How to build PyQt5 for Autodesk Maya 2019 64bit

Written by Cyrille Fauvel – Autodesk Developer Network (April 2013)   
Updated by Lanh Hong and Chengxi Li - Autodesk Developer Network (January 2019)   
  
  
Building SIP and PyQt for Maya 2019 is a python binding to the Qt library. Because Maya uses Qt internally, you can use the PyQt modules in Maya python scripts to create custom UI. PyQt does not have the same licensing as Maya, Qt, or Python. Please consult the PyQt website for information about licensing for PyQt [<http://www.riverbankcomputing.com/>].

The following are instructions for building a copy of the PyQt modules that have been known to work with Maya.  
  
Maya 2019 uses Qt5.6.1 which is binary compatible with the latest version of PyQt – 5.11.3 / SIP - 4.19.13  
  
Use the Maya modified version of the Qt source code. A copy of the customized Qt 5.6.1 source is available from Autodesk's Open Source web-site [<http://www.autodesk.com/lgplsource>] and includes text files describing how to configure, build and install Qt for each platform supported by Maya.  
  
**Note**: With Maya 2019, there is no need to build PySide since it is coming by default in Maya, nor have to rebuild Qt since the main Qt tools to build PyQt are now included in the Maya distributions (i.e. qmake, moc, …). Also coming by default in the Maya include and lib folders are libxml, openSSL, OpenAL, python2.7, qt-5.6.1, and tbb so you do not need to rebuild any of those libraries like before unless you have a very specific need.

**Important**: Maya 2019 ships without the devkit, include and mkspecs folders. You can get the Maya 2019 devkit from the Maya Develop Center [<https://www.autodesk.com/developmaya>] for Windows, OSX, and Linux. Download the devkit and unzip the files into your Maya root folder. Make sure to read the instructions in the Maya Documentation to install the devkit, include and mkspecs folders properly on your system (Maya Developer Help > Setting up your build environment).

The scripts used in this document are posted on [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).  
  
Download SIP and PyQt source. I downloaded **'sip-4.19.13'** and **'PyQt5\_gpl-5.11.3'**. Unzip them into one folder.

PyQt5: <https://www.riverbankcomputing.com/software/pyqt/download5>  
SIP: <http://www.riverbankcomputing.com/software/sip/download>

Mac

Download SIP and PyQt and unzip them into one local folder.

*‘/Users/cyrille/Documents/\_Maya2019/Scripts/*’ being my local folder.   
*/Users/cyrille/Documents/\_Maya2019/Scripts/sip-4.19.13  
/Users/cyrille/Documents/\_Maya2019/Scripts/PyQt5\_gpl-5.11.3*  
  
Here are the instructions and scripts for building SIP and PyQt.   
  
Follow the instructions from the Maya Documentation to setup your environment (Maya Developer Help > Setting up your build environment > Mac OS X environment)   
  
If you would like to use Xcode 7.3.1 to compile it and you are having multiple installation of Xcode. Please backup /Applications/Xcode.app and use Xcode 7.3.1 to replace it.   
  
Use xcode-select to change active xcode like below:

sudo xcode-select -switch /Applications/Xcode.app/Contents/Developer

The **qt.con**f file uses **MAYA\_LOCATION** and **DEVKIT\_LOCATION** to locate the expected header/library files. Therefore, users must set both environment variables before building the PyQt5.  
  
**DEVKIT\_LOCATION** should point to the directory where the devkit include, mkspecs, cmake directories are located.  
  
Modify **devkit/bin/qt.conf** as below:

**qt.conf**

[Paths]  
Prefix=  
Libraries=$(MAYA\_LOCATION)/MacOS  
Binaries=$(DEVKIT\_LOCATION)/devkit/bin  
Headers=$(DEVKIT\_LOCATION)/include/Qt  
ArchData=$(DEVKIT\_LOCATION)  
Data=$(DEVKIT\_LOCATION)  
HostData=$(DEVKIT\_LOCATION)  
HostBinaries=$(DEVKIT\_LOCATION)/devkit/bin  
HostLibraries=$(MAYA\_LOCATION)/MacOS

