



**EECE416 :Microcomputer Fundamentals and Design  
("Microcomputer & Microprocessor")**

# **COMPUTER HISTORY**

# Computers and Microprocessors

## ⌘ Everywhere

☑ PC, VCR, DVD, Toys

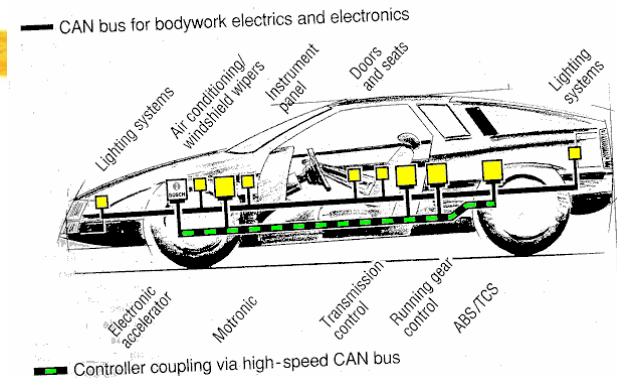
☑ Phones, Cars, etc

## ⌘ Hardware and Software

## ⌘ Embedded Computing

## ⌘ Mobile Computing

## ⌘ Computers and Microprocessors



# Evolution of Microprocessor

## ^ First Generation

- ⊗ 10s of Vacuum Tubes

## ^ Second Generation

- ⊗ Advent of Transistors (solid-state)

## ^ Third Generation

- ⊗ Advent of IC (Integrated Circuit)
- ⊗ Chips

## ^ Fourth Generation

- ⊗ VLSI (Very Large Scale Integration)

## ^ Advent of uP

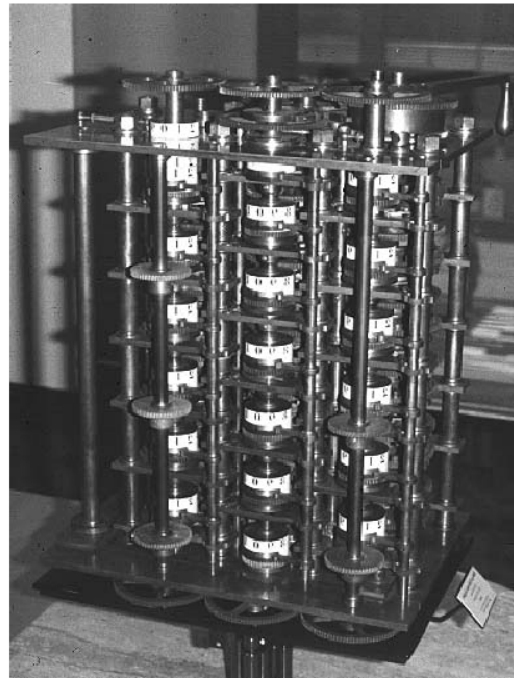
- ⊗ Intel 8080 → 8086 → 80186 → 286 → 386 → 486 → Pentium
- ⊗ Motorola 6800 → 68000 → 68020
- ⊗ Zilog Z80 series

## ^ And the rest is, history

# Charles Babbage's Differential Engine

- ⌘ To solve 6<sup>th</sup> degree differential equation (1842)
- ⌘ Incompletion

$$f(x) = \sum_{i=0}^n a_i x^i$$



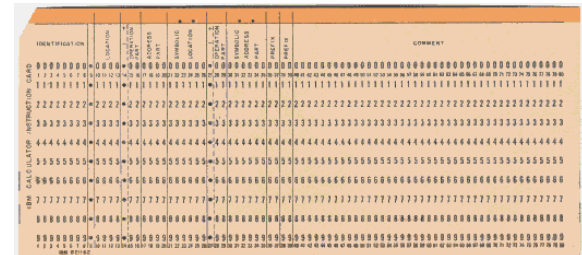
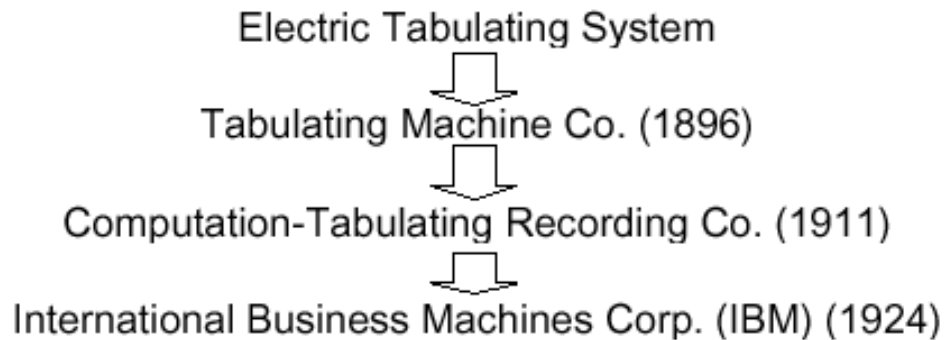
$$\Delta^t y_{j+1} = \Delta^t y_j + \Delta^{t+1} y_j$$

# IBM

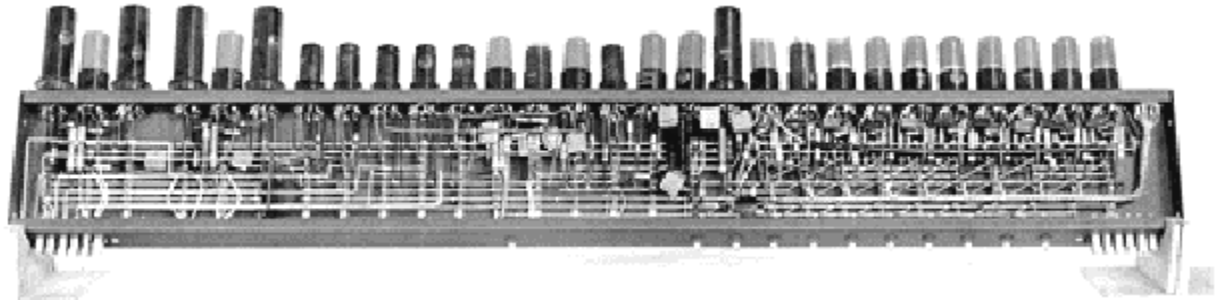
## International Business Machines Corp. (IBM)

