SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING

INTRODUCTION TO PROJECT TEAM ASIGNMENT

Microcomputer Systems 2
using PIC and Assembly
DT080A-3 (MICR-2208)

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About Project Team Assignment

- Any kind of Project related to:
  - Electronics,
  - Communication,
  - Software design,
  - Controll, etc…
- Project Team: 3 ± 1 Student
- Accommodation: Laboratory room KE 4-040 (440)
- Supervisor: Dr. Yuri Panarin, room 427,
  - yuri.Panarin@tudublin.ie
- 48 hours in 3 weeks

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About Project Team Assignment

- Assessment sheet:

Title:		8/5/19	10:00		
Supervisor: Yuri Panarin		2nd Assessor:			
Assessment Component [Group/Individual]	Weight	Student1		Student2	
Technical Communications Skills [I]	10%	70	7.0	70	7.0
Performance & Attainment Evaluation [G]	30%	75	22.5	75	22.5
Final Report [I]	25%	60	15.0	55	13.8
Final Presentation [G]	10%	65	6.5	65	6.5
Interview [I]	10%	80	8.0	75	7.5
Attendance & Participation [I]	15%	80	12.0	80	12.0
Total Mark			71.0		69.3

- The dates for Team Assignment are Mon 27 Jan to Fri 14 Feb

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About Project Team Assignment

- Components for Projects
- Minor components :
  - Resistors, transistors , LEDs, wires, etc…
- are available from lab technician
- Major components:
  - uControllers, shields, motors, specific modules/boards

  are partially available from supervisor or should be bought by students

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Projects' history

- Early days, 20 year ago…
- Mainly design, build and test electronic circuit using:
  - Pin boards
  - PCB,
  - Breadboards
- Also software design.

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Projects' history (~15 years ago)

- Later on, ~15 year ago…
- Mainstream: electronic circuit or software design
- MicroControllers become more and more popular
  - Mainly PIC MicroControllers
  - Use facilities in laboratory 423
  - Based on PIC development Boards, PCB or breadboards
- Problems: needs expensive development Boards and Software
- Good things: use your experience of the 2nd-year Microcomputer courses: MICR-2101 and MICR-2201

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Projects' history (~10 years ago)

- And finally revolution - Arduino comes to the market!
- Arduino is a common name for different development boards based on Atmega-168 or 326 uController
- The boards are equipped with:
  - sets of digital and analog input/output (I/O) pins
  - serial communications interfaces: USB, I2C, etc.
  - various expansion boards ('shields')
- Arduino was so successful, that the number of Arduino – based Projects quickly replaced the other types.
- Arduino uses simple C-based open-source language.

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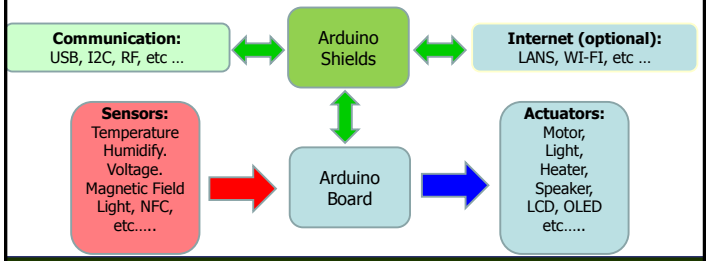
Arduino Project Structure

- Typical Project based on Arduino Board with sensors and actuators
- It can be stand-alone or controlled via communication or internet
- This meets current trends in electronics.



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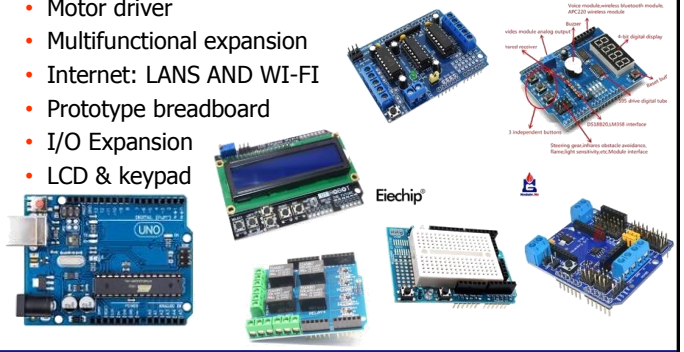
Popular Arduino boards & shields (UNO)

- The first and most popular (classic D1) was Arduino UNO
- There are many expansion shields for this:
  - Motor driver
  - Multifunctional expansion
  - Internet: LANS AND WI-FI
  - Prototype breadboard
  - I/O Expansion
  - LCD & keypad



