



# Quick Start Guide for Intel® FPGA Development Tools on the Nimbix Cloud

Updated for Intel® Quartus® Prime Design Suite: **17.0.1**



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# 1. Quick Start Guide for Intel® FPGA Development Tools on the Nimbix Cloud

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This user guide describes how to run Intel® Quartus® Prime Pro Edition and Intel FPGA SDK for OpenCL™<sup>(1)(2)</sup> using the Nimbix Cloud platform. Nimbix Cloud specializes on high-performance computing services that use containers on bare-metal machines. Additionally, Nimbix provides a web interface to your virtual desktops, which enables you to use Intel FPGA software from any computer.

You can learn about the available licensing models, how to create an account, how to transfer files to and from your account, and how to manage the lifecycle of your bare metal machines. The last sections of this user guide show examples of using Intel Quartus Prime Design Space Explorer II, and Intel FPGA SDK for OpenCL.

## 1.1. Creating a Nimbix Account

To access the Nimbix cloud you must create a Nimbix account. With your account, you can launch applications in containers on bare metal machines.

- Sign-up for the Nimbix cloud service at:

<https://www.nimbix.net/new-contact/>

### Related Information

[Accounts, Teams and Billing](#)  
In Nimbix Cloud Help

## 1.2. Licensing Intel FPGA Software for Cloud

Intel supports two licensing models for Cloud users:

[Pay-As-You-Go Licensing Model](#) on page 3

[Bring your Own License \(BYOL\) Licensing Model](#) on page 4

### 1.2.1. Pay-As-You-Go Licensing Model

The Pay-As-You-Go licensing model charges a flat rate per each minute the machine is running. The rate depends on the machine characteristics.

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(1) The Intel FPGA SDK for OpenCL is based on a published Khronos Specification, and has passed the Khronos Conformance Testing Process. Current conformance status can be found at [www.khronos.org/conformance](http://www.khronos.org/conformance).

(2) OpenCL and the OpenCL logo are trademarks of Apple Inc. used by permission of the Khronos Group™.



- To use the Pay-As-You-Go licensing model, select the appropriate image from the Nimbix Application Catalog.

**Note:** During the introductory period, Intel waives one year of licensing fees for FPGA software development tools.

**Note:** To use the DSP Builder for Intel FPGAs, you need the Mathworks\* MATLAB\* and Simulink\* environments available on your machine.

### Related Information

#### [System Requirements](#)

In *DSP Builder for Intel FPGAs Introduction Handbook*

## 1.2.2. Bring your Own License (BYOL) Licensing Model

Use the BYOL licensing model when you prefer to use your existing Intel Quartus Prime Pro Edition license.

The BYOL licensing model requires you to host the license on a server. You can use your own server, or let Nimbix host the license server for you.

### 1.2.2.1. Hosting your License Server on the Nimbix Cloud

To setup a license server for your account:

1. Contact Nimbix customer service.  
Nimbix can launch a server, and provide you with the MAC address.
2. Regenerate your Intel Quartus Prime license for the Nimbix license server from the Self Service Licensing Server.
  - You must log on your My Intel account.
  - For details on using the Self-Service Licensing Server, refer to *Using the Self-Service Licensing Center* in *Intel FPGA Software Installation and Licensing*.

### Related Information

- [Nimbix Service Portal](#)
- [Using the Self-Service Licensing Center](#)
- [Intel FPGA Self-Service Licensing Center](#)

## 1.3. Licensing IP Cores

If the IP cores in your design require licensing, use the BYOL licensing model. The BYOL licensing model requires that you host the license on a server. You can either use your own server, or let Nimbix host the license server for you.

To license IP cores:

1. Contact Nimbix customer service.  
Nimbix can launch a server and provide you with the MAC address.
2. With the MAC address, contact your IP vendor to regenerate license.



## Related Information

Nimble Service Portal

## 1.4. Managing Intel FPGA Software on the Nimble Cloud

A session of Intel FPGA software on the Nimble Cloud follows a distinct sequence:

1. [Signing In the Nimble Web Portal](#) on page 5
2. [Selecting Intel FPGA Software](#) on page 5
3. [Specifying Workflow](#) on page 6
4. [Specifying Job Parameters](#) on page 6
5. [Submitting your Job](#) on page 8
6. [\(Desktop Workflow Only\) Launching the Intel Quartus Prime Pro Edition Software](#) on page 8
7. [Terminating the Job](#) on page 10

### 1.4.1. Signing In the Nimble Web Portal

1. Visit the Nimble platform page at:  
<https://mc.jarvice.com/>
2. Sign into your account.  
A successful sign in takes you to the Dashboard page.

