CM3 Stack operations

- CM3 supports only Full Descending stack.
- Initialization of SP (MSP) is at the end of RAM. (check slot0 of vector table).
- Stack instructions:
    - push --> STMFD --> STMDB
    - pop --> LDMFD --> LDMIA
- The stack is used during exception/interrupt. Also functions can use stack for storing values of registers.

ARM Function

- Syntax:

```
func:
    ...
    ...
    mov pc, lr
```

- ARM follows AAPCS calling convention.
- AAPCS: ARM Archietcture Procedure Call Standard
    - Arguments to function are passed via r0, r1, r2, r3.
    - The function return value is available in r0.
    - If arguments are more than 4, they should be pushed on the stack.
    - The called function is free to modify r0, r1, r2, r3 and r12. If calling function have to use these registers, it must store them (on the stack) before any function call and restore them back after the function call.
    - The called function should not modify r4 to r11. If called function have to use these registers, it must store them (on the stack) when function begin and restore them back before function return.
- When a function is called, the return address is saved in LR. If function is doing nested function call, it must store LR on stack and restore it back.

AVR

- AVR is microcontroller archietcture developed in ATMEL.
- Design by Alf & Vegard and named as "Alf Vegard RISC". Later on it is named as "Advanced Virtual RISC".
- According to Atmel "AVR" is name of product.
- AVR microcontrollers:
    - Classic family: AT90XXX
    - Tiny family: ATTinyXX
    - Mega family: ATMegaXX
    - X-Mega family: Extended Mega family
    - Specialized: CAN, USB, ...

    - AVR32: 32-bit AVR

- AVR microcontroller = AVR core + Flash + SRAM + Interrupt controller + Peripherals + EEPROM (optional)

AVR core

- 8-bit ALU
- General purpose registers: r0-r31 (8-bits)
    - r0-r25: General purpose
    - r26-r31 can also be used as address registers in pairs.
        - r26-r27 -- X
        - r28-r29 -- Y
        - r30-r31 -- Z
- SREG: Status Register
    - N, Z, C, V, S, H, I, T
- PC: 16-bit program counter (for flash upto 64K locations)
- SP(SPH+SPL): 16-bit stack pointer (In IO address space)