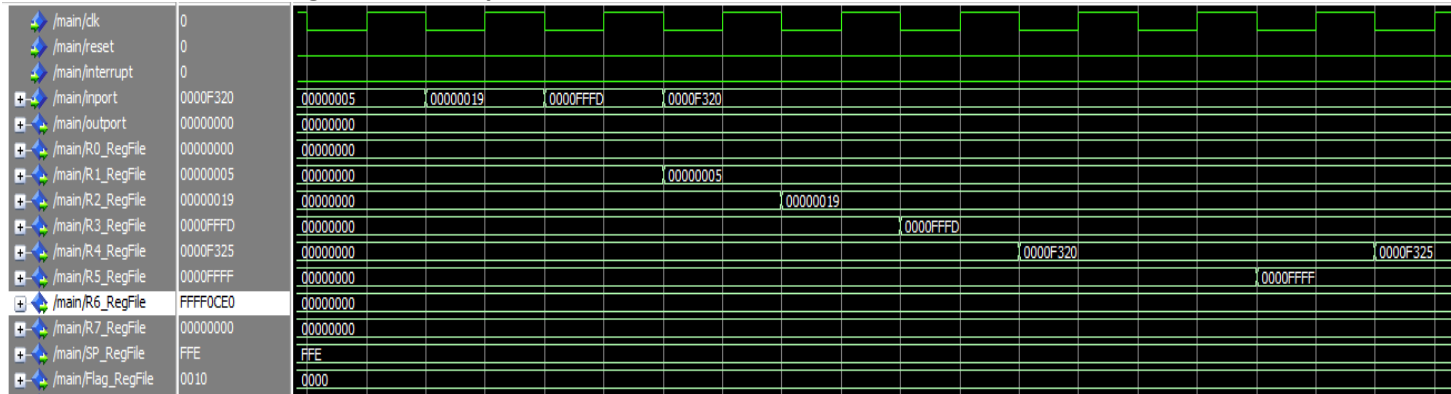


After forwarding:



Two operand file:

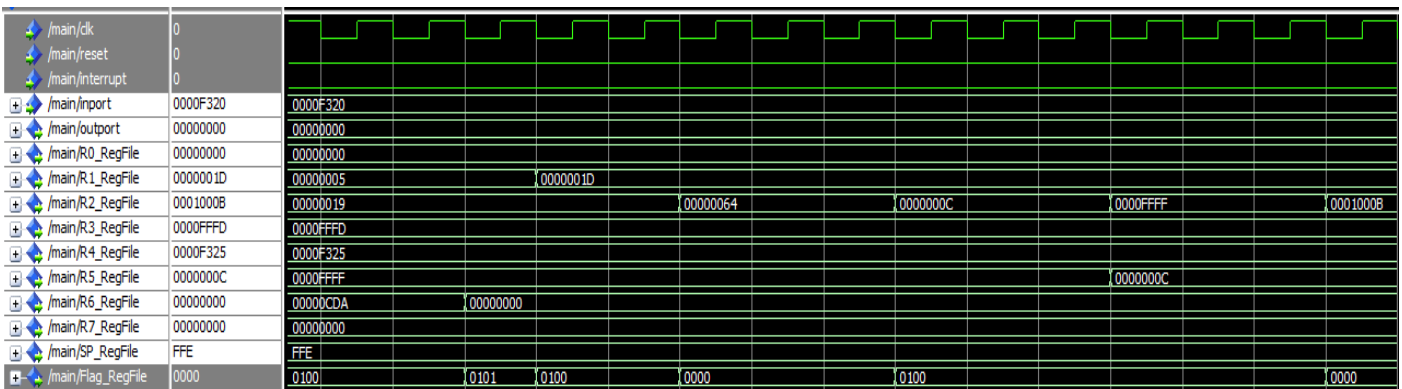
