IoT Training Thingsboard

Hasbi Ash Shiddieqy

Agenda

01

Introduction IoT

02

ESP32

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Power Sensor

04

Thingsboard

05

Dashboard Demo

06

Hands-on

Yang akan dilakukan

Konfigurasi IDE untuk Pemograman ESP32

Platform IO for ESP8266 dan ESP32

Mengirimkan data ke cloud Thingsboard

Provisioning device pada thingsboard

Membuat real time user Dashboard

Thingsboard Dashboard

01

Introduction

What is IoT?

"Internet" dan "Things"

Barang yang dapat:

- Diprogram
- Mengirim data ke tempat lain (terhubung dalam jaringan)
- Dapat dikendalikan dari jarak jauh

Aplikasi

Building and home automation

Automasi gedung dan rumah
Power management, AC, Deteksi gas bocor, Motion sensor, Smart Lock

Smart Cities

Pengaturan konsumsi daya seperti pada lampu jalan, CCTV, menggunakan koneksi jarak jauh (LoRa/NB-IoT), biasanya dikontrol secara centralized

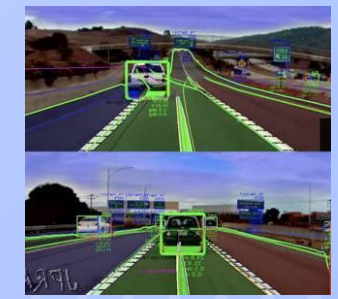
Aplikasi dari IoT

Smart Manufacturing

Smart factory dan Industri 4.0, system yang membutuhkan desain security dan robust. Untuk mencapai lingkungan factory/pabrik yang smarter, safer, dan more efficient

Automotive

Teknology otomotif yang pintar, mulai dari OBC, Head unit, Telementry kontrol.



Aplikasi dari IoT

WEARABLES

Ultra low power untuk wearable device

HEALTCARE

Revolusi kesehatan, monitoring pasien, telehealth system

AGRICULTURE

Mempercepat process dan efisiensi pertanian. Transport, drone/Survey, automasi

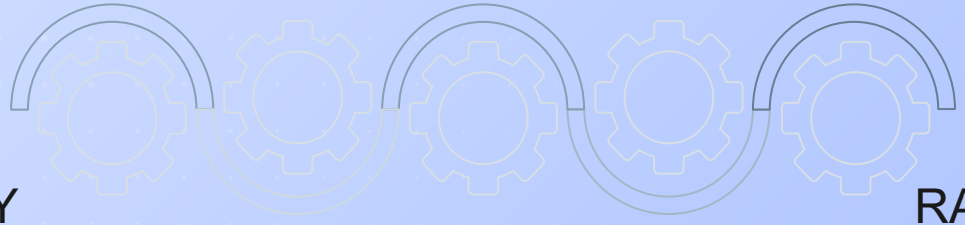
Metric Design

POWER MANAGEMENT

Supply Daya menggunakan baterai, energy harvesting.

COMPLEXITY

Kemudahan desain dan development



CONNECTIVITY

Banyak standar koneksi yang biasa digunakan tergantung dari kebutuhan

SECURITY

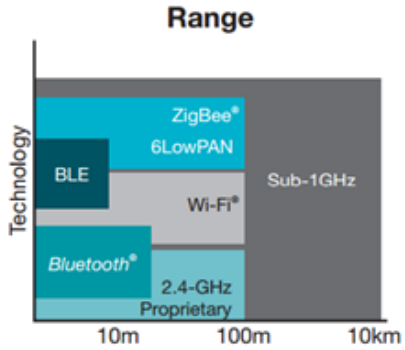
Hardware security dan protokol yang aman/secure.

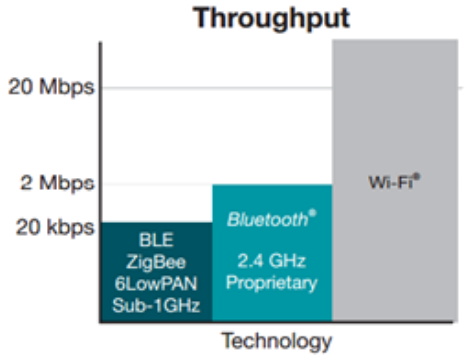
RAPID EVOLUTION

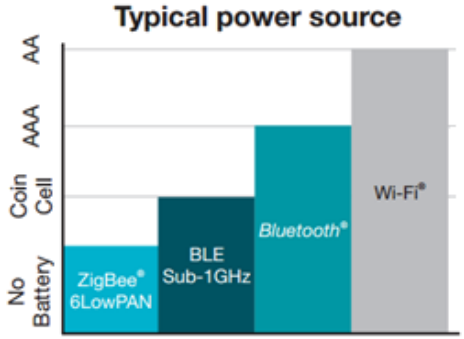
Flexibilitas bisa digunakan di berbagai aplikasi

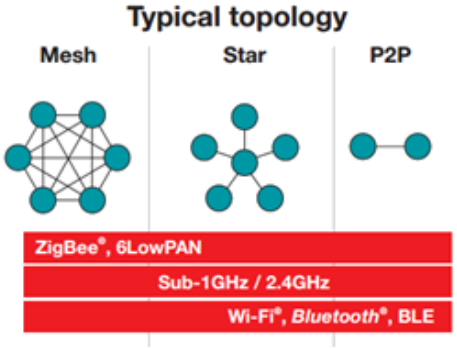
PARAMETER CONNECTIVITY

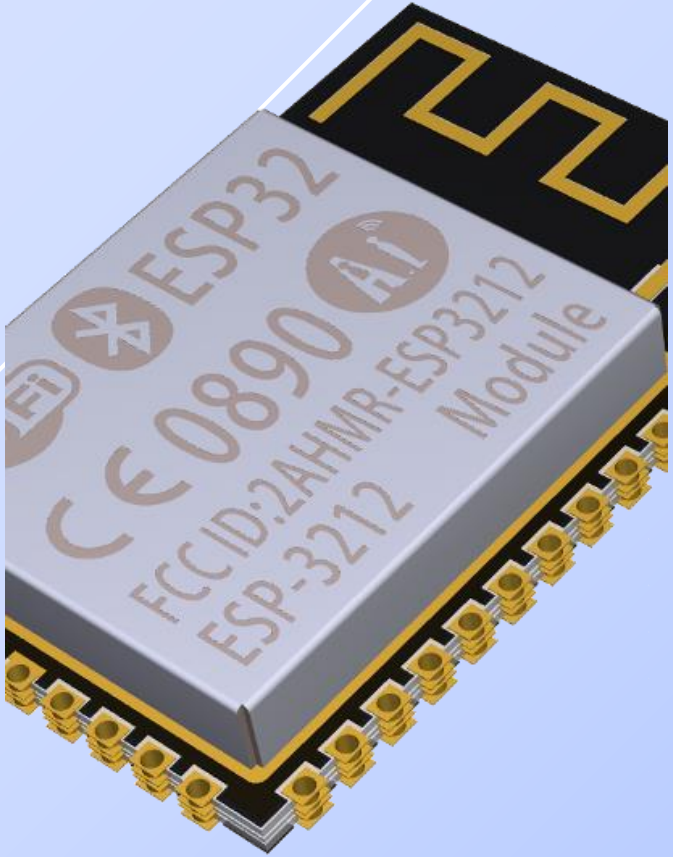
Range
Throughput
Power source
Topology







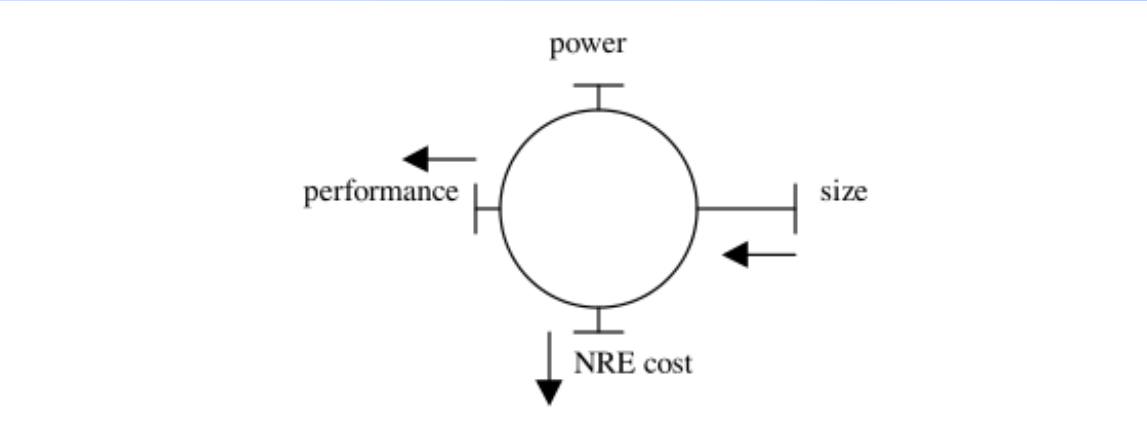




02

ESP Programming

Perbandingan development board



Perbandingan Prosesor

Model	Clock	Flash	SRAM
ATMega328 (Arduino Nano)	16 Mhz	32 kB	2 kB
STM32F103C8T (Blue Pill)	72 Mhz	64 kB	20 kB
LPC1769 (LPCXpresso)	100 MHz	512 kB	64 kB
ESP32	240 MHz (600 MIPS)	External ~16 MB (tipikal 4 MB)	520 kB
ESP8266	80 ~ 160 MHz	External ~ 16 MiB	80 kB

ESP32 Features and Specifications

- Wireless connectivity WiFi: 150.0 Mbps data rate with HT40
- Bluetooth: BLE (Bluetooth Low Energy) and Bluetooth Classic
- Processor: Tensilica Xtensa Dual-Core 32-bit LX6 microprocessor, running at 160 or 240 MHz
- ROM: 448 KB
- SRAM: 520 KB
- Low Power: ensures that you can still use ADC conversions, for example, during deep sleep.