Untar the **include/qt-5.6.1-include.tar.gz** into **/include/Qt**  
  
Untar the **qt-5.6.1-mkspecs.tar.gz** into **/Applications/Autodesk/maya2019/mkspecs**. Make sure the **qconfig.pri** looks like this:  
  
**qconfig.pri**

#configuration  
 CONFIG += release def\_files\_disabled exceptions no\_mocdepend stl x86\_64 qt #qt\_framework   
QT\_ARCH = macosx   
QT\_EDITION = OpenSource   
QT\_CONFIG += minimal-config small-config medium-config large-config full-config no-pkg-config dwarf2 phonon phonon-backend accessibility opengl reduce\_exports ipv6 getaddrinfo ipv6ifname getifaddrs png no-freetype system-zlib nis cups iconv openssl corewlan concurrent xmlpatterns multimedia audio-backend svg script scripttools declarative release x86\_64 qt #qt\_framework  
#versioning   
QT\_VERSION = 5.6.1   
QT\_MAJOR\_VERSION = 5   
QT\_MINOR\_VERSION = 6   
QT\_PATCH\_VERSION = 1  
  
#namespaces   
QT\_LIBINFIX =  
QT\_NAMESPACE =   
QT\_NAMESPACE\_MAC\_CRC =

Build Prerequisite for PyQt

You’ll need to build setuptools and enum34 before installing SIP. Please find the source on the PyPI.

After extracting the source code, please use commands like ***sudo /Applications/Autodesk/maya2019/maya.app/Contents/bin/mayapy setup.py install*** to install them.

Build & Install SIP

Save the script below into the same folder as the SIP and PyQt folders. Use the script to build and install SIP. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**sip.sh**

#!/usr/bin/env bash  
   
MAYAQTBUILD="`dirname \"$0\"`" # Relative  
export MAYAQTBUILD="`( cd \"$MAYAQTBUILD\" && pwd )`" # Absolutized and normalized  
pushd $MAYAQTBUILD  
   
export SIPDIR=$MAYAQTBUILD/sip-4.19.13  
export MAYA\_LOCATION=/Applications/Autodesk/maya2019  
   
pushd $SIPDIR  
$MAYA\_LOCATION/Maya.app/Contents/bin/mayapy ./configure.py --arch=x86\_64 --sip-module PyQt5.sip  
make  
sudo make install  
popd  
  
popd

Build & Install PyQt

Save the script below into the same folder as the SIP and PyQt folders. Use the script to build and install PyQt. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**pyqt.sh**

#!/usr/bin/env bash  
   
MAYAQTBUILD="`dirname \"$0\"`" # Relative  
export MAYAQTBUILD="`( cd \"$MAYAQTBUILD\" && pwd )`" # Absolutized and normalized  
pushd $MAYAQTBUILD  
   
export MAYA\_LOCATION=/Applications/Autodesk/maya2019/Maya.app/Contents  
export DEVKIT\_LOCATION=/Applications/Autodesk/maya2019  
export QTDIR=$DEVKIT\_LOCATION/devkit  
export QMAKESPEC=$DEVKIT\_LOCATION/mkspecs/macx-clang  
export INCDIR\_QT=$DEVKIT\_LOCATION/include/Qt  
export LIBDIR\_QT=$MAYA\_LOCATION/MacOS  
  
error=0  
if [ ! -f $QMAKESPEC/qmake.conf ];  
then  
  echo "You need to install qt-5.6.1-mkspecs.tar.gz in $QTDIR/mkspecs !"  
  error=1  
fi  
if [ ! -f $INCDIR\_QT/QtCore/qdir.h ];  
then  
  echo "You need to uncompress $MAYA\_LOCATION/devkit/include/qt-5.6.1-include.tar.gz in $INCDIR\_QT !"  
  error=1  
fi  
# qt.conf - /Applications/Autodesk/maya2019/Maya.app/Contents/Resources  
if [ ! -f $QTDIR/bin/qt.conf ];  
then  
  echo "You need to copy $QTDIR/Resources/qt.conf in $QTDIR/bin !"  
  error=1  
fi  
   
