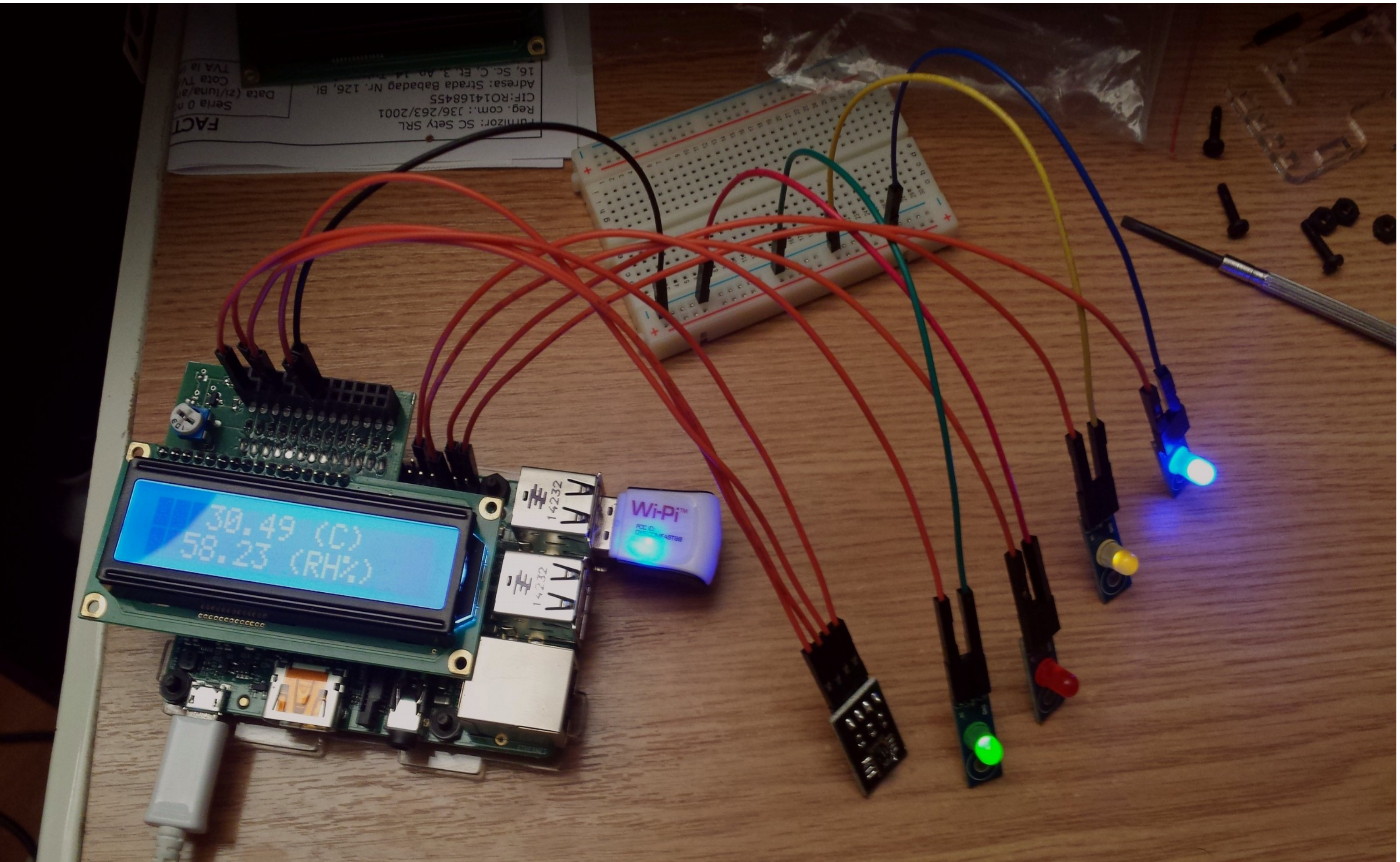
pi + sensor = weather station



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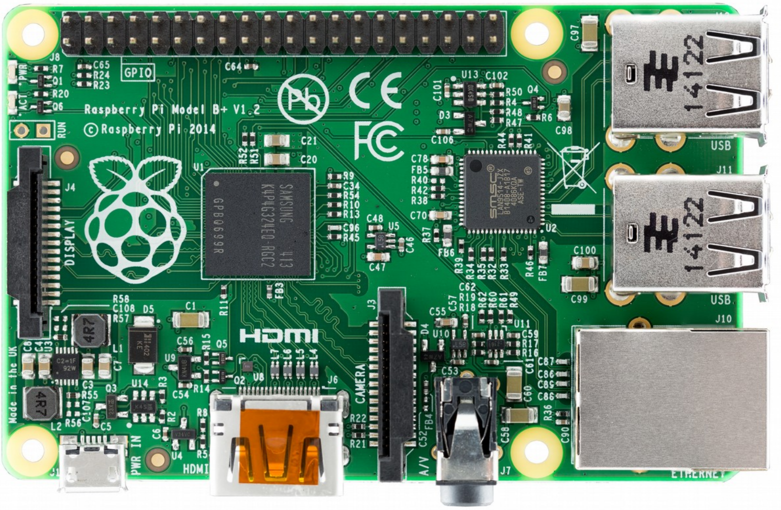
1.2

Contents:

- about the Raspberry PI
- technologies used for the project
- driving the components
- the weather station as a whole
- short demo
- Q&A
- closing thoughts

Raspberry PI B+

