Chap-6
Flow Control Instructions
Part-1
Jump Instructions

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Outline

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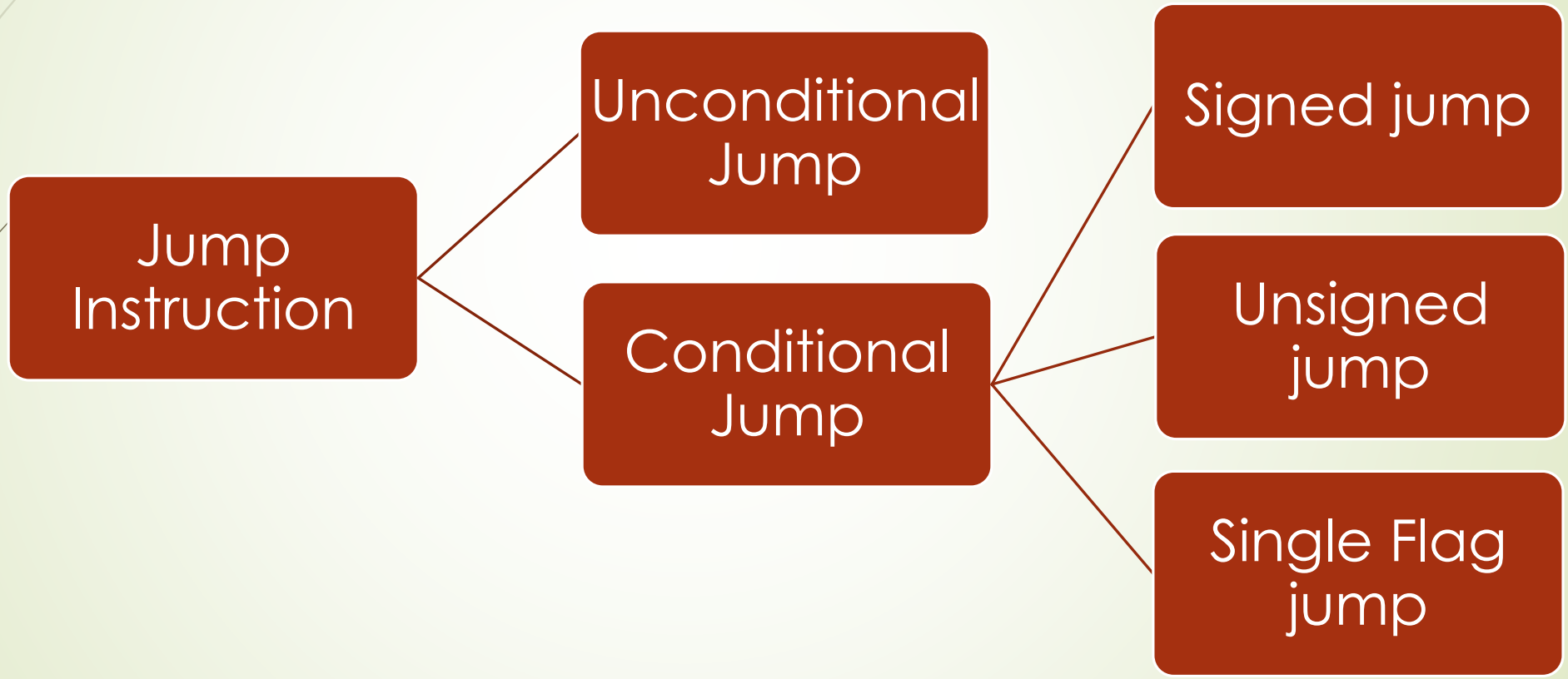
Jump Instructions

- For assembly language programs to carry out useful tasks, there must be a way to make decisions and repeat sections of code.
- Jump Instructions can help in this regard.
- The jump and loop instructions transfer control to another part of the program.
- To control the general flow of the instructions, jump instructions are used.

