Embedd GUI

2013-06-04 Tue

View documentation as: | INFO.js | pdf | Single HTML | Org-Mode | . This documentation is written under the GNU Free Documentation License. Project Links: | SVN Repository | RCOS Observatory | Prebuilt Debian Images | Olimex Forum Post |

Overview

A note from the Author

This documentation is written under the GNU Free Documentation License. The SVN repository with the source code for this project can be found here. This documentation is viewable as an html info file, a single html file, a pdf, and in its original org-mode format. This project would not be possible without funding from the Rensselaer Center for Open Source. The RCOS Observatory Project page can be found here.

I would like to extend a special thanks to:

- Sean O' Sullivan
- Professor Goldschmidt, Ph.D
- Professor Krishnamoorthy, Ph.D
- Timothy Cantwell
- Jorel Lalicki
- RCOS Members for their continued support

Happy Hacking! :)

Nick Guthrie

License

Primary Objective

- The goal of this project is to give users the ability to install Qt Embedded on an open source hardware system to allow for cheap, fast prototyping of graphical user interfaces.

Background

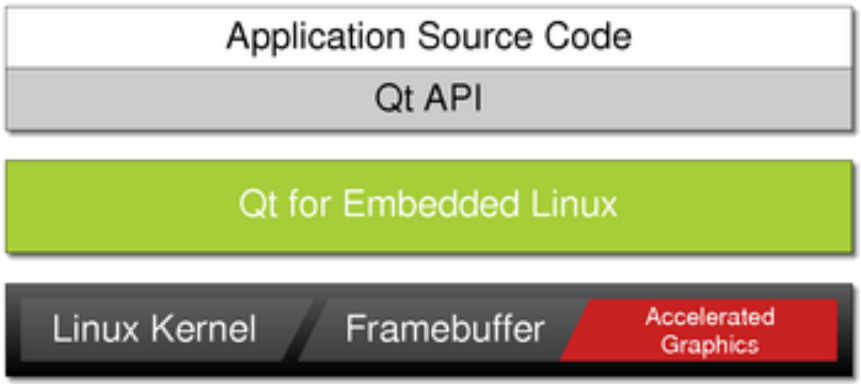
We live in a world surrounded by computers - from our (arguably excessive) coffee machines to our cell phones and cars, microcomputers play an integral role in our everyday lives. With the cost of electronics rapidly decreasing, and touchscreens becoming commonplace even on low cost consumer products, a unique need has arisen for a unified way of creating user interfaces on embedded devices.

Why we need it

It is easy for small companies and hobbyists to prototype microcontroller based products, such as environmental sensors and other equipment. However, user interface design is generally left at basic pushbuttons and potentiometers, with at most a simple text display on a serial LCD. The barrier to entry into high end touchscreen interfaces is high: it often involves more development/work than the device itself, and there exist few unified solutions for multi-processor and display targeted builds. The few solutions that do exist are prohibitively expensive: For example, a license of Segger EmWin costs $12,300... per target architecture/CPU! Embedd GUI aims to be a

"drop in" interface for embedded developers to rapidly incorporate touch-screens into projects.

How/Technologies - Qt Embedded



- "Qt for Embedded Linux is a C++ framework for GUI and application development for embedded devices."
- "Qt for Embedded Linux applications write directly to the framebuffer, eliminating the need for the X Window System and saving memory."
- Qt Embedded allows us to run graphical interfaces without the heavy weight of running an entire graphical desktop.
- Features
  - Pointer Handling
  - Character Input
  - Display Management
  - Hardware Accelerated Graphics
  - Fonts
- Links
  - http://qt-project.org/doc/qt-4.8/qt-embedded-linux.html

RCOS Presentations and Multimedia

A13 OlinuXino 4.3" Touchscreen Qt Embedded Demo

- Video Here is a demonstration of Qt Embedded touchscreen running the raycasting demo and the styledemo.

RCOS Summer 2013 - Meeting 7 - Open Source Spectrometer + Embedded GUI

- Video
- Presentation Slides

A13-OLinuXino-MICRO Qt Embedded Fluidlauncher Video

- Video

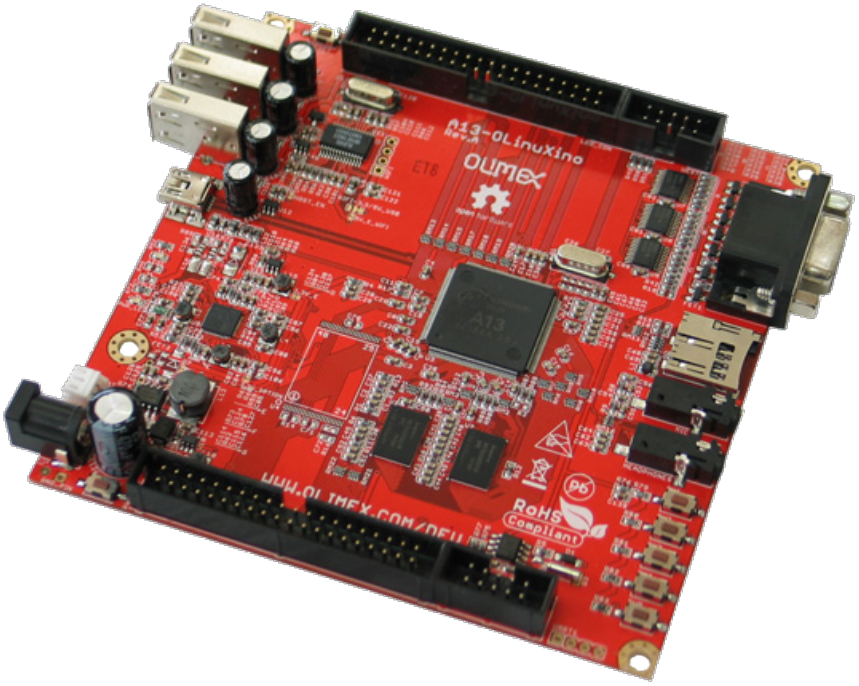
RCOS Summer 2013 - Initial Presentation

- Presentation Slides

Hardware

Actual

A13-OlinuXino



- Overview
  A13-OLinuXino is a low-cost single-board Linux computer in a very compact nano-ITX form. It uses the very first Cortex A8 processor available in eLQFP176 package, produced by Allwinner Technology Inc A13.

- Features
  - A13 Cortex A8 processor at 1GHz, 3D Mali400 GPU
  - 512 MB RAM (2 x 256Mbit x 8)
  - 6-16VDC input power supply, noise immune design
  - 3 + 1 USB hosts, 3 available for users, 1 leads to onboard pinout
  - 1 USB OTG which can power the board
  - SD-card connector for booting optional Linux image

  - VGA video output
  - Battery option and connector
  - LCD signals available on connector so you still can use LCD if you diasble VGA/HDMI
  - Microphone input
  - 4 Mount holes
  - RTC PCF8536 on board for real time clock and alarms
  - 5 Keys on board for android navigation
  - UEXT connectorfor connecting addtional UEXT modules like Zigbee, Bluetooth, Relays, etc
  - GPIO connector with 68/74 pins and these signals:
  - 17 for adding NAND flash;
  - 22 for connecting LCDs;
  - 20+4 including 8 GPIOs which can be input, output, interrupt sources;
  - 3x I2C;
  - 2x UARTs;
  - SDIO2 for connectinf SDcards and modules;
  - 5 system pins: +5V, +3.3V, GND, RESET, NMI
  - Dimensions: 120 x 120 mm (4.7x4.7")
  - Optional low-cost 7" LCD with touchscreen

- Links
  - Retailers
    - Olimex
    - microcontrollershop.com
  - Datasheets
    - User Manual
    - A13-processor brief and datasheet
  - Hardware
    - GitHub OLINUXINO Project
  - Software
    - GitHub OLINUXINO Project

        * A1x Linux
    - Community
        * OLinuXino forum for discussion and community support
        * Freenode #olimex irc channel for OLinuXino development discussions

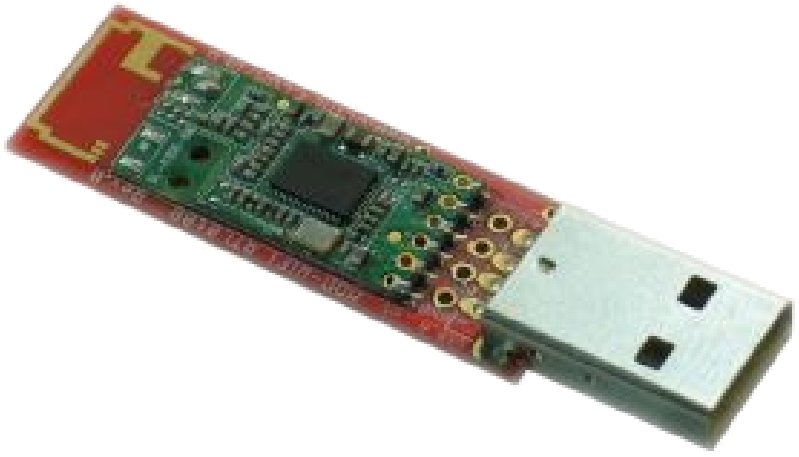
- Extracted CPU Info

Processor	ARMv7 Processor rev 2 (v7l)
BogoMIPS	1001.88
Features	swp half thumb fastmult vfp edsp neon vfpv3
CPU implementer	0x41
CPU architecture	7
CPU variant	0x3
CPU part	0xc08
CPU revision	2
Hardware	sun5i
Revision	0000
Serial	0000000000000000

