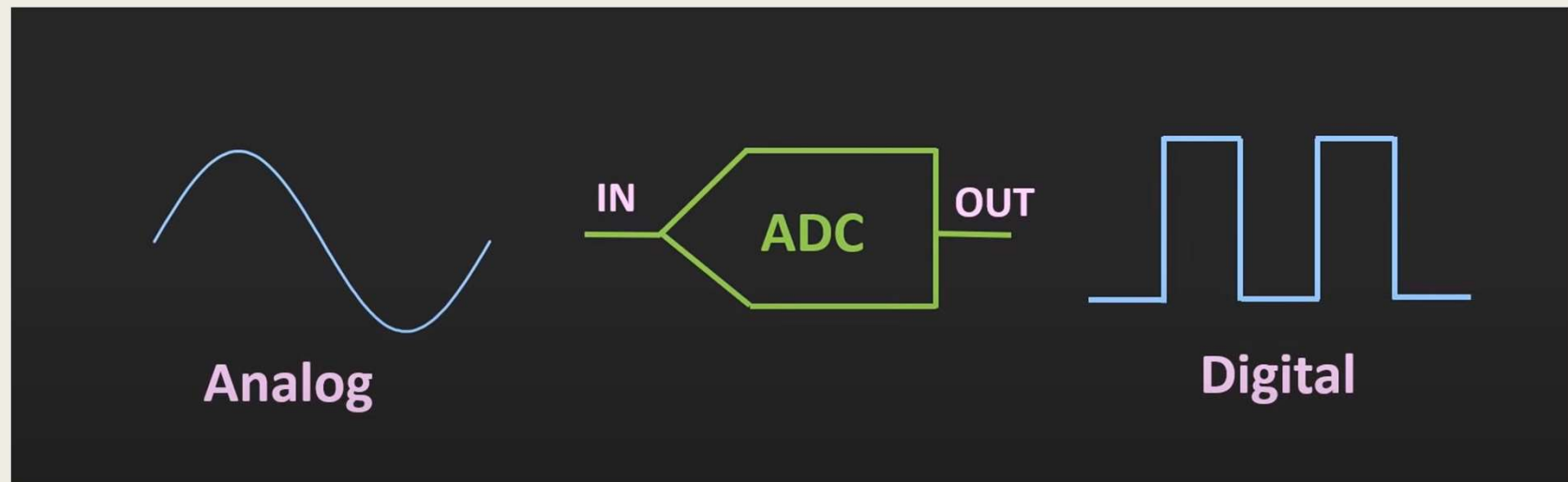


# ADC & DAC

# Analog to Digital Converter

- Analog-to-Digital converter (ADC) is an electronic circuit that converts an analog signal into a digital signal.



# Why we need ADC?

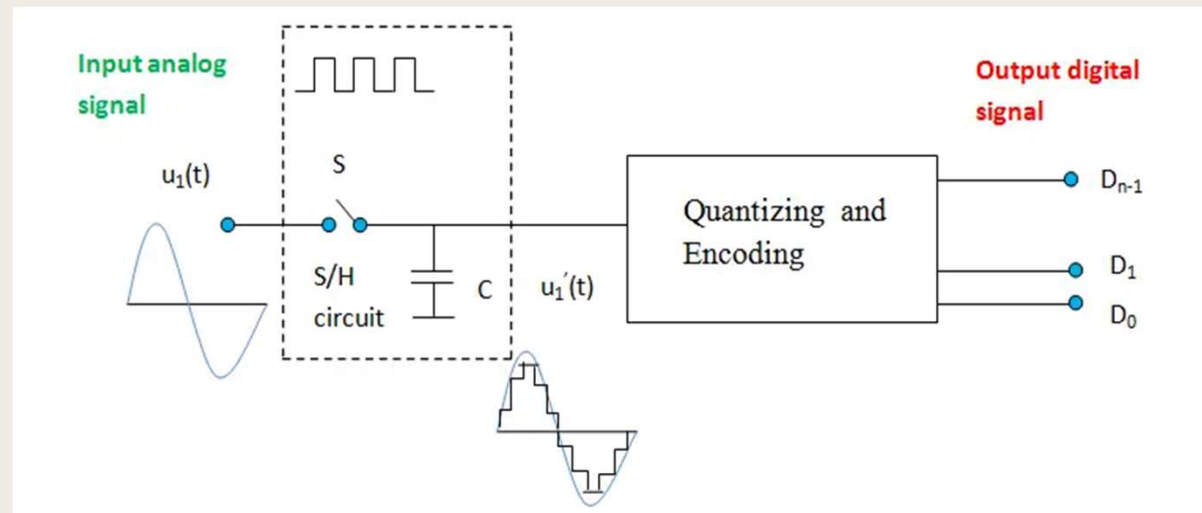
- Real time Signals are analog in nature.
- Controllers understands only digital.

