CMP201
Microprocessors Systems

Lab 1 – Circuit Design using
Intel Quartus Prime

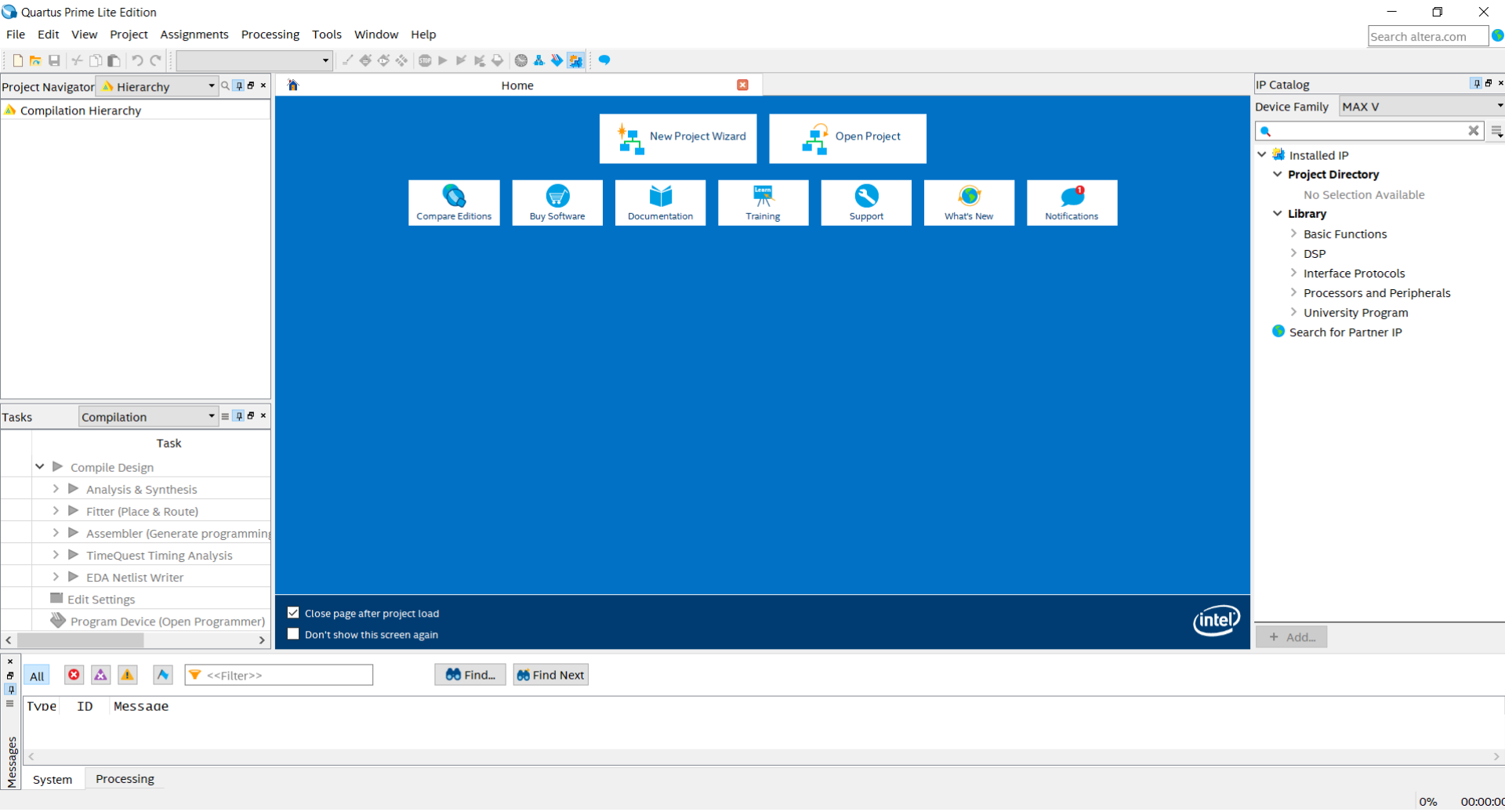
1- Setup & Run Quartus

- When You download (or copy) the setup file, Get 3 files:
  - Quartus Prime Lite
  - Modelsim Altera Starter edition
  - Max V
- Put all 3 setup files in one folder and run Quartus setup file

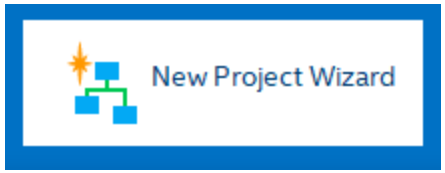
1- Setup & Run Quartus

- Quartus Prim (Lite / Web edition)
  - No need for Lic
  - Next, Next, Next, …
- Run Quatrus Prim icon on the desktop or from the start window 

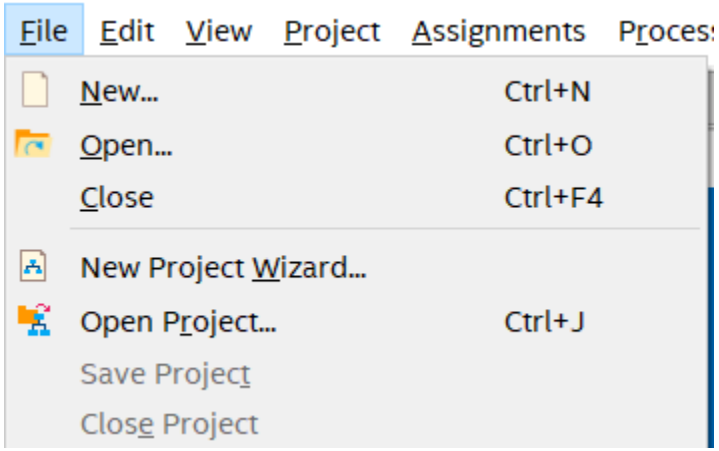
1- Setup & Run Quartus



2- New Project

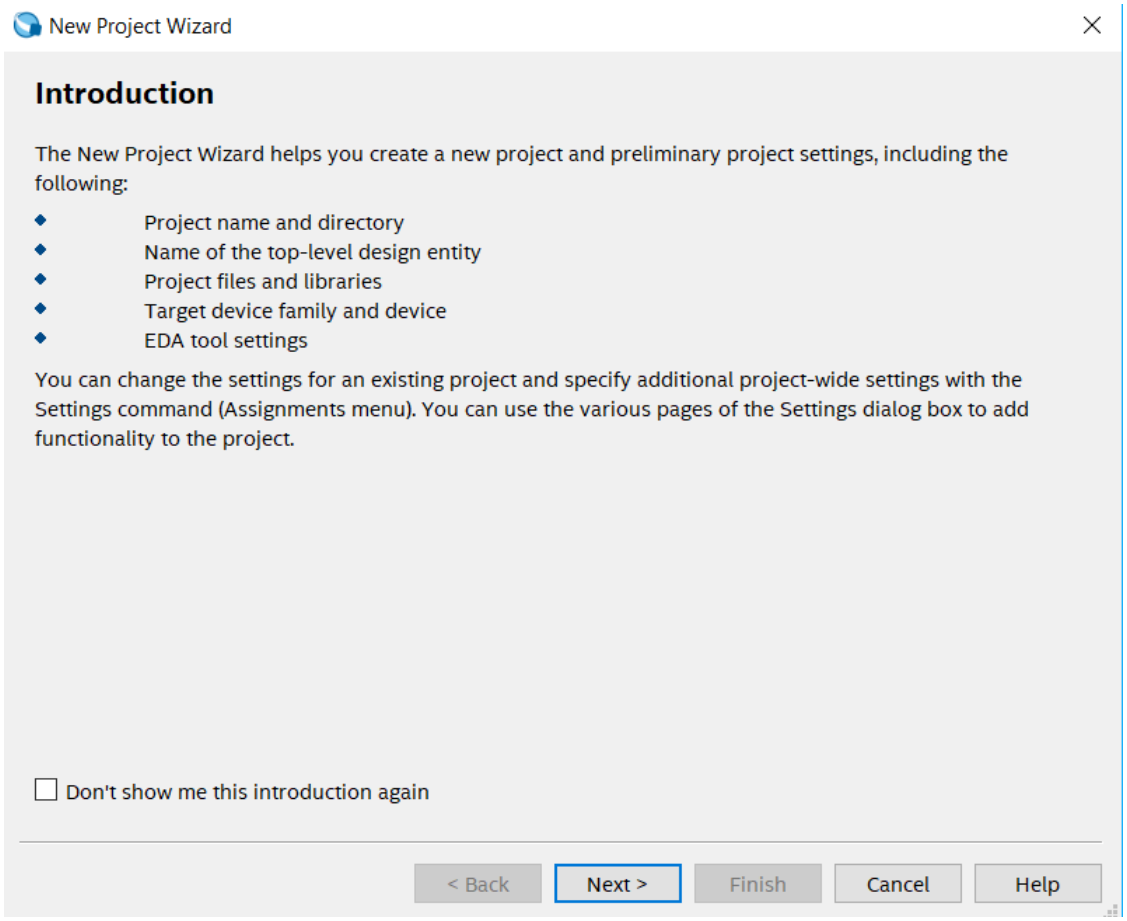
- Click on 

- Or “File” then “New Project Wizard”



