Internet of Things

IoT Architectures

IoT Technologies

FACULDADE ENGENHARIA
Departamento de Informática

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Today’s Class

- IoT Architectures

- Used Technologies
  - Sensors
  - Actuators
  - Servers

IoT Architecture

- To be able to design and develop robust and efficient Internet of Things (IoT) systems, there must be a well-thought architecture that perfectly connects an IoT solution to the requirements of an IoT application.

- This is extremely important in the IoT ecosystem where a design may involve the integration of many different kinds of physical objects, devices, technologies, and services.

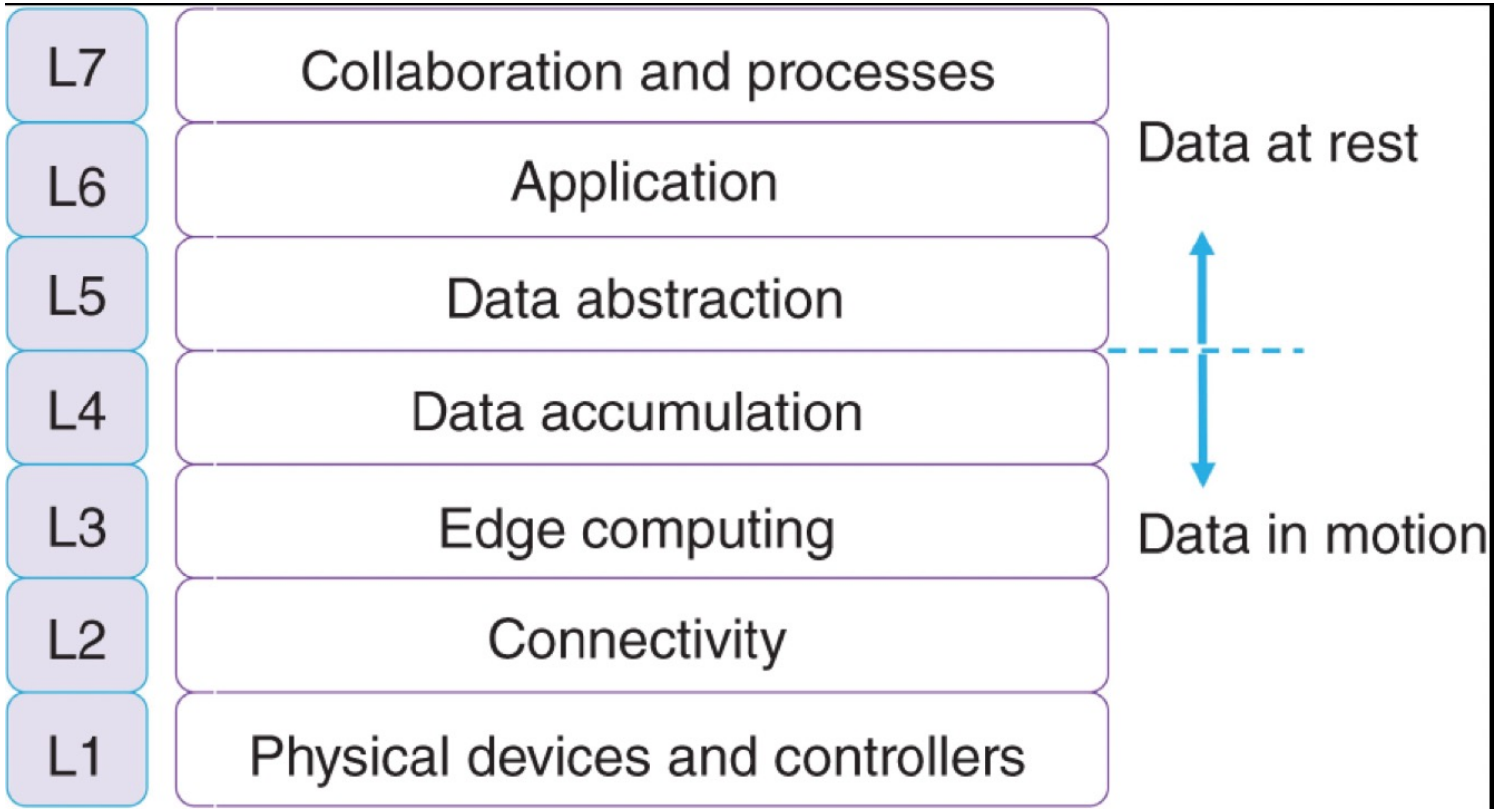
IoT Architecture

- One of the challenges in both the design of an IoT system and describing the functionalities of various protocols and services used in the IoT domain is the absence of a general architecture that can simplify the high-level design.

- Various architecture models have been published by different companies, organizations, and research communities. But there is no specific model that is agreed by everyone or can handle the requirements of all types of IoT applications.

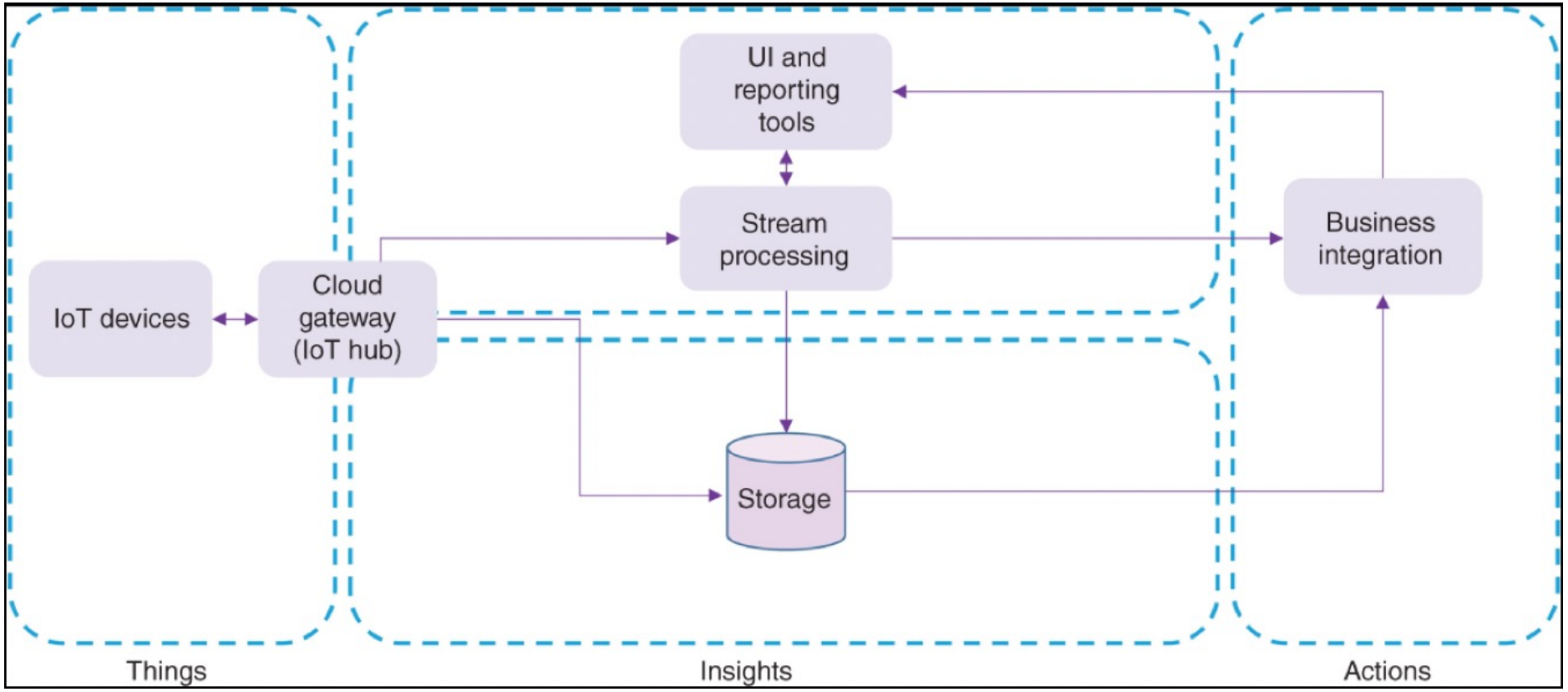
IoT Architecture

- IoT World Forum (IoTWF) Architecture Model
  - **(led by Cisco, IBM, Rockwell Automation, and others)**



