

Agenda

Midterm Review

Semester Lookahead

Serial Intro

Serial Workshop

What does this mean?



What does this mean?



What does this mean?



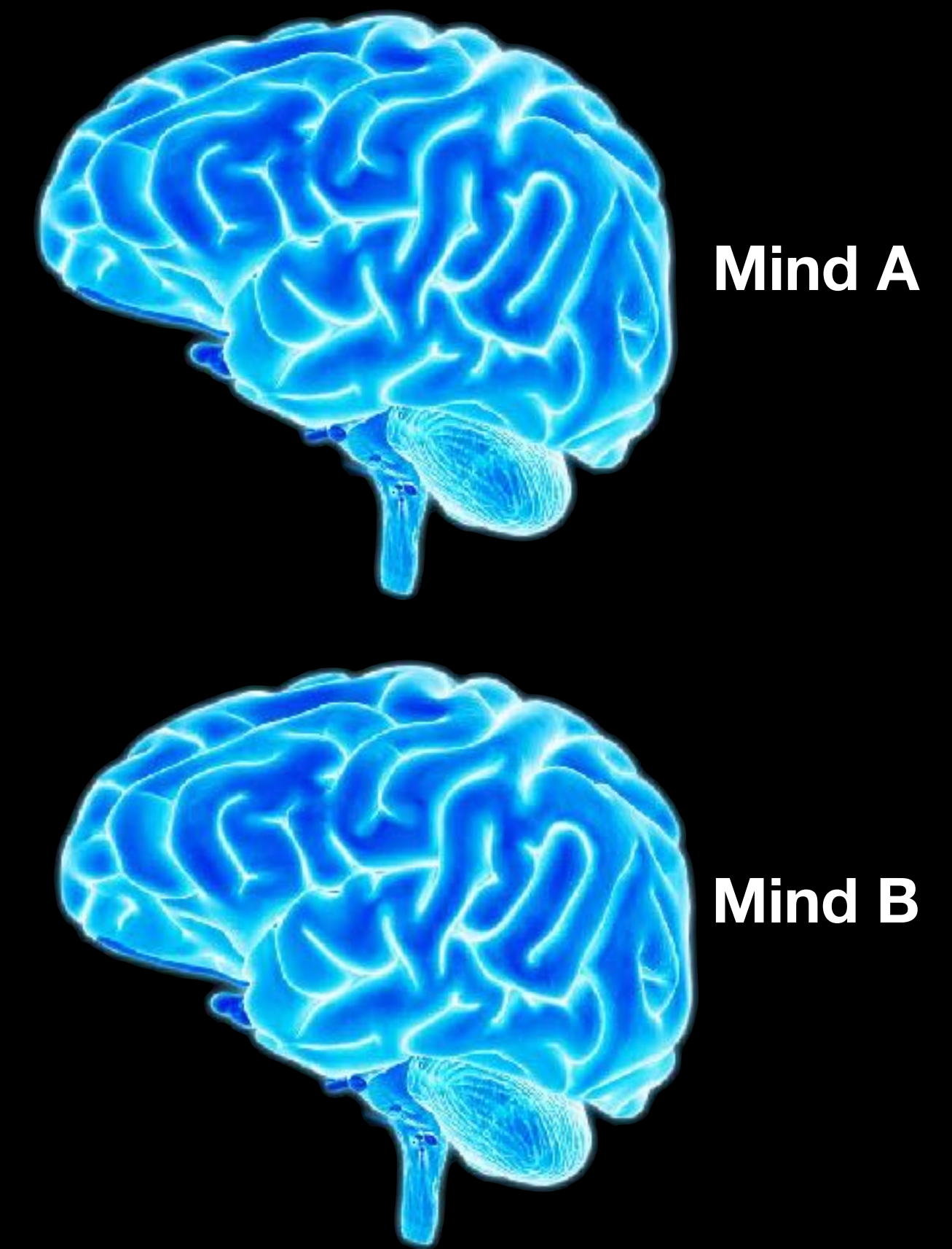
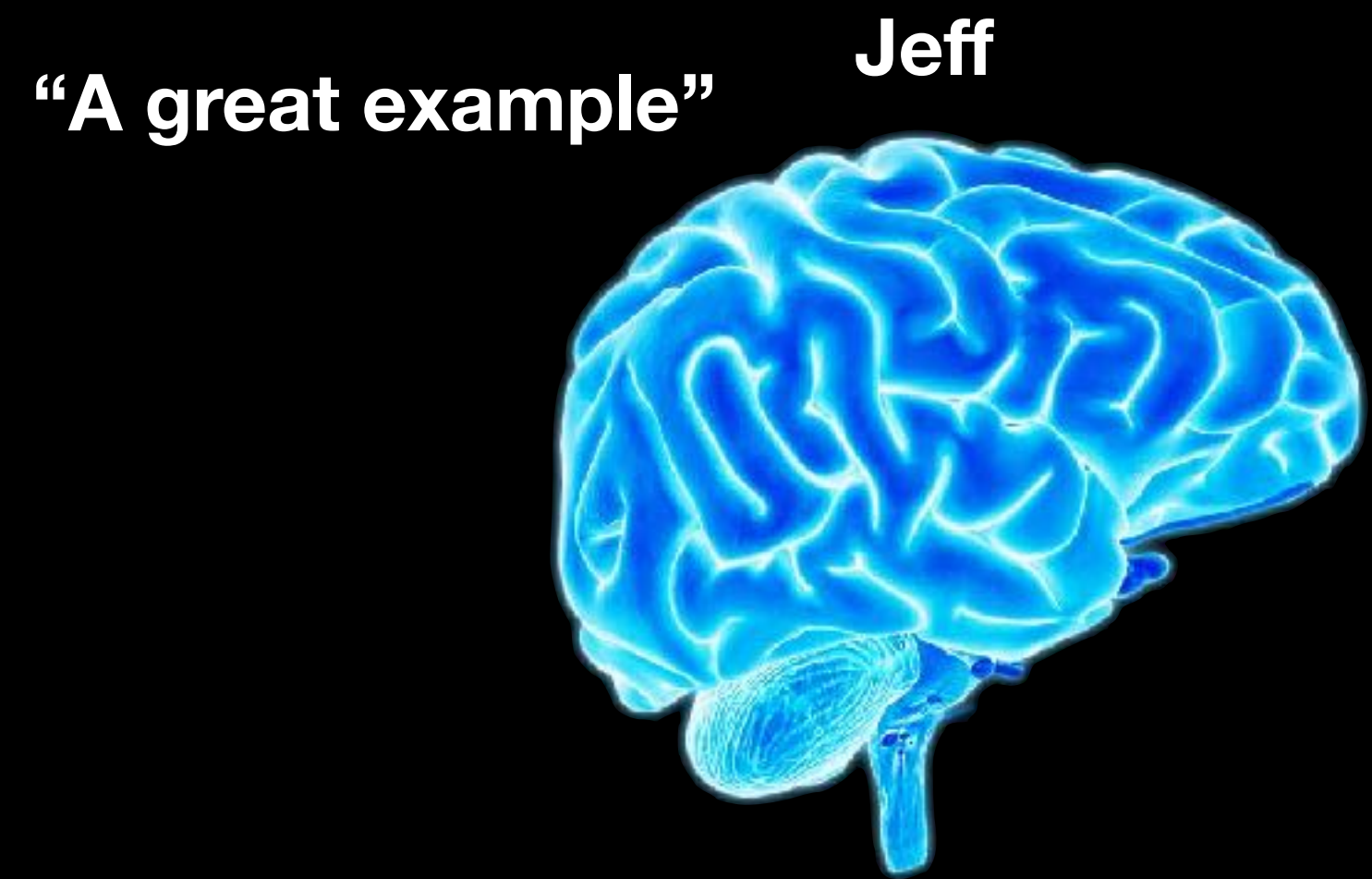


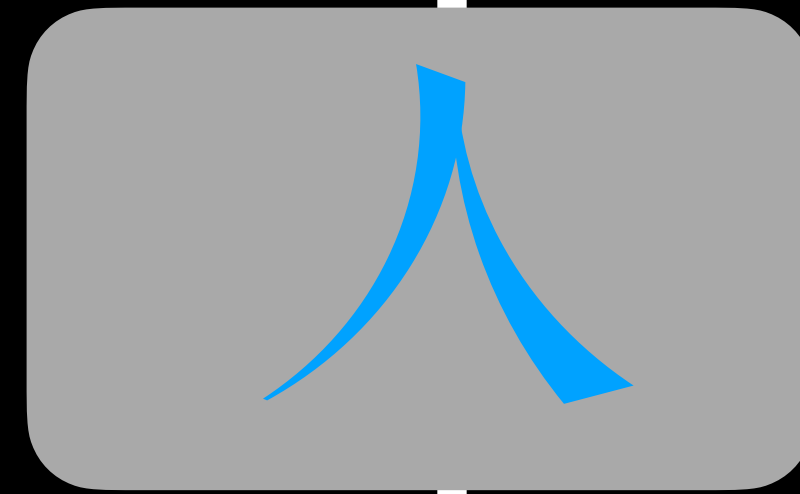
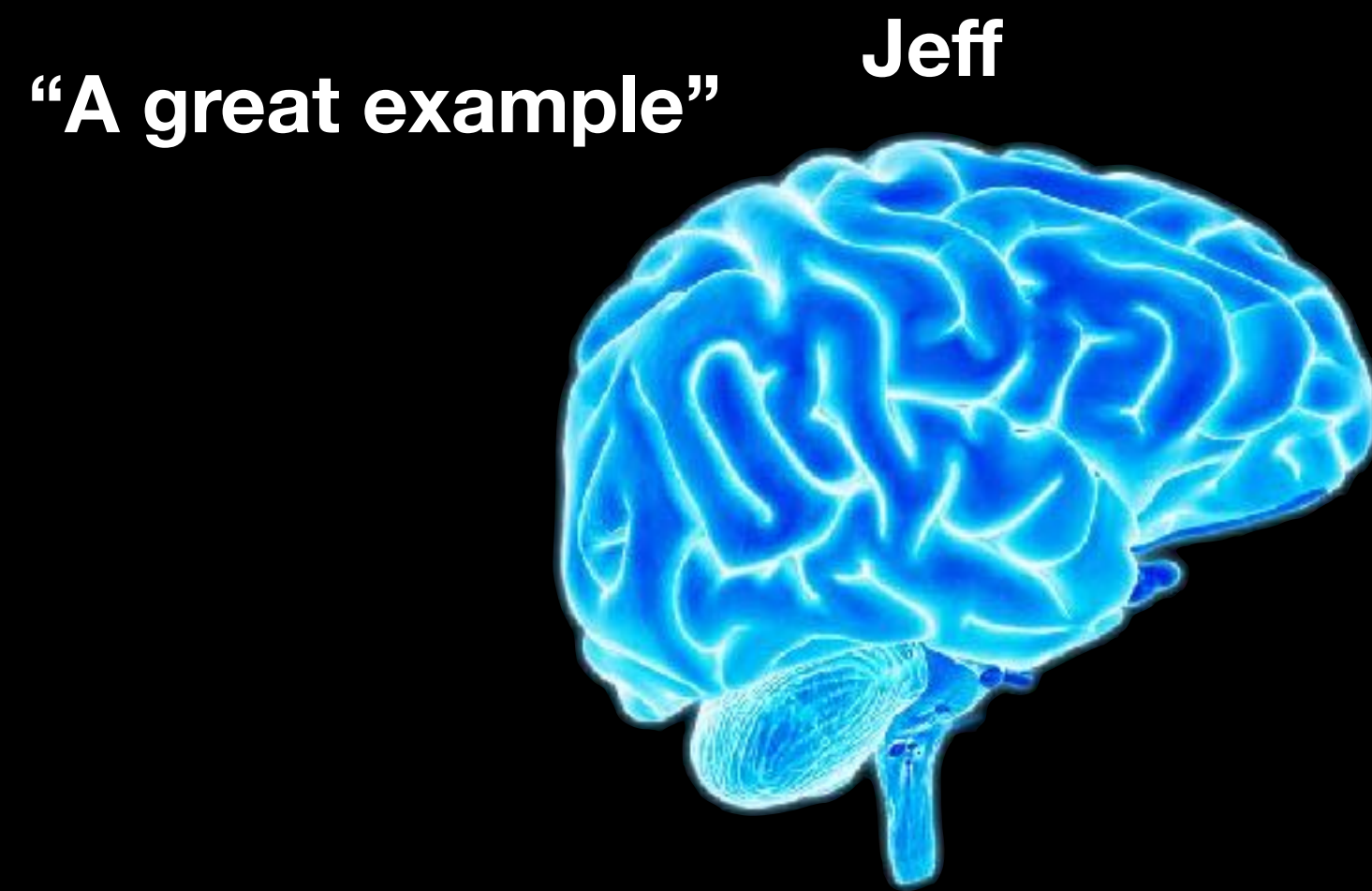
Ceci n'est pas une pipe.