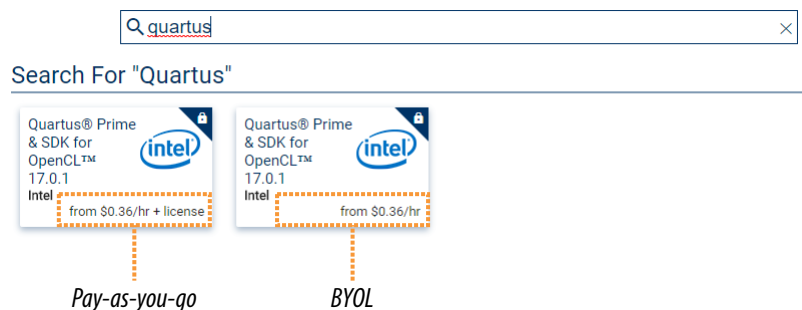
### 1.4.2. Selecting Intel FPGA Software

Select the Intel FPGA software installation to include in your session. The available options depend on the licensing model you use.

1. In your account's Dashboard page, click **Nimble** ► **Compute** to access the application catalog.

You can also filter the results by entering text in the search bar.

**Figure 1. Intel FPGA Software Available on the Nimble Cloud**



2. Select the type of image to launch. The options are:

#### Option

*If you use the Pay-As-You-Go licensing model*

#### Description

Select the image specifying computation price plus license price



<b>Option</b>	<b>Description</b>
<i>If you use the BYOL licensing model</i>	Select the image specifying only the computation hourly price

After you select the application, the workflow selection dialog box opens.

**Related Information**

Licensing Intel FPGA Software for Cloud on page 3

**1.4.3. Specifying Workflow**

The workflow specifies whether to run a command line program, or launch a GUI desktop.

**Figure 2. Available Workflows Containing Intel Quartus Prime Pro Edition and Intel FPGA SDK for OpenCL**



- Click the workflow you want to use. The options are:

<b>Option</b>	<b>Description</b>
<i>Batch Mode</i>	Launches a session that can only handle batch commands using /bin/bash. You can monitor the output using your account's Dashboard.
<i>Desktop Mode</i>	Launches a session that emulates a desktop computer, and allows you to work through an interactively. The Dashboard displays the connection address and credentials, once available.

After you select the workflow, the job configuration dialog box appears.

**1.4.4. Specifying Job Parameters**

After selecting your workflow, you specify hardware settings, launch time settings, and other optional parameters.



For information on uploading data to your account, refer to *Persistent Storage and Data Transference*.

### Related Information

[Persistent Storage and Data Transference](#) on page 11

#### 1.4.4.1. Specifying Hardware Settings

You can specify the memory size and number of cores for your session.

- In the **General** tab, select the **Machine Type**. The price per hour changes depending on your selection.

**Figure 3. Set Machine Type and Submit Job**



- To edit your design without compiling, any small instance is enough.
- To compile a design that uses a larger device family, select a server size that meets the physical memory requirements for the family. For example, an Intel Arria® 10 device can use a 8 core, 64GB RAM instance for Intel Quartus Prime Pro Edition software version 17.0.1. For information about other devices, refer to *Intel Quartus Prime Pro Edition Software and Device Support Release Notes*.

**Note:** In Intel Quartus Prime Pro Edition software, using a machine with a higher number of processors can reduce compilation time. To take advantage of this, specify the number of processors for compilation. Refer to *Enabling Multi-Processor Compilation* in *Intel Quartus Prime Pro Edition Handbook Volume 1*.

### Related Information

- [Memory Recommendations](#)  
In *Intel Quartus Prime Pro Edition Software and Device Support Release Notes*
- [Enabling Multi-Processor Compilation](#)  
In *Intel Quartus Prime Pro Edition Handbook Volume 1*



### 1.4.4.2. (Batch Workflow Only) Specifying Running Command

- If you select the **Batch** workflow, enter the command to run.

Figure 4. Specify Command in Batch Workflow

Batch  
Run a batch command using /bin/bash. The output may be monitored directly in your web browser.

GENERAL	OPTIONAL	STORAGE	PREVIEW SUBMISSION
---------	----------	---------	--------------------

Machine

Machine type

Cores  \$0.36/hr

Parameters

Command

### 1.4.5. Submitting your Job

After defining all the job parameters, you are ready to submit the job.

- Click **Submit**.  
Your account's Dashboard opens, and displays your job details and status.

### 1.4.6. (Desktop Workflow Only) Launching the Intel Quartus Prime Pro Edition Software

In the **Desktop** workflow, launch the Intel Quartus Prime Pro Edition software manually from your virtual desktop.