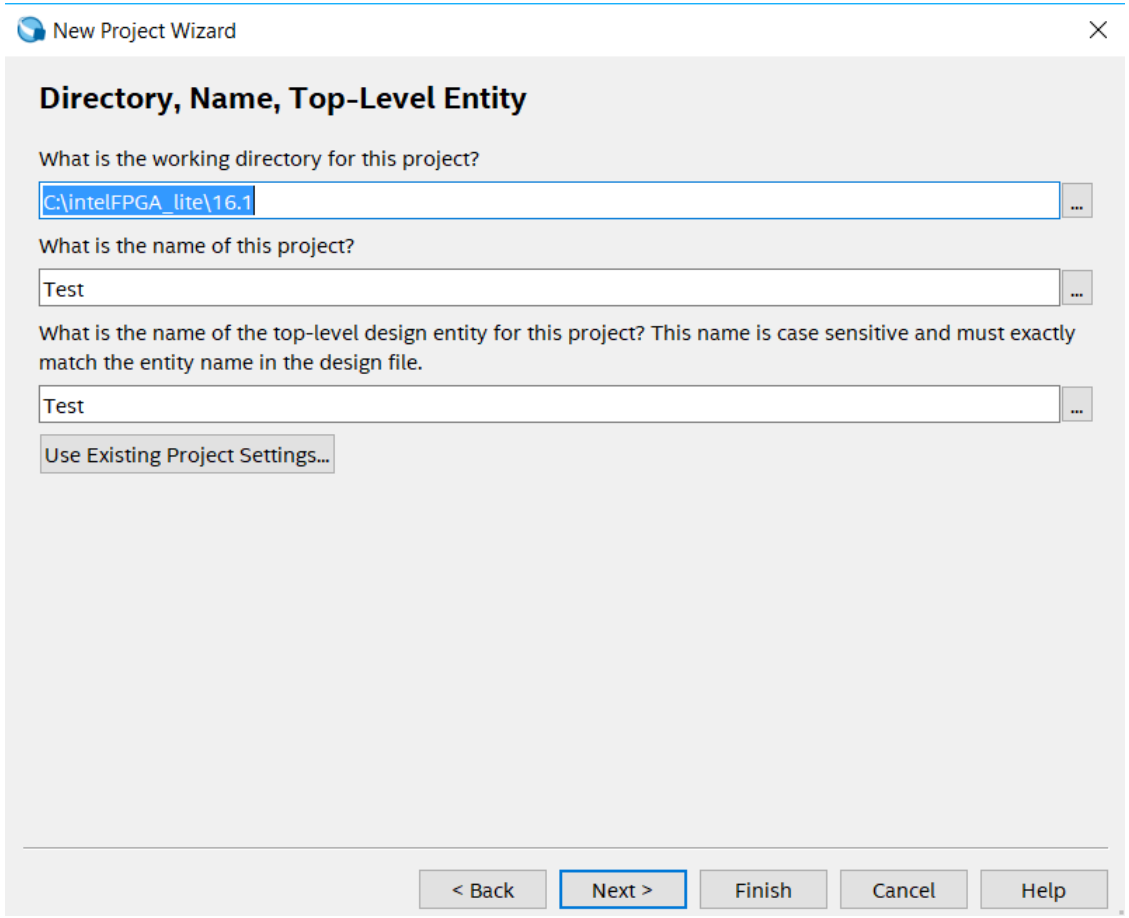
2- New Project

- Click Next



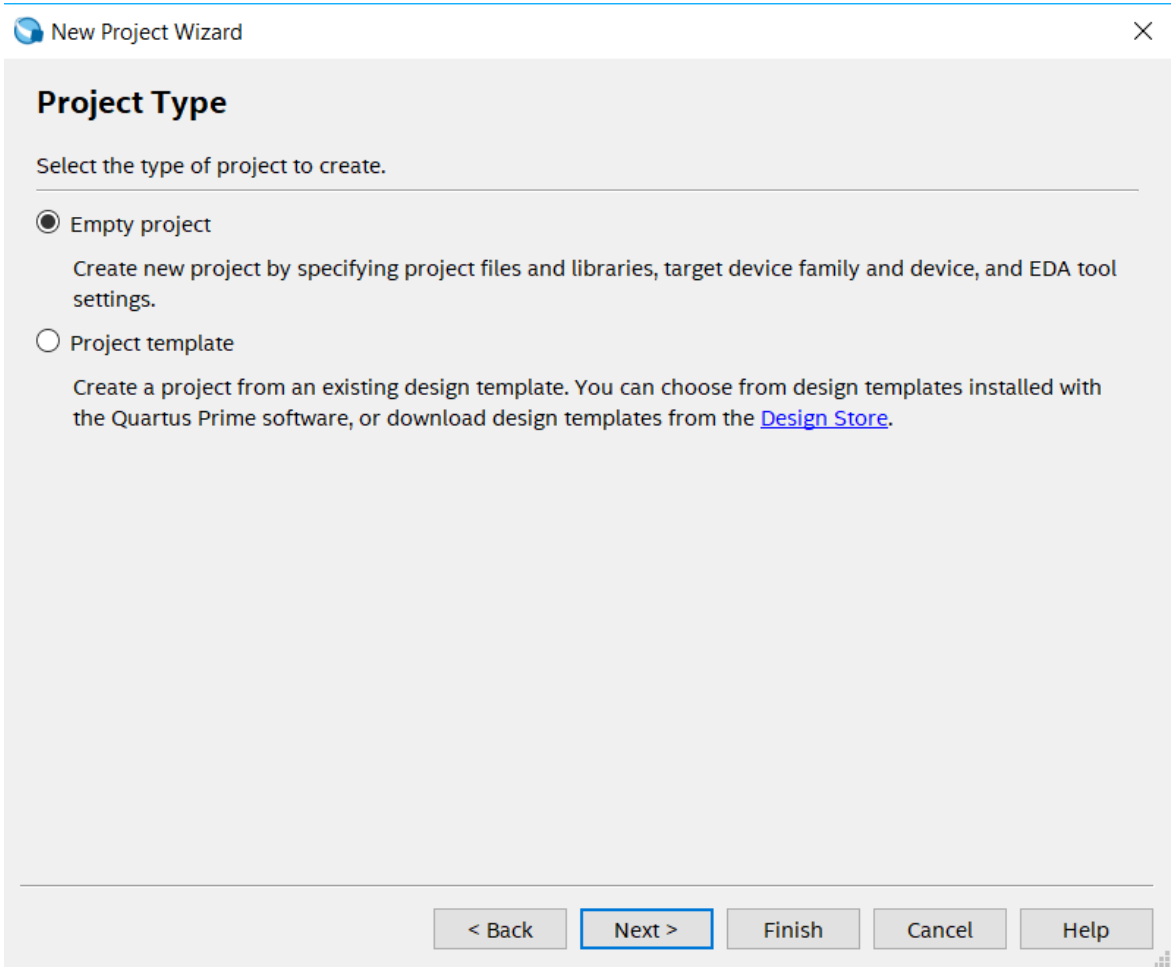
2- New Project

- Enter Your Project Directory & Name



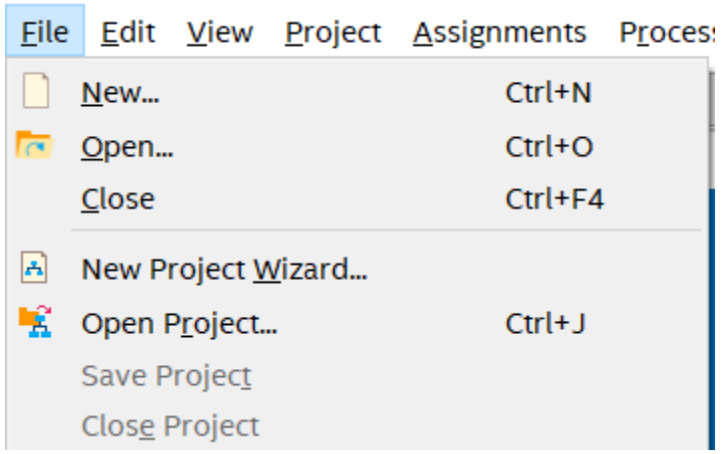
2- New Project

- Select Empty Project & Click Finish



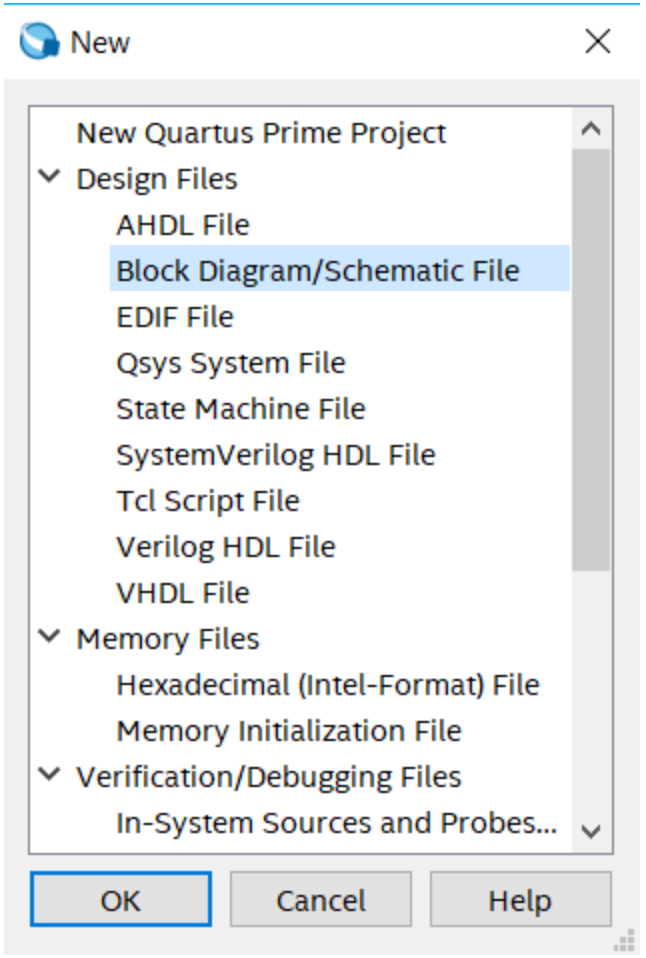
3- New Schematic File

- Click on “File” then “New”