    - Derived From:

```
cat /proc/cpuinfo
```

USB Wireless LAN Module



- Overview
  - The MOD-WIFI-RTL8188 is a USB WiFi module that is supported by the A13-OLinuXino and A13-OLinuXino-MICRO boards.
  - It uses the same WiFi board that comes as standard on the A13-OLinuXino-WIFI.
  - The WM-294 WiFi board on this module contains the popular RealTek RTL8188CUS single-chip Wireless LAN adapter. There are drivers available for Windows, Linux/Android and Mac, so you aren't limited only to using this module on an A13-OLinuXino board.
- Features
  - Has WM-294 module with RTL8188CUS, IEEE 802.11b/g/n
  - Operates in 2.4 GHz frequency bands
  - 1x1 MIMO technology improves effective throughput and range over existing 802.11 b/g products
  - Data rates up to 150Mbps
  - 802.11e-compatible bursting and i standards
  - BPSK, QPSK, 16 QAM, 64 QAM modulation schemes
  - WEP, TKIP, AES, WPA, and WPA2 hardware encryption schemes
  - Standard USB type A connector
  - On-board antenna
  - 5V/3.3V operation modes via SMD jumper (5V by default)
  - 4 test pads for easy tracking of the supply, d-, d+, and GND
  - PCB: FR-4, 1.00 mm (0.039"), solder mask, silkscreen component print
  - Dimensions: 65.15 × 20.38 mm (2.56 × 0.80")
- Links
  - Retailers
    - MicroControllerShop.com
    - Olimex
  - Datasheets
    - CC&C Technologies WM-294 Datasheet
    - MOD-WIFI-RTL8188 Schematic

4.3-inch LCD for A13 OLinuXino, 480x272, with Touch Screen

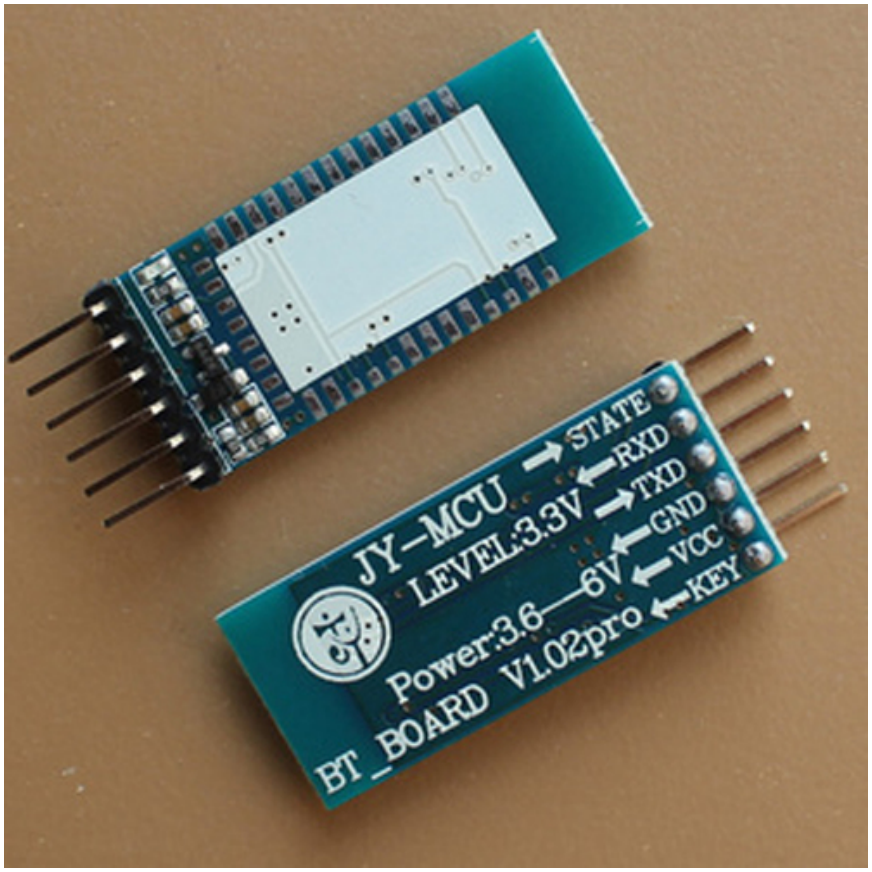
- Overview
  - This is a 4.3-inch LCD with a resistive touch screen and an interface board that has been tested to work with A13 OLinuXino boards.
  - It connects to your A13 OLinuXino board by a 2×20-pin connector.
  - The display board and the OLinuXino board both have male box headers, so you will need a 40-pin IDC ribbon cable which is sold separately.
- Features
  - TFT Panel
    - Bo Lymin BT043DCNNHHp$ 4.3-inch (480×272) a-Si color TFT-LCD with white LED / CCFL backlight
    - 262K colors
    - Anti-glare surface
    - Resistive touchscreen panel
    - 40-pin connector for connection to A13-OLinuXino boards

        * 3.3V single power input with built-in power supply circuit
    - LCD Controller
        * MCU interface: 8/9/16/18-bit 80/68 series MCU interface
        * Display RAM size: 640×240×3×6 bits, e.g. 320×240 two-frame buffer with 262K colors
        * Arbitrary display memory start position selection
        * 8-bit / 16-bit interface: supports 65K (R5G6B5) / 262K (R6G6B6) color data format
        * 9-bit / 18-bit interface: supports 262K (R6G6B6) color data format

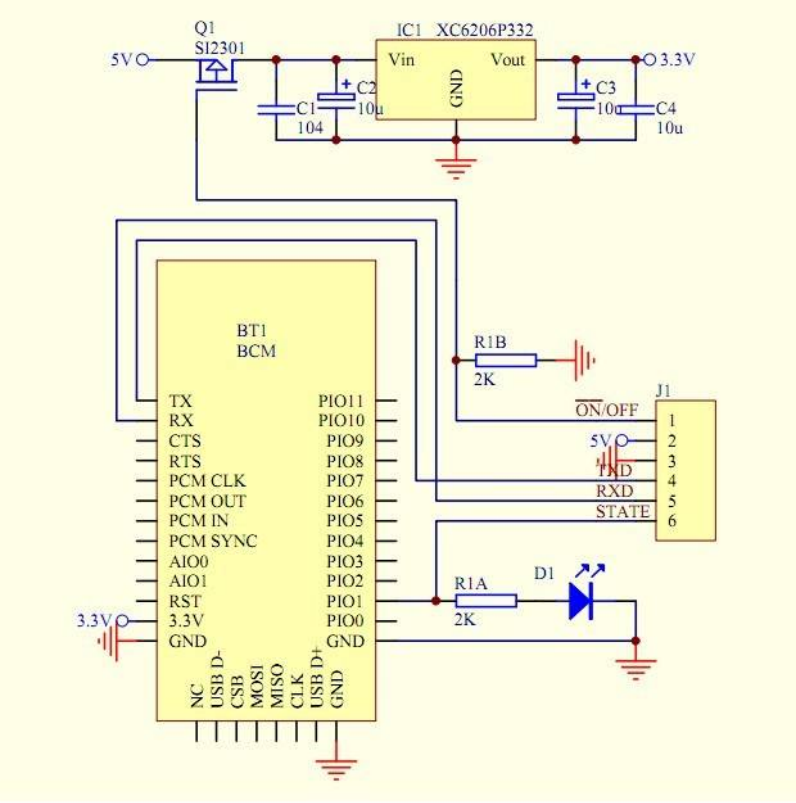
- Interface Board View
    - Note: The A13-OLinuXino boards come with an Android image set up for using a VGA display.
    - To use this LCD, you'll need to upload a new image with the appropriate settings.
    - A ready-made image (as well as the default VGA image so you can switch back) is available on the A13 OLinuXino Wiki Page (they are intended for 7-inch displays, so be sure also to get the A13-LCD43 script, which adjusts the resolution for this display size).

- Links
    - Retailers
        * microcontrollershop.com
        * Olimex
    - Datasheets
        * Download Datasheet
        * Download Schematic
    - Demonstrations
        * Video of the Multitouch Feature

JY-MCU Bluetooth Board V1.02



- Specifications



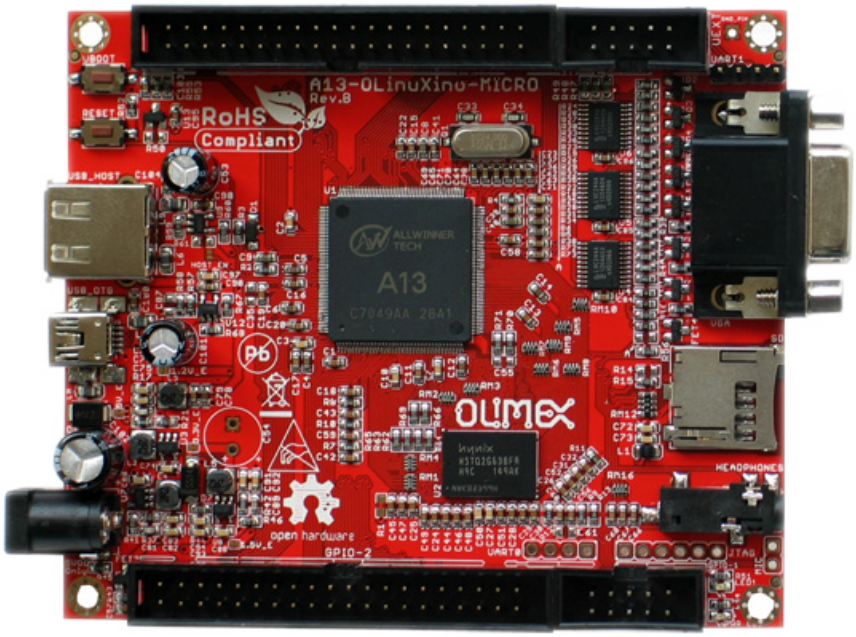
  - This shield have extract the VCCGNDTXDRXD of the bluetooth.
    - (TXDRXD are both 3.3V)
  - This shield has LED indication light.
  - Input Voltage 3.3V-6V
  - Size : 15.5mm*39.8mm

- Features
  - This module power supply input is 3.6 ˜ 6V, please be careful that it should be not more than 7V.
  - compatible with master modeslave mode and both master-slave mode
  - This module include key interface and state interface compared with Smart Bluetooth Module Baseboard.

