

STM32 Microcontroller Peripherals - Preliminary Framework

1. Core Peripherals

- **Cortex-M4 Core**
 - NVIC (Nested Vectored Interrupt Controller)
 - SYSTICK Timer
 - SCB (System Control Block)
 - FPU (Floating Point Unit)
 - MPU (Memory Protection Unit)

2. Clock and Reset

- **RCC (Reset and Clock Control)**
 - HSE (High-Speed External)
 - HSI (High-Speed Internal)
 - LSE (Low-Speed External)
 - LSI (Low-Speed Internal)
 - PLL (Phase-Locked Loop)
 - AHB/APB Bus Clocks

3. Memory

- **Flash Memory**
 - Flash Interface
 - Option Bytes
 - Write/Erase Operations
- SRAM (Static Random-Access Memory)
- EEPROM (Electrically Erasable Programmable Read-Only Memory)

4. GPIO (General Purpose Input/Output)

- **Pin Configurations**
 - Input Mode
 - Output Mode
 - Alternate Function
 - Analog Mode
- **GPIO Registers**
 - MODER (Mode Register)
 - OTYPER (Output Type Register)
 - OSPEEDR (Output Speed Register)
 - PUPDR (Pull-Up/Pull-Down Register)

5. Timers and Counters

- **General Purpose Timers**
 - TIMx (e.g., TIM1, TIM2, etc.)
 - Input Capture/Output Compare
 - PWM (Pulse Width Modulation)
- **Advanced Control Timers**
 - TIM1, TIM8
- **Basic Timers**
 - TIM6, TIM7

6. Communication Interfaces

- USART/UART (Universal Synchronous/Asynchronous Receiver/Transmitter)
- SPI (Serial Peripheral Interface)
- I2C (Inter-Integrated Circuit)
- CAN (Controller Area Network)
- USB (Universal Serial Bus)
- Ethernet (if applicable)

7. Analog Peripherals

- **ADC (Analog-to-Digital Converter)**
 - Regular/Injected Channels
 - DMA Configuration
- DAC (Digital-to-Analog Converter)
- Comparators
- Op-Amps

8. Power Management

- **PWR (Power Control)**
 - Low Power Modes (Sleep, Stop, Standby)
 - Voltage Regulators
 - Battery Backup Domain

9. Interrupts and Exceptions

- Interrupt Vector Table
- Exception Handling
- External Interrupts (EXTI)
- Priority Grouping

10. DMA (Direct Memory Access)

- **DMA Channels**
 - Memory-to-Memory Transfers
 - Peripheral-to-Memory Transfers
 - Circular Mode
- **DMA Controller**
 - Stream/Channel Configuration
 - Transfer Complete/Interrupts

11. Security and Protection

- Watchdog Timers
 - Independent Watchdog (IWDG)
 - Window Watchdog (WWDG)
- CRC (Cyclic Redundancy Check)
- Encryption/Decryption Hardware
- Firewall Protection

12. Debugging and Programming

- SWD (Serial Wire Debug)
- JTAG Interface
- ITM (Instrumentation Trace Macrocell)
- DWT (Data Watchpoint and Trace Unit)

13. Miscellaneous Peripherals

- RTC (Real-Time Clock)
- Backup Registers
- WWDG (Window Watchdog)
- IWDG (Independent Watchdog)

Start-Up Code Initialization Checklist

1. Stack Pointer Initialization
2. Relocation of Vector Table
3. Initialization of Global/Static Variables
4. Memory Remapping (if required)
5. Configuration of System Clock

6. Initialization of Peripherals (GPIO, Clocks, etc.)
7. Enabling Interrupts and Fault Handlers
8. Calling Main Function