



SENSOR NETWORKS

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SENSOR LAB

ECE 6615

“One of the 10 technologies that will change the world” !!!

MIT Technology Review, 2003

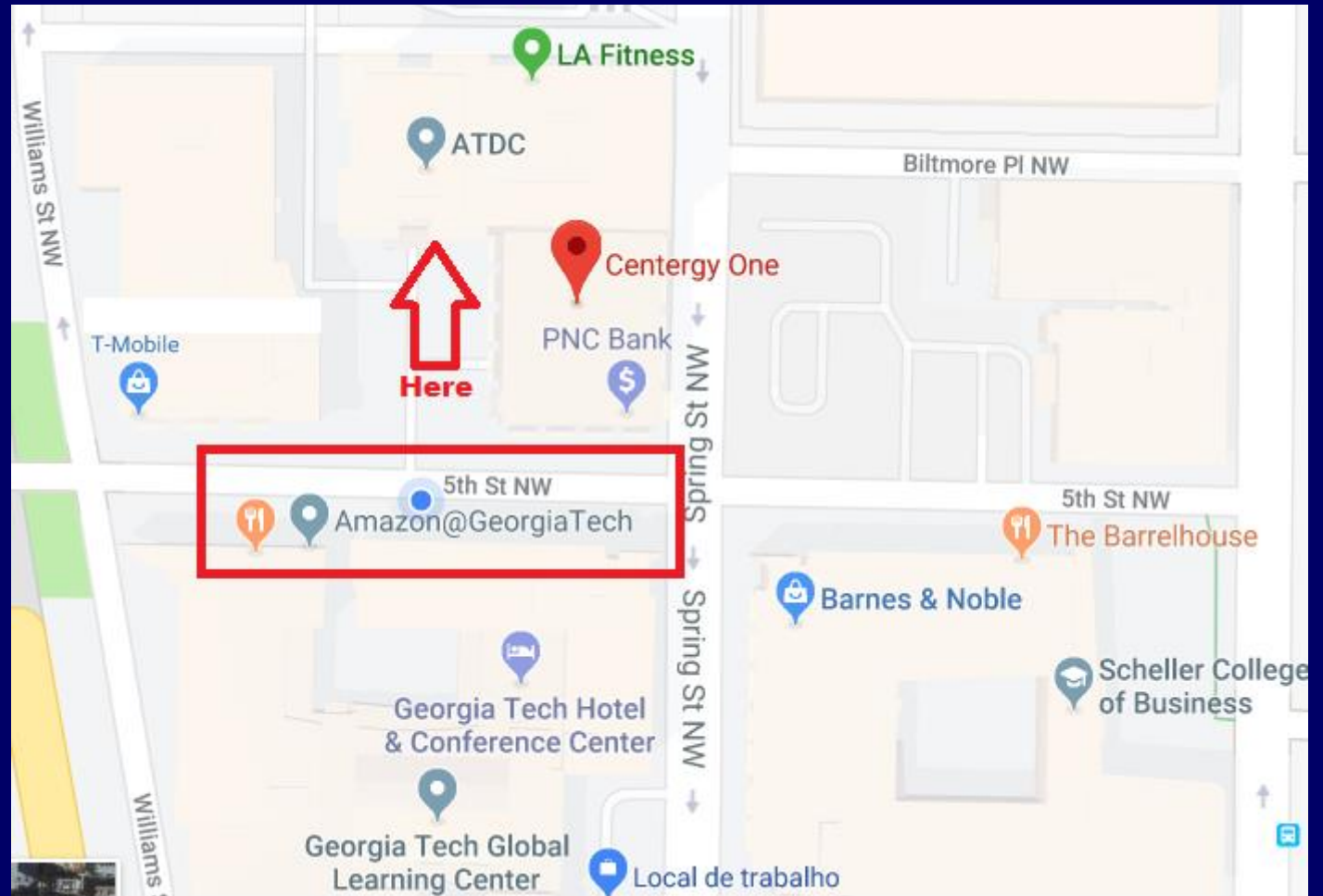


SENSOR LAB LOCATION

ECE 6615

Address: Centergy
One, Room 5135,

75 5th Street NW,
Atlanta, GA 30318





DIFFERENCES FROM AD-HOC NETWORKS

- The lab assignment will have three simple parts that will teach how to use the sensors.
- The lab assignment will be conducted in a **group**.
- Each group will have around **5 +/- students** depending on the class size.



