Introduction to 8086 Assembly

Lecture 2

80x86 architecture, registers and basic assembly

Intel 8086 microprocessor

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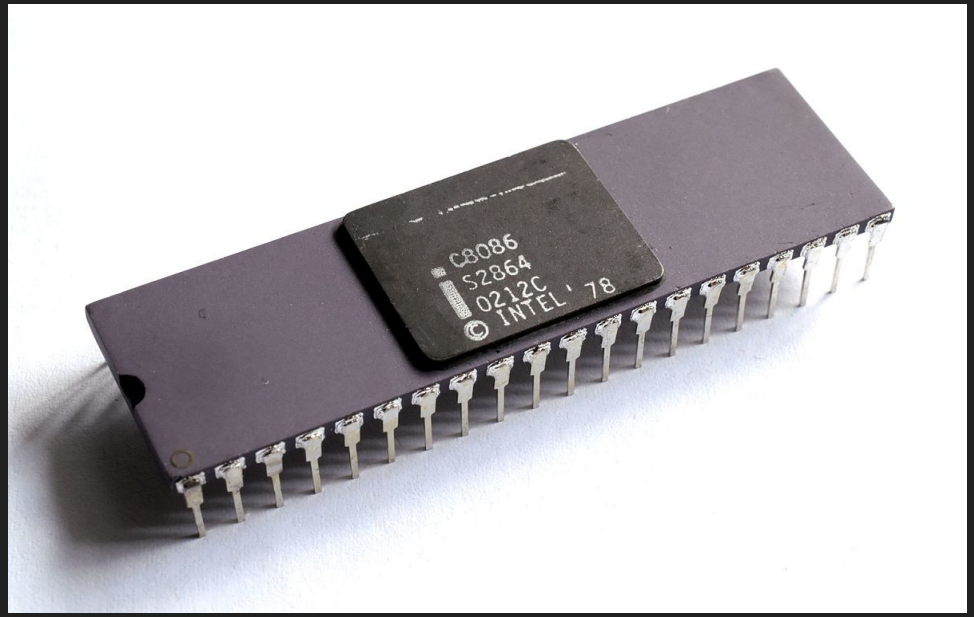
- released in 1978
- **16 bit**
- the **x86** family



https://en.wikipediB.org/wiki/Intel_8086

CPU, Memory, instructions and data

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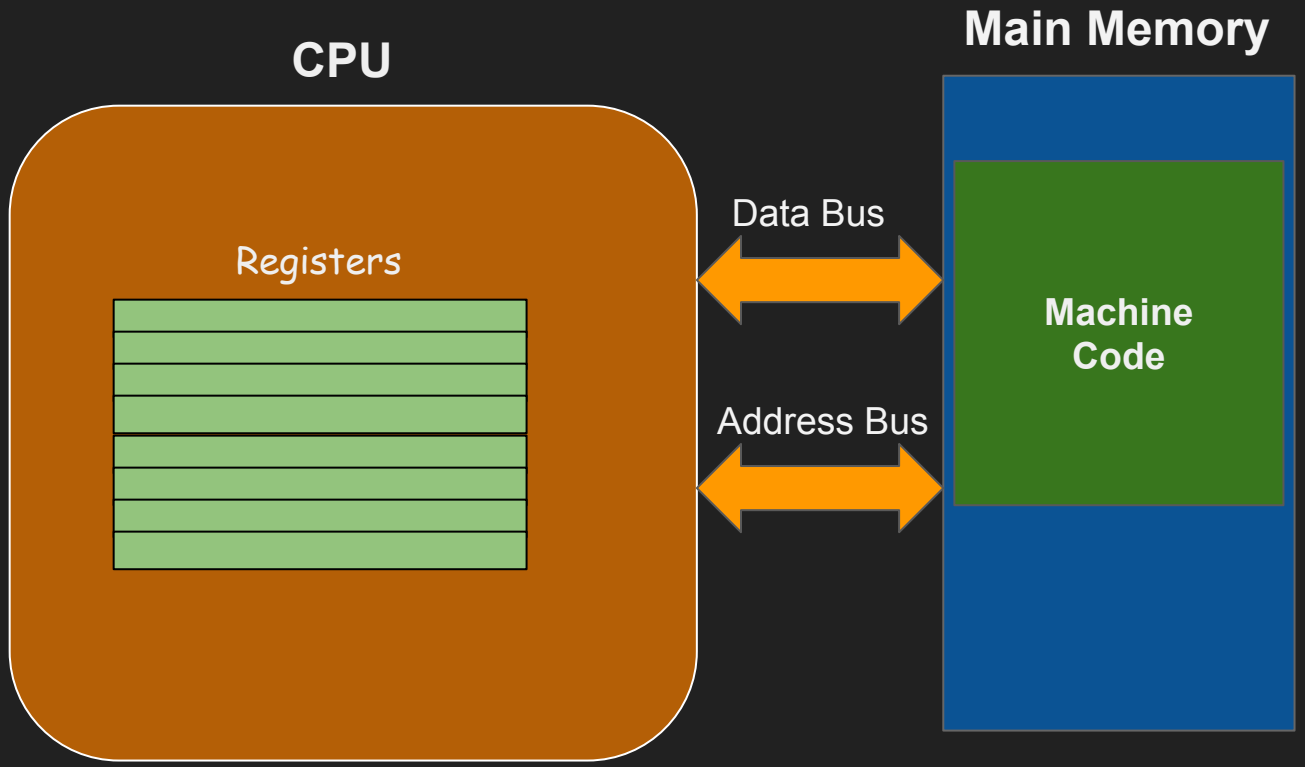

CPU, Memory, instructions and data

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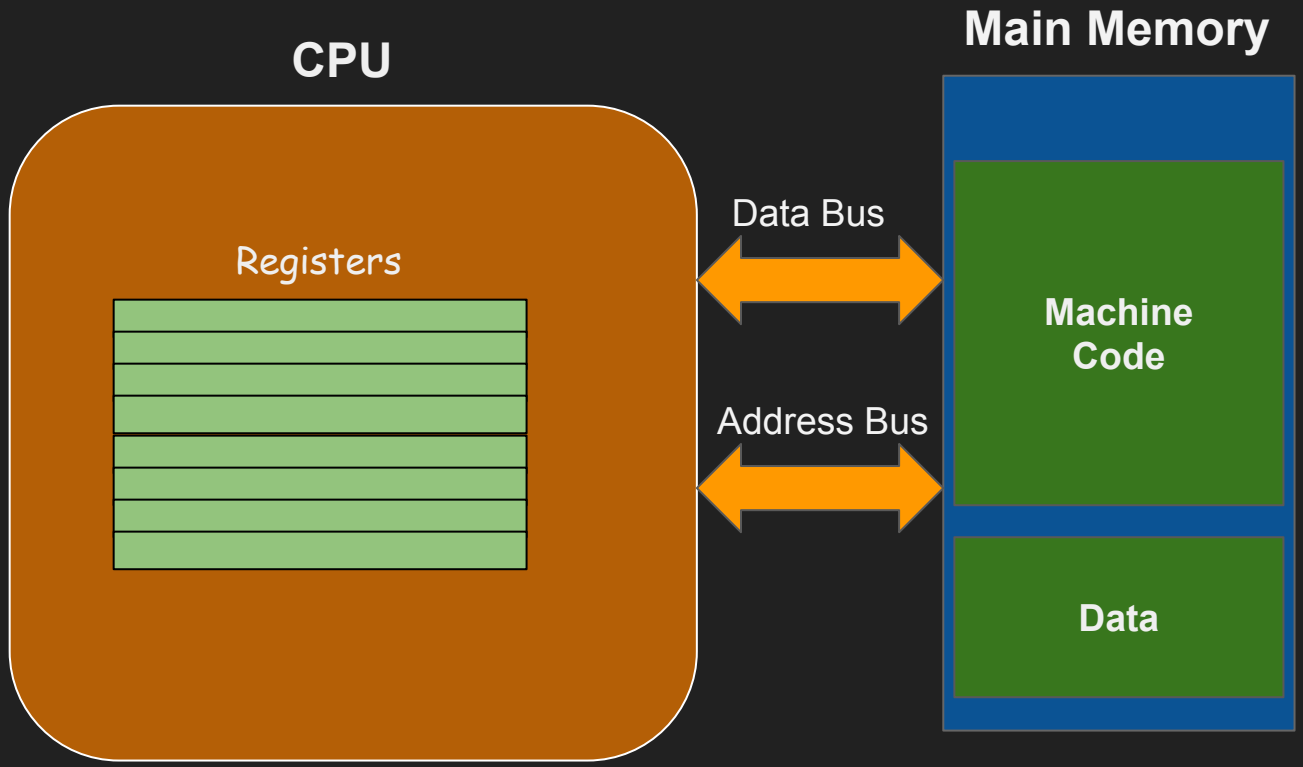