Magritte

This is not a painting by Magritte

This is not the idea that this is not a painting by Magritte...

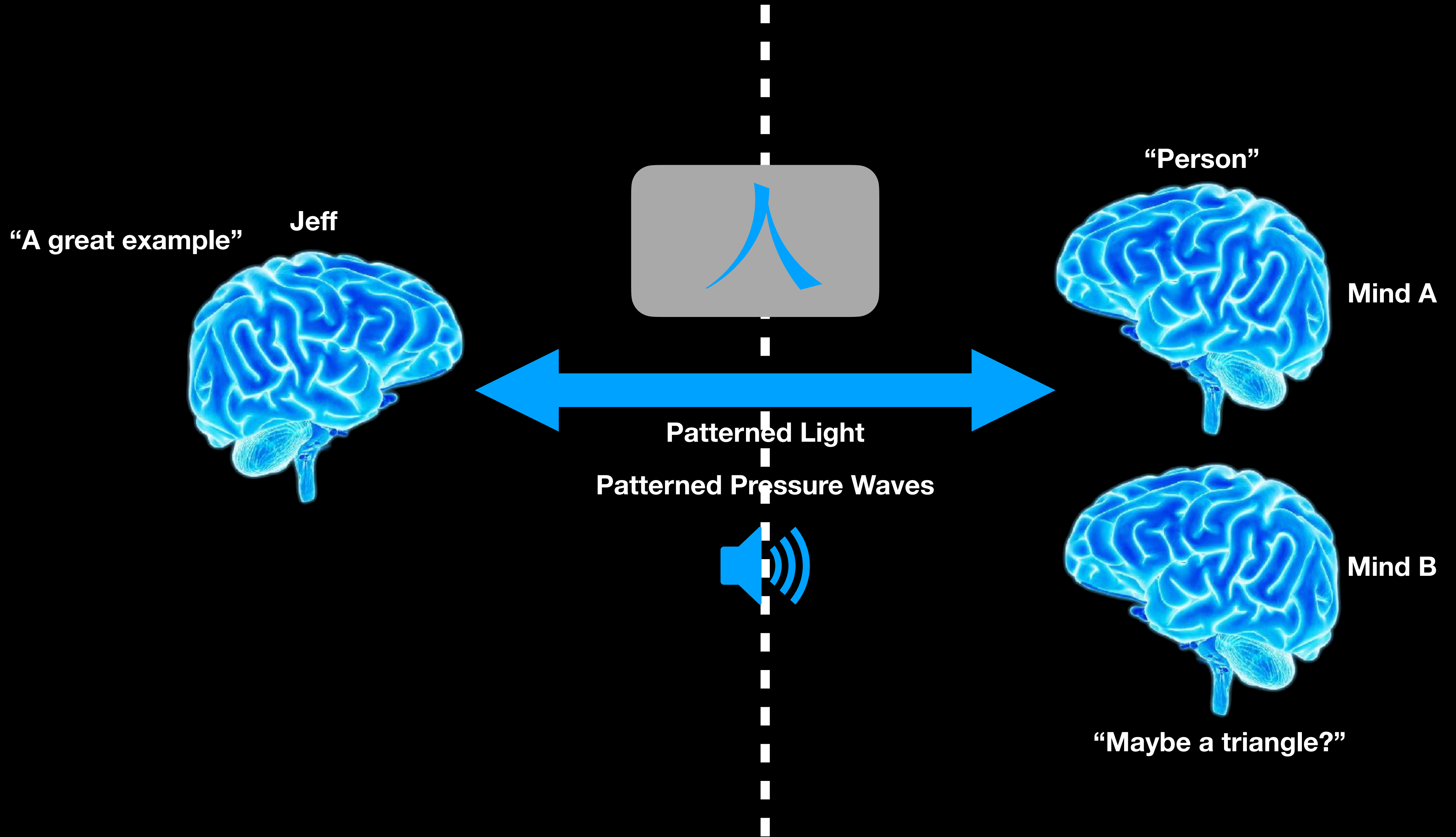




Patterned Light

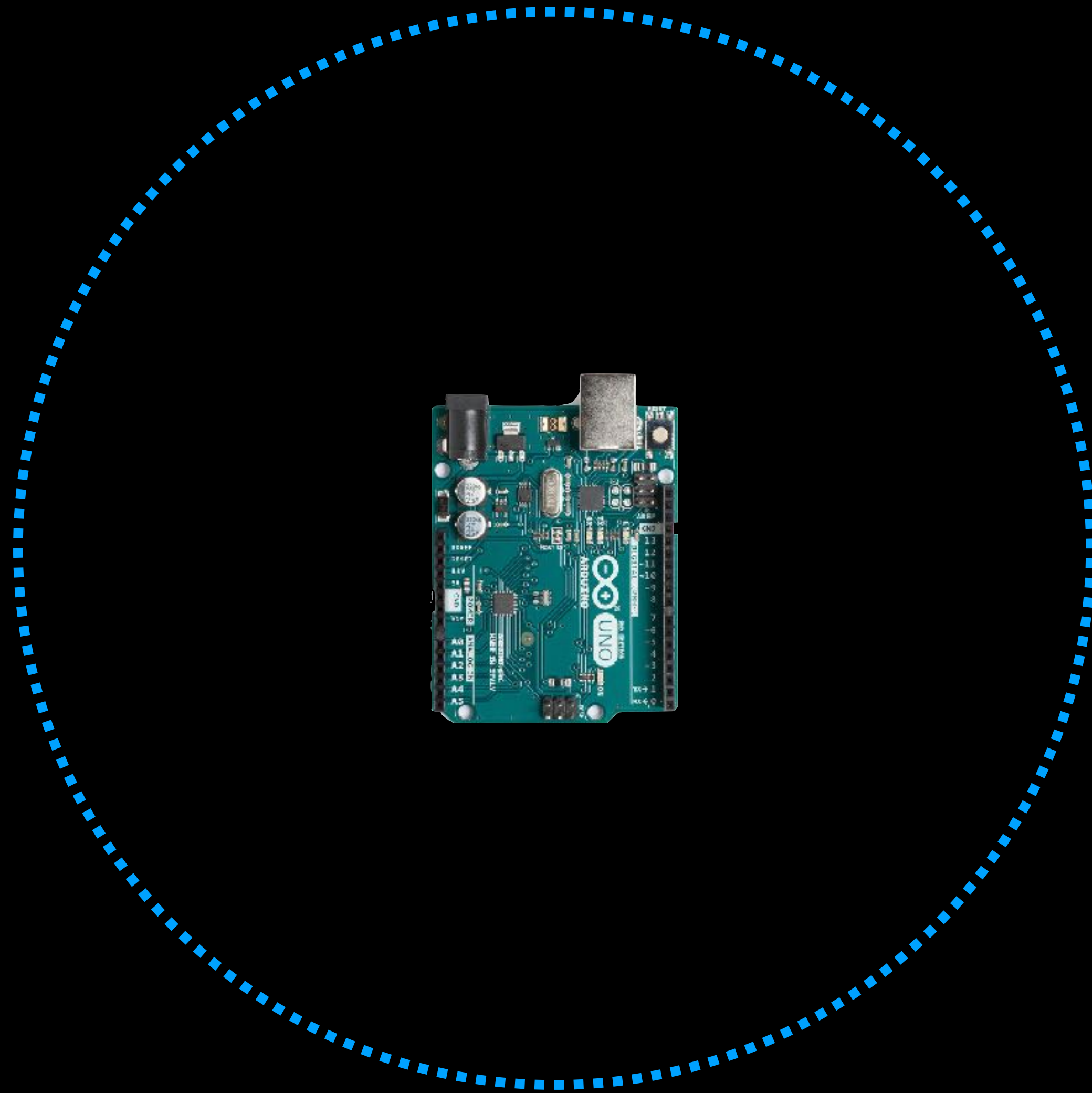
Patterned Pressure Waves





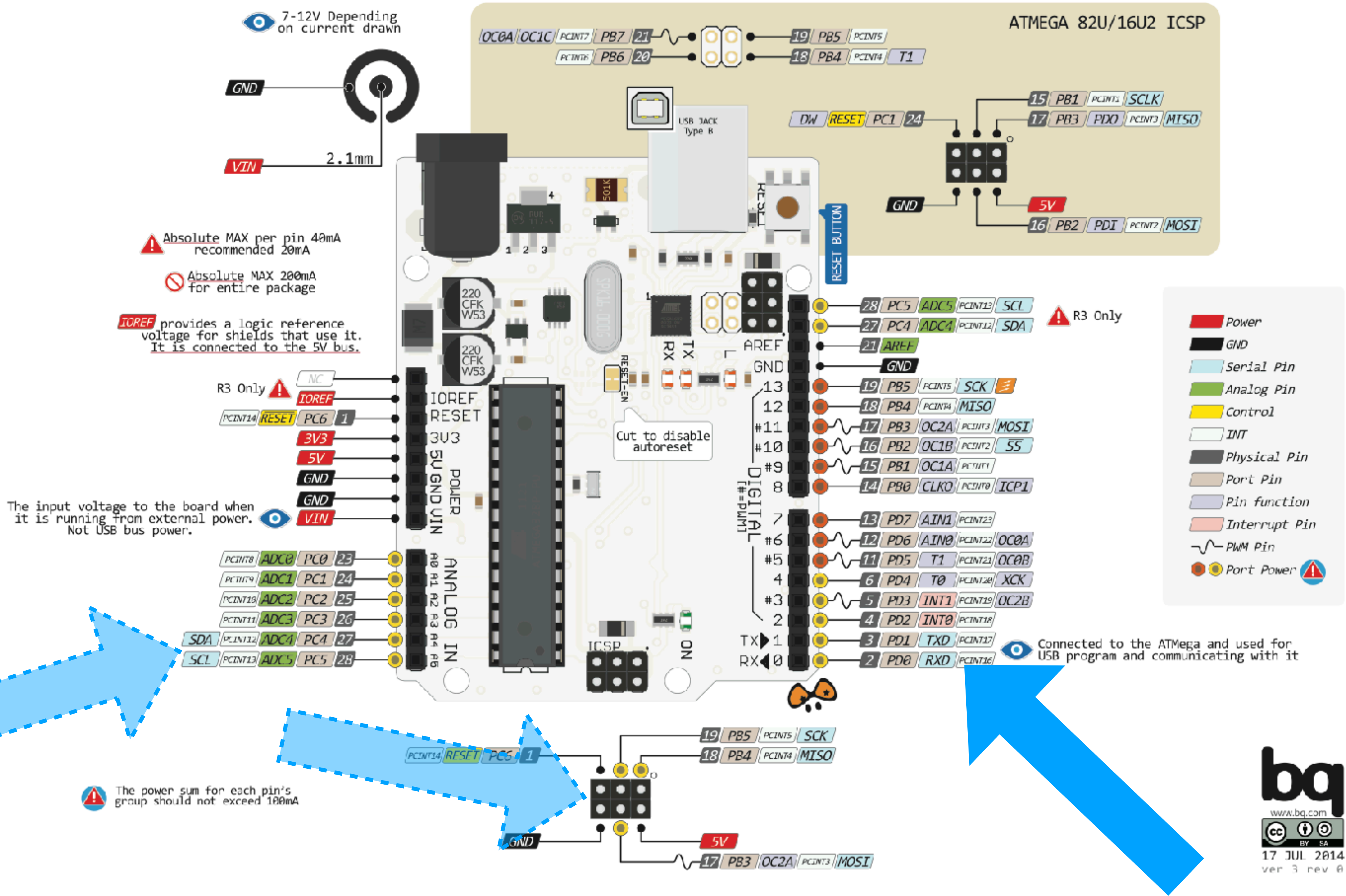
Why Serial?





