

Grayhill 3Dxx Display Products

Setup and Usage of Qt 5.9.3 Development Software – Linux

Revision C2



Revision History

| Revision | Date | Description | |
|----------|------------|---|--|
| A | 01/12/2018 | Original Release Qt-5.9.3 library support Ubuntu 16.04 64 bit Virtual Machine with flashback gnome desktop | |
| В | 01/18/2018 | Minor enhancements to the VM Resolved non-system impacting Qt Warning Updated default configuration Updated screen shots | |
| С | 04/06/2018 | Minor updates to provide consistency with the release of the Windows documentation | |
| C1 | 06/13/2018 | Updates for installing support and library archives | |
| C2 | 06/19/2018 | Resolve C1 cross reference issues Update library building instructions | |



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Introduction

This document describes:

- Setup and usage of the Qt-based development environment for Grayhill 3Dxx display products
- Code development for a 3Dxx Display product in the Qt IDE
- Accessing various 3Dxx hardware features via this code
- Loading developed application code onto a 3Dxx Display product

This Qt cross-platform development environment runs under Linux. The Linux system is supported as a virtual machine using Oracle's VirtualBox (<u>https://www.virtualbox.org/wiki/VirtualBox</u>) software.

The virtual machine is Ubuntu 16.04 using gnome flashback for the desktop; additionally PuTTY (telnet client software - http://www.putty.org) has been installed.

The different features of the Grayhill displays are described below as are differences in their installation.

This document is intended for use by software developers who are familiar with programming in C/C++ using the Qt framework. Experience developing applications for Linux platforms is a definite plus.

Screen shots were designed to be as accurate as possible and should be used for reference.

Note: Qt is licensed under the terms of LGPL and GPL; these are open-source licensing agreements. Please reference <u>https://www1.qt.io/qt-licensing-terms/</u> for a detailed explanation. Additional information is also located at <u>https://www.gnu.org/licenses/licenses.html</u>.



Supported Hardware Products

The Qt-based development environment is supported on the following Grayhill 3Dxx Color Display Models:

- 3D50
- 3D70
- 3D2104

The table below summarizes the key features of each of these models. Note that the features of a specific product may vary depending on the purchased hardware configuration.

| Model Number | 3D50 | 3D70 | 3D2104 |
|---------------------------|----------------|----------------|----------------|
| Display Size (inches) | 5 | 7 | 10.4 |
| Pixel Count (w x h) | 800 x 480 | 800 x 480 | 1024 x 768 |
| Touch Screen Input | Yes | Yes | Yes |
| Real Time Clock | Yes | Yes | Yes |
| CAN Ports | 2 | 2 | 3 |
| Camera Inputs | 2 | 3 | 4 |
| LISP ports | 1 (maintenance | 1 (maintenance | 1 (maintenance |
| USB ports | only) | only) | only) |
| RS232 | 1 (maintenance | 1 (maintenance | 1 (maintenance |
| K5232 | only) | only) | only) |
| Built-in Ethernet | 0 | 1 | 1 |
| Digital Input (dedicated) | 1 | 4 | 0 |
| Digital Output | 1 | 4 | 0 |
| (dedicated) | 1 | 4 | |
| Digital Input / Output | 3 | 0 | 4 |
| Analog Input | 0 | 2 | 0 |
| Audio Output | No | 1 channel | No |
| Buzzer | No | Yes | Yes |

Recommended Equipment from Grayhill

If using Model 3D50 5 Inch Display: 3D50DEV-100 3D50 Development Kit

If using Model 3D70 7 Inch Display: 3D70DEV-100 3D70 Development Kit

If using Model 3D2104 10.4 Inch Display: 3D2104DEV-100 3D2104 Development Kit



Other Recommended Equipment

Other Recommended Equipment (for all displays)

- An Ethernet port connected to a DHCP server that can be connected to the 3Dxx Display. This port should be on the same network as the development PC.
- PC Running Windows XP* or Windows 7/10 with the following features:
 - 4 GB RAM (minimum)
 - 40 GB available hard drive space (minimum)
 - Ethernet port
 - RS232 Port (or USB to serial adapter)
 - Internet Access
 * Note: if using Windows XP make sure that exFAT file system support has been installed in order to read distribution media (http://www.microsoft.com/enus/download/details.aspx?id=19364)

Software Required

The following files are available for download from Grayhill at: http://www.grayhill.com/qt43d

- Qt Virtual Disk Image
- QtGhSupportLinux
 - Files for building Qt applications
 - Support utilities for building Qt applications
 - Example projects from Grayhill
- 3Dxx_Qt_Usage_Guide_Linux.pdf (this document)



Installation Overview

This is a brief overview of the installation steps for the Qt-based development environment for a Grayhill 3Dxx Display.

- First connect the 3Dxx Development Kit hardware to the PC being used. This includes connecting the serial port and Ethernet port interfaces. For the 3D50 Display this procedure is described in detail in the document "3D50 Devolpment Quick Start Guide.pdf" and for the model 3D70 Display it is described in the document "3D70 Devlopment Quick Start Guide.pdf".
- Next the VirtualBox application will be downloaded from the internet and installed on the development PC. This application allows one to run a virtual computer system in a window on the PC. This means that all other Windows PC applications can be running along with this virtual computer application. This virtual computer will be used to run a version of Linux. All Qt-based development will be done under this Linux environment.
- Next the VirtualBox application will be configured. The only thing that the user must configure is the serial port interface, but this procedure will be explained. Grayhill provides a pre-configured image of Linux that has the Qt development environment already installed.
- Then a Linux script will be run to update some items in the Qt development environment. This script will only need to be run once.
- The serial and Ethernet links to the target 3Dxx Display hardware will be established. Another Linux script will be run to configure the actual 3Dxx Display product to operate with Qt instead of VUI Builder©. This second script will need to be run on each 3Dxx Display product that will be operated with Qt.
- Finally instructions are provided on how to open and run a Qt demonstration project in either the Linux desktop environment or on the 3Dxx Display target hardware. This demonstration project shows how to use touch screen "buttons", how to use touch screen swipes, how to set the 3Dxx backlight, how to operate the 3Dxx camera input, and how to access and set the real time clock. For the 3D70 Display there are also samples of using the audio output, the analog input, and the internal buzzer.



Installation of VirtualBox

This section shows how to download and install VirtualBox Version 5.1.8. If a newer version is available, it will probably work just fine, but the screen shots shown below may be different.

- Navigate to this web page: https://www.virtualbox.org/
- Click on "Download VirtualBox ..." selection



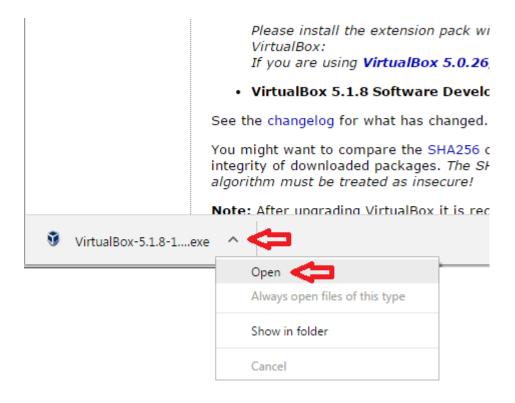


• Click on download for VirtualBox 5.1.8 for Windows as shown below

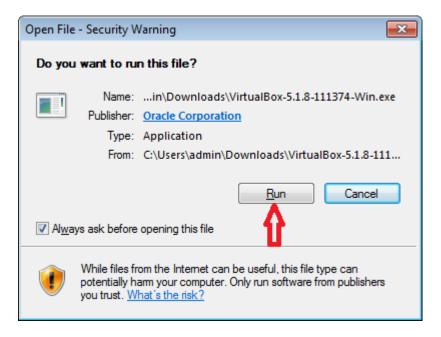




• When the download completes, click on "Open" option. (Note that this download example was done using a Chrome browser. If a different web browser is used then this open operation may look different.)



• When the "Open File – Security Warning" appears, click on "Run"





• Next the following "Welcome..." dialog should appear. Click on "Next" button





• Next will appear this "Custom Setup" dialog. Do not make any changes, just click "Next" button

NOTE!

Make sure that the installation location is on a local disk drive, not a network storage unit! This is because during installation the network connections will be disconnected so that the VirtualBox can install network adapter software and this will make network storage units inaccessible.

| 😸 Oracle VM VirtualBox 5.1.8 Setup | x | | | |
|---|---|--|--|--|
| Custom Setup | | | | |
| Select the way you want features to be installed. | | | | |
| Click on the icons in the tree below to change the way features will be installed. | | | | |
| Image: WirtualBox Application Oracle VM VirtualBox 5.1.8 Image: WirtualBox USB Support Oracle VM VirtualBox 5.1.8 Image: WirtualBox Networking Oracle VM VirtualBox 5.1.8 | | | | |
| VirtualBox Bridger VirtualBox Host-C VirtualBox Python 2.x Su VirtualBox Python 2.x Su VirtualBox Python 2.x Su | | | | |
| Location: C:\Program Files\Oracle\VirtualBox\ Browse | | | | |
| Version 5.1.8 Disk Usage < Back Next > Cancel | | | | |

• On the second "Custom Setup" screen the first three options may be adjusted as desired, but leave the "Register file associations" option checked. When done, click "Next" button



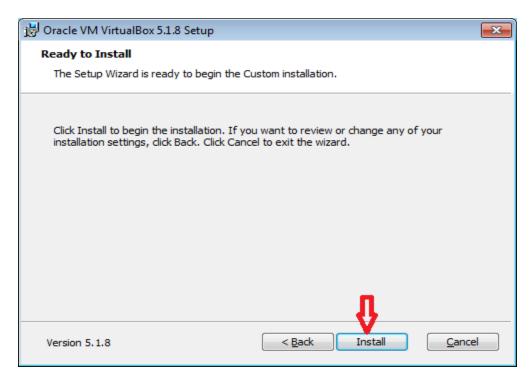
| 🔀 Oracle VM VirtualBox 5.1.8 Setup | x | |
|---|---|--|
| Custom Setup | | |
| Select the way you want features to be installed. | | |
| | | |
| Please choose from the options below: | | |
| Create start menu entries | | |
| Create a shortcut on the desktop | | |
| Create a shortcut in the Quick Launch Bar | | |
| Register file associations | | |
| • | | |
| | | |
| Л | | |
| Version 5.1.8 < <u>Back</u> <u>Next</u> > <u>Cancel</u> | | |



• The following "Warning: Network Interface" dialog should appear next. Make sure that there are no network accessing programs running (i.e. email) on the computer. Exit any such programs and then click "Yes" button.

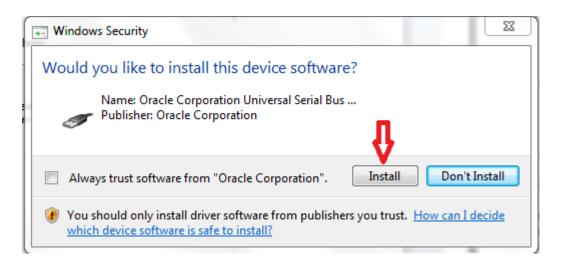


• The next dialog is "Ready to Install" as shown here. Click on the "Install" button





- If a "User Account Control" window appears, click "Yes" button
- If any "Windows Security" windows appear as shown below, click on "Install" button. Several such windows may appear asking permission to install various driver software modules



• When installation is finished, this window should appear. Uncheck the "Start Oracle VM VirtualBox..." selection and click the "Finish" button

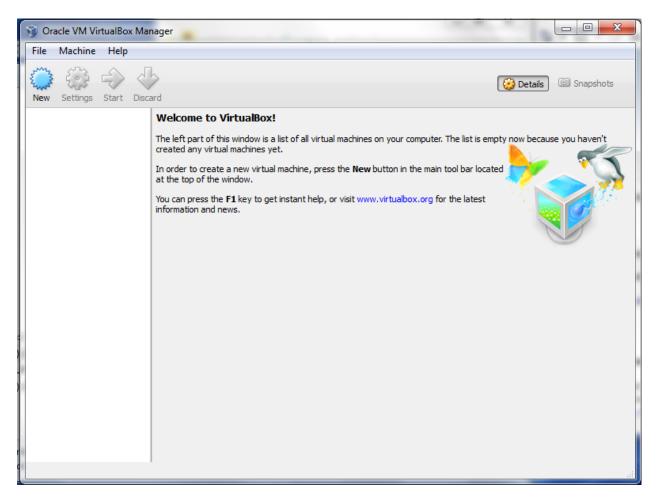
| B Oracle VM VirtualBox 5.1.8 Setup | | × |
|------------------------------------|---|-----|
| | Oracle VM VirtualBox 5.1.8 installation is complete. | |
| | Click the Finish button to exit the Setup Wizard. | |
| | Start Oracle VM VirtualBox 5.1.8 after installation | |
| Version 5.1.8 | < <u>B</u> ack <u>Finish</u> <u>C</u> ano | cel |

• Reboot computer at this time to re-establish network connections.



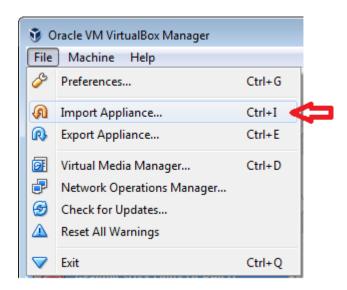
Setup VirtualBox Linux Environment

- After the computer reboots; create the "C:\VMSharedFolder" folder. This folder can be used to transfer files between the Windows and Linux environments.
- Copy the file "Qt Virtual Disk Image" to any location on the development PC. Remember the location of this copied .ova file as it will be needed later.
- Start the Oracle VM VirtualBox program. This screen should appear:





• Click on "File -> Import Appliance"





• Click on the open folder icon as shown below and navigate to the previously copied file: "Qt Virtual Disk Image" and open it. N.B. The following example references revision B of the ova.

NOTE

The above .ova file is quite large and if distributed on a USB memory stick, that memory stick must use exFAT format. If operating under Windows XP, then the exFAT file system support package must be installed in order to access this media (see note under **Other Recommended Equipment** for more details).

• Click "Next"

| | ? <mark>×</mark> |
|--|------------------|
| Import Virtual Appliance | |
| Appliance to import | |
| VirtualBox currently supports importing appliances saved in the Open Virtualization Fo (OVF). To continue, select the file to import below. | rmat |
| J:\VirtualMachines\Appliances\Qt 5.9.3\Grayhill 3Dxx Qt 5.9.3 Rev B.ova | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| Expert Mode | Cancel |



- Adjust any settings as appropriate, such as number of processors or RAM size and then click "Import" button.
- Click "Import"

| Applia These ar | | red in the appliance and the suggested settings of the imported VirtualBox machines. You can change many of the n the items and disable others using the check boxes below. |
|--------------------|--|--|
| Virtual S | System 1 | |
| | Name | Grayhill 3Dxx Qt 5.9.3 Rev B_1 |
| 9 | Description | QT 5.9.3 Revision B |
| | Guest OS Type | 🚰 Ubuntu (64-bit) |
| | CPU | 1 |
| | RAM | 4096 MB |
| 0 | DVD | |
| Ø | USB Controller | |
| | Sound Card | V ICH AC97 |
| 5 | Network Adapter | ☑ Intel PRO/1000 MT Desktop (82540EM) |
| ۵ | Storage Controller (IDE) | PIIX4 |
| ۵ | Storage Controller (IDE) | РШХ4 |
| 4 🏈 | Storage Controller (SATA) | AHCI |
| | 🙆 Virtual Disk Image | J:\VirtualMachines\DiskDrives\Grayhill 3Dxx Qt 5.9.3 Rev B_1\Grayhill 3Dxx Qt 5.9.3 Rev B-disk001.vmdk |
| | ialize the MAC address of all n : is not signed | etwork cards |
| | | Restore Defaults Import Cancel |

N.B. The example above shows a "_1" suffix; a machine with the name "Grayhill 3Dxx Qt 5.9.3 Rev B" already exists.