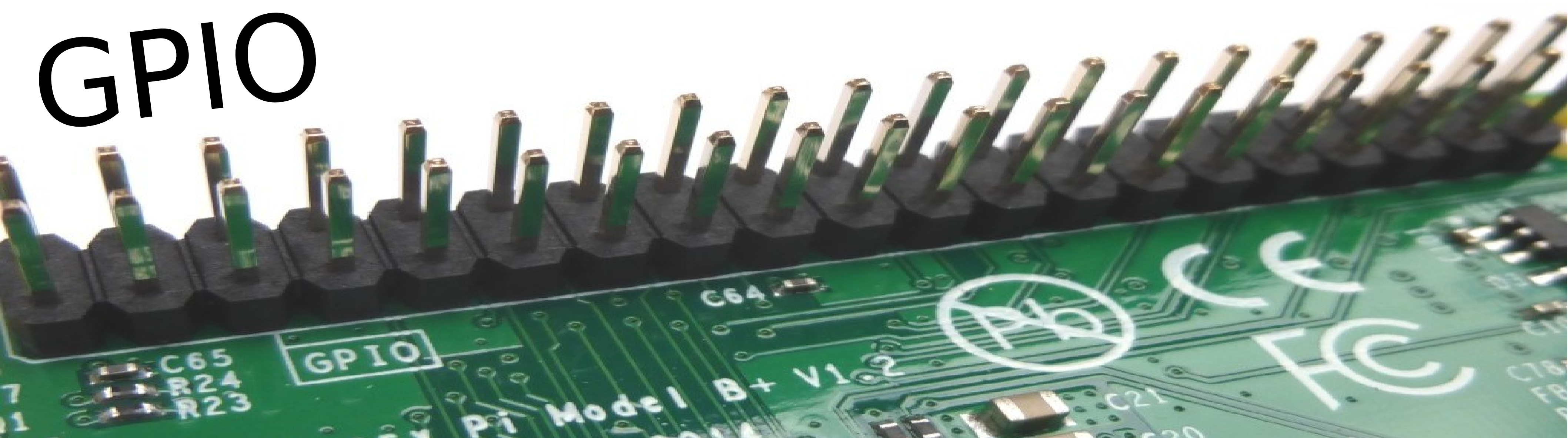


- full OS-capable PC for $35
- Broadcom SoC running at 700MHz with 512 MB RAM
- runs 32-bit ARM builds of Linux or the BSDs
- various peripherals including: 4xUSB, Ethernet, Composite A/V, HDMI
- General Purpose Input/Output header

- 40 in number
- have PWM support, but mostly used digitally
- have kernel drivers on all major OS-es

