

Quartus Installation Instructions
(Last Updated for Quartus v22.1.1)

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 v22.1.1)

Quartus Installation Instructions

Quartus Installation for Windows 10/11

1. Go to the [Quartus Prime Lite 22.1.1 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) 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-windows.exe	Size: 1.6 GB SHA1: 3694a64cc8253450ad7682a552396f7e292dad09
** 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. ** Installation size: 8.86 GB		
Questa® - Intel® FPGA Edition	Download QuestaSetup-22.1std.1.917-windows.exe	Size: 780.1 MB SHA1: 61219c4ba8cd88d51a87dfe5623ff6bacf346185
** Installation size: 2.73 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		

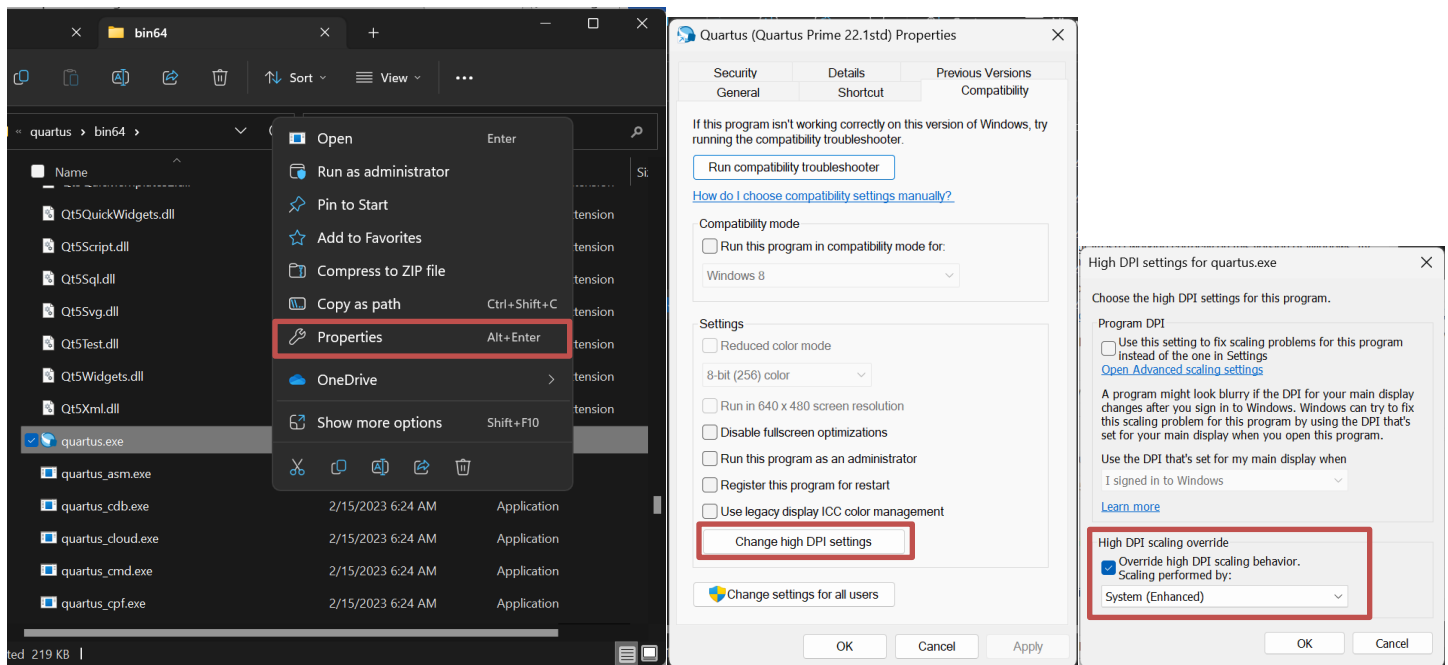
Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

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-22.1std.1.917-windows.exe

Note that the numbers after the 22 might change as new versions become available.

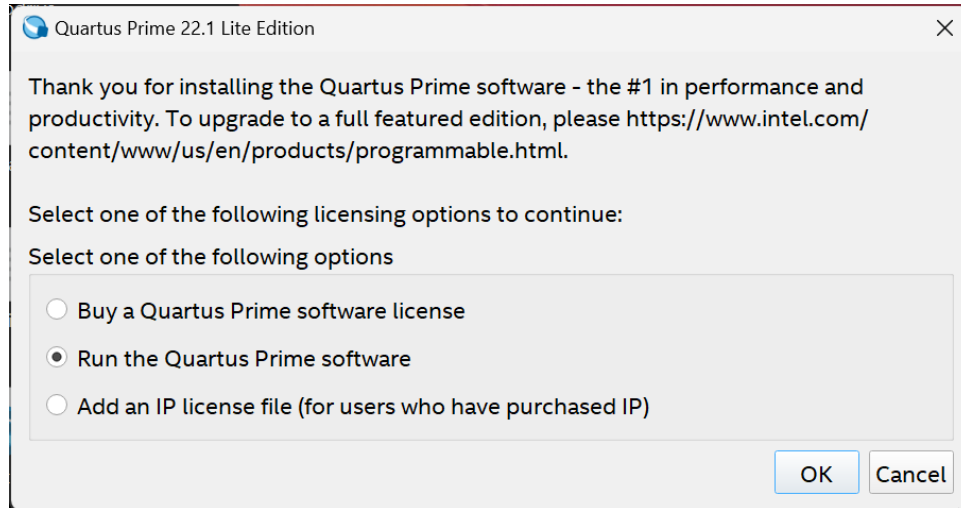
- a) Windows may tell you that it is not safe to run this program with something like Windows protected your PC. Ignore this message. Select More info or something similar to get Windows to continue and then select Run anyway.
 - b) Leave all default options in the installer and select Next each time it is necessary.
 - c) When the Finish option is presented, de-select Launch USB Blaster II driver installation and Run the Quartus Prime Software 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\22.1std\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

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6. When the installation is done, run the Quartus software from the Start menu or the desktop shortcut. When a Quartus Prime 22.1 Lite Edition window appears (see below), select the second option (as shown), i.e., Run the Quartus Prime software and then select OK. I suggest that you drag the Quartus desktop icon into your Taskbar for easiest access.



Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

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

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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 v22.1.1)

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
```

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

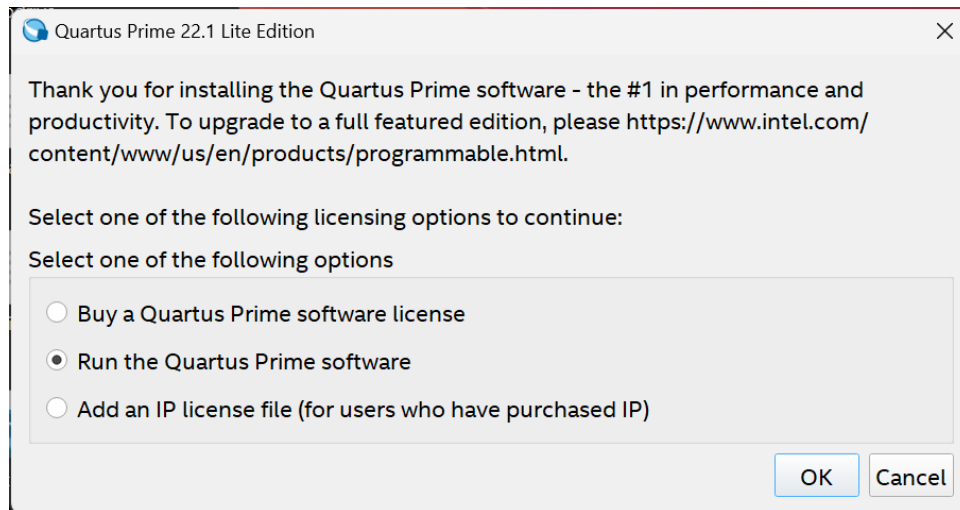
Quartus Installation Instructions

(Last Updated for Quartus v22.1.1)

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/22.1std/quartus/bin/quartus`. In the window that appears, select Run the Quartus Prime software and then select OK.



Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

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 v22.1.1)

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.

Downloads

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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
cyclonev-19.1.0.670.qdz

Size: 1.3 GB
SHA1: a618a94985875978f5b19aad64cfa78c60c33370

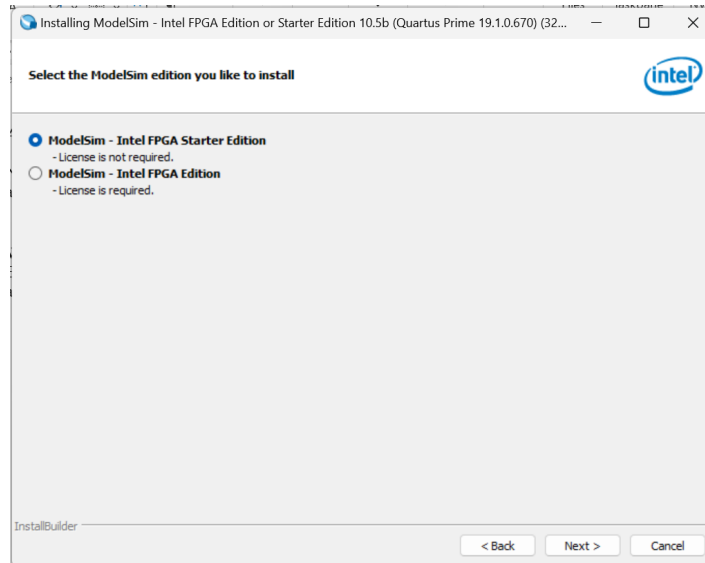
3. After Modelsim has finished downloading, run the following file to install it.

Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

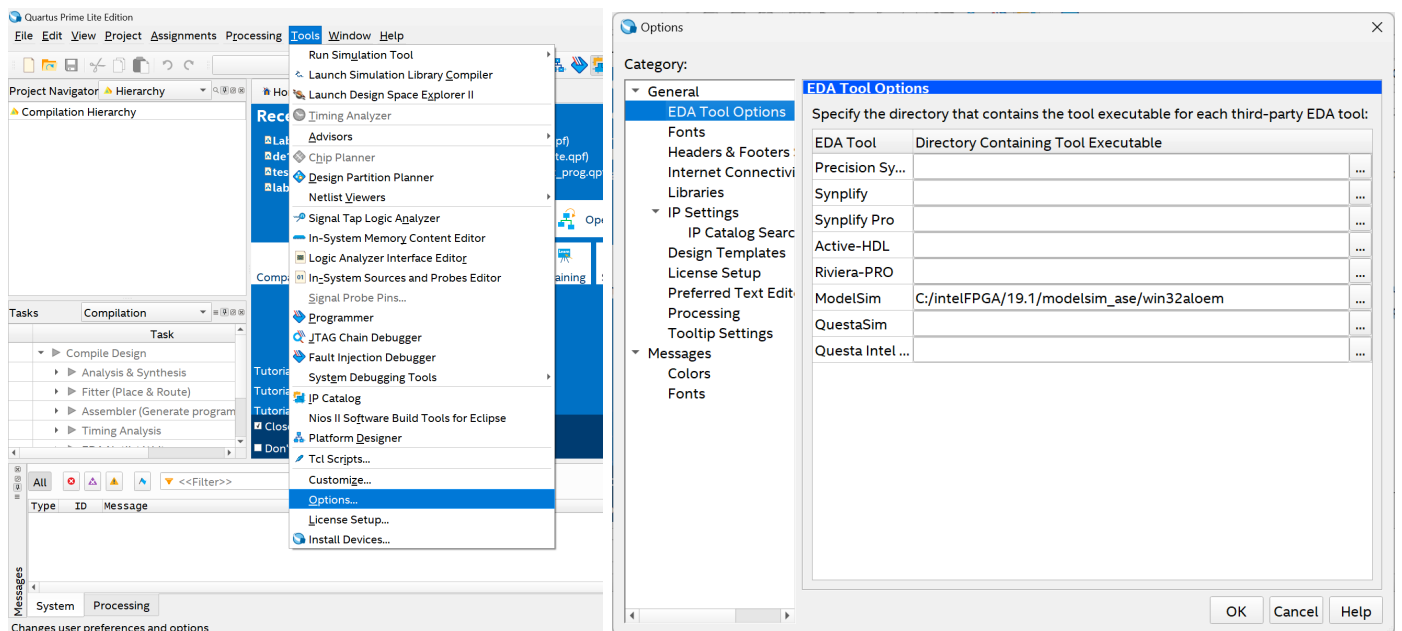
ModelSimSetup-19.1.0.670-windows.exe