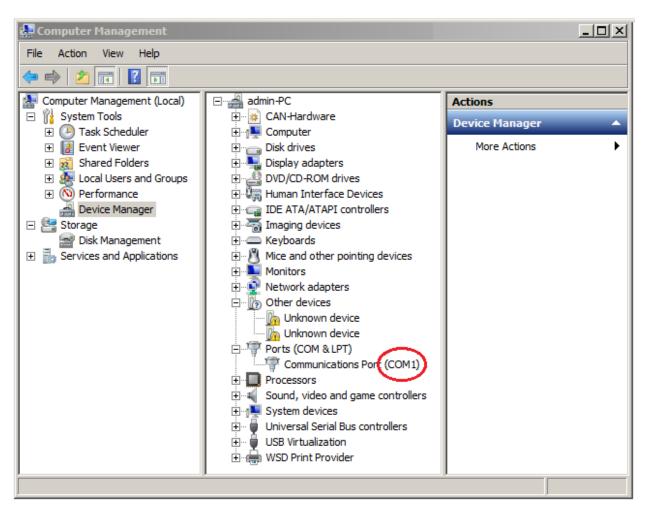
Setup VirtualBox Serial Port

In order to access the 3Dxx Display Linux console, a serial port that operates at 115200 baud is required. If the development PC has a built-in serial port that is going to be used for this purpose, then proceed with the setup instructions below to configure the VirtualBox Serial Port. If a USB to serial port converter is going to be used, then skip the VirtualBox Serial Port setup and continue with the step:



Starting Linux Development Environment from VirtualBox.

Determine what COM port is assigned to the serial port that is going to be used. This can be determined by accessing the Device Manager window and looking under the "Ports (COM & LPT)" entry. In the example shown below the serial port is assigned to "COM1".



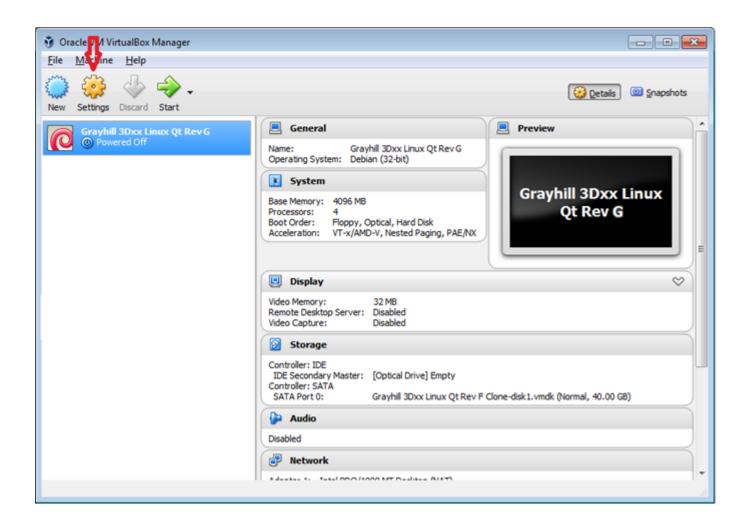
Note: Using a COM port greater than 9 will not work!

Close the "Device Manager" dialog box, but remember the COM port number used.

After the previous VirtualBox "Import" operation was performed, this screen should appear.

• Select "Settings"







• When the "Grayhill 3Dxx Linux Qt ... -Settings" dialog box appears, click on the "Serial Ports" item on the left column as shown:

N.B. Serial port 1 should already be configured as COM1 as part of the appliance import

| 🙆 Gray | 🥝 Grayhill 3Dxx Linux Qt Rev G - Settings 🔹 🔹 | | | | |
|-----------|---|--|--|--|--|
| | General | Serial Ports | | | |
| F | System | Port 1 Port 2 Port 3 Port 4 | | | |
| | Display | Enable Serial Port | | | |
| \square | Storage | Port Number: COM1 IRQ: 4 I/O Port: 0x3F8 | | | |
| | Audio | Port Mode: Host Device 🔻 | | | |
| ₽ | Network | ✓ Connect to existing pipe/socket Path/Address: COM4 | | | |
| | Serial Ports | | | | |
| Ø | USB | | | | |
| | Shared Folders | | | | |
| | User Interface | | | | |
| | | | | | |
| | | OK Cancel | | | |



- Select the "Port 1" tab
 - Select "Enable Serial Port"
 - Set "Port Number:" to "COM1" no matter what COM port is being used.
 - Set "Port Mode:" to "Host Device"
 - Set "Path/Address:" to the COM port name and number from the previous "Device Manager" step

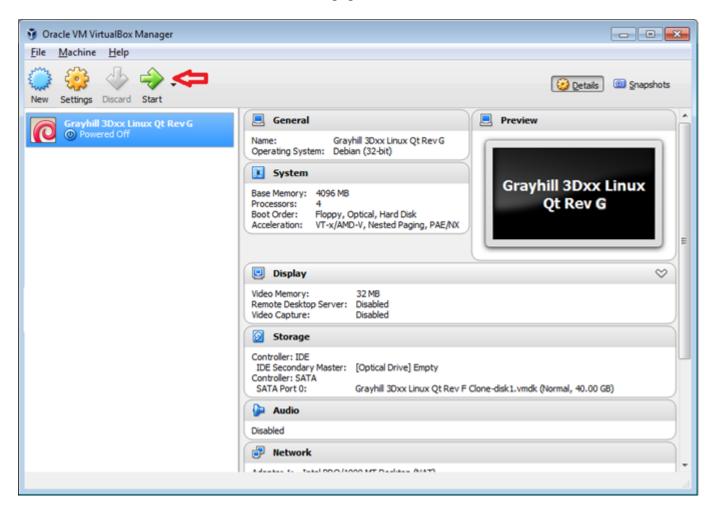
An example is shown below. When these settings are correct click "OK"

| ę | 🧿 Gra | yhill 3Dxx Qt 5.9. | 3 Rev A - Settings |
|---|------------|--------------------|---|
| | | General | Serial Ports |
| | H | System | Port 1 Port 2 Port 3 Port 4 |
| | | Display | ☑ Enable Serial Port |
| | \bigcirc | Storage | Port Number: COM1 IRQ: 4 I/O Port: 0x3F8 |
| | | Audio | Port Mode: Host Device Connect to existing pipe/socket |
| | ₽ | Network | Path/Address: COM1 |
| | | Serial Ports | |
| | Ø | USB | |
| | | Shared Folders | |
| | = | User Interface | |
| | | | |
| | | | OK Cancel |



Starting Linux Development Environment from VirtualBox

• When focus returns to this screen, click on the big, green "Start: arrow



• If any messages such as the ones shown below appear when Linux first starts, click on the icon to prevent these messages from appearing again

| 👩 Grayhill 3D50 Linux [Running] - Oracle VM VirtualBox | |
|--|---|
| Machine View Devices Help | |
| You have the Auto capture keyboard option turned on. This will cause the Virtual | host machine: when the keyboard is captured, all 11 🛞 🕅 🧲 |
| The Virtual Machine reports that the guest OS supports mouse pointer integration | use pointer is over the Virtual Machine's display are 🛛 🛞 🚫 夫 |
| Computer | |
| | |
| home | |



VirtualBox Linux Passwords

- ghguest !admin!
- root !rty32999!

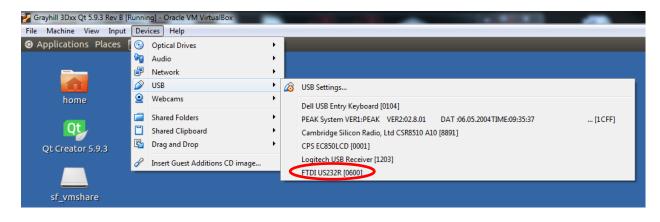


Configuring 3Dxx Display's IP Address

In order to complete the setup of the Qt development environment for the 3Dxx Display hardware; the IP address assigned to the 3Dxx Display must be determined.

In order to perform these tasks, it is necessary to connect the 3Dxx Display to the same network as the development PC.

- Connect the 3Dxx Display serial port to a serial port on the development PC
- Determine the serial port device name to use for PuTTY (serial communication between the VM and the display). This depends on how the 3Dxx Display serial port is physically connected to the development PC. If using a built-in serial port on the development PC, remember the serial port device name is "/dev/ttyS0". If using a USB to serial port adapter, remember the serial port device name is "/dev/ttyUSB0".
- **Only** if using the USB to serial port adapter: it must be activated at this time by clicking on the "Devices" menu option at the top of the VirtualBox screen. Select "USB" and click on the USB to serial port adapter device name in order to select it. A sample is shown here (the USB device name may be different than shown):





Launch PuTTY (multiple options)

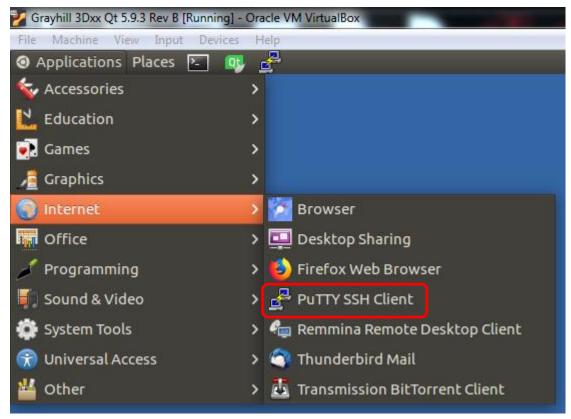
• Click on the top panel PuTTY icon



o Double Click on the desktop PuTTY icon



◦ Select Putty from Applications → Internet → PuTTY SSH Client





The PuTTY Configuration screen appears.

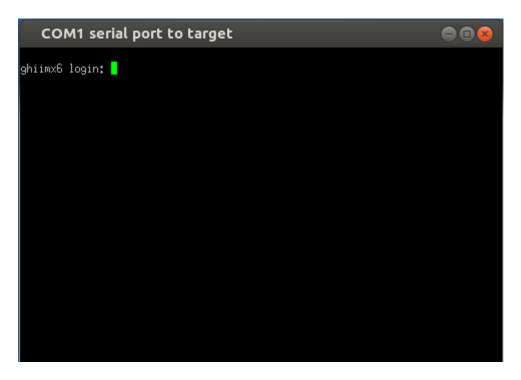
- Select COM1
- Click "Load"

| 8 PuTTY Configuration | | | | |
|---|---|-------------------------|--|--|
| Category: ▼ Session Logging ♥ Terminal Keyboard Bell Features ♥ Window Appearance Behaviour Translation Selection Colours Fonts ♥ Connection Data Proxy Telnet | Basic options for your PuTTY ses Specify the destination you want to connect Serial line /dev/ttyS0 Connection type: Raw Telnet Rlogin SSH Load, save or delete a stored session Saved Sessions COM1 Default Settings COM1 COM4 (USB) Close window on exit: Always Never Only on clear | t to Speed 115200 | | |
| Rlogin SSH About | Open | Cancel | | |
| Hoode | Open | concer | | |

• Click "Open"



• Make sure that the 3Dxx Display is powered up and press the "Enter" key.



- A "ghiimx6 login:" prompt should appear. If the 3Dxx Display was just powered up; startup messages may appear as well, but when they are done, pressing the "Enter" key should produce a "ghiimx6 login:" prompt as shown.
- At the "ghiimx6 login:" prompt enter "root" (no password is required).
- Depending on the IP address type, refer to the appropriate appendix:
 - o Dynamic Appendix J: Dynamic IP Address
 - Static Appendix K: Static IP Address
- Launch a Terminal Command Window by clicking once on the icon shown here:

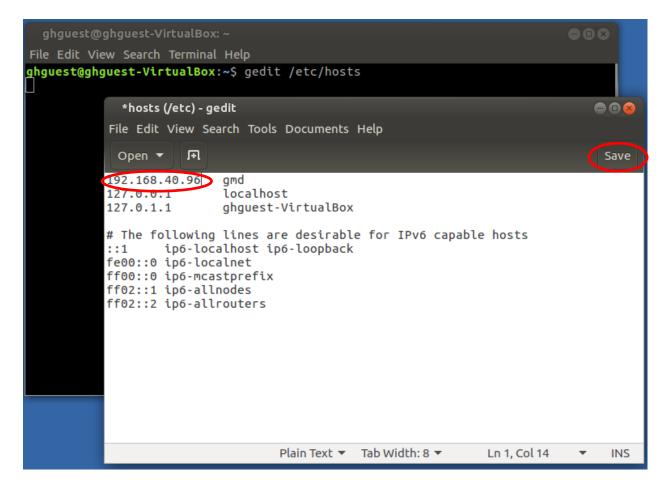


- In the terminal window type the following command:
 - o gedit /etc/hosts

This opens the IP address configuration file for the Linux system in a text editor program so that the IP address of the 3Dxx Display can be configured.



- Update the IP address associated with "gmd"
- Click "Save"; then close the editing session



N.B. If the IP address of the display changes; hosts must be updated and Qt Creator re-launched



Configure VM and Display

This section describes the configuration for a 3Dxx Display for operation with the Qt development environment. *QtGhSupportLinux* is a self-extracting archive; when it is executed, the files it contains are extracted. The "-y" flag allows existing files to be replaced. One of the files in the archive, *QtGhSupportLinuxAutoRun*, is the actual installer script and is manually executed after the extraction.

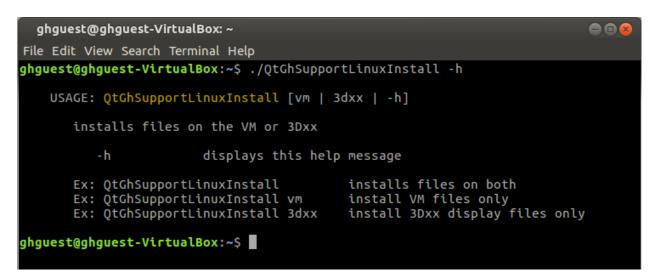
- On the Virtual Machine, launch Firefox (Applications → Internet) and navigate to <u>http://www.grayhill.com/qt43d</u>
- Download **QtGhSupportLinux**
- Copy the file to */home/ghguest*, which is just "Home" if after downloading "Open Containing Folder" is selected from Firefox downloads
- Open a terminal window
 - chmod 755 QtGhSupportLinux
 - ./QtGhSupportLinux –y

```
ghguest@ghguest-VirtualBox: ~
                                                                           000
File Edit View Search Terminal Help
ghguest@ghguest-VirtualBox:~$ ls
         Documents Music
                                       OtGhSupportLinux Videos
bin
                              Public
Desktop Downloads Pictures Qt5.9.3 Templates
ghguest@ghguest-VirtualBox:~$ chmod 755 QtGhSupportLinux
ghguest@ghguest-VirtualBox:~$ ./QtGhSupportLinux -y
7-Zip SFX 16.02 : Copyright (c) 1999-2016 Igor Pavlov : 2016-05-21
p7zip Version 16.02 (locale=en_US.UTF-8,Utf16=on,HugeFiles=on,64 bits,1 CPU x64
Extracting archive: ./QtGhSupportLinux
Path = ./QtGhSupportLinux
Гуре = 7z
Everything is Ok
ghguest@ghguest-VirtualBox:~$
```

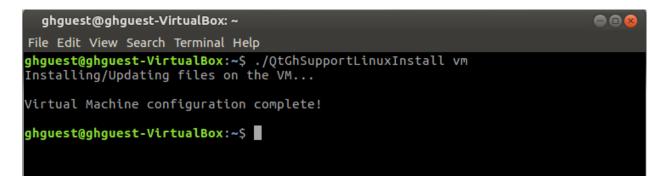
- Make the installation script executable
 - chmod 755 QtGhSupportLinuxInstall



- *QtGhSupportLinuxInstall* installs VM support files and/or installs the necessary libraries on the display based on the arguments provided.
 - o ./ QtGhSupportLinuxInstall [vm | 3dxx | -h]



• ./QtGhSupportLinuxInstall vm





- ./QtGhSupportLinuxInstall 3dxx
- Display installation and configuration takes a few minutes to execute. If everything works correctly the script concludes with the following:

```
setup3Dxx completed successfully... rebooting
```

If this message does not appear, the problem(s) **must** be corrected before continuing.

ghguest@ghguest-VirtualBox: ~ File Edit View Search Terminal Help ghguest@ghguest-VirtualBox:~\$./QtGhSupportLinuxInstall 3dxx Transfering files to display... Configuring the display... Setup Grayhill 3Dxx Display for Qt-5.9.3 Fri Jun 8 10:16:41 CDT 2018 Making 3Dxx Flash File system writeable and creating writeablefs script Disabling VUI Builder and other applications on 3Dxx Installing IPKs... Updating GCC Libraries on 3Dxx Display Installing gcclibs (4.8.3) to root... Configuring gcclibs. Updating Grayhill I/O Libraries on 3Dxx Display Installing ghdrv-lib (1.1) to root... Configuring ghdrv-lib. Updating glibc Libraries on 3Dxx Display Installing glibc (2.18.0) to root... Configuring glibc. Updating GPU Libraries on 3Dxx Display Installing gpu-viv2 (3.0.101+4.1.1) to root... Configuring gpu-viv2. Updating Qt5 Libraries on 3Dxx Display No packages removed. Installing qt593 (5.9.3) to root... Configuring qt593. bootargs already set to console=ttymxc0,115200 lpj=7905280 rootfstype=ext4 root= /dev/mmcblk0p1 rw rootwait board-ghi imx6.pn=3D70VT-100 Updating /etc/profile script Updating /etc/profile.local script Updating /usr/lib/fonts setup3Dxx completed successfully... rebooting ghguest@ghguest-VirtualBox:~\$



Selecting a 3Dxx Qt Widget Demo Project

Qt Widget demonstration projects are provided for each of the 3Dxx Displays. There is a file in each demonstration program called "ghwrapper.cpp". This file is a focal point for the demonstration program's operation and in the very beginning of this file are comments explaining how the demonstration program works.