- The key interface on the baseboard is the master mode button and can be controlled by high level from external MCU, then this module will search again automatically.
- The STATE interface on the baseboard is interface for LED STATE output feet, when bluetooth module don't not connected with other device and then output pulse, when bluetooth module connected with other device and then output high level, and the MCU will judge the state, then this module will search again automatically.

Testing

A13-OLinuXino-MICRO (No Touchscreen Support)



- Features
  - A13 Cortex A8 processor at 1GHz, 3D Mali400 GPU
  - 256 MB RAM (128Mbit x 16)
  - 5VDC input power supply with own ICs, noise immune design
  - 1 USB host
  - 1 USB OTG which can power the board

- SD-card connector for booting the Linux image
- VGA video output
- LCD signals available on connector so you still can use LCD if you diasble VGA/HDMI
- Audio output
- Microphone input pads (no connector)
- 1 User key
- 4 Mount holes
- UEXT connectorfor connecting addtional UEXT modules like Zigbee, Bluetooth, Relays, etc
- GPIO connector with 68/74 pins and these signals:
  - 17 for adding NAND flash;
  - 22 for connecting LCDs;
  - 20+4 including 8 GPIOs which can be input, output, interrupt sources;
  - 3x I2C;
  - 2x UARTs;
  - SDIO2 for connectinf SDcards and modules;
  - 5 system pins: +5V, +3.3V, GND, RESET, NMI
- Dimensions: 100 x 85 mm (3.950x3.350")
- Optional low-cost 7" LCD with touchscreen

- FAQ
  - There is only 1 USB host on the board, how can I connect simultaneously my USB mouse and USB keyboard?
    - You should use external USB hub.
  - What software is available for the board?
    - The software development changes very rapidly. So far we have reports for number of Linux distributions working properly with the MICRO, please visit the WIKI and the GitHub pages of A13-OLinuXino-MICRO to find suitable distributions;additionally you might want to check on the forum for additional help

  - I bought A13-LCD7-TS but when I connect it to the A13-OLinuXino-MICRO I receive no image on the display. What do I do wrong?
    * The default A13-OLinuXino-MICRO image is set for a VGA display and resolution. To use LCD with A13-OLinuXino-MICRO you need to upload new image with the appropriate settings.
    * The download links for the images may be found in the wiki article for A13-OLinuXino.
  - What is the operating temperature range of A13-OLinuXino?
    * The board works in the commercial temeprature range 0+70C
  - Where can I find the Android image for the A13-OLinuXino-MICRO?
    * At the moment we haven't tested Android booting from SD card. Android from SD card is currently not officially supported. However note that there are people reporting success getting it to run - head to the Olimex forums for more recent info.

- Documentation
  - A13-OLinuXino-MICRO User Manual
  - ManyCore Lite SoC for Android 4.0 PAD

- Links
  - General
    * https://github.com/OLIMEX/OLINUXINO
    * https://www.olimex.com/Products/OLinuXino/A13/A13-OLinuXino-MICRO/
    * http://linux-sunxi.org/Main_Page - for discussion and community support
    * https://www.olimex.com/forum/ - for OLinuXino development discussions
  - Software Sources
    * https://www.olimex.com/wiki/A13-OLinuXino-MICRO
      · https://docs.google.com/file/d/0B-bAEPML8fwlTWFweEZGM0hmMkE/edit
    * https://www.olimex.com/wiki/A13-OLinuXino

- Extrated CPU Info

Processor	ARMv7 Processor rev 2 (v7l)
BogoMIPS	1001.88
Features	swp half thumb fastmult vfp edsp neon vfpv3
CPU implementer	0x41
CPU architecture	7
CPU variant	0x3
CPU part	0xc08
CPU revision	2
Hardware	sun5i
Revision	0000
Serial	0000000000000000

  - Derived From:

    ```
    cat /proc/cpuinfo
    ```

- Research on Touchscreen Support
  - Problem Overview
    - Problem with the A13 Micro: All debian images are built for 512 MB of RAM, 256 is all that is available
  - Research
    - Xman Conversation {Link}
      - <xman> hi, What happens if my dram_size = 512 in [dram_para], but my board have only 256MB?
      - <WarheadsSE> xman: which board ?
      - <xman> https://www.olimex.com/Products/OLinuXino/A13/A13-OLinuXino-MICRO/
      - techn$_>$$with256MBramyoupropablyneedtodisablemali, framebufferandg2d..mem$
        $500MB < techn_>example$

· xman> 64M and 32M is for what?

· techn$_>$$64Mmali, 32Mforreservedframebuffer(formaliuse)\ldots$

· <WarheadsSE> xman: then you should be enable appropriately adjust the dram para, but you might need an updated uboot that has a 256M SPL

· ..

· <WarheadsSE> the Wifi has an AXP, which the Mirco doesn't.

- <WarheadsSE> That's a big difference.
- ...
- <xman> so, you edit fex, uptade kernel and update u-boot?
- <WarheadsSE> yes, fex change, kernel source change, u-boot source change
- <WarheadsSE> recompile all.
- ..
- <WarheadsSE> For the moment, they need to use the provided kernel source repository, and the associated uboot.

        * Olimex General Conversation {Link}
        * In Depth Conversation about Recompiling Kernal from Source {Link}

    - Compile Kernal From Source
        * Links
            - https://www.olimex.com/forum/index.php?topic=747.msg3558#msg3558

```
git clone git://github.com/linux-sunxi/u-boot-sunxi.git
git clone https://github.com/hehopmajieh/linux-sunxi
cd linux-sunxi
git checkout origin/sunxi-3.0
make a13_olinuxino_micro CROSS_COMPILE=arm-linux-gnueabi-
make ARCH=arm a13om_defconfig
make ARCH=arm menuconfig
```

4.3" LCD Screen

- FPC4034006
- tl-c430ve display
- 4.3" FPC4304006 MP4 MP5 GPS lcd display panel
- Place of Origin: Guangdong, China (Mainland)
- Brand Name: BYD

Quick Reference

Connect to Serial via Bluetooth

Prerequisite: configure rfcomm.conf

1. Initialize Connection

   ```
   sudo rfcomm connect rfcomm2
   ```

2. Connect with Screen

   ```
   sudo screen /dev/rfcomm2 115200
   ```

3. Login

Communicate via SSH

```
ssh root@192.168.12.200 -p 22122
```

Connect with SFTP for File Transfer

```
sftp -P 22122 root@192.168.12.200
```

- Change Local Directory

  ```
  lcd /local/directory
  ```

- Get File

  ```
  get <file>
  ```

- Send File

  ```
  put <file>
  ```

Send Files via SCP

Overview

scp allows files to be copied to, from, or between different hosts. It uses ssh for data transfer and provides the same authentication and same level of security as ssh.

Examples

- Copy the file "foobar.txt" from a remote host to the local host

```
scp -P 22122 root@192.168.12.200:foobar.txt /some/local/directory
```

- Copy the file "foobar.txt" from the local host to a remote host

```
scp -P 22122 foobar.txt root@192.168.12.200:/some/remote/directory
```

- Copy the directory "foo" from the local host to a remote host's directory "bar"

```
scp -P 22122 -r foo root@192.168.12.200:/some/remote/directory/bar
```

- Copy the file "foobar.txt" from remote host "rh1.edu" to remote host "rh2.edu"

```
scp -P 22122 your_username@rh1.edu:/some/remote/directory/foobar.txt your_username
```

- Copying the files "foo.txt" and "bar.txt" from the local host to your home directory on the remote host

```
scp -P 22122 foo.txt bar.txt root@192.168.12.200:~
```

- Copy the file "foobar.txt" from the local host to a remote host using port 2264

```
scp -P 22122 -P 2264 foobar.txt root@192.168.12.200:/some/remote/directory
```

- Copy multiple files from the remote host to your current directory on the local host

```
scp -P 22122 root@192.168.12.200:/some/remote/directory/\{a,b,c\} .
scp -P 22122 root@192.168.12.200:~/\{foo.txt,bar.txt\} .
```

- Receive and Entire Directory

```
scp -r root@192.168.12.222:/root/Desktop/src/tslib tslib_v2
```

Links

- http://www.hypexr.org/linux_scp_help.php

Check Remaining Space on Hard Drive

```
du -h <path_of_the_dir> | tail -1
```

Sync Files with rsync

Sync a Directory From Host To Device

/ will not modify host directory /

```
rsync -rtvz -e "ssh -p 22122" /home/slayer/Desktop/foo/ root@192.168.12.200:/root/Desk
```

Links

- http://mike-hostetler.com/blog/2007/12/08/rsync-non-standard-ssh-port/
- http://www.jveweb.net/en/archives/2010/11/synchronizing-folders-with-rsync.html

Building Projects with Qmake

1. Build Project

   ```
   /usr/local/bin/qmake project.pro
   make clean
   make
   ```

2. Send binary files over to device (either with rsync, scp, or sftp)
3. Run program

Backups

Backup the SD Card

1. Navigate to backup directoryhttp://raspberrypi.stackexchange.com/questions/311/how-do-i-backup-my-raspberry-pi

   ```
   cd BAK/
   ```

2. connect card to linux, unmounted
3. copy card contents with dd

```
sudo dd if=/dev/mmcblk0 | gzip > ./debian_configured_v1.image.gz
```

Restore the SD Card

1. insert unmounted card
2. unzip to card

```
sudo gzip -dc /path/to/debian_configured_v1.image.gz | dd of=/dev/mmcblk0
```

Backup Data to Web Storage

```
rsync -rtvz --progress /media/Global/Global/BAK/embedd_gui/bin nickguthrie.com:nickgut
```

Links

- How do I make a Backup of my Rasberry Pi {Link}
  1. Make a full backup of the image
     - If you are running linux then you can use the dd command to make a full backup of the image:
       `dd if=/dev/sdx of=/path/to/image`
     - or for compression:
       `dd if=/dev/sdx | gzip > /path/to/image.gz`
     - Where sdx is your SD card.
  2. To restore the backup you reverse the commands:
     - Uncompressed
       `dd if=/path/to/image of=/dev/sdx`
     - or when compressed:
       `gzip -dc /path/to/image.gz | dd of=/dev/sdx`

HOWTO

Obtain Hardware

The hardware used in this guide:

- A13-OlinuXino
- USB Wireless LAN Module

Copy Debian Image to SD Card

Overview

- I am installing a Debian Image found here.
  - Specifically: A13 Debian 2GB card image without XFCE4 with GCC, GPIO, WIFI, WTHERNET, UVC, Python, OpenCV

Steps

1. Download Debian Image
2. Unrar Debian Image

```
unrar e A13_debian_WIFI_GCC_GPIO_IN_OUT_AUTO_load_withoutX_I2C_100KHz_UVC_Python_C
```

3. Copy img file to card

```
dd bs=4M oflag=sync if=A13_Micro_Debian_1GHz_GPIO_100kHz_I2C_WIFI_USB_LAN_without_
```

   - WARNING: will overwrite everything on card

Links

- http://www.cnx-software.com/2012/12/21/olimex-a13-olinuxino-micro-development-board-unboxing-and-review/
- https://www.olimex.com/wiki/Prebuilt_SD_card_images_running_debian

Configure Touchscreen (script.bin)

Overview

- The script.bin will determine what display can be used.
- There are different configurations for different displays when you use Linux because the dot pitch is different.

