DIGITAL ALARM CLOCK USING VHDL

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Contents :

Abstract :

- The aim of this project is to design a 24 hour digital clock along with alarm which displays the time digitally, in contrast to an Analog clock where time is indicated by positions of rotating hands.
- Digital clocks are much reliable,accurate,maintainance free and portable.So these clocks are more common and easy to know the time in a digital screen.
- In this project we are using VHDL code for desingning of digital clock along with alarm and it is implemented using Xilinx ise Software.

Software used :

- Xilinx Ise

Introduction :

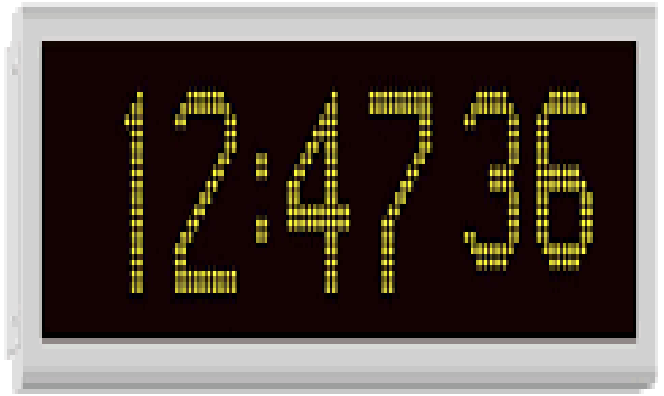
- Time is such a fundamental concept that it is very difficult to define. To measure time is needed that will repeat itself at regular intervals the number of intervals counted gives a quantitative measure of the duration.
- The earliest references for the measurement of time are the moon and sun. When the sun and the moon were not visible, it was impossible to know the exact time. So clocks were developed to measure out the hours between checks with the sun and the moon.

- The process of measuring time has progressively became more accurate and the devices more localized ever since.
- In our modern time, the time is predominately measured by mechanical and recently by electronic clocks.
- All clocks measure time, but different clocks can have status or importance. Many centuries have been spent devising method for the determination and measurement of time historically, clocks and watches of all sorts lie at an important cross roads of science, technology and society.

- Basically we can see two types of clocks in real world namely Analog and Digital clocks. Analog clocks were designed first later digital clocks are came into race.
- Compare to Analog clocks these Digital clocks are much more Efficient, Accurate, User friendly and they have Multifunctional Capabilities.
- In this project the more accurate clock alarm using VHDL is presented.

Digital Clocks used in :

- Digital wrist Watches
- Smart phones
- Wall clocks
- At Railway stations etc…



Theory Behind Digital Clock :