This table compares the features of the demonstration programs:

| Program Name | ghqtdemo | gh7indemo | gh10indemo |
|----------------------------|------------|------------|--------------|
| Target Display | Model 3D50 | Model 3D70 | Model 3D2104 |
| Orientation | Portrait | Landscape | Landscape |
| Real Time Clock setting | Yes | Yes | Yes |
| CAN input | Yes | Yes | Yes |
| CAN output | No | Yes | Yes |
| Touch Screen tap input | Yes | Yes | Yes |
| Touch Screen Swipes | Yes | Yes | Yes |
| Digital Inputs shown | 4 | 4 | 4 |
| Digital Outputs shown | 4 | 4 | 4 |
| Video inputs shown | 2 | 3 | 3 |
| Buzzer demo | N/A | Yes | Yes |
| Audio Output demo | N/A | Yes | N/A |
| Analog Input demo | N/A | Yes | N/A |



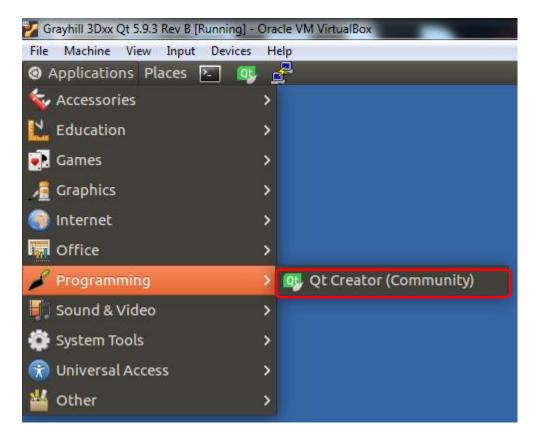
Build and Run 3Dxx Embedded Application (Widget)

The VM comes ready to run (aside from the previous configuration steps). This section details how to build and run a demo application.

Complete instructions for configuration can be found in the appendices.

If not already started, launch Qt Creator by performing one of the following actions:

• Select "Applications" (word in the upper left-hand corner of the Linux window), then navigate through "Programming" and click on "Qt Creator …"



• Click on the Qt icon in the panel

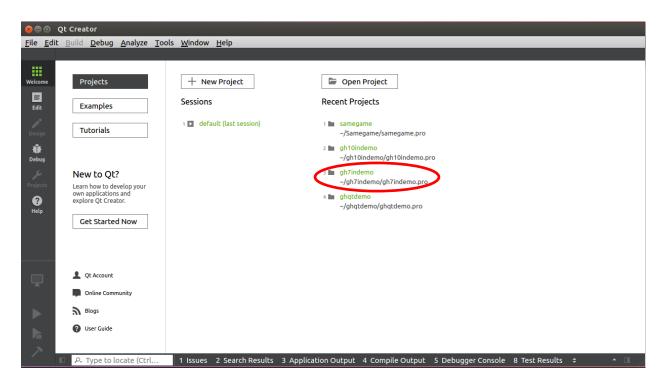




• Double click on the Qt icon on the desktop



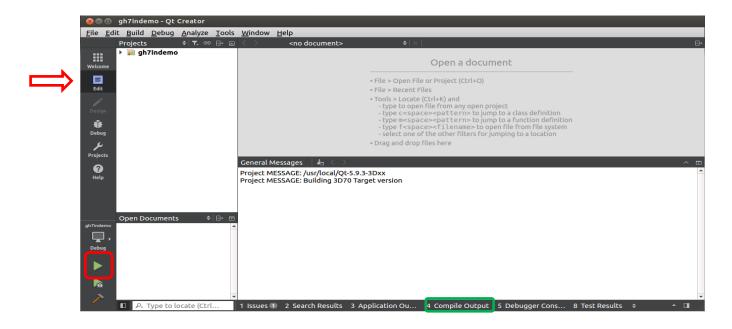
Select the gh7indemo project from "Qt Creator" main window. Click on "gh7indemo".



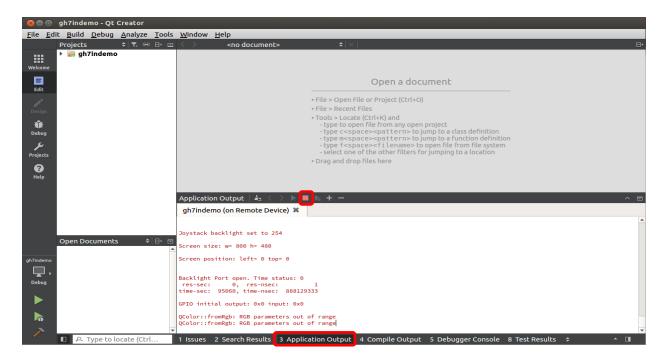
Note: To open a non-recent project; select "Open Project" and navigate to the project's .pro file



The "Edit" view is displayed. Click on the green arrow to run (a check for building is also done).



• Click on the green arrow to run (a check to see if the executable is up to date is performed; if compilation is necessary the output can be viewed by clicking on the "Compile Output" tab)



- Select the "Application Output" tab.
- Clicking the red square terminates the target session.



Appendix A: Configuring a Manual Qt Kit for Grayhill Displays

Note: This appendix is included for reference and is not a required installation step; Grayhill automatically installs the kit configuration as part of the support file installation. A kit is a collection of utilities (qmake, compilers, debugger, etc...) used to build a project.

- Launch Qt Creator
- Select Tools \rightarrow Options

| | gh7indemo - Qt Creator | | | | | | |
|--------------------------|---|----------------------|------------------|--|--|---------------------------|---------|
| <u>F</u> ile <u>E</u> di | t <u>B</u> uild <u>D</u> ebug <u>A</u> nalyze | Tools <u>W</u> indow | <u>H</u> elp | | | | |
| | Projects 🗢 🕈 🐨 | | Ctrl+ | к 🔶 🔶 | | | |
| | 🕨 📠 gh7indemo | <u>C</u> ++ | | - F | | | |
| Welcome | | QML/JS | | - F | | | |
| | | Tests | | - F | | | |
| Edit | | <u>C</u> ode Pasting | 1 | - F | | | |
| 1 | | <u>B</u> ookmarks | | → | | | |
| Design | | Git | | - F | | | |
| ÷. | | Text Editing | Macros | -> | | | |
| Debug | | For <u>m</u> Editor | | • | | | |
| بر | | External | | • | | | |
| Projects | | Diff | | <u> </u> | Open a document | | |
| ? | | Options | | • File > Open I | ile or Project (Ctrl+O) | | |
| Help | | | | • File > Recen | | | |
| | Open Documents 🔷 | | | - type to op - type c <sp - type m<sp - type f<sp< th=""><th>te (Ctrl+K) and en file from any open project acc>>pattern> to jump to a class del acc>>pattern> to jump to a function acc>>filename> to open file from fil of the other filters for jumping to a loo p files here</th><th>n definition le system</th><th></th></sp<></sp </sp | te (Ctrl+K) and en file from any open project acc>>pattern> to jump to a class del acc>>pattern> to jump to a function acc>>filename> to open file from fil of the other filters for jumping to a loo p files here | n definition le system | |
| gh7indemo | | | | | | | |
| Π. | | | | | | | |
| Debug | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| > | | T | | | | | |
| | ■ P. Type to locate (Ctr | 1 Issues | 2 Search Results | Application Output | 4 Compile Output 5 Debugger C | Console 8 Test Results | ÷ • 🖬 / |



- Select "Build & Run"
- Select the "General" tab

| 8 Options | | | | | |
|-------------------------------------|--|--|--|--|--|
| Filter | Build & Run | | | | |
| Environment | General Kits Qt Versions Compilers Debuggers Qbs CMake | | | | |
| Text Editor | Projects Directory | | | | |
| 🚮 FakeVim | ○ Current directory | | | | |
| Help | Directory /home/ghguest Browse | | | | |
| {} C++ | Build and Run | | | | |
| 🗸 Qt Quick | ☐ Save all files before build | | | | |
| 🕵 Build & Run | ✓ Always build project before deploying it | | | | |
| 🔎 Debugger | ✓ Always deploy project before running it ✓ Word-wrap application output | | | | |
| 💥 Designer | Open Compile Output pane when building | | | | |
| Analyzer | ✓ Open Application Output pane on output when running | | | | |
| Version Control | Open Application Output pane on output when debugging | | | | |
| Devices | Always ask before stopping applications | | | | |
| 🚮 Code Pasting | Stop applications before building: None 🔹 | | | | |
| QA Test Settings | Default build directory: tProject:Name}-%{CurrentKit:FileSystemName}-%{CurrentBuild:Name}")} Reset | | | | |
| ✓ Apply X Cancel ✓ OK | | | | | |

The "General" tab is where project wide customization is done. Review and select the desired configuration.



Device

The section describes how to establish an Ethernet based connection to the display.

- Select "Devices"
- Click "Add..."

| Options | |
|------------------|---|
| Filter | Devices |
| Environment | Devices Android QNX |
| Text Editor | Device: 3Dxx Target (default for Generic Linux) |
| FakeVim | General <u>Remove</u> |
| Help | Name: 3Dxx Target Set As Default |
| {} c++ | Type: Generic Linux Test |
| 🔎 Qt Quick | Auto-detected: No Show Running Processes |
| 🕕 Build & Run | Deploy Public Key |
| ଭ Debugger | Type Specific |
| 📡 Designer | Machine type: Physical Device |
| Analyzer | Authentication type: |
| Version Control | Host name: gmd SSH port: 22 Check host key |
| Devices | Free ports: 10000-10100 Timeout: 20s \$ |
| Code Pasting | Username: root |
| QA Test Settings | Password: Show password |
| | Private key file: Browse Create New |
| | Apply X Cancel Apply |



| 😣 Device Configuration | n Wizard Selection | | | | | | |
|------------------------------------|--------------------------------|--|--|--|--|--|--|
| Available device types: | | | | | | | |
| Generic Linux Device QNX Device | | | | | | | |
| | ¥ <u>C</u> ancel √Start Wizard | | | | | | |

- Select "Generic Linux Device"
- Click "Start Wizard"



| onnection | | |
|-----------------------|---|-----------------------------|
| Connection Summary | The name to identify this configuration: The device's host name or IP address: | 3Dxx Target |
| Summary | The device's nost name or IP address: The username to log into the device: | gmd root |
| | The authentication type: The user's password: | Password O Key O Agent |
| | The file containing the user's private key: | /ghguest/.ssh/id_rsa Browse |
| | | |

- Populate the fields as illustrated above
- N.B. The IP address associated with gmd was configured in */etc/hosts* (C:\Windows\System32\drivers\etc)
- Click "Next"



| New Generic Linux Device Configuration Setup Summary | | | | | | | |
|--|---|--|--|--|--|--|--|
| Connection | The new device configuration will now be created. In addition, device connectivity will be tested. | | | | | | |
| | < <u>B</u> ack <u>Finish</u> Cancel | | | | | | |

- Verify the 3Dxx Display is still powered up
- Click "Finish" The Ethernet link to the 3Dxx Display will be tested and if successful the following result screen appears

| 8 Device Test |
|---|
| Connecting to host Checking kernel version Linux 3.0.35 armv7l |
| Checking if specified ports are available All specified ports are available. |
| Device test finished successfully. |
| |
| X Close |

• Click "Close"



| ilter | Devices |
|-----------------|---|
| Environment | Devices Android QNX |
| Text Editor | Device: 3Dxx Target (default for Generic Linux) |
| 🚡 FakeVim | General <u>R</u> emove |
| 🖉 Help | Name: 3Dxx Target Set As Default |
|) C++ | Type: Generic Linux Test |
| 🔍 Qt Quick | Auto-detected: No Show Running Processes |
| 😼 Build & Run | Current state: Unknown Deploy Public Key |
| 🔉 Debugger | Type Specific |
| 🗸 Designer | Machine type: Physical Device |
| Analyzer | Authentication type: Password Key Key via ssh-agent |
| Version Control | Host name: gmd SSH port: 22 Check host key |
| Devices | Free ports: 10000-10100 Timeout: 20s |
| Code Pasting | Username: root |
| A Test Settings | Password: |
| | Private key file: Browse Create New |

• Click the upper arrow on the right side of the "Timeout:" box to increase timeout value to "20s"



• Devices Summary

| 8 Options | |
|------------------|---|
| Filter | Devices |
| Environment | Devices Android QNX |
| Text Editor | Device: 3Dxx Target (default for Generic Linux) |
| 🕌 FakeVim | General <u>Remove</u> |
| Help | Name: 3Dxx Target Set As Default |
| {} c++ | Type: Generic Linux Test |
| 🗸 Qt Quick | Auto-detected: No Show Running Processes |
| 🕕 Build & Run | Current state: Unknown Deploy Public Key |
| 🔍 Debugger | Type Specific |
| 💥 Designer | Machine type: Physical Device |
| Malyzer | Authentication type: • Password · Key · Key via ssh-agent |
| Version Control | Host name: gmd SSH port: 22 🗘 🖸 Check host key |
| Devices | Free ports: 10000-10100 Timeout: 20s \$ |
| Code Pasting | Username: root |
| QA Test Settings | Password: |
| | Private key file: Browse Create New |
| | ✓ Apply X Cancel |

- Name name of the device
- Host name can be "alias" like *gmd* specified in */etc/hosts* or a hard coded IP
- Timeout 20s
- Username root

N.B. Remember to "Test" to make sure connectivity has been established



Compiler

- Select "Build & Run"
- Select the "Compilers" tab
- Click "Add"; then select GCC \rightarrow C

| Options | | |
|---|---|-----|
| Filter | Build & Run | |
| Environment | General Kits Qt Versions Compilers Debuggers Qbs CMake | |
| Environment Text Editor FakeVim Help C++ Qt Quick Build & Run Debugger Designer Analyzer Version Control Devices Code Pasting Arest Settings | Varie Type * Auto-detected * C++ GCC (C++, x86 64bit in /usr/bin) GCC (C++, x86 54bit in /usr/bin) GCC (C, x86 64bit in /usr/bin) GC (C) GC (C) | C++ |
| | ✓Apply ¥ ⊆ancel ✓ OK | |