1890, Herman Hollerith (1860 - 1926, USA), (1890 Census)

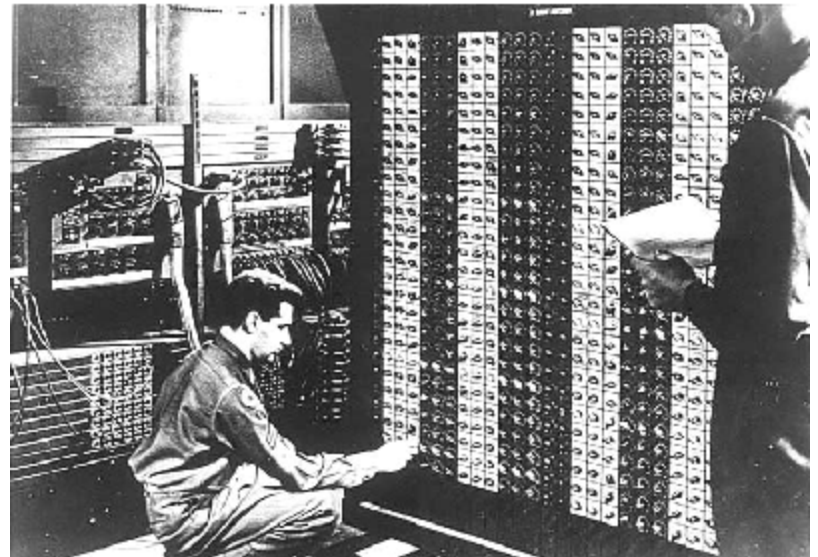
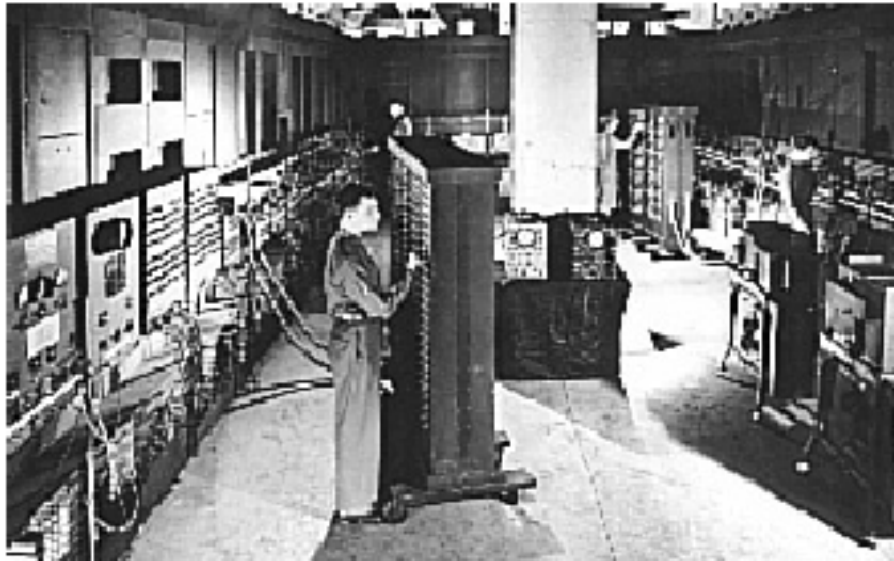
– **Punching Cards, Tabulating Machine**



# ENIAC



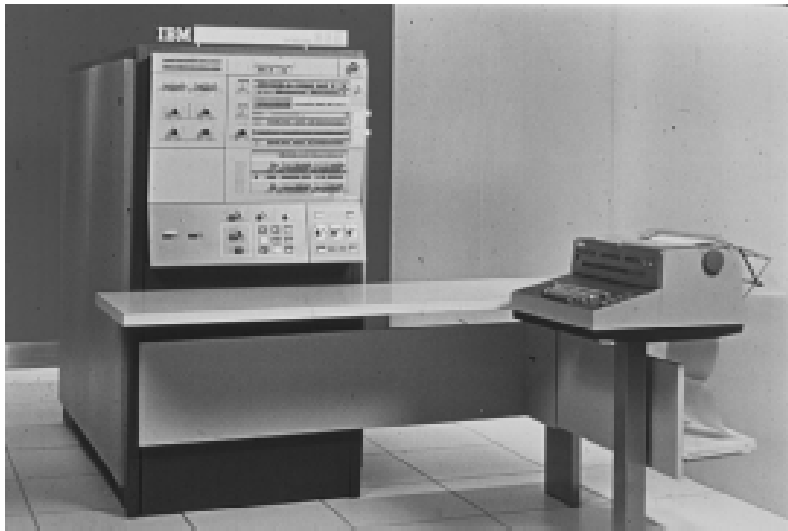
- ⌘ Electronic Numerical Integrator and Calculator, 1943-46.
- ⌘ First general purpose electronic computer
- ⌘ [Smithsonian Museum of American History](#)



# IBM, 1964

## ⌘ System/360

- ⊞ “third-generation” computer
- ⊞ 7 Year long Sabre project for World wide airline reservation – fully implemented