1. In your account's Dashboard, click the window to open the virtual desktop in a new browser tab.



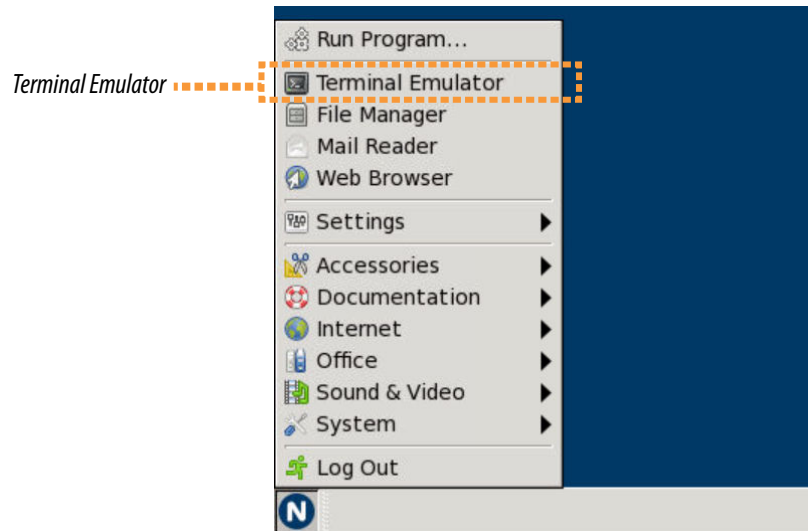


Figure 5. Link to Virtual Desktop



2. In your virtual desktop, open the terminal by clicking **Start** ► **Terminal Emulator**.

Figure 6. Open Terminal Emulator



This action launches a terminal.

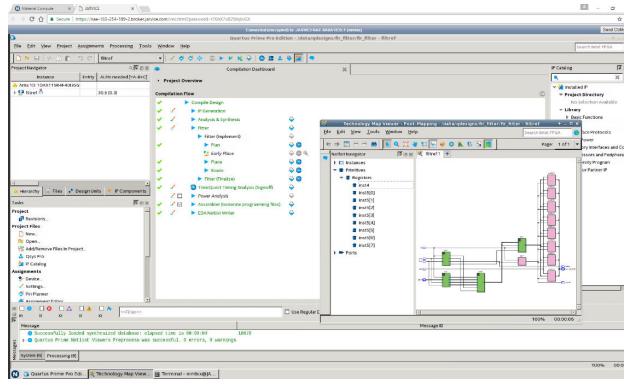
3. In the terminal, enter:

```
quartus&
```

The Intel Quartus Prime Pro Edition software opens.



Figure 7. Intel Quartus Prime Pro Edition in Virtual Desktop



If you are using the BYOL licensing model and do not have a license server, Intel Quartus Prime software prompts you to create one.

### Related Information

[Bring your Own License \(BYOL\) Licensing Model](#) on page 4

## 1.4.7. Terminating the Job

After finishing your Intel Quartus Prime session, you can terminate the job. This action stops the billing, helping you keep costs low.

**Caution:** Save the information you want to keep in the `/data` directory. Once your job terminates, all files outside `/data` are lost.

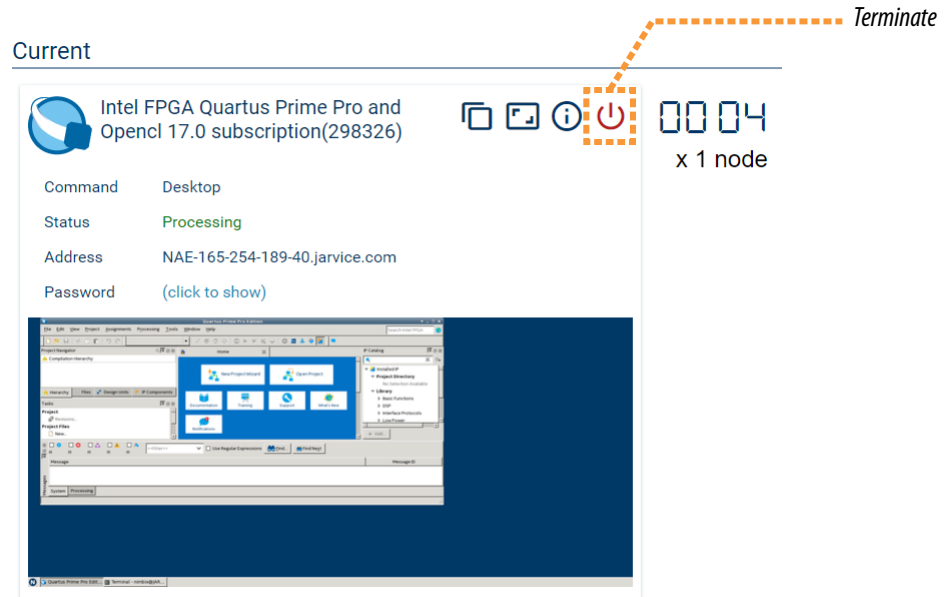


You can terminate your job in two ways:

### Terminating a Job from the Nimbix Dashboard

- Click the **Power** button from the jobs list.