Intel 8086 architecture

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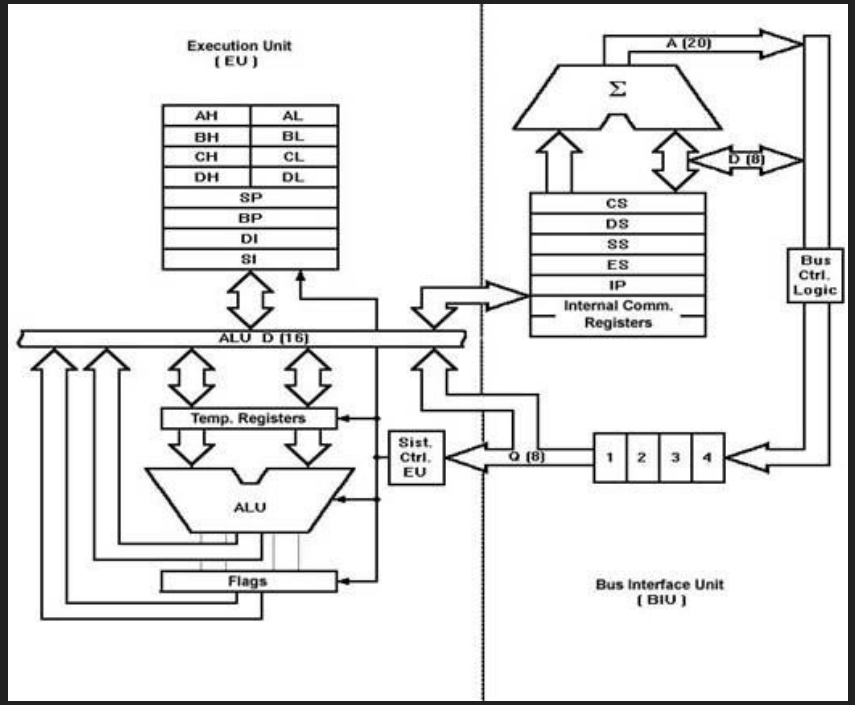
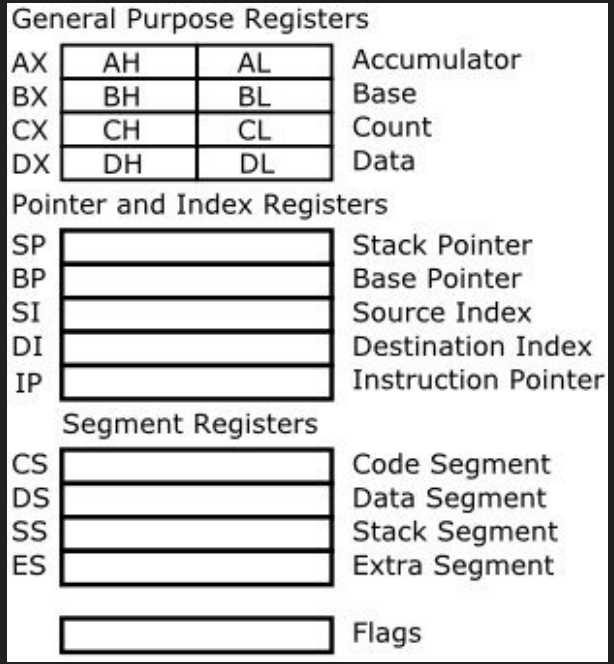


http://www.cosc.brocku.ca/~bockusd/3p92/Local_Pages/8086_achitecture.htm

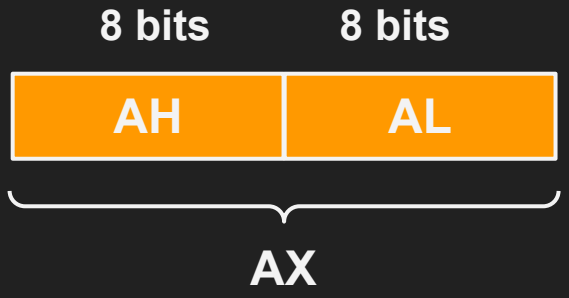
Intel 8086 registers

- 16 bit registers
- 8 bit access
  - AX,BX,CX,DX
  - e.g. AX = (AH | AL)



http://bucarotechelp.com/computers/architecture/86011201.asp

Intel 8086 registers



General Purpose Registers			
AX	AH	AL	Accumulator
BX	BH	BL	Base
CX	CH	CL	Count
DX	DH	DL	Data

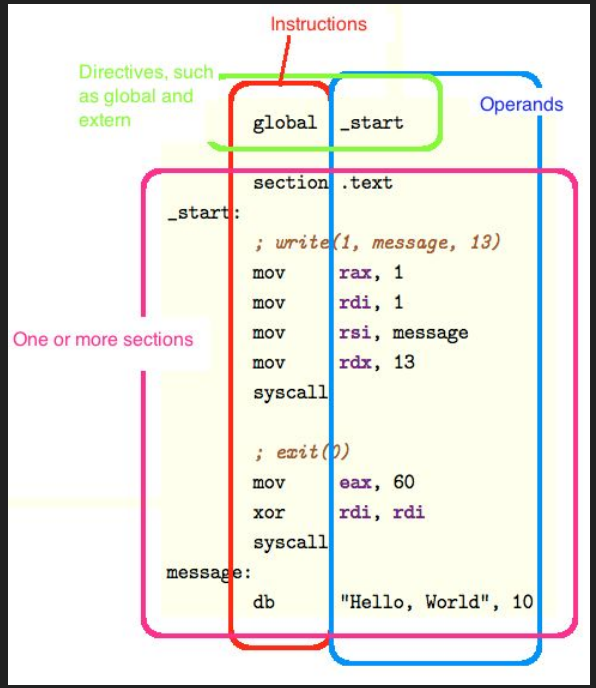
Pointer and Index Registers		
SP		Stack Pointer
BP		Base Pointer
SI		Source Index
DI		Destination Index
IP		Instruction Pointer

Segment Registers		
CS		Code Segment
DS		Data Segment
SS		Stack Segment
ES		Extra Segment

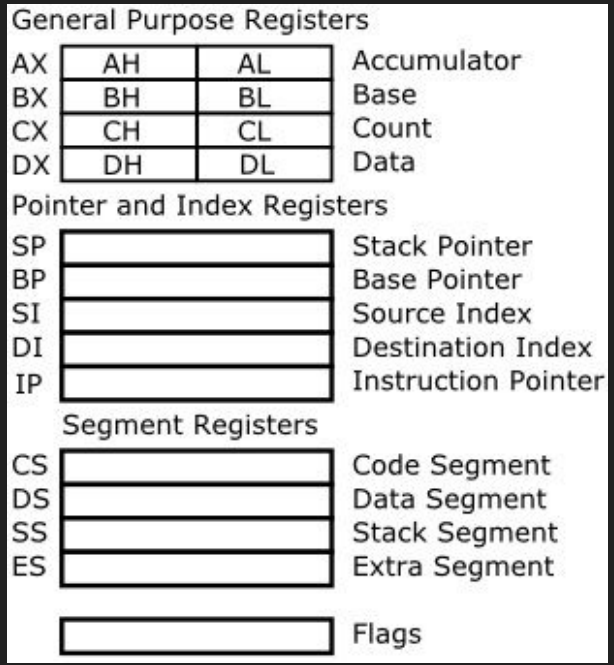
		Flags

http://bucarotechelp.com/computers/architecture/86011201.asp

Intel 8086 assembly syntax



http://cs.lmu.edu/~ray/notes/nasmtutorial/



http://bucarotechelp.com/computers/architecture/86011201.asp

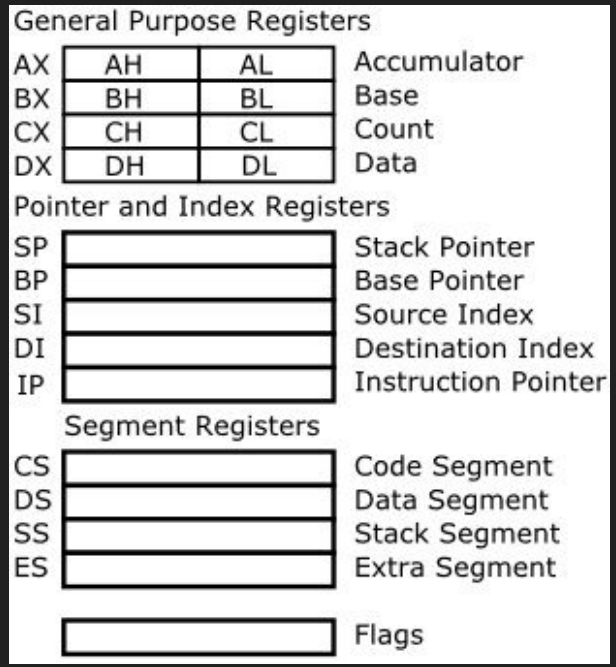
Intel 8086 assembly commands


```
mov x,y
xchg x,y

inc x
dec x

add x,y
sub x,y
neg x

; bitwise operators
and x,y
or  x,y
xor x,y
not x
```



