

Installing and configuring Quantum Apprentice

Version 2.5 (September 2017)

This document describes how to install Quantum Apprentice, which is a Visual Basic Application intended to run in Microsoft Excel and in recent developer versions of LibreOffice Calc. Microsoft Excel is available on both Windows and Mac OS but not Linux. LibreOffice is available on Windows, Mac OS and Linux. If you install qOp on Windows or Mac OS and intend to run Quantum Apprentice, you must have either Excel or LibreOffice. If you install qOp on Linux and intend to run Quantum Apprentice, you must have LibreOffice. If you intend to run Quantum Apprentice using LibreOffice, please make sure to see the last section of this document which describes the releases of LibreOffice with the necessary support.

Before setting up Quantum Apprentice, you should complete the configuration of your qOp environment as described in the qOp Install Guide. Quantum Apprentice is designed to work with components of qOp. The workspaces created by dw contain qmi and sol files which can be viewed (and manipulated, in the case of qmi files) by Quantum Apprentice. Without completing the qOp installation, Quantum Apprentice will not be able to render the 128-qubit simulator in the Chimera tab on start-up.

This document uses the following typeface conventions:

- Commands for you to enter are shown in a fixed-width font, such as: `ps -ef`
- File and directory names are shown in a bold fixed-width font, such as: **foo.bar**
- The shell prompt is indicated via `$` and so the `cp` command would appear as: `$ cp`

Finding Quantum Apprentice in the qOp 2.5 installation

The qOp installation files for Windows, Mac OS and Linux are:

qOp.win32_2.5.tar.gz

qOp.osx_2.5.tar.gz

qOp.linux_2.5.tar.gz

Refer to the qOp Install Guide for the appropriate operating system to see how to install the qOp 2.5 package. Quantum Apprentice should be at the top-level of the installed qOp directory and it should have this name:

Quantum Apprentice.xlsm

Note that the file name contains a space, which can cause problems if you choose to move or copy the file using a command issued from a shell prompt. To work around this issue, enclose the file name in quotes (either single or double) as follows:

```
$ cp "Quantum Apprentice.xlsm" $HOME
```

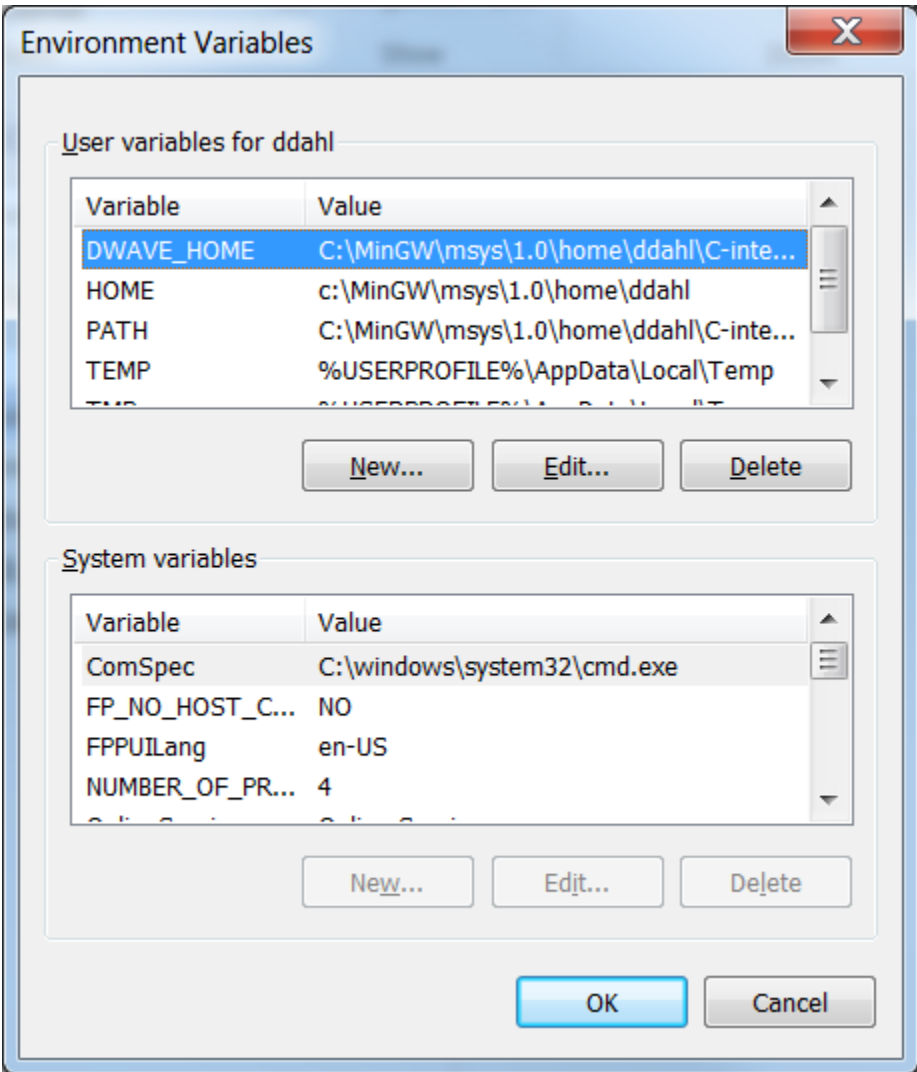
The suffix at the end of the file name refers to an Excel spreadsheet that contains macros. The first three tabs of the spreadsheet do not rely on macros, but the last four tabs make extensive use of Visual Basic for Applications and macros to provide support for the interface to the 128-qubit simulator and also

