gpioexpled

Version 1.0.0 – 16 June 2016
Kit Bishop

Document History

Version	Date	Change Details
Version 1.0.0	16 June 2016	First released version

Contents

1. Overview

gpioexpled is C++ program that controls the Omega Expansion Dock LED.

Notes:

- The **gpioexpled** library uses of the **libnewgpio** library that is available and documented at https://github.com/KitBishop/Omega-GPIO-I2C-Arduino/tree/master/libnewgpio

gpioexpled consists of single program in static and dynamic forms that controls the LED.

This program is described in more detail in this document.

The program was developed on a KUbuntu-14.04 system running in a VirtualBox VM and uses the OpenWrt toolchain for building the code:

The toolchain used can be found at:

- https://s3-us-west-2.amazonaws.com/onion-cdn/community/openwrt/OpenWrt-Toolchain-ar71xx-generic_gcc-4.8-linaro_uClibc-0.9.33.2.Linux-x86_64.tar.bz2

and details of its setup and usage can be found at:

- https://community.onion.io/topic/9/how-to-install-gcc/22

gpioexpled comes with **NO GUARANTEES** ☺ but you are free to use it and do what you want with it.

2. Files Supplied

gpioexpled is supplied in files in a GitHub repository at https://github.com/KitBishop/Omega-GPIO-I2C-Arduino/tree/master/gpioexpled. This repository contains the following important directories and files:

- **gpioexpled.pdf** – this documentation as a PDF file
- **Makefile** – the Makefile for **gpioexpled** library
- **hdr** – directory containing header (***.h**) files for **gpioexpled** library
- **src** – directory containing source (***.cpp**) files for **gpioexpled** library
- **bin** – directory containing the built program code:
    - **dynamic/gpioexpled** – the dynamically linked version of the program
    - **static/gpioexpled** – the statically linked version of the program

3. Usage and Installation

Installing and using the program is simple. It primarily consists of linking the program and if needed (see below) the gpio library code.

3.1. Using gpioexpled statically linked program

To use **gpioexpled** statically linked program you simply need to copy the program to the Omega and run it.

3.2. Using and Installing gpioexpled dynamically linked program

To use **gpioexpled** dynamically linked program you need to copy it and the **libnewgpio** library to your Omega and then run the program.

Since **gpioexpled** dynamically linked program makes use of **libnewgpio** library for the I2C communication, you will also need to dynamically link to copy **libnewgpio.so** to the **/lib** directory on your Omega

Alternatively, you can copy the library to any location that may be set up in any **LD_LIBRARY_PATH** directory on your Omega. For example, I use the following for testing:

- Created directory **/root/lib**
- Copied the libraries to **/root/lib**
- Added the following lines to my **/etc/profile** file:

```
LD_LIBRARY_PATH=/root/lib:$LD_LIBRARY_PATH
export LD_LIBRARY_PATH
```

4. Using Makefile

A **Makefile** is supplied that can be used to build the library.

4.1. Modify Makefile

The **Makefile** will need modifying:

- You **NEED** to and **MUST** change **TOOL_BIN_DIR** to the "bin" directory of your OpenWrt uClibc toolchain. E.G. make appropriate change to **<xxxx>** in:

  TOOL_BIN_DIR=<xxxx>/OpenWrt-Toolchain-ar71xx-generic_gcc-4.8-linaro_uClibc-0.9.33.2.Linux-x86_64/toolchain-mips_34kc_gcc-4.8-linaro_uClibc-0.9.33.2/bin

- You **MAY** need to change **LIBNEWGPIO_DIR** to relative directory of libnewgpio if you are not using the sources as originally supplied.
  The default if using the standard **source** directory structure as supplied is:

  LIBNEW-GPIO_DIR=../libnewgpio

4.2. Makefile targets

The **Makefile** implements the following set of targets:

- **make**
  The default target. Performs a complete build of both static and dynamic link versions of the program.
  This is directly equivalent to:

  make static dynamic

- **make static**
  Performs a complete build of just the static link version of the program.

- **make dynamic**
  Performs a complete build of just the dynamic link version of the program.

- **make clean**
  Removes all previous build files, both static and dynamic link versions.
  This is directly equivalent to:

  make clean-static clean-dynamic

- **make clean-static**
  Removes all previous build files for static link versions only
  .

- **make clean-dynamic**
  Removes all previous build files for dynamic link versions only

If the following is added to the **make** command line:

builddep=1

then **libnewgpio** library that the program depends on will also be built before building the program.

5. Running the gpioexpled Program

The gpioexpled program can be run from the directory where the program is placed:

```
./gpioexpled <parameters>
```

The program parameters are documented by running the command:

```
./gpioexpled help
```

Which gives the self-explanatory output:

```
Usage
Commands - one of:
       ./gpioexpled <ledhex>
              Starts output to expansion led
       ./gpioexpled rgb <r> <g> <b>
              Starts output to expansion led using decimal rgb values
       ./gpioexpled stop
              Terminates output to expansion led
       ./gpioexpled help
              Displays this usage information
Where:
       <ledhex> specifies the hex value to be output to expansion led
              Must be a six digit hex value with or without leading 0x
              The order of the hex digits is: rrggbb
       <r> <g> <b> specify the decimal values for output to expansion led
              Each value is in the range 0..100
```

```
                  0 = off, 100 = fully on
```

When the program is run using one of the forms:

```
./gpioexpled <ledhex>
```

Or:

```
./gpioexpled rgb <r> <g> <b>
```

A separate process is started in the background to keep the LED lit. This process continues until it is terminated using:

```
./gpioexpled stop
```

6. Further Development

Development of **gpioexpled** is on-going. There will be changes and additions to the code in the future.