Note that the numbers after the 22 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/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 v22.1.1)

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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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 cyclonev-19.1.0.670.qdz	Size: 1.3 GB SHA1: a618a94985875978f5b19aad64cf78c60c33370
Intel® MAX® II, Intel® MAX® V Device Support. (13.1MB)	Download max-19.1.0.670.qdz	Size: 11.4 MB SHA1: 90a3be6febda19ef0c4140b0ecec0798b1f38a5
Intel® MAX® 10 Device Support. (343.3MB)	Download max10-19.1.0.670.qdz	Size: 332.8 MB SHA1: cd99cd6e153867499e6a460d89661940f59ac60a

Intel® Quartus® Software

ModelSim-Intel® FPGA Edition (includes Starter Edition)	Download ModelSimSetup-19.1.0.670-linux.run	Size: 998.7 MB SHA1: 354404a6fb70dd7837fe27a0cce262eada9c1d86
Intel® Quartus® Prime (includes Nios® II EDS)	Download QuartusLiteSetup-19.1.0.670-linux.run	Size: 1.8 GB SHA1: ea512441cd6658c3e0225c85ccc09417110ab572

** Nios® II EDS requires you to install an Eclipse IDE manually.

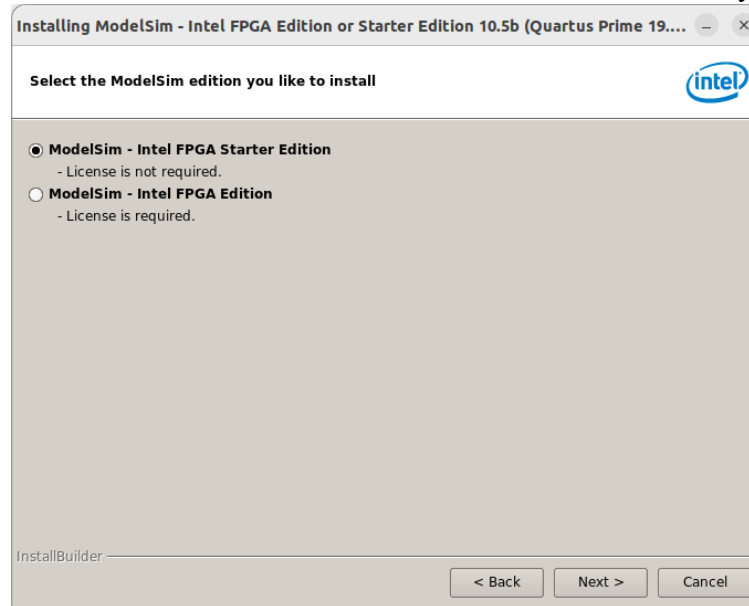
3. Open a terminal and Open a terminal and navigate to your Downloads folder. We can then run the ModelSim installer by issuing the following commands. Make sure that you do not run the ModelSim installer as root!