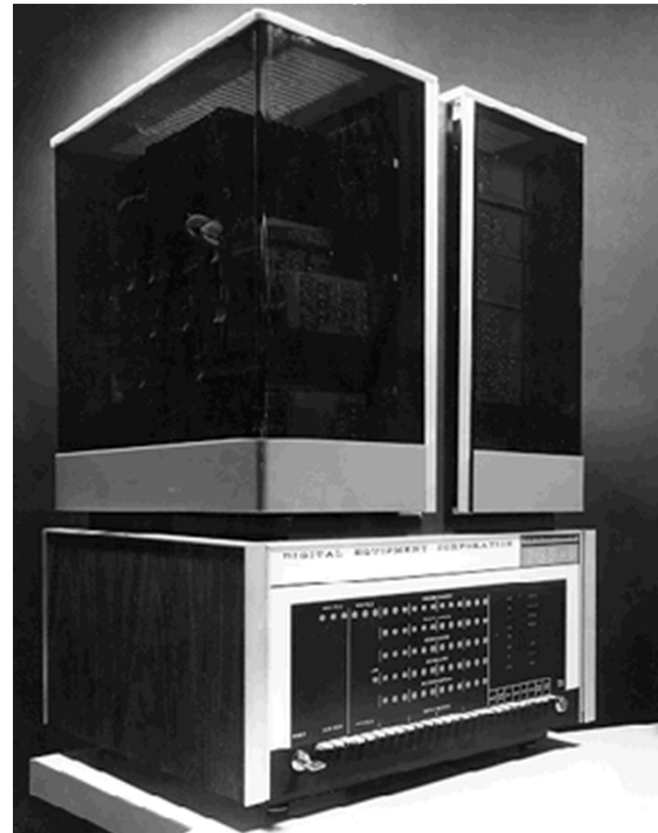


# DEC, 1965

## ⌘ Digital Equipment Corp (DEC)

- ⊞ PDP-8 ("programmed Data Processor")
- ⊞ **first commercially** successful minicomputer
- ⊞ **\$18,000** - one-fifth the price of a small IBM 360 mainframe.
- ⊞ **A great success by**
  - ⊞ Speed
  - ⊞ small size
  - ⊞ reasonable cost
- ⊞ **Well accepted by**
  - ⊞ manufacturing plants
  - ⊞ small businesses
  - ⊞ scientific laboratories.

⌘ DEC (1957) → Compaq (1998) → HP (2002) → No Computer Business (2011?) or Yes?



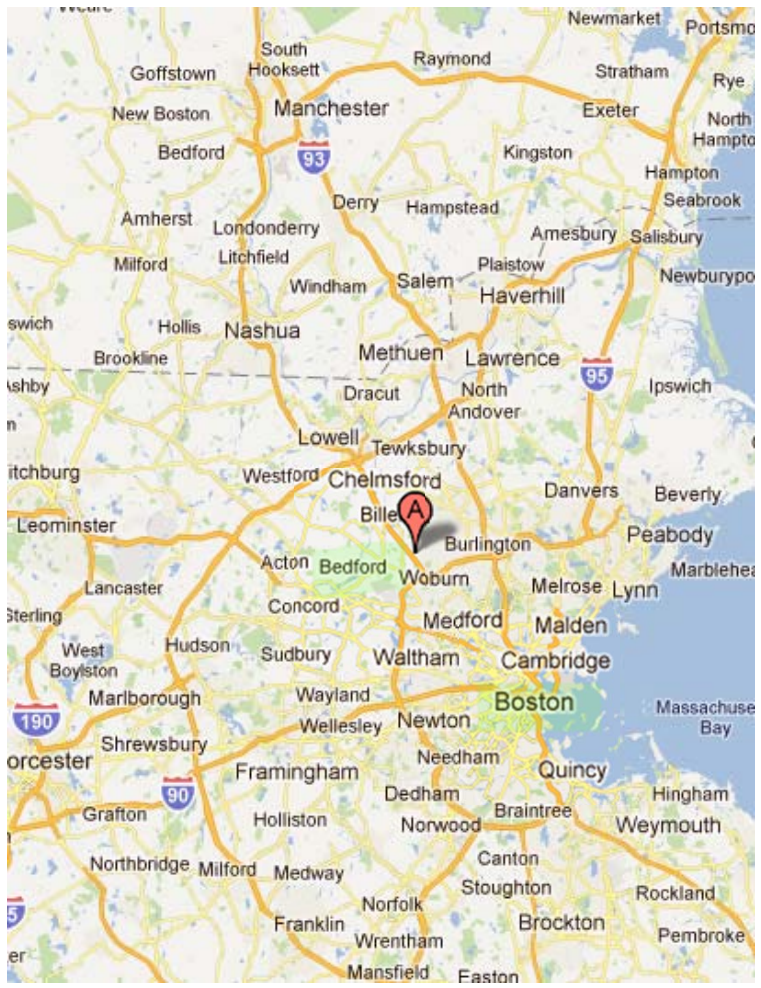


# DEC VAX 11/780 – My Experience in early 1980s

digital



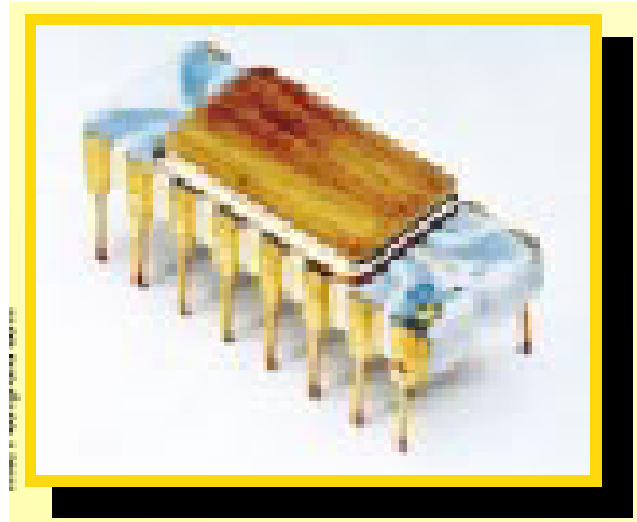
⌘ VAX (Virtual Address eXtension) :16 → 32



# INTEL, 1971 (“computer in a chip”)

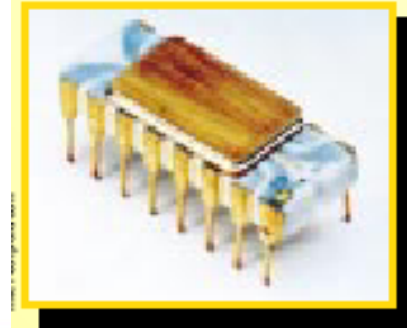
## ⌘ Intel

- ☒ introduced 4-bit Microprocessor (4004)