Peripheral Input/Output:

- Peripheral interface with DMA that includes capacitive touch
- ADCs (Analog-to-Digital Converter)
- DACs (Digital-to-Analog Converter)
- I^2C (Inter-Integrated Circuit)
- UART (Universal Asynchronous Receiver/Transmitter)
- SPI (Serial Peripheral Interface)
- I^2S (Integrated Interchip Sound)
- RMII (Reduced Media-Independent Interface)
- PWM (Pulse-Width Modulation).

Program Env

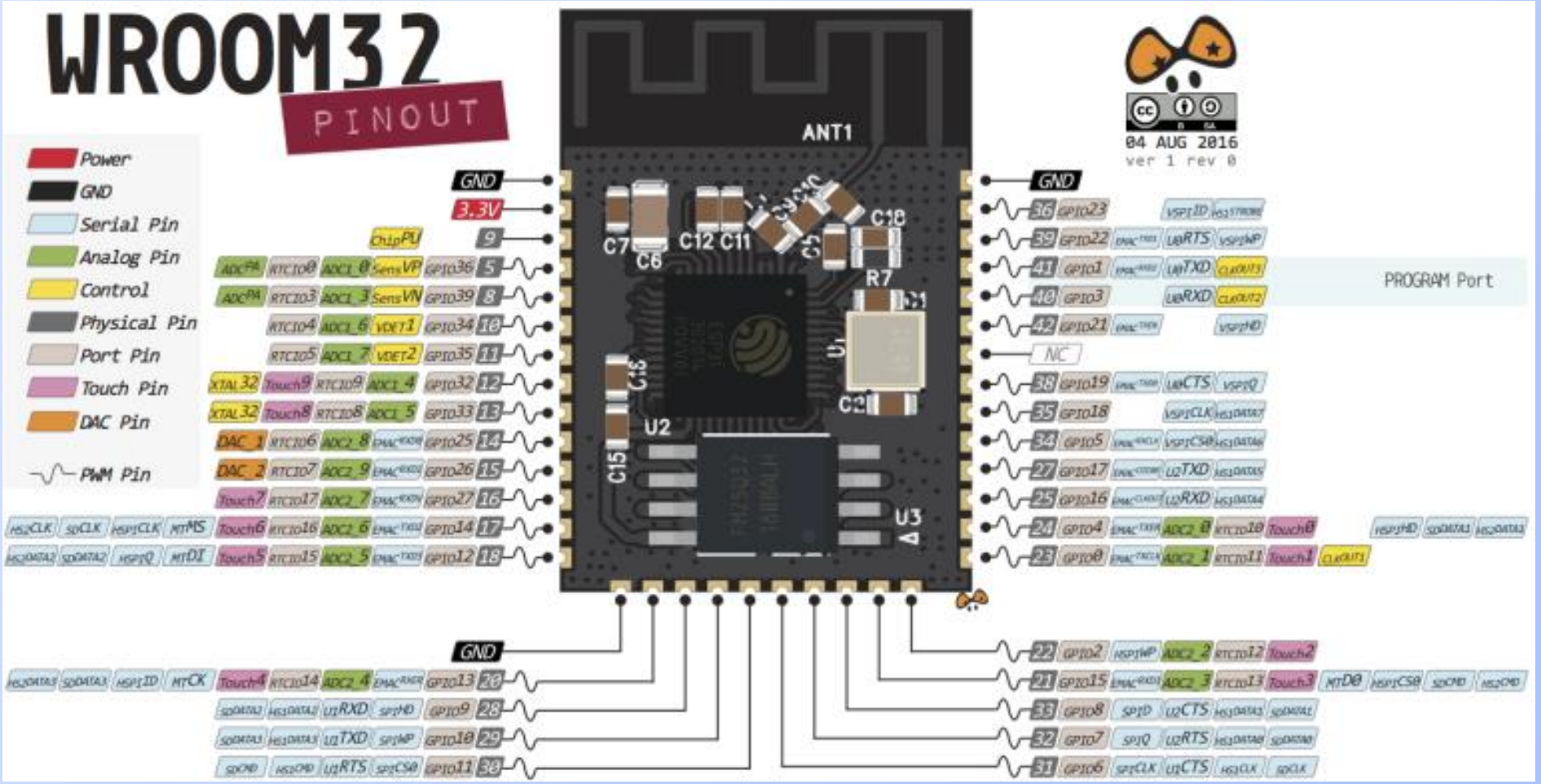
Arduino IDE
Espressif IDF
Micropython
JavaScript
LUA

(Windows, Mac OS X and Linux)

