

Today's Topics

- ☐ What's a computer?
 - ☐ What's a computer for?
 - ☐ Classification of computers
 - ☐ Historical Development
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What's a computer?

A functional unit that can perform substantial computations, including numerous arithmetic operations and logic operations without human intervention during a run. In information processing, the term computer usually describes a digital computer. A computer may consist of a stand-alone unit or may consist of several interconnected units

Source: IBM Dictionary of Computing

What's a computer for?

In short, computing and data processing

- ☐ Science, Engineering & Architecture
 - ☐ Manufacturing
 - ☐ Business, e.g., ATM, Credit card, etc.
 - ☐ Education
 - ☐ Medicine & Health Care
 - ☐ Entertainment
 - ☐ Computer at home
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Classification (by scale)

- ☐ Wintel PC and its clones
- ☐ Apple McIntosh / iBook
- ☐ Workstation
- ☐ Mainframe
- ☐ Supercomputer



Personal
Computer

Classification (obsolete)

- ☐ Microcomputer
 - ☐ Minicomputer
 - ☐ Mainframe
 - ☐ Supercomputer
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Computer Generations

Generation	Technology	Typical Speed (Operations per second)	Typical Computer	Remark
First (1946-1957)	Vacuum Tube	40,000	UNIVAC	Machine Language
Second (1958-1964)	Transistor	200,000	IBM7094	High-level Language
Third (1965-1971)	Small and medium scale integration	1,000,000	IBM system/360	Multi-Processing OS

Computer Generations (Cont'd)

Generation	Technology	Typical Speed (Operations per second)	Typical Computer	Remark
Fourth (1972-1977)	Large scale integratiion	10,000,000	Apple	Parallel Processing Object-Oriented
Fifth (1978- 1991)	Very large scale integration	100,000,000	IBM PC UNIX Workstation	Computer Network Microprocessor
Sixth (1991 -)	Ultra large scale integration	1,000,000,000	Wintel PC, Apple McIntosh	Internet, WWW, E- commerce

Processor development

1980s Intel Processor

	80286	386TM DX	386TM SX	486TM DX
Introduced	1982	1985	1988	1989
Clock speed	6-12.5 MHz	16-33	16-33	25-50
Bus width	16	32	16	32
Number of transistors	134,000	275,000	275,000	1.2 M
Feature size (µm)	1.5	1	1	0.8-1
Addressable memory	16 MB	4 GB	16 MB	4 GB
Virtual memory	1 GB	64 TB	64 TB	64 TB

Processor development (cont'd)

1990s Intel Processor

	486TM SX	Pentium	Pentium Pro	Pentium II
Introduced	1991	1993	1995	1997
Clock speed	16-33	60-166	150-200	200-300
Bus width	32	32	64	64
Number of transistors	1.185 M	3.1 M	5.5 M	7.5 M
Feature size (µm)	1	0.8	0.6	0.35
Addressable memory	4 GB	4 GB	64 GB	64 GB
Virtual memory	64 TB	64 TB	64 TB	64 TB

Processor development (cont'd)

Recent Intel Processor

	Pentium III	Pentium 4	Itanium	Itanium 2
Introduced	1999	2000	2001	2002
Clock speed	450-660	1.3-1.8 GHz	733-800	900 MHz-1 GHz
Bus width	64	64	64	64
Number of transistors	9.5 M	42 M	25 M	220 M
Feature size (nm)	250	180	180	180
Addressable memory	64 GB	64 GB	64 GB	64 GB
Virtual memory	64 TB	64 TB	64 TB	64 TB

Processor development (cont'd)

Recent Intel Processor

	Core 2 Duo	Core 2 Quad	Core i5	Core i7
Introduced	2006	2008	2011	2011
Clock speed	1.06-1.2GHz	3 GHz	2.7-3.4 GHz	3.2-3.5 GHz
Bus width	64	64	64	64
Number of transistors	167 M	820 M	995 M	2270 M
Feature size (μm)	65	45	32	32
Addressable memory	64 GB	64 GB	64 GB	64 GB
Virtual memory	64 TB	64 TB	64 TB	64 TB

Source: Stallings' Computer Organization and Architecture, wikipedia

Moore's Law

- ❑ Gordon Moore (1965) stated
“The density of transistors in an integrated circuit will double every year.”
 - ❑ Now changed to
“The density of silicon chips double every 18 months.”
 - ❑ The effects: every year or two, the followings approximately double
 - Processor speeds
 - Memory required to run & Secondary storage
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Supercomputer's Performance

- ❑ Measured in GFLOPS (**G**iga **F**loating point **O**perations **P**er **S**econd), TFLOPS (Tera FLOPS) or PFLOPS (Peta FLOPS)
- ❑ Current Top 3 Supercomputers (PFLOPS)*
 - Fujitsu K Computer (Japan) 10.51
 - NUDT Tianhe-1A (China) 2.566
 - Cray Jaguar (US) 1.759

*Visit i.top500.org for more details on the ranking

Microprocessor's Performance

- ❑ Measured in MIPS (**M**illion **I**nstructions **p**er **s**econd)
 - ❑ Reported Data
 - Pentium Pro 541 @ 200 MHz
 - AMD Athlon 3561 @ 1.2 GHz
 - Pentium 4 Extreme 9726 @ 3.2 GHz
 - Core 2 X6800 27079 @ 2.93 GHz
 - Core i7 920 (quad) 82300 @ 2.66 GHz
 - Core i7 3960x (hex) 177730 @ 3.33 GHz
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Microprocessor's Performance

- ❑ Critics of MIPS refer to it as **Meaningless Indication of Processor Speed**" or "**Meaningless Information on Performance for Salespeople**" or "**Meaningless Integer Performance Spec.**"
 - ❑ Benchmarks such as SPECint, SPECfp by **Standard Performance Evaluation Corporation**
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Next Class's Topic

- Computer Organization
 - CPU
 - Memory
 - Auxiliary Memory
 - I/O Device
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