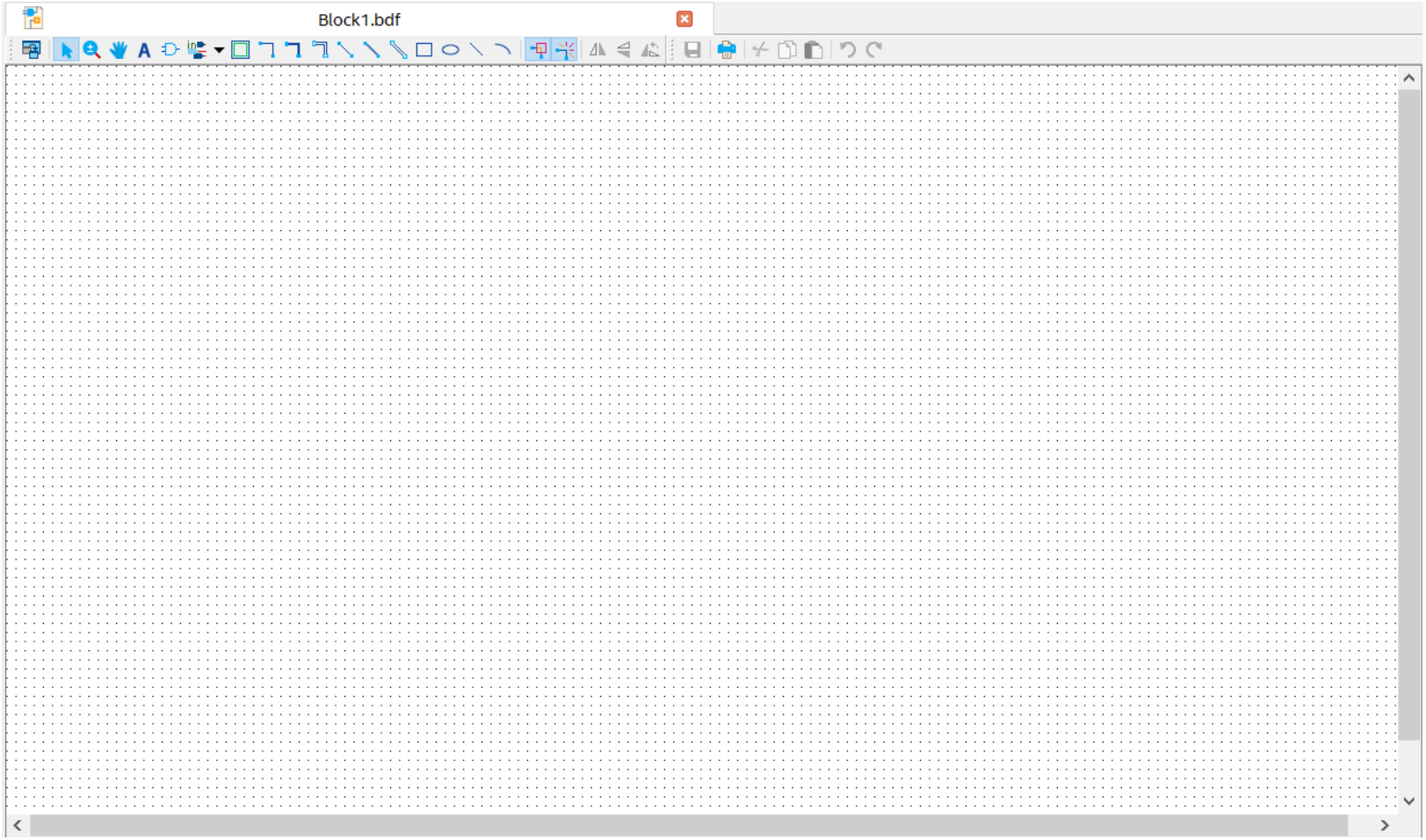
- Create a new

  “Block Diagram/Schematic File”



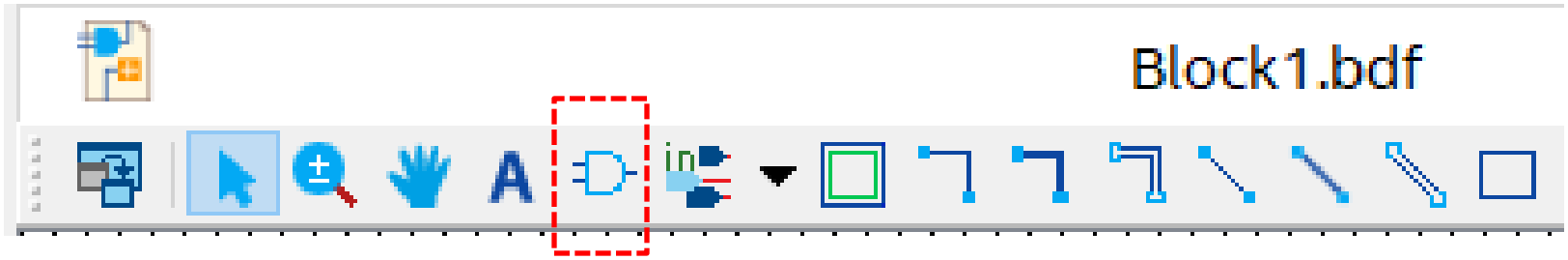
3- New Schematic File

- The new window is our schematic workspace



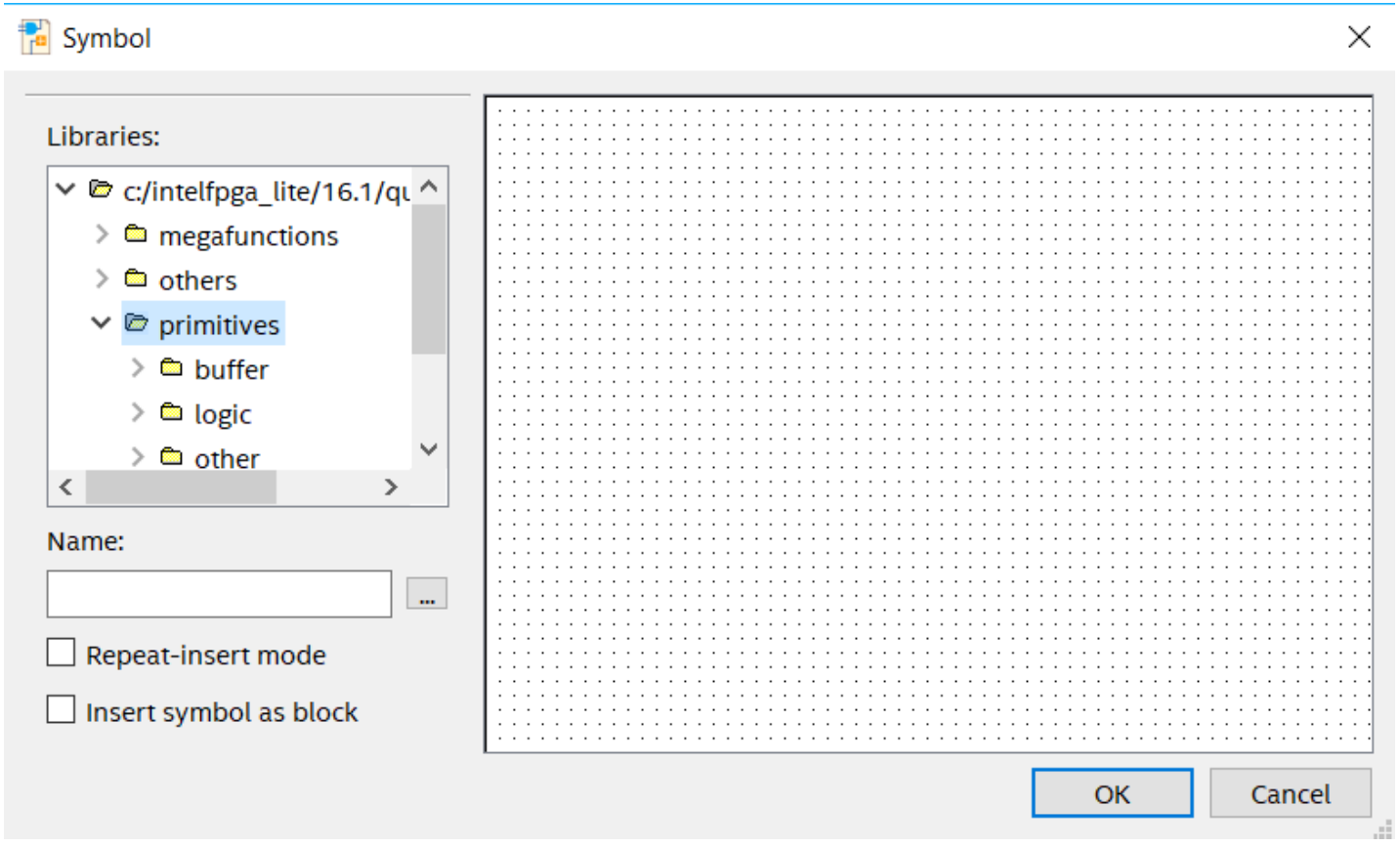
4- Add Gates

- Add a gate by double click in any place in the workspace
- Or by clicking on “Symbol Tool” icon