• Populate the fields as illustrated

"Name:" ARM-GCC

"Compiler path:" Click "Browse..." and navigate to the desired file

/opt/OSELAS.Toolchain-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-gcc

| 8 | Choose Executa | able | | | | | | |
|----|-----------------|------|----------|--|----------------------------|--|----------------------|----------------|
| 0 | Recent | • | S opt | OSELAS.Toolchain-2013.12.3 | arm-cortexa9-linux-gnueabi | gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12 | -sanitized t | oin 🕨 |
| 仚 | Home | Nan | ne | | | | Size | Modified |
| | Desktop | | arm-cort | exa9-linux-gnueabi-addr2line | | | 4.2 MB | 4 Dec |
| D | Documents | | | exa9-linux-gnueabi-ar | | | 4.3 MB | 4 Dec |
| ÷ | Downloads | | | :exa9-linux-gnueabi-as :exa9-linux-gnueabi-c++ | | | 6.3 MB 2.8 MB | 4 Dec 4 Dec |
| 99 | Music | | arm-cort | exa9-linux-gnueabi-c++filt | | | 4.1 MB | 4 Dec |
| Ø | Pictures | | | :exa9-linux-gnueabi-cpp :exa9-linux-gnueabi-elfedit | | | 2.8 MB 108.3 kB | 4 Dec 4 Dec |
| H | Videos | | arm-cort | exa9-linux-gnueabi-g++ | | | 2.8 MB | 4 Dec |
| | sf_vmshare 🔺 | | | texa9-linux-gnueabi-gcc texa9-linux-gnueabi-gcc-4.8.3 | | | 2.8 MB 2.8 MB | 4 Dec 4 Dec |
| + | Other Locations | | | exa9-linux-gnueabi-gcc-ar exa9-linux-gnueabi-gcc-nm | | | 151.2 kB 150.9 kB | |
| | | | arm-corl | exa9-linux-gnueabi-gcc-ranlib | | | 150.9 kB | 4 Dec |
| | | 1.15 | | | | | | All Files 🔻 |
| | | | | | | | Cancel | Open |

Click "Open" "ABI:"

Select "arm-linux-generic-elf-32bit" (if not automatically pre-selected)

• The configuration portion of the screen should look similar to:

| Options | | |
|------------------|--|-------------|
| Filter | Build & Run | |
| Environment | General Kits Qt Versions Compilers Debuggers Qbs CMake | |
| Text Editor | Name Type | Add * |
| 🕌 FakeVim | ▼ Auto-detected ▼ C++ | Clone |
| Help | GCC (C++, x88 64bit in /usr/bin) GCC GCC (C++, x88 54bit in /usr/bin) GCC | Remove |
| {} c++ | C CCC (C, X86 64bit in /usr/bin) GCC | |
| 🗸 Qt Quick | CCC (c, x86 32bit in /usr/bin) CCC | |
| 🕔 Build & Run | C++ | |
| Debugger | | |
| 💢 Designer | | |
| Analyzer | Name: ARM-GCC | |
| Version Control | Compiler path: /opt/OSELAS.Toolchain-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-gcc Browse | |
| Devices | Platform codegen flags: | |
| 🚰 Code Pasting | Platform linker flags: ABI: arm-linux-generic-elf-32bit - arm - linux - generic - elf - 32bit - | |
| QA Test Settings | AB: arm-linux-genericelf-32bit • elf - 32bit - | |
| | | |
| | | <u>√о</u> к |



• Repeat the above steps for $GCC \rightarrow C++$

| Ø Options | | |
|------------------|--|---|
| Filter | Build & Run | |
| Environment | General Kits Qt Versions Compilers Debuggers Qbs CMake | |
| Text Editor | Name Type Add | 1 |
| FakeVim | Auto-detected Clone | |
| Help | CCC (C++, x86 debit in /usr/bin) CCC CCC (C++, x86 zebit in /usr/bin) CCC Remove | |
| {} c++ | ▼ c | |
| Qt Quick | GCC (c, x86 4bli in /usr/bin) GCC GCC (c, x86 52bli in /usr/bin) GCC | |
| Build & Run | ▼ Manual ▼ C++ | |
| | | |
| Debugger | 220 220 220 220 220 220 220 220 220 220 | |
| 💢 Designer | | |
| Analyzer | Name: ARM-5CC | |
| Version Control | Compiler path: //op/OSELAS.Toolchaim-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-gcc Browse | |
| Devices | anne parte parte and an anne anne anne anne anne anne a | |
| Code Pasting | Platform line gen may - | |
| QA Test Settings | ABL: arm-inux-genericelf-32bit • arm - linux generice - elf 32bit - | |
| | Bor January Aleieur Jean Janu | |
| | | |
| | | |
| | d Apply X cancel d QK | |
| | | |

• Click "Apply"



Debugger

- Select the "Debuggers" tab
- Click "Add"
- Populate the fields as illustrated
 - "Name:" 3Dxx Target Debugger
 - "Path:" Click "Browse..." and navigate to the desired file (should be previous directory) /opt/OSELAS.Toolchain-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-gcc

| 😣 Choose E | xecutable | | |
|-------------|---|--------------------|----------------|
| 🔿 Recent | 📢 🖸 opt OSELAS.Toolchain-2013.12.3 arm-cortexa9-linux-gnueabi gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sa | nitized | bin 🕨 |
| 🔂 Home | Name | Size | Modified |
| 🛅 Desktop | ♦ arm-cortexa9-linux-gnueabi-gcc | 2.8 MB | 4 Dec |
| Documen | arm-cortexa9-linux-gnueabi-gcc-4.8.3 arm-cortexa9-linux-gnueabi-gcc-ar | 2.8 MB 151.2 kB | 4 Dec 4 Dec |
| 🕹 Download | | 150.9 kB | |
| J Music | ♦ arm-cortexa9-linux-gnueabi-gcc-ranlib ♦ arm-cortexa9-linux-gnueabi-gcov | 150.9 kB 1.6 MB | 4 Dec 4 Dec |
| Pictures | 🔹 arm-cortexa9-linux-gnueabi-gdb | 25.8 MB | 4 Dec |
| Videos | arm-cortexa9-linux-gnueabi-gprof arm-cortexa9-linux-gnueabi-ld | 4.7 MB 5.8 MB | 4 Dec 4 Dec |
| 🔳 sf_vmshar | e 📤 🗇 arm-cortexa9-linux-gnueabi-ld.bfd | 5.8 MB | 4 Dec 4 Dec |
| + Other Loc | arm-cortexa9-linux-gnueabi-nm ations 🗇 arm-cortexa9-linux-gnueabi-objcopy | 4.2 MB 5.2 MB | 4 Dec 4 Dec |
| | arm-cortexa9-linux-gnueabi-objdump arm-cortexa9-linux-gnueabi-ranlib | 6.0 MB | 4 Dec |
| | | | All Files 🔻 |
| | Ca | ncel | Open |

• Click "Open"; the configuration portion of the screen should look similar to

| 8 Options | | |
|------------------|---|------------|
| Filter | Build & Run | |
| Environment | General Kits Qt Versions Compilers Debuggers Qbs CMake | |
| Text Editor | | Add |
| 🔏 FakeVim | Auto-detected System CDB at /usr/bin/gdb /usr/bin/gdb | Clone |
| B Help | * Mapual | Remov |
| () c++ | | |
| 📣 Qt Quick | | |
| 🚯 Build & Run | | |
| Debugger | | |
| 🗶 Designer | 4 | |
| Analyzer | | |
| Version Control | Name: 3Dxx Target Debugger | |
| Devices | Path: /opt/OSELAS.Toolchain-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-gdb Browse | |
| Code Pasting | Type: CDB | |
| QA Test Settings | ABIs: arm-linux-generic-elf-32bit | |
| | Version: 7.6.1 | |
| | Working directory: Browse | |
| | | |
| | ¥ ⊆ance | √ 0 |

• Click "Apply"

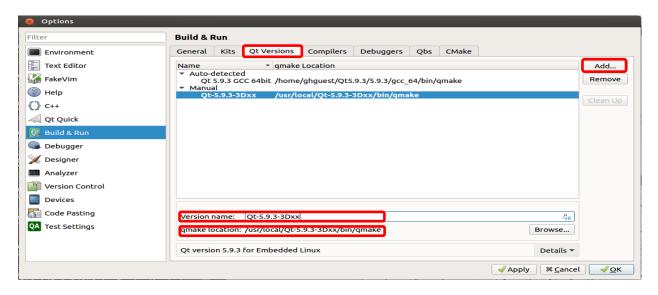


qmake

- Select the "Qt Versions" tab
- Click "Add" (Select a qmake Executable dialog box appears, still referencing the last path)
- Navigate to the qmake version associated with the library (e.g. "/usr/local/Qt-5.9.3-3Dxx/bin/qmake"

| 8 | Select a qmake | Exec | utal | ble | | | | | | | |
|---------|-----------------|------|------|-----|-------|---------------|-----|---|----|---------|----------|
| \odot | Recent | • | 9 | usr | local | Qt-5.9.3-3Dxx | bin | ► | | | |
| ۵ | Home | Nar | ne | | | | | | | Size | Modified |
| | Desktop | - | qma | ake | | | | | | 35.3 MB | 10:49 |
| D | Documents | | | | | | | | | | |
| ∻ | Downloads | | | | | | | | | | |
| 99 | Music | | | | | | | | | | |
| ø | Pictures | | | | | | | | | | |
| | Videos | | | | | | | | | | |
| | sf_vmshare 📤 | | | | | | | | | | |
| + | Other Locations | | | | | | | | | | |
| | | | | | | | | | | | |
| | 1 | | | | | | | | | | qmake 🔻 |
| | | | | | | | | | Ca | ncel | Open |

- Click "Open"
- Update "Version name:" to "Qt-5.9.3-3Dxx"





Kit

- Select the "Kits" tab
- Click "Add"
- Populate the fields as illustrated

"Name:" Qt-5.9.3-3Dxx "Device type:" Select "Generic Linux Device" from the pick list N.B. Automatically updates Device "Sysroot": Click "Browse..." and navigate to desired path /home/ghguest/GrayhillDisplayPlatform/sysroot-target

| 😣 Choose Directo | ту | | | |
|-------------------|--|---|-------|----------------|
| ⊘ Recent | GrayhillDisplayPlatform sysroot-target | Þ | | 5 |
| 🔂 Home | Name | | Size | Modified |
| 🖿 Desktop | include | | | 8 Dec |
| Documents | kernel-headers | | | 8 Dec 8 Dec |
| 🕹 Downloads | | | | 8 Dec |
| J Music | | | | |
| Pictures | | | | |
| ► Videos | | | | |
| 🔳 sf_vmshare 🔺 | | | | |
| + Other Locations | | | | |
| | | | | |
| | | | | All Files 🔻 |
| | | C | ancel | Open |
| | | | | |

Click "Open""Compiler:C:" Select "ARM-GCC" from the pick list"Compiler:C++:" Select "ARM-G++" from the pick list"Debugger:"Select "3Dxx Target Debugger" from the pick list"Qt version:"Select "Qt-5.9.3-3Dxx" from the pick list

N.B. The selected names match those used when creating the various kit sub-components



| ilter | Build & Run | | |
|---------------------------------------|---|--|-------------|
| Environment | General Kits Qt Versio | ns Compilers Debuggers Qbs CMake | |
| Text Editor | Name | | Add |
| | Auto-detected Desktop Ot 5.9.3 G | CC 64bit (default) | Clone |
| Help | ✓ Manual | | Remove |
| } c++ | @ Qt-5.9.5-5DXX | | Make Defaul |
| Qt Quick | | | |
| 🗸 Quild & Run | Name: | Qt-5.9.3-3Dxx | Q |
| Debugger | File system name: | | |
| 🖉 Designer | Device type: | Generic Linux Device 👻 | j |
| Analyzer | Device: | 3Dxx Target (default for Generic Linux) 👻 | Manage |
| Version Control | Sysroot: | /home/ghguest/GrayhillDisplayPlatform/sysroot-target | Browse |
| Devices | Comellon | C: ARM-GCC | |
| Code Pasting | Compiler: | C++: ARM-GCC | Manage |
| A Test Settings | Environment: | No changes to apply. | Change |
| · · · · · · · · · · · · · · · · · · · | Debugger: | 3Dxx Target Debugger | Manage |
| | Qt version: | Qt 5.9.3 GCC 64bit 👻 | Manage |
| | Qt mkspec: | |] |
| | CMake Tool: | | Manage |
| | CMake generator: | <none> - <none>, Platform: <none>, Toolset: <none></none></none></none></none> | Change |
| | CMake Configuration | CMAKE_CXX_COMPILER:STRING=%{Compiler:Executable:Cxx}; CMA | Change |
| | Additional Qbs Profile Setti | ings | Change |

- Verify contents are correct
- Click "OK"

Now that a Qt kit is configured; it is possible to develop, build, test, debug, run and enjoy Qt applications.



Appendix B: Configuring a 3Dxx Project

Note: This appendix is included for reference and is not a required installation step; Grayhill automatically configures the project as part of the support file installation.

If not already running, launch Qt Creator. (See Build and Run 3Dxx Embedded Application)

Open the gh7indemo project from "Qt Creator" main window click on "Open Project" button.

N.B. If present. a previous project can be opened by clicking on the project name listed below "Recent Projects".

| <mark>⊗⊜</mark> ∎ g | h7indemo - Qt | Creator | | |
|---------------------------|-----------------------------|-----------------------------|---------------------------------|---|
| <u>F</u> ile <u>E</u> dit | <u>B</u> uild <u>D</u> ebug | <u>A</u> nalyze <u>T</u> oo | ols <u>W</u> indow <u>H</u> elp | |
| | | | | |
| Welcome | Projects | | + New Project | Dpen Project |
| Edit | Examples | | Sessions | Recent Projects |
| Design | Tutorials | | 1 D default (current session | n) 1 g h7indemo ~/gh7indemo/gh7indemo.pro |



- An "Open File" dialog window will appear
- Navigate to the 3Dxx Demo project's ".pro" file as shown in the example below;

| 8 | Open File | | | |
|---------|-----------------|--|---------------------|-----------------|
| \odot | Recent | Image: Second state in the second state in the second state is a second state in the | | |
| 仚 | Home | Name 🔺 | Size | Modified |
| | Desktop | content | | Mon |
| D | Documents | images | 2.1 kB | Mon 14:14 |
| ∻ | Downloads | gh7indemo.pro samegame.gmlproject | 2.1 KB 309 bytes | 14-14 15 Feb |
| 99 | Music | | | |
| ø | Pictures | | | |
| × | Videos | | | |
| | sf_vmshare 📤 | | | |
| + | Other Locations | | | |
| | | | | |
| | | All Project | s | • |
| | | | Cancel | Open |

- Click "Open"
- If the "*project*.pro.user" file is missing, which is normal if the project has never been opened before, a "Configure Project" dialog appears. If this dialog doesn't appear, proceed to where the "Projects" icon is selected.
- If the "Configure Project" dialog appears

| 800 | 🧔 🗐 gh7indemo - Qt Creator | | | | | | | |
|---------------------------|--|------------------|---|------------------|--------------------|--------------------|----------------|---------|
| <u>F</u> ile <u>E</u> dit | <u>B</u> uild <u>D</u> ebug <u>A</u> nalyze <u>T</u> ools <u>W</u> ind | low <u>H</u> elp | | | | | | |
| | | | | | | | | |
| Welcome | Manage Kits | 1 | Configure Project | | | | | |
| E | Import Existing Build | | Qt Creator can use the following k | | mo: | | | |
| Edit | | | The project gh7indemo is not yet of Qt Creator uses the kit Qt-5.9.3-3 | | :t. | | | |
| Design | Active Project | | Select all kits | | | | | |
| N Debug | gh7indemo 👻 | | 🗌 🖵 Desktop Qt 5.9.3 GCC 64bi | t | | | Details 🔻 | |
| p | Build & Run | | ✓ 🖵 Qt-5.9.3-3Dxx | | | | Details 🔻 | |
| Projects | Desktop Qt 5.9.3 GCC 64bit Ot-5.9.3-3Dxx | | Import Build From | | | | Details 🔻 | |
| Help | Project Settings | | | | | | | |
| gh7indemo | | | | | | Config | ure Project | |
| Unconfigur | Editor Code Style | | | | | | | |
| ed | Dependencies | | | | | | | |
| | Clang Static Analyzer | | | | | | | |
| R ÎK | | | | | | | | |
| \nearrow | | | | | | | | |
| | P. Type to locate (Ctrl 1 Issue) | ies 2 Sear | ch Results 3 Application Output | 4 Compile Output | 5 Debugger Console | 6 General Messages | 8 Test Results | ÷ ^ 🛛 / |