Development board

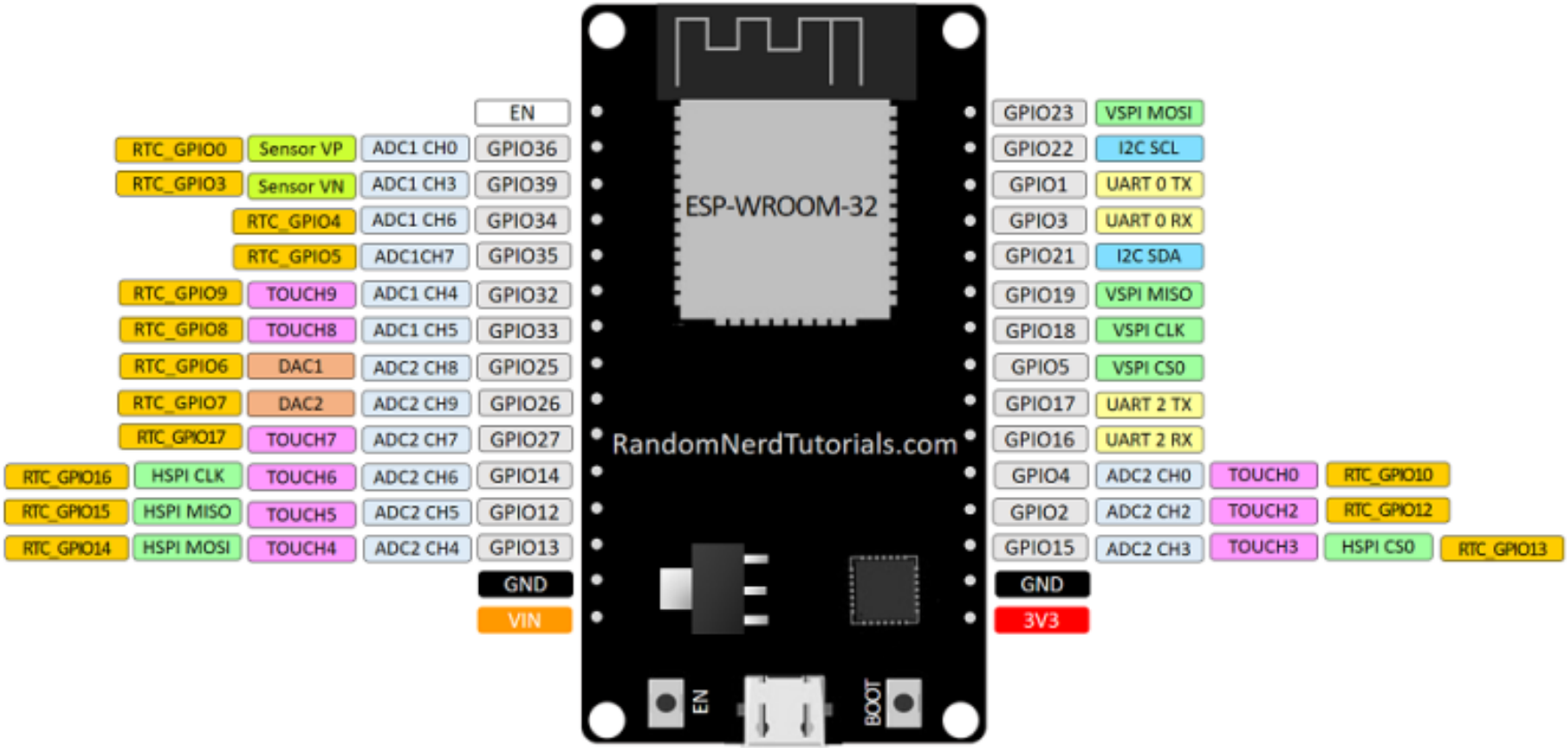
WROOM32

PINOUT



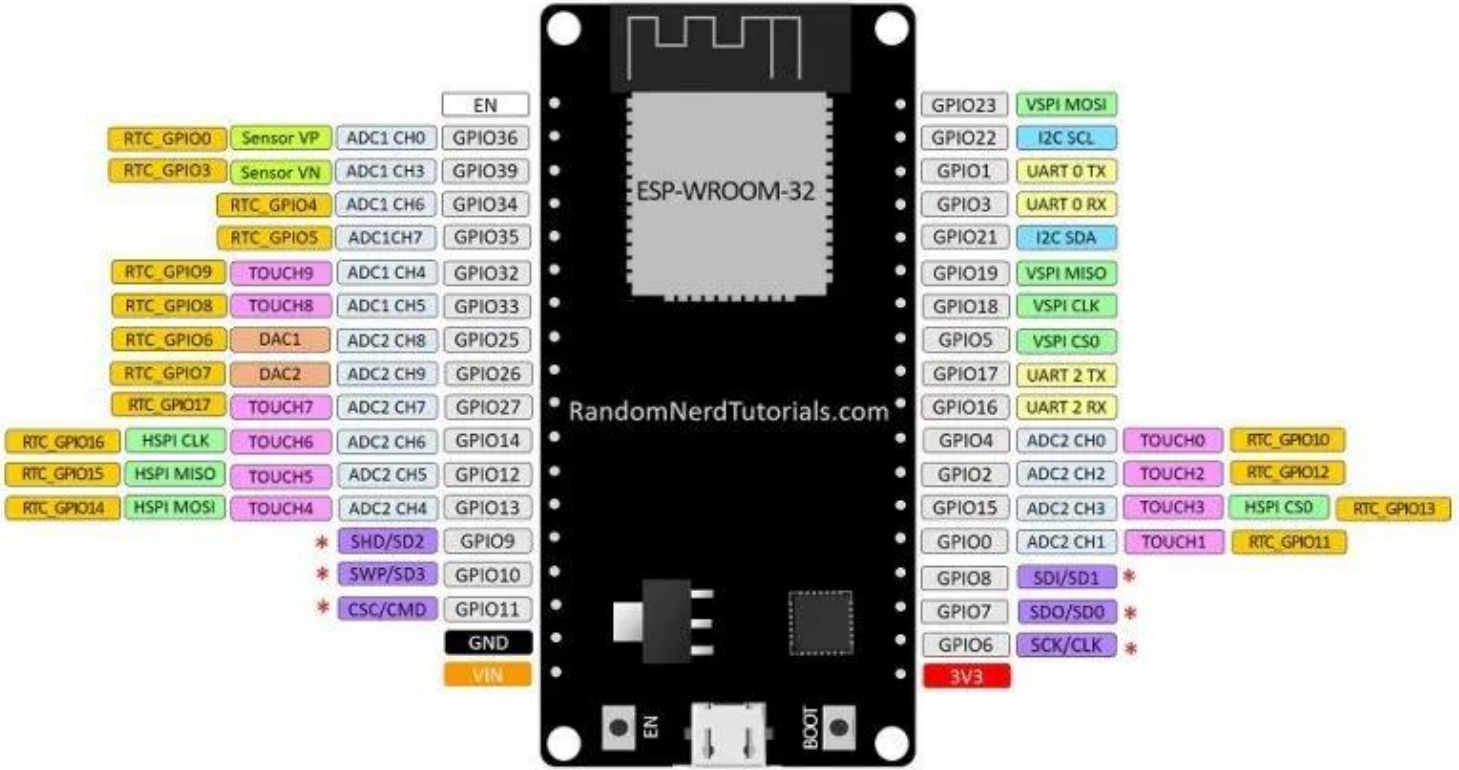
ESP32 DEVKIT V1 – DOIT

version with 30 GPIOs



ESP32 DEVKIT V1 – DOIT

version with 36 GPIOs



* Pins SCK/CLK, SDO/SD0, SDI/SD1, SHD/SD2, SWP/SD3 and SCS/CMD, namely, GPIO6 to GPIO11 are connected to the integrated SPI flash integrated on ESP-WROOM-32 and are not recommended for other uses.

ESP32 Pinout Reference

Input only pins

- GPIO 34
- GPIO 35
- GPIO 36
- GPIO 39

ESP32 has 18 x 12 bits ADC input channels (while the ESP8266 only has 1x 10 bits ADC).

- ADC1_CH0 (GPIO 36) ADC1_CH1 (GPIO 37)
- ADC1_CH2 (GPIO 38) ADC1_CH3 (GPIO 39)
- ADC1_CH4 (GPIO 32) ADC1_CH5 (GPIO 33)
- ADC1_CH6 (GPIO 34) ADC1_CH7 (GPIO 35)
- ADC2_CH0 (GPIO 4) ADC2_CH1 (GPIO 0)
- ADC2_CH2 (GPIO 2) ADC2_CH3 (GPIO 15)
- ADC2_CH4 (GPIO 13) ADC2_CH5 (GPIO 12)
- ADC2_CH6 (GPIO 14) ADC2_CH7 (GPIO 27)
- ADC2_CH8 (GPIO 25) ADC2_CH9 (GPIO 26)

There are 2 x 8 bits DAC channels on the ESP32 to convert digital signals into analog voltage signal outputs. These are the DAC channels:

- DAC1 (GPIO25)
- DAC2 (GPIO26)

ESP32 PINOUT REFERENCE

Strapping Pins

The ESP32 chip has the following strapping pins:

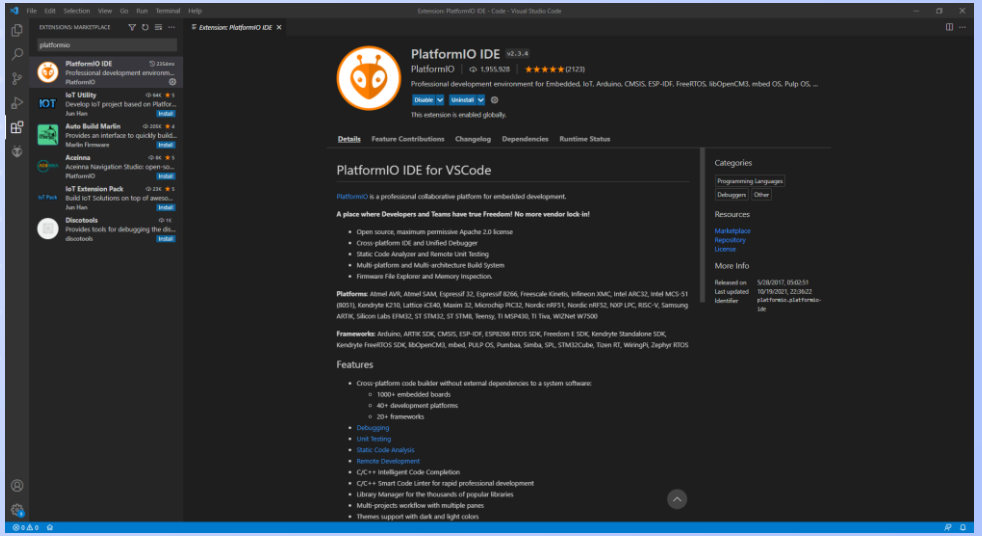
GPIO 0
GPIO 2
GPIO 4
GPIO 5 (must be HIGH during boot)
GPIO 12 (must be LOW during boot)
GPIO 15 (must be HIGH during boot)

Pins HIGH at Boot

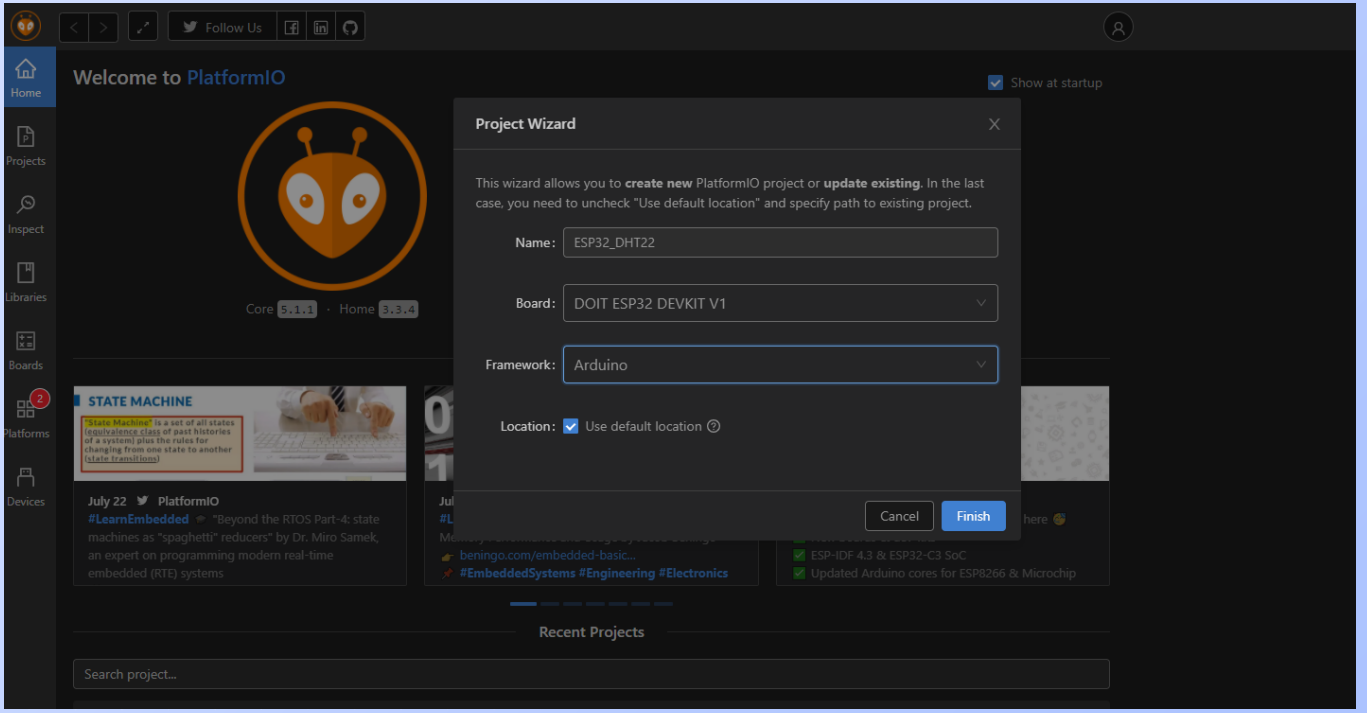
GPIO 1
GPIO 3
GPIO 5
GPIO 6 to GPIO 11 (connected to the ESP32 integrated SPI flash memory – not recommended to use).
GPIO 14
GPIO 15

