Umreženi embeded sistemi
Laboratorijske vežbe

Osnovne informacije

Kontakt:

- Email: anja_tanovic@uns.ac.rs
- Kancelarija: NTP 110

Materijal za vežbe:

- https://www.elektronika.ftn.uns.ac.rs/umrezeni-embeded-sistemi/specifikacija/specifikacija-predmeta/
- https://github.com/AnjaTanovic/Umrezeni-embeded-sistemi

Polaganje vežbi:

- Projekat – 50 poena

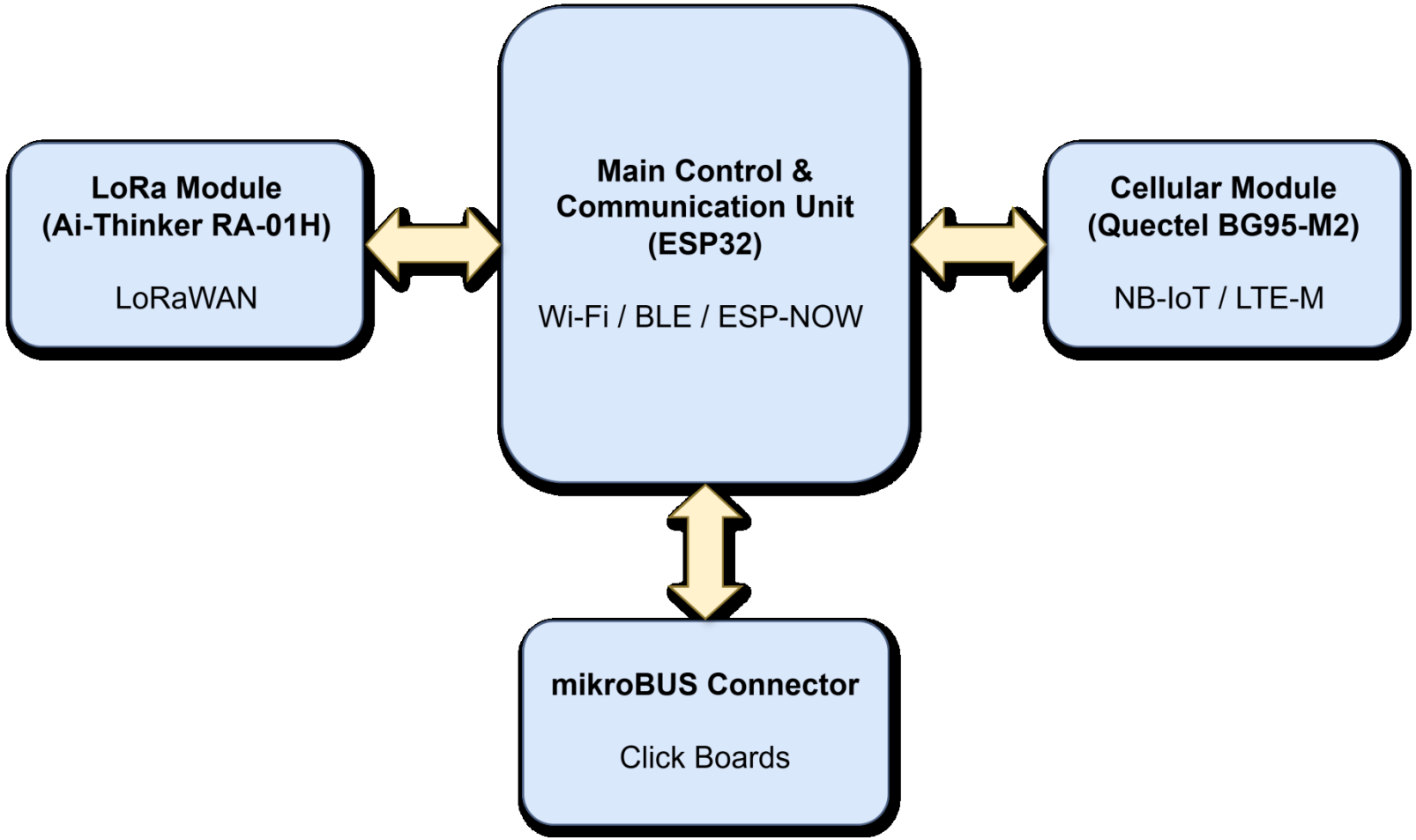
Plan laboratorijskih vežbi

- V1 – WiBLEN razvojna ploča
- V2 – Low Power režimi i RTC
- V3 – ESP32 kao web server
- V4 – ESP32 kao web klijent: HTTP GET metoda i REST API
- V5 – ESP32 kao web klijent: prosleđivanje podataka cloud aplikaciji
- V6 – Node-RED i MQTT protokol
- V7 – Front end
- V8 – Back end i baze podataka
- V9 – LoRaWAN
- V10 – NB-IoT