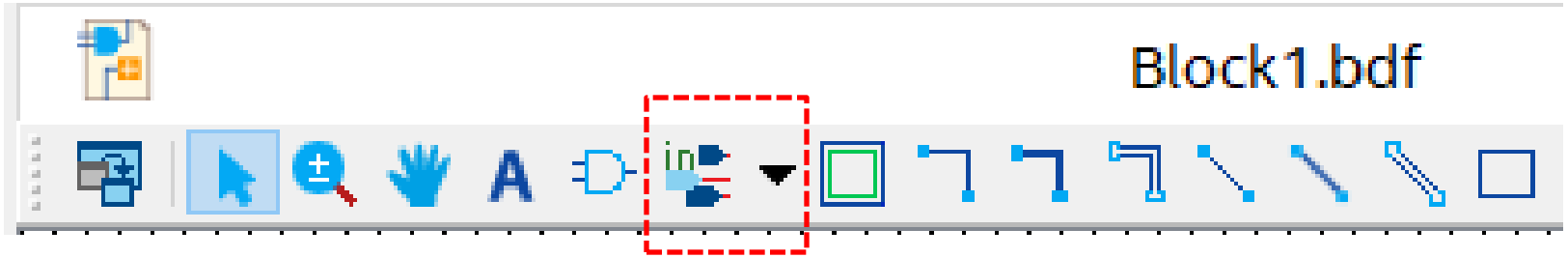
4- Add Gates

- Write the Gate Name (ex: and2)
- Or select it from “primitives” library



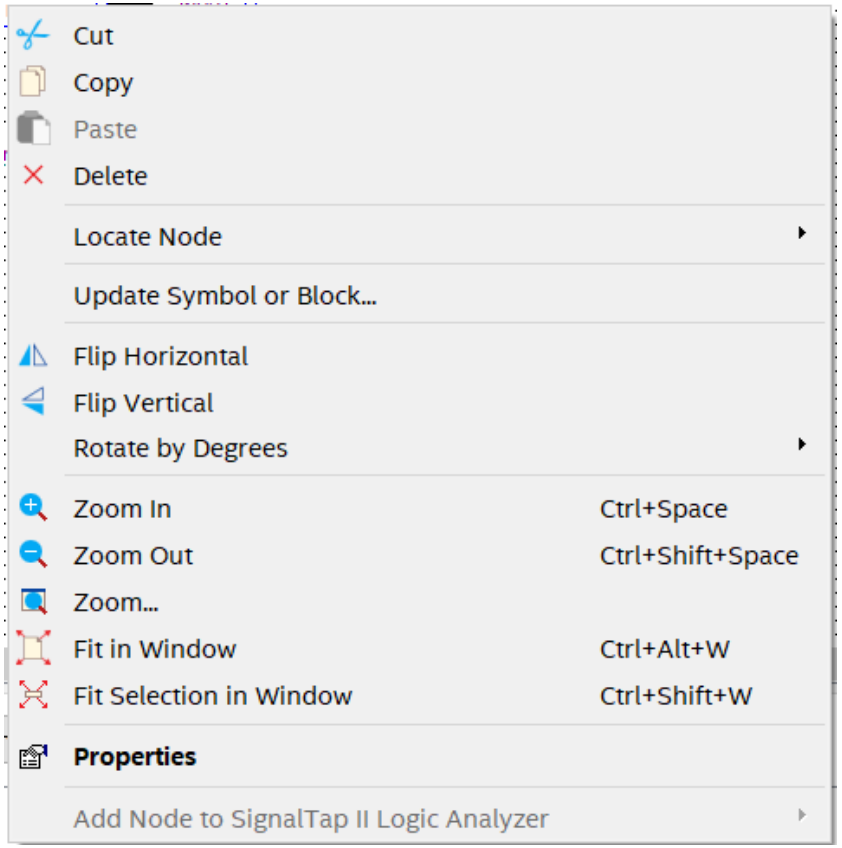
4- Add Gates

- Add a IO pin by selecting it from Toolbox



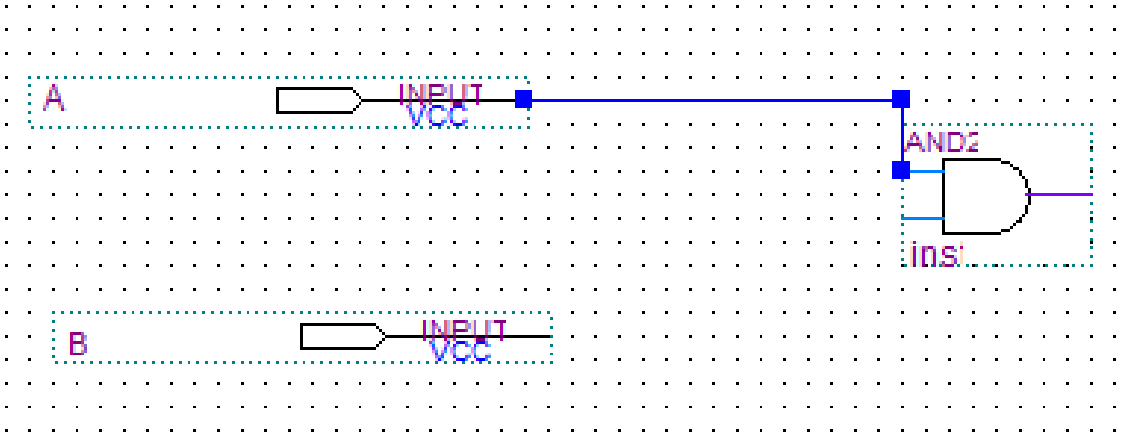
4- Add Gates

- Change an input/output pin name by double click on its label or right click then “Properties”



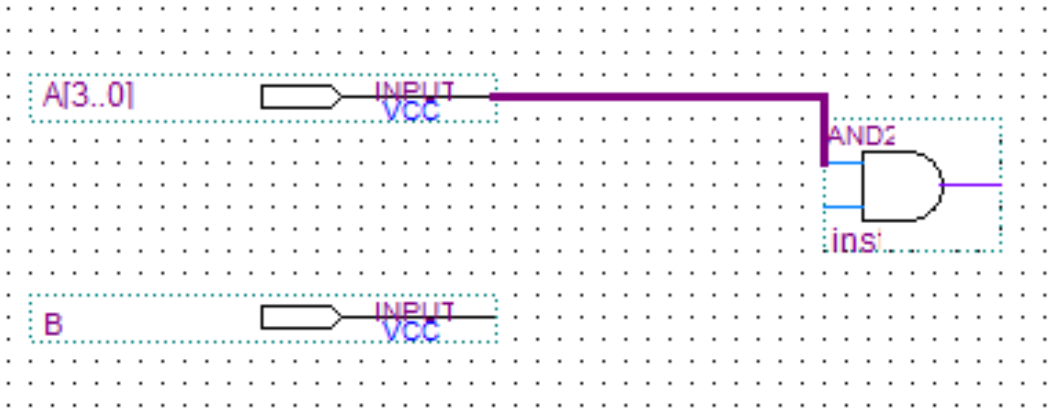
5- Add Connections/Wires

- Connect 2 pins by putting the mouse on the edge of the gate then drag to the other pin
- Or write the wire name on the 2 pins

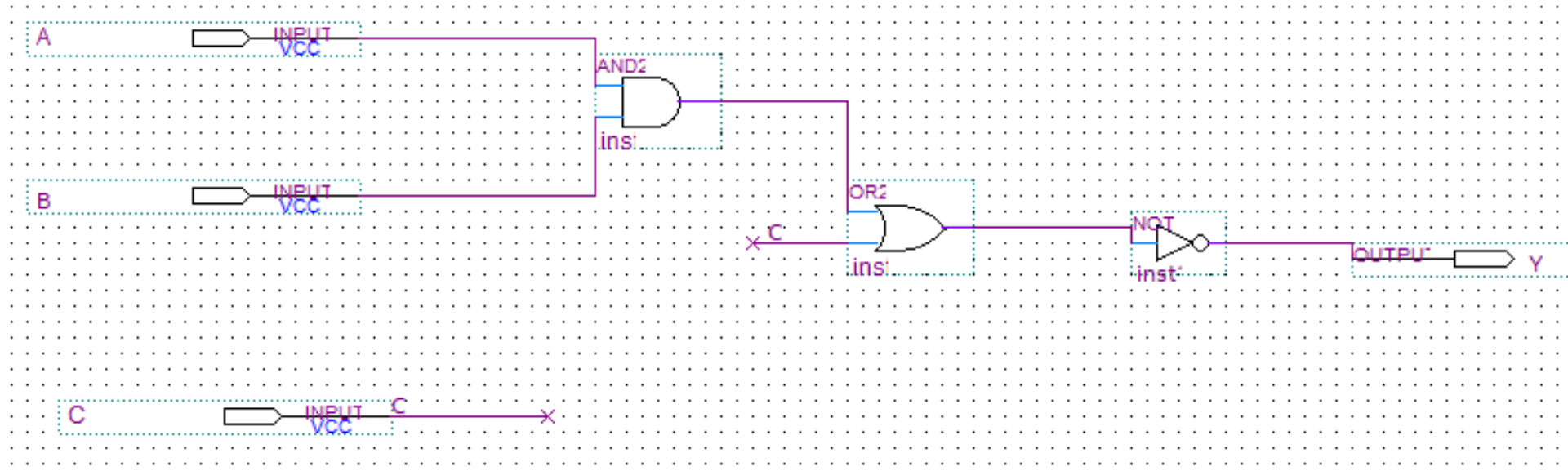


5- Add Connections/Wires

- You can define a connection as a bus instead of a 1-bit wire
- Name the input as “Bus_name[Start_bit..End_bit]”
  - For Example “A[0..3]” will create a 4-bit bus named “A”