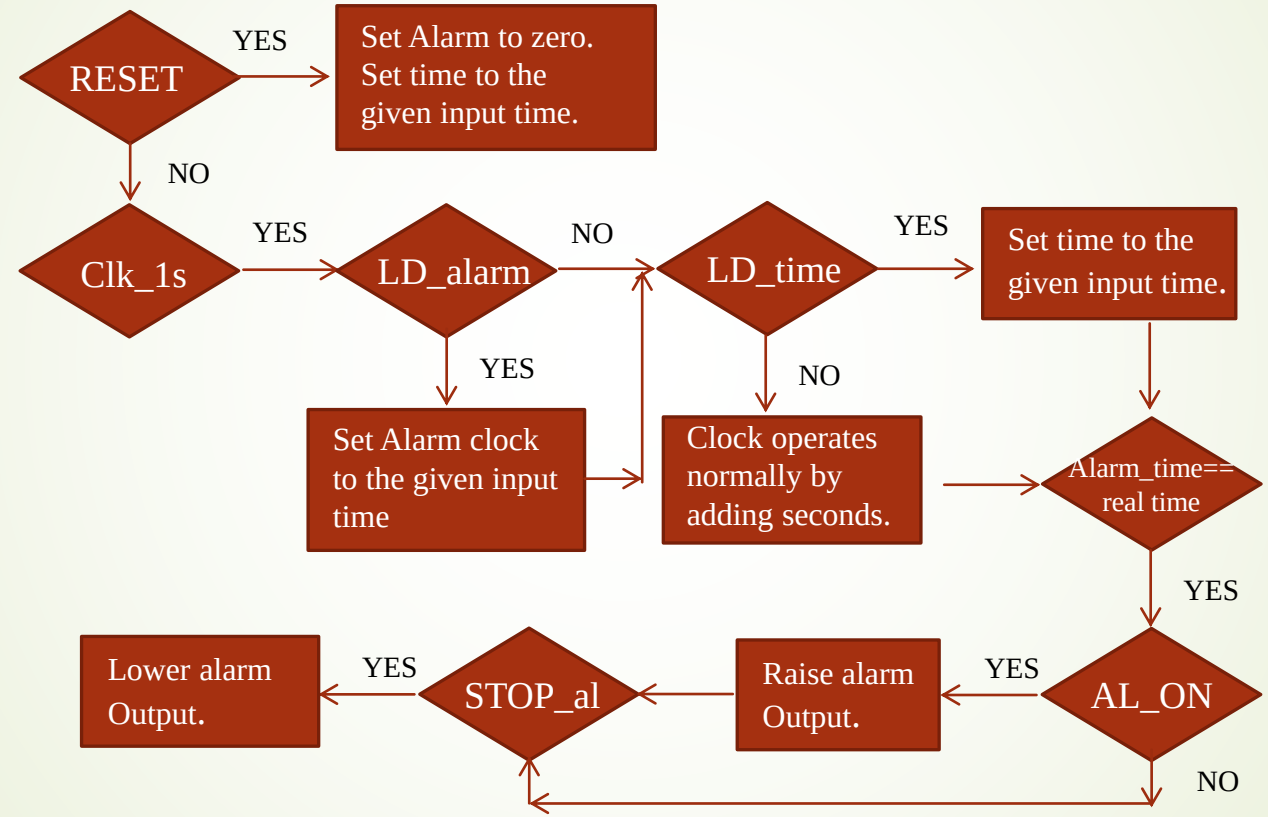
- We know that 60 seconds equal to one minute and 60 minutes equals to one hour hence the minute section is derived by second section and hour section by minute section.
- Each of the minute and second section has been designed to give a count from 00 to 59 after which it resets to 00 and the hours section to give a count from 00 to 24 hours after which it resets to 00.
- For each cycle of 00 to 59 in a second section the minute section increases its count by 1.

- Similarly for each cycle of 00 to 59 in minute section the hour section increases its count by 1.
- In the above way when the clock reaches 23 hours 59 minutes and 59 seconds each of the section resets to 00 giving us a display of 00:00:00 popularly known as the zeroth(0) hour.

Features adapted for Designing :

- Clock generation
- Initializing clock time to a particular value
- Setting time for a Alarm
- Enabling and Disabling Alarm

Flow Chart :


RESET
YES
Set Alarm to zero.
Set time to the
given input time.
NO
Clk_1s
YES
LD_alarm
NO
LD_time
YES
Set time to the
given input time.
YES
Set Alarm clock
to the given input
time
NO
Clock operates
normally by
adding seconds.
Alarm_time==
real time
YES
Lower alarm
Output.
YES
STOP_al
Raise alarm
Output.
YES
AL_ON
NO