```
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 v22.1.1)

- 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

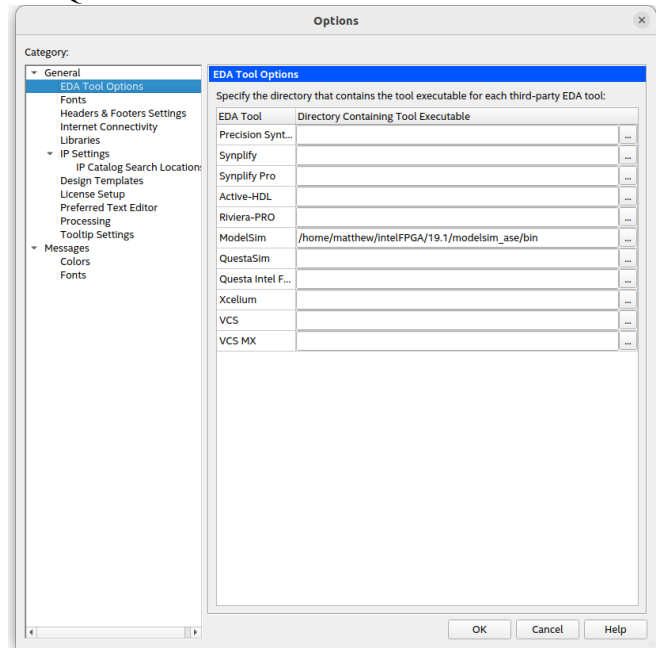
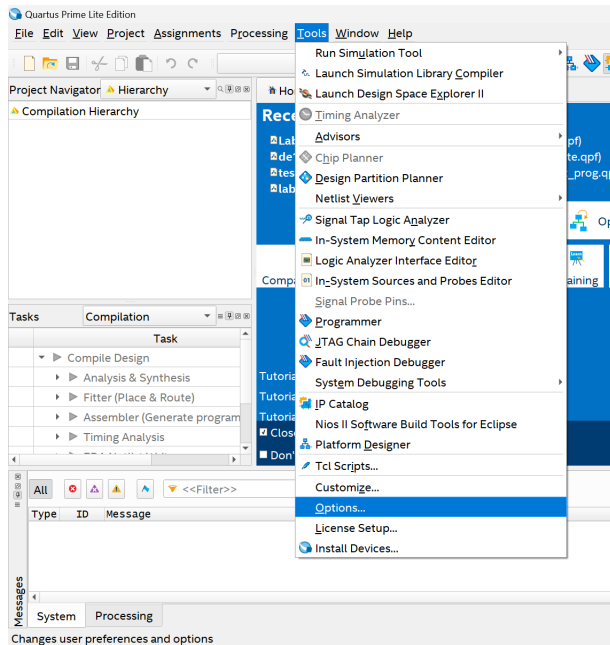
sudo apt upgrade

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 v22.1.1)

7. 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 v22.1.1)

Questa Installation for Windows 10/11

1. Go to the [Quartus Prime Lite 22.1.1 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 Edition as shown with arrows on the left. You may need to accept a license agreement.

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** Installation size: 2.73 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 v22.1.1)

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

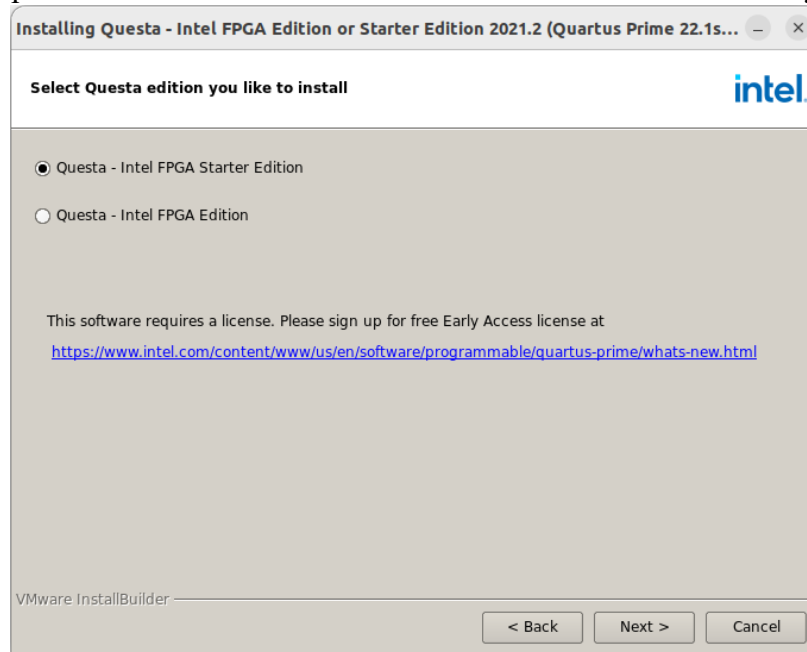
`QuestaSetup-22.1std.1.917-windows.exe`

Note that the numbers after the 22 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 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 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 `c423609f3c29`.