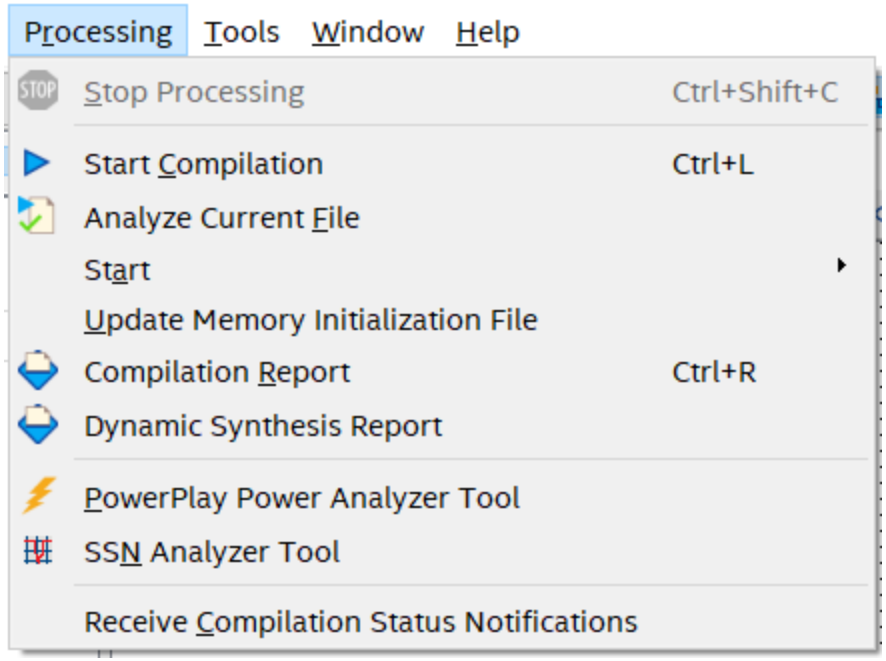


6- Draw the Circuit

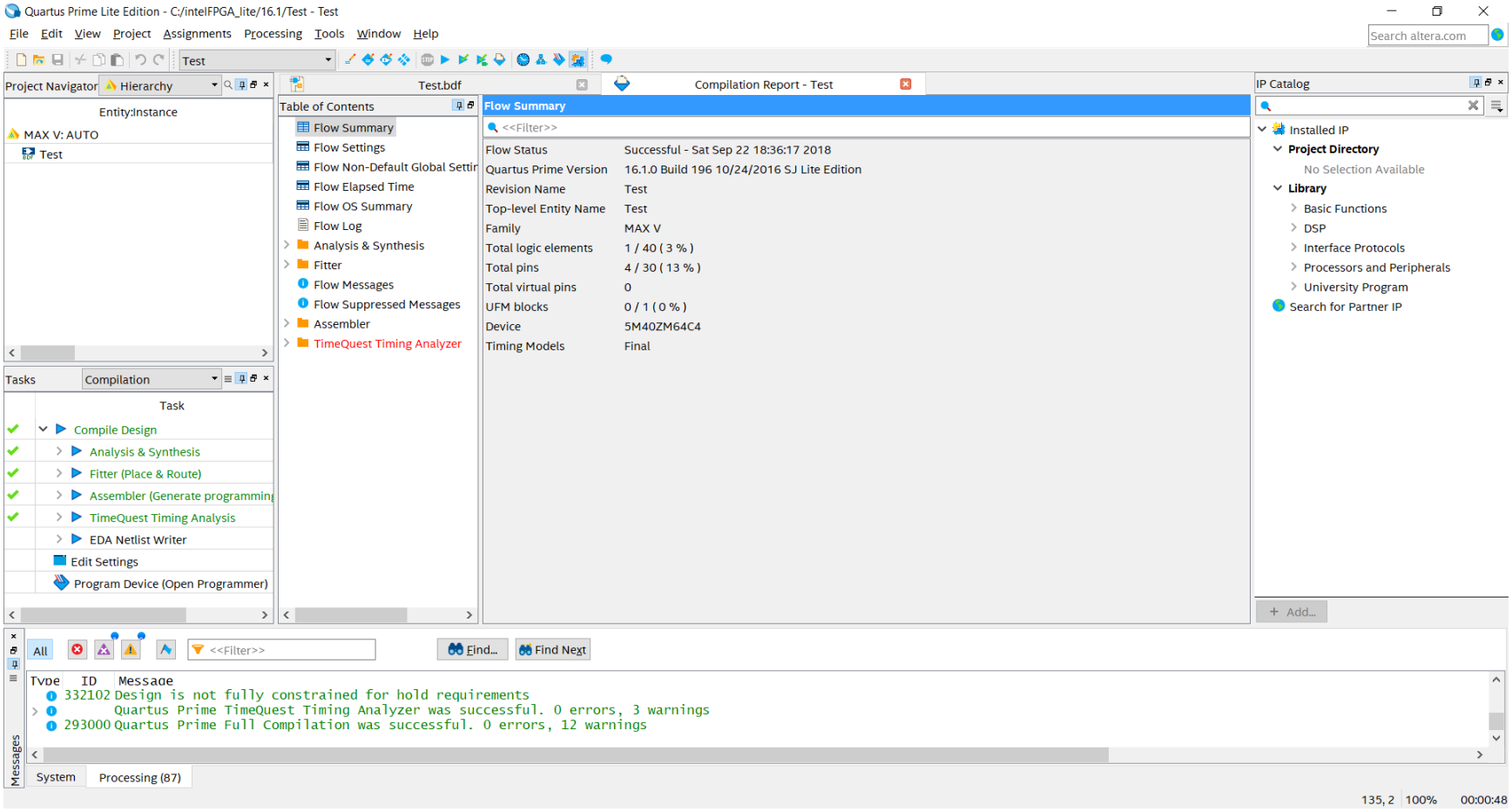


7- Compile the Circuit

- Save the schematic file
- Compile the circuit by clicking on “Processing” then “Start Compilation”



7- Compile the Circuit

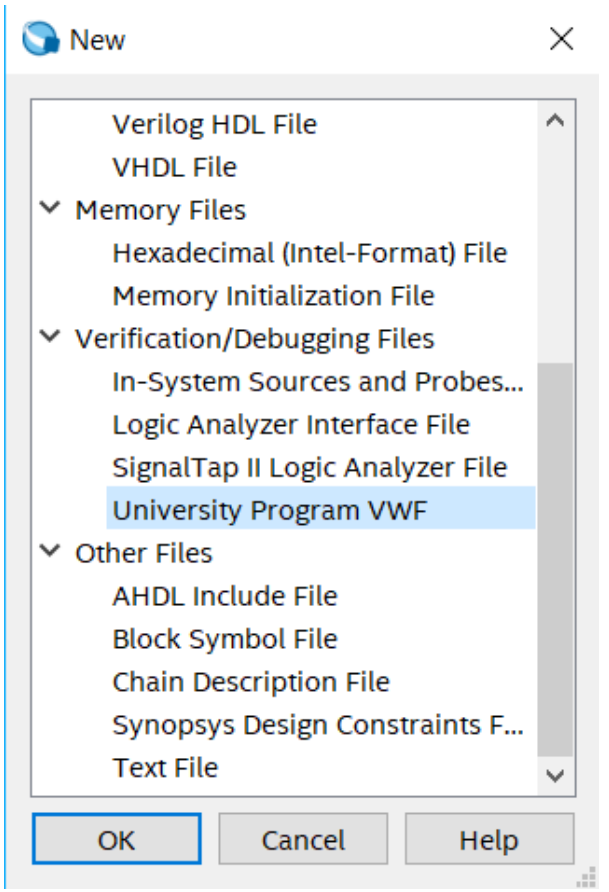


7- Compile the Circuit

- It will check the circuit for any:
  - Unconnected Pins
  - Short Circuits
  - Loops
  - Multiple pins/gates with same name