Arduino is lonely

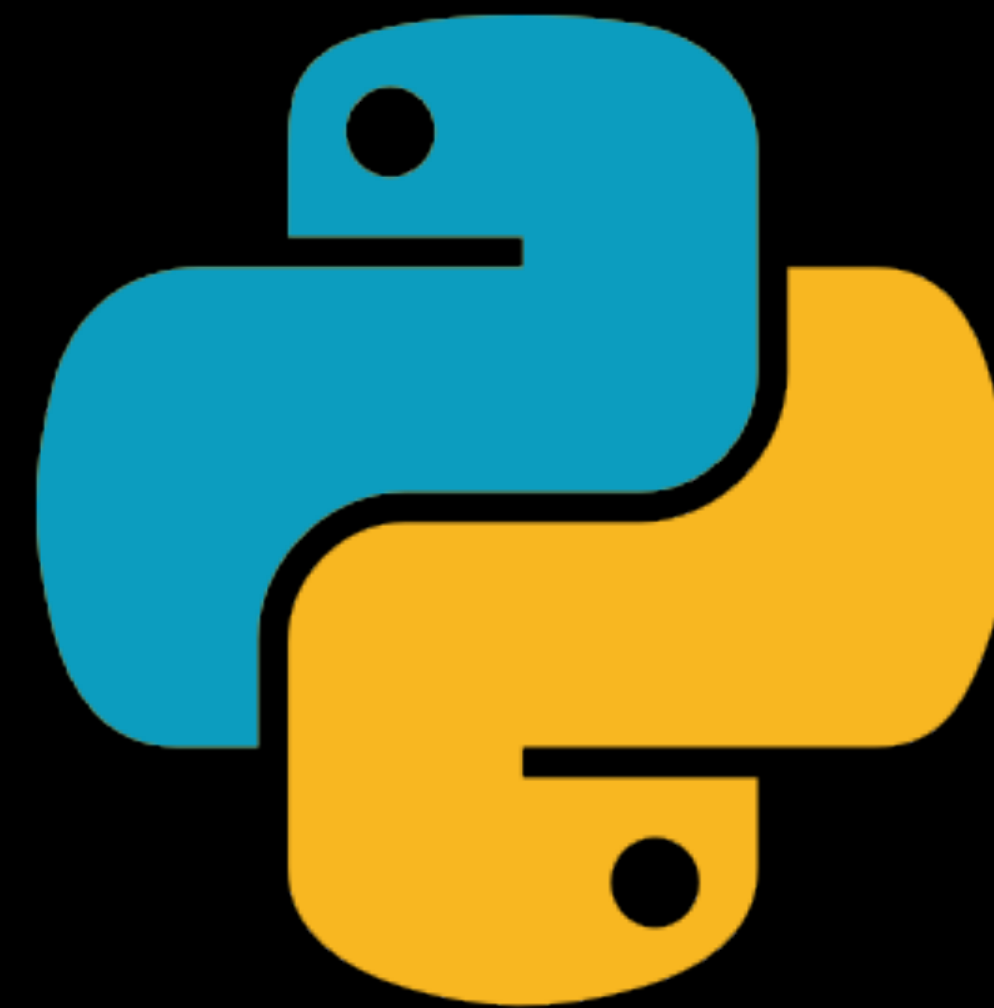
UNO PINOUT



Arduino can talk to the world three ways

PO5 *JS

p5.js



Fingerprint Sensors

“This great GT-521F52 fingerprint module from ADH-Tech communicates over TTL Serial so you can easily embed it into your next project.” - Sparkfun product page



Adafruit's

GSM + GPS

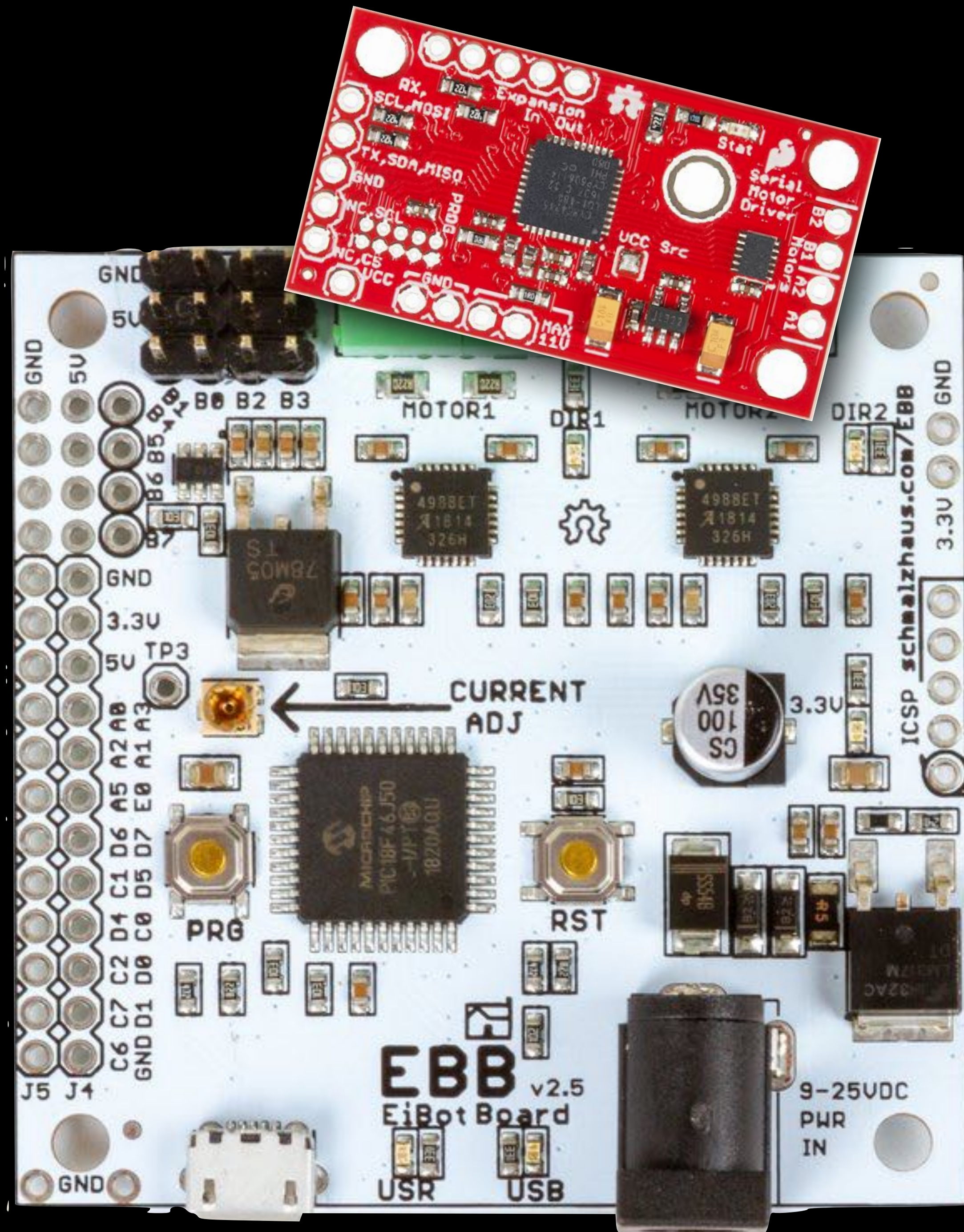
“On its own, this module can't do anything. It requires a microcontroller to drive it! We suggest and use an Arduino but **any 3-5V microcontroller with a UART can send and receive commands over the RX/TX pins.**”

- Adafruit product page



Cheap Motor Control

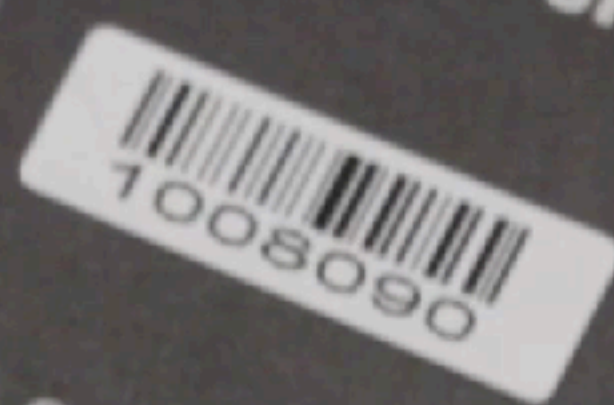
“You can easily **type commands** to it using a **terminal emulator**, or write your own application to send commands for moving the stepper motors.” - EEB Product page