test=`grep 'Data=$(DEVKIT\_LOCATION)' $QTDIR/bin/qt.conf`  
if [ -z "$test" ];  
then  
  echo "You need to edit $QTDIR/bin/qt.conf to use 'Data=\$(DEVKIT\_LOCATION)'"  
  error=1  
fi  
test=`grep 'Headers=$(DEVKIT\_LOCATION)/include/Qt' $QTDIR/bin/qt.conf`  
if [ -z "$test" ];  
then  
  echo "You need to edit $QTDIR/bin/qt.conf to use 'Headers=\$(DEVKIT\_LOCATION)/include/Qt'"  
  error=1  
fi  
test=`grep 'Libraries=$(MAYA\_LOCATION)/MacOS' $QTDIR/bin/qt.conf`  
if [ -z "$test" ];  
then  
  echo "You need to edit $QTDIR/bin/qt.conf to use 'Libraries=\$(MAYA\_LOCATION)/MacOS'"  
  error=1  
fi  
  
if [ $error -eq 1 ];  
then  
    exit  
fi  
   
export DYLD\_LIBRARY\_PATH=$MAYA\_LOCATION/MacOS  
export DYLD\_FRAMEWORK\_PATH=$MAYA\_LOCATION/Frameworks  
   
export SIPDIR=$MAYAQTBUILD/sip-4.19.13  
export PYQTDIR=$MAYAQTBUILD/PyQt5\_gpl-5.11.3  
   
export SIP\_EXE=$MAYA\_LOCATION/Frameworks/Python.framework/Versions/2.7/bin/sip  
export SIP\_INCLUDE=$MAYA\_LOCATION/Frameworks/Python.framework/Versions/2.7/include/python2.7  
  
pushd $PYQTDIR  
export PATH=$QTDIR/bin:$PATH  
  
echo   
echo Environment  
echo -----------  
set  
echo -----------  
echo QT Settings  
echo -----------  
qmake -query  
echo -----------  
echo  
$MAYA\_LOCATION/bin/mayapy ./configure.py QMAKE\_MAC\_SDK=macosx10.11 QMAKE\_RPATHDIR+=$LIBDIR\_QT --sip=$SIP\_EXE --sip-incdir=$SIP\_INCLUDE -w --no-designer-plugin   
make -j 8  
sudo make install  
popd  
  
popd

Note that I am compiling against Mac OS X SDK 10.11 which is same as the developer environment. If you want to compile against other versions, please modify the script (macosx10.11).  
  
You're done! Please check the testing paragraph at the end of the article.

Linux

Download SIP and PyQt and unzip them into one local folder.

*‘/home/li/Documents/*Maya2019/Scripts’ being my local folder.   
*/home/li/Documents/Maya2019/Scripts/sip-4.19.13   
/home/li/Documents/Maya2019/Scripts/PyQt5\_gpl-5.11.3*  
  
  
Here are the instructions and scripts for building SIP and PyQt.  
  
Follow the instructions from the Maya Documentation to setup your environment (Maya Developer Help > Setting up your build environment > Linux environment).  
  
The **qt.conf** file uses **MAYA\_LOCATION** and **DEVKIT\_LOCATION** to locate the expected header/library files. Therefore, users must set both environment variables before building the PyQt5.  
  
**DEVKIT\_LOCATION** should point to the directory where the devkit include, mkspecs, cmake directories are located.  
  
Please backup your **qt.conf** first, you'll need to restore it after building PyQt5. Replace **…/bin/qt.conf** with below:

**qt.conf**

[Paths]   
Prefix=   
Libraries=$(MAYA\_LOCATION)/lib   
Binaries=$(DEVKIT\_LOCATION)/bin  
Headers=$(DEVKIT\_LOCATION)/include/Qt   
ArchData=$(DEVKIT\_LOCATION)   
Data=$(DEVKIT\_LOCATION)   
HostData=$(DEVKIT\_LOCATION)   
HostBinaries=$(DEVKIT\_LOCATION)/bin

Untar the **/include/qt-5.6.1-include.tar.gz** into **/include/Qt**  
  
Untar the **/mkspecs/qt-5.6.1-mkspecs.tar.gz** into **/mkspecs**  
  
Make qmake, moc executables from the Maya bin directory 

sudo chmod aog+x /usr/autodesk/maya2019/bin/moc   
sudo chmod aog+x /usr/autodesk/maya2019/bin/qmake

Build Prerequisite for PyQt

You’ll need to build setuptools and enum34 before installing SIP. Please find the source on the PyPI.