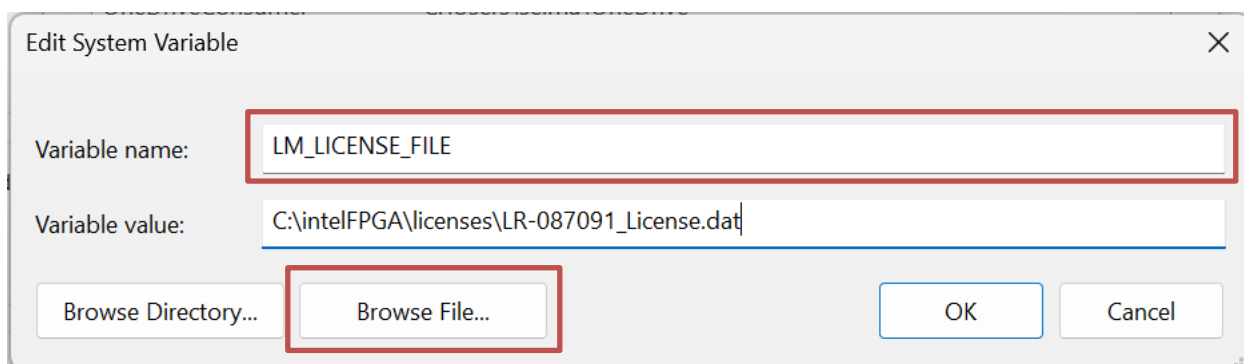
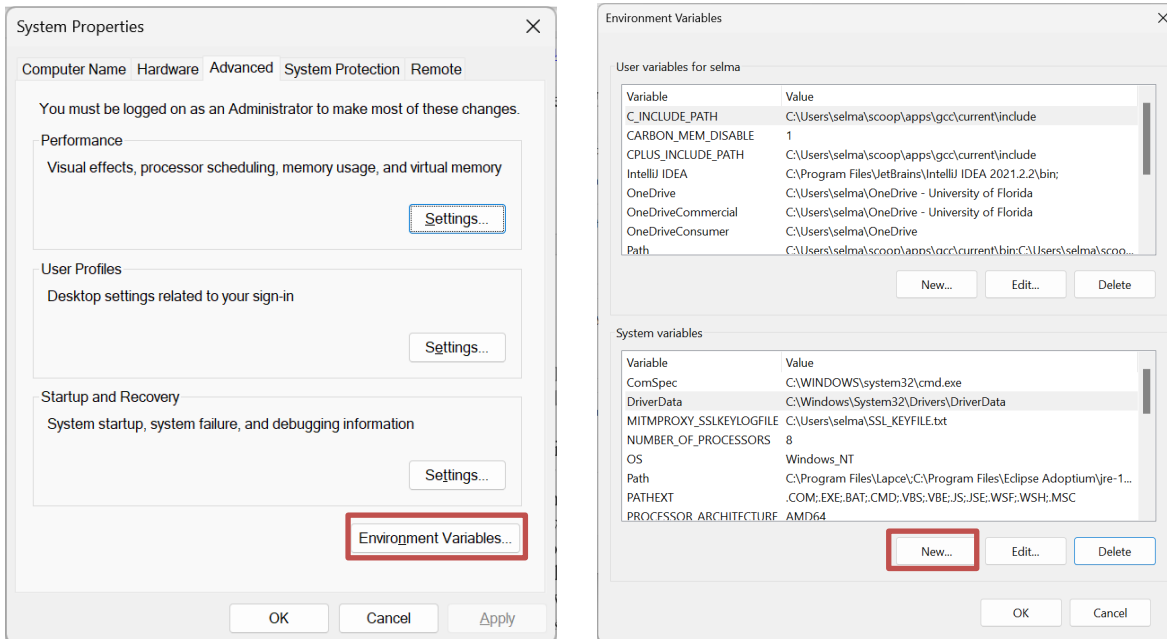
```
Wireless LAN adapter Wi-Fi:  
Connection-specific DNS Suffix . : attlocal.net  
Description . . . . . : Killer(R) Wi-Fi 6 AX1650s 160MHz Wireless Network Adapter  
Physical Address. . . . . : C4-23-60-9F-3C-29  
DHCP Enabled. . . . . : Yes  
Autoconfiguration Enabled . . . . : Yes
```

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

7. 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 v22.1.1)

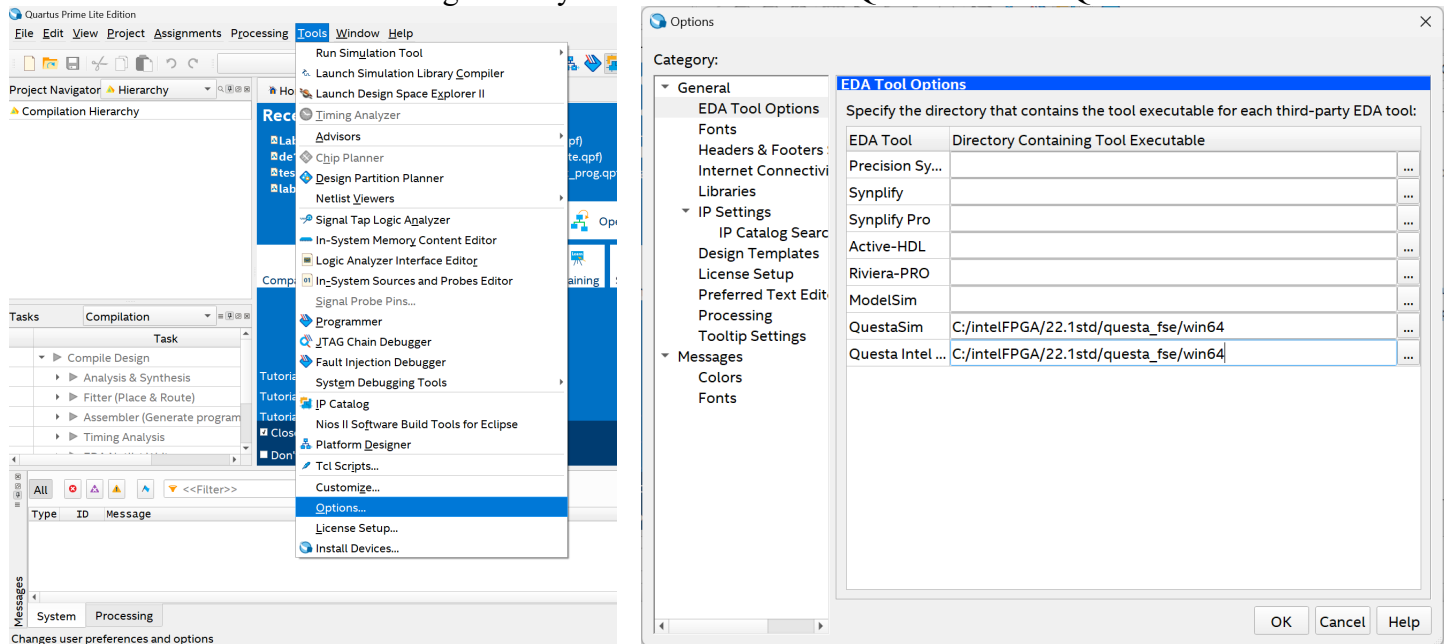
8. We need to set the `LM_LICENSE_FILE` environment variable globally so that Questa knows where to find the license file.
 - a) In the Start menu, search for Edit the system environment variables.
 - b) Click the Environment Variables button in the bottom right corner of the window that appears.
 - 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.



