

5.2.1 Simulation Using Quartus and ModelSim

This section provides a step-by-step guide for installing Quartus and ModelSim, and simulating the full adder designed in the previous section.

Note: Required setup files have to be downloaded before starting the section.

Setting-up the Environment

Download setup files corresponding to

- Intel Quartus Prime Lite Edition Design Software Version 20.1.1
- ModelSim Intel FPGA Edition Version 20.1.1
- Intel Cyclone IV Device Support file

into a single directory and run the Quartus installer. Proceed until the installer prompts for selecting components to install. Select all the components in the list except ModelSim paid version (see Figure 5.2).

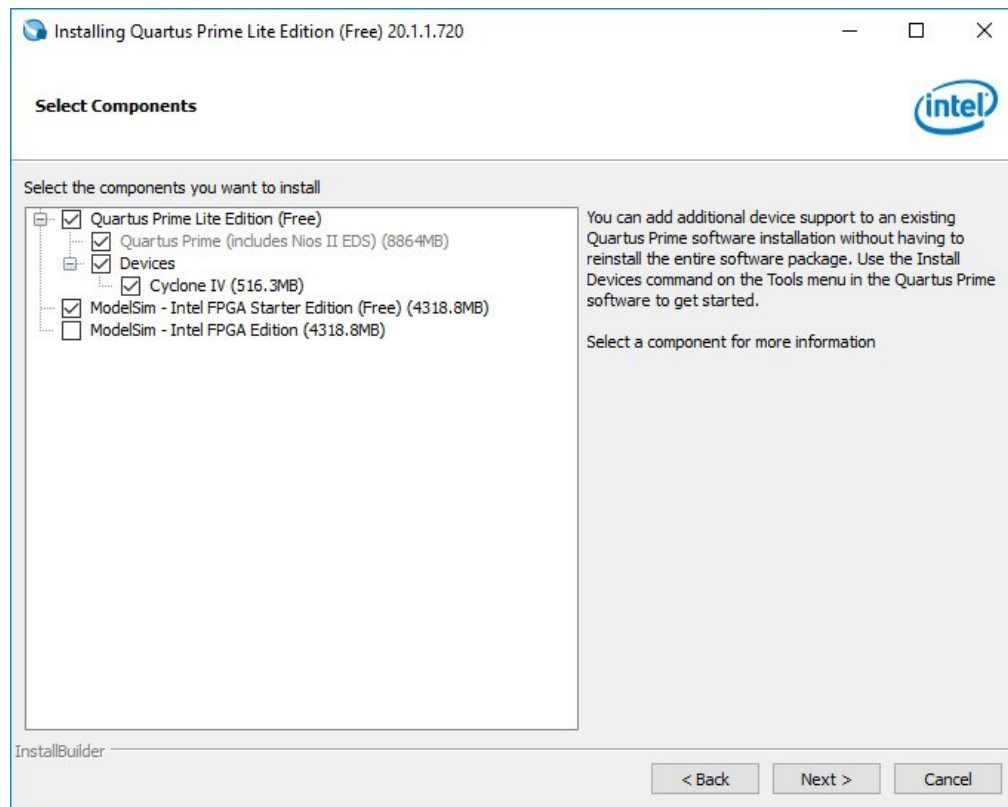


Figure 5.2: Quartus installer: selecting components to install

After setting-up the required software tools, open *Quartus Prime Lite 20.1.1* Design Software. It will bring you to the home screen of Quartus illustrated in Figure 5.3. To verify that the ModelSim has been integrated correctly, complete the steps mentioned below;

1. Click **Tools > Options** from the menu bar. This will open up the **Options** dialog box.
2. Select **EDA Tool Options** listed under **General** category in the left-hand side pane.
3. There should be file paths mentioned in-front of **ModelSim** and **ModelSim-Altera** (see Figure 5.4).
4. From your file manager/explorer, navigate to the mentioned location and check whether **modelsim.exe** file exists. If so, you are good to go. Press **Cancel** button to exit without modifying anything.
5. If not, find the location of the **modelsim.exe** file and replace the current paths by the correct path. Press **OK** to save and exit.