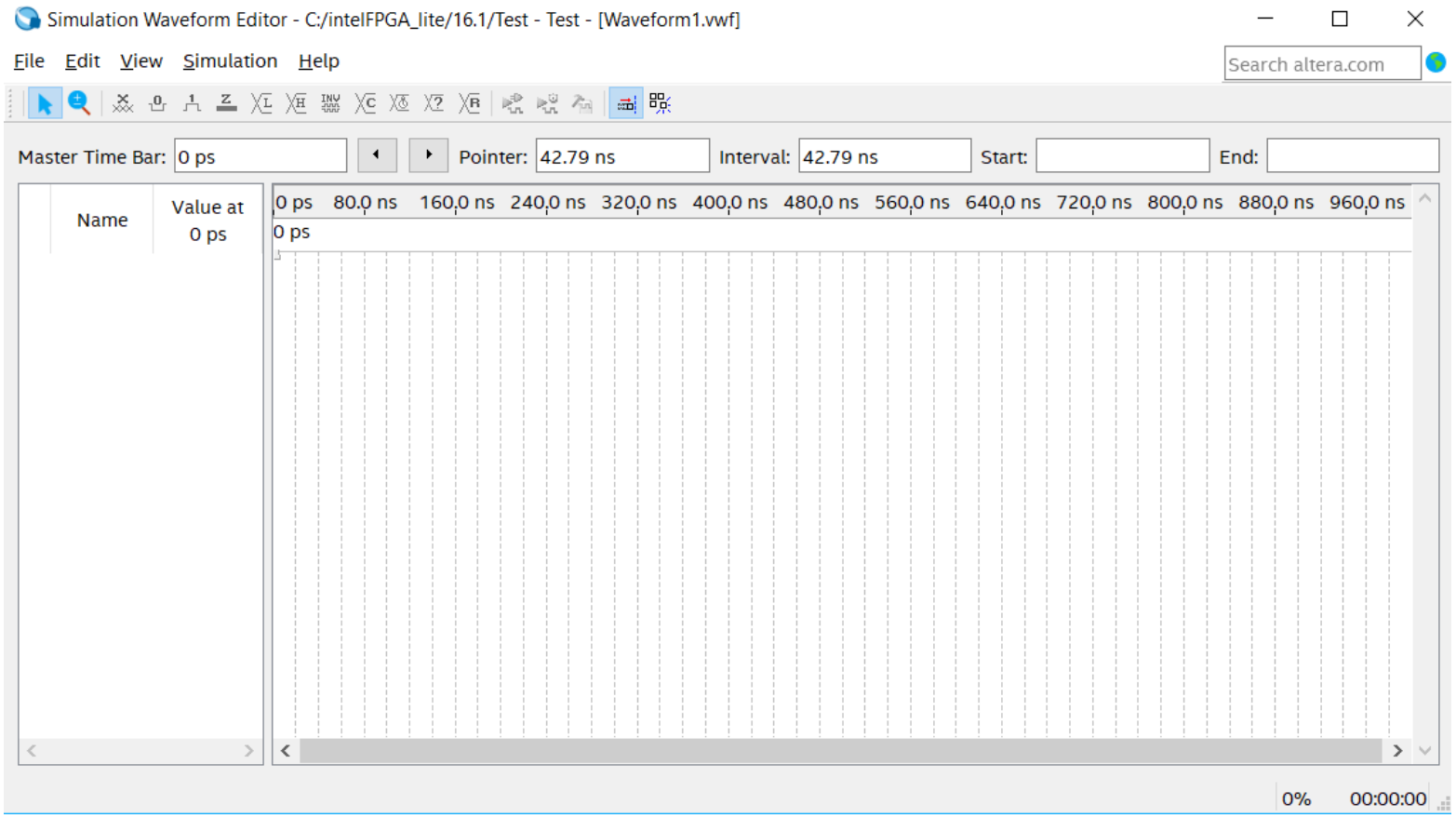
8- Simulate the Circuit

- Create a waveform to test your design
- Select “New” from “File” menu
- Then select
  “University Program VWF”



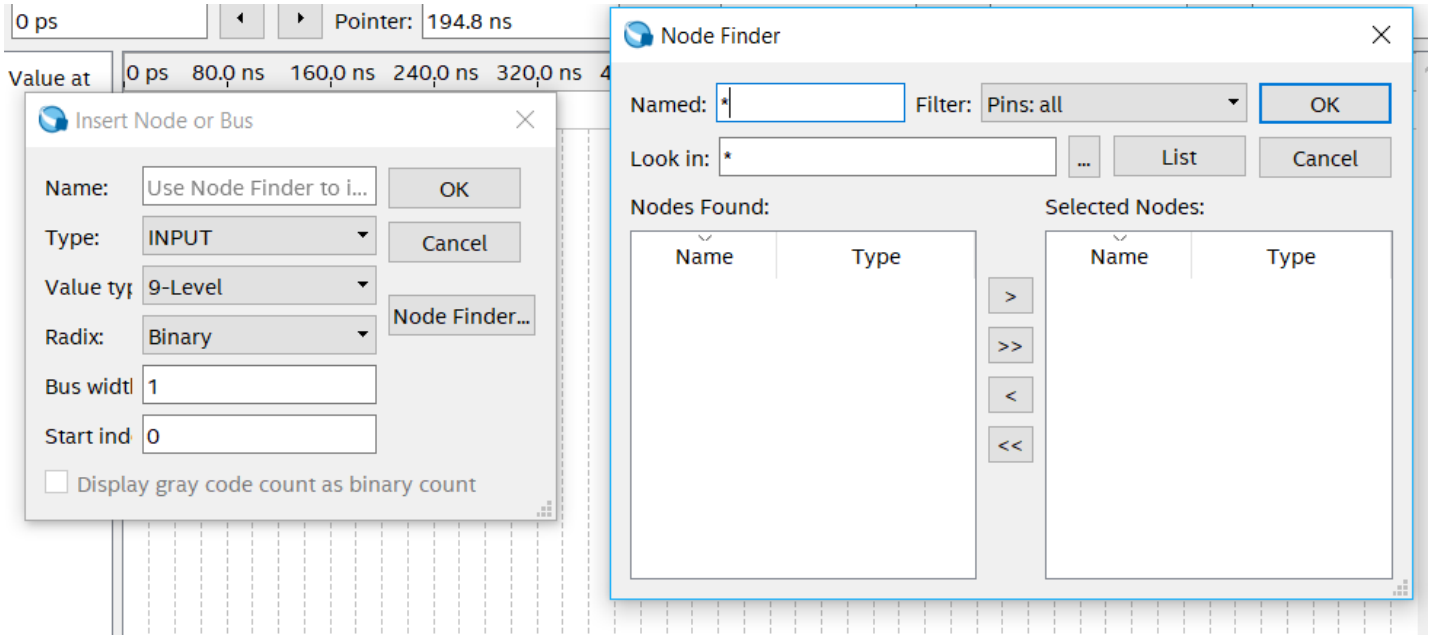
8- Simulate the Circuit

- The new window will be used to create the waveform



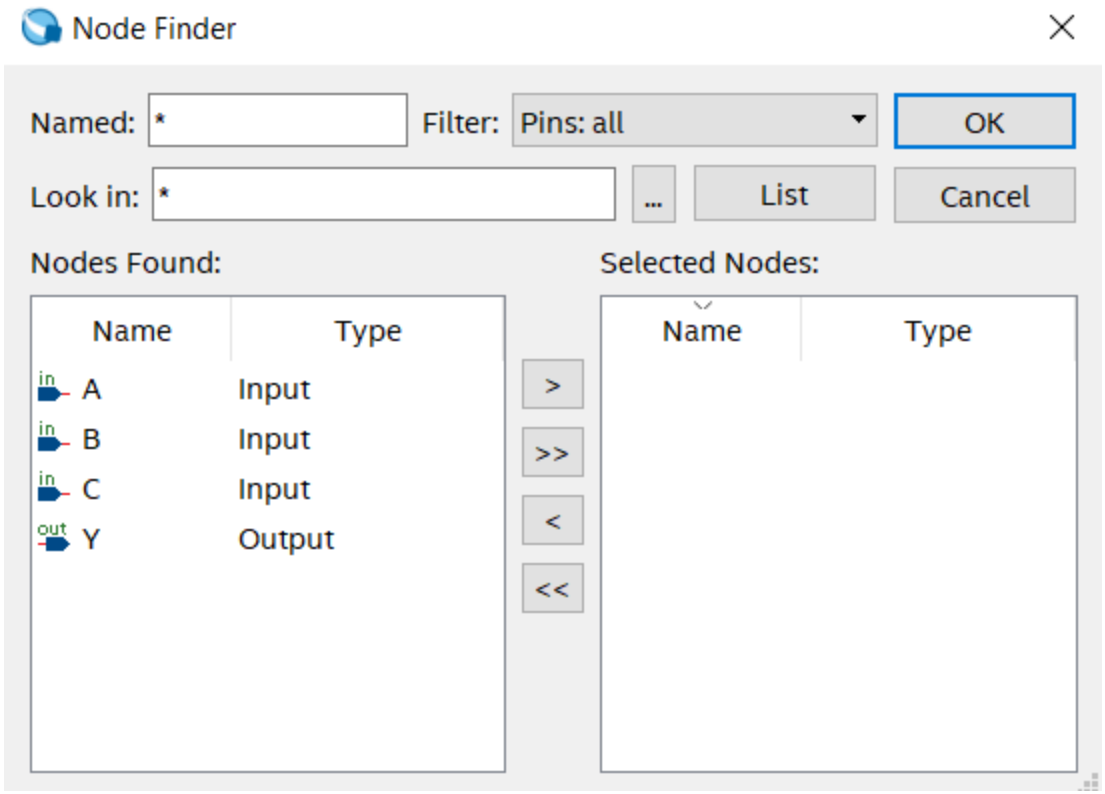
8- Simulate the Circuit

- To add an input/output/wire
  - Double click on a cell in the name column
  - Or right click and select “Insert Node or Bus”



