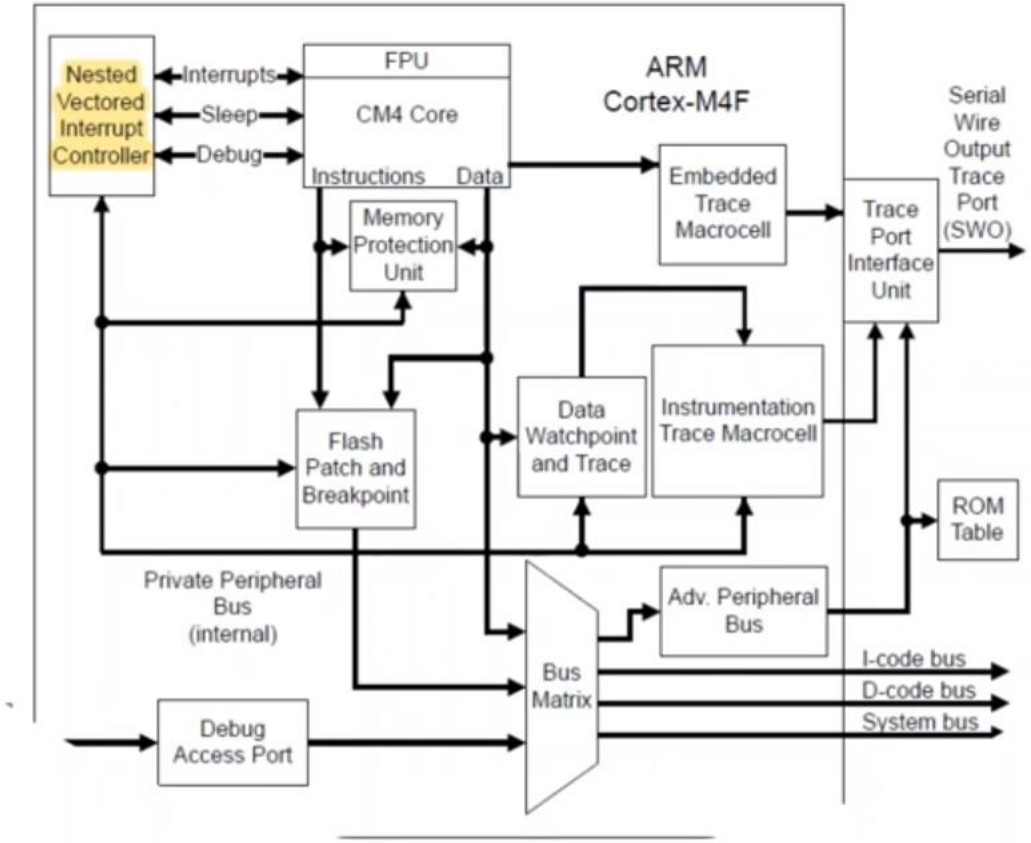
NVIC : NESTED VECTOR INTERRUPTS CONTROLLER

MUHAMMAD ELZEINY

FEATURES

- 78 interrupts.
- A programmable priority level of 0-7 for e interrupt.
- Low-latency exception and interrupt handling.
- Level and pulse detection of interrupt signals.
- Grouping of priority values into group priority and sub-priority fields.
- Interrupt tail-chaining and late arriving mechanism.
- An external Non-maskable interrupt (NMI).