QPU's (if available). See the manual page for Quantum Apprentice (QUAPP.pdf) for details on the individual tabs. Recommended practice is to copy Quantum Apprentice to a different location (outside the qOp release) and open it from there. The original copy of Quantum Apprentice serves as a "backup" in case the copy becomes corrupted.

Configuring your environment variables so that Quantum Apprentices runs correctly is a different process under Windows, Mac OS and Linux. Refer to the appropriate section below for steps you'll need to take on your platform:

Configuring the Windows environment

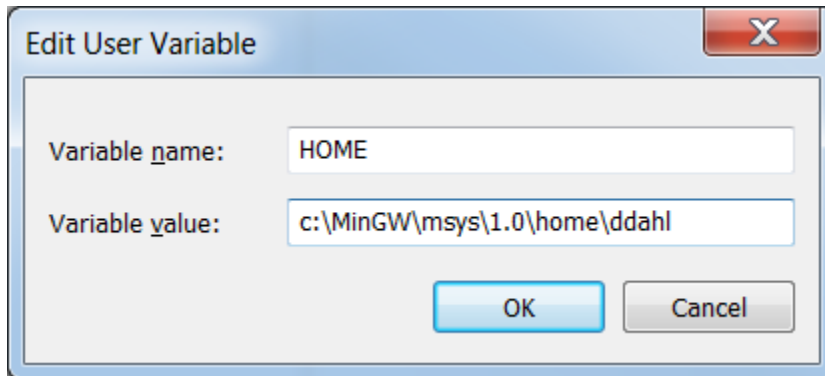
During the Windows installation of qOp, you will have modified your shell start-up files to provide values for environment variables used by qOp components. These configuration steps only effect programs run from the shell prompt. Since Quantum Apprentice is usually started from a visual interface (e.g., Windows Explorer), the configuration steps from the shell do not apply to the environment of Quantum Apprentice. To configure the environment for Quantum Apprentice, you must use the Windows Control Panel to initialize variables. Start the Windows Control Panel and search for "environment variables" in the search box. Launch the Environment Variables control panel:



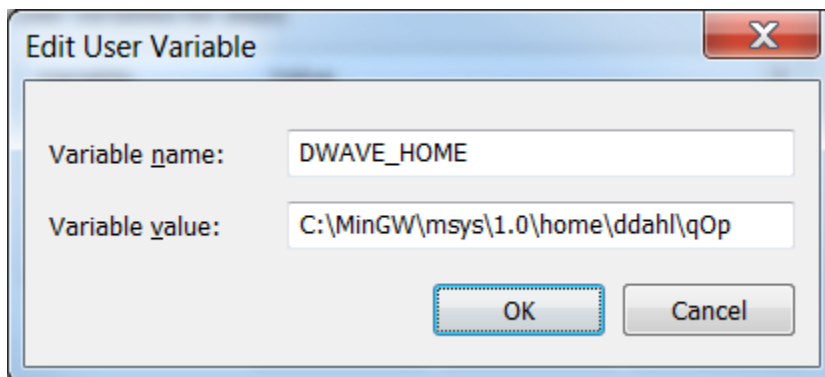
Add or modify your setting for the HOME environment variable. The value of this variable is the Windows location for the home directory of your MinGW installation. Your shell prompt may give a location for your HOME environment variable that looks like this:

```
$ echo $HOME  
  
/usr/home/ddahl
```