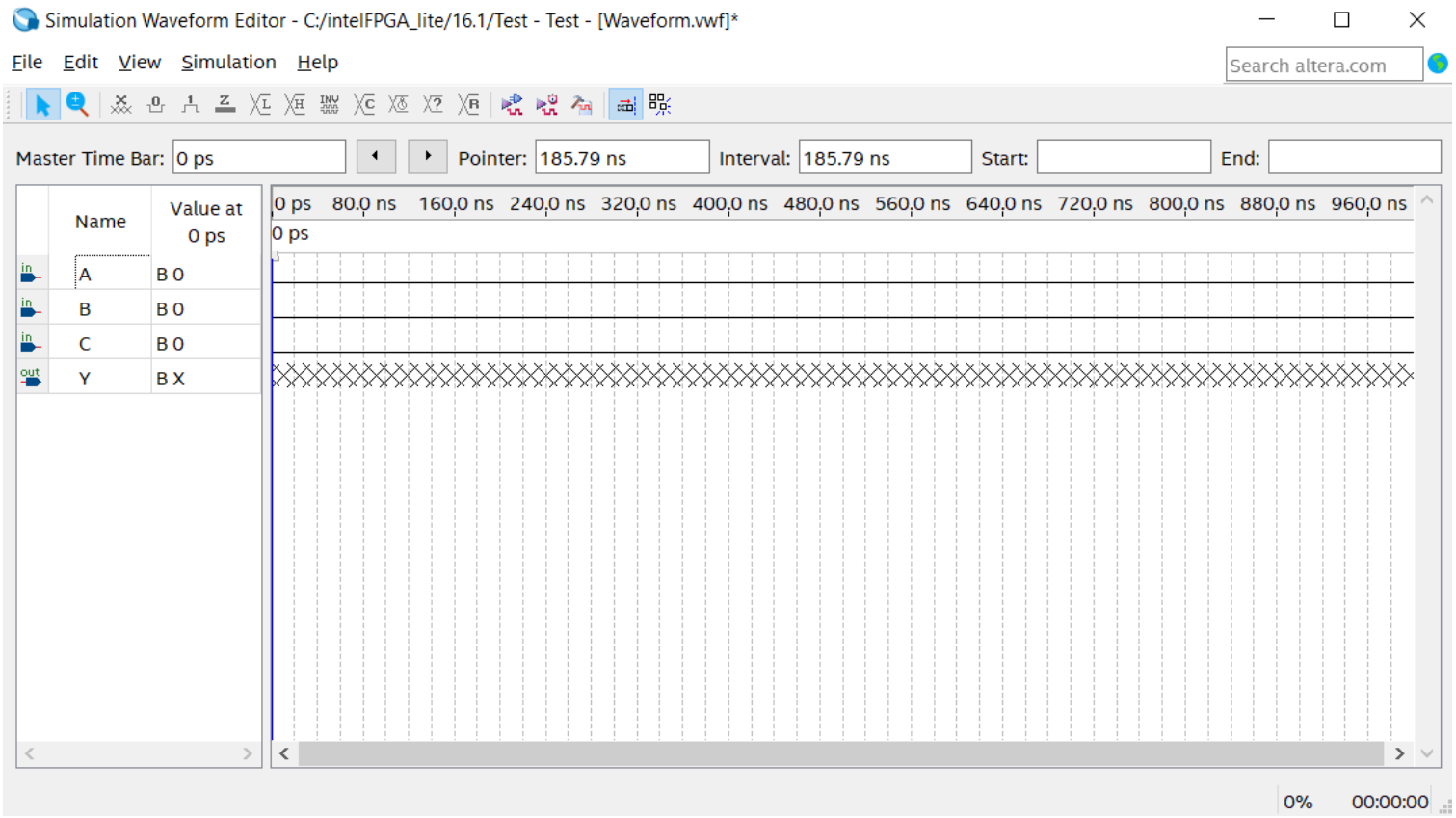
8- Simulate the Circuit

- Write the node name & select its parameters
- Or click “List” to see all the nodes in your design



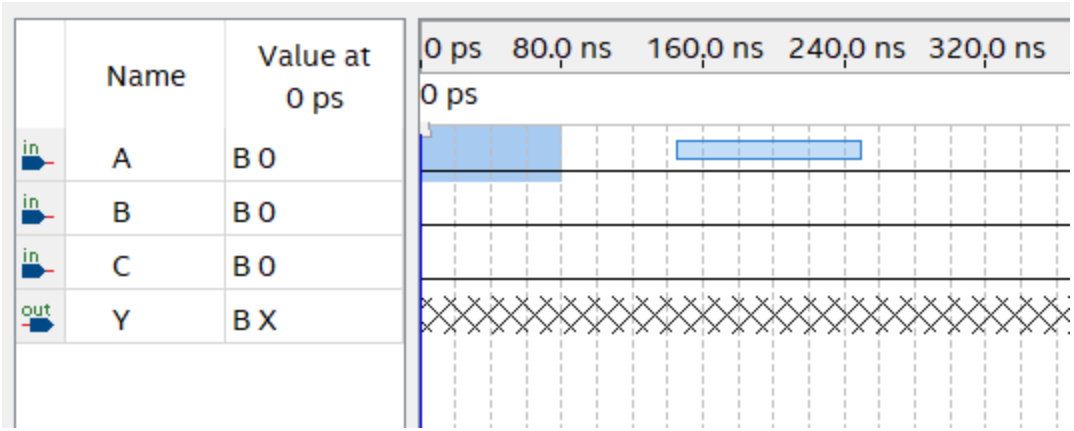
8- Simulate the Circuit

- Add all inputs/outputs you want to observe



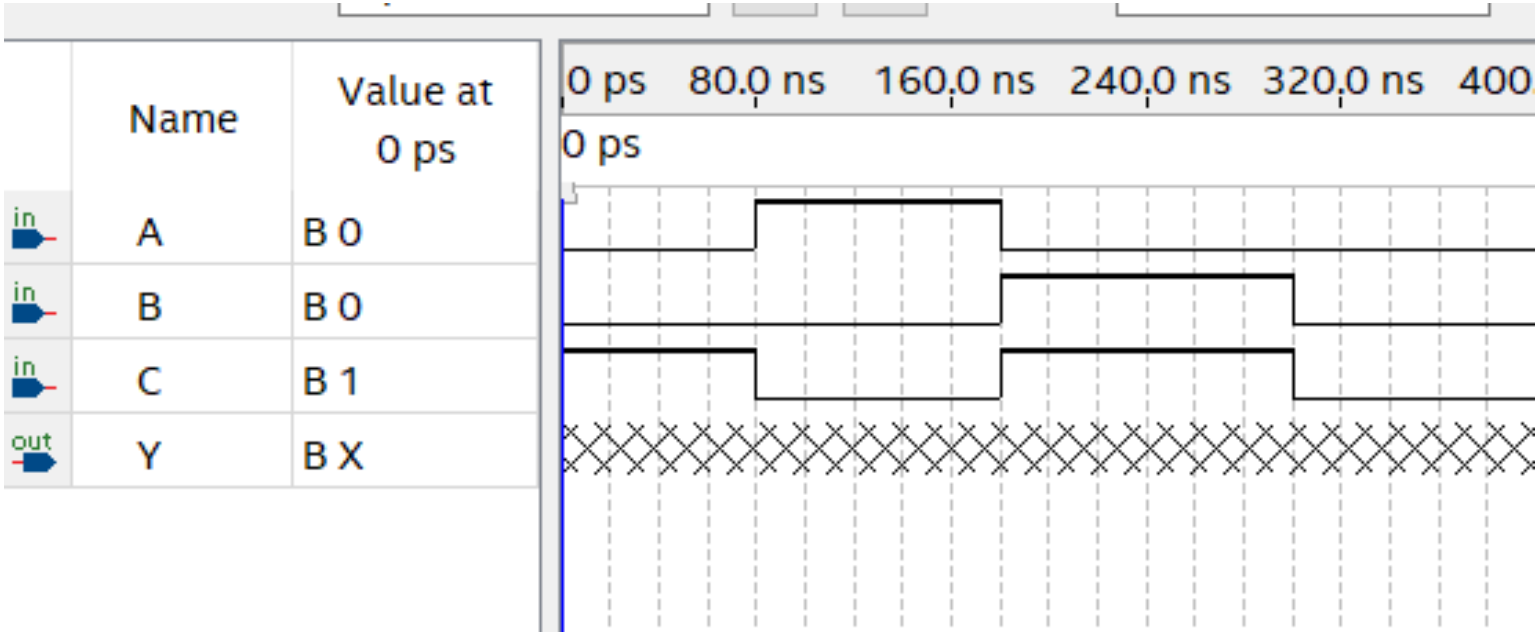
8- Simulate the Circuit

- The waveform is divided into sets of 10ns
- To change the value of a specific part
  - Click on the part you want to change then drag
  - Change the value from the tool bar or by right click



