

Embedded IoT

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Course Outline

- ★ Introduction to IoT and Embedded Systems.
 - General Overview of IoT.
 - Core Hardware Components used in IoT devices.
 - Operating Systems for IoT devices.
 - Networking and Basic Networking Hardware.

Course Outline

- ★ Arduino Platform and C Programming.
 - Recap of Arduino Programming.
 - Interfacing with Arduino.
- ★ The Raspberry Pi Platform and Python Programming.
 - Introduction to the Raspberry Pi environment.
 - Brief intro to Linux CLI and how to execute python code on Linux.
 - Basic Networking on the Raspberry Pi.

Course Outline

- ★ Hands-on Project.
 - An IoT-based weather reporting system.
 - Home Automation System.
- ★ What next?
 - How to handle commercial projects.
 - Security as a feature.

Introduction to IoT and Embedded Systems

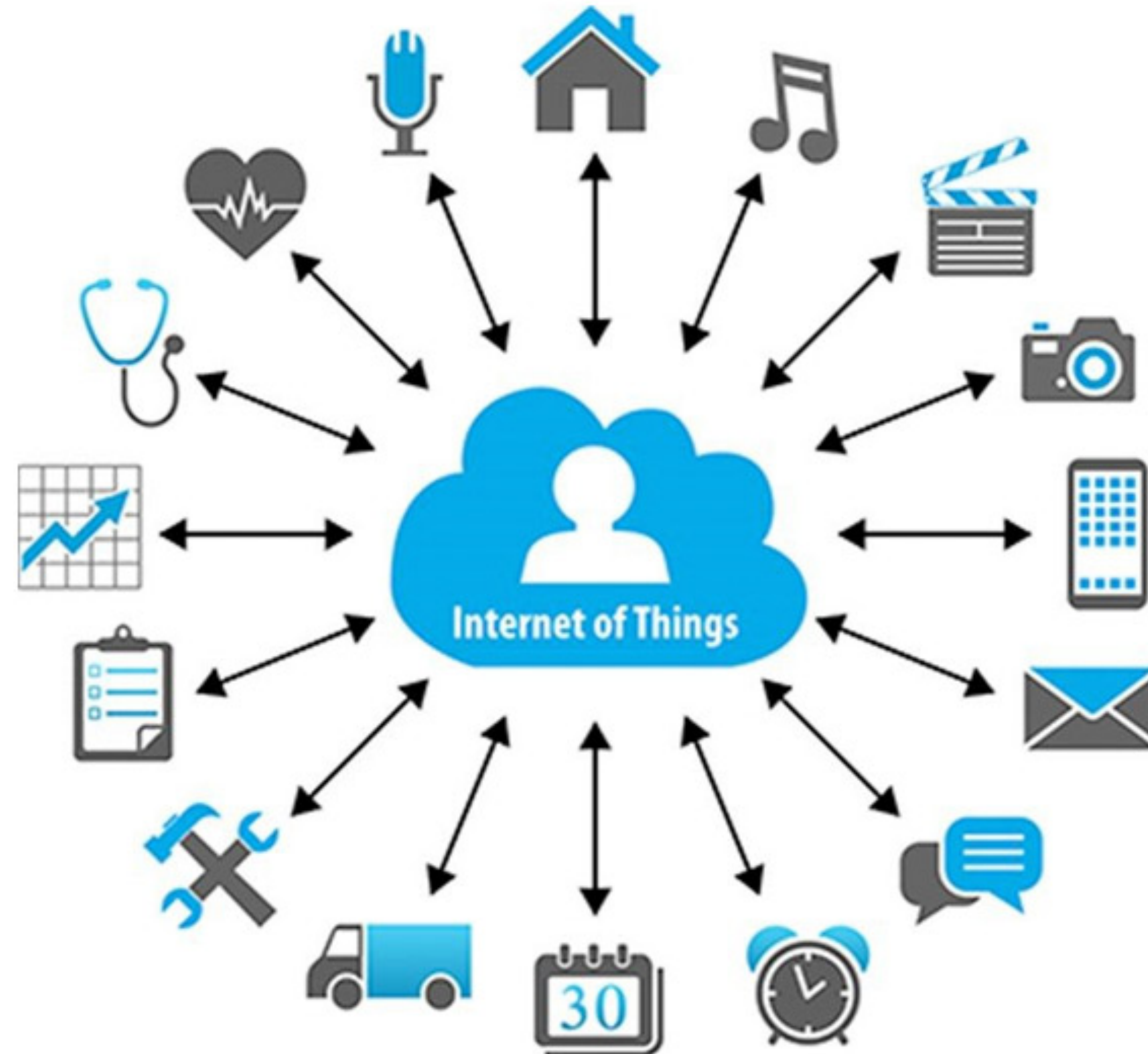
- General Overview

What is IoT?

