Intel® Quartus® Prime Lite and Nios® II SBT for Eclipse Installation Instructions

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Intel has a wealth of training content for FPGA developers. The name Altera still shows up on most of the content, because Intel acquired Altera in 2015. Much of the content is still relevant after half a decade; but as the programming tools have evolved, the older training material is a little dated. The little steps can get lost as menus and features have changed. One thing we found that appears to be lost is how to set up all this software to start development. Many little steps have to be followed. This article covers the setup for Quartus Prime Lite and Nios® II SBT for Eclipse for two different development systems: Windows 10 and Ubuntu 18.0.4. The choice of the host development system is up to you. The article also serves as a starting point for future papers on the Intel FPGA product line.

Note: As the software changes, even this article will get a little dated. These are the steps as of this date.

Links to the software:

- Intel Quartus Prime Lite Edition V21.0
  https://www.intel.com/content/www/us/en/products/details/fpga/development-tools/quartus-prime/resource.html

  o If you are using Windows, you will need the 7zip utility to unpack the .tar file.

- Nios® II SBT for Eclipse

  o For Windows:
    https://archive.eclipse.org/technology/epp/downloads/release/mars/2/eclipse-cpp-mars-2-win32-x86_64.zip

  o For Linux:
    https://archive.eclipse.org/technology/epp/downloads/release/mars/2/eclipse-cpp-mars-2-linux-gtk-x86_64.tar.gz

1.1 Windows Installation

These next 3 sections cover installing Quartus and the tools for Nios II SBT for Eclipse on Windows 10.

### 1.1.1 Download and Install the Quartus Prime Lite Edition Software

Quartus needs to be downloaded and installed first.

1. There are several download options on the Quartus Prime Lite download page, but download the large Tar file that includes all the separate components.
2. Use 7zip or an equivalent utility to extract the files from the tar file.
3. Open a command prompt with administrative privileges.
4. Change the directory to the root of the folder you extracted and run the setup.bat file.
5. Click the Next button when the first screen appears.
6. Read, accept the license agreement, and click Next.
7. Choose the installation folder, and click Next.

8. The Select Components Screen appears. You can accept the defaults and click Next, or you can deselect the FPGA devices you are not going to develop for. You can always re-run the installer to make changes. Click Next.
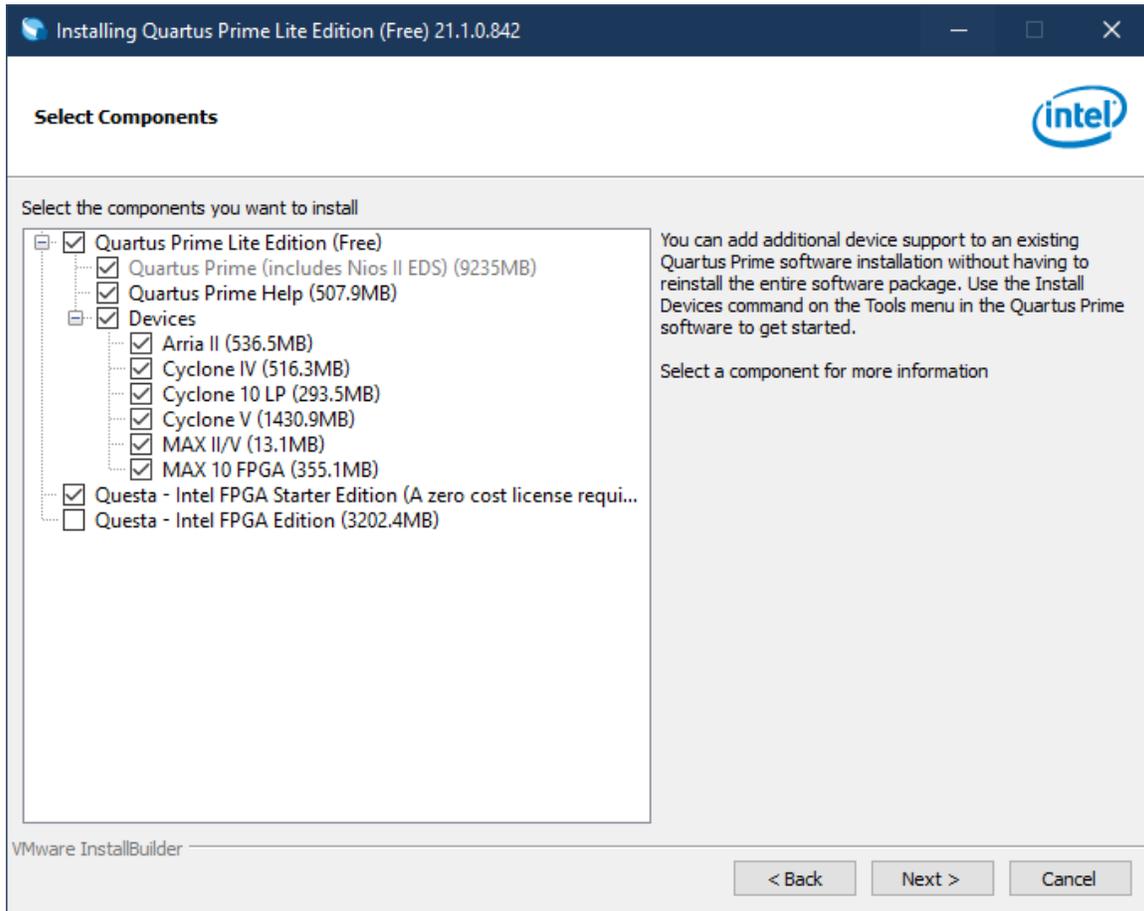
9. A summary appears, click Next, and the installation will begin.
10. After the primary installation completes, one last dialog appears to install the USB driver for the USB Blaster II programming cable. Leave these items checked and click Finish.