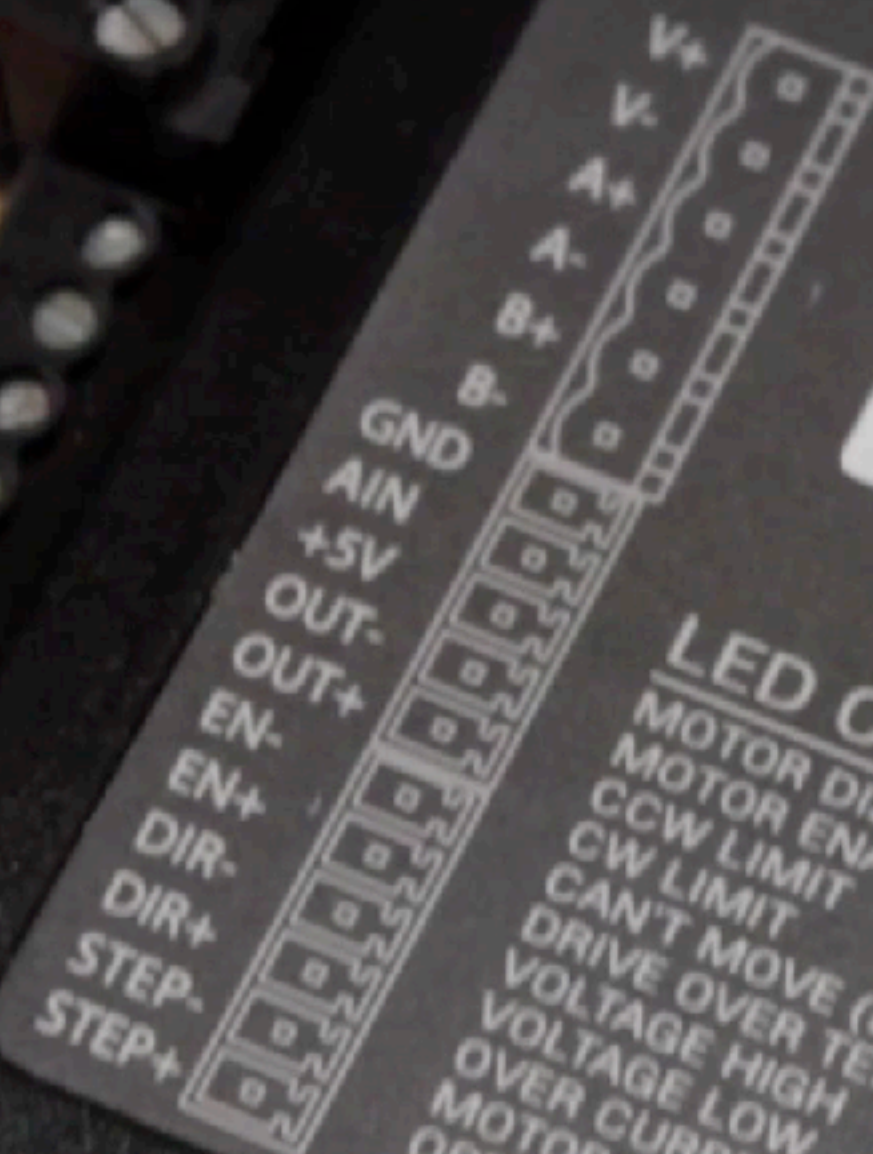
Mid-priced Motor Control



AUTOMATIONDIRECT
STP-DRV-4850
STEP MOTOR DRIVER



CE
RoHS

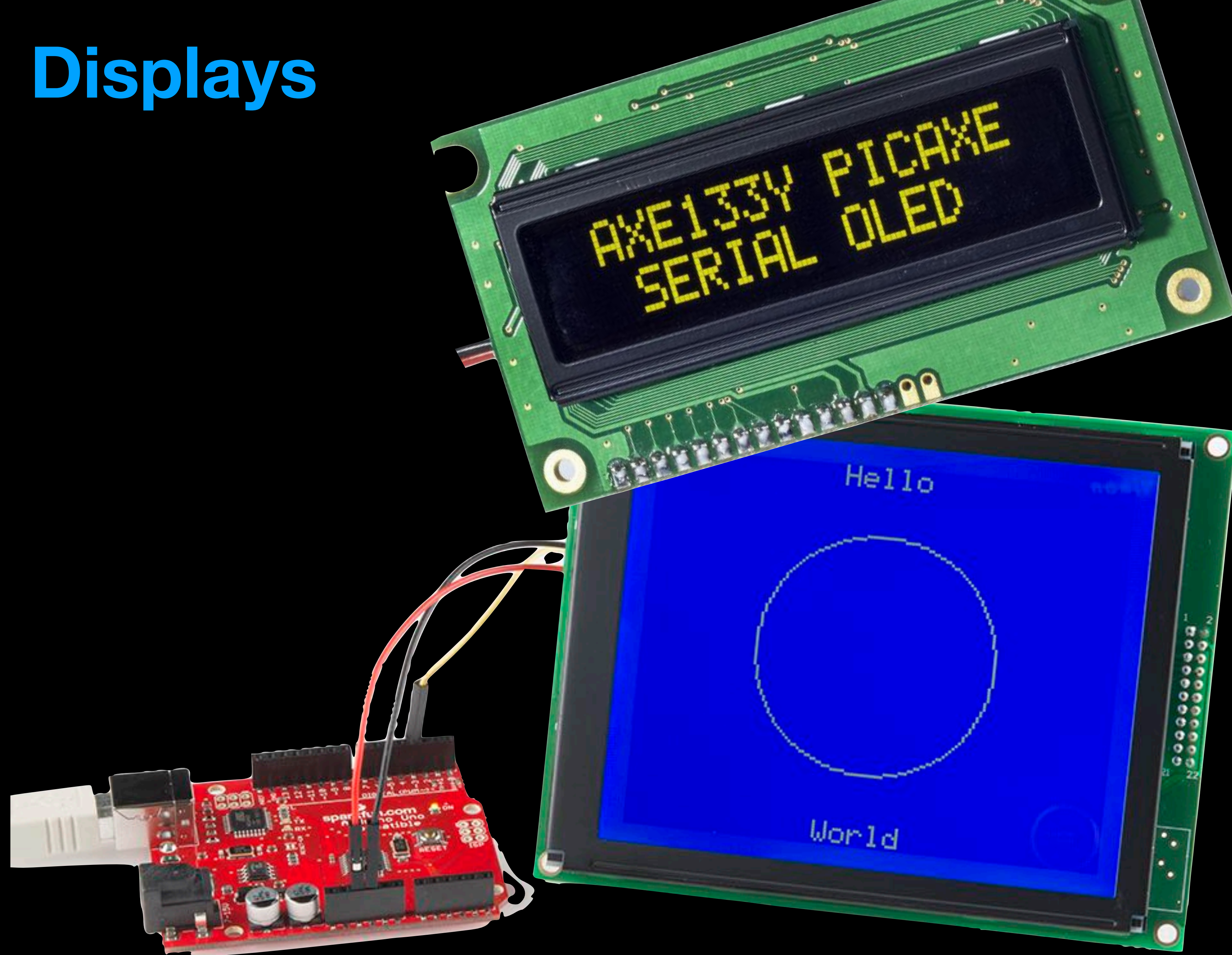


LED Codes

MOTOR DISABLED	GR=Green
MOTOR ENABLED	RD=Red
CCW LIMIT	SOLID GREEN
CW LIMIT	1 GR + 2 RD
CAN'T MOVE (DISABLED)	2 GR + 2 RD
DRIVE OVER TEMP	1 GR + 1 RD
VOLTAGE HIGH	2 GR + 3 RD
VOLTAGE LOW	1 GR + 4 RD
MOTOR CURRENT OVER	2 GR + 4 RD
OPEN MOTOR PHASE	1 GR + 4 RD
COMM ERROR	2 GR + 5 RD
	1 GR + 5 RD
	1 GR + 6 RD
	1 GR + 7 RD

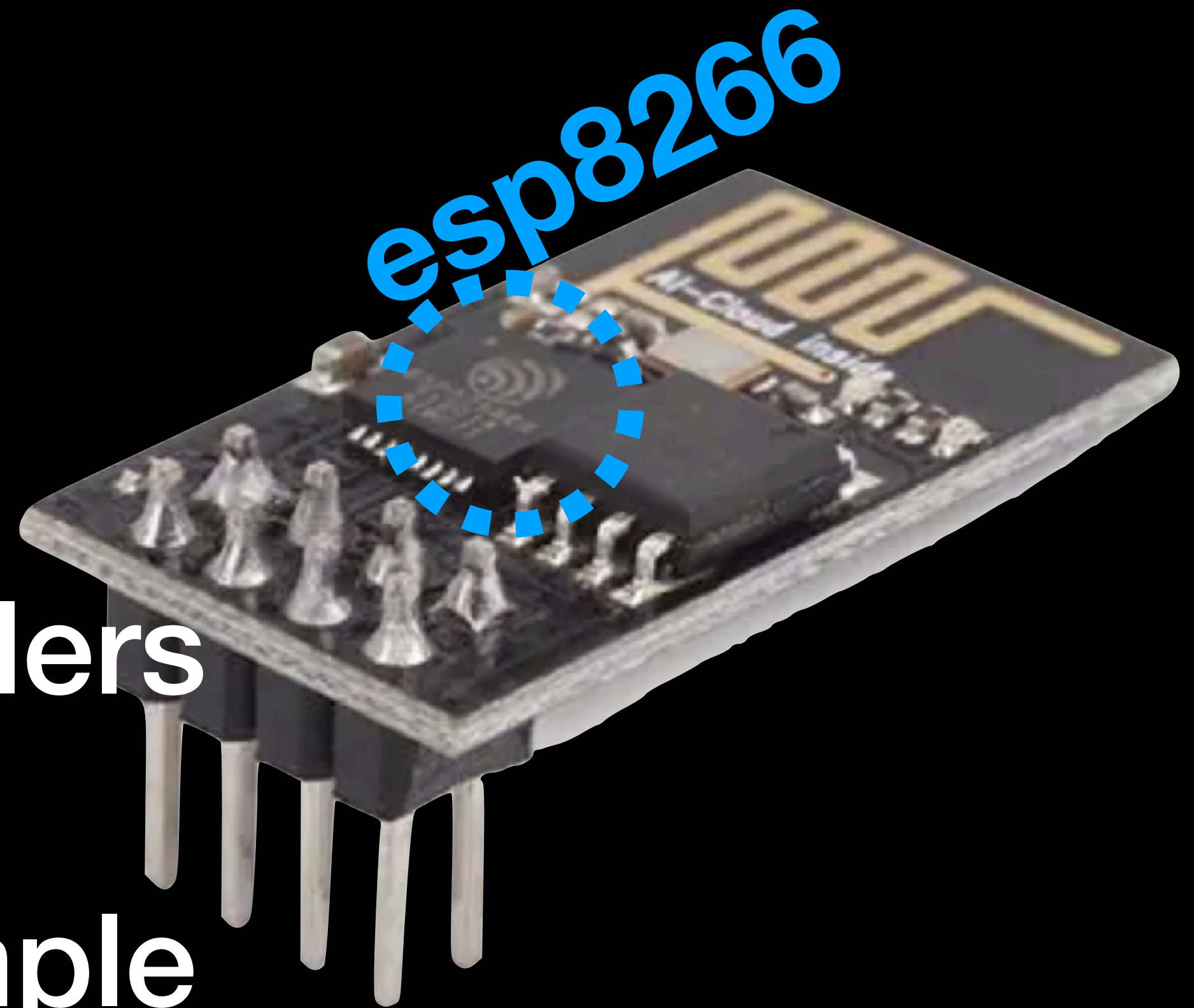


Displays



Wifi-serial circa 2014

“This small module allow[ed] microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using **Hayes-style [serial] commands.**”
- Wikipedia