IoT Architecture

- Microsoft IoT Architecture Model



IoT Tecnologies

- IoT Devices
  - Edge Devices
  - Sensors and atuators
  - Microcontrolers
- Cloud
  - Cloud edge | Fog
- Data Centers
  - Servers

IoT Devices can be everywere

Amazon Echo

Internet refrigerator

IP picture frame

Pacemaker & Monitor

Tweet-a-watt: monitor energy use

bikes

cars

scooters

Security Camera

Slingbox: remote control cable TV

Web-enabled toaster + weather forecaster

AR devices

Fitbit

Internet phones

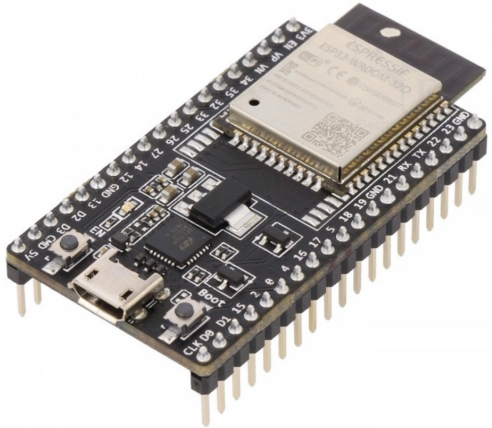
Gaming devices

sensorized, bed mattress

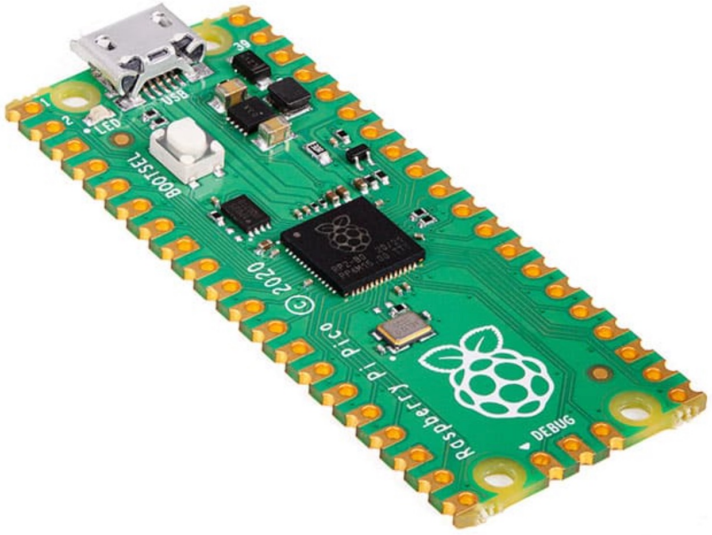
diapers

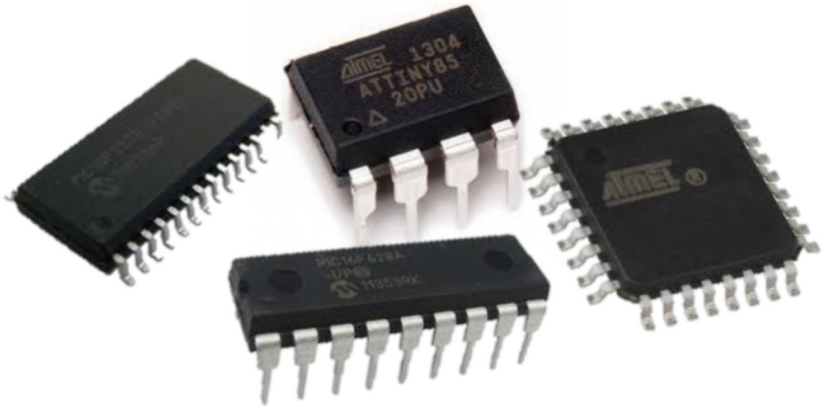
IoT Devices

- Microcontrollers



- Small computer on a single integrated circuit.