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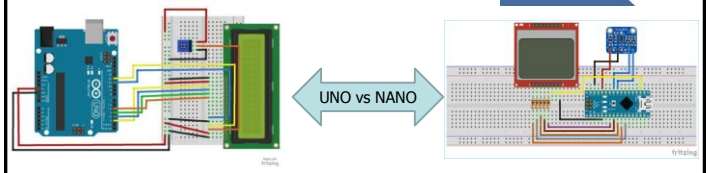
Popular Arduino board & shields (NANO)

- However my favourite board is NANO
- It has the same functionalities as UNO, but is also breadboard-friendly, which make your Project smaller, robust, tidy.
- It also has some shields such as LANS.
- Project Layout: UNO vs NANO



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Useful links and problems

- Some useful links https://store.arduino.cc/ (official)
  - https://www.pantechsolutions.net/blog/top-100-arduino-projects-for-engineering-students/
  - https://www.electronicshub.org/arduino-project-ideas/
  - https://create.arduino.cc/projecthub/projects/tags/sensor
  - https://create.arduino.cc/projecthub/projects/tags/embedded
  - https://www.projectsof8051.com/arduino-projects/
  - https://www.electronicsforu.com/arduino-projects-ideas
- Being inexpensive, cost effective platform for students' projects Arduino has some problems. Main is an internet connectivity. There are two solutions, both expensive :o(
  - Use Arduino internet shields (or ESP-01 - new, cheep!)
  - Use latest Arduino boards, such as YUN, etc…

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Instruments of Things (IoT)

- Internet of Things (IoT) comprises things that have unique identities and are connected to the Internet
- The focus on IoT is in the configuration, control and networking via the Internet of devices or "Things" that are traditionally not associated with the internet
- Eg: pump, utility meter, car engine
- IoT is a new revolution in the capabilities of the endpoints that are connected to the internet

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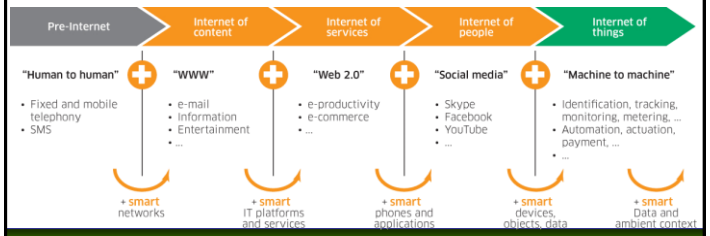
Internet of Things - Evolution

- The Scope of IoT is not limited to just connecting things (device, appliances, machines) to the Internet
- IoT allows these things to communicate and exchange data (control& information)
- Processing on these data will provide us various applications towards a common user or machine goal



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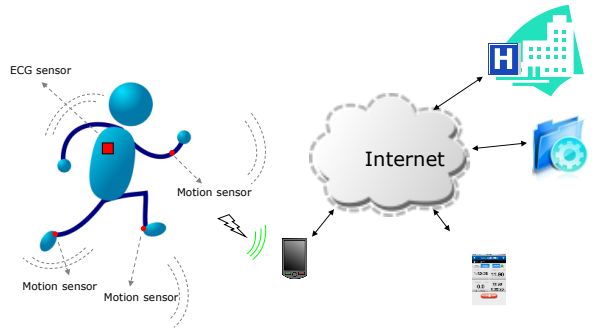
IOT: People connecting with Things



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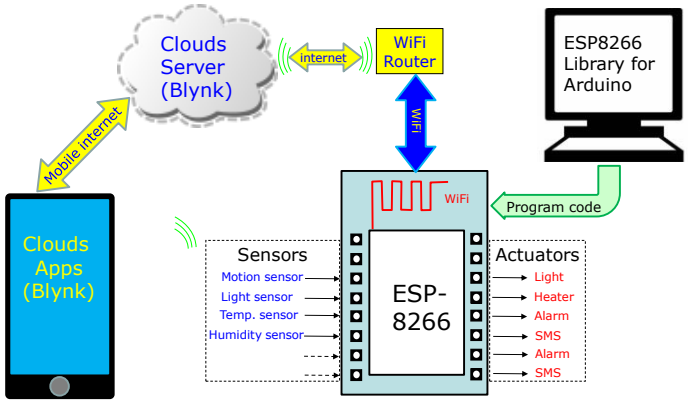
IoT Project Example