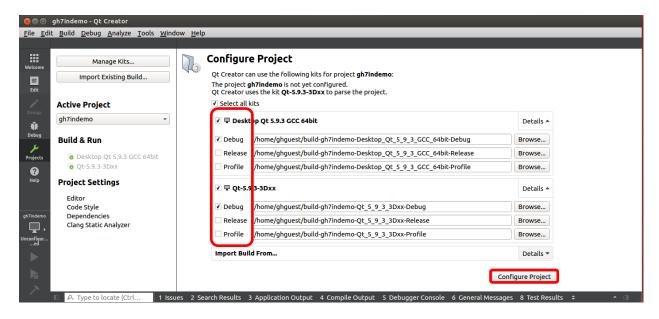


"Desktop Qt 5.9.3 GCC 64bit"

 Expand by clicking on "Details" Select "Debug" Unselect "Release" Unselect "Profile"

"Qt-5.9.3-3Dxx"

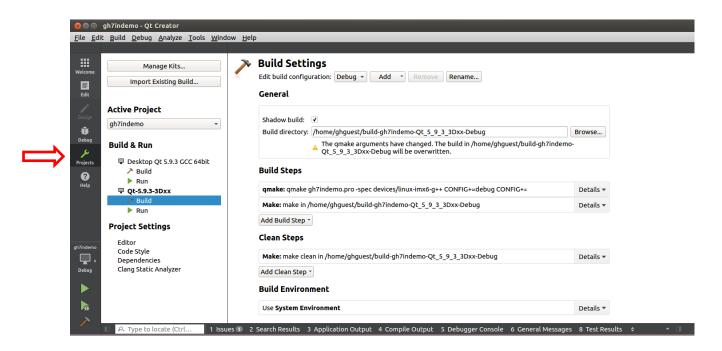
• Expand by clicking on "Details" Select "Debug" Unselect "Release" Unselect "Profile"



• Click "Configure Project"



• On the main "Qt Creator" window select "Projects"



- If the desired kit is not shown see Appendix A: Configuring a Manual Qt Kit for Grayhill Displays
- N.B. Clicking "Manage Kits" is the same as selecting "Tools \rightarrow Options"

"Active Project" is a drop down pick list with the active project shown.

"Build & Run" lists the available kits.

N.B. The selected kit is emphasized in **bold**. A kit (set of utilities) is how the project will be built, e.g. the main kit difference is the compiler as the Qt-5.9.3-3Dxx kit uses a cross compiler for the display.

N.B. Clicking on an actual kit name selects either Build or Run (depending on which one was previously selected)

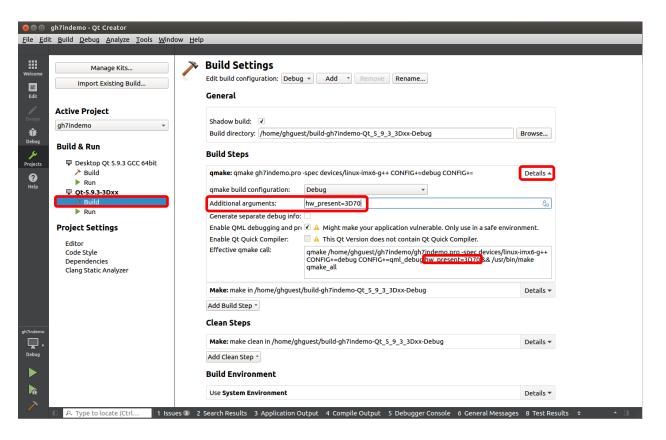


Build

This is a target (3Dxx Display) build example walk-through; select "Build".

- Expand the Details tab associated with qmake (under Build Steps)
- "Additional arguments" Enter "hw_present=3D70" N.B. This is a case sensitive field.

N.B. the parameter is automatically added to the "effective qmake call" command syntax. This field is configured based on the actual target hardware display size.





Run

- Select "Run"
- Deployment Method:

Method: Deploy to Remote Linux Host (should be defult) Files to deploy: Local File Path location of the local file(s) (auto-populated) Remote Directory location on the target (auto-populated)

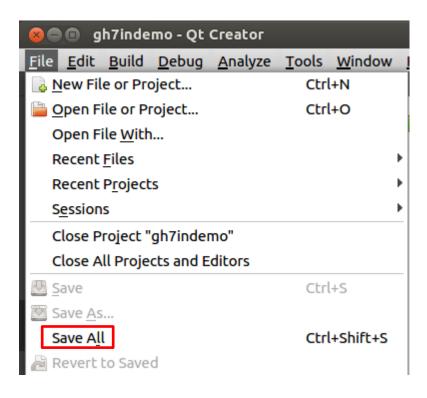
N.B. The file information may not be populated until after a build is done

- Expand " Details" for "Upload files via SFTP"
- N.B. On rare occasions Qt Creator thinks the files have been deployed and will not re-send the files to the target; disabling this functionality avoids the situation.
 - Make sure neither box is selected
 - Set "Working directory:" under Run to the directory associated with the "Executable on device:"
 - Enter "/home/demo7in" in the box

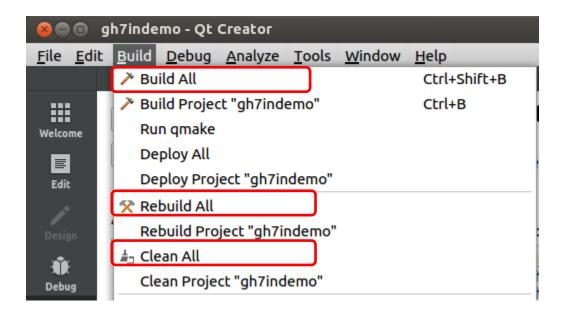
| 😣 🖻 💷 gh7indemo - Qt Creator | | |
|---|--|------------|
| <u>File Edit Build Debug Analyze Tools Wind</u> | low <u>H</u> elp | |
| Manage Kits Import Existing Build Active Project | Run Settings Deployment Method: Deploy to Remote Linux Host Time to be | |
| Design gh7indemo 👻 | Files to deploy: Local File Path Remote Directory | |
| Image: Second state Second state Debug Build & Run Projects Image: Desktop Qt 5.9.3 GCC 64bit | /home/ghguest/gh7indemo/images /home/ghguest/build-gh7indemo-Qt_5_9_3_3Dxx-Debug/gh7indemo /home/demo7in | |
| 2 >> Build | Check for free disk space Details * | |
| Help P Qt-5.9.3-3Dxx | Upload files via SFTP | |
| <u>→ Build</u> | | |
| 🕨 Run | gnore missing files | |
| Project Settings | Add Deploy Step * | |
| Editor Code Style | Add Deptoy Scep * | |
| Dependencies | Run | |
| Clang Static Analyzer | Run configuration: gh7indemo (on Remote Device) v Add Remove Rename | |
| | Executable on host: //home/ahquest/build-ah7indemo-Qt 5 9 3 3Dxx-Debua/ah7indemo | |
| n7indemo | Executable on device: /home/demo7in/gh7indemo | |
| ¬ , | Alternate executable on device: | |
| Debug | Arguments: | |
| | Working directory: /home/demo7in | |
| | | |
| | Debuager Settings | |
| P. Type to locate (Ctrl 1 Issu | Distribution of the second sec | ^ [|



• **Save!** File \rightarrow Save All



• Build the image for the target

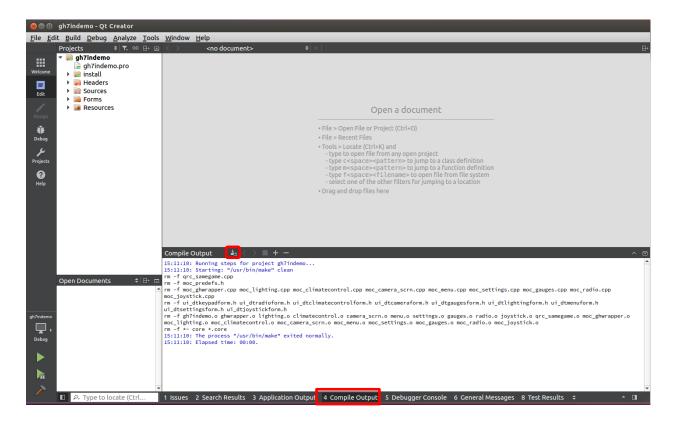


- Build Let Qt Creator decide what is out of date
- Rebuild Force Qt creator to re-compile everything
- Clean Remove all the existing artifacts generated by previous builds



• Select "Clean Project "gh7indemo""

The bottom ribbon of Qt Creator has various panes (views) that can be examined. Click on "4 Compile Output). Note: image is shown post click; so the results and actions of the clean are shown.



Click on the paintbrush icon to clear the contents



• Next, select Build → Build Project "gh7indemo"

The following illustrates the last few lines in "Compile Output"

| <pre>glibc-2.18-binutils-2.24-kernel-3.12-sanitized/sysroot-arm-cortexa9-linux-gnueabi/usr/include/gh7indemo/joystick.h -o moc_joystick.cpp /pt/OSELAS.Toolchain-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-ge+ /-o-pipe -march=armv7-a -mfpurencon-DLINX=1_DEGL_API_F8-1 = M+no-psabi -O UJ_OPENGL_FIDERC_DEFINES -mfloat-abisoftfp -g =std=gnu+11 -Wall -W - D_REENTRANT -fPIC -DOM_HARDWARE -DQT_QML_DEBUG -DQT_QUTCK_LIB -DQT_WIDGETS_LIB -DQT_GUI_LIB -DQT_QML_LIB -DQT_NETWORK_LIB -OQT_CORE_LIB -I/gh7indemo -TI/gh7indemo -I/home/ghguest/(rayhillDisplayPlatform/sysroot-target/kernel-headers/include -I/home/ghguest/(rayhillDisplayPlatform/sysroot- target/usr/include -I/usr/local/Qt-5.9.3-3Dxx/include/Qtum/include/QtQtwt -I/usr/local/Qt-5.9.3-3Dxx/include/QtWidgets -I/usr/ local/Qt-5.9.3-3Dxx/include/QtGui -I/usr/local/Qt-5.9.3-3Dxx/include/Qtum/include/QtWnetwork -I/usr/local/Qt-5.9.3-3Dxx/ include/QtCore -III/home/ghguest/imx6_3d104/Grayhill-iMX6/platform-3D50_std/sysroot-target/include -I/home/ghguest/imx6_3d104/Grayhill-iMX6/ platform-3D50_std/sysroot-target/usr/local/Qt-5.9.3-3Dxx/mkspecs/devices/linux-imx6-g++ -o moc_joystick.cpp /opt/OSELAS.Toolchain-2013.12.3/arm-cortexa9-linux-gnueabi/gcc-4.8.3-glibc-2.18-binutils-2.24-kernel-3.12-sanitized/bin/arm-cortexa9-linux-gnueabi-g++ Wl,-rpath-/home/ghguest/imx6_3d104/Grayhill-iMX6/platform-3D50_std/sysroot-target/lib</pre> |
|--|
|--|

Note: When there are errors, they are also highlighted/summarized in the "Issues" tab.

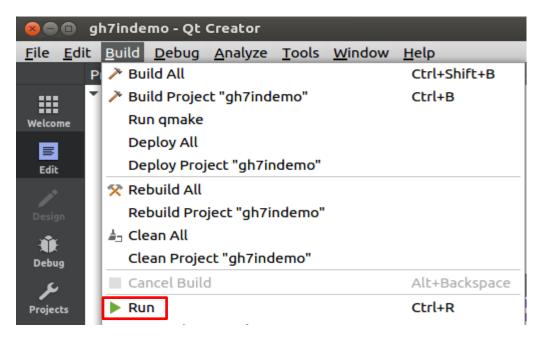
Deployment (running the compiled image on the target) can also be accomplished multiple ways

• Using the green triangle on the left hand side

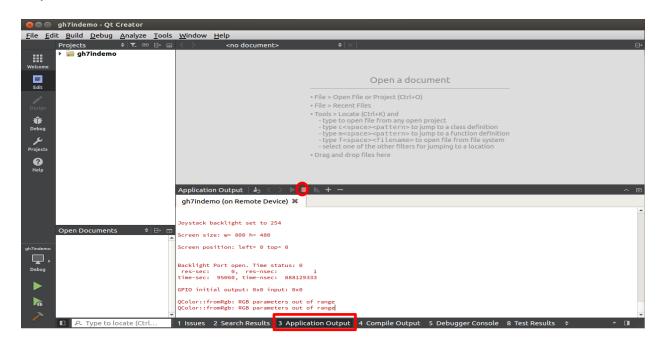
| gh7indemo - Qt Creator Edit Build Debug Analyze Tools Window Help | |
|---|---|
| | no document> |
| ▼ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ | Open a document |
| ome | File > Open File or Project (Ctrl+O) |
| 🕨 🕨 😥 Sources | • File > Recent Files |
| Porms Porms Porms Porns P | Tools - Locate (Ctrl+K) and type to open file from any open project type c<space>-pattern> to jump to a class definition</space> type m<space>-pattern> to jump to a function definition</space> type f<space>-cfilename> to open file from file system</space> select one of the other filters for jumping to a location |
| 15:25:46: Uploa 15:25:46: Uploa 15:25:46: Uploa 15:25:46: Uploa 15:25:46: Uploa 15:25:46: Uploa | <pre>t</pre> |
| Steme Open Documents Image: The state of the state o | <pre>dding file "/home/ghyquest/ghrindemo/images/NHZ_radio.png" dding file "/home/ghyquest/ghrindemo/images/NHZ_settings.png" dding file "/home/ghyquest/ghrindemo/images/NpentPiperSymphony.mp3" dding file "/home/ghyquest/ghrindemo/images/powerButch.png" dding file "/home/ghyquest/ghrindemo/images/RedAbbitAAvB.png" dding file "/home/ghyquest/ghrindemo/images/RedAbbitAAvB.sng"</pre> |
| 15:25:46: Uploa | dding file "/home/ghguest/gh7indemo/images/target467x467.png" dding file "/home/ghguest/build-gh7indemo-Qt_5_9_3_3Dxx-Debug/gh7indemo" fles successfully deployed. |
| 15:25:48: Elaps | y step finished. ed time: 00:05. |
| P. Type to locate (Ctrl 1 Issues 2 Sea | arch Results 3 Application Output 4 Compile Output 5 Debugger Console 6 General Messages 8 Test Results 💠 🔺 🗆 |



• From the Build menu



• Keyboard short-cut (see Run above - <Ctrl-r>)



Switch (by selecting) to the "Application Output" tab; this is where qDebug messages are output.

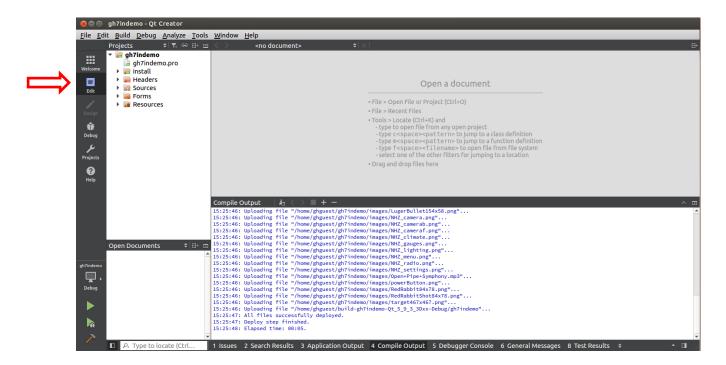
Click the red square to terminate the target session.