http://bucarotechelp.com/computers/architecture/86011201.asp

Intel 8086 assembly commands

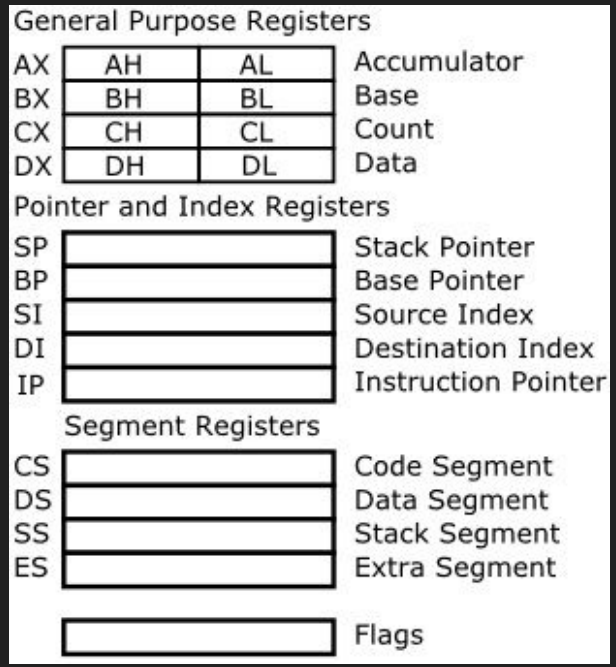

```
mov x,y

inc x
dec x

add x,y     ; x <- x+y
sub x,y     ; x <- x-y

; bitwise operators
and x,y     ; x <- x & y
or  x,y     ; x <- x | y
xor x,y     ; x <- x ^ y
```

`x,y:` **register, constant, memory (address)**



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Intel 8086 assembly commands

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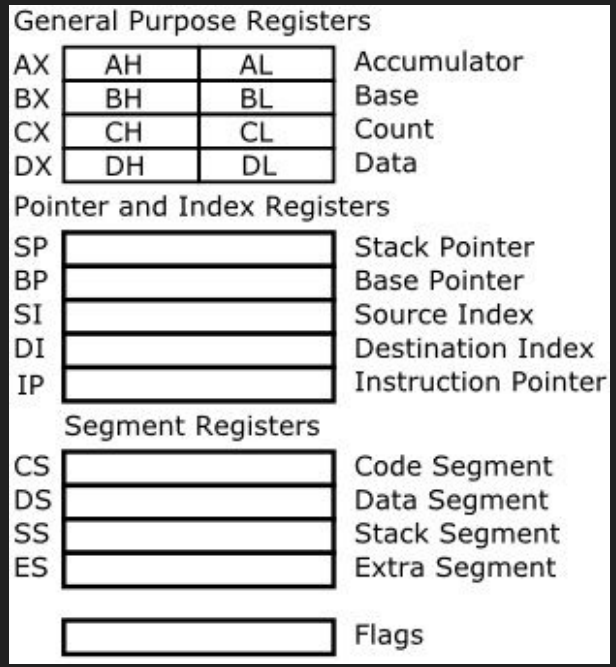
assume u, v are memory locations (variables)

```
mov ax, bx
mov ax, 1
mov al, ah
mov cl, 123
mov ax, [u]
mov [v], bx
mov byte [v], 12

mov [v], [u]
```



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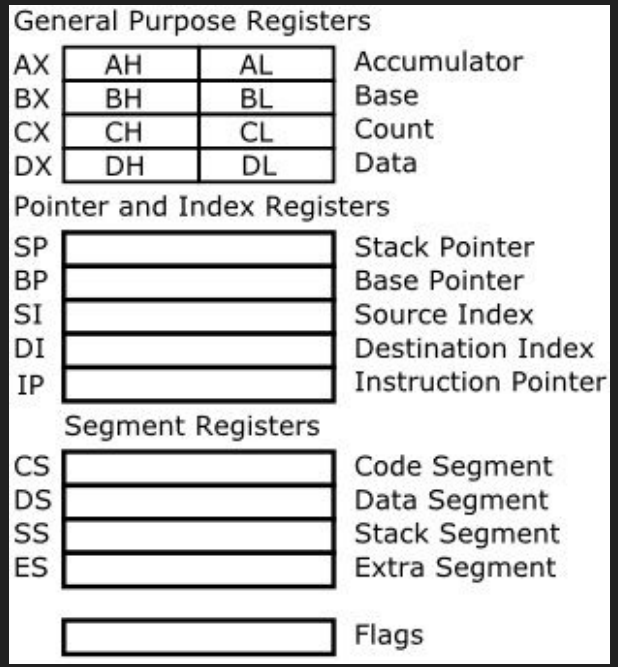

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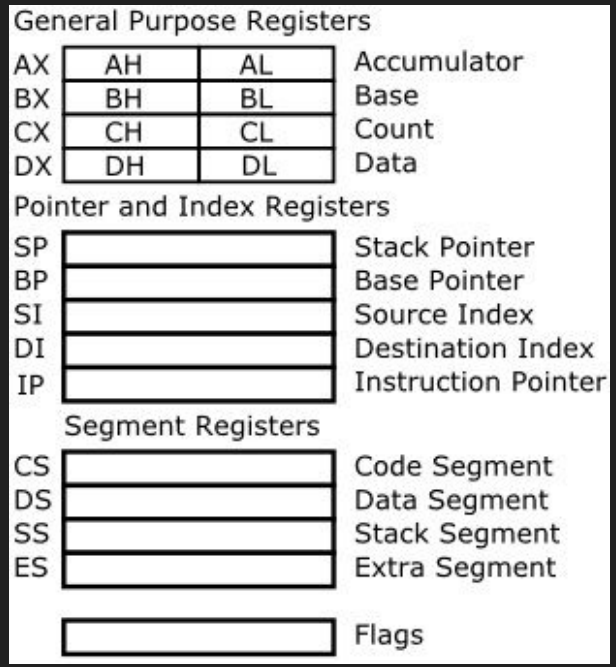
```

~~`mov [v], [u]`~~

```
mov ax,[u]
mov [v], ax
```



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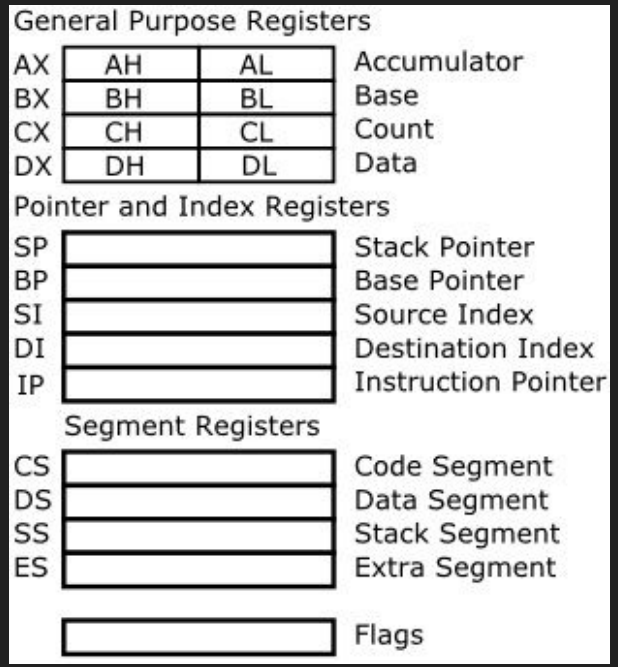

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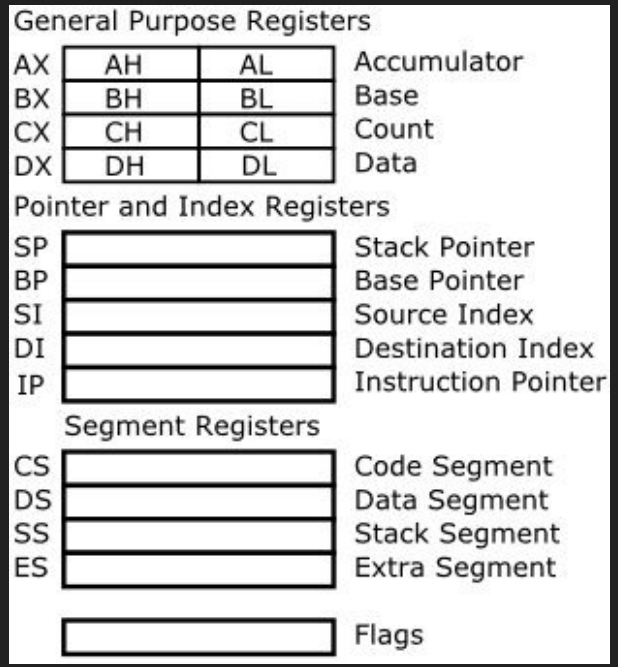

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add al, ah
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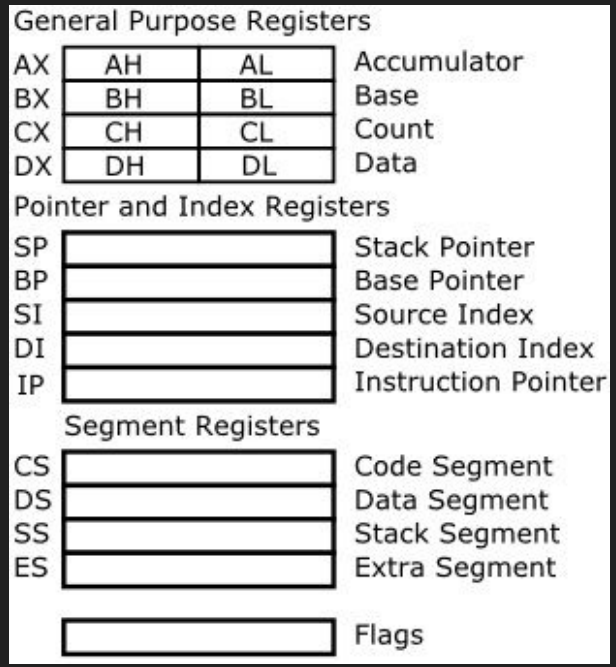
add ax, [u]
add [v], bx
add byte [v], 12
```