9. Restart your computer for your changes to take effect.
10. Once your computer reboots, open a command prompt and run `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.
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 **edt_wedtq.dll** and copy it into `C:\intelFPGA_lite\22.1std\quartus\bin64`. Make sure to replace the older version of this file in the destination.

Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

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 `C:/intelFPGA/22.1std/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 v22.1.1)

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

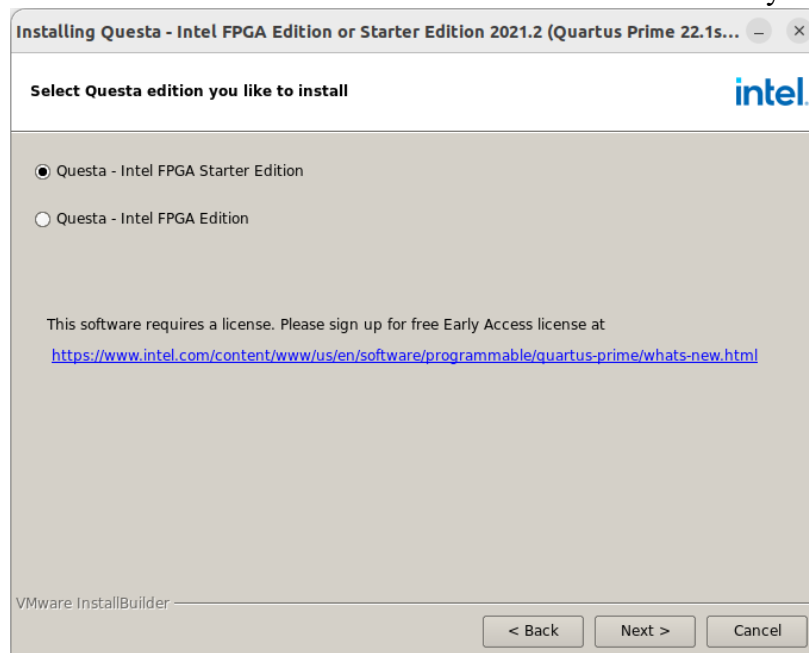
** Installation size: 0.35 GB

Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

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.



