INTRO TO RPI (PART 3)

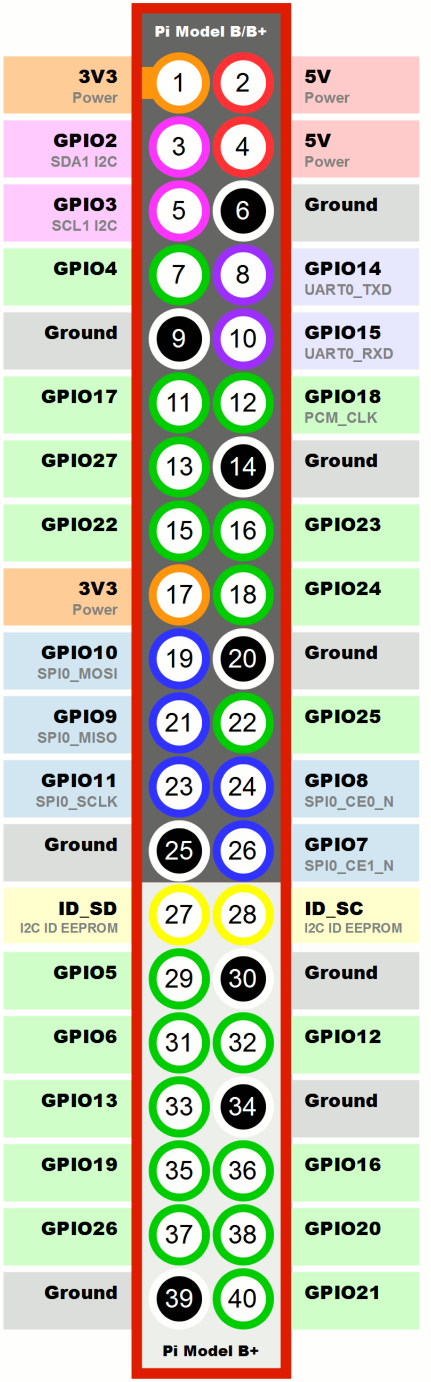
BY SUTD IEEE

AGENDA

- RPi Serial Communication (Contd.)
- Using Firebase with RPi (the right way)
- Running a Web Server on the RPi