**Figure 8. Terminating a Job from the Dashboard**



The job terminates, and the Cloud Service Provider stops charging.

### Terminating a Job from the Virtual Desktop

1. Click **Start** ► **Log Out**. A menu with three buttons appears.

**Figure 9. Terminating a Job from the Virtual Desktop**



2. Click **Shut down**.

*Note:* Clicking **Log Out** only suspends the machine; charges continue to accrue.

## 1.5. Persistent Storage and Data Transference

Nimbix provides each account with 1 TB of storage mounted on the `/data` directory. Files that you save in other directories are not persistent. All machines from the same account share the `/data` directory. Contact Nimbix to share the `/data` directory across multiple accounts.



You can access data from the /data directory in several ways:

Access Mode	Description
/data directory	Works for jobs launched from the same account
Nimble File Manager	Launches a new job, and incurs cost
SSH File Transfer Protocol (SFTP)	Use: <pre>stfp drop.jarvice.com</pre> Username is your user name on Nimble, password is the Account API key. Obtain this password from your account's Dashboard
Secure Copy Protocol (scp) on a running job	Use: <pre>scp &lt;local file&gt; nimble@&lt;hostname&gt;:/data/</pre> Obtain the hostname and password from your account's Dashboard. For more details, refer to <i>Obtaining Hostname and Password of a Nimble Job</i>

### Related Information

- [Specifying Hardware Settings](#) on page 7
- [Data Transfer](#)  
In Nimble Cloud Help
- [Obtaining the Hostname and Password of a Nimble Job](#) on page 20

## 1.6. Intel FPGA Software Installation Path

In your machine, the installation of Intel FPGA software is in:

```
/opt/intelFPGA_pro/<release>
```

## 1.7. Example: Running Intel Quartus Prime Design Space Explorer II

The Intel FPGA applications that you can use on the Nimble Cloud include the Intel Quartus Prime Design Space Explorer II tool. This tool increases performance by automatically iterating through combinations of Intel Quartus Prime software settings to find optimal design results.

Intel Quartus Prime Design Space Explorer II maximizes performance on machines with many cores.

### 1.7.1. Starting Intel Quartus Prime Design Space Explorer II

To start Intel Quartus Prime Design Space Explorer II, select a large instance with multiple CPU cores. The compilations run on the same machine and share the memory.

1. Select an instance type with enough memory for the desired parallelism.



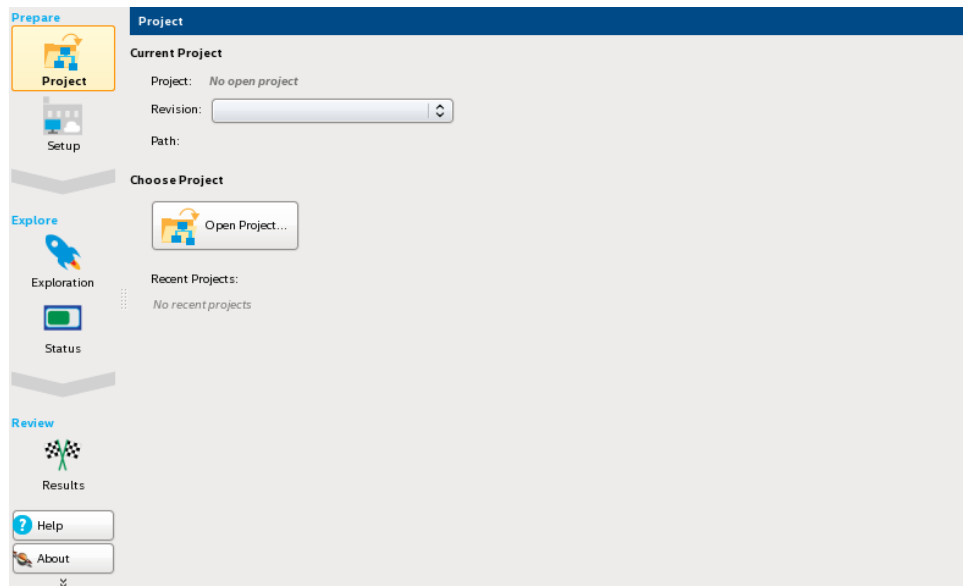
An Intel Arria 10 design requires about 50GB of RAM. To perform ten compilations in parallel, select the Nimbix n5 machine type. This machine has 512GB RAM and 16 CPU cores.

