LaACES Student Ballooning Course

Expanding the Arduino Mega
Useful Peripherals

Expanding the Arduino Mega

- You can enhance your project by adding additional shields to the microcontroller
  - Commercial shields are available to perform specific tasks
  - They can be used for prototyping before adding a more permanent component to your PCB
  - Custom shields can be designed, like the MegaSat

Commercial Shields

- Using a shield can simplify a project because there is less assembly required and discrete components are already calculated and soldered on
- More information is available online to help with troubleshooting because many others have purchased and used the same shield(s)
- There is existing documentation on the device
- Because the design is complete, you will not be able to easily make changes

Ultimate GPS Logger Shield

- This shield is a datalogger, and it incorporates GPS with an SD card for storage
- It connects directly to the Arduino Mega and is being used to enhance the MegaSat's datalogging features

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Proto-Shields

- Proto-shields are perfboards that connect to the pins on the microcontroller
- Perfboards contain holes for soldering in components and are used to test your circuit before making it permanent on your PCB
- You are limited on space and the wiring can get messy

Arduino Mega Proto-Shield

- There's minimal assembly required and several rows of empty sockets for soldering in components
- It connects directly to the Mega in the same manner as the datalogger
- You can use this to test your circuit before soldering

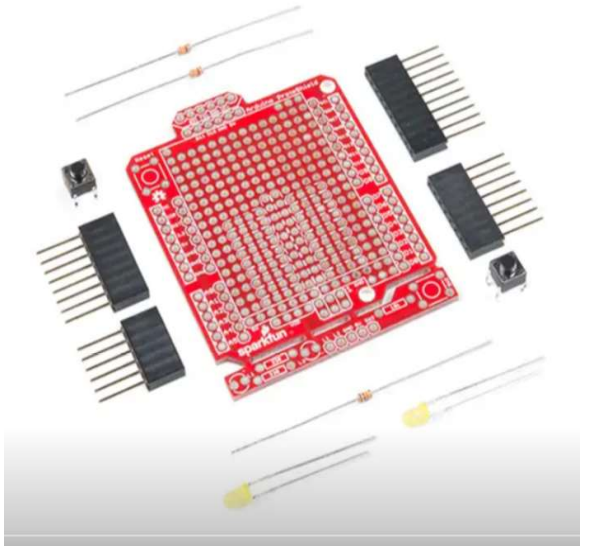

Figure 1: Arduino Mega Protoshield (not assembled)

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Custom PCB Shields

- You can customize a shield for your microcontroller using PCB software
- This allows for more complex designs with custom functions
- There is a learning curve for PCB design software and PCB boards can be costly and can have a long lead time

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MegaSat

- The MegaSat was designed as a custom shield to facilitate an easier learning environment for students
- It attaches directly to an Arduino Mega

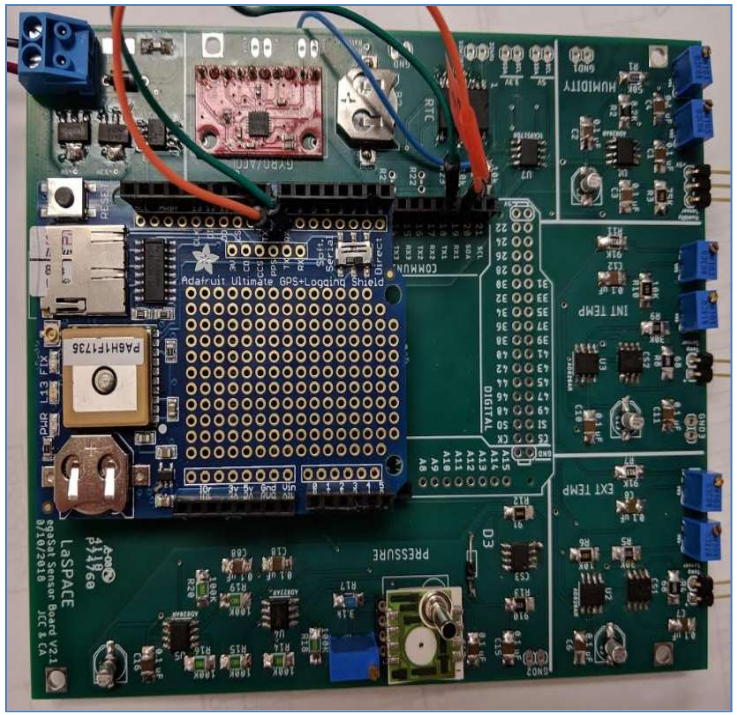

Figure 2: MegaSat prototype with datalogger and accelerometer breakout board

External Breakout Boards

- External boards are different from shields because they do not stack on the microcontroller
- They can be made to connect directly to a PCB and usually act as modules to perform specific tasks
- These have to be wired correctly and may increase the complexity of your design

SparkFun Triple Axis Accelerometer and Gyroscope Breakout

- The MegaSat uses a breakout board to further enhance your experience
- The accelerometer/gyroscope microchip is very small and would be difficult for a beginner to solder
- Breakout boards come with all components soldered in place and are easy to incorporate into your PCB design

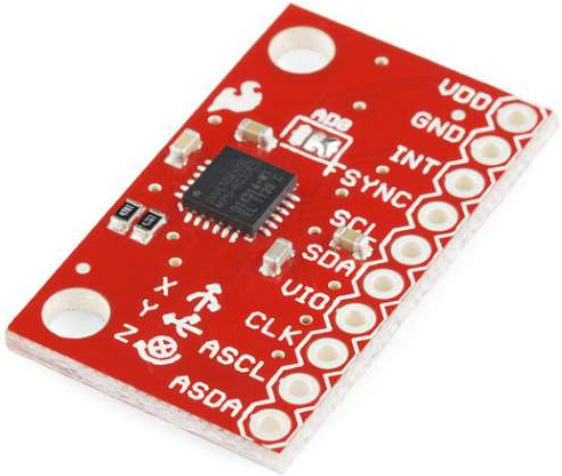

Figure 3: Sparkfun accelerometer/gyroscope breakout board

Expansion

- Students are encouraged to explore further options to expand their payload
- Make sure you select a shield that is compatible with your microcontroller
  - There are differences between the Arduino Mega and other Arduino microcontrollers, such as the UNO, so most shields are not interchangeable

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Addendum

- https://www.digikey.com/product-detail/en/sparkfun-electronics/DEV-13820/1568-1866-ND/9341916?WT.srch=1&gclid=Cj0KCQiAm5viBRD4ARIsADGUT26G1F045FBRjURFn1PY_JH40gTpcUJxdOu0fMySSM5COcHZl7keR6UaArTZEALw_wcB
- https://www.sparkfun.com/products/11028