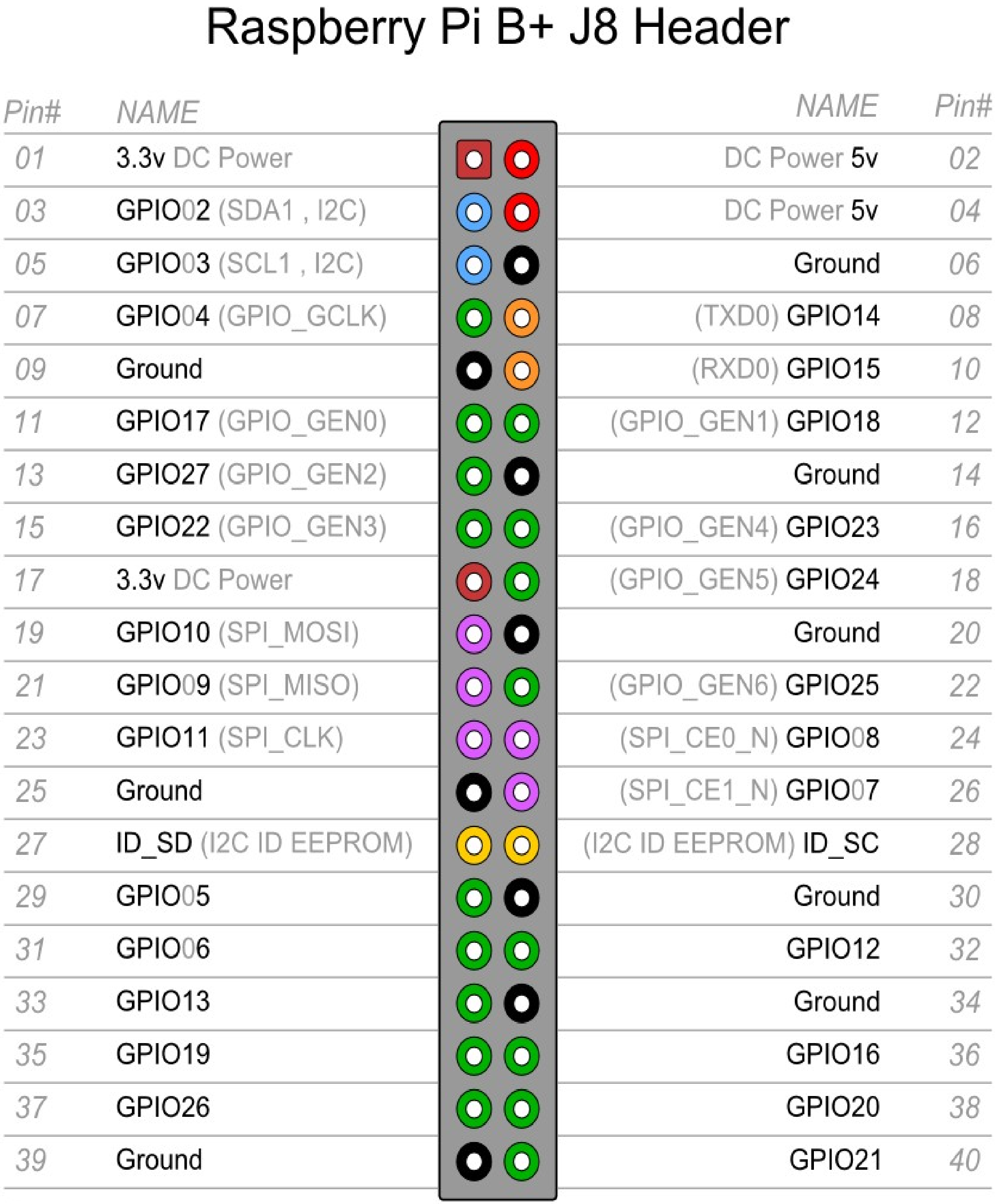
  (file descriptors can be found in /sys/class/gpio)
- have pre-made libraries for BASIC, C, C++, Java, Perl, Python and Lua

GPIO



lua-periphery

- C library
- Has functions for:
  - setting up
  - reading from
  - outputting to
  - cleaning up
- the GPIO pins