Platform IO IDE

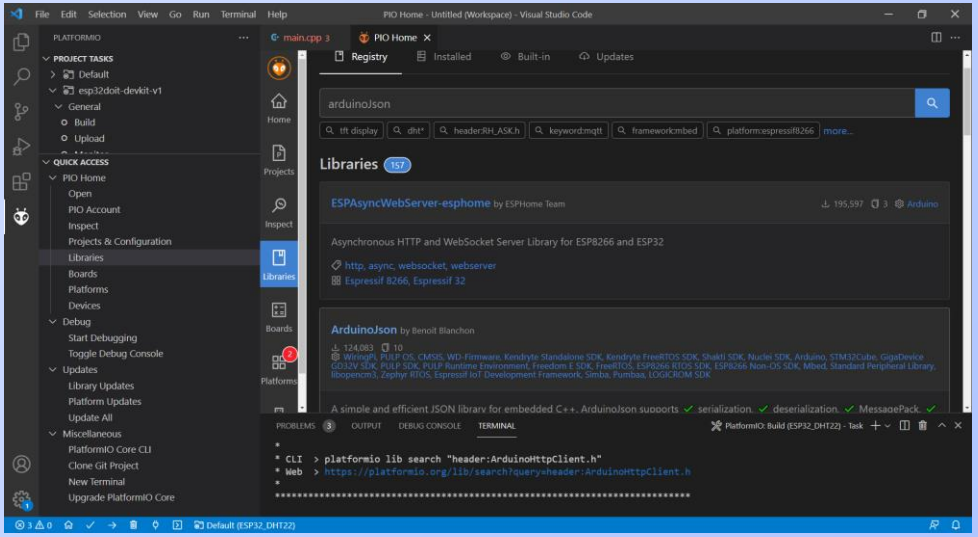
PlatformIO IDE berjalan diatas VSCode sebagai official extentions
Pada menu Extention Manager pada sidebar IDE VScode– search platformIO – pilih install