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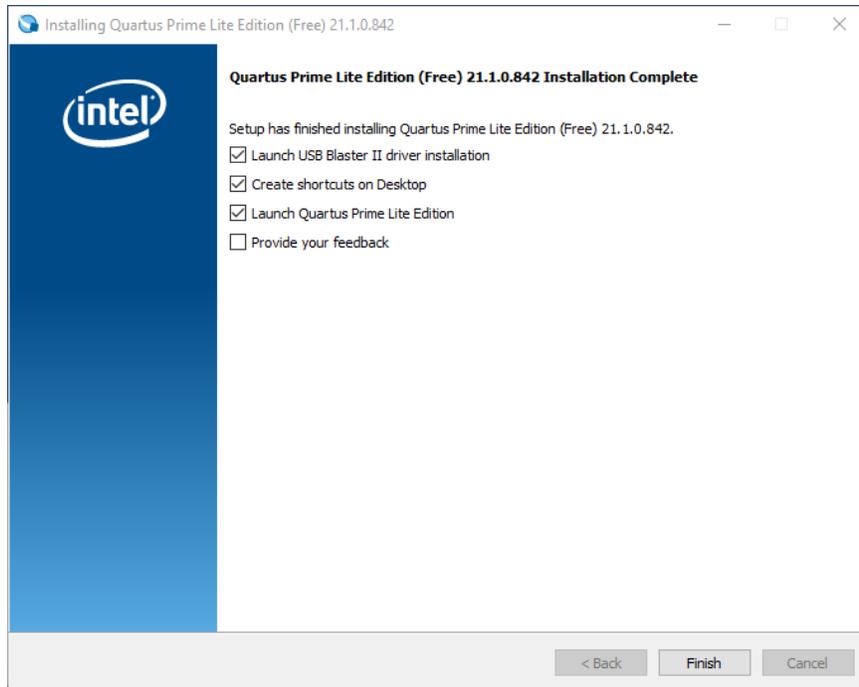
11. The driver installer appears. Just accept all defaults to install the driver.
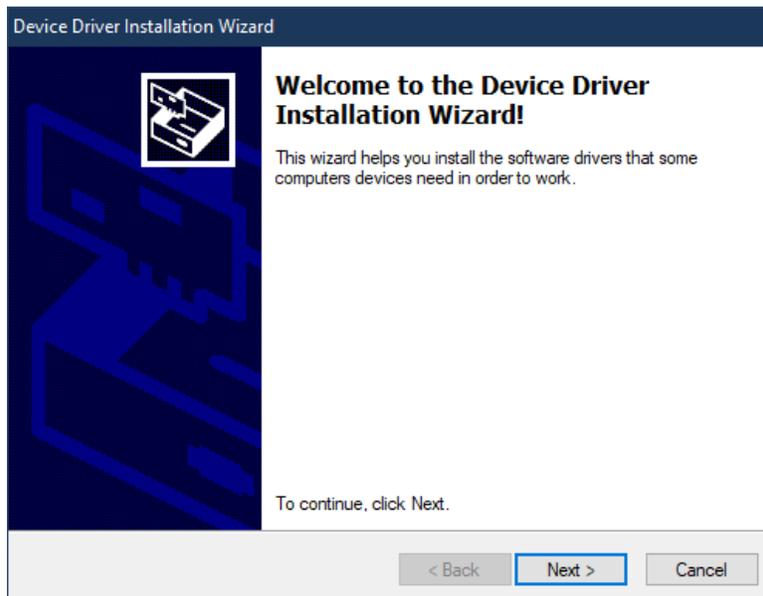

1.1.2 Enable WSL and Ubuntu Terminal

Before the Nios tools are installed, WSL and an Ubuntu 18.0.4 terminal must be installed.

