

Quartus Installation Instructions
(Last Updated for Quartus v23.1.1)

Throughout EEL3701, we will be using Intel’s Quartus Prime software suite to design, simulate, and compile digital circuit designs for use on the DE10-Lite FPGA Development Board. The installation of Quartus Prime will take multiple steps. Make sure to install both Quartus and one simulator, either ModelSim or Questa. I would recommend using ModelSim as your simulator because it does not require a license. The Questa simulator has a more complicated setup but works better on Linux.

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Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Quartus Installation Instructions


Quartus Installation for Windows 10/11

1. Go to the [Quartus Prime Lite 23.1.1 Windows download page](#) and select the “Individual Files” tab of the website, as shown in the red rectangle. (Note that newer version may be available but should **NOT** be installed.)
2. You only need to download, the following, as shown with arrows on the left:
 - a) Quartus® Prime (includes Nios II EDS)
 - b) MAX® 10 FPGA device support
 - c) MAX® II, MAX® V device support
 - d) Cyclone® V device support




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Intel® Quartus® Software

Quartus® Prime (includes Nios II EDS)		Download QuartusLiteSetup-23.1std.1.993-windows.exe	Size: 1.6 GB SHA1: ad8fb45076b42f332f46264ccaeb3af8e34829de
** Installation size: 8.55 GB			
Questa*-Intel® FPGA and Starter Editions		Download QuestaSetup-23.1std.1.993-windows.exe	Size: 802.4 MB SHA1: ba612aec6a697ec0b3643e8c61e08434606093e
** Installation size: 3.31 GB			

Devices

Arria® II device support		Download arria_lite-23.1std.1.993.qdz	Size: 499.1 MB SHA1: 89bdc25bba825e9642b2e24c83796297d2a2b7c5
** Installation size: 0.52 GB			
Cyclone® IV device support		Download cyclone-23.1std.1.993.qdz	Size: 466 MB SHA1: 4c260c32282032c477d5520a84ebd1200d01ecf0
** Installation size: 0.50 GB			
Cyclone® 10 LP device support		Download cyclone10lp-23.1std.1.993.qdz	Size: 265.7 MB SHA1: 7e6e789fee10fe26346c66dab65a5c4a66811de0
** Installation size: 0.29 GB			
Cyclone® V device support		Download cyclonev-23.1std.1.993.qdz	Size: 1.3 GB SHA1: 4d849516eac750c95eaa5848d22573d60e5cca26
** Installation size: 1.40 GB			
MAX® II, MAX® V device support		Download max-23.1std.1.993.qdz	Size: 11.4 MB SHA1: 085005853bb61e0d4181a3aea8a31e79ab35c2d3
** Installation size: 0.01 GB			
MAX® 10 FPGA device support		Download max10-23.1std.1.993.qdz	Size: 286.5 MB SHA1: 158ff328b61b17181056aa9309e619147e217fb3
** Installation size: 0.35 GB			

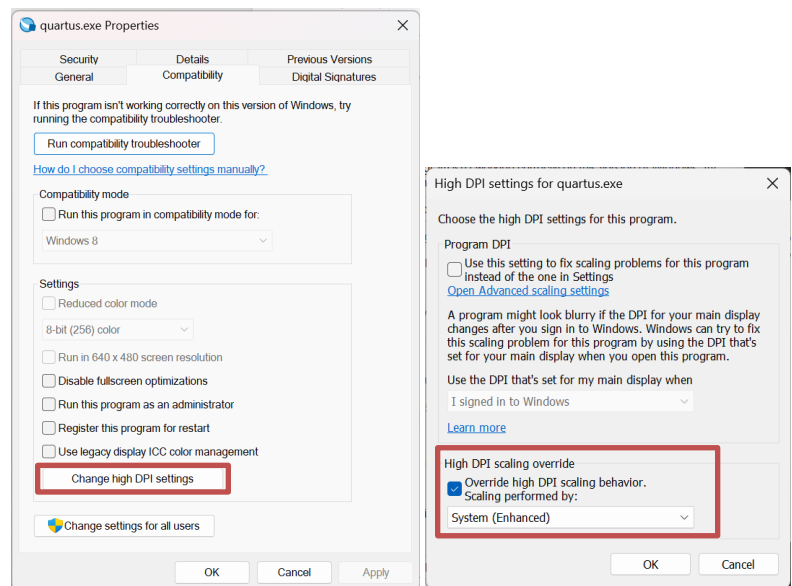
Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

3. Select each of the files specified above for download. You may need to accept license agreements for some of the downloaded files.
4. After the Quartus software has finished downloading, run the below installation file to install the Quartus software.

`QuartusLiteSetup-23.1std.1.993-windows`

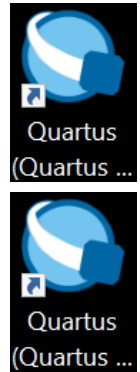
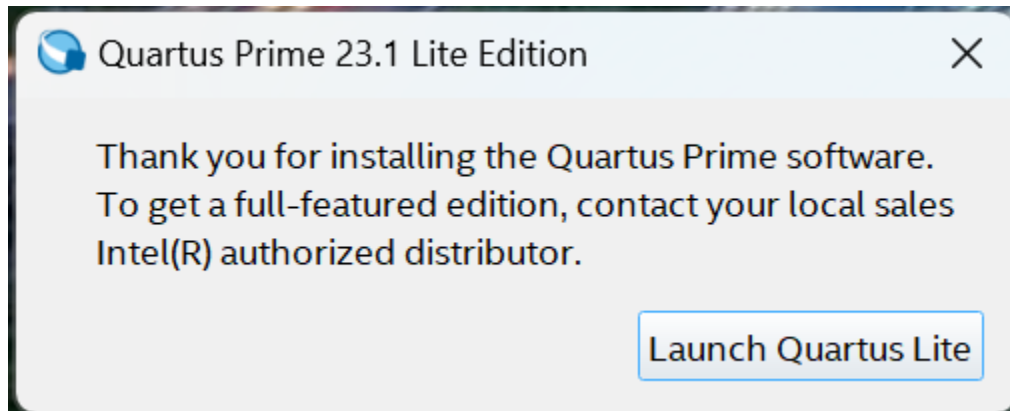
Note that the numbers after the 23 might change as new versions become available.

- a) Windows may tell you that it is not safe to run this program with something like Windows protected your PC. Ignore this message. Select More info or something similar to get Windows to continue and then select Run anyway.
 - b) Leave all default options in the installer and select Next each time it is necessary.
 - c) When the Finish option is presented, de-select Launch USB Blaster II driver installation and Launch Quartus Prime Lite Edition and then select Finish.
5. If you have a High DPI display, some Quartus programs such as the simulation editor will not look correct. To fix this problem, navigate to `C:\intelFPGA_lite\23.1std\quartus\bin64` and find `quartus.exe`. Right click on `quartus.exe` and choose Properties. Click on the Compatibility tab and click on the button labelled Change high DPI settings. In the window that appears, check the checkbox next to Override high DPI scaling behavior and choose the System (Enhanced) option in the dropdown menu. Click OK on the High DPI settings window and then Apply on the properties window.



Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

6. When the installation is done, run the Quartus software from the Start menu or the desktop shortcut. When a Quartus Prime 23.1 Lite Edition window appears (see below), select Launch Quartus Lite. I suggest that you drag the Quartus desktop icon into your Taskbar for easiest access.



7. Once you get your DE10-Lite, attach it to your computer and complete the driver installation as specified below. This should work for both Windows 11 and Windows 10.
- Connect the USB-Blaster (DE10-Lite) to your PC.
 - Open Device Manager.
 - Locate USB-Blaster under Other devices.
 - Right-click on USB-Blaster and select Update Driver.
 - Choose Browse my computer for drivers.
 - Select the Browse... button in the new window.
 - Navigate to your Quartus installation directory:
 - This is typically found at: `C:\intelFPGA_lite\23.1std\quartus\drivers`
 - If you can't find this directory, try clicking "This PC" then you should be able to find the C: drive or the intelFPGA_lite folder.
 - Adjust the path according to your specific Quartus version (e.g., it may not be 22.1std for you).
 - Note: Stop at the drivers folder, i.e., do not go deeper by opening a folder within the drivers folder.
 - Confirm the file path and click Next.
 - If prompted by Windows Security:
 - Check the box for Always trust software from "Altera Corporation".
 - Click Install.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Quartus Installation for Linux

The installation directions provided in this document were designed for default Ubuntu 22.04 LTS, as this is the most recent distribution that is officially supported by Quartus.