Raspberry Pi B+ J8 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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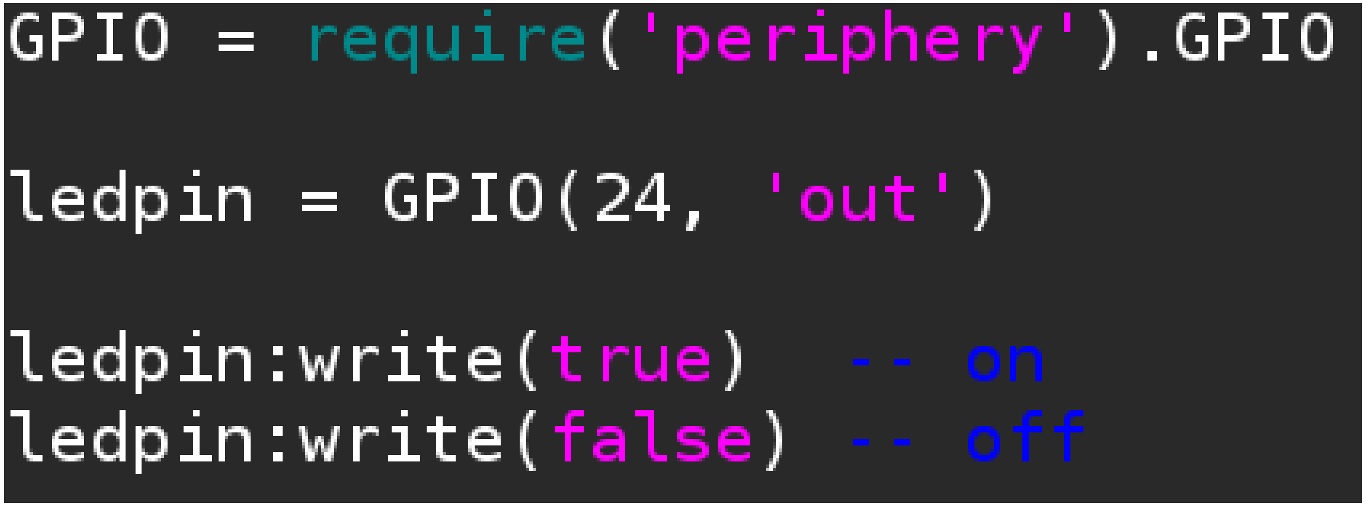
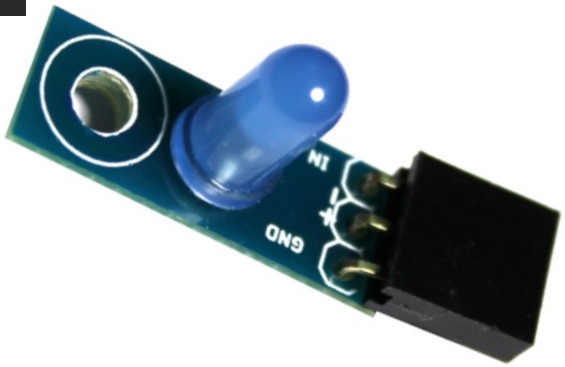
5v brick LEDs