Note: Failure to install WSL and Ubuntu will end up in a project creation failure: "error creating project Failed to execute: wsl dos2unix create-this-bsp; /create-this-bsp –cpu"
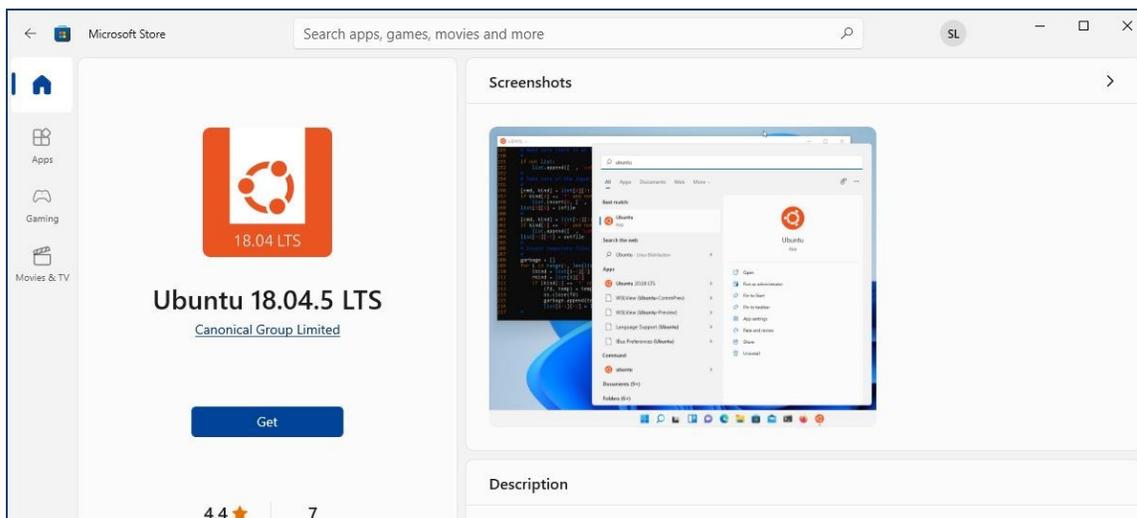
1. Open Control Panel.
2. Open Programs and Features.
3. Click on Turn Windows features on or off.

4. Check the box Windows Subsystem for Linux, and click OK.
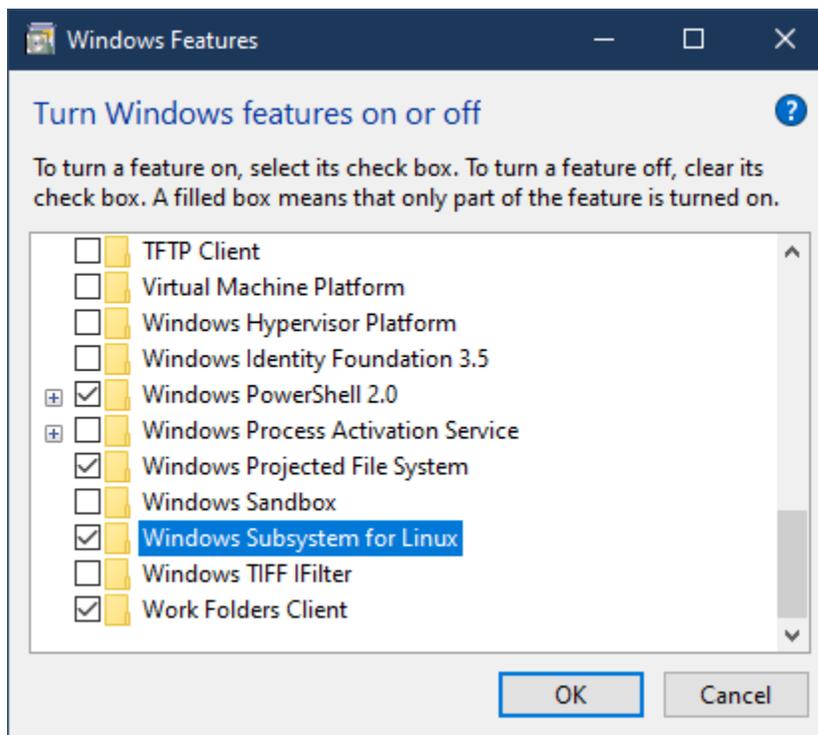
5. Reboot the computer when asked.
6. After the computer reboots, open the Store app.
7. Search for Ubuntu 18.0.4 LTS.

8. Click on Get to install the application.
9. When the Ubuntu terminal has installed, open the terminal.
10. The system will finish installation and you will be asked for a user name, which has to be in all lower case.
11. Enter a password.

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12. Make sure the terminal is up to date by running:

    ```
    sudo apt update
    ```

13. Next, we need to install some tools. Run the following commands:

    ```
    sudo apt install wsl
    sudo apt install dos2unix
    sudo apt install make
    sudo apt install build-essential
    sudo apt upgrade
    ```

14. The Nios tools require WSL 1.0. WSL 2.0 has issues. You can check the version by opening a command prompt and running the following:

    ```
    Wsl -l -v
    ```


If the result shows 2 instead of 1 under VERSION, then run the following command to set it to 1.