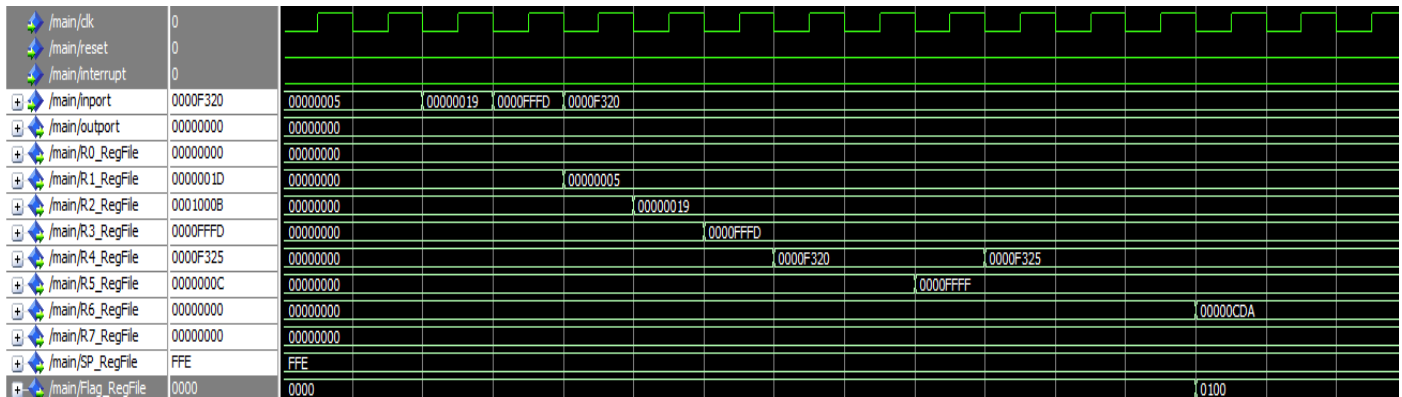
Before forwarding without no operation