- The basic premise of and goal of IoT is to “***connect the unconnected***”.
- IoT is a technology transition in which devices will allow us to ***sense*** and ***control*** the physical world by making objects smarter and connecting them through an ***intelligent network***.



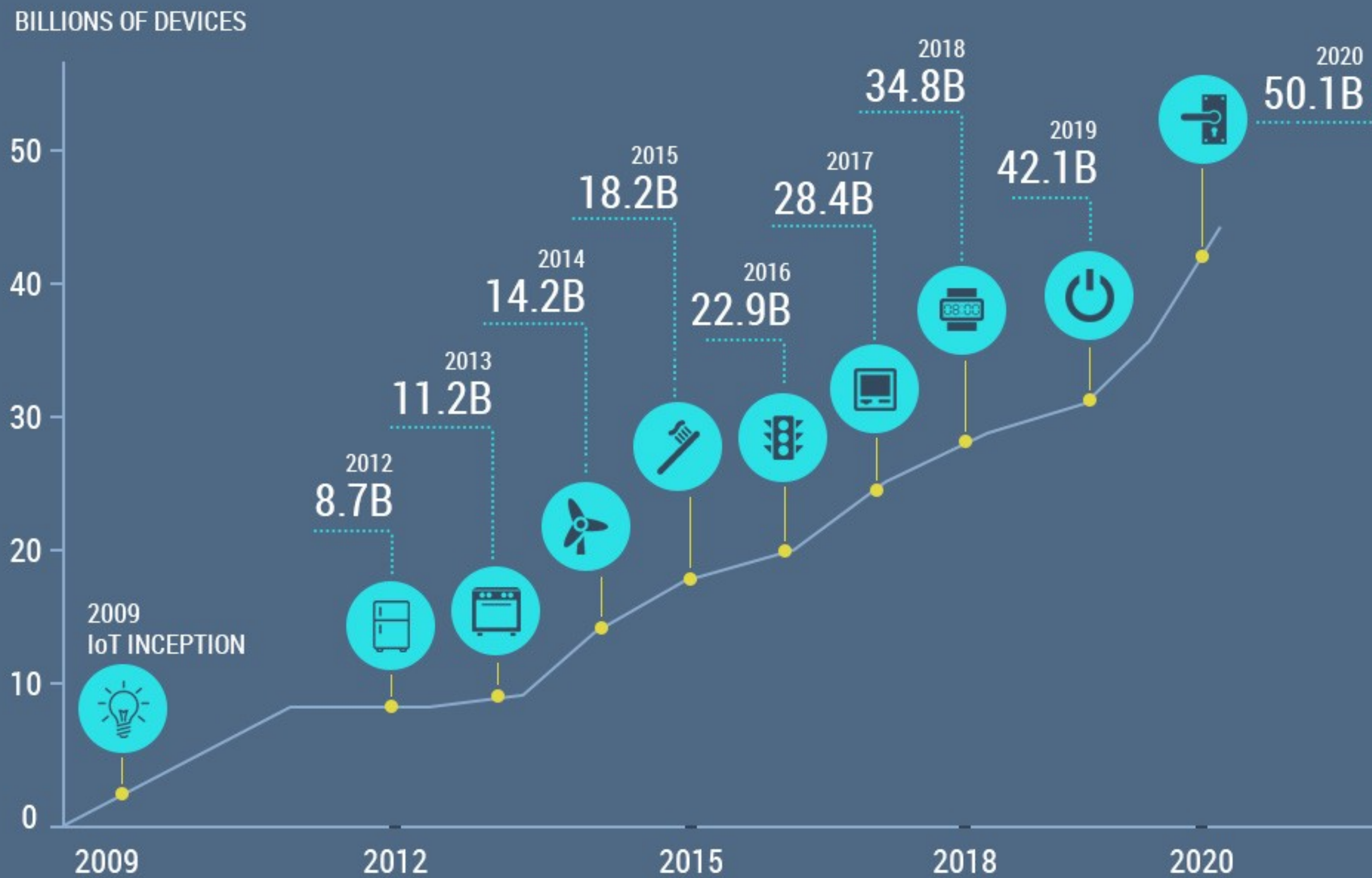
What is IoT?