Sensor Node Hardware

STM32 IoT Node

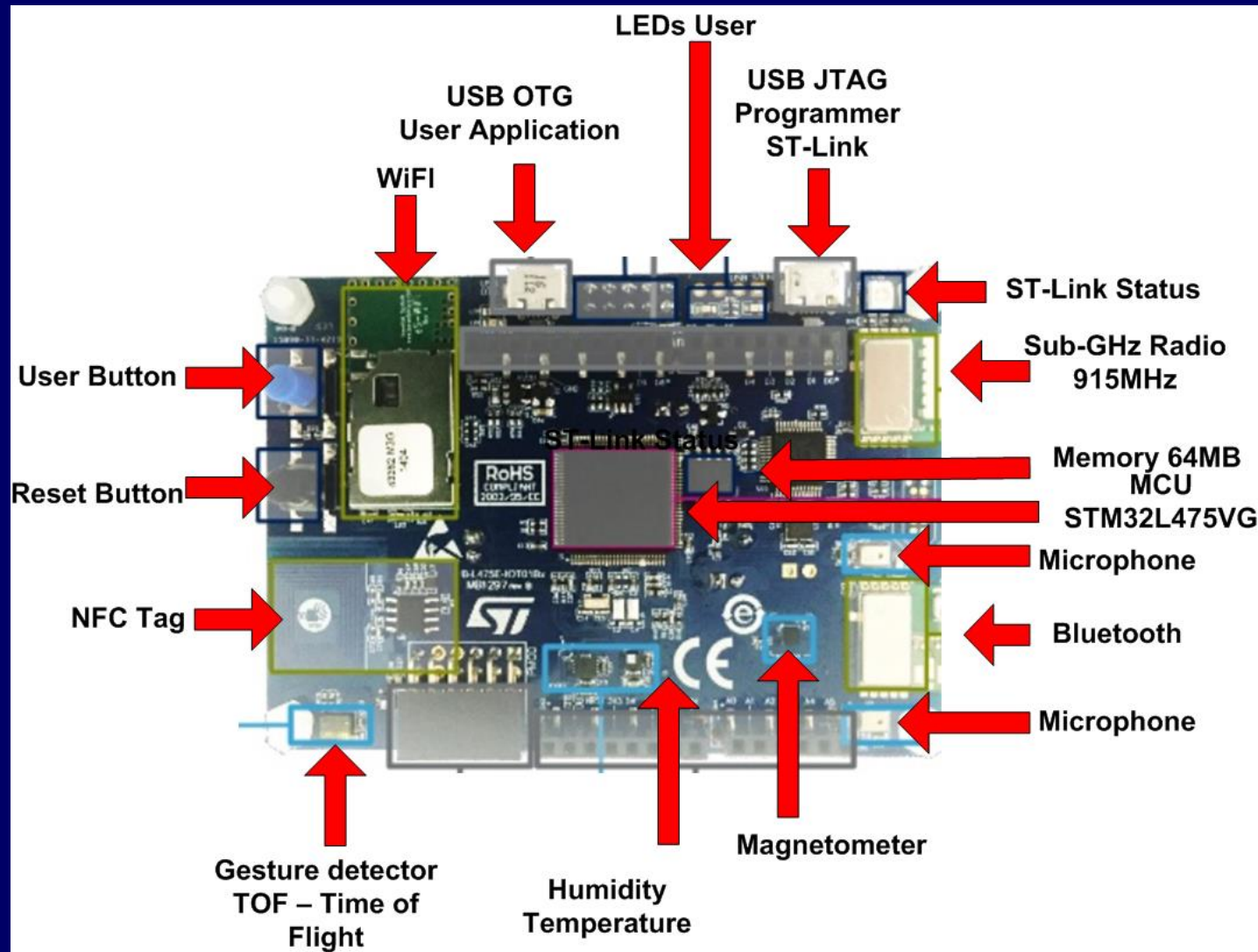
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- The B-L475E-IOT01A Discovery kit for IoT node allows users to develop applications with direct connection to cloud servers.





STM32 IoT Node Characteristics





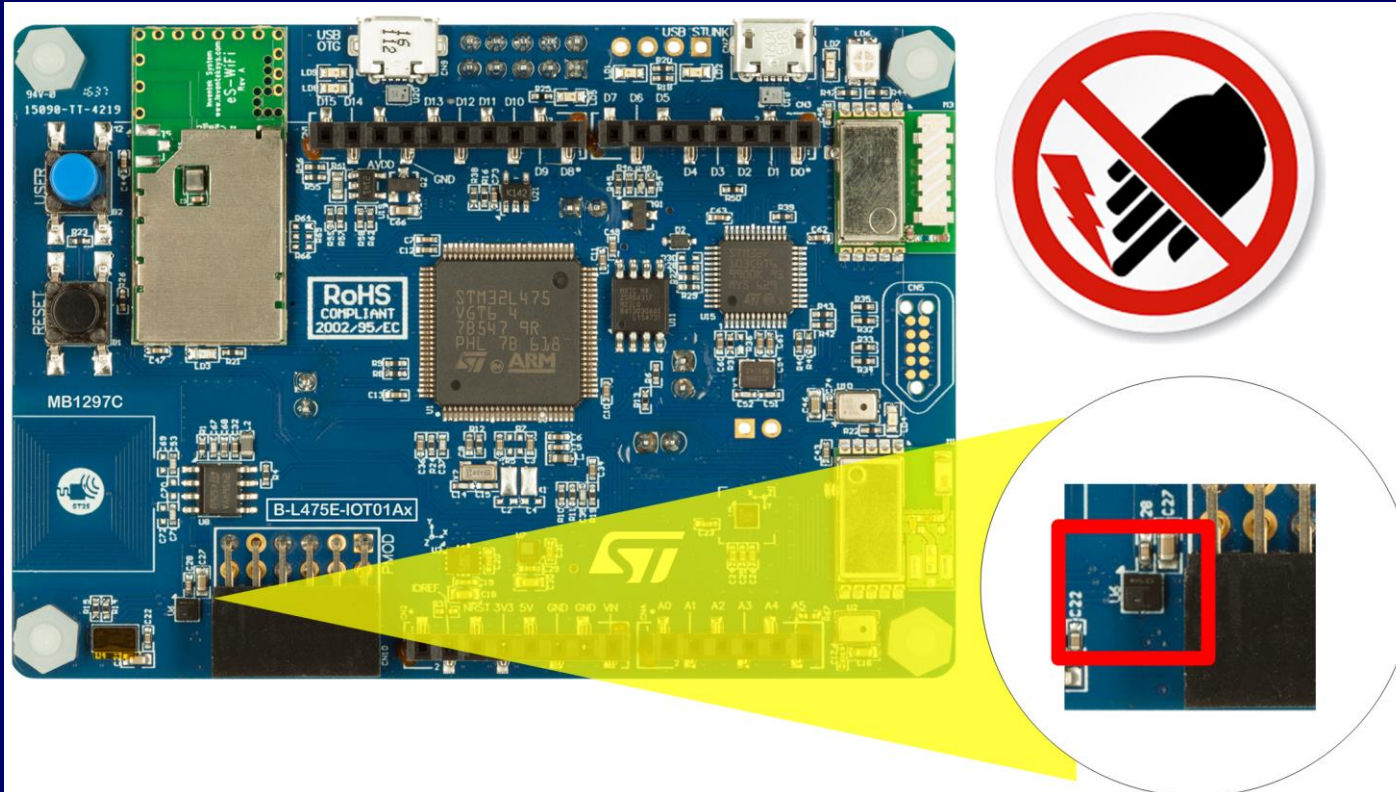
STM32 IoT node Specs

- **Robust, Easy to use, Lower Cost**
- **Sensors:**
 - [HTS221](#) Capacitive digital sensor for relative humidity and temperature
 - [LIS3MDL](#) High-performance MEMS 3-axis magnetometer and 3D accelerometer
 - [LSM6DSL](#) 3D MEMS gyroscope
 - [LPS22HB](#) MEMS nano pressure sensor: 260-1260 hPa absolute digital output barometer
 - [VL53L0X](#) Time-of-flight and gesture-detection sensor
 - (2) [MP34DT01](#) digital omnidirectional MEMS microphones