~~`add [v], [u]`~~

```
mov ax,[u]
add [v],ax
```



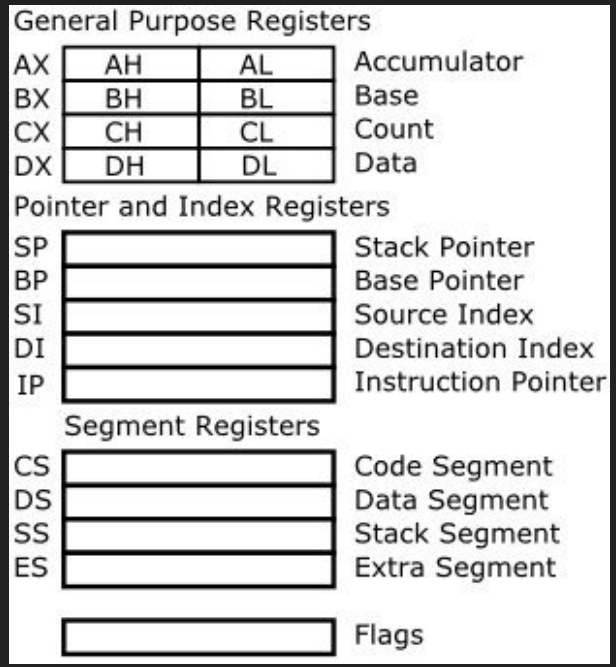
http://bucarotechelp.com/computers/architecture/86011201.asp

Intel 8086 assembly commands


```
; bx = (ax-10)*2

; ax = (ax+1)*8

; ax = (ax-1)*9
```



http://bucarotechelp.com/computers/architecture/86011201.asp

Intel 8086 assembly commands

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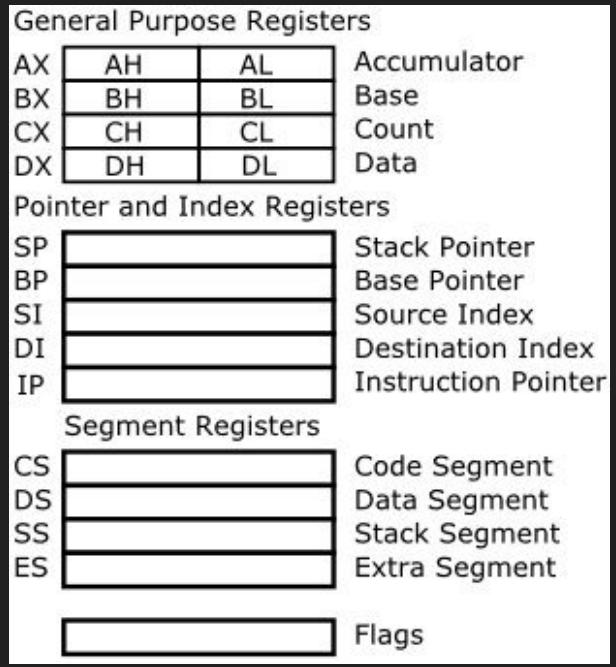
```
; bx = (ax-10)*2
mov bx, ax
sub bx, 10
add bx, bx
; ax = (ax+1)*8
```

```
; ax = (ax-1)*9
```



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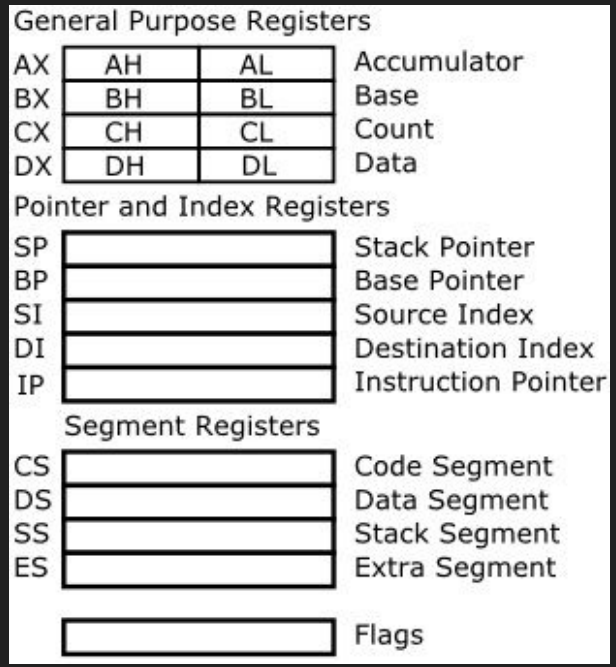
```
; bx = (ax-10)*2
mov bx, ax
sub bx, 10
add bx, bx

; ax = (ax+1)*8
inc ax
add ax,ax
add ax,ax
add ax,ax

; ax = (ax-1)*9
```



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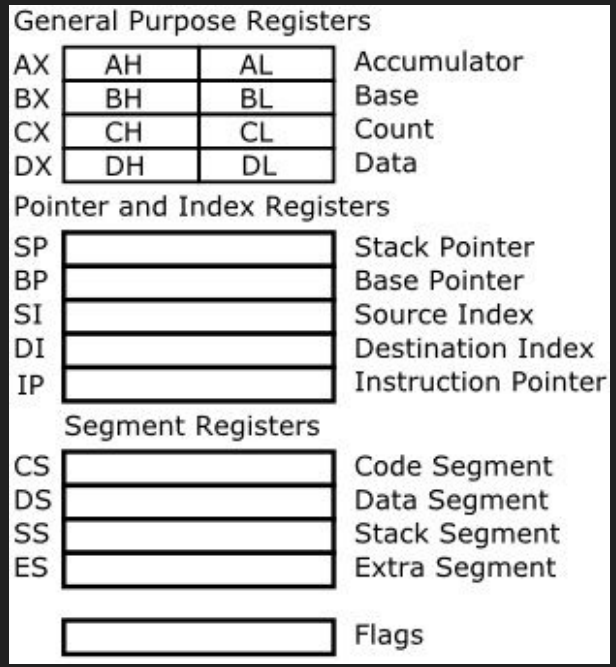
mov bx, ax
sub bx, 10
add bx, bx