Membuat project baru



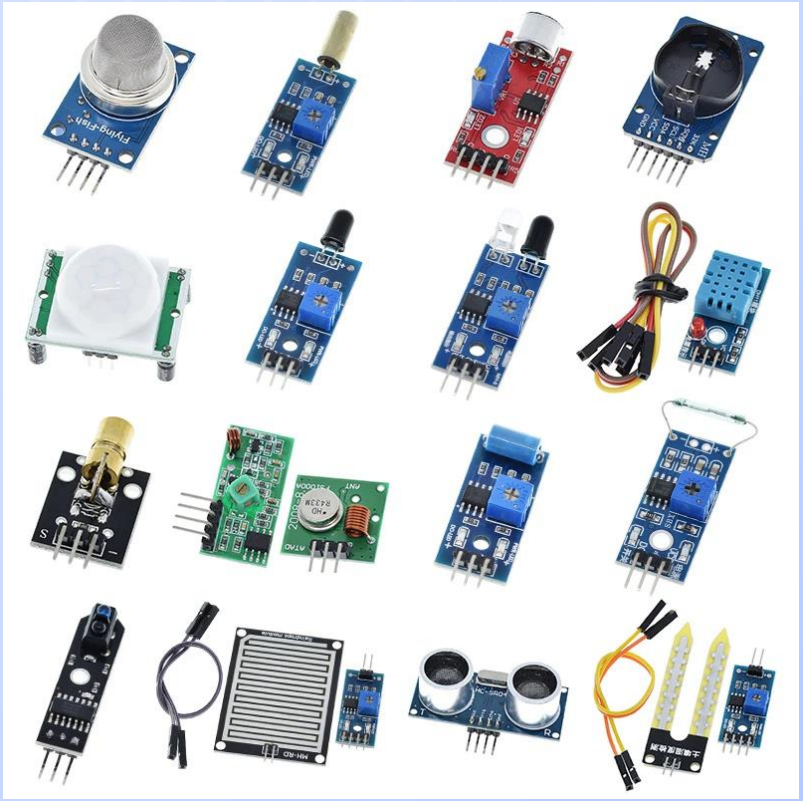
Install library untuk sensor

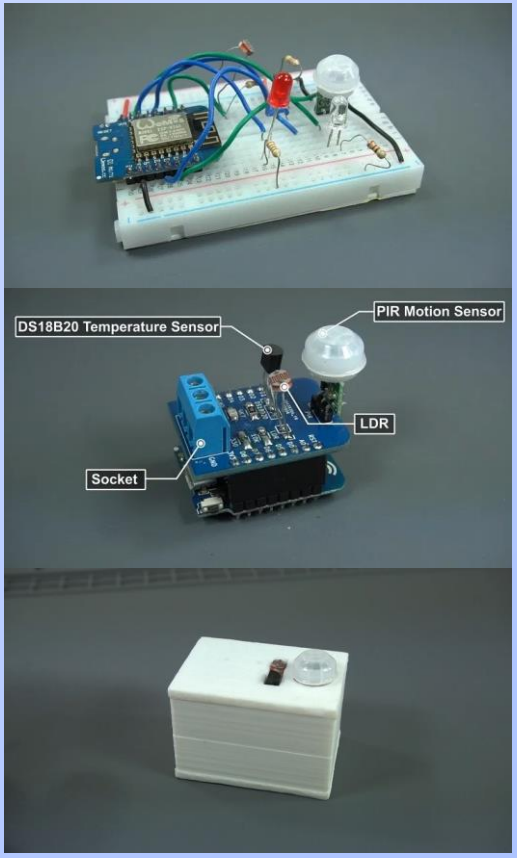


03

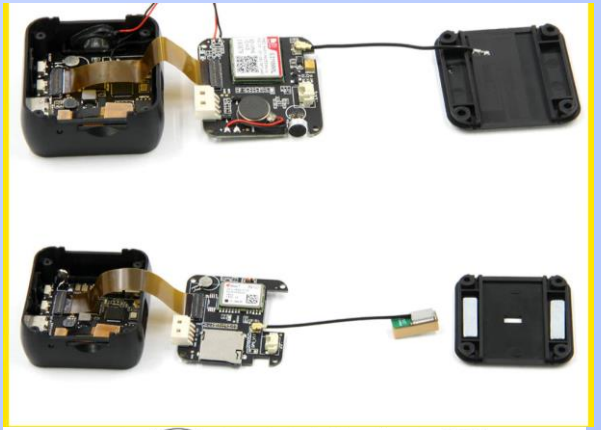
Power Sensor

Sensor

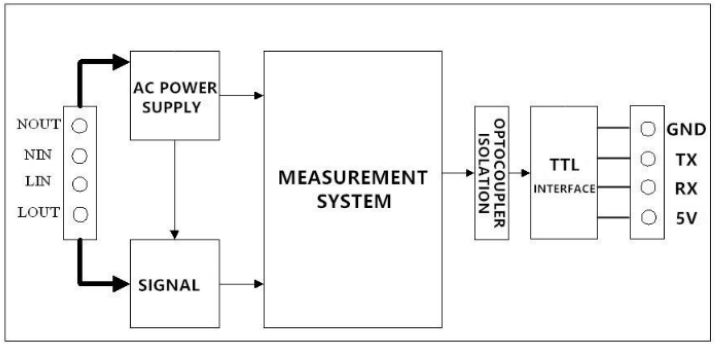




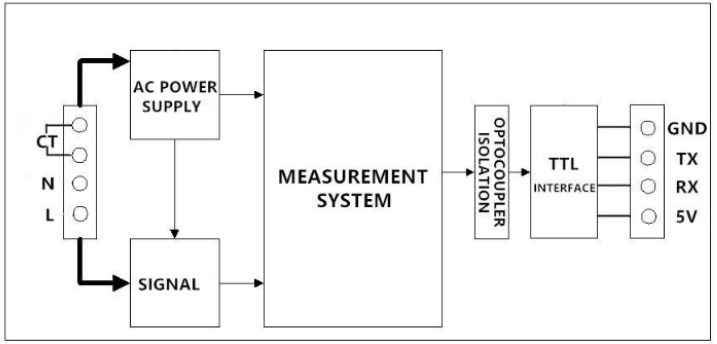
Shield or board custom



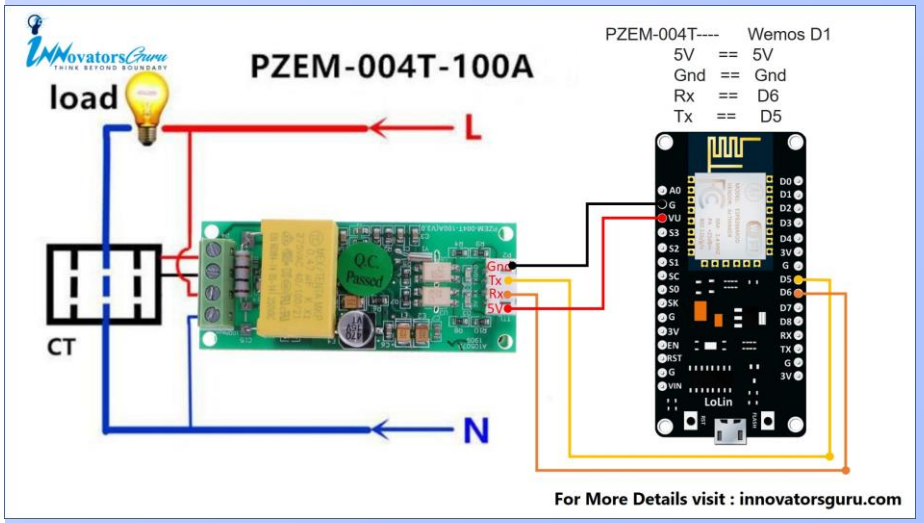
Power Sensor



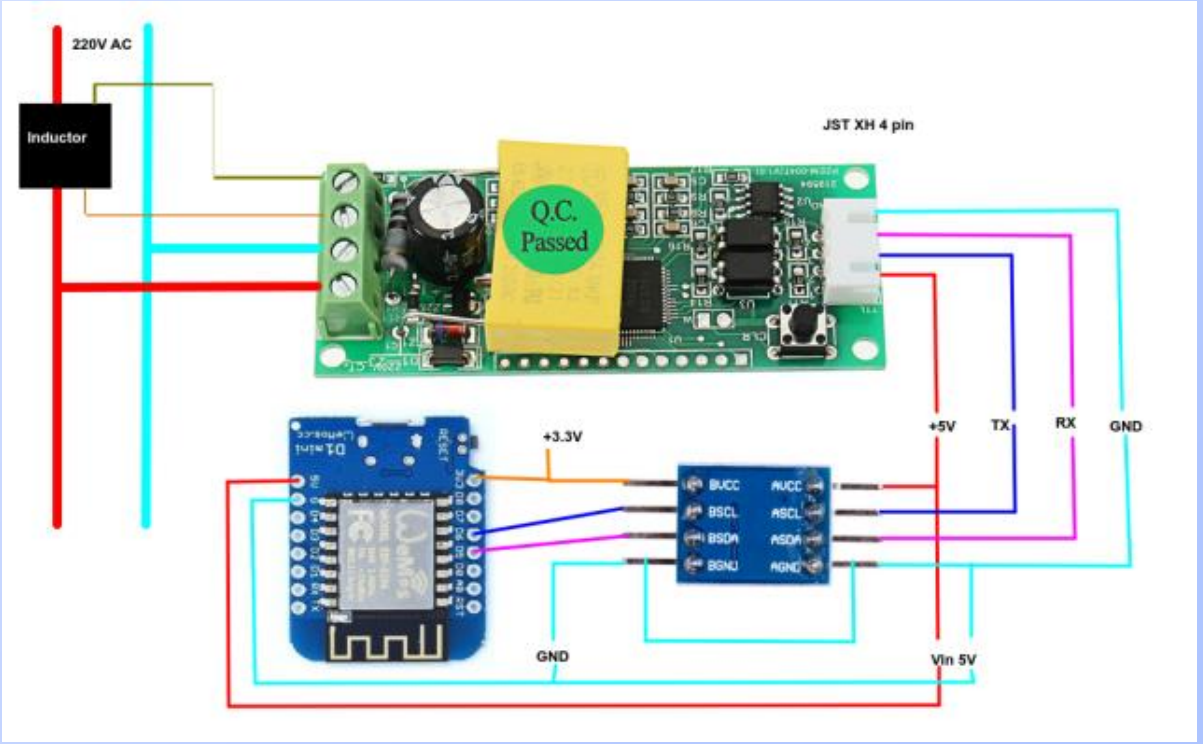
Picture 3.1 PZEM-004T-10A Functional block diagram



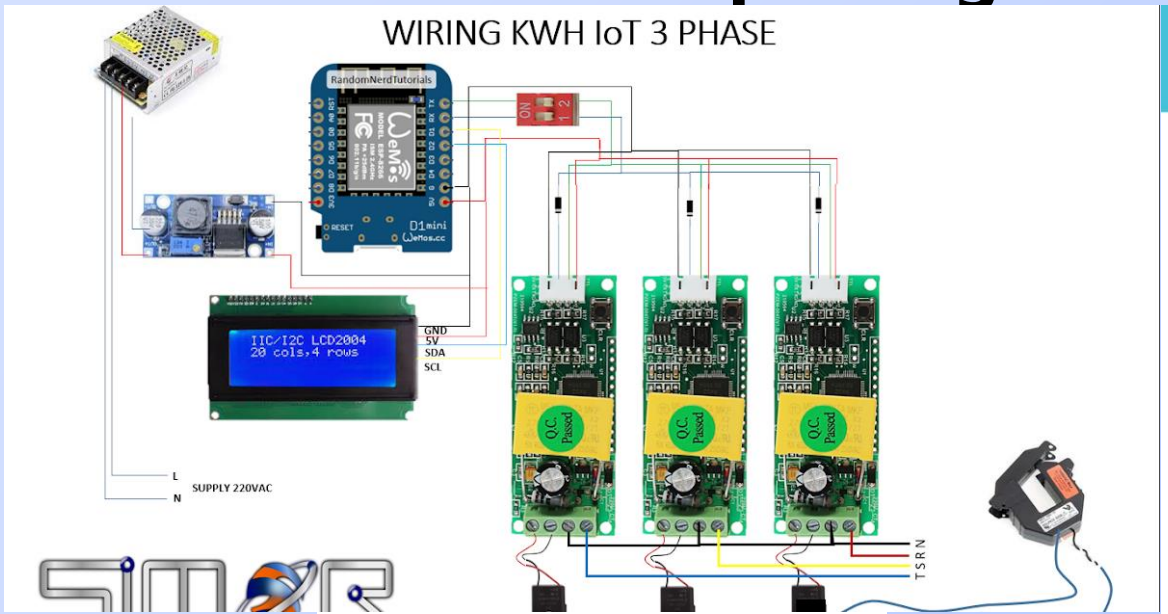
Picture 3.2 PZEM-004T-100A Functional block diagram