# ADC Process

- There are mainly two steps involves in the process of conversion.

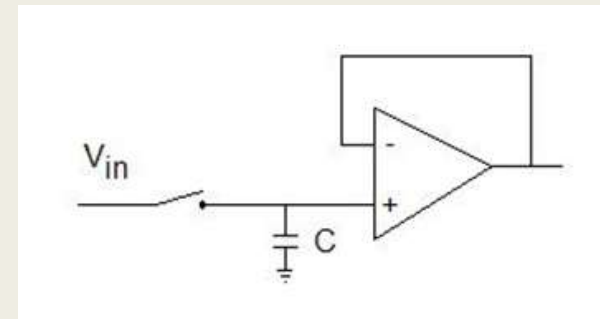
They are

- *Sampling and Holding*
- *Quantizing and Encoding*



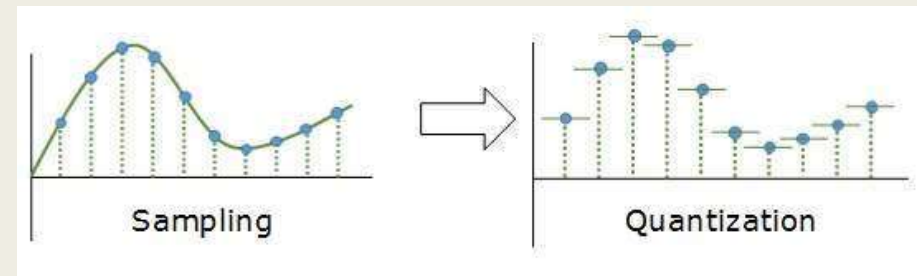
# Sampling and Holding

- Process of converting continuous signal into discrete signal.
- Nyquist Sampling Theorem



# Quantizing and Encoding

- Resolution
- Values =  $2^N$ , Where N is No. of bits
- Step Size =  $\frac{V_{ref}}{2^N}$ , where Vref is Reference Voltage



# STM32 ADC Modes of Operation

- Single Conversion Mode
- Continuous Conversion Mode
- Scan Mode
- Discontinuous Mode

# STM32 ADC Resolution

- One 12-bit analog-to-digital converter is embedded and shares up to 16 external channels.
- Refer Datasheet. (ADC Section)

## **Analog-to-digital converter (ADC)**

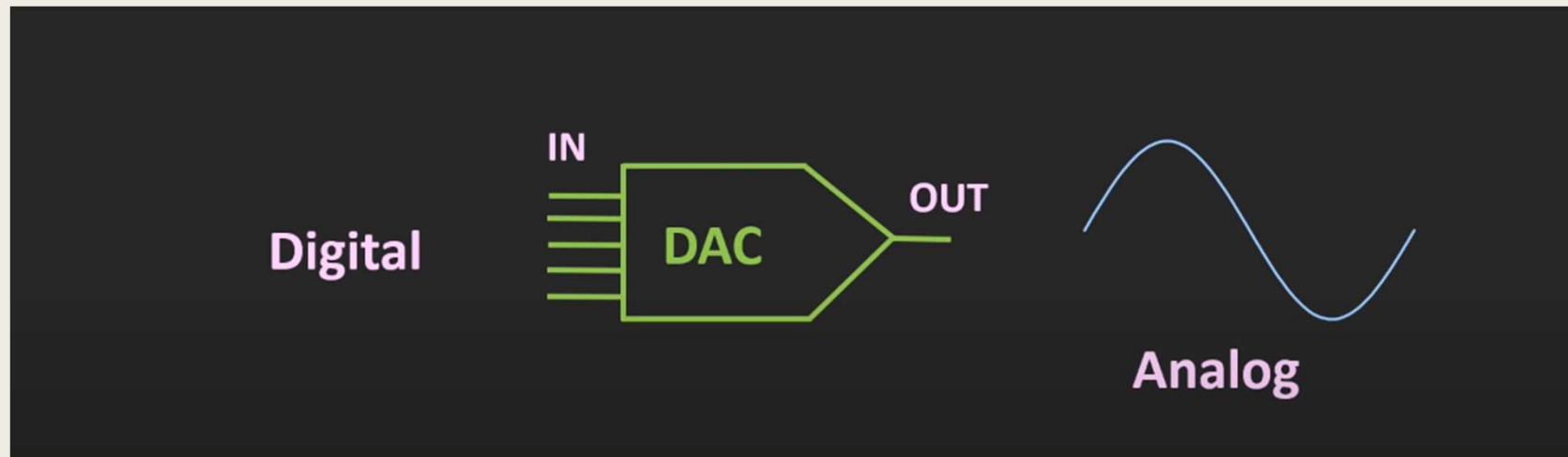
One 12-bit analog-to-digital converter is embedded and shares up to 16 external channels, performing conversions in the single-shot or scan mode. In scan mode, automatic conversion is performed on a selected group of analog inputs.