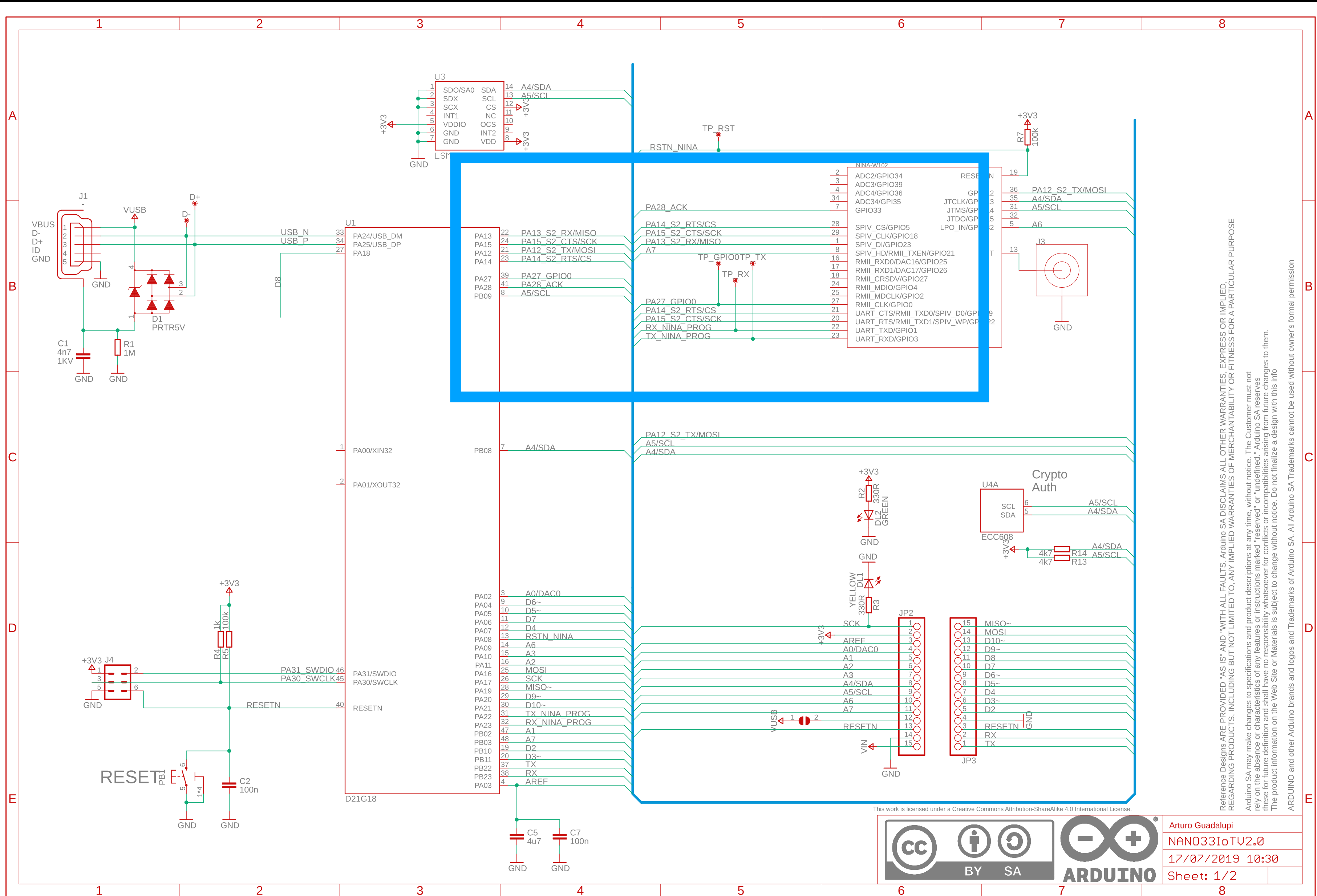


Wifi post 2018

“In late October 2014, Espressif Systems released a software development kit (SDK) for programming the chip directly, which removed the need for a separate microcontroller.”

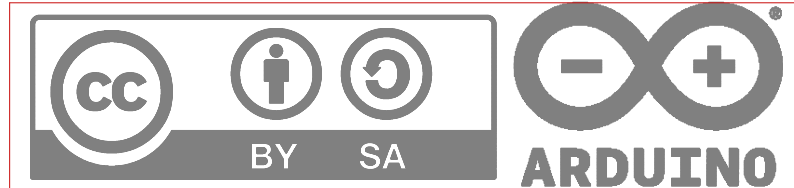
- Wikipedia



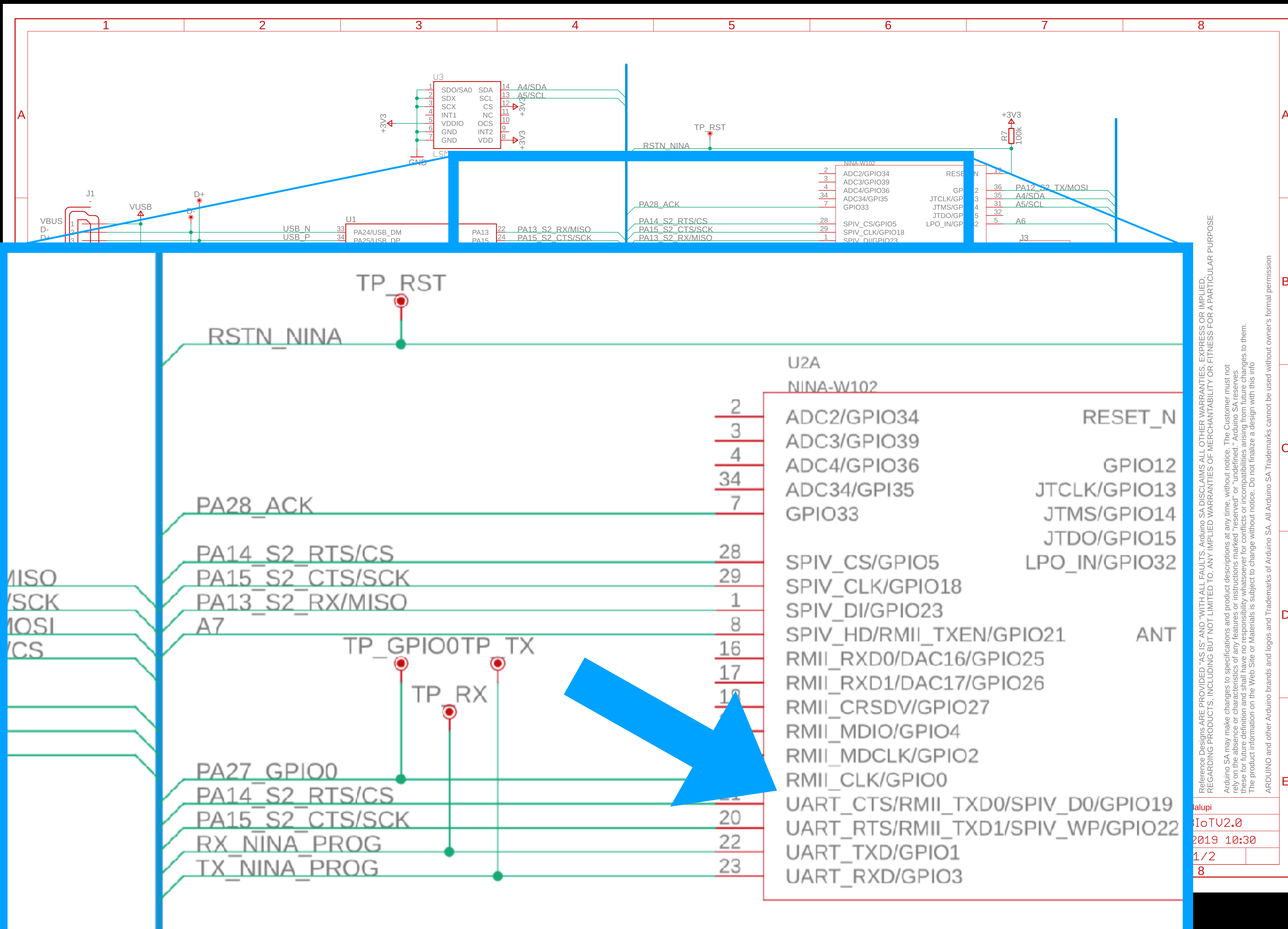


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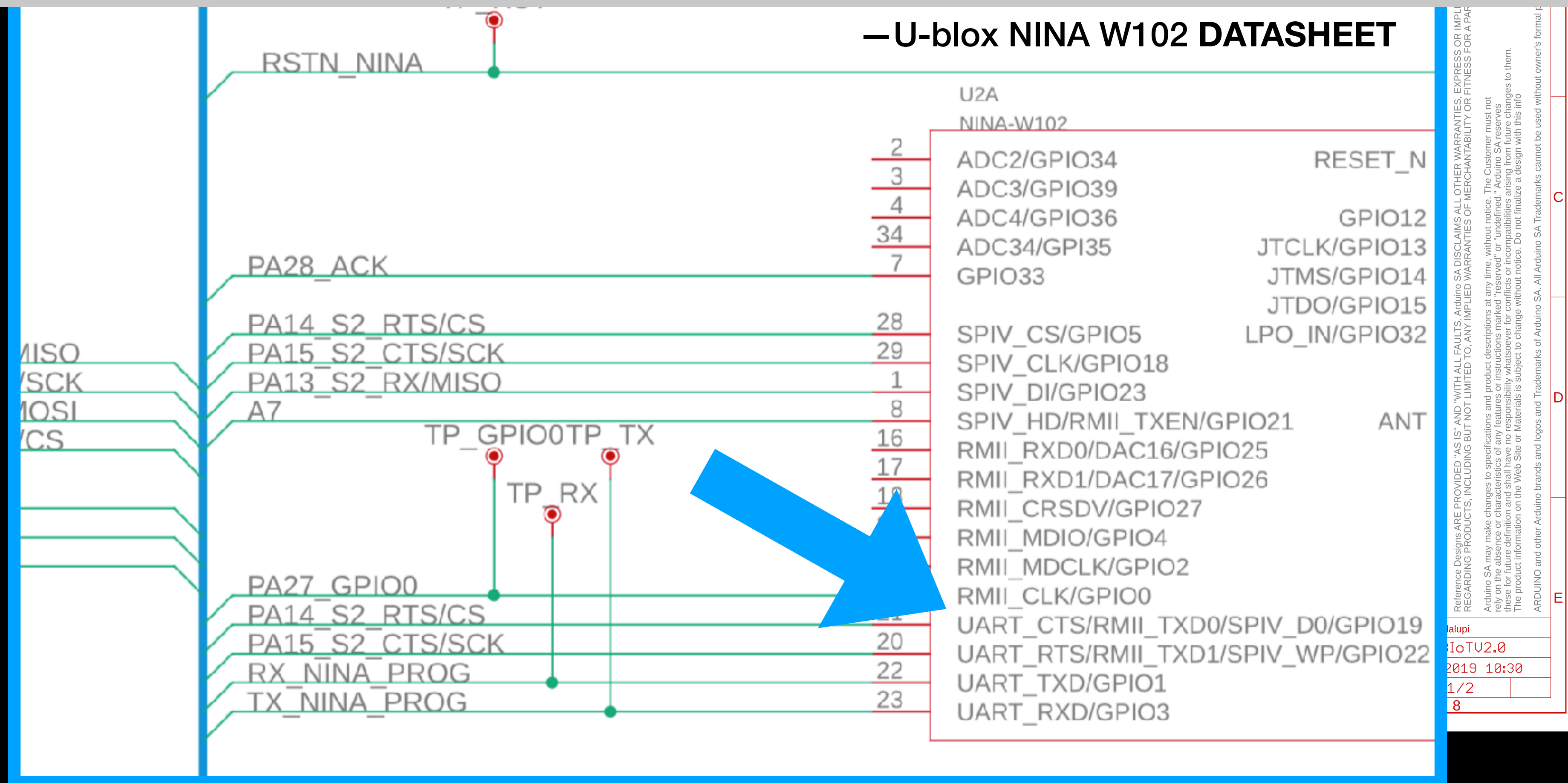


