# Embedded Systems

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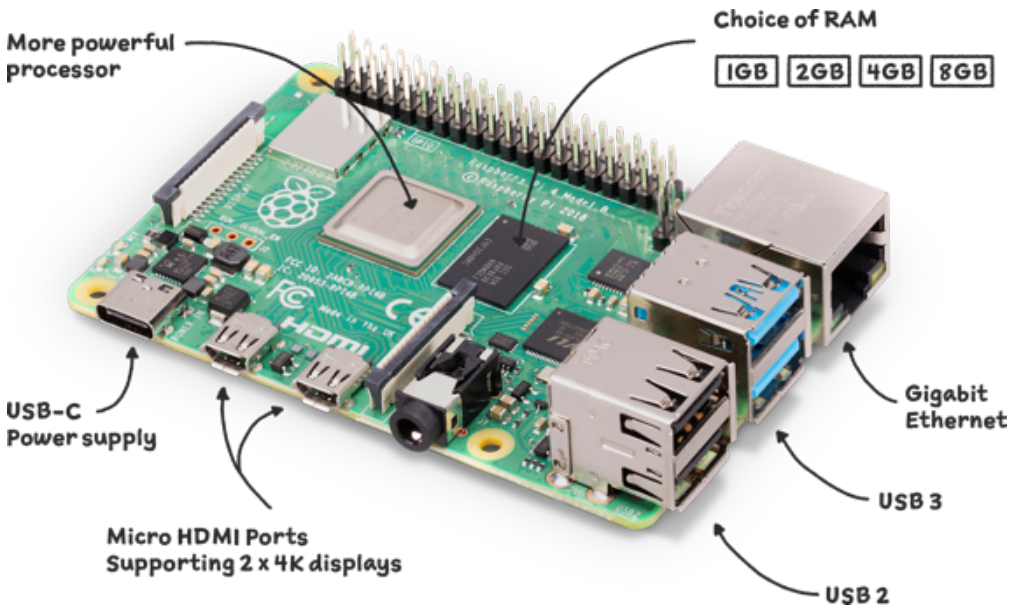
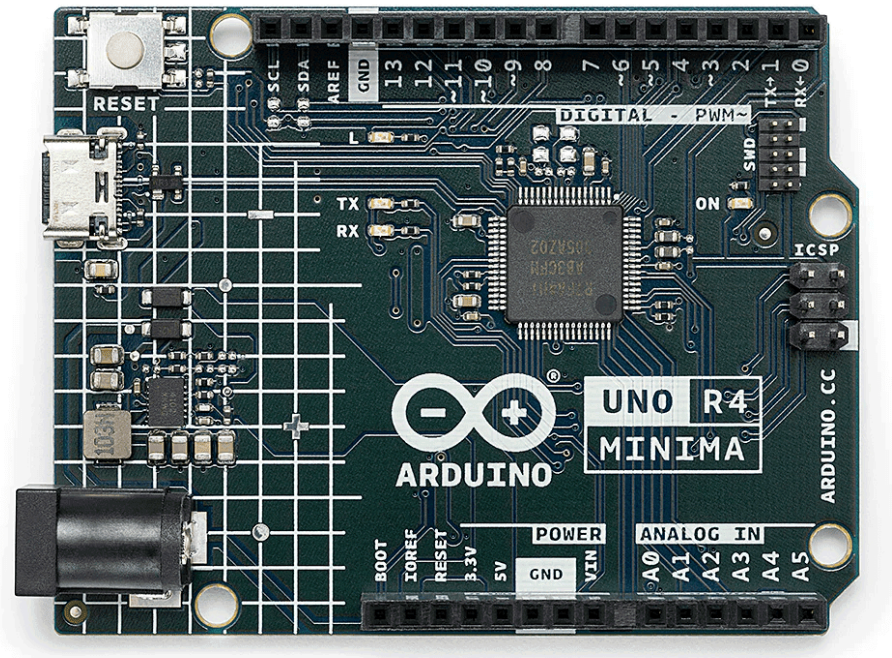
# Embedded System ?

- Computer system that comprises of:
  - Processor
  - Memory
  - I/O
- General-purpose computers systems are designed to handle a wide range of applications.
- Embedded systems are optimized for a specific function.


More powerful processor
Choice of RAM
1GB
2GB
4GB
8GB
USB-C Power supply
Micro HDMI Ports Supporting 2 x 4K displays
Gigabit Ethernet
USB 3
USB 2


RESET
DIGITAL - PWM~
TX
RX
ON
ICSP
UNO R4
MINIMA
ARDUINO
ARDUINO.CC
POWER
ANALOG IN
GND

# Role of Assembly Language

- Modren embedded systems are based on micro-controllers consisting of internal.
  - Memory
  - I/O
- Developing embedded systems is often done in languages that are closer to bare metal.
- Assembly offers unparalleled control, efficiency, and optimization capabilities.
- Use of Assembly can significantly enhance the performance and reliability of the system.

# Architecture

- ARM Processors -> AArch32 and AArch64
  - Based on RISC design principles
  - Reduced instruction set computer (RISC) focuses on simplifying instructions and increasing speed.
- Atom Processors -> x86 and x86-64
- AMD Ryzen Embedded Processors -> x86 and x86-64
- PI uses Quad core Cortex-A72 64-bit SoC.
- UNO uses Renesas RA4M1 32-bit SoC
- They both basically use a Arm processors like the majority of boards

# Applications

- Internet of things devices (IoT)
  - Smart thermostats, speakers, lighting, cameras, locks, appliances, fitness trackers, basically everything.
- Automotive
  - Engine control, Safety features like airbags and ABS, Entertainment systems.
- Aerospace and Defense
  - Flight control, Weapon systems, Communication systems.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amazon


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PANDORA
Happy
B day

# Cons

- Privacy Concerns
  - IoT devices collect data
    - What data ?
    - How much data ?
- Security Vulnerabilities
  - Vulnerable to hacking and unauthorized access
  - Who sees your data ?

# References


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- [3] “Intel Atom,” Wikipedia, Oct. 07, 2021. https://en.wikipedia.org/wiki/Intel_Atom

# Thank You :)