    ```
    wsl --set-version Ubuntu-18.04 1
    ```

15. Create an environment variable for WSL. Open Control Panel->System.
16. On the right side of the page, click on "Advanced system settings".
17. Click on Environment variables.
18. Under System variables click New.
19. Enter the following:

    Variable Name: WSLENV
   Variable Value: SOPC_KIT_NIOS2/p
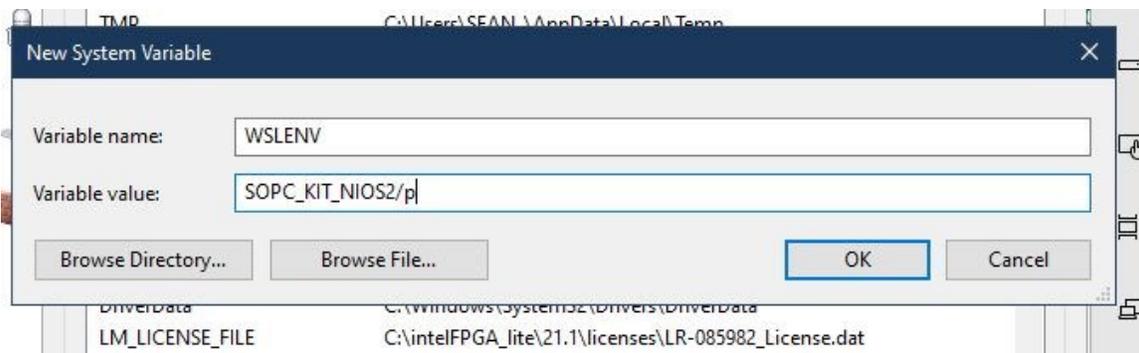
20. Click OK.
21. Reboot the system.