; ax = (ax+1)*8
inc ax
add ax,ax
add ax,ax
add ax,ax

; ax = (ax-1)*9
dec ax
mov si,ax
add ax,ax
add ax,ax
add ax,ax
add ax,si
```



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80386 (IA-32, i386)

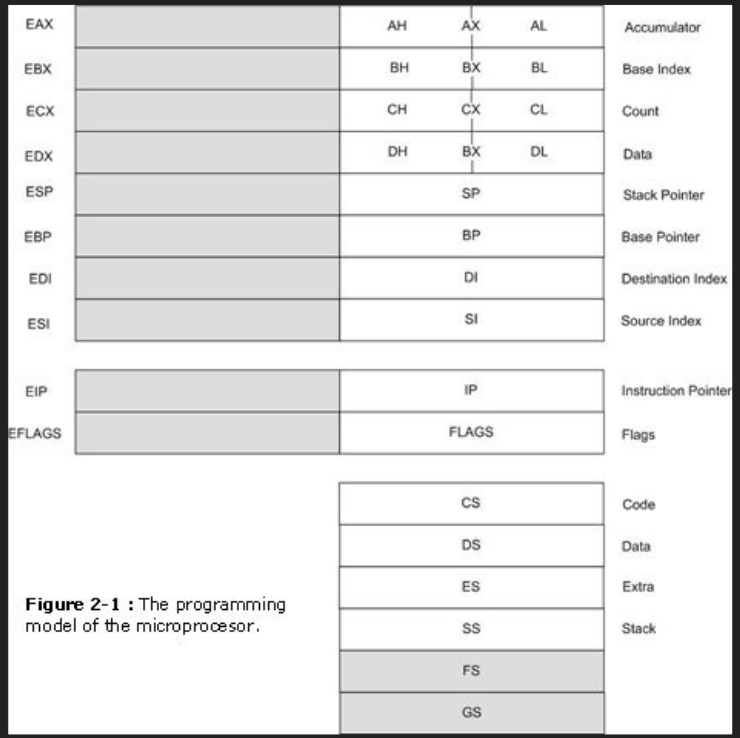
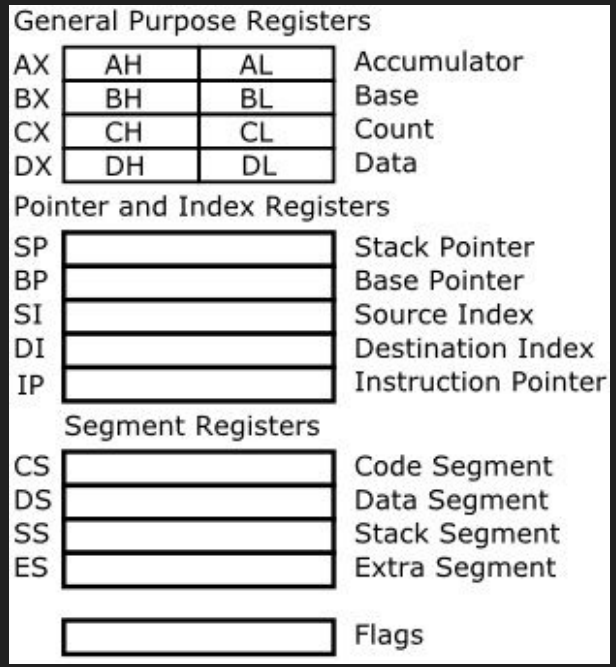


Figure 2-1 : The programming model of the microprocesor.

http://www.byclb.com/TR/Tutorials/microprocessors/ch2_1.htm

8086, 80286



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80386 (IA-32, i386)

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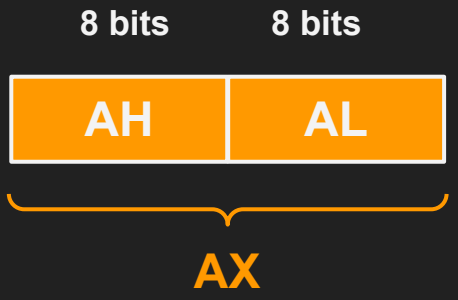

