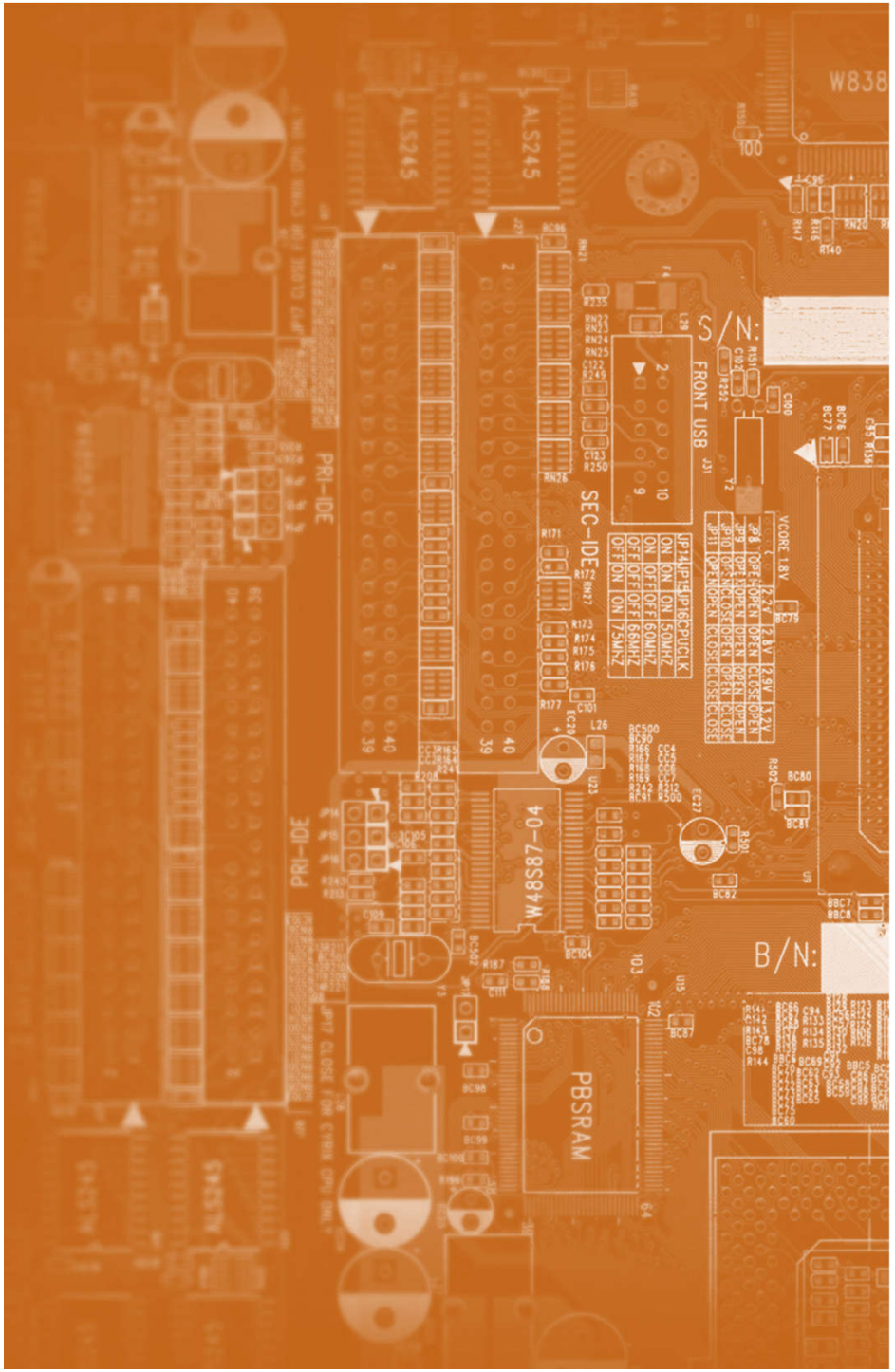

STM32 Microcontrollers Course