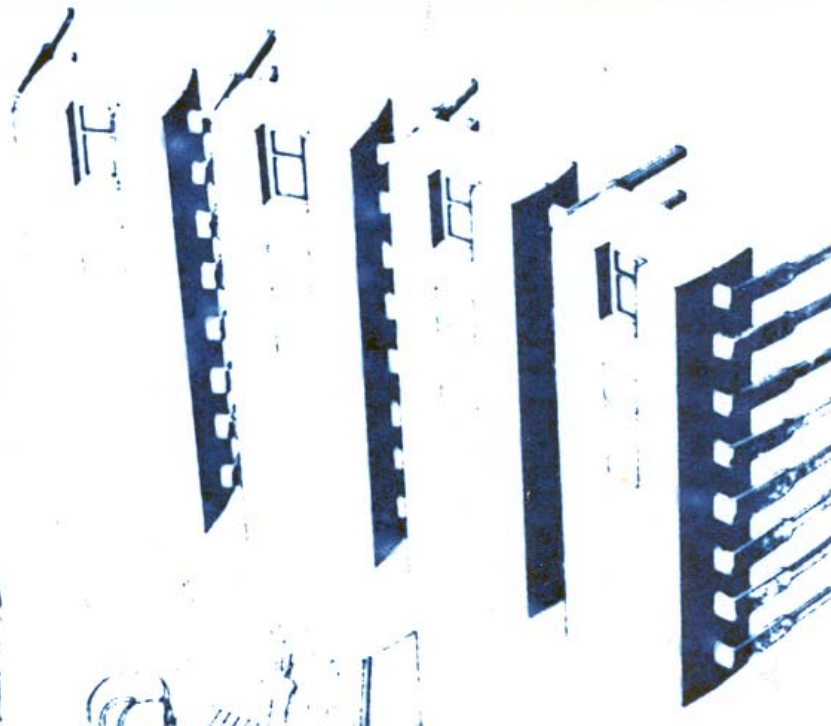


# Intel 4004 (Yr 1971)

Intel's first advertisement for the 4004 microprocessor appeared in the 15 November 1971 issue of Electronic News.



## Announcing a new era of integrated electronics



### A micro-programmable computer on a chip!

Intel introduces an integrated CPU complete with a 4 bit parallel adder, sixteen 4 bit registers, an accumulator and a push-down stack on one chip. It is one of a family of four new ICs which comprise the MCS-4 micro-computer system -- the first system to bring you the power and flexibility of a dedicated general-purpose computer at low cost in as few as two dual in-line packages.

MCS-4 systems provide complete computing and control functions for test systems, data terminals, billing machines, measuring systems, numeric control systems and process control systems.

The heart of any MCS-4 system is a Type 4004 CPU, which includes a powerful set of 45 instructions. Add one or more Type 4001 ROMs for program storage and data tables gives you a fully functioning micro-programmed computer. To this you may add Type 4002 RAMs for read-write memory and Type 4003 registers to expand the output ports.

Using no circuitry other than ICs from this family of four, you can create a system with 4096 8-bit bytes of ROM storage and 5120 bits of RAM storage. When you require rapid turn-around or need only a few systems, Intel's erasable and re-programmable ROM, Type 1701, may be substituted for the Type 4001 mask-programmed ROM.

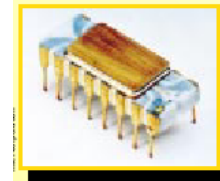
# Behind Story of 4004

## ⌘ Intel

- ⊞ Robert Noyce and Gordon Moore founded Intel in 1968
- ⊞ 12 employees
- ⊞ First year revenue: \$2,672
- ⊞ Main product: Computer Memory
- ⊞ First Product: 3101 (64-bit memory)

## Story-Continued

- ⌘ 1969: Busicom(Japanese Co) order "A set of chips for a programmable calculator" with advanced money of \$60,000. → multiple custom chips.
- ⌘ Ted Hoff (designer): "single-chip, general purpose logic device, which would retrieve its instructions from memory"
- ⌘ Result: Intel 4004 Microprocessor
  - ⊠ 1/8"x 1/6"
  - ⊠ 2300 transistors
- ⌘ Busicom under financial problem → Intel bought back the right
- ⌘ And, the rest is history
- ⌘ 1971: Intel 4004, \$200
- ⌘ 1972: Intel 8008, 8-bit, \$360



# Computer based on 8080

## ⌘ Altair 8800 Computer

- ☑ Intel 8080
- ☑ Ed Roberts
- ☑ His daughter's name
- ☑ \$397
- ☑ Intel supplied the chip for \$75 each



The January 1975 cover of Popular Electronics

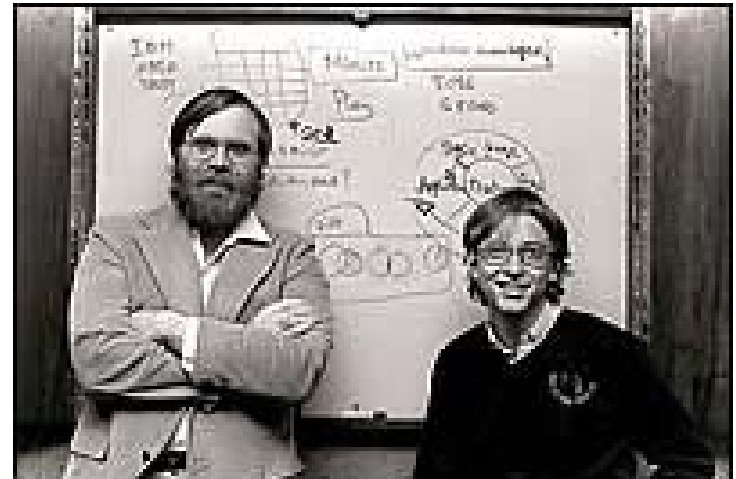


## Seattle Connection and “Micro Soft”

- ⌘ 1968: Mother’s group at Lakeside School raised money for Math class project (\$3000)
- ⌘ Arranged to buy sometime on a computer for the class (“time-sharing”)
- ⌘ Old teletype machine → Telephone → DEC Minicomputer (owned by General Electric) in downtown Seattle
- ⌘ 2 gifted students: 10<sup>th</sup> grader (Paul Allen) and 8<sup>th</sup> grader (Bill Gates) → computer nerds
- ⌘ Learned how to program using **Basic** (**beginner’s all purpose symbolic instruction code**; developed at Dartmouth College in 1964)
- ⌘ 1971: Paul Allen went to Washington State University, and Bill Gates, later in 1973, to Harvard.
- ⌘ 1971: Started a part-time company, Traf-O-Data.
- ⌘ 1972: They bought one of the first Intel 8008 chip for \$360. Added some electronics for traffic data collection in digital format

## Altair 8800 and Micro Soft

- ⌘ Altair8800 needed software
- ⌘ Ed Roberts received letter from a company:  
“they already created a version of Basic for Altai 8800”
- ⌘ Within 30 days they [Gates and Allen] finished the version.
- ⌘ They also regained the right to market in themselves.
- ⌘ Formed Micro Soft in 1977.