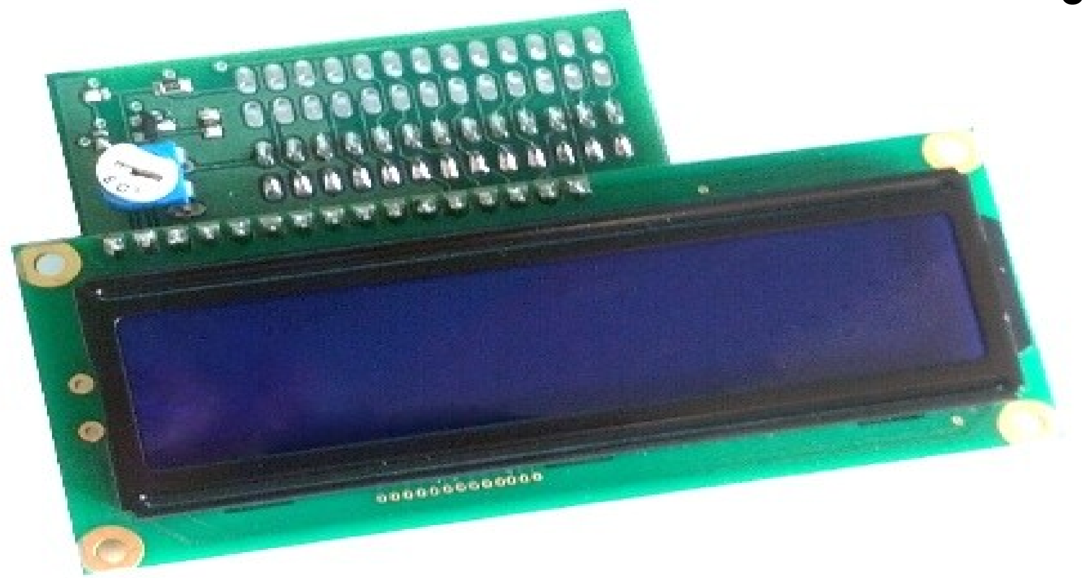


```
GPIO = require('periphery').GPIO

ledpin = GPIO(24, 'out')

ledpin:write(true)  -- on
ledpin:write(false) -- off
```



LCD

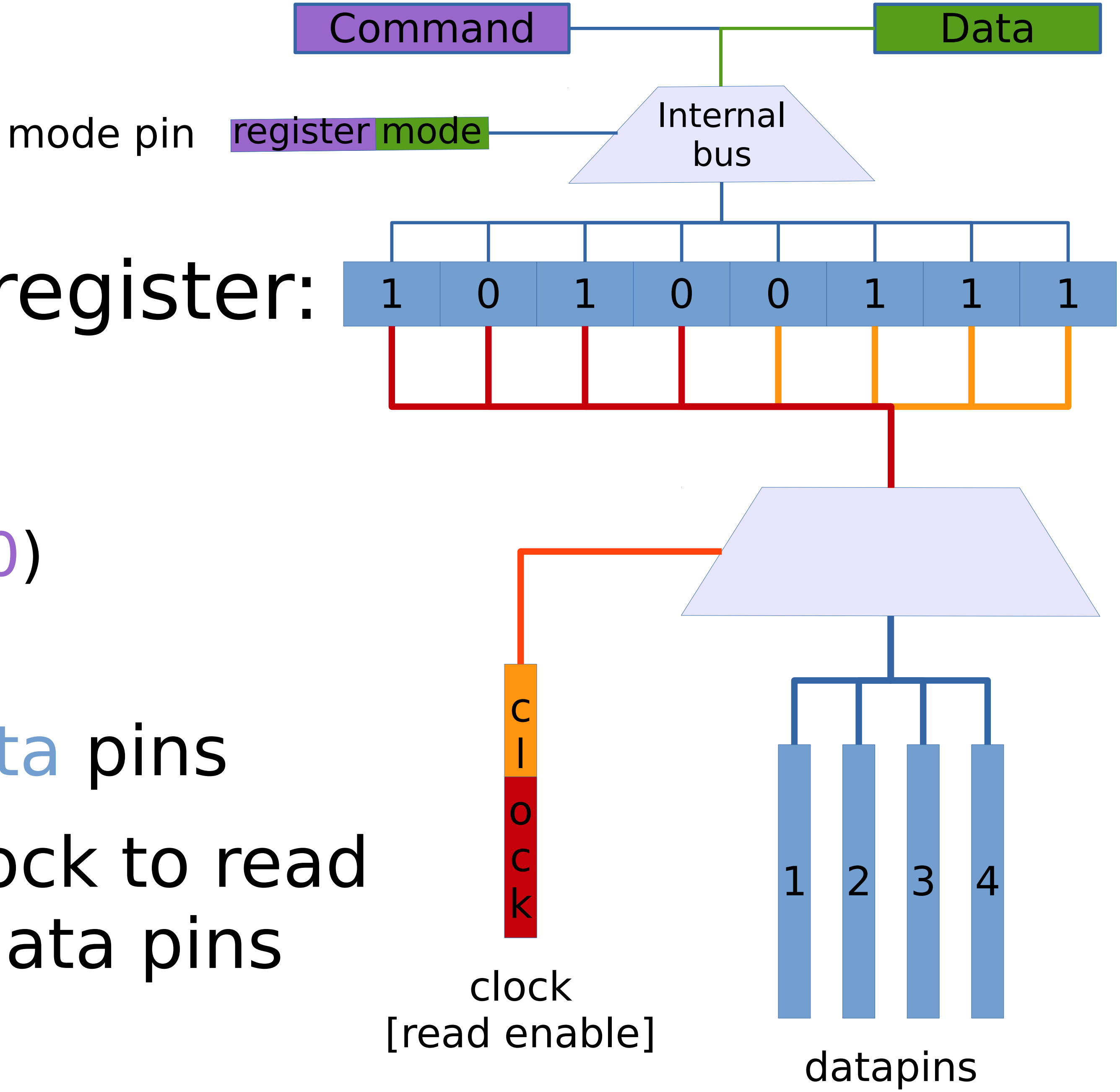
- Adafruit 16x2 LCD SHIELD
- 8 bit operation mode, fully ASCII capable