80386 (IA-32, i386)

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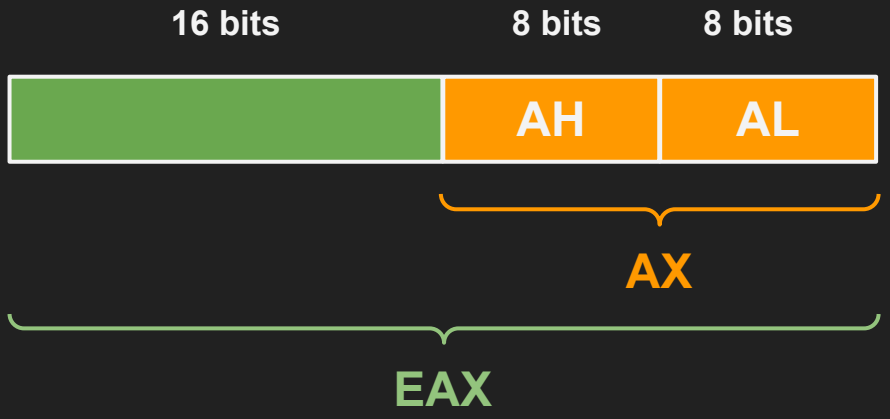

64 bit x86 systems (x86-64, x64, AMD64)

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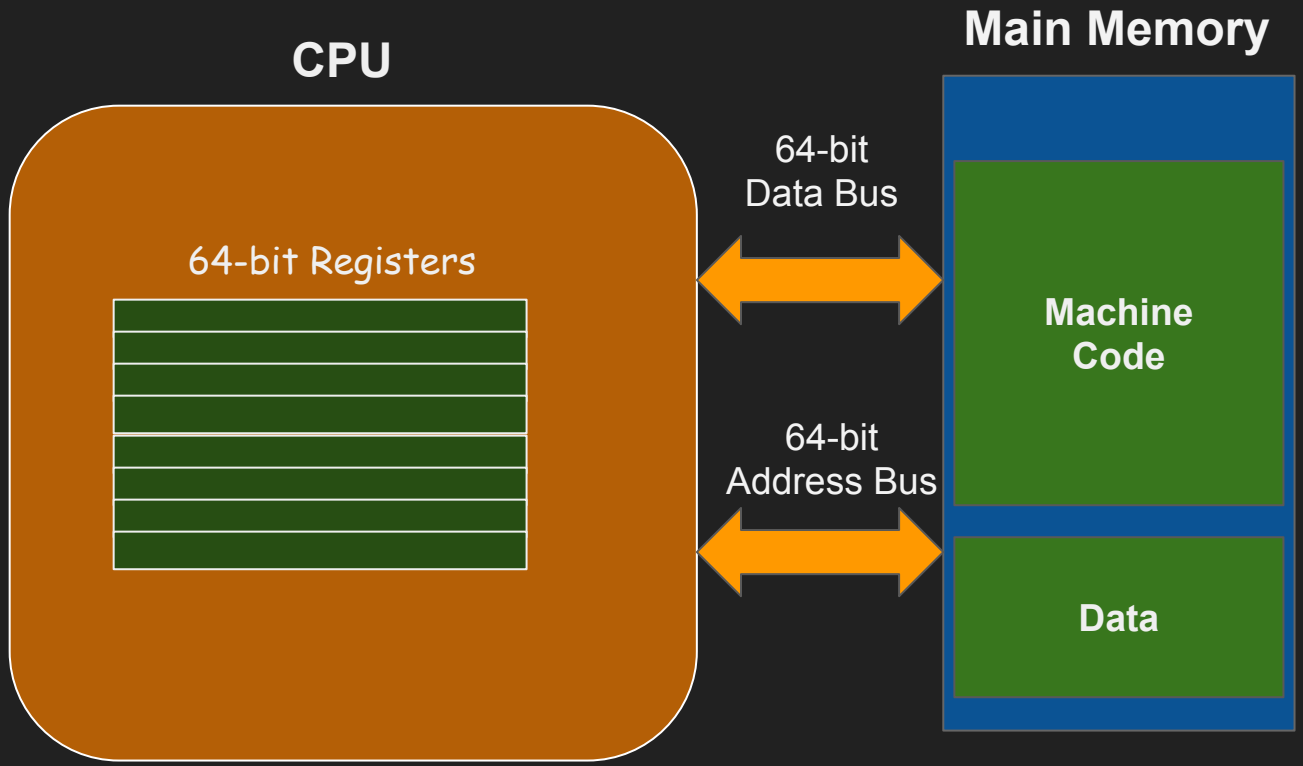

x86-64 bit registers

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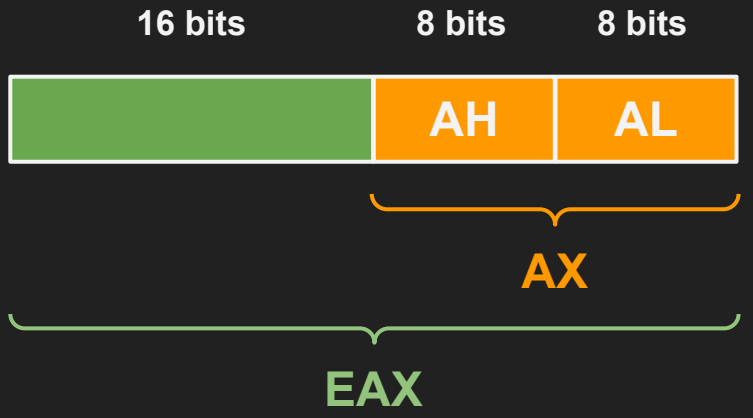
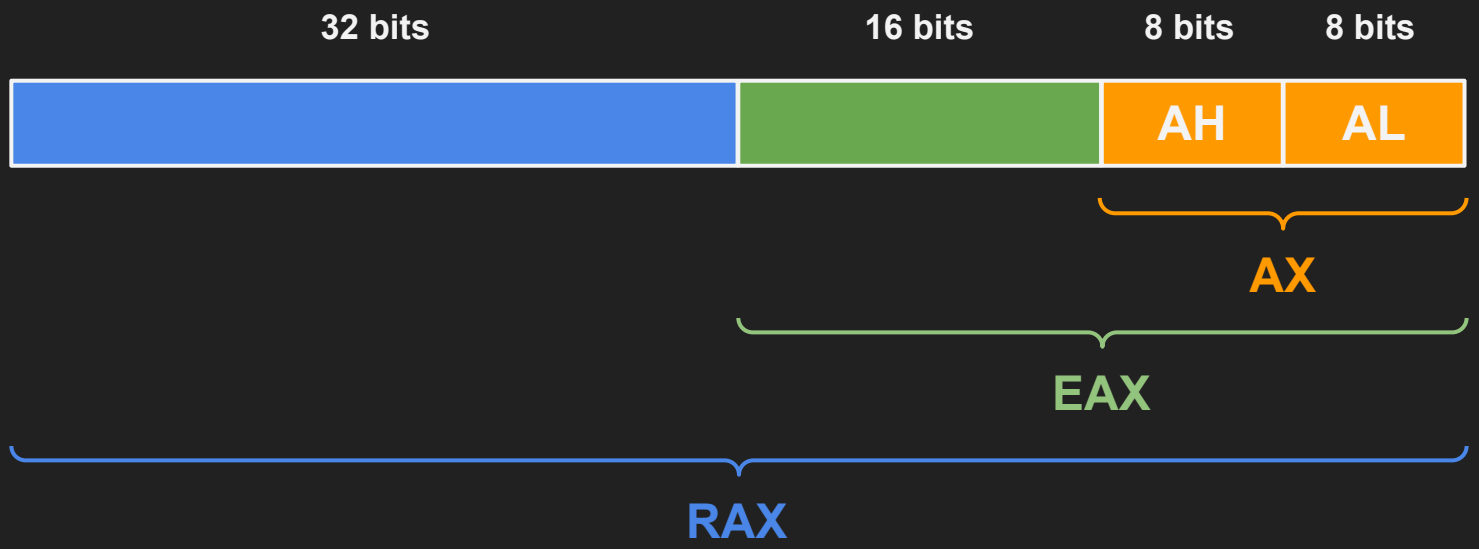


x86-64 bit registers



x86-64 bit registers

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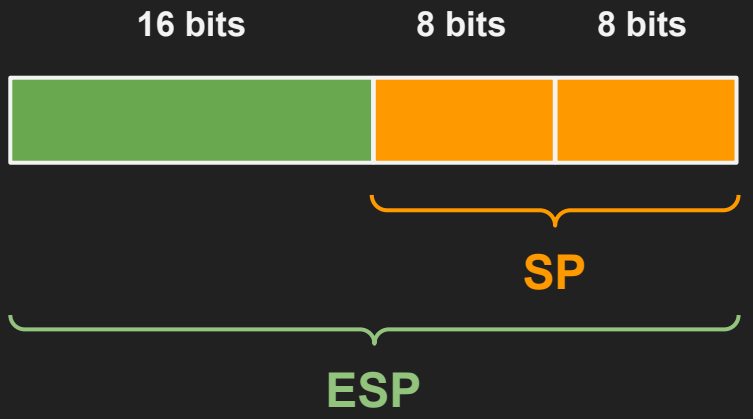
