Day 2-2

Assignment:

- Homework 02, Due Tuesday
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Today's Topics:

- libsoc
- Python GPIO
- PWM

libsoc

- C library for interfacing with common System on Chip (SoC) peripherals through generic kernel interfaces (https://github.com/jackmitch/libsoc)
- Aimed at new Linux users
  - intends to be a stepping stone to enable a user to get started quickly.
  - optimized for reliability rather than speed. While the library should be fast, no guarantees are made on it's determinism and it should not be used in time critical routines.

Installing

- Already installed on Bone
- bone$ **`sudo apt install libsoc2 libsoc-dev`**

libsoc Example (exercises/sensors/libsoc)

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/wait.h>

#include <libsoc_gpio.h>
#include <libsoc_debug.h>

// Blinks an LED attached to P9_14
#define GPIO_OUTPUT  50
```

Mapping P9_14 to gpio 50

P9

DGND	1	2	DGND
VDD_3V3	3	4	VDD_3V3
VDD_5V	5	6	VDD_5V
SYS_5V	7	8	SYS_5V
PWR_BUT	9	10	SYS_RESETN
GPIO_30	11	12	GPIO_60
GPIO_31	13	14	GPIO_50
GPIO_48	15	16	GPIO_51
GPIO_5	17	18	GPIO_4
I2C2_SCL	19	20	I2C2_SDA
GPIO_3	21	22	GPIO_2
GPIO_49	23	24	GPIO_15
GPIO_117	25	26	GPIO_14
GPIO_115	27	28	GPIO_113
GPIO_111	29	30	GPIO_112
GPIO_110	31	32	VDD_ADC
AIN4	33	34	GNDA_ADC
AIN6	35	36	AIN5
AIN2	37	38	AIN3
AIN0	39	40	AIN1
GPIO_20	41	42	GPIO_7
DGND	43	44	DGND
DGND	45	46	DGND

P8

DGND	1	2	DGND
GPIO_38	3	4	GPIO_39
GPIO_34	5	6	GPIO_35
GPIO_66	7	8	GPIO_67
GPIO_69	9	10	GPIO_68
GPIO_45	11	12	GPIO_44
GPIO_23	13	14	GPIO_26
GPIO_47	15	16	GPIO_46
GPIO_27	17	18	GPIO_65
GPIO_22	19	20	GPIO_63
GPIO_62	21	22	GPIO_37
GPIO_36	23	24	GPIO_33
GPIO_32	25	26	GPIO_61
GPIO_86	27	28	GPIO_88
GPIO_87	29	30	GPIO_89
GPIO_10	31	32	GPIO_11
GPIO_9	33	34	GPIO_81
GPIO_8	35	36	GPIO_80
GPIO_78	37	38	GPIO_79
GPIO_76	39	40	GPIO_77
GPIO_74	41	42	GPIO_75
GPIO_72	43	44	GPIO_73
GPIO_70	45	46	GPIO_71

http://beagleboard.org/Support/bone101/#headers

Mapping P9_14 to gpio 50

bone$ **config-pin -i P9_14**

```
Pin name: P9_14
Function if no cape loaded: gpio
Function if cape loaded: default gpio gpio_pu gpio_pd pwm
Function information: gpio1_18 default gpio1_18 gpio1_18 gpio1_18 ehrpwm1A
Cape: cape-universala cape-universal cape-universaln
```

Kernel GPIO id: *50*

PRU GPIO id: 82

bone$ **config-pin -q P9_14**

P9_14 Mode: default

Direction: out Value: 1

libsoc Example

```
int main(void) {
  gpio *gpio_output;    // Create gpio pointer
  libsoc_set_debug(1);  // Enable debug output
  // Request gpio
  gpio_output = libsoc_gpio_request(GPIO_OUTPUT,
                                    LS_SHARED);
  // Set direction to OUTPUT
  libsoc_gpio_set_direction(gpio_output, OUTPUT);

  libsoc_set_debug(0);   // Turn off debug printing
                         // for fast toggle
```

libsoc Example

```
  int i;
  for (i=0; i<1000000; i++) { // Toggle GPIO X times
    libsoc_gpio_set_level(gpio_output, HIGH);
    usleep(100000);          // sleep 100,000 uS
    libsoc_gpio_set_level(gpio_output, LOW);
    usleep(100000);
  }

  if (gpio_output) {
    // Free gpio request memory
    libsoc_gpio_free(gpio_output); }

  return EXIT_SUCCESS;
}
```

Libsoc - Compile and Run

```
bone$ gcc –lsoc -o blinkLED blinkLED.c
bone$ ./blinkLED
libsoc-debug: debug enabled (libsoc_set_debug)
libsoc-gpio-debug: requested gpio (50, libsoc_gpio_request)
libsoc-gpio-debug: GPIO already exported (50, libsoc_gpio_request)
libsoc-gpio-debug: setting direction to out (50, libsoc_gpio_set_direction)
libsoc-debug: debug disabled (libsoc_set_debug)
```

libsoc Examples

- https://github.com/jackmitch/libsoc/tree/master/test

gpio_test.c	gpio: add support for 'both' edge mode	4 months ago
i2c_test.c	i2c: document test_spi and libsoc_spi.h	9 months ago
pwm_test.c	pwm: small touch ups and fix seeking issue	7 months ago
spi_test.c	spi: fix segfault in test if spidevice doesn't exist	7 months ago

- exersizes/sensors/libsoc

Python GPIO

- Adafruit (http://www.adafruit.com/) has a nice BBB Python GPIO library
- https://github.com/adafruit/adafruit-beaglebone-io-python

Python install

- Already installed

Python GPIO Code

```
#!/usr/bin/env python
import Adafruit_BBIO.GPIO as GPIO
import time

pin = "P9_14"

GPIO.setup(pin, GPIO.OUT)

while True:
    GPIO.output(pin, GPIO.HIGH)
    time.sleep(0.5)
    GPIO.output(pin, GPIO.LOW)
    time.sleep(0.5)
```

Python Examples

- https://github.com/adafruit/adafruit-beaglebone-io-python/tree/master/test

test_adc.py	fix for ADC segmentation faults, bump to 0.0.9	a
test_gpio_input.py	- Fixed broke GPIO.gpio_function() It should now allow calls with the...	a
test_gpio_output.py	- Fixed broke GPIO.gpio_function() It should now allow calls with the...	a
test_gpio_setup.py	Add new test case for 3 digit gpio	a
test_pwm_setup.py	fix for polarity not getting set properly, add polarity as optional p...	a
test_spi.py	fix for SPI not loading spidevX.X correctly based on load order	4 m
test_uart.py	add simple uart test	a

- exercises/python