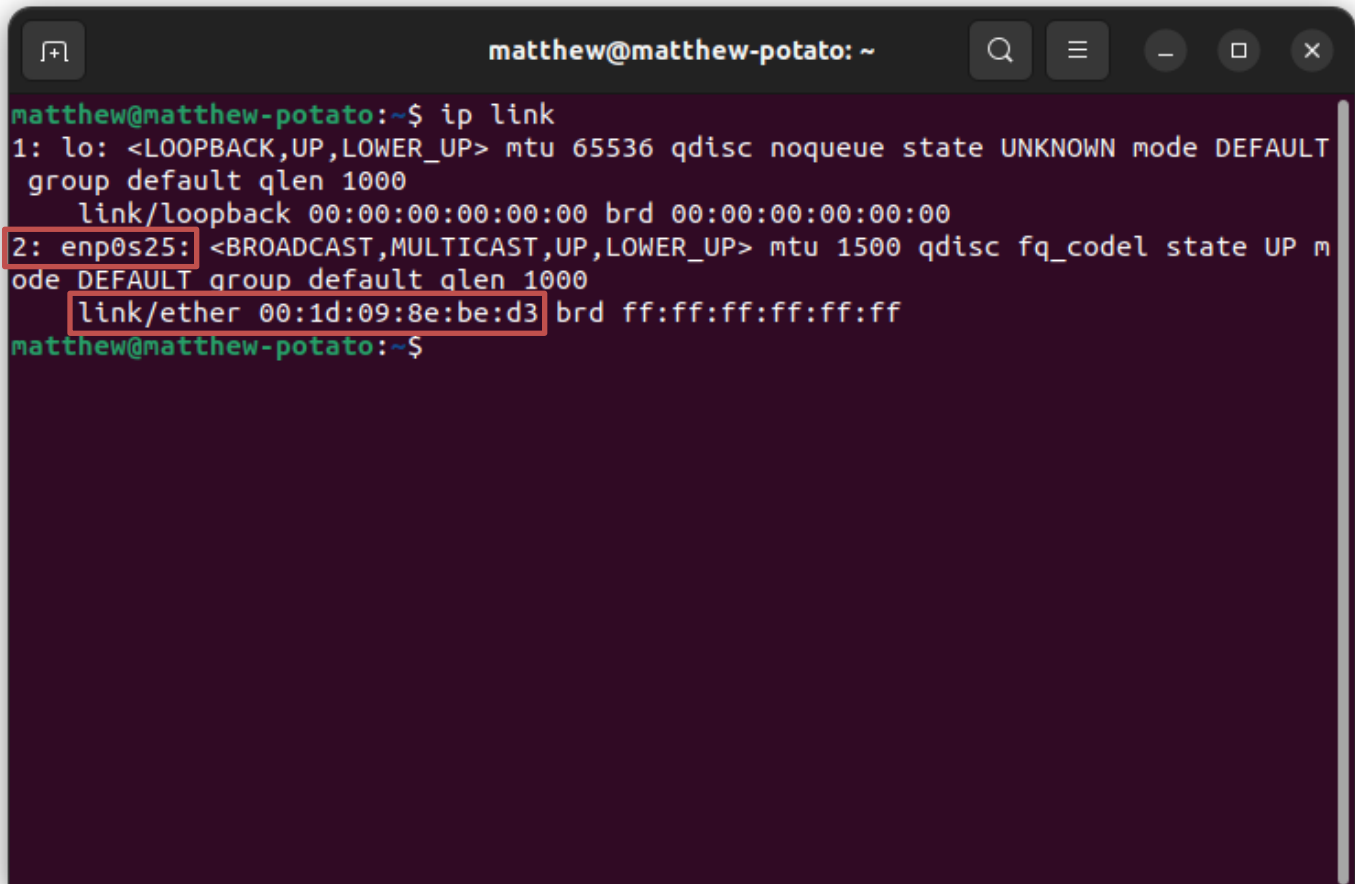
5. To allow easy access to your Questa installation, create a text file called `questa.desktop` using the text editor of your choice and copy the following contents into it. Make sure to change `YOURUSERNAME` to the username of the account that you installed Questa for.

```
[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 v22.1.1)

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`.



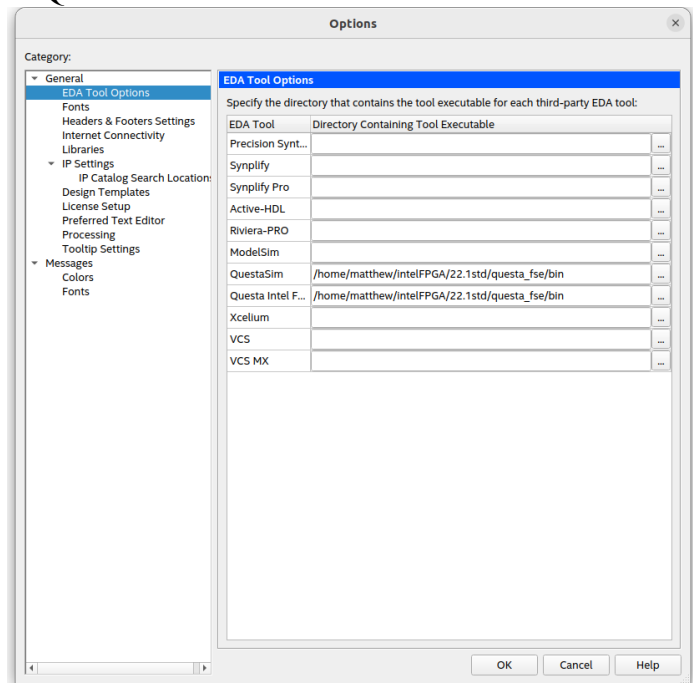
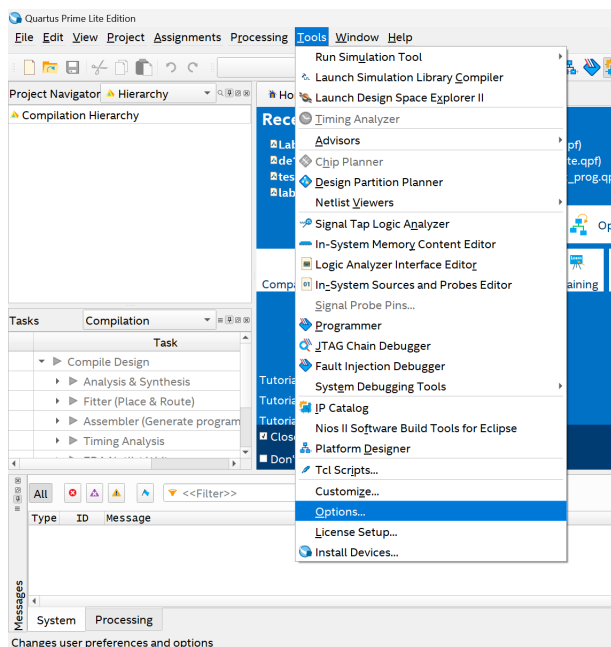
```
matthew@matthew-potato:~$ ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT
   group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s25: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP m
   ode DEFAULT group default qlen 1000
    link/ether 00:1d:09:8e:be:d3 brd ff:ff:ff:ff:ff:ff
matthew@matthew-potato:~$
```

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 v22.1.1)

- 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.
- 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.

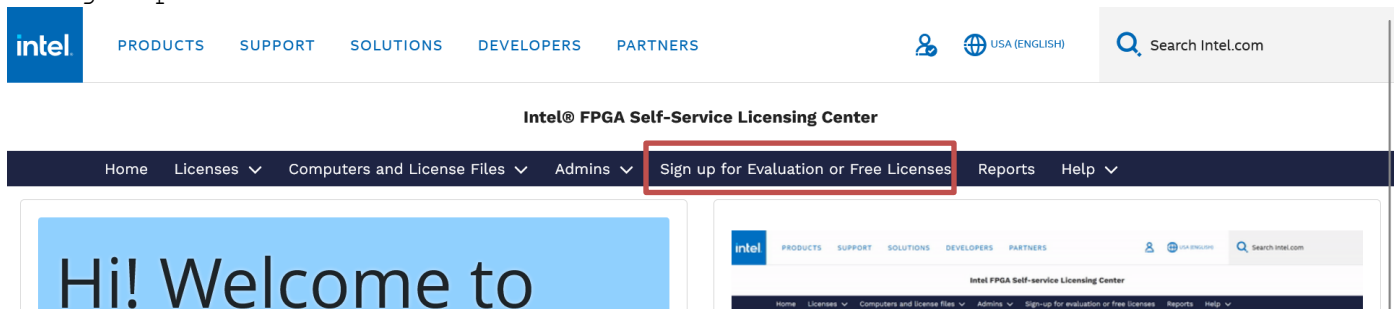
Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

Appendices

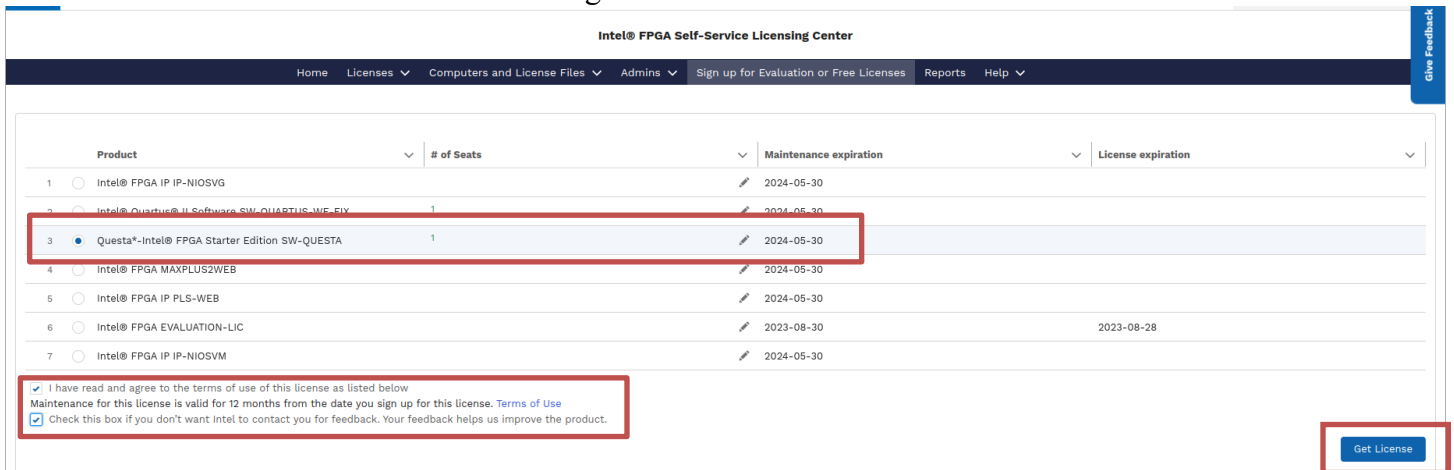
Obtaining a Questa License

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 Free Licenses**.

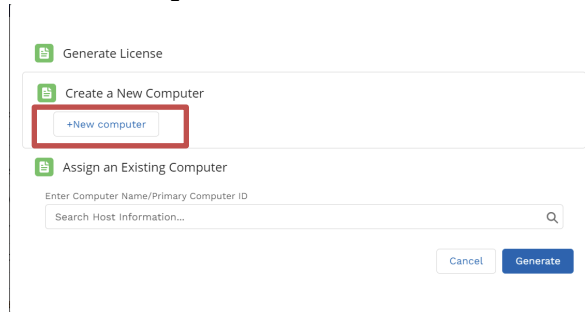


