MAI4CAREU

Master programmes in Artificial Intelligence 4 Careers in Europe

University of Cyprus

MAI650 Internet of Things

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Co-financed by the European Union
Connecting Europe Facility

This Master is run under the context of Action No 2020-EU-IA-0087, co-financed by the EU CEF Telecom under GA nr. INEA/CEF/ICT/A2020/2267423

CS6xx Internet of Things (8 ECTS)

Course purpose and objectives: The purpose of the course is to provide an overview on IoT tools and applications and to introduce to students hands-on IoT communication concepts through lab exercises.

Learning outcomes: Upon completion of this course, students will be able to explain the definition and usage of the term “Internet of Things” in different contexts. More specifically, the students will know how to apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis

Teaching methodology: interactive face-to-face lectures, group activities and discussions, in class/lab activities, student presentations and guest lectures or significant recorded public lectures

Assessment: Final exam (50%), midterm exam (20%) and assignments/project (30%).

Main text:

Rajkumar Buyya, Amir Vahid Dastjerdi, Internet of Things Principles and Paradigms, Morgan Kaufmann; 1st edition, 2016

J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.

Other reading:

Jamil Y. Khan and Mehmet R. Yuce, Internet of Things (IoT) Systems and Applications, 2019, ISBN 9789814800297

David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 2016, Cisco Press.

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INTRODUCTION

IoT Devices - Introduction

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3. Examples
4. IoT Device Lifecycle

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INTENDED LEARNING OUTCOMES

Upon completion of this introductory unit, students will be:

1. familiar with IoT Devices.
2. familiar with the lifecycle of an IoT Device.
3. familiar with IoT Devices used in real life

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Introduction

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The "Things" characteristics

- Ability to collect data and interact with the environment
- Often constrained devices with limited processing capabilities
- Have the ability to transmit data
- Consisted of hardware and software
- Have a specific purpose generally meant to do one single task

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IoT Devices

- Depending on the type of the IoT device it includes:
  - Wireless sensors
  - Software
  - Actuators
  - Computer Devices

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IoT Devices

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IoT Devices - Sensors

Temperature

Pressure

Flow

Level Sensors

Humidity sensors

Tilt sensors

...

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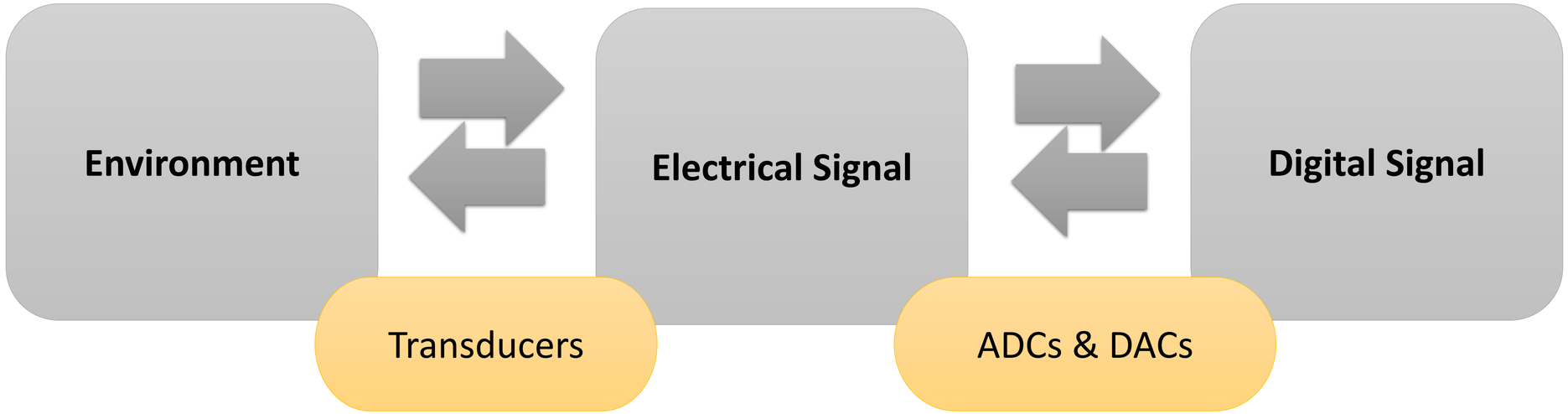
Generic sensor