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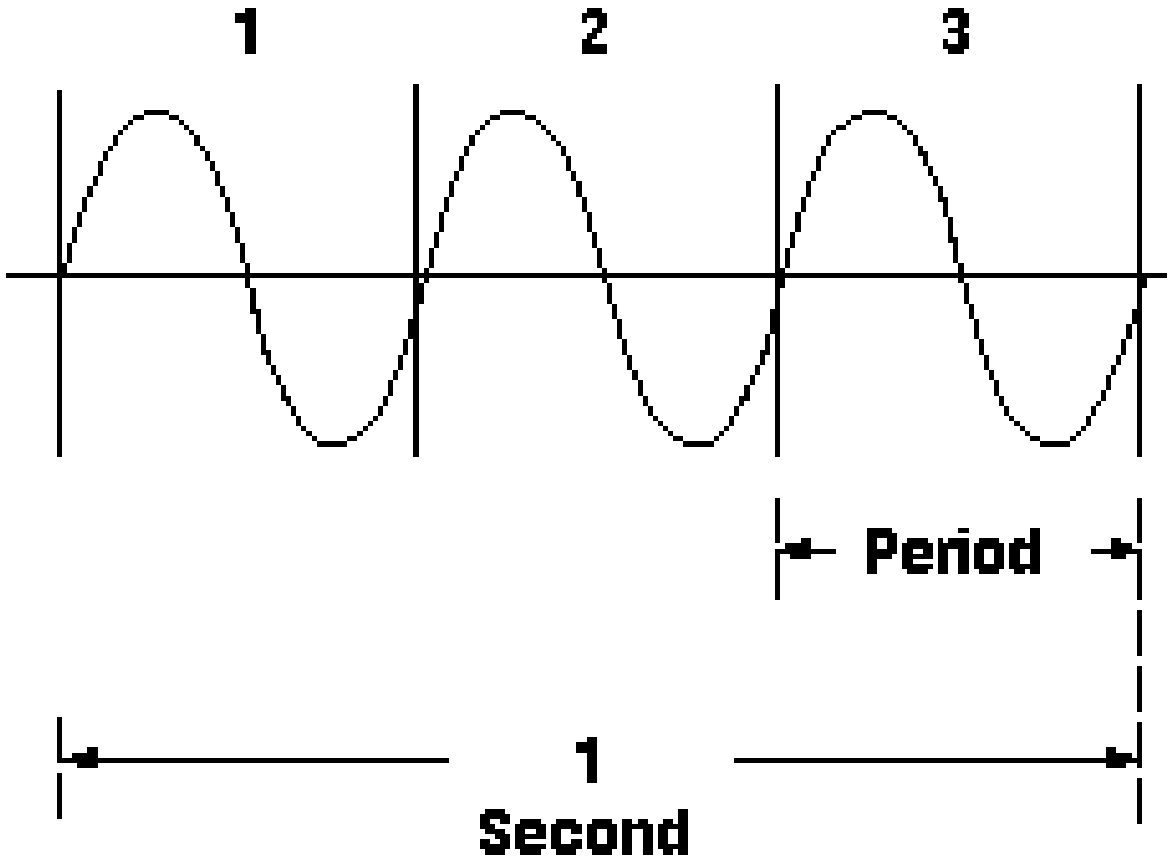
Summer 2016

