Analog to Digital in the Atmel Mega 2560
Questions?
Quiz
A2D in the Mega2560

- The mega2560 contains hardware that implements successive approximation
- 16 mega2560 pins can be configured as analog input pins
Mega2560: The Connections

AREF: (for our purposes) connect to +5V
- ADC will measure voltages between 0 and AREF

Connect input analog signal to the appropriate ADC pin
A Code Example: Configuration
(do this once)

```c
// Initialize adc
adc_set_reference(ADC_REF_AREF);       // Use the AREF reference pin
adc_set_adlar(0);                      // For our purposes, always use 0
adc_set_prescalar(ADC_PRESCALAR_128);  // Necessary with 16MHz clock
                                          // and 10 bit resolution

// Turn on ADC Converter
adc_set_enable(ADC_ENABLE);
```
A Code Example: Use

```c
uint16_t val;

// Can do the following an arbitrary number of times

adc_set_channel(ADC_CHANNEL_0);        // ADC0

// Actually start a conversion
adc_start_conversion();

// Could go off and do something else for a while>

val = adc_read(); // Read the analog value
Analog Conversion Notes

- All functions are provided in oulib
- See OUlib documentation for the definition of constants

- Can get to the example code from the Atmel HowTo
  
  www.cs.ou.edu/~fagg/classes/general/atmel
Analog Conversion Notes

• Setting the maximum voltage:

```c
adc_set_reference(ADC_REF_AREF); // Use the AREF reference pin
```

• Can also use a fixed voltage (+2.56V):

```c
adc_set_reference(ADC_REF_2p56V);
```
Analog Conversion Notes

• Determining how fast the conversion requires:

  \texttt{adc\_set\_prescalar(ADC\_PRESCALAR\_128); // Necessary with 16MHz clock}
  \texttt{// and 10 bit resolution}

• Conversion requires:
  \[
  \frac{128 \times 15}{16000000} \text{ seconds}
  \]
  – Can convert faster, but may not get the full 10-bit resolution
Analog Conversion Notes

• Reading out the value:

  val = adc_read();  // Read the analog value

• Blocks until conversion is complete
• Will return a value between 0 and 0x3FF (1023)