Arturo Guadalupi
 NAN033IoT V2.0
 17/07/2019 10:30
 Sheet: 1/2

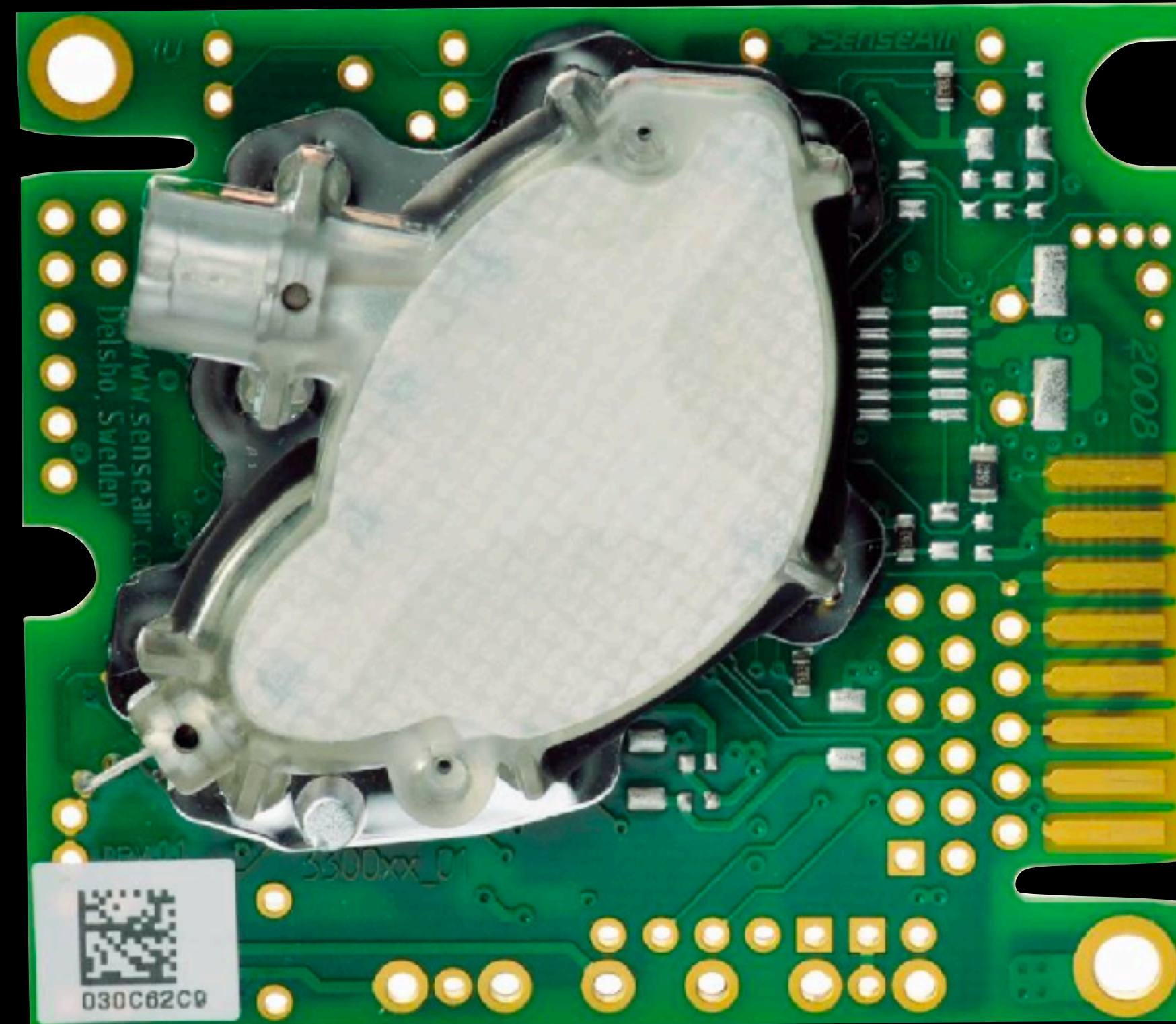


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2.7.1 UARTs NINA-W10 modules have three UART interfaces, UART0 to UART2. Each interface provides asynchronous communication support for RS232, RS485, and IrDA standards (with external drivers). UART0 serves as the primary interface port. The maximum speed for all UART interfaces is 5 Mbit/s.



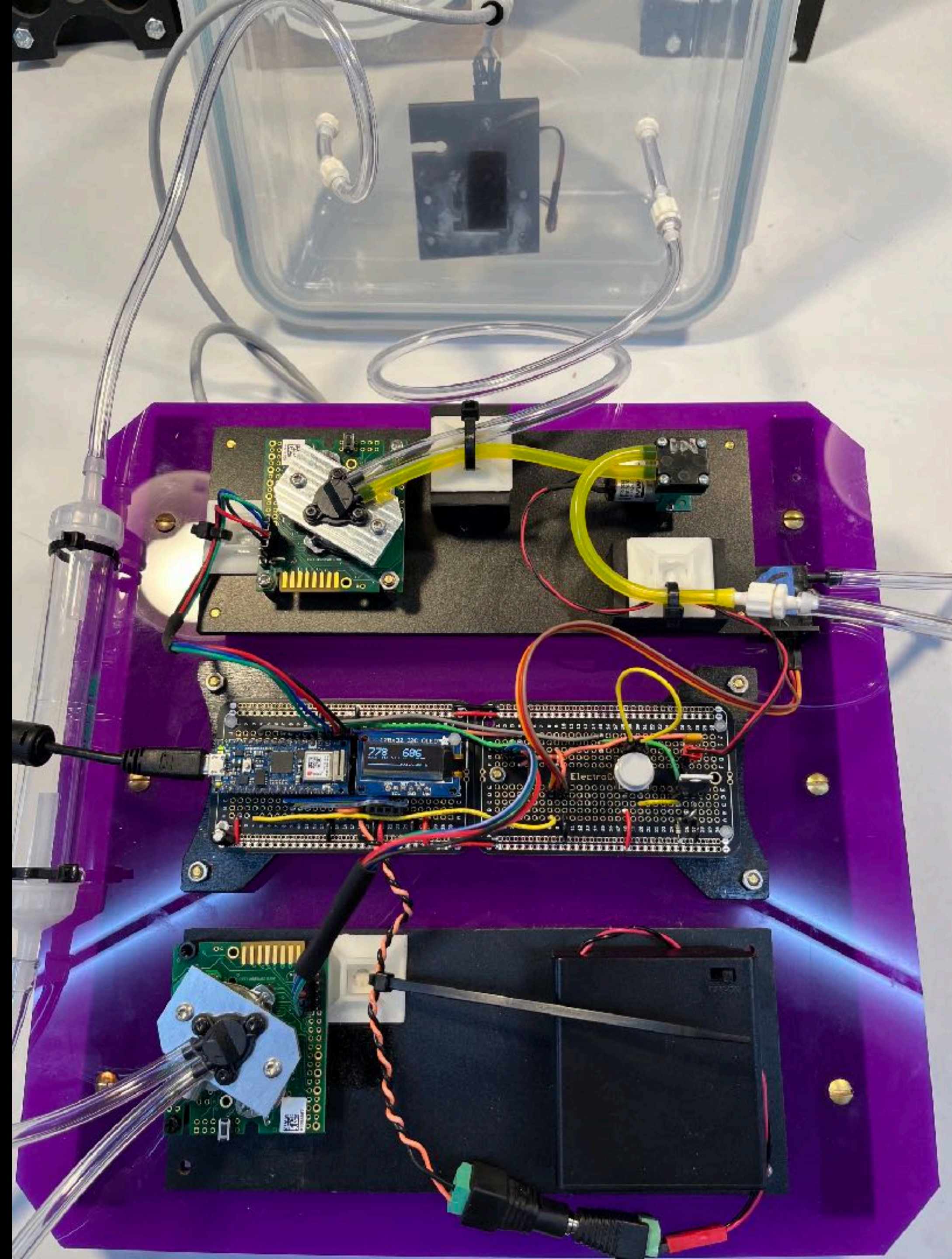
CO2 Sensor



UART Serial, I2C *and*
analog outputs

CO2 Sensor Suite:

2x serial to K30
1x serial to computer
WIFI to cloud (option)
I2C to sensors and display