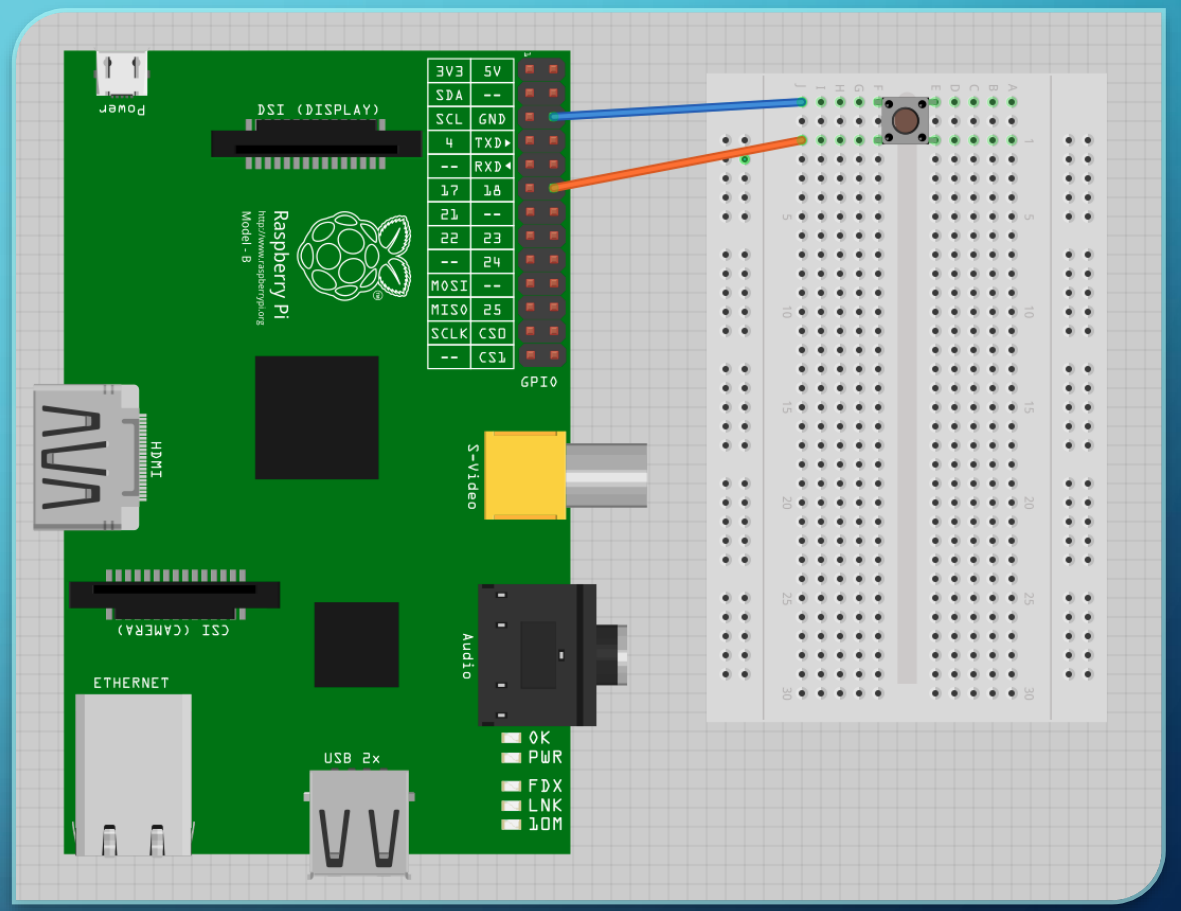
RPI GPIO

https://pinout.xyz/#



ACTIVITY: PUSH BUTTON

- Connect one end of the button to BCM26
- Connect the other end on the same side to GND



ACTIVITY: PUSH BUTTON

- GPIO.setup(26, GPIO.IN, pull_up_down=GPIO.PUD_UP)
- GPIO.input(26)

ACTIVITY: PUSH BUTTON - DEBOUNCE

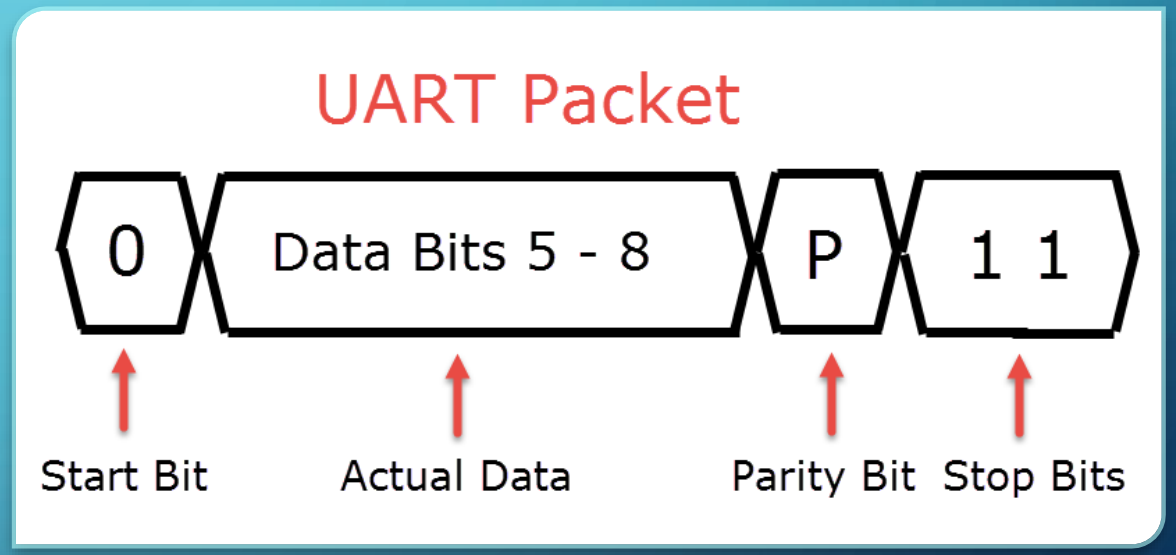
- Oscillation in mechanical switch in button => Multiple button presses
- Logic:
  - Wait for x ms after button pressed and until button is released
  - Only then register it as 1 button press