Hazards faced without forwarding:

1. SUB R5,R4,R6 hazard is read after write R4 & R5
2. AND R7,R6,R6 hazard is read after write R6
3. SHR R2,3 hazard is read after write R2
4. SWAP R2,R5 hazard is read after write R2
5. ADD R5,R2,R2 hazard is read after write R2 & R5

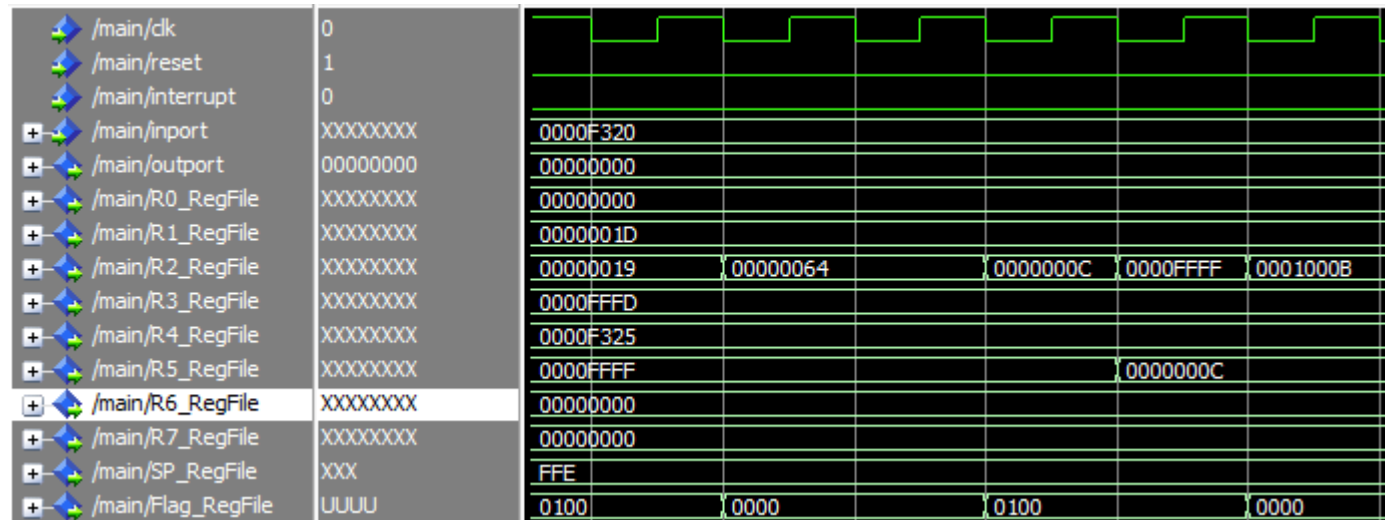
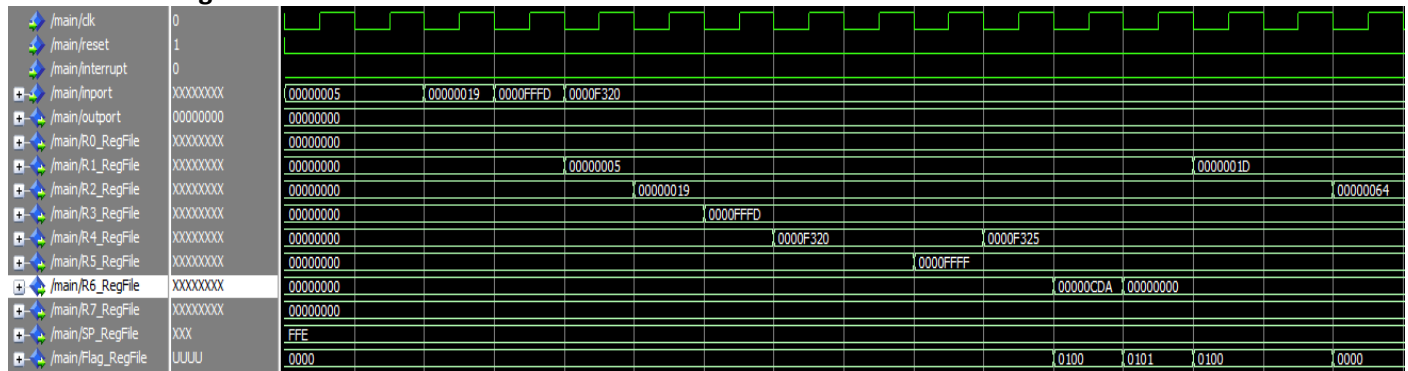
Before forwarding with no operation(solving the hazards with nop)



```
.ORG 2 #this is the interrupt address
100
```