Clocks and Timers

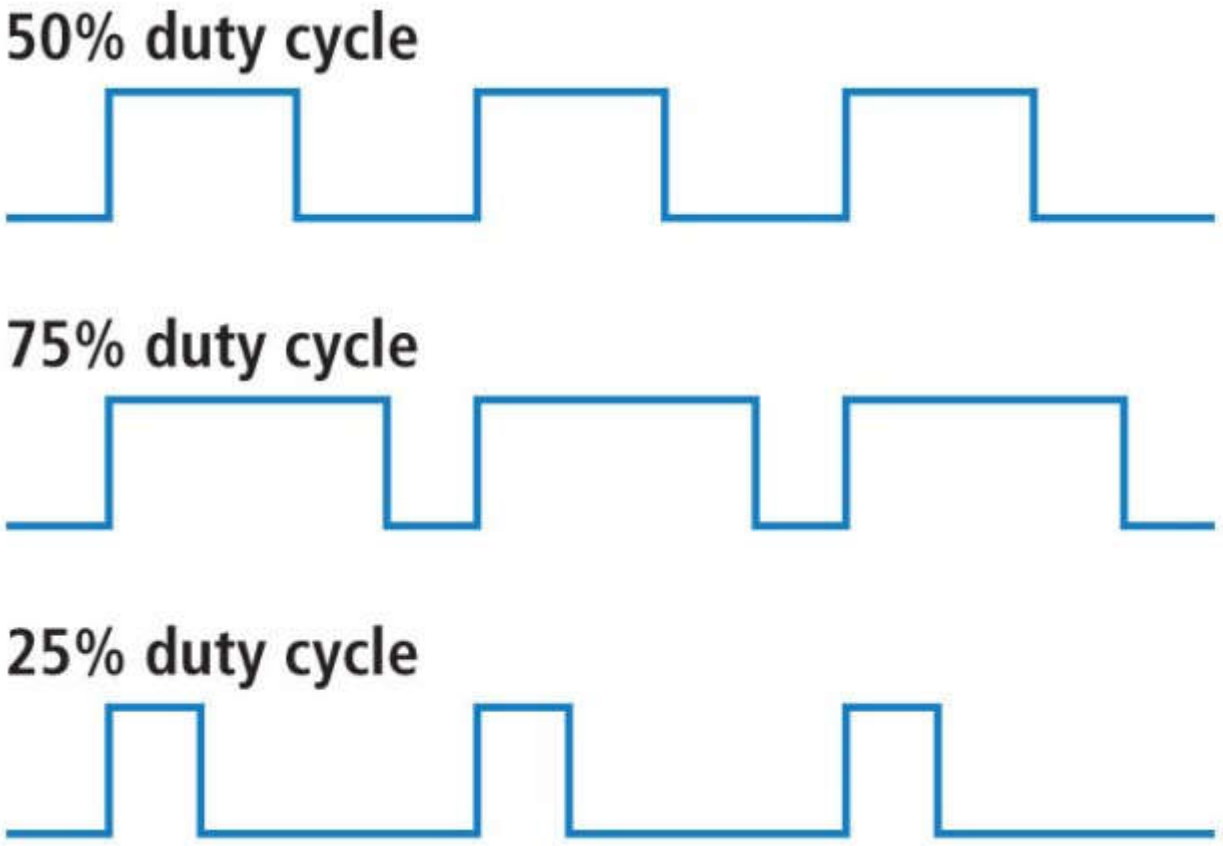
life.augmented

Frequency VS Period



$$\text{Frequency} = \frac{3 \text{ Cycles per Second}}{} = 3 \text{ Hz}$$

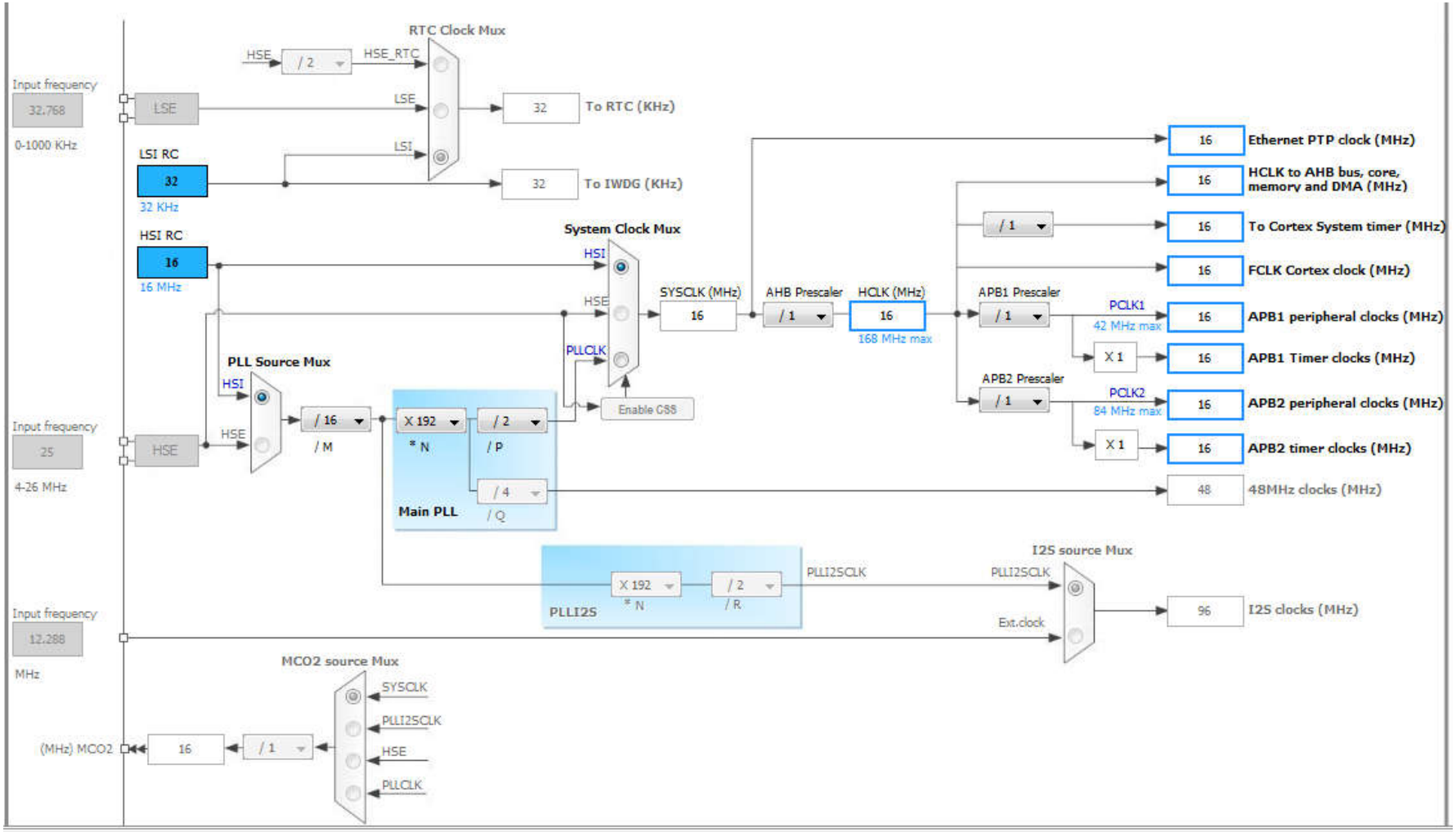
Duty Cycle



Clock Overview

- Clock Generators
  - RC Circuits
  - Crystal Oscillators
- Clock Generators Locations
  - Internal
  - External
- Clock Sources in STM32 Series
  - HSI (High Speed Internal)
  - HSE (High Speed External)
  - LSI : 40khz
  - LSE : 32.768 hz
  - PLL Clock
- **HCLK (Processor Clock)**

Clock Diagram



Clock Specifications

- Each subsystem increase power consumptions
  - Every subsystem can be switched off independently to optimize power consumption
- APB (High-Performance Bus)
  - APB1 has lower speed
    - In STM32F1xxx maximum speed is 36MHZ
  - APB2 has higher speed
    - IN STM32F1xxx Maximum speed is 72MHZ