WiBLEN razvojna ploča

WiBLEN - karakteristike

- **Wi** – WiFi
- **B** – BLE
- **L** – LoRa
- **E** – ESP-NOW
- **N** – NB-IoT

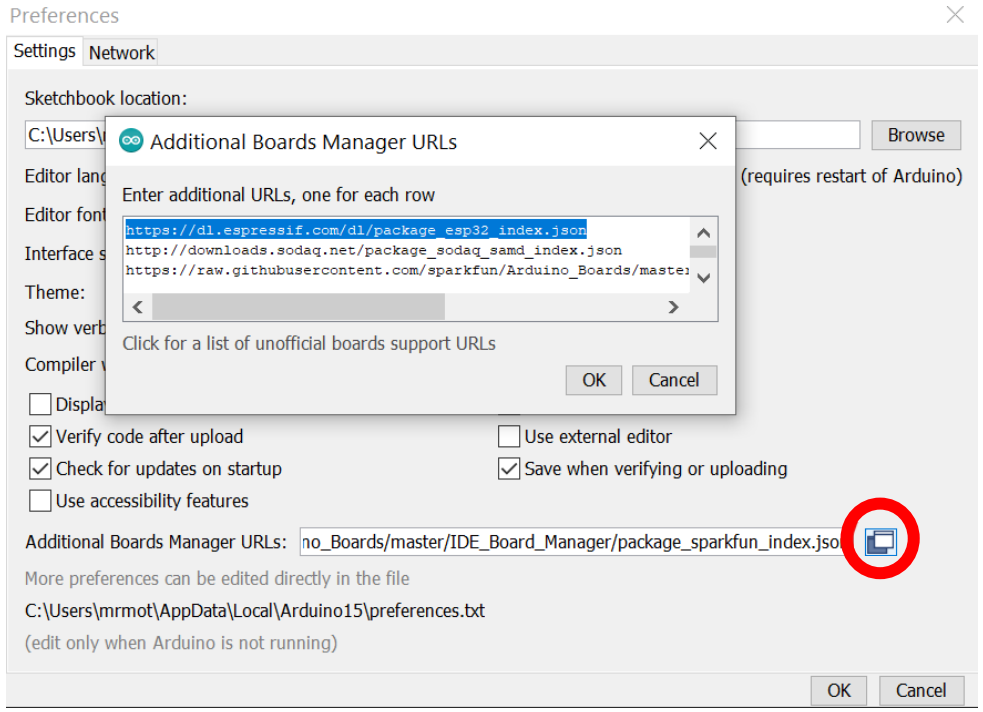


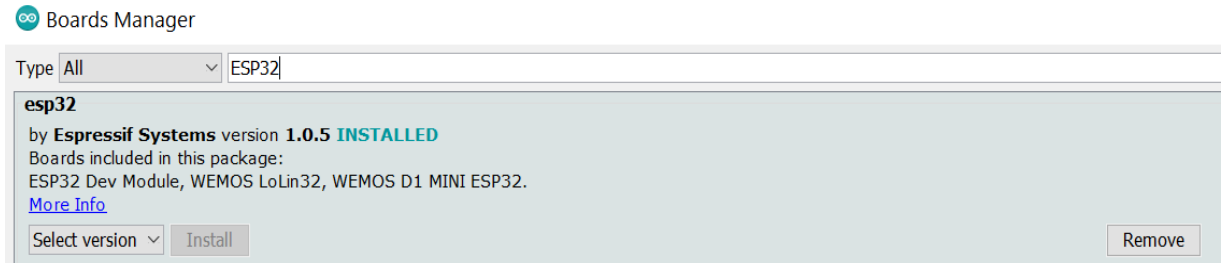
Hardverske karakteristike

Resource	Parameter
Master Chip	ESP32 (240 MHz Xtensa dual-core 32-bit LX6 microprocessor, with ULP coprocessor)
Internal RAM	520 KB SRAM
External RAM	External PSRAM (8 MB)
Flash Memory	External SPI Flash (4 MB)
Wireless Communication	Wi-Fi (IEEE 802.11 b/g/n), Bluetooth (Bluetooth V4.2 BR/EDR and Bluetooth LE specification), ESP-NOW
Cellular Communication	NB-IoT / LTE-M cellular module (Quectel BG95-M2)
NB-IoT Frequency Bands	LTE Cat-NB2 (Band 3, 8, 20) / LTE Cat-M1 (Band 3, 8, 20), region-dependent frequency bands for Europe
LoRa Communication	LoRa transceiver module (Ai-Thinker RA-01H)