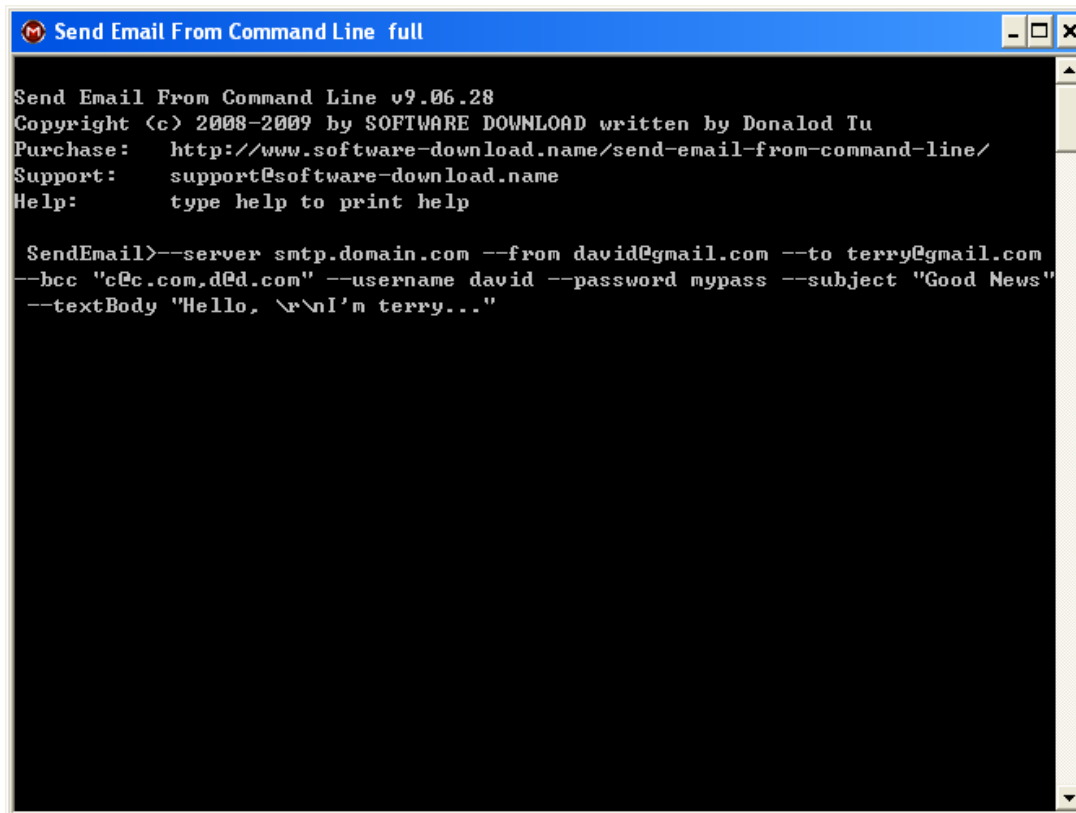




# Micro soft - main IBM PC software provider

## ⌘ MS-DOS

- ☒ or Micro soft Disk Operating System
- ☒ the basic software for the newly released IBM PC
- ☒ Start of a long partnership between IBM and Microsoft



```
Send Email From Command Line full
Send Email From Command Line v9.06.28
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Purchase:  http://www.software-download.name/send-email-from-command-line/
Support:   support@software-download.name
Help:     type help to print help

SendEmail>--server smtp.domain.com --from david@gmail.com --to terry@gmail.com
--bcc "c@c.com,d@d.com" --username david --password mypass --subject "Good News"
--textBody "Hello, \r\nI'm terry..."
```

# Behind Story of MS-DOS

## ⌘ IBM: Manhattan Project for PC

- ☑ Approached Microsoft
- ☑ Intel 8086 suggested
- ☑ *Basic* for PC project offered
- ☑ Operation System needed

## ⌘ Bill Gates

- ☑ Contacted Tim Patterson (of Seattle Computer Products): File Allocation for Basic → QDOS (quick and dirty operating system)
- ☑ Deal of the Century
  - ☒ Bought QDOS for \$50,000.
  - ☒ Supplied it to IBM as MS-DOS

# Commodore, 1977

## ⌘ The Commodore PET (“Personal Electronic Transactor”)

- ☑ first of several personal computers released in 1977
- ☑ straightforward to operate.



# 1977: Apple II

## ⌘ Apple II

- ⊞ instant success when released in 1977
- ⊞ printed circuit motherboard
- ⊞ switching power supply
- ⊞ Keyboard
- ⊞ case assembly
- ⊞ Manual
- ⊞ game paddles
- ⊞ cassette tape
- ⊞ computer game "Breakout"



## 1977: TRS-80

- ⌘ TRS-80
- ⌘ Tandy Radio Shack
- ⌘ In the first month after its release, sold 10,000 units
- ⌘ company's projected sales for 1 year: 3,000 units



# 1981: IBM PC

## ⌘ IBM 5150 PC Personal Computer

- ⊞ 4.77-MHz Intel 8088 CPU
- ⊞ 64KB RAM
- ⊞ 40KB ROM
- ⊞ one 5.25-inch floppy drive (160KB capacity)
- ⊞ PC-DOS 1.0 (Microsoft's MS-DOS)
- ⊞ US\$3000
- ⊞ Microsoft BASIC
- ⊞ CP/M-86
- ⊞ Easywriter 1.0. A fully loaded version with color graphics costs US\$6000.
- ⊞ CGA graphics card for the PC, giving 640x200 resolution with 16 colors.



# 1981: big portable

- ⌘ Adam Osborne
- ⌘ first portable computer
- ⌘ the Osborne I
  - ☒ weighed 24 pounds
  - ☒ cost \$1,795
  - ☒ Used Z80 (NOT IBM-PC clone (yet!))



# 1981: Apollo - First Workstations

## ⌘ Apollo Computer

- ☑ first workstation
- ☑ offering more power than some minicomputers at a fraction of the price.





