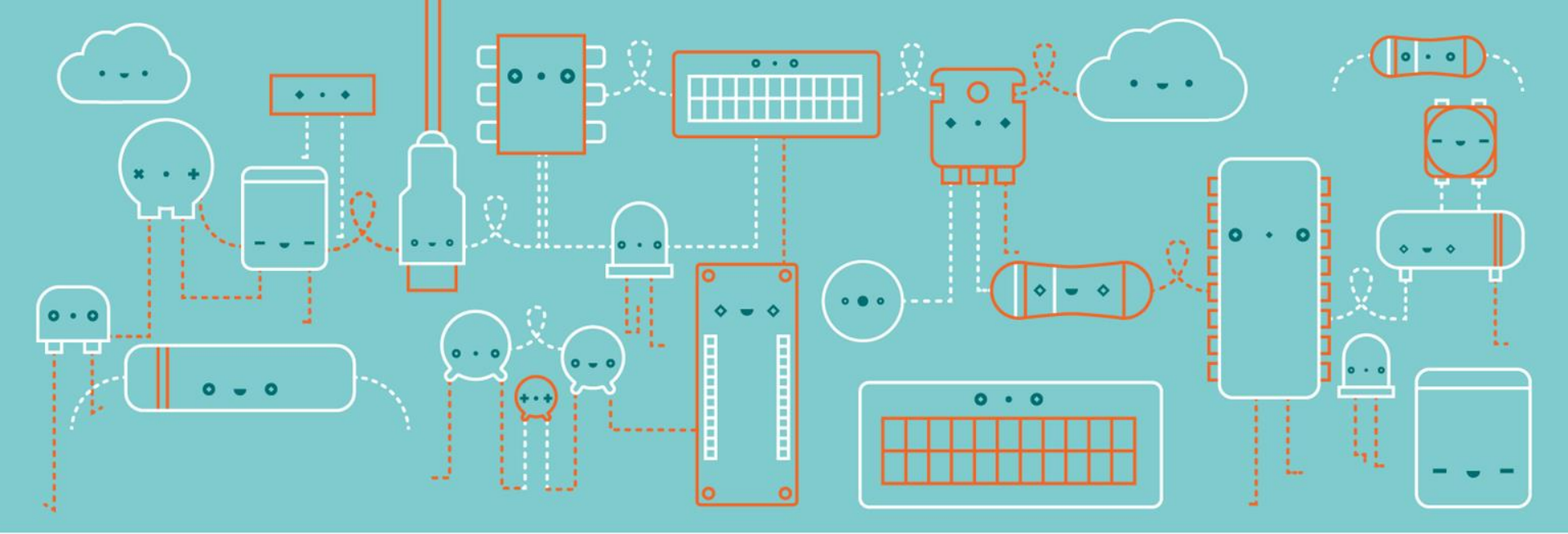

Plataformas Hardware para IoT en la nube

César Augusto Álvarez Gaspar. ***MsC.***

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AGENDA

- **INTRODUCCIÓN**
  - Internet de las Cosas
- **PLATAFORMAS HARDWARE**
  - Esp8266
  - Esp32
  - Raspberry Pi
  - Thunderboard
  - Arduino Nano 33 Iot
- **INTEGRACIÓN CON ARDUINO**
  - Repositorio
  - Instalación de tarjeta en Arduino

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INTRODUCCIÓN

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Internet de las Cosas (IoT)

