tinkerTank Meetup V: The Python Language +

Presented by: Lance Gobaira
Hosted by: Charles Irizarry & Kevin Sanchez
Sponsors: Moonlighter & Skyscanner

Who Am I?

Amatuer Tinkerer / RC Pilot
Professional Site Reliability Engineer

- 1st PC was an IBM PS/2
- 1st language was TI-BASIC
- Using Python since v2.6
- Still owns LEGO Mindstorms

Lance Gobaira

Prerequisites

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1. x86_64 based Computer (Any laptop should do)
2. Raspberry Pi with Ethernet
3. SDCARD pre-loaded with Rasbian Jessie
4. CAT-5 Ethernet Cable
5. USB Ethernet Dongle
6. Optional, but highly recommended:

    i. Solderless Breadboard
    ii. Male to Female Jumper Wires
    iii. 270Ω Resistor
    iv. Single LEDs

Raspberry Pi

CPU Architecture

ARM vs x86_64

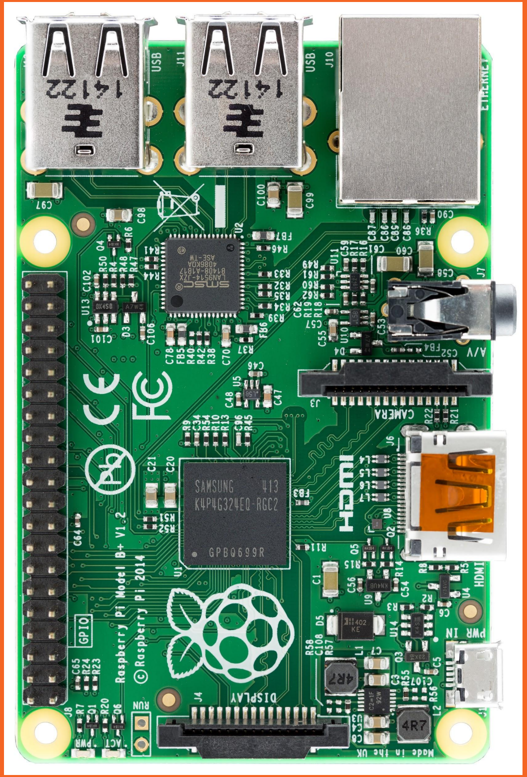
There are fundamental differences in the instructuction sets available on ARM based processors.

Generally, code must be compiled for each architecture separately. (Kernel, libraries, interpreters, etc)

Connectivity

10/100 Ethernet 802.3
WiFi 802.11
Bluetooth 802.15
GPIO
PWM*
HDMI + Analog Audio
Camera
USB
I2C, SPI, UART, DSI