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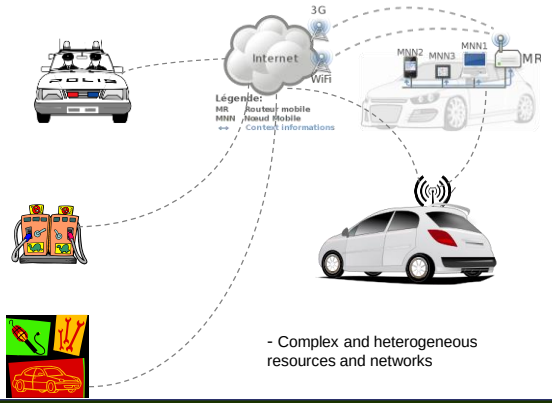
IoT: Things connecting with Things



- Complex and heterogeneous resources and networks

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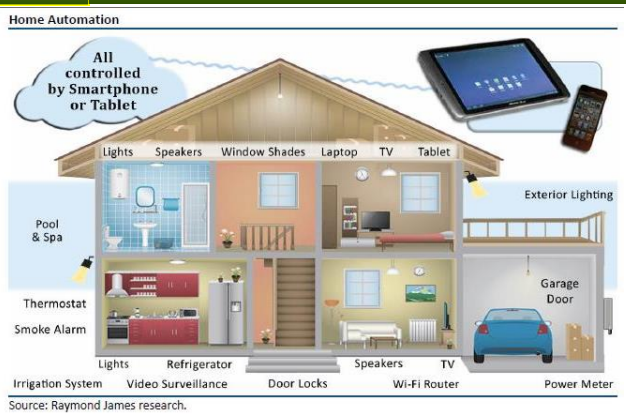
IoT Applications : Smart Home



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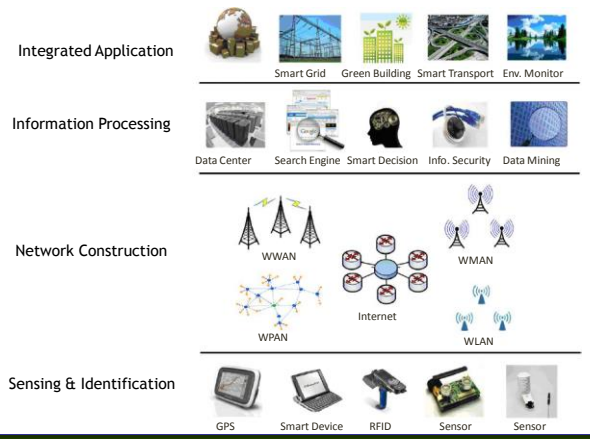
IoT Architecture



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Popular IoTs – ESP8266 vs ESP32

MCU	ESP8266	ESP32
802.11 b/g/n Wi-Fi	HT20	HT40
Bluetooth	X	Bluetooth 4.2 and BLE
Typical Frequency	80 MHz	160 MHz
SRAM	X	✓
Flash	X	✓
GPIO	17	36
Software PWM	8 channels	16 channels
SPI/I2C/I2S/UART	2/1/2/2	4/2/2/2
ADC	10-bit	12-bit
CAN	X	✓
Ethernet MAC Interface	X	✓
Touch Sensor	X	✓
Temperature Sensor	X	✓
Hall effect sensor	X	✓

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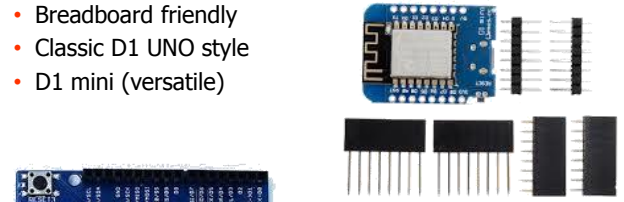
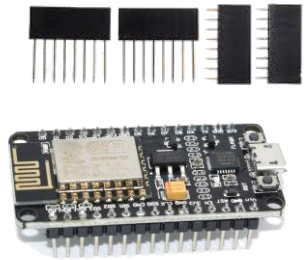
ESP-8266 & ESP-32 shapes/sizes

- Both ESP modules come with three different shapes/sizes.
  - Breadboard friendly
  - Classic D1 UNO style
  - D1 mini (versatile)