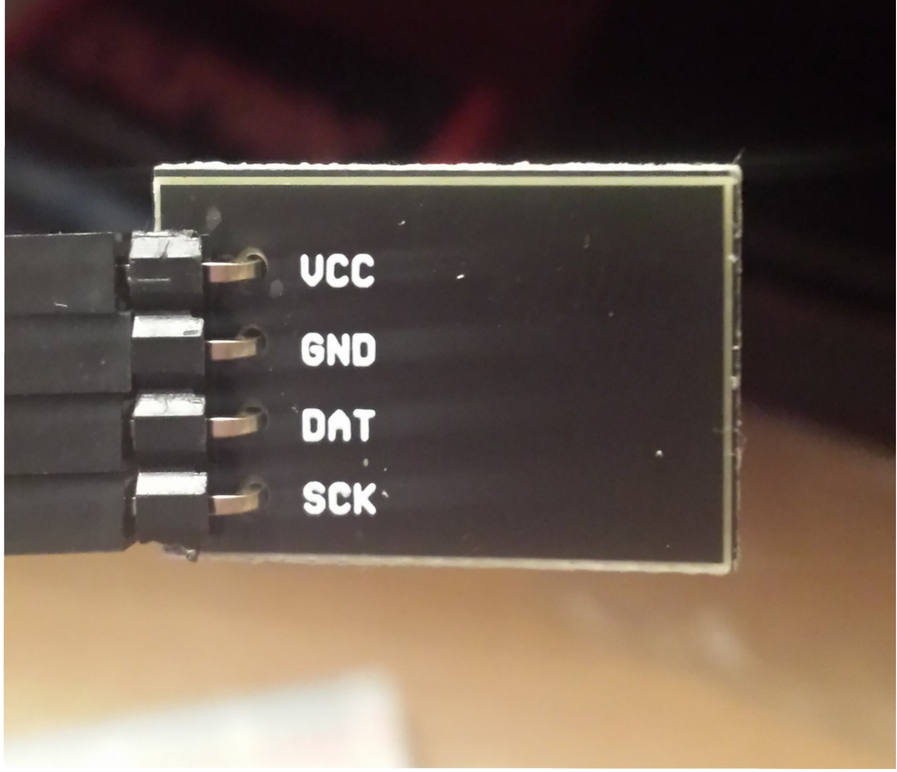
- uses 6 GPIO pins:
  - 1 mode selector
  - 1 serial clock
  - 4 data pins

Writing to the register:

- mode pin:
  - command (0)
  - data (1)
- output to data pins
- tick serial clock to read 4 bits from data pins