1. Go to the [Quartus Prime Lite 22.1.1 Linux download page](#) and select the “Individual Files” tab of the website, as shown in the red rectangle. (Note that newer version may be available but should **NOT** be installed.)
2. You only need to download, the following, as shown with arrows on the left:
 - a) Intel Quartus Prime (includes Nios II EDS)
 - b) Intel MAX 10 FPGA Device Support
 - c) Intel MAX II, Intel MAX V Device Support
 - d) Intel Cyclone V Device Support

Downloads

Multiple Download **Individual Files** Additional Software Copyleft Licensed Source

Intel® Quartus® Software

Intel® Quartus® Prime (includes Nios II EDS)	Download QuartusLiteSetup-22.1std.1.917-linux.run	Size: 1.8 GB SHA1: d1923058d69fe8c0593486d2a0b430133a48dd39
** Nios® II EDS requires you to install an Eclipse IDE manually. ** Installation size: 8.33 GB		
Questa* - Intel® FPGA Edition	Download QuestaSetup-22.1std.1.917-linux.run	Size: 1.6 GB SHA1: a10a65aecdf2b2d2bfbfaf1fa159d938b3cab4bf
** Installation size: 4.09 GB		

Devices

Intel® Arria® II device support	Download arria_lite-22.1std.1.917.qdz	Size: 499.1 MB SHA1: e9d3ce3a3a8581576f1a33c63a306c922fdd617d
** Installation size: 0.52 GB		
Intel® Cyclone® IV device support	Download cyclone-22.1std.1.917.qdz	Size: 465.8 MB SHA1: cbbfc3ffdcce8a2535b9e129bd7444f3fa18b71f
** Installation size: 0.50 GB		
Intel® Cyclone® 10 LP device support	Download cyclone10lp-22.1std.1.917.qdz	Size: 265.5 MB SHA1: a26747672b0e8f48c0e6691760760b3ce60cba42
** Installation size: 0.29 GB		
Intel® Cyclone® V device support	Download cyclonev-22.1std.1.917.qdz	Size: 1.3 GB SHA1: 379e51b9e908cd43b9515f93f42f2a230a405a60
** Installation size: 1.40 GB		
Intel® MAX® II, Intel® MAX® V device support	Download max-22.1std.1.917.qdz	Size: 11.4 MB SHA1: 003f41439dc18b20c58177a329d8afa132869886
** Installation size: 0.01 GB		
Intel® MAX® 10 FPGA device support	Download max10-22.1std.1.917.qdz	Size: 286.4 MB SHA1: c3a42e7dedae4ffad45320062b4492818df74f5e
** Installation size: 0.35 GB		

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

3. Select each of the files specified above for download. You may need to accept license agreements for some of the downloaded files.
4. Open a terminal and navigate to your Downloads folder. We can then run the Quartus installer by issuing the following commands. Make sure that you do not run the Quartus installer as root!

```
chmod +x QuartusLiteSetup-22.1std.1.917-linux.run  
./QuartusLiteSetup-22.1std.1.917-linux.run
```

- j) Leave all default options in the installer and select Next each time it is necessary.
 - k) When the Finish option is presented, de-select Run the Quartus Prime Software and then select Finish.
5. To allow easy access to your Quartus installation, create a text file called `quartus.desktop` using the text editor of your choice and copy the following contents into it. Make sure to change `YOURUSERNAME` to the username of the account that you installed Quartus for.

```
[Desktop Entry]  
Version=1.0  
Type=Application  
Terminal=false  
Exec=/home/YOURUSERNAME/intelFPGA_lite/22.1std/quartus/bin/quartus  
Name=Quartus  
Icon=/home/YOURUSERNAME/intelFPGA_lite/22.1std/quartus/adm/quartusii.png
```

- a) If your distribution supports desktop icons, you can copy this file to your Desktop folder and it will work as a desktop shortcut
 - b) To add a Quartus shortcut to your Apps menu, copy this file to `~/.local/share/applications`, creating that folder if necessary. This was tested for GNOME 44.
6. To allow Quartus to program your DE10-Lite board, we must add a udev rule enabling access to the USB-Blaster programming hardware on the DE10-Lite. Create the text file `/etc/udev/rules.d/51-altera-usb-blaster.rules` (requires superuser privileges) and populate it with the following:

```
SUBSYSTEM=="usb", ATTR{idVendor}=="09fb", ATTR{idProduct}=="6001", MODE="0666"  
SUBSYSTEM=="usb", ATTR{idVendor}=="09fb", ATTR{idProduct}=="6002", MODE="0666"  
SUBSYSTEM=="usb", ATTR{idVendor}=="09fb", ATTR{idProduct}=="6003", MODE="0666"  
SUBSYSTEM=="usb", ATTR{idVendor}=="09fb", ATTR{idProduct}=="6010", MODE="0666"  
SUBSYSTEM=="usb", ATTR{idVendor}=="09fb", ATTR{idProduct}=="6810", MODE="0666"
```

7. Restart your computer so that the new udev rules take effect.
8. Many Linux systems still encounter a permissions error when trying to connect to the USB Blaster, even after adjusting the udev rules. This shows up in an “Unable to read device chain – JTAG chain broken” error while using the programmer. This can be remediated by adjusting the JTAG daemon’s settings. Run the following in a terminal:

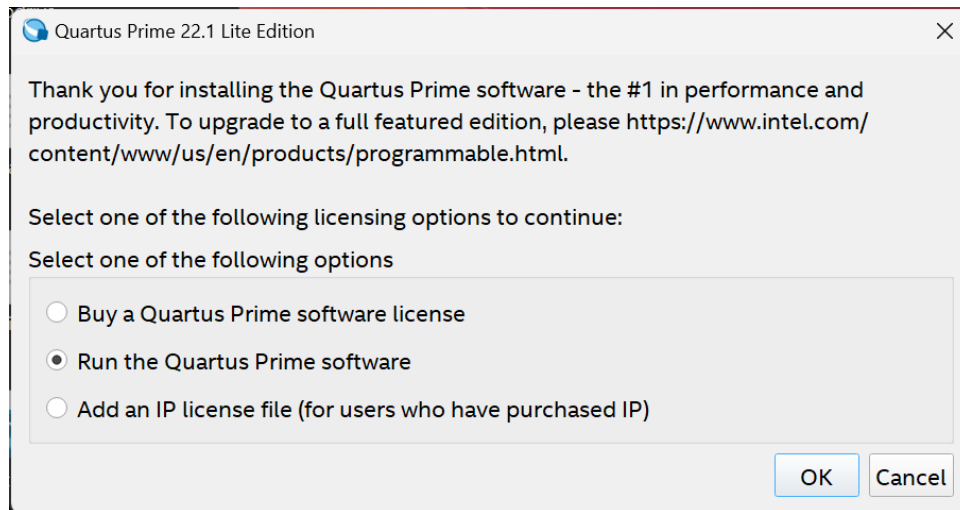
```
killall jtagd  
  
cd ~/intelFPGA_lite/22.1std/quartus/bin  
  
sudo mkdir /etc/jtagd  
  
sudo cp ../linux64/pgm_parts.txt /etc/jtagd/jtagd.pgm_parts  
  
./jtagd
```

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

9. You can verify that you are able to program your DE10-Lite by disconnecting and reconnecting it to your computer and running `./jtagconfig` in the same terminal you ran the above commands. If your setup is correct, you should see output that looks like:

```
1) USB-Blaster [1-2]
   031050DD 10M50DA(.|ES)/10M50DC
```

10. Run Quartus using either the `.desktop` file we made earlier or by running `~/intelFPGA_lite/23.1std/quartus/bin/quartus`. In the window that appears, select Run the Quartus Prime software and then select OK.



