Summary:

Students will familiarize themselves with the MegaSat input/output architecture by identifying the usage of the Arduino Mega I/O pins.

Materials:

Each student should have the following materials, equipment, and supplies:

- Arduino Mega microcontroller
- Laptop with Arduino IDE installed w/ USB AB cable
- Breadboard
- Wires / Jumpers
- Wire Strippers
- 1x LEDs
- 1x 1 kΩ resistors
- 2x 10 kΩ resistors
- 1x pushbutton
- 1x toggle switch

Procedure:

NOTE: For the circuits in the following activity, it best to use your breadboard to build the circuits. We recommend setting up connecting the 5V to one of the rows at the top of the breadboard and the ground pin to on of the bottom rows.

This will creates power and ground rails that you can easily then connect to the other part of the circuits as needed.

Example 1 – Single LED

1. Assemble the circuit from the schematic in Figure 1 on a breadboard. Connect cathode (short lead) to ground. Connect a 1k resistors from the anode (long lead) of the LED to the Arduino digital pin 13.
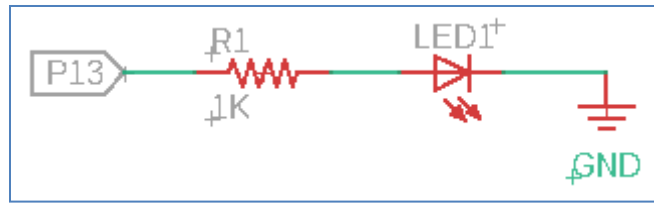
Figure 1: Schematic for a single LED

2. Write a simple loop that powers the LED on for 5 seconds and off for 5 seconds.

3. You should observe the LED blink off and on after you upload the code. Notice the on-board LED blinks in the same pattern. It is connected internally to pin 13 and will replicate react to the signals on that pin
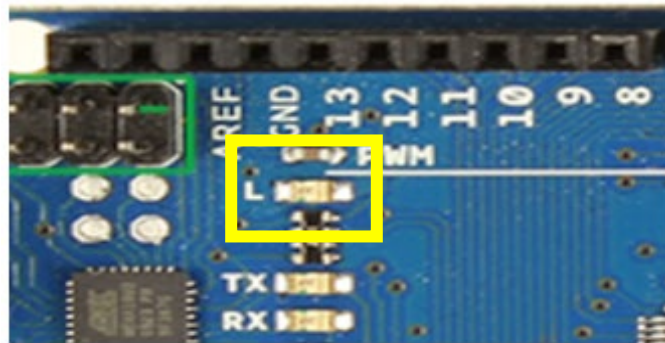

Figure 3: Diagram showing location of on-board LED

4. Turn off the power supply and disconnect the USB cable from the microcontroller. Leave the circuit connected.

5. Assemble the circuit in Figure 4. Using the breadboard, connect a 10k resistor(value of resistor is not critical, any similar resistor should work) to the 5V supply on the microcontroller to digital pin 7.

6. Connect the toggle switch to the pin 7 and ground. When you flip the switch, the voltage at pin 7 should go to ground.
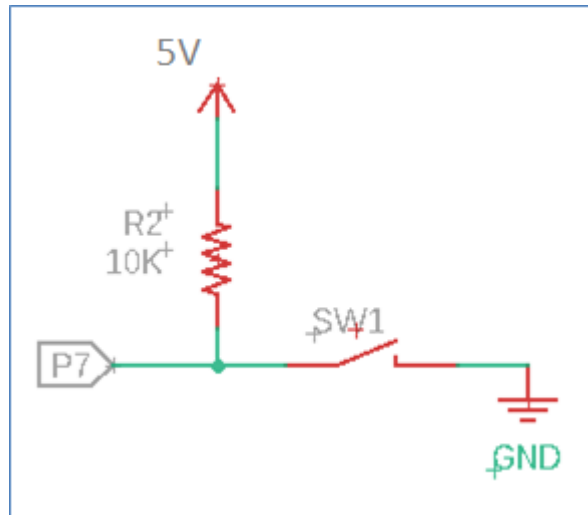
Figure 4: Schematic of toggle switch

7. Turn on the power supply. Write a simple code that will read the state of digital P7. It should report "HIGH" when the toggle switch is open and "LOW" when the toggle switch is closed. Output these values to the serial monitor so you can monitor the behavior of the switch.

8. Next combine the digital input and output. Write a program that will turn the LED off and on by reading the state of a toggle switch. The LED should turn on when the switch is closed and off when the switch is opened.

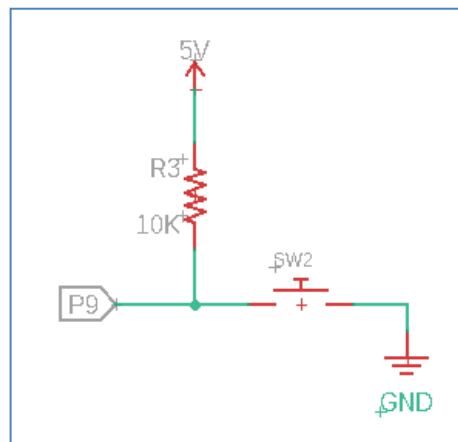9. Next we will replace the switch with a pushbutton. Assemble the circuit in Figure 5 using a pushbutton.

Figure 5: Schematic for the pushbutton

10. Write a program that will turn the LED on and off by reading the state of the pushbutton. It should turn on or off when the button is pressed.

Expected Outcomes:

Each team should complete the activity with the knowledge and skills to do simple digital output and input with the Arduino Mega microcontroller.