What is IoT?

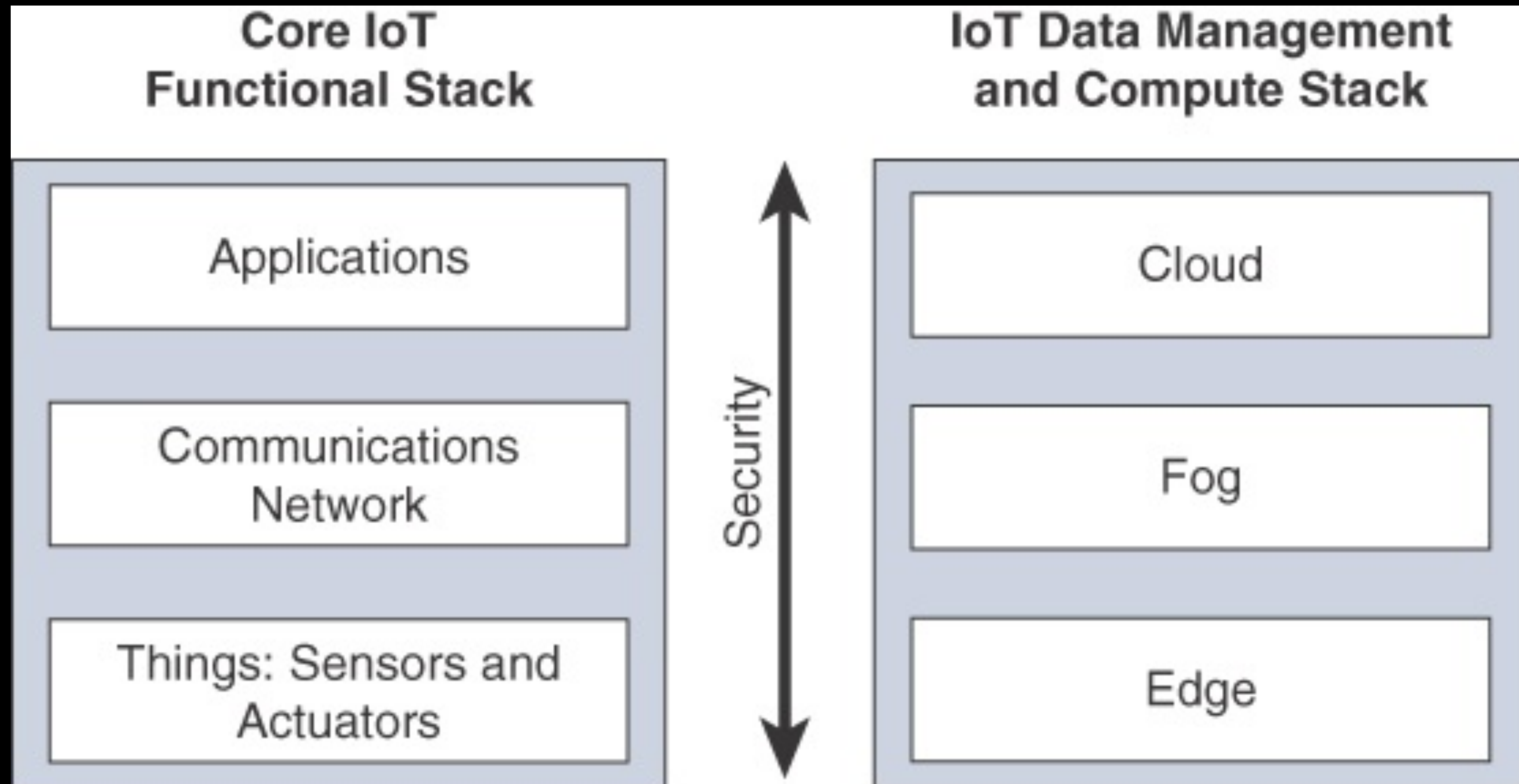
GROWTH OF THE IoT

THE NUMBER OF CONNECTED