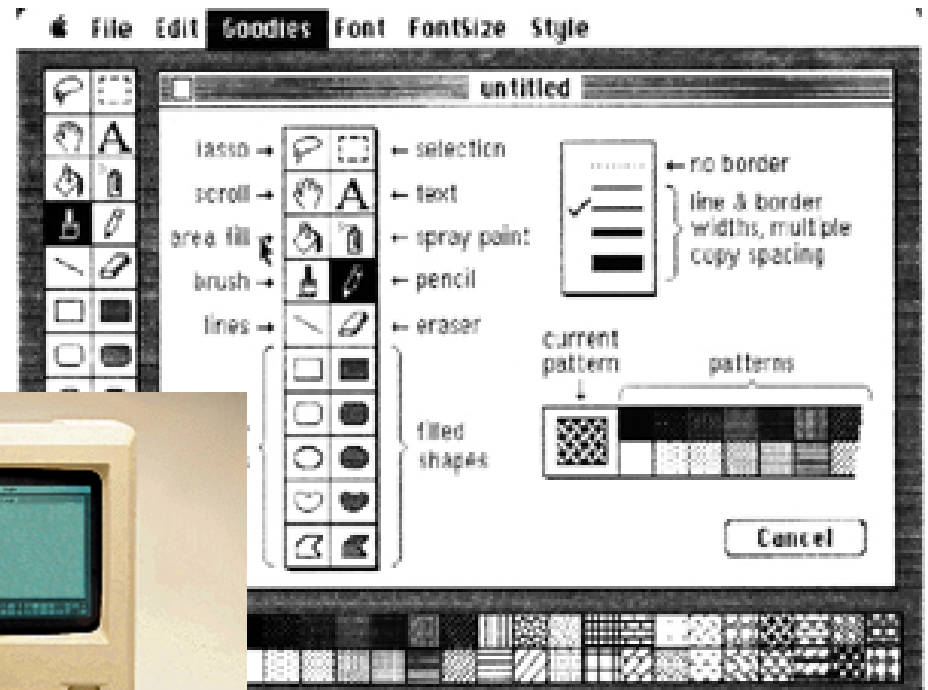
# 1982: SUN Microsystems

- ⌘ Sun Microsystems is founded in 1982.  
"SUN" - **Stanford University Network**.
- ⌘ Motto: "Network is the computer".
- ⌘ Four employees.
- ⌘ The SUN-2 features
  - ☒ a Motorola 68010 processor.
  - ☒ 4MB of memory
  - ☒ 400MB Fujitsu M2351 disk.



# 1984: Apple Macintosh

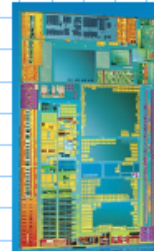
- ⌘ Apple Computer's **Steve Jobs**
- ⌘ **Apple Macintosh** at the Flint Center of DeAnza College in Cupertino, California.
- ⌘ **The Macintosh:**
  - ⏏ 8-MHz 32-bit Motorola 68000 CPU
  - ⏏ built-in 9-inch B/W screen
  - ⏏ 512x342 graphics
  - ⏏ 400KB 3.5-inch floppy disk drive
  - ⏏ Mouse
  - ⏏ 128KB RAM
  - ⏏ weighs 20 pounds
  - ⏏ Price: \$2500.



# Intel Processor History

Note Title

8/30/2011



4-bit

4004

8008

8080

8085

8086

8088

80286/80186

80386

486

Pentium

Pentium Pro

Pentium II

Celeron

Pentium III

Pentium 4

Itanium

Core Duo

Atom Z540  
N270

core i7

"Tunnel Creek"  
80632  
80618

"Stellarton"  
(Tunnel Creek)  
+ FPGA

Embedded Atom processor

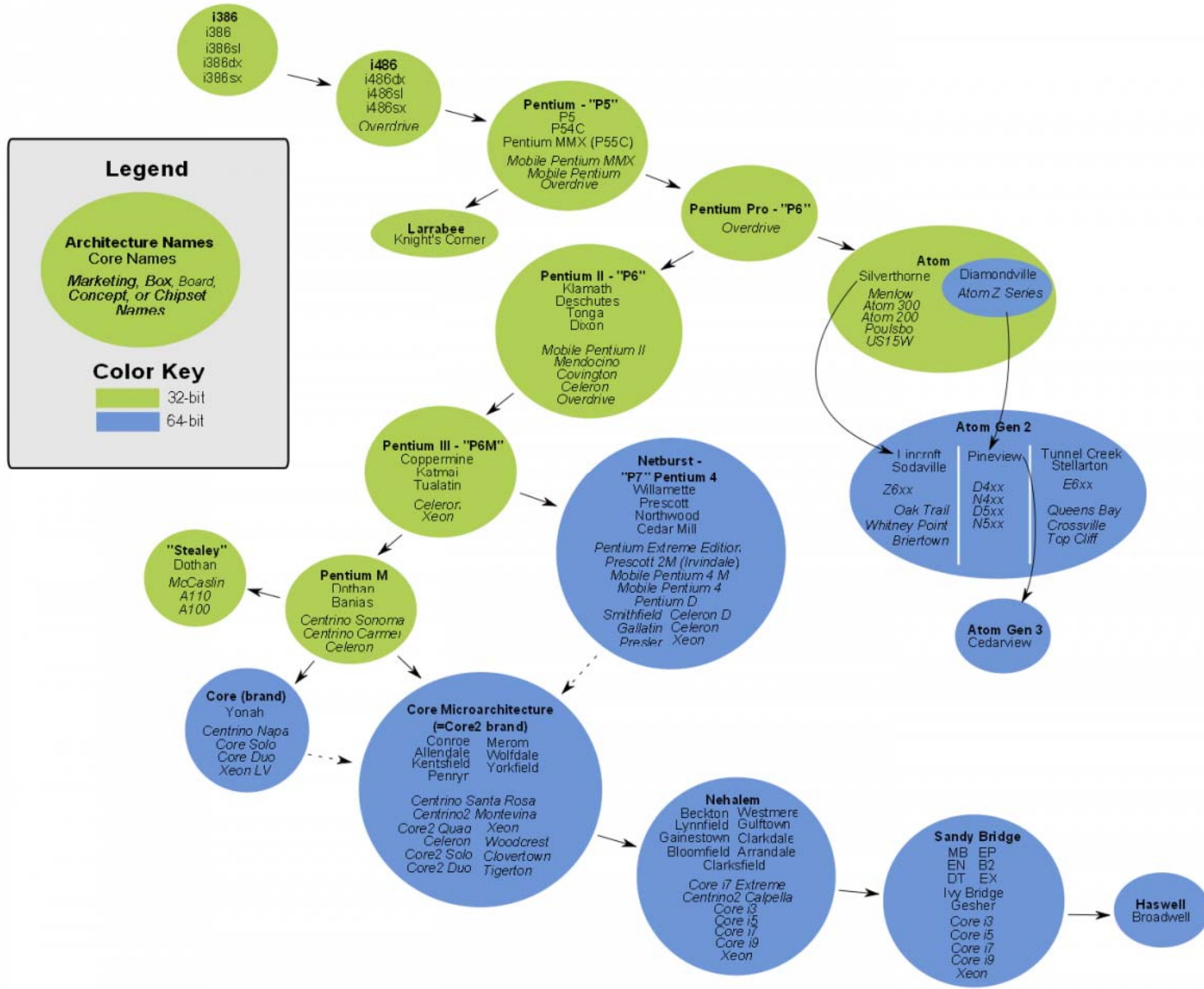
7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2