After extracting the source code, please use commands like ***sudo /usr/autodesk/maya2019/bin/mayapy setup.py install*** to install them.

Build & Install SIP

Save the script below into the same folder as the SIP and PyQt folders. Use the script to build and install SIP. PyQt requires to build private sip module since 5.11. You’ll need to add “–sip-module PyQt5.sip” to the configuration. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**sip.sh**

#!/usr/bin/env bash  
   
MAYAQTBUILD="`dirname \"$0\"`" # Relative  
export MAYAQTBUILD="`( cd \"$MAYAQTBUILD\" && pwd )`" # Absolutized and normalized  
pushd $MAYAQTBUILD  
   
export SIPDIR=$MAYAQTBUILD/sip-4.19.13  
export MAYA\_LOCATION=/usr/autodesk/maya2019  
   
pushd $SIPDIR  
$MAYA\_LOCATION/bin/mayapy ./configure.py --sip-module PyQt5.sip  
make  
sudo make install  
popd  
  
popd

Build & Install PyQt

Save the script below into the same folder as the SIP and PyQt folders. Use the script to build and install PyQt. You’ll need to install OpenGL headers before compiling the PyQt. You could install it by installing mesa-libGL-devel or simply install glew and glew-devel to make sure nothing is missing. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**pyqt.sh**

#!/usr/bin/env bash  
   
MAYAQTBUILD="`dirname \"$0\"`" # Relative  
export MAYAQTBUILD="`( cd \"$MAYAQTBUILD\" && pwd )`" # Absolutized and normalized  
pushd $MAYAQTBUILD  
   
export MAYA\_LOCATION=/usr/autodesk/maya2019  
export QTDIR=$MAYA\_LOCATION  
export DEVKIT\_LOCATION=$MAYA\_LOCATION  
export QMAKESPEC=$QTDIR/mkspecs/linux-g++-64  
export INCDIR\_QT=$MAYA\_LOCATION/include/Qt  
export LIBDIR\_QT=$QTDIR/lib  
  
error=0  
if [ ! -f $QMAKESPEC/qmake.conf ];  
then  
  echo "You need to install qt-5.6.1-mkspecs.tar.gz in $QTDIR/mkspecs !"  
  error=1  
fi  
if [ ! -f $INCDIR\_QT/QtCore/qdir.h ];  
then  
  echo "You need to uncompress $MAYA\_LOCATION/include/qt-5.6.1-include.tar.gz in $INCDIR\_QT !"  
  error=1  
fi  
# qt.conf - $QTDIR/bin/qt.conf  
if [ ! -f $QTDIR/bin/qt.conf ];  
then  
  echo "You need to copy $QTDIR/Resources/qt.conf in $QTDIR/bin !"  
  error=1  
fi  
  
# The grep string should be in single quote('), if it is in double quote (""),   
# shell will expand the variable, hence the intension of the below grep will fail   
test=`grep 'Headers=$(DEVKIT\_LOCATION)/include/Qt' $QTDIR/bin/qt.conf`  
if [ -z "$test" ];  
then  
  echo "You need to edit $QTDIR/bin/qt.conf to use 'Headers=$(DEVKIT\_LOCATION)/include/Qt'"  
  error=1  
fi  
  
if [ $error -eq 1 ];  
then  
    exit  
fi  
   
export SIPDIR=$MAYAQTBUILD/sip-4.19.13  
export PYQTDIR=$MAYAQTBUILD/PyQt5\_gpl-5.11.3  
   
pushd $PYQTDIR  
export PATH=$QTDIR/bin:$PATH  
$QTDIR/bin/mayapy ./configure.py LIBDIR\_QT=$LIBDIR\_QT INCDIR\_QT=$INCDIR\_QT MOC=$QTDIR/bin/moc -w --no-designer-plugin   
#change 8 to the count of cores your computer

make -j 8  
sudo make install  
popd  
  
popd

You're done! Please check the testing paragraph at the end of the article.