11. Once you get your DE10-Lite, attach it to your computer and complete the driver installation as specified in https://www.terasic.com.tw/wiki/Altera_USB_Blaster_Driver_Installation_Instructions.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Quartus Installation for Intel Macs

The best way to run Quartus on an Intel Mac is to dual boot Windows on your device by setting up Bootcamp. Students have also had success running the Windows version of Quartus through Parallels and other virtual machine software. Macs are not officially supported in this course, so you may need to do additional troubleshooting to get everything working correctly. See the Windows tutorials for installing Quartus and a simulator for more information.

Quartus Installation for ARM Macs

Quartus is x86 software and it has no native Mac port, so the best way to get it running is to run it in a Linux VM with the FEX x86 emulator. I have chosen to use UTM (free VM software) for this tutorial, but you could also do this in Parallels (paid) if you prefer. M1 Macs are not officially supported in this course, so you may need to do additional troubleshooting to get everything working correctly.

1. Download UTM from <https://docs.getutm.app/installation/macOS/>. You can download it for free by clicking Download from Github. Install UTM like you would install any other Mac application.
2. Download Ubuntu Desktop 22.04's ARM ISO from <https://cdimage.ubuntu.com/jammy/daily-live/current/>. The file should be called `jammy-desktop-arm64.iso`.
3. Open UTM. Choose New VM, then Virtualize, then Linux. Make sure to use the default QEMU backend instead of Apple Virtualization. Quartus does not work on Apple Virtualization VMs yet. For the VM specifications, I recommend using at least 4096 MB of RAM but only one CPU core. From our testing, using multiple CPU cores in your VM will reduce Quartus's performance substantially. The disk size should be at least 32 GB, though more is recommended. For the boot image, select the `jammy-desktop-arm64.iso` you downloaded earlier.
4. Start the virtual machine. Once you are booted into a desktop, choose Install Ubuntu and fill out the settings for the installer. Make sure to do a minimal installation because this will make sure there is sufficient disk space for Quartus to install. The installation will take 10-30 minutes depending on your computer.
5. Once the installation is completed, shut down the virtual machine. From the UTM VM info page, remove `jammy-desktop-arm64.iso` from the disk drive. Power on the VM and log in using the username and password you set up during the installation. A first boot window will appear with information about Ubuntu, and you can click through it without installing any additional software.
6. From the applications grid in the bottom left of the screen, open up a terminal and run the following commands to update your system and install necessary packages. These commands will have you enter your password, and what you type for your password will be completely hidden. This is normal.

```
sudo apt update
sudo apt upgrade
sudo apt install curl
```

7. Install the FEX x86 emulator by running the following command (all one line). You will be prompted to enter your password.

```
curl --silent https://raw.githubusercontent.com/FEX-Emu/FEX/main/Scripts/InstallFEX.py --output /tmp/InstallFEX.py && python3 /tmp/InstallFEX.py && rm /tmp/InstallFEX.py
```

8. The installer will prompt you for some options. You should have the installer download and install a rootfs automatically and set it as the default. You should be able to answer 'y' for every question it asks.
9. In a terminal, enter the FEX environment by typing `FEXBash`. You can now follow the Linux installation instructions to install Quartus within the `FEXBash` environment.
 - a. The only modification you need to make to the installation process is to insert `FEXBash` before the `Exec` command in the Quartus desktop entry if you decide to make one.
10. Anytime you want to run Quartus, you must start it from within a `FEXBash` environment.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Simulator Installation Instructions

Modelsim Installation for Windows 10/11

Modelsim is a free simulator that doesn't require a license to use. We will install Modelsim 19.1, the last version of Modelsim released by Intel.

1. Go to the [Quartus Prime Lite 19.1 Windows download page](#) and select the "Individual Files" tab of the website, as shown in the red rectangle. (Note that newer version may be available but should **NOT** be installed.)
2. You only need to download ModelSim-Intel FPGA Edition (includes Starter Edition), as shown by the arrow on the left. You may need to accept a license agreement.

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Intel® Quartus® Software

ModelSim-Intel® FPGA Edition (includes Starter Edition)

Download
ModelSimSetup-19.1.0.670-windows.exe

Size: 968.2 MB
SHA1: e3ebbf01c653892decdf7f18c2a3862ccc36954

Intel® Quartus® Prime (includes Nios® II EDS)

Download
QuartusLiteSetup-19.1.0.670-windows.exe

Size: 1.5 GB
SHA1: f3de26a3a6288b6258aeb7d89a406ba22330684

** Nios® II EDS on Windows requires Ubuntu 18.04 LTS on Windows Subsystem for Linux (WSL), which requires a manual installation.
** Nios® II EDS requires you to install an Eclipse IDE manually.

Devices

Intel® Arria® II Device Support. (536.5MB)

Download
arria_lite-19.1.0.670.qdz

Size: 499.1 MB
SHA1: 602527e267e23673abacac6926bc2081b485d0a8

Intel® MAX® 10 Device Support. (343.3MB)

Download
max10-19.1.0.670.qdz

Size: 332.8 MB
SHA1: cd99cd6e153867499e6a460d89661940f59ac60a

Intel® MAX® II, Intel® MAX® V Device Support. (13.1MB)

Download
max-19.1.0.670.qdz

Size: 11.4 MB
SHA1: 90a3be6febda19ef0c4140b0eccc0798b1f38a5

Intel® Cyclone® IV Device Support. (516.3MB)

Download
cyclone-19.1.0.670.qdz

Size: 466 MB
SHA1: 8ec1a1aff0374be90371121eff351ca4ec17ea3c

Intel® Cyclone® 10 LP Device Support. (293.5MB)

Download
cyclone10lp-19.1.0.670.qdz

Size: 265.7 MB
SHA1: b2622b757b842d83890a7e1c1fee65448cc76d8f

Intel® Cyclone® V Device Support. (1434.3MB)

Download

Size: 1.3 GB

3. After Modelsim has finished downloading, run the following file to install it.

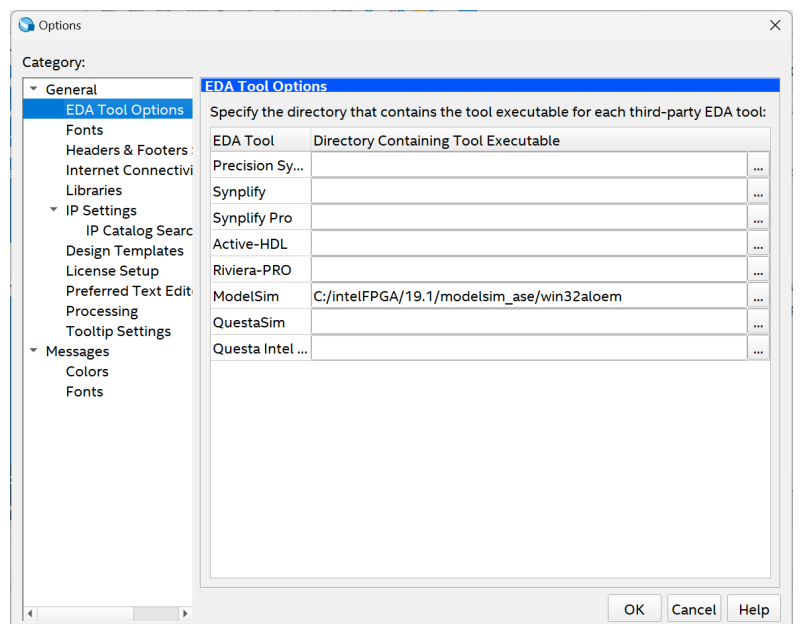
Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

ModelSimSetup-19.1.0.670-windows.exe

Note that the numbers after the 19 might change as new versions become available.

- a) Windows may tell you that it is not safe to run this program with something like Windows protected your PC. Ignore this message. Select More info or something similar to get Windows to continue and then select Run anyway.
4. When prompted to select which version of ModelSim you want to install, choose to install ModelSim Starter Edition
 - a) Leave all default options in the installer and select Next each time it is necessary.

5. Once the installation has completed, open Quartus and navigate to Tools->Options. In the Options window, select EDA Tool Options in the left panel. In the text box next to the ModelSim label, insert the path to Modelsim's win32aloem folder. The default install location uses the path C:/intelFPGA_lite/19.1/modelsim_ase/win32aloem. Click OK to save the simulator settings. Now you will be able to use ModelSim from the Quartus VWF editor.



Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Modelsim Installation for Linux

Modelsim is a free simulator that doesn't require a license to use. We will install Modelsim 19.1, the last version of Modelsim released by Intel. This installation guide was designed for stock Ubuntu 22.04 LTS.

1. Go to the [Quartus Prime Lite 19.1 Linux download page](#) and select the "Individual Files" tab of the website, as shown in the red rectangle. (Note that newer version may be available but should **NOT** be installed.)
2. You only need to download ModelSim-Intel FPGA Edition (includes Starter Edition, as shown by the arrow on the left. You may need to accept a license agreement.

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Devices

Intel® Arria® II Device Support. (536.5MB)

Download arria_lite-19.1.0.670.qdz Size: 499.1 MB SHA1: 602527e267e23673abacac6926bc2081b485d0a8

Intel® Cyclone® 10B Device Support. (288.5 MB)

Download cyclone10b-19.1.0.670.qdz Size: 288.5 MB SHA1: 62822b757b842a88880e7a1c1a88448c78a8f

Intel® Cyclone® V Device Support. (434.3 MB)

Download cyclonev-19.1.0.670.qdz Size: 434.3 MB SHA1: 62822b757b842a88880e7a1c1a88448c78a8f

Intel® VAX® / Intel® VAX® V Device Support. (1.3 MB)

Download max-19.1.0.670.qdz Size: 1.3 MB SHA1: 62822b757b842a88880e7a1c1a88448c78a8f

Intel® VAX® 10 Device Support. (343.3 MB)

Download max10-19.1.0.670.qdz Size: 343.3 MB SHA1: 62822b757b842a88880e7a1c1a88448c78a8f

Intel® Quartus® Software

Download ModelSimSetup-19.1.0.670-linux.run Size: 988.7 MB SHA1: 354424e5

Intel® Quartus® Prime (includes Vios® FDS)

Download QuartusPrimeSetup-19.1.0.670-linux.run Size: 1.6 GB SHA1: 6a512441

Intel® Vios® FDS requires you to manually install the FDS manually.

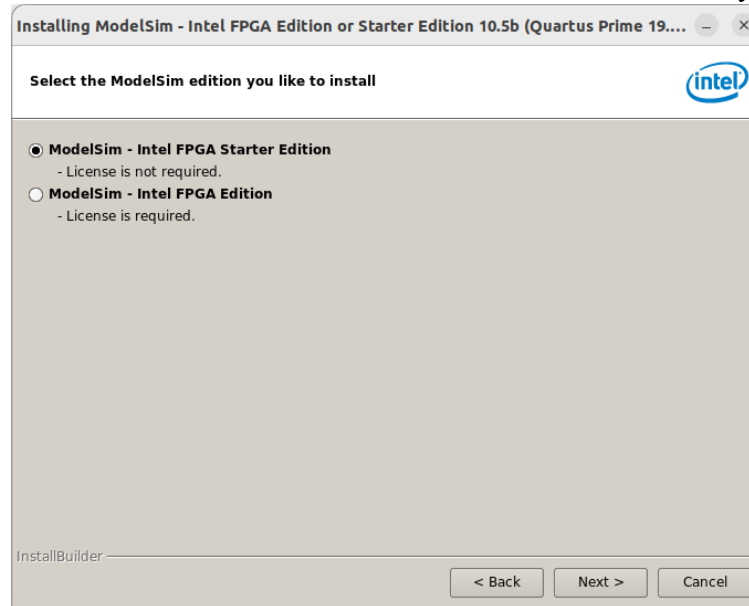
3. Open a terminal and Open a terminal and navigate to your Downloads folder. We can then run the ModelSim installer by issuing the following commands. Make sure that you do not run the ModelSim installer as root!

```
chmod +x ModelSimSetup-19.1.0.670-linux.run
./ModelSimSetup-19.1.0.670-linux.run
```

4. When prompted to select which version of ModelSim you want to install, choose to install ModelSim Starter Edition

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

- a) Leave all default options in the installer and select **Next** each time it is necessary.



5. ModelSim uses a number of old 32-bit dependencies that we must install. Luckily, these packages can still be found in Ubuntu's repositories. To install these packages, open a terminal and run

```
sudo dpkg --add-architecture i386

sudo apt update

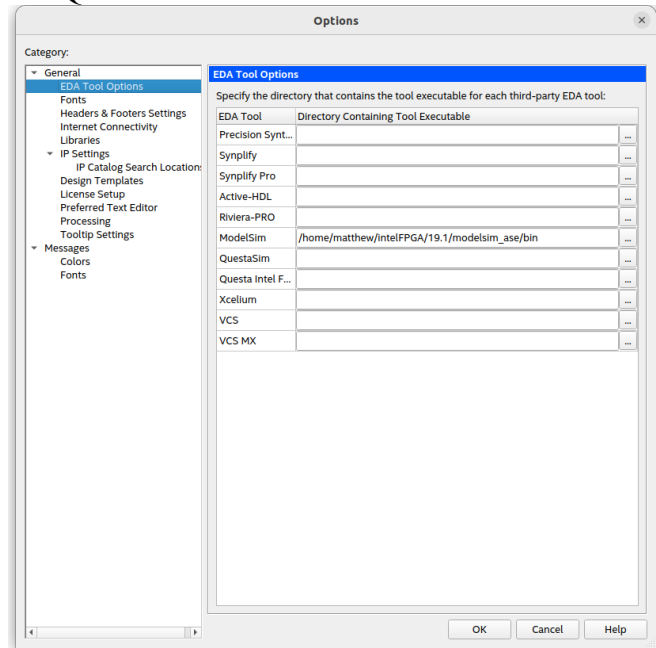
sudo apt upgrade

sudo apt install libc6:i386 libncurses5:i386 libstdc++6:i386 \
lib32ncurses6 libxft2 libxft2:i386 libxext6 libxext6:i386
```

6. To force Modelsim to use the libraries we just installed, we must edit its launch script. Use the text editor of your choice to edit `~/intelFPGA_lite/19.1/modelsim_ase/bin/vsim` and make the following changes. You will need superuser privileges to edit this file.
- a) Change `mode=${MTI_VCO_MODE:-"32"}` to `mode=${MTI_VCO_MODE:-"32"}`
 - b) Change `vco="linux_rh60"` to `vco="linux"`

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

- Once the installation has completed, open Quartus and navigate to Tools->Options. In the Options window, select EDA Tool Options in the left panel. In the text box next to the ModelSim label, insert the path to Modelsim's bin folder. The default install location uses the path /home/**YOURUSERNAME**/intelFPGA/19.1/modelsim_ase/bin. Click OK to save the simulator settings. Now you will be able to use ModelSim from the Quartus VWF editor.



Unfortunately, the ModelSim GUI (used in Digital Design) does not work when following these installation instructions. I'm not sure if this is due to something being broken in ModelSim or if it can be fixed by installing additional dependencies.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Questa Installation for Windows 10/11

1. Go to the [Quartus Prime Lite 23.1.1 Windows download page](#) and select the “Individual Files” tab of the website, as shown in the red rectangle. (Note that newer version may be available but should **NOT** be installed.)
2. You only need to download Questa*-Intel® FPGA and Starter Editions as shown with arrows on the left. You may need to accept a license agreement.

