

# COL-216 Lab-report-2.6

2020CS10356

March 2022

## 1 Introduction

This lab assignment is VHDL description of processor.

There is a make file available in the submission directory which can compile all the files in one attempt.

**Follow the commands to run make file in linux system (if available)**

**1.**make (compiles all the files )

**2.**make plot (gtkwave of processor )

**3.**make clean (cleans the vcd files )

An additional component is added shifter.

**Made slight changes in shifter and Data Memory for adjustments in DT instructions**

## 2 Shifter

Shifter is made according to lecture notes and as per lab report flags are set correspondingly

Shifter also shifts the corresponding operands in DT and DP instructions.

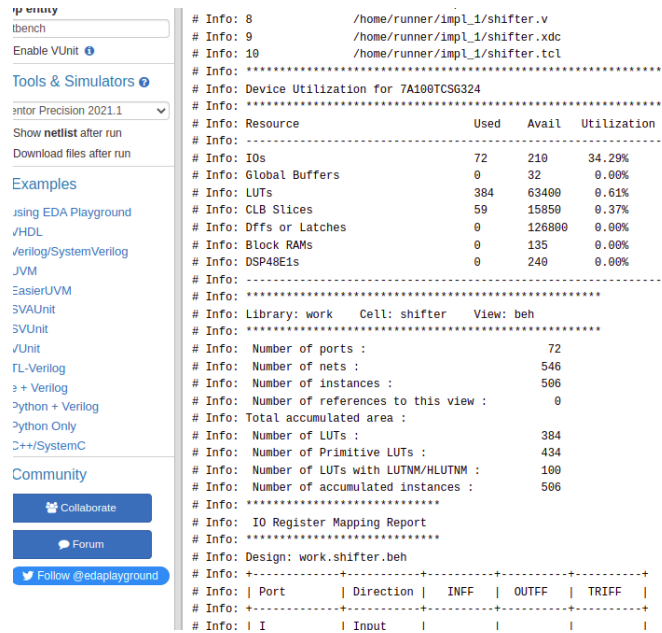


Figure 1: New Device Utilisation for shifter

shifter is added with suitable glueing in the processor between register files and ALU extra clock cycle is added for this.

A test bench for shifter is also provided in the directory to test shifter.

### 3 Data Memory

There are also slight changes made in data memory part WriteEn signal is made a 4 bit signal and removing other 3 write ports.

1111-will write a complete word

1000-will write 1 byte

0100-will write 2 byte

0010-will write 3 byte

0001-will write 4 byte

1100-will write 1 half word

0011-will write 2 half word.