Steps

1. Create LCD script directory

   ```
   mkdir scripts;
   cd scripts;
   ```

2. Download VGA_LCD_scripts_A13.zip

3. Extract the folders

   ```
   unzip VGA_LCD_scripts_A13.zip
   ```

4. Mount 17 MB Fat32 Partition to Computer

5. Backup script.bin on device

   ```
   cd /media/mmcblk0
   cp script.bin script.bin.BAK
   ```

6. Copy correct script.bin to Device

   ```
   cp scripts/script_GPIO_LCD_480x272/script.bin /media/mmcblk0
   ```

Links

- Olimex.com Wiki: Configuration of hardware in the Debian Image

Modifying the script.bin file (Optional)

Overview

- The bin2fex and fex2bin program supplied by Olimex can be used to convert the script.bin binary file to a readable/editable text file, which can then be modified and converted back into a script.bin binary file.

Installation

1. extract A13 tar file

   ```
   cd bin/
   tar -zxvf fex2bin_bin_fex_tools.tar.gz
   ```

2. install libusb

   ```
   sudo apt-get install libusb-1.0-0-dev
   ```

3. Build Files

   ```
   make clean
   make -k
   ```

General Usage

- Using bin2fex
  - First, get hold of the script.bin file located in the boot loader partition (do this by mounting either the RFSFAT16_BOOTLOADER_00000 from Livesuit, or the actual partition image from the tablet). Place it on the Desktop of your Ubuntu machine. Then, from a terminal on the Desktop, run:

    ```
    # ./bin2fex script.bin script.fex
    ../bin/A13_script_files/fex2bin_bin_fex_tools/bin2fex script.bin script.fex
    ```

    * This converts the script.bin file into script.fex. Here's the output produced - script.fex.

- Using fex2bin
  - To convert back, it's simply the reverse:

    ```
    # ./fex2bin script.fex script.bin
    ../bin/A13_script_files/fex2bin_bin_fex_tools/fex2bin script.fex script.bin
    ```

    * This can then be placed back on the bootloader partition (remember to also overwrite script0.bin).

Errors

- INIT: cannot execute "/sbin/getty"
  - Description
    - During boot, serial connaction outputs error:

      `INIT: cannot execute "/sbin/getty"`
  - Probable Cause
    - The util-linux is not installed

Links

- Configuration of hardware in the debian image {Link}
  - Tools
    - Script file
      - The script.bin is a text file with very important configuration parameters like port GPIO assignments, DDR memory parameters, Video resolution etc, by changing these parameters in the script.bin you can configure your Linux without need to re-compile your kernel again and again this is smart way Allwinner provides for tweaking A13 Linux Kernel
    - fex
      - The fex tool will convert a script.bin file to a text file and back again.
      - This allows the easy modification of the settings that are in the script.bin file
    - Tools and script files
      - A13 script bin and fex tool
      - The directory A13_script_files contains:

        script.bin the default script with VGA800x600settings

        fex2bin_bin_fex_tools.tar.gz tools fex2bin and bin2fex for converting the *.bin script file to *.fex(text file)

        script_GPIO_VGA script with VGA800x600settings

        script_GPIO_LCD_800x480 script with LCD800x480settings
  - Changing A13-OLinuxino settings to VGA800x600 or LCD800x480

* The default SD card setup is made with settings for VGA 800x600. If you want to switch between VGA 800x600 and LCD800x480 mode then you have to replace the existing script.bin file from the first SD card partitition (note that this partition is FAT - so you can replace the file under Windows or Linux) with the script.bin file from script_GPIO_VGA directory (if you want to change to VGA800x600 mode) or from script_GPIO_LCD_800x480 directory (if you want to change to LCD800x600 mode).
* Establish WIFI connection
  1. plug in MOD-WIFI-RTL8188 if the board is not A13-OLinuXino-WIFI

     `type ifconfig -a`

     · Output

```
lo Link encap:Local Loopback

          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
tunl0 Link encap:IPIP Tunnel HWaddr

          NOARP  MTU:1480  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
wlan2 Link encap:Ethernet HWaddr 48:02:2a:eb:21:1c

          inet addr:192.168.0.229  Bcast:192.168.0.255  Mask:255.255.
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:166 errors:0 dropped:726 overruns:0 frame:0
          TX packets:7 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:31361 (30.6 KiB)  TX bytes:1248 (1.2 KiB)
```

     · and look at your wlan number. In this case we have wlan2

2. open the file /etc/network/interfaces- for example using vi tool

   ```
   vi /etc/network/interfaces
   ```

   - and change

     ```
     auto wlan2
     iface wlan2 inet dhcp
     wpa-ssid YourSSIDname
     wpa-psk YourWPAkey
     reboot A13-OLinuXino board
     ```

   - Chek your connection

     ```
     ifconfig -a
     ```

   - if everything is ok you should see something as:

     ```
     wlan1 Link encap:Ethernet HWaddr 48:02:2a:eb:21:1c

       inet addr:192.168.0.229  Bcast:192.168.0.255  Mask:255.255.255.0
       UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
       RX packets:166 errors:0 dropped:726 overruns:0 frame:0
       TX packets:7 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:31361 (30.6 KiB)  TX bytes:1248 (1.2 KiB)
     ```

* Establish ethernet connection using USB-ETHERNET adapter recommended supported adapter USB-ETHERNET-AX88772B

  1. plug in USB-ETHERNET-AX88772B adapter
  2. type

     ```
     ifconfig -a
     ```

     - you should see something like this

       ```
       eth1 Link encap:Ethernet HWaddr 00:80:80:9a:4a:63

                 inet addr:192.168.0.113  Bcast:192.168.0.255  Mask:255.25
                 UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
                 RX packets:58 errors:0 dropped:0 overruns:0 frame:0
                 TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
                 collisions:0 txqueuelen:1000
                 RX bytes:7852 (7.6 KiB)  TX bytes:510 (510.0 B)
       lo Link encap:Local Loopback
       ```

```
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
tunl0 Link encap:IPIP Tunnel HWaddr

          NOARP  MTU:1480  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

- look at your eth number. In this case we have eth1

3. open the file /etc/network/interfaces- for example using vi tool

   ```
   vi /etc/network/interfaces
   ```

   - and change the following rows

     ```
     auto eth1
     iface eth1 inet dhcp
     where eth1 is the interface number
     reboot A13-OLinuXino board
     ```

   - or type ifup eth1

4. Check your connection

   ```
   ifconfig -a
   ```

   - if everything is ok you should see something as:

     ```
     eth1 Link encap:Ethernet HWaddr 00:80:80:9a:4a:63

          inet addr:192.168.0.113  Bcast:192.168.0.255  Mask:255.2
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:725 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:77056 (75.2 KiB)  TX bytes:1686 (1.6 KiB)
     ```

* GPIO changing

1. lsmod

   ```
   type lsmod
   ```

   - if sun4i-gpio is present - OK
   - unless type modprobe sun4i-gpio

2. go to /sys/devices/virtual/misc/sun4i-gpio/pins and type ls

   - list of supported pins will be shown
   - example for port reading:

     ```
     cat pe4 read PortE4 the result should be 0 or 1 example for port
     ```

- Changing A13 GPIO direction

  1. extract fex2bin_bin2fex_tools on linux machine

     ```
     sudo su
     cd fex2bin_bin2fex_tools directory
     mount /dev/sdx1 /mnt/sd # mount first partitition on SD card
     ./bin2fex /mnt/sd/script.bin > /mnt/sd/script_test.fex # conve
     gedit /mnt/sd/script_test.fex
     ```

  - GPIOs are defined in the end.
  - where

    ```
    Pxx<mode><pull><drive><data> mode 0-7, 0=input, 1=ouput, 2-7 I/O func
    ```

  - for example: if you want to change GPIO direction then change first parameter after port name

    ```
    gpio_pin_8 = port:PE08<0><default><default><default>make PE8 input gp
    ```

  - save and exit
  - ./fex2bin /mnt/sd/script_test.fex > /mnt/sd/script.bin- convert fex to bin

- fex2bin and bin2fex - script.bin {Link}

- Overview
  - During the boot process, the processor reads a file called script.bin, located in the bootloader (nanda) partition. This file contains all of the processor configuration details (such as pin functions, voltages, clock frequencies, memory configuration etc) and is essential to the correct operation of the tablet. The purpose of this file should be distinguished from that of build.prop, located in /system/build.prop. The latter is a configuration for Android, once it's started. script.bin is configuration for the processor.
  - Note that there is also a file in the bootloader partition called script0.bin - this is a backup and must be identical to script.bin.
  - For more information on the boot process and the function of script.bin, have a look at these links:
    - http://rhombus-tech.net/allwinner_a10/a10_boot_process/
    - http://elinux.org/Hack_A10_devices
    - http://www.cnx-software.com/2012/05/06/editing-allwinner-a10-board-configuration-files-script-bin/
    - http://linux-sunxi.org/Sunxi-tools
    - The second link above shows a really neat trick where the pins normally intended for interfacing with the SD card are remapped to a UART port, so you can get a serial port by connecting to the SD card slot!
  - The script.bin file is actually the binary equivalent of the COMMON_SYS_CONFIG100000 file found in the unpacked Livesuit image. The human-readable version is called a "FEX" file, since that's the extension used by some conversion programs. There are a couple of tools available which can convert between the binary and FEX formats, and these are described below. This - http://linux-sunxi.org/Fex_Guide - is a description of the sections in the FEX file.

        - (There is an online version of these tools available at https://www.miniand.com/tools/fexc, but I couldn't get it to work.)

- Installation

    * To get the tools, go to the git repository at https://github.com/linux-sunxi/sunxi-tools/ and download the ZIP file (called sunxi-tools-master.zip). Extract this, and place the folder on the Desktop of your Linux machine. Open a terminal, cd to the folder, then run

      ```
      sudo apt-get install libusb-1.0-0-dev
      ```

        - (this installs libusb, which is required for compilation). Then type make which should compile the files. This creates two programs (actually it creates a lot more, but these are the only two we're interested in) called bin2fex and fex2bin.

- Using bin2fex

    * First, get hold of the script.bin file located in the boot loader partition (do this by mounting either the RFS-FAT16_BOOTLOADER_00000 from Livesuit, or the actual partition image from the tablet). Place it on the Desktop of your Ubuntu machine. Then, from a terminal on the Desktop, run:

      ```
      sunxi-tools-master/bin2fex script.bin script.fex
      ```

        - This converts the script.bin file into script.fex. Here's the output produced - script.fex.

- Using fex2bin

    * To convert back, it's simply the reverse:

      ```
      sunxi-tools-master/fex2bin script.fex script.bin
      ```

        - This can then be placed back on the bootloader partition (remember to also overwrite script0.bin).

- Using fex2bin on the COMMON_SYS_CONFIG100000 LiveSuit file

    * You can use fex2bin to convert the COMMON_SYS_CONFIG100000 file from the unpacked LiveSuit image into a script.bin file. However, I initially got an error saying "E: CONFIG:696: invalid character at 27" or similar (which means line 696, character 27). Looking at the file, it turned out there were quotes missing at a certain point. Here's the original part of the file:

```
[msc_feature]
vendor_name             =USB 2.0
product_name            =USB Flash Driver
To get it to convert properly, I put quotes as follows:

[msc_feature]
vendor_name             ="USB 2.0"
product_name            ="USB Flash Driver"
```

        - I'm not sure why quotes were missed out here, since they're present everywhere else.

- Which version ends up on the tablet?

    * If you're eagle-eyed, you may notice something at this point. In the unpacked LiveSuit files, there are essentially two copies of script.bin. One is the human-readable COMMON_SYS_CONFIG100000 file, the other is the script.bin located within the RFSFAT16_BOOTLOADER_00000 image file. The two copies are identical (if you use fex2bin/bin2fex to convert between them, and remember the quotation marks). So, which one actually ends up on the tablet?

    * I made a slight modification to one, then the other, packing and burning a complete LiveSuit image each

time, and determined that it's the script.bin inside RFSFAT16_BOOTLOADER_00000 which ends up on the tablet (hardly surprising, since RFSFAT16_BOOTLOADER_00000 is a byte-for-byte copy of the nanda tablet partition). To be on the safe side, I would still ensure that COMMON_SYS_CONFIG100000 is identical to the script.bin file - maybe LiveSuit uses COMMON_SYS_CONFIG100000 for its own initial configuration, or something.

- imx233-olinuxino-with-lcd-4-3-and-touchscreen {Link}
- Product Info {Link}
- Changing A13-OLinuxino settings to VGA800x600 or LCD800x480 {Link}
- http://olimex.wordpress.com/2012/12/19/a13-lcd7ts-support-in-linux/
- (As of 1 March 2013, the current Debian build for this MICRO version does not yet support a touch panel.)
  - http://184.172.168.133-static.reverse.softlayer.com/product_info.php?cPath=&products_i
- How to make 7" LCD Screen working on the A13Micro with Debian or Custom distrib?

Configure Debian

Configure Wireless (Dynamic IP Address)

- Steps
  - Determine Wireless Device

    ```
    dmesg
    ```

    - Found as wlan3
  - Configure /etc/network/interfaces as Root

```
auto wlan3
iface wlan3 inet dhcp
    wpa-ssid TVCOG
    wpa-psk COGpass1
```

  - Restart the Networking Service

```
service networking restart
```

  - Test the Network

```
ifconfig
ping google.com
```

- Links
  - How to connect to a wireless network from the ubuntu command line
  - debian linux wpa wpa2 wireless wifi networking

Configure Static IP Address

- Steps
  - Determine Information

```
ifconfig
```

    * Find:
      · address
      · netmask
      · gateway
      · DNS Servers

- Modify /etc/network/interfaces as Root

```
auto wlan3
iface wlan3 inet static
   wpa-ssid TVCOG
   wpa-psk COGpass1
   address 192.168.12.222
   netmask 255.255.255.0
   gateway 192.168.12.1
```

- Modify /etc/resolv.conf as Root

```
domain techvalleycenterofgravity.com
search techvalleycenterofgravity.com
nameserver 64.22.32.8
nameserver 64.22.32.9
```

- Restart Networking as Root

```
/etc/init.d/networking restart
```

- Test Results

```
ifconfig
ping google.com
```

- Links
  - Linux Basics set a Static IP on Ubuntu

Set Date

- Steps

```
date --set="10 JUL 2013 12:27:00"
```

- Links
  - http://www.cyberciti.biz/faq/howto-set-date-time-from-linux-command-prompt/

Set Keyboard Locale

- Overview
  - My keyboard layout was set to UK, which meant I typed things like ¬ instead of ~ and £ instead of #.
  - This can easily be remidied from the commandline.
- Steps
  1. Modify the keyboard locale

     ```
     sudo dpkg-reconfigure keyboard-configuration
     ```

  2. reboot

     ```
     reboot -h now
     ```

- Links
  - AskUbuntu.com: Changing keyboard layout in ubuntu 12.04 server command-line interface

Install Programs

- Steps
  1. update packages

     ```
     apt-get update; apt-get upgrade; apt-get dist-upgrade
     ```

  2. install packages

     ```
     apt-get install aptitude emacs build-essentials pkg-config
     ```

     - emacs is obviously "optional" but is the preferred text-editor of choice for real programmers ;)

Configure SSH to start on Boot

- Steps
  - Install ssh server

```
apt-get install openssh-server
```

  - Create or modify the /etc/init.d/sshd init script as follows:

```
#! /bin/sh
#
# start/stop the secure shell daemon

case "$1" in
'start')

    # Start the ssh daemon
    if [ -x /usr/sbin/sshd ]; then
            echo "starting SSHD daemon"
            /usr/sbin/sshd &
    fi
    ;;

'stop')
    # Stop the ssh daemon
    /usr/bin/pkill -x sshd
    ;;
*)
    echo "usage: /etc/init.d/sshd {start|stop}"
;;
```

  - Check that /etc/rc3.d/S89sshd exists (or any sshd startup script exists) and is a soft link to /etc/init.d/sshd.
    - If not, create it using the following command:

```
ln -s /etc/init.d/sshd /etc/rc3.d/S89sshd
```

  - Determine that ssh is running

    ```
    service ssh status
    ```

  - Determine Port Open

    ```
    netstat -tlpn
    ```

    * Port is: 22122

  - Determine IP Address to connect to

    ```
    ifconfig
    ```

  - Connect to ssh

    ```
    ssh root@192.168.12.128 -p 22122
    ```

- Debugging
  - Check ports being listened on

    ```
    netstat -an | grep "LISTEN"
    ```

- Links
  - Configure Open SSH Server To Start Up On System Boot
  - SSH Connection Refused On Raspberry Pi Cannot Find Why

Install XFCE (Optional)

- Overview
  - Most of this guide is dedicated to setting up this micro-controller to run QT Embedded, which allows the use of graphical programs without runnng a graphical desktop (XFCE). That being said it is possible to install one, I haven't worked on getting touchscreen support working with it, but Olimex has posted a few tutorials and it does work fine with a mouse.
- Steps

```
apt-get install --no-install-recommends xorg xfce4 alsa-base alsa-utils;
apt-get install --no-install-recommends cpufrequtils gamin xdg-utils;
apt-get install --no-install-recommends desktop-base gnome-icon-theme dmz-cursor-t
apt-get install --no-install-recommends xfce4-terminal xfce4-power-manager xfce4-s
startx;
```

- Links
  - Installing GUI
    http://lcncolinuxino.blogspot.com/p/installing-gui.html
    - Overview
      Optionally if desired, a GUI user interface can be installed. This section describes how to install a small foot print xfce4 user interface.
    - Steps

```
apt-get install --no-install-recommends xorg xfce4 alsa-base alsa-utils;
apt-get install --no-install-recommends cpufrequtils gamin xdg-utils;
apt-get install --no-install-recommends desktop-base gnome-icon-theme dm
apt-get install --no-install-recommends xfce4-terminal xfce4-power-manag
apt-get install --no-install-recommends thunar-archive-plugin thunar-med
apt-get install --no-install-recommends xfburn htop squeeze bzip2 zip un
# Finally start the user interface with:
startx;
```

    - Links

Configure Serial Communication with Bluetooth Module

Communicate to Bluetooth

- Connecting
- Installation
  - Connect to Linvar
    Passphrase: 1234
  - Configure /etc/bluetooth/rfcomm.conf