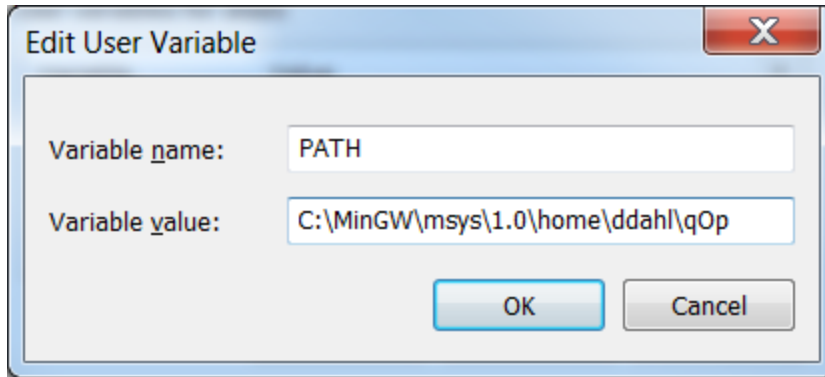
The value in the Windows Control Panel for the HOME environment variable should include the explicit location of this directory as known to the Windows file system:



Add or modify your setting for the DWAVE_HOME environment variable. The value of this variable should be the top-level directory of the qOp 2.5 installation. For example:



Add or modify your setting for the PATH environment variable. The value of this variable should be the same as DWAVE_HOME, which is the top-level directory of the qOp 2.5 installation. If you already have defined a value for your PATH variable and it contains other directories, add the new value to the end of the list of directories on PATH and separate it from the earlier entries in the list with a colon (":") character. For example:



Save your changes to the Windows environment by hitting OK. Now you should be able to start Quantum Apprentice by double-clicking on it in Windows Explorer.

Setting these Windows environment variables should enable Quantum Apprentice to run initialize and run correctly under both Microsoft Excel and LibreOffice Calc.

Configuring the Mac OS environment

The Mac OS environment is similar to the Windows environment in that GUI applications such as Microsoft Excel or LibreOffice obtain their environment independently from the shell. To configure environment variables used by GUI applications, Mac OS provides a command called `launchctl`. Issue these three `launchctl` commands at your shell prompt on Mac OS:

```
$ launchctl setenv HOME $HOME
$ launchctl setenv DWAVE_HOME $DWAVE_HOME
$ launchctl setenv DYLD_LIBRARY_PATH $DYLD_LIBRARY_PATH
```

Make sure to complete your qOp installation and configuration before issuing these commands. You should only have to issue these `launchctl` commands one time. After issuing them, these three variables should be in the environment of any GUI application started from the Mac OS finder. This should suffice for Quantum Apprentice to initialize correctly – under both Microsoft Excel and LibreOffice Calc.

Configuring the Linux environment

The Linux environment requires LibreOffice to run Quantum Apprentice. LibreOffice is integrated into the shell environment, so the settings that you provide to qOp via your shell start-up files should also provide the correct configuration information to Quantum Apprentice. Start LibreOffice from the shell prompt and then open Quantum Apprentice using `File > Open`. Quantum Apprentice should be correctly initialized.

LibreOffice development versions

LibreOffice has only very recently added support for the object model used by Quantum Apprentice. In order to run Quantum Apprentice under LibreOffice, you will have to obtain a developer's version of LibreOffice. Here is the download area for daily builds of LibreOffice:

<http://dev-builds.libreoffice.org/daily/master>

Builds dated September 2017 or later should contain adequate support for running Quantum Apprentice. At some point in the future, LibreOffice will include all necessary support in the officially released versions. This is likely to happen with the next major release of LibreOffice, which should have label 6.0.