IoT Devices

Raspberry Pi (https://www.raspberrypi.org)

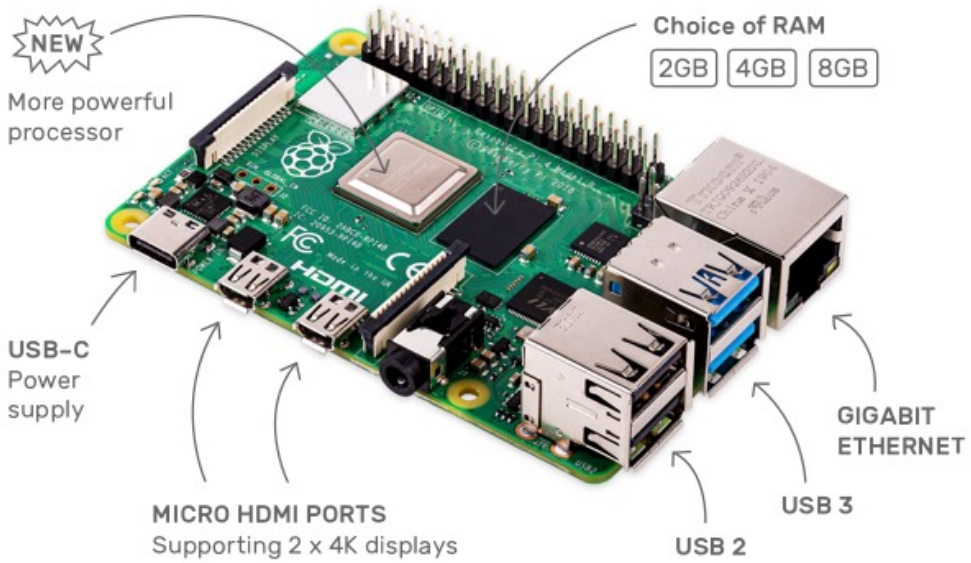
- Raspberry Pi 400 (https://www.raspberrypi.org/products/raspberry-pi-400)

- Raspberry Pi 4(https://www.raspberrypi.org/products/raspberry-pi-4-model-b/)