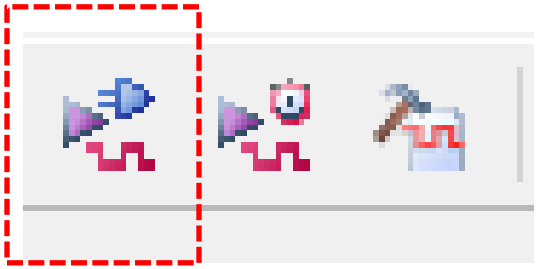
8- Simulate the Circuit

- Set your test scenario



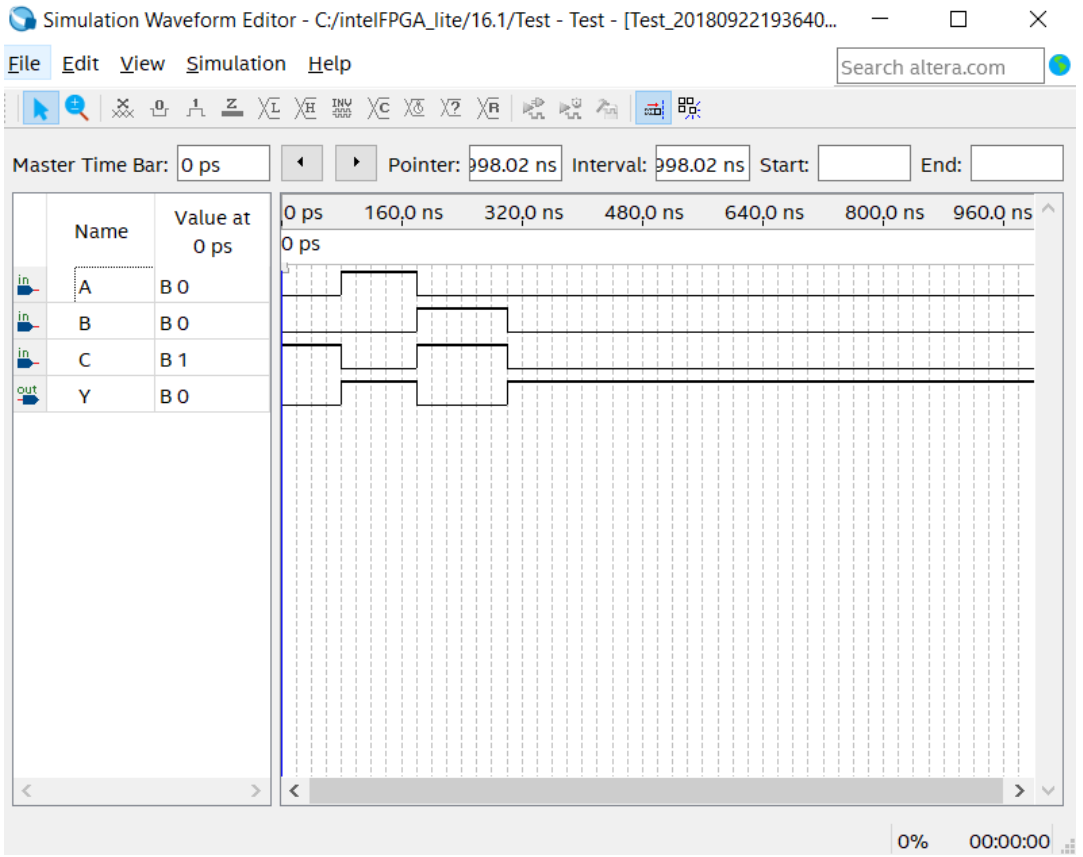
8- Simulate the Circuit

- Run the waveform simulation by clicking on this button from the tool bar



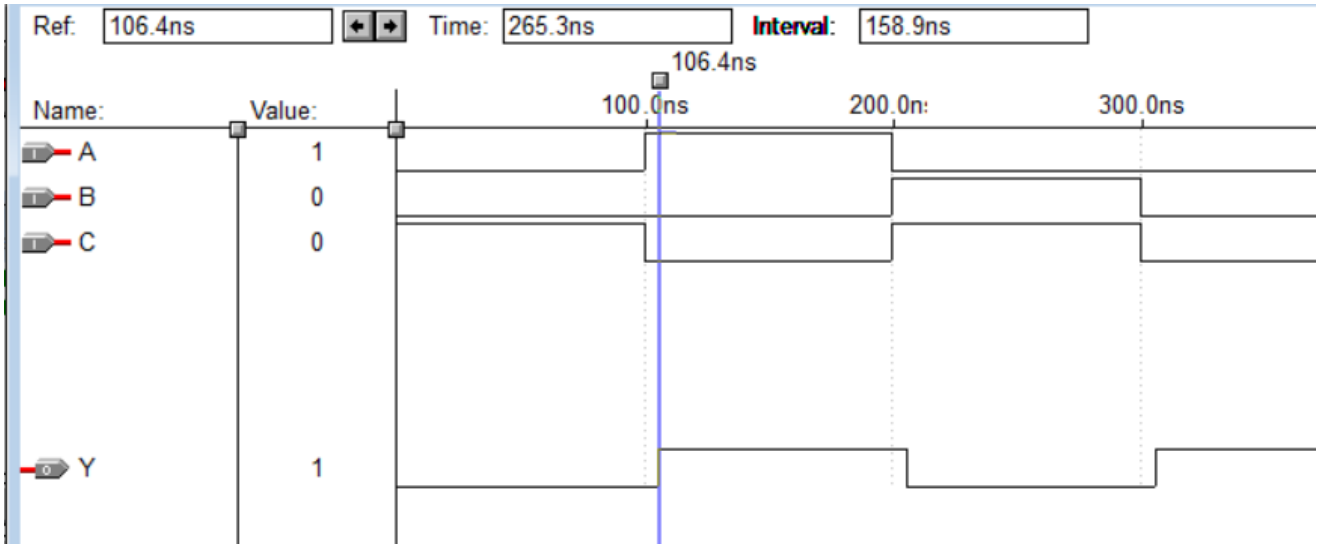
8- Simulate the Circuit

- The output pins values will be changed in the waveform window



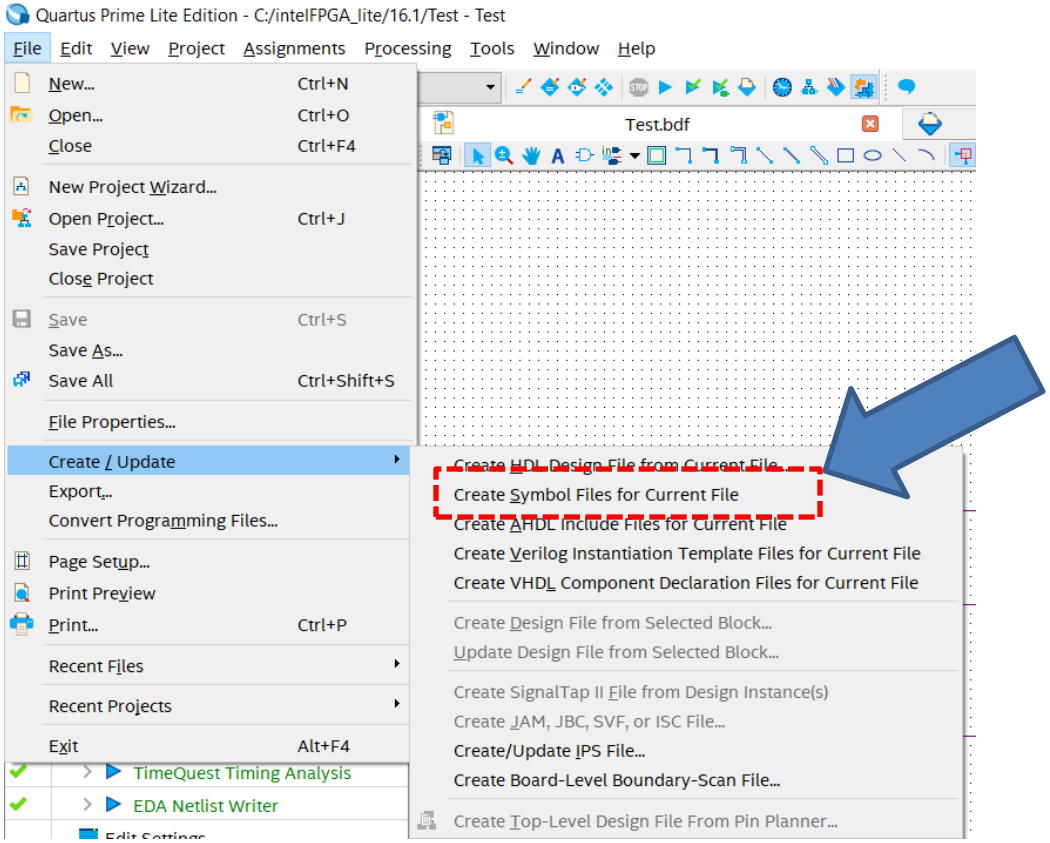
8- Simulate the Circuit

- In Advanced Sittings (More Realistic)
- The output do not change instantly, it takes a little delay to see the output

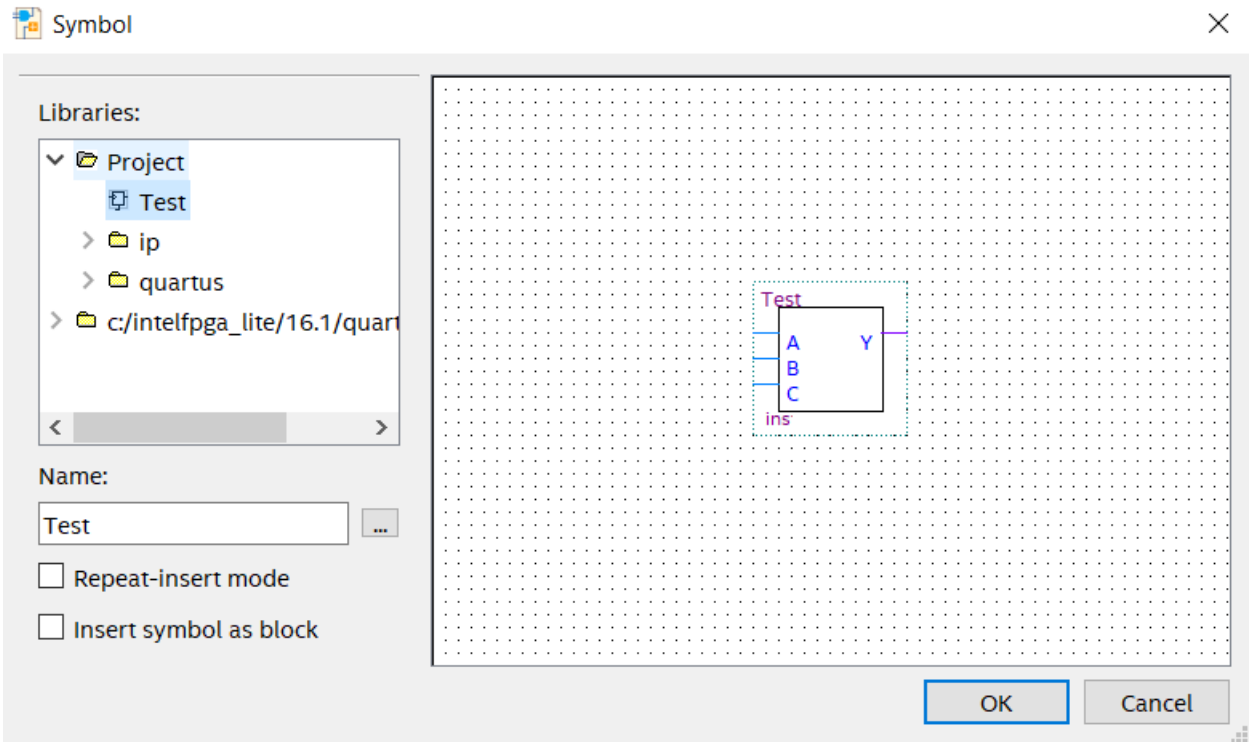


9- Reuse Your Circuit

- To reuse your circuit as a component
- Select “Create Symbol Files from Current File”



9- Reuse Your Circuit



10- Tips

- Do not name a project/file/label as “2” or “7aga” there is no variables that starts with “number”
- Do not add spaces or special characters in your file name or component name
- Save all your files in the same project directory

10- Tips

- Run Quartus as adminstrator
- Read the Error messages if any appears
- If Simulation is stuck
  - Add “onbreak {resume}” to simulation options