

# Intro to Internet of Things with ESP/Arduino



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# Outline I

## 1 Internet

## 2 Internet of Things

## 3 Device: ESP

## 4 Implementation

## 1 Internet

## 2 Internet of Things

## 3 Device: ESP

## 4 Implementation

# What is the internet?

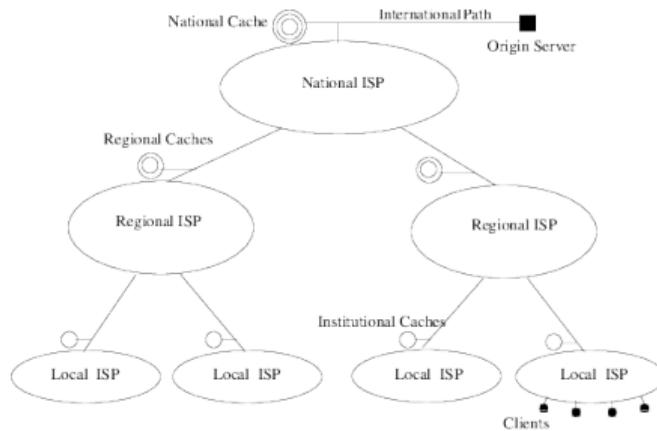
A network connecting an enormous number of computing devices.

How to operate a network like this?

- Wire them all together?
- Who connects to whom?
- How many steps to send a message?

# Hierarchy+Protocol

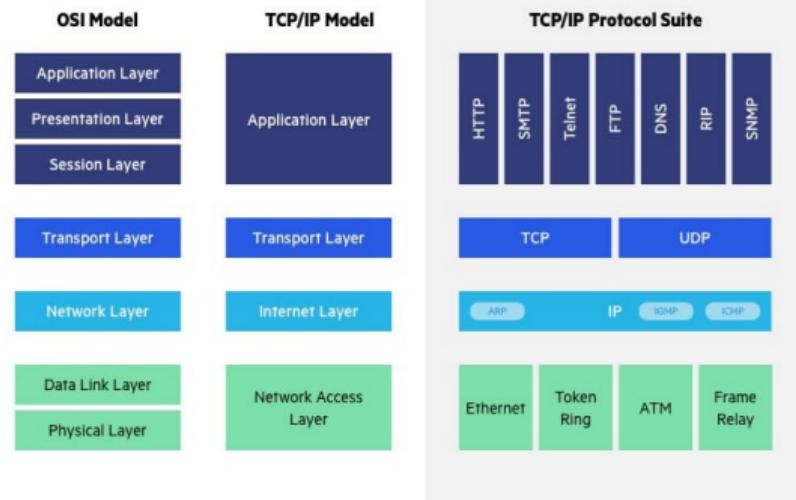
- Devices are connected by hierarchy.
- Different devices are connected via different protocols.
- Data is coded according to the layers of the internet model.



(Hu, Rodriguez, and Biersack 2000)

# Layers of the internet

- 1 HTTP request
- 2 TCP port
- 3 IP address
- 4 MAC address
- 5 Wireless LAN

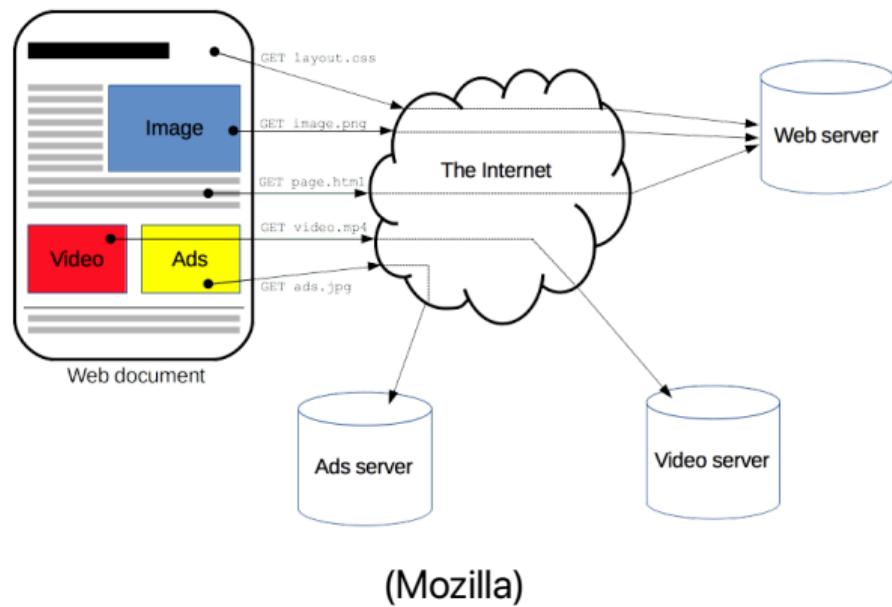


(Imperva)