IoT Devices

Completely upgraded, re-engineered

Faster, more powerful

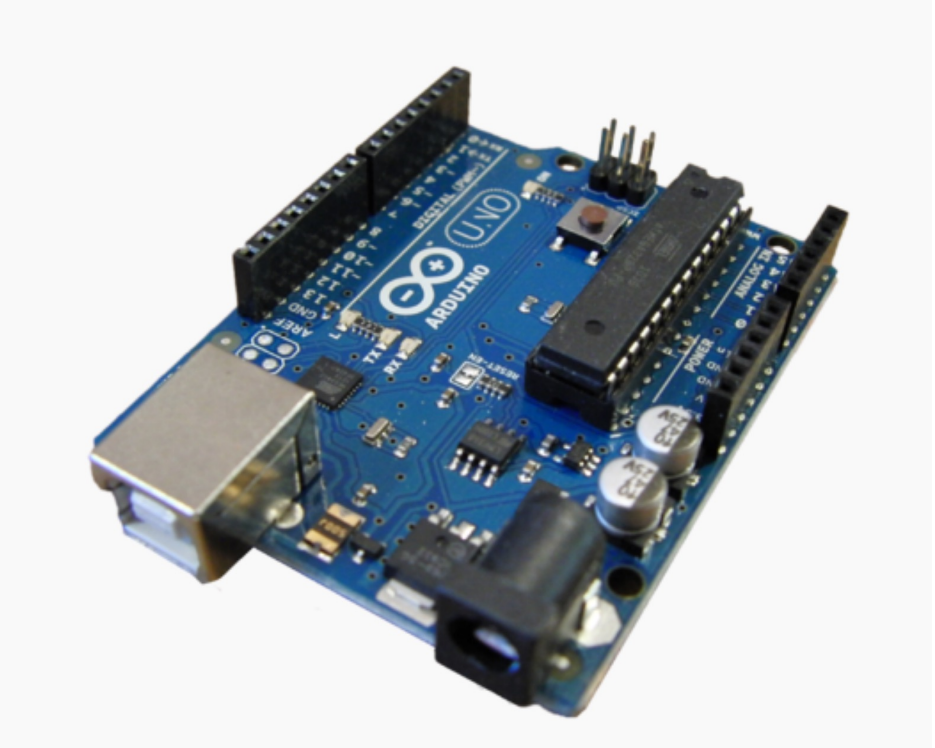


From **$35**

You'll recognise the price along with the basic shape and size, so you can simply drop your new Raspberry Pi into your old projects for an upgrade; and as always, we've kept all our software backwards-compatible, so what you create on a Raspberry Pi 4 will work on any older models you own too.

IoT Devices

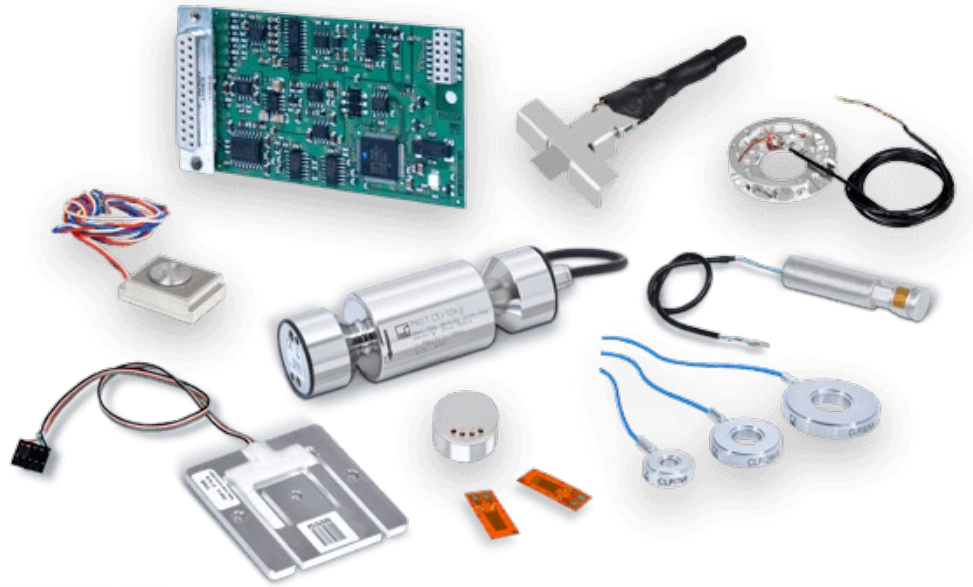
- Arduino
  - https://www.arduino.cc
  - Prototyping