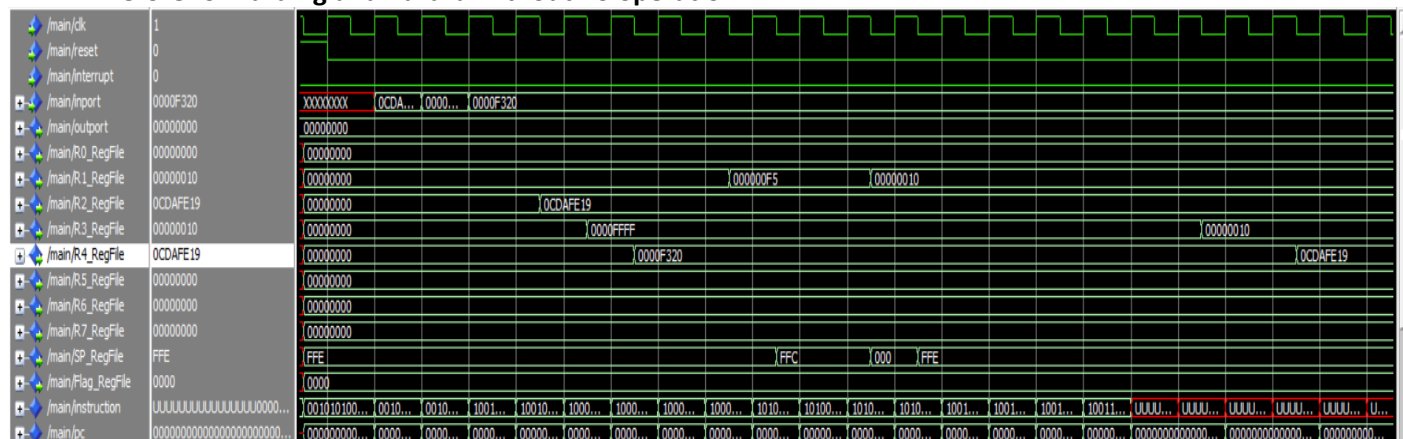
```
.ORG 10
in R1 #add 5 in R1
in R2 #add 19 in R2
in R3 #FFFD
in R4 #F320
IADD R3,R5,2 #R5 = FFFF , flags no change
ADD R1,R4,R4 #R4= F325 , C-->0, N-->0, Z-->0
NOP
NOP
SUB R5,R4,R6 #R6= 0CDA , C-->1, N-->0, Z-->0
NOP
NOP
AND R7,R6,R6 #R6= 00000000 , C-->no change, N-->0, Z-->1
OR R2,R1,R1 #R1=1D , C--> no change, N-->0, Z--> 0
SHL R2,2 #R2=64 , C--> 0, N -->0 , Z -->0
NOP
SHR R2,3 #R2=0C , C -->1, N-->0 , Z-->0
NOP
NOP
SWAP R2,R5 #R5=0C ,R2=FFFF ,no change for flags
NOP
NOP
ADD R5,R2,R2 #R2= 1000B (C,N,Z= 0)
```

After forwarding:

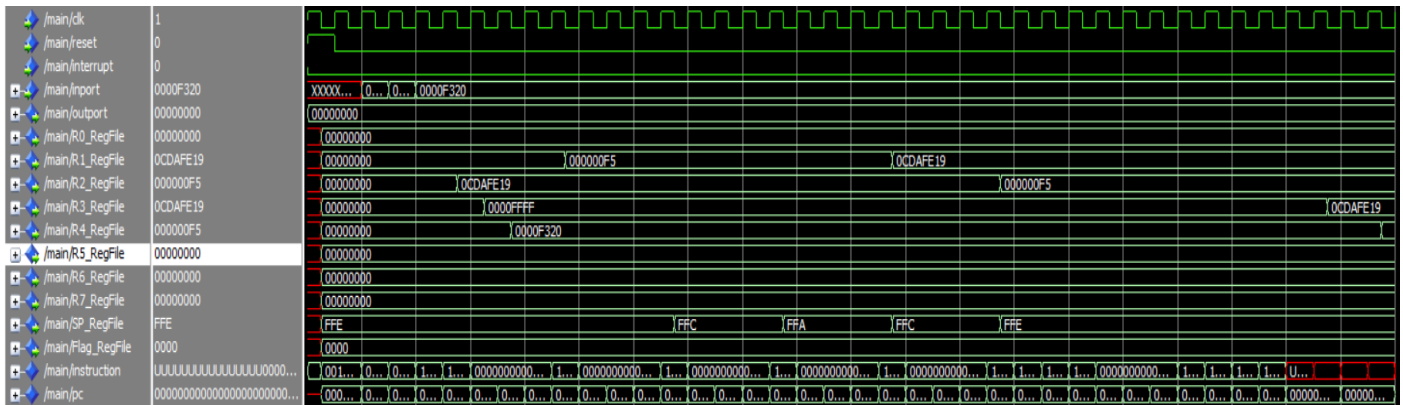


Memory file:

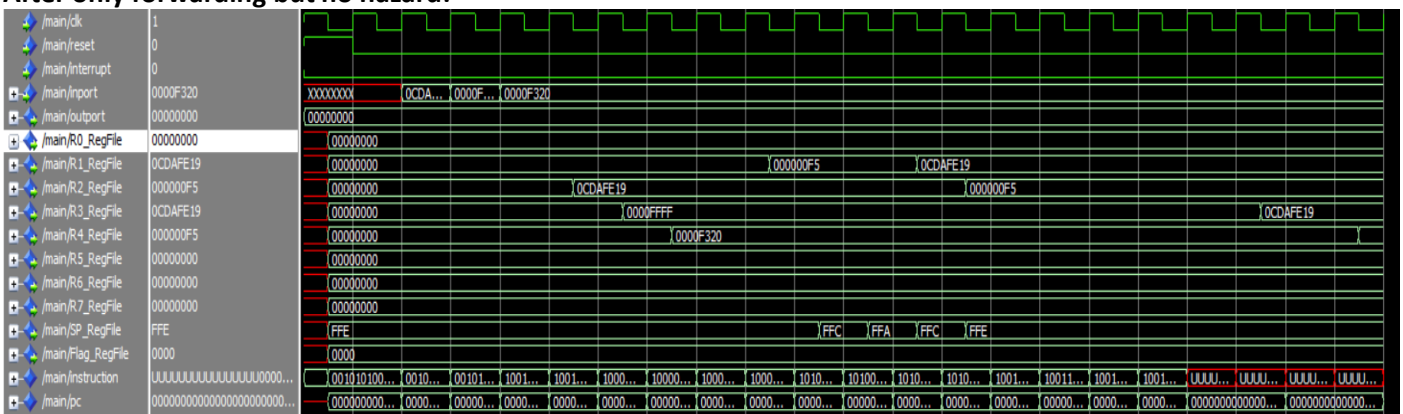
Before forwarding and hazard without no operation



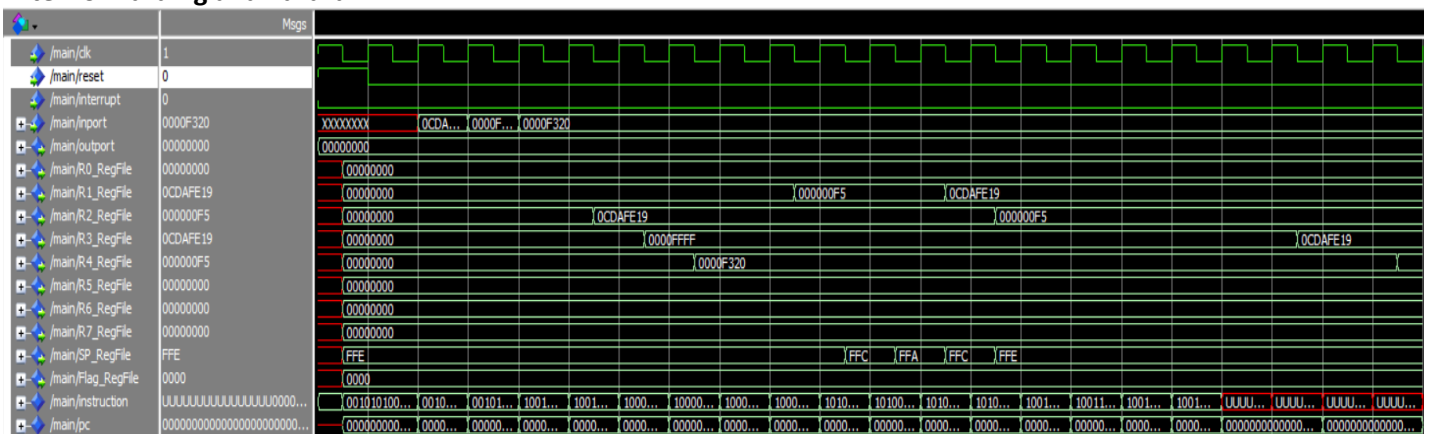
Before forwarding and hazard with no operation(solving the hazards with nop)