STM32 IoT node – Humidity and Temperature sensor

HTS221 Capacitive digital sensor for relative humidity and temperature



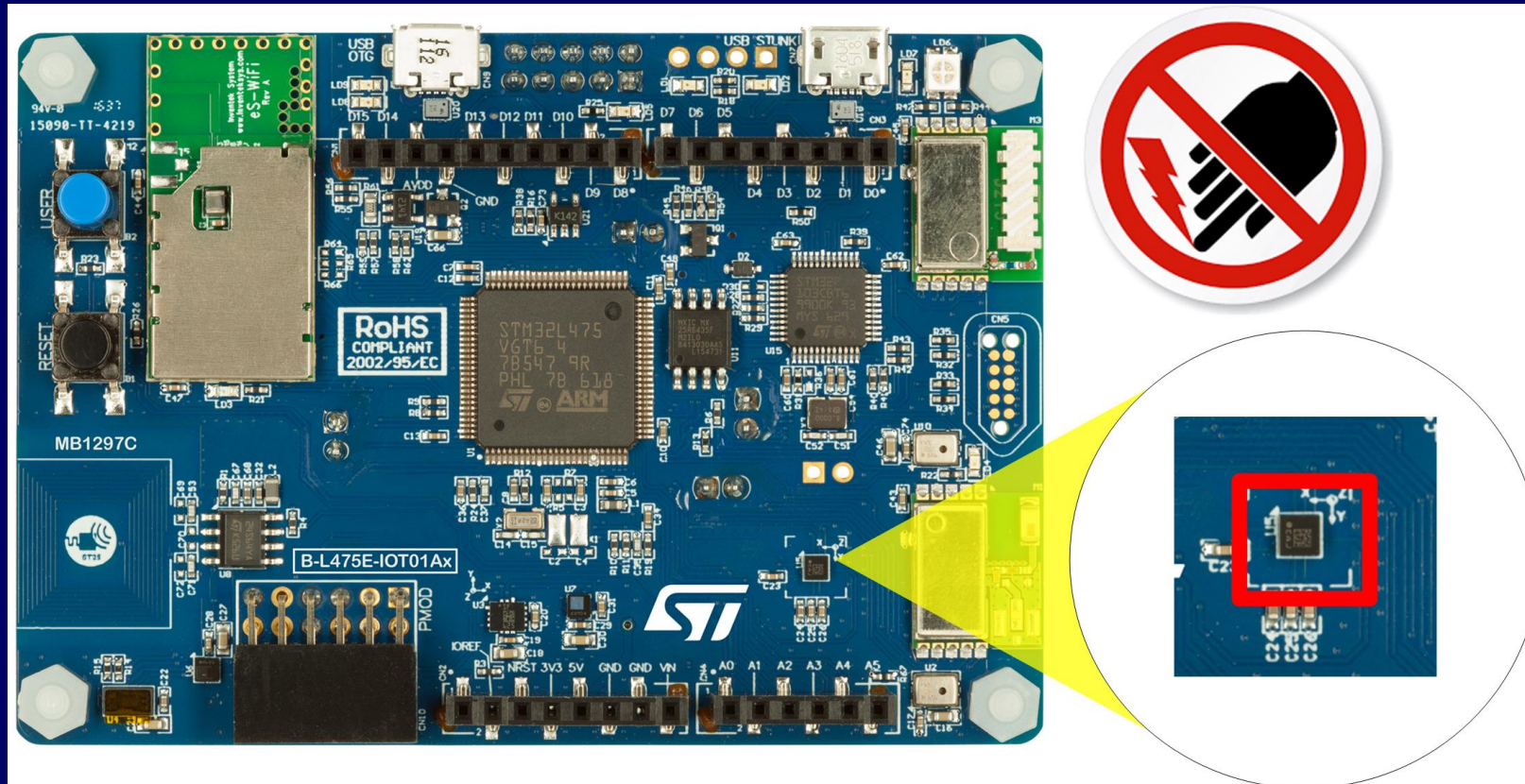
Humidity
accuracy: $\pm 3.5\%$ rH,
(20 to +80% rH)
Temperature
accuracy:
 $\pm 0.5^\circ \text{C}$,
(15 to +40 $^\circ \text{C}$)