Salud

Agricultura de precisión

Control de procesos

Logística

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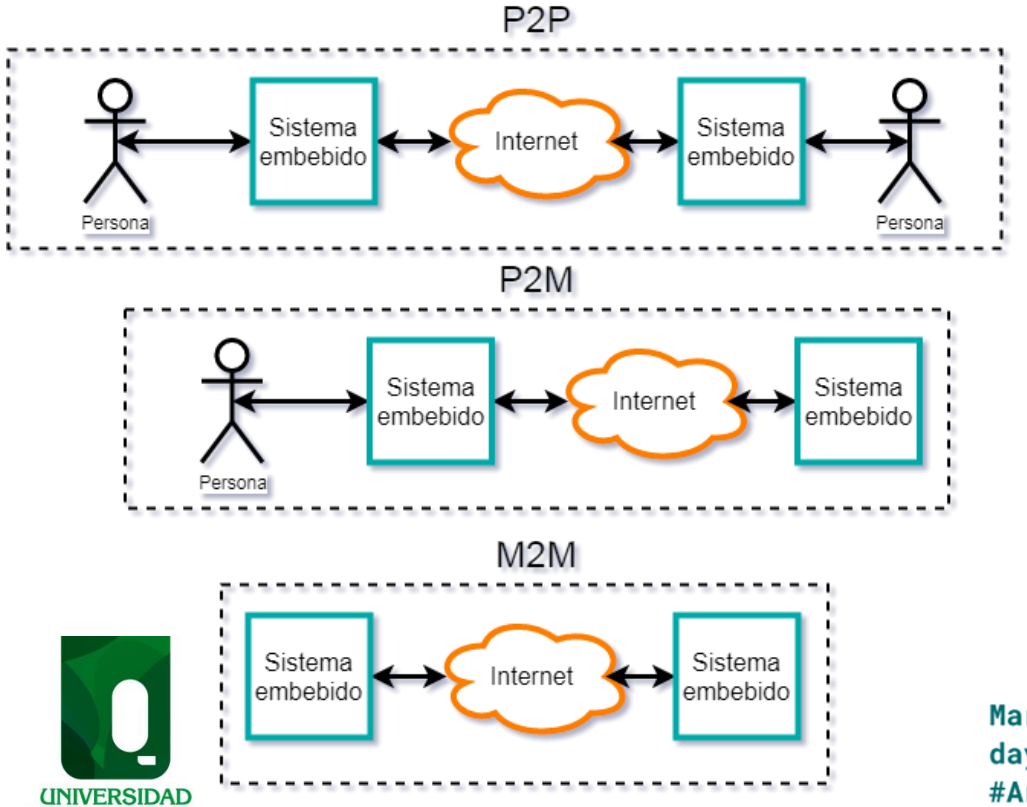
Internet de las Cosas (IoT)



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PLATAFORMAS HARDWARE

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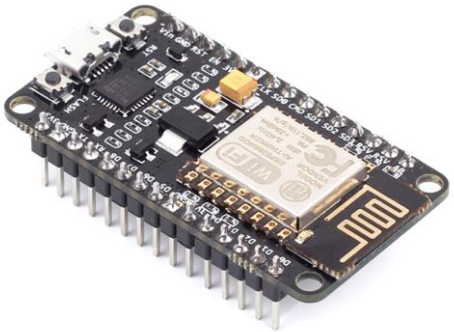
Plataformas Hardware



Esp8266

Esp8266 -01

Esp32

Raspberry Pi4

Thunder Board

Arduino Nano 33 IoT

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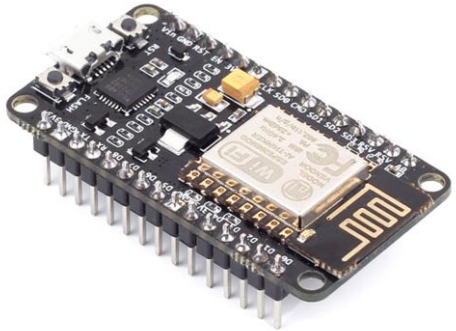
Esp8266 - Esp8266 -01



Esp8266

Categories	Items	Parameters
Wi-Fi	Certification	Wi-Fi Alliance
	Protocols	802.11 b/g/n (HT20)
	Frequency Range	2.4 GHz ~ 2.5 GHz (2400 MHz ~ 2483.5 MHz)
	TX Power	802.11 b: +20 dBm
		802.11 g: +17 dBm
		802.11 n: +14 dBm
	Rx Sensitivity	802.11 b: –91 dbm (11 Mbps)
		802.11 g: –75 dbm (54 Mbps)
		802.11 n: –72 dbm (MCS7)
	Antenna	PCB Trace, External, IPEX Connector, Ceramic Chip
Hardware	CPU	Tensilica L106 32-bit processor
	Peripheral Interface	UART/SDIO/SPI/I2C/I2S/IR Remote Control
		GPIO/ADC/PWM/LED Light & Button
	Operating Voltage	2.5 V ~ 3.6 V
	Operating Current	Average value: 80 mA
	Operating Temperature Range	–40 °C ~ 125 °C
	Package Size	QFN32-pin (5 mm x 5 mm)
	External Interface	-
Software	Wi-Fi Mode	Station/SoftAP/SoftAP+Station
	Security	WPA/WPA2
	Encryption	WEP/TKIP/AES
	Firmware Upgrade	UART Download / OTA (via network)
	Software Development	Supports Cloud Server Development / Firmware and SDK for fast on-chip programming
	Network Protocols	IPv4, TCP/UDP/HTTP
	User Configuration	AT Instruction Set, Cloud Server, Android/iOS App