```
#
# RFCOMM configuration file.
#

rfcomm0 {
        # Automatically bind the device at startup
        bind no;

        # Bluetooth address of the device
        device 00:12:03:27:71:07;

        # RFCOMM channel for the connection
        channel 1;

        # Description of the connection
        comment "Example Bluetooth device";
}
```

  - Restart Bluetooth

```
service bluetooth restart
```

  - Determine the Hardware Address
    The hardware address should be replaced with that of your phone. If you don't know the hardware address of your phone yet, you can get it by running:

- Bind the Address

```
sudo rfcomm bind 0 00:12:03:27:71:07
```

- Links
  - How to setup Bluetooth

Get Serial Over Linux

- Installation
  - Determine hardware a
  - Modify /etc/bluetooth/rfcomm.conf as Root

```
rfcomm2 {
        # Automatically bind the device at startup
        bind no;

        # Bluetooth address of the device
        device 00:12:03:27:71:07;

        # RFCOMM channel for the connection
        channel 1;

        # Description of the connection
        comment "Olimex";
}
```

  - Restart Bluetooth

```
sudo service bluetooth restart
```

- Connecting
  1. Initialize Connection

```
sudo rfcomm connect rfcomm2
```

2. Connect with Screen

```
screen /dev/rfcomm2 115200
```

3. Login

- Links
  - 5 linux unix commands for connecting to the serial console
  - how to pair a bluetooth device from command line on linux

Install ARM Toolchain with Buildroot

Steps

1. Download Buildroot

```
mkdir bld; cd bld
wget http://buildroot.net/downloads/buildroot-2013.05.tar.gz
tar -xvf buildroot-2013.05.tar.gz
cd buildroot-2013.05
```

2. Run Menu Config

```
make menuconfig
```

   - Relevant Configurations:

Target Architecture	ARM (little endian)
Target Architecture Variant	Cortex-A8
Toolchain	Sourcery Codebench ARM 2011.09

3. If you are on a 64-bit system

```
sudo apt-get install ia32-libs
```

- See Error

4. Install toolchain binaries

```
su
cp -a ext-toolchain /opt/ext_toolchain
cp /etc/environment /etc/environment.BAK
```

   - Append :/opt/ext_toolchain/bin/ to Path

```
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games
```

5. Logout and Login or Reboot

- Buildroot Toolchain Error: "error while loading shared libraries: libstdc++.so.6"
  - Error:
    - error while loading shared libraries: libstdc++.so.6: cannot open shared object file: No such file or directory
  - Probable Cause
    - Its looking for 32-bit library, which is not installed since I have a 64-bit system
  - Solution
    - Install the 32 bit libraries

```
sudo apt-get install ia32-libs
```

  - Links
    - http://stackoverflow.com/questions/11471722/libstdc-so-6-cannot-open-shared-object-file-no-such-file-or-directory

Links

- Using buildroot for real projects
    - This is a great presentation that demonstrates how to use buildroot very clearly.

Configure tslib on Device

Overview

```
One of the first problems we had with OLinuxIno-A13 board is the touchscreen support.
The manual was published on the official Olimex blog, but source packages had updated,
After some experiments, we solved this problem.
Here is a full step-by-step manual how to get the device works well under Debian
```

- Dimrobotics

Steps

1. Install make and automake

   ```
   apt-get install make automake
   ```

2. Download tslib source code and go to its directory:

   ```
   git clone https://github.com/kergoth/tslib.git
   cd tslib
   ```

3. Download and apply the patch using GNU patch utility:

   ```
   wget https://raw.github.com/webconn/OLINUXINO/master/SOFTWARE/A13/TOUCHSCREEN/tsli
   patch -p0 < tslib.patch
   ```

4. Configure, make and install:

   ```
   autoreconf -vi
   ./configure --prefix=/usr
   make
   make install
   ```

5. Then, let's load a kernel module and check touchscreen:

```
modprobe sun4i-ts
dmesg | grep sun4i-ts
```

   - Result

```
[12951.630000] sun4i-ts.c: sun4i_ts_init: start ...
[12951.640000] sun4i-ts: tp_screen_size is 5 inch.
[12951.650000] sun4i-ts: tp_regidity_level is 5.
[12951.660000] sun4i-ts: tp_press_threshold_enable is 0.
[12951.670000] sun4i-ts: rtp_sensitive_level is 15.
[12951.670000] sun4i-ts: rtp_exchange_x_y_flag is 0.
[12951.690000] sun4i-ts.c: sun4i_ts_probe: start...
[12951.710000] input: sun4i-ts as /devices/platform/sun4i-ts/input/input4
[12951.730000] sun4i-ts.c: sun4i_ts_probe: end
```

6. To load this kernel module automatically, add a line into /etc/modules:

```
echo sun4i-ts >> /etc/modules
```

7. Export Some Variables

```
export TSLIB_TSEVENTTYPE=raw
export TSLIB_CONSOLEDEVICE=none
export TSLIB_FBDEVICE=/dev/fb0
export TSLIB_TSDEVICE=/dev/input/event4
export TSLIB_CALIBFILE=/usr/etc/pointercal
export TSLIB_CONFFILE=/usr/etc/ts.conf
export TSLIB_PLUGINDIR=/usr/lib/tsg
```

8. Next, configure raw input module of the tslib.

   - Open /usr/etc/ts.conf and uncomment the line which contains "module_raw input".

9. To load configuration variables while system is loading, write these lines into /etc/environment file (check highlighted number):

```
TSLIB_TSEVENTTYPE=raw
TSLIB_CONSOLEDEVICE=none
TSLIB_FBDEVICE=/dev/fb0
TSLIB_TSDEVICE=/dev/input/event3
TSLIB_CALIBFILE=/etc/pointercal
TSLIB_CONFFILE=/usr/etc/ts.conf
TSLIB_PLUGINDIR=/usr/lib/ts
```

Errors

- undefined macro: AC_DISABLE_STATIC
  - Error Caused
    - while attempting to do "autoreconf -vi" when building tslib
  - Error Message

```
configure.ac:24: error: possibly undefined macro: AC_DISABLE_STATIC
      If this token and others are legitimate, please use m4_pattern_allow.
      See the Autoconf documentation.
```

  - Solution

```
apt-get install libtool
```

  - Links
    - http://www.friendlyarm.net/forum/topic/621

Test tslib Input Received from Touchscreen

```
cat /dev/input/event3 | hexdump
```

Links

- http://www.dimrobotics.com/2013/06/olinuxino-a13-touchscreen-support-in.html
- http://www.armadeus.com/wiki/index.php?title=Qt/Embedded#Touchscreen_handling

Configure QT for Embedded Linux

Steps

- Install QT on Development Platform
  http://suchakra.wordpress.com/2011/05/17/qt-on-mini2440/

  ```
  sudo apt-get install qtcreator
  ```

- Install TSLIB on Development Platform
  http://billforums.station51.net/viewtopic.php?f=8&t=15

  ```
  cd ~/src
  git clone https://github.com/kergoth/tslib.git tslib
  cd tslib
  # custom patch for Olinuxino
  wget https://raw.github.com/webconn/OLINUXINO/master/SOFTWARE/A13/TOUCHSCREEN/tsli
       patch -p0 < tslib.patch
  ./autogen.sh
  ./configure --host=arm-linux-gnueabihf --prefix=/usr/local/tslib --enable-static -
  make -j5
  su
  export PATH=$PATH:opt/ext_toolchain/bin/
  make install
  ```

  - Make sure to modify qmake.conf file when installing qt-embedded
    by including:

    ```
    QMAKE_INCDIR  += /usr/local/tslib/include
    QMAKE_LIBDIR  += /usr/local/tslib/lib
    ```

- Install qt-everywhere on Development Platform

  - Steps

    1. Install Source

       ```
       tar -xvf qt-everywhere-opensource-src-4.6.2.tar.gz /usr/local/qt
       ```

    2. Replace the whole text in mkspecs/qws/linux-arm-g++/qmake.conf
       by the following:

```
#
# qmake configuration for building with arm-linux-g++
#
include(../../common/gcc-base-unix.conf)
include(../../common/g++-unix.conf)
include(../../common/linux.conf)
include(../../common/qws.conf)

# modifications to g++.conf
QMAKE_CC                = arm-linux-gnueabihf-gcc -mcpu=cortex-a8 -mtune
QMAKE_CXX               = arm-linux-gnueabihf-g++ -mcpu=cortex-a8 -mtune
QMAKE_LINK              = arm-linux-gnueabihf-g++ -mcpu=cortex-a8 -mtune
QMAKE_LINK_SHLIB        = arm-linux-gnueabihf-g++ -mcpu=cortex-a8 -mtune

# modifications to linux.conf
QMAKE_AR                = arm-linux-gnueabihf-ar cqs
QMAKE_OBJCOPY           = arm-linux-gnueabihf-objcopy
QMAKE_STRIP             = arm-linux-gnueabihf-strip
QMAKE_RANLIB            = arm-linux-gnueabihf-ranlib