Datasheet: <http://www.st.com/en/mems-and-sensors/hts221.html>



STM32 IoT node – Magnetometer and Accelerometer

LIS3MDL High-performance MEMS 3-axis magnetometer and 3D accelerometer

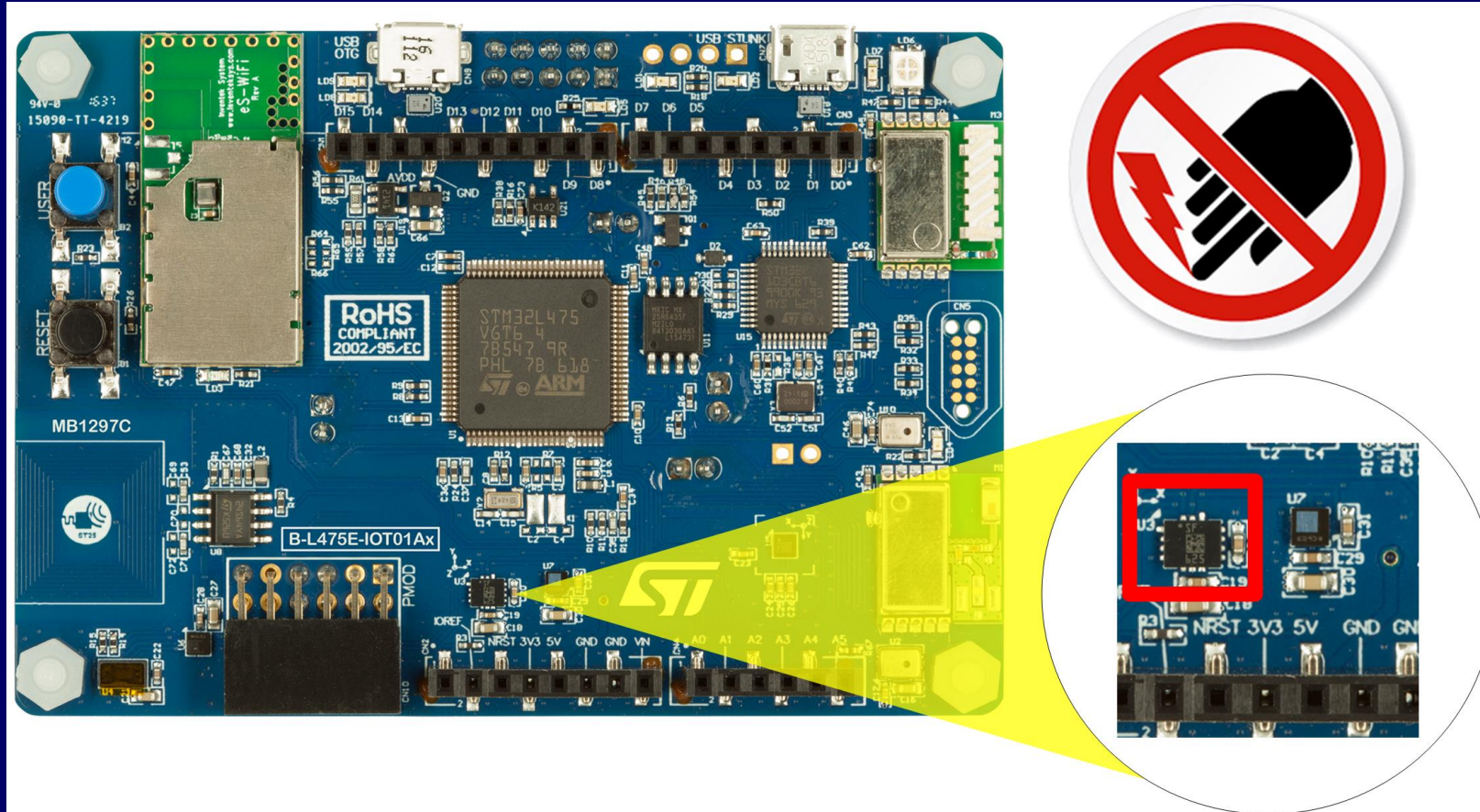


Datasheet: <http://www.st.com/en/mems-and-sensors/lis3mdl.html>



STM32 IoT node – Gyroscope sensor

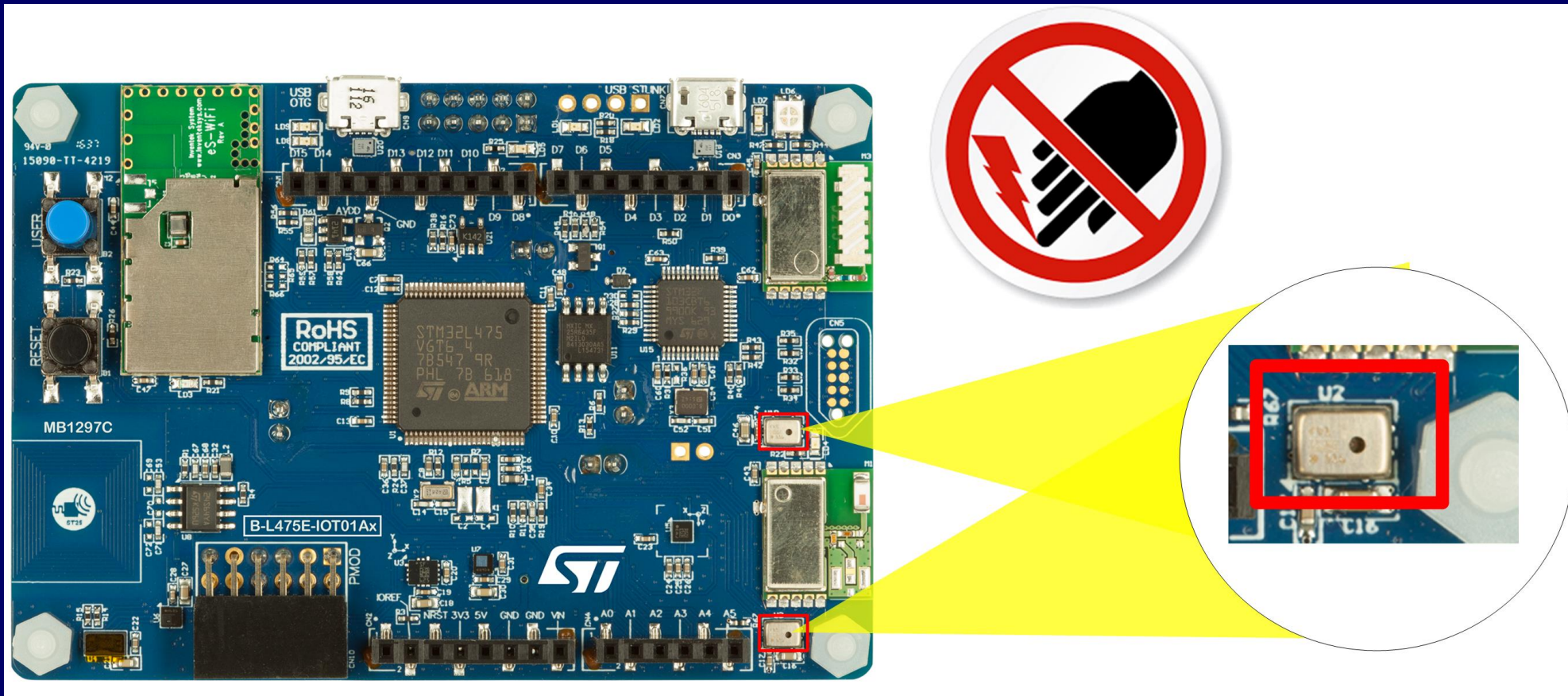
- LSM6DSL 3D MEMS gyroscope