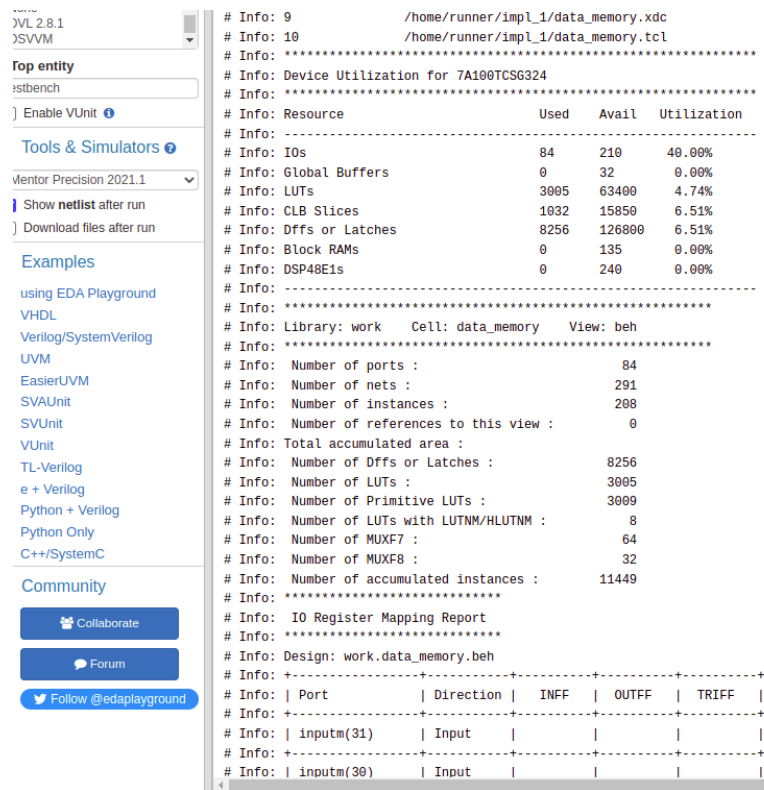


Figure 2: New Device Utilization for Data Memory

## 4 Testcases

### Test Case 1

```
.text
mov r0, 5
mov r0,r0,ASR 12
mov r1, 5
strb r1, [r0]
add r1, r1, 3
.end
0=X"E3A00005",1=X"E1A00640",2=X"E3A01005",3=X"E5C01000",4=X"E2811003",others=X"00000000"
```

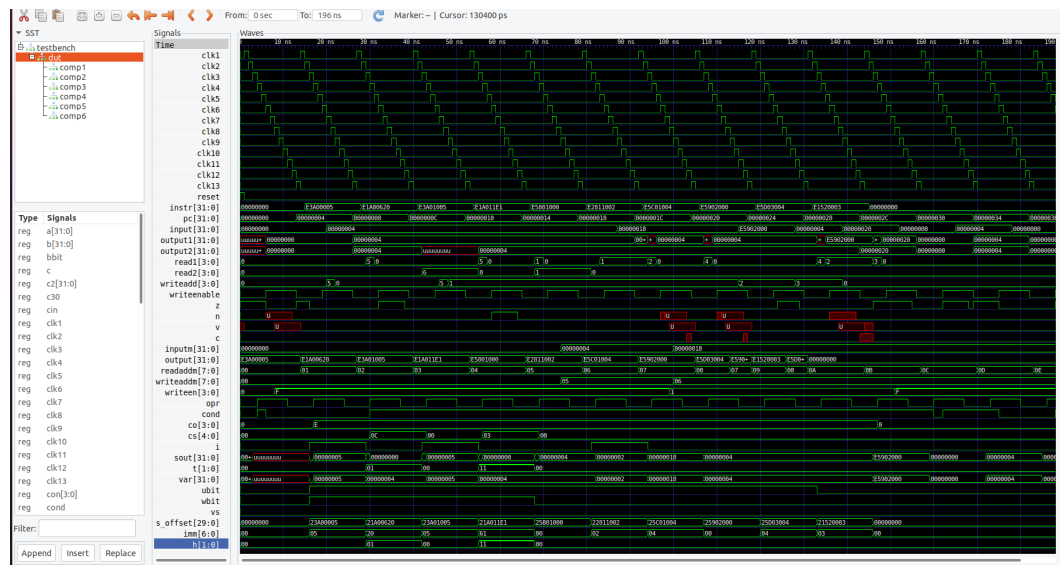


Figure 3: Example-1

0=X" E3A00005",1=X" E1A00640",2=X" E3A01005",3=X" E5801000",4=X" E5D02000",others=X" 00000000