SERIAL COMMUNICATION

- Send data bit by bit, instead of all at once
- Many protocols:
  - UART / USART
  - SPI
  - I2C
  - …

SERIAL COMMUNICATION (UART)

- Universal Asynchronous Receiver-Transmitter
- Star-Bit
- Data Bits
- Parity Bit (Optional)
- Stop Bit/s



PYTHON SERIAL IN RPI (WITH ARDUINO)

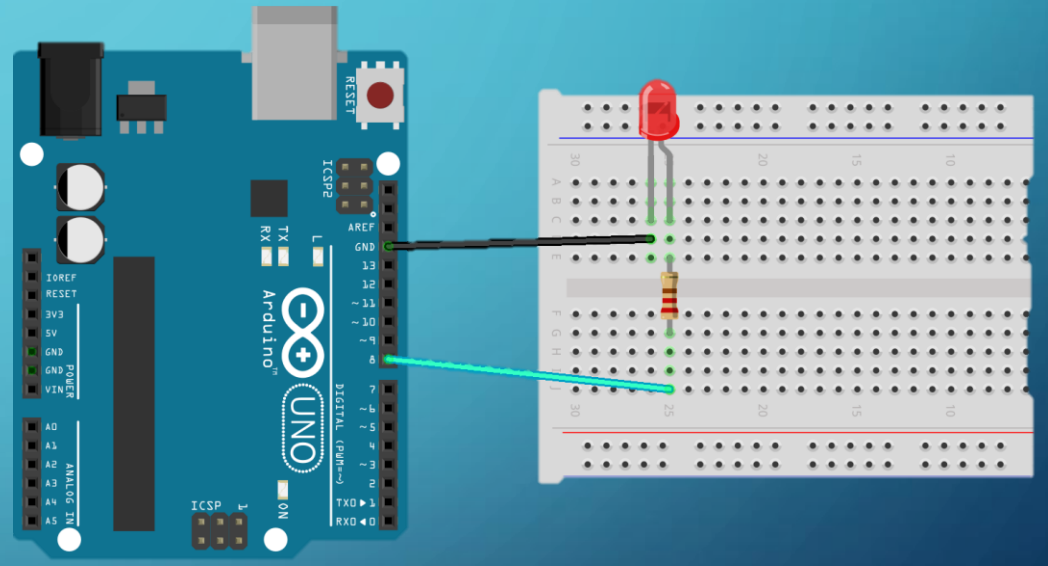
- Why?
  - Offload processing and simple tasks to Arduino
  - Add more input/ output pins
  - Connect to other serial peripherals
- How?
  - Connect a USB cable from the Pi to the Arduino

PYTHON SERIAL IN RPI (WITH ARDUINO)

- Install pyserial
  - `sudo pip3 install pyserial`
- Create a Python file
  - `import serial`
  - `ser = serial.Serial('/dev/tty*', 9600)`
  - `ser.write('Something')` >> 'Something' must be in *bytes*
- Check serial port name:
  - `ls /dev/tty*`