Esp8266 -01

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Esp32

Categories	Items	Specifications
Certification	RF certification	FCC/CE-RED/IC/TELEC/KCC/SRRC/NCC
	Wi-Fi certification	Wi-Fi Alliance
	Bluetooth certification	BQB
	Green certification	RoHS/REACH
Test	Reliablity	HTOL/HTSL/uHAST/TCT/ESD
Wi-Fi	Protocols	802.11 b/g/n (802.11n up to 150 Mbps)
		A-MPDU and A-MSDU aggregation and 0.4 μs guard interval support
	Frequency range	2.4 GHz ~ 2.5 GHz
Bluetooth	Protocols	Bluetooth v4.2 BR/EDR and BLE specification
	Radio	NZIF receiver with –97 dBm sensitivity
		Class-1, class-2 and class-3 transmitter
		AFH
	Audio	CVSD and SBC

Categories	Items	Specifications
Hardware	Module interfaces	SD card, UART, SPI, SDIO, I²C, LED PWM, Motor PWM, I²S, IR, pulse counter, GPIO, capacitive touch sensor, ADC, DAC, Two-Wire Automotive Interface (TWAI®, compatible with ISO11898-1)
	On-chip sensor	Hall sensor
	Integrated crystal	40 MHz crystal
	Integrated SPI flash	4 MB
	Operating voltage/Power supply	3.0 V ~ 3.6 V
	Operating current	Average: 80 mA
	Minimum current delivered by power supply	500 mA
	Recommended operating temperature range	–40 °C ~ +85 °C
	Package size	(18.00±0.10) mm × (25.50±0.10) mm × (3.10±0.10) mm
	Moisture sensitivity level (MSL)	Level 3

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Raspberry Pi4

Raspberry Pi4

2.1 Hardware

- Quad core 64-bit ARM-Cortex A72 running at 1.5GHz
- 1, 2 and 4 Gigabyte LPDDR4 RAM options
- H.265 (HEVC) hardware decode (up to 4Kp60)
- H.264 hardware decode (up to 1080p60)
- VideoCore VI 3D Graphics
- Supports dual HDMI display output up to 4Kp60

2.3 Software

- ARMv8 Instruction Set
- Mature Linux software stack
- Actively developed and maintained
  - Recent Linux kernel support
  - Many drivers upstreamed
  - Stable and well supported userland
  - Availability of GPU functions using standard APIs

2.2 Interfaces

- 802.11 b/g/n/ac Wireless LAN
- Bluetooth 5.0 with BLE
- 1x SD Card
- 2x micro-HDMI ports supporting dual displays up to 4Kp60 resolution
- 2x USB2 ports
- 2x USB3 ports
- 1x Gigabit Ethernet port (supports PoE with add-on PoE HAT)
- 1x Raspberry Pi camera port (2-lane MIPI CSI)
- 1x Raspberry Pi display port (2-lane MIPI DSI)
- 28x user GPIO supporting various interface options:
  - Up to 6x UART
  - Up to 6x I2C
  - Up to 5x SPI
  - 1x SDIO interface
  - 1x DPI (Parallel RGB Display)
  - 1x PCM
  - Up to 2x PWM channels
  - Up to 3x GPCLK outputs

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Thunder Board

Thunder Board

1.3 Hardware Content

The following key hardware elements are included on the Thunderboard EFR32BG22:

- EFR32BG22 Wireless Gecko SoC with 76.8 MHz operating frequency, 512 kB kB flash and 32 kB RAM
- 2.4 GHz ceramic antenna for wireless transmission
- Silicon Labs Si7021 relative humidity and temperature sensor
- Silicon Labs Si1133 UV index and ambient light sensor
- Silicon Labs Si7210 hall effect sensor
- TDK InvenSense ICM-20648 6-axis inertial sensor
- Macronix ultra low power 8 Mbit SPI flash (MX25R8035F)
- One LED and one push button
- Power enable signals and isolation switches for ultra low power operation
- On-board SEGGER J-Link debugger for easy programming and debugging, which includes a USB virtual COM port and Packet Trace Interface (PTI)
- Mini Simplicity connector for access to energy profiling and advanced wireless network debugging
- Breakout pads for GPIO access and connection to external hardware
- Reset button
- Automatic switchover between USB and battery power
- CR2032 coin cell holder

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INTEGRACIÓN CON ARDUINO

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https://github.com/espressif/arduino-esp32

Arduino core for the ESP32

build passing | ESP32 Arduino CI passing

Need help or have a question? Join the chat at chat on gitter

Contents

Development Status

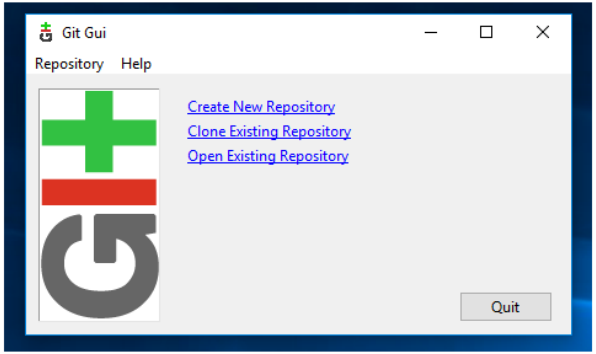
Latest Stable Release release v1.0.6 | release date yesterday | downloads@latest 1.4k

Latest Development Release release v1.0.6 | release date yesterday | downloads@latest 1.4k

Steps to install Arduino ESP32 support on Windows

Tested on 32 and 64 bit Windows 10 machines

1. Download and install the latest Arduino IDE `Windows Installer` from arduino.cc
2. Download and install Git from git-scm.com
3. Start `Git GUI` and run through the following steps:
   - Select `Clone Existing Repository`



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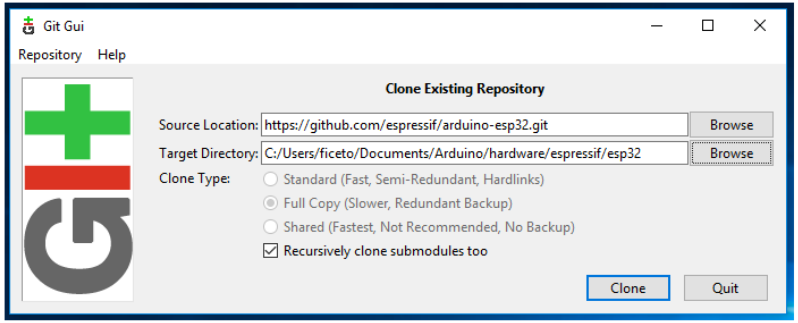
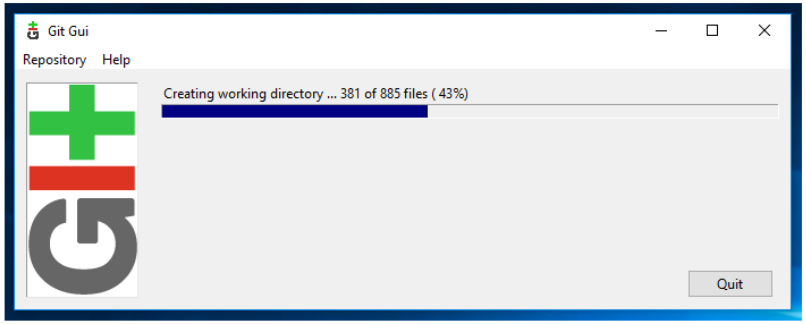
- Select source and destination
  - Sketchbook Directory: Usually `C:/Users/[YOUR_USER_NAME]/Documents/Arduino` and is listed underneath the "Sketchbook location" in Arduino preferences.
  - Source Location: `https://github.com/espressif/arduino-esp32.git`
  - Target Directory: `[ARDUINO_SKETCHBOOK_DIR]/hardware/espressif/esp32`
  - Click `Clone` to start cloning the repository