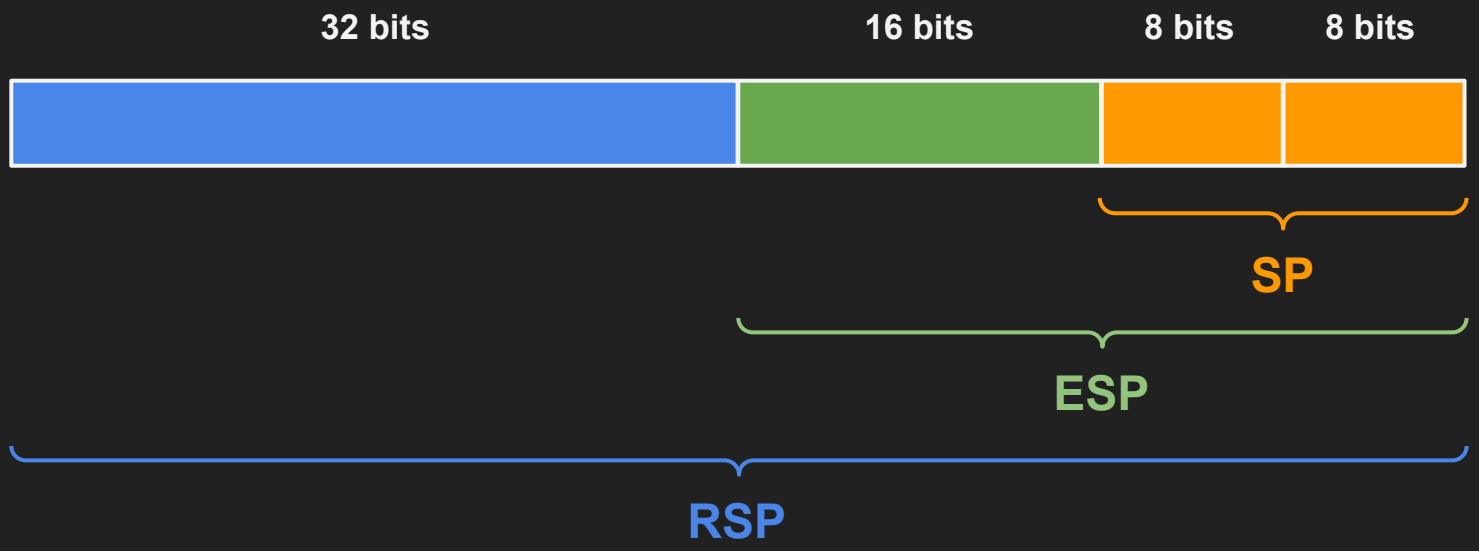


x86-64 bit registers



x86-64 bit registers

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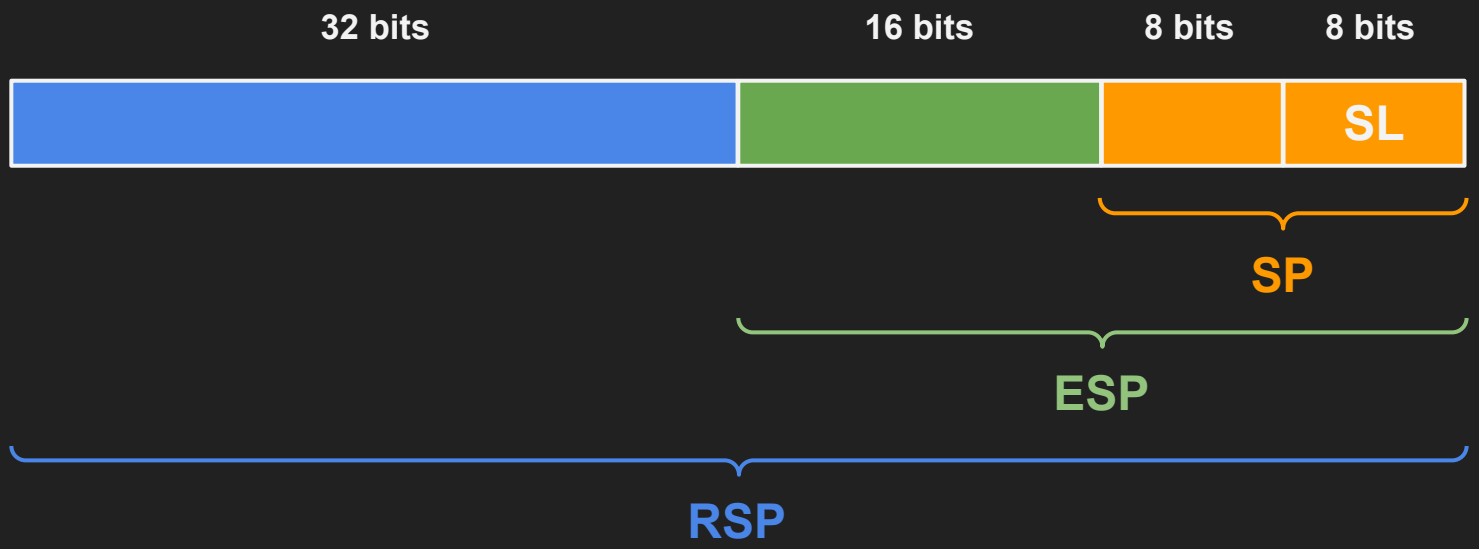
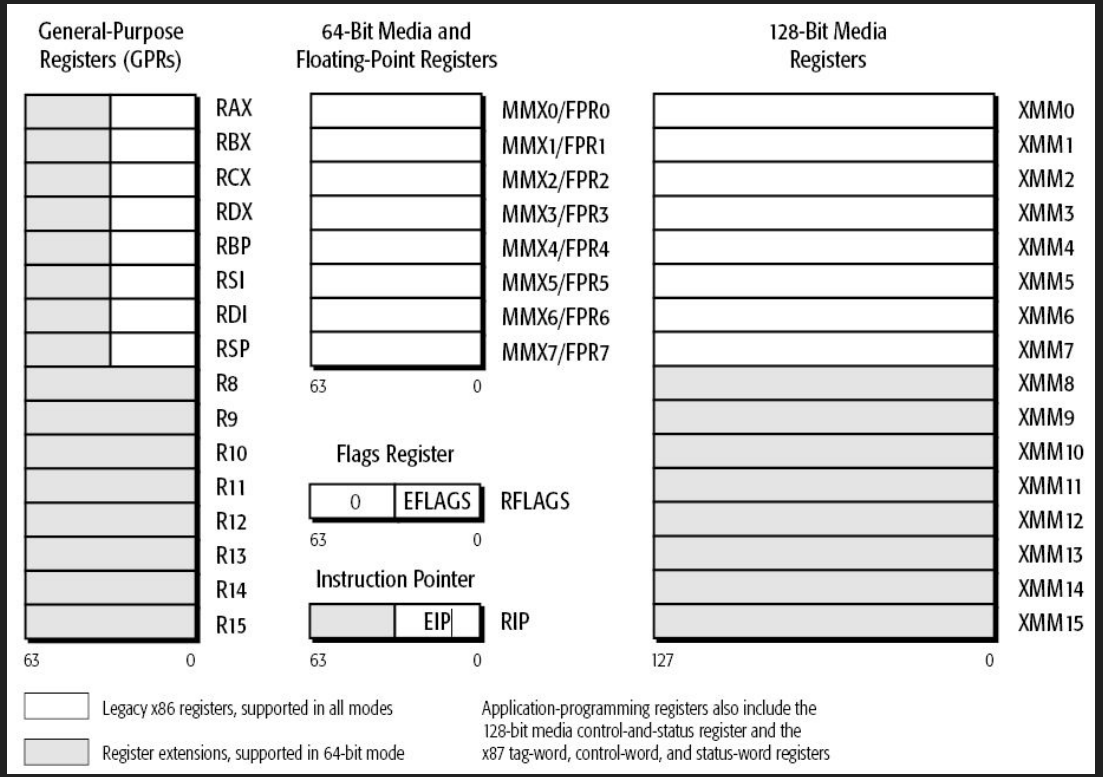


x86-64 bit registers (x86-64, AMD64, Intel64, x64)



https://www.viva64.com/en/a/0029/

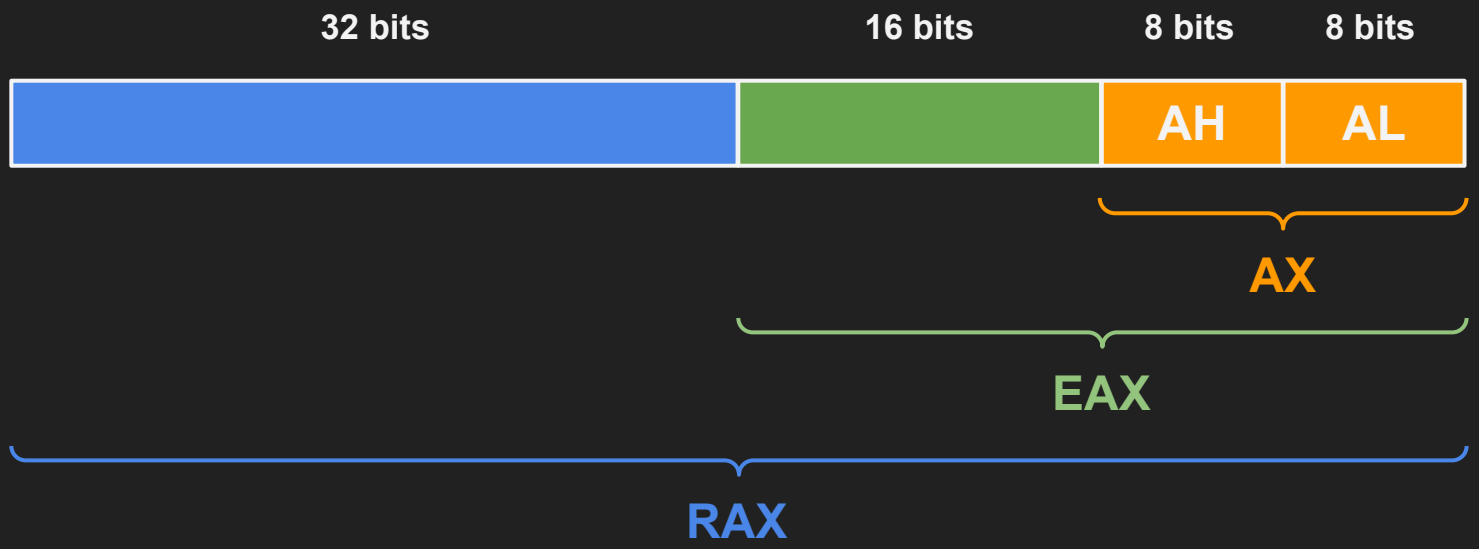
x86-64 registers

- RAX
- RCX
- RDX
- RBX
- RBP
- RSI
- RDI
- RSP
- R8
- R9
- R10
- R11
- R12
- R13
- R14
- R15

x86-64 registers

- RAX = R0
- RCX = R1
- RDX = R2
- RBX = R3
- RBP = R4
- RSI = R5
- RDI = R6