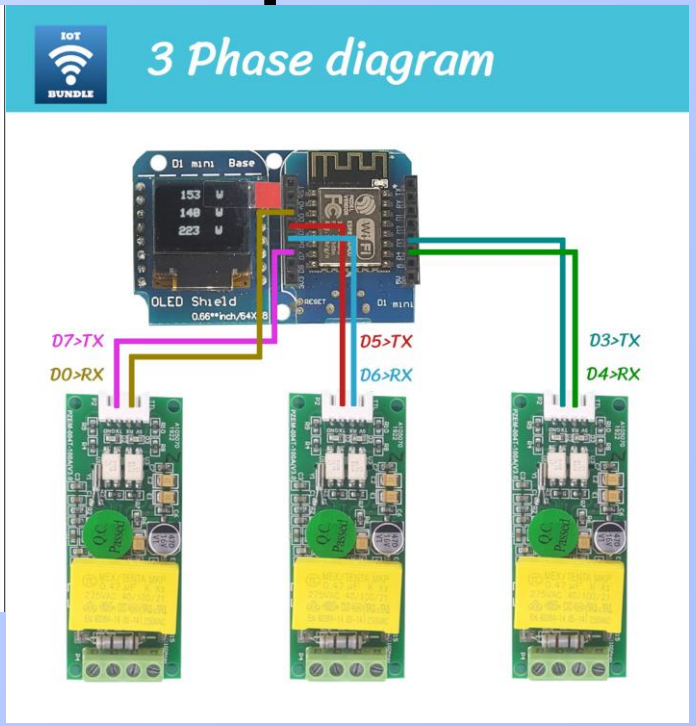


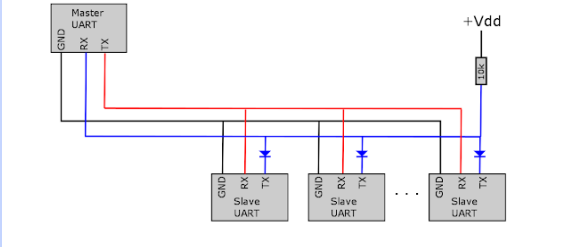
TTL Voltage level



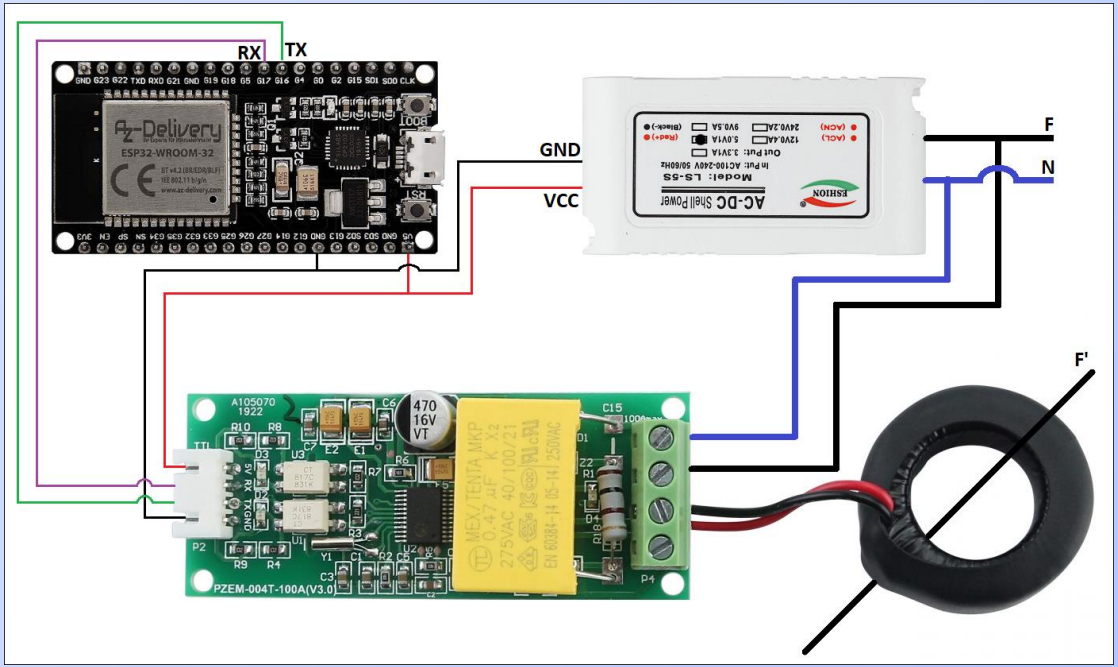
RS485 TTL Multiplexing dan full Duplexx





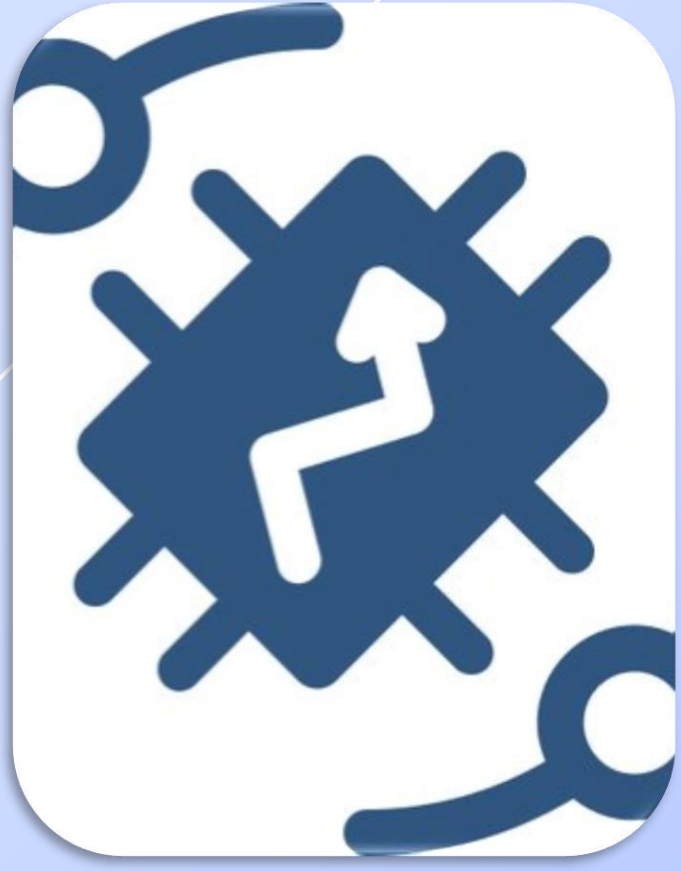


Test PZEM



ESP32 Serial2
Pin D16 RX
Pin D17 TX

```
Custom Address:1
Voltage: 226.40V
Current: 0.00A
Power: 0.00W
Energy: 0.002kWh
Frequency: 50.0Hz
PF: 0.00
```



04

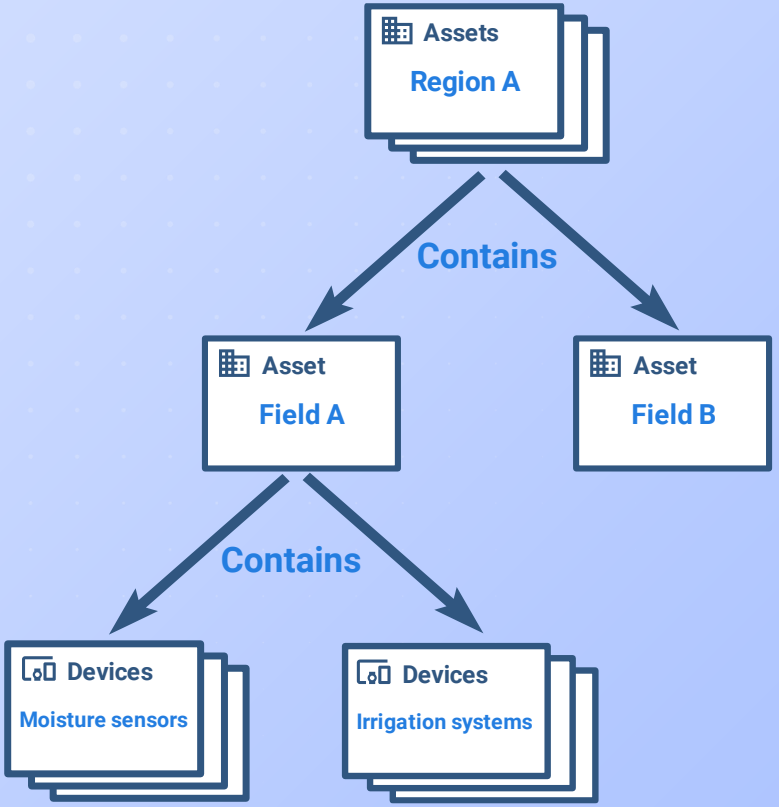
Thingsboard

Cloud Thingsboard

http://103.175.217.120:8080

ThingsBoard is an open-source server-side platform yang memungkinkan untuk monitor dan control perangkat IoT. Gratis untuk digunakan secara personal dan commercial dan dapat digunakan dimana saja

Asset dan Customer



Telemetri Data

- **Collect** data from devices using various protocols and integrations;
- **Store** time series data in SQL (PostgreSQL) or NoSQL (Cassandra or Timescale) databases;
- **Query** the latest time series data values or all data within the specified time range with flexible aggregation;
- **Subscribe** to data updates using WebSockets for visualization or real-time analytics;
- **Visualize** time series data using configurable and highly customizable widgets and dashboards;
- **Filter and analyze** data using flexible Rule Engine;
- **Generate** alarms based on collected data;
- **Forward** data to external systems using External Rule Nodes (e.g. Kafka or RabbitMQ Rule Nodes).

ESP32 data ke Cloud

Buat project baru pada Platform IO
Koneksikan sensor yang akan di ambil data
Buat koneksi Wi-Fi
Kirim data menggunakan library thingsboard

Konfigurasi Device

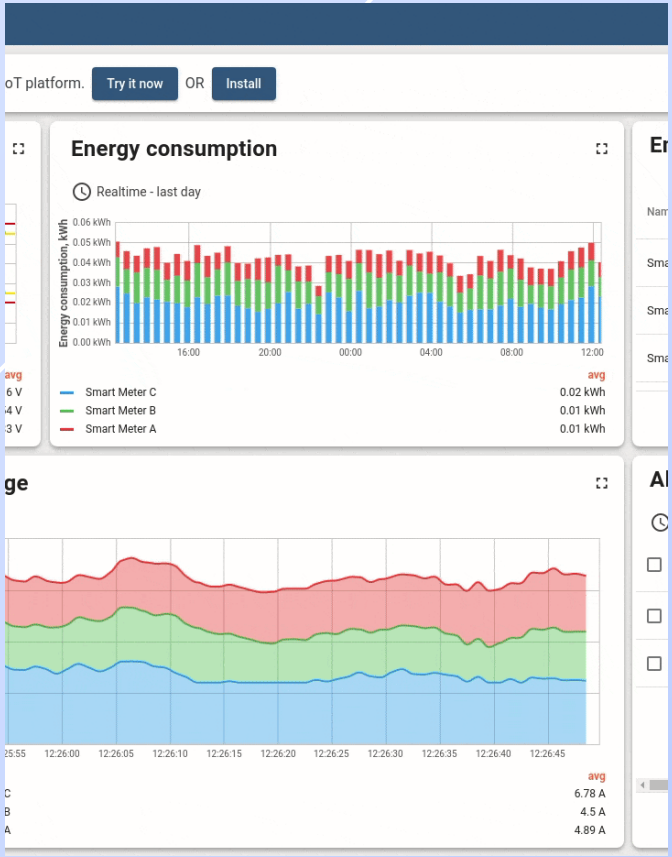
Provision Perangkat (device)
Provision Asset
Provision Dashboard data

Profile

Unik Device profile
Unik Asset (Create Relation)
Provision Dashboard data
Membuat state khusus

