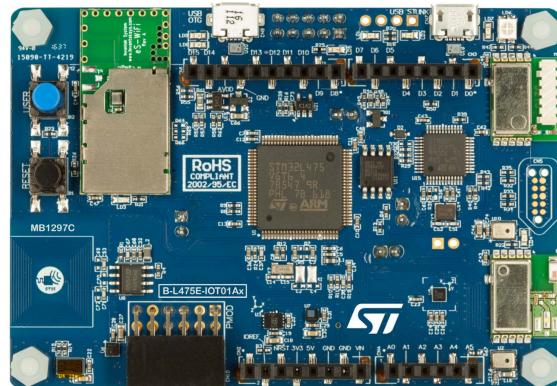


DISCOVER THE STM32 BOARD

BASICS OF PROGRAMMING - SOFTWARE AND HARDWARE

The "**STM32 IoT Node Board**" is a programming board, which means it allows a user to create a programme and put it inside the board.

To execute this programme, you need a "microcontroller", i.e. the brain of the board (visible on our board in the middle - the big black square). The name of our microcontroller is: **STM32L475VG**.



THE GPIOs

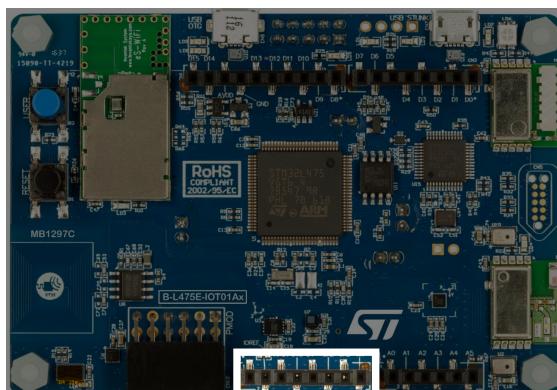
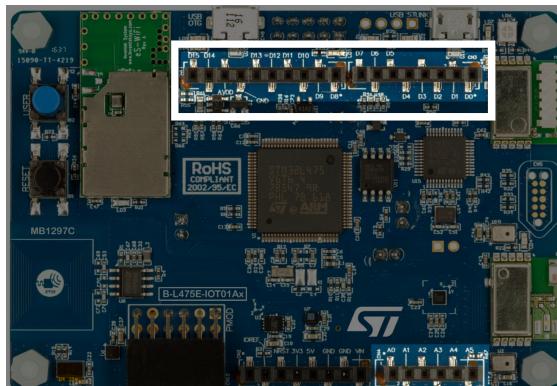
As you can see, there are lots of "legs" or "pins" around the microcontroller, called "General Purpose Input / Output" (or GPIO in short). Basically, you can use them to interact with the outer world. Even if there are lots of GPIOs, you cannot use all of them. The usable GPIOs are located on the top and bottom of the board.

There are these black rectangles with holes in them, called "**pinouts blocks**". If you look closely, you can observe some inscriptions around (D0, D1, D2, D3, ..., A0, A1, A2, ...). These inscriptions are the names of the GPIOs.

We will discover the differences between Ax pins (A0, A1, ...) and Dx pins (D0, D1, D2, ...), further in the activities.

Another pinout block remains which is a "**power pinout block**". You can use these pinouts to power your sensors or actuators (like motor, light, and lots of different things).

The inscription on top of the pinout block, inform us how to use it. The "**5V**" is like the "+" (positive pole) of a battery and the "**GND**" (short for "Ground") is the "-" (negative pole).



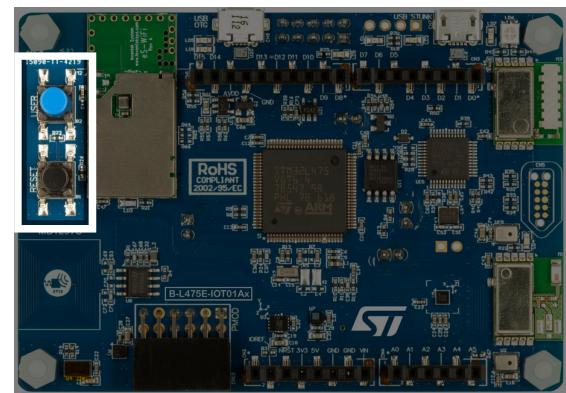
DISCOVER THE STM32 BOARD



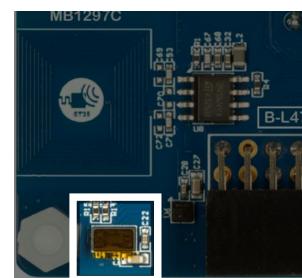
THE PERIPHERALS

The difference between the number of GPIOs available through the pinout block and the number of legs of the microcontroller can be explained by the presence of multiple peripherals already connected to the microcontroller, available on the "STM32 IoT Node Board" itself. The presence of all these peripherals makes this specific board very attractive, as it will enable you to implement a large range of activities, from simple to complex, and from basic to playful. This is a real asset for performing engaging activities in the classroom.

