ECSE 444: Microprocessors
Lab 3 Addendum: Single ADC Peripheral

This addendum replaces some sections of the original lab instructions for using only a single ADC peripheral. This addendum is required for the B-L4S5I version, but can be applied to the B-L475E version as well.

ADC Configuration

The B-L4S5I version only has a single ADC peripheral, ADC1. The ADC has a number of channels available (under *Mode*); IN1-INX should all be disabled. Enable the Temperature Sensor Channel and the Vrefint Channel.

Under *ADC_Settings*, make note of the options for *Resolution*. Under *ADC_Regular_ConversionMode* > *Number of Conversion*, set this number to *2*. This will tell the ADC that you are using 2 channels, namely the temperature sensor and the Verfint, and it will enable the *Scan Conversion Mode* under *ADC_Settings*. It will also make appear 2 separate *Rank* submenus. For each *ADC_Regular_ConversionMode* > *Rank* you'll find options for *Channel* and *Sampling Time*. Give a rank to each channel enabled and choose a sampling time for each channel that satisfies sampling time guidelines for the sensors and takes the ADC clock frequency into account. The ADC clock frequency can be changed under the Clock Configuration tab.

Note: you can empirically test if your ADC has too short a sampling time. If you increase the sampling time, and the sampled value increases significantly, then you need to give the sensor's output more time to converge.
Now generate your code and load your project in STM32CubeIDE.

Adding the DMA

Due to how scan conversion works, it is actually much easier to get multiple values from the ADC using the DMA. Add a DMA request to the ADC and ensure the correct bitwidth.

Reading the ADC Output

The HAL Driver Manual describes how to make use of the ADC API in Section 7.2. Using the DMA means you will not be polling the ADC, but you will still need to wait for the conversions to finish.

Write code to start conversions approximately every 100 ms. Verify your choice of ADC sampling time and observe the effect of changing ADC resolution.

Scaling the ADC Output

Refer to the original lab instructions.