x86-64: The Language That Can do Everything and Nothing

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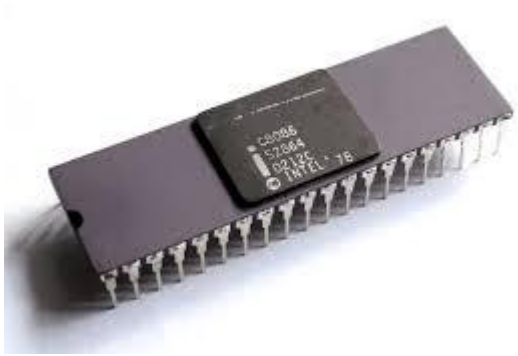
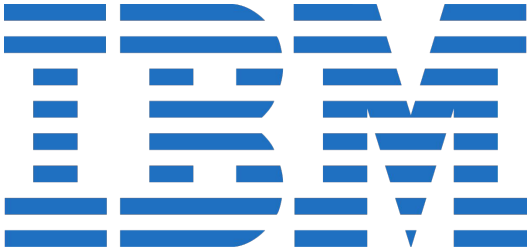
History

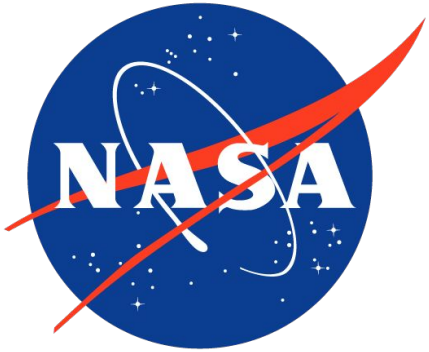
- Intel founded by Robert Noyce and Gordon Moore

- Developed 8086 microprocessor in 1976

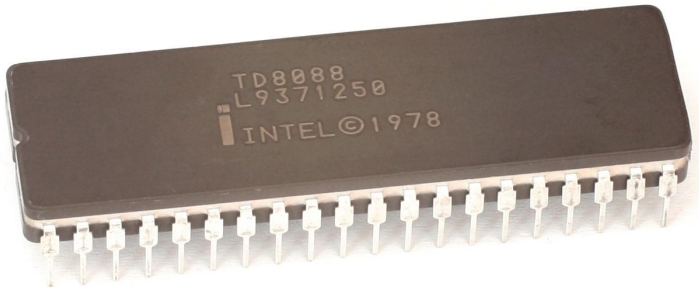


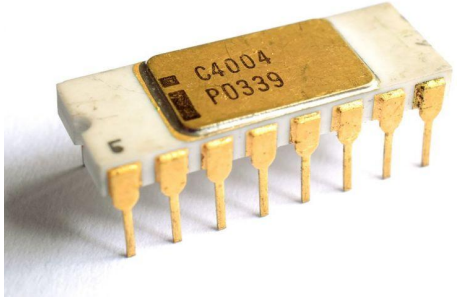


History

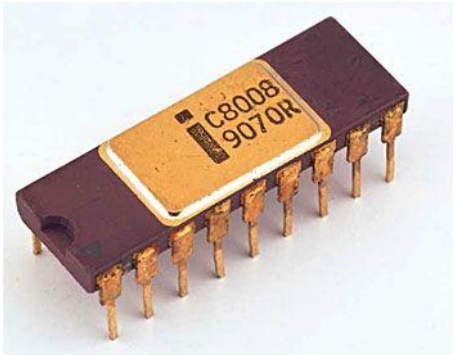


- 8086 used by NASA and eventually IBM when the 8088 was released.
- 8088
  - 16 bits over 8 bit cycles
  - backwards compatible
  - massively popular

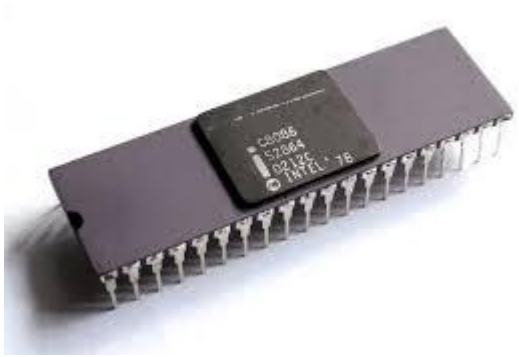




4004 (1971)



8008 (1972)



8086 (1978)

80386 (1985)

Pentium 4 (2000)

Core i9 (2017)

Data Types (Registers)

x86 - 16 Bit

Maximum size is a word, 16 bits

x86 - 32 Bit

Maximum size of 32 bits, Doubleword, and registers are prefixed with ‘E’

x86 - 64 Bit

Maximum size of 64 bits, Quadword, and registers are prefixed with ‘R’

Byte - 8 bits | Word - 16 bits | Doubleword - 32 bits | Quadwords - 64 bits | Double Quadwords - 128 bits

Control Structures

JUMP

```
JMP   _label
JNE   _label
JGE   _label
```

LOOP

```
LOOP     _label
LOOPNE   _label
LOOPZ    _label
```

CALL / RET

```
CALL   _procedure_label
RET
```

MIPS versus x86

MIPS Standard Prologue

```
SUB     $sp, $sp, 0x8
SW      $ra, 8 ($sp)
SW      $fp, 4 ($sp)
ADD     $fp, $sp, 0x8
```

X86 Equivalent

```
PUSH    rbp
ADD     rbp, rsp
SUB     rsp, 0x8
```

MIPS Standard Epilogue

```
LW      $sp, $sp, 0x8
LW      $ra, 8 ($sp)
ADD     $fp, 4 ($sp)
JR      $fp, $sp, 0x8
```

X86 Equivalent

```
LEAVE
RET
```

You can stop yawning now and watch a fun demo