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Intel® Quartus® Software

Quartus® Prime (includes Nios II EDS)	Download QuartusLiteSetup-23.1std.1.993-windows.exe	Size: 1.6 GB SHA1: ad8fb45076b42f332f46264ccaeb3af8e34829de
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** Installation size: 3.31 GB		

Devices

Arria® II device support	Download arria_lite-23.1std.1.993.qdz	Size: 499.1 MB SHA1: 89bdc25bba825e9642b2e24c83796297d2a2b7c5
** Installation size: 0.52 GB		
Cyclone® IV device support	Download cyclone-23.1std.1.993.qdz	Size: 466 MB SHA1: 4c260c32282032c477d5520a84ebd1200d01ecf0
** Installation size: 0.50 GB		
Cyclone® 10 LP device support	Download cyclone10lp-23.1std.1.993.qdz	Size: 265.7 MB SHA1: 7e6e789fee10fe26346c66dab65a5c4a66811de0
** Installation size: 0.29 GB		
Cyclone® V device support	Download cyclonev-23.1std.1.993.qdz	Size: 1.3 GB SHA1: 4d849516eac750c95eaa5848d22573d60e5cca26
** Installation size: 1.40 GB		
MAX® II, MAX® V device support	Download max-23.1std.1.993.qdz	Size: 11.4 MB SHA1: 085005853bb61e0d4181a3aea8a31e79ab35c2d3
** Installation size: 0.01 GB		
MAX® 10 FPGA device support	Download max10-23.1std.1.993.qdz	Size: 286.5 MB SHA1: 158ff328b61b17181056aa9309e619147e217fb3
** Installation size: 0.35 GB		

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

3. After the Quartus software has finished downloading, run the below installation file to install the Quartus software.

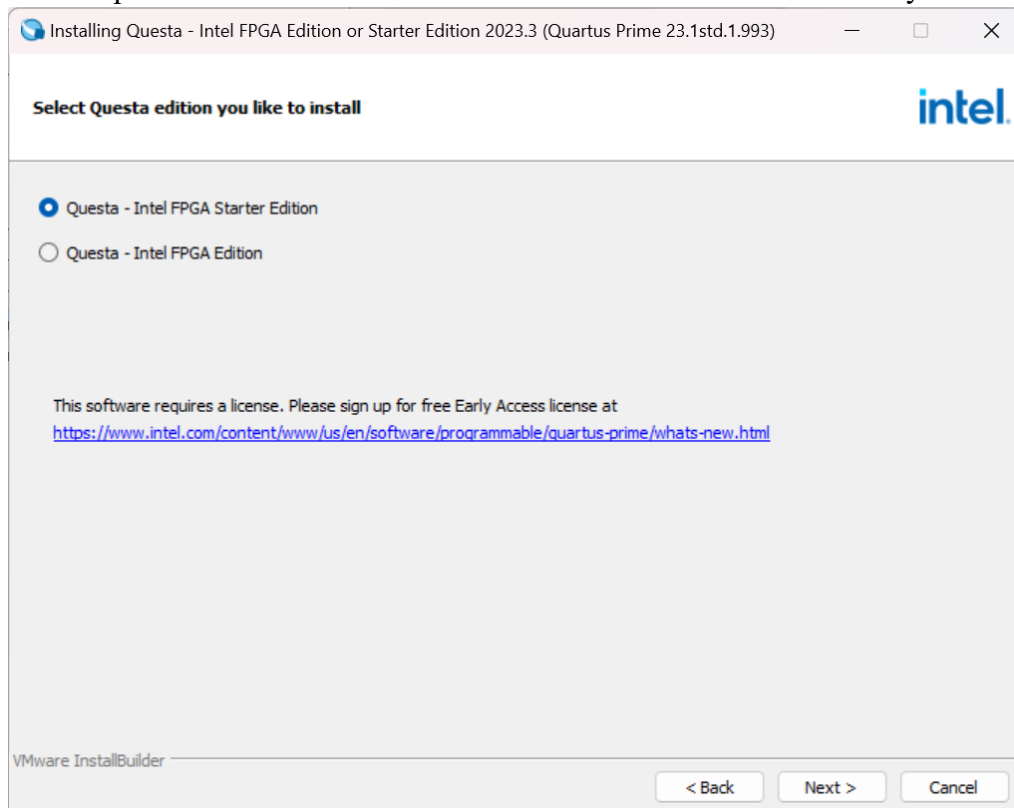
`QuestaSetup-23.1std.1.993-windows.exe`

4. Note that the numbers after the 23 might change as new versions become available.

a) Windows may tell you that it is not safe to run this program with something like Windows protected your PC. Ignore this message. Select More info or something similar to get Windows to continue and then select Run anyway.

5. When prompted to select which version of Questa you want to install, choose Questa - Intel FPGA Starter Edition

a) Leave all default options in the installer and select Next each time it is necessary.



6. To prepare for acquiring a Questa License, we must find the hardware ID number of your network card. Intel uses this number to verify that your computer is licensed to use Questa. Open a Powershell window and run the command `ipconfig /all`. (without the period) This will list all of the network adapters connected to your computer. Look for your computer's main WiFi or network card in this list and locate its Physical Address. The hardware ID number that you will put into the Intel website is your network adapter's Physical Address **with the dashes removed**. Save this number for use when requesting your Questa License. For example, the ID number in the below screenshot is `f4c88a3f40b2`.

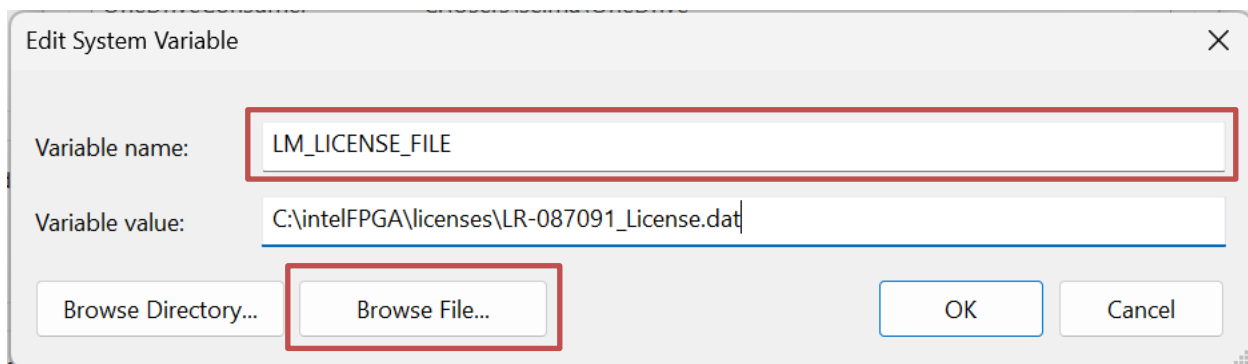
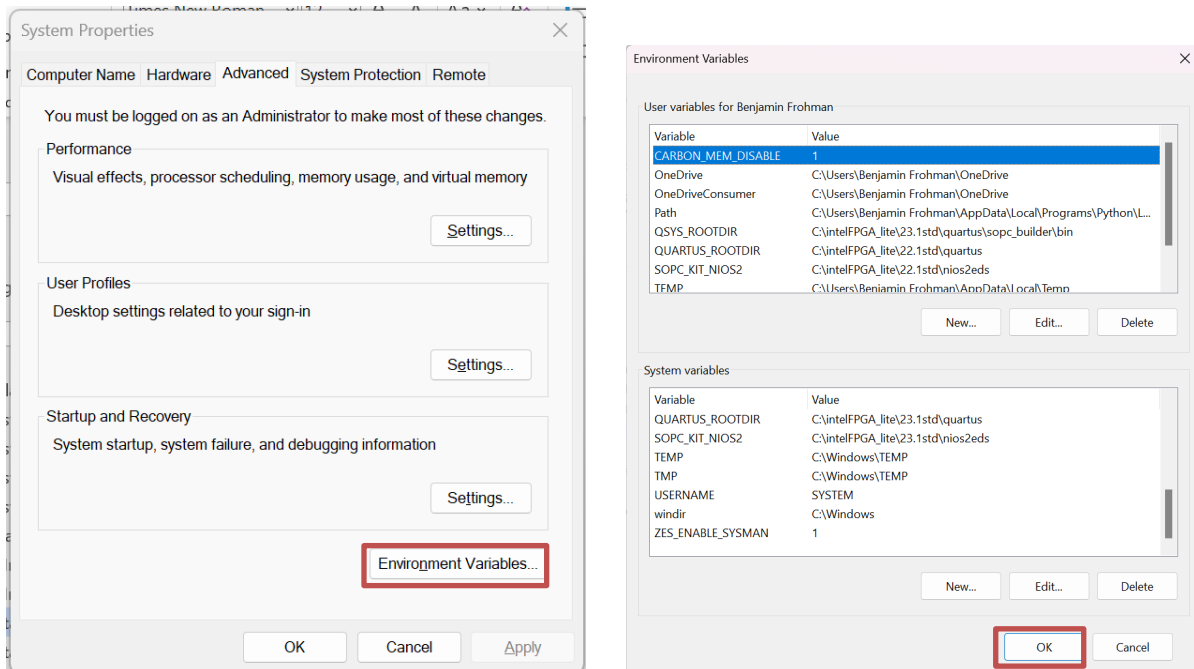
```
Wireless LAN adapter Wi-Fi:
Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Wi-Fi 6E AX211 160MHz
Physical Address. . . . . : F4-C8-8A-3F-40-B2
```