Appendix C: Debugging

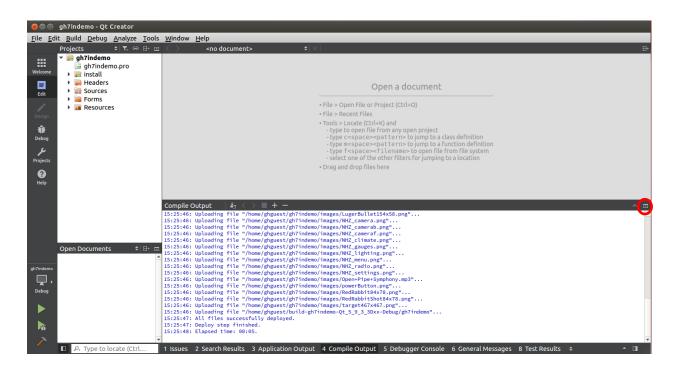
Let's face it; code never initially does what it is *supposed* to do; but rather what it was **told** to do! Luckily Qt Creator has a built-in debugger.

• First set a breakpoint Load gh7indemo Select the "Edit" view Expand contents of gh7indemo

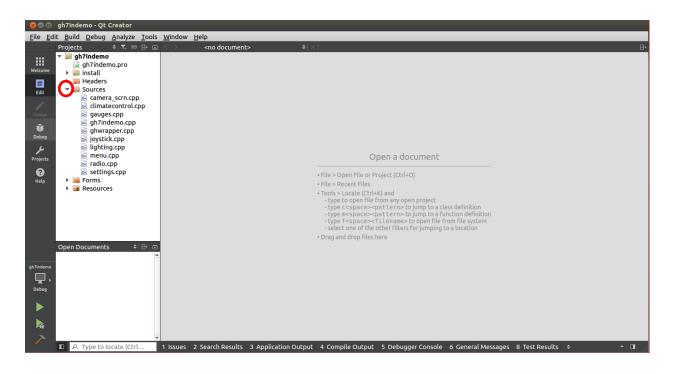




• Close the "Compile Output" pane

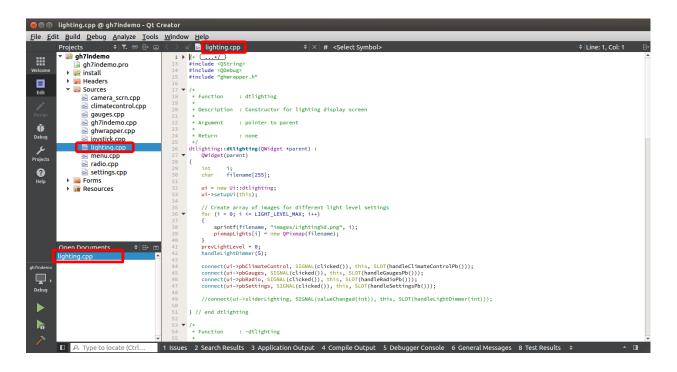


• Expand the "Source" folder under the project file list





• Select the desired file; under "Sources" select "lighting.cpp" by double clicking

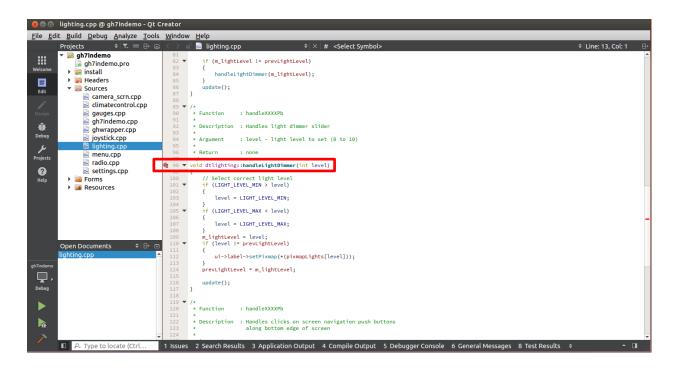




The file being displayed (edited) is shown in the "Open Documents" section as well as on the top of the editor pane. Additional open files can be selected by either selecting them from "Open Documents" or the up/down triangular arrows to the right of the file name. Also, the X to their right will close the file.

Select the line of code to set the breakpoint. N.B. The editor is not context aware; so it is possible to set a breakpoint on a commented out line.

- Scroll down to line 98 ("void dtlighting::handleLightDimmer (int level)")
- Left click on the mouse to the left of the line number; a red circle will appear

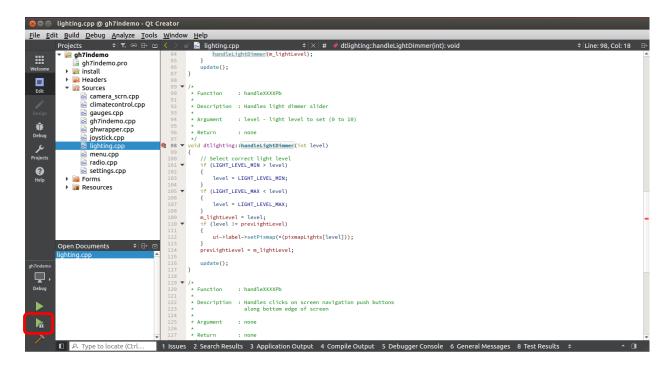


- Also notice in the scroll bar gutter, the indication of where the breakpoint is in relation to the file.
- Save



• Click on the green arrow like "Run" from above; but with the homely lady bug.

N.B. This may cause the project to be re-compiled if the initial build was not configured for debug.



The code begins execution and quickly hits the breakpoint.

Note that the display has not been updated yet. The method (handleLightDimmer) is invoked during the class creation – line 42 handleLightDimmer(5);.

Lastly, note the breakpoint is actually at line 101; the first executable statement within the function/method.



| ×00 | lighting.cpp @ gh7inden | no - Ot C | reator | | | | | | | | | | |
|--|--|------------|--|--|--|--|------------------|-----------------|-----------------------|--------------------|-----------------|---------------|---------------|
| File Edit Build Debug Analyze Tools Window Help | | | | | | | | | | | | | |
| | | ∍ ⊞+ ⊡ | | 🗈 🗟 lighting | .cpp | \$ × # | dtlighting::hand | lleLightDimmer(| int): void 🗢 Line: 10 | 1, Col: 5 🛛 🕀+ | Name | Value | Туре |
| Welcome Edit Design Debug Projects Welp | iii gh7indemo.pro iii gh7indemo.pro iiii headers iiii Headers iiii cources camera_scrn.cp climatecontrol gauges.cpp gh7indemo.cpi gh7indemo.cpi gh7indemo.cpi gystick.cpp iiighting.cpp radio.cpp radio.cpp Forms iiii Resources | op copp | 81 82 ▼ 88 84 85 86 87 99 91 92 93 94 95 96 97 95 96 97 98 99 90 91 92 92 93 93 94 95 96 97 97 98 90 91 92 92 93 94 95 96 96 91 91 92 92 93 94 95 96 96 91 91 92 92 93 94 95 96 96 91 92 92 93 94 95 96 96 91 92 92 93 94 95 96 96 91 92 92 93 94 95 96 96 91 92 92 93 96 97 97 96 97 97 97 98 97 97 98 97 97 98 97 90 91 92 93 96 97 91 92 92 93 96 97 91 92 92 93 94 95 96 96 97 97 97 98 97 97 98 97 97 98 97 97 98 97 98 97 97 98 97 97 98 97 97 98 97 97 98 97 97 97 98 97 97 98 97 97 98 97 97 98 97 97 98 97 97 98 97 97 98 97 97 98 97 97 97 97 97 97 97 97 97 97 97 97 97 | <pre>if (m_Li) { hand y update() } /* * Function * Descripti * * Argument * * // Selec f (LIGH { leve j (LIGH { leve m.lightl </pre> | <pre>ghtLevel != pr leLightDimmer(;</pre> | evLightLevel) m_lightLevel); XXPb light dimmer slider light level to set o htDimmer(int level) t level level) L_MIN; level) L_MAX; | | | my, voig * Line. 10 | | level ► this | | int |
| | lighting.cpp | A | Debugg | | | 41 🖉 🖒 🗉 🛛 Threa | ds: #1 🗢 | | topped at breakpoint | | | | <u>V</u> iews |
| gh7indemo | | | | Function dtlighting:: | File | Line 101 | | Number 3 | | File ighting.cp | Line | Addro 0x18 | |
| Debug | | | 2 3 | dtlighting: | lighting.cpp lighting.cpp ghwrapper gh7indemo | 42 . 257 | | • 3 | Immer(int) | ignting.cp | p 101 | 0x18 | 220 |
| | ■ P. Type to locate (Ct | rl | 1 Issues | 2 Search R | esults 3 App | lication Output 4 C | ompile Output 5 | Debugger Cons | ole 6 General Mess | ages 8 Test | Results | \$ | • II // |

• The debugger pane illustrates the calling tree

| Debugger | | Threads: #1 | • |
|------------|--|--|------------------------|
| Level Fund | tion | File | Line |
| 2 dtlig | hting::handleLightDimmer(int) hting::dtlighting(QWidget *) /rapper::GHwrapper(QStackedWidget *)) | lighting.cpp lighting.cpp ghwrapper.cpp gh7indemo.cpp | 101 42 257 38 |

- Clicking on line 2 jumps to the aforementioned caller
- Debugger stepping option menu



The debugger features the usual (Mouse over the icons for a description)

- \circ Step Over <F10>
- \circ Step In $\langle F11 \rangle$
- Step Out >Shift>+<F11>



Appendix D: Build and Run 3Dxx Desktop Application

Select "Projects"

| See a gh7indemo.pro @ gh7indemo - Qt Creator | | | | | | | | |
|---|--|--|------------------|------------|--|--|--|--|
| Eile Edit Build Debug Analyze Tools Mundow Help | | | | | | | | |
| | | | | | | | | |
| Welcome | Manage Kits | Run Settings | | | | | | |
| E | Import Existing Build | Deployment | | | | | | |
| Edit | | Method: Deploy to Remote Linux Host - Add - Remove Rename | | | | | | |
| Design | Active Project | Files to deploy: | | | | | | |
| ŵ | gh7indemo 👻 | Local File Path Remote Directory | | | | | | |
| Debuo Je | Build & Run | /home/ghguest/gh7indemo/images /home/demo7in /home/ghguest/build-gh7indemo-Qt_5_9_3_3Dxx-Debug/gh7indemo /home/demo7in | | | | | | |
| Projects | Desktop Qt 5.9.3 GCC 64bit Build Run | Check for free disk space | Details 🔻 | | | | | |
| Help | Qt-5.9.3-3Dxx | Upload files via SFTP | Details 👻 | | | | | |
| | ➢ Build ■ Run | | | | | | | |
| | | | | | | | | |
| | Project Settings Run | | | | | | | |
| | Editor Code Style Dependencies | Remove Rename | | | | | | |
| | Clang Static Analyzer | Executable on host: /home/ghguest/build-gh7indemo-Qt_5_9_3_3Dxx-Debug/gh7indemo Executable on device: /home/demo7in/gh7indemo | 0 | | | | | |
| | | Alternate executable on device: | d instead | | | | | |
| | | Arguments: | | | | | | |
| gh7indemo | | Working directory: /home/demo7in | | | | | | |
| | | | | | | | | |
| Debug | | | | | | | | |
| | | Debugger Settings | | | | | | |
| | | ✓ Enable C++ | | | | | | |
| | | Enable QML <u>What are the prerequisites?</u> | | , | | | | |
| · · · · | ■ P. Type to locate (Ctrl 1 Issu | es 2 Search Results 3 Application Output 4 Compile Output 5 Debugger Console 6 General Messages | 8 Test Results 💠 | ▲ □ | | | | |



Select Desktop Kit (Desktop Qt 5.9.3 GCC 64bit)

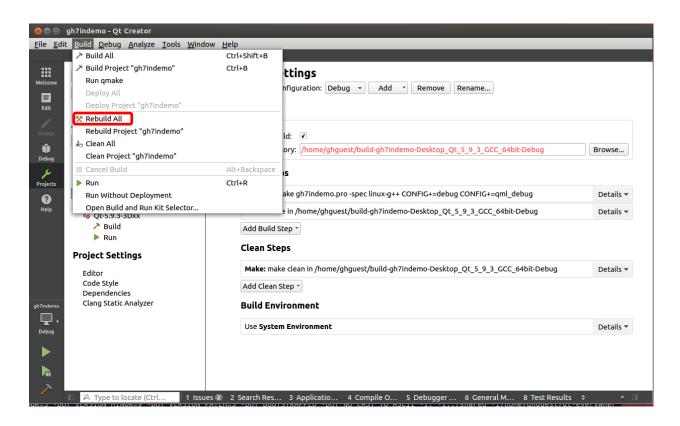
| See a gh7indemo - Qt Creator | | | | | | | |
|---|--|--------|---|-----------|--|--|--|
| <u>File Edit Build D</u> ebug <u>A</u> nalyze <u>T</u> ools <u>W</u> indow <u>H</u> elp | | | | | | | |
| Welcome | Manage Kits Import Existing Build | ~ | | | | | |
| Design | Active Project gh7indemo + | | Shadow build: Build directory: //home/ghguest/build-gh7indemo-Desktop Qt 5 9 3 GCC 64bit-Debug | Browse | | | |
| Debug Projects | Build & Run Build & Run Build | | Build Steps | | | | |
| ? | n Build | | qmake: qmake gh7indemo.pro -spec linux-g++ CONFIG+=debug CONFIG+=qml_debug | Details 👻 | | | |
| Help | Run Qt-5.9.3-3Dxx | | Make: make in /home/ghguest/build-gh7indemo-Desktop_Qt_5_9_3_GCC_64bit-Debug | Details 👻 | | | |
| | Build | | Add Build Step - | | | | |
| | ► Run | | Add Build Step | | | | |
| | Project Settings | | Clean Steps | | | | |
| | Editor | | Make: make clean in /home/ghguest/build-gh7indemo-Desktop_Qt_5_9_3_GCC_64bit-Debug | Details 🔻 | | | |
| | Code Style | | Add Clean Step - | | | | |
| gh7indemo | Dependencies Clang Static Analyzer | | Build Environment | | | | |
| Debug | | | Use System Environment | Details 🔻 | | | |
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| | P. Type to locate (Ctrl 1 Issu | es z 2 | Search Res 3 Applicatio 4 Compile O 5 Debugger 6 General M 8 Test Results 💠 | <u> </u> | | | |

N.B. Selecting "Desktop Qt 5.9.3 GCC 64bit" highlights either "Build" or "Run" depending on which action was previously selected.



Select "Rebuild All" from the "Build" menu

N.B. It may take a few seconds to refresh the menu options.



Click on the "Compile Output" and "Issues" selectors on the bottom of the Qt Creator window to check for error messages and problems.

The desktop version can now be run by clicking on the big green "Run" arrow on the lower left corner of the Qt Creator window.

Click on the "Application Output" item on the bottom row to view application output.

Click on red square on "Application Output" window to stop application.



Appendix E: Build and Run QML Demonstration Program

The following steps illustrate how to build and run the QML demonstration program "Samegame".

- From Qt Creator open the "samegame" project. (Select "Welcome" to go to home screen)
- Select desired kit
- Update "Additional arguments": under "Build Steps" "Details" to reflect the proper hardware
- Select "Build->Rebuild All" to build program
- Click on the green arrow "Run" button to run program



Appendix F: Setting up a 3Dxx Qt Program to Run at Boot Up

This section describes how to configure a program to automatically execute at boot up.