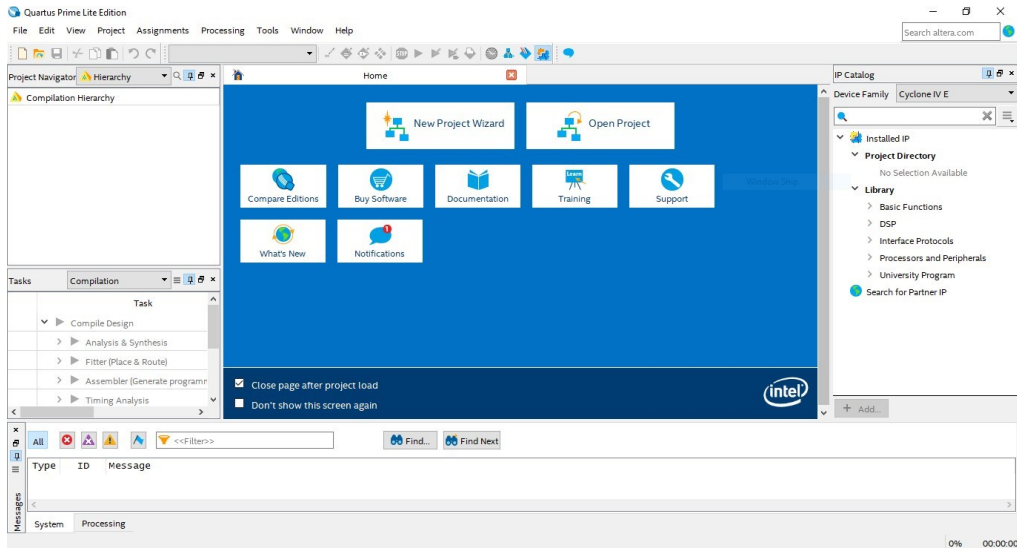


Figure 5.3: Quartus home screen

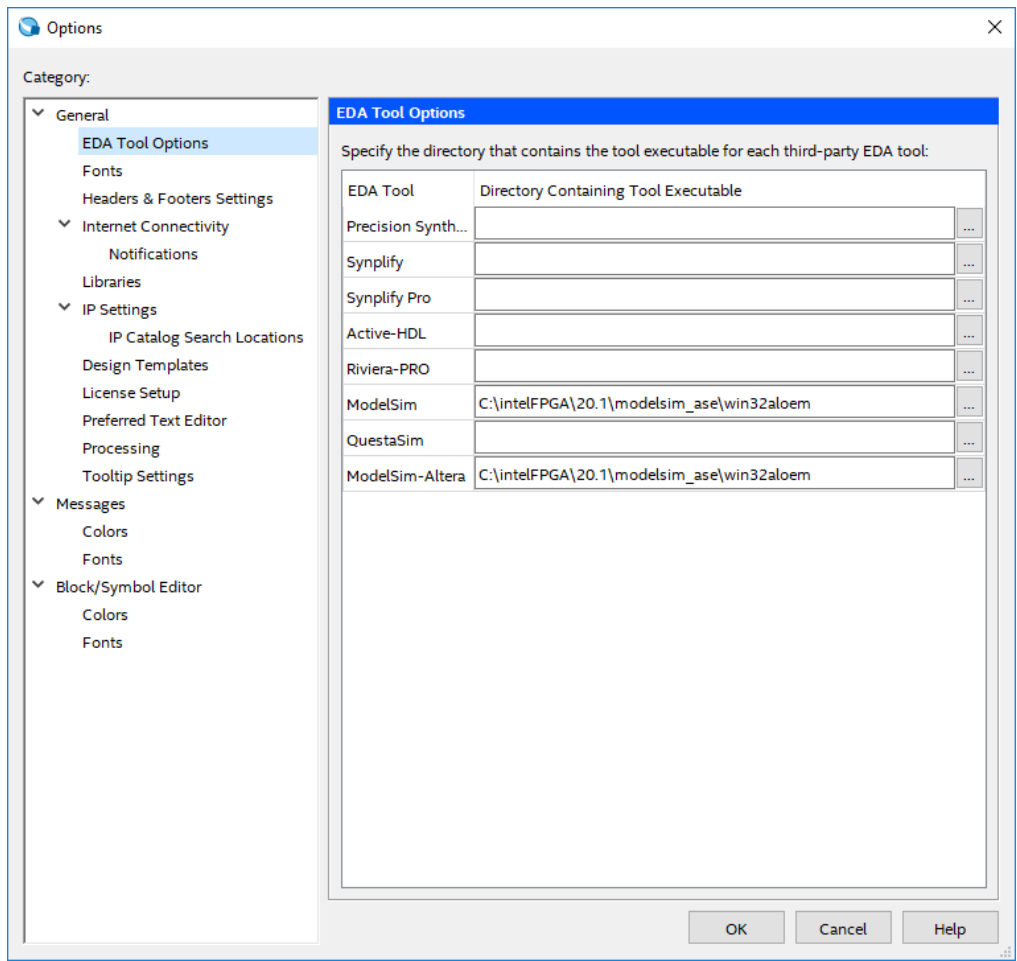


Figure 5.4: Setting ModelSim path

Creating a New Project

To start the **New Project Wizard**, either click on the "New Project Wizard" button on the home screen or goto **File > New Project Wizard**. This will open up the window illustrated in Figure 5.5.