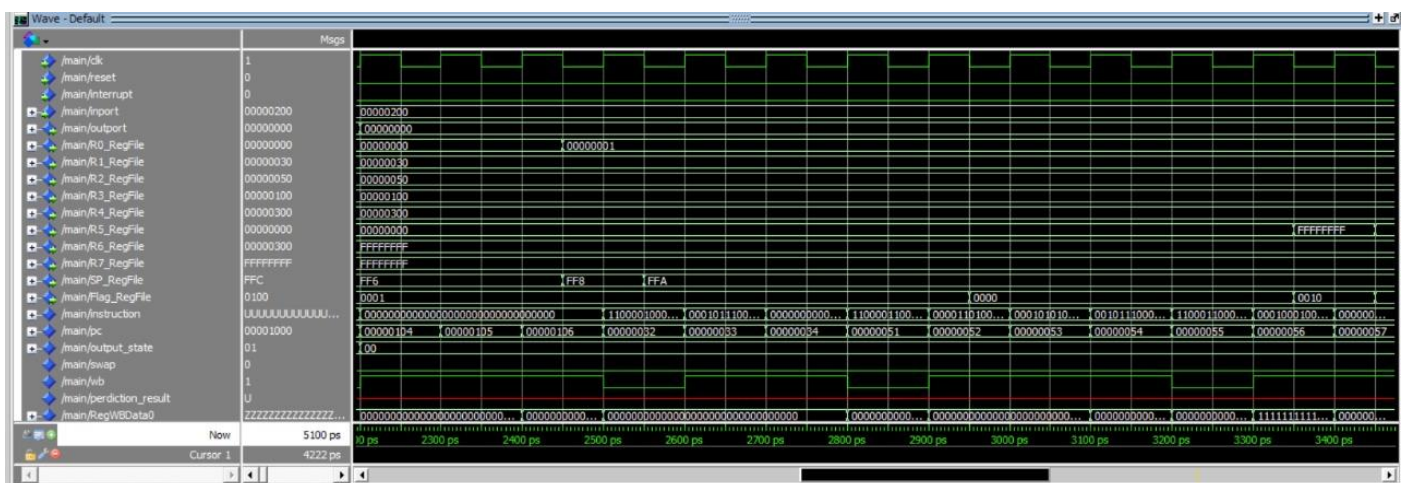
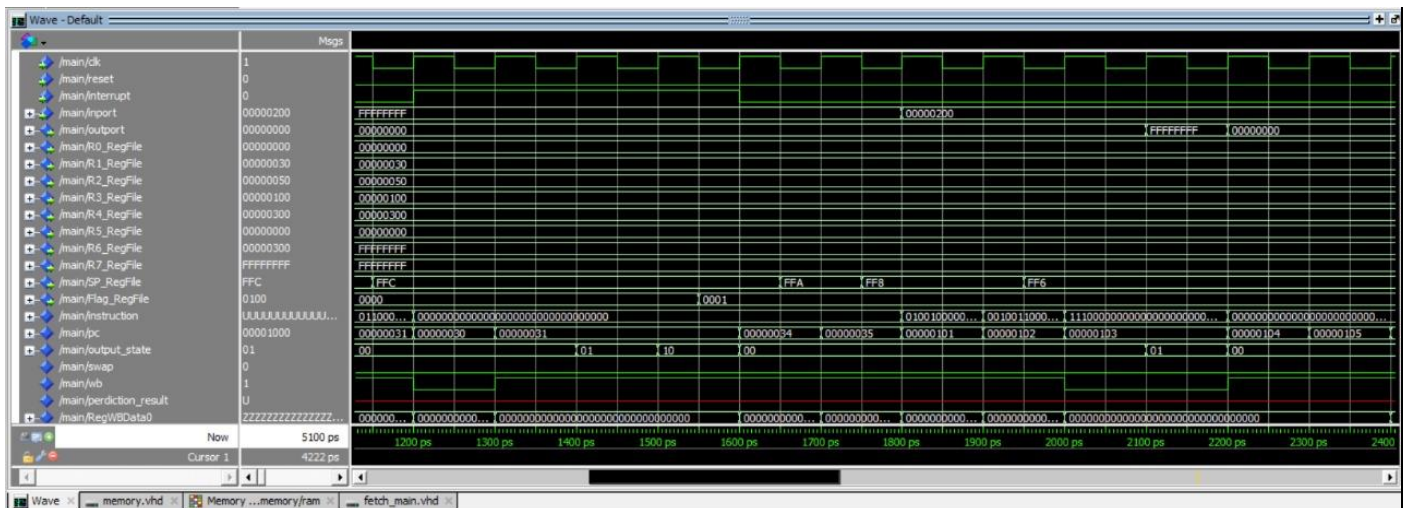