2. Launch job.
3. In the virtual desktop, open a terminal and enter:

```
quartus_dsew&
```

Intel Quartus Prime Design Space Explorer II starts.

**Figure 10. Intel Quartus Prime Design Space Explorer II**



### Related Information

[Specifying Hardware Settings](#) on page 7

## 1.7.2. Setting Up an Intel Quartus Prime Project

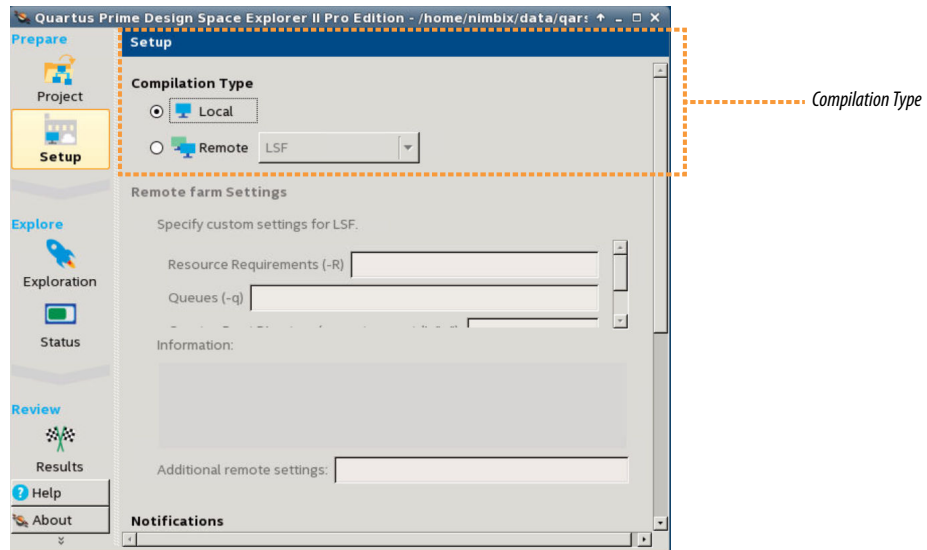
Prepare your project for compilation.

1. On the **Project** tab, click **Open Project**, and select an Intel Quartus Prime project.

If you don't have an example at hand, copy an example from the `$QUARTUS_ROOTDIR/qdesigns` directory in your local folder.

2. Click the **Setup** tab. In **Compilation Type**, select **Local**.

Figure 11. Setup Tab

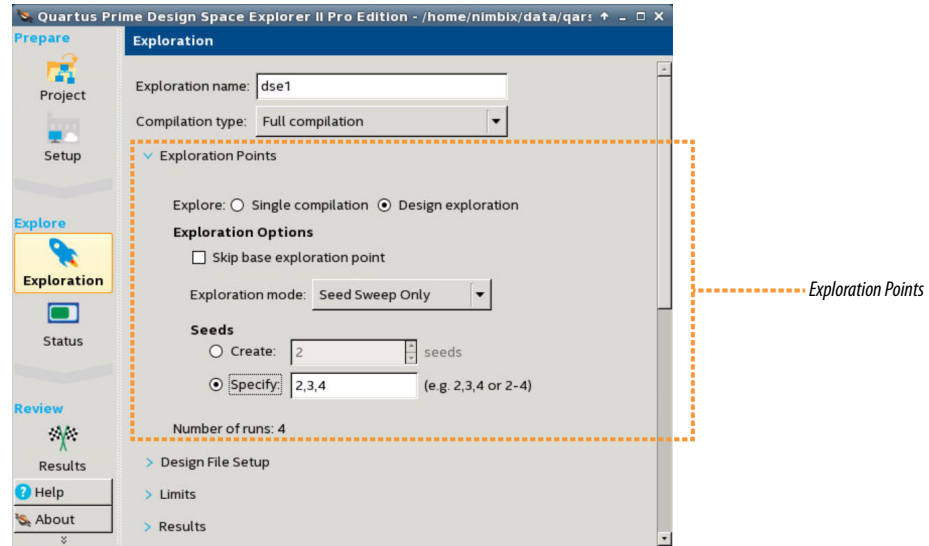


3. On the **Exploration** tab, click to display **Exploration Points**. Specify the following settings:

Option	Description
<b>Explore</b>	Select <b>Design Exploration</b>
<b>Skip base exploration point</b>	Enable to avoid performing a base compile with no seed or assignment changes
<b>Exploration Mode</b>	Select <b>Seed Sweep Only</b>
<b>Seeds</b>	Select <b>Specify</b> , and enter a range of seeds to test out