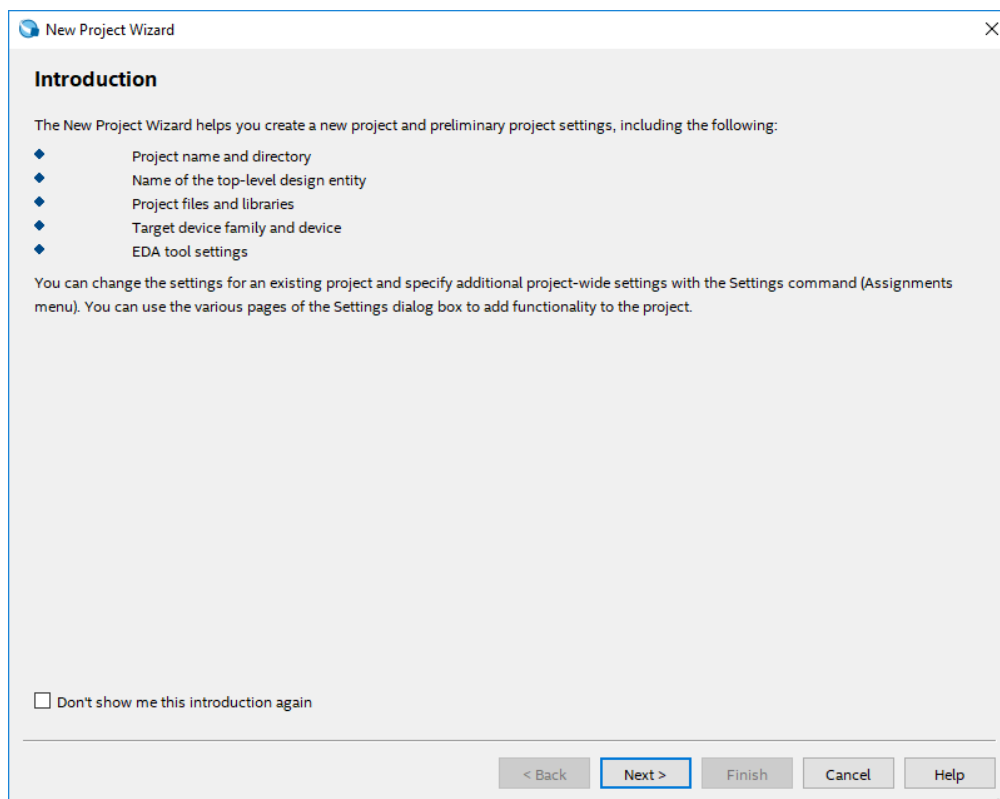


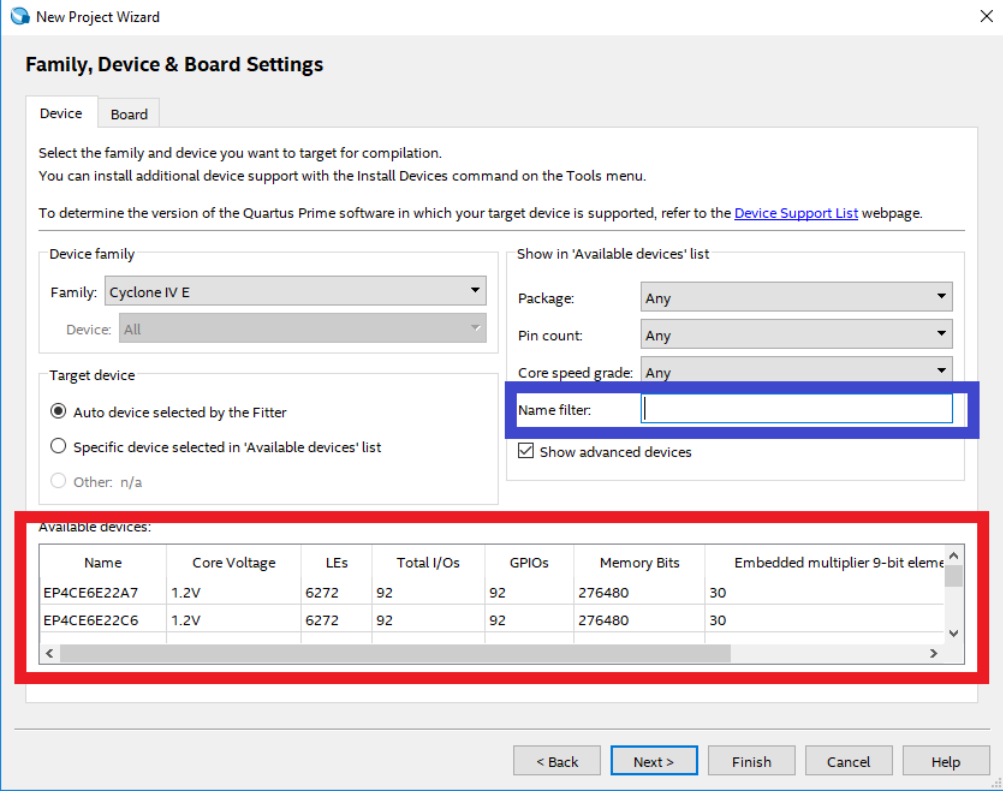
Figure 5.5: New Project Wizard

Follow the instructions listed below to create a new project.

1. Click **Next** to navigate to the project details form.
2. Specify a working directory and a suitable name for the project and click **Next**.
3. Specify the project type. Since we are creating this project from scratch, select **Empty project**. Click **Next**.
4. If we need to use any already-existing files, we can specify them here. Since there are no such files, click **Next** to continue.
5. Carefully select the device family and model. In order to use *DE0-Nano* development board (which will be used in a later experiment), select the following:
 - Family: Cyclone IV E
 - Device: EP4CE22F17C6N

See Figure 5.6. Click  to continue.

6. If we need to use any additional third part software tools along with Quartus, we can specify them here. Since we are not going to use any, click **Next** to move on.
7. Finally, a summary of all the attributes of the new project will be shown. If everything is correct, click **Finish**. This will create the new project and will bring you to the screen shown in Figure 5.7.



The image shows the 'New Project Wizard' window, specifically the 'Family, Device & Board Settings' tab. The 'Device' sub-tab is active. The 'Device family' section has 'Family' set to 'Cyclone IV E' and 'Device' set to 'All'. The 