DEVICES WILL EXCEED 50 BILLION BY 2020

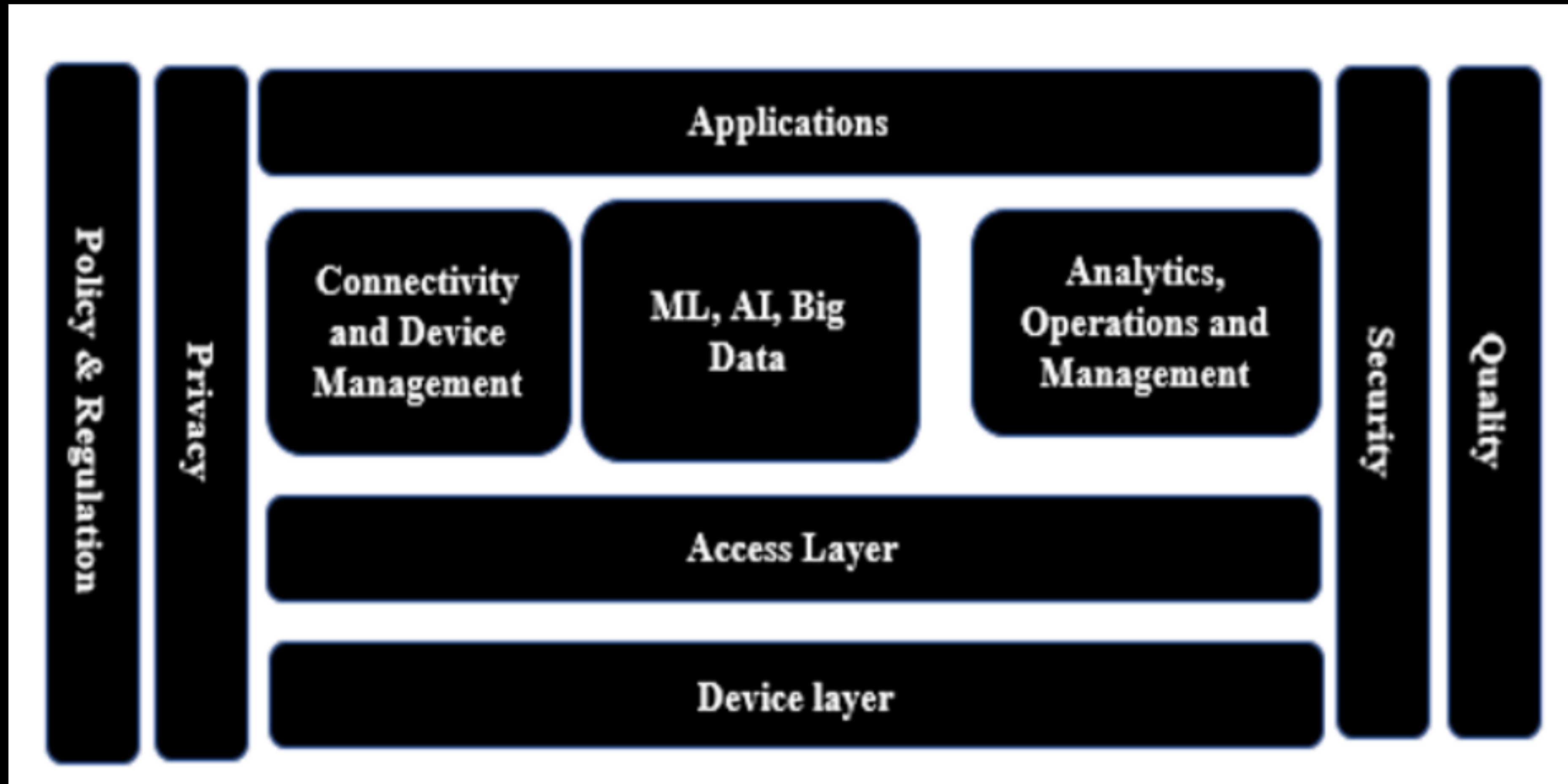