Windows

Download SIP and PyQt and unzip them into one local folder.

*‘D:\\_\_sdkext\\_Maya2019\Scripts’* being my local folder.

*D:\\_\_sdkext\\_Maya2019\Scripts\sip-4.19.13  
D:\\_\_sdkext\\_Maya2019\Scripts\PyQt5\_gpl-5.11.3*  
  
  
Here are the instructions and scripts for building SIP and PyQt.  
  
Follow the instructions from the Maya Documentation to setup your environment (Maya Developer Help > Setting up your build environment > Windows environment (64-bit))  
  
Please backup your **qt.conf** first, you'll need to restore it after building PyQt5.

Replace **…/bin/qt.conf** with below:

**qt.conf**

[Paths]  
Prefix=$(MAYA\_LOCATION)  
Libraries=lib   
Binaries=bin   
Headers=include/Qt  
Data=.  
Plugins=qt-plugins   
Translations=qt-translations   
Qml2Imports=qml

Unzip the **/include/qt-5.6.1-include.tar.gz** into **/include/Qt**   
  
Unzip the **/mkspecs/qt-5.6.1-mkspecs.tar.gz** into **/mkspecs**

Modify the mkspecs\common\msvc-destop.conf. Find QMAKE\_LIBS\_QT\_ENTRY and make sure is ***-lqtmain -lshell32.***

Rename the folder inside /include/Qt/qtnfc to qtnfc.disabled.

Please run following build scripts with VS2015 x64 Native Tools Command Prompt. If your Maya is installed in folders that requires administrator privilege (e.g. Program files), please run the command prompt as Administrator.

Environment Setup

Save the script below into the same folder as the SIP and PyQt folders. Use the script to setup the environment. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**setup.bat**

@echo off  
  
set MAYAVERSION=2019  
set ADSKQTVERSION=5.6.1  
set SIPVERSION=4.19.13  
set PYQTVERSION=5.11.3  
set MAYADRIVE=m:  
set BUILDDRIVE=v:  
  
if exist %MAYADRIVE%\nul subst %MAYADRIVE% /d  
subst %MAYADRIVE% "C:\Program Files\Autodesk\Maya%MAYAVERSION%"  
set MAYA\_LOCATION=%MAYADRIVE%  
  
set MAYAPYQTBUILD=%~dp0  
rem Removing trailing \  
set MAYAPYQTBUILD=%MAYAPYQTBUILD:~0,-1%  
  
if exist %BUILDDRIVE%\nul subst %BUILDDRIVE% /d  
subst %BUILDDRIVE% "%MAYAPYQTBUILD%"  
  
set SIPDIR=%BUILDDRIVE%\sip-%SIPVERSION%  
set PYQTDIR=%BUILDDRIVE%\PyQt5\_gpl-%PYQTVERSION%  
rem set ADSKQTDIR=%BUILDDRIVE%\qt-%ADSKQTVERSION%  
set QTDIR=%MAYA\_LOCATION%  
  
set PATH=%QTDIR%\bin;%PATH%  
set MSVC\_VERSION=2015  
set MSVC\_DIR=C:\Program Files (x86)\Microsoft Visual Studio 14.0  
set QMAKESPEC=%QTDIR%\mkspecs\win32-msvc%MSVC\_VERSION%  
set \_QMAKESPEC\_=win32-msvc%MSVC\_VERSION%  
  
if ["%LIBPATH%"]==[""] call "%MSVC\_DIR%\VC\vcvarsall" amd64  
  
set INCLUDE=%INCLUDE%;%MAYA\_LOCATION%\include\python2.7  
set LIB=%LIB%;%MAYA\_LOCATION%\lib

Build Prerequisite for PyQt

You’ll need to build setuptools and enum34 before installing SIP. Please find the source on the PyPI.

After extracting the source code, please use commands like ***"C:\Program Files\Autodesk\maya2019\bin\mayapy.exe"setup.py install*** with administrator privilege to install them.