7. Follow the instructions in [Obtaining a Questa License](#)

8. Once you have obtained your Questa license, copy it to a safe folder where it won't accidentally get deleted. This tutorial assumes that you create the folder `C:\intelFPGA\licenses` and copy your license file there.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

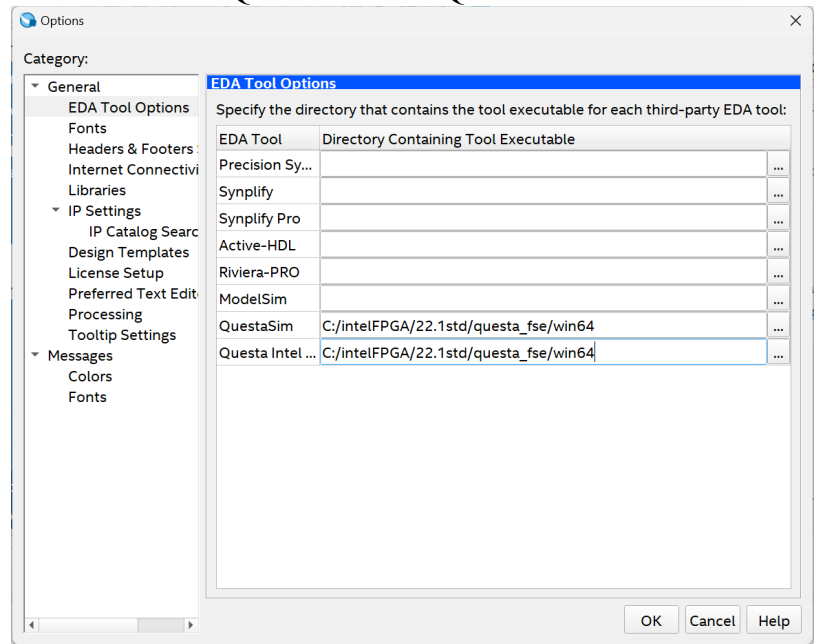
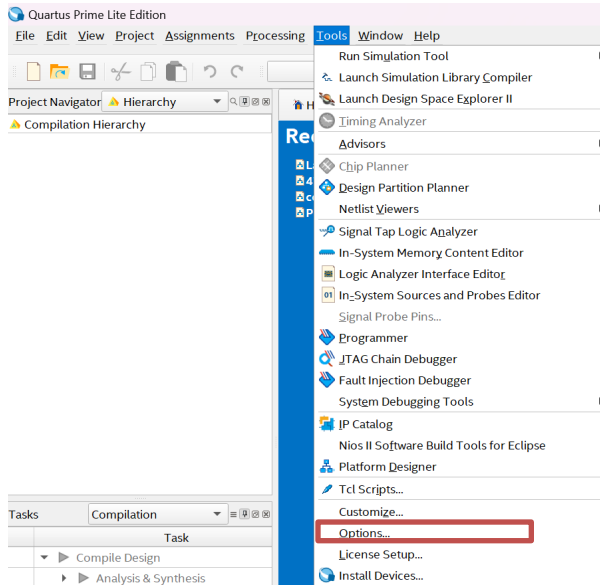
9. We need to set the `LM_LICENSE_FILE` environment variable globally so that Questa knows where to find the license file.
 - a) In the Start menu, search for Edit the system environment variables.
 - b) Click the Environment Variables button in the bottom right corner of the window that appears.
 - c) Under the System Variables section (bottom half of the window), click New.
 - d) In the window that appears, type in `LM_LICENSE_FILE` for the variable name. To set the variable's value, click the Browse File button in the bottom left corner of the window and navigate to where you stored your license file. Double click on the license file to save its path to the environment variable.
 - e) Click OK to confirm the new environment variable.



10. Restart your computer for your changes to take effect.
11. Once your computer reboots, open a command prompt (type `cmd` in the Start menu) and enter `lmutil lmdiag` to confirm that your license is found correctly. If your license cannot be verified, double check that your `LM_LICENSE_FILE` environment variable is set correctly.
12. By default, Questa aggressively optimizes your circuit designs so much that the outputs of your simulations will not be visible in the Quartus VWF viewer. To fix this, we need to replace the VWF viewer's library file with a modified version that sets Questa to not optimize your designs while simulating. Download **edt_wedtq.dll** (in the provided zip file, `quartus22.1_installation_library.zip`) and copy it into the folder `C:\intelFPGA_lite\23.1std\quartus\bin64`. Make sure to replace the older version of this file in the destination.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

13. Open Quartus and navigate to Tools->Options. In the Options window, select EDA Tool Options in the left panel. In the text boxes next to the Questa and Questa – Intel labels, insert the path to Questa’s bin folder. The default install location uses the path `C:/intelFPGA/23.1std/questa_fse/win64`. Click OK to save the simulator settings. Now you will be able to use Questa from the Quartus VWF editor.



Please note that using Questa from its main GUI (such as in Digital Design) leads to the over-aggressive optimization that can break some simulations. I haven't used Questa much yet, but if I find a workaround to make the Questa GUI behave properly then I will update this document.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Quarta Installation for Linux

The installation directions provided in this document were designed for default Ubuntu 22.04 LTS, as this is the most recent distribution that is officially supported by Quartus.

1. Go to the [Quartus Prime Lite 22.1.1 Linux download page](#) and select the “Individual Files” tab of the website, as shown in the red rectangle. (Note that newer version may be available but should **NOT** be installed.)
2. You only need to download Quarta - Intel FPGA Edition as shown with arrows on the left. You may need to accept a license agreement.

Downloads

Multiple Download **Individual Files** Additional Software Copyleft Licensed Source

Intel® Quartus® Software

Intel® Quartus® Prime (includes Nios II EDS)	Download QuartusLiteSetup-22.1std.1.917-linux.run	Size: 1.8 GB SHA1: d1923058d69fe8c0593486d2a0b430133a48dd39
** Nios® II EDS requires you to install an Eclipse IDE manually. ** Installation size: 8.33 GB		
Quarta* - Intel® FPGA Edition	Download QuartaSetup-22.1std.1.917-linux.run	Size: 1.6 GB SHA1: a10a65aecdf2b2d2bfbaf1fa159d938b3cab4bf
** Installation size: 4.09 GB		