Fans

Interior electronics port

Gas sampling port

Diffusor

Measurement electronics

Water supply

Airspeed sensor

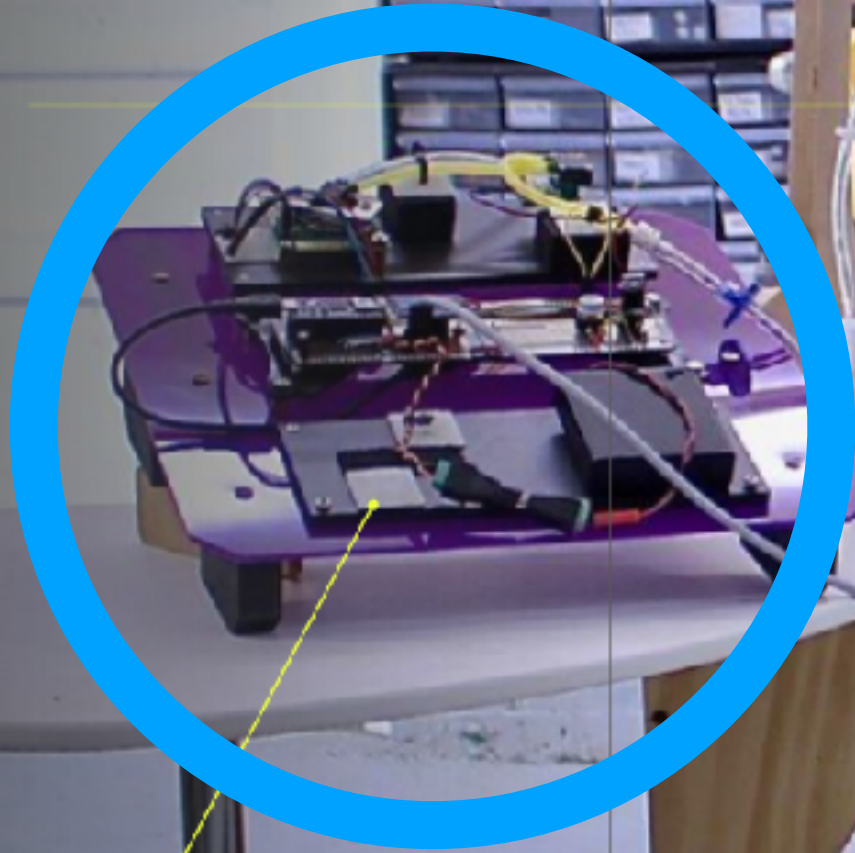
Sample return line

Sprinklers

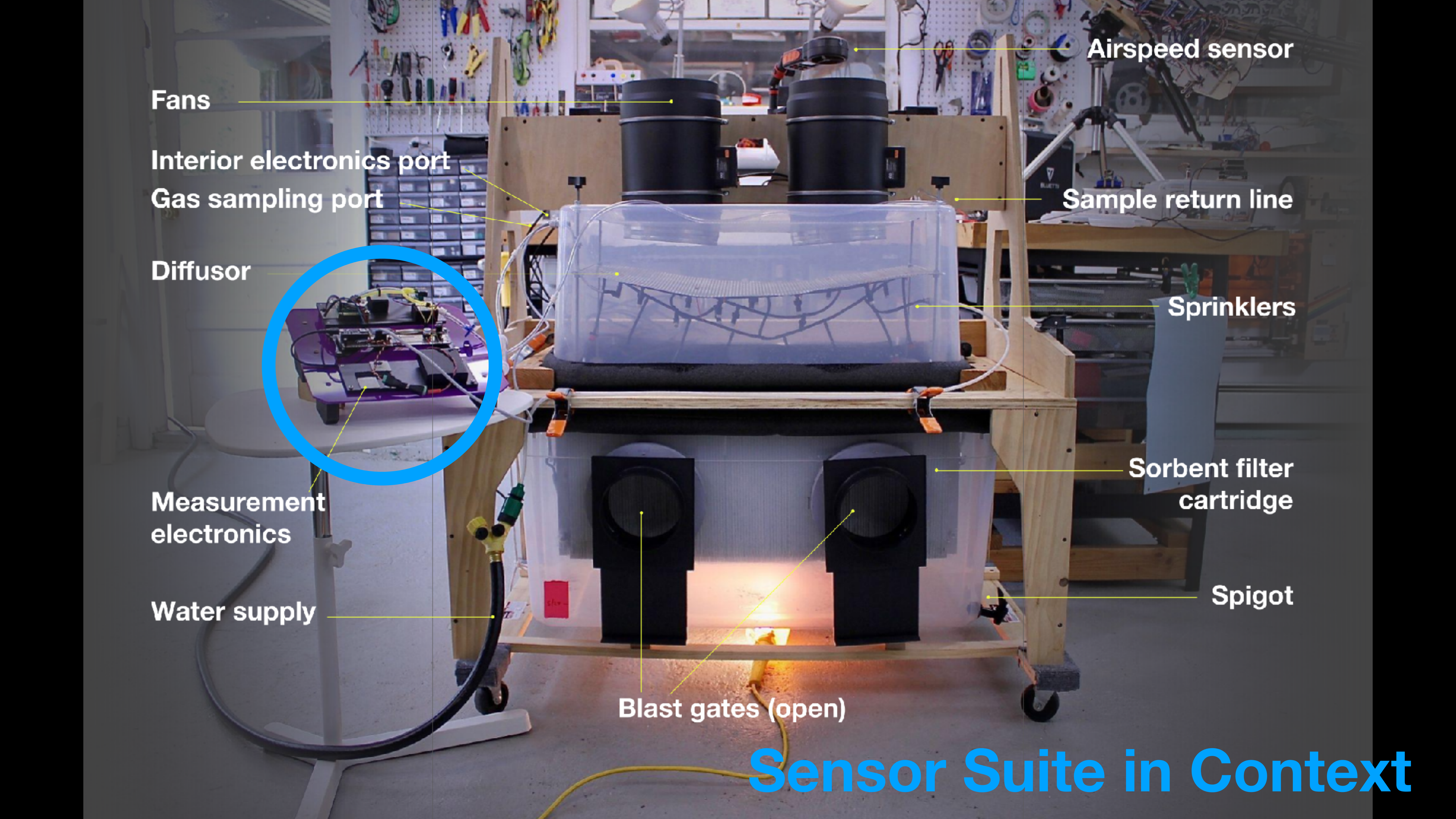
Sorbent filter cartridge

Spigot

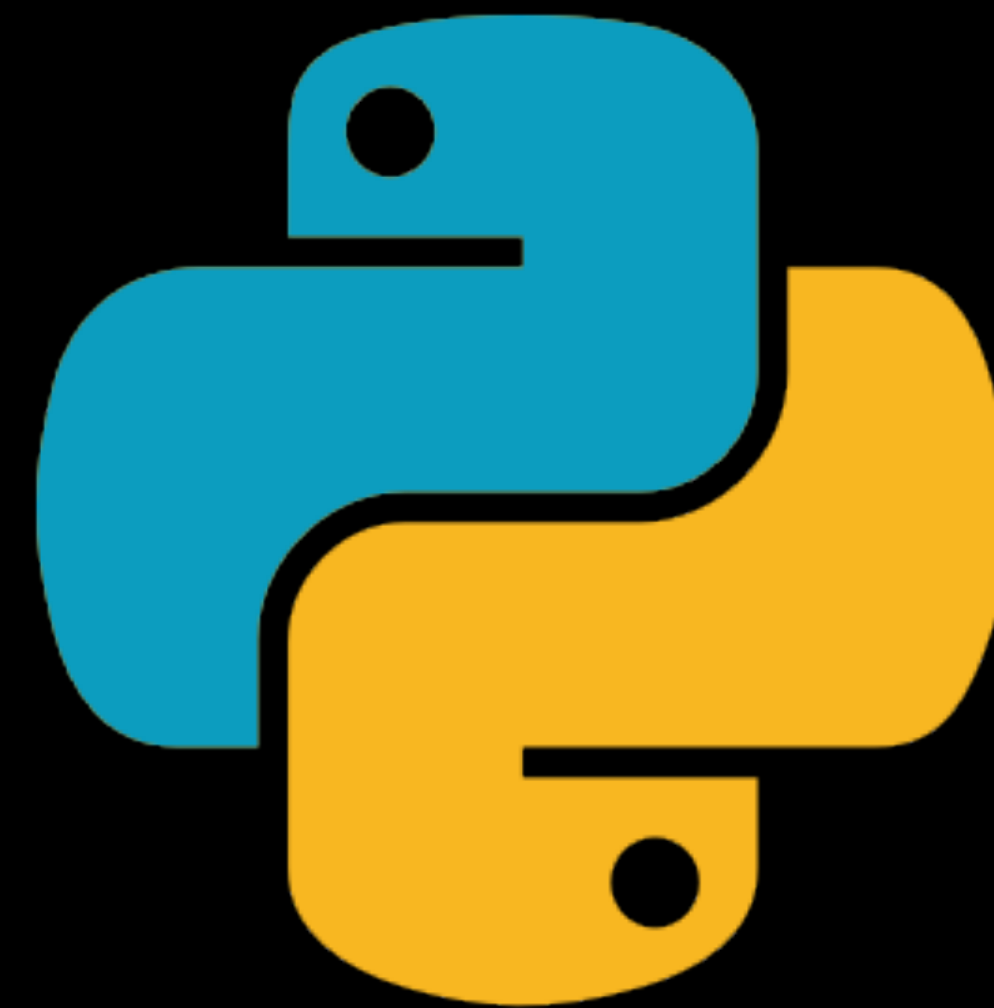
Blast gates (open)

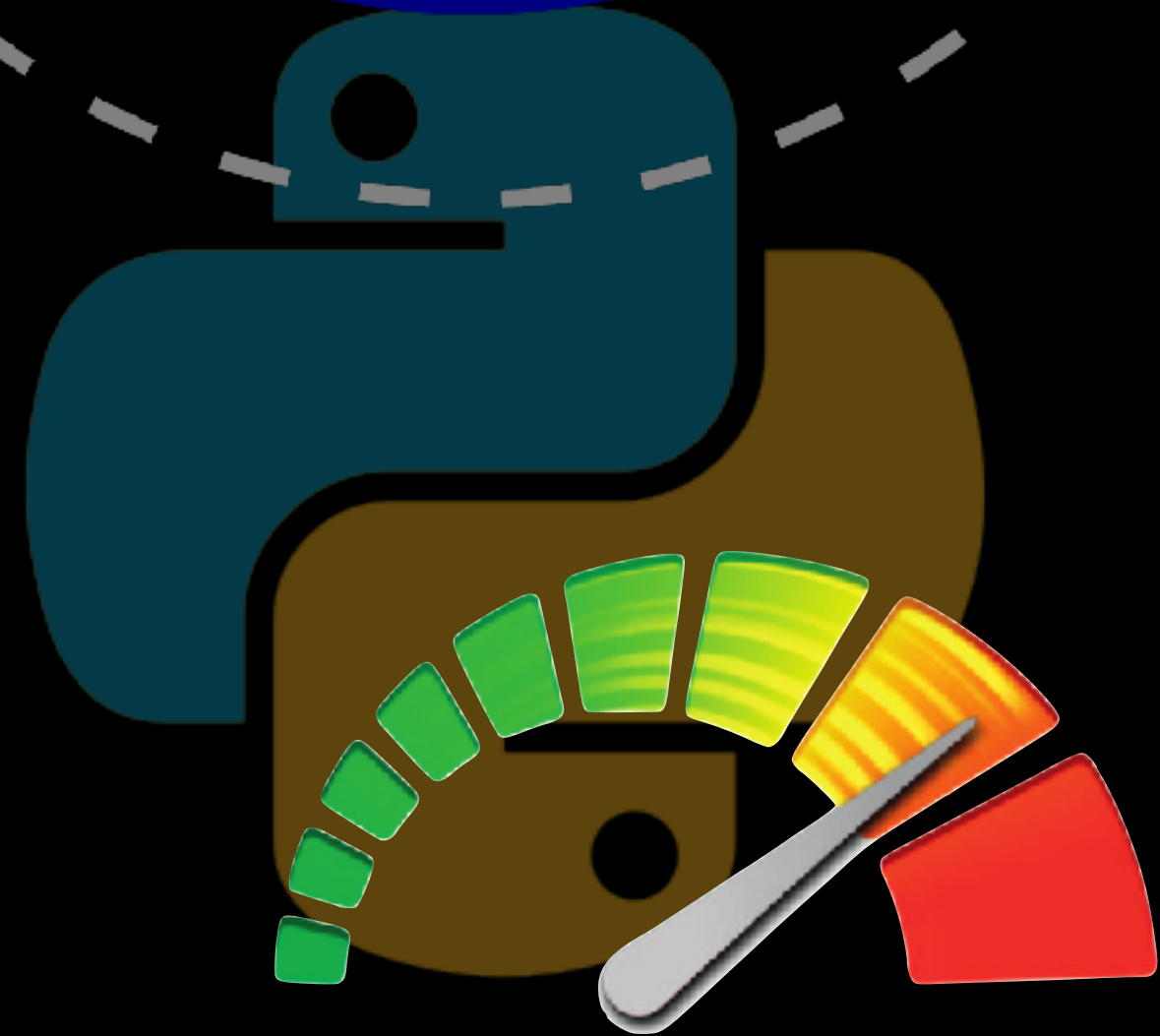


Sensor Suite in Context



p5.js

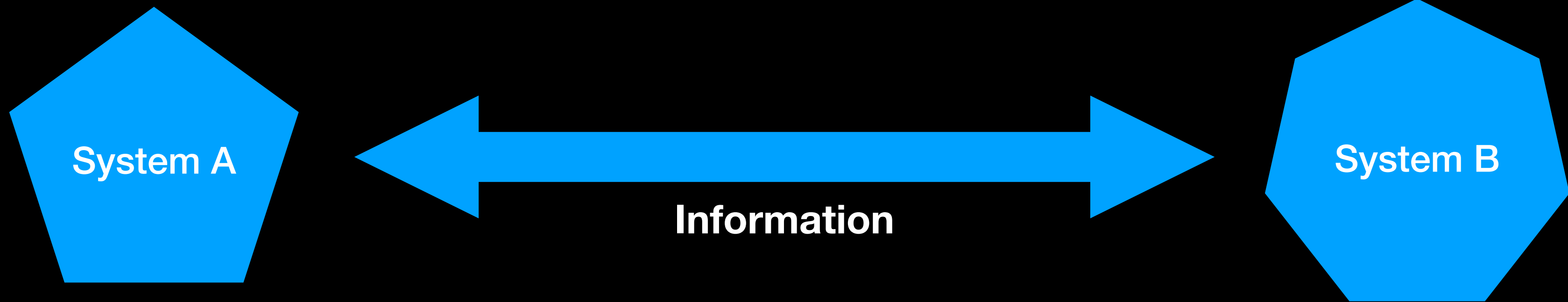




etc...