- RSP = R7
- R8
- R9
- R10
- R11
- R12
- R13
- R14
- R15

x86-64 bit registers



x86-64 bit registers

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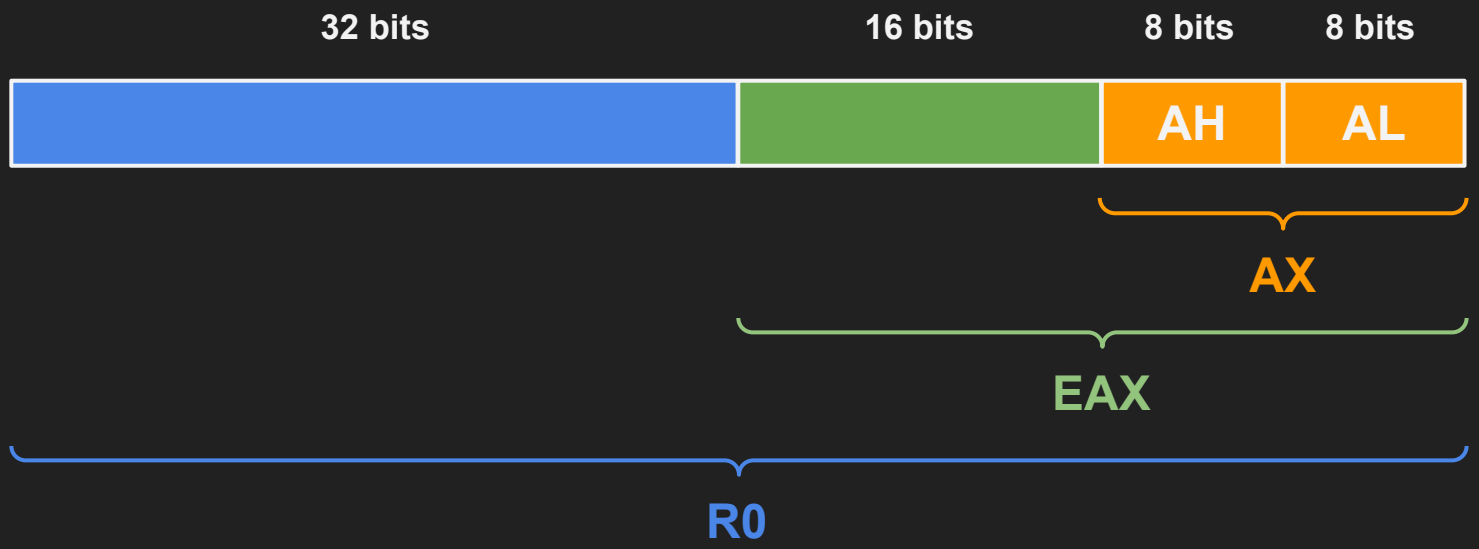

x86-64 bit registers

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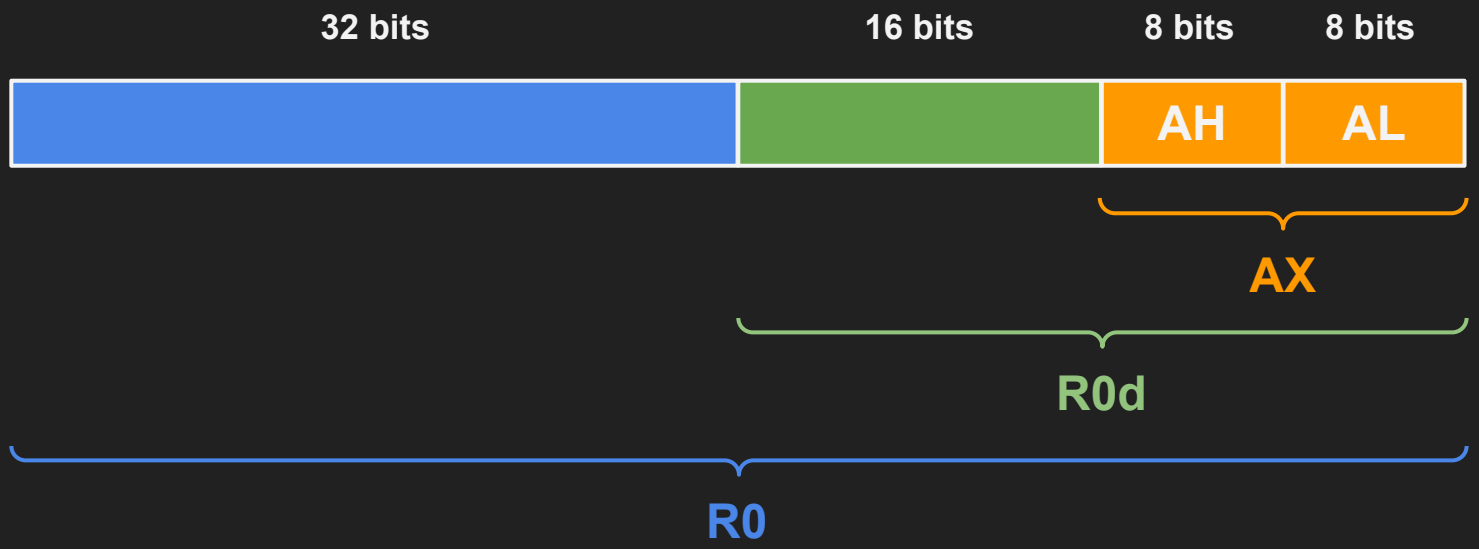

x86-64 bit registers

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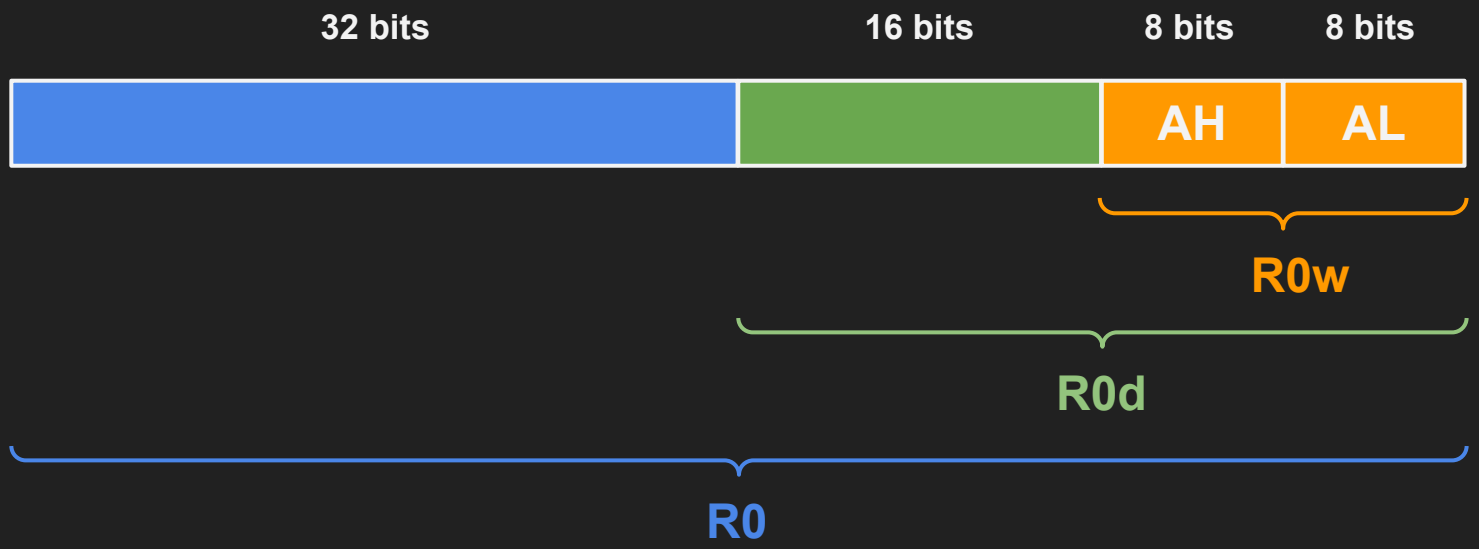
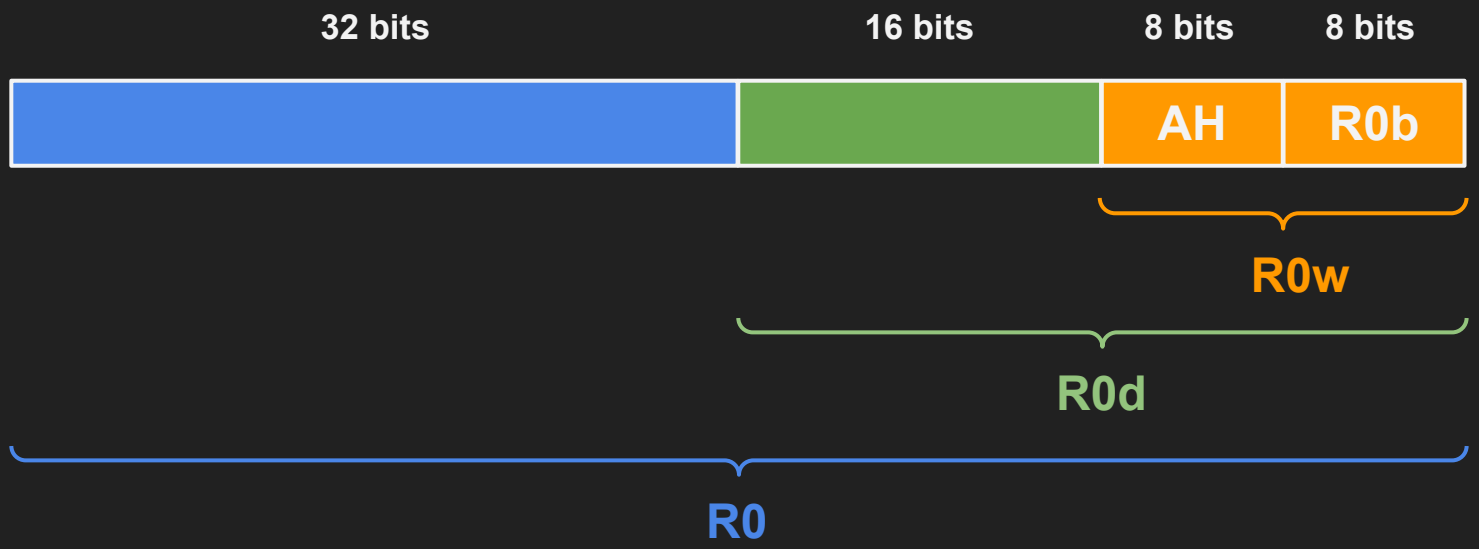


x86-64 bit registers



x86-64 bit registers

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