05

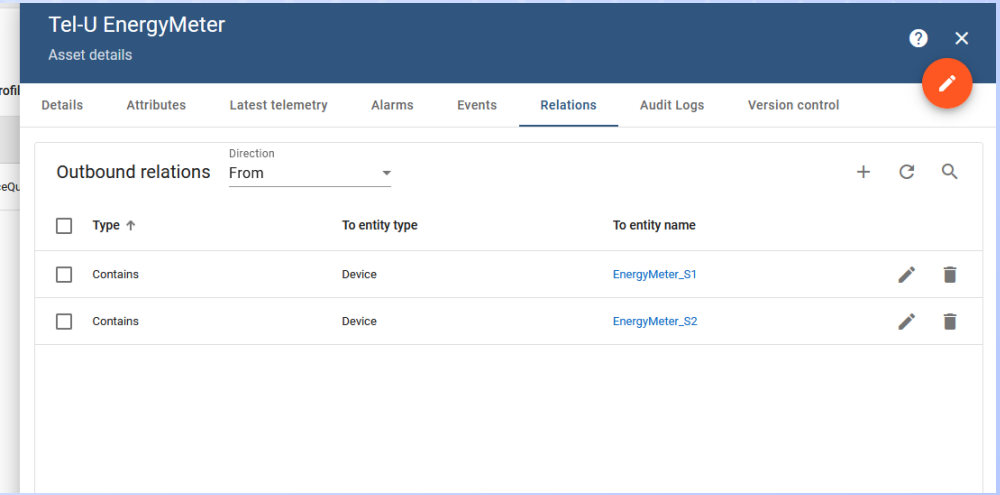
Dashboard Demo

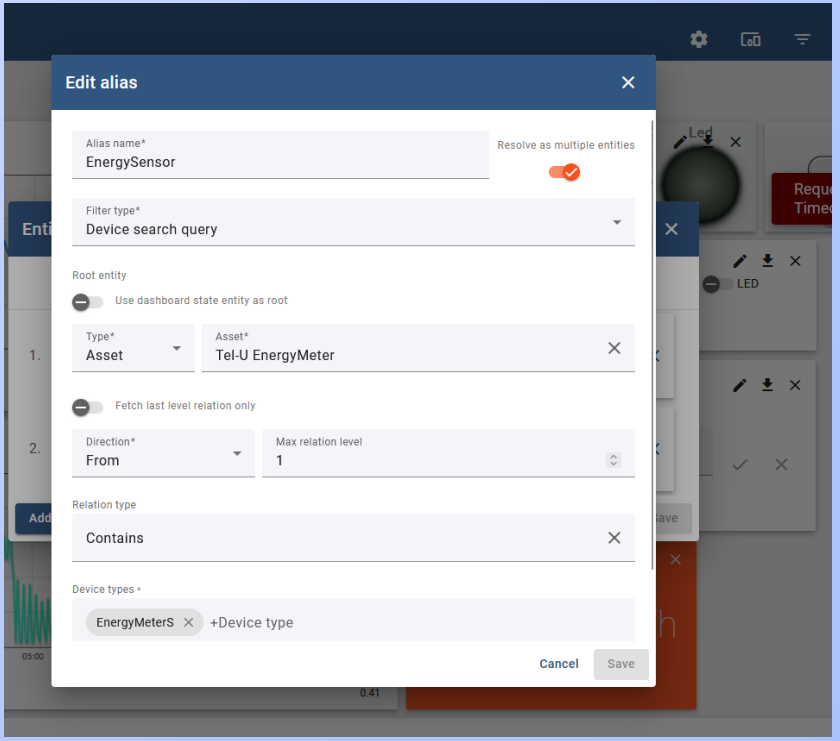


Tampilkan data pada Dashboard

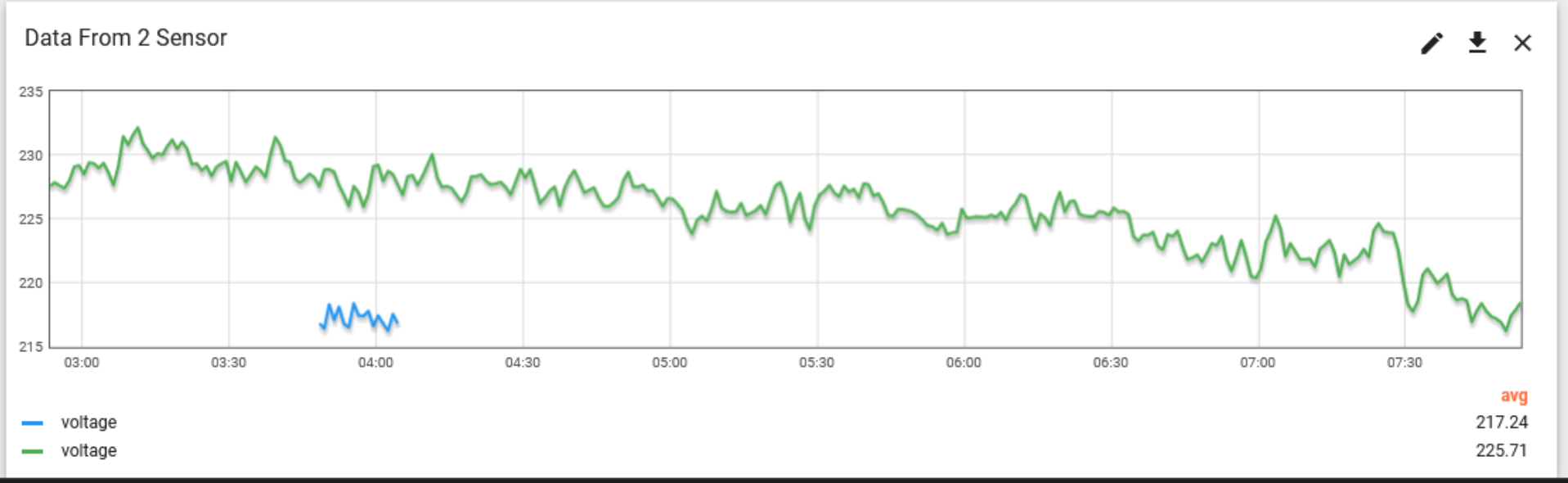
Membuat Alias pada Dashboard

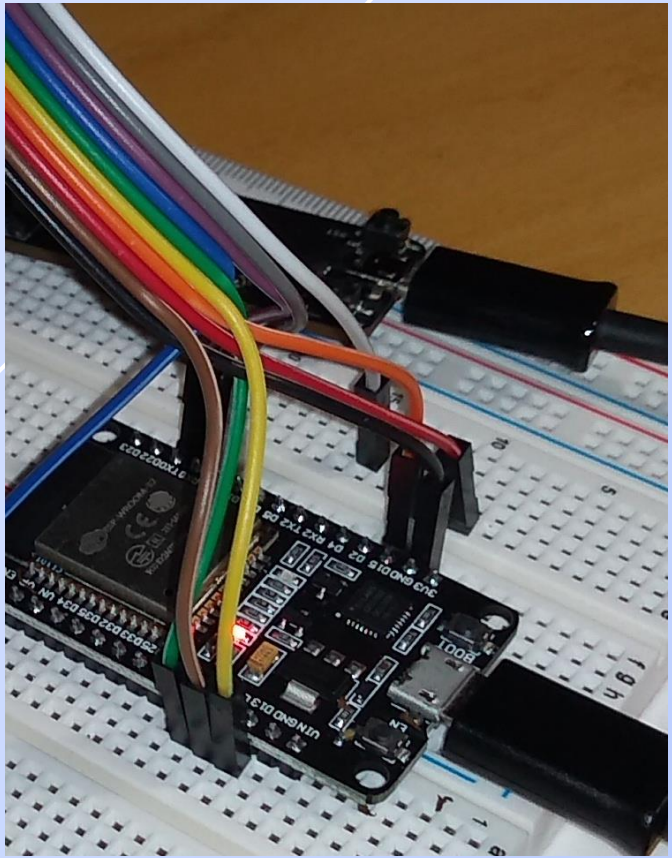
Pada Entities – Asset set Relation EnergyMeter





Menampilkan 2 Sensor





06

Hands-On

95%

Gunakan beberapa ESP32/ESP8266 untuk terkoneksi ke cloud thingsboard

Thanks!