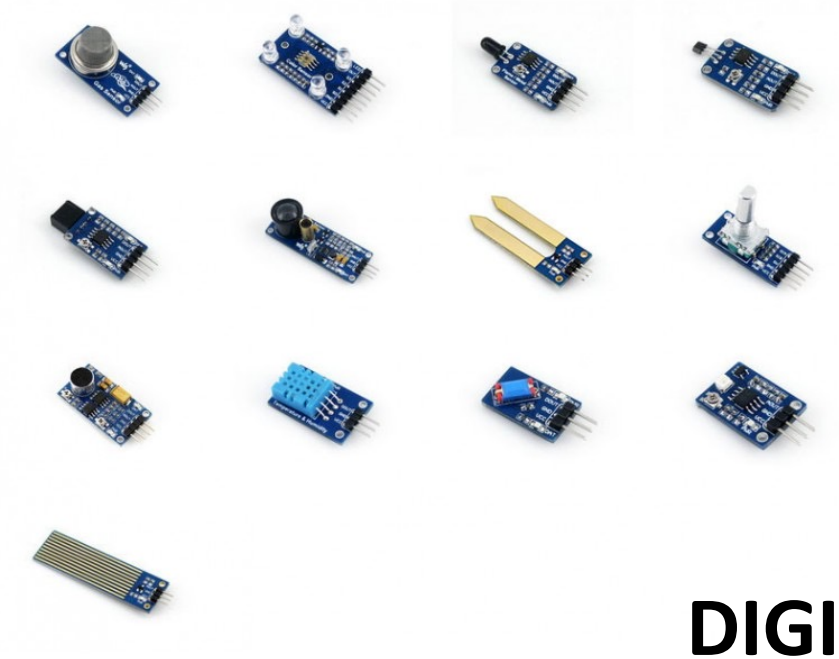


IoT Edge Devices

Sensors

- Temperature
- Ultrasonics
- Infrared
- Accelerometers
- Shock
- Gyros
- CO2
- Pressure
- Magnetics
- Etc.





DIGITAL OR ANALOG

IoT Edge Devices

- Sensors

- https://www.youtube.com/watch?v=XI49uFm5HRE

IoT Edge Devices

Atuators

- Hydraulic
- Pneumatic
- Electrical
- Digital Systems

IoT Edge Devices

- **Atuators**

- https://www.youtube.com/watch?v=LHn7O6PUaoY

IoT Cloud Technologies

- **Data Centers**
- **Servers**
  - **DATABASES**

Data Centers

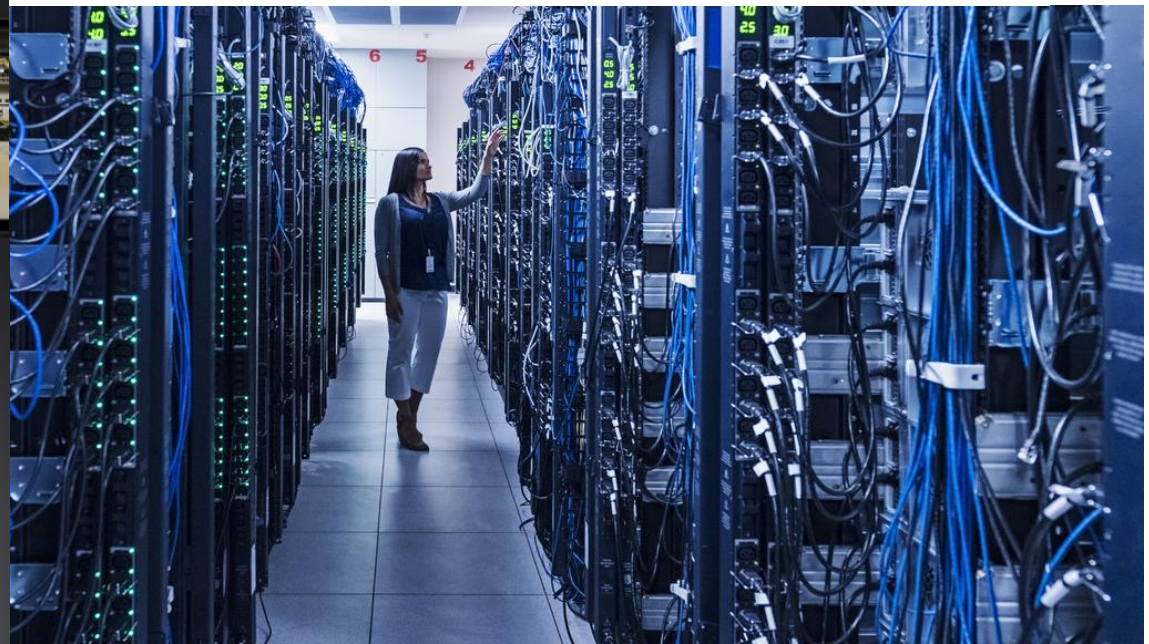
- A data center **stores and shares applications and data**. It comprises components that include switches, storage systems, servers, routers, and security.