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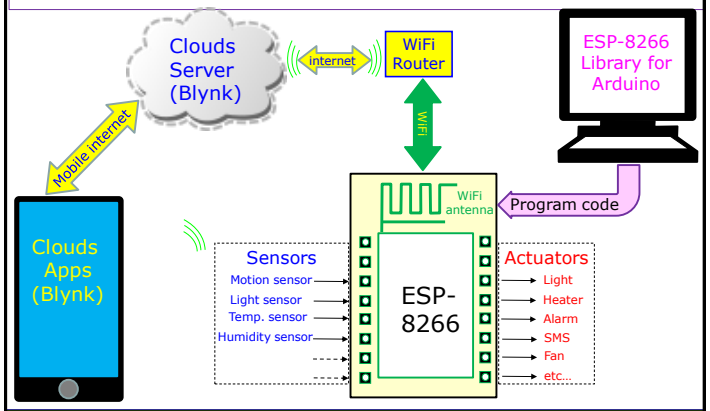
IoT Project Example



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Installing ESP8266 & Blynk with Arduino

- Including the ESP8266 & Blynk library in the Arduino IDE
- https://www.electronicslovers.com/2018/06/esp8266-in-combination-with-blynk-app.html
  - 1 Abstract
  - 2 Introduction
  - 3 ESP8266
  - 4 Blynk Application
  - 5 Including the ESP8266 in the Arduino IDE
  - 6 Including the Blynk library in the Arduino IDE
  - 7 Functional principle
  - 8 Initialising the connection between the Board and Blynk app
  - 9 Basic project

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Useful ESP links

- https://makeradvisor.com/esp32-vs-esp8266/
- ESP8266
  - How to Install the ESP8266 Board in Arduino IDE
  - Esp8266 in Combination with Blynk App ...
    - File → Examples → Blynk → Boards_WiFi → BlynkBlink → NodeMCU
  - ESP8266 Projects and Tutorials
  - Home Automation Using ESP8266
- ESP32
  - Installing the ESP32 Board in Arduino IDE
  - ESP32 Projects and Tutorials
  - Learn ESP32 with Arduino IDE
- **Free projects for:** ESP32 or ESP8266

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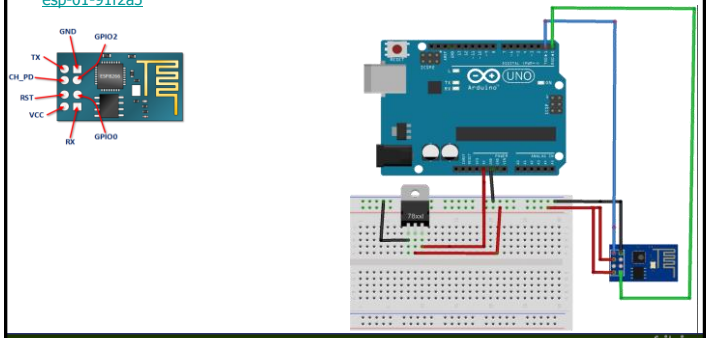
ESP1 as WiFi module for Arduinos

- https://www.hackster.io/ROBINTHOMAS/programming-esp8266-esp-01-with-arduino-011389
- https://www.instructables.com/id/Using-ESP-01-and-Arduino-UNO/
- https://create.arduino.cc/projecthub/jeffpar0721/add-wifi-to-arduino-uno-663b9e
- https://create.arduino.cc/projecthub/58296/air-meter-making-1-use-the-arduino-wi-fi-module-esp-01-91f2a5



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Sensors available in Market

- https://www.instructables.com/id/Arduino-37-in-1-Sensors-Kit-Explained/

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37 Arduino sensor Kits list:

Active buzzer module	Rotate encode module
Passive buzzer module	Light break sensor module
Common cathode RED&GREEN LED module	Finger pulse sensor module
Two color common cathode LED module	Magnetic spring module
Knock sensor module	Obstacle avoidance sensor module
Shock switch sensor module	Tracking sensor module
Photo resistor sensor module	Microphone sensor module
Push button module	Laser transmit module
Tilt switch module	Relay module
RGB LED module	Analog temperature sensor module
Infrared transmit module	18b20 temperature sensor module
RGB colorful LED module	Digital temperature sensor module
Hydrargyrum switch sensor module	Linear hall Sensor module
Colorful auto flash module	Flame sensor module
Magnet-ring sensor module	High sensitive voice sensor module
Hall sensor module	Humidity sensor module
Infrared receive sensor module	Joystick PS2 module
Analog Hall sensor module	Touch sensor module
Magic ring module	

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Instruments of Things (IoT)

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