LoRa Frequency Bands	Sub-GHz ISM bands (868 MHz EU / 915 MHz US)
Interfaces	USB Interface, mikroBUS-compatible expansion interface
mikroBUS Supported Interfaces	SPI, I^2C, UART, GPIO, PWM
Power Supply	USB and battery-powered operation
Antenna Interfaces	External antennas for LoRa, NB-IoT/LTE-M and GNSS

Instalacija potrebnog softvera

- **Arduino IDE** -> https://www.arduino.cc/en/software/
- Dodavanje nove ploče u Arduino IDE: File -> Preferences -> Additional Boards Manager URLs -> https://dl.espressif.com/dl/package_esp32_index.json
- Instaliranje nove ploče: Tools -> Board -> Boards Manager -> **esp32**





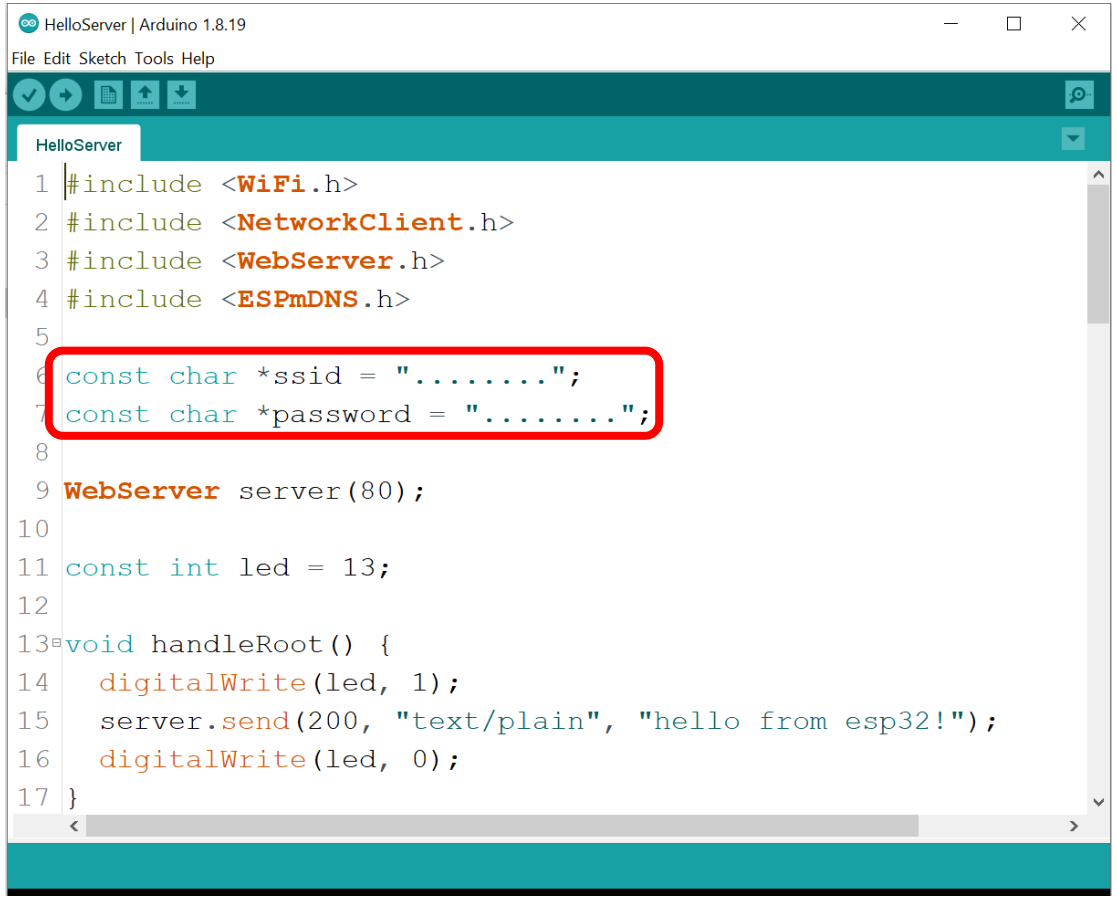
Arduino IDE – konfiguracija

- Izbor ploče: Tools -> Board -> ESP32 Arduino -> **ESP32 Dev Module**
- Izbor porta: Tools -> Port -> **COMx**