Datasheet: http://www.st.com/content/st_com/en/products/mems-and-sensors/inemo-inertial-modules/lsm6dsl.html

STM32 IoT node – Microphone sensor

- MP34DT01 digital omnidirectional MEMS microphones

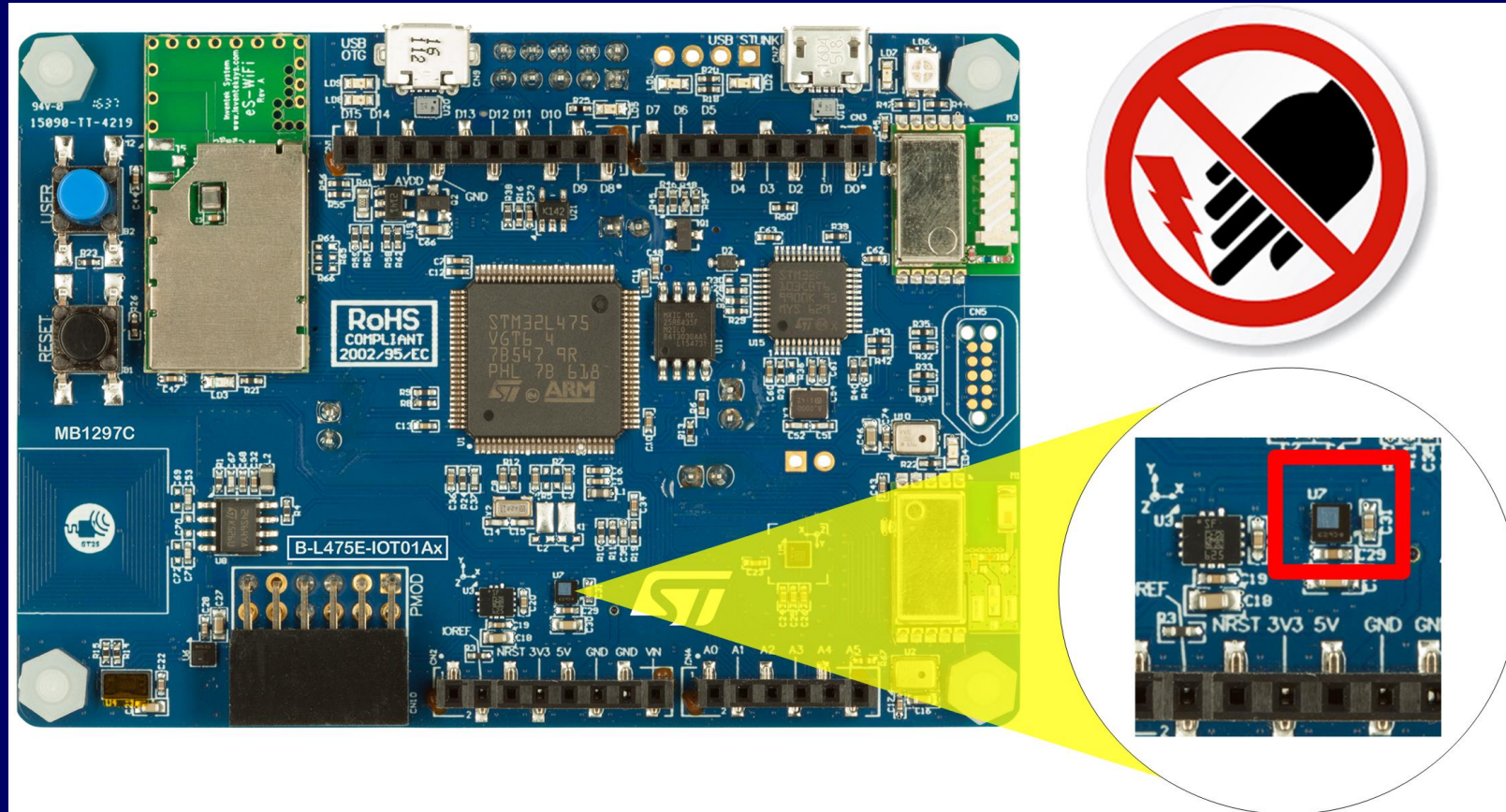


Datasheet: <http://www.st.com/en/audio-ics/mp34dt01-m.html>



STM32 IoT node – Pressure sensor

- LPS22HB MEMS nano pressure sensor: 260-1260 hPa absolute digital output barometer