Advanced High-Performance Buses

- APB
  - SDIO
  - FSMC
  - CRCE
  - FLTIF
  - SRAM
  - DMA2
  - DMA1

Advanced High-Performance Buses

- APB1
  - DAC
  - Power System
  - Backup Systems
  - CAN
  - USB Controller
  - I2Cs : I2C1,I2C2
  - UARTs : UART2,UART3,UART4,UART5
  - Watchdog
  - Timers : TIM2,TIM3,TIM4,TIM5,TIM6,TIM7,TIM12,TIM13,TIM14

Advanced High-Performance Buses

- APB2
  - Timers : TIM1,TIM8,TIM9,TIM10,TIM11
  - GPIOs
  - ADC1
  - ADC2
  - ADC3
  - USART1
  - SPI1

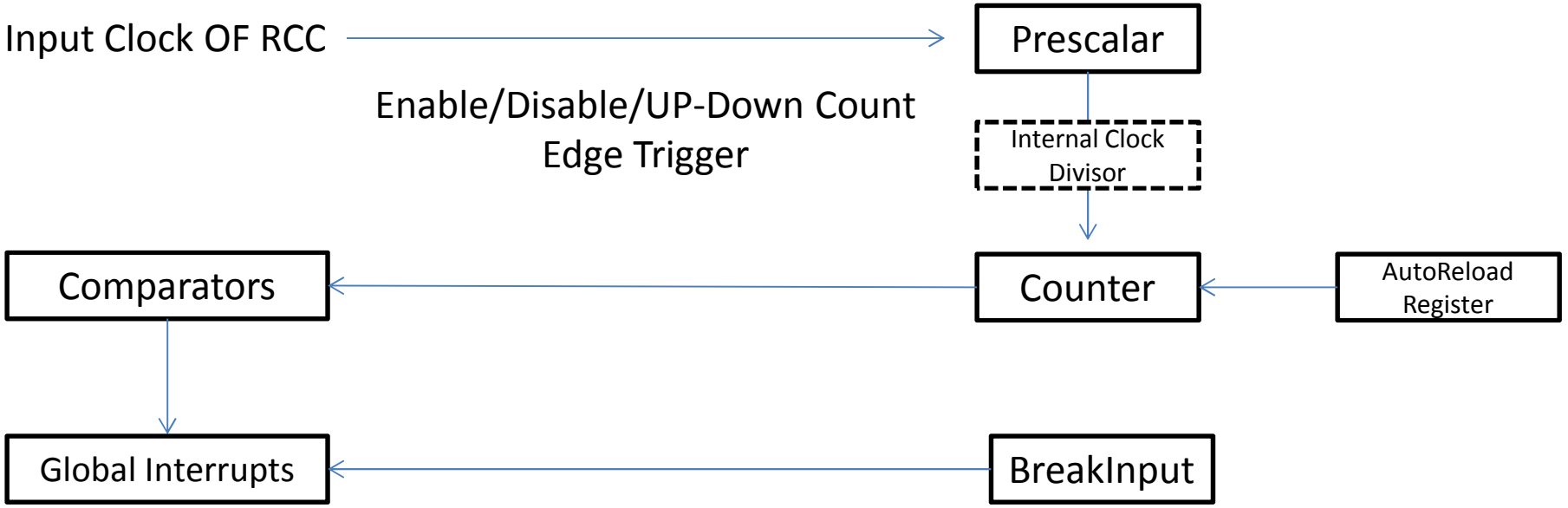
Processor Clock

- HCLK
  - Cortex System Timer (SysTick)
  - FCLK (Free Running Clock)

Timers

- Input Capture (measuring length of input signal)
- Generating Wave Forms (PWM)
- From MicroSeconds to MilliSeconds
- Configurable Period and Frequency

Basic Timers



Project

- Make a LED Toggling using a Basic Timer which Toggle every 1 Second

PWM

- Next Session