PRIORITY GROUPING

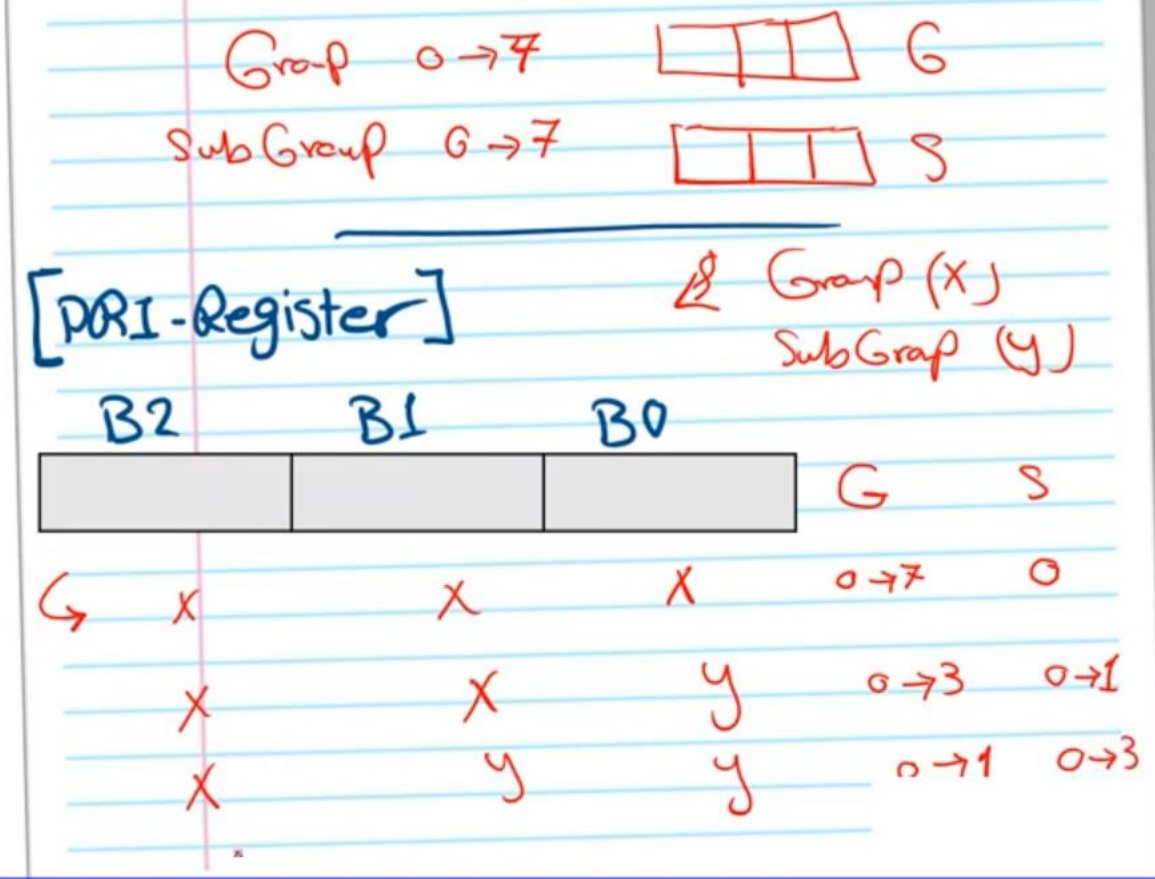
- The NVIC can assign each interrupt to Group and sub-group
- If the pending\active interrupts have different Group priority → The higher will serve\preempt first.
- If the pending interrupts have different sub-Group priority → the higher one will be served first (but can't preempt the active one)
- If the pending interrupts have the same Group and sub-group priority → the first ordered in vector table will be served first (but can't preempt the active one)

Interrupt	Group	Sub-Group
Int0	0	0
Int1	1	0
Int2	0	0
Int3	0	1

PRIORITY GROUPING

- The NVIC can assign each interrupt to Group and sub-group
- If the pending\active interrupts have different Group priority → The higher will serve\preempt first.
- If the pending interrupts have different sub-Group priority → the higher one will be served first (but can't preempt the active one)
- If the pending interrupts have the same Group and sub-group priority → the first ordered in vector table will be served first (but can't preempt the active one)