Datasheet: <http://www.st.com/en/mems-and-sensors/lps22hb.html>

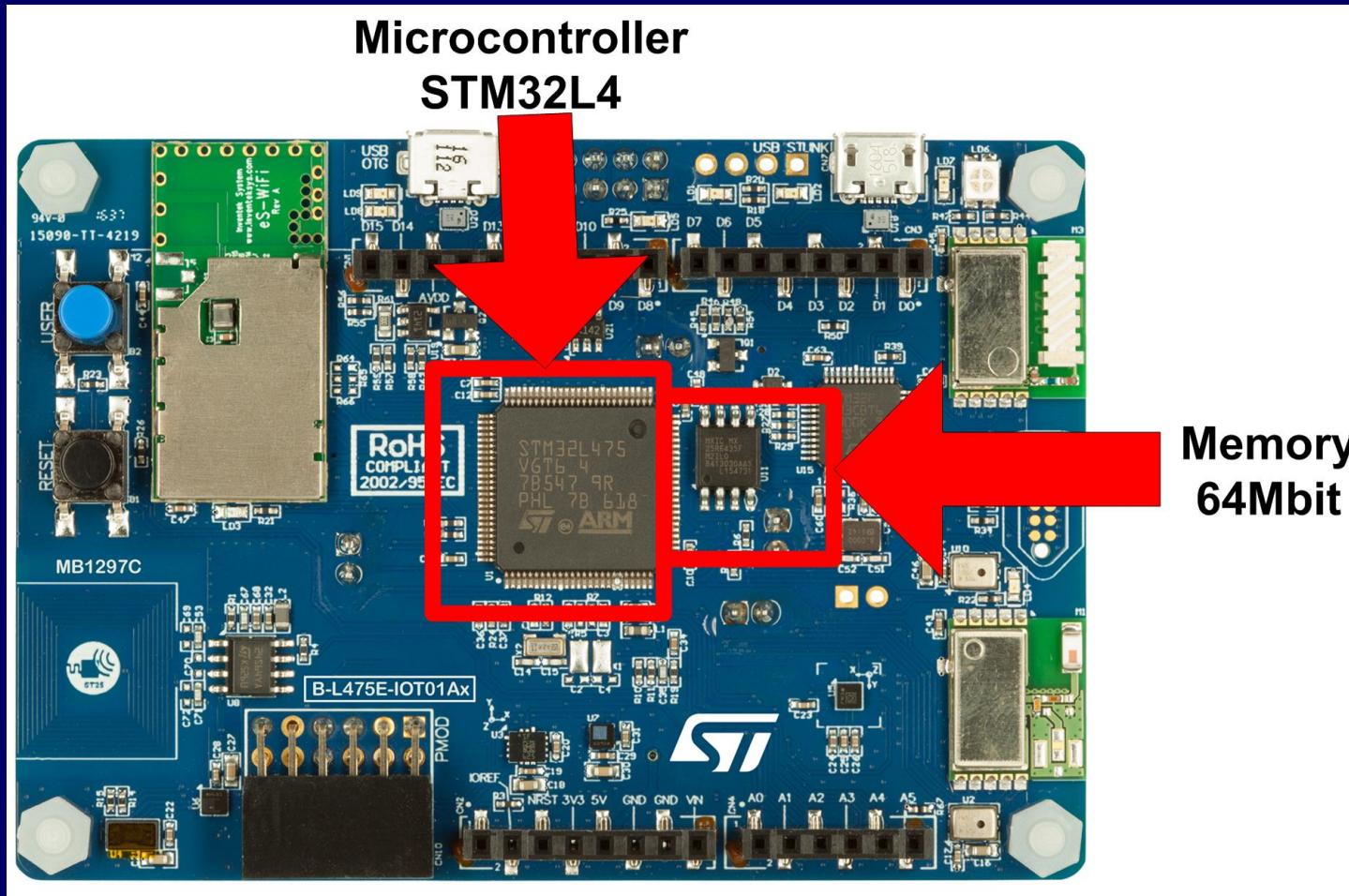


STM32 IoT node Specs

- STM32L4 series MCU with ARM Cortex core
- Memory
 - 1 megabyte of Flash memory and 128 kilobytes of SRAM (via the STM32L4 MCU) – 80 MHz.
 - 64-Mbit Quad-SPI (Macronix) Flash memory.