1.1.3   Download and Add the Nios® II SBT for Eclipse into Quartus Prime Lite Edition
A variant of Eclipse called Nios II SBT for Eclipse is used to develop applications for Nios II. The Nios II SBT for Eclipse is a separate download and integration in the Quartus installation.
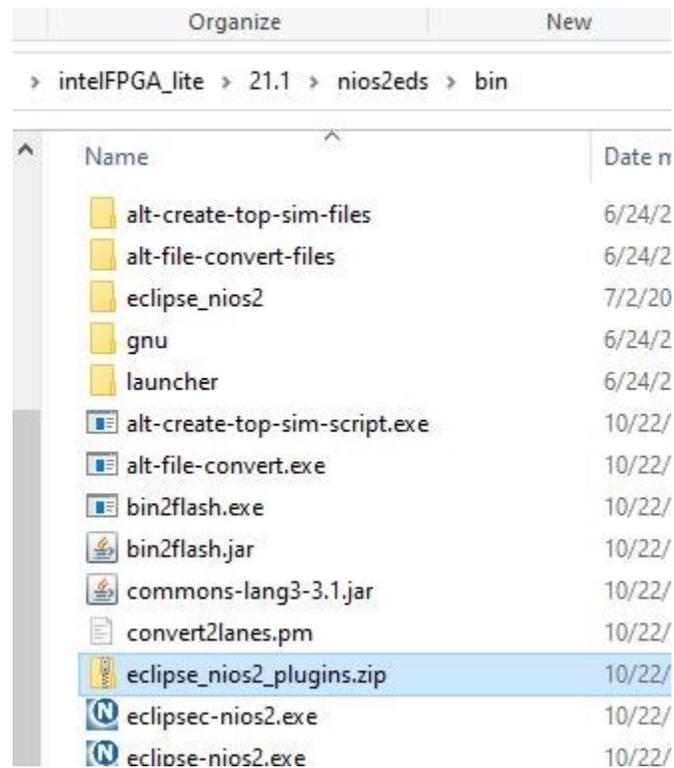
1. Download the Nios II SBT for Eclipse from the link provided.
2. Extract the zip file to the \intelFPGS_lite\21.1\nios2eds\bin folder. The result should be a folder called eclipse in the \intelFPGS_lite\21.1\nios2eds\bin directory.
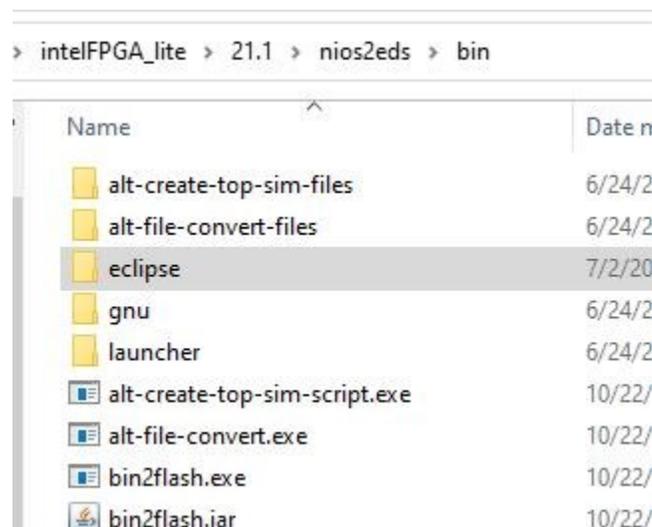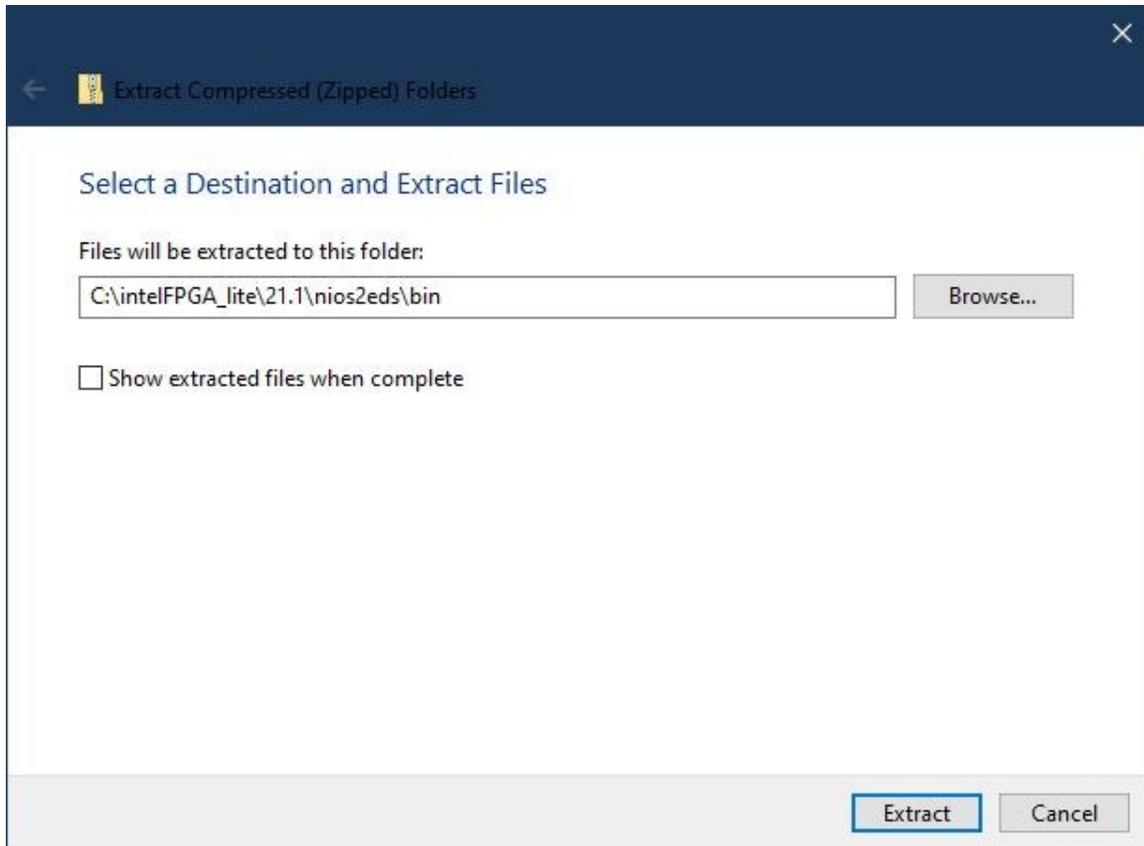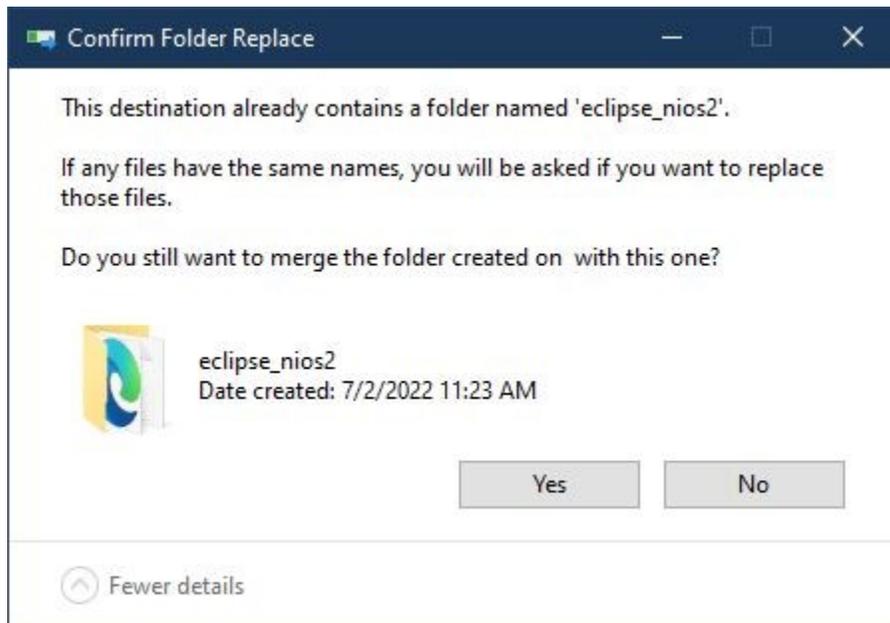

3. Rename the eclipse folder to eclipse_nios2.
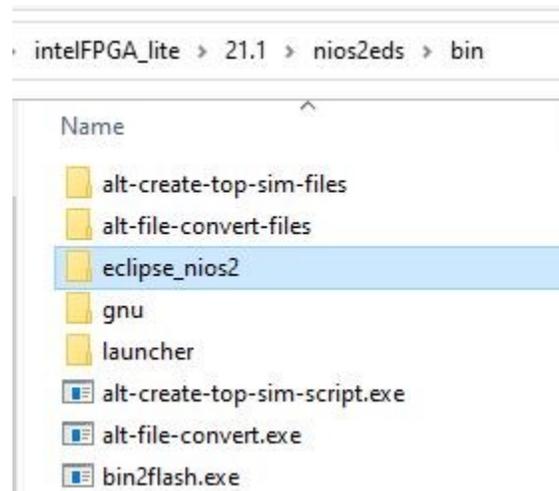
In the \intelFPGS_lite\21.1\nios2eds\bin directory is a file called eclipse_nios2_plugins.zip.