'Target device' section has 'Auto device selected by the Fitter' selected. The 'Show in 'Available devices' list' section has 'Package', 'Pin count', and 'Core speed grade' all set to 'Any'. The 'Name filter' text box is highlighted with a blue square. The 'Available devices' table is highlighted with a red square and contains two rows of device information. The 'Next >' button is highlighted with a blue border.

Family, Device & Board Settings

Device | Board

Select the family and device you want to target for compilation.
You can install additional device support with the Install Devices command on the Tools menu.

To determine the version of the Quartus Prime software in which your target device is supported, refer to the [Device Support List](#) webpage.

Device family

Family: Cyclone IV E
Device: All

Target device

☒ Auto device selected by the Fitter
☐ Specific device selected in 'Available devices' list
☐ Other: n/a

Show in 'Available devices' list

Package: Any
Pin count: Any
Core speed grade: Any
Name filter:
☒ Show advanced devices

Available devices:

Name	Core Voltage	LEs	Total I/Os	GPIOs	Memory Bits	Embedded multiplier 9-bit elements
EP4CE6E22A7	1.2V	6272	92	92	276480	30
EP4CE6E22C6	1.2V	6272	92	92	276480	30

< Back | Next > | Finish | Cancel | Help

Figure 5.6: Family, device and board selection. Red square: select device type here. Blue square: type a part of the device name to filter the list