- Open a terminal window on the target
- Create a launch script for the desired application
 - o cd /etc/init.d
 - o echo <mark>"#! /bin/sh −l</mark>
 - o cd /home/demo7in
 - /home/demo7in/gh7indemo &" > launchQtApp *spawn application process*
 - cat launchQtApp
 - o chmod 755 launchQtApp

Explanation set into proper directory treat as login (runs profile) set directory for images spawn application process

verify contents make script executable

| COM1 serial port to target | |
|--|--|
| | |
| <pre>root@ghiimx6:~ cd /etc/init.d root@ghiimx6:/etc/init.d echo "#! /bin/sh -1 >cd /home/demo7in >/home/demo7in/gh7indemo &" > launchQtApp root@ghiimx6:/etc/init.d cat launchQtApp #! /bin/sh -1 cd /home/demo7in /home/demo7in/gh7indemo & root@ghiimx6:/etc/init.d chmod 755 launchQtApp root@ghiimx6:/etc/init.d _</pre> | |

- Create a link to the launch script created above
 - o cd /etc/rc.d
 - ln –s /etc/init.d/launchQtApp S12qtApp
 - o ls −l S12qtApp

set into proper directory create soft link to executable file verify link creation

| COM1 serial port to target | | |
|---|---|--|
| root@ghiimx6:~ cd /etc/init.d | | |
| root@ghiimx6:/etc/init.d echo "#! /bin/ | /sh -l | |
| >cd /home/demo7in | | |
| >/home/demo7in/gh7indemo &" > launchQt | | |
| root@ghiimx6:/etc/init.d cat launchQtAp | PP | |
| #! /bin/sh -l | | |
| cd /home/demo7in | | |
| /home/demo7in/gh7indemo & | | |
| root@ghiimx6:/etc/init.d chmod 755 laum | nchQtApp | |
| root@ghiimx6:/etc/init.d cd /etc/rc.d | | |
| root@ghiimx6:/etc/rc.d ln −s /etc/init. | .d/launchQtApp S12qtApp | |
| root@ghiimx6:/etc/rc.d ls -l S12qtApp | | |
| lrwxrwxrwx 1 root root | 23 Jan 18 13:02 S12qtApp -> /etc/init.d/launchQtApp | |
| root@ghiimx6:/etc/rc.d 🗧 | | |
| | | |

Note: Do not try to launch multiple Qt applications at boot up or try to launch the ghvehicleapp application along with a Qt application as they will conflict with one another.

Note: When switching from running one application to another, even between Qt applications, it is a good idea to do a reboot of the 3Dxx Display in between to make sure that the hardware is properly reset. This can be done by entering the "reboot" command on the 3Dxx Display Linux console.



Appendix G: Interfacing 3Dxx Hardware from QT Software

The 3Dxx Display contains the following custom component interfaces:

- LCD
- LCD Backlight
- Camera driver
- CAN driver
- Digital I/O driver
- Analog Input driver (Model 3D70 only)
- Buzzer (Models 3D70, 3D2104)
- Audio Output (Model 3D70 only)

This section explains how to access the functionality of these components. The programming interfaces and provided API functions are covered, with the syntax and parameters defined. Sample code is also provided where appropriate.

<u>LCD</u>

The Grayhill 3Dxx Series Display uses a 16 bit per pixel LCD screen. The pixel dimensions of various 3Dxx Display products are shown in the section



Supported Hardware **Products**. The default orientation of the frame buffer is landscape mode (wider pixel dimension is in horizontal direction).

LCD Backlight

The LCD Backlight setting is a value between 0 (minimum) and 100 (maximum) inclusive. The brightness value can be set in the file /sys/class/backlight/pwm-backlight.0/brightness

Sample Code:

```
int value = 80;
QFile file("/sys/class/backlight/pwm-backlight.0/brightness");
if (file.open(QIODevice::WriteOnly | QIODevice::Text))
{
    QTextStream out(&file);
    out << value;
    file.close();
}
```

Camera Driver Interface

The Grayhill 3Dxx Display device can contain multiple camera inputs. NTSC and PAL format video inputs are supported by modifying the camera input sensor parameters. The camera output can be displayed on the LCD. The following camera display parameters can be modified:

- Window parameters window size and window position
- Color parameters brightness, contrast, saturation and hue
- Rotation
- Input sensor parameters provides support for NTSC and PAL formats
- Camera output to LCD foreground or background with color key

Camera output is displayed at 30fps. **Note:** Only one camera input can be active at a time.

Interface:

The Qt application can interface with the Camera driver using the Camera class.

Data Types:

```
typedef struct SENSORPARAMS // Must be set according to camera input
type
                             // NTSC
{
                                        PAL
    unsigned int top;
                             // 4
                                        5
                             // 0
    unsigned int left;
                                        4
                             // 480
   unsigned int height;
                                        567
    unsigned int width;
                            // 640
                                        640
} SENSORPARAMS, *PSENSORPARAMS;
#define FOREGROUND
                     (1)
```



```
// These are the only allowed values for VIDEO COLOR KEY xxx:
#define VIDEO COLOR KEY BLACK
                                  (0 \times 0 0 0 0 0 0 0 0)
#define VIDEO COLOR KEY RED
                                  (0 \times 00 FF 0 0 0 0)
#define VIDEO COLOR KEY GREEN
                                  (0 \times 0000 FF00)
#define VIDEO COLOR KEY BLUE
                                  (0x00000FF)
#define VIDEO COLOR KEY YELLOW (0x00FFFF00)
#define VIDEO COLOR KEY CYAN
                                  (0 \times 0000 FFFF)
#define VIDEO COLOR KEY MAGENTA (0x00FF00FF)
#define VIDEO COLOR KEY WHITE
                                  (OxOOFFFFFF)
typedef struct DISPLAYPARAMS
{
    unsigned int top;
                          // top left window y-coordinate
    unsigned int left;
                          // top left window x-coordinate
                          // (must be divisible by 4)
    unsigned int height; // window vertical size
    unsigned int width; // window horizontal size
                // NOTE: top + height must not exceed height of
display
                 // and left + width must not exceed display width
    unsigned int rotate; // 0-7, see below
                          // FOREGROUND or BACKGROUND +
    unsigned int fg;
VIDEO COLOR KEY XXX
} DISPLAYPARAMS, *PDISPLAYPARAMS;
```

The camera output always operates in native landscape mode. Use the following rotation values to support other display and camera orientations:

| Value | Rotation |
|----------|-------------------------------|
| 0 | No rotation |
| 1 | Vertical flip |
| 2 | Horizontal flip |
| 3 | 180 |
| 4 | 90 right |
| 5 | 90 right with vertical flip |
| 6 | 90 right with horizontal flip |
| 7 | 90 left |
| <u> </u> | |

| #define | HUE_CODE_ | 00 | (0x00) |
|---------|-----------|----|--------|
| #define | HUE CODE | 7F | (0x7F) |
| #define | HUE_CODE_ | 80 | (0x80) |

```
typedef struct _COLORPARAMS
{
    unsigned int brightness; // 0-255
    unsigned int saturation; // 0-255
    unsigned int hue; // HUE_CODE_00, HUE_CODE_7F, or
HUE_CODE_80
    unsigned int contrast; // 0-255
} COLORPARAMS, *PCOLORPARAMS;
```

Function Prototypes:

Camera::Camera

Camera class constructor

Syntax

Camera:: Camera (int camnum, int fbdev = FB_DEV_0);

Parameters

int camnum

[in]

Camera Number. Valid range 1-2 for Model 3D50, 1-3 for Model 3D70, 1-4 for Model 3D2104

#define FB_DEV_0 (0) // GRAPHICS being sent to /dev/fb0
#define FB_DEV_1 (1) // GRAPHICS being sent to /dev/fb1

#define FB_DEV_1 (1) // GRAPHICS being sent to /dev/fb1
int fbdev

ιI

[in]

The "fbdev" value must indicate whether the GRAPHICS are being sent to fb0 or fb1. When GRAPHICS are being sent to fb0, then video will be sent to fb1 and only foreground mode is allowed. This is the default assumed if "fbdev" is missing. If GRAPHICS are being sent to fb1, then video will be sent to fb0 and both

foreground and background modes are supported. In order to send GRAPHICS to fb1, add this parameter to the command line that launches Qt: -display LinuxFb:/dev/fb1

Return Value

none

Camera::setdisplayparams

Sets the following display window parameters

- origin
- window size
- rotation



• foreground or background with color key (When using background mode the camera video only shows through where the graphics data is set to the color that matches the specified color key. Graphics of any other color will appear on top of the camera video image.)

Syntax

int Camera::setdisplayparams(PDISPLAYPARAMS p);

Parameters

PDISPLAYPARAMS

p [in] refer to DISPLAYPARAMS structure

Return Value

int 0 indicates success, -1 indicates failure

Camera::setcolorparams

Sets the following camera color parameters

- Brightness
- Saturation
- Contrast
- Hue

Syntax

int Camera::setcolorparams(PCOLORPARAMS p);

Parameters

PCOLORPARAMS

refer to COLORPARAMS structure

Return Value

int 0 indicates success, -1 indicates failure

p [in]

Camera::setsensorparams

Sets the camera sensor parameters

Syntax

int Camera::setsensorparams(PSENSORPARAMS psensor);

Parameters

PSENSORPARAMS psensor [in] refer to SENSORPARAMS structure

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Return Value

int always returns 0

Camera::show

Enables or disables the camera

Syntax

int Camera::show(int enable);

Parameters

int enable [in] 1 = enable, 0 = disable

Return Value

int 0 indicates success, -1 indicates failure

Required Files:

Header File: camera.h Link Library : libghdrv.so

Sample Code:

```
#include "camera.h"
COLORPARAMS color;
DISPLAYPARAMS disp;
int cameranum = 1; // camera input 1
Camera cam(cameranum);
disp.top = 0;
disp.left
           = 80;
disp.height = 480;
disp.width = 640;
disp.rotate = 4;
                  // rotate 90 degree right
disp.fg = FOREGROUND;
// configure display parameters
cam.setdisplayparams(&disp);
// start camera
cam.show(1);
// change color parameters
```



color.brightness = 50; color.saturation = 128; color.contrast = 128; color.hue = 0; // configure color parameters cam.setcolorparams(&color);

. . . .

// stop l+camera
cam.show(0);



CAN Driver Interface

The 3D50 and 3D70 Displays includes two CAN controller modules. Available CAN ports are CAN1 and CAN2. The 3D2104 Display includes three CAN controller modules. Available CAN ports are CAN1, CAN2, and CAN3. The CAN controller supports both standard and extended frames.

Interface:

The Qt demo application can interface with the CAN bus driver using the CAN class.

Data Types:

```
/* special flag bits for the CAN_ID */
#define CAN_EFF_FLAG 0x80000000 /* EFF flag (add to ID to activate 29-bit ID) */
#define CAN_RTR_FLAG 0x40000000 /* remote transmission request */
#define CAN_ERR_FLAG 0x20000000 /* error frame */
struct _CANMSG
{
    unsigned int ID;
    unsigned int Length; // Data Length Code of the Msg (0..8)
    unsigned char Data[8];
};
typedef struct _CANMSG CANMSG, *PCANMSG;
```

Function Prototypes:

CAN::CAN

CAN class constructor

Syntax CAN::CAN(int num);

Parameters

int num [in] CAN Port Number. Valid range 1-2 for Models 3D50, 3D70; 1-3 for Model 3D2104

Return Value

none

CAN::OpenPort

Opens the CAN socket

Syntax



int CAN::OpenPort(void);

Parameters

none

Return Value

int non-zero value indicates success, -1 indicates failure

CAN::WritePort

Writes a single CAN frame to the CAN port.

Syntax

int CAN::WritePort(PCANMSG TxMsg);

Parameters

PCANMSG TxMsg [in] Contains the CAN frame to be written

Return Value

int 0 indicates success, -1 indicates failure

CAN::ReadPort

Attempts to read a single CAN frame from the CAN port. Note that the CAN socket is configured to be non-blocking, so calls to ReadPort will return even if there is no data.

Syntax

```
int CAN::ReadPort(PCANMSG RxMsg);
```

Parameters

PCANMSG RxMsg [out] Contains the CAN frame received

Return Value

int

contains the number of bytes read, -1 indicates failure

CAN::ClosePort

Closes the CAN socket

Syntax

```
void CAN::ClosePort(void);
```



Parameters

none

Return Value

none

Required Files:

Header File: can.h Link Library : libghdrv.so

Sample Code:

```
#include ``can.h"
CANMSG TxMsg;
CANMSG RxMsq;
int bytesread = 0;
int cannum = 1;
                 // CAN1
/* Init TX and RX message */
TxMsg.ID = 0x23;
TxMsq.Length = 8;
for (int i=0; i<8; i++)
     TxMsg.Data[i] = (0x11 * (i+1)); // fill random data
memset((void *)&RxMsg, 0, sizeof(CANMSG));
// CAN1
CAN can(cannum);
can.OpenPort();
can.WritePort(&TxMsg);
do
{
     bytesread = can.ReadPort(&RxMsg);
     // add delay
} while (bytesread != sizeof(CANMSG));
can.ClosePort();
```



Digital I/O Driver Interface

The Model 3D50 Display, Model 3D70 Display, and Model 3D2104 Display each have four digital inputs and four digital outputs, but they are configured differently and these differences will be explained. Each device uses the same library calls to read the digital inputs and set the digital outputs.

On the 3D50 Five Inch Display Pin 4 on its connector is a dedicated input only pin. Pin 5 is a dedicated output only pin. Pins 6, 7, and 8 are shared I/O pins that can be used to output a signal or input a signal.

On the Model 3D70 Seven Inch Display each of the four inputs are dedicated and so operate independently of any output pins.

On the Model 3D2104 10.4 Inch Display all digital output pins are shared I/O pins that can be used to output a signal or input a signal.

For a shared I/O pin to function as an input, the corresponding output must be set low.

| Model 3D50 Pins | Model 3D70 Pins | Model 3D2104 Pins |
|-----------------------------|------------------------------|------------------------------|
| Input 1 (Pin 4) | Input 1 (Pin 4 Connector A) | Input 1 or Output 1 (Pin 10) |
| Input 2 or Output 2 (Pin 6) | Input 2 (Pin 8 Connector B) | Input 2 or Output 2 (Pin 21) |
| Input 3 or Output 3 (Pin 7) | Input 3 (Pin 9 Connector B) | Input 3 or Output 3 (Pin 32) |
| Input 4 or Output 4 (Pin 8) | Input 4 (Pin 10 Connector B) | Input 4 or Output 4 (Pin 9) |
| Output 1 (Pin 5) | Output 1 (Pin11 Connector B) | |
| | Output 2 (Pin12 Connector B) | |
| | Output 3 (Pin13 Connector B) | |
| | Output 4 (Pin14 Connector B) | |

The following table summarizes all of the digital I/O pins for each model:

Interface:

A Qt application may set or get the digital I/O pin states by calling the appropriate C library function as described below.

```
#define GHIOLIB CH1
                         (0x01)
#define GHIOLIB CH2
                         (0x02)
#define GHIOLIB CH3
                         (0x03)
#define GHIOLIB CH4
                         (0 \times 04)
#define GHIOLIB MAX DIGITAL IO (4)
#define GHIOLIB DIG IN FLOAT
                               (0)
#define GHIOLIB DIG IN PULL DN (1)
#define GHIOLIB DIG IN PULL UP (2)
#define GHIOLIB RET OK
                               0
#define GHIOLIB RET ERROR
                               1
#define GHIOLIB_RET_NOTSUPPORTED 2
```

ghiolib_setDigIncfg (Model 3D70 only)



Sets input pin pull-up/pull-down configuration.