4. Extract the eclipse_nios2_plugins.zip file to the \intelFPGS_lite\21.1\nios2eds\bin directory. The process will overwrite the \intelFPGS_lite\21.1\nios2eds\bin\eclipse_nios2 directory.
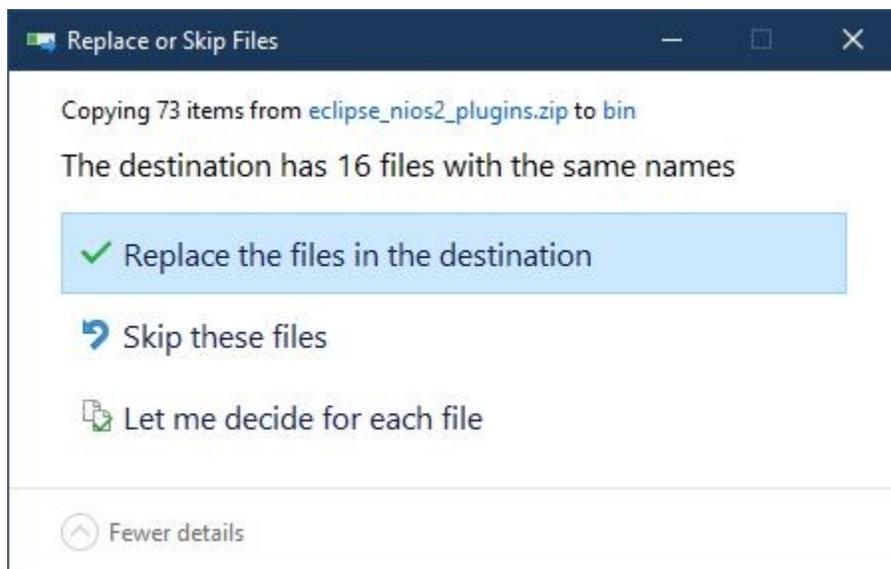
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5. You will be asked to give permission to overwrite the folder. Click Yes.
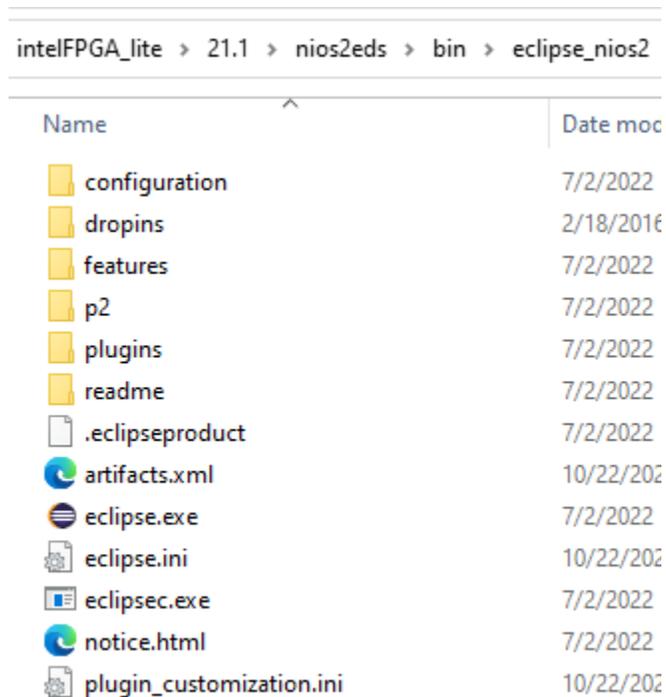

6. There will be messages asking about overwriting files. Click the box to do this for all current items.
7. Click Yes.

8. There will be another question asking to replace the files. Click on Replace the files in the destination.

You may have to repeat these last two steps a couple of times to complete the process. Once completed, Eclipse and the Nios II plugins will be installed. Eclipse should now be ready to be used for application development. Make sure you see the plugin_customizaton.ini in the \intelFPGS_lite\21.1\nios2eds\bin\eclipse_nios2 folder.

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1.2 Ubuntu Installation

Ubuntu 18.0.4 LTS is the supported version called out by the Quartus support page. There are other Linux distributions supported, but Ubuntu gets the most attention. The next two sections discuss setting up Quartus and the Nios® II tools for application development.

Note: Quartus also supports other Linux distributions. Ubuntu is the most commonly used. These steps may apply to other supported distributions as well.

1.2.1 Download and Install the Quartus Prime Lite Edition Software
First, we need to download and install the Quartus Prime Lite Edition software. The Lite Edition is free and fully supports the MAX 10.