# tslib
QMAKE_INCDIR  += /usr/local/tslib/include
QMAKE_LIBDIR  += /usr/local/tslib/lib
QMAKE_LFLAGS += -Wl,-rpath-link=/usr/local/tslib/lib

load(qt_config)
```

3. Configure Qt

```
make clean; ./configure -embedded arm -prefix /usr/local/qt -little-endi
```

   * Some optional arguments depending on your requirements

      - Enable touchscreen library support : -qt-mouse-tslib

      - Enable USB keyboard support : -qt-kbd-linuxinput

        * The above options affect the QtGui library so you need to replace only QtGui.so.x.x file on your root filesystem if you are planning to make changes.

    4. Make

       ```
       make -j 5
       sudo make install
       ```

        * Wait for a couple of hours to compile libraries

    5. Install

       ```
       su -p
       make install
       ```

        * libraries will be installed in *usr/local/qt/lib*

  - Errors

    * *opt/ext_ toolchain/bin*../lib/gcc/arm-linux-gnueabihf/4.7.3/../../../../arm-linux-gnueabihf/bin/ld: cannot find -lbootstrap

    http://www.qtcentre.org/archive/index.php/t-41850.html

- Copy Libraries Over to Device

  - Steps

    1. Copy qt libraries to device.

       ```
       rsync -rtvz -a -e "ssh -p 22122" /usr/local/qt/ root@192.168.12.200:/usr
       ```

    2. Add some environment variables to by adding the following lines to /etc/environment.

       ```
       LD_LIBRARY_PATH=/usr/local/qt/lib
       QTDIR=/usr/local/qt
       QWS_MOUSE_PROTO=tslib:/dev/input/event2
       QWS_DISPLAY=LinuxFB:mmWidth=310:mmHeight=190
       ```

        * To add mouse support you could have a line such as:

          ```
          export QWS_MOUSE_PROTO=IntelliMouse:/dev/input/event2
          ```

    3. Try running a sample application. You should have demos installed at *usr/local/qt/demos/embedded*

        * Try running styledemo:

          ```
          cd /usr/local/qt/demos/embedded/
          ./styledemo/styledemo -qws
          ```

        * Or fluidlauncher

          ```
          cd /usr/local/qt/demos/embedded/
          ./fluidlauncher/fluidlauncher -qws
          ```

  - Warning

        * /dev/input/event# may change depending on the ordering and number of USB inputs you have plugged in.

        * Booting with a mouse and a keyboard plugged in will result in a different event # for touchscreen than without.

        * To check what different events are, trying inputting data with the mouse/keyboard/touchscreen and seeing which outputs data

          ```
          cat /dev/input/event1 | hexdump
          ```

Links

- http://qt-project.org/wiki/Building_Qt_for_Embedded_Linux
- http://qt-project.org/doc/qt-4.8/qt-embedded-install.html
- https://www.olimex.com/forum/index.php?topic=399.0

```
./configure -xplatform qws/linux-arm-g++ -embedded arm -prefix /usr/qtarm/usr/loca
```

- https://code.google.com/p/a13-olinuxino/wiki/PageName
- https://www.olimex.com/forum/index.php?topic=751.msg3702#msg3702
- http://suchakra.wordpress.com/2011/05/30/developing-qt-apps/
- https://code.google.com/p/a13-olinuxino/source/browse/CrossNG.wiki?repo=wiki
- Getting started with Qt.pdf
  - has working notes for proper installation of tslib.

Simple Sample Programs

Basic Output to LCD Screen

MainWindow.cpp

```
#include "mainwindow.h"
#include "ui_mainwindow.h"



MainWindow::MainWindow(QWidget *parent) :
    QMainWindow(parent),
    ui(new Ui::MainWindow)
{
    ui->setupUi(this);
    QWidget::showFullScreen();
}

MainWindow::~MainWindow()
{
    delete ui;
}

void MainWindow::buttonClickHandler()
{

}
```

MainWindow.h

```
#ifndef MAINWINDOW_H
#define MAINWINDOW_H

#include <QMainWindow>

namespace Ui {
class MainWindow;
}

class MainWindow : public QMainWindow
{
    Q_OBJECT

public:
    explicit MainWindow(QWidget *parent = 0);
    ~MainWindow();

public slots:
    void buttonClickHandler();

private:
    Ui::MainWindow *ui;
};

#endif // MAINWINDOW_H
```

moc_mainwindow.cpp

```
/****************************************************************************
** Meta object code from reading C++ file 'mainwindow.h'
**
** Created by: The Qt Meta Object Compiler version 67 (Qt 5.0.1)
**
** WARNING! All changes made in this file will be lost!
****************************************************************************/

#include "mainwindow.h"
#include <QtCore/qbytearray.h>
```

```
#include <QtCore/qmetatype.h>
#if !defined(Q_MOC_OUTPUT_REVISION)
#error "The header file 'mainwindow.h' doesn't include <QObject>."
#elif Q_MOC_OUTPUT_REVISION != 67
#error "This file was generated using the moc from 5.0.1. It"
#error "cannot be used with the include files from this version of Qt."
#error "(The moc has changed too much.)"
#endif

QT_BEGIN_MOC_NAMESPACE
struct qt_meta_stringdata_MainWindow_t {
    QByteArrayData data[3];
    char stringdata[32];
};
#define QT_MOC_LITERAL(idx, ofs, len) \
    Q_STATIC_BYTE_ARRAY_DATA_HEADER_INITIALIZER_WITH_OFFSET(len, \
    offsetof(qt_meta_stringdata_MainWindow_t, stringdata) + ofs \
        - idx * sizeof(QByteArrayData) \
ORG-LIST-END-MARKER
    )
static const qt_meta_stringdata_MainWindow_t qt_meta_stringdata_MainWindow = {
    {
QT_MOC_LITERAL(0, 0, 10),
QT_MOC_LITERAL(1, 11, 18),
QT_MOC_LITERAL(2, 30, 0)
    },
    "MainWindow\0buttonClickHandler\0\0"
};
#undef QT_MOC_LITERAL

static const uint qt_meta_data_MainWindow[] = {

 // content:
       7,       // revision
       0,       // classname
       0,    0, // classinfo
       1,   14, // methods
       0,    0, // properties
       0,    0, // enums/sets
       0,    0, // constructors
```

```
       0,       // flags
       0,       // signalCount

 // slots: name, argc, parameters, tag, flags
       1,    0,   19,    2, 0x0a,

 // slots: parameters
    QMetaType::Void,

       0        // eod
};

void MainWindow::qt_static_metacall(QObject *_o, QMetaObject::Call _c, int _id, void *
{
    if (_c == QMetaObject::InvokeMetaMethod) {
        MainWindow *_t = static_cast<MainWindow *>(_o);
        switch (_id) {
        case 0: _t->buttonClickHandler(); break;
        default: ;
        }
    }
    Q_UNUSED(_a);
}

const QMetaObject MainWindow::staticMetaObject = {
    { &QMainWindow::staticMetaObject, qt_meta_stringdata_MainWindow.data,
      qt_meta_data_MainWindow,  qt_static_metacall, 0, 0}
};


const QMetaObject *MainWindow::metaObject() const
{
    return QObject::d_ptr->metaObject ? QObject::d_ptr->dynamicMetaObject() : &staticM
}

void *MainWindow::qt_metacast(const char *_clname)
{
    if (!_clname) return 0;
    if (!strcmp(_clname, qt_meta_stringdata_MainWindow.stringdata))
        return static_cast<void*>(const_cast< MainWindow*>(this));
```

```
    return QMainWindow::qt_metacast(_clname);
}

int MainWindow::qt_metacall(QMetaObject::Call _c, int _id, void **_a)
{
    _id = QMainWindow::qt_metacall(_c, _id, _a);
    if (_id < 0)
        return _id;
    if (_c == QMetaObject::InvokeMetaMethod) {
        if (_id < 1)
            qt_static_metacall(this, _c, _id, _a);
        _id -= 1;
    } else if (_c == QMetaObject::RegisterMethodArgumentMetaType) {
        if (_id < 1)
            *reinterpret_cast<int*>(_a[0]) = -1;
        _id -= 1;
    }
    return _id;
}
QT_END_MOC_NAMESPACE
```

ui_mainwindow.h

```
/********************************************************************************
** Form generated from reading UI file 'mainwindow.ui'
**
** Created by: Qt User Interface Compiler version 5.0.1
**
** WARNING! All changes made in this file will be lost when recompiling UI file!
********************************************************************************/

#ifndef UI_MAINWINDOW_H
#define UI_MAINWINDOW_H

#include <QtCore/QVariant>
#include <QtWidgets/QAction>
#include <QtWidgets/QApplication>
#include <QtWidgets/QButtonGroup>
#include <QtWidgets/QHeaderView>
#include <QtWidgets/QLabel>
```

```
#include <QtWidgets/QLineEdit>
#include <QtWidgets/QMainWindow>
#include <QtWidgets/QMenuBar>
#include <QtWidgets/QPushButton>
#include <QtWidgets/QStatusBar>
#include <QtWidgets/QToolBar>
#include <QtWidgets/QWidget>

QT_BEGIN_NAMESPACE

class Ui_MainWindow
{
public:
    QWidget *centralWidget;
    QPushButton *pushButton;
    QLabel *label;
    QLineEdit *lineEdit;
    QMenuBar *menuBar;
    QToolBar *mainToolBar;
    QStatusBar *statusBar;

    void setupUi(QMainWindow *MainWindow)
    {
        if (MainWindow->objectName().isEmpty())
            MainWindow->setObjectName(QStringLiteral("MainWindow"));
        MainWindow->resize(524, 300);
        centralWidget = new QWidget(MainWindow);
        centralWidget->setObjectName(QStringLiteral("centralWidget"));
        pushButton = new QPushButton(centralWidget);
        pushButton->setObjectName(QStringLiteral("pushButton"));
        pushButton->setGeometry(QRect(20, 110, 93, 27));
        label = new QLabel(centralWidget);
        label->setObjectName(QStringLiteral("label"));
        label->setGeometry(QRect(20, 40, 62, 17));
        lineEdit = new QLineEdit(centralWidget);
        lineEdit->setObjectName(QStringLiteral("lineEdit"));
        lineEdit->setGeometry(QRect(20, 70, 113, 27));
        MainWindow->setCentralWidget(centralWidget);
        menuBar = new QMenuBar(MainWindow);
        menuBar->setObjectName(QStringLiteral("menuBar"));
```

```
        menuBar->setGeometry(QRect(0, 0, 524, 25));
        MainWindow->setMenuBar(menuBar);
        mainToolBar = new QToolBar(MainWindow);
        mainToolBar->setObjectName(QStringLiteral("mainToolBar"));
        MainWindow->addToolBar(Qt::TopToolBarArea, mainToolBar);
        statusBar = new QStatusBar(MainWindow);
        statusBar->setObjectName(QStringLiteral("statusBar"));
        MainWindow->setStatusBar(statusBar);

        retranslateUi(MainWindow);
        QObject::connect(pushButton, SIGNAL(clicked()), MainWindow, SLOT(buttonClickHa