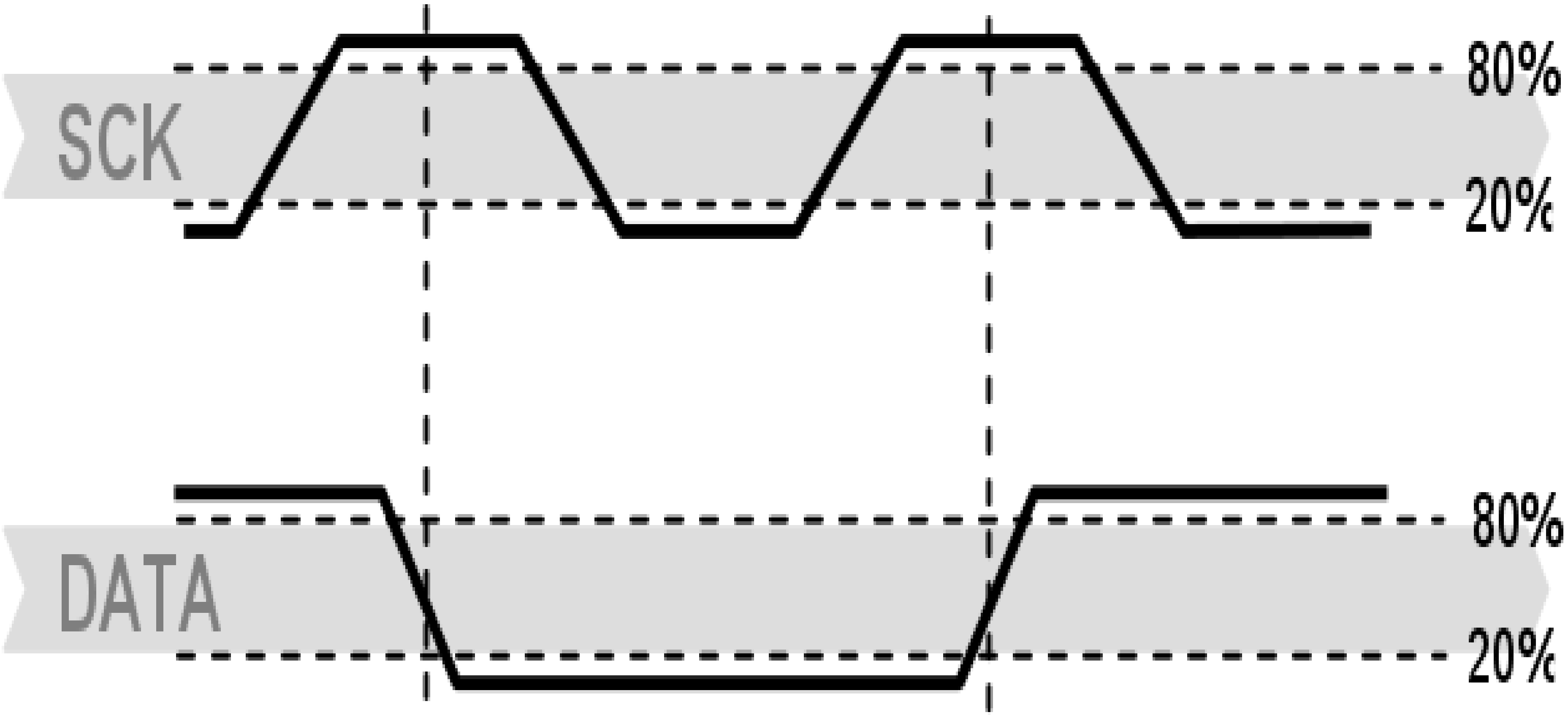


SHT11

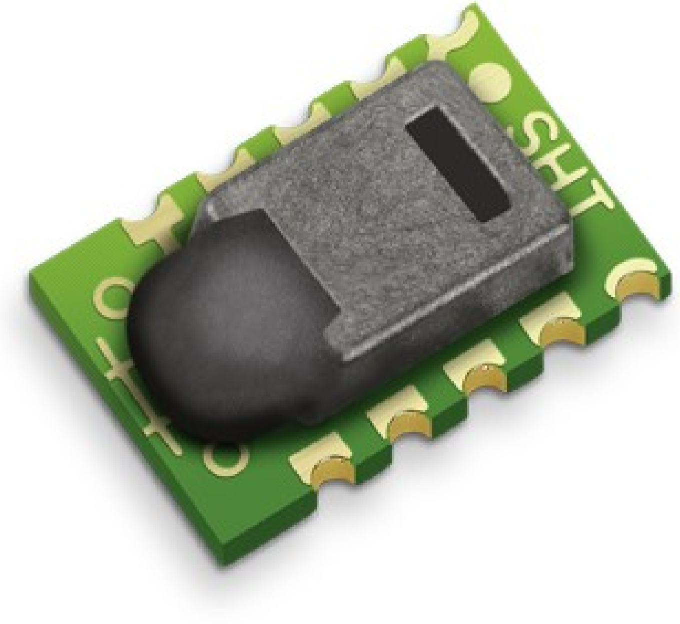


- temperature and humidity sensing digital IC
- VCC usually around 4v
- bi-directional DATA line
- All I/O coordinated by the Serial ClocK

Initiating SHT11 Transmission

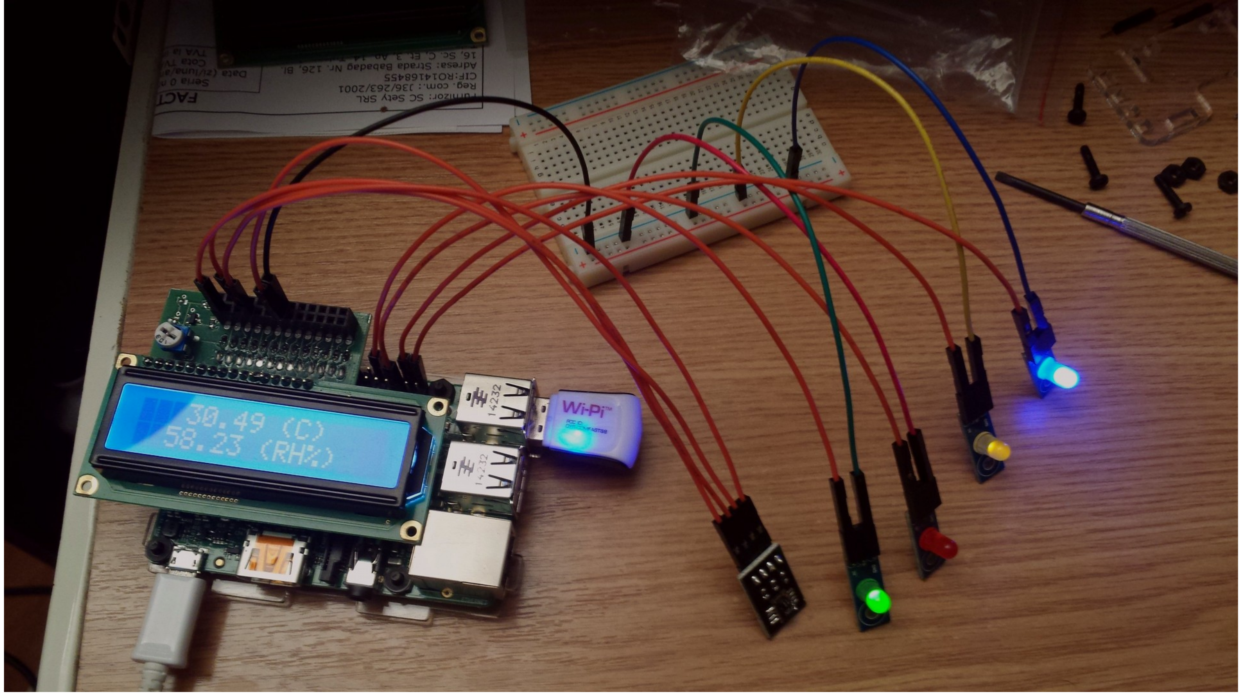


Communicating with the sensor:



- write 1 bit/clock cycle
- commands are 1 byte:
  - 0x03 for temperature
  - 0x05 for humidity
- results are on 2 bytes + 1 CRC byte
  - raw results require minor processing

PI-sense



- each component has a Lua table
- central WeatherStation table which:
  - reads all necessary parameters from config
  - queries the SHT11 for temperature and humidity
  - writes to the LCD
  - triggers the appropriate LEDs

DEMO

Q&A

github.com/aznashwan/lua-sense

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