1. There are several download options but download the large Tar file that includes all the separate components.
2. Open the Files and go to the Downloads folder.
3. Double-click on the Tar file and extract the files to /Downloads/Quartus.
4. Open the terminal, and navigate to /downloads/Quartus.
5. Run the setup.sh script by typing the following and hit enter:

   ```
   ./setup.sh
   ```

6. Click the Next button when the first screen appears.
7. Read, accept the license agreement, and click Next.
8. Choose the installation folder, and click Next.
9. The Select Components Screen appears. You can accept the defaults, and click Next, or you can deselect the FPGA devices you are not going to develop for. You can always re-run the installer to make changes. Click Next.
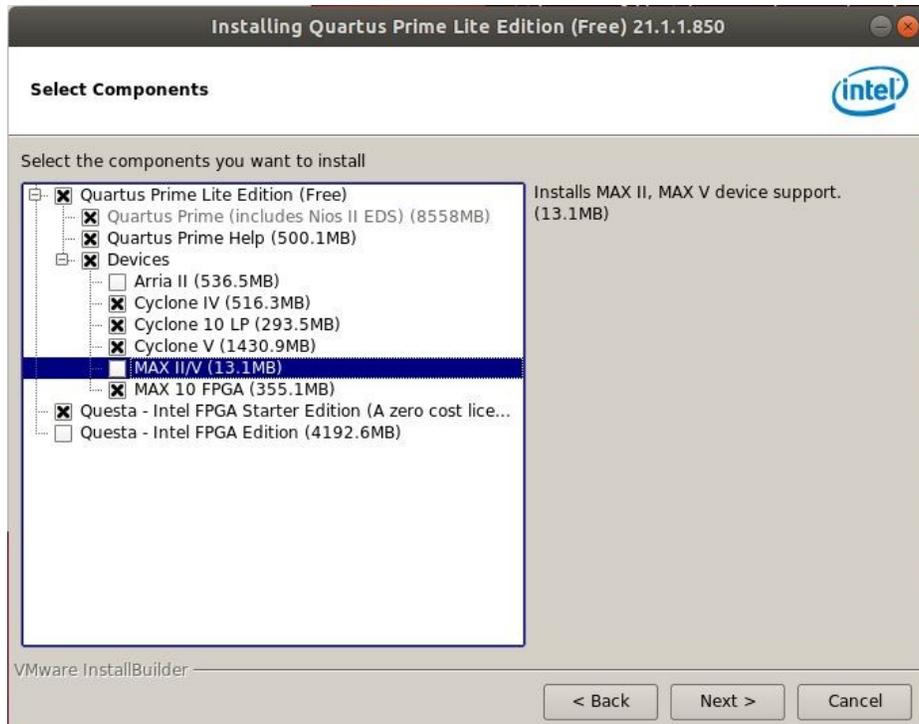
10. A summary appears, click Next, and the installation will begin.
11. After the primary installation completes, one last dialog appears to set up a shortcut and some other items. Just click Finish.

1.2.2 Download and Add the Nios® II SBT for Eclipse into Quartus Prime Lite Edition

A variant of Eclipse called Nios II SBT for Eclipse is used to develop applications for Nios II. The Nios II SBT for Eclipse is a separate download and integration in the Quartus installation.