# (Almost) Everything is a HTTP request

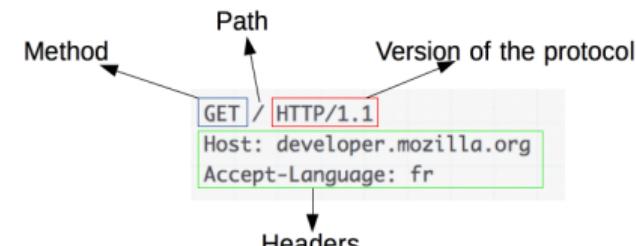
HTTP follows a client-server model.

- Client request
- Serve respond



# HTTP request

- Method: GET, POST
- Path
- Header
- Body



(Mozilla)

## 1 Internet

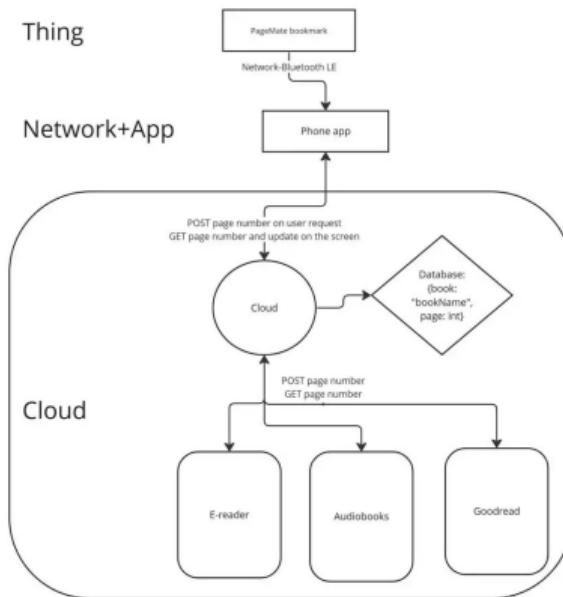
## 2 Internet of Things

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# Components

- 1 Node
- 2 Gateway
- 3 Cloud
- 4 Database



# Example: Power Cable Monitoring

- Long distance between towers
- Connection hard/dangerous to install



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# What is a computer?

## 1 Processing Unit: ALU

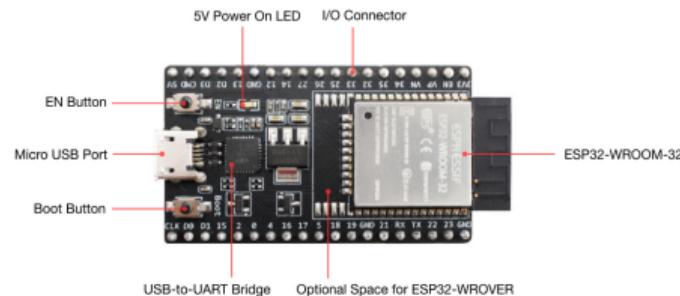
- Arithmetic operation
- Signal processing
- Conditional decision

## 2 Memory: hierarchy

## 3 I/O

- ADC
- USB
- Wireless

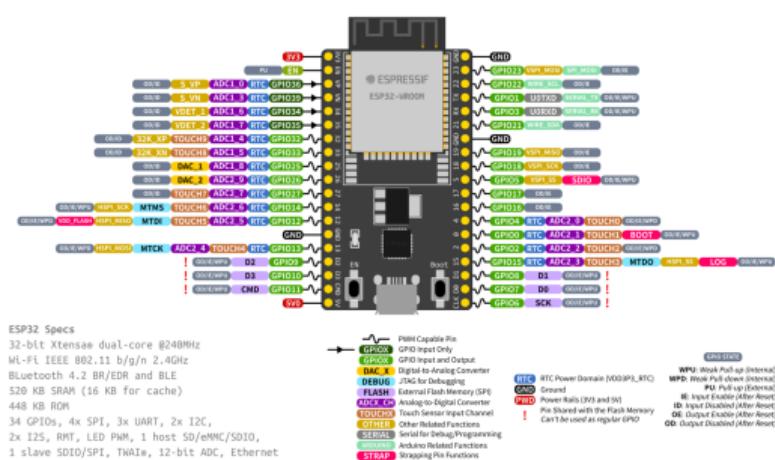
ESP32 is a system on chip  
(SoC).



(Espressif)

# **Embedded Computer**

- Does not have operating system.
- Application is embedded into the firmware.



## (Espressif)

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