Types of Jump Instructions



Unconditional Jump

- The ***JMP*** instruction causes an unconditional transfer of control.
- As the name suggests, no condition is needed to jump to the mentioned destination label.
- Syntax: **JMP destination_label**

- Here, the destination is usually a label in the same segment as the JMP itself.
- Example:

```
MOV AX, 5
MOV BX, 3
JMP L1
MOV BX, 1
L1: MOV BX, 4
```

What will be the final value in AX and BX registers?

Conditional Jumps

- The syntax of conditional jump is:

Jxxx destination_label

- If the condition for the jump is ***true***, the next instruction to be executed is the one at ***destination_label***, which may precede or follow the jump instructions itself.
- If the condition is ***false***, the instruction immediately following the jump is done next.
- Range of a Conditional Jump:
  - The structure of the machine code of a conditional jump requires that destination_label must precede the jump instruction by no more that 126 bytes, or follow it by no more than 127 bytes.

Conditional Jump Example

```
Instruction 1          ; general instruction
Instruction 2          ; general instruction
Instruction 3          ; general instruction
……                     ; general instructions continues
……                     ; general instructions continues
CMP AX, BX             ; Compare instruction
Jxxx L1                ; Conditional Jump
Instruction 7
Instruction 8
L1: MOV AX, 0
……
……
……..
```

If the condition is false, it will jump to the next line.

If condition is true, it will jump to "L1: MOV Ax, 0"

How CPU implements a Conditional Jump

- To implement a conditional jump, the CPU looks at the Flag registers.
- You already know that flag register reflects the result of the last thing the processor did. (In chapter 5)

- If the conditions for the jump (expressed as a combination of status flag settings) are true; the CPU adjusts the IP to point to the destination label, so that the instruction at this label will be done next.
- If the jump condition is false, then IP is not altered; this means the next instruction in line will be done.

Types of Conditional Jumps

- There are three category:
  - ***Signed Jumps:***
    - Used when a signed interpretation is being given to results
  - ***Unsigned Jumps:***
    - Used for an unsigned interpretation
  - ***Single-Flag Jumps:***
    - Operates on settings of individual flags.

Note: Jump instructions does not effects on flags.

Signed Jumps

Signed Jumps

Symbol	***Description***	***Condition for Jumps***
JG/JNLE	jump if greater than jump if not less than or equal to	ZF = 0 and SF = OF
JGE/JNL	jump if greater than or equal to jump if not less than or equal to	SF = OF
JL/JNGE	jump if less than jump if not greater than or equal	SF <> OF
JLE/JNG	jump if less than or equal jump if not greater than	ZF = 1 or SF <> OF

Unsigned Jumps

Unsigned Conditional Jumps

Symbol	*Description*	*Condition for Jumps*
JA/JNBE	jump if above	CF = 0 and ZF = 0
	jump if not below or equal	
JAE/JNB	jump if above or equal	CF = 0
	jump if not below	
JB/JNAE	jump if below	CF = 1
	jump if not above or equal	
JBE/JNA	jump if equal	CF = 1 or ZF = 1
	jump if not above	

Single-Flag Jumps

Single-Flag Jumps

Symbol	*Description*	*Condition for Jumps*
JE/JZ	jump if equal	ZF = 1
	jump if equal to zero	
JNE/JNZ	jump if not equal	ZF = 0
	jump if not zero	
JC	jump if carry	CF = 1
JNC	jump if no carry	CF = 0
JO	jump if overflow	OF = 1
JNO	jump if no overflow	OF = 0
JS	jump if sign negative	SF = 1
JNS	jump if nonnegative sign	SF = 0
JP/JPE	jump if parity even	PF = 1
JNP/JPO	jump if parity odd	PF = 0

Conditional Jump Examples

Example 6.1 Suppose AX and BX contain signed numbers. Write some code to put the biggest one in CX.

Solution:

```
        MOV   CX,AX          ;put AX in CX
        CMP   BX,CX          ;is BX bigger?
        JLE   NEXT           ;no, go on
        MOV   CX,BX          ;yes, put BX in CX
NEXT:
```

Thank You