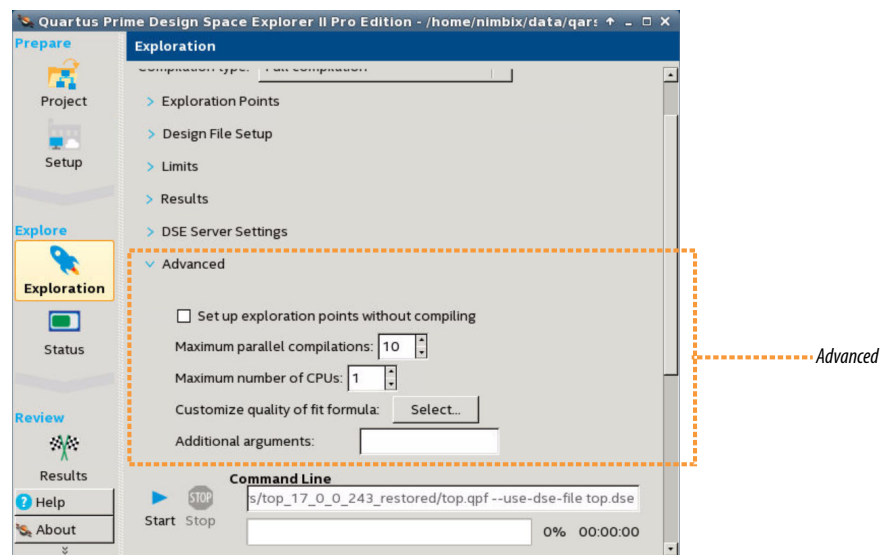
Figure 12. Exploration Points in Exploration Tab



4. To configure parallelism, click **Advanced**. Specify the following settings:

Option	Description
<b>Maximum parallel compilations</b>	In the example with Intel Arria 10 and n5 machine type, enter 10.
<b>Maximum number of CPUs</b>	Number of CPUs each compiler must use. Since the CPUs are shared among the 10 compilers, divide the number of CPU cores by the number of compilers. Since the n5 machine has 16 cores and 512 GB of physical RAM, for the Intel Arria 10 example you use one CPU per compiler.

Figure 13. Advanced Settings in Exploration Tab

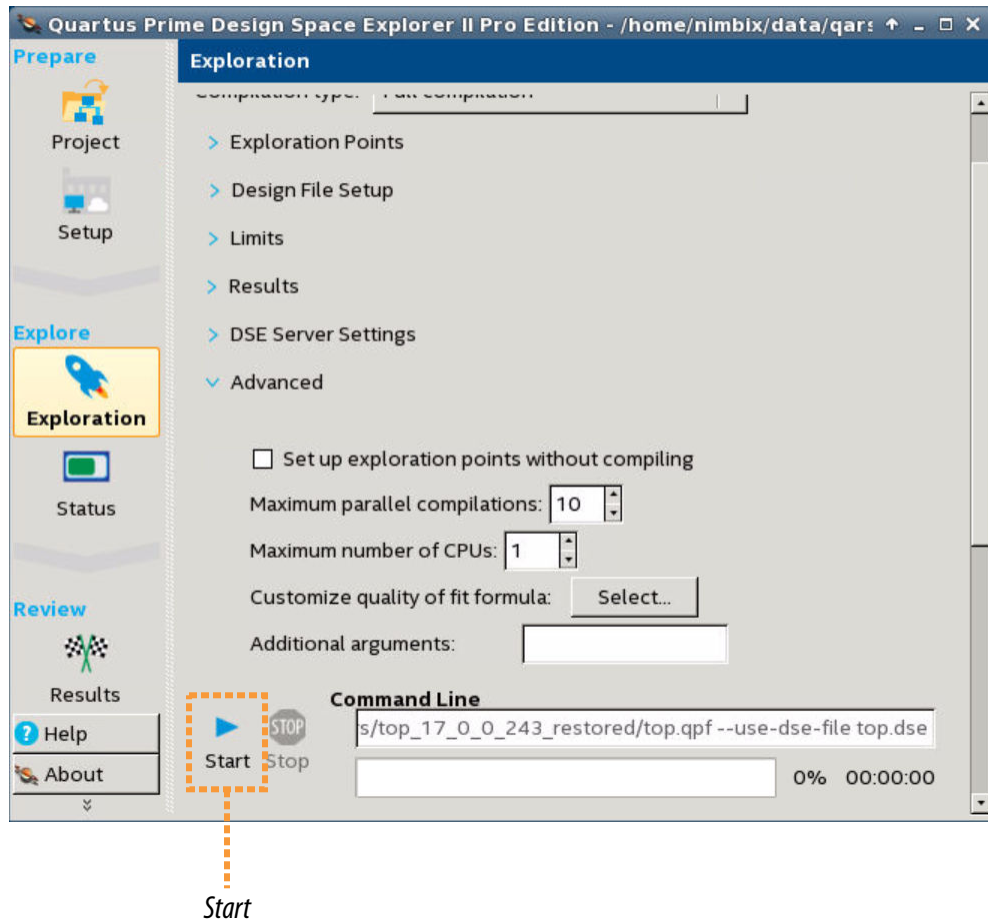


On warning about performing more than one compilation simultaneously, click **OK**.