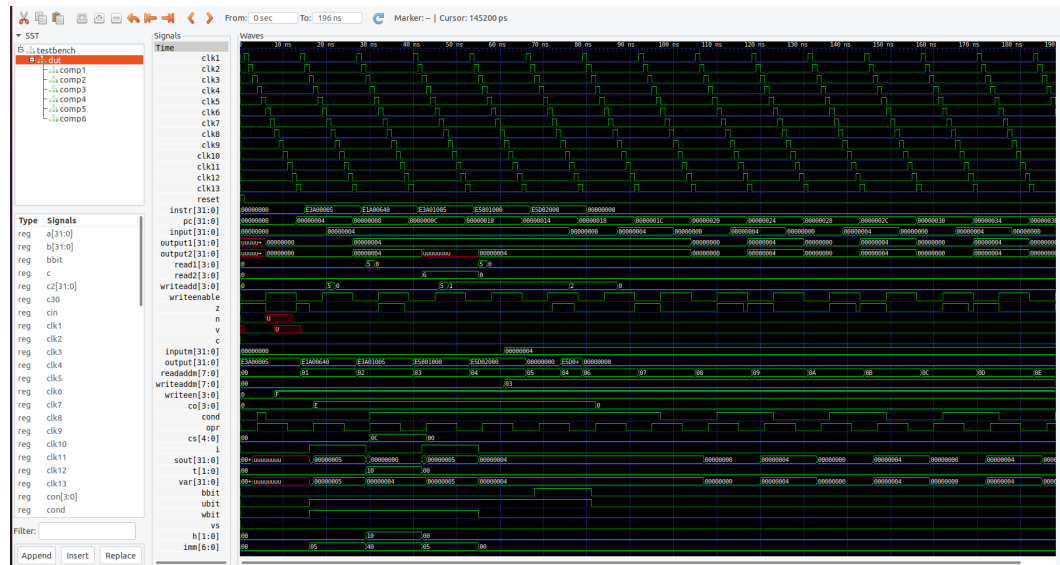


Figure 4: Example-2

### Test Case-03

```
.text
```

```
mov r0, 5
```

```
mov r0,r0,LSR 12
```

```
mov r1, 5
```

```
mov r1,r1,ROR 3
```

```
strb r1, [r0]
```

```
ldrb r2, [r0]
```

```
.end
```

```
0=X"E3A00005",1=X"E1A00620",2=X"E3A01005",3=X"E1A011E1",4=X"E5C01000",5=X"E5D02000",
```

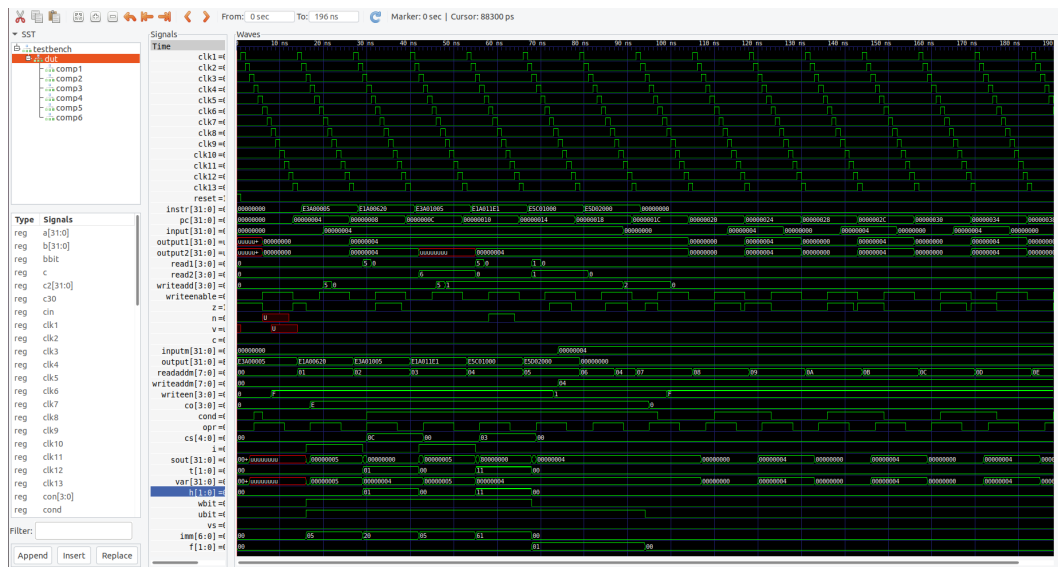


Figure 5: Example-3

8=X" E5D03004",9=X" E1520003",others=X" 00000000"