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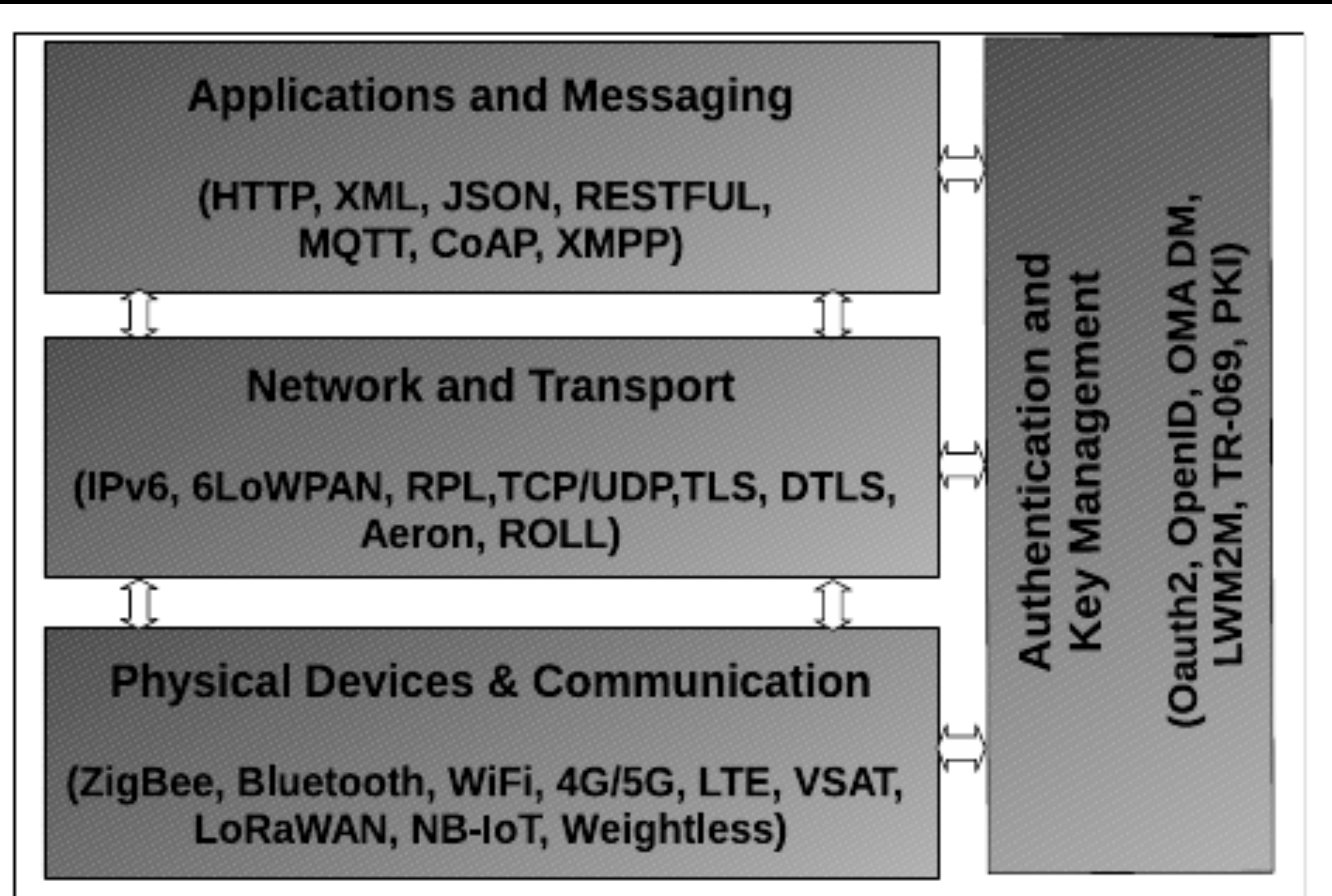
IoT Architecture