STM32 IoT node Microcontroller and Memory

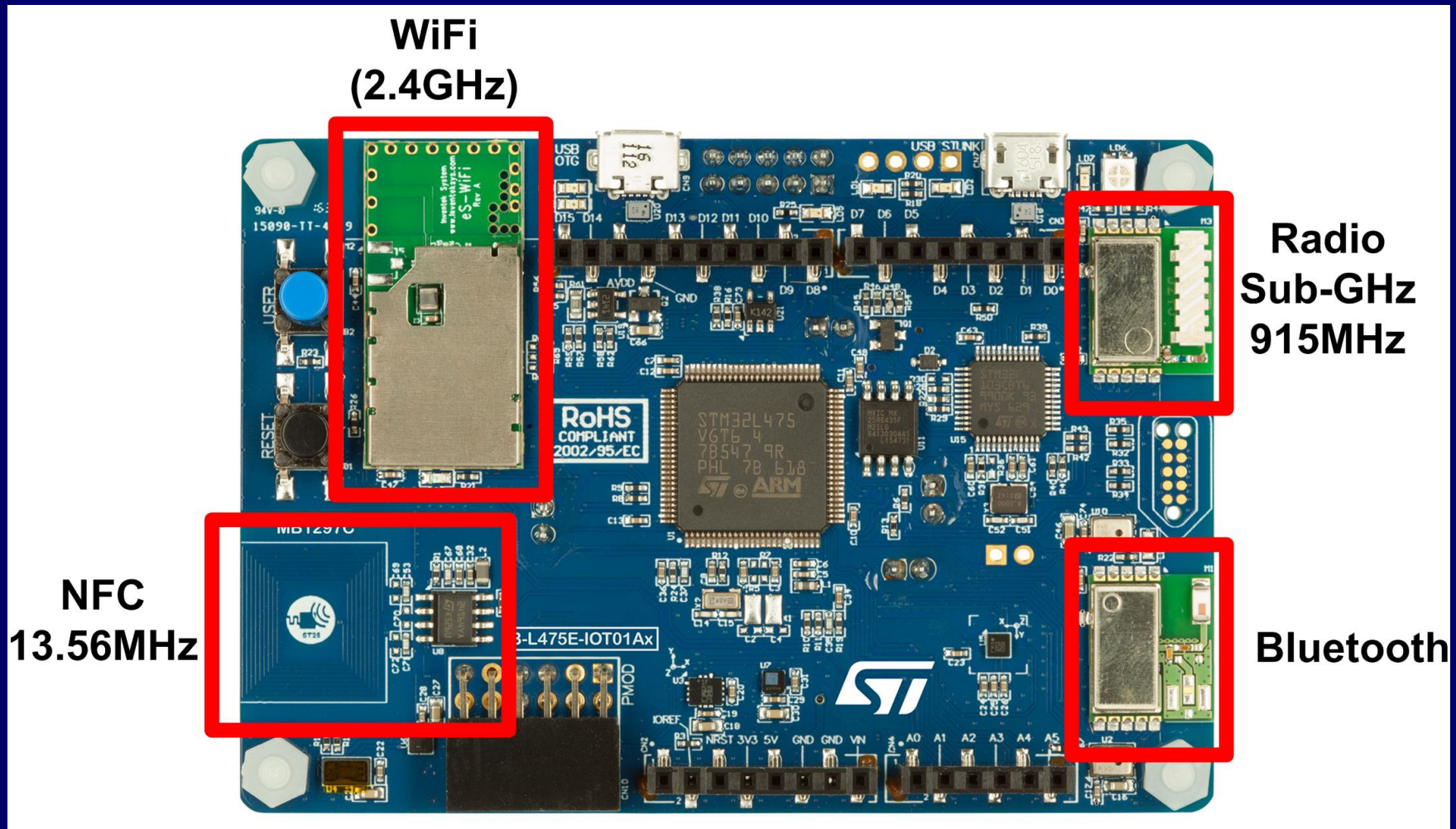




STM32 IoT node Specs

- Bluetooth – BLE (Bluetooth Low Energy) ([SPBTLE-RF](#))
- Wi-Fi – 2.4GHz Wi-Fi® module Inventek ISM43362-M3G-L44 (802.11 b/g/n compliant)
- Sub-GHz RF - 915 MHz ([SPSGRF](#)).
- NFC-tag IC (M24LR).

STM32 IoT node Wireless Interface sensor





I want my own SMT32 IoT Node, Where to buy?

Board model: B-L475E-IOT01A1 (915MHz – US)

■ Distributor: Future Electronics

– Site: <http://www.futureelectronics.com>

– Link: <http://www.futureelectronics.com/en/Search.aspx?dsNav=Ntk:PartNumberSearch%7cB%2f-L475E%2f-IOT01A1%7c1%7c,Ny:True,Nea:True>

– Cost: \$50 + shipment

■ Distributor: Digikey

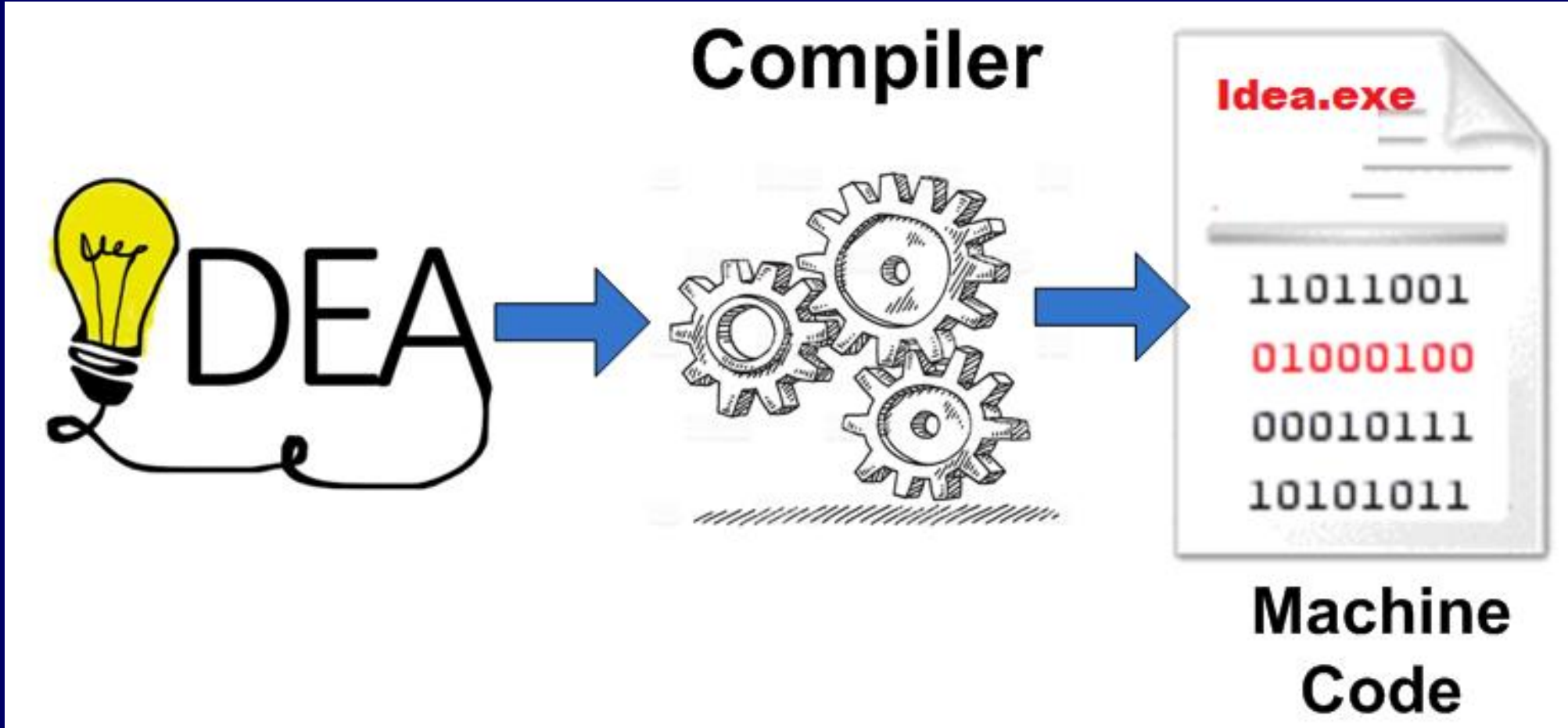
– Site: www.digikey.com

– Link: <https://www.digikey.com/products/en/rf-if-and-rfid/rf-evaluation-and-development-kits-boards/859?k=B-L475E-IOT01A&k=&pkeyword=B-L475E-IOT01A&pv47=31601&mnonly=0&ColumnSort=0&page=1&quantity=0&ptm=0&fid=0&pageSize=25>