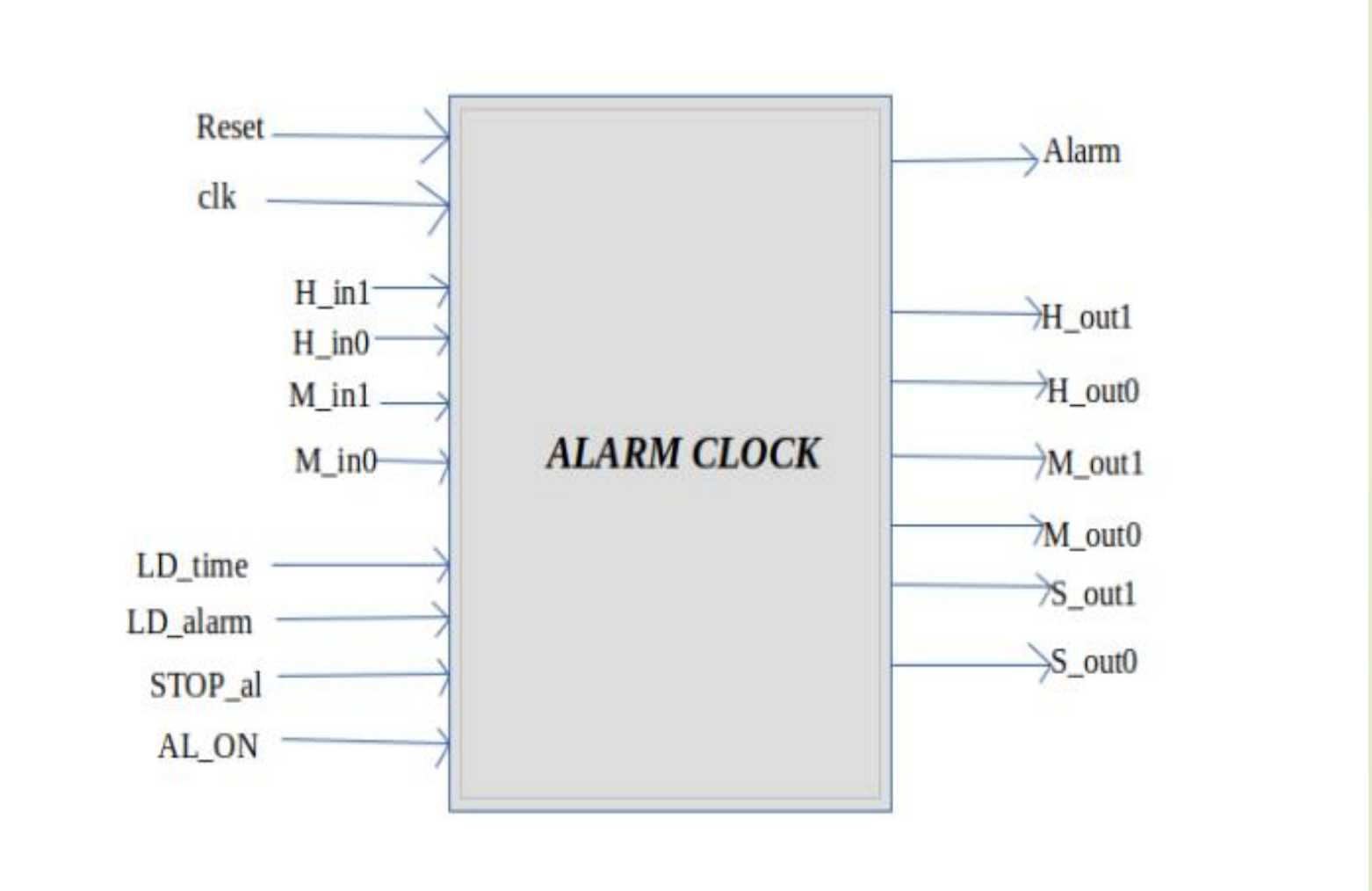
Explanation :

- The program is activated with the clock pulse checking of reset pin.
- If the reset signal is activated, then we load the alarm to zero and provide the necessary data of the time, which would be in 24 hour format for ease of readability.
- If the reset signal is not activated then at the positive edge of the clock pulse we check for the status of the load alarm.

- If the load alarm is activated then we have to load the alarm time into the clock.
- If the load alarm is not activated then we have to check for the status of load time.
- If the load time is activated then we have to set the time to the given input time.
- If the load time is not activated then the real time clock has to keep on running.

- If the real time alarm and the load alarm coincides each other then the alarm-on signal is activated.
- Next, the clock checks for the status of alarm-on signal.
- Whenever the alarm-on signal is activated we rise the alarm. The raised alarm gets lowered after stop-alarm signal is activated.
- If the alarm is not activated then the real time is keeps on running.
- This happens until any of the signals are activated or changed.