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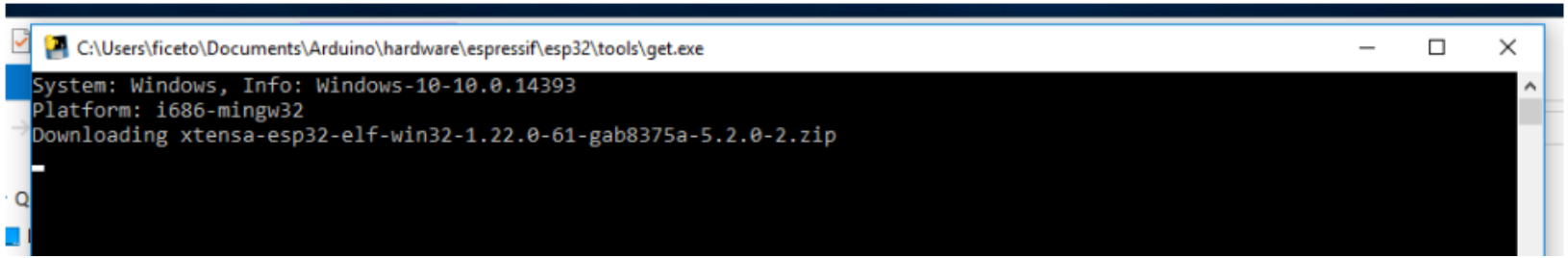
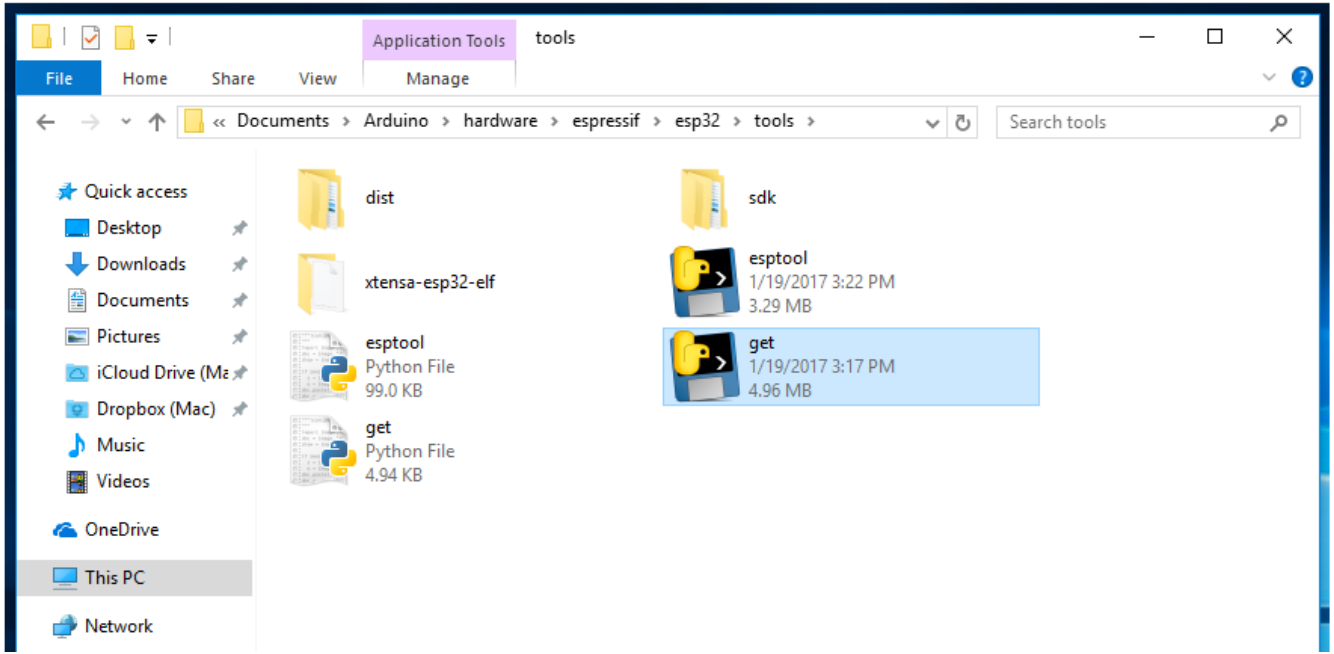
- open a `Git Bash` session pointing to `[ARDUINO_SKETCHBOOK_DIR]/hardware/espressif/esp32` and execute `git submodule update --init --recursive`
- Open `[ARDUINO_SKETCHBOOK_DIR]/hardware/espressif/esp32/tools` and double-click `get.exe`