1. Download the Nios II SBT for Eclipse for Linux: https://archive.eclipse.org/technology/epp/downloads/release/mars/2/eclipse-cpp-mars-2-linux-gtk-x86_64.tar.gz .
2. Open Files and copy the Eclipse tar file to ~/intelFPGA_lite/21.1/nios2eds/bin.
3. Double-click on the tar file and extract the contents to the ~/intelFPGA_lite/21.1/nios2eds/bin folder. The result should be a folder called eclipse in the ~/intelFPGS_lite/21.1/nios2eds/bin directory.
4. Rename the eclipse folder to eclipse_nios2.
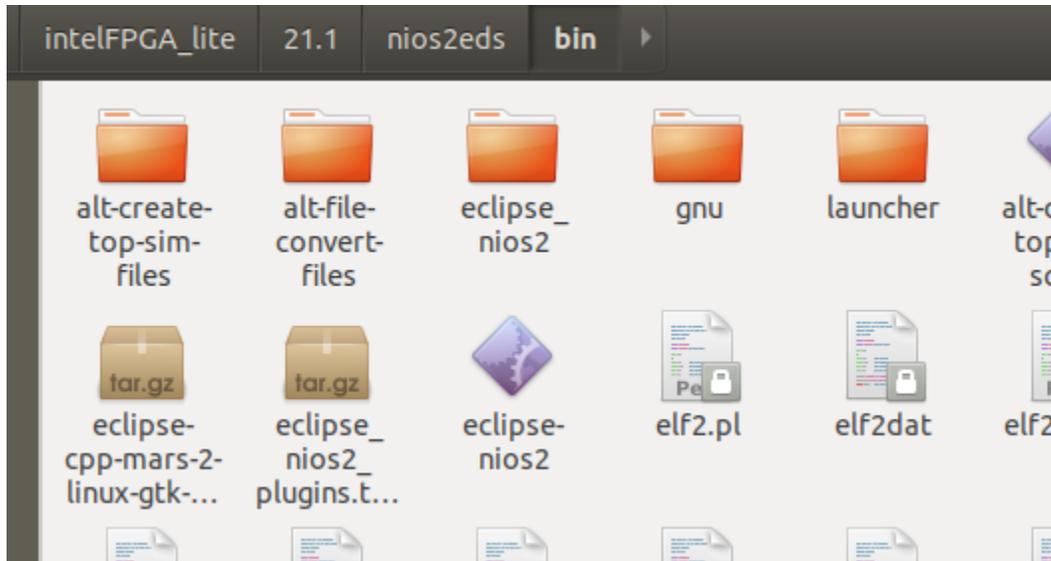
5. In the same directory, double-click on the Eclipse_nios2_plugins.tar file. The process will overwrite the ~/intelFPGS_lite/21.1/nios2edsbin/eclipse_nios2 folder.
6. A warning appears asking about replacing files, click Replace ALL the files.
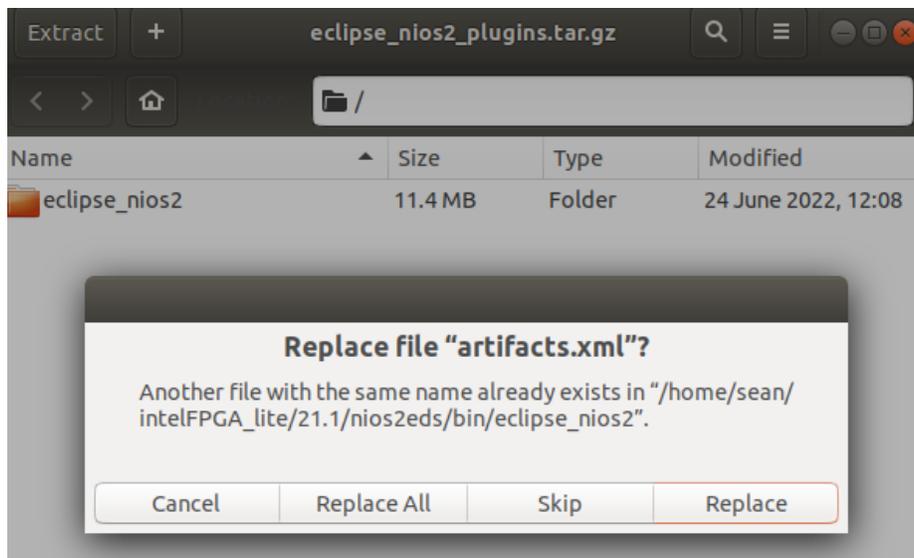
Once completed Eclipse and the Nios II plugins will be installed. Eclipse is ready to be sued for application development. Make sure you see the plugin_customizaton.ini in the \intelFPGS_lite\21.1\nios2eds\bin\eclipse_nios2 folder.
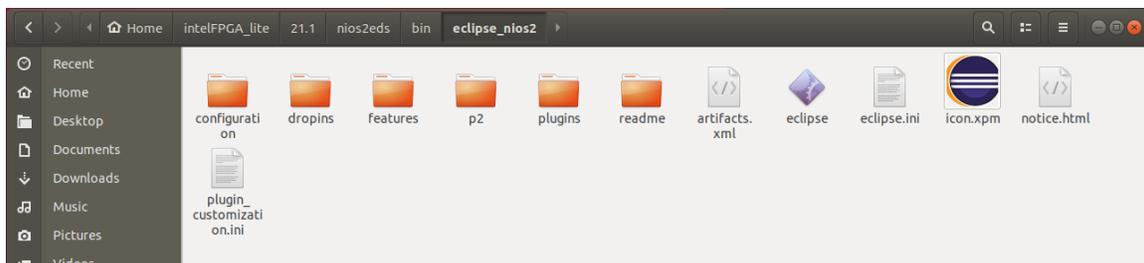
7. Let's make sure the system is up to date. Open the terminal and run the following:

```
sudo apt update
```

8. Next, we need to install some tools. Run the following commands:

```
sudo apt install wsl
sudo apt install dos2unix
sudo apt install make
sudo apt install build-essential
```

9. We need to update the OpenJDK to fix issues launching Eclipse from Quartus. Run the following to get the latest OpenJDK 8 release:

```
sudo apt-get install openjdk-8-jre
```

10. Navigate to ~/intelFPGA/20.1/quartus/linux64
11. Run the following to rename the jre64 folder

```
mv jre64 jre64_old
```

12. Finally, run the following to link the installed OpenJDK to the jre64 folder.

```
ln -s /user/lib/jvm/java-1.8.0-openjdk-amd64/jre jre64
```

Please keep in mind that these steps are for the specific version to tools called out. Future changes to the tools may result in additional or different steps.

1.3 Next Steps

The software setup is key to getting started with development for Intel FPGAs. This article serves as a foundation for future hands-on FPGA articles.

1.4 References

The following references were used for this article:

Nios II Software Developer Handbook - 3.1. Installing Eclipse IDE into Nios® II EDS (intel.com)

Is the Nios® II Software Build Tools (SBT) for Eclipse included... (intel.com)

How to install the Windows* Subsystem for Linux* (WSL) on Windows* OS? (intel.com)
Getting Start Install WSL - Terasic Wiki

failed to execute: wsl dos2unix create-this-app - Intel Communities