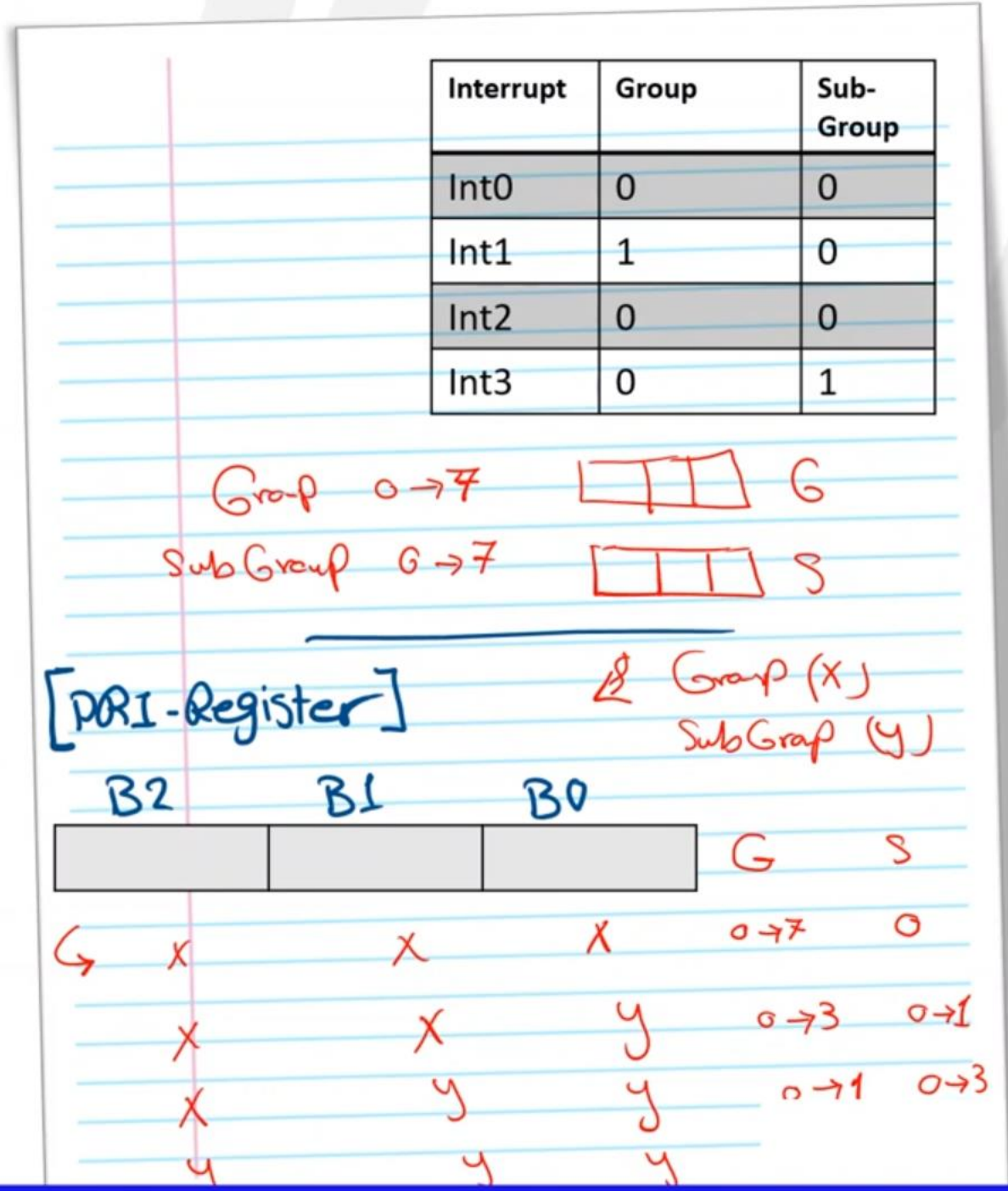
Interrupt	Group	Sub-Group
Int0	0	0
Int1	1	0
Int2	0	0
Int3	0	1



PRIORITY GROUPING

- The NVIC can assign each interrupt to Group and sub-group
- If the pending\active interrupts have different Group priority → The higher will serve\preempt first.
- If the pending interrupts have different sub-Group priority → the higher one will be served first (but can't preempt the active one)
- If the pending interrupts have the same Group and sub-group priority → the first ordered in vector table will be served first (but can't preempt the active one)

