Arduino

- *Arduino is an open-source electronics platform based on easy-to-use hardware and software*
  - Source: https://www.arduino.cc/
- First Arduino prototype was introduced in 2005
- Board for prototyping embedded systems
  - It can read sensors and control actors
- Easy to use
- Not expensive
- Works on several platforms: Windows, Linux, Mac

Arduino

- Several IDEs are available
  - Arduino IDE
  - Arduino Eclipse plugin
  - Arduino for Visual Studio
  - Arduino for Atmel Studio
  - And many more …

Arduino – Getting Started

- What do we need?
  - Computer with installed IDE
  - Arduino board with mini USB cable
  - That's all!
- How do we start?
  - Connect board with PC
  - Load a sample program into the IDE
  - Download the program to the board
  - That's it!

Olimexino-32U4

- Arduino-compatible board by Olimex
  - 8-bit ATmega32U4 microcontroller by ATMEL
  - Several I/O-ports available: GPIO, PWM, ADC
  - Select “Arduino Leonardo” in the IDE
- USB port
  - Power connection
  - Flash software
  - Transfer information using serial communication

First Steps with the Arduino IDE

- Download the IDE and install it on the computer
- Drivers for the board might have to be installed
- Connect the board to the computer
  - The program on the board starts
- Open the IDE
- Load a sample program
- Select the board's COM-port
- Download the sample program to the board
  - The program on the board starts after the download

The First Arduino *Sketch* – Blink Example

```
void setup() {
    pinMode (7, OUTPUT);
}
void loop() {
    digitalWrite (7, HIGH);
    delay(1000); // milliseconds
    digitalWrite (7, LOW);
    delay(1000);
}
```

Arduino – Accessing Ports

```
const int analogOutput = 11; // PWM (int in [0:255])
const int analogInput = A0; // ADC (int in [0:1023])
const int digitalOutput = 7;
const int digitalInput = 13;

void setup() {
      pinMode (analogOutput, OUTPUT);
      pinMode (analogInput, INPUT);
      pinMode (digitalOutput, OUTPUT);
      pinMode (digitalInput, INPUT);
}
```

Arduino – Accessing Ports

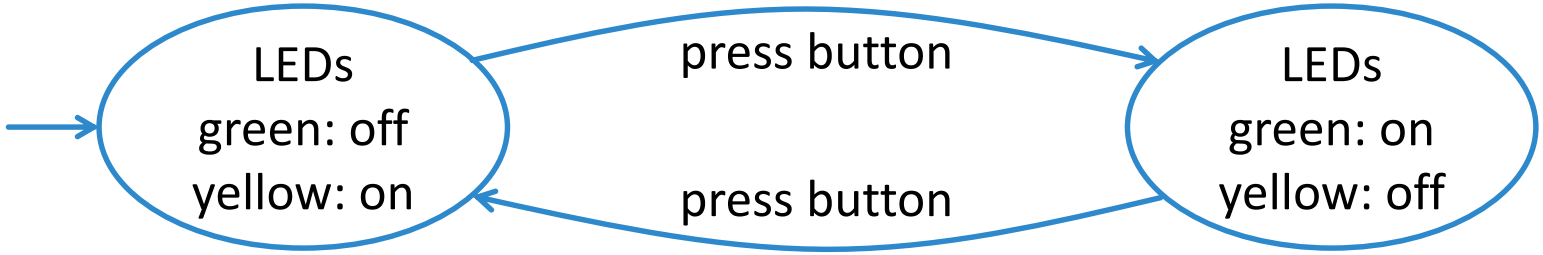
```
void loop() {
      int val;

      val = 0; // val in [0:255])
      analogWrite (analogOutput, val);
      val = analogRead (analogInput);
      // val now in [0:1023])

      val = LOW; // or HIGH
      digitalWrite (digitalOutput, val);
      val = digitalRead (digitalInput);
      // val now in {LOW, HIGH}
}
```

Exercise 1

- Hardware
  - Olimexino-32U4
- Requirements
  - If the button is not pressed, then the yellow LED shall be switched on and the green LED shall be switched off
  - If the button is pressed, then the green LED shall be switched on and the yellow LED shall be switched off

Exercise 2

- Hardware
  - Olimexino-32U4
- Requirements
  - At the beginning the yellow LED shall be switched on, the green LED shall be switched off
  - If the button is pressed, then both LEDs change their state.



Exercise 3

- Hardware
  - Olimexino-32U4
  - Test board with switch and LED
- Requirements
  - At the beginning the test board LED shall be switched off
  - If the test board button is pressed, then the LED changes its state.