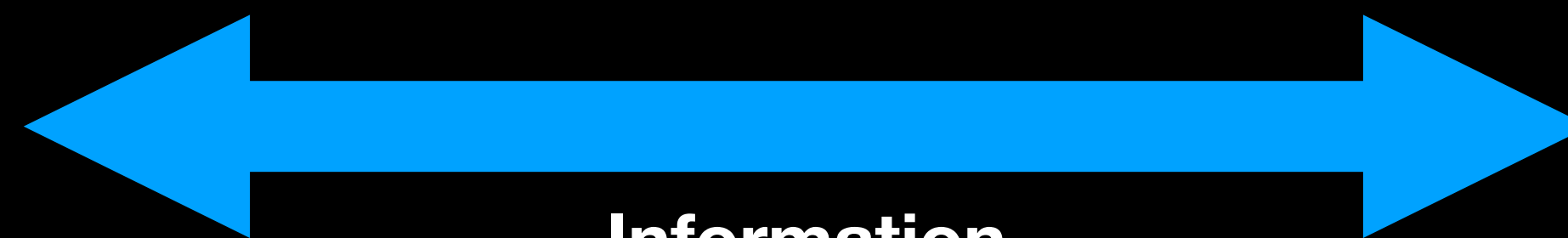
etc...



Mind A



Mind B



Information

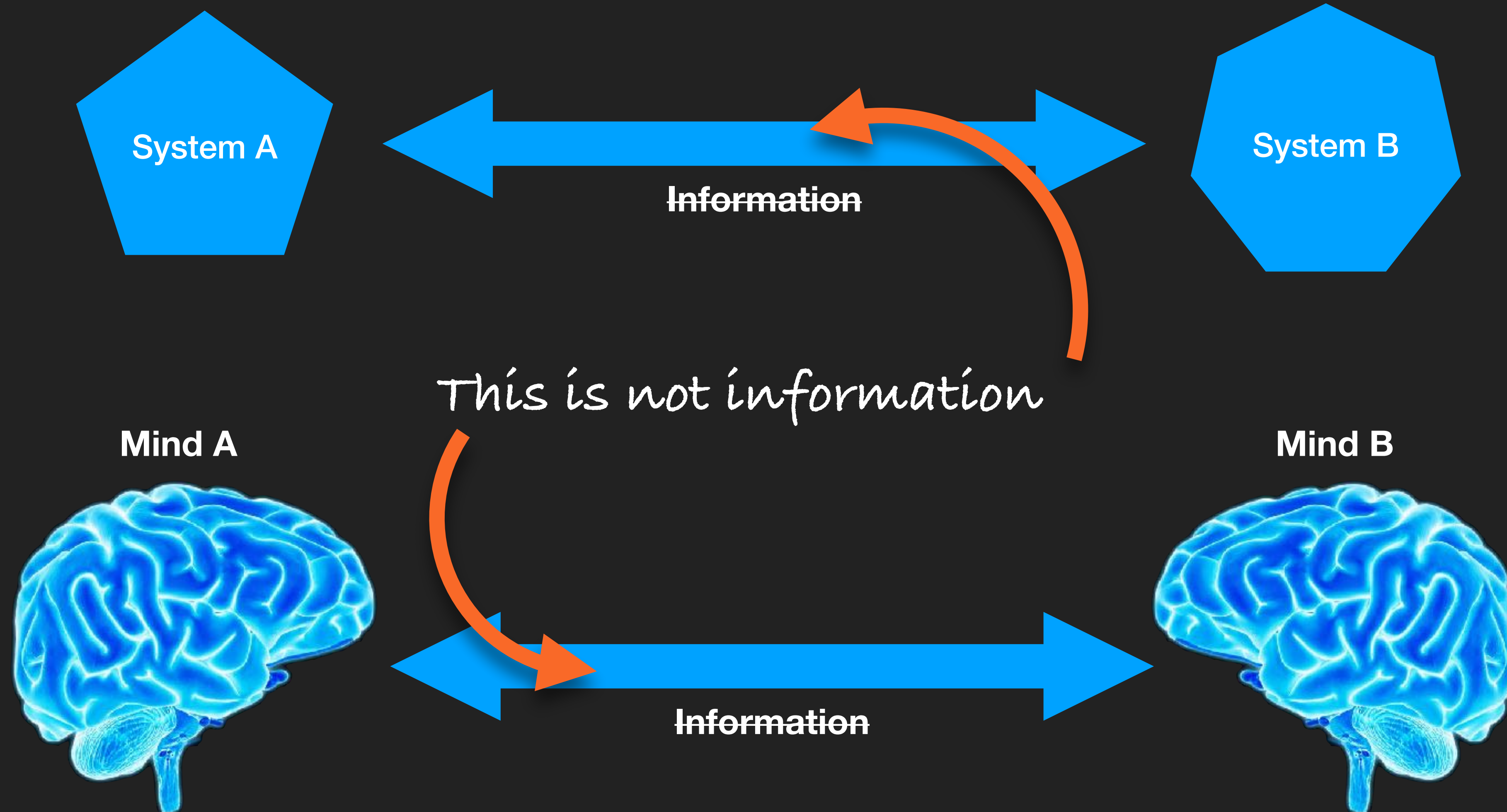


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System A

System B

Information

This is not information

Mind A

Mind B

Information



Variable declaration in code:

```
byte b = 64;
```

Bits in memory:

0100 0000

Variable name:

"b"

Value to us (decimal):

"64"

ASCII symbol

"@"

Method:

```
Serial.write(b)
```

Bits sent out serially:

0100 0000

64->"@"

```
Serial.print(b)
```

0011 0100

52->"4"

0011 0110

54->"6"

```
Serial.println(b)
```

0000 1101

13->"CR"

0000 1010

10->"LF"

0011 0100

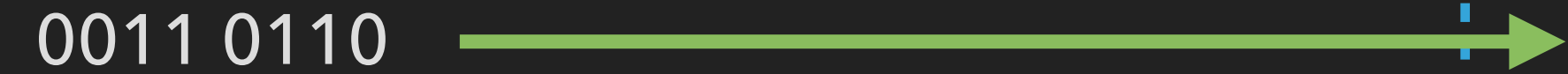
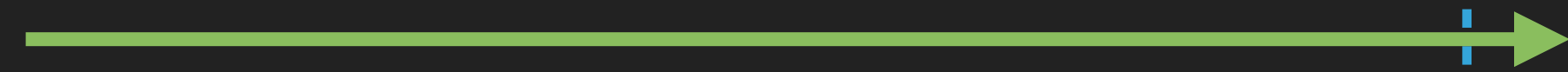
52->"4"

0011 0110

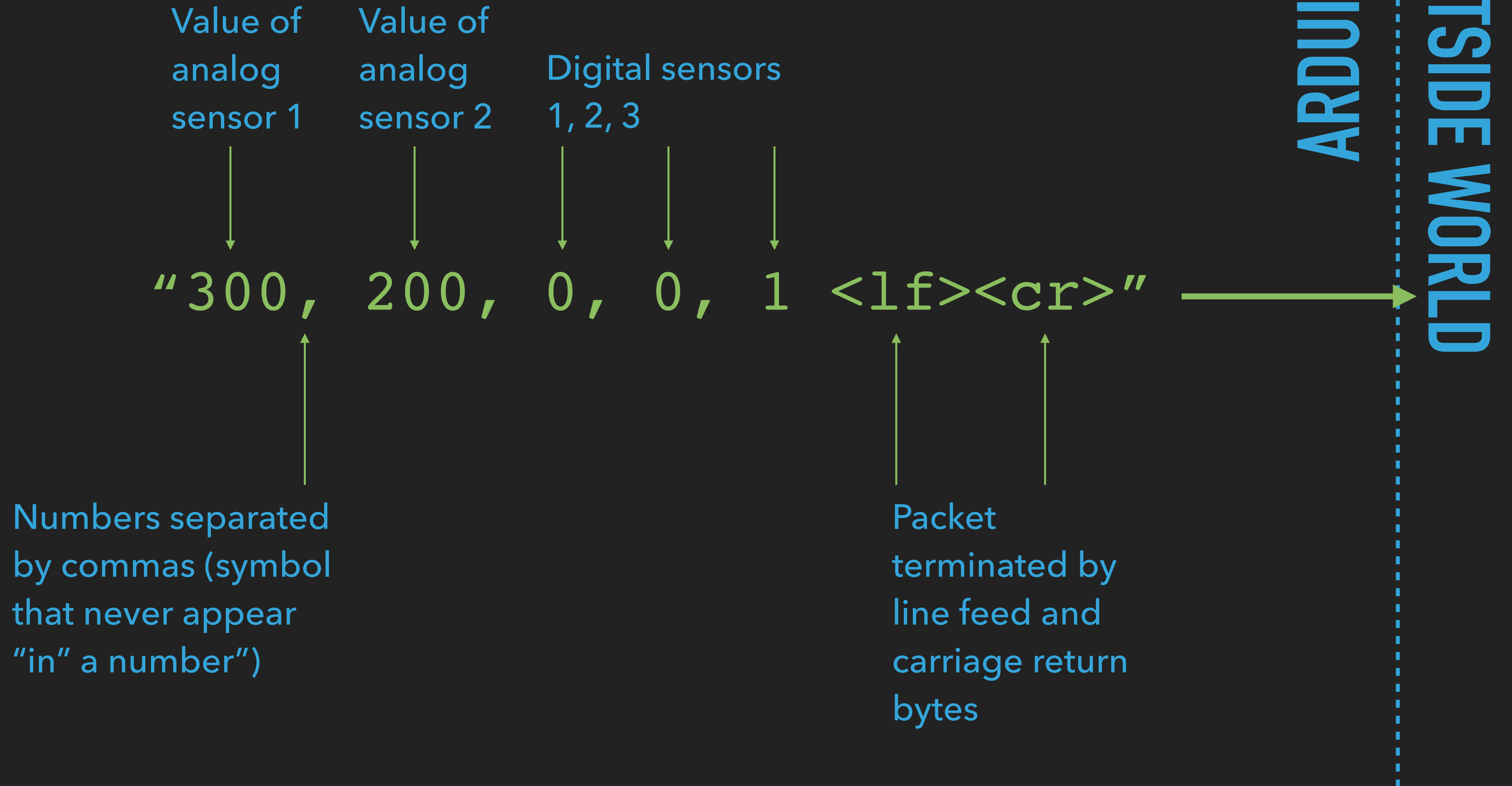
54->"6"

ARDUINO

OUTSIDE WORLD



Sender generates data "packet" as a string



Receiver breaks up packet into parts

OUTSIDE WORLD

P5