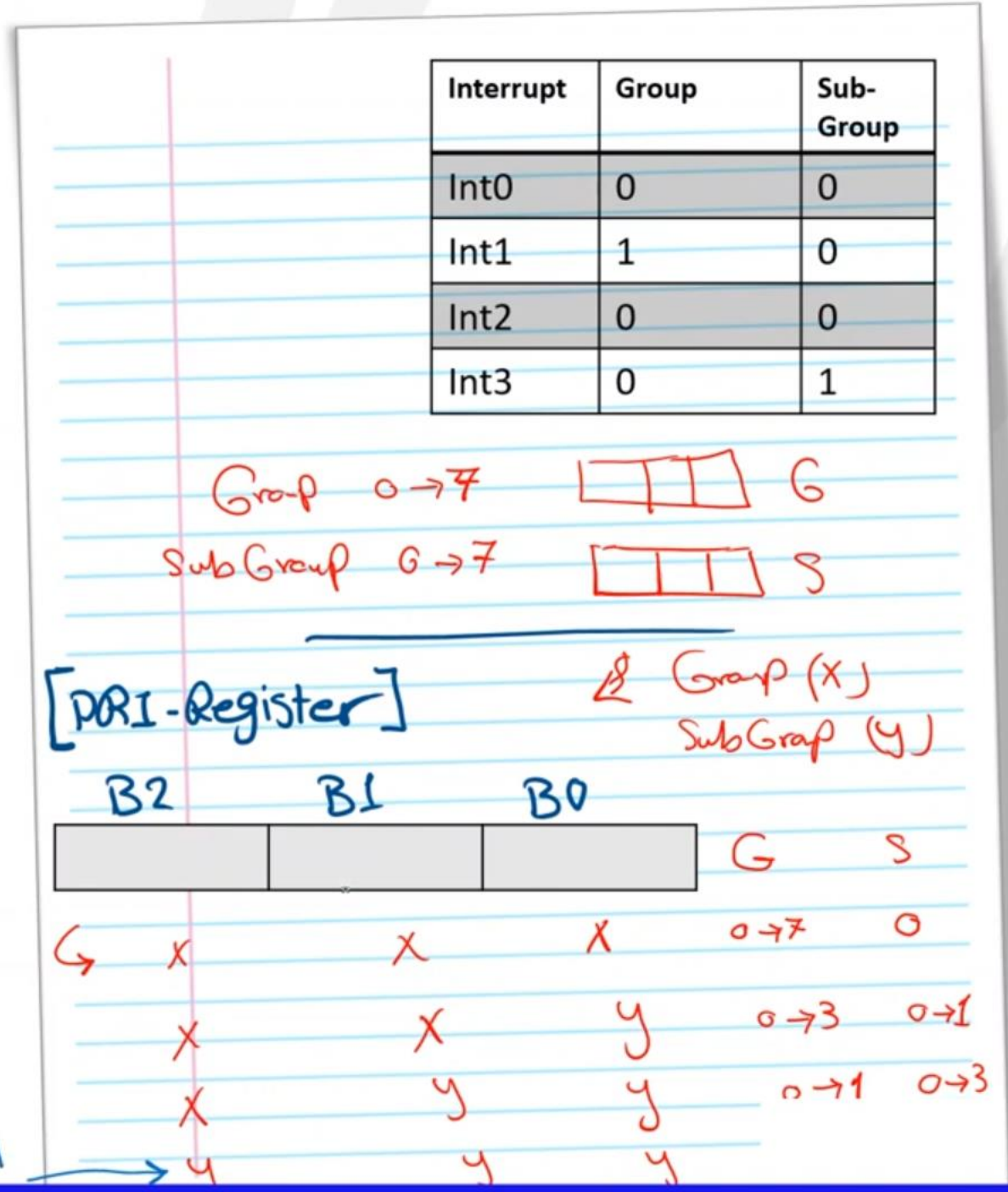
Interrupt	Group	Sub-Group
Int0	0	0
Int1	1	0
Int2	0	0
Int3	0	1