Do you have any questions?

youremail@freepik.com
+91 620 421 838
yourwebsite.com



10x faster

It’s a treatment 10 times faster than previous treatments

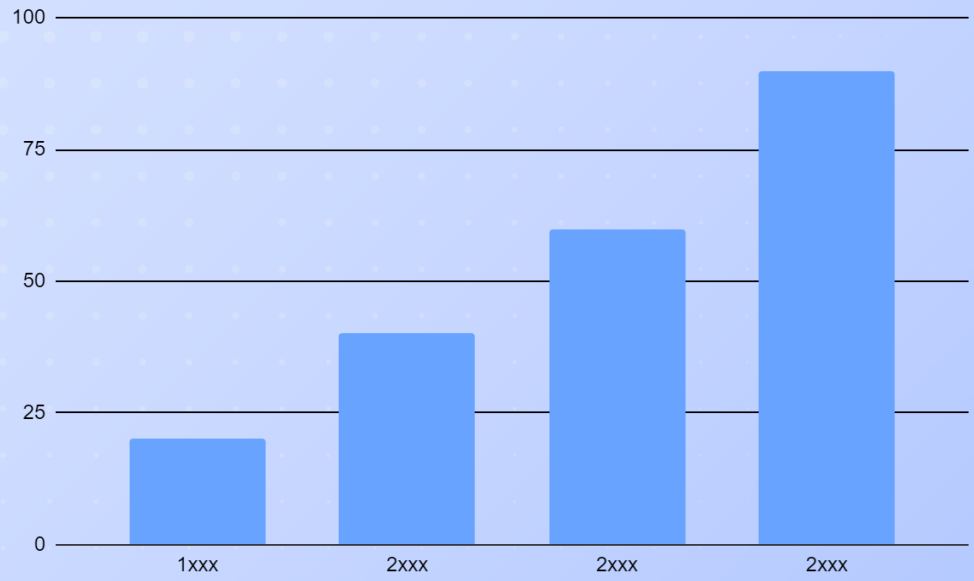
50%

Reduction in complications

85%

Success rate for the breakthrough

Column chart

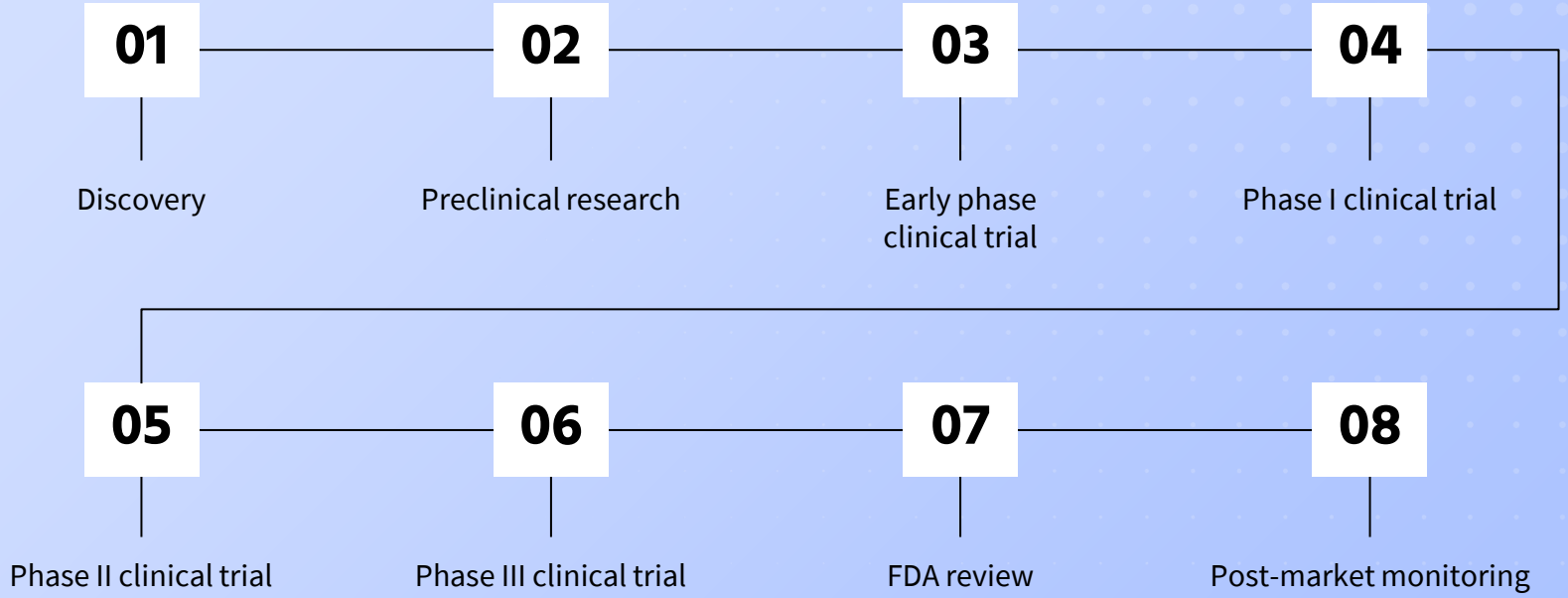


Understanding the numbers

Use this slide to present data on the outcomes of patients who have received treatment for a particular condition or disease. A column chart can be an effective way to illustrate changes in patient outcomes over time. Consider including data from clinical trials or real-world patient populations to showcase the impact of your breakthrough

Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**

Milestones


01
Discovery
02
Preclinical research
03
Early phase clinical trial
04
Phase I clinical trial
05
Phase II clinical trial
06
Phase III clinical trial
07
FDA review
08
Post-market monitoring

Treatment options

Treatment option	Efficacy rate	Side effects	Cost	Availability
Medication A	80%	Mild	$	Widely available
Medication B	70%	Moderate	$	Available only with prescription
Surgery	90%	High	$	Requires specialized facilities
Radiation therapy	75%	Moderate	$	Available in most hospitals
Immunotherapy	65%	Moderate	$	Available only in select medical centers
Physical therapy	60%	Mild	$	Widely available

Clinical trial phases

Phase 1: Safety and dosage

- **Participants**: 20-100 healthy volunteers
- **Objective**: To determine safe dosage and identify side effects
- **Duration**: 6 months
- **Success rate**: 80% of participants completed the trial without experiencing significant side effects

Phase 2: Side effects

- **Participants**: Up to several hundred people with the condition
- **Objective**: Determine effectiveness and further evaluate safety
- **Duration**: 12 months
- **Success rate**: 65% of participants experienced a significant improvement in symptoms

Phase 3: Large-scale testing

- **Participants**: From several hundred to thousands of people with the condition
- **Objective**: To confirm effectiveness, monitor side effects, and compare to standard treatments
- **Duration**: 24 months
- **Success rate**: New treatment was better in 75% cases

Phase 4: Post-market monitoring

- **Participants**: Thousands of people with the condition who are taking the drug
- **Objective**: To monitor long-term safety and effectiveness and detect rare side effects
- **Duration**: Ongoing
- **Success rate**: No major safety concerns have been identified in the two years since the drug was approved for market use

Data and statistics

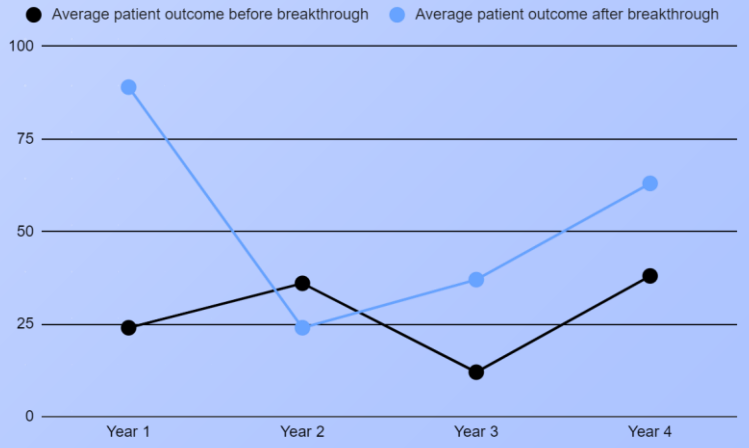
The tool increased early diagnosis rates by **50%**

100 lives saved by new treatment in 1st year

25% less complications with new technique

Key performance indicator	Number
Patients treated	2,500
Success tate	95%
Average recovery time	3 days

Trend in patient outcomes



Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**

Implications

“It's been a true lifesaver for me. I can enjoy life again without any discomfort”

— Sofia Hill, Patient

“I've seen a significant improvement in patient outcomes. This breakthrough makes treatment more efficient and personalized”

— Dr. Jane Doe, Medical Professional

“We are impressed with the safety and effectiveness of this breakthrough. It will greatly benefit patients and healthcare systems”

— Sanjay Patel, Regulatory Body Representative

Key members

John Doe

You can replace the image on the screen with your own

Role: Lead Researcher

Contributions:

- You can enter a description of the contributions here
- You can enter a description of the contributions here
- You can enter a description of the contributions here

Sarah James

You can replace the image on the screen with your own

Role: Clinical Trial Manager

Contributions:

- You can enter a description of the contributions here
- You can enter a description of the contributions here
- You can enter a description of the contributions here

Results and conclusions

Background

Briefly introduce the context of the investigation, such as the medical condition or problem being addressed and the goals

Study design

Describe the design of the study, such as whether it was a randomized controlled trial or observational study, the sample size and the inclusion and exclusion criteria

Findings

Summarize the main findings of the investigation, including statistical results and any important trends or patterns observed

Impact

Discuss the implications of the findings for patients, healthcare providers, and other stakeholders. You could also mention any potential limitations of the study or areas for future research

Conclusions

01 Briefly summarize the main findings of the study or analysis

02 Discuss the implications of the findings and how they relate to the original research question

References

Include a reference page with the sources used in your presentation. List the sources in alphabetical order and include the author's name, the title of the source, the publication date and the publisher or URL

Alternative resources

Here’s an assortment of alternative resources whose style fits the one of this template:

Vectors

- Geometric background
- Colorful background with geometric shapes

Resources

Did you like the resources on this template? Get them for free at our other websites:

Photos

- Medication addiction
- People collage design
- Front view of female doctor
- Medium shot woman wearing mask
- Woman medic measuring pulse of patient
- Medium shot doctor wearing mask indoors

Vectors

- Gradient halftone technology instagram post