3. Click the radio button next to Questa-Intel FPGA Starter Edition. Click the pencil icon next to Questa-Intel FPGA Starter Edition in the # of Seats column and type in 1. Leave all other rows in their default values. You must do these steps in exactly this order or the page will automatically refresh. See the below screenshot. Check the license agreement checkboxes below the table and click **Get License**.

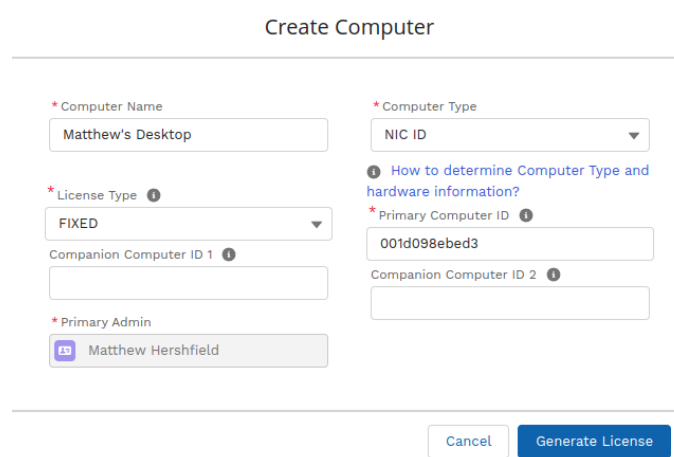


Quartus Installation Instructions (Last Updated for Quartus v22.1.1)

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



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 Qesta 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 **Generate License**.

A screenshot of a "Create Computer" form. The form has several fields: "Computer Name" with the value "Matthew's Desktop"; "Computer Type" with a dropdown menu set to "NIC ID"; "License Type" with a dropdown menu set to "FIXED"; "Companion Computer ID 1" (empty); "Primary Admin" with a dropdown menu set to "Matthew Hershfield"; and "Primary Computer ID" with the value "001d098ebd3". There is also a "Companion Computer ID 2" field (empty). At the bottom right are "Cancel" and "Generate License" buttons. A link "How to determine Computer Type and hardware information?" is visible next to the "Primary Computer ID" field.

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 Qesta Installation Tutorial.

Quartus Installation Instructions

(Last Updated for Quartus v22.1.1)

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>