IoT Architecture



IoT Architecture



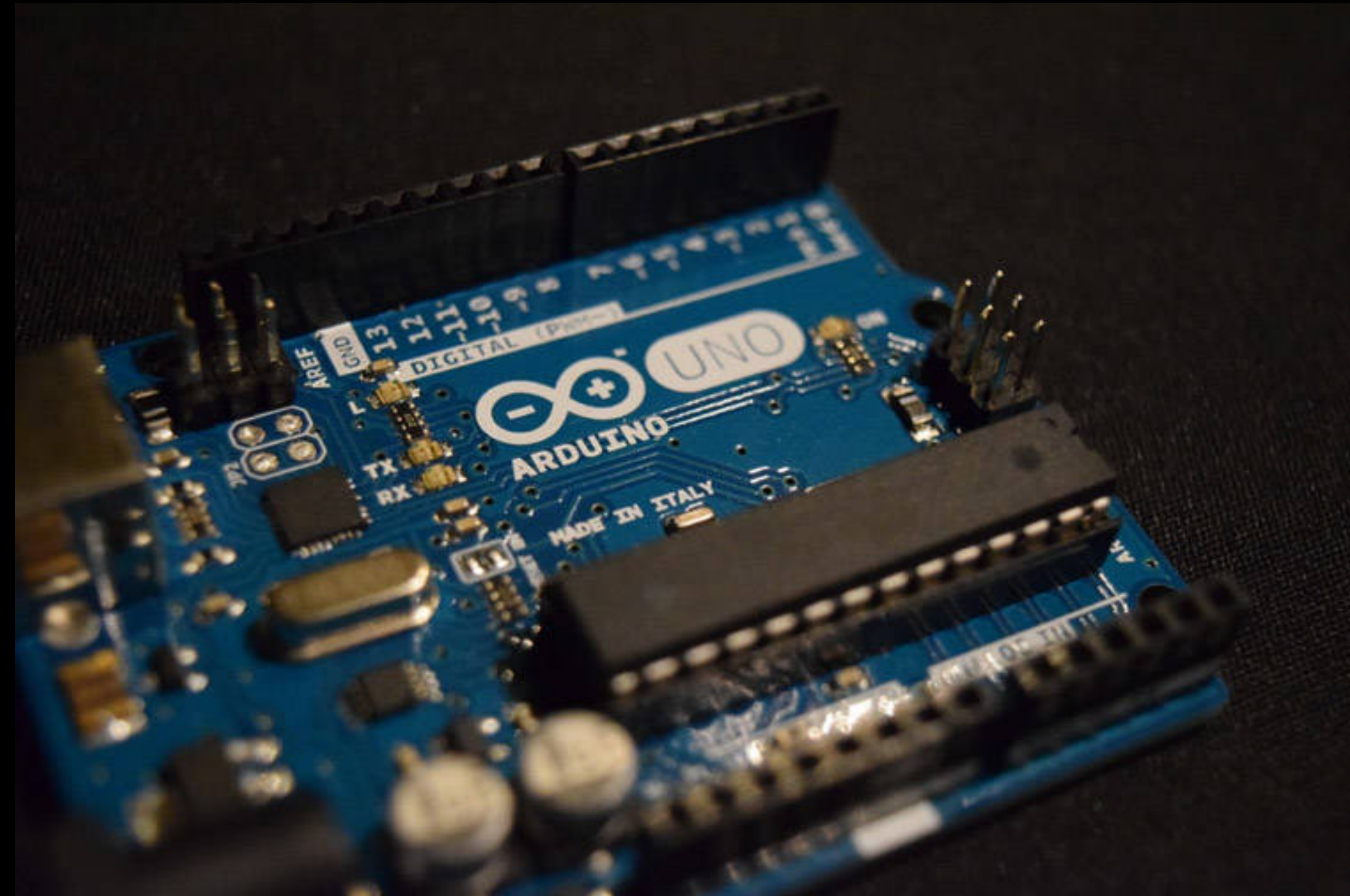
Introduction to IoT and Embedded Systems

- Core Hardware Components used in IoT

Microcontroller Development Boards

- Arduino
 - GPIO pins
 - 6 Analog in
 - 14 Digital - 6 PWM
 - 5V - Logic Level Voltage
 - ATMega328P - Processor