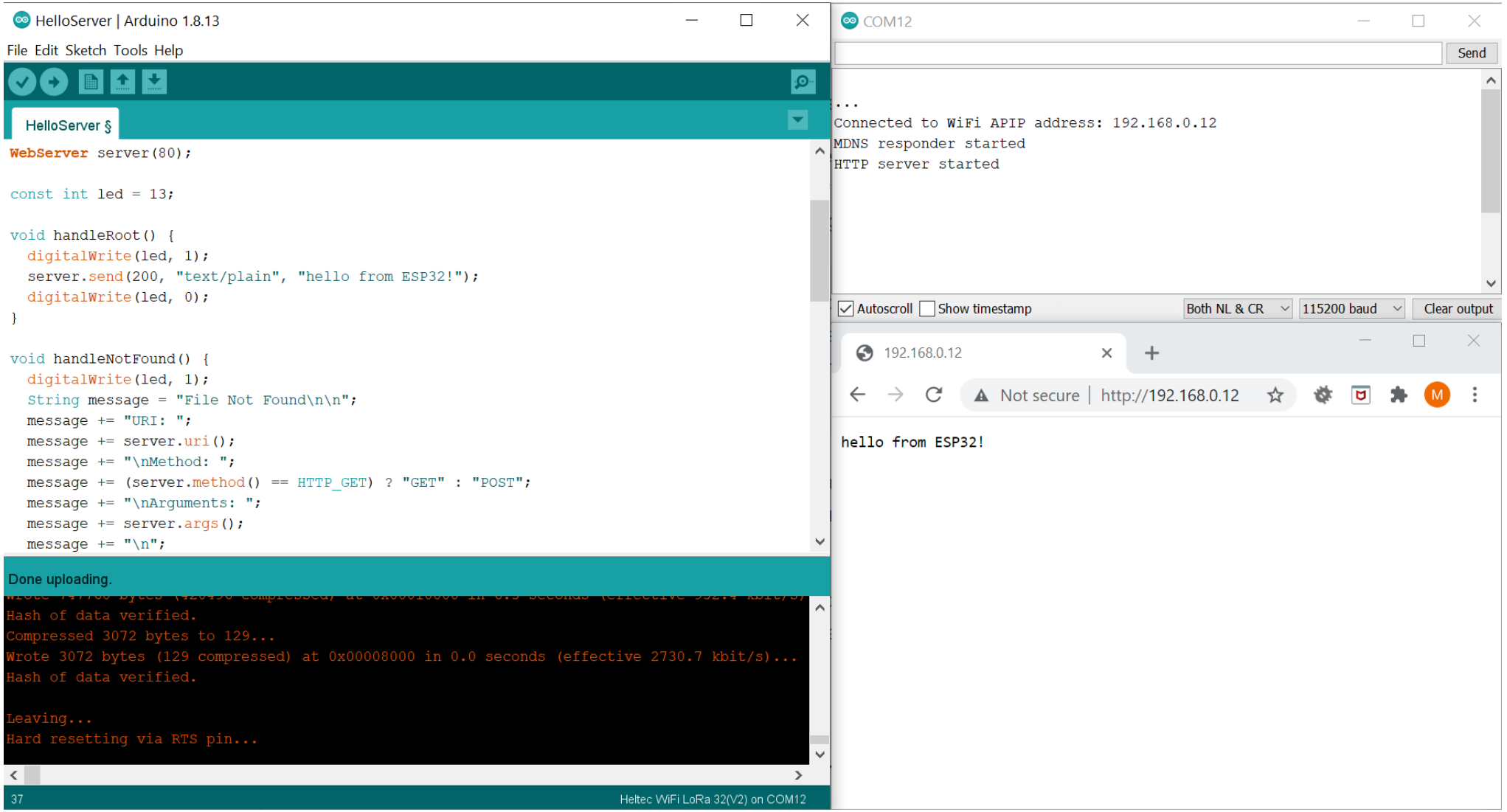
- Device Manager - provera porta COMx

Primer 1: Web server

- Primer: File -> Examples -> Examples for ESP32 Dev Module -> WebServer -> **HelloServer**
- Uneti ssid i password