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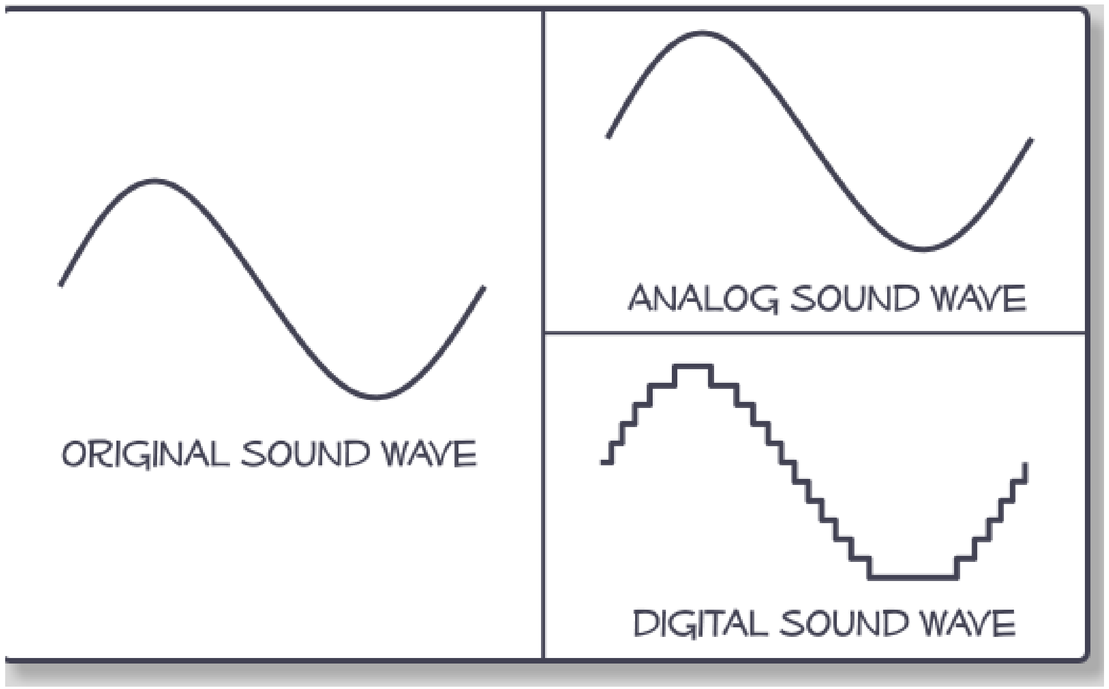
Analog and Digital Converters

ADC: Analog to Digital Conversion, converts an analog voltage to a digital value

DAC: Digital to Analog Converter (less common): converts a digital value to an analog voltage



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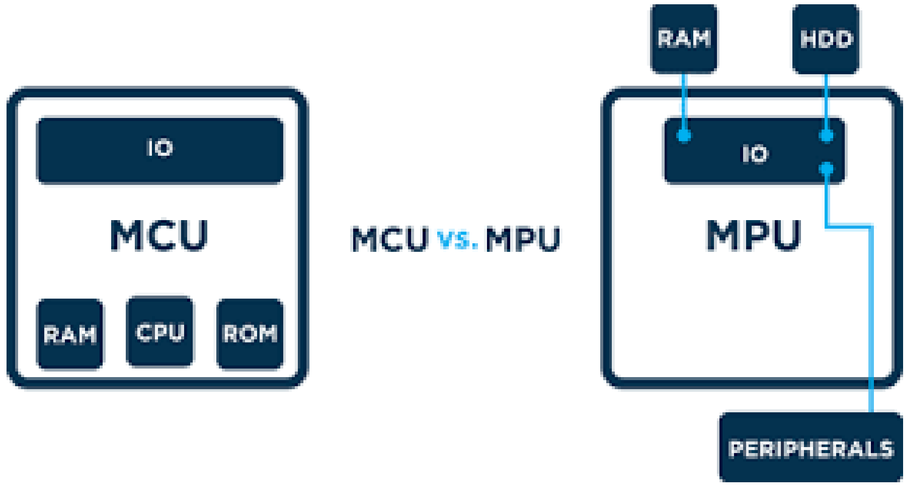
Hardware

There is a reason they call it hardware — it is hard," Tony Fadell, father of the iPod

IoT Hardware families:

- Microcontroller based devices – MCU
- Microprocessor based devices – MPU



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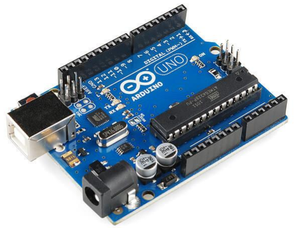
Microcontroller based devices – MCU

"A microcontroller (or MCU, short for microcontroller unit) is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals." (Wikipedia)



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Microprocessor based devices – MPU

Microprocessor is an IC which has only the CPU inside them

They use same kind of CPU architecture than your PC or your smartphone

Run a full Operating System: usually Linux-like

PC with no keyboard, mouse nor screen

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Examples

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Examples of “Things” product

Smart Locks

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Examples of “Things” product

Smart Coffee Makers

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Examples of “Things” product

Tracking Devices

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Examples of “Things” product