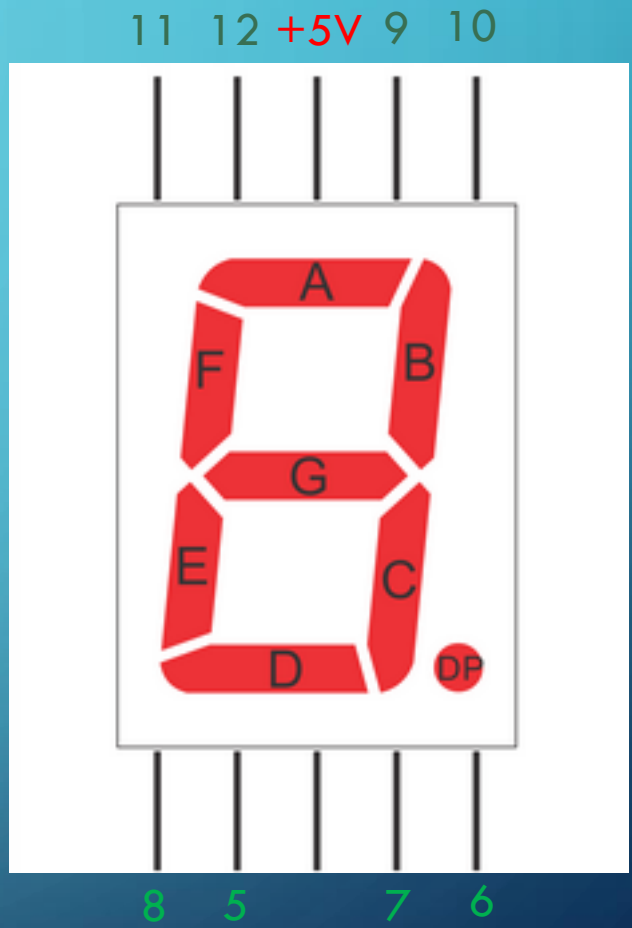
ON ARDUINO

```
String inString = "";
void serialEvent() {
      char c = ' ';
      c = Serial.read();
      if (c != '\n') {
            inString += c;
      } else {
            // Do Something !
            inString = "";
      }
}
```



ON ARDUINO

- Seven Segment Display
  - Common Anode
  - Connect one of the ‘Com’ to +5V
  - Connect other pins to Arduino Digital Pins
    - Through RESISTORS!



SPI AND I2C

- RPi has:
  - 3 SPI Bus's (Only one accessible via the headers)
  - 2 I2C Bus's accessible through the headers
  - I think

FIREBASE (THE RIGHT WAY)

- ‘Database Secrets’ is deprecated
- ‘python-firebase’ module not updated in 4 years
- The right way?
  - Firebase Admin SDK (Python)

FIREBASE (THE RIGHT WAY)

- Open your Firebase Console
- Navigate to Project Settings >> Service Accounts
- Generate new Private Key >> Save that file in your project folder

FIREBASE (THE RIGHT WAY)

- In the Firebase Console:
- Open Database Tab
- Navigate to ‘Rules’
- Change it to this:

```
{
  "rules": {
    ".read": "auth.uid === 'some_UID'",
    ".write": "auth.uid === 'some_UID'"
  }
}
```

- Publish

FIREBASE (THE RIGHT WAY)

- How to install?
  - `sudo pip3 install firebase-admin`
- Create a Python file
  - `import firebase_admin`
  - `from firebase_admin import credentials`
  - `from firebase_admin import db`

FIREBASE (THE RIGHT WAY)

```
cred = credentials.Certificate('mykey.json')
firebase_admin.initialize_app(cred, {
    'databaseURL':
'https://your_database.firebaseio.com/',
    'databaseAuthVariableOverride': {
        'uid': 'your_uid'
    }
})
```

FIREBASE (THE RIGHT WAY)

- To use the database:
  - `mydatabase = db.reference()`
  - Get:
    - `mydatabase.get()`
    - `mydatabase.child('some_child').get()`
  - Set:
    - `mydatabase.child('some_child').set( { "key": "value" } )`
  - Update
  - Push

FIREBASE (THE RIGHT WAY)

- Refer to the template to learn how to continuously get a certain database entry

FIREBASE (THE RIGHT WAY)

- Your task:
  - Write another file that asks for an `input` and updates a particular database entry using `.set()` -> On your computer
  - Run a script on the RPi to continuously read that same database entry and based on that asks the Arduino to display said input on the 7-Segment Display

FLASK SERVER

- Flask is a Python framework that allows you to manage your web servers
  - It is not a web server! (Though it comes with one by default)
- Install:
  - virtualenv:
    - `sudo pip3 install virtualenv`
    - `mkdir myproject`
    - `cd myproject`
    - `virtualenv myvenv`
    - `. myvenv/bin/activate`
  - flask:
    - `pip3 install Flask`

FLASK SERVER

- Refer to ‘flaskapp’ in Templates for example

THE END