PRIORITY GROUPING

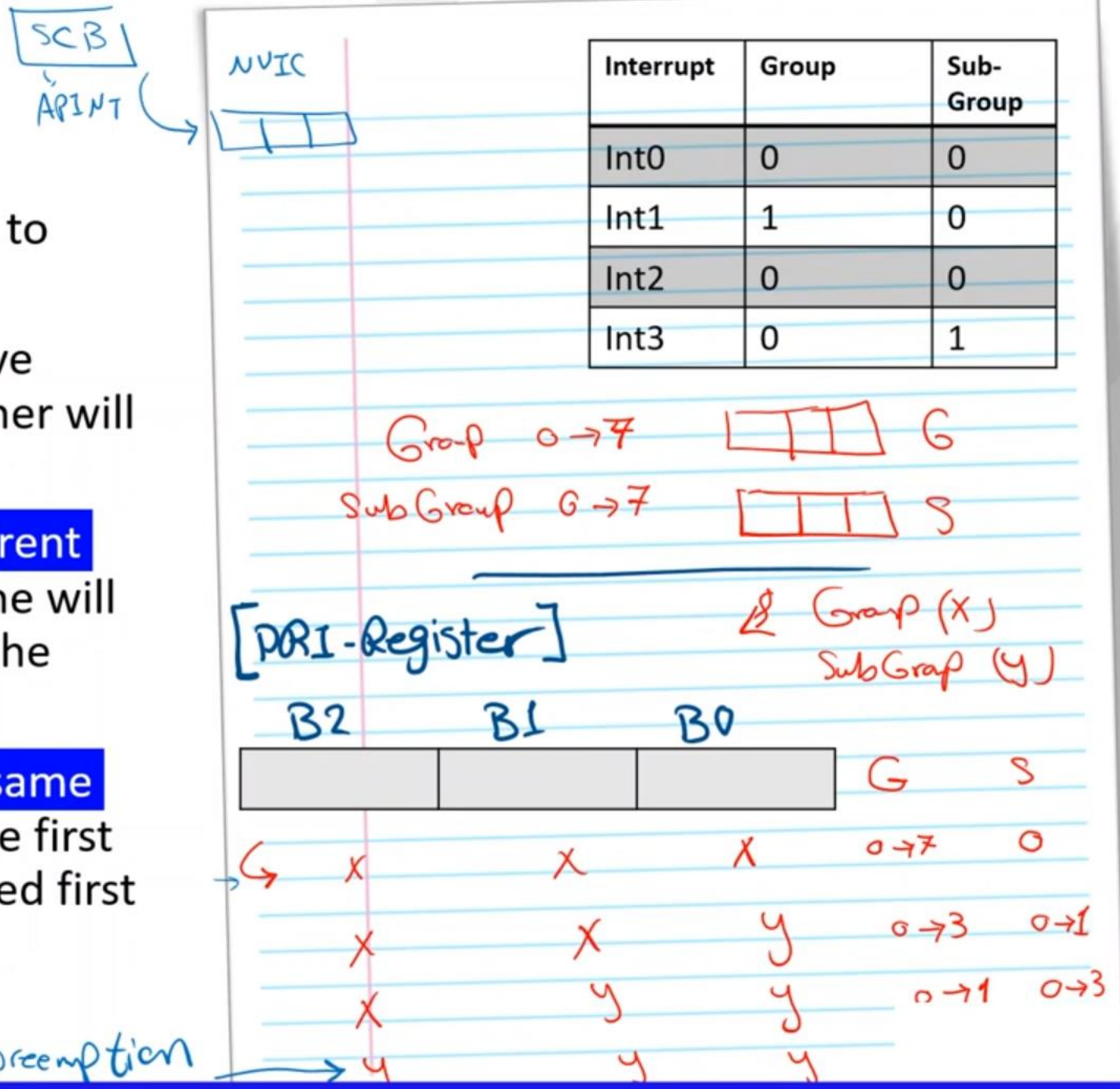
- The NVIC can assign each interrupt to Group and sub-group
- If the pending\active interrupts have different Group priority → The higher will serve\preempt first.
- If the pending interrupts have different sub-Group priority → the higher one will be served first (but can't preempt the active one)
- If the pending interrupts have the same Group and sub-group priority → the first ordered in vector table will be served first (but can't preempt the active one)

Interrupt	Group	Sub-Group
Int0	0	0
Int1	1	0
Int2	0	0
Int3	0	1



PRIORITY GROUPING

- The NVIC can assign each interrupt to Group and sub-group
- If the pending\active interrupts have different Group priority → The higher will serve\preempt first.
- If the pending interrupts have different sub-Group priority → the higher one will be served first (but can't preempt the active one)
- If the pending interrupts have the same Group and sub-group priority → the first ordered in vector table will be served first (but can't preempt the active one)



REGISTERS DESCRIPTIONS

Objective	Register Name	Module
Enable\Disable All Interrupts	PRIMSK	Core
Enable\Disable All Exceptions (Except NMI)	FAULTMSK	Core
Define the minimum priority for exception processing.	BASEPRI	Core
Trigger System-Interrupts \Faults by SW	INTCTRL	SCB
Trigger any Interrupt by SW	SWTRIG	NVIC
Enable\Disable NVIC gate for each Interrupt.	ENx	NVIC
Enable\Disable SCB gate for each System-Interrupts \ Faults.	SYSHNDCTRL	SCB
Configure Priority for Interrupts	PRIx	NVIC
Configure Priority for System-Interrupts \ Faults.	SYSPRIx	SCB
Indicate the cause of faults	FAULTSTAT \ HFAULTSTAT	SCB
Priority grouping control	APINT	SCB
Indicate the offset of the vector table base address	VTABLE	SCB
The Current Active Exception	PSR	Core