Block Diagram :



Pins Description :

PIN	INPUT/OUTPUT	DESCRIPTION
reset	Input	Active high reset pulse, to set the time to the input hour and minute and the second to 00. It should also set the Alarm to low. For normal operation this input should be 0.
clk	Input	A 10Hz input clock. This should be used to generate each real-time second.

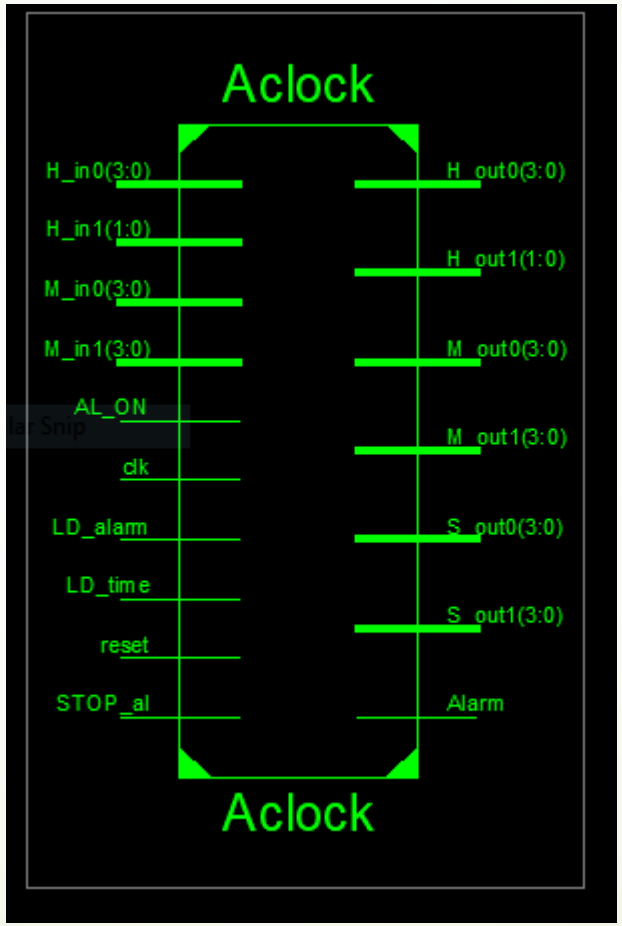
H_in1	Input(2 bit)	It is the MSB bit of the hour.
H_in0	Input(4 bit)	It is used to set the LSB digit of hour.
M_in1	Input(4 bit)	It is used to set the MSB digit of the minute.
M_in0	Input(4 bit)	It is used to set the LSB of the minute.
LD_time	Input	If set time should be loaded into clock.

LD_alarm	Input	If LD_alarm=1 alarm time should be set to values of the inputs. If not clock should act normally.
STOP_al	Input	If alarm(output) is high then STOP_al=1 will bring output back to low.
AL_ON	Input	If high the alarm is ON, if low the alarm function is OFF.