– Cost: \$53 + shipment

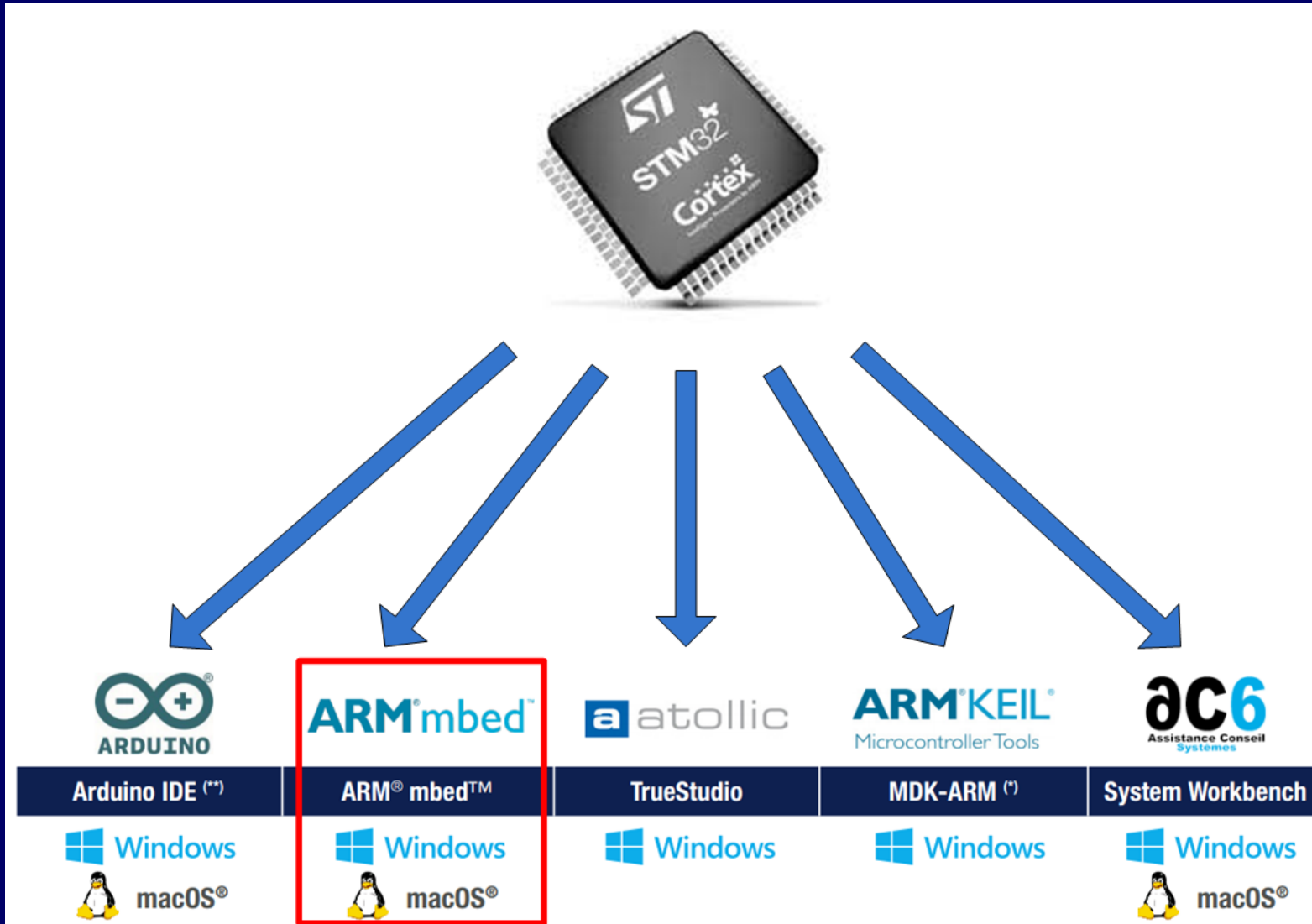


Code compiler



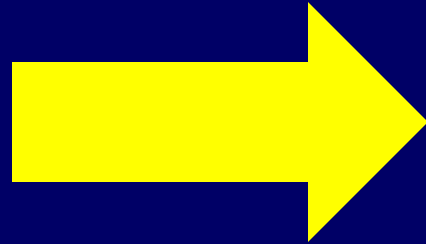


STM32 compilers





MBED Online Compiler



<https://os.mbed.com/>



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Arm Mbed OS developer site

Mbed OS 5

Mbed simplifies and speeds up the creation and deployment of IoT devices based on Arm microcontrollers.

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209,599 compilations in the last 7 days

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<input type="checkbox"/>	Name	Tags	Modified	Description
Your Program Workspace is empty. You can import a program or create a new one .				

Workspace Details

cmartins3

Total Programs 0
Modified n/a

Recently Modified



STM documentation and tutorials

- <http://www.st.com/en/evaluation-tools/b-l475e-iot01a.html>

MBED documentation and tutorials

- <https://os.mbed.com/platforms/ST-Discovery-L475E-IOT01A/>