Primer 1: Web server

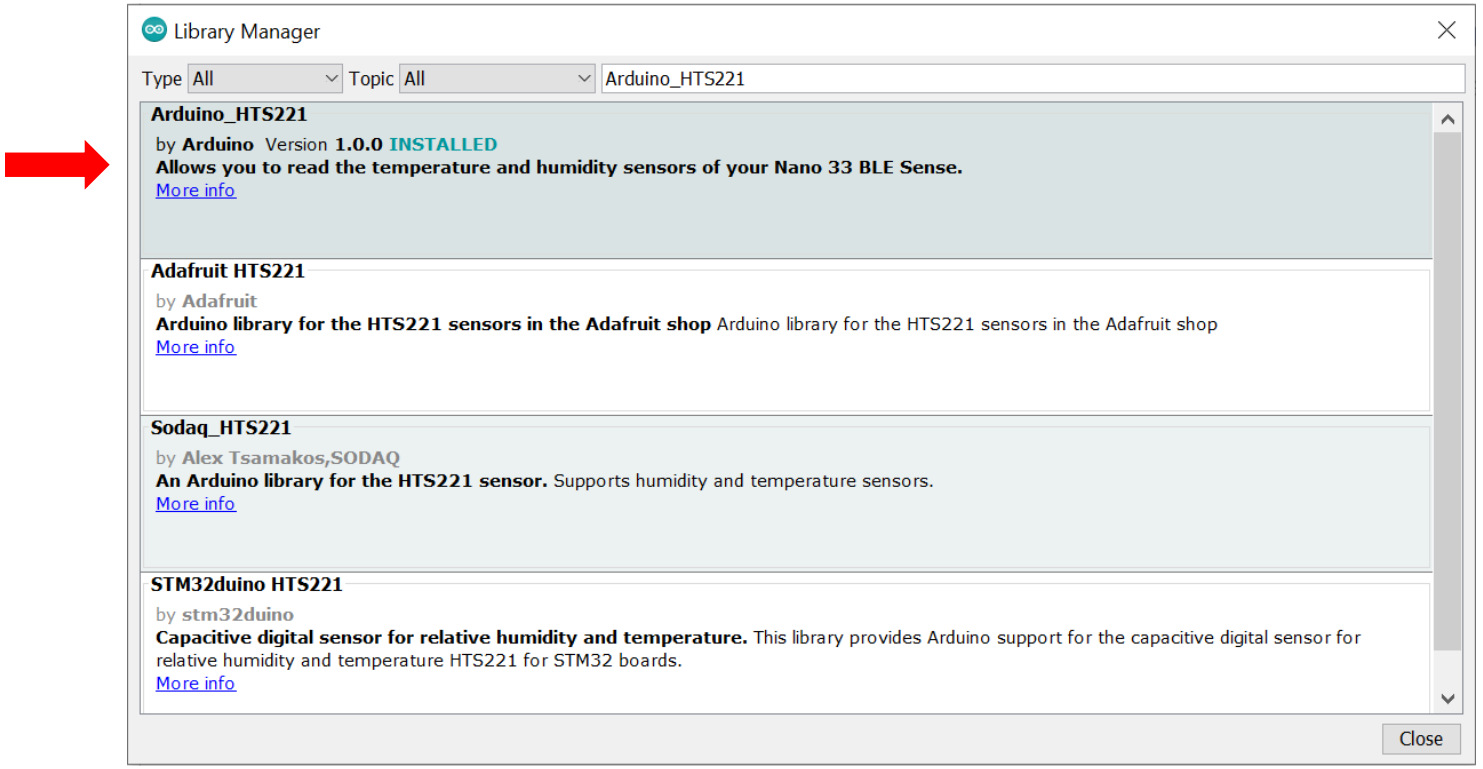


Temp&Hum Click Board

- https://www.mikroe.com/temp-hum-click
- Temp&Hum Click koristi HTS221, visoko precizan 16-bitni senzor relativne vlažnosti i temperature
- Temperaturni raspon: 0 °C – 60 °C
- Raspon relativne vlažnosti: 0 % – 100 % RH

Primer 2: Temp&Hum Click

- Instaliranje biblioteke: Sketch -> Include Library -> Manage Libraries -> **Arduino_HTS221**
- Primer: File -> Examples -> Examples for any board -> Arduino_HTS221 -> **ReadSensors**



Primer 2: Temp&Hum Click