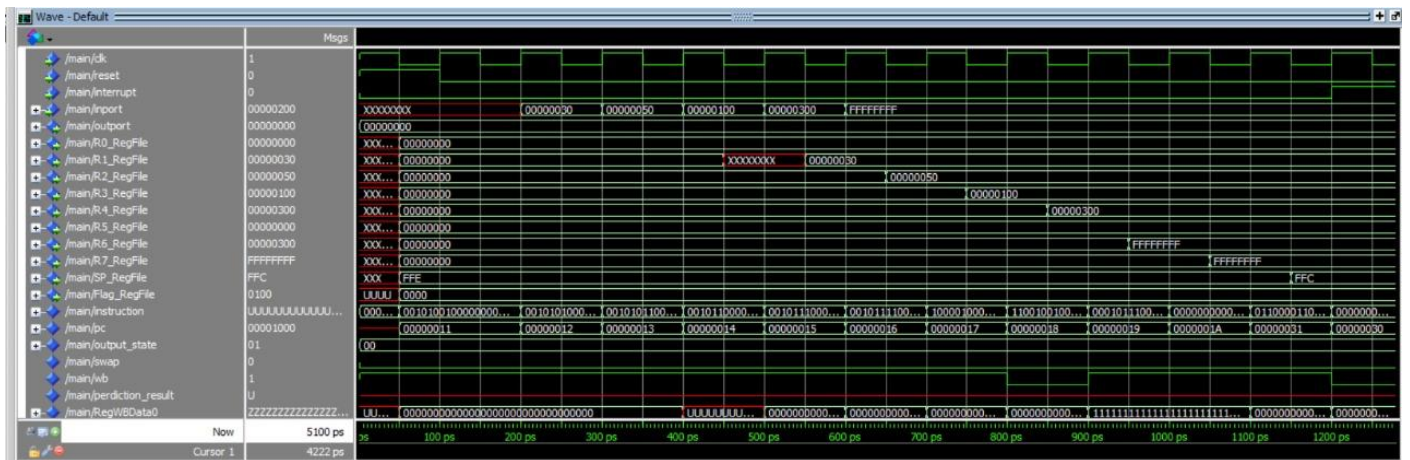
After only forwarding but no hazard:

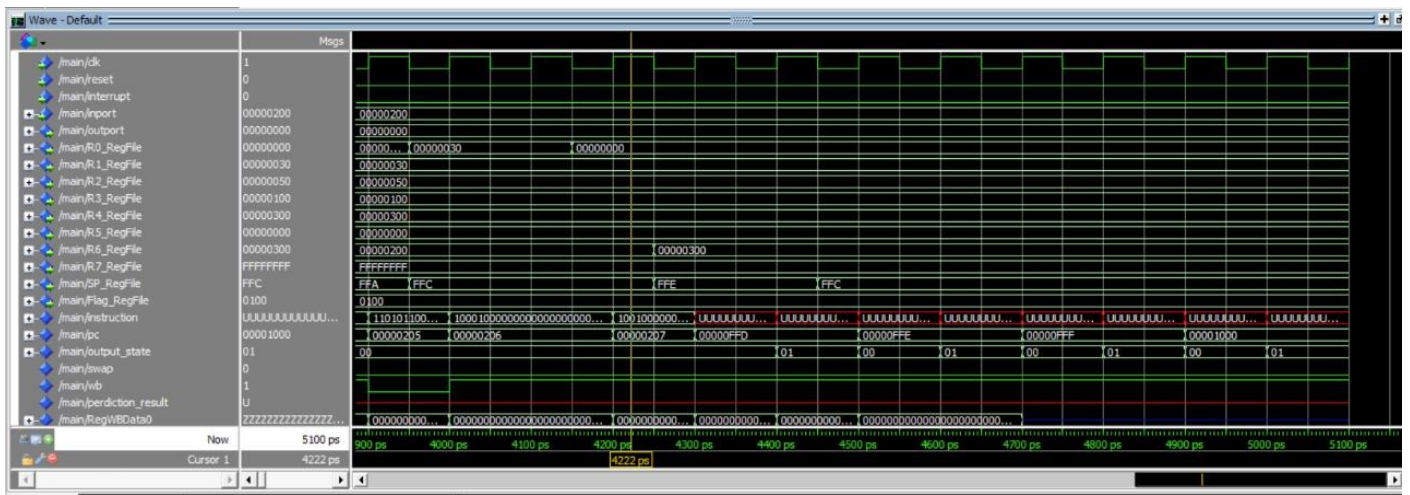
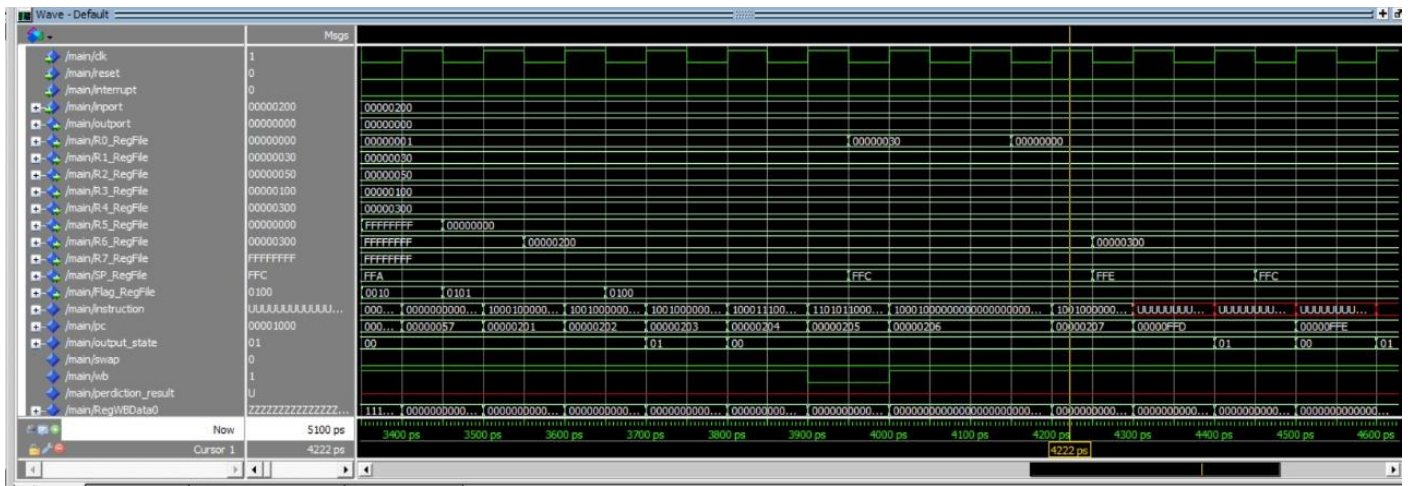


After forwarding and hazard:



Branch file:





The following case show that the interrupt is working correctly.