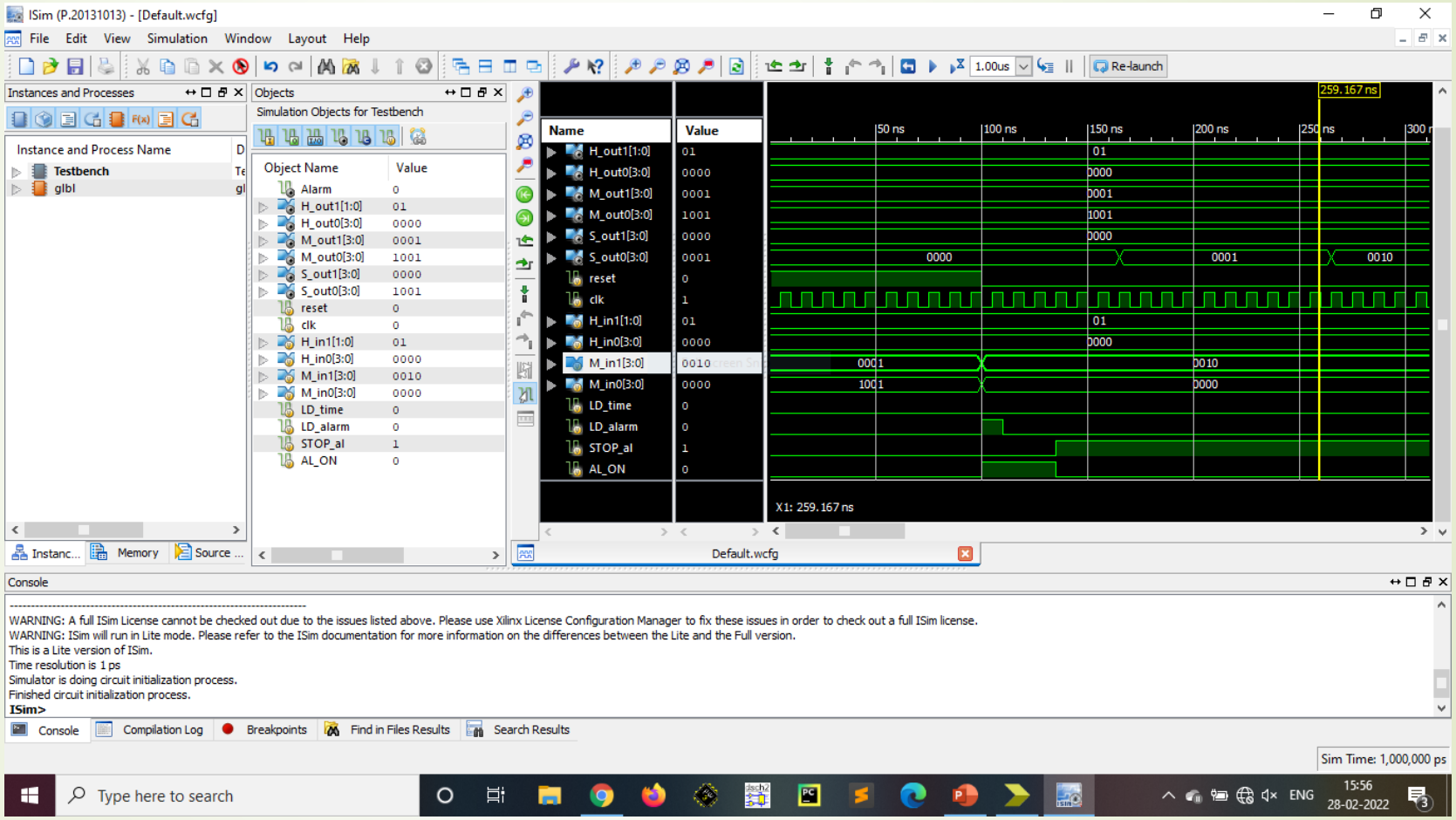
Alarm	Output	This will go high if alarm time equlas current time and AL_ON is high. It remains high until STOP_al is high.
H_out1	Output(2 bit)	The MSB digit of the hour, the valid values are 0 to 2.
H_out0	Output(4 bit)	The LSB digit of the hour , the valid values are 0 to 9.