Data Centers

- Servers should be in a Data Center

- Proper power, fire protection, networking, cooling, and physical security

What is a Server?



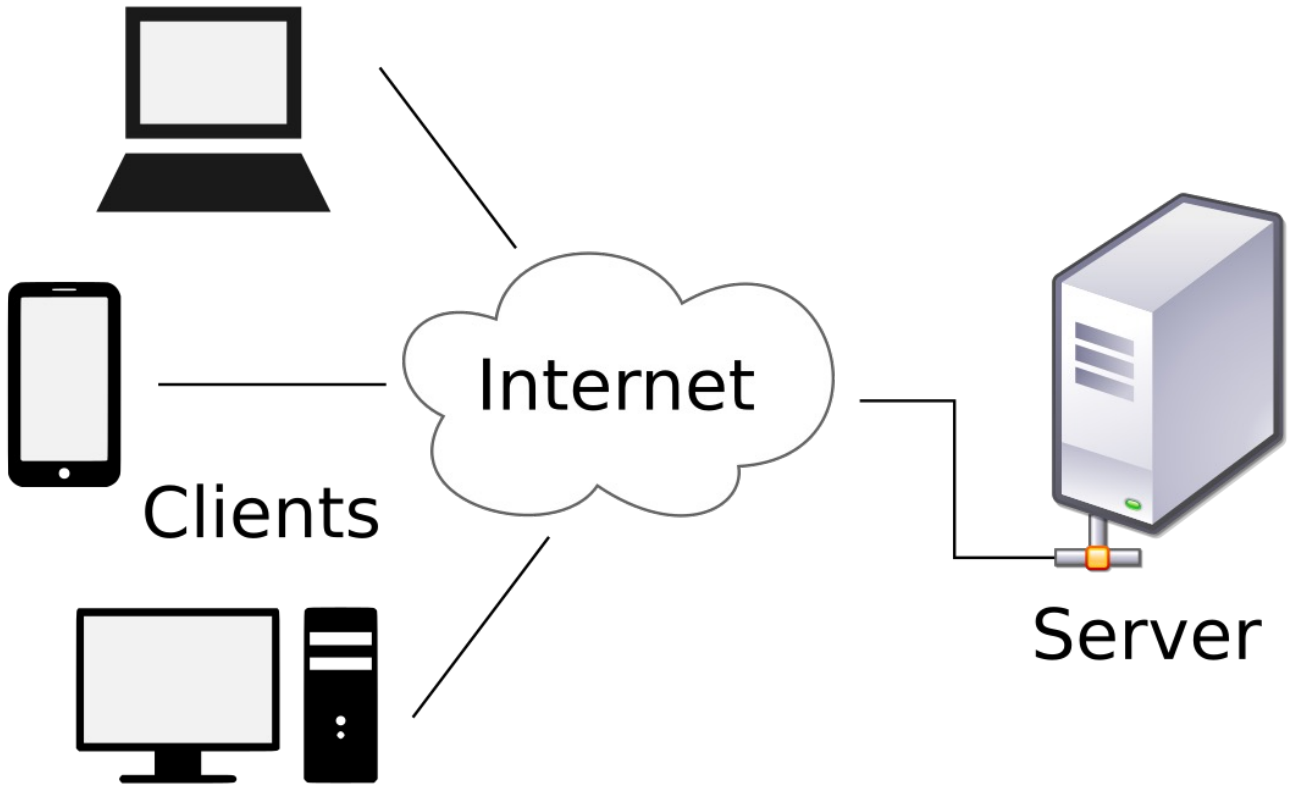
What is a Server?

- A server is a computer or system that provides resources, data or services to other computers, known as clients.

- If a computer share resources with clients they are considered servers.

What is a Server?

- One to many.



What is a Server?

- Expected to serve hundreds, thousands, or millions of clients.
- Expected to last longer than workstations, which also justifies the additional cost.

The IoT Ecosystem

Questions?