- When `get.exe` finishes, you should see the following files in the directory



4. Plug your ESP32 board and wait for the drivers to install (or install manually any that might be required)

5. Start Arduino IDE

6. Select your board in `Tools > Board` menu

7. Select the COM port that the board is attached to

Esp32

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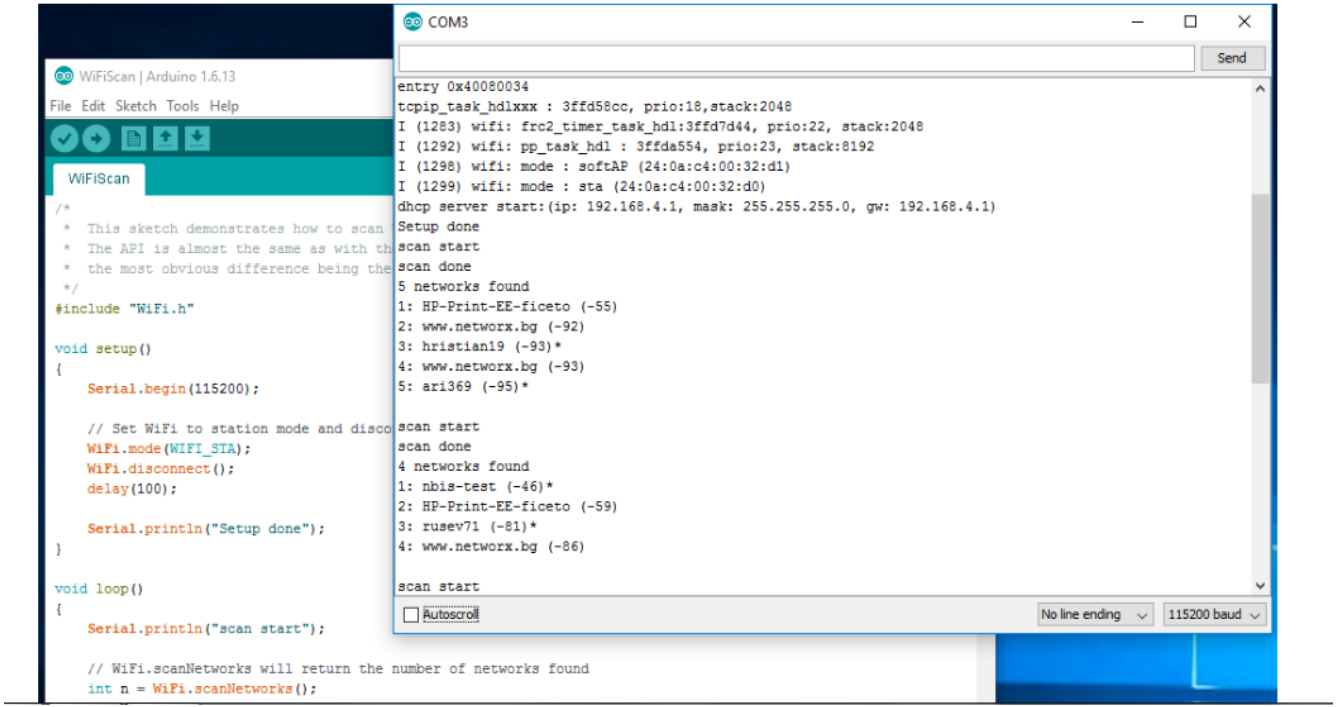
8. Compile and upload (You might need to hold the boot button while uploading)



César Augusto Álvarez Gaspar
caalvarez@uniquindio.edu.co

Thank you!

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