

# System on a Chip (SoC) Microcontroller for End Station Deployments

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The planned ambient pressure and temperature measurement sensors (Bosch BMP390) were tested and developed using an Adafruit Feather S3-TFT Reverse board. This is similar to the ones used for the field mapping units but with all connectors located on the reverse of the PCB such that only the display and buttons are on one side. The only network connectivity available on these boards is WiFi. Both the field mapping units and these were done on the jlab\_guest SSID (service set identifier, basically a network name) which uses a WPA (WiFi Protected Access) passphrase which rotates monthly as the means of security. This makes this network unsuitable for production deployment. There are two other networks available in the end station: jlab and jlab\_hallb, both of which use a username/password as the means of security, normally a CUE (common user environment) account issued by JLab for each user.

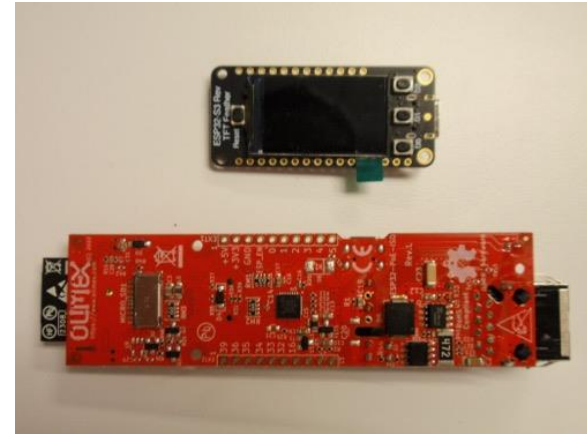
As using a personal CUE account is not appropriate and a generic/general one is not available as well as the possible issues with wireless connectivity during beam operations it was decided to switch to a wired ethernet connection as the means of network access. The Olimex ESP32-POE-ISO was selected as the replacement board. This offers the same family of SOC as the previous Adafruit board, ESP32; along with the same programming environment, Arduino. While it lacks the display of the Adafruit it gains PoE (power over ethernet) as both the means of powering and network connectivity. This particular model also has galvanic isolation between the ethernet power and rest of the board.

- **The development board for the end station pressure and humidity monitoring was changed due to networking issues**
  - WiFi to wired Ethernet
- **Same family of SoC and software allowed for minimal changes and quick development**
- **Final deployment after integration with existing software**
  - Need get sensor values into EPICS PVs

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Software development consisting of a small snippet of code to display the network MAC (machine access control) address, which is a unique identifier, in order for it to properly be added to the JLab network and get IP (internet protocol) assignments via DHCP (dynamic host control protocol). Also needing modification to the code was the pin assignments for the I2C bus as these were different between the boards.

The new development boards can successfully communicate with the pressure sensor as well as have been deployed to the Hall B development subnet. The remaining tasks are to fabricate adapter cables for the sensors (old board used STEMMA QT connectors, new one uses 0.1" headers), develop an enclosure, and integrate with the existing ActiveMQ message broker currently deployed to use MQTT to convert the sensor readings to EPICS PVs.



Top/Black = previous board  
Bottom/Red = new board