The ADC can be served by the DMA controller. An analog watchdog feature allows very precise monitoring of the converted voltage of one, some or all selected channels. An interrupt is generated when the converted voltage is outside the programmed thresholds.

To synchronize A/D conversion and timers, the ADCs could be triggered by any of TIM1, TIM2, TIM3, TIM4 or TIM5 timer.



# Digital to Analog Converter



# Why we need DAC?

- To understand the digital data in real world.
- Audio files are stored as digital data in the memory of a computer and to play it back.

# Resolution & Step Size

- Resolution =  $2^n$

- Step size =  $\frac{V_{ref}}{2^n}$

$V_{ref}$  = Reference voltage

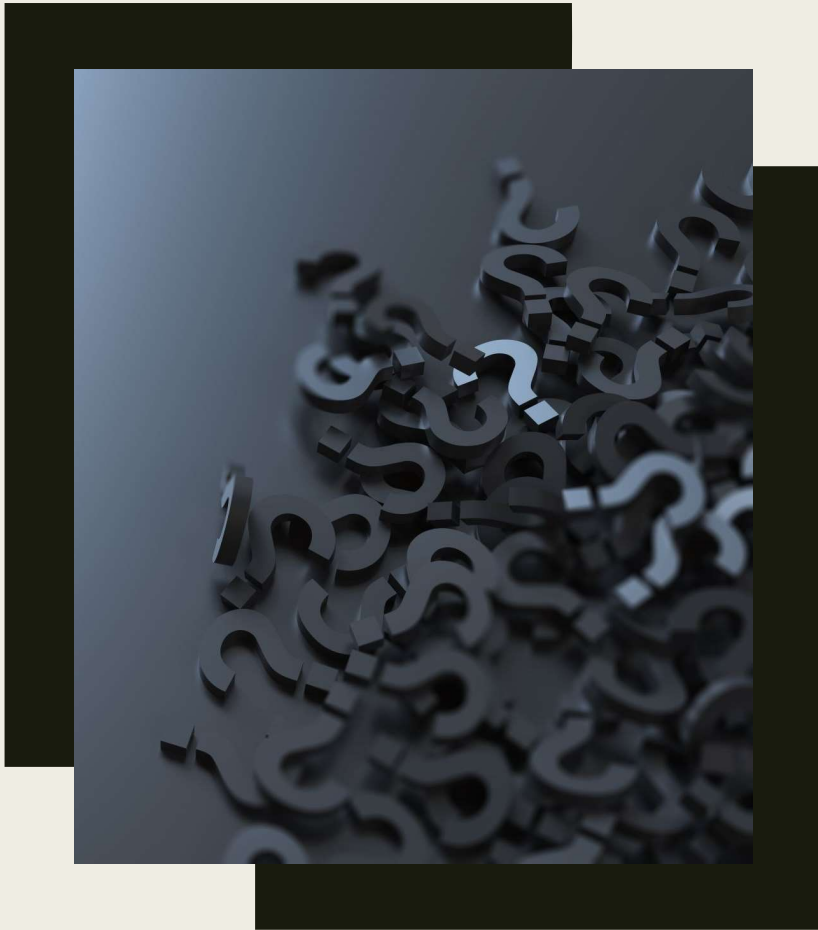
$n$  = number of bits.

# STM32 DAC Modes of Operation

- Normal Mode
- Sample And Hold Mode

# STM32 DAC Resolution

- The STM32 DAC has a resolution of 12-Bit that can be configured to be 8-bit as well.
- Refer Datasheet. (DAC Section)



QUERIES?



THANK YOU