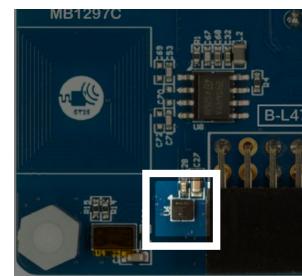
- **BUTTONS:** On the left side of the board, you can find two buttons. The black one is the **RESET** button, enabling the program to restart if you need it. The other one can be used in our program to **detect when the user push-it** (short push, long push, release it, etc). It can be useful for creating simple user interactions, such as a quiz button for organising competitions using the board.



- **DISTANCE SENSOR:** Let's have a look at the bottom on the lower-left corner of the board. Just on the right of the nylon screw, you can find a sensor to measure distance. It is officially called the "**time of flight**" because it measures the time it takes for a laser beam to travel back and forth (**fly**) from the sensor to an object.



- **TEMPERATURE & HUMIDITY SENSOR:** Next to the "time of flight" sensor on the right, you can find a thermometer and hygrometer sensor ("2 in 1"). This can be useful to implement activities linked to the monitoring of heat or to approaching meteorological concepts.



DISCOVER THE STM32 BOARD



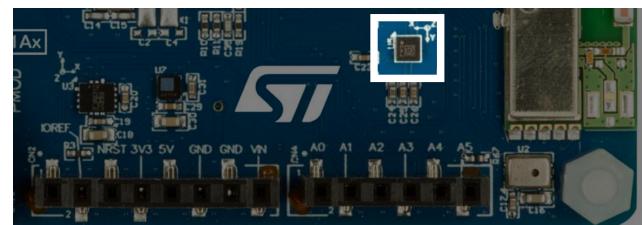
- **ACCELEROMETER & GYROSCOPE SENSOR:** On the centre of the board, just above the pinout block, there is the accelerometer and gyroscope sensor ("2 in 1"). An accelerometer is used to measure acceleration. You can use it to detect the movements of the board (for instance, if the board is shaken). A gyroscope gives us information about the inclination of the board. This sensor works on 3 axes (X, Y, and Z), which implies you can detect movements in 3D space.



- **ATMOSPHERIC PRESSURE SENSOR:** Next to the Accelerometer/Gyroscope sensor, you can find a little sensor called the barometer. This sensor gives us the value of the atmospheric pressure.



- **MAGNETOMETER SENSOR:** Next to the barometer, you can see the magnetometer. It is used to retrieve the value of a magnetic field. It can also measure values on 3 axes (X, Y, and Z).



- **MICROPHONE:** On the right corner, you can see the Microphone, useful to capture sounds.

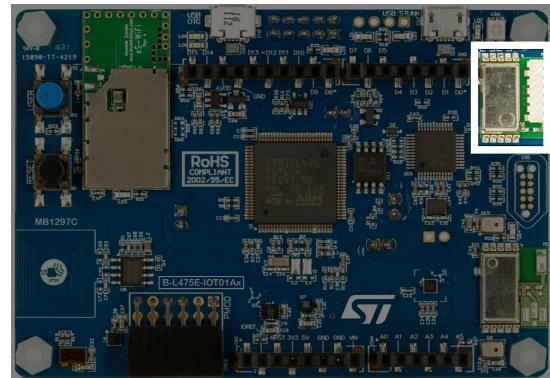


DISCOVER THE STM32 BOARD



THE MODULES

- **BLUETOOTH MODULE:** On the top left of the board, you can find the Bluetooth module. It can be used to communicate and exchange data with other devices (such as another STM32 IoT Node Board, or your phone).



- **MICRO-USB CONNECTORS:** On the top of the board, you can see two micro-USB connectors. The USB port on the right is the one you will be using most of the time, as it enables to connect the board to your computer and send the program you will have done on MakeCode to the microcontroller. You can also see a second one on the left, call "OTG USB port". This particular one enables you to program the board to act and be recognised as another device such as a keyboard, mouse or gamepad.

