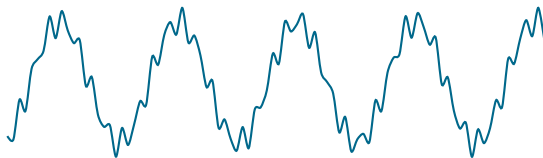


ESP 32 Introduction Workshop

How to IoT

Joren Six



April 2017

OVERVIEW

INTRODUCTION

What is the ESP32?

Why is it useful?

Are there alternatives?

How to program the ESP32?

HANDS-ON

Helpful Knowledge

Getting started

Blink

Hello WiFi

Sending data - UDP or TCP?

Packing data - OSC Protocol

Sending sensor data

Mesh networking

SUPPLEMENTARY MATERIAL

INTRO - WHAT IS THE ESP32?

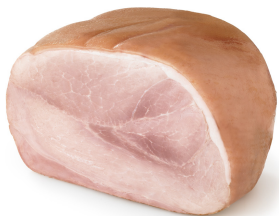


Fig: ESP? ESP? ESP? ESP?

ESP32 is a low cost, low power microcontroller series. Designed and supported by Espressif systems.

- ▶ Integrated WiFi
- ▶ Dual core Tensilica Xtensa LX6
- ▶ Bluetooth Smart Tranciever
- ▶ Sucessor to the ESP8266
- ▶ Relatively new, about one year old

INTRO - WHAT IS THE ESP32?

It is a microcontroller **series**.

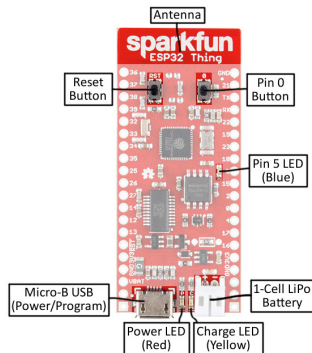


- ▶ ESP32-CoreBoard or ESP32-DevKitC by Espressif systems
- ▶ ESP32-WROOM-32
- ▶ Olimex ESP32-EVB
- ▶ **Sparkfun ESP32 Thing**
- ▶ Many more

INTRO - WHAT IS THE ESP32 THING?

It is an ESP32 **implementation** by Sparkfun.

- ▶ Integrated Lithium-Ion battery charger - charge using micro USB
- ▶ Breadboard compatible
- ▶ Large amount of IO exposed
- ▶ Close to the Dev board

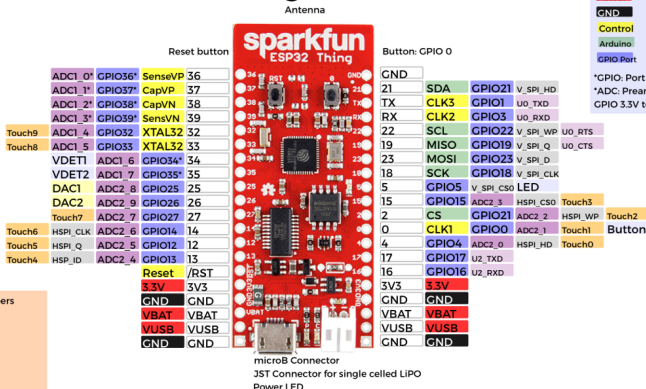


INTRO - WHAT IS THE ESP32 THING?

SparkFun ESP32 Thing (DEV-13907)

Name	ADC
Power	DAC
GND	SPI
Control	UART
Arduino	Touch
GPIO Port	Misc

*GPIO: Port Input Only
*ADC: Preamplifier ADC
GPIO 3.3V tolerant only



INTRO - WHY IS IT USEFUL?



- ▶ IoT use-cases: sending sensor data to the internet
- ▶ Wearables: small, battery powered and wireless
- ▶ Arduino like applications

Fig: ESP32-Thing by Sparkfun

INTRO - ARE THERE ALTERNATIVES?

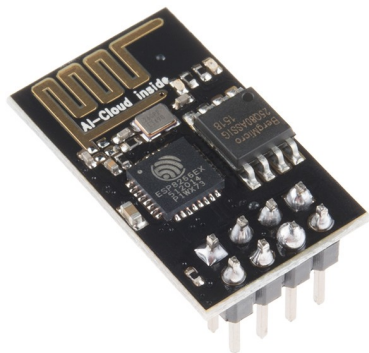


Fig: ESP 8266

- ▶ ESP8266
 - ▶ Less powerful
 - ▶ Cheaper
 - ▶ WiFi connection unreliable
 - ▶ No bluetooth
- ▶ Arduino UNO WiFi
 - ▶ Less powerful
 - ▶ More expensive
 - ▶ Larger
 - ▶ No battery plug
- ▶ Many others

INTRO - HOW TO PROGRAM THE ESP32?

ESP-IDF

Arduino

- ▶ **Easy to get started**
- ▶ **Large community**
 - ▶ Supported sensors!
 - ▶ Libraries
- ▶ Very limited 'IDE'
- ▶ No debugging
- ▶ Limited functionality



Fig: Arduino logo

- ▶ C/C++ toolchain
- ▶ Hard to setup
- ▶ IDE of your choice
- ▶ JTAG Debugging
- ▶ (Free)RTOS
- ▶ Full functionality

Micropython

- ▶ Python 3.x
- ▶ REPL
- ▶ Limited functionality

PlatformIO

- ▶ Aduino like
- ▶ IDE based on Atom

HANDS-ON - HELPFUL KNOWLEDGE

- ▶ Experience with Arduino environment or cross compiling for microcontrollers
- ▶ Reading Serial communication
- ▶ Basic knowledge of git

HANDS-ON - GETTING STARTED

`http://0110.be/posts/ESP32`

HANDS-ON - BLINK



Fig: Blinky blink

HANDS-ON - HELLO WiFI

Fig: WiFi connection

HANDS-ON - HELLO WiFI - UDP OR TCP?

TCP over IP

- ▶ Order guaranteed
- ▶ Data checked and potentially resend
- ▶ High latency
- ▶ Ideal when you need guarantees
- ▶ Think in streams

UDP over IP

- ▶ Order not guaranteed
- ▶ Data can disappear
- ▶ Low latency
- ▶ Good for real-time data (audio/video)
- ▶ Think in packets

HANDS-ON - HELLO WiFi - OSC PROTOCOL

OSC Protocol

- ▶ A simple standardized way to pack data
- ▶ Universal support and libraries
- ▶ Originally developed to connect music instruments

HANDS-ON - SENDING SENSOR DATA

HANDS-ON - MESH NETWORKING

SUPPLEMENTARY MATERIAL