Devices

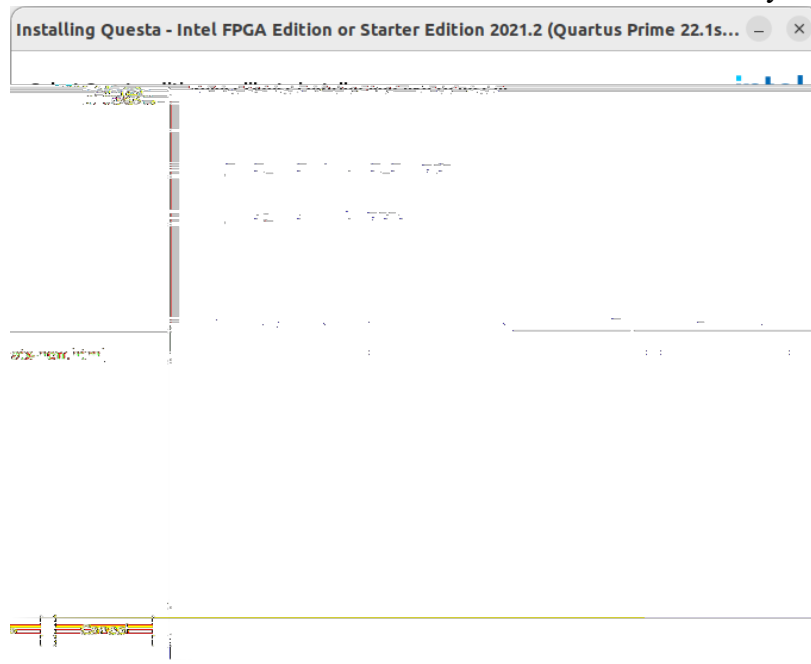
Intel® Arria® II device support	Download arria_lite-22.1std.1.917.qdz	Size: 499.1 MB SHA1: e9d3ce3a3a8581576f1a33c63a306c922fdd617d
** Installation size: 0.52 GB		
Intel® Cyclone® IV device support	Download cyclone-22.1std.1.917.qdz	Size: 465.8 MB SHA1: cbbfc3ffdcee8a2535b9e129bd7444f3fa18b71f
** Installation size: 0.50 GB		
Intel® Cyclone® 10 LP device support	Download cyclone10lp-22.1std.1.917.qdz	Size: 265.5 MB SHA1: a26747672b0e8f48c0e6691760760b3ce60cba42
** Installation size: 0.29 GB		
Intel® Cyclone® V device support	Download cyclonev-22.1std.1.917.qdz	Size: 1.3 GB SHA1: 379e51b9e908cd43b9515f93f42f2a230a405a60
** Installation size: 1.40 GB		
Intel® MAX® II, Intel® MAX® V device support	Download max-22.1std.1.917.qdz	Size: 11.4 MB SHA1: 003f41439dc18b20c58177a329d8afa132869886
** Installation size: 0.01 GB		
Intel® MAX® 10 FPGA device support	Download max10-22.1std.1.917.qdz	Size: 286.4 MB SHA1: c3a42e7dedae4ffad45320062b4492818df74f5e
** Installation size: 0.35 GB		

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

3. Open a terminal and navigate to your Downloads folder. We can then run the Questa installer by issuing the following commands. Make sure that you do not run the Questa installer as root!

```
chmod +x QuestaSetup-22.1std.1.917-linux.run  
./QuestaSetup-22.1std.1.917-linux.run
```

4. When prompted to select which version of Questa you want to install, choose `Questa - Intel FPGA Starter Edition`
 - a) Leave all default options in the installer and select `Next` each time it is necessary.



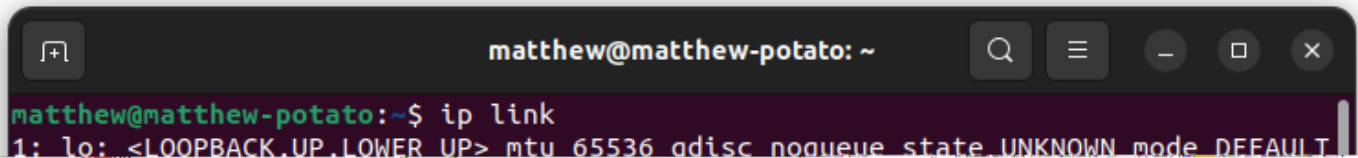
5. To allow easy access to your Questa installation, create a text file called `questa.desktop` using the text editor of your choice and copy the following contents into it. Make sure to change `YOURUSERNAME` to the username of the account that you installed Questa for.

```
[Desktop Entry]  
Version=1.0  
Type=Application  
Terminal=true  
Exec=/home/YOURUSERNAME/intelFPGA/22.1std/questa_fse/bin/vsim  
Name=Questa
```

- a) If your distribution supports desktop icons, you can copy this file to your Desktop folder and it will work as a desktop shortcut
- b) To add a Quartus shortcut to your Apps menu, copy this file to `~/.local/share/applications`, creating that folder if necessary. This was tested for GNOME.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

6. To prepare for acquiring a Questa License, we must find the hardware ID number of your network card. Intel uses this number to verify that your computer is licensed to use Questa.
 - a) Open a terminal and run the command `ip link`. (without the period)
 - b) Look for an adapter named `eth0` or `enp0sXX`. Under that entry, look for a line starting with `link/XXXX` followed by a series of digits and letters. This series of digits and letters (**without colons**) is your network card ID. Save this number for use when requesting your Questa License. For example, the ID number in the below screenshot is `001d098ebed3`.



```
matthew@matthew-potato: ~  
matthew@matthew-potato:~$ ip link  
1: lo: <LOOPBACK,UP,LOWER UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT link/001d098ebed3
```

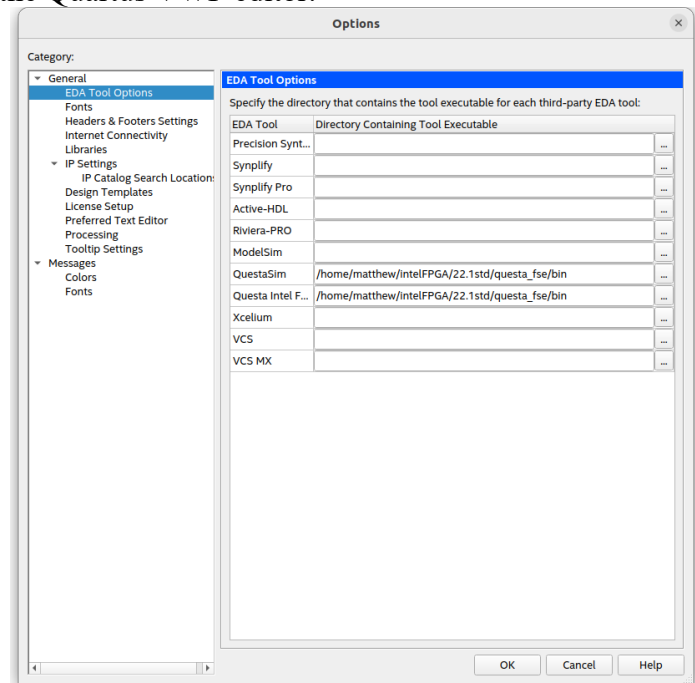


7. Follow the instructions in [Obtaining a Questa License](#)
8. Once you have obtained your Questa license, copy it to a safe folder where it won't accidentally get deleted. This tutorial assumes that you create the folder `~/intelFPGA/licenses` and copy your license file there.
9. We need to set the `LM_LICENSE_FILE` environment variable globally so that Questa knows where to find the license file. To do this, create `/etc/environment.d/90quartus-license.conf` and populate it with the following text. Make sure to use the username you installed Questa for and the correct name of your license file. You will need superuser privileges to create this file.

```
LM_LICENSE_FILE=/home/YOURUSERNAME/intelFPGA/licenses/LR-XXXXXX_License.dat
```
10. Restart your computer so that the changed environment variable takes effect.

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

11. By default, Questa aggressively optimizes your circuit designs so much that the outputs of your simulations will not be visible in the Quartus VWF viewer. To fix this, we need to replace the VWF viewer's library file with a modified version that sets Questa to not optimize your designs while simulating. Download **libedt_wedtq.so** and copy it into `~/intelFPGA_lite/22.1std/quartus/linux64`. Make sure to replace the older version of this file in the destination.
12. Open Quartus and navigate to Tools->Options. In the Options window, select EDA Tool Options in the left panel. In the text boxes next to the Questa and Questa - Intel labels, insert the path to Questa's bin folder. The default install location uses the path `/home/YOURUSERNAME/intelFPGA/22.1std/questa_fse/bin`. Click OK to save the simulator settings. Now you will be able to use Questa from the Quartus VWF editor.



The Questa GUI does work for Linux (unlike Modelsim), but using Questa from its GUI (such as for Digital Design) leads to the over-aggressive optimization that can break some simulations. To disable this, go to Simulation->Design Optimization->Visibility, and click the radio button next to Apply full visibility to all modules.

