How to build PyQt5 for Autodesk Maya 2019 64bit

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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.

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.

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.

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.

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.

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.

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.

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.

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.