Syntax

int ghiolib_setDigIncfg(int ch, uint8_t config);

Parameters

int ch

[in]

Input pin to configure (GHIOLIB_CH1, GHIOLIB_CH2, GHIOLIB_CH3, or GHIOLIB_CH4) uint8_t config

[in]

GHIOLIB_DIG_IN_FLOAT, GHIOLIB_DIG_IN_PULL_DN, or GHIOLIB_DIG_IN_PULL_UP

Return Value

```
int GHIOLIB_RET_OK, GHIOLIB_RET_ERROR, or GHIOLIB_RET_NOTSUPPORTED
```

ghiolib_getDigIn

This function reads the state of an input pin.

Syntax

int ghiolib getDigIn(int ch, uint8 t *value);

Parameters

int ch
 [in]
 Input pin to read (GHIOLIB_CH1, GHIOLIB_CH2, GHIOLIB_CH3, or GHIOLIB_CH4)
uint8_t *value
 [out]
 Returns 0 if input is low, else returns 1

Return Value

int GHIOLIB_RET_OK, GHIOLIB_RET_ERROR, or GHIOLIB_RET_NOTSUPPORTED

ghiolib_getDigOut

Reads the current state of an output pin.

Syntax

int ghiolib_getDigOut(int ch, uint8_t *value);

Parameters

```
int ch
    [in]
    Output pin to read (GHIOLIB_CH1, GHIOLIB_CH2, GHIOLIB_CH3, or GHIOLIB_CH4)
uint8_t *value
    [out]
```



Returns 0 if output is set low, else returns 1

Return Value

int GHIOLIB_RET_OK, GHIOLIB_RET_ERROR, or GHIOLIB_RET_NOTSUPPORTED

ghiolib_setDigOut

This function sets the current state of an output pin.

Syntax

int ghiolib setDigOut(int ch, uint8 t value);

Parameters

```
int ch
    [in]
    Output pin to set (GHIOLIB_CH1, GHIOLIB_CH2, GHIOLIB_CH3, or GHIOLIB_CH4)
uint8_t value
    [in]
    If 0 sets output pin low, else sets output pin high (Vbatt)
```

Return Value

```
int GHIOLIB_RET_OK, GHIOLIB_RET_ERROR, or GHIOLIB_RET_NOTSUPPORTED
```

Required Files:

Header File: ghiolib.h Link Library: libghiodrv.so

Sample Qt Code:

```
#include <QDebug>
```

```
// For access to ghiolib
typedef u_int16_t uint16_t;
typedef u_int8_t uint8_t;
#ifdef __cplusplus
extern "C" {
#endif
#include "ghiolib.h"
#ifdef __cplusplus
}
#endif
int channel;
uint8_t digValue;
int gpioOutput;
```



```
int
        qpioInput;
int
        gpioStatus;
// Set inputs to pull down mode and read current inputs and outputs for each channel
qpioOutput = 0;
gpioInput = 0;
for (channel = 0; channel < GHIOLIB MAX DIGITAL IO; channel++)
{
    // Set input to pull down mode
    gpioStatus = ghiolib setDigIncfg(channel + 1, GHIOLIB DIG IN PULL DN);
    if ((GHIOLIB RET OK != gpioStatus) && (GHIOLIB RET NOTSUPPORTED != gpioStatus))
    {
        qDebug("ERROR (%d) doing ghiolib setDigIncfg on channel: %d\n",
               gpioStatus, channel + 1);
    }
    // Read current output setting
    digValue = 0;
    gpioStatus = ghiolib getDigOut(channel + 1, &digValue);
    if (GHIOLIB RET OK != gpioStatus)
    {
        qDebug("ERROR (%d) doing ghiolib getDigOut on channel: %d\n",
               gpioStatus, channel + 1);
    }
    else
    {
        if (1 == digValue)
        {
            gpioOutput |= (1 << channel);</pre>
        }
    }
    // Read current input
    digValue = 0;
    gpioStatus = ghiolib getDigIn(channel + 1, &digValue);
    if (GHIOLIB RET OK != gpioStatus)
    {
        qDebug("ERROR (%d) doing ghiolib getDigIn on channel: %d\n",
               gpioStatus, channel + 1);
    }
    else
    {
        if (1 == digValue)
        {
            gpioInput |= (1 << channel);</pre>
        }
    }
}
qDebug("GPIO initial output: 0x%x input: 0x%x\n", gpioOutput, gpioInput);
```



Analog Inputs (Model 3D70 only)

The Model 3D70 Display has two analog inputs. Analog Input 1 is connected to Pin 4 on Connector B and Analog Input 2 is connected to Pin 5 on Connector B. The Analog Inputs can be used to read resistance, voltage, or current with respect to the analog return pin (pin 7 on Connector B).

Interface:

A Qt application may configure or read an analog input pin by calling the appropriate C library function as described below.

```
#define GHIOLIB CH1
                        (0x01)
#define GHIOLIB CH2
                        (0x02)
#define GHIOLIB MAX ANALOG IN (2)
#define GHIOLIB ANALOG 5V
                               (0)
#define GHIOLIB ANALOG 15000HM (1)
#define GHIOLIB ANALOG 10V
                            (2)
#define GHIOLIB ANALOG 50000HM (3)
#define GHIOLIB ANALOG 20MA
                             (4)
#define GHIOLIB RET OK
                              0
#define GHIOLIB RET ERROR
                              1
#define GHIOLIB RET NOTSUPPORTED 2
typedef struct ADCVALUES
{
     uint16_t adcch;
     uint16 t adcvref;
     uint16 t adcstatus;
     uint16 t adcconfig;
} ADCVALUES, *PADCVALUES;
```

ghiolib_setADCcfg (Model 3D70 only)

This function configures an analog input for one of five different reading modes.

Syntax

```
int ghiolib setADCcfg(int ch, uint8 t config);
```

Parameters

int ch [in]

Input to configure (GHIOLIB_CH1 or GHIOLIB_CH2)

uint8_t config

[in]

GHIOLIB_ANALOG_5V, GHIOLIB_ANALOG_10V, GHIOLIB_ANALOG_15000HM, GHIOLIB_ANALOG_50000HM, or GHIOLIB_ANALOG_20MA

Return Value

int GHIOLIB_RET_OK, GHIOLIB_RET_ERROR, or GHIOLIB_RET_NOTSUPPORTED



ghiolib_getADCIn (Model 3D70 only)

This function gets a reading from an analog input pin.

Syntax

int ghiolib getADCin(int ch, PADCVALUES p);

Parameters

int ch [in] Input to read (GHIOLIB_CH1 or GHIOLIB_CH2) PADCVALUES p

[out]

Reading is returned in member "adcch" of this structure. Other items in this structure can be ignored.

Return Value

int GHIOLIB_RET_OK, GHIOLIB_RET_ERROR, or GHIOLIB_RET_NOTSUPPORTED

Required Files:

Header File: ghiolib.h Link Library: libghiodrv.so

Sample Qt Code:

```
#include <QDebug>
```

```
// For access to ghiolib
typedef u_int16_t uint16_t;
typedef u_int8_t uint8_t;
#ifdef __cplusplus
extern "C" {
#endif
#include "ghiolib.h"
```

```
#ifdef __cplusplus
}
#endif
int channel = 0;
ADCVALUES analogData;
int gpioStatus;
// Set analog input 1 to read 0 to 10 volts
gpioStatus = ghiolib setADCcfg(channel + 1, GHIOLIB ANALOG 10V);
```



```
if (GHIOLIB_RET_OK != gpioStatus)
{
    qDebug("ERROR (%d) doing ghiolib_setADCcfg on channel: %d\n",
        gpioStatus, channel + 1);
}
// Get current reading
gpioStatus = ghiolib_getADCin(channel + 1, &analogData);
if (GHIOLIB_RET_OK != gpioStatus)
{
    qDebug("ERROR (%d) doing ghiolib_getDigOut on channel: %d\n",
        gpioStatus, channel + 1);
}
qDebug("Reading from channel %d is %d millivolts\n", channel + 1, analogData.adcch);
```



Buzzer (Models 3D70, 3D2104)

The Model 3D70 and 3D2104 Displays have an internal buzzer that can be sounded on command.

Interface:

A Qt application can turn the internal buzzer on or off by sending the proper number to the buzzer control file.

Required Files:

Header File: none Link Library: none

Sample Qt Code:

```
#include <QString>
#include <QDebug>
OFile
             buzzerFile;
bool
             buzzerFileOpen;
buzzerFile.setFileName("/sys/class/backlight/pwm-
backlight.3/brightness");
buzzerFileOpen = buzzerFile.open(QIODevice::WriteOnly |
QIODevice::Text);
if (false == buzzerFileOpen)
{
    qDebug("Error opening buzzer file\n");
}
// To turn buzzer ON
if (true == buzzerFileOpen)
{
    QTextStream buzzerOut(&buzzerFile);
   buzzerOut << 10;</pre>
}
// . . .
// To turn buzzer OFF
if (true == buzzerFileOpen)
{
   QTextStream buzzerOut(&buzzerFile);
   buzzerOut << 0;</pre>
}
```



Audio Output (Model 3D70 only)

The Model 3D70 Display has the ability to play an mp3 audio file and send the audio output to a monaural line out (pins 1, AUDIO OUT, and 2, AUDIO RET, on the B connector).

Interface:

A Qt application can start playing an mp3 audio file and can stop the playing of the audio file using a Linux utility called mpg123.

Required Files:

Header File: none Link Library: none Executable: mpg123 (normally installed on Model 3D70 Display)

Sample Qt Code:

// To play mp3 file "sounds.mp3" // Note that by placing mp3 file in "images" folder, Qt will automatically // download the mp3 file to the target with the other image files being used. // Command shown to play mp3 file will first stop playing any mp3 file // that may already be playing. system("test `pidof mpg123` && kill `pidof mpg123` ;" "mpg123 -q images/sounds.mp3 &"); // To stop playing mp3 file (if any) system("test `pidof mpg123` && kill `pidof mpg123`");



Appendix H: Setting 3Dxx Flash File System R/W Mode

- To immediately set the 3Dxx Display file system to read-write mode enter this console command:
 mount –o remount rw /
- The above command only remains in effect until the next reboot and is usually stored in a script file here: /home/writeablefs.
- To have the 3Dxx Display file system set to read-write mode on boot-up, edit the file /etc/init.d/rconce and add the above command to the end of this file just before the final "exit" command like this:

```
...
...
case "$1" in
    start)
    do_start >&2
        ;;
        *)
        echo "Usage: $0 {start}" >&2
        exit 1
        ;;
esac
mount -o remount rw /
exit 0
```

- To leave the 3Dxx Display file system set to read-only mode on boot-up, edit the file /etc/init.d/rconce and remove the "mount –o remount rw /" line near the end of the file (or comment it out by putting a "#" in column one of that line)
- Another way to have the 3Dxx Display file system set to read-write mode on boot-up, is to add a link to the "writeablefs" script in the home directory like this:
 - \circ ln -s /home/writeablefs /etc/rc.d/S03writeablefs

The 3Dxx configuration script utilizes this technique to configure the 3Dxx Display file system to be in read-write mode to make Qt development more convenient.



Appendix I: Building Qt Library Source

Note: This appendix is included for reference and is **not** a required step.

This section describes the procedure to download and build the Qt 5.9.3 library code. *QtLibrarySrcLinux* is a self-extracting archive; when it is executed, the files it contains are extracted. The "-y" flag allows existing files to be replaced. One of the files in the archive, *QtLibrarySrcLinux AutoRun*, is the actual installer script and is manually executed after the extraction. This procedure relies on both Qt Creator and the Grayhill support files having been previously downloaded and installed.

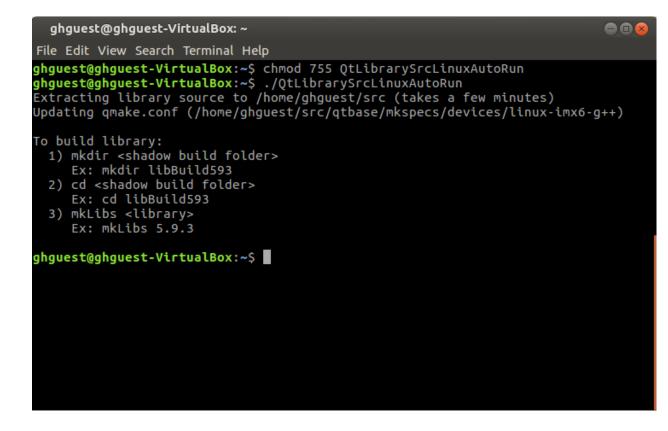
Please reference <u>http://doc.qt.io/qt-5/windows-requirements.html</u> for additional information.

- On the Virtual Machine, launch Firefox (Applications → Internet) and navigate to http://www.grayhill.com/qt43d
- Download *QtLibrarySrcLinux*
- Copy the file to */home/ghguest*, which is just "Home" if after downloading "Open Containing Folder" is selected from Firefox downloads
- Open a terminal window
 - chmod 755 QtLibrarySrcLinux
 - ./ QtLibrarySrcLinux -y

```
ghguest@ghguest-VirtualBox: ~
                                                                             - • •
File Edit View Search Terminal Help
ghguest@ghguest-VirtualBox:~$ ls
                                      GrayhillExamples
bin
                                                        QtGhSupportLinuxAutoRun
build-gh7indemo-Qt_5_9_3_3Dxx-Debug
                                      Music
                                                         QtLibrarySrcLinux
                                                         targetRootFiles
build-ghqtdemo-Qt_5_9_3_3Dxx-Debug
                                      Pictures
Desktop
                                      pointercal
                                                         Templates
Documents
                                      Public
                                                         Videos
Downloads
                                      Qt5.9.3
GrayhillDisplayPlatform
                                      OtGhSupportLinux
ghguest@ghguest-VirtualBox:~$ chmod 755 QtLibrarySrcLinux
ghguest@ghguest-VirtualBox:~$ ./QtLibrarySrcLinux -y
7-Zip SFX 16.02 : Copyright (c) 1999-2016 Igor Pavlov : 2016-05-21
p7zip Version 16.02 (locale=en US.UTF-8,Utf16=on,HugeFiles=on,64 bits,1 CPU x64)
Extracting archive: ./QtLibrarySrcLinux
Path = ./QtLibrarySrcLinux
Type = 7z
Everything is Ok
ghguest@ghguest-VirtualBox:~$
```



- chmod 755 QtLibrarySrcLinuxAutoRun
- ./ QtLibrarySrcLinuxAutoRun



- Verify SYSROOT_PATH is set properly before building
 - echo \$SYSROOT_PATH
 - o export SYSROOT_PATH=\${HOME}/GrayhillDisplayPlatform/sysroot-target



Appendix J: Dynamic IP Address

Enter this command to find the 3Dxx Display Ethernet IP address:
 o ifconfig eth0

The IP address of the 3Dxx Display is displayed after the tag "inet addr:" and is circled in red in the example output shown below.

- If the tag "inet addr:" is not present; enter these commands and try the "ifconfig eth0" command again
 - o ifdown eth0
 - \circ if up eth 0
- In this example the IP address is 192.168.40.118 Make a note of this IP address

| B COM1 - PuTTY |
|--|
| |
| ghiimx6 login: root |
| login[675]: root login on 'ttymxc0' |
| running /etc/profile.local |
| Setting backlight to 100 |
| root@ghiimx6:~ ifconfig eth0 |
| eth0 Link encap:Ethernet HWaddr 00:10:25:0C:76:9D |
| inet addr:192.168.40.118 |
| UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 |
| RX packets:207899 errors:0 dropped:0 overruns:0 frame:0 |
| TX packets:4054 errors:0 dropped:0 overruns:0 carrier:0 |
| collisions:0 txqueuelen:1000 |
| RX bytes:48756330 (46.4 MiB) TX bytes:360850 (352.3 KiB) |
| |
| root@ghiimx6:~ |
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Appendix K: Static IP Address

If using a **static** IP address for the display, once the address is determined:

- cp /etc/network/interfaces /etc/network/interfaces.bak
- vi /etc/network/interfaces
- replace

 iface eth0 inet dhcp
 udhcpc_opts -t 5 -T 3 -A 20 -S &
- with iface eth0 inet static address 192.168.40.118 netmask 255.255.255.0

Google "linux interface file" for additional information