Build & Install SIP

Save the script below into the same folder as the SIP and PyQt folders. Use the script to build and install SIP. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**sip.bat**

@echo off  
set XXX=%~dp0  
if ["%MAYAPYQTBUILD%"]==[""] call "%XXX%setup.bat"  
  
pushd %SIPDIR%  
rem "%MAYA\_LOCATION%\bin\mayapy" configure-ng.py --spec %\_QMAKESPEC\_%  
"%MAYA\_LOCATION%\bin\mayapy" configure.py --sip-module PyQt5.sip  
nmake  
nmake install  
popd

Build & Install PyQt

Save the script below into the same folder as the SIP and PyQt folders. Use the script to build and install PyQt. You can also find this script on our [Github](https://github.com/cyrillef/Maya-PyQt-Scripts).

**pyqt.bat**

@echo off  
set XXX=%~dp0  
if ["%MAYAPYQTBUILD%"]==[""] call "%XXX%setup.bat"  
  
set QMAKESPEC=%QTDIR%\mkspecs\%\_QMAKESPEC\_%  
if not exist "%QMAKESPEC%\qmake.conf" (  
    echo "You need to uncompress %MAYA\_LOCATION%\mkspecs\qt-5.6.1-mkspecs.tar.gz !"  
    goto end  
)  
if not exist "%MAYA\_LOCATION%\include\Qt\QtCore\qdir.h" (  
    echo "You need to uncompress %MAYA\_LOCATION%\include\qt-5.6.1-include.tar.gz in %MAYA\_LOCATION%\include\Qt !"  
    goto end  
)  
findstr /L /C:"Headers=include/Qt" "%MAYA\_LOCATION%\bin\qt.conf" >nul 2>&1  
if ERRORLEVEL 1 (  
    echo "You need to edit %MAYA\_LOCATION%\bin\qt.conf to use 'Headers=include/Qt'"  
    goto end  
)  
findstr /L /C:"-lqtmain -lshell32" "%QTDIR%\mkspecs\common\msvc-desktop.conf" >nul 2>&1  
if ERRORLEVEL 1 (  
    echo "You need to edit %QTDIR%\mkspecs\common\msvc-desktop.conf to use 'QMAKE\_LIBS\_QT\_ENTRY     = -lqtmain -lshell32'"  
    goto end  
)  
if not exist "%MAYA\_LOCATION%\include\Qt\qtnfc.disabled" (  
    echo "You need to rename %MAYA\_LOCATION%\include\Qt\qtnfc to %MAYA\_LOCATION\include\Qt\qtnfc.disabled"  
    goto end  
)  
      
pushd %PYQTDIR%  
  
"%MAYA\_LOCATION%\bin\mayapy" configure.py --spec %QMAKESPEC% LIBDIR\_QT="%QTDIR%\lib" INCDIR\_QT="%QTDIR%\include\Qt" MOC="%QTDIR%\bin\moc.exe" --sip="%QTDIR%\Python\sip.exe" --sip-incdir="%QTDIR%\Python\include" -w --no-designer-plugin  
nmake  
nmake install  
popd  
  
:end

You're done! Please check the testing paragraph at the end of the article.

Testing

Copy and paste this example in the Maya Script Editor (in a Python tab), and execute the code:

import sys   
from PyQt5.QtWidgets import (QWidget, QToolTip, QPushButton)   
from PyQt5.QtGui import QFont       
   
class Example(QWidget):  
    def \_\_init\_\_(self):  
        super(Example,self).\_\_init\_\_()  
        self.initUI()  
  
    def initUI(self):  
        QToolTip.setFont(QFont('SansSerif', 10))  
        self.setToolTip('This is a <b>QWidget</b> widget')  
        btn = QPushButton('Button', self)  
        btn.setToolTip('This is a <b>QPushButton</b> widget')  
        btn.resize(btn.sizeHint())  
        btn.move(50, 50)   
        self.setGeometry(300, 300, 300, 200)  
        self.setWindowTitle('Tooltips')  
        self.show()  
          
ex = Example()

If you see the dialog showing, you are all set.