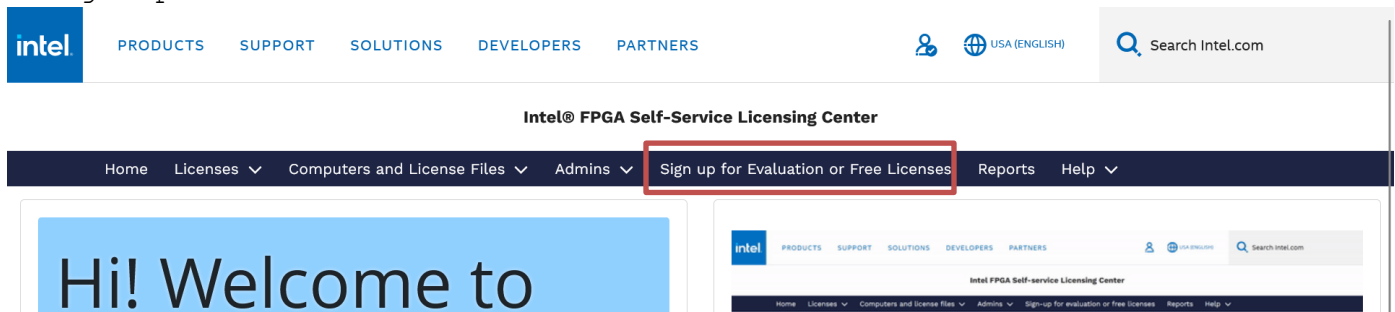
Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

Appendices

Obtaining a Questa License

Questa is the newest simulator provided by Intel. It supports modern hardware and uses modern dependencies, but it unfortunately requires a free license to use. Getting a Questa license is a somewhat involved process. Only follow these instructions if you are installing Questa. If you are using ModelSim as your simulator you do not need to get a license.

1. Using Google Chrome or Chromium, navigate to the [Intel Self-Service Licensing Center](#). The website will not allow you to get a license if you use Firefox. Click **Enroll** for Intel® FPGA Self Service Licensing Center (SSLC) and create an account. I would recommend signing up using your UF email. The enrollment process may require you to download the Microsoft Authenticator app onto your phone for two-factor authentication. I have not found a way to circumvent this requirement.
2. Once you have activated your account, go to the [Home Page for the Self-Service Licensing Center](#) and click on **Sign up for Evaluation or No-Cost Licenses**.



3. Click the radio button next to **Questa-Intel® FPGA Starter Edition**. Type 1 in the # of seats box at the bottom of the page. Leave all other rows in their default values. You must do these steps in exactly this order or the page will automatically refresh. See the below screenshot. Check the license agreement checkboxes below the table and click **Next**.

Select Product & Add Additional Details Add Host & Generate License

Web Description	Maintenance Expiration	License Expiration
<input type="checkbox"/> Intel® Quartus® Prime Software 90-Day Evaluation (Standard and Pro Editions) (License: EVALUATION-LIC)	2025-04-08	2025-04-08
<input type="checkbox"/> Agilix™ 5 E-Series FPGA Software Enablement (License: SW-AGILEX-5E)	2026-01-08	2026-01-08
<input checked="" type="checkbox"/> Questa®-Intel® FPGA Starter Edition (License: SW-QUESTA)	2026-01-08	
<input type="checkbox"/> Nios® V/m Microcontroller Intel® FPGA IP (License: IP-NIOSVM)	2026-01-08	
<input type="checkbox"/> Nios® V/g General Purpose Processor Intel® FPGA IP (License: IP-NIOSVG)	2026-01-08	
<input type="checkbox"/> Nios® V/c Compact Microcontroller Intel® FPGA IP (License: IP-NIOSVC)	2026-01-08	
<input type="checkbox"/> MIPI CSI 2 Intel® FPGA IP (License: IP-MIPI-CSI-2)	2026-01-08	
<input type="checkbox"/> AXI Multichannel DMA for PCI Express (License: IP-PCIEMCDMA-AXI)	2026-01-08	
<input type="checkbox"/> GTS Auto-negotiation/Link Training Feature for Ethernet (License: IP-ETH-ANLT)	2026-01-08	
<input type="checkbox"/> Auto-Negotiation/Link Training Feature F-Tile Hard IP for Ethernet (License: IP-ETH-F-ANLT)	2026-01-08	
<input type="checkbox"/> F-Tile Hard IP for Ethernet, supporting from 10G to 400G Ethernet with optional 1588 PTP feature (License: IP-ETH-FTILEHIP)	2026-01-08	
<input type="checkbox"/> KR/CR (AN/LT) for H-tile Ethernet HIP (100GE) (License: IP-ETH-HTILEKRCR)	2026-01-08	
<input type="checkbox"/> H-tile Ethernet Hard-IP (100GE) (License: IP-ETH-HTILEHIP)	2026-01-08	
<input type="checkbox"/> E-tile Ethernet Hard-IP (10GE/25GE/100GE) (License: IP-ETH-ETILEHIP)	2026-01-08	
<input type="checkbox"/> AXI Multichannel DMA for PCI Express, supporting Agilix 5 (License: IP-PCIEMCDMA-AGS)	2026-01-08	
<input type="checkbox"/> Discontinued - Nios® II/F Processor Intel® FPGA IP (License: IP-NIOS)	2025-04-08	
<input type="checkbox"/> Discontinued - MAX+PLUS® II Software License for Student and University Members (License: PLS-WEB)	2026-01-08	
<input type="checkbox"/> Discontinued - Intel® Quartus® II Software (License: SW-QUARTUS-WE-FIX)	2026-01-08	
<input type="checkbox"/> Discontinued - MAX+PLUS® II Software (License: MAXPLUS2WEB)	2026-01-08	

* # of Seats

Next

Quartus Installation Instructions (Last Updated for Quartus v23.1.1)

4. In the window that appears, click **New Computer** under **Create a New Computer**

* Generate License (Create a New Computer Or Choose an Existing Computer)

Choose an Existing Computer ⓘ
[View All Computers](#)

There are no existing computers.
Please create a New Computer.

Create a New Computer ⓘ **+New Computer**

* I have read and agree to the terms of use of this license as listed below
Maintenance for this license is valid for 12 months from the date you sign up for this license. [Terms of Use](#)

Check this box if you don't want Intel to contact you for feedback. Your feedback helps us improve the product.

Back **Generate**

5. Give the computer a memorable name. Under **License Type**, select **Fixed**. This creates a single-user license tied to your individual computer. Under **Computer Type**, select **NIC ID**. This will tell Intel that your computer will be identified by its network card. Under **Primary Computer ID**, type in the hardware ID of your network card (found earlier in your operating system's Questa installation tutorial). The hardware ID should only include hexadecimal digits (0-9, a-f). **Make sure to remove any spaces, dashes, or colons in the number**. The form should look like the below screenshot, but with a different Computer Name and Primary Computer ID. Finally, click **Save**, make sure the correct computer is selected, and click **Generate**.

Create Computer

* Computer Name ⓘ Benjamin's Computer

* License Type ⓘ FIXED

Companion Computer ID 1 ⓘ

* Primary Admin ⓘ Benjamin Frohman

* Computer Type ⓘ NIC ID

How to find your hardware information (NIC/Host/Guard ID)? ⓘ

* Primary Computer ID ⓘ f4c88a3f40b2

Companion Computer ID 2 ⓘ

Cancel **Save**

* Generate License (Create a New Computer Or Choose an Existing Computer)

Choose an Existing Computer ⓘ
[View All Computers](#)

F4C88A3F40B2 Benjamin's Computer

Create a New Computer ⓘ **+New Computer**

* I have read and agree to the terms of use of this license as listed below
Maintenance for this license is valid for 12 months from the date you sign up for this license. [Terms of Use](#)

Check this box if you don't want Intel to contact you for feedback. Your feedback helps us improve the product.

Back **Generate**

Quartus Installation Instructions

(Last Updated for Quartus v23.1.1)

6. Look for an email from `authorization@intel.com` sent to the address you used to create your Intel account. A license file named `LR-XXXXXX_License.dat` should be attached to the email. Download that file and return to the Questa Installation Tutorial.

Sources

- <https://stackoverflow.com/questions/18704913/unable-to-lock-chain-insufficient-port-permissions>
- https://wiki.archlinux.org/title/Intel_Quartus_Prime
- https://cdrdv2-public.intel.com/666293/quartus_install-683472-666293.pdf
- <https://web.archive.org/web/20220614084754/https://ecen3350.rocks/static/usb-blaster.pdf>