*caveat emptor



http://elinux.org/RPi_Low-level_peripherals

GPIO

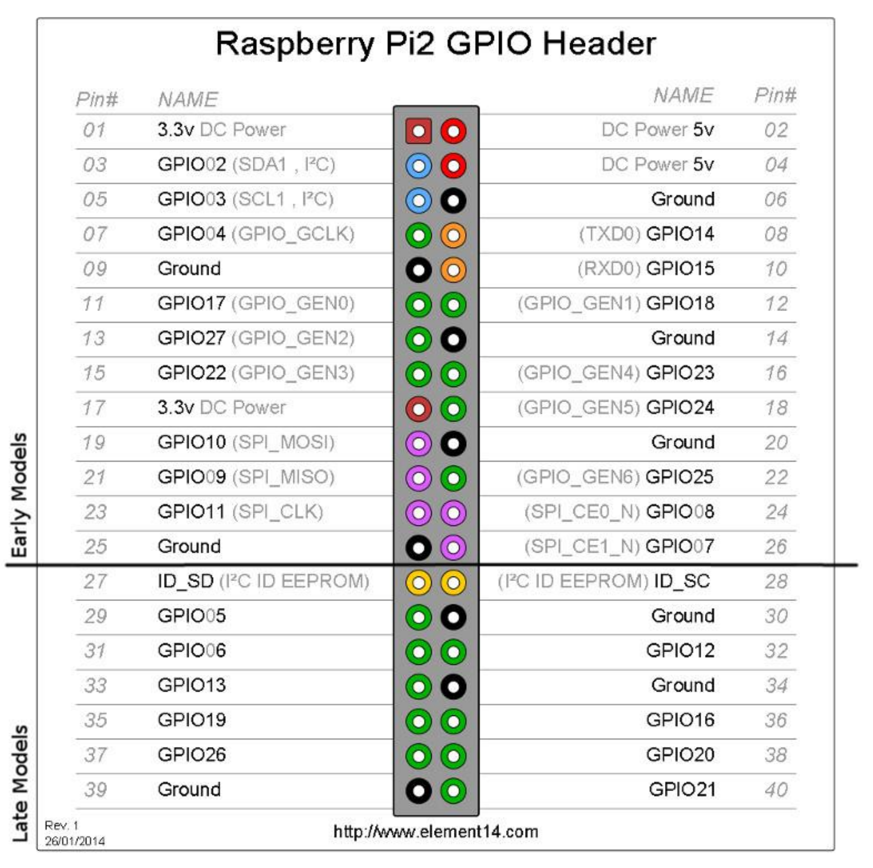
General Purpose Input and Output

General-purpose input/output (GPIO) is a generic pin on an integrated circuit whose behavior—including whether it is an input or output pin—is controllable by the user at run time. GPIO pins have no predefined purpose, and go unused by default

https://en.wikipedia.org/wiki/General-purpose_input/output

GPIO Pinout

https://learn.sparkfun.com/tutorials/raspberry-gpio/all#gpio-pinout



Raspberry Pi2 GPIO Header

Pin#	NAME	NAME	Pin#
01	3.3v DC Power	DC Power 5v	02
03	GPIO02 (SDA1 , I²C)	DC Power 5v	04
05	GPIO03 (SCL1 , I²C)	Ground	06
07	GPIO04 (GPIO_GCLK)	(TXD0) GPIO14	08
09	Ground	(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)	(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)	Ground	14
15	GPIO22 (GPIO_GEN3)	(GPIO_GEN4) GPIO23	16
17	3.3v DC Power	(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)	Ground	20
21	GPIO09 (SPI_MISO)	(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)	(SPI_CE0_N) GPIO08	24
25	Ground	(SPI_CE1_N) GPIO07	26
27	ID_SD (I²C ID EEPROM)	(I²C ID EEPROM) ID_SC	28
29	GPIO05	Ground	30
31	GPIO06	GPIO12	32
33	GPIO13	Ground	34
35	GPIO19	GPIO16	36
37	GPIO26	GPIO20	38
39	Ground	GPIO21	40

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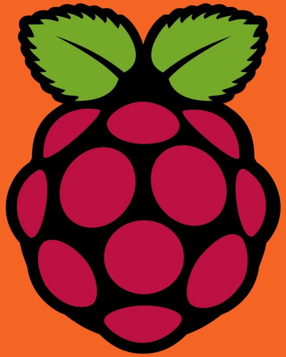
http://www.element14.com

 + = **Raspbian**

Raspbian Linux

https://www.raspbian.org/

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware.

Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

PyCharm

JetBrains PyCharm

https://www.jetbrains.com/pycharm/

PyCharm is an IDE used for programming in Python. It provides many features which accelerate development.

It is cross-platform working on Windows, Mac OS X and Linux.

Community Edition is released under the Apache License.

Python

Python 3

https://docs.python.org/3/

Python is a widely used high-level, general-purpose, interpreted, dynamic programming language.

Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than possible in other languages.

https://en.wikipedia.org/wiki/Python_(programming_language)

Requests

http://docs.python-requests.org/en/master/

Requests is the only Non-GMO HTTP library for Python, safe for human consumption.

Flask

http://flask.pocoo.org/

Flask is a microframework for Python based on Werkzeug, Jinja 2 and good intentions. And before you ask: It's BSD licensed!

RPi.GPIO

https://sourceforge.net/projects/raspberry-gpio-python/

This package provides a class to control the GPIO on a Raspberry Pi.

Note: Due to the inherent design of Python and Linux this module is unsuitable for real-time or timing critical applications.

threading

https://docs.python.org/3/library/threading.html

A thread of execution is the smallest sequence of programmed instructions that can be managed independently by a scheduler, which is typically a part of the operating system.

https://en.wikipedia.org/wiki/Thread_(computing)

queue

https://docs.python.org/3.5/library/queue.html

The queue module implements multi-producer, multi-consumer queues. It is especially useful in threaded programming when information must be exchanged safely between multiple threads.

schedule

https://pypi.python.org/pypi/schedule

Python job scheduling for humans.

An in-process scheduler for periodic jobs that uses the builder pattern for configuration. Schedule lets you run Python functions (or any other callable) periodically at pre-determined intervals using a simple, human-friendly syntax.

gpiozero

https://gpiozero.readthedocs.io/en/v1.2.0/index.html

A simple interface to everyday GPIO components used with Raspberry Pi.

APIs

Don’t reinvent the wheel...

Although the Pi is a very capable machine. We can amplify this by using the power of the “Cloud” to access enormous amounts of computational power.

Learn More

Yearning for More?
Check out these resources

Raspberry Pi

Python Language

- RPi.GPIO Library
- Flask
- Requests

Nifty APIs

C Programming (Wiring Pi)

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