REGISTERS DESCRIPTIONS

Objective	Register Name	Module
Enable\Disable All Interrupts	PRIMSK	Core
Enable\Disable All Exceptions (Except NMI)	FAULTMSK	Core
Define the minimum priority for exception processing.	BASEPRI	Core
Trigger System-Interrupts \Faults by SW	INTCTRL	SCB
Trigger any Interrupt by SW	SWTRIG	NVIC
Enable\Disable NVIC gate for each Interrupt.	ENx	NVIC
Enable\Disable SCB gate for each System-Interrupts \ Faults.	SYSHNDCTRL	SCB
Configure Priority for Interrupts	PRIx	NVIC
Configure Priority for System-Interrupts \ Faults.	SYSPRIx	SCB
Indicate the cause of faults	FAULTSTAT \ HFAULTSTAT	SCB
Priority grouping control	APINT	SCB
Indicate the offset of the vector table base address	VTABLE	SCB
The Current Active Exception	PSR	Core

Interrupt Enabling Gates

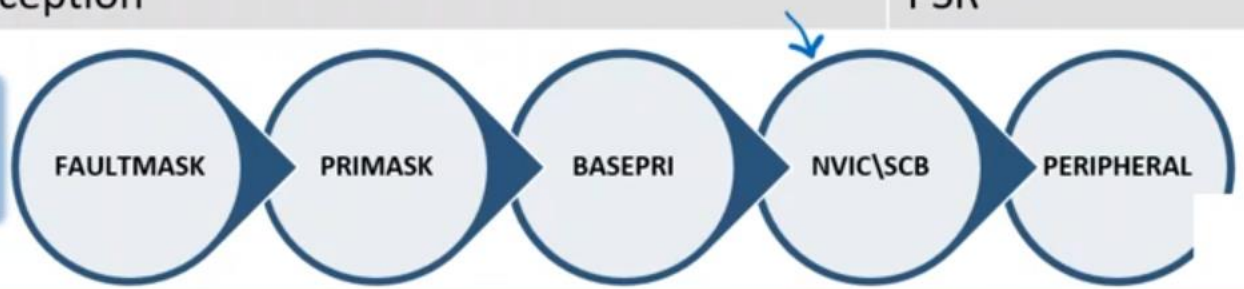
REGISTERS DESCRIPTIONS

Objective	Register Name	Module
Enable\Disable All Interrupts	PRIMSK	Core
Enable\Disable All Exceptions (Except NMI)	FAULTMSK	Core
Define the minimum priority for exception processing.	BASEPRI	Core
Trigger System-Interrupts \Faults by SW	INTCTRL	SCB
Trigger any Interrupt by SW	SWTRIG	NVIC
Enable\Disable NVIC gate for each Interrupt.	ENx	NVIC
Enable\Disable SCB gate for each System-Interrupts \ Faults.	SYSHNDCTRL	SCB
Configure Priority for Interrupts	PRIx	NVIC
Configure Priority for System-Interrupts \ Faults.	SYSPRIx	SCB
Indicate the cause of faults	FAULTSTAT \ HFAULTSTAT	SCB
Priority grouping control	APINT	SCB
Indicate the offset of the vector table base address	VTABLE	SCB
The Current Active Exception	PSR	Core

NVIC → IRQ

SCB → System Interrupts

Interrupt Enabling Gates



#TASK – INTCTRL DRIVER

API: Types

- IntCtrl_InterruptType

API: Functions

- void IntCtrl_init(void)

Configuration

- InterruptPeripheralGates
- InterruptGroup Priority
- InterruptSub-Group Priority

#TASK – INTCTRL DRIVER

API: Types

- IntCtrl_InterruptType

API: Functions

- void IntCtrl_init(void)

Configuration

- InterruptPeripheralGates
- InterruptGroup Priority
- InterruptSub-Group Priority

Dynamic Code (Configuration)

- IntCtrl_Cfg.h
- IntCtrl_Lcfg.c

Static Code

- IntCtrl.c
- IntCtrl.h
- IntCtrl_Types.h

#TASK – INTCTRL DRIVER

API: Types

- IntCtrl_InterruptType

API: Functions

- void IntCtrl_init(void)

Configuration

- InterruptPeripheralGates
- InterruptGroup Priority
- InterruptSub-Group Priority

Dynamic Code (Configuration)

- IntCtrl_Cfg.h
- IntCtrl_Lcfg.c

Static Code

- IntCtrl.c
- IntCtrl.h
- IntCtrl_Types.h