<https://arduino.cc>



Microcontroller Development Boards

- Adafruit Feather



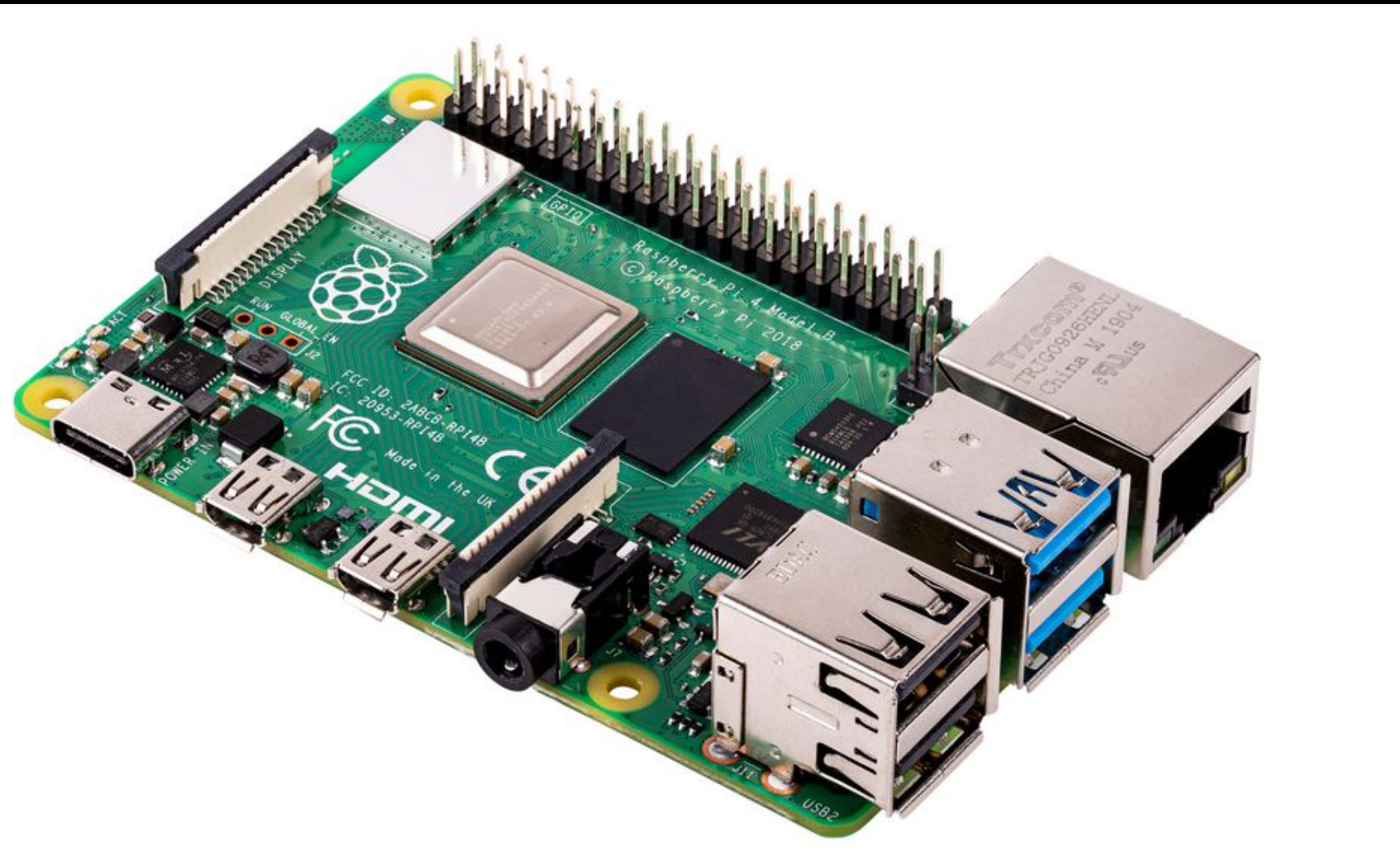
- Adafruit Fona



- ESP8266



Single Board Computers



- Raspberry Pi



- BeagleBone Black



- Dragon Board

Introduction to IoT and Embedded Systems

- Operating Systems for IoT devices

Operating Systems for IoT Devices

- ★ Android
- ★ Linux based on Debian
- ★ Open Embedded
- ★ Ubuntu IoT Core
- ★ Windows 10 IoT Core.
- ★ RIOT
- ★ Fuchsia OS
- ★ Contiki
- ★ TinyOS



Introduction to IoT and Embedded Systems

- An Introduction to Networking

Terminology, Interfaces and Protocols

Networking Glossary

- **Connection:** Pieces of related information that are transferred through a network.
- **Packet:** The most basic unit that is transferred over a network.
- **Network Interface:** Any kind of software interface to networking hardware.
- **LAN, WAN.**
- **Port:** An address on a single machine that can be tied to a specific piece of software. (Not a physical interface or location).
- **Firewall:** A program that decides whether traffic coming into a server or going out should be allowed.
- **NAT:** Network Address Translation.
- **VPN:** Virtual Private Network.

Protocols

- **IP:** (Internet Protocol) - IP Addresses.
- **ICMP** (Internet Control Message Protocol) - Ping
- **TCP** (Transmission Control Protocol)
 - FTP - File Transfer Protocol
 - HTTP - HyperText Transfer Protocol
 - SFTP - Secure File Transfer Protocol
 - SSH - Secure Shell
 - Telnet
- **UDP** - User Datagram Protocol
- **DNS** - Domain Name System

NEXT WEEK

- Working with Arduino &
Raspberry Pi