Ch. 2

* Protected Mode – native state of processor. Programs have separate memory areas name segments. Processor prevents programs from referencing memory outside their segments.
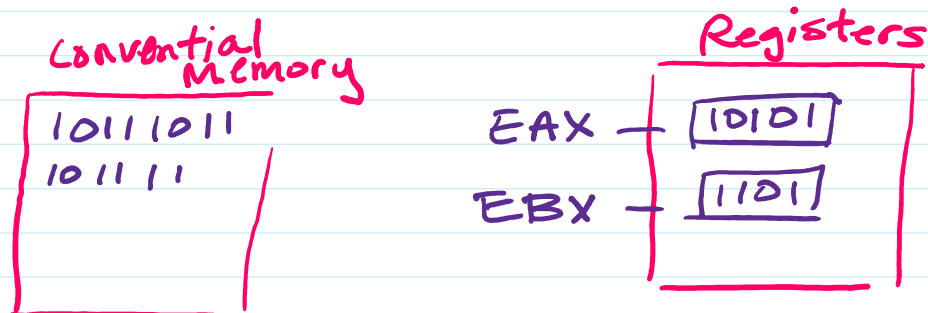
* Virtual 8086 Mode – Processor can safely execute real-address mode software, such as MS-Dos programs in sandbox-like environment.

→ If program crashes or attempts to write data into system memory area, it will not affect other programs at the same time.

* 32-bit x86 Processor

* Register – high-speed storage location directly inside the CPU (central Processing Unit)

↳ Designed to access @ much higher speed than conventional memory

Conventional Memory

1011 1011
1011 11

Registers

EAX — 10101

EBX — 1101

* 32-Bit General Purpose Registers

EAX, EBX, ECX, EDX, EBP,

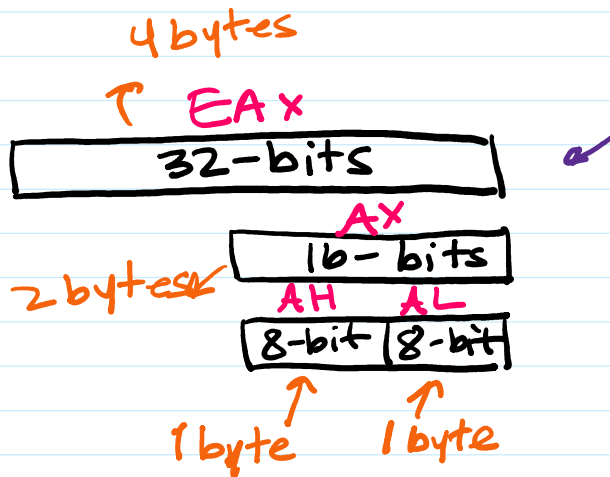# EAX, EBX, ECX, EDX, EBP, ESP, ESI, EDI, EFLAGS, EIP

```
EAX
EBX
ECX
EDX
...
```

* Are used for arithmetic & data movement

4 bytes

↑ EAX

| 32-bits |

✓ 00000010

mov EAX, 10h

mov <u>AX</u>, 20h

2 bytes →

AX

| 16-bits |

$\underbrace{0000}|0020$

mov AL, 30h

AH   AL

| 8-bit | 8-bit |

0000 | 00 30

mov AH, 22h

↑ 1 byte   ↑ 1 byte

0000 | 22 30

mov AX, 4040h
mov AL, 20h

AX

| ? | 4020 |

max unsigned = $2^{16}-1$ in <u>AX</u>

<u>32-bit</u>	<u>16-bit</u>	<u>8-bit (High)</u>	<u>8-bit (Low)</u>
EAX	AX	AH	AL
EBX	BX	BH	BL
ECX	CX	CH	CL
EDX	DX	DH	DL
ESI	SI		
EDI	DI		
EBP	BP		
ESP	SP		

* EAX - used for multiplication & division

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   instructions (automatically)

* ECX - loop counter

* ESP - stack pointer (keep address of
   last value added to stack)

* ESI & EDI - used for high-speed memory
   transfer instructions

* EBP - used by high-level languages to
   reference function parameters & local
   variables on the stack.