        QMetaObject::connectSlotsByName(MainWindow);
    } // setupUi

    void retranslateUi(QMainWindow *MainWindow)
    {
        MainWindow->setWindowTitle(QApplication::translate("MainWindow", "MainWindow",
        pushButton->setText(QApplication::translate("MainWindow", "PushButton", 0));
        label->setText(QApplication::translate("MainWindow", "TextLabel", 0));
    } // retranslateUi

};

namespace Ui {
    class MainWindow: public Ui_MainWindow {};
} // namespace Ui

QT_END_NAMESPACE

#endif // UI_MAINWINDOW_H
```

mainwindow.ui

```
<?xml version="1.0" encoding="UTF-8"?>
<ui version="4.0">
 <class>MainWindow</class>
 <widget class="QMainWindow" name="MainWindow">
  <property name="geometry">
   <rect>
```

```
  <x>0</x>
  <y>0</y>
  <width>524</width>
  <height>300</height>
 </rect>
</property>
<property name="windowTitle">
 <string>MainWindow</string>
</property>
<widget class="QWidget" name="centralWidget">
 <widget class="QPushButton" name="pushButton">
  <property name="geometry">
   <rect>
    <x>20</x>
    <y>110</y>
    <width>93</width>
    <height>27</height>
   </rect>
  </property>
  <property name="text">
   <string>PushButton</string>
  </property>
 </widget>
 <widget class="QLabel" name="label">
  <property name="geometry">
   <rect>
    <x>20</x>
    <y>40</y>
    <width>62</width>
    <height>17</height>
   </rect>
  </property>
  <property name="text">
   <string>TextLabel</string>
  </property>
 </widget>
 <widget class="QLineEdit" name="lineEdit">
  <property name="geometry">
   <rect>
    <x>20</x>
```

```
     <y>70</y>
     <width>113</width>
     <height>27</height>
    </rect>
   </property>
  </widget>
 </widget>
 <widget class="QMenuBar" name="menuBar">
  <property name="geometry">
   <rect>
    <x>0</x>
    <y>0</y>
    <width>524</width>
    <height>25</height>
   </rect>
  </property>
 </widget>
 <widget class="QToolBar" name="mainToolBar">
  <attribute name="toolBarArea">
   <enum>TopToolBarArea</enum>
  </attribute>
  <attribute name="toolBarBreak">
   <bool>false</bool>
  </attribute>
 </widget>
 <widget class="QStatusBar" name="statusBar"/>
</widget>
<layoutdefault spacing="6" margin="11"/>
<resources/>
<connections>
 <connection>
  <sender>pushButton</sender>
  <signal>clicked()</signal>
  <receiver>MainWindow</receiver>
  <slot>buttonClickHandler()</slot>
  <hints>
   <hint type="sourcelabel">
    <x>82</x>
    <y>165</y>
   </hint>
```

```
    <hint type="destinationlabel">
     <x>145</x>
     <y>199</y>
    </hint>
   </hints>
  </connection>
 </connections>
 <slots>
  <slot>buttonClickHandler()</slot>
 </slots>
</ui>
```

Build a Button that does Something on Screen

Hello World Program

Source Code

```
////////////////////////////////////////////////////////////////////////////
/**
 *  @file hello_world.cpp
 *  @brief Test basic functionality.
 *
 *  @title Hello World
 *  @author Nicholas Guthrie
 *  @web http//nickguthrie.com
 *  @created June 11, 2013
 *
 *  Compile with: g++ -g -o ../../bin/testing/hello_world hello_world.cpp
 */
////////////////////////////////////////////////////////////////////////////
//------------------------------------------------------------- :Libraries:
//                      _    _ _                 _
//                     | |  (_) |__ _ _ __ _ _ _(_)___ ___
//                     | |__| | '_ \ '_/ _` | '_| / -_|_-<
//                     |____|_|_.__/_| \__,_|_| |_\___/__/
//
// ---------------------------------------------------------------------------
// Input-Output
#include <iostream>             /* input-output stream - necessary for cout */
//#include <fstream>            /* to use file stream */
```

```
using namespace std;            /* to not need std:: on all io */
//Strings
//#include <string>             /* to use strings */
//#include <sstream>            /* use strings like cout */
//#include <cstdlib>            /* for atoi */
//#include <cctype>             /* for atoi */
//#include <vector>
//#include <map>
//Math
//#include <math>               /* pow, sqrt and use compile flag -lm */
//#include <algorithm>          /* use sort and find */

//------------------------------------------------------------------- :Global:
//                            ___ _     _          _
//                           / __| |___| |__  __ _| |
//                          | (_ | / _ \ '_ \/ _` | |
//                           \___|_\___/_.__/\__,_|_|
//
// ---------------------------------------------------------------------------
//const int EMPTY = -1;
//------------------------------------------------------------ :Prototypes:
//                  ___          _       _
//                 | _ \_ _ ___| |_ ___| |_ _  _ _ __  ___ ___
//                 |  _/ '_/ _ \  _/ _ \  _| || | '_ \/ -_|_-<
//                 |_| |_| \___/\__\___/\__|\_, | .__/\___/__/
//                                          |__/|_|
//
//---------------------------------------------------------------------------
int Example_Function();
//------------------------------------------------------------------- :Main:
//                             __  __      _
//                            |  \/  |__ _(_)_ _
//                            | |\/| / _` | | ' \
//                            |_|  |_\__,_|_|_||_|
//
// ---------------------------------------------------------------------------
int main ( int argc, char* argv[] )
{
    ////////////////////////////
    // Variables
```

```
    ////////////////////////////
    cout << "hello world" << endl;

    ////////////////////////////
    // Input
    ////////////////////////////

    ////////////////////////////
    // Output
    ////////////////////////////

    ////////////////////////////
    // Exititing
    ////////////////////////////
    return 0;
}
//--------------------------------------------------------------------- :Functions:
//                      ___             _   _
//                     | __|  _ _ _  __| |_(_)___ _ _  ___
//                     | _| || | ' \/ _|  _| / _ \ ' \(_-<
//                     |_| \_,_|_||_\__|\__|_\___/_||_/__/
//
//
//---------------------------------------------------------------------------
////////////////////////////////////////////////////////////////////////////
/**
 *  @brief
 *  @warning
 *  @param[in]
 *  @return
 */
////////////////////////////////////////////////////////////////////////////
int Example_Function()
{
    return -1;
}
```

Toggle A LED (A13-Olimex-Micro)

Toggle a LED

- Using the Commandline
  - Turn it On

```
echo 1 > /sys/devices/virtual/misc/sun4i-gpio/pin/pg9
```

  - Turn it Off

```
echo 0 > /sys/devices/virtual/misc/sun4i-gpio/pin/pg9
```

- Using C Code

```
////////////////////////////////////////////////////////////////////////////
/**
 *  @file gpio.c
 *  @brief Toggle pg9 LED gpio.
 *
 *  Turns the Status LED on for two seconds, off for two seconds, then exits.
 *
 *  @title gpio.c
 *  @author Nicholas Guthrie
 *  @created 2013-06-13
 *
 *  Compile with: gcc gpio.c -o ../../bin/testing/gpio
 */
////////////////////////////////////////////////////////////////////////////
/**
 * This program is free software: you can redistribute it and/or modify it under
 * the terms of the GNU General Public License as published by the Free Software
 * Foundation, either version 3 of the License, or (at your option) any later
 * version.
 *
 * This program is distributed in the hope that it will be useful, but WITHOUT
 * ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS
```

```
 * FOR A PARTICULAR PURPOSE.  See the GNU General Public License for more
 * details.
 *
 * You should have received a copy of the GNU General Public License along with
 * this program.  If not, see <http://www.gnu.org/licenses/>.
 */
////////////////////////////////////////////////////////////////////////////////
//------------------------------------------------------------------ :Libraries:
//                       _    _ _                  _
//                      | |  (_) |__ _ _ __ _ _ _(_)___ ___
//                      | |__| | '_ \ '_/ _` | '_| / -_|_-<
//                      |____|_|_.__/_| \__,_|_| |_\___/__/
//
// ----------------------------------------------------------------------------
#include <stdio.h>
#include <fcntl.h>
#include <string.h>
#include <unistd.h> //for sleep

//------------------------------------------------------------------- :Main:
//                               __  __      _
//                              |  \/  |__ _(_)_ _
//                              | |\/| / _` | | ' \
//                              |_|  |_\__,_|_|_||_|
//
// ----------------------------------------------------------------------------
int main()
{
    // Variables
    char s_0[] = "0";
    char s_1[] = "1";
    int fd;
    int num = 0;

    // Open GPIO Pin
    if( (fd=open("/sys/devices/virtual/misc/sun4i-gpio/pin/pg9", O_RDWR)) < 0 )
    {
        printf("ERROR Opening file, Exiting.\n");
        return 1;
    }
```

```
    else
    {
        printf("Sucessfully opened file.\n");
    }

    // Turn LED On
    if( write(fd, s_1, strlen(s_1)) < 0 )
    {
        printf("  Error writing s_1, Exiting\n");
    }
    else
    {
        printf("  LED ON\n");
    }

    sleep(2);

    // Turn LED Off
    if( write(fd, s_0, strlen(s_0)) < 0 )
    {
        printf("  Error writing s_0, Exiting\n");
    }
    else
    {
        printf("  LED OFF\n");
    }

    sleep(2);

    // Close file
    if( close(fd)<0 )
    {
        printf("ERROR closing file, Exiting.\n");
        return 1;
    }
    else
    {
        printf("Sucessfully closed file.\n");
    }
}
```

- Links
  - A13 Olinuxino Playing with GPIOS

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```
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                 Version 1.3, 3 November 2008

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