# Intel Side --- 8086 to Pentium Pro

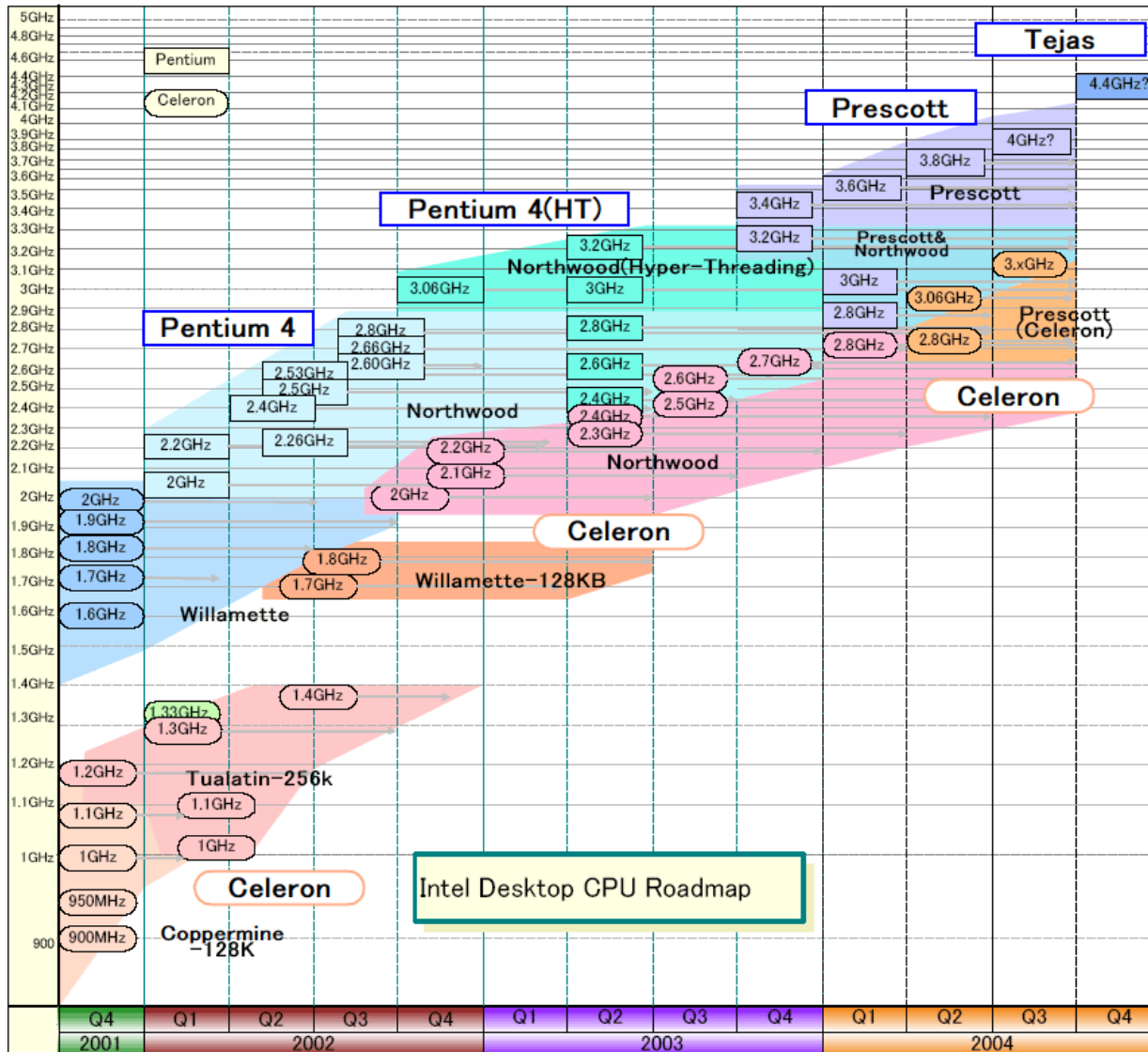
**Processor Performance Over Time and  
Other Key Features of the Intel Architecture**

Intel Processor	Date of Product Introduction	Performance in MIPs <sup>1</sup>	Max. CPU Frequency at Introduction	No. of Transistors on the Die	Main CPU Register Size <sup>2</sup>	Extern. Data Bus Size <sup>2</sup>	Max. Extern. Addr. Space
8086	1978	0.8	8 MHz	29 K	16	16	1 MB
Intel 286	1982	2.7	12.5 MHz	134 K	16	16	16 MB
Intel386™ DX	1985	6.0	20 MHz	275 K	32	32	4 GB
Intel486™ DX	1989	20	25 MHz	1.2 M	32	32	4 GB
Pentium®	1993	100	60 MHz	3.1 M	32	64	4 GB
Pentium Pro	1995	440	200 MHz	5.5 M	32	64	64 GB

### 32/64-bit Intel Architectures and their Core Names and Code Names



# Intel Side



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# Intel 805XX Product Codes

## Intel 805xx product codes

Intel discontinued the use of part numbers such as 80486 in the marketing of mainstream x86-architecture microprocessors with the introduction of the Pentium brand in 1993. However, numerical codes, in the 805xx range, continued to be assigned to these processors for internal and part numbering uses. The following is a list of such product codes in numerical order:

Product code	Marketing name(s)	Codename(s)
80500	Pentium	P5 (A-step)
80501	Pentium	P5
80502	Pentium	P54C, P54CS
80503	Pentium with MMX Technology	P55C, Tillamook
80521	Pentium Pro	P6
80522	Pentium II	Klamath
80523	Pentium II, Celeron, Pentium II Xeon	Deschutes, Covington, Drake
80524	Pentium II, Celeron	Dixon, Mendocino
80525	Pentium III, Pentium III Xeon	Katmai, Tanner
80526	Pentium III, Celeron, Pentium III Xeon	Coppermine, Cascades
80528	Pentium 4, Xeon	Willamette (Socket 423), Foster
80529	<i>cancelled</i>	Timna
80530	Pentium III, Celeron	Tualatin

# Intel 805XX Product Codes

80531	Pentium 4, Celeron	Willamette (Socket 478)
80532	Pentium 4, Celeron, Xeon	Northwood, Prestonia, Gallatin
80533	Pentium III	Coppermine (cD0-step)
80534	Pentium 4 SFF	Northwood (small form factor)
80535	Pentium M, Celeron M 310–340	Banias
80536	Pentium M, Celeron M 350–390	Dothan
80537	Core 2 Duo T5xxx, T7xxx, Celeron M 5xx	Merom
80538	Core Solo, Celeron M 4xx	Yonah
80539	Core Duo, Pentium Dual-Core T-series	Yonah
80541	Itanium	Merced
80542	Itanium 2	McKinley
80543	Itanium 2	Madison
80546	Pentium 4, Celeron D, Xeon	Prescott (Socket 478), Nocona, Irwindale, Cranford, Potomac
80547	Pentium 4, Celeron D	Prescott (LGA 775)
80548	<i> canceled </i>	Tejas and Jayhawk
80549	Itanium 2 90xx	Montecito



# Intel 805XX Product Codes

80550	Dual-Core Xeon 71xx	Tulsa
80551	Pentium D, Pentium EE, Dual-Core Xeon	Smithfield, Paxville DP
80552	Pentium 4, Celeron D	Cedar Mill
80553	Pentium D, Pentium EE	Presler
80554	Celeron 800/900/1000 ULV	Shelton
80555	Dual-Core Xeon 50xx	Dempsey
80556	Dual-Core Xeon 51xx	Woodcrest
80557	Core 2 Duo E4xxx, E6xxx, Dual-Core Xeon 30xx, Pentium Dual-Core E2xxx	Conroe
80560	Dual-Core Xeon 70xx	Paxville MP
80562	Core 2 Quad, Core 2 Extreme QX6xxx, Quad-Core Xeon 32xx	Kentsfield
80563	Quad-Core Xeon 53xx	Clovertown
80564	Xeon 7200	Tigerton-DC
80565	Xeon 7300	Tigerton
80566	Atom Z5xx	Silverthorne
80567	Itanium 91xx	Montvale
80569	Core 2 Quad Q9xxx, Core 2 Extreme QX9xxx, Xeon 33xx	Yorkfield

# Intel 805XX Product Codes

80570	Core 2 Duo E8xxx, Xeon 31xx	Wolfdale
80571	Core 2 Duo E7xxx, Pentium Dual-Core E5xxx, Pentium Dual-Core E2210	Wolfdale-3M
80573	Xeon 5200	Wolfdale-DP
80574	Core 2 Extreme QX9775, Xeon 5400	Harpertown
80576	Core 2 Duo P7xxx, T8xxx, P8xxx, T9xxx, P9xxx, SL9xxx, SP9xxx, Core 2 Extreme X9xxx	Penryn
80577	Core 2 Duo P7xxx, P8xxx, SU9xxx, T6xxx, T8xxx	Penryn-3M
80578	LE80578	Vermilion Range
80579	EP80579	Tolapai
80580	Core 2 Quad Q8xxx, Q9xxx, Xeon 33xx	Yorkfield-6M
80581	Core 2 Quad Q9xxx	Penryn-QC
80582	Xeon 74xx	Dunnington
80583	Xeon 74xx	Dunnington-QC
80584	Xeon X33x3 LV	Yorkfield CL
80585	Core 2 Solo SU3xxx, Celeron 7xx, 9xx	Penryn-L
80586	Atom 2xx, N2xx	Diamondville
80587	Atom 3xx	Diamondville DC
80588	Xeon L3014, E3113	Wolfdale-CL

# Intel 806XX Product Codes

## Intel 806xx product codes

Product code	Marketing name(s)	Codename(s)
80601	Core i7, Xeon 35xx	Bloomfield
80602	Xeon 55xx	Gainestown
80603	Itanium 93xx	Tukwila
80604	Xeon 65xx, Xeon 75xx	Beckton
80605	Core i5-7xx, Core i7-8xx, Xeon 34xx	Lynnfield
80606	<i>canceled</i>	Havendale
80607	Core i7-7xx QM, Core i7-8xx QM, Core i7-9xx XM	Clarksfield
80608	<i>canceled</i>	Auburndale
80609	Atom	Lincroft
80610	Atom N400, D400, D500	Pineview

# Intel 806XX Product Codes

80611	<i> canceled </i>	Larrabee
80612	Xeon C35xx, Xeon C55xx	Jasper Forest
80613	Core i7-9xxX, Xeon 36xx	Gulftown
80614	Xeon 56xx	Westmere-EP
80615	Xeon E7-28xx, Xeon E7-48xx	Westmere-EX
80616	Pentium G6xxx, Core i3-5xx, Core i5-6xx	Clarkdale
80617	Core i5-5xx, Core i7-6xxM/UM/LM	Arrandale
80618	Atom	Tunnel Creek
80620	Xeon	Sandy Bridge-EP-8, Sandy Bridge-EP-4
80621	Xeon	Sandy Bridge-EP-8, Sandy Bridge-EP-4
80622	Xeon	Sandy Bridge-EP-8
80623	Xeon E3-xxxx, Core i3/i5/i7-2xxx, Pentium Gxxx	Sandy Bridge-HE-4, Sandy Bridge-M-2
80627	Core i3/i5/i7-2xxxM,, Pentium Bxxx, Celeron Bxxx	Sandy Bridge-HE-4, Sandy Bridge-H-2, Sandy Bridge-M-2
80632	Atom	Tunnel Creek
80640	Atom	Penwell
80641	Atom	Cedar View