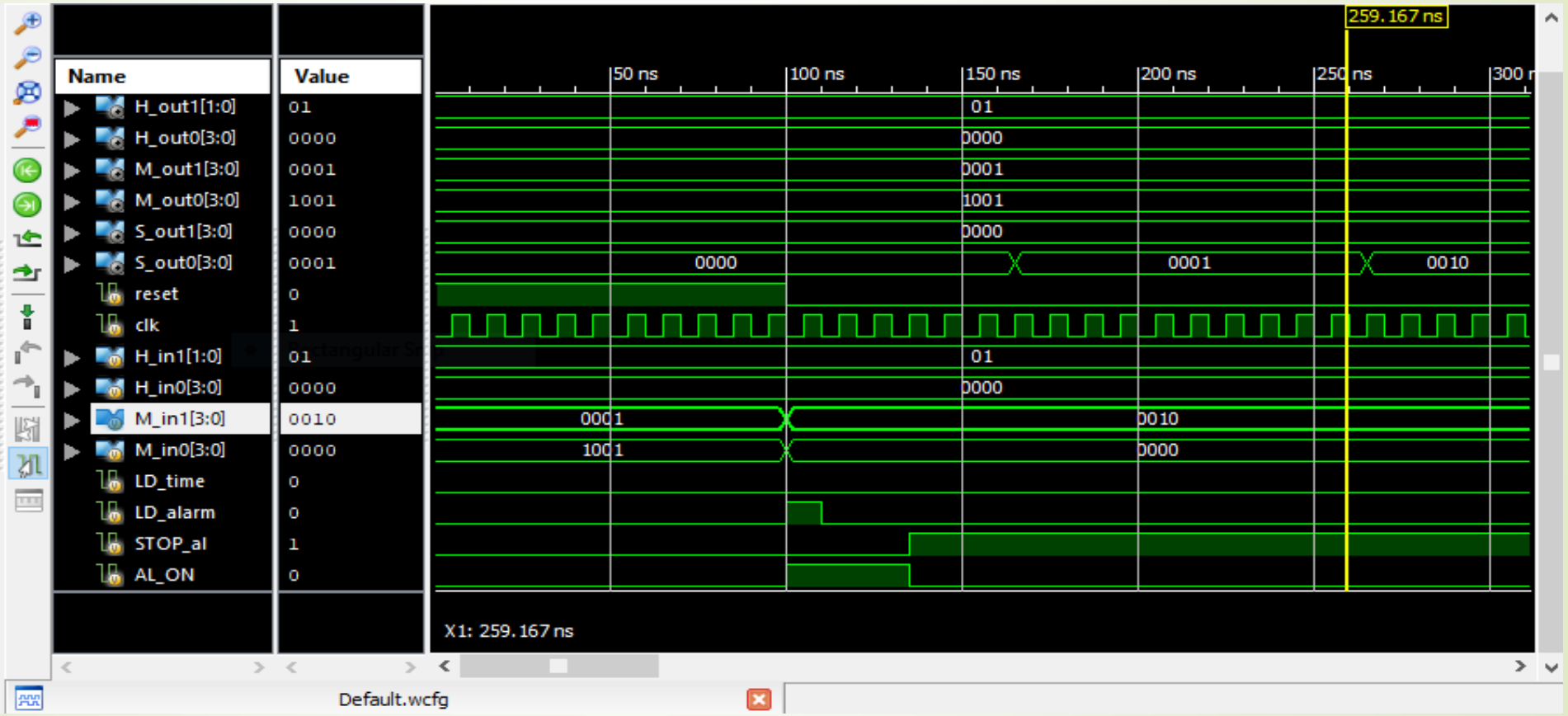
M_out1	Output(4 bit)	The MSB digit of the minute, the valid values are 0 to 5.
M_out0	Output(4 bit)	The LSB digit of the minute, the valid values are 0 to 9.
S_out1	Output(4 bit)	The MSB digit of the Second, the valid values are 0 to 5.
S_out0	Output(4 bit)	The LSB digit of the Second, the valid values are 0 to 9.

RTL_Schematic :



Simulation Result :




Name
Value
H_out1[1:0]
01
H_out0[3:0]
0000
M_out1[3:0]
0001
M_out0[3:0]
1001
S_out1[3:0]
0000
S_out0[3:0]
0001
reset
0
clk
1
H_in1[1:0]
01
H_in0[3:0]
0000
M_in1[3:0]
0010
M_in0[3:0]
0000
LD_time
0
LD_alarm
0
STOP_al
1
AL_ON
0
259.167 ns
50 ns
100 ns
150 ns
200 ns
250 ns
X1: 259.167 ns
Default.wcfg

Conclusion :

- In this project Digital clock is capable of displaying minutes and 24 hours along with capable of Alarm feature. Digital clock along with Alarm has been simulated and verified using Xilinx Ise.
- This project can be expanded by adding additional features.


Thank You !