Your project is ready for compilation.

5. To compile, click **Start**.

Figure 14. Start Compilation



### Related Information

[Persistent Storage and Data Transference](#) on page 11

## 1.8. Example: Running "Hello World" Using the Intel FPGA SDK for OpenCL

If you are new to the Intel FPGA SDK for OpenCL, use the "Hello World" example included in the Intel FPGA software installation as a starting point.

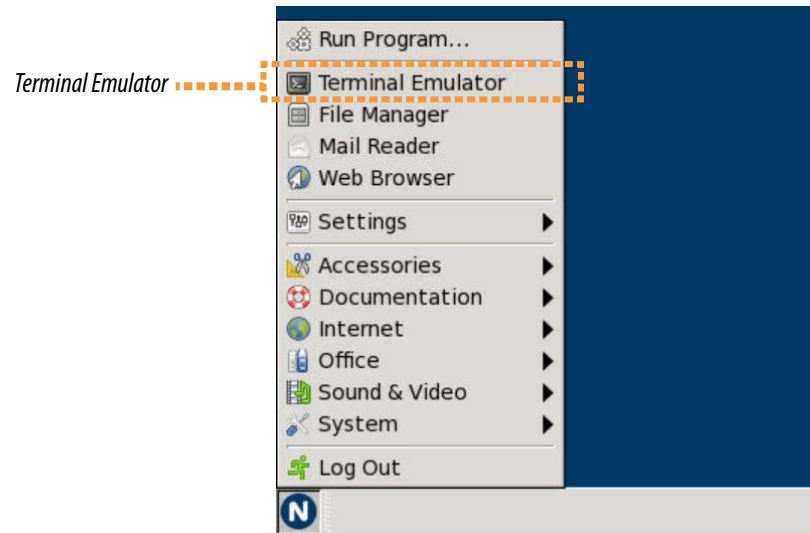
To set up the "Hello World" example:

1. In your virtual desktop, open the terminal by clicking **Start ► Terminal Emulator**.





Figure 15. Open Terminal Emulator



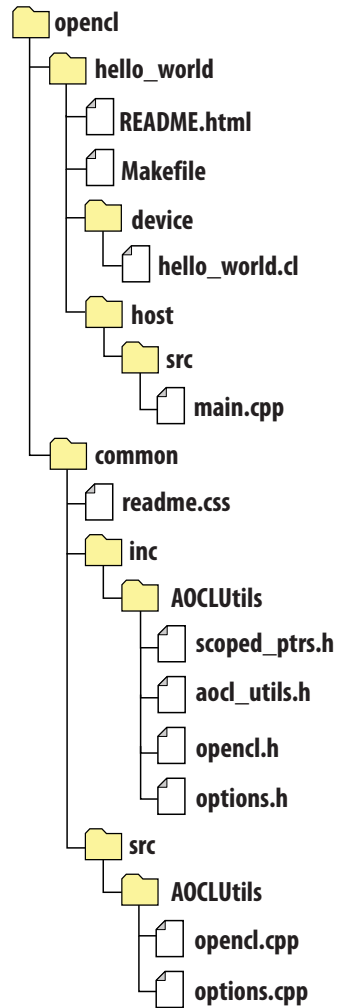
This action launches a terminal.

2. Copy the example folder from the Intel FPGA software installation to the /data directory. In the terminal, enter:

```
cp -r $INTELFPGA_ROOTDIR/examples/openc1 /data
```

The example files are now in the /data/openc1 folder.

Figure 16. Contents of openc1 Folder



3. With a web browser, open the `README.html` file. Follow the instructions to run the "Hello World" example.



Figure 17. Terminal After Executing the "Hello World" Example

```
Terminal - nimbix@JARVICENAE-0A0A1856:~/data/hello_world
File Edit View Terminal Go Help
CL_DEVICE_PREFERRED_VECTOR_WIDTH_SHORT = 2
CL_DEVICE_PREFERRED_VECTOR_WIDTH_INT = 1
CL_DEVICE_PREFERRED_VECTOR_WIDTH_LONG = 1
CL_DEVICE_PREFERRED_VECTOR_WIDTH_FLOAT = 1
CL_DEVICE_PREFERRED_VECTOR_WIDTH_DOUBLE = 0
Command queue out of order? = false
Command queue profiling enabled? = true
Using AOCX: hello_world.aocx

Kernel initialization is complete.
Launching the kernel...

Thread #2: Hello from Altera's OpenCL Compiler!

Kernel execution is complete.
[nimbix@JARVICENAE-0A0A1856 hello_world]$
```

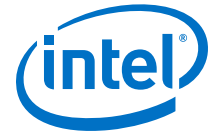
To find more examples of using Intel FPGA SDK for OpenCL, go to the Developer Zone in the Altera website.