Smart Thermostat

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Examples of “Things” product

Smart Watch

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Examples of “Things” product

Home Security Devices

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IoT Device Lifecycle

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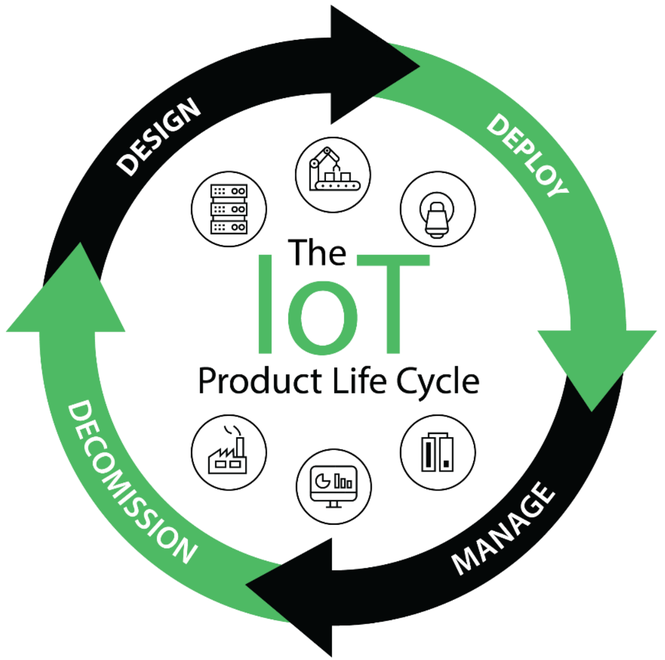
IoT Device Lifecycle

1. Design
2. Deploy
3. Manage
4. Decommission



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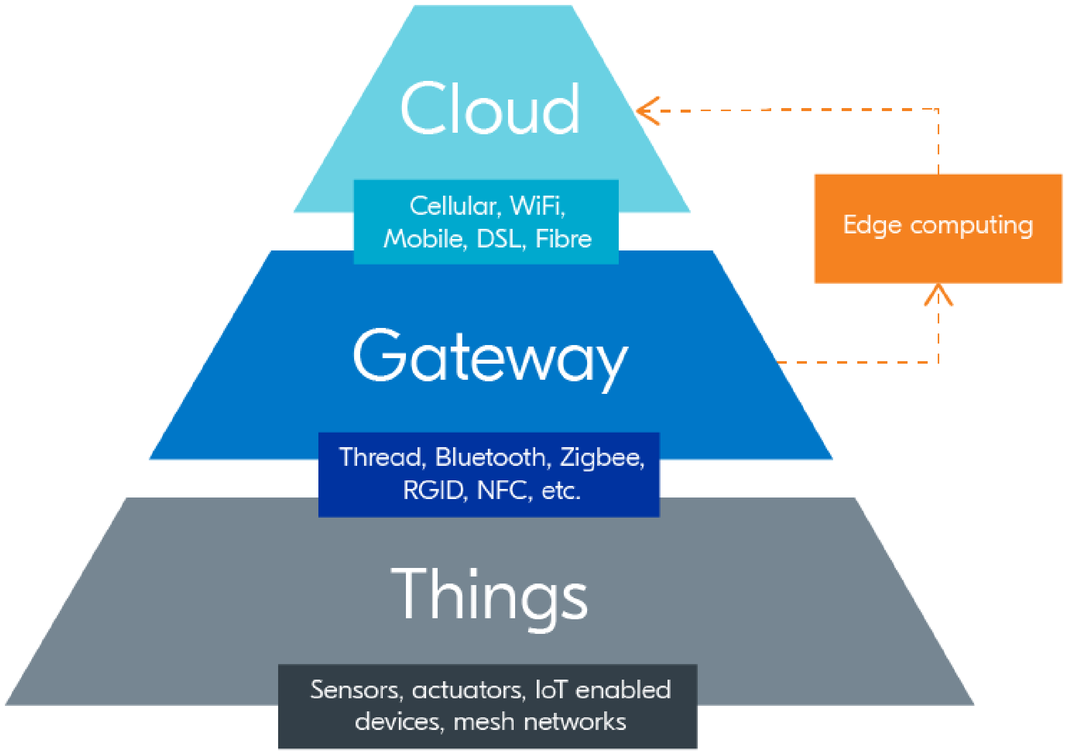
IoT Device Communication Architecture



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IoT Devices and Smart Environments

Smart Home

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IoT Devices and Smart Environments

Healthcare IoT

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IoT Devices and Smart Environments

Smart City

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Summary

- Introduced the “Things” in the Internet of Things.
- Talk about how to select and interface common sensors and actuators to support real life IoT applications.
- Present which smart devices can be used to create a smart environment.
- Present examples.

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