**Related Information**

- [Developer Zone](#)
- [Getting Started with the Intel FPGA SDK for OpenCL for Linux](#)  
In *Intel FPGA SDK for OpenCL Getting Started Guide*

### 1.9. Document Revision History for Quick Start Guide for Intel FPGA Development Tools on the Nimbix Cloud

Date	Version	Changes
2017.10.13	17.0.1	Initial release of the document.



## A. Appendix: About Setting Up Secure Shell (SSH) Connections to your Nimble Machine

In addition to the web browser, you can connect to the virtual desktop of an existing Nimble job using the SSH protocol and VNC Viewer. One of the advantages of using VNC is that you can do copy and paste.

This section demonstrates how to obtain your Nimble job's hostname and password, and how to upload a public key file to your Nimble account.

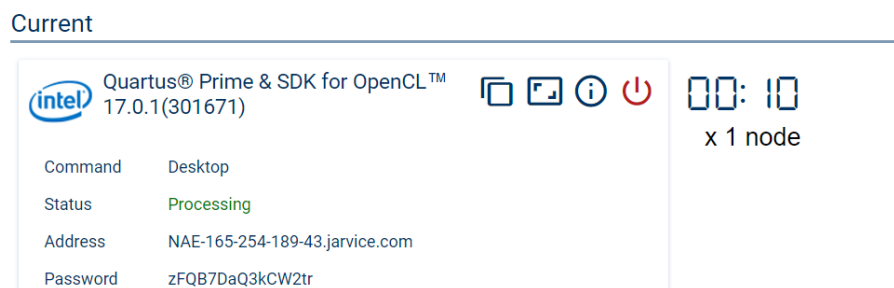
### A.1. Obtaining the Hostname and Password of a Nimble Job

Use the following information to connect using SSH:

*Note:* The hostname and password are different for every job.

- In the Nimble Web Portal, the Dashboard displays information about all jobs. Running jobs appear with a **Processing** status.
- The hostname is the **Address** field
- The password appears after you click (**click to show**).

**Figure 18. Dashboard Display of a Job in Processing Status**



With this information, you can start defining the authentication and security features of your connection.

### A.2. Installing SSH Public Key in a Nimble Account

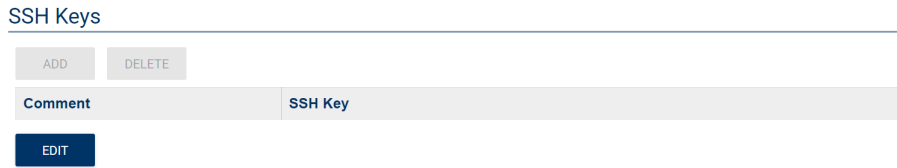
If you are authenticating your connection with a key pair file, you must upload the public key file to your Nimble account.

1. Go to Nimble Web Portal.
2. In the upper right corner, click Nimble, and then click **Account**.

The **Account** page displays the SSH keys uploaded into your account.

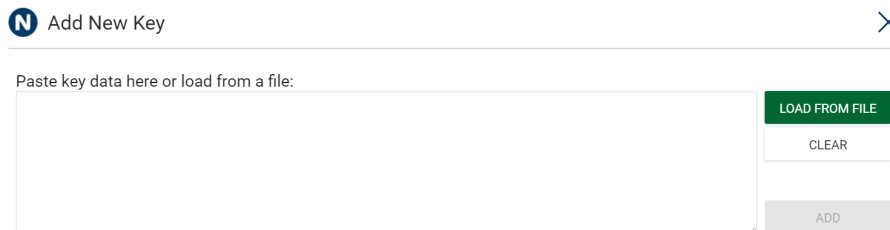


**Figure 19. List of Uploaded SSH Keys in a Nimbix Account (Empty)**



- Under **SSH Keys**, click **Edit**, and then click **Add**.

**Figure 20. Add New SSH Public Key**



- In the **Paste New Public Key or Add From File** dialog box, click **Load From File**.
- Upload your public key file with `.pub` extension. Click **Add**. This action redirects you to the **Account** page.
- Click **Save**.

The SSH key appears in the **SSH Keys** list.

**Figure 21. List of Uploaded SSH Keys in a Nimbix Account (Not Empty)**

